




Key Performance Indicator			
			
Line Counting			
Lines of Code	481219	↗	✓
Source Lines Of Code	401326	↗	✓
Effective Lines Of Code	325196	↗	✓
Cyclomatic Complexity	12265	↗	✓
Comment Rate	16 %	↘	✗
Decision Making			
Business Value	1912	→	I
Technical Debt	3626	↗	I
Maturity Index	65 %	↘	C
Stability Index	84 %	↗	B
Reusability Index	44 %	↘	D

## Squore 18.0.11

### Reference Manual

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# Reference Manual

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## Abstract

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## Table of Contents

1. Introduction .....	1
1.1. Foreword .....	1
1.2. About This Document .....	1
1.3. Contacting Squoring Technologies Product Support .....	1
1.4. Responsibilities .....	1
1.5. Getting the Latest Version of this Manual .....	2
2. Coding Standards .....	3
2.1. ABAP .....	3
2.1.1. ABAP Metrics .....	3
2.1.2. ABAP Ruleset .....	8
2.2. ADA .....	13
2.2.1. ADA Metrics .....	13
2.2.2. ADA Ruleset .....	21
2.3. C .....	23
2.3.1. C Metrics .....	23
2.3.2. C Ruleset .....	31
2.4. COBOL .....	35
2.4.1. COBOL Metrics .....	35
2.4.2. COBOL Ruleset .....	41
2.5. C++ .....	48
2.5.1. C++ Metrics .....	48
2.5.2. C++ Ruleset .....	57
2.6. C# .....	60
2.6.1. C# Metrics .....	60
2.6.2. C# Ruleset .....	69
2.7. Fortran .....	72
2.7.1. Fortran Metrics .....	72
2.7.2. Fortran Ruleset .....	77
2.8. Java .....	80
2.8.1. Java Metrics .....	80
2.8.2. Java Ruleset .....	87
2.9. Javascript .....	89
2.9.1. Javascript Metrics .....	89
2.9.2. Javascript Ruleset .....	94
2.10. MindC .....	97
2.10.1. MindC Metrics .....	97
2.10.2. MindC Ruleset .....	105
2.11. Objective-C .....	109
2.11.1. Objective-C Metrics .....	109
2.11.2. Objective-C Ruleset .....	117
2.12. PHP .....	120
2.12.1. PHP Metrics .....	120
2.12.2. PHP Ruleset .....	127
2.13. Python .....	130
2.13.1. Python Metrics .....	130
2.13.2. Python Ruleset .....	135
2.14. PL/SQL .....	138
2.14.1. PL/SQL Metrics .....	138
2.14.2. PL/SQL Ruleset .....	144
2.15. TSQL .....	146

2.15.1. TSQL Metrics .....	146
2.15.2. TSQL Ruleset .....	150
2.16. VB.net .....	152
2.16.1. VB.net Metrics .....	152
2.16.2. VB.net Ruleset .....	161
2.17. Xaml .....	164
2.17.1. Xaml Metrics .....	164
2.17.2. Xaml Ruleset .....	169
<b>3. Repository Connectors .....</b>	<b>173</b>
3.1. Folder Path .....	173
3.1.1. Description .....	173
3.1.2. Usage .....	173
3.2. Zip Upload .....	173
3.2.1. Description .....	173
3.2.2. Usage .....	173
3.3. CVS .....	173
3.3.1. Description .....	173
3.3.2. Usage .....	174
3.4. ClearCase .....	174
3.4.1. Description .....	174
3.4.2. Usage .....	174
3.5. Perforce .....	175
3.5.1. Description .....	175
3.5.2. Usage .....	175
3.6. Git .....	176
3.6.1. Description .....	176
3.6.2. Usage .....	176
3.7. PTC Integrity .....	176
3.7.1. Description .....	177
3.7.2. Usage .....	177
3.8. TFS .....	177
3.8.1. Description .....	177
3.8.2. Usage .....	178
3.9. Synergy .....	178
3.9.1. Description .....	178
3.9.2. Usage .....	179
3.10. SVN .....	179
3.10.1. Description .....	179
3.10.2. Usage .....	180
3.11. Using Multiple Nodes .....	180
<b>4. Data Providers .....</b>	<b>181</b>
4.1. AntiC .....	181
4.1.1. Description .....	181
4.1.2. Usage .....	181
4.2. Automotive Coverage Import .....	181
4.2.1. Description .....	181
4.2.2. Usage .....	181
4.3. Automotive Tag Import .....	181
4.3.1. Description .....	182
4.3.2. Usage .....	182
4.4. BullseyeCoverage Code Coverage Analyzer .....	182
4.4.1. Description .....	182
4.4.2. Usage .....	182

4.5. CPD .....	182
4.5.1. Description .....	182
4.5.2. Usage .....	182
4.6. Cppcheck .....	183
4.6.1. Description .....	183
4.6.2. Usage .....	183
4.7. Cppcheck (plugin) .....	183
4.7.1. Description .....	183
4.7.2. Usage .....	183
4.8. CPPTest .....	183
4.8.1. Description .....	184
4.8.2. Usage .....	184
4.9. Cantata .....	184
4.9.1. Description .....	184
4.9.2. Usage .....	184
4.10. CheckStyle .....	184
4.10.1. Description .....	184
4.10.2. Usage .....	184
4.11. CheckStyle (plugin) .....	185
4.11.1. Description .....	185
4.11.2. Usage .....	185
4.12. CheckStyle for SQALE (plugin) .....	185
4.12.1. Description .....	185
4.12.2. Usage .....	186
4.13. Cobertura format .....	186
4.13.1. Description .....	186
4.13.2. Usage .....	186
4.14. CodeSonar .....	186
4.14.1. Description .....	186
4.14.2. Usage .....	186
4.15. Compiler .....	187
4.15.1. Description .....	187
4.15.2. Usage .....	187
4.16. Coverity .....	187
4.16.1. Description .....	187
4.16.2. Usage .....	187
4.17. ESLint .....	187
4.17.1. Description .....	187
4.17.2. Usage .....	188
4.18. FindBugs .....	188
4.18.1. Description .....	188
4.18.2. Usage .....	188
4.19. FindBugs (plugin) .....	188
4.19.1. Description .....	188
4.19.2. Usage .....	189
4.20. Function Relaxer .....	189
4.20.1. Description .....	189
4.20.2. Usage .....	189
4.21. FxCop .....	189
4.21.1. Description .....	189
4.21.2. Usage .....	189
4.22. GCov .....	190
4.22.1. Description .....	190

4.22.2. Usage .....	190
4.23. GNATcheck .....	190
4.23.1. Description .....	190
4.23.2. Usage .....	190
4.24. GNATCompiler .....	190
4.24.1. Description .....	190
4.24.2. Usage .....	191
4.25. JSHint .....	191
4.25.1. Description .....	191
4.25.2. Usage .....	191
4.26. JUnit Format .....	191
4.26.1. Description .....	191
4.26.2. Usage .....	191
4.27. JaCoCo .....	192
4.27.1. Description .....	192
4.27.2. Usage .....	192
4.28. Klocwork .....	192
4.28.1. Description .....	192
4.28.2. Usage .....	192
4.29. Rational Logiscope .....	193
4.29.1. Description .....	193
4.29.2. Usage .....	193
4.30. MSTest .....	193
4.30.1. Description .....	193
4.30.2. Usage .....	193
4.31. MemUsage .....	193
4.31.1. Description .....	193
4.31.2. Usage .....	193
4.32. NCover .....	194
4.32.1. Description .....	194
4.32.2. Usage .....	194
4.33. Oracle PLSQL compiler Warning checker .....	194
4.33.1. Description .....	194
4.33.2. Usage .....	194
4.34. MISRA Rule Checking using PC-lint .....	195
4.34.1. Description .....	195
4.34.2. Usage .....	195
4.35. PMD .....	195
4.35.1. Description .....	195
4.35.2. Usage .....	195
4.36. PMD (plugin) .....	195
4.36.1. Description .....	195
4.36.2. Usage .....	196
4.37. Polyspace .....	196
4.37.1. Description .....	196
4.37.2. Usage .....	196
4.38. MISRA Rule Checking with QAC .....	196
4.38.1. Description .....	196
4.38.2. Usage .....	197
4.39. Unit Test Status from Rational Test RealTime .....	197
4.39.1. Description .....	197
4.39.2. Usage .....	197
4.40. ReqIF .....	197

4.40.1. Description .....	197
4.40.2. Usage .....	198
4.41. SQL Code Guard .....	198
4.41.1. Description .....	198
4.41.2. Usage .....	198
4.42. Squan Sources .....	198
4.42.1. Description .....	198
4.42.2. Usage .....	199
4.43. Squore Import .....	201
4.43.1. Description .....	201
4.43.2. Usage .....	201
4.44. Squore Virtual Project .....	201
4.44.1. Description .....	201
4.44.2. Usage .....	201
4.45. StyleCop .....	201
4.45.1. Description .....	201
4.45.2. Usage .....	202
4.46. StyleCop (plugin) .....	202
4.46.1. Description .....	202
4.46.2. Usage .....	202
4.47. Tessy .....	202
4.47.1. Description .....	202
4.47.2. Usage .....	202
4.48. VectorCAST .....	203
4.48.1. Description .....	203
4.48.2. Usage .....	203
4.49. CodeSniffer .....	203
4.49.1. Description .....	203
4.49.2. Usage .....	203
4.50. Configuration Checker .....	203
4.50.1. Description .....	204
4.50.2. Usage .....	204
4.51. Csv Coverage Import .....	204
4.51.1. Description .....	204
4.51.2. Usage .....	204
4.52. CSV Findings .....	204
4.52.1. Description .....	204
4.52.2. Usage .....	204
4.53. CSV Import .....	205
4.53.1. Description .....	205
4.53.2. Usage .....	205
4.54. Csv Tag Import .....	206
4.54.1. Description .....	206
4.54.2. Usage .....	206
4.55. CPU Data Import .....	206
4.55.1. Description .....	206
4.55.2. Usage .....	206
4.56. Memory Data Import .....	207
4.56.1. Description .....	207
4.56.2. Usage .....	207
4.57. Stack Data Import .....	207
4.57.1. Description .....	207
4.57.2. Usage .....	207

4.58. Ticket Data Import .....	208
4.58.1. Description .....	208
4.58.2. Usage .....	208
4.59. Jira .....	210
4.59.1. Description .....	210
4.59.2. Usage .....	210
4.60. Mantis .....	211
4.60.1. Description .....	211
4.60.2. Usage .....	211
4.61. OSLC .....	212
4.61.1. Description .....	212
4.61.2. Usage .....	212
4.62. pep8 .....	212
4.62.1. Description .....	212
4.62.2. Usage .....	212
4.63. pycodestyle / pep8 (plugin) .....	213
4.63.1. Description .....	213
4.63.2. Usage .....	213
4.64. PHP Code Coverage .....	213
4.64.1. Description .....	213
4.64.2. Usage .....	213
4.65. pylint .....	213
4.65.1. Description .....	213
4.65.2. Usage .....	214
4.66. pylint (plugin) .....	214
4.66.1. Description .....	214
4.66.2. Usage .....	214
4.67. Qac_8_2 .....	214
4.67.1. Description .....	214
4.67.2. Usage .....	214
4.68. Qac_8_2 CERT Import .....	214
4.68.1. Description .....	214
4.68.2. Usage .....	215
4.69. SonarQube .....	215
4.69.1. Description .....	215
4.69.2. Usage .....	215
4.70. Adding More Languages to Squan Sources .....	215
4.71. Advanced COBOL Parsing .....	218
4.72. Using Data Provider Input Files From Version Control .....	218
4.73. Providing a catalog file to a Data Provider for Offline XSL Transformations .....	219
4.74. Creating your own Data Providers and Repository Connectors .....	220
4.74.1. Data Provider Parameters .....	220
4.74.2. Localising your Data Provider .....	223
4.74.3. Running your Data Provider .....	225
4.74.4. Built-in Data Provider Frameworks .....	230
5. Cloning Detection .....	232
5.1. Cloning Metrics .....	232
5.1.1. CCLC - Code Cloning Line Counting .....	232
5.1.2. CC - Code Cloned .....	232
5.1.3. CFTC - Control Flow Token (CFT) Cloned .....	232
5.1.4. CAC - Children Artefact Cloned .....	232
5.1.5. CN - Clones Number .....	233
5.1.6. RS - Repeated Substrings (Repeated Code Blocks) .....	233



5.1.7. CFTRS - Repeated Substrings in Control Flow Token .....	233
5.1.8. ICC - Inner Code Cloned .....	233
5.1.9. ICFTC - Inner Control Flow Token Cloned .....	233
5.2. Cloning Violations .....	234
5.2.1. CC (R_NOCC) .....	234
5.2.2. CFTC (R_NOCFTC) .....	234
5.2.3. CAC (R_NOCAC) .....	234
5.2.4. RS (R_NORS) .....	234
5.2.5. CFTRS (R_NOCFTRS) .....	234
6. Glossary .....	235
6.1. Acceptance Testing .....	235
6.2. Accessibility .....	235
6.3. Accuracy .....	235
6.4. Accuracy of Measurement .....	236
6.5. Acquirer .....	236
6.6. Action .....	237
6.7. Activity .....	237
6.8. Actor .....	238
6.9. Adaptability .....	238
6.10. Agreement .....	239
6.11. Analysability .....	239
6.12. Analysis Model .....	239
6.13. Architecture .....	239
6.14. Attractiveness .....	240
6.15. Attribute .....	240
6.16. Availability .....	241
6.17. Base Measure .....	241
6.18. Baseline .....	242
6.19. Branch .....	242
6.20. Branch Coverage .....	243
6.21. Branch Testing .....	243
6.22. Budget .....	244
6.23. Build .....	244
6.24. Call Graph .....	244
6.25. Capability Maturity Model .....	245
6.26. Certification .....	245
6.27. Certification Criteria .....	245
6.28. Change Control Board .....	246
6.29. Change Control System .....	246
6.30. Change Management .....	246
6.31. Changeability .....	247
6.32. Co-existence .....	247
6.33. Code .....	247
6.34. Code Coverage .....	248
6.35. Code Freeze .....	248
6.36. Code Review .....	248
6.37. Code Verification .....	248
6.38. Coding .....	249
6.39. Cohesion .....	249
6.40. Commercial-Off-The-Shelf (COTS) .....	250
6.41. Commit .....	250
6.42. Commitment .....	250
6.43. Compatibility .....	251

6.44. Complexity .....	251
6.45. Component .....	252
6.46. Conciseness .....	252
6.47. Condition .....	253
6.48. Configuration .....	253
6.49. Configuration Control .....	253
6.50. Configuration Item .....	254
6.51. Configuration Management .....	255
6.52. Configuration Management System .....	255
6.53. Conflict .....	256
6.54. Conformance .....	256
6.55. Connectivity .....	257
6.56. Consistency .....	257
6.57. Constraint .....	257
6.58. Content Coupling .....	258
6.59. Context of Use .....	258
6.60. Contract .....	258
6.61. Control Coupling .....	259
6.62. Control Flow .....	259
6.63. Control Flow Diagram .....	259
6.64. Convention .....	260
6.65. Correctability .....	260
6.66. Correctness .....	260
6.67. Coupling .....	261
6.68. Coverage .....	261
6.69. Criteria .....	262
6.70. Criticality .....	262
6.71. Custom Software .....	262
6.72. Customer .....	263
6.73. Data .....	263
6.74. Data Coupling .....	264
6.75. Data Flow .....	264
6.76. Data Flow Diagram .....	265
6.77. Data Management .....	265
6.78. Data Model .....	265
6.79. Data Processing .....	266
6.80. Data Provider .....	266
6.81. Data Store .....	267
6.82. Data Type .....	267
6.83. Database .....	267
6.84. Decision Criteria .....	268
6.85. Decoupling .....	268
6.86. Defect .....	268
6.87. Degree of Confidence .....	269
6.88. Deliverable .....	269
6.89. Delivery .....	269
6.90. Dependability .....	270
6.91. Deployment .....	270
6.92. Derived Measure .....	270
6.93. Design .....	271
6.94. Design Pattern .....	271
6.95. Developer .....	272
6.96. Development .....	272

6.97. Development Testing .....	273
6.98. Direct Measure .....	273
6.99. Direct Metric .....	274
6.100. Document .....	274
6.101. Documentation .....	275
6.102. Dynamic Analysis .....	276
6.103. Earned Value .....	276
6.104. Effectiveness .....	276
6.105. Efficiency .....	276
6.106. Efficiency Compliance .....	277
6.107. Effort .....	277
6.108. Encapsulation .....	277
6.109. End User .....	278
6.110. Entity .....	278
6.111. Entry Point .....	279
6.112. Environment .....	279
6.113. Error .....	280
6.114. Error Tolerance .....	280
6.115. Evaluation .....	280
6.116. Evaluation Activity .....	281
6.117. Evaluation Group .....	281
6.118. Evaluation Method .....	282
6.119. Evaluation Module .....	282
6.120. Evaluation Technology .....	283
6.121. Evaluation Tool .....	283
6.122. Execute .....	283
6.123. Execution Efficiency .....	284
6.124. Execution Time .....	284
6.125. Exit .....	284
6.126. Expandability .....	284
6.127. Extendability .....	285
6.128. External Attribute .....	285
6.129. External Measure .....	285
6.130. External Quality .....	286
6.131. External Software Quality .....	286
6.132. Facility .....	287
6.133. Failure .....	287
6.134. Failure Rate .....	288
6.135. Fault .....	289
6.136. Fault Tolerance .....	289
6.137. Feasibility .....	290
6.138. Feature .....	290
6.139. Feature Freeze .....	290
6.140. Finite State Machine .....	291
6.141. Flexibility .....	291
6.142. Frozen Branch .....	291
6.143. Function .....	291
6.144. Functional Analysis .....	292
6.145. Functional Requirement .....	292
6.146. Functional Size .....	293
6.147. Functional Testing .....	293
6.148. Functional Unit .....	293
6.149. Functionality .....	293

6.150. Functionality Compliance .....	294
6.151. Generality .....	294
6.152. Generic Practice .....	294
6.153. Glossary .....	295
6.154. Goal .....	295
6.155. Granularity .....	295
6.156. Historical Information .....	295
6.157. Hybrid Coupling .....	295
6.158. Impact Analysis .....	296
6.159. Implementation .....	296
6.160. Implied Needs .....	297
6.161. Incremental Development .....	297
6.162. Indicator .....	297
6.163. Indicator Value .....	298
6.164. Indirect Measure .....	298
6.165. Indirect Metric .....	299
6.166. Information .....	299
6.167. Information Analysis .....	299
6.168. Information Management .....	299
6.169. Information Need .....	300
6.170. Information Product .....	300
6.171. Inspection .....	300
6.172. Installability .....	301
6.173. Installation Manual .....	301
6.174. Integration .....	301
6.175. Integration Test .....	302
6.176. Integrity .....	302
6.177. Interface Testing .....	302
6.178. Intermediate Software Product .....	302
6.179. Internal Attribute .....	303
6.180. Internal Measure .....	303
6.181. Internal Quality .....	304
6.182. Internal Software Quality .....	304
6.183. Interoperability .....	305
6.184. Interoperability Testing .....	305
6.185. Interval Scale .....	305
6.186. Item .....	306
6.187. Iteration .....	306
6.188. Key Practices .....	306
6.189. Key Process Area .....	307
6.190. Knowledge Base .....	307
6.191. Learnability .....	307
6.192. Lessons Learned .....	308
6.193. Level of Performance .....	308
6.194. Life Cycle .....	308
6.195. Life Cycle Model .....	309
6.196. Maintainability .....	309
6.197. Maintainability Compliance .....	310
6.198. Maintainer .....	310
6.199. Maintenance .....	310
6.200. Maintenance Manual .....	311
6.201. Maturity .....	312
6.202. Measurable Concept .....	312

6.203. Measurand .....	312
6.204. Measure .....	312
6.205. Measurement .....	313
6.206. Measurement Analyst .....	314
6.207. Measurement Experience Base .....	314
6.208. Measurement Function .....	314
6.209. Measurement Method .....	315
6.210. Measurement Procedure .....	315
6.211. Measurement Process .....	316
6.212. Measurement Process Owner .....	316
6.213. Measurement Sponsor .....	316
6.214. Measurement User .....	316
6.215. Metric .....	317
6.216. Milestone .....	317
6.217. Mock Object .....	318
6.218. Model .....	318
6.219. Modifiability .....	318
6.220. Modifiable .....	319
6.221. Modularity .....	319
6.222. Module .....	319
6.223. Moke Object .....	320
6.224. Multidimensional Analysis .....	320
6.225. Network .....	320
6.226. Nonfunctional Requirement .....	321
6.227. Nontechnical Requirement .....	321
6.228. Object .....	321
6.229. Object Model .....	322
6.230. Object Oriented Design .....	322
6.231. Observation .....	322
6.232. Observation Period .....	323
6.233. Operability .....	323
6.234. Operand .....	323
6.235. Operational Testing .....	324
6.236. Operator .....	324
6.237. Operator Manual .....	325
6.238. Optional Attribute .....	325
6.239. Optional Requirement .....	325
6.240. Organisational Unit .....	326
6.241. Path .....	326
6.242. Path Analysis .....	326
6.243. Path Testing .....	327
6.244. Pathological Coupling .....	327
6.245. Peer Review .....	327
6.246. Performance .....	328
6.247. Performance Indicator .....	328
6.248. Performance Testing .....	329
6.249. Pilot Project .....	329
6.250. Portability .....	329
6.251. Portability Compliance .....	329
6.252. Practice .....	330
6.253. Precision .....	330
6.254. Predictive Metric .....	331
6.255. Procedure .....	331

6.256. Process .....	331
6.257. Process Assessment .....	332
6.258. Process Assessment Model .....	332
6.259. Process Capability .....	333
6.260. Process Capability Determination .....	333
6.261. Process Capability Level .....	333
6.262. Process Context .....	333
6.263. Process Improvement .....	334
6.264. Process Improvement Objective .....	334
6.265. Process Improvement Program .....	334
6.266. Process Improvement Project .....	335
6.267. Process Metric .....	335
6.268. Process Outcome .....	335
6.269. Process Performance .....	336
6.270. Process Purpose .....	336
6.271. Product .....	337
6.272. Product Line .....	338
6.273. Product Metric .....	338
6.274. Productivity .....	338
6.275. Programmer Manual .....	338
6.276. Project .....	339
6.277. Project Management .....	339
6.278. Project Phase .....	340
6.279. Prototype .....	340
6.280. Qualification .....	341
6.281. Qualification Testing .....	341
6.282. Quality .....	341
6.283. Quality Assurance .....	342
6.284. Quality Control .....	343
6.285. Quality Evaluation .....	343
6.286. Quality Factor .....	344
6.287. Quality Management .....	344
6.288. Quality Measure Element .....	344
6.289. Quality Metric .....	345
6.290. Quality Model .....	345
6.291. Quality in Use .....	345
6.292. Rating .....	346
6.293. Rating Level .....	347
6.294. Readability .....	347
6.295. Recoverability .....	347
6.296. Recovery .....	348
6.297. Reengineering .....	348
6.298. Regression Testing .....	348
6.299. Release .....	349
6.300. Reliability .....	349
6.301. Reliability Compliance .....	350
6.302. Repeatability of Results of Measurements .....	350
6.303. Replaceability .....	351
6.304. Reproducibility of Results of Measurements .....	351
6.305. Request For Change .....	352
6.306. Request For Information .....	352
6.307. Request For Proposal .....	352
6.308. Requirement .....	352

6.309. Requirements Analysis .....	353
6.310. Requirements Derivation .....	354
6.311. Requirements Document .....	354
6.312. Requirements Engineering .....	354
6.313. Requirements Partitioning .....	355
6.314. Requirements Review .....	355
6.315. Requirements Specification .....	355
6.316. Requirements Traceability .....	356
6.317. Requirements Traceability Matrix .....	356
6.318. Resource .....	357
6.319. Resource Utilisation .....	357
6.320. Result .....	357
6.321. Retirement .....	358
6.322. Reverse Engineering .....	358
6.323. Risk .....	359
6.324. Risk Acceptance .....	359
6.325. Risk Analysis .....	360
6.326. Robustness .....	360
6.327. Role .....	360
6.328. Routine .....	361
6.329. Run .....	361
6.330. Safety .....	362
6.331. Satisfaction .....	362
6.332. Scale .....	362
6.333. Security .....	363
6.334. Service .....	364
6.335. Service Level Agreement .....	364
6.336. Simplicity .....	364
6.337. Software .....	365
6.338. Software Asset Management .....	365
6.339. Software Development Process .....	366
6.340. Software Engineering .....	366
6.341. Software Item .....	366
6.342. Software Life Cycle .....	367
6.343. Software Product Evaluation .....	367
6.344. Software Quality .....	368
6.345. Software Quality Characteristic .....	368
6.346. Software Quality Evaluation .....	368
6.347. Software Quality Measure .....	369
6.348. Software Repository .....	369
6.349. Software Unit .....	369
6.350. Source Code .....	370
6.351. Specification .....	370
6.352. Stability .....	370
6.353. Stage .....	371
6.354. Stakeholder .....	371
6.355. Standard .....	372
6.356. Standard Process .....	372
6.357. Statement .....	372
6.358. Statement Testing .....	373
6.359. Statement of Work .....	373
6.360. Static Analysis .....	373
6.361. Statistical Process Control .....	374

6.362. Step .....	375
6.363. Stress Testing .....	375
6.364. Structural Testing .....	375
6.365. Stub .....	376
6.366. Suitability .....	376
6.367. Supplier .....	377
6.368. Support .....	377
6.369. Support Manual .....	378
6.370. System .....	378
6.371. System Testing .....	378
6.372. Task .....	379
6.373. Technical Requirement .....	379
6.374. Technique .....	380
6.375. Test .....	380
6.376. Test Case .....	381
6.377. Test Case Suite .....	381
6.378. Test Coverage .....	381
6.379. Test Documentation .....	382
6.380. Test Environment .....	382
6.381. Test Objective .....	383
6.382. Test Plan .....	383
6.383. Test Procedure .....	383
6.384. Testability .....	384
6.385. Testing .....	384
6.386. Testing Description .....	385
6.387. Time Behaviour .....	385
6.388. Tool .....	386
6.389. Total Quality Management .....	386
6.390. Traceability .....	386
6.391. Traceable .....	387
6.392. Trunk .....	387
6.393. Understandability .....	387
6.394. Unit Test .....	388
6.395. Unit of Measurement .....	388
6.396. Usability .....	389
6.397. Usability Compliance .....	389
6.398. User .....	389
6.399. User Documentation .....	390
6.400. User Manual .....	391
6.401. Validation .....	391
6.402. Value .....	393
6.403. Verification .....	393
6.404. Version .....	394
6.405. Work Breakdown Structure .....	394
6.406. Work Product .....	395
<b>7. Standards .....</b>	<b>396</b>
7.1. CMMi .....	396
7.2. DOD-STD-2167A .....	396
7.3. IEC 61508 .....	397
7.4. IEC 61508-3 .....	397
7.5. IEC 61508-7 .....	397
7.6. IEEE 1012 .....	398
7.7. IEEE 1058 .....	398



7.8. IEEE 1061 .....	398
7.9. IEEE 1074 .....	398
7.10. IEEE 1220 .....	399
7.11. IEEE 1233 .....	399
7.12. IEEE 1320 .....	399
7.13. IEEE 1362 .....	399
7.14. IEEE 1490 .....	400
7.15. IEEE 610.12 .....	400
7.16. IEEE 829 .....	400
7.17. IEEE 830 .....	400
7.18. IEEE 982 .....	401
7.19. ISO 5806 .....	401
7.20. ISO 8402 .....	401
7.21. ISO 9001 .....	401
7.22. ISO 9127 .....	401
7.23. ISO 9241 .....	402
7.24. ISO 9241-10 .....	403
7.25. ISO 9241-11 .....	404
7.26. ISO/IEC 12119 .....	405
7.27. ISO/IEC 12207 .....	405
7.28. ISO/IEC 14143 .....	405
7.29. ISO/IEC 14143-1 .....	406
7.30. ISO/IEC 14143-3 .....	406
7.31. ISO/IEC 14598 .....	407
7.32. ISO/IEC 14598-1 .....	407
7.33. ISO/IEC 14598-2 .....	408
7.34. ISO/IEC 14598-3 .....	408
7.35. ISO/IEC 14598-4 .....	409
7.36. ISO/IEC 14598-5 .....	409
7.37. ISO/IEC 14598-6 .....	410
7.38. ISO/IEC 14756 .....	410
7.39. ISO/IEC 14764 .....	410
7.40. ISO/IEC 15026 .....	411
7.41. ISO/IEC 15026-1 .....	411
7.42. ISO/IEC 15026-2 .....	411
7.43. ISO/IEC 15288 .....	412
7.44. ISO/IEC 15289 .....	412
7.45. ISO/IEC 15414 .....	413
7.46. ISO/IEC 15474 .....	413
7.47. ISO/IEC 15474-1 .....	413
7.48. ISO/IEC 15474-2 .....	414
7.49. ISO/IEC 15504 .....	414
7.50. ISO/IEC 15504-1 .....	415
7.51. ISO/IEC 15504-2 .....	415
7.52. ISO/IEC 15504-3 .....	416
7.53. ISO/IEC 15504-4 .....	416
7.54. ISO/IEC 15504-5 .....	417
7.55. ISO/IEC 15504-6 .....	418
7.56. ISO/IEC 15504-7 .....	418
7.57. ISO/IEC 15846 .....	419
7.58. ISO/IEC 15910 .....	419
7.59. ISO/IEC 15939 .....	420
7.60. ISO/IEC 19759 .....	420

7.61. ISO/IEC 19770 .....	420
7.62. ISO/IEC 19770-1 .....	421
7.63. ISO/IEC 19770-2 .....	421
7.64. ISO/IEC 20000 .....	422
7.65. ISO/IEC 2382 .....	422
7.66. ISO/IEC 2382-1 .....	423
7.67. ISO/IEC 25000 .....	424
7.68. ISO/IEC 25001 .....	424
7.69. ISO/IEC 25010 .....	425
7.70. ISO/IEC 25012 .....	425
7.71. ISO/IEC 25020 .....	425
7.72. ISO/IEC 25021 .....	426
7.73. ISO/IEC 25030 .....	426
7.74. ISO/IEC 25040 .....	427
7.75. ISO/IEC 25045 .....	427
7.76. ISO/IEC 25051 .....	427
7.77. ISO/IEC 25060 .....	428
7.78. ISO/IEC 25062 .....	428
7.79. ISO/IEC 26514 .....	429
7.80. ISO/IEC 29881 .....	429
7.81. ISO/IEC 90003 .....	429
7.82. ISO/IEC 9126 .....	429
7.83. ISO/IEC 9126-1 .....	430
7.84. ISO/IEC 9126-2 .....	431
7.85. ISO/IEC 9126-3 .....	431
7.86. ISO/IEC 9126-4 .....	432
7.87. ISO/IEC 9294 .....	432
7.88. ISO/IEC 99 .....	433
7.89. ISO/IEC SQuaRE .....	433
7.90. ISO/IEC/IEEE 15289 .....	434
7.91. ISO/IEC/IEEE 24765 .....	435
7.92. RTCA/EUROCAE .....	435
7.93. SIGIST .....	435
7.94. Team Software Process .....	435
<b>A. Data Provider Frameworks .....</b>	<b>437</b>
A.1. Current Frameworks .....	437
A.2. Legacy Frameworks .....	441
<b>B. Squore XML Schemas .....</b>	<b>467</b>
input-data-2.xsd .....	467
form.xsd .....	469
properties-1.2.xsd .....	471
config-1.3.xsd .....	472
analysis.xsd .....	474
decision.xsd .....	479
description.xsd .....	480
exports.xsd .....	481
highlights.xsd .....	482
properties.xsd .....	485
tutorials.xsd .....	486
wizards.xsd .....	493
<b>C. Licences .....</b>	<b>497</b>
Software Licence Agreement .....	497
Redistributed Software .....	503

Licences .....	504
Index .....	570

# 1. Introduction

## 1.1. Foreword

This document was released by Squoring Technologies.

It is part of the user documentation of the Squore software product edited and distributed by Squoring Technologies.

## 1.2. About This Document

The Reference Manual provides a complete reference for the metrics, glossary and standards used in Squore 18.0.11.

This manual is intended for Squore administrators and end-users. It gives useful information about the technical background of Squore and important knowledge basis to understand what is measured and how.

If you are already familiar with Squore, you can navigate this manual by looking for what has changed since the previous version. New functionality is tagged with **(new in 18.0)** throughout this manual. A summary of the new features described in this manual is available in the entry **\*\*\* What's New in Squore 18.0?** of this manual's Index.

For information on how to use and configure Squore, the full suite of manuals includes:

- Squore Installation Checklist
- Squore Installation and Administration Guide
- Squore Getting Started Guide
- Squore Command Line Interface
- Squore Configuration Guide
- Squore Eclipse Plugin Guide
- Squore Reference Manual


## 1.3. Contacting Squoring Technologies Product Support

If the information provided in this manual is erroneous or inaccurate, or if you encounter problems during your installation, contact Squoring Technologies Product Support: <https://support.squoring.com/>

You will need a valid Squore customer account to submit a support request. You can create an account on the support website if you do not have one already.

For any communication:

 [support@squoring.com](mailto:support@squoring.com)

 **Squoring Technologies Product Support**  
76, allées Jean Jaurès / 31000 Toulouse - FRANCE

## 1.4. Responsibilities

Approval of this version of the document and any further updates are the responsibility of Squoring Technologies.

## 1.5. Getting the Latest Version of this Manual

The version of this manual included in your Squore installation may have been updated. If you would like to check for updated user guides, consult the Squoring Technologies documentation site to consult or download the latest Squore manuals at <https://support.squoring.com/documentation/18.0.11>. Manuals are constantly updated and published as soon as they are available.

## 2. Coding Standards

This chapter describes the list of metrics and rules for each language supported by . Note that this is not the complete list of metrics and rules in , only the ones generated by our source code parser. Some of the rules may also be disabled by default in your configuration. For more information about your analysis model, consult 's and , which provide more information about each metric and rule.

### 2.1. ABAP

#### 2.1.1. ABAP Metrics

##### **Andthen Operators**

- **Mnemonic** ANTH
- **Description** Number of 'andthen' operators

##### **Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

##### **Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

##### **Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

##### **Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

##### **Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

##### **Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

##### **Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

##### **Code Cloning Line Counting**

- **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Number of Check instruction**

→ **Mnemonic** CHECK

→ **Description** Number of Check instruction

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

#### **Public Constant**

→ **Mnemonic** CPBL

→ **Description** Public Constant

#### **Protected Constant**

→ **Mnemonic** CPRT

→ **Description** Protected Constant

#### **Private Constant**

→ **Mnemonic** CPRV

→ **Description** Private Constant

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### **Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### Default Statement

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

#### Distinct Operands

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### Distinct Operators

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### Public Data

→ **Mnemonic** DPBL

→ **Description** Public Data

#### Protected Data

→ **Mnemonic** DPRT

→ **Description** Protected Data

#### Private Data

→ **Mnemonic** DPRV

→ **Description** Private Data

#### Else Statements

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### Call to exit

→ **Mnemonic** EXIT

→ **Description** Number of calls to the exit function

#### For Statements

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

#### File Type Count

→ **Mnemonic** FTYP

→ **Description** File Type Count

#### Structures Added

→ **Mnemonic** SADD



→ **Description** Number of control structures added since the previous version.

#### **Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

#### **Structures Removed**

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

#### **Header Lines Of Comment**

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

#### **Header Lines Of Code**

→ **Mnemonic** HLOC

→ **Description** Number of lines between the function or class definition and the first opening brace.

#### **Cloned Code**

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### **Cloned Control Flow Tokens**

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### **If Statements**

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### **Line Count**

→ **Mnemonic** LC

→ **Description** Number of lines.

#### **Loop Statements**

→ **Mnemonic** LOOP

→ **Description** Number of loop statements in the function

#### **Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

#### **Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### Non-Cyclic Paths

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

#### Orelse operators

→ **Mnemonic** OREL

→ **Description** Number of 'orelse' operators

#### Return Statements

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

#### Repeated Code Blocks

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### Skipped Lines of Comment code

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

#### Source Lines Of Code

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

#### Executable Statements

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### Switch Statements

→ **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### Throw Statements

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### Operand Occurrences

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### Operator Occurrences

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### Try Statements

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### Lines Added

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### Lines Modified

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### Lines Removed

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### While Statements

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.1.2. ABAP Ruleset

#### Avoid using APPEND statements in loops

→ **Mnemonic** AVOIDAPPENDINLOOP

→ **Description** Avoid using COMMIT WORK statements in loops.

#### Avoid using APPEND in SQL SELECT statements

→ **Mnemonic** AVOIDAPPENDINSELECT

→ **Description** Avoid using APPEND in SQL SELECT statements.

#### Avoid using BREAK-POINT

→ **Mnemonic** AVOIDBREAKPOINT

→ **Description** Avoid using BREAK-POINT

#### Avoid using CHECK in SQL SELECT statements

→ **Mnemonic** AVOIDCHECKINSELECT

→ **Description** Avoid using CHECK in SQL SELECT statements

#### Avoid using COMMIT WORK statements in loops

→ **Mnemonic** AVOIDCOMMITWORKINLOOP

→ **Description** Avoid using COMMIT WORK statements in loops.

**Avoid obsolete DATA BEGIN OF OCCURS statement**

- **Mnemonic** AVOIDDATAOCCURS
- **Description** Avoid obsolete DATA BEGIN OF OCCURS statement

**Avoid using INSERT statements in loops**

- **Mnemonic** AVOIDINSERTINLOOP
- **Description** Avoid using INSERT statements in loops. Querying in a loop can lead to performance issues.

**Avoid using INSERT in SQL SELECT statements**

- **Mnemonic** AVOIDINSERTINSELECT
- **Description** Avoid using INSERT in SQL SELECT statements

**Avoid using SQL INTO statements in loops**

- **Mnemonic** AVOIDINTOINLOOP
- **Description** Avoid using SQL INTO statements in loops.

**Avoid using SELECT \***

- **Mnemonic** AVOIDSELECTALL
- **Description** SELECT \* should be avoided as it does not enable to keep control on the flow return and could therefore be error prone and potentially lead to performance issues.

**Avoid using the SQL "BYPASSING BUFFER" clause**

- **Mnemonic** AVOIDSELECTBYPASS
- **Description** The BYPASSING BUFFER clause causes the SELECT statement to avoid the SAP buffering and to read directly from the database and not from the buffer on the application server.

**Avoid using SELECT DISTINCT Statement**

- **Mnemonic** AVOIDSELECTDISTINCT
- **Description** The SQL DISTINCT clause causes the SELECT statement to avoid the SAP buffering and to read directly from the database and not from the buffer on the application server.

**Avoid SELECT SQL statement without a WHERE clause**

- **Mnemonic** AVOIDSELECTNOWHERE
- **Description** Avoid SELECT SQL statement without a WHERE clause

**Avoid SELECT SQL statement with a WHERE clause containing the NOT EQUAL operator**

- **Mnemonic** AVOIDSELECTWHERENOTEQ
- **Description** Avoid SELECT SQL statement with a WHERE clause containing the NOT EQUAL operator.

**Avoid using SQL Aggregate Functions**

- **Mnemonic** AVOIDSQLAGGREGATEFUNC
- **Description** SQL COUNT(..) , MIN(..) , MAX(..) , SUM(..) , AVG(..) functions cause the SAP table buffer to be bypassed and so usage of such functions can lead to some performance issues.

**Avoid using SUBMIT statements in loops**

→ **Mnemonic** AVOIDSUBMITINLOOP

→ **Description** Avoid using SUBMIT statements in loops.

#### **Avoid using UPDATE, MODIFY, DELETE statements in loops**

→ **Mnemonic** AVOIDUPDELINLOOP

→ **Description** Avoid using UPDATE, MODIFY, DELETE statements in loops. Querying in a loop can lead to performance issues.

#### **Avoid UPDATE or DELETE SQL Statement without a WHERE clause**

→ **Mnemonic** AVOIDUPDELNOWHERE

→ **Description** Avoid UPDATE or DELETE SQL Statement without a WHERE clause

#### **Avoid using GROUP BY in queries**

→ **Mnemonic** AVOIDUSINGSQLGROUPBY

→ **Description** Using GROUP BY in SQL queries can lead to performance issues.

#### **Avoid using the JOIN SQL clause**

→ **Mnemonic** AVOIDUSINGSQLJOIN

→ **Description** Using the SQL JOIN clause leads to bypass the SAP table buffer.

#### **Avoid using LIKE in SQL queries**

→ **Mnemonic** AVOIDUSINGSQLLIKE

→ **Description** Using LIKE in SQL queries can lead to performance issues.

#### **Avoid using the WAIT statement**

→ **Mnemonic** AVOIDWAIT

→ **Description** Avoid using the WAIT statement.

#### **The class name should conform to the defined standard**

→ **Mnemonic** CLASSNAMINGCONVENTION

→ **Description** The class name should conform to the defined standard

#### **Commented-out Source Code is not allowed**

→ **Mnemonic** R\_CSTAT

→ **Description** Commented-out Source Code is not allowed

#### **Missing Default**

→ **Mnemonic** DEFAULT

→ **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

#### **Missing final else**

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Forbid call to a system function**

→ **Mnemonic** FORBIDCALLCFUNC

→ **Description** Call of a System Function: CALL 'cfunc' is only intended for internal usage. Incompatible changes and further development is possible at any time and without warning or notice.

**Forbid calls to dialog transactions**

→ **Mnemonic** FORBIDCALLDIALTRANS

→ **Description** Forbid calls to dialog transactions.

**Forbid use of GENERATE REPORT / SUBROUTINE POOL / DYNPRO**

→ **Mnemonic** FORBIDGENERATEPROG

→ **Description** This statement is exclusively for internal use within SAP Technology Development. Incompatible changes or developments are possible at any time without prior warning or notes.

**Forbid calls to GET RUN TIME.**

→ **Mnemonic** FORBIDGETRUNTIME

→ **Description** Forbid calls to GET RUN TIME.

**Forbid use of INSERT/DELETE REPORT/TEXTPOOL**

→ **Mnemonic** FORBIDINSERTPROG

→ **Description** This statement is exclusively for internal use within SAP Technology Development. Incompatible changes or developments are possible at any time without prior warning or notice.

**Forbid uses of OFFSET in ASSIGN**

→ **Mnemonic** FORBIDOFFSETINASSIGN

→ **Description** Forbid uses of OFFSET in ASSIGN.

**Forbid use of SYSTEM-CALL**

→ **Mnemonic** FORBIDSYSTEMCALL

→ **Description** This statement is only for !Internal use in SAP Basis development!. Its use is subject to various restrictions, not all of which may be listed in the documentation. Changes and further development, which may be incompatible, may occur at any time, without warning or notice!

**The form name should conform to the defined standard**

→ **Mnemonic** FORMNAMINGCONVENTION

→ **Description** The form name should conform to the defined standard

**The function name should conform to the defined standard**

→ **Mnemonic** FUNCTIONNAMINGCONVENTION

→ **Description** The function name should conform to the defined standard

**Avoid calling a function module without handling exceptions**

→ **Mnemonic** HANDLEERRORCALLFUNC

→ **Description** Handling the exceptions when calling a function module is optional but should be mandatory to correctly handle errors in production.

**The macro name should conform to the defined standard**

- **Mnemonic** MACRONAMINGCONVENTION
- **Description** The macro name should conform to the defined standard

**The method name should conform to the defined standard**

- **Mnemonic** METHODNAMINGCONVENTION
- **Description** The method name should conform to the defined standard

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

**Factorizable Functions**

- **Mnemonic** CAC\_FN
- **Description** Consider functions refactorization

**Factorizable Packages**

- **Mnemonic** CAC\_PKG
- **Description** Consider packages refactorization

**Cloned Classes**

- **Mnemonic** CC\_CL
- **Description** There shall be no duplicated classes

**Cloned Files**

- **Mnemonic** CC\_FI
- **Description** There shall be no duplicated files

**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**Continue shall not be used**

- **Mnemonic** NOCONT
- **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

**FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**Do not use "Native SQL" instructions**

→ **Mnemonic** NONNATIVESQL

→ **Description** Native SQL should not be used.

**Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Prevent use of EDITOR-CALLS**

→ **Mnemonic** PREVENTEDITORCALL

→ **Description** This statement bypasses the authority checks that are performed when calling the ABAP editor via transaction code.

**The program or report name should conform to the defined standard**

→ **Mnemonic** PROGREPORTNAMINGCONVENTION

→ **Description** The program or report name should conform to the defined standard

**Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

## 2.2. ADA

### 2.2.1. ADA Metrics

**Andthen Operators**

→ **Mnemonic** ANTH



→ **Description** Number of 'andthen' operators

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

#### **Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### **Brace Lines**

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

#### **Case Blocks**

→ **Mnemonic** CABL

→ **Description** Number of 'case' blocks in 'switch' in the function

#### **Case Labels**

→ **Mnemonic** CASE

→ **Description** Number of 'case' labels in the function

#### **Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### **Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### **Declare operators**

→ **Mnemonic** DECBL

→ **Description** Number of Declare operators

#### **Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

#### **Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### **Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### **Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### **Entry Statements**

→ **Mnemonic** ENTRY

→ **Description** Number of Entry statements

#### **Exception When blocks**

→ **Mnemonic** EXBL

→ **Description** Number of 'when' blocks in 'exception handler'.

#### **Exception handlers**

→ **Mnemonic** EXGR

→ **Description** Number of Exception handlers

#### **For Statements**

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

#### **Structures Added**

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

#### **Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

#### **Structures Removed**

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

#### **Goto Statements**

→ **Mnemonic** GOTO

→ **Description** Number of 'goto' statements

#### **Header Lines Of Comment**

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

#### **Header Lines Of Code**

→ **Mnemonic** HLOC

→ **Description** Number of lines between the function or class definition and the first opening brace.

#### **Cloned Code**

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### **Cloned Control Flow Tokens**

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### **If Statements**

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### **Generic object**

→ **Mnemonic** ISGEN

→ **Description** The object is declared generic

#### **Label Statements**

→ **Mnemonic** LABEL

→ **Description** Number of Label statements

#### Line Count

→ **Mnemonic** LC

→ **Description** Number of lines.

#### Loop Statements

→ **Mnemonic** LOOP

→ **Description** Number of loop statements in the function

#### Mixed Lines

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

#### AND operators

→ **Mnemonic** NBAND

→ **Description** Number of AND operators

#### Constants

→ **Mnemonic** NBCONST

→ **Description** Number of Constants

#### Private constant

→ **Mnemonic** NBCONSTPRIV

→ **Description** Number of Private constants

#### Public constants

→ **Mnemonic** NBCONSTPUB

→ **Description** Number of Public constants

#### Declared functions

→ **Mnemonic** NBDFUNC

→ **Description** Number of Declared functions/procedures

#### Private functions/Procedures

→ **Mnemonic** NBDFUNCPRIV

→ **Description** Number of Private function/Procedure

#### Public functions

→ **Mnemonic** NBDFUNCPUB

→ **Description** Number of Public functions/procedures

#### Exceptions

→ **Mnemonic** NBEXCEPT

→ **Description** Number of Declared Exceptions

#### Private exceptions

→ **Mnemonic** NBEXCEPTPRIV

→ **Description** Number of Private exceptions

#### Public exceptions

→ **Mnemonic** NBEXCEPTPUB

→ **Description** Number of Public exceptions

#### Separate functions/procedures

→ **Mnemonic** NBFUNCDSEP

→ **Description** Number of Separate functions/procedures

#### OR operators

→ **Mnemonic** NBOR

→ **Description** Number of OR operators

#### Separate packages

→ **Mnemonic** NBPACKDSEP

→ **Description** Number of package declared Separate

#### Protected objects

→ **Mnemonic** NBPROTOBJDSEP

→ **Description** Number of Declred Protected objects

#### Renamed objects

→ **Mnemonic** NBRENA

→ **Description** Number of Renamed object

#### Subtypes

→ **Mnemonic** NBSTYP

→ **Description** Number of Subtypes

#### Separate tasks

→ **Mnemonic** NBTASKDSEP

→ **Description** Number of task declared Separate

#### Types

→ **Mnemonic** NBTYP

→ **Description** Number of Types

#### Derived types

→ **Mnemonic** NBTYPDRV

→ **Description** Number of Derived types

#### Private types

→ **Mnemonic** NBTYPPRIV

→ **Description** Number of Private types

#### Public types

→ **Mnemonic** NBTYPPUB

→ **Description** Number of Public types

#### Variables

→ **Mnemonic** NBVAR

→ **Description** Number of Variables

#### Private variables

→ **Mnemonic** NBVARPRIV

→ **Description** Number of Private variables

#### Public variables

→ **Mnemonic** NBVARPUB

→ **Description** Number of Public variables

#### With statements

→ **Mnemonic** NBWITH

→ **Description** Number of With statements

#### Maximum Nested Structures

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### Non-Cyclic Paths

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

#### Orelse operators

→ **Mnemonic** OREL

→ **Description** Number of 'orelse' operators

#### Raise statements

→ **Mnemonic** RAISE

→ **Description** Number of Raise statements

#### Return Statements

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

#### Repeated Code Blocks

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### Skipped Lines of Comment code

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

#### Source Lines Of Code

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

#### Executable Statements

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### Switch Statements

→ **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### Operand Occurrences

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### Operator Occurrences

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### Lines Added

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### Lines Modified

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### Lines Removed

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### While Statements

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

### 2.2.2. ADA Ruleset

#### **Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

#### **Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

#### **Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

#### **Exit Label shall be named**

- **Mnemonic** EXTLABEL
- **Description** Each exit label shall be named.

#### **Use 'exit when' instead of if... exit syntax**

- **Mnemonic** EXTWHEN
- **Description** Use 'exit when' instead of if... exit syntax.

#### **Each loop shall be named**

- **Mnemonic** LOOPNAMED
- **Description** Each loop shall be named.

#### **Abort shall not be used**

- **Mnemonic** NOABORT
- **Description** Use of 'abort'

#### **Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

#### **Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

#### **Factorizable Functions**

- **Mnemonic** CAC\_FN



→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **Delay shall not be used**

→ **Mnemonic** NODELAY

→ **Description** Use of 'delay'

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **There shall be no 'when others' in exception handler**

→ **Mnemonic** NOWHEN\_OTHERS

→ **Description** There shall be no 'when others' in exception handler.

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Parameters shall be ordered: 'IN', 'OUT', 'IN OUT'.**

→ **Mnemonic** PARAMORDER

→ **Description** Parameters shall be ordered: 'IN', 'OUT', 'IN OUT'.

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Multiple Exit in loop**

→ **Mnemonic** SGLEXT

→ **Description** There shall be a single exit by loop.

## 2.3. C

### 2.3.1. C Metrics

#### **Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

#### **Assignment Operators**

→ **Mnemonic** ASOP

→ **Description** Number of assignment operators used in the source file

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

#### **Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### Brace Lines

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

#### Break in Loop

→ **Mnemonic** BRKL

→ **Description** Number of 'break' statements in loop in the function

#### Break in Switch

→ **Mnemonic** BRKS

→ **Description** Number of 'break' statements in 'switch' in the function

#### Case Blocks

→ **Mnemonic** CABL

→ **Description** Number of 'case' blocks in 'switch' in the function

#### Calls To

→ **Mnemonic** CAL2

→ **Description** Number of explicit calls to the function.

#### Called Functions

→ **Mnemonic** CALD

→ **Description** Number of distinct functions defined in the project source file and called by the function.

#### Calls From

→ **Mnemonic** CALF

→ **Description** Number of explicit calls from the function.

#### Calling Functions

→ **Mnemonic** CALI

→ **Description** Number of distinct functions calling the function.

#### Called External Functions

→ **Mnemonic** CALX

→ **Description** Number of distinct external functions called by the function - external i.e. not defined in the project

#### Case Labels

→ **Mnemonic** CASE

→ **Description** Number of 'case' labels in the function

#### Code Cloning Line Counting

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Recursive Calls**

→ **Mnemonic** CDRI

→ **Description** Number of directly recursive calls in the function.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Called Depth**

→ **Mnemonic** CGDD

→ **Description** Maximum depth of called functions.

#### **Calling Depth**

→ **Mnemonic** CGDI

→ **Description** Maximum depth of calling functions.

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Minimum Number of Indirect Cycles**

→ **Mnemonic** CIRI

→ **Description** Minimum number of indirect call graph cycles in which the function is involved (excluding recursive calls).

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

#### **Comparison Operators**

→ **Mnemonic** CPOP

→ **Description** Number of comparison operators used in the source file

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### Minimum Number of Cycles

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### Default Statement

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

#### Distinct Operands

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### Distinct Operators

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### Do While Statements

→ **Mnemonic** DOWH

→ **Description** Number of 'do...while' statements in the function

#### Else Statements

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### For Statements

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

#### Structures Added

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

#### Structures Modified

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

#### Structures Removed

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

#### Goto Statements

→ **Mnemonic** GOTO

→ **Description** Number of 'goto' statements

#### Header Lines Of Comment

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

#### Header Lines Of Code

→ **Mnemonic** HLOC

→ **Description** Number of lines between the function or class definition and the first opening brace.

#### Cloned Code

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### Cloned Control Flow Tokens

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### If Statements

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### Line Count

→ **Mnemonic** LC

→ **Description** Number of lines.

#### Use of longjump

→ **Mnemonic** LONGJMP

→ **Description** Use of longjump

#### Loop Statements

→ **Mnemonic** LOOP

→ **Description** Number of loop statements in the function

#### Memory Allocation

→ **Mnemonic** MEMALLOC

→ **Description** Memory Allocation

#### Memory Freeing

→ **Mnemonic** MEMFREE

→ **Description** Memory Freeing

#### Mixed Lines

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

#### Maximum Nested Structures

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### Number of Parameters

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

#### Non-Cyclic Paths

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

#### Use of offsetof

→ **Mnemonic** OFFSETOF

→ **Description** Use of offsetof

#### Orelse operators

→ **Mnemonic** OREL

→ **Description** Number of 'orelse' operators

#### Number of #DEFINE

→ **Mnemonic** P\_DEFINE

→ **Description** Number of #DEFINE

#### Number of #ELIF

→ **Mnemonic** P\_ELIF

→ **Description** Number of #ELIF

#### Number of #ELSE

→ **Mnemonic** P\_ELSE

→ **Description** Number of #ELSE

#### Number of #ENDIF

→ **Mnemonic** P\_ENDIF

→ **Description** Number of #ENDIF

#### Number of #ERROR

→ **Mnemonic** P\_ERROR

→ **Description** Number of #ERROR

#### Number of #IF

→ **Mnemonic** P\_IF

→ **Description** Number of #IF

#### **Number of #IFDEF**

→ **Mnemonic** P\_IFDEF

→ **Description** Number of #IFDEF

#### **Number of #IFDEF**

→ **Mnemonic** P\_IFNDEF

→ **Description** Number of #IFNDEF

#### **Number of Include**

→ **Mnemonic** P\_INCLUDE

→ **Description** Number of Include

#### **Compiler FLAG Nested Level**

→ **Mnemonic** P\_NEST

→ **Description** Compiler FLAG Nested Level

#### **Number of #PRAGMA**

→ **Mnemonic** P\_PRAGMA

→ **Description** Number of #PRAGMA

#### **Number of #UNDEF**

→ **Mnemonic** P\_UNDEF

→ **Description** Number of #UNDEF

#### **Number of #WARNING**

→ **Mnemonic** P\_WARNING

→ **Description** Number of #WARNING

#### **Return Statements**

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

#### **Repeated Code Blocks**

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### **Use of setjump**

→ **Mnemonic** SETJMP

→ **Description** Use of setjump

#### **Signal Functions**



→ **Mnemonic** SIGNAL

→ **Description** Use of signal Functions

#### Skipped Lines of Comment code

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

#### Source Lines Of Code

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

#### Special Operators

→ **Mnemonic** SPOP

→ **Description** Number of special operators used in the source file

#### Executable Statements

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### IO Functions

→ **Mnemonic** STDIO

→ **Description** Use IO Functions

#### String Conversions

→ **Mnemonic** STRINGCONV

→ **Description** Use of String Conversions

#### Switch Statements

→ **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### System Functions

→ **Mnemonic** SYSCOM

→ **Description** Use of system Functions

#### Ternary operators

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### Time Handling

→ **Mnemonic** TIMEHDL

→ **Description** Use of Time Handling

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

**While Statements**

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

## 2.3.2. C Ruleset

**Missing Break**

- **Mnemonic** BRKFINAL
- **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Missing compound statement**

- **Mnemonic** COMPOUND
- **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if**

- **Mnemonic** COMPOUNDIF
- **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Dynamic Memory Allocation shall not be used**

- **Mnemonic** DYNMEMALLOC
- **Description** Dynamic heap memory allocation shall not be used. This precludes the use of the functions calloc, malloc, realloc and free (see [MISRA-C:2004]: RULE 20.4)

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Macro longjmp or setjmp shall not be used**

- **Mnemonic** JUMP
- **Description** (The setjmp macro and the longjmp function shall not be used (see [MISRA-C:2004]: RULE 20.7).

**Nesting Level of Preprocessing directives is too high**

- **Mnemonic** R\_MAXPNEST
- **Description** Nesting Level of Preprocessing directives is too high

**Assignment in Boolean**

- **Mnemonic** NOASGCOND
- **Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison**

- **Mnemonic** NOASGINBOOL
- **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

**Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Recursion are not allowed**

→ **Mnemonic** NORECURSION

→ **Description** Functions shall not called themselves either directly or indirectly (see [MISRA-C:2004]: RULE 16.2).

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Macro offsetof shall not be used**

→ **Mnemonic** OFFSETOF

→ **Description** The macro offsetof, in library <stddef.h>, shall not be used (see [MISRA-C:2004]: RULE 20.6).

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

#### **Signal or Raise shall not be used**

→ **Mnemonic** SIGNAL

→ **Description** The signal handling facilities of <signal.h> shall not be used (see [MISRA-C:2004]: RULE 20.8).

#### **IO Functions shall not be used**

→ **Mnemonic** STDIO

→ **Description** The input/output library <stdio.h> shall not be used in production code (see [MISRA-C:2004]: RULE 20.9).

#### **'atof, atoi or atol' shall not be used**

→ **Mnemonic** STRINGCONV

→ **Description** The library functions atof, atoi and atol from library <stdlib.h> shall not be used (see [MISRA-C:2004]: RULE 20.10).

#### **'abort, exit, getenv or system' shall not be used**

→ **Mnemonic** SYSCOM

→ **Description** The library functions abort, exit, getenv and system from library <stdlib.h> shall not be used (see [MISRA-C:2004]: RULE 20.11).

#### **Time Handling Functions shall not be used**

→ **Mnemonic** TIMEHDL

→ **Description** The time handling functions of library <time.h> shall not be used: time, strftime, clock, difftime, mktime (see [MISRA-C:2004]: RULE 20.12).

## 2.4. COBOL

### 2.4.1. COBOL Metrics

#### **Arithmetic Operators**

→ **Mnemonic** AROP

→ **Description** Number of arithmetic operators

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### **CALL Statements**

→ **Mnemonic** CALL

→ **Description** Number of CALL statements

#### **Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Comment lines with code**

→ **Mnemonic** CLOC\_CODE

→ **Description** Number of lines of comments in the source file(s) whose first word is a keyword.

#### **Comment lines without alphabetic characters**

→ **Mnemonic** CLOC\_NULL

→ **Description** Number of lines of comments in the source file(s) without alphabetic character.

#### **Real comment lines with alphabetic characters**

→ **Mnemonic** CLOC\_REAL

→ **Description** Number of real lines of comments in the source file(s) with alphabetic characters.

#### **Conditions**

→ **Mnemonic** COND

→ **Description** Number of conditions

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### **Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### **Debug lines**

→ **Mnemonic** DEBUG

→ **Description** Number of lines of debug in the source file(s).

#### **DISPLAY statements**

→ **Mnemonic** DISPLAY

→ **Description** Number of DISPLAY statements

#### **Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### **Distinct Operands in Data Div.**

→ **Mnemonic** DOPD\_DD

→ **Description** Number of distinct operands in Data Division: variables and constants ([Halstead,76]: n2)

#### **Distinct Operands in Procedure Div.**

→ **Mnemonic** DOPD\_PD

→ **Description** Number of distinct operands in Procedure Division: variables and constants ([Halstead,76]: n2)

#### **Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### **Distinct Operators in Data Div.**

→ **Mnemonic** DOPT\_DD

→ **Description** Number of distinct operators in Data Division: language keywords ([Halstead,76]: n1)

#### **Distinct Operators in Procedure Div.**

→ **Mnemonic** DOPT\_PD

→ **Description** Number of distinct operators in Procedure Division: language keywords ([Halstead,76]: n1)

#### **Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### **EVALUATE Statements**

→ **Mnemonic** EVAL

→ **Description** Number of EVALUATE statements

#### **Call to exit**

→ **Mnemonic** EXIT

→ **Description** Number of calls to the exit function

#### **File Declarations**

→ **Mnemonic** FD

→ **Description** Number of file declarations

#### **Files Used**

→ **Mnemonic** FDUS



→ **Description** Number of references to files

#### **Goto Statements**

→ **Mnemonic** GOTO

→ **Description** Number of 'goto' statements

#### **Cloned Code**

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### **Cloned Control Flow Tokens**

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### **Is IDMS active**

→ **Mnemonic** IDMS\_ACTIVE

→ **Description** Is IDMS active in program

#### **IDMS instructions called**

→ **Mnemonic** IDMS\_CALLBD

→ **Description** Number of IDMS instructions called

#### **IDMS records called**

→ **Mnemonic** IDMS\_CALLREC

→ **Description** Number of IDMS records called

#### **IDMS calls for modification**

→ **Mnemonic** IDMS\_MOD

→ **Description** Number of calls for modification

#### **IDMS calls for reading/searching**

→ **Mnemonic** IDMS\_READ

→ **Description** Number of calls for reading/searching

#### **IDMS subschema definition**

→ **Mnemonic** IDMS\_SSCH

→ **Description** Number of IDMS subschema definition

#### **If Statements**

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### **Line Count**

→ **Mnemonic** LC

→ **Description** Number of lines.

#### **Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### **Number of paragraphs**

→ **Mnemonic** PARA

→ **Description** Number of paragraphs.

#### **PERFORM Statements**

→ **Mnemonic** PERF

→ **Description** Number of PERFORM statements

#### **Repeated Code Blocks**

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### **Data Declarations**

→ **Mnemonic** SD

→ **Description** Number of data declarations

#### **Data Used**

→ **Mnemonic** SDUS

→ **Description** Number of used data

#### **Number of Sections**

→ **Mnemonic** SECT

→ **Description** Number of sections.

#### **Source Lines Of Code**

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

#### **Executable Statements**

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### **STOP Statements**

→ **Mnemonic** STOP

→ **Description** Number of STOP statements

#### **TIMES Clauses**

→ **Mnemonic** TIME

→ **Description** Number of TIMES clauses in PERFORM statements

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operand Occurrences in Data Div.**

→ **Mnemonic** TOPD\_DD

→ **Description** Number of occurrences of operands in Data Division: variables and constants ([Halstead,76]: N2)

#### **Operand Occurrences in Procedure Div.**

→ **Mnemonic** TOPD\_PD

→ **Description** Number of occurrences of operands in Procedure Division: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Operator Occurrences in Data Div.**

→ **Mnemonic** TOPT\_DD

→ **Description** Number of occurrences of operators in Data Division: language keywords ([Halstead,76]: N1)

#### **Operator Occurrences in Procedure Div.**

→ **Mnemonic** TOPT\_PD

→ **Description** Number of occurrences of operators in Procedure Division: language keywords ([Halstead,76]: N1)

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **UNTIL Clauses**

→ **Mnemonic** UNTL

→ **Description** Number of UNTIL clauses in PERFORM statements

**VARYING Clauses**

- **Mnemonic** VARY
- **Description** Number of VARYING clauses in PERFORM statements

**WHEN Clauses**

- **Mnemonic** WHEN
- **Description** Number of WHEN and WHENOTHER clauses in EVALUATE Statements

## 2.4.2. COBOL Ruleset

**BLOCK Clause**

- **Mnemonic** BLOCKSIZE
- **Description** In the FILE-DESCRIPTION section, each file description shall always use the BLOCK CONTAINS 0 RECORDS clause. The system will assign the BLOCK-SIZE automatically when allocating the file.

**Column 7 for \* and D Only**

- **Mnemonic** COLUMN7
- **Description** Only \* and D shall be used in column 7.

**Comment Division**

- **Mnemonic** COMMENT\_DIVISION
- **Description** A comment is recommended before each division.

**Comment FD**

- **Mnemonic** COMMENT\_FD
- **Description** A comment is recommended before each file description.

**Comment First Level**

- **Mnemonic** COMMENT\_FIRST\_LEVEL
- **Description** A comment is recommended before each first level of IF or PERFORM.

**Comment Variable 01 and 77**

- **Mnemonic** COMMENT\_FIRST\_VARIABLE
- **Description** A comment is recommended before each variable 01 and 77.

**Empty lines around DIVISION**

- **Mnemonic** CPRS\_DIVISION
- **Description** An empty line shall precede and follow a DIVISION.

**Empty line after EXIT**

- **Mnemonic** CPRS\_EXIT
- **Description** An empty line shall follow an EXIT statement.

**Bad statement indentation**

→ **Mnemonic** CPRS\_INDENT

→ **Description** The nested statements shall be indented.

#### **Bad indentation of scope terminator**

→ **Mnemonic** CPRS\_SCOPE\_TERMINATOR

→ **Description** Scope terminators must be on the same column as the beginning of the block to facilitate program readability.

#### **Empty line after SECTION**

→ **Mnemonic** CPRS\_SECTION

→ **Description** An empty line shall follow a SECTION.

#### **Variable declaration format**

→ **Mnemonic** DCLWS

→ **Description** A variable shall be declared in the WORKING STORAGE using the format ^W

#### **Paragraphs having exact same name**

→ **Mnemonic** R\_DUPPARA

→ **Description** Paragraphs having exact same name in the same PROGRAM-ID is forbidden.

#### **Missing END-EVALUATE**

→ **Mnemonic** EVALWITHENDEVAL

→ **Description** An EVALUATE statement shall be closed by END-EVALUATE

#### **Close file once**

→ **Mnemonic** FILECLOSEONCE

→ **Description** A file shall be closed only once

#### **Close open file**

→ **Mnemonic** FILEOPENCLOSE

→ **Description** A file shall be opened and closed in the same program

#### **Open file once**

→ **Mnemonic** FILEOPENONCE

→ **Description** A file shall be opened only once

#### **Use FILE STATUS**

→ **Mnemonic** FILESTATUS

→ **Description** FILE STATUS shall be used to manage I/O errors.

#### **Single GOBACK**

→ **Mnemonic** GOBACK

→ **Description** Only a single GOBACK shall be used in a subprogram.

#### **IDMS FIND CURRENT**

- **Mnemonic** IDMSFINDCURRENT
- **Description** IDMS FIND CURRENT is forbidden

**IDMS One modify by PERFORM**

- **Mnemonic** IDMSONEMODFORPERF
- **Description** Each IDMS modify statement (MODIFY/ERASE/STORE) should be in a specific perform

**IDMS One same call**

- **Mnemonic** IDMSONESAMECALL
- **Description** Avoid duplicated IDMS call.

**IDMS Ready Protected Update**

- **Mnemonic** IDMSREADYPRTUPD
- **Description** Each IDMS Ready Update statement should be defined in PROTECTED mode.

**IDMS Return Code**

- **Mnemonic** IDMSRETURNCODE
- **Description** After each IDMS statement, return code should be checked.

**Missing END-IF**

- **Mnemonic** IFWITHENDIF
- **Description** An IF statement shall be closed by an END-IF

**Avoid using inline PERFORM with too many lines of code**

- **Mnemonic** INLINE\_PERFORM\_SIZE
- **Description** Avoid Cobol programs containing PERFORM - END-PERFORM loops with more than 80 lines.

**Standard Label**

- **Mnemonic** LABELSTD
- **Description** In the FILE-DESCRIPTION section, each file description shall always use the LABEL RECORD STANDARD clause. Only the standard labels are checked by the system.

**Missing END-ADD**

- **Mnemonic** MISSING\_END\_ADD
- **Description** An ADD statement shall be closed by an END-ADD.

**Missing END-CALL**

- **Mnemonic** MISSING\_END\_CALL
- **Description** An CALL statement shall be closed by an END-CALL.

**Missing END-COMPUTE**

- **Mnemonic** MISSING\_END\_COMPUTE
- **Description** An COMPUTE statement shall be closed by an END-COMPUTE.

**Missing END-DELETE**

- **Mnemonic** MISSING\_END\_DELETE
- **Description** An DELETE statement shall be closed by an END-DELETE.

**Missing END-DIVIDE**

- **Mnemonic** MISSING\_END\_DIVIDE
- **Description** An DIVIDE statement shall be closed by an END-DIVIDE.

**Missing END-MULTIPLY**

- **Mnemonic** MISSING\_END\_MULTIPLY
- **Description** An MULTIPLY statement shall be closed by an END-MULTIPLY.

**Missing END-READ**

- **Mnemonic** MISSING\_END\_READ
- **Description** An READ statement shall be closed by an END-READ.

**Missing END-RETURN**

- **Mnemonic** MISSING\_END\_RETURN
- **Description** An RETURN statement shall be closed by an END-RETURN.

**Missing END-REWRITE**

- **Mnemonic** MISSING\_END\_REWRITE
- **Description** An REWRITE statement shall be closed by an END-REWRITE.

**Missing END-SEARCH**

- **Mnemonic** MISSING\_END\_SEARCH
- **Description** An SEARCH statement shall be closed by an END-SEARCH.

**Missing END-START**

- **Mnemonic** MISSING\_END\_START
- **Description** An START statement shall be closed by an END-START.

**Missing END-STRING**

- **Mnemonic** MISSING\_END\_STRING
- **Description** An STRING statement shall be closed by an END-STRING.

**Missing END-SUBTRACT**

- **Mnemonic** MISSING\_END\_SUBTRACT
- **Description** An SUBTRACT statement shall be closed by an END-SUBTRACT.

**Missing END-UNSTRING**

- **Mnemonic** MISSING\_END\_UNSTRING
- **Description** An UNSTRING statement shall be closed by an END-UNSTRING.

**Missing END-WRITE**

→ **Mnemonic** MISSING\_END\_WRITE

→ **Description** An WRITE statement shall be closed by an END-WRITE.

**Missing FILLER**

→ **Mnemonic** MISSING\_FILLER

→ **Description** Even the 'FILLER' word is optional since Cobol85, it is recommended to write it.

**No more than 3 nested IF**

→ **Mnemonic** NESTEDIF

→ **Description** There shall be no more than 3 nested IF statements

**Nested Program**

→ **Mnemonic** NESTED\_PROGRAM

→ **Description** Nested program is not recommended

**ALTER shall not be used**

→ **Mnemonic** NOALTER

→ **Description** The ALTER statement shall not be used. Labels are decided only at execution time.

**Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

**Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

**Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

**Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

**Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

**Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files



**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**No Conditional GOTO**

- **Mnemonic** NOCONDGOTO
- **Description** Conditional GO TO shall not be used. Use EVALUATE instead.

**No MOVE CORRESPONDING**

- **Mnemonic** NOCORRESPONDING
- **Description** MOVE CORRESPONDING shall not be used.

**COMPUTE instead of ADD**

- **Mnemonic** NOCPXADD
- **Description** COMPUTE shall be used to add more than 2 data instead of ADD.

**COMPUTE instead of SUBTRACT**

- **Mnemonic** NOCPXSUBTRACT
- **Description** COMPUTE shall be used to add more than 2 data instead of SUBTRACT.

**No DEBUG MODE**

- **Mnemonic** NODEBUG
- **Description** DEBUGGING-MODE shall not be used

**COMPUTE instead of DIVIDE**

- **Mnemonic** NODIVIDE
- **Description** COMPUTE shall be used instead of DIVIDE.

**FIXME shall not be committed in sources code**

- **Mnemonic** R\_NOFIXME
- **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**No INITIALIZE**

- **Mnemonic** NOINITIALIZE
- **Description** INITIALIZE shall not be used. Use MOVE to initialize variable.

**COMPUTE instead of MULTIPLY**

- **Mnemonic** NOMULTIPLY
- **Description** COMPUTE shall be used instead of MULTIPLY.

**No procedural COPY**

→ **Mnemonic** NOPROCCOPY

→ **Description** Procedural COPY clauses shall not be used. Use subprograms instead.

**No RENAMES**

→ **Mnemonic** NORENAMES

→ **Description** The RENAMES clause shall not be used.

**Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**No Variables S9(9)**

→ **Mnemonic** NOVARS9

→ **Description** The variables shall not be declared in S9(9) COMP. It implies a conversion

**Avoid GOTO jumps out of PERFORM range**

→ **Mnemonic** NO\_GOTO\_OUT\_OF\_PERFORM\_RANGE

→ **Description** Avoid Cobol Programs containing sections or paragraphs that are called by PERFORM statements and that contain a GO TO statement to another section or paragraph that is not in the scope of the initial PERFORM.

**Avoid OPEN/CLOSE inside loops**

→ **Mnemonic** NO\_OPEN\_CLOSE\_INSIDE\_LOOP

→ **Description** Avoid Cobol programs using OPEN or CLOSE in loops. Following loops are taken into account:  
- PERFORM TIMES / UNTIL / VARYING

**Avoid accessing data by using the position and length**

→ **Mnemonic** NO\_REFERENCE\_ACCESS

→ **Description** Avoid Cobol programs accessing part of data by using a position and a length.

**Use COMP for OCCURS**

→ **Mnemonic** OCCURSCOMP

→ **Description** For the OCCURS DEPENDING ON clause, the corresponding item shall be declared using COMP or BINARY.

**Avoid mixing paragraphs and sections**

→ **Mnemonic** PARA\_OR\_SECT\_ONLY

→ **Description** A program should not mix paragraphs and sections.

**Perform with no THRU**

→ **Mnemonic** PERFORMWITHTHRU

→ **Description** The call of a paragraph shall be made in the use of PERFORM paragraphName THRU paragraphNameExit.

#### **Bad paragraph position used in PERFORM**

→ **Mnemonic** POSITION\_OF\_PERFORM\_RANGE

→ **Description** On a PERFORM range: P1 THRU P2, P1 must be declared before P2.

#### **READ-WRITE Instruction**

→ **Mnemonic** READWRITE

→ **Description** READ A INTO B or WRITE A FROM B forms shall be used for reading/writing a file.

#### **Avoid using READ statement without AT END clause**

→ **Mnemonic** READ\_AT\_END

→ **Description** Avoid Cobol programs using READ statements without the AT END clause.

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Statement shall be in uppercase**

→ **Mnemonic** UPPERCASE

→ **Description** A COBOL statement shall be written in uppercase to keep the program readable.

#### **Use SYNCHRONIZED**

→ **Mnemonic** USESYNCH

→ **Description** SYNCHRONIZED shall be used for COMP, COMP-1, COMP-2, POINTER and INDEX variables.

#### **Homonymous variable shall not be used**

→ **Mnemonic** VARNAME

→ **Description** There shall be no homonymous variables.

#### **Use WHEN OTHER**

→ **Mnemonic** WHENOTHER

→ **Description** EVALUATE shall end by a WHEN OTHER clause.

## 2.5. C++

### 2.5.1. C++ Metrics

#### **Constant Data**

→ **Mnemonic** ACST

→ **Description** Number of constant data

**Number of Attributes**

- **Mnemonic** ANBR
- **Description** Number of attributes

**Number of data without accessibility**

- **Mnemonic** ANON
- **Description** Number of data without accessibility

**Andthen Operators**

- **Mnemonic** ANTH
- **Description** Number of 'andthen' operators

**Public Data**

- **Mnemonic** APBL
- **Description** Number of public data

**Protected Data**

- **Mnemonic** APRT
- **Description** Number of protected data

**Private data**

- **Mnemonic** APRV
- **Description** Number of private data

**Assignment Operators**

- **Mnemonic** ASOP
- **Description** Number of assignment operators used in the source file

**Static Data**

- **Mnemonic** ASTA
- **Description** Number of static data

**Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Comparison Operators**

- **Mnemonic** CPOP
- **Description** Number of comparison operators used in the source file

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

- **Mnemonic** DDT
- **Description** Maximun depth of the inheritance tree from the class

**Default Statement**

- **Mnemonic** DEFT
- **Description** Number of 'default' blocks in 'switch' in the function

**Depth of Inheritance Tree**

- **Mnemonic** DIT
- **Description** Maximun depth of the class inheritance tree

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Multiple Inheritance Indicator**

- **Mnemonic** MII
- **Description** Number of classes from which the class inherits directly

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Methods without Accessibility**

- **Mnemonic** MNON
- **Description** Number of methods without any accessibility specifier

**Public Methods**

- **Mnemonic** MPBL
- **Description** Number of public methods

**Protected Methods**

- **Mnemonic** MPRT
- **Description** Number of protected methods

**Private Methods**

- **Mnemonic** MPRV
- **Description** Number of private methods

**Static Methods**

- **Mnemonic** MSTA
- **Description** Number of static methods

**Number of Ancestors**

- **Mnemonic** NAC
- **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

- **Mnemonic** NDC
- **Description** Number of classes which inherit from the class directly or indirectly

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures



**Number Of Children**

→ **Mnemonic** NOC

→ **Description** Number of classes which inherit directly from the class

**Number of Parameters**

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

**Or else operators**

→ **Mnemonic** OREL

→ **Description** Number of 'or else' operators

**Number of #DEFINE**

→ **Mnemonic** P\_DEFINE

→ **Description** Number of #DEFINE

**Number of #ELIF**

→ **Mnemonic** P\_ELIF

→ **Description** Number of #ELIF

**Number of #ELSE**

→ **Mnemonic** P\_ELSE

→ **Description** Number of #ELSE

**Number of #ENDIF**

→ **Mnemonic** P\_ENDIF

→ **Description** Number of #ENDIF

**Number of #ERROR**

→ **Mnemonic** P\_ERROR

→ **Description** Number of #ERROR

**Number of #IF**

→ **Mnemonic** P\_IF

→ **Description** Number of #IF

**Number of #IFDEF**

→ **Mnemonic** P\_IFDEF

→ **Description** Number of #IFDEF

**Number of #IFDEF**

- **Mnemonic** P\_IFNDEF
- **Description** Number of #IFDEF

**Number of Include**

- **Mnemonic** P\_INCLUDE
- **Description** Number of Include

**Compiler FLAG Nested Level**

- **Mnemonic** P\_NEST
- **Description** Compiler FLAG Nested Level

**Number of #PRAGMA**

- **Mnemonic** P\_PRAGMA
- **Description** Number of #PRAGMA

**Number of #UNDEF**

- **Mnemonic** P\_UNDEF
- **Description** Number of #UNDEF

**Number of #WARNING**

- **Mnemonic** P\_WARNING
- **Description** Number of #WARNING

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Special Operators**

- **Mnemonic** SPOP

→ **Description** Number of special operators used in the source file

#### Executable Statements

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### Switch Statements

→ **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### Ternary operators

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### Throw Statements

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### Operand Occurrences

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### Operator Occurrences

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### Try Statements

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### Lines Added

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### Lines Modified

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### Lines Removed

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### While Statements

→ **Mnemonic** WHIL

- **Description** Number of 'while' statements in the function

**Weighted Method per Class**

- **Mnemonic** XWMC
- **Description** Sum of cyclomatic complexities of methods implemented outside the class definition

## 2.5.2. C++ Ruleset

**Missing Break**

- **Mnemonic** BRKFINAL
- **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Missing compound statement**

- **Mnemonic** COMPOUND
- **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if**

- **Mnemonic** COMPOUNDIF
- **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Nesting Level of Preprocessing directives is too high**

- **Mnemonic** R\_MAXPNEST
- **Description** Nesting Level of Preprocessing directives is too high

**Assignment in Boolean**

→ **Mnemonic** NOASGCOND

→ **Description** Assignment operators shall not be used in expressions that yield a boolean value

#### **Assignment without Comparison**

→ **Mnemonic** NOASGINBOOL

→ **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

#### **Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

- **Mnemonic** SGLBRK
- **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.6. C#

### 2.6.1. C# Metrics

#### Constant Data

- **Mnemonic** ACST
- **Description** Number of constant data

#### Internal Data

- **Mnemonic** AINT
- **Description** Number of internal data (only applicable to C#)

#### Number of Attributes

- **Mnemonic** ANBR
- **Description** Number of attributes

#### Number of data without accessibility

- **Mnemonic** ANON
- **Description** Number of data without accessibility

#### Andthen Operators

- **Mnemonic** ANTH
- **Description** Number of 'andthen' operators

#### Public Data

- **Mnemonic** APBL
- **Description** Number of public data

#### Protected Internal Data

- **Mnemonic** APIN
- **Description** Number of protected internal data (only applicable to C#)

#### Protected Data

- **Mnemonic** APRT
- **Description** Number of protected data

#### Private data

- **Mnemonic** APRV
- **Description** Number of private data

**Assignment Operators**

- **Mnemonic** ASOP
- **Description** Number of assignment operators used in the source file

**Static Data**

- **Mnemonic** ASTA
- **Description** Number of static data

**Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function



**Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

**Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

**Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

**Comparison Operators**

→ **Mnemonic** CPOP

→ **Description** Number of comparison operators used in the source file

**Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

**Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

→ **Mnemonic** DDT

→ **Description** Maximun depth of the inheritance tree from the class

**Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

**Depth of Inheritance Tree**

- **Mnemonic** DIT
- **Description** Maximun depth of the class inheritance tree

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Foreach Statements**

- **Mnemonic** FORE
- **Description** Number of 'foreach' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Multiple Inheritance Indicator**

- **Mnemonic** MII
- **Description** Number of classes from which the class inherits directly

**Internal Methods**

- **Mnemonic** MINT
- **Description** Number of internal methods (only applicable to C#)

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Methods without Accessibility**

- **Mnemonic** MNON
- **Description** Number of methods without any accessibility specifier

**Public Methods**

- **Mnemonic** MPBL
- **Description** Number of public methods

**Protected Internal Methods**

- **Mnemonic** MPIN
- **Description** Number of protected internal methods(only applicable to C#)

**Protected Methods**

- **Mnemonic** MPRT
- **Description** Number of protected methods

**Private Methods**

- **Mnemonic** MPRV
- **Description** Number of private methods

**Static Methods**

- **Mnemonic** MSTA
- **Description** Number of static methods

**Number of Ancestors**

- **Mnemonic** NAC
- **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

- **Mnemonic** NDC
- **Description** Number of classes which inherit from the class directly or indirectly

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Number Of Children**

- **Mnemonic** NOC
- **Description** Number of classes which inherit directly from the class

**Number of Parameters**

- **Mnemonic** NOP
- **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Orelse operators**

- **Mnemonic** OREL
- **Description** Number of 'orelse' operators

**Constant Properties**

- **Mnemonic** PCST
- **Description** Number of constant properties

**Properties with Get**

- **Mnemonic** PGET
- **Description** Number of properties with a setter (only applicable to C#)

**Internal Properties**

- **Mnemonic** PINT
- **Description** Number of internal properties (only applicable to C#)

**Properties**

- **Mnemonic** PNBR
- **Description** Total number of properties

**Properties without Accessibility**

- **Mnemonic** PNON
- **Description** Number of properties without accessibility specifier

**Public Properties**

- **Mnemonic** PPBL
- **Description** Number of public properties

**Protected Internal Properties**

- **Mnemonic** PPIN
- **Description** Number of protected internal properties (only applicable to C#)

**Protected Properties**

- **Mnemonic** PPRT
- **Description** Number of protected properties

**Private Properties**

- **Mnemonic** PPRV
- **Description** Number of private properties

**Properties with Set**

- **Mnemonic** PSET
- **Description** Number of properties with a getter (only applicable to C#)

**Static Properties**

- **Mnemonic** PSTA
- **Description** Number of static properties in the class

**Number of #DEFINE**

- **Mnemonic** P\_DEFINE
- **Description** Number of #DEFINE

**Number of #ELIF**

- **Mnemonic** P\_ELIF
- **Description** Number of #ELIF

**Number of #ELSE**

- **Mnemonic** P\_ELSE
- **Description** Number of #ELSE

**Number of #ENDIF**

- **Mnemonic** P\_ENDIF
- **Description** Number of #ENDIF

**Number of #ENDREGION**

- **Mnemonic** P\_ENDREGION
- **Description** Number of #ENDREGION

**Number of #ERROR**

- **Mnemonic** P\_ERROR
- **Description** Number of #ERROR

**Number of #IF**

- **Mnemonic** P\_IF
- **Description** Number of #IF

**Number of #IFDEF**

- **Mnemonic** P\_IFDEF
- **Description** Number of #IFDEF

**Number of #IFDEF**

- **Mnemonic** P\_IFNDEF
- **Description** Number of #IFNDEF

**Compiler FLAG Nested Level**

- **Mnemonic** P\_NEST
- **Description** Compiler FLAG Nested Level

**Number of #PRAGMA**

- **Mnemonic** P\_PRAGMA
- **Description** Number of #PRAGMA

**Number of #REGION**

- **Mnemonic** P\_REGION
- **Description** Number of #REGION

**Number of #UNDEF**

- **Mnemonic** P\_UNDEF
- **Description** Number of #UNDEF

**Number of #WARNING**

- **Mnemonic** P\_WARNING
- **Description** Number of #WARNING

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Special Operators**

- **Mnemonic** SPOP
- **Description** Number of special operators used in the source file

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### **Ternary operators**

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### **Throw Statements**

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Try Statements**

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **While Statements**

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.6.2. C# Ruleset

#### **Backward Goto shall not be used**

→ **Mnemonic** BWGOTO

→ **Description** Backward gotos shall not be used.

#### **Missing compound statement**



**→ Mnemonic COMPOUND**

**→ Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if****→ Mnemonic COMPOUNDIF**

**→ Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed****→ Mnemonic R\_CSTAT**

**→ Description** Commented-out Source Code is not allowed

**Missing Default****→ Mnemonic DEFAULT**

**→ Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else****→ Mnemonic ELSEFINAL**

**→ Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Assignment in Boolean****→ Mnemonic NOASGCOND**

**→ Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison****→ Mnemonic NOASGINBOOL**

**→ Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes****→ Mnemonic CAC\_CL**

**→ Description** Consider classes refactorization

**Factorizable Files****→ Mnemonic CAC\_FI**

**→ Description** Consider files refactorization

**Factorizable Functions****→ Mnemonic CAC\_FN**

**→ Description** Consider functions refactorization

**Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

**Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

**Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.7. Fortran

### 2.7.1. Fortran Metrics

**Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

**Number of arithmetic if**

→ **Mnemonic** ARIF

→ **Description** Count number of arithmetic if

**Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Number of declarative statements**

- **Mnemonic** DECL
- **Description** Count number of declarative statements

**Default Statement**

- **Mnemonic** DEFT
- **Description** Number of 'default' blocks in 'switch' in the function

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Or else operators**

- **Mnemonic** OREL
- **Description** Number of 'or else' operators

**% of parsed tokens**

- **Mnemonic** PARSE
- **Description** Percent of parsed tokens

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

## 2.7.2. Fortran Ruleset

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Use of continue is deprecated (Fortran)**

- **Mnemonic** NOCONTINUE
- **Description** The 'continue' statement is deprecated.

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Incorrect Function Name**

- **Mnemonic** NAMING\_FUNCTION
- **Description** Function name does not fit the convention.

**Incorrect Module Name**

- **Mnemonic** NAMING\_MODULE
- **Description** Module name does not fit the convention.



**Incorrect Program Name**

- **Mnemonic** NAMING\_PROGRAM
- **Description** Program name does not fit the convention.

**Incorrect Subroutine Name**

- **Mnemonic** NAMING\_SUBROUTINE
- **Description** Subroutine name does not fit the convention.

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

**Factorizable Functions**

- **Mnemonic** CAC\_FN
- **Description** Consider functions refactorization

**Factorizable Packages**

- **Mnemonic** CAC\_PKG
- **Description** Consider packages refactorization

**Cloned Classes**

- **Mnemonic** CC\_CL
- **Description** There shall be no duplicated classes

**Cloned Files**

- **Mnemonic** CC\_FI
- **Description** There shall be no duplicated files

**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**Continue shall not be used**

- **Mnemonic** NOCONT
- **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

**'cycle' shall not be used**

- **Mnemonic** NOCYCL
- **Description** The 'cycle' statement shall not be used.

**FIXME shall not be committed in sources code**

- **Mnemonic** R\_NOFIXME
- **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**GOTO shall not be used**

- **Mnemonic** NOGOTO
- **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

**Label out a switch**

- **Mnemonic** NOLABEL
- **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

**Avoid Duplicated Blocks in Function**

- **Mnemonic** RS\_FN
- **Description** There shall be no duplicated parts in functions

**'stop' shall not be used**

- **Mnemonic** NOSTOP
- **Description** The 'stop' statement shall not be used.

**TODO shall not be committed in sources code**

- **Mnemonic** R\_NOTODO
- **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

- **Mnemonic** ONECASE
- **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Relaxed violation**

- **Mnemonic** RELAX
- **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

- **Mnemonic** RETURN
- **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

**Use of SAVE and DATA**

- **Mnemonic** SAVE\_DATA\_USE

→ **Description** A function must not use the SAVE and DATA statements.

#### Multiple exit

→ **Mnemonic** SGLEXIT

→ **Description** For any iteration statement there shall be at most one 'exit' statement used for loop termination.

## 2.8. Java

### 2.8.1. Java Metrics

#### Constant Data

→ **Mnemonic** ACST

→ **Description** Number of constant data

#### Number of Attributes

→ **Mnemonic** ANBR

→ **Description** Number of attributes

#### Number of data without accessibility

→ **Mnemonic** ANON

→ **Description** Number of data without accessibility

#### Andthen Operators

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

#### Public Data

→ **Mnemonic** APBL

→ **Description** Number of public data

#### Protected Data

→ **Mnemonic** APRT

→ **Description** Number of protected data

#### Private data

→ **Mnemonic** APRV

→ **Description** Number of private data

#### Assignment Operators

→ **Mnemonic** ASOP

→ **Description** Number of assignment operators used in the source file

#### Static Data

→ **Mnemonic** ASTA

→ **Description** Number of static data

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

#### **Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### **Brace Lines**

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

#### **Break in Loop**

→ **Mnemonic** BRKL

→ **Description** Number of 'break' statements in loop in the function

#### **Break in Switch**

→ **Mnemonic** BRKS

→ **Description** Number of 'break' statements in 'switch' in the function

#### **Case Blocks**

→ **Mnemonic** CABL

→ **Description** Number of 'case' blocks in 'switch' in the function

#### **Case Labels**

→ **Mnemonic** CASE

→ **Description** Number of 'case' labels in the function

#### **Catch Statements**

→ **Mnemonic** CATC

→ **Description** Number of 'catch' statements in the function

#### **Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

#### **Comparison Operators**

→ **Mnemonic** CPOP

→ **Description** Number of comparison operators used in the source file

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### **Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### **Depth of Descendant Tree**

→ **Mnemonic** DDT

→ **Description** Maximum depth of the inheritance tree from the class

#### **Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

#### **Depth of Inheritance Tree**

→ **Mnemonic** DIT

→ **Description** Maximum depth of the class inheritance tree

#### **Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### **Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### **Do While Statements**

→ **Mnemonic** DOWH

→ **Description** Number of 'do...while' statements in the function

#### **Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### **For Statements**

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

#### **Structures Added**

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

#### **Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

#### **Structures Removed**

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

#### **Header Lines Of Comment**

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

#### **Header Lines Of Code**

→ **Mnemonic** HLOC

→ **Description** Number of lines between the function or class definition and the first opening brace.

#### **Cloned Code**

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### **Cloned Control Flow Tokens**

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### **If Statements**

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### **Line Count**

→ **Mnemonic** LC

→ **Description** Number of lines.

#### **Loop Statements**

→ **Mnemonic** LOOP

→ **Description** Number of loop statements in the function

#### **Multiple Inheritance Indicator**

→ **Mnemonic** MII

→ **Description** Number of classes from which the class inherits directly

#### **Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

#### **Methods without Accessibility**

→ **Mnemonic** MNON

→ **Description** Number of methods without any accessibility specifier

#### **Public Methods**

→ **Mnemonic** MPBL

→ **Description** Number of public methods

#### **Protected Methods**

→ **Mnemonic** MPRT

→ **Description** Number of protected methods

#### **Private Methods**

→ **Mnemonic** MPRV

→ **Description** Number of private methods

#### **Static Methods**

→ **Mnemonic** MSTA

→ **Description** Number of static methods

#### **Number of Ancestors**

→ **Mnemonic** NAC

→ **Description** Number of classes from which the class inherits directly or indirectly

#### Number of Descendants

→ **Mnemonic** NDC

→ **Description** Number of classes which inherit from the class directly or indirectly

#### Maximum Nested Structures

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### Number Of Children

→ **Mnemonic** NOC

→ **Description** Number of classes which inherit directly from the class

#### Number of Parameters

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

#### Non-Cyclic Paths

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

#### Orelse operators

→ **Mnemonic** OREL

→ **Description** Number of 'orelse' operators

#### Return Statements

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

#### Repeated Code Blocks

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### Skipped Lines of Comment code

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

#### Source Lines Of Code

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).



**Special Operators**

- **Mnemonic** SPOP
- **Description** Number of special operators used in the source file

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Ternary operators**

- **Mnemonic** TERN
- **Description** Number of ternary operators i.e. ?:

**Throw Statements**

- **Mnemonic** THRO
- **Description** Number of 'throw' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Try Statements**

- **Mnemonic** TRY
- **Description** Number of 'try' statements in the function

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

**While Statements**

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

## 2.8.2. Java Ruleset

**Missing Break**

- **Mnemonic** BRKFINAL
- **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Missing compound statement**

- **Mnemonic** COMPOUND
- **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if**

- **Mnemonic** COMPOUNDIF
- **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Assignment in Boolean**

- **Mnemonic** NOASGCOND
- **Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison**

- **Mnemonic** NOASGINBOOL
- **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.9. Javascript

### 2.9.1. Javascript Metrics

#### **Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Default Statement**

- **Mnemonic** DEFT
- **Description** Number of 'default' blocks in 'switch' in the function

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**Max Nested Functions**

- **Mnemonic** FNST
- **Description** Max Nested Functions

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

**Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

**Number of Parameters**

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

**Orelse operators**

→ **Mnemonic** OREL

→ **Description** Number of 'orelse' operators

**Return Statements**

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

**Executable Statements**

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

**Switch Statements**

→ **Mnemonic** SWIT



→ **Description** Number of 'switch' statements in the function

#### **Ternary operators**

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### **Throw Statements**

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Try Statements**

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **While Statements**

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.9.2. Javascript Ruleset

#### **Missing Break**

→ **Mnemonic** BRKFINAL

→ **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Missing compound statement**

→ **Mnemonic** COMPOUND

→ **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if**

→ **Mnemonic** COMPOUNDIF

→ **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

→ **Mnemonic** R\_CSTAT

→ **Description** Commented-out Source Code is not allowed

**Missing Default**

→ **Mnemonic** DEFAULT

→ **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else**

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Assignment in Boolean**

→ **Mnemonic** NOASGCOND

→ **Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison**

→ **Mnemonic** NOASGINBOOL

→ **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

**Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

**Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

**Factorizable Packages**

- **Mnemonic** CAC\_PKG
- **Description** Consider packages refactorization

**Cloned Classes**

- **Mnemonic** CC\_CL
- **Description** There shall be no duplicated classes

**Cloned Files**

- **Mnemonic** CC\_FI
- **Description** There shall be no duplicated files

**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**There shall be a no code before first case**

- **Mnemonic** NOCODEBEFORECASE
- **Description** There shall be a no code before the first case of a switch statement.

**Continue shall not be used**

- **Mnemonic** NOCONT
- **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

**Fallthrough shall be avoided**

- **Mnemonic** NOFALLTHROUGH
- **Description** There shall be no fallthrough the next case in a switch statement.

**FIXME shall not be committed in sources code**

- **Mnemonic** R\_NOFIXME
- **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**Label out a switch**

- **Mnemonic** NOLABEL
- **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

**Avoid Duplicated Blocks in Function**

- **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

**Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

**Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.10. MindC

### 2.10.1. MindC Metrics

**Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

**Assignment Operators**

→ **Mnemonic** ASOP

→ **Description** Number of assignment operators used in the source file

**Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

**Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### Blank Lines

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### Brace Lines

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

#### Break in Loop

→ **Mnemonic** BRKL

→ **Description** Number of 'break' statements in loop in the function

#### Break in Switch

→ **Mnemonic** BRKS

→ **Description** Number of 'break' statements in 'switch' in the function

#### Case Blocks

→ **Mnemonic** CABL

→ **Description** Number of 'case' blocks in 'switch' in the function

#### Calls To

→ **Mnemonic** CAL2

→ **Description** Number of explicit calls to the function.

#### Called Functions

→ **Mnemonic** CALD

→ **Description** Number of distinct functions defined in the project source file and called by the function.

#### Calls From

→ **Mnemonic** CALF

→ **Description** Number of explicit calls from the function.

#### Calling Functions

→ **Mnemonic** CALI

→ **Description** Number of distinct functions calling the function.

#### Called External Functions

→ **Mnemonic** CALX

→ **Description** Number of distinct external functions called by the function - external i.e. not defined in the project

#### Case Labels

→ **Mnemonic** CASE

→ **Description** Number of 'case' labels in the function

#### **Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

#### **Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

#### **Recursive Calls**

→ **Mnemonic** CDRI

→ **Description** Number of directly recursive calls in the function.

#### **Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

#### **Called Depth**

→ **Mnemonic** CGDD

→ **Description** Maximum depth of called functions.

#### **Calling Depth**

→ **Mnemonic** CGDI

→ **Description** Maximum depth of calling functions.

#### **Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

#### **Minimum Number of Indirect Cycles**

→ **Mnemonic** CIRI

→ **Description** Minimum number of indirect call graph cycles in which the function is involved (excluding recursive calls).

#### **Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

#### **Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

#### **Comparison Operators**

→ **Mnemonic** CPOP

→ **Description** Number of comparison operators used in the source file

#### **Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

#### **Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

#### **Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

#### **Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

#### **Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

#### **Do While Statements**

→ **Mnemonic** DOWH

→ **Description** Number of 'do...while' statements in the function

#### **Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

#### **For Statements**

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

#### **Structures Added**

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

#### **Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

#### **Structures Removed**

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

#### **Goto Statements**

→ **Mnemonic** GOTO

→ **Description** Number of 'goto' statements

#### **Header Lines Of Comment**

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

#### **Header Lines Of Code**

→ **Mnemonic** HLOC

→ **Description** Number of lines between the function or class definition and the first opening brace.

#### **Cloned Code**

→ **Mnemonic** ICC

→ **Description** Duplicated code in this artefact

#### **Cloned Control Flow Tokens**

→ **Mnemonic** ICFTC

→ **Description** Number of duplicated tokens in control flow of functions

#### **If Statements**

→ **Mnemonic** IF

→ **Description** Number of 'if' statements

#### **Line Count**

→ **Mnemonic** LC

→ **Description** Number of lines.

#### **Use of longjump**

→ **Mnemonic** LONGJMP

→ **Description** Use of longjump

#### **Loop Statements**

→ **Mnemonic** LOOP

→ **Description** Number of loop statements in the function

#### **Memory Allocation**

→ **Mnemonic** MEMALLOC

→ **Description** Memory Allocation

#### **Memory Freeing**



→ **Mnemonic** MEMFREE

→ **Description** Memory Freeing

#### **Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

#### **Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

#### **Number of Parameters**

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

#### **Non-Cyclic Paths**

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

#### **Use of offsetof**

→ **Mnemonic** OFFSETOF

→ **Description** Use of offsetof

#### **Or else operators**

→ **Mnemonic** OREL

→ **Description** Number of 'or else' operators

#### **Number of #DEFINE**

→ **Mnemonic** P\_DEFINE

→ **Description** Number of #DEFINE

#### **Number of #ELIF**

→ **Mnemonic** P\_ELIF

→ **Description** Number of #ELIF

#### **Number of #ELSE**

→ **Mnemonic** P\_ELSE

→ **Description** Number of #ELSE

#### **Number of #ENDIF**

→ **Mnemonic** P\_ENDIF

→ **Description** Number of #ENDIF

#### **Number of #ERROR**

→ **Mnemonic** P\_ERROR

→ **Description** Number of #ERROR

#### **Number of #IF**

→ **Mnemonic** P\_IF

→ **Description** Number of #IF

#### **Number of #IFDEF**

→ **Mnemonic** P\_IFDEF

→ **Description** Number of #IFDEF

#### **Number of #IFDEF**

→ **Mnemonic** P\_IFNDEF

→ **Description** Number of #IFNDEF

#### **Number of Include**

→ **Mnemonic** P\_INCLUDE

→ **Description** Number of Include

#### **Compiler FLAG Nested Level**

→ **Mnemonic** P\_NEST

→ **Description** Compiler FLAG Nested Level

#### **Number of #PRAGMA**

→ **Mnemonic** P\_PRAGMA

→ **Description** Number of #PRAGMA

#### **Number of #UNDEF**

→ **Mnemonic** P\_UNDEF

→ **Description** Number of #UNDEF

#### **Number of #WARNING**

→ **Mnemonic** P\_WARNING

→ **Description** Number of #WARNING

#### **Return Statements**

→ **Mnemonic** RETURN

→ **Description** Number of 'return' statements in the function

#### **Repeated Code Blocks**

→ **Mnemonic** RS

→ **Description** Duplicated blocks in the function

#### **Use of setjump**

→ **Mnemonic** SETJMP

→ **Description** Use of setjump

#### Signal Functions

→ **Mnemonic** SIGNAL

→ **Description** Use of signal Functions

#### Skipped Lines of Comment code

→ **Mnemonic** SKLC

→ **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

#### Source Lines Of Code

→ **Mnemonic** SLOC

→ **Description** Number of lines of source code in the source file(s).

#### Special Operators

→ **Mnemonic** SPOP

→ **Description** Number of special operators used in the source file

#### Executable Statements

→ **Mnemonic** STAT

→ **Description** Total number of executable statements.

#### IO Functions

→ **Mnemonic** STDIO

→ **Description** Use IO Functions

#### String Conversions

→ **Mnemonic** STRINGCONV

→ **Description** Use of String Conversions

#### Switch Statements

→ **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### System Functions

→ **Mnemonic** SYSCOM

→ **Description** Use of system Functions

#### Ternary operators

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### Time Handling

→ **Mnemonic** TIMEHDL

→ **Description** Use of Time Handling

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **While Statements**

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.10.2. MindC Ruleset

#### **Missing Break**

→ **Mnemonic** BRKFINAL

→ **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

#### **Backward Goto shall not be used**

→ **Mnemonic** BWGOTO

→ **Description** Backward gotos shall not be used.

#### **Missing compound statement**

→ **Mnemonic** COMPOUND

→ **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

#### **Missing compound if**

→ **Mnemonic** COMPOUNDIF

- **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Dynamic Memory Allocation shall not be used**

- **Mnemonic** DYNMEMALLOC
- **Description** Dynamic heap memory allocation shall not used. This precludes the use of the functions calloc, malloc, realloc and free (see [MISRA-C:2004]: RULE 20.4)

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Macro longjmp or setjmp shall not be used**

- **Mnemonic** JUMP
- **Description** (The setjmp macro and the longjmp function shall not be used (see [MISRA-C:2004]: RULE 20.7).

**Nesting Level of Preprocessing directives is too high**

- **Mnemonic** R\_MAXPNEST
- **Description** Nesting Level of Preprocessing directives is too high

**Assignment in Boolean**

- **Mnemonic** NOASGCOND
- **Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison**

- **Mnemonic** NOASGINBOOL
- **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Recursion are not allowed**

→ **Mnemonic** NORECURSION

→ **Description** Functions shall not called themselves either directly or indirectly (see [MISRA-C:2004]: RULE 16.2).

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Macro offsetof shall not be used**

→ **Mnemonic** OFFSETOF

→ **Description** The macro offsetof, in library <stddef.h>, shall not be used (see [MISRA-C:2004]: RULE 20.6).

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

**Signal or Raise shall not be used**

→ **Mnemonic** SIGNAL

→ **Description** The signal handling facilities of <signal.h> shall not be used (see [MISRA-C:2004]: RULE 20.8).

**IO Functions shall not be used**

→ **Mnemonic** STDIO

→ **Description** The input/output library <stdio.h> shall not be used in production code (see [MISRA-C:2004]: RULE 20.9).

**'atof, atoi or atol' shall not be used**

→ **Mnemonic** STRINGCONV

→ **Description** The library functions atof, atoi and atol from library <stdlib.h> shall not be used (see [MISRA-C:2004]: RULE 20.10).

**'abort, exit, getenv or system' shall not be used**

→ **Mnemonic** SYSCOM

→ **Description** The library functions abort, exit, getenv and system from library <stdlib.h> shall not be used (see [MISRA-C:2004]: RULE 20.11).

**Time Handling Functions shall not be used**

→ **Mnemonic** TIMEHDL

→ **Description** The time handling functions of library <time.h> shall not be used: time, strftime, clock, difftime, mktime (see [MISRA-C:2004]: RULE 20.12).

## 2.11. Objective-C

### 2.11.1. Objective-C Metrics

**Constant Data**

→ **Mnemonic** ACST

→ **Description** Number of constant data

**Number of Attributes**

→ **Mnemonic** ANBR

→ **Description** Number of attributes

**Number of data without accessibility**

→ **Mnemonic** ANON

→ **Description** Number of data without accessibility

**Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators



**Public Data**

- **Mnemonic** APBL
- **Description** Number of public data

**Protected Data**

- **Mnemonic** APRT
- **Description** Number of protected data

**Private data**

- **Mnemonic** APRV
- **Description** Number of private data

**Assignment Operators**

- **Mnemonic** ASOP
- **Description** Number of assignment operators used in the source file

**Static Data**

- **Mnemonic** ASTA
- **Description** Number of static data

**Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Comparison Operators**

- **Mnemonic** CPOP
- **Description** Number of comparison operators used in the source file

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

→ **Mnemonic** DDT

→ **Description** Maximun depth of the inheritance tree from the class

**Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

**Depth of Inheritance Tree**

→ **Mnemonic** DIT

→ **Description** Maximun depth of the class inheritance tree

**Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

→ **Mnemonic** DOWH

→ **Description** Number of 'do...while' statements in the function

**Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

**For Statements**

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

**Structures Added**

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

**Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Multiple Inheritance Indicator**

- **Mnemonic** MII
- **Description** Number of classes from which the class inherits directly

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Methods without Accessibility**

→ **Mnemonic** MNON

→ **Description** Number of methods without any accessibility specifier

**Public Methods**

→ **Mnemonic** MPBL

→ **Description** Number of public methods

**Protected Methods**

→ **Mnemonic** MPRT

→ **Description** Number of protected methods

**Private Methods**

→ **Mnemonic** MPRV

→ **Description** Number of private methods

**Static Methods**

→ **Mnemonic** MSTA

→ **Description** Number of static methods

**Number of Ancestors**

→ **Mnemonic** NAC

→ **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

→ **Mnemonic** NDC

→ **Description** Number of classes which inherit from the class directly or indirectly

**Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures

**Number Of Children**

→ **Mnemonic** NOC

→ **Description** Number of classes which inherit directly from the class

**Number of Parameters**

→ **Mnemonic** NOP

→ **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

→ **Mnemonic** PATH

→ **Description** Number of non-cyclic paths in the function.

**Orelse operators**

- **Mnemonic** OREL
- **Description** Number of 'orelse' operators

**Properties**

- **Mnemonic** PNBR
- **Description** Total number of properties

**Number of #DEFINE**

- **Mnemonic** P\_DEFINE
- **Description** Number of #DEFINE

**Number of #ELIF**

- **Mnemonic** P\_ELIF
- **Description** Number of #ELIF

**Number of #ELSE**

- **Mnemonic** P\_ELSE
- **Description** Number of #ELSE

**Number of #ENDIF**

- **Mnemonic** P\_ENDIF
- **Description** Number of #ENDIF

**Number of #ERROR**

- **Mnemonic** P\_ERROR
- **Description** Number of #ERROR

**Number of #IF**

- **Mnemonic** P\_IF
- **Description** Number of #IF

**Number of #IFDEF**

- **Mnemonic** P\_IFDEF
- **Description** Number of #IFDEF

**Number of #IFDEF**

- **Mnemonic** P\_IFNDEF
- **Description** Number of #IFDEF

**Number of Include**

- **Mnemonic** P\_INCLUDE
- **Description** Number of Include

**Compiler FLAG Nested Level**

- **Mnemonic** P\_NEST
- **Description** Compiler FLAG Nested Level

**Number of #PRAGMA**

- **Mnemonic** P\_PRAGMA
- **Description** Number of #PRAGMA

**Number of #UNDEF**

- **Mnemonic** P\_UNDEF
- **Description** Number of #UNDEF

**Number of #WARNING**

- **Mnemonic** P\_WARNING
- **Description** Number of #WARNING

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Special Operators**

- **Mnemonic** SPOP
- **Description** Number of special operators used in the source file

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT

→ **Description** Number of 'switch' statements in the function

#### **Ternary operators**

→ **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### **Throw Statements**

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Try Statements**

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **While Statements**

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

#### **Weighted Method per Class**

→ **Mnemonic** XWMC

→ **Description** Sum of cyclomatic complexities of methods implemented outside the class definition

## 2.11.2. Objective-C Ruleset

#### **Missing Break**



→ **Mnemonic** BRKFINAL

→ **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

#### **Backward Goto shall not be used**

→ **Mnemonic** BWGOTO

→ **Description** Backward gotos shall not be used.

#### **Missing compound statement**

→ **Mnemonic** COMPOUND

→ **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

#### **Missing compound if**

→ **Mnemonic** COMPOUNDIF

→ **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

#### **Commented-out Source Code is not allowed**

→ **Mnemonic** R\_CSTAT

→ **Description** Commented-out Source Code is not allowed

#### **Missing Default**

→ **Mnemonic** DEFAULT

→ **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

#### **Missing final else**

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

#### **Assignment in Boolean**

→ **Mnemonic** NOASGCOND

→ **Description** Assignment operators shall not be used in expressions that yield a boolean value

#### **Assignment without Comparison**

→ **Mnemonic** NOASGINBOOL

→ **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

#### **Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### Label out a switch

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### Avoid Duplicated Blocks in Function

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### TODO shall not be committed in sources code

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### Missing case in switch

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### Relaxed violation

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### Multiple exits are not allowed

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### Risky Empty Statement

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### Multiple break in loop are not allowed

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.12. PHP

### 2.12.1. PHP Metrics

#### Constant Data

→ **Mnemonic** ACST

→ **Description** Number of constant data

**Number of Attributes**

- **Mnemonic** ANBR
- **Description** Number of attributes

**Number of data without accessibility**

- **Mnemonic** ANON
- **Description** Number of data without accessibility

**Andthen Operators**

- **Mnemonic** ANTH
- **Description** Number of 'andthen' operators

**Public Data**

- **Mnemonic** APBL
- **Description** Number of public data

**Protected Data**

- **Mnemonic** APRT
- **Description** Number of protected data

**Private data**

- **Mnemonic** APRV
- **Description** Number of private data

**Static Data**

- **Mnemonic** ASTA
- **Description** Number of static data

**Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

- **Mnemonic** DDT
- **Description** Maximum depth of the inheritance tree from the class

**Default Statement**

- **Mnemonic** DEFT
- **Description** Number of 'default' blocks in 'switch' in the function

**Depth of Inheritance Tree**

- **Mnemonic** DIT
- **Description** Maximun depth of the class inheritance tree

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**Call to exit**

- **Mnemonic** EXIT
- **Description** Number of calls to the exit function

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Foreach Statements**

- **Mnemonic** FORE
- **Description** Number of 'foreach' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**HTML Lines of Code**

- **Mnemonic** HTML
- **Description** Number of HTML lines of code in the source file(s).

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Constant Methods**

- **Mnemonic** MCST
- **Description** Number of 'constant' methods i.e. which do not modify the object

**Multiple Inheritance Indicator**

→ **Mnemonic** MII

→ **Description** Number of classes from which the class inherits directly

**PHP/HTML Mixed Lines**

→ **Mnemonic** MIXL

→ **Description** Number of lines containing both PHP and HTML in the source files.

**Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

**Methods without Accessibility**

→ **Mnemonic** MNON

→ **Description** Number of methods without any accessibility specifier

**Public Methods**

→ **Mnemonic** MPBL

→ **Description** Number of public methods

**Protected Methods**

→ **Mnemonic** MPRT

→ **Description** Number of protected methods

**Private Methods**

→ **Mnemonic** MPRV

→ **Description** Number of private methods

**Static Methods**

→ **Mnemonic** MSTA

→ **Description** Number of static methods

**Number of Ancestors**

→ **Mnemonic** NAC

→ **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

→ **Mnemonic** NDC

→ **Description** Number of classes which inherit from the class directly or indirectly

**Maximum Nested Structures**

→ **Mnemonic** NEST

→ **Description** Maximum number of nested structures



**Number Of Children**

- **Mnemonic** NOC
- **Description** Number of classes which inherit directly from the class

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Or else operators**

- **Mnemonic** OREL
- **Description** Number of 'or else' operators

**PHP Lines of Code**

- **Mnemonic** PHPL
- **Description** Number of PHP lines of code in the source file(s).

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Ternary operators**

- **Mnemonic** TERN
- **Description** Number of ternary operators i.e. ?:

**Throw Statements**

- **Mnemonic** THRO
- **Description** Number of 'throw' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Try Statements**

- **Mnemonic** TRY
- **Description** Number of 'try' statements in the function

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

**While Statements**

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

## 2.12.2. PHP Ruleset

**Missing Break**

- **Mnemonic** BRKFINAL
- **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Missing compound statement**

**→ Mnemonic COMPOUND**

**→ Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if****→ Mnemonic COMPOUNDIF**

**→ Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed****→ Mnemonic R\_CSTAT**

**→ Description** Commented-out Source Code is not allowed

**Missing Default****→ Mnemonic DEFAULT**

**→ Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else****→ Mnemonic ELSEFINAL**

**→ Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Assignment in Boolean****→ Mnemonic NOASGCOND**

**→ Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison****→ Mnemonic NOASGINBOOL**

**→ Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes****→ Mnemonic CAC\_CL**

**→ Description** Consider classes refactorization

**Factorizable Files****→ Mnemonic CAC\_FI**

**→ Description** Consider files refactorization

**Factorizable Functions****→ Mnemonic CAC\_FN**

**→ Description** Consider functions refactorization

**Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **There shall be a no code before first case**

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Fallthrough shall be avoided**

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.13. Python

### 2.13.1. Python Metrics

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

#### **Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

→ **Mnemonic** BRKL

→ **Description** Number of 'break' statements in loop in the function

**Catch Statements**

→ **Mnemonic** CATC

→ **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

→ **Mnemonic** CCN

→ **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

→ **Mnemonic** CFT

→ **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

→ **Mnemonic** CGDM

→ **Description** Maximum depth of the call graph.

**Comment Lines**

→ **Mnemonic** CLOC

→ **Description** Number of lines of comments in the source file(s).

**Continue Statements**

→ **Mnemonic** CONT

→ **Description** Number of 'continue' statements in the function

**Commented Statements**

→ **Mnemonic** CSTAT

→ **Description** Number of Commented Statements.

**Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

- **Mnemonic** DDT
- **Description** Maximun depth of the inheritance tree from the class

**Depth of Inheritance Tree**

- **Mnemonic** DIT
- **Description** Maximun depth of the class inheritance tree

**Number of DocString lines**

- **Mnemonic** DOCL
- **Description** Count number of lines of python DocString

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**Call to exit**

- **Mnemonic** EXIT
- **Description** Number of calls to the exit function

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Multiple Inheritance Indicator**

- **Mnemonic** MII
- **Description** Number of classes from which the class inherits directly

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Number of Ancestors**

- **Mnemonic** NAC
- **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

- **Mnemonic** NDC
- **Description** Number of classes which inherit from the class directly or indirectly



**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Number Of Children**

- **Mnemonic** NOC
- **Description** Number of classes which inherit directly from the class

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**% of parsed tokens**

- **Mnemonic** PARSE
- **Description** Percent of parsed tokens

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Throw Statements**

- **Mnemonic** THRO
- **Description** Number of 'throw' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### Operator Occurrences

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### Try Statements

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### Lines Added

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### Lines Modified

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### Lines Removed

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### While Statements

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.13.2. Python Ruleset

### There shall be a `__init__` method in the class.

→ **Mnemonic** CLASSNOINIT

→ **Description** There shall be a `__init__` method in the class.

### Missing compound statement

→ **Mnemonic** COMPOUND

→ **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

### Missing compound if

→ **Mnemonic** COMPOUNDIF

→ **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

### Missing final else

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

#### **Method should have "self" as first argument**

→ **Mnemonic** METHODSELFFIRST

→ **Description** Method has an attribute different the "self" as first argument.

#### **Method without parameter**

→ **Mnemonic** METHODWITHOUTPARAM

→ **Description** Method without parameter.

#### **Assignment in Boolean**

→ **Mnemonic** NOASGCOND

→ **Description** Assignment operators shall not be used in expressions that yield a boolean value

#### **Assignment without Comparison**

→ **Mnemonic** NOASGINBOOL

→ **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

#### **Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **Exec shall not be used.**

→ **Mnemonic** NOEXEC

→ **Description** Use of 'exec'

#### **EXIT PROGRAM shall not be used**

→ **Mnemonic** NOEXIT

→ **Description** EXIT PROGRAM shall not be used in a subprogram. Use GOBACK instead

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Label out a switch**

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

#### **Print shall not be used.**

→ **Mnemonic** NOPRINT

→ **Description** Use of 'print'

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **'star' parameter shall not be used.**

→ **Mnemonic** NOSTARPARAM

→ **Description** Use of star parameter

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **There shall be only one Statement per line**

→ **Mnemonic** ONESTMTPERLINE

→ **Description** There shall be only one Statement per line

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Risky Empty Statement**

→ **Mnemonic** RISKYEMPTY

→ **Description** Risky Empty Statement

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.14. PL/SQL

### 2.14.1. PL/SQL Metrics

#### **Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

#### **Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

#### **Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

#### **Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

#### **Brace Lines**

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

**Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

**For Statements**

→ **Mnemonic** FOR

→ **Description** Number of 'for' statements in the function

**Structures Added**

→ **Mnemonic** SADD

→ **Description** Number of control structures added since the previous version.

**Structures Modified**

→ **Mnemonic** SMOD

→ **Description** Number of control structures modified since the previous version.

**Structures Removed**

→ **Mnemonic** SREM

→ **Description** Number of control structures removed since the previous version.

**Goto Statements**

→ **Mnemonic** GOTO

→ **Description** Number of 'goto' statements

**Header Lines Of Comment**

→ **Mnemonic** HCOM

→ **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Number of Parameters**

- **Mnemonic** NOP
- **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Or else operators**

- **Mnemonic** OREL
- **Description** Number of 'or else' operators



**Number of #DEFINE**

- **Mnemonic** P\_DEFINE
- **Description** Number of #DEFINE

**Number of #ELIF**

- **Mnemonic** P\_ELIF
- **Description** Number of #ELIF

**Number of #ELSE**

- **Mnemonic** P\_ELSE
- **Description** Number of #ELSE

**Number of #ENDIF**

- **Mnemonic** P\_ENDIF
- **Description** Number of #ENDIF

**Number of #ERROR**

- **Mnemonic** P\_ERROR
- **Description** Number of #ERROR

**Number of #IF**

- **Mnemonic** P\_IF
- **Description** Number of #IF

**Number of #IFDEF**

- **Mnemonic** P\_IFDEF
- **Description** Number of #IFDEF

**Number of #IFDEF**

- **Mnemonic** P\_IFNDEF
- **Description** Number of #IFNDEF

**Number of Include**

- **Mnemonic** P\_INCLUDE
- **Description** Number of Include

**Compiler FLAG Nested Level**

- **Mnemonic** P\_NEST
- **Description** Compiler FLAG Nested Level

**Number of #PRAGMA**

- **Mnemonic** P\_PRAGMA
- **Description** Number of #PRAGMA

**Number of #UNDEF**

- **Mnemonic** P\_UNDEF
- **Description** Number of #UNDEF

**Number of #WARNING**

- **Mnemonic** P\_WARNING
- **Description** Number of #WARNING

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

**While Statements**

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

## 2.14.2. PL/SQL Ruleset

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

**Factorizable Functions**

- **Mnemonic** CAC\_FN
- **Description** Consider functions refactorization

**Factorizable Packages**

- **Mnemonic** CAC\_PKG
- **Description** Consider packages refactorization

**Cloned Classes**

- **Mnemonic** CC\_CL
- **Description** There shall be no duplicated classes

**Cloned Files**

- **Mnemonic** CC\_FI
- **Description** There shall be no duplicated files

**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**Commit Used**

- **Mnemonic** NOCOMMIT
- **Description** Commit instruction used in code

**FIXME shall not be committed in sources code**

- **Mnemonic** R\_NOFIXME
- **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**GOTO shall not be used**

- **Mnemonic** NOGOTO
- **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

**Rollback Used**

- **Mnemonic** R\_NOROLLBACK
- **Description** Rollback instruction used in code

**Avoid Duplicated Blocks in Function**

- **Mnemonic** RS\_FN
- **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

- **Mnemonic** R\_NOTODO
- **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

→ **Mnemonic** ONECASE

→ **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

## 2.15. TSQL

### 2.15.1. TSQL Metrics

**Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

**Header Blocks Of Comment**

→ **Mnemonic** BHCO

→ **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

→ **Mnemonic** BLAN

→ **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

→ **Mnemonic** BRAC

→ **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

→ **Mnemonic** BRKL

→ **Description** Number of 'break' statements in loop in the function

**Catch Statements**

→ **Mnemonic** CATC

→ **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

→ **Mnemonic** CCLC

→ **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Delete Statements**

- **Mnemonic** DELETE
- **Description** Number of Delete statements

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Insert Statements**

- **Mnemonic** INSERT
- **Description** Number of Insert statements

**Label Statements**

- **Mnemonic** LABEL
- **Description** Number of Label statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Mixed Lines**

- **Mnemonic** MLOC
- **Description** Number of lines containing both code and comment in the source files.

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Select Statements**

- **Mnemonic** SELECT
- **Description** Number of Select statements

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Throw Statements**

- **Mnemonic** THRO



→ **Description** Number of 'throw' statements in the function

#### **Operand Occurrences**

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### **Operator Occurrences**

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### **Try Statements**

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### **Lines Added**

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### **Lines Modified**

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### **Lines Removed**

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### **Update Statements**

→ **Mnemonic** UPDATE

→ **Description** Number of Update statements

#### **While Statements**

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.15.2. TSQL Ruleset

#### **Backward Goto shall not be used**

→ **Mnemonic** BWGOTO

→ **Description** Backward gotos shall not be used.

#### **Commented-out Source Code is not allowed**

→ **Mnemonic** R\_CSTAT

→ **Description** Commented-out Source Code is not allowed

#### **Missing final else**

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

#### **Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

#### **Factorizable Functions**

→ **Mnemonic** CAC\_FN

→ **Description** Consider functions refactorization

#### **Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### **Cloned Classes**

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### **Cloned Files**

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### **Cloned Functions**

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### **Cloned Algorithmic**

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### **Continue shall not be used**

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### **FIXME shall not be committed in sources code**

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### **GOTO shall not be used**

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### **Avoid Duplicated Blocks in Function**

→ **Mnemonic** RS\_FN

→ **Description** There shall be no duplicated parts in functions

#### **TODO shall not be committed in sources code**

→ **Mnemonic** R\_NOTODO

→ **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

#### **Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

#### **Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

#### **Multiple break in loop are not allowed**

→ **Mnemonic** SGLBRK

→ **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 2.16. VB.net

### 2.16.1. VB.net Metrics

#### **Constant Data**

→ **Mnemonic** ACST

→ **Description** Number of constant data

#### **Fiend Attributes**

→ **Mnemonic** AFRI

→ **Description** Number of Friend Attributes

#### **Number of Attributes**

→ **Mnemonic** ANBR

→ **Description** Number of attributes

#### **Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

**Public Data**

- **Mnemonic** APBL
- **Description** Number of public data

**Protected Data**

- **Mnemonic** APRT
- **Description** Number of protected data

**Private data**

- **Mnemonic** APRV
- **Description** Number of private data

**Shadowed Attributes**

- **Mnemonic** ASHD
- **Description** Number of Shadowed Attributes

**Shared Attributes**

- **Mnemonic** ASHR
- **Description** Number of Shared Attributes

**Number of comment blocks**

- **Mnemonic** BCOM
- **Description** Number of comment blocks.

**Header Blocks Of Comment**

- **Mnemonic** BHCO
- **Description** Number block of comment placed before the beginning of the artefact.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Brace Lines**

- **Mnemonic** BRAC
- **Description** Number of lines of code containing only a brace in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Stop Statements**

- **Mnemonic** BRKP
- **Description** Number of Stop Statements (Breakpoints)

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).

**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

→ **Mnemonic** CYCL

→ **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Depth of Descendant Tree**

→ **Mnemonic** DDT

→ **Description** Maximun depth of the inheritance tree from the class

**Default Statement**

→ **Mnemonic** DEFT

→ **Description** Number of 'default' blocks in 'switch' in the function

**Depth of Inheritance Tree**

→ **Mnemonic** DIT

→ **Description** Maximun depth of the class inheritance tree

**Distinct Operands**

→ **Mnemonic** DOPD

→ **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

→ **Mnemonic** DOPT

→ **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

→ **Mnemonic** DOWH

→ **Description** Number of 'do...while' statements in the function

**Friend Events**

→ **Mnemonic** EFRI

→ **Description** Number of Friend Events

**Else Statements**

→ **Mnemonic** ELSE

→ **Description** Number of 'else' statements

**Events**

→ **Mnemonic** ENBR

→ **Description** Number of Events

**Public Events**

→ **Mnemonic** EPBL

→ **Description** Number of Public Events

**Protected Events**

- **Mnemonic** EPRT
- **Description** Number of Protected Events

**Private Events**

- **Mnemonic** EPRV
- **Description** Number of Private Events

**Shadowed Events**

- **Mnemonic** ESHD
- **Description** Number of Shadowed Events

**Shared Events**

- **Mnemonic** ESHR
- **Description** Number of Shared Events

**Call to exit**

- **Mnemonic** EXIT
- **Description** Number of calls to the exit function

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Header Lines Of Comment**

- **Mnemonic** HCOM
- **Description** Number of comment lines placed before the beginning of the artefact.

**Header Lines Of Code**

- **Mnemonic** HLOC
- **Description** Number of lines between the function or class definition and the first opening brace.

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**End Statements**

- **Mnemonic** KILL
- **Description** Number of End Statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Declare Members**

- **Mnemonic** MDEC
- **Description** Number of Declare Members

**Delegate Members**

- **Mnemonic** MDEL
- **Description** Number of Delegate Members

**Friend Members**

- **Mnemonic** MFRI
- **Description** Number of Friend Members

**Multiple Inheritance Indicator**

- **Mnemonic** MII
- **Description** Number of classes from which the class inherits directly



**Mixed Lines**

→ **Mnemonic** MLOC

→ **Description** Number of lines containing both code and comment in the source files.

**Must Members**

→ **Mnemonic** MMST

→ **Description** Number of Must Members

**Methods without Accessibility**

→ **Mnemonic** MNON

→ **Description** Number of methods without any accessibility specifier

**Partial Members**

→ **Mnemonic** MPAR

→ **Description** Number of Partial Members

**Public Methods**

→ **Mnemonic** MPBL

→ **Description** Number of public methods

**Protected Methods**

→ **Mnemonic** MPRT

→ **Description** Number of protected methods

**Private Methods**

→ **Mnemonic** MPRV

→ **Description** Number of private methods

**Shadowed Members**

→ **Mnemonic** MSHD

→ **Description** Number of Shadowed Members

**Shared Members**

→ **Mnemonic** MSHR

→ **Description** Number of Shared Members

**Number of Ancestors**

→ **Mnemonic** NAC

→ **Description** Number of classes from which the class inherits directly or indirectly

**Number of Descendants**

→ **Mnemonic** NDC

→ **Description** Number of classes which inherit from the class directly or indirectly

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Number Of Children**

- **Mnemonic** NOC
- **Description** Number of classes which inherit directly from the class

**Number of Methods**

- **Mnemonic** NOM
- **Description** Number of methods defined in the class

**Number of Parameters**

- **Mnemonic** NOP
- **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Orelse operators**

- **Mnemonic** OREL
- **Description** Number of 'orelse' operators

**% of parsed tokens**

- **Mnemonic** PARSE
- **Description** Percent of parsed tokens

**Friend Properties**

- **Mnemonic** PFRI
- **Description** Number of Friend Properties

**Must Properties**

- **Mnemonic** PMST
- **Description** Number of Must Properties

**Properties**

- **Mnemonic** PNBR
- **Description** Total number of properties

**Public Properties**

- **Mnemonic** PPBL
- **Description** Number of public properties

**Protected Properties**

- **Mnemonic** PPRT
- **Description** Number of protected properties

**Private Properties**

- **Mnemonic** PPRV
- **Description** Number of private properties

**Shadowed Properties**

- **Mnemonic** PSHD
- **Description** Number of Shadowed Properties

**Shared Properties**

- **Mnemonic** PSHR
- **Description** Number of Shared Properties

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Skipped Lines of Comment code**

- **Mnemonic** SKLC
- **Description** Skipped Lines of Comment code i.e. lines that match a user defined regular expression to skip lines of comments.

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Ternary operators**

- **Mnemonic** TERN

→ **Description** Number of ternary operators i.e. ?:

#### Throw Statements

→ **Mnemonic** THRO

→ **Description** Number of 'throw' statements in the function

#### Operand Occurrences

→ **Mnemonic** TOPD

→ **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

#### Operator Occurrences

→ **Mnemonic** TOPT

→ **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

#### Try Statements

→ **Mnemonic** TRY

→ **Description** Number of 'try' statements in the function

#### Lines Added

→ **Mnemonic** LADD

→ **Description** Number of lines added since the previous version.

#### Lines Modified

→ **Mnemonic** LMOD

→ **Description** Number of lines modified since the previous version.

#### Lines Removed

→ **Mnemonic** LREM

→ **Description** Number of lines removed since the previous version.

#### While Statements

→ **Mnemonic** WHIL

→ **Description** Number of 'while' statements in the function

## 2.16.2. VB.net Ruleset

#### Backward Goto shall not be used

→ **Mnemonic** BWGOTO

→ **Description** Backward gotos shall not be used.

#### Missing Case Else clause

→ **Mnemonic** CASEELSE

→ **Description** The final clause of a Select statement shall be the Case Else clause.

#### Missing final else

→ **Mnemonic** ELSEFINAL

→ **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

#### **Use of Exit Do statement**

→ **Mnemonic** EXITDO

→ **Description** Do not use Exit Do statement to break a Do loop.

#### **Use of Exit Function statement**

→ **Mnemonic** EXITFCT

→ **Description** Do not use Exit Function statement, use Return instead.

#### **Use of Exit For statement**

→ **Mnemonic** EXITFOR

→ **Description** Do not use Exit For statement to break a For loop.

#### **Use of Exit Property statement**

→ **Mnemonic** EXITPROP

→ **Description** Do not use Exit Property statement, use Return instead.

#### **Use of Exit Select statement**

→ **Mnemonic** EXITSELECT

→ **Description** Do not use Exit Select statement to exit a Select statement.

#### **Use of Exit Sub statement**

→ **Mnemonic** EXITSUB

→ **Description** Do not use Exit Sub statement.

#### **Use of Exit Try statement**

→ **Mnemonic** EXITTRY

→ **Description** Do not use Exit Try statement to exit a Try statement.

#### **Use of Exit While statement**

→ **Mnemonic** EXITWHILE

→ **Description** Do not use Exit While statement to break a While loop.

#### **Factorizable Classes**

→ **Mnemonic** CAC\_CL

→ **Description** Consider classes refactorization

#### **Factorizable Files**

→ **Mnemonic** CAC\_FI

→ **Description** Consider files refactorization

**Factorizable Functions**

- **Mnemonic** CAC\_FN
- **Description** Consider functions refactorization

**Factorizable Packages**

- **Mnemonic** CAC\_PKG
- **Description** Consider packages refactorization

**Cloned Classes**

- **Mnemonic** CC\_CL
- **Description** There shall be no duplicated classes

**Cloned Files**

- **Mnemonic** CC\_FI
- **Description** There shall be no duplicated files

**Cloned Functions**

- **Mnemonic** CC\_FN
- **Description** There shall be no duplicated functions

**Cloned Algorithmic**

- **Mnemonic** CFTC\_FN
- **Description** There shall be no algorithmic cloning

**Continue shall not be used**

- **Mnemonic** NOCONT
- **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

**FIXME shall not be committed in sources code**

- **Mnemonic** R\_NOFIXME
- **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

**GOTO shall not be used**

- **Mnemonic** NOGOTO
- **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

**Avoid Duplicated Blocks in Function**

- **Mnemonic** RS\_FN
- **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

- **Mnemonic** R\_NOTODO
- **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**No case in Select**

→ **Mnemonic** ONECASE

→ **Description** Every Select statement shall have at least one case clause.

**Relaxed violation**

→ **Mnemonic** RELAX

→ **Description** A rule violation is relaxed and justified.

**Multiple exits are not allowed**

→ **Mnemonic** RETURN

→ **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

**Multiple Exit Do statement**

→ **Mnemonic** SGLEXITDO

→ **Description** For any iteration statement there shall be at most one Exit statement used for loop termination.

**Multiple Exit (Function, Sub or Property) statement**

→ **Mnemonic** SGLEXITFCT

→ **Description** A Function, Sub or Property must have only one Exit statement.

**Multiple Exit For statement**

→ **Mnemonic** SGLEXITFOR

→ **Description** For any iteration statement there shall be at most one Exit statement used for loop termination.

**Multiple Exit While statement**

→ **Mnemonic** SGLEXITWHILE

→ **Description** For any iteration statement there shall be at most one Exit statement used for loop termination.

## 2.17. Xaml

### 2.17.1. Xaml Metrics

**Andthen Operators**

→ **Mnemonic** ANTH

→ **Description** Number of 'andthen' operators

**Number of attributes**

→ **Mnemonic** ATTR

→ **Description** Number of attributes.

**Number of comment blocks**

→ **Mnemonic** BCOM

→ **Description** Number of comment blocks.

**Blank Lines**

- **Mnemonic** BLAN
- **Description** Number of blank lines of code in the source file(s).

**Break in Loop**

- **Mnemonic** BRKL
- **Description** Number of 'break' statements in loop in the function

**Break in Switch**

- **Mnemonic** BRKS
- **Description** Number of 'break' statements in 'switch' in the function

**Case Blocks**

- **Mnemonic** CABL
- **Description** Number of 'case' blocks in 'switch' in the function

**Case Labels**

- **Mnemonic** CASE
- **Description** Number of 'case' labels in the function

**Catch Statements**

- **Mnemonic** CATC
- **Description** Number of 'catch' statements in the function

**Code Cloning Line Counting**

- **Mnemonic** CCLC
- **Description** Number of lines in source code used when searching for code duplication

**Cyclomatic Complexity**

- **Mnemonic** CCN
- **Description** Number of linearly independent paths in the function control graph.

**Control Flow Token**

- **Mnemonic** CFT
- **Description** Number of tokens in the control flow of functions

**Call Graph Depth**

- **Mnemonic** CGDM
- **Description** Maximum depth of the call graph.

**Comment Lines**

- **Mnemonic** CLOC
- **Description** Number of lines of comments in the source file(s).



**Continue Statements**

- **Mnemonic** CONT
- **Description** Number of 'continue' statements in the function

**Commented Statements**

- **Mnemonic** CSTAT
- **Description** Number of Commented Statements.

**Minimum Number of Cycles**

- **Mnemonic** CYCL
- **Description** Minimum number of call graph cycles in which the function is involved (including recursivity).

**Default Statement**

- **Mnemonic** DEFT
- **Description** Number of 'default' blocks in 'switch' in the function

**Distinct Operands**

- **Mnemonic** DOPD
- **Description** Number of distinct operands: variables and constants ([Halstead,76]: n2)

**Distinct Operators**

- **Mnemonic** DOPT
- **Description** Number of distinct operators: language keywords ([Halstead,76]: n1)

**Do While Statements**

- **Mnemonic** DOWH
- **Description** Number of 'do...while' statements in the function

**Else Statements**

- **Mnemonic** ELSE
- **Description** Number of 'else' statements

**Number of XML elements**

- **Mnemonic** ELT
- **Description** Number of XML elements.

**For Statements**

- **Mnemonic** FOR
- **Description** Number of 'for' statements in the function

**Structures Added**

- **Mnemonic** SADD
- **Description** Number of control structures added since the previous version.

**Structures Modified**

- **Mnemonic** SMOD
- **Description** Number of control structures modified since the previous version.

**Structures Removed**

- **Mnemonic** SREM
- **Description** Number of control structures removed since the previous version.

**Goto Statements**

- **Mnemonic** GOTO
- **Description** Number of 'goto' statements

**Cloned Code**

- **Mnemonic** ICC
- **Description** Duplicated code in this artefact

**Cloned Control Flow Tokens**

- **Mnemonic** ICFTC
- **Description** Number of duplicated tokens in control flow of functions

**If Statements**

- **Mnemonic** IF
- **Description** Number of 'if' statements

**Line Count**

- **Mnemonic** LC
- **Description** Number of lines.

**Loop Statements**

- **Mnemonic** LOOP
- **Description** Number of loop statements in the function

**Maximum Nested Structures**

- **Mnemonic** NEST
- **Description** Maximum number of nested structures

**Number of Parameters**

- **Mnemonic** NOP
- **Description** Number of formal parameters in the function

**Non-Cyclic Paths**

- **Mnemonic** PATH
- **Description** Number of non-cyclic paths in the function.

**Orelse operators**

- **Mnemonic** OREL
- **Description** Number of 'orelse' operators

**Return Statements**

- **Mnemonic** RETURN
- **Description** Number of 'return' statements in the function

**Repeated Code Blocks**

- **Mnemonic** RS
- **Description** Duplicated blocks in the function

**Source Lines Of Code**

- **Mnemonic** SLOC
- **Description** Number of lines of source code in the source file(s).

**Executable Statements**

- **Mnemonic** STAT
- **Description** Total number of executable statements.

**Switch Statements**

- **Mnemonic** SWIT
- **Description** Number of 'switch' statements in the function

**Ternary operators**

- **Mnemonic** TERN
- **Description** Number of ternary operators i.e. ?:

**Number of text blocks**

- **Mnemonic** TEXT
- **Description** Number of text blocks.

**Throw Statements**

- **Mnemonic** THRO
- **Description** Number of 'throw' statements in the function

**Operand Occurrences**

- **Mnemonic** TOPD
- **Description** Number of occurrences of operands: variables and constants ([Halstead,76]: N2)

**Operator Occurrences**

- **Mnemonic** TOPT
- **Description** Number of occurrences of operators: language keywords ([Halstead,76]: N1)

**Try Statements**

- **Mnemonic** TRY
- **Description** Number of 'try' statements in the function

**Lines Added**

- **Mnemonic** LADD
- **Description** Number of lines added since the previous version.

**Lines Modified**

- **Mnemonic** LMOD
- **Description** Number of lines modified since the previous version.

**Lines Removed**

- **Mnemonic** LREM
- **Description** Number of lines removed since the previous version.

**While Statements**

- **Mnemonic** WHIL
- **Description** Number of 'while' statements in the function

## 2.17.2. Xaml Ruleset

**Missing Break**

- **Mnemonic** BRKFINAL
- **Description** An unconditional break statement shall terminate every non-empty switch clause (see [MISRA-C:2004]: RULE 15.2).

**Backward Goto shall not be used**

- **Mnemonic** BWGOTO
- **Description** Backward gotos shall not be used.

**Comment Before Paragraph**

- **Mnemonic** COMMENT
- **Description** A comment shall introduce a section or a paragraph.

**Missing compound statement**

- **Mnemonic** COMPOUND
- **Description** The statement forming the body of a switch, while, do ... while or for statement shall be a compound statement (see [MISRA-C:2004]: RULE 14.8).

**Missing compound if**

- **Mnemonic** COMPOUNDIF
- **Description** An if (expression) construct shall be followed by a compound statement. The else keyword shall be followed by either a compound statement, or another if statement (see [MISRA-C:2004]: RULE 14.9).

**Commented-out Source Code is not allowed**

- **Mnemonic** R\_CSTAT
- **Description** Commented-out Source Code is not allowed

**Missing Default**

- **Mnemonic** DEFAULT
- **Description** The final clause of a switch statement shall be the default clause (see [MISRA-C:2004]: RULE 15.3).

**Missing final else**

- **Mnemonic** ELSEFINAL
- **Description** All if ... else if constructs shall be terminated with an else clause (see [MISRA-C:2004]: RULE 14.10).

**No Resources**

- **Mnemonic** FORBIDDEN\_ELEMENT
- **Description** Elements 'ResourceDictionary' are forbidden.

**Resources Folder**

- **Mnemonic** IN\_FOLDER
- **Description** ResourceDictionary shall be in a 'Resources' directory

**Assignment in Boolean**

- **Mnemonic** NOASGCOND
- **Description** Assignment operators shall not be used in expressions that yield a boolean value

**Assignment without Comparison**

- **Mnemonic** NOASGINBOOL
- **Description** Assignment operators shall not be used in expressions that do not contain comparison operators.

**Factorizable Classes**

- **Mnemonic** CAC\_CL
- **Description** Consider classes refactorization

**Factorizable Files**

- **Mnemonic** CAC\_FI
- **Description** Consider files refactorization

**Factorizable Functions**

- **Mnemonic** CAC\_FN
- **Description** Consider functions refactorization

**Factorizable Packages**

→ **Mnemonic** CAC\_PKG

→ **Description** Consider packages refactorization

#### Cloned Classes

→ **Mnemonic** CC\_CL

→ **Description** There shall be no duplicated classes

#### Cloned Files

→ **Mnemonic** CC\_FI

→ **Description** There shall be no duplicated files

#### Cloned Functions

→ **Mnemonic** CC\_FN

→ **Description** There shall be no duplicated functions

#### Cloned Algorithmic

→ **Mnemonic** CFTC\_FN

→ **Description** There shall be no algorithmic cloning

#### There shall be a no code before first case

→ **Mnemonic** NOCODEBEFORECASE

→ **Description** There shall be a no code before the first case of a switch statement.

#### Continue shall not be used

→ **Mnemonic** NOCONT

→ **Description** The 'continue' statement shall not be used (see [MISRA-C:2004]: RULE 14.5).

#### Fallthrough shall be avoided

→ **Mnemonic** NOFALLTHROUGH

→ **Description** There shall be no fallthrough the next case in a switch statement.

#### FIXME shall not be committed in sources code

→ **Mnemonic** R\_NOFIXME

→ **Description** FIXME shall not be committed in sources code as it brings confusion regarding code reliability.

#### GOTO shall not be used

→ **Mnemonic** NOGOTO

→ **Description** A unconditional GOTO shall not be used to jump outside the paragraph.

#### Label out a switch

→ **Mnemonic** NOLABEL

→ **Description** A switch label shall only be used when the most closely-enclosing compound statement is the body of a switch statement (see [MISRA-C:2004]: RULE 15.1).

**Avoid Duplicated Blocks in Function**

- **Mnemonic** RS\_FN
- **Description** There shall be no duplicated parts in functions

**TODO shall not be committed in sources code**

- **Mnemonic** R\_NOTODO
- **Description** TODO shall not be committed in sources code as it brings confusion regarding code reliability.

**Missing case in switch**

- **Mnemonic** ONECASE
- **Description** Every switch statement shall have at least one case clause (see [MISRA-C:2004]: RULE 15.5).

**Relaxed violation**

- **Mnemonic** RELAX
- **Description** A rule violation is relaxed and justified.

**Resources Filename**

- **Mnemonic** RESOURCES\_FILENAME
- **Description** All XAML resources files shall be suffixed with 'Resources.xaml'

**Multiple exits are not allowed**

- **Mnemonic** RETURN
- **Description** A function shall have a single point of exit at the end (see [MISRA-C:2004]: RULE 14.7).

**Risky Empty Statement**

- **Mnemonic** RISKYEMPTY
- **Description** Risky Empty Statement

**Multiple break in loop are not allowed**

- **Mnemonic** SGLBRK
- **Description** For any iteration statement there shall be at most one 'break' statement used for loop termination (see [MISRA-C:2004]: RULE 14.6).

## 3. Repository Connectors

### 3.1. Folder Path

#### 3.1.1. Description

The simplest method to analyse source code in Squore is to provide a path to a folder containing your code.

##### Note

Remember that the path supplied for the analysis is a path local to the machine running the analysis, which may be different from your local machine. If you analyse source code on your local machine and then send results to the server, you will not be able to view the source code directly in Squore, since it will not have access to the source code on the other machine. A common workaround to this problem is to use UNC paths (`\\Server\Share`, `smb://server/share...`) or a mapped server drive in Windows.

#### 3.1.2. Usage

Folder Path has the following options:

- **Datapath (path, mandatory)** Specify the absolute path to the folder containing the files you want to include in the analysis. The path specified must be accessible from the server.

The full command line syntax for Folder Path is:

```
-r "type=FROMPATH,path=[text]"
```

## 3.2. Zip Upload

#### 3.2.1. Description

This Repository Connector allows you to upload a zip file containing your sources to analyse. Select a file to upload in the project wizard and it will be extracted and analysed on the server.

##### Note

The contents of the zip file are extracted into Squore Server's temp folder. If you want to uploaded files to persist, contact your Squore administrator so that the uploaded zip files and extracted sources are moved to a location that is not deleted at each server restart.

#### 3.2.2. Usage

This Repository Connector is only available from the web UI, not from the command line interface.

## 3.3. CVS

#### 3.3.1. Description

The Concurrent Versions System (CVS), is a client-server free software revision control system in the field of software development.

For more details, refer to <http://savannah.nongnu.org/projects/cvs>.



**Note**

The following is a list of commands used by the CVS Repository Connector to retrieve sources:

```
→ cvs -d $repository export [-r $branch] $project
→ cvs -d $repository co -r $artefactPath -d $tmpFolder
```

### 3.3.2. Usage

CVS has the following options:

- **Repository ( repository , mandatory)** Specify the location of the CVS Repository.
- **Project ( project , mandatory)** Specify the name of the project to get files from.
- **Tag or Branch ( branch )** Specify the tag or branch to get the files from.

The full command line syntax for CVS is:

```
-r "type=CVS,repository=[text],project=[text],branch=[text]"
```

## 3.4. ClearCase

### 3.4.1. Description

IBM Rational ClearCase is a software configuration management solution that provides version control, workspace management, parallel development support, and build auditing. The command executed on the server to check out source code is: \$cleartool \$view\_root\_path \$view \$vob\_root\_path.

For more details, refer to <http://www-03.ibm.com/software/products/en/clearcase>.

**Note**

The ClearCase tool is configured for Linux by default. It is possible to make it work for Windows by editing the configuration file

### 3.4.2. Usage

ClearCase has the following options:

- **View root path ( view\_root\_path , mandatory, default: /view)** Specify the absolute path of the ClearCase view.
- **Vob Root Path ( vob\_root\_path , mandatory, default: /projets)** Specify the absolute path of the ClearCase vob.
- **View ( view )** Specify the label of the view to analyse sources from. If no view is specified, the current ClearCase view will be used automatically, as retrieved by the command cleartool pwv -s.
- **Server Display View ( server\_display\_view )** When viewing source code from the Explorer after building the project, this parameter is used instead of the view parameter specified earlier. Leave this field empty to use the same value as for view.
- **Sources Path ( sub\_path )** Specify a path in the view to restrict the scope of the source code to analyse. The value of this field must not contain the vob nor the view. Leave this field empty to analyse the code in the entire view. This parameter is only necessary if you want to restrict to a directory lower than root.

The full command line syntax for ClearCase is:

```
-r "type=ClearCase,view_root_path=[text],vob_root_path=[text],view=[text],server_display_view=[text]"
```

## 3.5. Perforce

### 3.5.1. Description

The Perforce server manages a central database and a master repository of file versions. Perforce supports both Git clients and clients that use Perforce's own protocol.

For more details, refer to <http://www.perforce.com/>.

#### Note

The Perforce repository connector assumes that the specified depot exists on the specified Perforce server, that Squore can access this depot and that the Perforce user defined has the right to access it. The host where the analysis takes place must have a Perforce command-line client (p4) installed and fully functional. The P4PORT environment variable is not read by Squore. You have to set it in the form. The path to the p4 command can be configured in the `perforce_conf.tcl` file located in the `configuration/repositoryConnectors/Perforce` folder. The following is a list of commands used by the Perforce Repository Connector to retrieve sources:

```
→ p4 -p $p4port [-u username] [-P password] client -i <$tmpFolder/
  p4conf.txt
→ p4 -p $p4port [-u username] [-P password] -c $clientName sync
  "$depot/...@$label"
→ p4 -p $p4port [-u username] [-P password] client -d $clientName
→ p4 -p $p4port [-u username] [-P password] print -q -o $outputFile
  $artefactPath
```

The format of the `p4conf.txt` file is:

```
Client: $clientName
Root: $tmpFolder
Options: noallwrite noclobber nocompress unlocked nomodtime normdir
SubmitOptions: submitunchanged
view:
  $depot/... //$clientName/...
```

### 3.5.2. Usage

Perforce has the following options:

- **P4PORT ( p4port , mandatory )** Specify the value of P4PORT using the format [protocol:]host:port (the protocol is optional). This parameter is necessary even if you have specified an environment variable on the machine where the analysis is running.
- **Depot ( depot , mandatory )** Specify the name of the depot (and optionally subfolders) containing the sources to be analysed.
- **Revision ( label )** Specify a label, changelist or date to retrieve the corresponding revision of the sources. Leave this field empty to analyse the most recent revision for the sources.
- **Authentication ( useAccountCredentials , default: NO\_CREDENTIALS )**
- **Username ( username )**
- **Password ( password )**

The full command line syntax for Perforce is:

```
-r
" type=Perforce, p4port=[text], depot=[text], label=[text], useAccountCredentials=[multipleChoice]
```

## 3.6. Git

### 3.6.1. Description

Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

For more details, refer to <http://git-scm.com/>.

#### Note

The following is a list of commands used by the Git Repository Connector to retrieve sources:

```
→ git clone [$username:$password@$url] $tmpFolder
→ git checkout $commit
→ git log -1 "--format=%H"
→ git config --get remote.origin.url
→ git clone [$username:$password@$url] $tmpFolder
→ git checkout $commit
→ git fetch
→ git --git-dir=$gitRoot show $artefactPath
```

#### Note

Git 1.7.1 is known to fail with a fatal: HTTP request failed error on CentOS 6.9. For this OS, it is recommended to upgrade to git 2.9 as provided by software collections on <https://www.softwarecollections.org/en/scls/rhsc/rh-git29/> and point to the new binary in `git_config.tcl` or make the change permanent as described on <https://access.redhat.com/solutions/527703>.

### 3.6.2. Usage

Git has the following options:

- **URL ( url , mandatory )** URL of the git repository to get files from. The local, HTTP(s), SSH and Git protocols are supported.
- **Branch or commit ( commit )** This field allows specifying the SHA1 of a commit or a branch name. If a SHA1 is specified, it will be retrieved from the default branch. If a branch label is specified, then its latest commit is analysed. Leave this field empty to analyse the latest commit of the default branch.
- **Sub-directory ( subDir )** Specify a subfolder name if you want to restrict the analysis to a subpath of the repository root.
- **Authentication ( useAccountCredentials , default: NO\_CREDENTIALS )**
- **Username ( username )**
- **Password ( password )**

The full command line syntax for Git is:

```
-r
" type=Git , url=[text] , commit=[text] , subDir=[text] , useAccountCredentials=[multipleChoice] , usernam
```

## 3.7. PTC Integrity

### 3.7.1. Description

This Repository Connector allows analysing sources hosted in PTC Integrity, a software system lifecycle management and application lifecycle management platform developed by PTC.

For more details, refer to <http://www.ptc.com/products/integrity/>.

#### Note

You can modify some of the settings of this repository connector if the `si.exe` and `mksAPIViewer.exe` binaries are not in your path. For versions that do not support the `--xmlapi` option, you can also turn off this method of retrieving file information. These settings are available by editing `mks_conf.tcl` in the repository connector's configuration folder.

### 3.7.2. Usage

PTC Integrity has the following options:

- **Server Hostname ( `hostname` , mandatory )** Specify the name of the Integrity server. This value is passed to the command line using the parameter `--hostname`.
- **Port ( `port` )** Specify the port used to connect to the Integrity server. This value is passed to the command line using the parameter `--port`.
- **Project ( `project` )** Specify the name of the project containing the sources to be analysed. This value is passed to the command line using the `--project` parameter.
- **Revision ( `revision` )** Specify the revision number for the sources to be analysed. This value is passed to the command line using the `--projectRevision` parameter.
- **Scope ( `scope` , default: `name:*.c,name:*.h` )** Specifies the scope (filter) for the Integrity sandbox extraction. This value is passed to the command line using the `--scope` parameter.
- **Authentication ( `useAccountCredentials` , default: `NO_CREDENTIALS` )**
- **Username ( `username` )**
- **Password ( `password` )**

The full command line syntax for PTC Integrity is:

```
-r "type=MKS,hostname=[text],port=[text],project=[text],revision=[text],scope=[text],useAccountC
```

## 3.8. TFS

### 3.8.1. Description

Team Foundation Server (TFS) is a Microsoft product which provides source code management, reporting, requirements management, project management, automated builds, lab management, testing and release management capabilities. This Repository Connector provides access to the sources hosted in TFS's revision control system.

For more details, refer to <https://www.visualstudio.com/products/tfs-overview-vs>.

#### Note

The TFS repository connector (Team Foundation Server - Team Foundation Version Control) assumes that a TFS command-line client (Visual Studio Client or Team Explorer Everywhere) is installed on the Squore server and fully functional. The configuration of this client must be set up in the `tfs_conf.tcl`

file. The repository connector form must be filled according to the TFS standard (eg. the Project Path must begin with the '\$' character...). Note that this repository connector works with a temporary workspace that is deleted at the end of the analysis. The following is a list of commands used by the TFS Repository Connector to retrieve sources:

```
→ tf.exe workspace [/login:$username,$password] /server:$url /noprompt /
new $workspace
→ tf.exe workfold [/login:$username,$password] /map $path $tempFolder /
workspace:$workspace
→ tf.exe get [/login:$username,$password] /version:$version /recursive /
force $path
→ tf.exe workspace [/login:$username,$password] /delete $workspace
→ tf.exe view [/login:$username,$password] /server:$artefactPath
```

### Note

When using the Java Team Explorer Everywhere client, / is replaced by - and the view command is replaced by print.

## 3.8.2. Usage

TFS has the following options:

- **URL ( URL , mandatory)** Specify the URL of the TFS server.
- **Path ( path , mandatory)** Path the project to be analysed. This path usually starts with \$.
- **Version ( version )** Specify the version of the sources to analyse. This field accepts a changeset number, date, or label. Leave the field empty to analyse the most recent revision of the sources.
- **Authentication ( useAccountCredentials , default: NO\_CREDENTIALS)**
- **Username: ( username )**
- **Password ( password )**

The full command line syntax for TFS is:

```
-r
"type=TFS,URL=[text],path=[text],version=[text],useAccountCredentials=[multipleChoice],username=[text],password=[text]
```

## 3.9. Synergy

### 3.9.1. Description

Rational Synergy is a software tool that provides software configuration management (SCM) capabilities for all artifacts related to software development including source code, documents and images as well as the final built software executable and libraries.

For more details, refer to <http://www-03.ibm.com/software/products/en/ratisyne>.

### Note

The Synergy repository connector assumes that a project already exists and that the Synergy user defined has the right to access it. The host where the analysis takes place must have Synergy installed and fully functional. Note that, as stated in IBM's documentation on [http://pic.dhe.ibm.com/infocenter/synhelp/v7m2r0/index.jsp?topic=%2Fcom.ibm.rational.synergy.manage.doc%2Ftopics%2Fsc\\_t\\_h\\_start\\_cli\\_session.html](http://pic.dhe.ibm.com/infocenter/synhelp/v7m2r0/index.jsp?topic=%2Fcom.ibm.rational.synergy.manage.doc%2Ftopics%2Fsc_t_h_start_cli_session.html), using credentials is only supported on Windows, so use the NO\_CREDENTIALS option when Synergy runs

on a Linux host. The following is a list of commands used by the Synergy Repository Connector to retrieve sources:

```
→ ccm start -d $db -nogui -m -q [-s $server] [-pw $password] [-n $user -pw password]
→ ccm prop "$path@$projectSpec"
→ ccm copy_to_file_system -path $tempFolder -recurse $projectSpec
→ ccm cat "$artefactPath@$projectSpec"
→ ccm stop
```

## 3.9.2. Usage

Synergy has the following options:

- **Server URL ( `server` )** Specify the Synergy server URL, if using a distant server. If specified, the value is used by the Synergy client via the `-s` parameter.
- **Database ( `db` , **mandatory** )** Specify the database path to analyse the sources it contains.
- **Project Specification ( `projectSpec` , **mandatory** )** Specify the project specification for the analysis. Source code contained in this project specification will be analysed recursively.
- **Subfolder ( `subFolder` )** Specify a subfolder name if you want to restrict the scope of the analysis to a particular folder.
- **Authentication: ( `useAccountCredentials` , **default: NO\_CREDENTIALS** )** Note that, as stated in IBM's documentation, using credentials is only supported on Windows. The "No Credentials" must be used option when Synergy runs on a Linux host. For more information, consult [http://pic.dhe.ibm.com/infocenter/synhelp/v7m2r0/index.jsp?topic=%2Fcom.ibm.rational.synergy.manage.doc%2Ftopics%2Fsc\\_t\\_h\\_start\\_cli\\_session.html](http://pic.dhe.ibm.com/infocenter/synhelp/v7m2r0/index.jsp?topic=%2Fcom.ibm.rational.synergy.manage.doc%2Ftopics%2Fsc_t_h_start_cli_session.html).
- **( `name` )**
- **Password ( `password` )**

The full command line syntax for Synergy is:

```
-r
"type=Synergy,server=[text],db=[text],projectSpec=[text],subFolder=[text],useAccountCredentials=[text]
```

## 3.10. SVN

### 3.10.1. Description

Connecting to an SVN server is supported using svn over ssh, or by using a username and password.

For more details, refer to <https://subversion.apache.org/>.

#### Note

The following is a list of commands used by the SVN Repository Connector to retrieve sources (you can edit the common command base or the path to the executable in `<SQUARE_HOME>/configuration/repositoryConnectors/SVN/svn_conf.tcl` if needed):

```
→ svn info --xml --non-interactive --trust-server-cert --no-auth-cache [--username $username] [--password $password] [-r $revision] $url
→ svn export --force --non-interactive --trust-server-cert --no-auth-cache [--username $username] [--password $password] [-r $revision] $url
```

This Repository Connector now includes a hybrid SVN mode saves you an extra checkout of your source tree when using the `local_path` attribute (new in 18.0). Consult the reference below for more details.

### 3.10.2. Usage

SVN has the following options:

- **URL ( `url` , mandatory )** Specify the URL of the SVN repository to export and analyse. The following protocols are supported: `svn://`, `svn+ssh://`, `http://`, `https://`.
- **Revision ( `rev` )** Specify a revision number in this field, or leave it blank to analyse files at the HEAD revision.
- **External references ( `externals` , default: `exclude` )** Specify if when extracting sources from SVN the system should also extract external references.
- **Sources are already extracted in ( `local_path` )** Specify a path to a folder where the sources have already been extracted. When using this option, sources are analysed in the specified folder instead of being checked out from SVN. At the end of the analysis, the url and revision numbers are attached to the analysed sources, so that any source code access from the web interface always retrieves files from SVN. This mode is mostly used to save an extra checkout in some continuous integration scenarios.
- **Authentication ( `useAccountCredentials` , default: `NO_CREDENTIALS` )**
- **Username ( `username` )**
- **Password ( `password` )**

The full command line syntax for SVN is:

```
-r  
"type=SVN,url=[text],rev=[text],externals=[multipleChoice],local_path=[text],useAccountCredentials=[boolean]
```

## 3.11. Using Multiple Nodes

Squore allows using multiple repositories in the same analysis. If your project consists of some code that is spread over two distinct servers or SVN repositories, you can set up your project so that it includes both locations in the project analysis. This is done by labelling each source code node before specifying parameters, as shown below

```
-r "type=FROMPATH,alias=Node1,path=/home/projects/client-code"  
-r "type=FROMPATH,alias=Node2,path=/home/projects/common/lib"
```

Note that only alpha-numeric characters are allowed to be used as labels. In the artefact tree, each node will appear as a separate top-level folder with the label provided at project creation.

Using multiple nodes, you can also analyse sources using different Repository Connectors in the same analysis:

```
-r "type=FROMPATH,alias=Node1,path=/home/projects/common-config"  
-r "type=SVN,alias=Node2,url=svn+ssh://10.10.0.1/var/svn/project/src,rev=HEAD"
```

## 4. Data Providers

This chapter describes the available Data Providers and the default parameters that they accept via the Command Line Interface.

### 4.1. AntiC

#### 4.1.1. Description

AntiC is a part of the jlint static analysis suite and is launched to analyse C and C++ source code and produce findings.

For more details, refer to <http://jlint.sourceforge.net/>.

#### Note

On Linux, the antiC executable must be compiled manually before you run it for the first time by running the command:

```
# cd <SQUORE_HOME>/addons/tools/Antic_auto/bin/ && gcc antic.c -o antic
```

#### 4.1.2. Usage

AntiC has the following options:

→ **Source code directory to analyse ( dir )** Leave this parameter empty if you want to analyse all sources specified above.

The full command line syntax for AntiC is:

```
-d "type=Antic_auto,dir=[text]"
```

## 4.2. Automotive Coverage Import

#### 4.2.1. Description

Automotive Coverage Import provides a generic import mechanism for coverage results at function level.

#### 4.2.2. Usage

Automotive Coverage Import has the following options:

→ **CSV file ( csv )** Enter the path to the CSV containing the coverage data. The expected format of each line contained in the file is PATH;NAME;TESTED\_C1;OBJECT\_C1;TESTED\_MCC;OBJECT\_MCC;TESTED\_MCDC;OBJECT\_MCDC

The full command line syntax for Automotive Coverage Import is:

```
-d "type=Automotive_Coverage, csv=[text]"
```

## 4.3. Automotive Tag Import



### 4.3.1. Description

This data provider allows setting values for attributes in the project.

### 4.3.2. Usage

Automotive Tag Import has the following options:

- **CSV file ( csv )** Specify the path to the file containing the metrics.

The full command line syntax for Automotive Tag Import is:

```
-d "type=Automotive_Tag_Import, csv=[text]"
```

## 4.4. BullseyeCoverage Code Coverage Analyzer

### 4.4.1. Description

BullseyeCoverage is a code coverage analyzer for C++ and C. The coverage report file is used to generate metrics.

For more details, refer to <http://www.bullseye.com/>.

### 4.4.2. Usage

BullseyeCoverage Code Coverage Analyzer has the following options:

- **HTML report ( html )** Specify the path to the HTML report file generated by BullseyeCoverage.

The full command line syntax for BullseyeCoverage Code Coverage Analyzer is:

```
-d "type=BullseyeCoverage, html=[text]"
```

## 4.5. CPD

### 4.5.1. Description

CPD is an open source tool which generates Copy/Paste metrics. The detection of duplicated blocks is set to 100 tokens. CPD provides an XML file which can be imported to generate metrics as well as findings.

For more details, refer to <http://pmd.sourceforge.net/pmd-5.3.0/usage/cpd-usage.html>.

### 4.5.2. Usage

CPD has the following options:

- **CPD XML results ( xml )** Specify the path to the XML results file generated by CPD. The minimum supported version is PMD/CPD 4.2.5.

The full command line syntax for CPD is:

```
-d "type=CPD, xml=[text]"
```

## 4.6. Cppcheck

### 4.6.1. Description

Cppcheck is a static analysis tool for C/C++ applications. The tool provides an XML output which can be imported to generate findings.

For more details, refer to <http://cppcheck.sourceforge.net/>.

### 4.6.2. Usage

Cppcheck has the following options:

- **Cppcheck XML results ( `xml` )** Specify the path to the XML results file from Cppcheck. Note that the minimum required version of Cppcheck for this data provider is 1.61.

The full command line syntax for Cppcheck is:

```
-d "type=CPPCheck,xml=[text]"
```

## 4.7. Cppcheck (plugin)

### 4.7.1. Description

Cppcheck is a static analysis tool for C/C++ applications. The tool provides an XML output which can be imported to generate findings.

For more details, refer to <http://cppcheck.sourceforge.net/>.

#### Note

On Windows, this data provider requires an extra download to extract the Cppcheck binary in `<SQUORE_HOME>/addons/tools/CppCheck_auto/` and the MS Visual C++ 2010 Redistributable Package available from Microsoft. On Linux, you can install the cppcheck application anywhere you want. The path to the Cppcheck binary for Linux can be configured in `config.tcl`. For more information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications [`../install_admin_manual/index.html#sect_thirdparty_plugins`] section.

### 4.7.2. Usage

Cppcheck (plugin) has the following options:

- **Source code folder ( `dir` )** Specify the folder containing the source files to analyse. If you want to analyse all of source repositories specified for the project, leave this field empty.
- **Ignore List ( `ignores` )** Specify a semi-colon-separated list of source files or source file directories to exclude from the check. For example: `"lib;/folder2/"`. Leave this field empty to deactivate this option and analyse all files with no exception.

The full command line syntax for Cppcheck (plugin) is:

```
-d "type=CPPCheck_auto,dir=[text],ignores=[text]"
```

## 4.8. CPPTest

### 4.8.1. Description

Parasoft C/C++test is an integrated solution for automating a broad range of best practices proven to improve software development team productivity and software quality for C and C++. The tool provides an XML output file which can be imported to generate findings and metrics.

For more details, refer to <http://www.parasoft.com/product/cpptest/>.

### 4.8.2. Usage

CPPTest has the following options:

- **XML results file ( `xml` )** Specify the path to the CPPTest results file. This data provider is compatible with files exported from CPPTest version 7.2.10.34 and up.

The full command line syntax for CPPTest is:

```
-d "type=CPPTest,xml=[text]"
```

## 4.9. Cantata

### 4.9.1. Description

Cantata is a Test Coverage tool. It provides an XML output file which can be imported to generate coverage metrics at function level.

For more details, refer to <http://www.qa-systems.com/cantata.html>.

### 4.9.2. Usage

Cantata has the following options:

- **Cantata XML results ( `xml` )** Specify the path to the XML results file from Cantata 6.2

The full command line syntax for Cantata is:

```
-d "type=Cantata,xml=[text]"
```

## 4.10. CheckStyle

### 4.10.1. Description

CheckStyle is an open source tool that verifies that Java applications adhere to certain coding standards. It produces an XML file which can be imported to generate findings.

For more details, refer to <http://checkstyle.sourceforge.net/>.

### 4.10.2. Usage

CheckStyle has the following options:

- **CheckStyle results file ( `xml` )** Point to the XML file that contains Checkstyle results. Note that the minimum supported version is Checkstyle 5.3.

The full command line syntax for CheckStyle is:

```
-d "type=CheckStyle,xml=[text]"
```

## 4.11. CheckStyle (plugin)

### 4.11.1. Description

CheckStyle is an open source tool that verifies that Java applications adhere to certain coding standards. It produces an XML file which can be imported to generate findings.

For more details, refer to <http://checkstyle.sourceforge.net/>.

#### Note

This data provider requires an extra download to extract the CheckStyle binary in `<SQUORE_HOME>/addons/tools/CheckStyle_auto/`. For more information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications [../install\_admin\_manual/index.html#sect\_thirdparty\_plugins] section.. You may also deploy your own version of CheckStyle and force the Data Provider to use it by editing `<SQUORE_HOME>/configuration/tools/CheckStyle_auto/config.tcl`.

### 4.11.2. Usage

CheckStyle (plugin) has the following options:

- **Configuration file ( configFile )** A Checkstyle configuration specifies which modules to plug in and apply to Java source files. Modules are structured in a tree whose root is the Checker module. Specify the name of the configuration file only, and the data provider will try to find it in the CheckStyle\_auto folder of your custom configuration. If no custom configuration file is found, a default configuration will be used.
- **Xmx ( xmx , default: 1024m )** Maximum amount of memory allocated to the java process launching Checkstyle.
- **Excluded directory pattern ( excludedDirectoryPattern )** Java regular expression of directories to exclude from CheckStyle, for example: `^test|generated-sources|.*-report$` or `ou ^lib$`

The full command line syntax for CheckStyle (plugin) is:

```
-d "type=CheckStyle_auto,configFile=[text],xmx=[text],excludedDirectoryPattern=[text]"
```

## 4.12. CheckStyle for SQALE (plugin)

### 4.12.1. Description

CheckStyle is an open source tool that verifies that Java applications adhere to certain coding standards. It produces an XML file which can be imported to generate findings.

For more details, refer to <http://checkstyle.sourceforge.net/>.

#### Note

This data provider requires an extra download to extract the CheckStyle binary in `<SQUORE_HOME>/addons/tools/CheckStyle_auto_for_SQALE/`. For more

information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications [../install\_admin\_manual/index.html#sect\_thirdparty\_plugins] section.

### 4.12.2. Usage

CheckStyle for SQALE (plugin) has the following options:

- **Configuration file ( `configFile` , default: `config_checkstyle_for_sqale.xml` )** A Checkstyle configuration specifies which modules to plug in and apply to Java source files. Modules are structured in a tree whose root is the Checker module. Specify the name of the configuration file only, and the data provider will try to find it in the CheckStyle\_auto folder of your custom configuration. If no custom configuration file is found, a default configuration will be used.
- **Xmx ( `xmx` , default: `1024m` )** Maximum amount of memory allocated to the java process launching Checkstyle.

The full command line syntax for CheckStyle for SQALE (plugin) is:

```
-d "type=CheckStyle_auto_for_SQALE,configFile=[text],xmx=[text]"
```

## 4.13. Cobertura format

### 4.13.1. Description

Cobertura is a free code coverage library for Java. Its XML report file can be imported to generate code coverage metrics for your Java project.

For more details, refer to <http://cobertura.github.io/cobertura/>.

### 4.13.2. Usage

Cobertura format has the following options:

- **XML report ( `xml` )** Specify the path to the XML report generated by Cobertura (or by a tool able to produce data in this format).

The full command line syntax for Cobertura format is:

```
-d "type=Cobertura,xml=[text]"
```

## 4.14. CodeSonar

### 4.14.1. Description

Codesonar is a static analysis tool for C and C++ code designed for zero tolerance defect environments. It provides an XML output file which is imported to generate findings.

For more details, refer to <http://www.grammatech.com/codesonar>.

### 4.14.2. Usage

CodeSonar has the following options:

- **XML results file ( `xml` )** Specify the path to the XML results file generated by Codesonar. The minimum version of Codesonar compatible with this data provider is 3.3.

The full command line syntax for CodeSonar is:

```
-d "type=CodeSonar,xml=[text]"
```

## 4.15. Compiler

### 4.15.1. Description

Compiler allows to import information from compiler logs.

### 4.15.2. Usage

Compiler has the following options:

- **Compiler output file ( `txt` , mandatory)** Specify the path to a CSV compiler log file. Each line needs to match the following format: Path;Line;Rule;Descr where Rule is one of COMP\_ERR, COMPILER\_WARN or COMPILER\_INFO.

The full command line syntax for Compiler is:

```
-d "type=Compiler,txt=[text]"
```

## 4.16. Coverity

### 4.16.1. Description

Coverity is a static analysis tool for C, C++, Java and C#. It provides an XML output which can be imported to generate findings.

For more details, refer to <http://www.coverity.com/>.

### 4.16.2. Usage

Coverity has the following options:

- **XML results file ( `xml` )** Specify the path to the XML file containing Coverity results.

The full command line syntax for Coverity is:

```
-d "type=Coverity,xml=[text]"
```

## 4.17. ESLint

### 4.17.1. Description

ESLint is an open source tool that verifies that JavaScript applications adhere to certain coding standards. It produces an XML file which can be imported to generate findings.

For more details, refer to <https://eslint.org/>.

**Note**

This Data Provider is new in Squore 18.0

### 4.17.2. Usage

ESLint has the following options:

- **ESLint results file ( `xml` )** Point to the XML file that contains ESLint results in Checkstyle format.

The full command line syntax for ESLint is:

```
-d "type=ESLint,xml=[text]"
```

## 4.18. FindBugs

### 4.18.1. Description

Findbugs is an open source tool that looks for bugs in Java code. It produces an XML result file which can be imported to generate findings.

For more details, refer to <http://findbugs.sourceforge.net/>.

### 4.18.2. Usage

FindBugs has the following options:

- **XML results file ( `xml` )** Specify the location of the XML file containing Findbugs results. Note that the minimum supported version of FindBugs is 1.3.9.

The full command line syntax for FindBugs is:

```
-d "type=Findbugs,xml=[text]"
```

## 4.19. FindBugs (plugin)

### 4.19.1. Description

Findbugs is an open source tool that looks for bugs in Java code. It produces an XML result file which can be imported to generate findings. Note that the data provider requires an extra download to extract the Findbugs binary in `[INSTALLDIR]/addons/tools/Findbugs_auto/`. You are free to use FindBugs 3.0 or FindBugs 2.0 depending on what your standard is. For more information, refer to the Installation and Administration Manual's "Third-Party Plugins and Applications" section.

For more details, refer to <http://findbugs.sourceforge.net/>.

**Note**

This data provider requires an extra download to extract the Findbugs binary in `<SQUORE_HOME>/addons/tools/Findbugs_auto/`. For more information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications `[../install_admin_manual/index.html#sect_thirdparty_plugins]` section.

## 4.19.2. Usage

FindBugs (plugin) has the following options:

- **Classes ( `class_dir` , **mandatory** )** Specify the folders and/or jar files for your project in classpath format, or point to a text file that contains one folder or jar file per line.
- **Auxiliary Class path ( `auxiliarypath` )** Specify a list of folders and/or jars in classpath format, or specify the path to a text file that contains one folder or jar per line. This information will be passed to FindBugs via the `-auxclasspath` parameter.
- **Memory Allocation ( `xmx` , **default: 1024m** )** Maximum amount of memory allocated to the java process launching FindBugs.

The full command line syntax for FindBugs (plugin) is:

```
-d "type=Findbugs_auto,class_dir=[text],auxiliarypath=[text],xmx=[text]"
```

## 4.20. Function Relaxer

### 4.20.1. Description

Function Relaxer provides a generic import mechanism for relaxing functions in source code.

### 4.20.2. Usage

Function Relaxer has the following options:

- **CSV File ( `csv` )**

The full command line syntax for Function Relaxer is:

```
-d "type=Function_Relaxer,csv=[text]"
```

## 4.21. FxCop

### 4.21.1. Description

FxCop is an application that analyzes managed code assemblies (code that targets the .NET Framework common language runtime) and reports information about the assemblies, such as possible design, localization, performance, and security improvements. FxCop generates an XML results file which can be imported to generate findings.

For more details, refer to [https://msdn.microsoft.com/en-us/library/bb429476\(v=vs.80\).aspx](https://msdn.microsoft.com/en-us/library/bb429476(v=vs.80).aspx).

### 4.21.2. Usage

FxCop has the following options:

- **XML results file ( `xml` )** Specify the XML file containing FxCop's analysis results. Note that the minimum supported version of FxCop is 1.35.

The full command line syntax for FxCop is:

```
-d "type=FxCop,xml=[text]"
```



## 4.22. GCov

### 4.22.1. Description

GCov is a Code coverage program for C application. GCov generates raw text files which can be imported to generate metrics.

For more details, refer to <http://gcc.gnu.org/onlinedocs/gcc/Gcov.html>.

### 4.22.2. Usage

GCov has the following options:

- **Directory containing results files ( `dir` )** Specify the path of the root directory containing the GCov results files.
- **Results files extension ( `ext` , default: `*.c.gcov` )** Specify the file extension of GCov results files.

The full command line syntax for GCov is:

```
-d "type=GCov,dir=[text],ext=[text]"
```

## 4.23. GNATcheck

### 4.23.1. Description

GNATcheck is an extensible rule-based tool that allows developers to completely define a coding standard. The results are output to a log file that can be imported to generate findings.

For more details, refer to <http://www.adacore.com/gnatpro/toolsuite/gnatcheck/>.

### 4.23.2. Usage

GNATcheck has the following options:

- **Log file ( `txt` )** Specify the path to the log file generated by the GNATcheck run.

The full command line syntax for GNATcheck is:

```
-d "type=GnatCheck,txt=[text]"
```

## 4.24. GNATCompiler

### 4.24.1. Description

GNATCompiler is a free-software compiler for the Ada programming language which forms part of the GNU Compiler Collection. It supports all versions of the language, i.e. Ada 2012, Ada 2005, Ada 95 and Ada 83. It creates a log file that can be imported to generate findings.

For more details, refer to <http://www.adacore.com/gnatpro/toolsuite/compilation/>.

## 4.24.2. Usage

GNATCompiler has the following options:

- **Log file ( Log )** Specify the path to the log file containing the compiler warnings.

The full command line syntax for GNATCompiler is:

```
-d "type=GnatCompiler,log=[text]"
```

## 4.25. JSHint

### 4.25.1. Description

JSHint is an open source tool that verifies that JavaScript applications adhere to certain coding standards. It produces an XML file which can be imported to generate findings.

For more details, refer to <http://jshint.com/>.

#### **Note**

This Data Provider is new in Squore 18.0

### 4.25.2. Usage

JSHint has the following options:

- **JSHint results file (Checkstyle formatted): ( xml )** Point to the XML file that contains JSHint results Checkstyle formatted.

The full command line syntax for JSHint is:

```
-d "type=JSHint,xml=[text]"
```

## 4.26. JUnit Format

### 4.26.1. Description

JUnit is a simple framework to write repeatable tests. It is an instance of the xUnit architecture for unit testing frameworks. JUnit XML result files are imported as test artefacts and links to tested classes are generated in the project.

For more details, refer to <http://junit.org/>.

#### **Note**

The JUnit Data Provider no longer produces findings. Instead, it creates test artefacts (new in 18.0) with a Pass/Fail status so you can filter the artefacts in the Explorer or create action items based on a test's status.

### 4.26.2. Usage

JUnit Format has the following options:

- **Results folder ( `resultDir` , mandatory)** Specify the path to the folder containing the JUnit results (or by a tool able to produce data in this format). The data provider will parse subfolders recursively. Note that the minimum support version of JUnit is 4.10.
- **File Pattern ( `filePattern` , mandatory, default: `TEST-*.xml`)** Specify the pattern for files to read reports from.
- **Root Artefact ( `root` , mandatory, default: `tests[type=TEST_FOLDER]/junit[type=TEST_FOLDER]`)** Specify the name and type of the artefact under which the test artefacts will be created.

The full command line syntax for JUnit Format is:

```
-d "type=JUnit,resultDir=[text],filePattern=[text],root=[text]"
```

## 4.27. JaCoCo

### 4.27.1. Description

JaCoCo is a free code coverage library for Java. Its XML report file can be imported to generate code coverage metrics for your Java project.

For more details, refer to <http://www.eclemma.org/jacoco/>.

### 4.27.2. Usage

JaCoCo has the following options:

- **XML report ( `xml` , mandatory)** Specify the path to the XML report generated by JaCoCo. Note that the folder containing the XML file must also contain JaCoCo's report DTD file, available from <http://www.eclemma.org/jacoco/trunk/coverage/report.dtd>. XML report files are supported from version 0.6.5.

The full command line syntax for JaCoCo is:

```
-d "type=Jacoco,xml=[text]"
```

## 4.28. Klocwork

### 4.28.1. Description

Klocwork is a static analysis tool. Its XML result file can be imported to generate findings.

For more details, refer to <http://www.klocwork.com>.

### 4.28.2. Usage

Klocwork has the following options:

- **XML results file ( `xml` )** Specify the path to the XML results file exported from Klocwork. Note that Klocwork version 9.6.1 is the minimum required version.

The full command line syntax for Klocwork is:

```
-d "type=Klocwork,xml=[text]"
```

## 4.29. Rational Logiscope

### 4.29.1. Description

The Logiscope suite allows the evaluation of source code quality in order to reduce maintenance cost, error correction or test effort. It can be applied to verify C, C++, Java and Ada languages and produces a CSV results file that can be imported to generate findings.

For more details, refer to <http://www.kalimetrix.com/en/logiscope>.

### 4.29.2. Usage

Rational Logiscope has the following options:

→ **RuleChecker results file ( csv )** Specify the path to the CSV results file from Logiscope.

The full command line syntax for Rational Logiscope is:

```
-d "type=Logiscope, csv=[text]"
```

## 4.30. MSTest

### 4.30.1. Description

MS-Test automates the process of testing Windows applications. It combines a Windows development language, Basic, with a testing-oriented API.

For more details, refer to [https://en.wikipedia.org/wiki/Visual\\_Test](https://en.wikipedia.org/wiki/Visual_Test).

#### Note

This Data Provider is new in Squore 18.0

### 4.30.2. Usage

MSTest has the following options:

→ **MSTest results directory ( resultDir )** Specify the path to the results directory generated by MSTest.

→ **Test result file pattern ( filePattern )** Specify the pattern of files to extract Test data from.

The full command line syntax for MSTest is:

```
-d "type=MSTest, resultDir=[text], filePattern=[text]"
```

## 4.31. MemUsage

### 4.31.1. Description

### 4.31.2. Usage

MemUsage has the following options:

→ **Memory Usage excel file ( excel )**

The full command line syntax for MemUsage is:

```
-d "type=MemUsage,excel=[text]"
```

## 4.32. NCover

### 4.32.1. Description

NCover is a Code coverage program for C# application. NCover generates an XML results file which can be imported to generate metrics.

For more details, refer to <http://www.ncover.com/>.

### 4.32.2. Usage

NCover has the following options:

- **XML results file ( xml )** Specify the location of the XML results file generated by NCover. Note that the minimum supported version is NCover 3.0.

The full command line syntax for NCover is:

```
-d "type=NCover,xml=[text]"
```

## 4.33. Oracle PLSQL compiler Warning checker

### 4.33.1. Description

This data provider reads an Oracle compiler log file and imports the warnings as findings. Findings extracted from the log file are filtered using a prefix parameter.

For more details, refer to <http://www.oracle.com/>.

### 4.33.2. Usage

Oracle PLSQL compiler Warning checker has the following options:

→ **Compiler log file ( log )**

- **Prefixes ( prefix )** Prefixes and their replacements are specified as pairs using the syntax [prefix1|node1;prefix2|node2]. Leave this field empty to disable filtering. The parsing algorithm looks for lines fitting this pattern: [PATH;SCHEMA;ARTE\_ID;ARTE\_TYPE;LINE;COL;SEVERITY\_TYPE;WARNING\_ID;SEVERITY\_ID;DESCR] and keeps lines where [PATH] begins with one of the input prefixes. In each kept [PATH], [prefix] is replaced by [node]. If [node] is empty, [prefix] is removed from [PATH], but not replaced. Some valid syntaxes for prefix: One prefix to remove: svn://aaaa:12345/valid/path/from/svn One prefix to replace: svn://aaaa:12345/valid/path/from/svn|node1 Two prefixes to remove: svn://aaaa:12345/valid/path/from/svn|;svn://bbbb:12345/valid/path/from/other\_svn| Two prefixes to replace: svn://aaaa:12345/valid/path/from/svn;svn://bbbb:12345/valid/path/from/other\_svn| Two prefixes to replace: svn://aaaa:12345/valid/path/from/svn|node1;svn://bbbb:12345/valid/path/from/other\_svn|node2

The full command line syntax for Oracle PLSQL compiler Warning checker is:

```
-d "type=Oracle_PLSQLCompiler,log=[text],prefix=[text]"
```

## 4.34. MISRA Rule Checking using PC-lint

### 4.34.1. Description

PC-lint is a static code analyser. The PC-lint data provider reads an PC-lint log file and imports MISRA violations as findings.

For more details, refer to <http://www.gimpel.com/html/pcl.htm>.

### 4.34.2. Usage

MISRA Rule Checking using PC-lint has the following options:

- **Log file folder ( logDir )** Specify the path to the folder containing the PC-lint log files.
- **Extensions to exclude ( excludedExtensions , default: .h;.H)** Specify the file extensions to exclude from the reported violations.

The full command line syntax for MISRA Rule Checking using PC-lint is:

```
-d "type=PC_Lint_MISRA,logDir=[text],excludedExtensions=[text]"
```

## 4.35. PMD

### 4.35.1. Description

PMD scans Java source code and looks for potential problems like possible bugs, dead code, sub-optimal code, overcomplicated expressions, duplicate code... The XML results file it generates is read to create findings.

For more details, refer to <http://pmd.sourceforge.net>.

### 4.35.2. Usage

PMD has the following options:

- **XML results file ( xml )** Specify the path to the PMD XML results file. Note that the minimum supported version of PMD for this data provider is 4.2.5.

The full command line syntax for PMD is:

```
-d "type=PMD,xml=[text]"
```

## 4.36. PMD (plugin)

### 4.36.1. Description

PMD scans Java source code and looks for potential problems like possible bugs, dead code, sub-optimal code, overcomplicated expressions, duplicate code ... The XML results file it generates is read to create findings.

For more details, refer to <http://pmd.sourceforge.net>.

**Note**

This data provider requires an extra download to extract the PMD binary in `<SQUORE_HOME>/addons/tools/PMD_auto/`. For more information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications [`./install_admin_manual/index.html#sect_thirdparty_plugins`] section.. You may also deploy your own version of PMD and force the Data Provider to use it by editing `<SQUORE_HOME>/configuration/tools/PMD_auto/config.tcl`.

## 4.36.2. Usage

PMD (plugin) has the following options:

- **Ruleset file ( configFile )** Specify the path to the PMD XML ruleset you want to use for this analysis. If you do not specify a ruleset, the default one from `INSTALLDIR/addons/tools/PMD_auto` will be used.

The full command line syntax for PMD (plugin) is:

```
-d "type=PMD_auto,configFile=[text]"
```

## 4.37. Polyspace

### 4.37.1. Description

Polyspace is a static analysis tool which includes a MISRA checker. It produces an XML output which can be imported to generate findings. Polyspace Verifier detects RTE (RunTime Error) such as Division by zero, Illegal Dereferencing Pointer, Out of bound array index... Such information is turned into statistical measures at function level. Number of Red (justified/non-justified), Number of Grey (justified/non-justified), Number of Orange (justified/non-justified), Number of Green.

For more details, refer to <http://www.mathworks.com/products/polyspace/index.html>.

### 4.37.2. Usage

Polyspace has the following options:

- **DocBook results file ( xml )** Specify the path to the DocBook (main xml file) generated by Polyspace .
- **Ignore source file path ( ignoreSourceFilePath , default: false)** Removes all path elements when doing the mapping between files in Squore project and files in the Polyspace report. Be careful this can work only if file names in Squore project are unique.

The full command line syntax for Polyspace is:

```
-d "type=Polyspace,xml=[text],ignoreSourceFilePath=[booleanChoice]"
```

## 4.38. MISRA Rule Checking with QAC

### 4.38.1. Description

QAC identifies problems in C source code caused by language usage that is dangerous, overly complex, non-portable, difficult to maintain, or simply diverges from coding standards. Its CSV results file can be imported to generate findings.

For more details, refer to <http://www.phaedsys.com/principals/programmingresearch/pr-qac.html>.

## 4.38.2. Usage

MISRA Rule Checking with QAC has the following options:

- **Code Folder ( logDir )** Specify the path to the folder that contains the annotated files to process. For the findings to be successfully linked to their corresponding artefact, several requirements have to be met: - The annotated file name should be [Original source file name].txt e.g. The annotation of file "controller.c" should be called "controller.c.txt" - The annotated file location in the annotated directory should match the associated source file location in the source directory. e.g. The annotation for source file "[SOURCE\_DIR]/subDir1/subDir2/controller.c" should be located in "[ANNOTATIONS\_DIR]/subDir1/subDir2/controller.c.txt" The previous comment suggests that the source and annotated directory are different. However, these directories can of course be identical, which ensures that locations of source and annotated files are the same.
- **Extension ( ext , default: html)** Specify the extension used by QAC to create annotated files.

The full command line syntax for MISRA Rule Checking with QAC is:

```
-d "type=QAC_MISRA,logDir=[text],ext=[text]"
```

## 4.39. Unit Test Status from Rational Test RealTime

### 4.39.1. Description

Rational Test RealTime is a cross-platform solution for component testing and runtime analysis of embedded software. This Data Provider extracts coverage results, as well as tests and their status

For more details, refer to <http://www-01.ibm.com/software/awdtools/test/realtime/>.

#### Note

TRRT can now create test artefacts in your project tree (new in 18.0)

### 4.39.2. Usage

Unit Test Status from Rational Test RealTime has the following options:

- **.xrd folder ( logDir )** Specify the path to the folder containing the .xrd files generated by TRRT.
- **Excluded file extensions ( excludedExtensions , default: .h;.H)**
- **Generate Test artefacts and structure from .xrd files? ( generateTests , default: false)**

The full command line syntax for Unit Test Status from Rational Test RealTime is:

```
-d "type=TRRT,logDir=[text],excludedExtensions=[text],generateTests=[booleanChoice]"
```

## 4.40. ReqIF

### 4.40.1. Description

RIF/ReqIF (Requirements Interchange Format) is an XML file format that can be used to exchange requirements, along with its associated metadata, between software tools from different vendors.

For more details, refer to <http://www.omg.org/spec/ReqIF/>.



## 4.40.2. Usage

ReqIf has the following options:

→ ( **dir** )

→ **Spec Object Type ( objType , default: \_AUTO\_ )** Specify the SPEC\_OBJECT\_TYPE property LONG-NAME to be used to process the ReqIf file. Using the \_AUTO\_ value will let the Data Provider extract the value from the ReqIf file, and assumes that there is only one such definition.

The full command line syntax for ReqIf is:

```
-d "type=ReqIf,dir=[text],objType=[text]"
```

## 4.41. SQL Code Guard

### 4.41.1. Description

SQL Code Guard is a free solution for SQL Server that provides fast and comprehensive static analysis for T-Sql code, shows code complexity and objects dependencies.

For more details, refer to <http://www.sqlcodeguard.com>.

### 4.41.2. Usage

SQL Code Guard has the following options:

→ **XML results ( xml )** Specify the path to the XML files containing SQL Code Guard results.

The full command line syntax for SQL Code Guard is:

```
-d "type=SQLCodeGuard,xml=[text]"
```

## 4.42. Squan Sources

### 4.42.1. Description

Squan Sources provides basic-level analysis of your source code.

For more details, refer to <https://support.squoring.com>.

#### Note

The analyser can output info and warning messages in the build logs. Recent additions to those logs include better handling of structures in C code, which will produce these messages:

- [Analyzer] Unknown syntax declaration for function XXXXX at line yyy to indicate that we would have found a function but, probably due to preprocessing directives, we are not able to parse it.
- [Analyzer] Unbalanced ( ) blocks found in the file. Probably due to preprocessing directives, parenthesis in the file are not well balanced.
- [Analyzer] Unbalanced {} blocks found in the file. Probably due to preprocessing directives, curly brackets in the file are not well balanced.

**Tip**

You can specify the languages for your source code by passing pairs of language and extensions to the **languages** parameter. Extensions are case-sensitive and cannot be used for two different languages. For example, a project mixing php and javascript files can be analysed with:

```
--dp "type=SQuORE, languages=php:.php;javascript:.js,.JS"
```

In order to launch an analysis using all the available languages by default, do not specify the **languages** parameter in your command line.

## 4.42.2. Usage

Squan Sources has the following options:

- **Languages ( `languages` , default: `ada;c;cpp;csharp;cobol;java;fortran77;fortran90;php;python;vbnet` )**  
Check the boxes for the languages used in the specified source repositories. Adjust the list of file extensions as necessary. Note that two languages cannot use the same file extension, and that the list of extensions is case-sensitive. Tip: Leave all the boxes unchecked and Squan Sources will auto-detect the language parser to use.
- **Force full analysis ( `rebuild_all` , default: `false` )** Analyses are incremental by default. Check this box if you want to force the source code parser to analyse all files instead of only the ones that have changed since the previous analysis. This is useful if you added new rule files or text parsing rules and you want to re-evaluate all files based on your modifications.
- **Generate control graphs ( `genCG` , default: `true` )** This option allows generating a control graph for every function in your code. The control graph is visible in the dashboard of the function when the analysis completes.
- **Use qualified names ( `qualified` , default: `false` )** Note: This option cannot be modified in subsequent runs after you create the first version of your project.
- **Limit analysis depth ( `depth` , default: `false` )** Use this option to limit the depth of the analysis to file-level only. This means that Squan Sources will not create any class or function artefacts for your project.
- **Add a 'Source Code' node ( `scnode` , default: `false` )** Using this options groups all source nodes under a common source code node instead of directly under the APPLICATION node. This is useful if other data providers group non-code artefacts like tests or requirements together under their own top-level node. This option can only be set when you create a new project and cannot be modified when creating a new version of your project.
- **'Source Code' node label ( `scnode_name` , default: `Source Code` )** Specify a custom label for your main source code node. Note: this option is not modifiable. It only applies to projects where you use the "Add a 'Source Code' node" option. When left blank, it defaults to "Source Code".
- **Compact folders ( `compact_folder` , default: `true` )** When using this option, folders with only one son are aggregates together. This avoids creating many unnecessary levels in the artefact tree to get to the first level of files in your project. This option cannot be changed after you have created the first version of your project.
- **Content exclusion via regexp ( `pattern` )** Specify a PERL regular expression to automatically exclude files from the analysis if their contents match the regular expression. Leave this field empty to disable content-based file exclusion.
- **File Filtering ( `files_choice` , default: `Exclude` )** Specify a pattern and an action to take for matching file names. Leave the pattern empty to disable file filtering.
- **pattern ( `pattern_files` )** Use a shell-like wildcard e.g. `*-test.c`. `*` Matches any sequence of characters in string, including a null string. `?` Matches any single character in string. `[chars]` Matches any character in the set given by chars. If a sequence of the form `x-y` appears in chars, then any character between `x` and

y, inclusive, will match. On Windows, this is used with the `-nocase` option, meaning that the end points of the range are converted to lower case first. Whereas `{[A-z]}` matches `'_'` when matching case-sensitively (`'_'` falls between the `'Z'` and `'a'`), with `-nocase` this is considered like `{[A-Za-z]}`. `\x` Matches the single character `x`. This provides a way of avoiding the special interpretation of the characters `*?[]` in pattern. Tip: Use `;` to separate multiple patterns.

- **Folder Filtering ( `dir_choice` , default: `Exclude` )** Specify a pattern and an action to take for matching folder names. Leave the pattern empty to disable folder filtering.
- **pattern ( `pattern_dir` )** Use a shell-like wildcard e.g. `'Test_*'`. `*` Matches any sequence of characters in string, including a null string. `?` Matches any single character in string. `[chars]` Matches any character in the set given by `chars`. If a sequence of the form `x-y` appears in `chars`, then any character between `x` and `y`, inclusive, will match. On Windows, this is used with the `-nocase` option, meaning that the end points of the range are converted to lower case first. Whereas `{[A-z]}` matches `'_'` when matching case-sensitively (`'_'` falls between the `'Z'` and `'a'`), with `-nocase` this is considered like `{[A-Za-z]}`. `\x` Matches the single character `x`. This provides a way of avoiding the special interpretation of the characters `*?[]` in pattern. Tip: Use `;` to separate multiple patterns.
- **Exclude files whose size exceeds ( `size_limit` , default: `500000` )** Provide the size in bytes above which files are excluded automatically from the Squore project (Big files are usually generated files or test files). Leave this field empty to deactivate this option.
- **Detect algorithmic cloning ( `clAlg` , default: `true` )** When checking this box, Squan Sources launches a cloning detection tool capable of finding algorithmic cloning in your code.
- **Detect text cloning ( `clTxt` , default: `true` )** When checking this box, Squan Sources launches a cloning detection tool capable of finding text duplication in your code.
- **Ignore blank lines ( `clIgnBlk` , default: `true` )** When checking this box, blank lines are ignored when searching for text duplication
- **Ignore comment blocks ( `clIgnCmt` , default: `true` )** When checking this box, blocks of comments are ignored when searching for text duplication
- **Minimum size of duplicated blocks ( `clRSlen` , default: `10` )** This threshold defines the minimum size (number of lines) of blocks that can be reported as cloned.
- **Textual Cloning fault ratio ( `clFR` , default: `0.1` )** This threshold defines how much cloning between two artefacts is necessary for them to be considered as clones by the text duplication tool. For example, a fault ratio of 0.1 means that two artefacts are considered clones if less than 10% of their contents differ.
- **Algorithmic cloning fault ratio ( `clAlgFR` , default: `0.1` )** This threshold defines how much cloning between two artefacts is necessary for them to be considered as clones by the algorithmic cloning detection tool.
- **Compute Textual stability ( `genTs` , default: `true` )** This option allows keeping track of the stability of the code analysed for each version. The computed stability is available on the dashboard as a metric called and can be interpreted as 0% meaning completely changed and 100% meaning not changed at all.
- **Compute Algorithmic stability ( `genAs` , default: `true` )** This option allows keeping track of the stability of the code analysed for each version. The computed stability is available on the dashboard as a metric called Stability Index (SI) and can be interpreted as 0% meaning completely changed and 100% meaning not changed at all.
- **Detect artefact renaming ( `clRen` , default: `true` )** This option allows Squan Sources to detect artefacts that have been moved since the previous version, ensuring that the stability metrics of the previous artefact are passed to the new one. This is typically useful if you have moved a file to a different folder in your source tree and do not want to lose the previous metrics generated for this file. If you do not use this option, moved artefacts will be considered as new artefacts.
- **Mark relaxed findings as suspicious ( `susp` , default: `MODIFIED_BEFORE` )** This option sets the suspicious flag on relaxed findings depending of the selected option. Applies on source code artifacts only.
- **Additional parameters ( `additional_param` )** These additional parameters can be used to pass instructions to external processes started by this data provider. This value is generally left empty in most cases.

The full command line syntax for Squan Sources is:

```
-d  
"type=SQuORE, languages=[multipleChoice], rebuild_all=[booleanChoice], genCG=[booleanChoice], qua
```

## 4.43. Squore Import

### 4.43.1. Description

Squore Import is a data provider used to import the results of another data provider analysis. It is generally only used for debugging purposes.

For more details, refer to <https://support.squoring.com>.

### 4.43.2. Usage

Squore Import has the following options:

→ **XML folder ( `inputDir` )** Specify the folder that contains the `squore_data_*.xml` files that you want to import.

The full command line syntax for Squore Import is:

```
-d "type=SQuOREImport, inputDir=[text]"
```

## 4.44. Squore Virtual Project

### 4.44.1. Description

Squore Virtual Project is a data provider that can use the output of several projects to compile metrics in a meta-project composed of the import sub-projects.

For more details, refer to <https://support.squoring.com>.

### 4.44.2. Usage

Squore Virtual Project has the following options:

→ **Paths to output.xml files ( `output` )** Specify the paths to all the `output.xml` files you want to include in the virtual project. Separate paths using `';`.

The full command line syntax for Squore Virtual Project is:

```
-d "type=SQuOREVirtualProject, output=[text]"
```

## 4.45. StyleCop

### 4.45.1. Description

StyleCop is a C# code analysis tool. Its XML output is imported to generate findings.

For more details, refer to <https://stylecop.codeplex.com/>.

## 4.45.2. Usage

StyleCop has the following options:

- **XML results file ( `xml` )** Specify the path to the StyleCop XML results file. The minimum version compatible with this data provider is 4.7.

The full command line syntax for StyleCop is:

```
-d "type=StyleCop,xml=[text]"
```

## 4.46. StyleCop (plugin)

### 4.46.1. Description

StyleCop is a C# code analysis tool. Its XML output is imported to generate findings.

For more details, refer to <https://stylecop.codeplex.com/>.

#### Note

Note that this data provider is not supported on Linux. On windows, this data provider requires an extra download to extract the StyleCop binary in `<SQUORE_HOME>/addons/tools/StyleCop_auto/` and .NET framework 3.5 to be installed on your machine (run `Net.SF.StyleCopCmd.Console.exe` manually once to install .NET automatically). For more information, refer to the Installation and Administration Guide's Third-Party Plugins and Applications `[../install_admin_manual/index.html#sect_thirdparty_plugins]` section.

### 4.46.2. Usage

StyleCop (plugin) has the following options:

- **Solution ( `sln` )** Specify the path to the .sln file to analyse. Leave empty to analyse all .sln found in the source repository.

The full command line syntax for StyleCop (plugin) is:

```
-d "type=StyleCop_auto,sln=[text]"
```

## 4.47. Tessa

### 4.47.1. Description

Tessa is a tool automating module/unit testing of embedded software written in dialects of C/C++. Tessa generates an XML results file which can be imported to generate metrics. This data provider supports importing files that have a `xml_version="1.0"` attribute in their header.

For more details, refer to <https://www.hitex.com/en/tools/tessa/>.

### 4.47.2. Usage

Tessa has the following options:

- **Results folder ( `resultDir` )** Specify the top folder containing XML result files from Tessy. Note that this data provider will recursively scan sub-folders looking for index.xml files to aggregate results.

The full command line syntax for Tessy is:

```
-d "type=Tessy,resultDir=[text]"
```

## 4.48. VectorCAST

### 4.48.1. Description

The VectorCAST Data Provider extracts coverage results, as well as tests and their status

For more details, refer to <https://www.vectorcast.com/>.

#### Note

VectorCAST can now create test artefacts in your project tree (new in 18.0)

### 4.48.2. Usage

VectorCAST has the following options:

- **HTML Report ( `html_report` )** Specify the path to the HTML report which contains the test results.
- **Create test artefacts from HTML report ( `generateTests` , default: false)**

The full command line syntax for VectorCAST is:

```
-d "type=VectorCAST,html_report=[text],generateTests=[booleanChoice]"
```

## 4.49. CodeSniffer

### 4.49.1. Description

CodeSniffer is a rulecker for PHP and Javascript

For more details, refer to <http://www.squizlabs.com/php-codesniffer>.

### 4.49.2. Usage

CodeSniffer has the following options:

- **CodeSniffer results file (checkstyle formmated xml) ( `xml` )** Point to the XML file that contains CodeSniffer results.

The full command line syntax for CodeSniffer is:

```
-d "type=codesniffer,xml=[text]"
```

## 4.50. Configuration Checker

### 4.50.1. Description

Use this tool to check for duplicated files or XML Elements between a custom configuration and the standard configuration.

### 4.50.2. Usage

Configuration Checker has the following options:

- **Standard Configuration Path ( s )**
- **Custom Configurations Path ( p )**

The full command line syntax for Configuration Checker is:

```
-d "type=conf-checker,s=[text],p=[text]"
```

## 4.51. Csv Coverage Import

### 4.51.1. Description

Csv Coverage Import provides a generic import mechanism for coverage results at function level

### 4.51.2. Usage

Csv Coverage Import has the following options:

- **CSV file ( csv )** Enter the path to the CSV containing the coverage data. The expected format of each line contained in the file is PATH;NAME;TESTED\_C1;OBJECT\_C1;TESTED\_MCC;OBJECT\_MCC;TESTED\_MCDC;OBJECT\_MCDC;TCOV\_MCC;TCOV\_MCDC;T

The full command line syntax for Csv Coverage Import is:

```
-d "type=csv_coverage,csv=[text]"
```

## 4.52. CSV Findings

### 4.52.1. Description

CSV Findings is a generic tool that allows importing findings into the project.

### 4.52.2. Usage

CSV Findings has the following options:

- **CSV File ( csv )** Specify the path to your CSV file containing findings. Each line in the file must use the following format and the file should include the following header: FILE;FUNCTION;RULE\_ID;MESSAGE;LINE;COL;STATUS;STATUS\_MESSAGE;TOOL

The full command line syntax for CSV Findings is:

```
-d "type=csv_findings,csv=[text]"
```

## 4.53. CSV Import

### 4.53.1. Description

Imports artefacts, metrics, findings, textual information and links from one or more CSV files. The expected CSV format for each of the input files is described in the user manuals in the `csv_import` framework reference.

#### Note

Consult `csv_import` Reference for more details about the expected CSV format.

### 4.53.2. Usage

CSV Import has the following options:

- **CSV Separator ( `separator` , default: `;` )** Specify the CSV Separator used in the CSV file.
- **CSV Delimiter ( `delimiter` , default: `"` )** CSV Delimiter is used when the separator is used inside a cell value. If a delimiter is used as a char in a cell it has to be doubled. The `'` char is not allowed as a delimiter.
- **Artefact Path Separator ( `pathSeparator` , default: `/` )** Specify the character used as a separator in an artefact's path in the input CSV file.
- **Case-sensitive artefact lookup ( `pathAreCaseSensitive` , default: `true` )** When this option is turned on, artefacts in the CSV file are matched with existing source code artefacts in a case-sensitive manner.
- **Ignore source file path ( `ignoreSourceFilePath` , default: `false` )** When ignoring source file path it is your responsibility to ensure that file names are unique in the project.
- **Create missing files ( `createMissingFile` , default: `false` )** Automatically creates the artefacts declared in the CSV file if they do not exist.
- **Ignore finding if artefact not found ( `ignoreIfArtefactNotFound` , default: `true` )** If a finding can not be attached to any artefact then it is either ignored (checked) or it is attached to the project node instead (unchecked).
- **Unknown rule ID ( `unknownRuleId` )** For findings of a type that is not in your ruleset, set a default rule ID. The value for this parameter must be a valid rule ID from your analysis model.
- **Measure ID for orphan artifacts count ( `orphanArteCountId` )** To save the total count of orphan findings as a metric at application level, specify the ID of the measure to use in your analysis model.
- **Measure ID for unknown rules count ( `orphanRulesCountId` )** To save the total count of unknown rules as a metric at application level, Specify the ID of the measure to use in your analysis model.
- **Information ID receiving the list of unknown rules IDs ( `orphanRulesListId` )** To save the list of unknown rule IDs as textual information at application level, specify the ID of the textual information to use in your analysis model.
- **CSV File ( `csv` )** Specify the path to the input CSV file containing artefacts, metrics, findings, textual information, links and keys.
- **Metrics CSV File ( `metrics` )** Specify the path to the CSV file containing metrics.
- **Infos CSV File ( `infos` )** Specify the path to the CSV file containing textual information.
- **Findings CSV File ( `findings` )** Specify the path to the CSV file containing findings.
- **Keys CSV File ( `keys` )** Specify the path to the CSV file containing artefact keys.
- **Links CSV File ( `links` )** Specify the path to the CSV file containing links.
- **Reports artefacts mapping problem as ( `level` , default: `info` )** When an artefact referenced in the csv file can not be found in the project, reports the problem as an information or as a warning.

The full command line syntax for CSV Import is:



```
-d  
"type=csv_import,separator=[text],delimiter=[text],pathSeparator=[text],pathAreCaseSensitive=
```

## 4.54. Csv Tag Import

### 4.54.1. Description

This data provider allows setting values for attributes in the project.

### 4.54.2. Usage

Csv Tag Import has the following options:

- **CSV file ( csv )** Specify the path to the file containing the metrics.

The full command line syntax for Csv Tag Import is:

```
-d "type=csv_tag_import, csv=[text]"
```

## 4.55. CPU Data Import

### 4.55.1. Description

CPU Data Import provides a generic import mechanism for CPU data from a CSV or Excel file.

#### Note

This Data Provider is new in Squore 18.0

### 4.55.2. Usage

CPU Data Import has the following options:

- **( root\_node , default: Resources )**
- **Data File ( xls\_file )** Specify the path to the file containing CPU information.
- **Sheet Name ( xls\_sheetname )** Specify the name of the Excel sheet that contains the CPU list.
- **CPU Column name ( xls\_key )** Specify the header name of the column which contains the CPU key.
- **Grouping Structure ( xls\_groups )** Specify the headers for Grouping Structure, separated by ";"
- **Filtering ( xls\_filters )** Specify the list of Header for filtering For example:  
"column\_name\_1=regex1;column\_name\_2=regex2;
- **( csv\_separator , default: ; )**
- **( cpu\_loop\_column\_name , default: Total Loop Time [ms] )**
- **( cpu\_idle\_column\_name , default: Average idle Time per loop [ms] )**
- **( cpu\_worst\_column\_name , default: Worse case idle Time per loop [ms] )**
- **( createOutput , default: true )**

The full command line syntax for CPU Data Import is:

```
-d  
"type=import_cpu,root_node=[text],xls_file=[text],xls_sheetname=[text],xls_key=[text],xls_grou
```

## 4.56. Memory Data Import

### 4.56.1. Description

Memory Data Import provides a generic import mechanism for memory data from a CSV or Excel file.

**Note**

This Data Provider is new in Squore 18.0

### 4.56.2. Usage

Memory Data Import has the following options:

- ( **root\_node** , **default: Resources** )
- **Data File ( xls\_file )** Specify the path to the file containing Memory information.
- **Sheet Name ( xls\_sheetname )** Specify the name of the Excel sheet that contains the Memory list.
- **Memory Column name ( xls\_key )** Specify the header name of the column which contains the Memory key.
- **Grouping Structure ( xls\_groups )** Specify the headers for Grouping Structure, separated by ";".
- **Filtering ( xls\_filters )** Specify the list of Header for filtering For example:  
"column\_name\_1=regex1;column\_name\_2=regex2;
- ( **csv\_separator** , **default: ;** )
- ( **memory\_size\_column\_name** , **default: Total** )
- ( **memory\_used\_column\_name** , **default: Used** )
- ( **memory\_type\_column\_name** , **default: Type** )
- ( **createOutput** , **default: true** )

The full command line syntax for Memory Data Import is:

```
-d  
"type=import_memory,root_node=[text],xls_file=[text],xls_sheetname=[text],xls_key=[text],xls_c
```

## 4.57. Stack Data Import

### 4.57.1. Description

Stack Data Import provides a generic import mechanism for stack data from a CSV or Excel file.

**Note**

This Data Provider is new in Squore 18.0

### 4.57.2. Usage

Stack Data Import has the following options:

- ( **root\_node** , **default: Resources** )
- **Data File ( xls\_file )** Specify the path to the file containing Stack information.

- **Sheet Name ( xls\_sheetname )** Specify the sheetname that contains the Stack list.
- **Stack Column name ( xls\_key )** Specify the header name of the column which contains the Stack key.
- **Grouping Structure ( xls\_groups )** Specify the headers for Grouping Structure, separated by ";".
- **Filtering ( xls\_filters )** Specify the list of Header for filtering For example: "column\_name\_1=regex1;column\_name\_2=regex2;
- **( csv\_separator , default: ; )**
- **( stack\_size\_column\_name , default: Stack Size [Bytes])**
- **( stack\_average\_column\_name , default: Average Stack Size used [Bytes])**
- **( stack\_worst\_column\_name , default: Worse Case Stack Size used [Bytes])**
- **( createOutput , default: true)**

The full command line syntax for Stack Data Import is:

```
-d
" type=import_stack,root_node=[text],xls_file=[text],xls_sheetname=[text],xls_key=[text],xls_g
```

## 4.58. Ticket Data Import

### 4.58.1. Description

Ticket Data Import provides a generic import mechanism for tickets from a CSV, Excel or JSON file. Additionally, it generates findings when the imported tickets have an unknown status or type.

#### Note

This Data Provider is new in Squore 18.0

This Data Provider provides fields so you can map all your tickets as Enhancements and defects and spread them over the following statuses: Open, In Implementation, In Verification, Closed.

Overlapping statuses and types will cause an error, but if a ticket's type or status is not declared in the definition, the ticket will still be imported, and a finding will be created.

### 4.58.2. Usage

Ticket Data Import has the following options:

- **Root Node ( root\_node , default: Tickets)** Specify the name of the node to attach tickets to.
- **Data File ( input\_file )** Specify the path to the CSV, Excel or JSON file containing tickets.
- **Excel Sheet Name ( xls\_sheetname )** Specify the sheet name that contains the ticket list if your import file is in Excel format.
- **Ticket ID ( artefact\_id )** Specify the header name of the column which contains the ticket ID.
- **Ticket Name ( artefact\_name )** Specify the pattern used to build the name of the ticket. The name can use any information collected from the CSV file as a parameter. Example: \${ID} : \${Summary}
- **Ticket UID ( artefact\_uid )** Specify the pattern used to build the ticket Unique ID. The UID can use any information collected from the CSV file as a parameter. Example: TK#\${ID}
- **Grouping Structure ( artefact\_groups )** Specify the headers for Grouping Structure, separated by ";" For example: "column\_name\_1=regex1;column\_name\_2=regex2;
- **Filtering ( artefact\_filters )** Specify the list of Header for filtering For example: "column\_name\_1=regex1;column\_name\_2=regex2;

- **Open Ticket Pattern ( `definition_open` )** Specify the pattern applied to define tickets as open. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Status=[Open|New]
- **In Development Ticket Pattern ( `definition_rd_progress` )** Specify the pattern applied to define tickets as in development. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Status=Implementing
- **Fixed Ticket Pattern ( `definition_vv_progress` )** Specify the pattern applied to define tickets as fixed. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Status=Verifying;Resolution=[fixed;removed]
- **Closed Ticket Pattern ( `definition_close` )** Specify the pattern applied to define tickets as closed. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Status=Closed
- **Defect Pattern ( `definition_defect` )** Specify the pattern applied to define tickets as defects. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Type=Bug
- **Enhancement Pattern ( `definition_enhancement` )** Specify the pattern applied to define tickets as enhancements. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Type=Enhancement
- **TODO Pattern ( `in_todo_list` )** Specify the pattern applied to include tickets in the TODO list. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: Sprint=2018-23
- **Creation Date Column ( `creation_date` )** Enter the name of the column containing the creation date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **Due Date Column ( `due_date` )** Enter the name of the column containing the due date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **Last Updated Date Column ( `last_updated_date` )** Enter the name of the column containing the last updated date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **Closure Date Column ( `closure_date` )** Enter the name of the column containing the closure date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **URL ( `url` )** Specify the pattern used to build the ticket URL. The URL can use any information collected from the CSV file as a parameter. Example: `https://example.com/bugs/${ID}`
- **Description Column ( `description` )** Specify the header of the column containing the description of the ticket.
- **Reporter Column ( `reporter` )** Specify the header of the column containing the reporter of the ticket.
- **Handler Column ( `handler` )** Specify the header of the column containing the handler of the ticket.
- **Priority Column ( `priority` )** Specify the header of the column containing priority data.
- **Severity Column ( `severity` )** Specify the header of the column containing severity data.
- **CSV Separator ( `csv_separator` )** Specify the character used in the CSV file to separate columns.
- **Information Fields ( `informations` )** Specify the list of extra textual information to import from the CSV file. This parameter expects a list of headers separated by ";" characters. For example: Company;Country;Resolution
- **Save Output ( `createOutput` )**

The full command line syntax for Ticket Data Import is:

```
-d
"type=import_ticket,root_node=[text],input_file=[text],xls_sheetname=[text],artefact_id=[text]
```

## 4.59. Jira

### 4.59.1. Description

This Data Provider extracts tickets and their attributes from a Jira instance to create ticket artefacts in your project.

For more details, refer to <https://www.atlassian.com/software/jira>.

#### Note

This Data Provider is new in Squore 18.0

The extracted JSON from Jira is then passed to the Ticket Data Import Data Provider (described in Section 4.58, "Ticket Data Import"). Finer configuration of the data passed from this Data Provider to Ticket Data Import is available by editing (or overriding) `<SQUORE_HOME>/addons/tools/jira/jira_config.xml`.

### 4.59.2. Usage

Jira has the following options:

- **Jira REST API URL ( `url` , mandatory )** The URL used to connect to your Jira instance's REST API URL (e.g: `https://jira.domain.com/rest/api/2`)
- **Jira User login ( `login` , mandatory )** Specify your Jira User login.
- **Jira User password ( `pwd` , mandatory )** Specify your Jira User password.
- **Number of queried tickets ( `max_results` , mandatory, default: -1 )** Maximum number of queried tickets returned by the query (default is -1, meaning 'retrieve all tickets').
- **Grouping Structure ( `artefact_groups` , default: `fields/components[0]/name` )** Specify the headers for Grouping Structure, separated by ";". For example: `column_name_1=regex1;column_name_2=regex2;`
- **Creation Date Field ( `creation_date` , default: `fields/created` )** Enter the name of the column containing the creation date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **Due Date Field ( `due_date` , default: `fields/duedate` )** Enter the name of the column containing the due date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **Last Updated Date Field ( `last_updated_date` , default: `fields/updated` )** Enter the name of the column containing the last updated date of the ticket. For example: `column_name{format="dd/mm/yyyy"}`. If format is not specified, the following is used by default: `dd/mm/yyyy`.
- **JQL Request ( `jql_request` )** Specify a JQL request (see JIRA documentation) in order to limit the number of elements sent by the JIRA server. For example: `project=MonProjet`. This parameter is optional.
- **Filtering ( `artefact_filters` , default: `fields/issuetype/name=(Task|Bug|Improvement|New Feature)` )** Specify the list of Header for filtering. For example: `"column_name_1=regex1;column_name_2=regex2;`
- **Open Ticket Pattern ( `definition_open` , default: `fields/status/name=[To Do|Open|In Progress|Reopened|In Review]` )** Specify the pattern applied to define tickets as open. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Status=[Open|New]`

- **In Development Ticket Pattern ( `definition_rd_progress` , default: `fields/status/name=[In Progress|In Review]`)** Specify the pattern applied to define tickets as in development. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Status=Implementing`
- **Fixed Ticket Pattern ( `definition_vv_progress` , default: `fields/status/name=[Verified]`)** Specify the pattern applied to define tickets as fixed. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Status=Verifying;Resolution=[fixed;removed]`
- **Closed Ticket Pattern ( `definition_close` , default: `fields/status/name=[Verified|Resolved|Closed|Done]`)** Specify the pattern applied to define tickets as closed. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Status=Closed`
- **Defect Pattern ( `definition_defect` , default: `fields/issuetype/name=[Bug]`)** Specify the pattern applied to define tickets as defects. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Type=Bug`
- **Enhancement Pattern ( `definition_enhancement` , default: `fields/issuetype/name=[Improvement|New Feature]`)** Specify the pattern applied to define tickets as enhancements. This field accepts a regular expression to match one or more column headers with a list of possible values. Example: `Type=Enhancement`
- **( `in_todo_list` , default: `fields/status/name=.*`)**
- **Information Fields ( `informations` , default: `fields/environment;fields/votes/votes`)** Specify the list of extra textual information to import from the CSV file. This parameter expects a list of headers separated by ";" characters. For example: `Company;Country;Resolution`

The full command line syntax for Jira is:

```
-d
" type=jira , url=[text] , login=[text] , pwd=[password] , max_results=[text] , artefact_groups=[text] , c
```

## 4.60. Mantis

### 4.60.1. Description

The Mantis Data Provider extracts tickets and their attributes from a Mantis installation and creates ticket artefacts. Prerequisites: This Data Provider queries Mantis tickets using the Mantis BT REST API. An API token is required to access this API. The Mantis server should be configured to avoid filtering 'Authorization' headers. See <http://docs.php.net/manual/en/features.http-auth.php#114877> for further details.

For more details, refer to <https://www.mantisbt.com>.

#### Note

This Data Provider is new in Squore 18.0

The extracted JSON from Mantis BT is then passed to the Ticket Data Import Data Provider (described in Section 4.58, "Ticket Data Import"). Finer configuration of the data passed from this Data Provider to Ticket Data Import is available by editing (or overriding) `<SQUORE_HOME>/addons/tools/mantis/mantis_config.xml`.

### 4.60.2. Usage

Mantis has the following options:

- **Mantis URL ( `url` , mandatory)** Specify the URL of the Mantis instance (e.g: `https://www.mantisbt.org/bugs/api/rest`)

- **Mantis API Token ( `api_token` , mandatory)** Copy the Mantis API Token generated from your Account Settings in Mantis.
- **Number of queried tickets ( `max_results` , mandatory, default: 50)** Maximum number of queried tickets returned by the query (default is 50. value=-1 means 'retrieve all tickets').

The full command line syntax for Mantis is:

```
-d "type=mantis,url=[text],api_token=[text],max_results=[text]"
```

## 4.61. OSLC

### 4.61.1. Description

OSLC-CM allows retrieving information from Change Management systems following the OSLC standard. Metrics and artefacts are created by connecting to the OSLC system and retrieving issues with the specified query.

For more details, refer to <http://open-services.net/>.

### 4.61.2. Usage

OSLC has the following options:

- **Change Server ( `server` )** Specify the URL of the project you want to query on the OSLC server. Typically the URL will look like this: `http://myserver:8600/change/oslc/db/3454a67f-656ddd4348e5/role/User/`
- **Query ( `query` )** Specify the query to send to the OSLC server (e.g.: `release="9TDE/TDE_00_01_00_00"`). It is passed to the request URL via the `?oslc_cm.query=` parameter.
- **Query Properties ( `properties` , default: `request_type,problem_number,crstatus,severity,submission_area,functionality...`)** Specify the properties to add to the query. They are passed to the OSLC query URL using the `?oslc_cm.properties=` parameter.
- **Login ( `login` )**
- **Password ( `password` )**

The full command line syntax for OSLC is:

```
-d "type=oslc_cm,server=[text],query=[text],properties=[text],login=[text],password=[password]"
```

## 4.62. pep8

### 4.62.1. Description

pep8 is a tool to check your Python code against some of the style conventions in PEP 88. Its CSV report file is imported to generate findings.

For more details, refer to <https://pypi.python.org/pypi/pep8>.

### 4.62.2. Usage

pep8 has the following options:

- **CSV results file ( `csv` )** Specify the path to the CSV report file created by pep8.

The full command line syntax for pep8 is:

```
-d "type=pep8, csv=[text]"
```

## 4.63. pycodestyle / pep8 (plugin)

### 4.63.1. Description

Style Guide for Python Code. Pep8 results are imported to produce findings on Python code. This data provider requires having pycodestyle or pep8 installed on the machine running the analysis and the pycodestyle or pep8 command to be available in the path. It is compatible with pycodestyle 2.4 or pep8 1.7 and may also work with older versions.

For more details, refer to <https://pypi.org/project/pycodestyle>.

### 4.63.2. Usage

pycodestyle / pep8 (plugin) has the following options:

→ **Source code directory to analyse ( dir )** Leave this field empty to analyse all sources.

The full command line syntax for pycodestyle / pep8 (plugin) is:

```
-d "type=pep8_auto, dir=[text]"
```

## 4.64. PHP Code Coverage

### 4.64.1. Description

Library that provides collection, processing, and rendering functionality for PHP code coverage information.

For more details, refer to <https://github.com/sebastianbergmann/php-code-coverage>.

### 4.64.2. Usage

PHP Code Coverage has the following options:

→ **Report Folder ( html\_report )** Specify the path to the HTML report folder which contains the coverage results.

The full command line syntax for PHP Code Coverage is:

```
-d "type=phpcodecoverage, html_report=[text]"
```

## 4.65. pylint

### 4.65.1. Description

Pylint is a Python source code analyzer which looks for programming errors, helps enforcing a coding standard and sniffs for some code smells (as defined in Martin Fowler's Refactoring book). Pylint results are imported to generate findings for Python code.

For more details, refer to <http://www.pylint.org/>.



## 4.65.2. Usage

pylint has the following options:

- **CSV results file ( csv )** Specify the path to the CSV file containing pylint results. Note that the minimum version supported is 1.1.0.

The full command line syntax for pylint is:

```
-d "type=pylint, csv=[text]"
```

## 4.66. pylint (plugin)

### 4.66.1. Description

Coding Guide for Python Code. Pylint results are imported to produce findings on Python code. This data provider requires having pylint installed on the machine running the analysis and the pylint command to be available in the path. It is known to work with pylint 1.7.0 and may also work with older versions.

### 4.66.2. Usage

pylint (plugin) has the following options:

- **Source code directory to analyse ( dir )** Leave this field empty to analyse all sources.

The full command line syntax for pylint (plugin) is:

```
-d "type=pylint_auto, dir=[text]"
```

## 4.67. Qac\_8\_2

### 4.67.1. Description

QA-C is a static analysis tool for MISRA checking.

For more details, refer to <http://www.programmingresearch.com/static-analysis-software/qac-qacpp-static-analyzers/>.

### 4.67.2. Usage

Qac\_8\_2 has the following options:

- **QAC output file ( txt , mandatory)** Specify the path to the .tab file to extract metrics from.

The full command line syntax for Qac\_8\_2 is:

```
-d "type=qac, txt=[text]"
```

## 4.68. Qac\_8\_2 CERT Import

### 4.68.1. Description

QA-C is a static analysis tool for MISRA and CERT checking.

For more details, refer to <http://www.programmingresearch.com/static-analysis-software/qac-qacpp-static-analyzers/>.

## 4.68.2. Usage

Qac\_8\_2 CERT Import has the following options:

→ **QAC CERT output file (.tab file) ( `txt` , mandatory)**

The full command line syntax for Qac\_8\_2 CERT Import is:

```
-d "type=qac_cert,txt=[text]"
```

## 4.69. SonarQube

### 4.69.1. Description

This data provider imports findings from SonarQube. Note that versions prior to 6.2 may not be supported.

For more details, refer to <https://www.sonarqube.org/>.

#### Note

This Data Provider is new in Squore 18.0

### 4.69.2. Usage

SonarQube has the following options:

→ **SonarQube Location ( `sonar` , default: `http://127.0.0.1:9000`)** Specify the URL of the SonarQube installation to work with (for example: `http://localhost:9000`)

→ **SonarQube Component Key ( `key` )**

→ **Version Name ( `version` )**

→ **Login ( `login` )**

→ **Password ( `password` )**

The full command line syntax for SonarQube is:

```
-d "type=sonarqube,sonar=[text],key=[text],version=[text],login=[text],password=[password]"
```

## 4.70. Adding More Languages to Squan Sources

Squan Sources can handle files written in languages that are not officially supported with a bit of extra configuration (new in 18.0). In this mode, only a basic analysis of the file is carried out so that an artefact is created in the project and findings can be attached to it. A subset of the base metrics from Squan Sources is optionally recorded for the artefact so that line counting, stability and text duplication metrics are available at file level for the new language.

The example below shows how you can add TypeScript files to your analysis:

1. Copy `<SQUORE_HOME>/configuration/tools/SQuORE/form.xml` and its `.properties` files into your own configuration
2. Edit `form.xml` to add a new language key and associated file extensions:

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="SQuORE" ...>
  <tag type="multipleChoice" key="languages" ...
  defaultValue="...;typescript">
    ...
    <value key="typescript" option=".ts,.TS" />
  </tag>
</tags>
```

Files with extensions matching the **typescript** language will be added to your project as **TYPESCRIPT\_FILE** artefacts

3. Edit the `defaultValue` of the `additional_param` field to specify how Squan Sources should count source code lines and comment lines in the new language, based on another language officially supported by Squore. This step is optional, and is only needed if you want the to record basic line counting metrics for the artefacts.

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="SQuORE" ...>
  ...
  <tag type="text" key="additional_param"
  defaultValue="typescript=javascript" />
  ...
</tags>
```

Lines in TypeScript files will be counted as they would for Javascript code.

4. Add translations for the new language key to show in the web UI in Squan Sources's `form_en.properties`

```
OPT.typescript.NAME=TypeScript
```

5. Add translations for the new artefact type in one of the properties files imported by your Description Bundle:

```
T.TYPESCRIPT_FILE.NAME=TypeScript File
```

6. The new artefact type should also be declared as a type in your model. The easiest way to do this is to add it to the **GENERIC\_FILE** alias in your analysis model, which is pre-configured to record the line counting metrics for new artefacts. You should also define a root indicator for you new artefact type. The following snippet shows a minimal configuration using a dummy indicator:

```
<!-- <configuration>/MyModel/Analysis/Bundle.xml -->
<?xml version="1.0" encoding="UTF-8"?>
<Bundle>
  ...
  <ArtefactType id="GENERIC_FILE" heirs="TYPESCRIPT_FILE" />


  <RootIndicator artefactTypes="TYPESCRIPT_FILE" indicatorId="DUMMY" />
  <Indicator indicatorId="DUMMY" scaleId="SCALE_INFO"
  targetArtefactTypes="TYPESCRIPT_FILE" displayTypes="IMAGE" />

  <Measure measureId="DUMMY">
    <Computation targetArtefactTypes="TYPESCRIPT_FILE" result="0" />
  </Measure>
  ...
</Bundle>
```

7. Reload your configuration and analyse a project, checking the box for TypeScript in Squan Sources's options to get Typescript artefacts in your project.

## ▼ Squan Sources


**SQuAN Sources**

Languages	<input type="checkbox"/> ABAP	abap, ABAP	
	<input checked="" type="checkbox"/> Ada	.adb, ADB, .ada, ADA, .ads, ADS, .adi, ADI	
	<input checked="" type="checkbox"/> C	.c, C	
	<input checked="" type="checkbox"/> C++	.cpp, CPP, h, H	
	<input type="checkbox"/> MindC	.mindc, MINDC	
	<input checked="" type="checkbox"/> C#	.cs, CS, .cscript, CSCRIPT	
	<input checked="" type="checkbox"/> Cobol	.cbl, CBL, .cob, COB, .cbx, CBX, .cpy, CPY	
	<input checked="" type="checkbox"/> Java	.java, JAVA	
	<input type="checkbox"/> JavaScript	.js, JS	
	<input checked="" type="checkbox"/> Fortran77	.f, F, .f77, F77, .for, FOR	
	<input checked="" type="checkbox"/> Fortran90	.f95, F95, .f90, F90, .f03, F03, .f08, F08	
	<input type="checkbox"/> Objective-C	.m, M, .mm, MM, .c, C, .h, H	
	<input checked="" type="checkbox"/> PHP	.php, PHP, .php5, PHP5	
	<input type="checkbox"/> PL/SQL	.sql, SQL	
	<input checked="" type="checkbox"/> Python	.py, PY	
	<input type="checkbox"/> TSQL	.tsql, TSQL	
	<input checked="" type="checkbox"/> TypeScript	.ts, TS	
	<input checked="" type="checkbox"/> VB.NET	.vb, VB	
	<input type="checkbox"/> Xaml	.xaml, XAML	

The new option for TypeScript files in Squan Sources

**Tip**

If you are launching an analysis from the command line, use the language key defined in step 2 to analyse TypeScript files:

```
-d
" type=SQuORE, languages=typescript, additional_param=typescript=javascript "
```

- After the analysis finishes and you can see your artefacts in the tree, use the Dashboard Editor to build a dashboard for your new artefact type.
- Finally, create a handler for the source code viewer to display your new file type into your configuration folder, by copying `<SquORE_HOME>/configuration/sources/javascript_file.properties` into your own configuration as `<SquORE_HOME>/configuration/sources/typescript_file.properties`.

## 4.71. Advanced COBOL Parsing

By default, Squan Sources generates artefacts for all PROGRAMs in COBOL source files. It is possible to configure the parser to also generate artefacts for all SECTIONS and PARAGRAPHS in your source code. This feature can be enabled with the following steps:

1. Open `<SQUORE_HOME>/configuration/tools/SQuORE/Analyzer/artifacts/cobol/ArtifactsList.txt`
2. Edit the list of artefacts to generate and add the section and paragraph types:

```
program
section
paragraph
```

3. Save your changes

If you create a new project, you will see the new artefacts straight away. For already-existing projects, make sure to launch a new analysis and check Squan Sources's **Force full analysis** option to parse the entire code again and generate the new artefacts.

## 4.72. Using Data Provider Input Files From Version Control

Input files for Squore's Data Providers, like source code, can be located in your version control system. When this is the case, you need to specify a variable in the input field for the Data Provider instead of an absolute path to the input file.

▼ Specify Repository Locations


Folder
  Zip Upload
  ClearCase
  Git
  PTC Integrity
  Perforce
  SVN
  Synergy
  TFS
 ⓘ

Datapath \*  ⓘ

Add repository

▶ Select Data Providers

▼ Cppcheck



Cppcheck XML results  ⓘ

A Data Provider using an input file extracted from a remote repository

The variable to use varies depending on your scenario:

→ **You have only one node of source code in your project**

In this case, the variable to use is `$src`.

→ **You have more than one node of source code in your project**

In this case, you need to tell Squore in which node the input file is located. This is done using a variable that has the same name as the alias you defined for the source code node in the previous step of the wizard. For example, if your nodes are labelled `Node1` and `Node2` (the default names), then you can refer to them using the `$Node1` and `$Node2` variables.

**Tip**

When using these variables from the command line on a linux system, the \$ symbol must be escaped:

```
-d "type=PMD,configFile=\$src/pmd_data.xml"
```

## 4.73. Providing a catalog file to a Data Provider for Offline XSL Transformations

When transforming an XML results file with an XSL stylesheet, the XML parser used by Squore will try to validate the XML file against the DTD declared in the XML header. In cases where the XSL transformation is running on a machine with no internet access, this can result in the execution of the Data Provider failing with a No route to host error message.

You can fix this issue by modifying the data provider to use a catalog file that will provide an alternate location for the DTD used to validate the XML. This feature can be used by all Data Providers that include an XSL transformation<sup>1</sup>.

The following example adds this functionality to the Cobertura Data Provider:

1. Add a catalog.xml file in the Data Provider's configuration folder:

```
<configuration>/tools/cobertura/catalog.xml :
<?xml version="1.0"?>
<catalog xmlns="urn:oasis:names:tc:entity:xmlns:xml:catalog">
  <rewriteSystem systemIdStartString="http://cobertura.sourceforge.net/xml"
    rewritePrefix="./DTD"/>
</catalog>
```

2. Copy the dtd that the XML needs to validate again inside a DTD folder in <configuration>/tools/cobertura/.

The catalog file will be used the next time the Data Provider is executed and the DTD declaration will dynamically be changed from:

```
<!DOCTYPE coverage SYSTEM "http://cobertura.sourceforge.net/xml/coverage-04.dtd">
```

to:

<sup>1</sup>The list includes:

- Cantata
- Cobertura
- CodeSonar
- Coverity
- CPD
- CPPCheck
- CPPTest
- FindBugs
- JaCoCo
- Klocwork
- NCover
- Polyspace
- sqlcodeguard

```
<!DOCTYPE coverage SYSTEM "<configuration>/tools/cobertura/DTD/coverage-04.dtd">">
```

For more information about how to write your catalog file, refer to <https://xerces.apache.org/xerces2-j/faq-xcatalogs.html>.

## 4.74. Creating your own Data Providers and Repository Connectors

All Data Providers are utilities that run during an analysis. They usually take an input file to parse or parameters specified by the user to generate output files containing violations or metrics to add to your project. Here is a non-exhaustive list of what some of them do:

- Use XSLT files to transform XML files
- Read information from Microsoft Excel files
- Parse HTML test results
- Query web services
- Export data from OSLC systems
- Launch external processes

Repository Connectors are based on the same model and are used to specifically retrieve source code and other data from source code management systems.

Read on to learn about how to configure your Data Provider and make it available in the web interface, and then understand how to implement the scripted part of a Data Provider that is executed during an analysis.

The last part of this section also introduces two frameworks that you can base your Data Providers on depending on whether you prefer to produce CSV or XML files for Squore.

### 4.74.1. Data Provider Parameters

A Data Provider's parameters are defined in a file called `form.xml`. The following is an example of `form.xml` for a Data Provider extending the GenericPerl framework:

## ▼ customDP



	<input checked="" type="checkbox"/> ux	<input type="text" value="usability"/>
tests	<input checked="" type="checkbox"/> it	<input type="text" value="integration"/>
	<input checked="" type="checkbox"/> ut	<input type="text" value="unit"/>
ignore_missing_sources	<input type="checkbox"/>	
input_file	<input type="text" value="myFile.xml"/>	
old_results	<input checked="" type="radio"/> Exclude <input type="radio"/> Include	
password *	<input type="password"/>	

CustomDP parameters

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="GenericPerl" needSources="true" image="CustomDP.png"
projectStatusOnFailure="ERROR">
  <tag type="multipleChoice" displayType="checkbox" optionTitle=" " key="tests">
    <value key="ux" option="usability" />
    <value key="it" option="integration" />
    <value key="ut" option="unit" />
  </tag>
  <tag type="booleanChoice" key="ignore_missing_sources" defaultValue="false" />
  <tag type="text" key="input_file" defaultValue="myFile.xml" changeable="false" /
>
  <tag type="multipleChoice" key="old_results" style="margin-left:10px"
displayType="radioButton" defaultValue="Exclude">
    <value key="Exclude" />
    <value key="Include" />
  </tag>
  <tag type="text" key="java_path" defaultValue="/usr/bin/java" hide="true" />
  <tag type="password" required="true" key="password" />
</tags>
```

**Tip**

You can find the XML schema for `form.xml` in `form.xsd`.

The **tags** element accepts the following attributes:

- **baseName (mandatory if you are not using an exec-phase)** indicates on which framework you are basing this Data Provider. The value of this attribute must match a folder from the `addons` folder of your installation.
- **needSources (optional, default: false)** allows specifying whether the Data Provider requires sources or not. When set to true, an error will be displayed if you try to select this Data Provider without adding any Repository Connector location to your project.
- **image (optional, default: none)** allows displaying a logo in the web UI for the Data Provider
- **projectStatusOnFailure (optional, default: ERROR)** defines what status the project ends in when this Data Provider produces an error. The following values are allowed:



- **IGNORE**
- **WARNING**
- **ERROR**
- **projectStatusOnWarning (optional, default: WARNING)** defines what status the project ends in when this Data Provider produces a warning. The following values are allowed:
  - **IGNORE**
  - **WARNING**
  - **ERROR**

Each **tag** element is a Data Provider option and allows the following attributes:

- **key (mandatory)** is the option's key that will be passed to the perl script, or can be used to specify the parameter's value from the command line
- **type (mandatory)** defines the type of the parameter. The following values are accepted:
  - **text** for free text entry
  - **password** for password fields
  - **booleanChoice** for a boolean
  - **multipleChoice** for offering a selection of predefined values

### Note

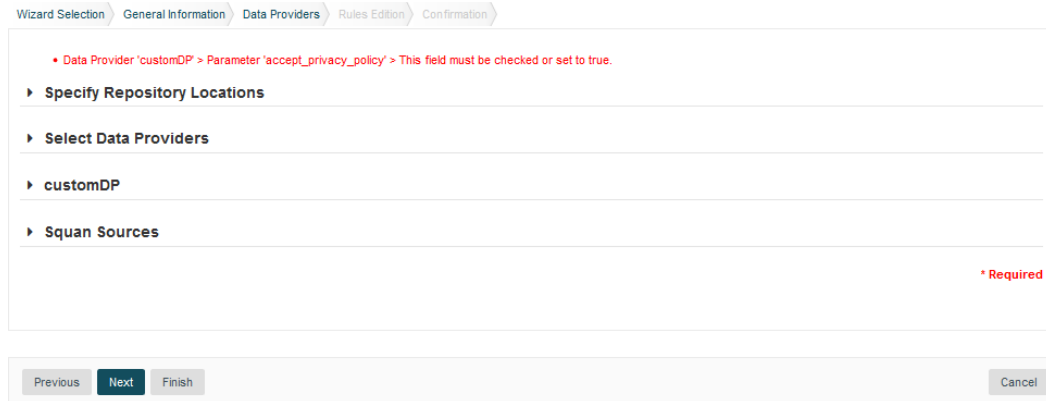
Predefined values are specified with a **value** element with a mandatory **key** attribute and an optional **option** attribute that allows modifying the value of the option from the UI. The input field for each **option** attribute is only displayed if the parent **tag** contains an **optionTitle** attribute.

- **displayType (optional)** allows specifying how to display a **multipleChoice** parameter by using one of:
  - **comboBox**
  - **radioButton**
  - **checkbox**
- **defaultValue (optional, default: empty)** is the value used for the parameter when not specified
- **hide (optional, default: false)** allows hiding a parameter from the web UI, which is useful when combining it with a default value
- **changeable (optional, default: true)** allows making a parameter configurable only when creating the project but read-only for following analyses when set to true
- **style (optional, default: empty)** allows setting basic css for the attribute in the web UI
- **required (optional, default: false)** allows showing a red asterisk next to the field in the web UI to make it visibly required.

### Tip

You can use a **required tag** of type **booleanchoice** to ensure that users must check a box in the web UI or set its value to *true* when building from the command line in order to proceed with the analysis (new in 18.0).

```
<tag type="booleanChoice" required="true" key="accept_privacy_policy" />
```



Clicking the **Next** button without checking a required checkbox displays an error

## 4.74.2. Localising your Data Provider

In order to display your Data Provider parameters in different languages in the web UI, your Data Provider's `form.xml` does not contain any hard-coded strings. Instead, Squore uses each parameter's `key` attribute to dynamically retrieve a translation from a `form_xx.properties` file located next to `form.xml`.

When you create a Data Provider, it is mandatory to include at least an English version of the strings in a file called `form_en.properties`. You are free to add other languages as needed. Here is a sample `.properties` for for the CustomDP you created in the previous section:

```
FORM.GENERAL.NAME = CustomDP
FORM.DASHBOARD.NAME = Test Status
FORM.GENERAL.DESCR = CustomDP imports test results for my project
FORM.GENERAL.URL = http://example.com/CustomDP

TAG.tests.NAME = Test Types
TAG.tests.DESCR = Check the boxes next to the types of test results contained in
the results

TAG.ignore_missing_sources.NAME = Ignore Missing Sources

TAG.input_file.NAME = Test Results
TAG.input_file.DESCR = Specify the absolute path to the file containing the test
results

TAG.old_results.NAME = Old Test Results
TAG.old_results.DESCR = If the previous analysis contained results that are not
in this results file, what do you want to do with the old results?
OPT.Exclude.NAME = discard
OPT.Include.NAME = keep

TAG.password.NAME = File Password
TAG.password.DESCR = Specify the password to decrypt the test results file
```

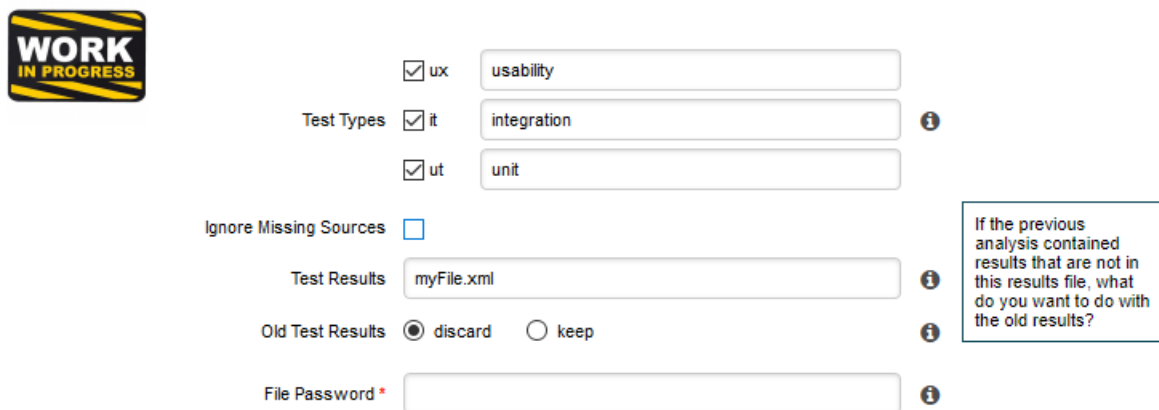
The syntax for the `.properties` file is as follows:

→ **FORM.GENERAL.NAME** is the display name of the Data Provider in the project wizard

- **FORM.DASHBOARD.NAME** is the display name of the Data Provider in the Explorer
- **FORM.GENERAL.DESCR** is the description displayed in the Data Provider's tooltip in the web UI
- **FORM.GENERAL.URL** is a reference URL for the Data Provider. Note that it is not displayed in the web UI yet.
- **TAG.tag\_name.NAME** allows setting the display name of a parameter
- **TAG.tag\_name.DESCR** is a help text displayed in a tooltip next to the Data Provider option in the web UI
- **OPT.option\_name.NAME** allows setting the display name of an option

Using the `form_en.properties` above for CustomDP results in the following being displayed in the web UI when launching an analysis:

▼ CustomDP



CustomDP pulling translations from a `.properties` file

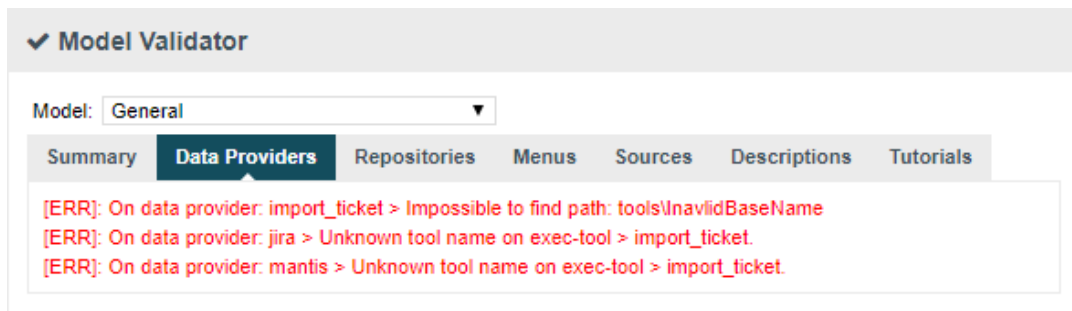
### Tip

Not all wizards display all Data Providers by default. If your Data Provider does not appear after refreshing your configuration, make sure that your wizard bundle allows displaying all Data Providers by reviewing the `tools` element of `Bundle.xml`:

```
<?xml version="1.0" encoding="UTF-8"?>
<Bundle>
  <Wizard ... >
    ...
    <tools all="true">
      ...
    </tools>
    ...
  </Wizard>
</Bundle>
```

For more information about the wizard bundle, consult the the chapter called "Project Wizards" in the Configuration Guide.

If you have made this change and your Data Provider still does not appear in your wizard, consult the Validator to find out if it was disabled because of an error in its configuration.



The General section of the Validator shows errors in your Data Providers

### 4.74.3. Running your Data Provider

Now that you have a new Data Provider available in the web interface (and the command line), this section will show you how to use these parameters and pass them to one or more scripts or executables in order to eventually write data in the format that Squore expects to import during the analysis.

At the end of a Data Provider execution, Squore expects a file named `input-data.xml` to be written in a specific location. The syntax of the XML file to generate is as follows:

```
<!-- input-data.xml syntax -->
<bundle version="2.0">
  <artifact [local-key=""] [local-parent=""] [parent=""] >
    <artifact [id="<guid-stable-in-time-also-used-as-a-key>"]
      name="Component" type="REQ" [location=""] >
      <info name="DESCR" value="The description of the object"/>
      <key value="3452-e89b-ff82"/>
      <metric name="TEST_KO" value="2"/>
      <finding name="AR120" loc="xxx" p0="The message" />
      <link name="TEST" local-dst=""|dst="" />
      <artifact id="" name="SubComponent" type="REQ">
        ...
      </artifact>
    </artifact>
  </artifact>

  <artifact id="" local-key="" name="" type="" local-parent=""|
parent="" [location=""] />
  ...

  <link name="" local-src=""|src="" local-dst=""|dst="" />
  ...

  <info local-ref=""|ref="" name="" value="" />
  ...

  <metric local-ref=""|ref="" name="" value="" />
  ...

  <finding local-ref=""|ref="" [location=""] p0="" />
  <finding local-ref=""|ref="" [location=""] p0="">
  <location local-ref=""|ref="" [location=""] />
  ...
  <relax status="RELAXED_DEROGATION|RELAXED_LEGACY|RELAXED_FALSE_POSITIVE"><![
CDATA[My Comment]]></relax>
```

```
</finding>
...
</bundle>
```

### Tip

You can find the XML schema for `input-data.xml` in `input-data-2.xsd`.

Your Data Provider is configured by adding an `exec-phase` element with a mandatory `id="add-data"` attribute in `form.xml`.

The basic syntax of an `exec-phase` can be seen below:

```
<exec-phase id="add-data">
  <exec name="tcl|perl|java|javascript or nashorn" | executable="/path/to/bin" |
  executable="executable_name">
    <arg value="\${<function>(<args>)}" />
    <arg value="-freeText" />
    <arg value="\${<predefinedVars>}" />
    <arg value="versions" />
    <arg value="-myTag" />
    <arg tag="myTag" />
    <env key="MY_VAR" value="SOME_VALUE" />
  </exec>
  <exec ... />
  <exec-tool name="another_data_provider">
    <param key="<tagName>" value="<value>" />
    <param key="<tagName>" tag="<tag>" />
    <param ... />
  </exec-tool>
  <exec-tool ... >
    ...
  </exec-tool>
</exec-phase>
```

## Executables

The `exec-phase` element accepts one or more launches of scripts or executables specified in an `exec` child element, that can receive arguments and environment variables specified via `arg` and `env` elements.

There are four built-in languages for executables:

- **tcl**
- **perl**
- **java**
- **javascript or nashorn**

The scripts are launched using the `tcl`, `perl`, or `java` runtimes defined in your Squore installation. This is also the case for `javascript`, which is handled by Java's Nashorn engine.

Other executables can be called, as long as they are available on the system's `PATH`, or configured in `config.xml`

Given the following `config.xml`:

```
<!-- config.xml (server or cli) -->
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<squore type="server" version="1.3">
```

```

<paths>
  <path name="python" path="C:\Python\python.exe" />
  <path name="git" path="C:\Git\bin\git.exe" />
</paths>
...
</squore>

```

git and python can be called in your Data Provider as follows:

```

<exec-phase id="add-data">
  <exec executable="git">
    ...
  </exec>
  <exec executable="python">
    ...
  </exec>
</exec-phase>

```

## Arguments

Argument values can be:

1. Free text passed in a value tag, useful to specify a parameter for your script

```

<exec executable="perl">
  <arg value="-V" />
</exec>

```

2. A tag key declared in form.xml passed as a tag attribute to retrieve the input specified by the user. If no input was specified, you can define a defaultValue :

```

<arg tag="maxValue" defaultValue="50" />
<arg tag="configFile" defaultValue="{getToolConfigDir(default.xml)}" />

```

3. One of the predefined functions

- **{getOutputFile(<relative/path/to/file>,<abortIfMissing>)}** returns the absolute path of an input-data.xml file output by an exec-phase . failIfMissing is an optional boolean which aborts the execution when set to **true** if the file is missing.
- **{getTemporaryFile(<relative/path/to/file>)}** returns the absolute path of a temporary file created by an exec (only for add-data and repo-add-data phases)
- **{getToolAddonsDir(<relative/path/to/file>)}** returns the absolute path of a file in the Data Provider's addons folder
- **{getToolConfigDir(<relative/path/to/file>)}** returns the absolute path of a file in the Data Provider's configuration folder
- **{path(<executable\_name>)}** returns the absolute path of an executable configured in config.xml, or just the executable name if the executable is available from the system's PATH.

```

<exec executable="...">
  <arg value="-git_path" />
  <arg value="{path(git)}" />

```

4. One of the predefined variables

- **{tmpDirectory}** to get an absolute path to a temp folder to create files
- **{sourcesList}** to get a list of the aliases and locations containing the data extracted by the repository connectors used in the analysis
- **{outputDirectory}** to get the absolute path of folder where the Data Provider needs to write the final input-data.xml

## Calling Other Data Providers

You can call and pass parameters to other Data Providers after your `exec-phase` using an `exec-tool` element. The `exec-tool` element uses a mandatory `name` which is the name of the folder containing the other Data Provider to launch in your configuration folder and supports passing the parameters expected by the other Data Provider via one or more `param` elements where:

- **key** is the name of the parameter expected by the other Data Provider (as defined in its `form.xml`)
- **value** allows passing free text
- **tag** allows passing the value of your own Data Provider's tag value to the other Data Provider and can be combined with a `defaultValue` attribute in case no value was specified by the user for the tag

As an example, the following Data Provider generates a CSV file that is then passed to the `pep8` Data Provider:

```
<exec-phase id="add-data">
  <exec executable="python">
    <arg value="consolidate-reports-recursive.py" />
    <arg value="-folders" />
    <arg tag="root_folder" />
    <arg value="-outputFile" />
    <arg value="output.csv" />
  </exec>
  <exec-tool name="pep8">
    <param key="csv" value="{getOutputFile(output.csv)}" />
    <param key="separator" tag="separator" defaultValue=";" />
  </exec-tool>
</exec-phase>
```

In this other example, a perl script is launched to retrieve issues from a ticketing system and the export data is passed to the `import_ticket` Data Provider:

```
<exec-phase id="add-data">
  <exec name="perl">
    <arg value="{getToolConfigDir(export_ticket.pl)}" />
    <arg value="-url" />
    <arg tag="url" />
    <arg value="-login" />
    <arg tag="login" />
    <arg value="-pwd" />
    <arg tag="pwd" />
    <arg value="-outputFile" />
    <arg value="{getOutputFile(exportdata.csv,false)}" />
  </exec>
  <exec-tool name="import_ticket">
    <param key="input_file" value="{getOutputFile(exportdata.csv)}" />
    <param key="csv_separator" value=";" />
  </exec-tool>
</exec-phase>
```

### Tip

If your Data Provider uses a perl script, Squore provides a small library that makes it easy to retrieve script arguments called `SQuORE::Args`. Using it as part of your script, you can retrieve arguments using the `get_tag_value()` function, as shown below:

```
# name: export_ticket.pl
# description: exports issues to a CSV file
use SQuORE::Args;
# ...
```

```
# ...
my $url = get_tag_value("url");
my $login = get_tag_value("login");
my $pwd = get_tag_value("pwd");
my $outputFile = get_tag_value("outputFile");
# ...
exit 0;
```

## Finding More Examples

If you want to find more examples of working Data Providers that use this syntax, check the following Data Providers in Squore's default configuration folder:

- **conf-checker** calls a jar file to write an XML file in Squore's exchange format
- **import\_ticket** parses a file to translate it into a format that can then be passed to **csv\_import** to import the tickets into Squore
- **jira** retrieves data from Jira and passes it to **import\_ticket**

## Creating Repository Connectors

The same syntax used to create Data Providers can be used to create Repository Connectors, and therefore instruct Squore to get source code from SCMs. Instead of using an `exec-phase` with the `id="add-data"`, your Repository Connector should define the following phases:

- `id="import"` defines how you extract source code and make it available to Squan Sources so it can be analysed. This phase is expected to return a path to a folder containing the sources to analyse or a `data.properties` file listing the path to the folder containing source and various other properties to be used in other executions:

```
directory=/path/to/sources-to-analyse
data.<key1>=<value1>
data.<key2>=<value2>
```

This phase is executed once per source code node in the project and allows you to use the following additional variables:

- `${outputSourceDirectory}` is the folder containing the sources to analyse
- `${alias}` is the alias used for the source code node (empty if there is only one source code node)
- `id="repo-add-data"` is similar to the `add-data` phase described for Data Providers in Section 4.74.3, "Running your Data Provider" and is expected to produce an `input-data.xml`. The only difference in the case of a Repository Connector is that this phase is executed once per source code node in the analysis.
- `id="display"` is the phase that is called when users request to view the source code for an artefact from the web UI. This phase is expected to return a `data.properties` file with the following keys:

```
filePath=/path/to/source/file
displayPath=<Artefact Display Path (optional)>
```

The contents of `filePath` will be loaded in the source code viewer, while the value of `displayPath` will be used as the file path displayed in the header of the source code viewer.

This phase allows you to use the following additional variables:

- `${scalInfo}` is text to display in the title bar of the source code viewer in the web interface
- `${artefactName}` is the name of the file to display



→ **`\${artefactPath}`** is the path (without the alias) of the file to display

During the **display** phase, you can retrieve any data set during the **import** phase for the repository using the **`\${getImportData(<key1>)}`** function

### Tip

Consult SVN's `form.xml` in `<SQUORE_HOME>/configuration/repositoryConnectors/SVN` for a working example of a Repository Connector that uses all the phases described above.

## Using the Squore toolkit

If you want your Data Provider to use the Squore toolkit to retrieve references to artefacts, the following variables are available (in the `add-data` and `repo-add-data` phases only):

→ **`\${tclToolkitDirectory}`**: the directory of the toolkit tcl code to execute

→ **`\${squanOutputDirectory}`**: the directory of containing the results of the execution of Squan Sources

In order to use the toolkit, your `exec` must use the tcl language. As an example, here is a sample `exec-phase` and associated tcl file to get you started:

```
<!--form.xml -->
<exec-phase id="repo-add-data">
  <exec name="tcl">
    <arg value="\${getToolAddonsDir(repo-add-data.tcl)}" />
    <arg value="\${tclToolkitFile}" />
    <arg value="\${squanOutputDirectory}" />
    <arg value="\${outputDirectory}" />
    <arg tag="xxx" />
  </exec>
</exec-phase>
```

```
#repo-add-data.tcl:
set toolkitFile [lindex $argv 0]
set sqOutputDir [lindex $argv 1]
set outputDir [lindex $argv 2]
set xxx [lindex $argv 3]

# Initialise the toolkit
puts "Initializing toolkit"
source $toolkitFile
toolkit::initialize $sqOutputDir $outputDir

# Execute your code
puts "Main execution"
# your code here
# ...

# Generate xml files (artefacts)
puts "Generating xml files"
toolkit::generate $outputDir {artefacts}
```

## 4.74.4. Built-in Data Provider Frameworks

In order to help you import data into Squore, the following Data Provider frameworks are provided and can write a valid `input-data.xml` file for you:

1. **csv\_import** (new in 18.0)

The `csv_import` framework allows you to write Data Providers that produce CSV files and then pass them on to the framework to be converted to an XML format that Squore understands. This framework allows you to import metrics, findings, textual information and links as well as generate your own artefacts. It is fully linked to the source code parser and therefore allows to locate existing source code artefacts generated by the source code parser (new in 18.0). Refer to the full `csv_import` Reference for more information.

2. **xml** (new in 18.0)

The `xml` framework is a sample implementation of a Data Provider that allows you to directly import an XML file or run it through an XSL transformation to that it matches the input format expected by Squore (`input-data.xml`). This framework therefore allows you to import metrics, findings, textual information and links as well as generate your own artefacts. Refer to the full `xml` Reference for more information.

**Tip**

If you are looking for the legacy Data Provider frameworks from previous versions of Squore, consult Section A.2, “Legacy Frameworks”.

The legacy Data Provider frameworks are still supported, however using the new frameworks is recommended for developing new Data Providers, as they are more flexible and provide more functionality to interact with source code artefacts.

## 5. Cloning Detection

This chapter lists the various metrics collected in Squore when running the cloning detection tool, as well as the violations presented in the Findings tab of the web interface.

Note that the concepts used for cloning detection in Squore are based on the notions of `longest common subsequence problem` ([http://en.wikipedia.org/wiki/Longest\\_common\\_subsequence\\_problem](http://en.wikipedia.org/wiki/Longest_common_subsequence_problem)) and `longest repeated substring problem` ([http://en.wikipedia.org/wiki/Longest\\_repeated\\_substring\\_problem](http://en.wikipedia.org/wiki/Longest_repeated_substring_problem)).

### 5.1. Cloning Metrics

None of the metrics below are set by the cloning detection tool if thresholds are not met. That is, if an artefact has no CC measure in the output file, that does NOT mean that it has no line in common with other artefacts. In models, metrics default to 0 though.

The two main thresholds are:

- A minimum size, to skip small artefacts
- A minimum cloning ratio, to keep only similar artefacts

#### 5.1.1. CCLC - Code Cloning Line Counting

Number of lines taken into account by the cloning detection tool (new in 18.0). This metric is impacted by parameters like "Ignore blank lines", or "Ignore comments blocks".

#### 5.1.2. CC - Code Cloned

Length of the highest Longest Common Substring (LCS) among all cloned artefacts.

Clones are looked in the whole application, in artefacts with the same language and the same type.

- Textual detection, using lines, with trailing spaces removed
- Two artefacts are cloned if they have 90% of lines in common, for  $LC \geq 10$

**Scope:** all artefacts but the root node.

#### 5.1.3. CFTC - Control Flow Token (CFT) Cloned

Length of the highest LCS among all cloned CFT.

Clones are looked in the whole application, in artefacts with the same language and the same type.

- Algorithmic detection, using CFT characters
- Two artefacts are cloned if they have 90% of characters in common, for  $CFT \geq 50$

**Scope:** all artefacts but the root node.

#### 5.1.4. CAC - Children Artefact Cloned

Number of clones in direct children of an artefact.

Parent clones are looked in the whole application, in artefacts with the same language and the same type.

Two classes may have two methods in common, for example, without being cloned. The CAC metric for these two classes will be two (assuming that they only have these two methods in common). Such artefacts should be re-factored (using inheritance for example).

- Use both textual (CC > 0) and algorithmic (CFTC > 0) cloning when counting
- Two parent artefacts are cloned if 25% of their direct children are cloned
- Small children artefacts (LC < 10) are taken in account, using exact comparison

**Scope:** all artefacts but the root node.

### 5.1.5. CN - Clones Number

Number of cloned artefacts.

Clones are looked in the whole application, in artefacts with the same language and the same type.

- Use both textual (CC > 0) and algorithmic (CFTC > 0) cloning when counting

**Scope:** all artefacts but the root node.

### 5.1.6. RS - Repeated Substrings (Repeated Code Blocks)

Length of all Repeated Substrings in the artefact definition.

That is, duplicated blocks in a function for example.

- Textual detection, using lines, with trailing spaces removed
- The metric is triggered if blocks longer than 10 are found, for LC >= 10

**Scope:** files and all children artefacts.

### 5.1.7. CFTRS - Repeated Substrings in Control Flow Token

Length of all Repeated Substrings in the artefact CFT.

That is, duplicated algorithmic blocks in a function for example.

- Algorithmic detection, using CFT characters
- The metric is triggered if blocks longer than 20 are found, for CFT >= 50

**Scope:** artefacts with a CFT, like functions.

### 5.1.8. ICC - Inner Code Cloned

Number of duplicated lines in an artefact.

Clones are looked in all descendants of the artefact. This basically sums all duplicated lines in descendants.

- Use textual cloning (CC > 0) when counting

**Scope:** all artefacts.

### 5.1.9. ICFTC - Inner Control Flow Token Cloned

Number of duplicated tokens in an artefact.

Clones are looked in all descendants of the artefact. This basically sums all cloned tokens in descendants.

→ Use algorithmic cloning (CFTC > 0) when counting

**Scope:** all artefacts.

## 5.2. Cloning Violations

This section lists all the findings that are reported by Squore cloning detection tool.

### 5.2.1. CC (R\_NOCC)

Avoid code duplication.

→ Similar artefacts (transitive closure) are part of the same violation

→ Use artefacts with textual cloning (CC > 0) when grouping

**Scope:** files and all children artefacts.

### 5.2.2. CFTC (R\_NOCFTC)

Avoid algorithmic cloning.

→ Similar artefacts (transitive closure) are part of the same violation

→ Use artefacts with algorithmic cloning (CFTC > 0) when grouping

**Scope:** artefacts with a CFT, like functions.

### 5.2.3. CAC (R\_NOCAC)

Consider refactorisation.

→ Similar artefacts (transitive closure) are part of the same violation

→ Use "refactorable" artefacts (CAC > 0) when grouping

**Scope:** files and all children artefacts.

### 5.2.4. RS (R\_NORS)

Consider refactorisation.

→ One violation per "refactorable" artefact (RS > 0)

**Scope:** files and all children artefacts.

### 5.2.5. CFTRS (R\_NOCFTRS)

Consider algorithmic refactorisation.

→ One violation per "refactorable" artefact (CFTRS > 0)

**Scope:** artefacts with a CFT, like functions.

## 6. Glossary

### 6.1. Acceptance Testing

Formal testing conducted to enable a user, customer, or other authorised entity to determine whether to accept a system or component. [ SIGIST ]

#### Other Definitions

Acceptance Testing [ IEEE 610.12 ]: Formal testing conducted to determine whether or not a system satisfies its acceptance criteria and to enable the customer to determine whether or not to accept the system.

#### See also

Standards:

- SIGIST
- IEEE 610.12

External Links:

- Wikipedia article: Acceptance\_testing [http://en.wikipedia.org/wiki/Acceptance\_testing]

### 6.2. Accessibility

Usability of a product, service, environment or facility by people with the widest range of capabilities. [ ISO/IEC/IEEE 24765, ISO/IEC 25062 ]

#### Notes

- Although "accessibility" typically addresses users who have disabilities, the concept is not limited to disability issues. [ ISO/IEC/IEEE 24765 ]

#### See also

Standards:

- ISO/IEC 25062
- ISO/IEC/IEEE 24765

### 6.3. Accuracy

The capability of the software product to provide the right or agreed results or effects with the needed degree of precision. [ ISO/IEC 9126-1 ]

#### Other Definitions

Accuracy [ ISO/IEC/IEEE 24765 ]:

1. A qualitative assessment of correctness, or freedom from error.
2. A quantitative measure of the magnitude of error

## See also

Standards:

- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765

## 6.4. Accuracy of Measurement

The closeness of the agreement between the result of a measurement and the true value of the measurand. [ ISO/IEC 14143-3, ISO/IEC/IEEE 24765 ]

### Notes

- Accuracy is a qualitative concept. The term precision should not be used for "accuracy"<sup>1</sup>. A true value is a value consistent with the definition of a given particular quantity and this is a value that would be obtained by a perfect measurement. In contexts where perfect measurement is not practically feasible, a conventional true value is a value attributed to a particular quantity and accepted, sometimes by convention, as having an uncertainty appropriate for a given purpose. 'Conventional true value', in the same reference, is sometimes called assigned value, best estimate of the value, conventional value or reference value. The accuracy should be expressed in terms of the Mean magnitude of relative error. [ ISO/IEC 14143-3 ]

## See also

Standards:

- ISO/IEC 99
- ISO/IEC 14143
- ISO/IEC/IEEE 24765

## 6.5. Acquirer

Individual or organisation that procures a system, software product, or software service from a supplier. [ ISO/IEC 9126-1, ISO/IEC 15939 ]

### Other Definitions

Acquirer [ ISO/IEC/IEEE 24765, ISO/IEC 12207 ]: Stakeholder that acquires or procures a product or service from a supplier.

Acquirer [ IEEE 1058, ISO/IEC 15288 ]: The individual or organization that specifies requirements for and accepts delivery of a new or modified software product and its documentation.

### Notes

- The acquirer may be internal or external to the supplier organization. Acquisition of a software product may involve, but does not necessarily require, a legal contract or a financial transaction between the acquirer and supplier. [ ISO/IEC/IEEE 24765 ]
- "buyer", "customer", "owner", "purchaser" are synonyms for acquirer. [ ISO/IEC/IEEE 24765 ]

---

<sup>1</sup> ISO/IEC 99:2007 International vocabulary of metrology - Basic and general concepts and associated terms

## See also

Glossary:

→ Supplier

Standards:

- IEEE 1058
- ISO/IEC 9126-1
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC 15939
- ISO/IEC/IEEE 24765

## 6.6. Action

Element of a step that a user performs during a procedure. [ ISO/IEC 26514 ]

## See also

Glossary:

- Procedure
- Step
- Task

Standards:

- ISO 5806
- ISO/IEC 26514

## 6.7. Activity

Any step taken or function performed, both mental and physical, toward achieving some objective. Activities include all the work the managers and technical staff do to perform the tasks of the project and organization. [ CMMi ]

## Other Definitions

Activity [ ISO/IEC 12207, ISO/IEC 15288 ]: Set of cohesive tasks of a process.

Activity [ IEEE 1490 ]: A component of work performed during the course of a project.

Activity [ ISO/IEC 14756 ]: An order submitted to the system under test (SUT) by a user or an emulated user demanding the execution of a data processing operation according to a defined algorithm to produce specific output data from specific input data and (if requested) stored data.

Activity [ IEEE 1074 ]: A defined body of work to be performed, including its required input information and output information

Activity [ ISO/IEC 90003 ]: Collection of related tasks.



Activity [ IEEE 829 ]: Element of work performed during the implementation of a process.

## Notes

- An activity normally has an expected duration, cost, and resource requirements. Activities are often subdivided into tasks. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Task

Standards:

- CMMi
- IEEE 829
- IEEE 1074
- IEEE 1490
- ISO/IEC 12207
- ISO/IEC 14756
- ISO/IEC 15288
- ISO/IEC 90003
- ISO/IEC/IEEE 24765

## 6.8. Actor

A role (with respect to that action) in which the enterprise object fulfilling the role participates in the action. [ ISO/IEC 15414 ]

## See also

Standards:

- ISO/IEC 15414

## 6.9. Adaptability

The capability of the software product to be adapted for different specified environments without applying actions or means other than those provided for this purpose for the software considered. [ ISO/IEC 9126-1 ]

## Notes

- Adaptability includes the scalability of internal capacity (e.g. screen fields, tables, transaction volumes, report formats, etc.). [ ISO/IEC 9126-1 ]
- If the software is to be adapted by the end user, adaptability corresponds to suitability for individualisation as defined in ISO 9241-10, and may affect operability. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Changeability

→ Flexibility

Standards:

→ ISO/IEC 9126-1

→ IEEE 610.12

## 6.10. Agreement

Mutual acknowledgement of terms and conditions under which a working relationship is conducted. [ ISO/IEC 12207, ISO/IEC 15288 ]

### See also

Standards:

→ ISO/IEC 12207

→ ISO/IEC 15288

## 6.11. Analysability

The capability of the software product to be diagnosed for deficiencies or causes of failures in the software, or for the parts to be modified to be identified. [ ISO/IEC 9126-1 ]

### See also

→ ISO/IEC 9126-1

## 6.12. Analysis Model

Algorithm or calculation combining one or more base and/or derived measures with associated decision criteria. [ ISO/IEC 25000 ]

### See also

Standards:

→ ISO/IEC 25000

## 6.13. Architecture

Fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution. [ ISO/IEC 15288 ]

### Notes

→ Architecture sometimes refers to the design of a system's hardware and software components. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.14. Attractiveness

The capability of the software product to be attractive to the user. [ ISO/IEC 9126-1 ]

### Other Definitions

Other definitions of this word are..

## See also

- ISO/IEC 9126-1

## 6.15. Attribute

A measurable physical or abstract property of an entity. [ ISO/IEC 12207, ISO/IEC 14598 ]

### Other Definitions

Attribute [ IEEE 610.12 ]: A characteristic of an item; for example, the item's color, size, or type.

Attribute [ ISO/IEC 15939, ISO/IEC 25000 ]: Inherent property or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means.

Attribute for Quality Measure [ ISO/IEC 25000 ]: Attribute that relates to software product itself, to the use of the software product or to its development process.

### Notes

- Can refer either to general characteristics such as reliability, maintainability, and usability or to specific features of a software product. ISO 9000 distinguishes two types of attributes: a permanent characteristic existing inherently in something; and an assigned characteristic of a product, process or system (e.g. the price of a product, the owner of a product). The assigned characteristic is not an inherent quality characteristic of that product, process or system. An attribute expresses some characteristic that is generally common to the instances of a class. The name of the attribute is the name of the role that the value class plays in describing the class, which may simply be the name of the value class (as long as using the value class name does not cause ambiguity). [ ISO/IEC/IEEE 24765 ]
- Attributes for quality measure are used in order to obtain quality measure elements. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- External Attribute
- Internal Attribute
- Optional Attribute

Standards:

- IEEE 610.12
- ISO/IEC 12207
- ISO/IEC 14598
- ISO/IEC 15939
- ISO/IEC/IEEE 24765

## 6.16. Availability

The degree to which a system or component is operational and accessible when required for use. [ ISO/IEC 20000 ]

### Other Definitions

Availability [ ISO/IEC 20000 ]: Ability of a component or service to perform its required function at a stated instant or over a stated period of time.

### Notes

- Often expressed as a probability. Availability is usually expressed as a ratio of the time that the service is actually available for use by the business to the agreed service hours. [ ISO/IEC 25000 ]

### See also

Glossary:

- Fault Tolerance

Standards:

- ISO/IEC 25000

## 6.17. Base Measure

Measure defined in terms of an attribute and the method for quantifying it. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

### Notes

- A base measure is functionally independent of other measures. [ ISO/IEC 15939 ]

### See also

Glossary:

- Measure
- Derived Measure
- Direct Measure
- External Measure
- Indirect Measure
- Internal Measure

Standards:

- ISO/IEC 99
- ISO/IEC 15939
- ISO/IEC 25000

## 6.18. Baseline

Formally approved version of a configuration item, regardless of media, formally designated and fixed at a specific time during the configuration item's life cycle. [ ISO/IEC 19770-1 ]

### Other Definitions

Baseline [ ISO/IEC 12207, ISO/IEC 15288 ]: Specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures.

Baseline [ ISO/IEC 20000 ]: Snapshot of the state of a service or individual configuration items at a point in time.

Baseline [ IEEE 1490 ]: An approved plan (for a project), plus or minus approved changes. It is compared to actual performance to determine if performance is within acceptable variance thresholds. Generally refers to the current baseline, but may refer to the original or some other baseline. Usually used with a modifier (e.g., cost performance baseline, schedule baseline, performance measurement baseline, technical baseline).

### Notes

- A baseline should be changed only through formal configuration management procedures. Some baselines may be project deliverables while others provide the basis for further work. Baselines, plus approved changes from those baselines, constitute the current configuration identification. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Configuration Management

Standards:

- IEEE 1490
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC 20000
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.19. Branch

A Branch is either:

- a conditional transfer of control from any statement to any other statement in a component, or
- an unconditional transfer of control from any statement to any other statement in the component except the next statement, or

- when a component has more than one entry point, a transfer of control to an entry point of the component. [ SIGIST ]

## Other Definitions

Branch [ ISO/IEC/IEEE 24765 ]:

1. a computer program construct in which one of two or more alternative sets of program statements is selected for execution.
2. a point in a computer program at which one of two or more alternative sets of program statements is selected for execution.
3. to perform the selection in (1).
4. any of the alternative sets of program statements in (1).
5. a set of evolving source file versions.

## Notes

- Every branch is identified by a tag. Often, a branch identifies the file versions that have been or will be released as a product release. May denote unbundling of arrow meaning, i.e., the separation of object types from an object type set. Also refers to an arrow segment into which a root arrow segment has been divided. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Branch Coverage

Standards:

- SIGIST
- ISO/IEC/IEEE 24765

## 6.20. Branch Coverage

The percentage of branches that have been exercised by a test case suite. [ SIGIST ]

## See also

Glossary:

- Branch
- Coverage

Standards:

- SIGIST

## 6.21. Branch Testing

Testing designed to execute each outcome of each decision point in a computer program. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Path Testing
- Statement Testing
- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.22. Budget

The approved estimate for the project or any work breakdown structure component or any schedule activity. [ IEEE 1490 ]

### Notes

- Often used also to refer to work effort as well as, or instead of, money. [ IEEE 1490 ]

## See also

Standards:

- IEEE 1490

## 6.23. Build

An operational version of a system or component that incorporates a specified subset of the capabilities that the final product will provide. [ IEEE 610.12, ISO/IEC/IEEE 24765 ]

## See also

Standards:

- IEEE 610.12
- ISO/IEC/IEEE 24765

## 6.24. Call Graph

A diagram that identifies the modules in a system or computer program and shows which modules call one another. [ ISO/IEC/IEEE 24765 ]

### Notes

- The result is not necessarily the same as that shown in a structure chart. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.25. Capability Maturity Model

Model that contains the essential elements of effective processes for one or more disciplines and describes an evolutionary improvement path from ad hoc, immature processes to disciplined, mature processes with improved quality and effectiveness. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Capability Maturity Model [ CMMi ]: A description of the stages through which software organizations evolve as they define, implement, measure, control, and improve their software processes. This model provides a guide for selecting process improvement strategies by facilitating the determination of current process capabilities and the identification of the issues most critical to software quality and process improvement.

### See also

Standards:

- CMMi
- ISO/IEC/IEEE 24765

## 6.26. Certification

A formal demonstration that a system or component complies with its specified requirements and is acceptable for operational use. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Certification [ ISO/IEC/IEEE 24765 ]:

1. A written guarantee that a system or component complies with its specified requirements and is acceptable for operational use.
2. The process of confirming that a system or component complies with its specified requirements and is acceptable for operational use.

### Example

- A written authorization that a computer system is secure and is permitted to operate in a defined environment. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Certification Criteria

Standards:

- ISO/IEC/IEEE 24765

## 6.27. Certification Criteria

A set of standards, rules, or properties to which an asset must conform in order to be certified to a certain level. [ ISO/IEC/IEEE 24765 ]



## Notes

- Certification criteria are defined by a certification policy. Certification criteria may be specified as a set of certification properties that must be met. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Certification

Standards:

- ISO/IEC/IEEE 24765

## 6.28. Change Control Board

A formally constituted group of stakeholders responsible for reviewing, evaluating, approving, delaying, or rejecting changes to a project, with all decisions and recommendations being recorded. [ IEEE 1490 ]

## See also

Standards:

- IEEE 1490

## 6.29. Change Control System

A collection of formal documented procedures that define how project deliverables and documentation will be controlled, changed, and approved. [ IEEE 1490, ISO/IEC/IEEE 24765 ]

## Notes

- In most application areas, the change control system is a subset of the configuration management system. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Change Management
- Configuration Management

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.30. Change Management

Judicious use of means to effect a change, or a proposed change, to a product or service. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Change Control System
- Configuration Management

Standards:

- ISO/IEC/IEEE 24765

## 6.31. Changeability

The capability of the software product to enable a specified modification to be implemented. [ ISO/IEC 9126-1 ]

### Notes

- Implementation includes coding, designing and documenting changes. [ ISO/IEC 9126-1 ]
- If the software is to be modified by the end user, changeability may affect operability. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Flexibility

Standards:

- ISO/IEC 9126-1

## 6.32. Co-existence

The capability of the software product to co-exist with other independent software in a common environment sharing common resources. [ ISO/IEC 9126-1 ]

## See also

Standards:

- ISO/IEC 9126-1

## 6.33. Code

In software engineering, computer instructions and data definitions expressed in a programming language or in a form output by an assembler, compiler, or other translator. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Code (verb) [ ISO/IEC/IEEE 24765 ]: To express a computer program in a programming language.

## See also

Glossary:

→ Coding

Standards:

→ ISO/IEC/IEEE 24765

## 6.34. Code Coverage

An analysis method that determines which parts of the software have been executed (covered) by the test case suite and which parts have not been executed and therefore may require additional attention. [ SIGIST ]

### See also

Glossary:

→ Coverage

Standards:

→ SIGIST

## 6.35. Code Freeze

A period during which non-critical changes to the code are not allowed. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Code

→ Feature Freeze

Standards:

→ ISO/IEC/IEEE 24765

## 6.36. Code Review

A meeting at which software code is presented to project personnel, managers, users, customers, or other interested parties for comment or approval. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Code

→ Coding

Standards:

→ ISO/IEC/IEEE 24765

## 6.37. Code Verification

Ensures by static verification methods the conformance of source code to the specified design of the software module, the required coding standards, and the safety planning requirements. [ IEC 61508-3 ]

### See also

→ IEC 61508-3

## 6.38. Coding

In software engineering, the process of expressing a computer program in a programming language. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Coding [ ISO/IEC/IEEE 24765 ]: The transforming of logic and data from design specifications (design descriptions) into a programming language.

### See also

Glossary:

→ Code

Standards:

→ ISO/IEC/IEEE 24765

## 6.39. Cohesion

In software design, a measure of the strength of association of the elements within a module. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Cohesion [ ISO/IEC/IEEE 24765 ]: The manner and degree to which the tasks performed by a single software module are related to one another.

### Notes

→ Types include coincidental, communicational, functional, logical, procedural, sequential, and temporal. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Coupling

Standards:

→ ISO/IEC/IEEE 24765

## 6.40. Commercial-Off-The-Shelf (COTS)

Software defined by a market-driven need, commercially available, and whose fitness for use has been demonstrated by a broad spectrum of commercial users. [ ISO/IEC 25051 ]

### Notes

- COTS software product includes the product description (including all cover information, data sheet, web site information, etc.), the user documentation (necessary to install and use the software), the software contained on a computer sensible media (disk, CD-ROM, internet downloadable, etc.). Software is mainly composed of programs and data. This definition applies also to product descriptions, user documentation and software which are produced and supported as separate manufactured goods, but for which typical commercial fees and licensing considerations may not apply. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Software Product

Standards:

- ISO/IEC 15289
- ISO/IEC 25051
- ISO/IEC 90003
- ISO/IEC/IEEE 24765

## 6.41. Commit

To integrate the changes made to a developer's private view of the source code into a branch accessible through the version control system's repository. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Configuration Management
- Software Repository

Standards:

- ISO/IEC/IEEE 24765

## 6.42. Commitment

An action resulting in an obligation by one or more of the participants in the act to comply with a rule or perform a contract. [ ISO/IEC 15414 ]

### Other Definitions

Commitment [ CMMi ]: A pact that is freely assumed, visible, and expected to be kept by all parties.

## Notes

- The enterprise object(s) participating in an action of commitment may be parties or agents acting on behalf of a party or parties. In the case of an action of commitment by an agent, the principal becomes obligated. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- CMMi
- ISO/IEC 15414
- ISO/IEC/IEEE 24765

## 6.43. Compatibility

The ability of two or more systems or components to perform their required functions while sharing the same hardware or software environment. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Compatibility [ ISO/IEC/IEEE 24765 ]: The ability of two or more systems or components to exchange information.

Compatibility [ ISO/IEC 2382-1 ]: The capability of a functional unit to meet the requirements of a specified interface without appreciable modification.

## See also

Standards:

- ISO/IEC 2382-1
- ISO/IEC/IEEE 24765

## 6.44. Complexity

The degree to which a system's design or code is difficult to understand because of numerous components or relationships among components. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Complexity [ ISO/IEC/IEEE 24765 ]: The degree to which a system or component has a design or implementation that is difficult to understand and verify.

## See also

Glossary:

- Maintainability

Standards:

- ISO/IEC/IEEE 24765

## 6.45. Component

An entity with discrete structure, such as an assembly or software module, within a system considered at a particular level of analysis. [ ISO/IEC 15026 ]

### Other Definitions

Component [ SIGIST ]: A minimal software item for which a separate specification is available.

Component [ IEEE 829 ]: One of the parts that make up a system.

Component [ ISO/IEC 29881 ]: Set of functional services in the software, which, when implemented, represents a well-defined set of functions and is distinguishable by a unique name.

Software Component [ IEEE 1061 ]: A general term used to refer to a software system or an element, such as module, unit, data, or document.

Software Component [ ISO/IEC/IEEE 24765 ]: A functionally or logically distinct part of a software configuration item, distinguished for the purpose of convenience in designing and specifying a complex SCI as an assembly of subordinate elements.

### Notes

- A component may be hardware or software and may be subdivided into other components. The terms "module," "component," and "unit" are often used interchangeably or defined to be sub-elements of one another in different ways depending upon the context. The relationship of these terms is not yet standardized. A component may or may not be independently managed from the end-user or administrator's point of view. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Configuration Item

Standards:

- IEEE 829
- IEEE 1061
- ISO/IEC 15026
- ISO/IEC 29881
- ISO/IEC/IEEE 24765
- SIGIST

## 6.46. Conciseness

Software attributes that provide implementation of a function with a minimum amount of code. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.47. Condition

A boolean expression containing no boolean operators. For instance  $A < B$  is a condition but  $A$  and  $B$  is not. [ RTCA/EUROCAE ]

### Other Definitions

Condition [ ISO 5806, ISO/IEC/IEEE 24765 ]: a description of a contingency to be considered in the representation of a problem, or a reference to other procedures to be considered as part of the condition.

### See also

Standards:

- RTCA/EUROCAE
- ISO/IEC/IEEE 24765

## 6.48. Configuration

The arrangement of a computer system or component as defined by the number, nature, and interconnections of its constituent parts. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Configuration [ ISO/IEC/IEEE 24765 ]: In configuration management, the functional and physical characteristics of hardware or software as set forth in technical documentation or achieved in a product.

Configuration [ ISO/IEC/IEEE 24765 ]: The arrangement of a system or network as defined by the nature, number, and chief characteristics of its functional units.

Configuration [ ISO/IEC/IEEE 24765 ]: The requirements, design, and implementation that define a particular version of a system or system component.

Configuration [ ISO/IEC 2382-1 ]: The manner in which the hardware and software of an information processing system are organized and interconnected.

### See also

Glossary:

- Configuration Item
- Configuration Management

Standards:

- ISO/IEC 2382-1
- ISO/IEC/IEEE 24765

## 6.49. Configuration Control



An element of configuration management, consisting of the evaluation, coordination, approval or disapproval, and implementation of changes to configuration items after formal establishment of their configuration identification. [ IEEE 610.12, ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Configuration Management

Standards:

→ IEEE 610.12

→ ISO/IEC/IEEE 24765

## 6.50. Configuration Item

Entity within a configuration that satisfies an end use function and that can be uniquely identified at a given reference point. [ ISO/IEC 12207 ]

### Other Definitions

Configuration Item [ ISO/IEC 19770 ]: Item or aggregation of hardware or software or both that is designed to be managed as a single entity.

Configuration Item [ ISO/IEC 20000-1 ]: Component of an infrastructure or an item which is, or will be, under the control of configuration management.

Configuration Item [ ISO/IEC/IEEE 24765 ]: An aggregation of hardware, software, or both, that is designated for configuration management and treated as a single entity in the configuration management process.

Configuration Item [ ISO/IEC/IEEE 24765 ]: Aggregation of work products that is designated for configuration management and treated as a single entity in the configuration management process.

Software Configuration Item [ ISO/IEC/IEEE 24765 ]: A software entity that has been established as a configuration item.

### Notes

→ Configuration items may vary widely in complexity, size and type, ranging from an entire system including all hardware, software and documentation, to a single module or a minor hardware component. [ ISO/IEC/IEEE 24765 ]

→ The SCI (Software Configuration Item) exists where functional allocations have been made that clearly distinguish equipment functions from software functions and where the software has been established as a configurable item. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Configuration

→ Configuration Management

Standards:

- ISO/IEC 12207
- ISO/IEC 19770
- ISO/IEC 20000
- ISO/IEC/IEEE 24765

## 6.51. Configuration Management

A discipline applying technical and administrative direction and surveillance to

- identify and document the functional and physical characteristics of a configuration item,
- control changes to those characteristics, record and report change processing and implementation status, and
- verify compliance with specified requirements. [ IEEE 610.12, ISO/IEC/IEEE 24765 ]

### Other Definitions

Configuration Management <ref name="sting">Software Technology Interest Group On-line Glossary, <http://www.apl.jhu.edu/Notes/Hausler/web/glossary.html> .</ref>: The process of identifying, defining, recording and reporting the configuration items in a system and the change requests. Controlling the releases and change of the items throughout the life-cycle.

Configuration Management [ ISO/IEC 29881 ]: Technical and organizational activities comprising configuration identification, control, status accounting, and auditing.

Software Configuration Management [ ISO/IEC 15846 ]: The process of applying configuration management throughout the software life cycle to ensure the completeness and correctness of Software Configuration Items.

### See also

Glossary:

- Change Management
- Configuration Control
- Configuration Item

Standards:

- IEEE 610.12
- ISO/IEC 15846
- ISO/IEC 29881
- ISO/IEC/IEEE 24765

External Links:

- Wikipedia article: Software Configuration Management [[http://en.wikipedia.org/wiki/Software\\_configuration\\_management](http://en.wikipedia.org/wiki/Software_configuration_management)]

## 6.52. Configuration Management System

The discipline of identifying the components of a continually evolving system to control changes to those components and maintaining integrity and traceability throughout the life cycle. [ ISO/IEC/IEEE 24765 ]

## Notes

- A subsystem of the overall project management system. It is a collection of formal documented procedures used to apply technical and administrative direction and surveillance to:
- \* identify and document the functional and physical characteristics of a product, result, service, or component;
- \* control any changes to such characteristics;
- \* record and report each change and its implementation status; and
- \* support the audit of the products, results, or components to verify conformance to requirements.

:It includes the documentation, tracking systems, and defined approval levels necessary for authorizing and controlling changes. [ IEEE 1490 ]

## See also

Glossary:

- Configuration Management

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.53. Conflict

A change in one version of a file that cannot be reconciled with the version of the file to which it is applied. [ ISO/IEC/IEEE 24765 ]

## Notes

- Conflicts can occur when versions from different branches are merged or when two committers work concurrently on the same file. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Version

Standards:

- ISO/IEC/IEEE 24765

## 6.54. Conformance

The fulfillment by a product, process or service of specified requirements. [ ISO/IEC 12207 ]

## See also

Glossary:

- Requirement

Standards:

→ ISO/IEC 12207

## 6.55. Connectivity

The capability of a system or device to be attached to other systems or devices without modification. [ ISO/IEC 2382-1 ]

See also

Standards:

→ ISO/IEC 2382-1

## 6.56. Consistency

The degree of uniformity, standardization, and freedom from contradiction among the documents or parts of a system or component. [ ISO/IEC/IEEE 24765 ]

Other Definitions

Consistency [ ISO/IEC/IEEE 24765 ]: Software attributes that provide uniform design and implementation techniques and notations.

See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.57. Constraint

A restriction on the value of an attribute or the existence of any object based on the value or existence of one or more others. [ ISO/IEC 15474-1 ]

Other Definitions

Constraint [ IEEE 1362 ]: An externally imposed limitation on system requirements, design, or implementation or on the process used to develop or modify a system.

Constraint [ IEEE 1490 ]: The state, quality, or sense of being restricted to a given course of action or inaction. An applicable restriction or limitation, either internal or external to a project, which will affect the performance of the project or a process. For example, a schedule constraint is any limitation or restraint placed on the project schedule that affects when a schedule activity can be scheduled and is usually in the form of fixed imposed dates.

Constraint [ IEEE 1233 ]: A statement that expresses measurable bounds for an element or function of the system.

Notes

→ That is, a constraint is a factor that is imposed on the solution by force or compulsion and may limit or modify the design changes. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Requirement

Standards:

→ IEEE 1233

→ IEEE 1362

→ IEEE 1490

→ ISO/IEC 15474-1

→ ISO/IEC/IEEE 24765

## 6.58. Content Coupling

A type of coupling in which some or all of the contents of one software module are included in the contents of another module. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Control Coupling

→ Coupling

→ Data Coupling

→ Hybrid Coupling

→ Pathological Coupling

Standards:

→ ISO/IEC/IEEE 24765

## 6.59. Context of Use

Users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used. [ ISO/IEC 25000 ]

## See also

Glossary:

→ Environment

Standards:

→ ISO/IEC 25000

## 6.60. Contract

Binding agreement between two parties, especially enforceable by law, or a similar internal agreement wholly within an organization. [ ISO/IEC 12207 ]

## Other Definitions

Contract [ IEEE 1490 ]: A mutually binding agreement that obligates the seller to provide the specified product or service or result and obligates the buyer to pay for it.

### See also

Standards:

- IEEE 1490
- ISO/IEC 12207

## 6.61. Control Coupling

A type of coupling in which one software module communicates information to another module for the explicit purpose of influencing the latter module's execution. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Content Coupling
- Coupling
- Data Coupling
- Hybrid Coupling
- Pathological Coupling

Standards:

- ISO/IEC/IEEE 24765

## 6.62. Control Flow

The sequence in which operations are performed during the execution of a computer program. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Control Flow Diagram
- Data Flow

Standards:

- ISO/IEC/IEEE 24765

## 6.63. Control Flow Diagram

A diagram that depicts the set of all possible sequences in which operations may be performed during the execution of a system or program. [ ISO/IEC/IEEE 24765 ]

## Notes

→ Types include box diagram, flowchart, input-process-output chart, state diagram. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Control Flow

→ Data Flow Diagram

Standards:

→ ISO/IEC/IEEE 24765

## 6.64. Convention

Requirement employed to prescribe a disciplined, uniform approach to providing consistency in a software product, that is, a uniform pattern or form for arranging data. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.65. Correctability

The degree of effort required to correct software defects and to cope with user complaints. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Maintainability

Standards:

→ ISO/IEC/IEEE 24765

## 6.66. Correctness

The degree to which a system or component is free from faults in its specification, design, and implementation. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Correctness [ ISO/IEC/IEEE 24765 ]: The degree to which software, documentation, or other items meet specified requirements.

Correctness [ ISO/IEC/IEEE 24765 ]: The degree to which software, documentation, or other items meet user needs and expectations, whether specified or not.

## See also

Glossary:

→ Fault

Standards:

→ ISO/IEC/IEEE 24765

## 6.67. Coupling

The manner and degree of interdependence between software modules. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Coupling [ ISO/IEC 19759 ]: The strength of the relationships between modules.

Coupling [ ISO/IEC/IEEE 24765 ]: A measure of how closely connected two routines or modules are.

Coupling [ ISO/IEC/IEEE 24765 ]: In software design, a measure of the interdependence among modules in a computer program

### Notes

→ Types include common-environment coupling, content coupling, control coupling, data coupling, hybrid coupling, and pathological coupling. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Cohesion

→ Control Coupling

→ Data Coupling

Standards:

→ ISO/IEC 19759

→ ISO/IEC/IEEE 24765

## 6.68. Coverage

The degree, expressed as a percentage, to which a specified coverage item has been exercised by a test case suite. [ SIGIST ]

### Other Definitions

Test Coverage [ ISO/IEC 12207 ]: Extent to which the test cases test the requirements for the system or software product.

test Coverage [ ISO/IEC/IEEE 24765 ]: The degree to which a given test or set of tests addresses all specified requirements for a given system or



component.

## See also

Glossary:

- Code Coverage
- Test Case
- Test Case Suite

Standards:

- ISO/IEC 12207
- ISO/IEC/IEEE 24765
- SIGIST

## 6.69. Criteria

Specific data items identified as contents of information items for appraising a factor in an evaluation, audit, test or review. [ ISO/IEC 15289 ]

### Other Definitions

Criteria [ ISO/IEC 15289 ]: standards, rules, or tests on which a judgment or decision can be based, or by which a product, service, result, or process can be evaluated.

## See also

Glossary:

- Certification Criteria
- Decision Criteria

Standards:

- ISO/IEC 15289

## 6.70. Criticality

The degree to which a system or component is operational and accessible when required for use. [ IEEE 829 ]

## See also

Standards:

- IEEE 829

## 6.71. Custom Software

Software product developed for a specific application from a user requirements specification. [ ISO/IEC 25000 ]

## See also

Glossary:

- Product
- Requirement

Standards:

- ISO/IEC 25000

## 6.72. Customer

Organization or person that receives a product or service. [ ISO/IEC 12207, ISO/IEC 15288 ]

### Other Definitions

Customer [ IEEE 1233 ]: The entity or entities for whom the requirements are to be satisfied in the system being defined and developed.

Customer [ IEEE 1362 ]: An individual or organization who acts for the ultimate user of a new or modified hardware or software product to acquire the product and its documentation.

Customer [ IEEE 830 ]: The person, or persons, who pay for the product and usually (but not necessarily) decide the requirements.

### Notes

- Synonyms of Customer are: acquirer, buyer, beneficiary, purchaser. [ ISO/IEC/IEEE 24765 ]
- A customer can be internal or external to the organization. The customer may be a higher level project. This is the entity to whom the system developer must provide proof that the system developed satisfies the system requirements specified. Customers are a subset of stakeholders. [ ISO/IEC/IEEE 24765 ]
- Example: an end-user of the completed system, an organization within the same company as the developing organization (e.g., System Management). [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Stakeholder

Standards:

- IEEE 830
- IEEE 1233
- IEEE 1362
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.73. Data

Collection of values assigned to base measures, derived measures, and/or indicators. [ ISO/IEC 15939, ISO/IEC 25000 ]

## Other Definitions

Data [ ISO/IEC/IEEE 24765 ]: A representation of facts, concepts, or instructions in a manner suitable for communication, interpretation, or processing by humans or by automatic means.

Data [ ISO/IEC 2382-1 ]: A reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or communication, or processing.

## See also

Glossary:

- Base Measure
- Derived Measure
- Indicator

Standards:

- ISO/IEC 2382-1
- ISO/IEC 15939
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.74. Data Coupling

A type of coupling in which output from one software module serves as input to another module. [ ISO/IEC/IEEE 24765 ]

### Notes

- Synonym for Data Coupling: input-output coupling. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Content Coupling
- Control Coupling
- Coupling
- Hybrid Coupling
- Pathological Coupling

Standards:

- ISO/IEC/IEEE 24765

## 6.75. Data Flow

The sequence in which data transfer, use, and transformation are performed during the execution of a computer program. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Control Flow

Standards:

→ ISO/IEC/IEEE 24765

## 6.76. Data Flow Diagram

A diagram that depicts data sources, data sinks, data storage, and processes performed on data as nodes, and logical flow of data as links between the nodes. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Synonyms for Data Flow Diagram: data flowchart, data flow graph. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Data Flow

→ Control Flow Diagram

Standards:

→ ISO/IEC/IEEE 24765

## 6.77. Data Management

In a data processing system, the functions that provide access to data, perform or monitor the storage of data, and control input-output operations. [ ISO/IEC 2382-1 ]

### Other Definitions

Data Management [ ISO/IEC/IEEE 24765 ]: The disciplined processes and systems that plan for, acquire, and provide stewardship for business and technical data, consistent with data requirements, throughout the data lifecycle.

## See also

Glossary:

→ Data

Standards:

→ ISO/IEC 2382-1

→ ISO/IEC/IEEE 24765

## 6.78. Data Model

A model about data by which an interpretation of the data can be obtained in the modeling tool industry. [ ISO/IEC 15474-1 ]

## Notes

- A data model is one that may be encoded and manipulated by a computer. A data model identifies the entities, domains (attributes), and relationships (associations) with other data and provides the conceptual view of the data and the relationships among data. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Data
- Model

Standards:

- ISO/IEC 15474-1
- ISO/IEC/IEEE 24765

## 6.79. Data Processing

The systematic performance of operations upon data. [ ISO/IEC 2382-1 ]

## Notes

- Example: arithmetic or logic operations upon data, merging or sorting of data, assembling or compiling of programs, or operations on text, such as editing, sorting, merging, storing, retrieving, displaying, or printing. [ ISO/IEC/IEEE 24765 ]
- The term data processing should not be used as a synonym for information processing. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Data

Standards:

- ISO/IEC 2382-1
- ISO/IEC/IEEE 24765

## 6.80. Data Provider

Individual or organisation that is a source of data. [ ISO/IEC 15939 ]

## See also

Standards:

- ISO/IEC 15939

## 6.81. Data Store

Organised and persistent collection of data and information that allows for its retrieval. [ ISO/IEC 15939 ]

### See also

Standards:

→ ISO/IEC 15939

## 6.82. Data Type

A class of data, characterized by the members of the class and the operations that can be applied to them. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Example: integers, real numbers, and character strings. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Data

Standards:

→ ISO/IEC/IEEE 24765

## 6.83. Database

A collection of data organized according to a conceptual structure describing the characteristics of the data and the relationships among their corresponding entities, supporting one or more application areas. [ ISO/IEC 2382-1 ]

### Other Definitions

Database [ ISO/IEC/IEEE 24765 ]: A collection of interrelated data stored together in one or more computerized files.

Database [ ISO/IEC 29881 ]: Collection of data describing a specific target area that is used and updated by one or more applications.

### See also

Glossary:

→ Data

→ Data Store

Standards:

→ ISO/IEC 2382-1

→ ISO/IEC 29881

→ ISO/IEC/IEEE 24765

## 6.84. Decision Criteria

Thresholds, targets, or patterns used to determine the need for action or further investigation, or to describe the level of confidence in a given result. [ ISO/IEC 15939, ISO/IEC 25000 ]

### See also

Glossary:

→ Criteria

Standards:

→ ISO/IEC 15939

→ ISO/IEC 25000

## 6.85. Decoupling

The process of making software modules more independent of one another to decrease the impact of changes to, and errors in, the individual modules. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Coupling

Standards:

→ ISO/IEC/IEEE 24765

## 6.86. Defect

A flaw in a system or system component that causes the system or component to fail to perform its required function. A defect, if encountered during execution, may cause a failure of the system. [ CMMi ]

### Other Definitions

Defect [ IEEE 1490 ]: An imperfection or deficiency in a project component where that component does not meet its requirements or specifications and needs to be either repaired or replaced.

### Notes

→ (1) Omissions and imperfections found during early life cycle phases and (2) faults contained in software sufficiently mature for test or operation. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Failure

→ Fault

→ Defect Density

Standards:

→ CMMi

→ IEEE 1490

## 6.87. Degree of Confidence

The degree of confidence that software conforms to its requirements. [ ISO/IEC 15026 ]

### See also

Standards:

→ ISO/IEC 15026

## 6.88. Deliverable

Items whose delivery to the customer is a requirement of the contract. [ ISO/IEC 15910 ]

### Other Definitions

Deliverable [ IEEE 1490 ]: Any unique and verifiable product, result, or capability to perform a service that must be produced to complete a process, phase, or project. Often used more narrowly in reference to an external deliverable, which is a deliverable that is subject to approval by the project sponsor or customer.

Deliverable [ ISO/IEC/IEEE 24765 ]: Item<sup>2</sup> to be provided to an acquirer or other designated recipient as specified in an agreement.

Deliverables [ ISO/IEC 15910 ]: Items whose delivery to the customer is a requirement of the contract.

### See also

Glossary:

→ Software Product

Standards:

→ IEEE 1490

→ ISO/IEC 15910

→ ISO/IEC/IEEE 24765

## 6.89. Delivery

Release of a system or component to its customer or intended user. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

---

<sup>2</sup>This item can be a document, hardware item, software item, service, or any type of work product.



→ Deliverable

Standards:

→ ISO/IEC/IEEE 24765

## 6.90. Dependability

Measure of the degree to which an item is operable and capable of performing its required function at any (random) time during a specified mission profile, given item availability at the start of the mission. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Dependability [ IEEE 982 ]: Trustworthiness of a computer system such that reliance can be justifiably placed on the service it delivers.

### Notes

→ Reliability, availability, and maintainability are aspects of dependability. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ IEEE 982

→ ISO/IEC/IEEE 24765

## 6.91. Deployment

Phase of a project in which a system is put into operation and cutover issues are resolved. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.92. Derived Measure

Measure that is defined as a function of two or more values of base measures. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

### Notes

→ A derived measure is a measure that is defined as a function of two or more values of base measures. Derived measures capture information about more than one attribute or the same attribute from multiple entities. Simple transformations of base measures (for example, taking the square root of a base measure) do not add information, thus do not produce derived measures. Normalisation of data often involves converting base measures into derived measures that can be used to compare different entities. [ ISO/IEC 15939 ]

- A transformation of a base measure using a mathematical function can also be considered as a derived. [ ISO/IEC 25000 ]

## See also

Glossary:

- Measure
- Base Measure
- Direct Measure
- Indirect Measure

Standards:

- ISO/IEC 99
- ISO/IEC 15939
- ISO/IEC 25000

## 6.93. Design

The process of defining the architecture, components, interfaces, and other characteristics of a system or component. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Design [ ISO/IEC/IEEE 24765 ]: The result of the process of defining the architecture, components, interfaces, and other characteristics of a system or component.

Design [ ISO/IEC/IEEE 24765 ]: The process of defining the software architecture, components, modules, interfaces, and data for a software system to satisfy specified requirements.

Design [ ISO/IEC/IEEE 24765 ]: The process of conceiving, inventing, or contriving a scheme for turning a computer program specification into an operational program.

Design [ ISO/IEC/IEEE 24765 ]: Activity that links requirements analysis to coding and debugging.

Design [ ISO/IEC 26514 ]: Stage of documentation development that is concerned with determining what documentation will be provided in a product and what the nature of the documentation will be.

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.94. Design Pattern

A description of the problem and the essence of its solution to enable the solution to be reused in different settings. [ ISO/IEC/IEEE 24765 ]

## Notes

- Not a detailed specification, but a description of accumulated wisdom and experience. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.95. Developer

Individual or organisation that performs development activities (including requirements analysis, design, testing through acceptance) during the software lifecycle process. [ ISO/IEC 12207, ISO/IEC 9126-1 ]

## Notes

- May include new development, modification, reuse, reengineering, maintenance, or any other activity that results in software products, and includes the testing, quality assurance, configuration management, and other activities applied to these products. Developers apply methodologies via enactment. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 9126-1
- ISO/IEC 12207
- ISO/IEC/IEEE 24765

## 6.96. Development

Software life cycle process that contains the activities of requirements analysis, design, coding, integration, testing, installation and support for acceptance of software products. [ ISO/IEC 90003, ISO/IEC 12207, ISO/IEC 15939 ]

## Other Definitions

Development [ ISO/IEC 26514 ]: Activity of preparing documentation after it has been designed.

## See also

Glossary:

- Developer
- Development Testing
- Process
- Software Life Cycle

Standards:

- ISO/IEC 12207

- ISO/IEC 15939
- ISO/IEC 26514
- ISO/IEC 90003

## 6.97. Development Testing

Formal or informal testing conducted during the development of a system or component, usually in the development environment by the developer. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Development Testing [ IEEE 829 ]: Testing conducted to establish whether a new software product or software-based system (or components of it) satisfies its criteria.

### See also

Glossary:

- Acceptance Testing
- Qualification Testing
- Operational Testing
- Testing

Standards:

- IEEE 829
- ISO/IEC/IEEE 24765

## 6.98. Direct Measure

A measure of an attribute that does not depend upon a measure of any other attribute. [ ISO/IEC 14598, ISO/IEC 9126-1 ]

### See also

Glossary:

- Base Measure
- Derived Measure
- Indirect Measure
- Measure

Papers:

- Software Engineering Metrics: What Do They Measure And How Do We Know [ [https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know) ]

Standards:

- ISO/IEC 9126-1

→ ISO/IEC 14598

## 6.99. Direct Metric

A metric that does not depend upon a measure of any other attribute. [ IEEE 1061 ]

### See also

Glossary:

- Direct Measure
- Indirect Metric
- Metric

Standards:

- IEEE 1061

## 6.100. Document

Uniquely identified unit of information for human use, such as a report, specification, manual or book, in printed or electronic form. [ ISO/IEC 9294 ]

### Other Definitions

Document (verb) [ ISO/IEC/IEEE 24765 ]: To add comments to a computer program.

Document [ ISO/IEC 15910 ]: An item of documentation.

Document [ ISO/IEC 20000 ]: Information and its supporting medium.

Document [ ISO/IEC 26514 ]: Separately identified piece of documentation which could be part of a documentation set.

### Notes

- Example: in software engineering: project plans, specifications, test plans, user manuals. [ ISO/IEC/IEEE 24765 ]
- Documents include both paper and electronic documents. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Documentation
- Installation Manual
- Maintenance Manual
- Operator Manual
- Support Manual
- User Manual

Standards:

- ISO/IEC 9294
- ISO/IEC 15910
- ISO/IEC 20000
- ISO/IEC 26514
- ISO/IEC/IEEE 24765

## 6.101. Documentation

Collection of related documents that are designed, written, produced and maintained. [ ISO/IEC 9294 ]

### Other Definitions

Documentation [ ISO/IEC 26514 ]: Information that explains how to use a software product.

Documentation [ IEEE 829 ]:

1. A collection of documents on a given subject.
2. Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.
3. The process of generating or revising a document.
4. The management of documents, including identification, acquisition, processing, storage, and dissemination.

### Examples

- Printed manuals, on-screen information, and stand-alone online help. [ ISO/IEC 26514 ]

### Notes

- Documentation can be provided as separate documentation or as embedded documentation or both. [ ISO/IEC 26514 ]

### See also

Glossary:

- Document
- Installation Manual
- Maintenance Manual
- Operator Manual
- Programmer Manual
- Support Manual
- Test Documentation
- User Documentation
- User Manual

Standards:

- IEEE 829
- ISO/IEC 9294
- ISO/IEC 26514

## 6.102. Dynamic Analysis

The process of evaluating a system or component based on its behavior during execution. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.103. Earned Value

The value of work performed expressed in terms of the approved budget assigned to that work for a schedule activity or work breakdown structure component. [ IEEE 1490 ]

### See also

Standards:

- IEEE 1490

## 6.104. Effectiveness

The capability of the software product to enable users to achieve specified goals with accuracy and completeness in a specified context of use. [ ISO/IEC 9126-1 ]

### Other Definitions

Effectiveness [ ISO/IEC 25062 ]: The accuracy and completeness with which users achieve specified goals.

### See also

- ISO/IEC 9126-1

## 6.105. Efficiency

Resources expended in relation to the accuracy and completeness with which users achieve goals. [ ISO/IEC 25062 ]

### Other Definitions

Efficiency [ IEEE 610.12, ISO/IEC/IEEE 24765 ]: The degree to which a system or component performs its designated functions with minimum consumption of resources.

Efficiency [ ISO/IEC 9126-1 ]: The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.

## Notes

- Resources may include other software products, the software and hardware configuration of the system, and materials (e.g. print paper, diskettes). [ ISO/IEC 9126-1 ]
- For a system which is operated by a user, the combination of functionality, reliability, usability and efficiency can be measured externally by quality in use. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Efficiency Compliance

Standards:

- IEEE 610.12
- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765
- ISO/IEC 25062

## 6.106. Efficiency Compliance

The capability of the software product to adhere to standards or conventions relating to efficiency. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Efficiency

Standards:

- ISO/IEC 9126-1

## 6.107. Effort

The number of labor units required to complete a schedule activity or work breakdown structure component. Usually expressed as staff hours, staff days, or staff weeks. [ IEEE 1490 ]

## See also

Standards:

- IEEE 1490

## 6.108. Encapsulation

A software development technique that consists of isolating a system function or a set of data and operations on those data within a module and providing precise specifications for the module. [ ISO/IEC/IEEE 24765 ]



## Other Definitions

Encapsulation [ IEEE 1320 ]: The concept that access to the names, meanings, and values of the responsibilities of a class is entirely separated from access to their realization.

Encapsulation [ ISO/IEC/IEEE 24765 ]: The idea that a module has an outside that is distinct from its inside, that it has an external interface and an internal implementation.

## See also

Standards:

- IEEE 1320
- ISO/IEC/IEEE 24765

## 6.109. End User

Individual person who ultimately benefits from the outcomes of the system. [ ISO/IEC 25000 ]

## Other Definitions

End User [ IEEE 1233 ]: The person or persons who will ultimately be using the system for its intended purpose. [ IEEE 1233 ]

End User [ ISO 9127 ]: The person who uses the software package.

End User [ ISO/IEC 29881 ]: Any person that communicates or interacts with the software at any time.

## See also

Standards:

- IEEE 1233
- ISO 9127
- ISO/IEC 25000
- ISO/IEC 29881

## 6.110. Entity

Object<sup>3</sup> that is to be characterised by measuring its attributes. [ ISO/IEC 15939, ISO/IEC 25000 ]

## Other Definitions

Entity [ IEEE 1320 ]: The representation of a set of real or abstract things that are recognized as the same type because they share the same characteristics and can participate in the same relationships.

Entity [ ISO/IEC 15474 ]: An object (i.e., thing, event or concept) that occurs in a model (i.e., transfer).

Entity [ ISO/IEC/IEEE 24765 ]: In computer programming, any item that can be named or denoted in a program.

Entity [ ISO/IEC 29881 ]: Logical component of the data store, representing fundamental things of relevance to the user, and about which persistent information is stored.

---

<sup>3</sup>An object can be a process, product, project, or resource.

## Examples

- A data item, program statement, or subprogram. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- IEEE 1320
- ISO/IEC 15474
- ISO/IEC 15939
- ISO/IEC/IEEE 24765
- ISO/IEC 25000
- ISO/IEC 29881

## 6.111. Entry Point

A point in a software module at which execution of the module can begin. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Exit

Standards:

- ISO/IEC/IEEE 24765

## 6.112. Environment

The configuration(s) of hardware and software in which the software operates. [ ISO 9127 ]

## Other Definitions

Environment [ IEEE 1362 ]: The circumstances, objects, and conditions that surround a system to be built.

Environment [ IEEE 1233 ]: The circumstances, objects, and conditions that will influence the completed system.

Environment [ IEEE 1320 ]: A concept space, i.e., an area in which a concept has an agreed-to meaning and one or more agreed-to names that are used for the concept.

## See also

Standards:

- IEEE 1233
- IEEE 1320
- IEEE 1362
- ISO 9127

## 6.113. Error

A human action that produces an incorrect result, such as software containing a fault. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Error [ ISO/IEC/IEEE 24765 ]:

1. An incorrect step, process, or data definition.
2. An incorrect result
3. The difference between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition.

### Notes

→ Example: omission or misinterpretation of user requirements in a software specification, incorrect translation, or

omission of a requirement in the design specification. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Defect
- Failure
- Fault

Standards:

- ISO/IEC/IEEE 24765

## 6.114. Error Tolerance

The ability of a system or component to continue normal operation despite the presence of erroneous inputs. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Fault Tolerance
- Robustness

Standards:

- ISO/IEC/IEEE 24765

## 6.115. Evaluation

Systematic determination of the extent to which an entity meets its specified criteria. [ ISO/IEC 12207 ]

## Other Definitions

Evaluation [ ISO/IEC 15414 ]: An action that assesses the value of something.

## Notes

- Example: The action by which an ODP system assigns a relative status to some thing according to estimation by the system. Value can be considered in terms of usefulness, importance, preference, acceptability, etc.; the evaluated target may be a credit rating, a system state, a potential behavior. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Evaluation Activity
- Evaluation Group
- Evaluation Method
- Evaluation Module
- Evaluation Technology

Standards:

- ISO/IEC 12207
- ISO/IEC 15414
- ISO/IEC/IEEE 24765

## 6.116. Evaluation Activity

Assessment of a software product against identified and applicable quality characteristics performed using applicable techniques or methods. [ ISO/IEC 25001 ]

## See also

Glossary:

- Evaluation
- Evaluation Group
- Evaluation Method
- Evaluation Module
- Evaluation Technology

Standards:

- ISO/IEC 25001

## 6.117. Evaluation Group

Organization responsible for specifying the software quality requirements as well as managing and implementing the software quality evaluation activities through the provision of technology, tools, experiences, and management skills. [ ISO/IEC 25001 ]

## See also

Glossary:

- Evaluation
- Evaluation Activity
- Evaluation Method
- Evaluation Module
- Evaluation Technology

Standards:

- ISO/IEC 25001

## 6.118. Evaluation Method

Procedure describing actions to be performed by the evaluator in order to obtain results for the specified measurement applied to the specified product components or on the product as a whole. [ ISO/IEC 25000 ]

## See also

Glossary:

- Evaluation
- Evaluation Activity
- Evaluation Group
- Evaluation Module
- Evaluation Technology

Standards:

- ISO/IEC 25000

## 6.119. Evaluation Module

A package of evaluation technology for a specific software quality characteristic or sub-characteristic. [ ISO/IEC 9126-1, ISO/IEC 14598 ]

## Notes

- The package includes evaluation methods and techniques, inputs to be evaluated, data to be measured and collected and supporting procedures and tools. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Evaluation
- Evaluation Activity
- Evaluation Group
- Evaluation Method
- Evaluation Technology

Standards:

- ISO/IEC 9126-1
- ISO/IEC 14598

## 6.120. Evaluation Technology

Technique, processes, tools, measures and relevant technical information used for evaluation. [ ISO/IEC 25001 ]

### See also

Glossary:

- Evaluation
- Evaluation Activity
- Evaluation Group
- Evaluation Method
- Evaluation Module

Standards:

- ISO/IEC 25001

## 6.121. Evaluation Tool

An instrument that can be used during evaluation to collect data, to perform interpretation of data or to automate part of the evaluation. [ ISO/IEC 14598-5 ]

### See also

Glossary:

- Evaluation

Standards:

- ISO/IEC 14598-5

## 6.122. Execute

To carry out an instruction, process, or computer program. [ IEEE 1490 ]

### Other Definitions

Execute [ IEEE 1490 ]: Directing, managing, performing, and accomplishing the project work, providing the deliverables, and providing work performance information.

### See also

Standards:

- IEEE 1490

## 6.123. Execution Efficiency

The degree to which a system or component performs its designated functions with minimum consumption of time. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Efficiency
- Execution Time

Standards:

- ISO/IEC/IEEE 24765

## 6.124. Execution Time

The time which elapses between task submission and completion. [ ISO/IEC 14756 ]

### Notes

- Processor time is usually less than elapsed time because the processor may be idle (for example, awaiting needed computer resources) or employed on other tasks during the execution of a program. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Execution Efficiency

Standards:

- ISO/IEC 14756
- ISO/IEC/IEEE 24765

## 6.125. Exit

A point in a software module at which execution of the module can terminate. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Entry Point

Standards:

- ISO/IEC/IEEE 24765

## 6.126. Expandability

The degree of effort required to improve or modify software functions' efficiency. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.127. Extendability

The ease with which a system or component can be modified to increase its storage or functional capacity.  
[ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Expandability

→ Flexibility

→ Maintainability

Standards:

→ ISO/IEC/IEEE 24765

## 6.128. External Attribute

A measurable property of an entity which can only be derived with respect to how it relates to its environment.  
[ ISO/IEC 14598-3 ]

## Notes

→ External attributes are those that relate to requirements (external properties of the software). External attributes can only be derived from the operational behavior of the system of which it is a part. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Internal Attribute

Standards:

→ ISO/IEC 14598

## 6.129. External Measure

An indirect measure of a product derived from measures of the behaviour of the system of which it is a part.  
[ ISO/IEC 9126-1, ISO/IEC 14598 ]

## Notes

→ The system includes any associated hardware, software (either custom software or off-the-shelf software) and users. [ ISO/IEC 9126-1 ]



- The number of failures found during testing is an external measure of the number of faults in the program because the number of failures are counted during the operation of a computer system running the program. [ ISO/IEC 9126-1 ]
- External measures can be used to evaluate quality attributes closer to the ultimate objectives of the design. [ ISO/IEC 9126-1 ]

## See also

### Glossary:

- Base Measure
- Derived Measure
- Direct Measure
- Indirect Measure
- Internal Measure
- Measure

### Standards:

- ISO/IEC 14598
- ISO/IEC 9126-1

## 6.130. External Quality

The extent to which a product satisfies stated and implied needs when used under specified conditions. [ ISO/IEC 9126-1, ISO/IEC 14598 ]

## Notes

- External Quality is the totality of characteristics of the software product from an external view. It is the quality when the software is executed, which is typically measured and evaluated while testing in a simulated environment with simulated data using external metrics. [ ISO/IEC 9126-1 ]

## See also

### Glossary:

- External Software Quality
- Internal Quality
- Quality
- Quality in Use

### Standards:

- ISO/IEC 9126-1
- ISO/IEC 9126-2
- ISO/IEC 14598

## 6.131. External Software Quality

Capability of a software product to enable the behavior of a system to satisfy stated and implied needs when the system is used under specified conditions. [ ISO/IEC 25000 ]

## Notes

- The number of failures found during testing is an external software quality measure related to the number of faults present in the program. The two measures are not necessarily identical since testing may not find all faults, and a fault may give rise to apparently different failures in different circumstances. [ ISO/IEC/IEEE 24765 ]
- Attributes of the behavior can be verified and/or validated by executing the software product during testing and operation. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- External Quality
- Internal Software Quality

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.132. Facility

Physical means or equipment for facilitating the performance of an action. [ ISO/IEC 12207, ISO/IEC 15288 ]

## Notes

- Buildings, instruments, tools. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.133. Failure

The termination of the ability of a product to perform a required function or its inability to perform within previously specified limits. [ ISO/IEC 9126-1, ISO/IEC 14598-5, ISO/IEC 25000 ]

## Other Definitions

Failure [ SIGIST ]: Deviation of the software from its expected delivery or service.

Failure [ IEEE 610.12 ]: The inability of a system or component to perform its required functions within specified performance requirements.

Failure [ ISO/IEC/IEEE 24765 ]: An event in which a system or system component does not perform a required function within specified limits.

## Notes

- According to Laprie et al.<sup>4</sup>, "a system failure occurs when the delivered service no longer complies with the specifications, the latter being an agreed description of the system's expected function and/or service". This definition applies to both hardware and software system failures. Faults or bugs in a hardware or a software component cause errors. An error is defined by Laprie et al. as that part of the system which is liable to lead to subsequent failure, and an error affecting the service is an indication that a failure occurs or has occurred. If the system comprises of multiple components, errors can lead to a component failure. As various components in the system interact, failure of one component might introduce one or more faults in another. [ University of Duke ]
- The fault tolerance discipline distinguishes between a human action (a mistake), its manifestation (a hardware or software fault), the result of the fault (a failure), and the amount by which the result is incorrect (the error). [ IEEE 610.12 ]

## See also

Glossary:

- Defect
- Fault
- Fault Tolerance

Standards:

- IEEE 610.12
- ISO/IEC 9126-1
- ISO/IEC 14598-5
- ISO/IEC 25000
- ISO/IEC/IEEE 24765
- SIGIST

## 6.134. Failure Rate

The ratio of the number of failures of a given category to a given unit of measure. [ ISO/IEC/IEEE 24765 ]

## Notes

- Failures per unit of time, failures per number of transactions, failures per number of computer runs. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Defect Density
- Failure

Standards:

<sup>4</sup>J. C. Laprie (Ed.). Dependability: Basic Concepts and Terminology. Springer-Verlag, Wein, New York, 1992.

→ IEEE 829

## 6.135. Fault

An incorrect step, process or data definition in a computer program. [ IEEE 610.12, ISO/IEC 9126-1 ]

### Other Definitions

Fault [ RTCA/EUROCAE ]: A manifestation of an error in software. A fault, if encountered may cause a failure.

Fault [ ISO/IEC/IEEE 24765 ]:

1. a manifestation of an error in software.
2. an incorrect step, process, or data definition in a computer program.
3. a defect in a hardware device or component.

### See also

Glossary:

→ Defect

→ Failure

Standards:

→ IEEE 610.12

→ ISO/IEC 9126-1

→ ISO/IEC/IEEE 24765

→ RTCA/EUROCAE

## 6.136. Fault Tolerance

The capability of the software product to maintain a specified level of performance in cases of software faults or of infringement of its specified interface. [ ISO/IEC 9126-1 ]

### Other Definitions

Fault Tolerance [ IEEE 610.12 ]:

1. The ability of a system or component to continue normal operation despite the presence of hardware or software faults.
2. The number of faults a system or component can withstand before normal operation is impaired.
3. Pertaining to the study of errors, faults, and failures, and of methods for enabling systems to continue normal operation in the presence of faults.

### Notes

→ The specified level of performance may include fail safe capability. [ ISO/IEC 9126-1 ]

### See also

Glossary:

- Fault
- Reliability

Standards:

- ISO/IEC 9126-1
- IEEE 610.12

## 6.137. Feasibility

The degree to which the requirements, design, or plans for a system or component can be implemented under existing constraints. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC/IEEE 24765

## 6.138. Feature

Distinguishing characteristic of a system item. [ IEEE 829 ]

### Notes

- Includes both functional and nonfunctional attributes such as performance and reusability. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- IEEE 829
- ISO/IEC/IEEE 24765

## 6.139. Feature Freeze

A period during which no new features are added to a specific branch. [ IEEE 829 ]

### Notes

- Allows the branch to stabilize for a release. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Code Freeze
- Feature

Standards:

- IEEE 829

→ ISO/IEC/IEEE 24765

## 6.140. Finite State Machine

A computational model consisting of a finite number of states and transitions between those states, possibly with accompanying actions. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.141. Flexibility

The ease with which a system or component can be modified for use in applications or environments other than those for which it was specifically designed. [ ISO/IEC/IEEE 24765, IEEE 610.12 ]

### See also

Glossary:

→ Adaptability

→ Changeability

Standards:

→ ISO/IEC/IEEE 24765

→ IEEE 610.12

## 6.142. Frozen Branch

A branch where no development takes place, either in preparation for a release or because active development has ceased on it. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.143. Function

A software module that performs a specific action, is invoked by the appearance of its name in an expression, may receive input values, and returns a single value. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Function [ IEEE 1233 ]: A task, action, or activity that must be accomplished to achieve a desired outcome.

Function [ IEEE 1320 ]: A transformation of inputs to outputs, by means of some mechanisms, and subject to certain controls, that is identified by a function name and modeled by a box.

Function [ ISO/IEC 26514 ]: Part of an application that provides facilities for users to carry out their tasks.

Function [ ISO/IEC/IEEE 24765 ]: A defined objective or characteristic action of a system or component.

## See also

Glossary:

→ Routine

Standards:

→ IEEE 1233

→ IEEE 1320

→ ISO/IEC 26514

→ ISO/IEC/IEEE 24765

## 6.144. Functional Analysis

A systematic investigation of the functions of a real or planned system. [ ISO/IEC 2382-1 ]

### Other Definitions

Functional Analysis [ ISO/IEC/IEEE 24765 ]: Examination of a defined function to identify all the sub-functions necessary to accomplish that function, to identify functional relationships and interfaces (internal and external) and capture these in a functional architecture, to flow down upper-level performance requirements and to assign these requirements to lower-level sub-functions.

## See also

Standards:

→ ISO/IEC 2382-1

→ ISO/IEC/IEEE 24765

## 6.145. Functional Requirement

A statement that identifies what a product or process must accomplish to produce required behavior and/or results. [ IEEE 1220 ]

### Other Definitions

Model [ ISO/IEC/IEEE 24765 ]: A requirement that specifies a function that a system or system component must be able to perform.

## See also

Glossary:

→ Nonfunctional Requirement

→ Requirement

Standards:

- IEEE 1220
- ISO/IEC/IEEE 24765

## 6.146. Functional Size

A size of the software derived by quantifying the functional user requirements. [ ISO/IEC 14143-1 ]

### See also

Standards:

- ISO/IEC 14143

## 6.147. Functional Testing

Testing that ignores the internal mechanism of a system or component and focuses solely on the outputs generated in response to selected inputs and execution conditions. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

- Testing conducted to evaluate the compliance of a system or component with specified functional requirements. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Performance Testing
- Structural Testing
- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.148. Functional Unit

An entity of hardware or software, or both, capable of accomplishing a specified purpose. [ ISO/IEC 2382-1 ]

### See also

Standards:

- ISO/IEC 2382-1

## 6.149. Functionality

The capability of the software product to provide functions which meet stated and implied needs when the software is used under specified conditions. [ ISO/IEC 9126-1 ]



## Other Definitions

Functionality [ IEEE 1362 ]: The capabilities of the various computational, user interface, input, output, data management, and other features provided by a product.

## Notes

- Functionality is one of the six characteristics of quality in the ISO/IEC 9126 quality model.
- This characteristic is concerned with what the software does to fulfil needs, whereas the other characteristics are mainly concerned with when and how it fulfils needs. [ ISO/IEC 9126-1 ]
- For a system which is operated by a user, the combination of functionality, reliability, usability and efficiency can be measured externally by quality in use. [ ISO/IEC 9126-1 ]

## See also

Standards:

- IEEE 1362
- ISO/IEC 9126-1

## 6.150. Functionality Compliance

The capability of the software product to adhere to standards, conventions or regulations in laws and similar prescriptions relating to functionality. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Functionality

Standards:

- ISO/IEC 9126-1

## 6.151. Generality

The degree to which a system or component performs a broad range of functions. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.152. Generic Practice

An activity that, when consistently performed, contributes to the achievement of a specific process attribute. [ ISO/IEC 15504 ]

## See also

Standards:

→ ISO/IEC 15504

## 6.153. Glossary

The collection of the names and narrative descriptions of all terms that may be used for defined concepts within an environment. [ IEEE 1320 ]

### See also

Standards:

→ IEEE 1320

## 6.154. Goal

Intended outcome of user interaction with a product. [ ISO/IEC 25062 ]

### Other Definitions

Goal [ ISO/IEC 9126-4 ]: An intended outcome.

### See also

Standards:

→ ISO/IEC 9126

→ ISO/IEC 25062

## 6.155. Granularity

The depth or level of detail at which data is collected. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.156. Historical Information

Documents and data on prior projects including project files, records, correspondence, closed contracts, and closed projects. [ IEEE 1490 ]

### See also

Standards:

→ IEEE 1490

## 6.157. Hybrid Coupling

A type of coupling in which different subsets of the range of values that a data item can assume are used for different and unrelated purposes in different software modules. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Coupling

Standards:

→ ISO/IEC/IEEE 24765

## 6.158. Impact Analysis

Identification of all system and software products that a change request affects and development of an estimate of the resources needed to accomplish the change. [ ISO/IEC/IEEE 24765 ]

### Notes

→ This includes determining the scope of the changes to plan and implement work, accurately estimating the resources needed to perform the work, and analyzing the requested changes' cost and benefits. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.159. Implementation

The process of translating a design into hardware components, software components, or both. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Implementation ISO/IEC/IEEE 24765 ]: The installation and customization of packaged software.

Implementation ISO/IEC/IEEE 24765 ]: Construction.

Implementation ISO/IEC 2382 ]: The system development phase at the end of which the hardware, software and procedures of the system considered become operational.

Implementation ISO/IEC 26514 ]: Phase of development during which user documentation is created according to the design, tested, and revised.

## See also

Glossary:

→ Coding

Standards:

→ ISO/IEC/IEEE 24765

## 6.160. Implied Needs

Needs that may not have been stated but are actual needs. [ ISO/IEC 25000 ]

### Other Definitions

Implied Needs [ ISO/IEC 9126-1, ISO/IEC 14598-1 ]: Needs that may not have been stated but are actual needs when the entity is used in particular conditions.

### Notes

- Implied needs are real needs which may not have been documented. [ ISO/IEC 9126-1 ]

### See also

Glossary:

- Requirement

Standards:

- ISO/IEC 9126-1
- ISO/IEC 14598-1
- ISO/IEC 25000

## 6.161. Incremental Development

A software development technique in which requirements definition, design, implementation, and testing occur in an overlapping, iterative (rather than sequential) manner, resulting in incremental completion of the overall software product. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC/IEEE 24765

## 6.162. Indicator

Measure that provides an estimate or evaluation of specified attributes derived from a model with respect to defined information needs. [ ISO/IEC 15939, ISO/IEC 25000 ]

### Other Definitions

Indicator [ ISO/IEC 9126-1, ISO/IEC 14598-1 ]: A measure that can be used to estimate or predict another measure.

### Notes

- Example: A flag or semaphore. [ ISO/IEC/IEEE 24765 ]
- The predicted measure may be of the same or a different software quality characteristic. ISO/IEC 9126-1
- Indicators may be used both to estimate software quality attributes and to estimate attributes of the development process. They are imprecise indirect measures of the attributes. ISO/IEC 9126-1

## See also

Glossary:

→ Indicator Value

Standards:

→ ISO/IEC 9126-1

→ ISO/IEC 15939

## 6.163. Indicator Value

Numerical or categorical result assigned to an indicator. [ ISO/IEC 15939 ]

## See also

Glossary:

→ Indicator

Standards:

→ ISO/IEC 15939

## 6.164. Indirect Measure

A measure of an attribute that is derived from measures of one or more other attributes. [ ISO/IEC 14598 ]

## Notes

→ An external measure of an attribute of a computing system (such as the response time to user input) is an indirect measure of attributes of the software as the measure will be influenced by attributes of the computing environment as well as attributes of the software. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Base Measure

→ Derived Measure

→ Direct Measure

→ External Measure

→ Internal Measure

Papers:

→ Software Engineering Metrics: What Do They Measure And How Do We Know [https://maisqual.squoring.com/wiki/index.php/Software\_Engineering\_Metrics:\_What\_Do\_They\_Measure\_And\_How\_Do\_We\_Know]

Standards:

→ ISO/IEC 14598

→ ISO/IEC 9126-1

## 6.165. Indirect Metric

An Indirect Metric is a metric that is derived from one or more other metrics. [ IEEE 1061 ]

### See also

Glossary:

→ Direct Metric

→ Metric

Standards:

→ IEEE 1061

## 6.166. Information

An information processing, knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning. [ ISO/IEC 2382-1 ]

### Notes

→ Although information will necessarily have a representation form to make it communicable, it is the interpretation of this representation (the meaning) that is relevant in the first place. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Information Analysis

Standards:

→ ISO/IEC 2382-1

→ ISO/IEC/IEEE 24765

## 6.167. Information Analysis

A systematic investigation of information and its flow in a real or planned system. [ ISO/IEC 2382-1 ]

### See also

Glossary:

→ Information

Standards:

→ ISO/IEC 2382-1

## 6.168. Information Management

In an information processing system, the functions of controlling the acquisition, analysis, retention, retrieval, and distribution of information. [ ISO/IEC 2382-1 ]

### See also

Glossary:

→ Information

Standards:

→ ISO/IEC 2382-1

## 6.169. Information Need

Insight necessary to manage objectives, goals, risks, and problems. [ ISO/IEC 15939 ]

### See also

→ ISO/IEC 15939

## 6.170. Information Product

One or more indicators and their associated interpretations that address an information need. [ ISO/IEC 15939, ISO/IEC 25000 ]

### Example

→ A comparison of a measured defect rate to planned defect rate along with an assessment of whether or not the difference indicates a problem. [ ISO/IEC 15939 ]

### See also

Glossary:

→ Indicator

→ Information

Standards:

→ ISO/IEC 15939

→ ISO/IEC 25000

## 6.171. Inspection

A static analysis technique that relies on visual examination of development products to detect errors, violations of development standards, and other problems. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Inspection [ IEEE 1490 ]: Examining or measuring to verify whether an activity, component, product, result, or service conforms to specified requirements.

## Notes

- Inspections are peer examinations led by impartial facilitators who are trained in inspection techniques. Determination of remedial or investigative action for an anomaly is a mandatory element of a software inspection, although the solution should not be determined in the inspection meeting. Types include code inspection; design inspection. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.172. Installability

The capability of the software product to be installed in a specified environment. [ ISO/IEC 9126-1 ]

## Notes

- If the software is to be installed by an end user, installability can affect the resulting suitability and operability. [ ISO/IEC 9126-1 ]

## See also

- ISO/IEC 9126-1

## 6.173. Installation Manual

A document that provides the information necessary to install a system or component, set initial parameters, and prepare the system or component for operational use. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Document
- Maintenance Manual
- Operator Manual
- Support Manual
- User Manual

Standards:

- ISO/IEC/IEEE 24765

## 6.174. Integration

The process of combining software components, hardware components, or both into an overall system. [ ISO/IEC/IEEE 24765 ]



## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.175. Integration Test

The progressive linking and testing of programs or modules in order to ensure their proper functioning in the complete system. [ ISO/IEC 2382 ]

## See also

Glossary:

→ Integration

→ Testing

Standards:

→ ISO/IEC 2382

## 6.176. Integrity

The degree to which a system or component prevents unauthorized access to, or modification of, computer programs or data. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.177. Interface Testing

Testing conducted to evaluate whether systems or components pass data and control correctly to one another. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Integration Test

→ System Testing

→ Testing

→ Unit Test

Standards:

→ ISO/IEC/IEEE 24765

## 6.178. Intermediate Software Product

A product of the software development process that is used as input to another stage of the software development process. [ ISO/IEC 14598, ISO/IEC 9126-1, ISO/IEC 25000 ]

## Notes

- Example: static and dynamic models, other documents and source code. [ ISO/IEC/IEEE 24765 ]
- In some cases an intermediate product may also be an end product. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Software Product

Standards:

- ISO/IEC 9126-1
- ISO/IEC 14598
- ISO/IEC/IEEE 24765
- ISO/IEC 25000

## 6.179. Internal Attribute

A measurable property of an entity which can be derived purely in terms of the entity itself. [ ISO/IEC 14598, ISO/IEC/IEEE 24765 ]

## Notes

- Internal attributes are those that relate to the internal organization of the software and its development. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- External Attribute

Standards:

- ISO/IEC 14598
- ISO/IEC/IEEE 24765

## 6.180. Internal Measure

A measure of the product itself, either direct or indirect. [ ISO/IEC 14598, ISO/IEC 9126-1, ISO/IEC/IEEE 24765 ]

## Notes

- An external measure of an attribute of a computing system (such as the response time to user input) is an indirect measure of attributes of the software as the measure will be influenced by attributes of the computing environment as well as attributes of the software. [ ISO/IEC 9126-1 ]
- The number of lines of code, complexity measures, the number of faults found in a walk through and the Fog Index are all internal measures made on the product itself. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Direct Measure
- External Measure
- Indirect Measure
- Measure

Standards:

- ISO/IEC 14598
- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765

## 6.181. Internal Quality

The totality of attributes of a product that determine its ability to satisfy stated and implied needs when used under specified conditions. [ ISO/IEC 9126-1, ISO/IEC/IEEE 24765 ]

### Notes

- Internal quality is the totality of characteristics of the software product from an internal view. Internal quality is measured and evaluated against the internal quality requirements. Details of software product quality can be improved during code implementation, reviewing and testing, but the fundamental nature of the software product quality represented by internal quality remains unchanged unless redesigned. [ ISO/IEC 9126-1 ]
- The term "internal quality", used in ISO/IEC 14598 to contrast with "external quality", has essentially the same meaning as "quality" in ISO 8402. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- External Quality
- Quality in Use

Standards:

- ISO/IEC 9126
- ISO/IEC 9126-1
- ISO/IEC 9126-3
- ISO/IEC 14598
- ISO/IEC/IEEE 24765

## 6.182. Internal Software Quality

Capability of a set of static attributes of a software product to satisfy stated and implied needs when the software product is used under specified conditions. [ ISO/IEC 25000 ]

## Examples

- The number of lines of code, complexity measures and the number of faults found in a walkthrough are all internal software quality measures made on the product itself. [ ISO/IEC/IEEE 24765 ]

## Notes

- Static attributes include those that relate to the software architecture, structure and its components. Static attributes can be verified by review, inspection and/or automated tools. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- External Software Quality

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.183. Interoperability

The capability of the software product to interact with one or more specified systems. [ ISO/IEC 9126-1 ]

### Notes

- Interoperability is used in place of compatibility in order to avoid possible ambiguity with replaceability. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.184. Interoperability Testing

Testing conducted to ensure that a modified system retains the capability of exchanging information with systems of different types, and of using that information. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.185. Interval Scale

Scale in which the measurement values have equal distances corresponding to equal quantities of the attribute. [ ISO/IEC/IEEE 24765 ]

## Notes

- Example: Cyclomatic complexity has the minimum value of one, but each increment represents an additional path. The value of zero is not possible. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Scale

Standards:

- ISO/IEC/IEEE 24765

## 6.186. Item

An entity such as a part, component, subsystem, equipment or system that can be individually considered. An item may consist of hardware, software or both. [ ISO/IEC 15026 ]

## See also

Standards:

- ISO/IEC 15026

## 6.187. Iteration

1. The process of performing a sequence of steps repeatedly.
2. A single execution of the sequence of steps. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.188. Key Practices

The infrastructures and activities that contribute most to the effective implementation and institutionalization of a key process area. [ CMMi ]

## Notes

In the CMMi process, each key process area is described in terms of the key practices that contribute to satisfying its goals. The key practices describe the infrastructure and activities that contribute most to the effective implementation and institutionalization of the key process area.

Each key practice consists of a single sentence, often followed by a more detailed description, which may include examples and elaboration. These

key practices, also referred to as the top-level key practices, state the fundamental policies, procedures, and activities for the key process area.

The components of the detailed description are frequently referred to as sub-practices.

The key practices describe "what" is to be done, but they should not be interpreted as mandating "how" the goals should be achieved. Alternative practices may accomplish the goals of the key process area. The key practices should be interpreted rationally to judge whether the goals of the key

process area are effectively, although perhaps differently, achieved.

### See also

- CMMi
- Key Process Area

## 6.189. Key Process Area

A cluster of related activities that, when performed collectively, achieve a set of goals considered important for establishing process capability. [ CMMi ]

### Notes

The key process areas have been defined to reside at a single maturity level. They are the areas identified by the SEI [<http://www.sei.cmu.edu>] to be the principal building blocks to help determine the software process capability of an organization and understand the improvements needed to advance to higher maturity levels.

- The Level 2 key process areas in the CMMi are Requirements Management, Software Project Planning, Software Project Tracking and Oversight, Software Subcontract Management, Software Quality Assurance, and Software Configuration Management.
- The Level 3 key process areas in the CMMi are Organization Process Focus, Organization Process Definition, Training Program, Integrated Software Management, Software Product Engineering, Intergroup Coordination, and Peer Reviews.
- The Level 4 key process areas are Quantitative Process Management and Software Quality Management.
- The Level 5 key process areas are Defect Prevention, Technology Change Management, and Process Change Management.

### See also

- CMMi
- Key Practices

## 6.190. Knowledge Base

A database that contains inference rules and information about human experience and expertise in a domain. [ ISO/IEC 2382-1 ]

### See also

- Standards:
- ISO/IEC 2382-1

## 6.191. Learnability

The capability of the software product to enable the user to learn its application. [ ISO/IEC 9126-1 ]

## Notes

→ The internal attributes correspond to suitability for learning as defined in ISO 9241-10. [ ISO/IEC 9126-1 ]

## See also

Standards:

→ ISO/IEC 9126-1

## 6.192. Lessons Learned

The learning gained from the process of performing the project. Lessons learned may be identified at any point. Also considered a project record, to be included in the lessons learned knowledge base. [ IEEE 1490 ]

## See also

Glossary:

→ Knowledge Base

Standards:

→ IEEE 1490

## 6.193. Level of Performance

The degree to which the needs are satisfied, represented by a specific set of values for the quality characteristics. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Performance

→ Performance Indicator

Standards:

→ ISO/IEC 9126-1

## 6.194. Life Cycle

Evolution of a system, product, service, project or other human-made entity from conception through retirement. [ ISO/IEC 12207, ISO/IEC 15288 ]

## Other Definitions

Life Cycle [ IEEE 1220 ]: The system or product evolution initiated by a perceived stakeholder need through the disposal of the products.

## See also

Glossary:

→ Life Cycle Model

Standards:

→ IEEE 1220

→ ISO/IEC 12207

→ ISO/IEC 15288

## 6.195. Life Cycle Model

Framework of processes and activities concerned with the life cycle that may be organized into stages, which also acts as a common reference for communication and understanding. [ ISO/IEC 12207, ISO/IEC 15288 ]

## See also

Glossary:

→ Life Cycle

Standards:

→ ISO/IEC 12207

→ ISO/IEC 15288

## 6.196. Maintainability

The capability of the software product to be modified. [ ISO/IEC 9126-1, ISO/IEC 14764 ]

## Other Definitions

Maintainability [ ISO/IEC/IEEE 24765 ]: The ease with which a software system or component can be modified to change or add capabilities, correct faults or defects, improve performance or other attributes, or adapt to a changed environment.

Maintainability [ ISO/IEC/IEEE 24765 ]: The average effort required to locate and fix a software failure.

Maintainability [ IEEE 982 ]: Speed and ease with which a program can be corrected or changed.

## Notes

→ Modifications may include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications. [ ISO/IEC 9126-1

## See also

Glossary:

→ Extendability

→ Flexibility



- Maintainer
- Maintenance

Standards:

- IEEE 982
- ISO/IEC 9126-1
- ISO/IEC 14764
- ISO/IEC/IEEE 24765

## 6.197. Maintainability Compliance

The capability of the software product to adhere to standards or conventions relating to maintainability. [ ISO/IEC 9126-1 ]

### See also

Glossary:

- Maintainability

Standards:

- ISO/IEC 9126-1

## 6.198. Maintainer

Individual or organization that performs maintenance activities. [ ISO/IEC 25000 ]

### Other Definitions

Maintainer [ ISO/IEC 9126-1, ISO/IEC 12207, ISO/IEC 14598 ]: An organisation that performs maintenance activities.

### See also

Glossary:

- Maintainability
- Maintenance

Standards:

- ISO/IEC 9126-1
- ISO/IEC 12207
- ISO/IEC 14598
- ISO/IEC 25000

## 6.199. Maintenance

The process of modifying a software system or component after delivery to correct faults, improve performance or other attributes, or adapt to a changed environment. [ IEEE 610.12, ISO/IEC/IEEE 24765 ]

## Other Definitions

Software Maintenance [ ISO/IEC 14764 ]: The totality of activities required to provide cost-effective support to a software system.

## Notes

- Maintenance activities include <sup>5</sup>:
- \* Perfective maintenance - Changes which improve the system in some way without changing its functionality;
- \* Adaptive maintenance - Maintenance which is required because of changes in the environment of a program;
- \* Corrective maintenance - The correction of previously undiscovered system errors.
- Maintainability is defined as the effort to perform maintenance tasks, the impact domain of the maintenance actions, and the error rate caused by those actions. <sup>6</sup>
- Pre-delivery activities include planning for post-delivery operations, supportability, and logistics determination. Post-delivery activities include software modification, training, and operating a help desk. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Maintainability
- Maintainer
- Maintenance Manual

Standards:

- IEEE 610.12
- ISO/IEC 14764
- ISO/IEC/IEEE 24765

## 6.200. Maintenance Manual

A software engineering project-deliverable document that enables a system's maintenance personnel (rather than users) to maintain the system. [ ISO/IEC/IEEE 24765 ]

## Notes

- Maintenance Manual is synonym for Support Manual. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Document
- Installation Manual
- Operator Manual

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<sup>5</sup>Ian Sommerville, "Software Engineering". Addison-Wesley, 1996.

<sup>6</sup>Harry M. Sneed & Agnes Kaposi. "A study on the effect of reengineering on maintainability". In Proceedings of the International Conference on Software Maintenance 1990, pages 91-99. IEEE, Computer Society Press 1990.

→ Support Manual

→ User Manual

Standards:

→ ISO/IEC/IEEE 24765

## 6.201. Maturity

The capability of the software product to avoid failure as a result of faults in the software. [ ISO/IEC 9126-1 ]

See also

Standards:

→ ISO/IEC 9126-1

## 6.202. Measurable Concept

Abstract relationship between attributes of entities and information needs. [ ISO/IEC 15939 ]

See also

→ ISO/IEC 15939

## 6.203. Measurand

Particular quantity subject to measurement. [ ISO/IEC 14143-3, ISO/IEC/IEEE 24765 ]

Notes

→ Example of operand: vapor pressure of a given sample of water at 20 °C. [ ISO/IEC/IEEE 24765 ]

→ The specification of a measurand may require statements about quantities such as time, temperature and pressure. [ ISO/IEC 99 ]

See also

Standards:

→ ISO/IEC 99

→ ISO/IEC 14143-3

→ ISO/IEC/IEEE 24765

## 6.204. Measure

Variable to which a value is assigned as the result of measurement. [ ISO/IEC 15939, ISO/IEC 25000 ]

Other Definition

Measure (verb) [ ISO/IEC 14598, ISO/IEC 15939 ]: To make a measurement.

Measure [ IEEE 1061 ]: A way to ascertain or appraise value by comparing it to a norm.

Measure (verb) [ IEEE 1061 ]: To apply a metric.

Measure [ ISO/IEC 14598 ]: The number or category assigned to an attribute of an entity by making a measurement.

Measure [ IEEE 982 ]: The number or symbol assigned to an entity by a mapping from the empirical world to the formal, relational world in order to characterize an attribute.

Measure [ IEEE 982 ]: The act or process of measuring.

## Notes

- The term "measures" is used to refer collectively to base measures, derived measures, and indicators. [ ISO/IEC 15939 ]

## See also

Glossary:

- Base Measure
- Derived Measure
- Direct Measure
- Indicator
- Indirect Measure
- Measurement
- Metric

Papers:

- Software Engineering Metrics: What Do They Measure And How Do We Know [[https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know)]

Standards:

- IEEE 982
- IEEE 1061
- ISO/IEC 14598
- ISO/IEC 15939
- ISO/IEC 25000

## 6.205. Measurement

Set of operations having the object of determining a value of a measure. [ ISO/IEC 25000 ]

### Other Definitions

Measurement [ ISO/IEC 99, ISO/IEC 15939 ]: Set of operations having the object of determining a value of a measure.

Measurement [ IEEE 1061 ]: Act or process of assigning a number or category to an entity to describe an attribute of that entity.

Measurement [ ISO/IEC 19759 ]: The assignment of numbers to objects in a systematic way to represent properties of the object.

Measurement [ ISO/IEC 9126-1, ISO/IEC 14598 ]: The use of a metric to assign a value (which may be a number or category) from a scale to an attribute of an entity.

Measurement [ ISO/IEC 19759 ]: the assignment of values and labels to aspects of software engineering (products, processes, and resources) and the models that are derived from them, whether these models are developed using statistical, expert knowledge or other techniques.

## Notes

- Measurement can be qualitative when using categories. For example, some important attributes of software products, e.g. the language of a source program (ADA, C, COBOL, etc.) are qualitative categories. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Measure

Standards:

- IEEE 1061
- ISO/IEC 99
- ISO/IEC 9126-1
- ISO/IEC 14598
- ISO/IEC 15939
- ISO/IEC 19759
- ISO/IEC 25000

## 6.206. Measurement Analyst

Individual or organisation that is responsible for the planning, performance, evaluation, and improvement of measurement. [ ISO/IEC 15939 ]

### See also

- ISO/IEC 15939

## 6.207. Measurement Experience Base

Data store that contains the evaluation of the information products and the measurement process as well as any lessons learned during the measurement process. [ ISO/IEC 15939 ]

### See also

- ISO/IEC 15939

## 6.208. Measurement Function

Algorithm or calculation performed to combine two or more base measures. [ ISO/IEC 15939, ISO/IEC 25000 ]

## Notes

- A function is an algorithm or calculation performed to combine two or more base measures. The scale and unit of the derived measure depend on the scales and units of the base measures from which it is composed as well as how they are combined by the function. [ ISO/IEC 15939 ]

## See also

Glossary:

- Measure
- Measurement

Standards:

- ISO/IEC 15939
- ISO/IEC 25000

## 6.209. Measurement Method

Logical sequence of operations, described generically, used in quantifying an attribute with respect to a specified scale. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

## Notes

- The type of measurement method depends on the nature of the operations used to quantify an attribute. Two types may be distinguished:
  - \* subjective — quantification involving human judgement,
  - \* objective — quantification based on numerical rules. [ ISO/IEC 15939 ]

## See also

Glossary:

- Attribute

Standards:

- ISO/IEC 99
- ISO/IEC 15939
- ISO/IEC 25000

## 6.210. Measurement Procedure

Set of operations, described specifically, used in the performance of a particular measurement according to a given method. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

## See also

Glossary:

→ Measurement Method

Standards:

→ ISO/IEC 99

→ ISO/IEC 15939

→ ISO/IEC 25000

## 6.211. Measurement Process

The process for establishing, planning, performing and evaluating software measurement within an overall project or organisational measurement structure. [ ISO/IEC 15939 ]

See also

→ ISO/IEC 15939

## 6.212. Measurement Process Owner

Individual or organisation responsible for the measurement process. [ ISO/IEC 15939 ]

See also

Glossary:

→ Measurement Process

Standards:

→ ISO/IEC 15939

## 6.213. Measurement Sponsor

Individual or organisation that authorises and supports the establishment of the measurement process. [ ISO/IEC 15939 ]

See also

Glossary:

→ Measurement Process

Standards:

→ ISO/IEC 15939

## 6.214. Measurement User

Individual or organisation that uses the information products. [ ISO/IEC 15939 ]

See also

Glossary:

→ Information Product

Standards:

→ ISO/IEC 15939

## 6.215. Metric

The defined measurement method and the measurement scale. [ ISO/IEC 14598, ISO/IEC 9126-1 ]

### Notes

- Metrics can be internal or external, and direct or indirect. [ ISO/IEC 9126-1 ]
- Metrics include methods for categorising qualitative data. [ ISO/IEC 9126-1 ]

### See also

Glossary:

- Direct Measure
- External Measure
- Indirect Measure
- Internal Measure
- Measure
- Measurement Method
- Scale

Standards:

- ISO/IEC 9126-1
- ISO/IEC 14598

## 6.216. Milestone

A significant point or event in the project. [ IEEE 1490 ]

### Other Definitions

Milestone [ IEEE 1058 ]: A scheduled event used to measure progress.

### Notes

- Major milestones for software projects may include an acquirer or managerial sign-off, baselining of a specification, completion of system integration, and product delivery. Minor milestones might include baselining of a software module or completion of a chapter of the user manual

### See also

Glossary:

- Base Measure
- Decision Criteria



- Derived Measure
- Measurement Function

Standards:

- ISO/IEC 15939

## 6.217. Mock Object

Temporary dummy objects created to aid testing until the real objects become available. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.218. Model

A semantically closed abstraction of a system or a complete description of a system from a particular perspective. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Model [ IEEE 1233 ]: A representation of a real world process, device, or concept.

Model [ ISO/IEC 15474 ]: A related collection of instances of meta-objects, representing (describing or prescribing) an information system, or parts thereof, such as a software product.

### See also

Standards:

- IEEE 1233
- ISO/IEC 15474
- ISO/IEC/IEEE 24765

## 6.219. Modifiability

The ease with which a system can be changed without introducing defects. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Flexibility
- Maintainability

Standards:

→ ISO/IEC/IEEE 24765

## 6.220. Modifiable

Structured and has a style such that changes can be made completely, consistently, and correctly while retaining the structure. [ ISO/IEC 12207 ]

### See also

Standards:

→ ISO/IEC 12207

## 6.221. Modularity

The degree to which a system or computer program is composed of discrete components such that a change to one component has minimal impact on other components. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Modularity [ ISO/IEC/IEEE 24765 ]: Software attributes that provide a structure of highly independent components.

Modularity [ ISO/IEC/IEEE 24765 ]: The extent to which a routine or module is like a black box

### See also

Glossary:

→ Cohesion

→ Coupling

→ Module

Standards:

→ ISO/IEC/IEEE 24765

## 6.222. Module

A program unit that is discrete and identifiable with respect to compiling, combining with other units, and loading. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Module [ ISO/IEC/IEEE 24765 ]:

1. A logically separable part of a program.
2. A set of source code files under version control that can be manipulated together as one.
3. A collection of both data and the routines that act on it.

## Notes

- The terms 'module', 'component,' and 'unit' are often used interchangeably or defined to be sub-elements of one another in different ways depending upon the context. The relationship of these terms is not yet standardized.

## See also

Glossary:

- Component
- Modularity

Standards:

- ISO/IEC/IEEE 24765

## 6.223. Moke Object

Temporary dummy objects created to aid testing until the real objects become available. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.224. Multidimensional Analysis

Multidimensional analysis is a measurement function that weights different base measures to give a more relevant insight of the final goal of the measure.

It was primarily developed by Kaner and Bond in Software Engineering Metrics: What Do They Measure And How Do We Know [[https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know)].

## See also

- Software Engineering Metrics: What Do They Measure And How Do We Know [[https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know)]

## 6.225. Network

An arrangement of nodes and interconnecting branches. [ ISO/IEC 2382-1 ]

## See also

Standards:

→ ISO/IEC 2382

## 6.226. Nonfunctional Requirement

A software requirement that describes not what the software will do but how the software will do it. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Software performance requirements, software external interface requirements, software design constraints, and software quality attributes. Nonfunctional requirements are sometimes difficult to test, so they are usually evaluated subjectively. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Functional Requirement

→ Requirement

Standards:

→ ISO/IEC/IEEE 24765

## 6.227. Nontechnical Requirement

Requirement affecting product and service acquisition or development that is not a property of the product or service. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Example: numbers of products or services to be delivered; data rights for delivered COTS nondevelopmental items; delivery dates; milestones with exit criteria; work constraints associated with training, site provisions, and deployment schedules. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Requirement

→ Technical Requirement

Standards:

→ ISO/IEC/IEEE 24765

## 6.228. Object

An encapsulation of data and services that manipulate that data. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Object [ ISO/IEC/IEEE 24765 ]: A specific entity that exists in a program at runtime in object-oriented programming.

Object [ ISO/IEC/IEEE 24765 ]: Pertaining to the outcome of an assembly or compilation process.

Object [ IEEE 1320 ]: A member of an object set and an instance of an object type.

## See also

Glossary:

→ Object Model

Standards:

→ IEEE 1320

→ ISO/IEC/IEEE 24765

## 6.229. Object Model

An integrated abstraction that treats all activities as performed by collaborating objects and encompassing both the data and the operations that can be performed against that data. [ ISO/IEC 12207 ]

### Notes

→ An object model captures both the meanings of the knowledge and actions of objects behind the abstraction of responsibility. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC 12207

→ ISO/IEC/IEEE 24765

## 6.230. Object Oriented Design

A software development technique in which a system or component is expressed in terms of objects and connections between those objects. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Object

→ Object Model

Standards:

→ ISO/IEC/IEEE 24765

## 6.231. Observation

Instance of applying a measurement procedure to produce a value for a base measure. [ ISO/IEC 15939, ISO/IEC 25000 ]

## See also

Standards:

- ISO/IEC 15939
- ISO/IEC 25000

## 6.232. Observation Period

The time interval, where the measurement procedure is observed for collecting (logging) measurement results for rating or validation, consisting of the rating interval and the supplementary run. [ ISO/IEC 14756 ]

## See also

Standards:

- ISO/IEC 14756

## 6.233. Operability

The capability of the software product to enable the user to operate and control it. [ ISO/IEC 9126-1 ]

## Notes

- Aspects of suitability, changeability, adaptability and installability may affect operability. [ ISO/IEC 9126-1 ]
- Operability corresponds to controllability, error tolerance and conformity with user expectations as defined in ISO 9241-10. [ ISO/IEC 9126-1 ]
- For a system which is operated by a user, the combination of functionality, reliability, usability and efficiency can be measured externally by quality in use. [ ISO/IEC 9126-1 ]

## See also

Standards:

- ISO/IEC 9126-1
- ISO 9241-10

## 6.234. Operand

A variable, constant, or function upon which an operation is to be performed. [ ISO/IEC/IEEE 24765 ]

## Notes

- Example: in the expression  $A = B + 3$ , B and 3 are the operands. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.235. Operational Testing

Testing conducted to evaluate a system or component in its operational environment. [ ISO/IEC 15504 ]

### See also

Glossary:

- Acceptance Testing
- Development Testing
- Qualification Testing
- Testing

Standards:

- IEEE 829
- ISO/IEC 15504

## 6.236. Operator

Individual or organisation that operates the system. [ ISO/IEC 12207, ISO/IEC 15939, ISO/IEC 25000 ]

### Other Definitions

Operator [ ISO/IEC/IEEE 24765 ]: A mathematical or logical symbol that represents an action to be performed in an operation.

Operator [ ISO/IEC 12207, ISO/IEC 15288 ]: Entity that performs the operation of a system.

Operator [ IEEE 1220 ]: An individual or an organization that contributes to the functionality of a system and draws on knowledge, skills, and procedures to contribute the function.

### Notes

- The role of operator and the role of user may be vested, simultaneously or sequentially, in the same individual or organization. An individual operator combined with knowledge, skills and procedures may be considered as an element of the system. In the context of this specific definition, the term entity means an individual or an organization. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Operand
- Operator Manual
- User

Standards:

- IEEE 1220
- ISO/IEC 12207
- ISO/IEC 15939

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.237. Operator Manual

A document that provides the information necessary to initiate and operate a system or component. [ ISO/IEC/IEEE 24765 ]

### Notes

- Typically described are procedures for preparation, operation, monitoring, and recovery. An operator manual is distinguished from a user manual when a distinction is made between those who operate a computer system (mounting tapes, etc) and those who use the system for its intended purpose. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Document
- Installation Manual
- Maintenance Manual
- Operator
- Support Manual
- User Manual

Standards:

- ISO/IEC/IEEE 24765

## 6.238. Optional Attribute

An attribute that may have no value for an instance. [ IEEE 1320 ]

### Notes

- Typically described are procedures for preparation, operation, monitoring, and recovery. An operator manual is distinguished from a user manual when a distinction is made between those who operate a computer system (mounting tapes, etc) and those who use the system for its intended purpose. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Attribute

Standards:

- IEEE 1320

## 6.239. Optional Requirement



Requirement of a normative document that must be fulfilled in order to comply with a particular option permitted by that document. [ ISO/IEC 14143 ]

## Notes

- Typically described are procedures for preparation, operation, monitoring, and recovery. An operator manual is distinguished from a user manual when a distinction is made between those who operate a computer system (mounting tapes, etc) and those who use the system for its intended purpose. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Requirement

Standards:

- ISO/IEC 14143

## 6.240. Organisational Unit

The part of an organisation that is the subject of measurement. [ ISO/IEC 15504-9, ISO/IEC 15939 ]

## Notes

- An organisational unit deploys one or more processes that operate within a coherent set of business goals. [ ISO/IEC 15939 ]

## See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15939

## 6.241. Path

In software engineering, a sequence of instructions that may be performed in the execution of a computer program. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Path [ ISO/IEC/IEEE 24765 ]: In file access, a hierarchical sequence of directory and subdirectory names specifying the storage location of a file.

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.242. Path Analysis

Analysis of a computer program to identify all possible paths through the program, to detect incomplete paths, or to discover portions of the program that are not on any path. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Path
- Path Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.243. Path Testing

Testing designed to execute all or selected paths through a computer program. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Branch Testing
- Path
- Path Analysis
- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.244. Pathological Coupling

A type of coupling in which one software module affects or depends upon the internal implementation of another. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Content Coupling
- Control Coupling
- Coupling
- Data Coupling
- Hybrid Coupling

Standards:

- ISO/IEC/IEEE 24765

## 6.245. Peer Review

A review of a software work product, following defined procedures, by peers of the producers of the product for the purpose of identifying defects and improvements. [ CMMi ]

## Other Definitions

Peer Review [ ISO/IEC/IEEE 24765 ]: Review of work products performed by peers during development of the work products to identify defects for removal.

## See also

Glossary:

→ Inspection

Standards:

→ CMMi

→ ISO/IEC/IEEE 24765

## 6.246. Performance

The degree to which a system or component accomplishes its designated functions within given constraints, such as speed, accuracy, or memory usage. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Level of Performance

→ Performance Indicator

→ Performance Testing

→ Process Performance

Standards:

→ ISO/IEC/IEEE 24765

## 6.247. Performance Indicator

An assessment indicator that supports the judgment of the process performance of a specific process. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Indicator

→ Performance

Standards:

→ ISO/IEC/IEEE 24765

## 6.248. Performance Testing

Testing conducted to evaluate the compliance of a system or component with specified performance requirements. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Functional Testing
- Performance
- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.249. Pilot Project

A project designed to test a preliminary version of an information processing system under actual but limited operating conditions and which will then be used to test the definitive version of the system. [ ISO/IEC 2382 ]

### See also

Standards:

- ISO/IEC 2382

## 6.250. Portability

The capability of the software product to be transferred from one environment to another. [ ISO/IEC 9126-1 ]

### Other Definitions

Portability [ ISO/IEC/IEEE 24765 ]: The ease with which a system or component can be transferred from one hardware or software environment to another.

Portability [ ISO/IEC 2382 ]: The capability of a program to be executed on various types of data processing systems without converting the program to a different language and with little or no modification.

### Notes

- The environment may include organisational, hardware or software environment. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.251. Portability Compliance

The capability of the software product to adhere to standards or conventions relating to portability. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Portability

Standards:

→ ISO/IEC 9126-1

## 6.252. Practice

An activity that contributes to the purpose or outcomes of a process or enhances the capability of a process. [ ISO/IEC 15504 ]

### Other Definitions

Practice [ ISO/IEC/IEEE 24765 ]: Requirements employed to prescribe a disciplined uniform approach to the software development process.

Practice [ IEEE 1490 ]: A specific type of professional or management activity that contributes to the execution of a process and that may employ one or more techniques and tools.

## See also

Glossary:

→ Key Practices

Standards:

→ IEEE 1490

→ ISO/IEC 15504

→ ISO/IEC/IEEE 24765

## 6.253. Precision

The degree of exactness or discrimination with which a quantity is stated. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Example: a precision of 2 decimal places versus a precision of 5 decimal places. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Accuracy

Standards:

→ ISO/IEC/IEEE 24765

## 6.254. Predictive Metric

A metric applied during development and used to predict the values of a software quality factor. [ IEEE 1061 ]

### See also

Glossary:

→ Metric

Standards:

→ IEEE 1061

## 6.255. Procedure

Ordered series of steps that specify how to perform a task. [ ISO/IEC 26514 ]

### Other Definitions

Procedure [ ISO/IEC 19770 ]: Specified way to carry out an activity or process.

Procedure [ ISO/IEC/IEEE 24765 ]: A portion of a computer program that is named and that performs a specific action.

Procedure [ ISO/IEC/IEEE 24765 ]: A routine that does not return a value.

### See also

Glossary:

→ Action

→ Step

→ Process

Standards:

→ ISO/IEC 19770

→ ISO/IEC 26514

→ ISO/IEC/IEEE 24765

## 6.256. Process

System of activities, which use resources to transform inputs into outputs. [ ISO/IEC" 25000 ]

### Other Definitions

Process [ ISO/IEC 15504-9, ISO/IEC 15939 ]: Set of interrelated activities that transform inputs into outputs.

Process [ ISO/IEC 2382 ]: Predetermined course of events defined by its purpose or by its effect, achieved under given conditions.

Process (verb) [ ISO/IEC/IEEE 24765 ]: To perform operations on data.

Process [ ISO/IEC 15414 ]: A collection of steps taking place in a prescribed manner and leading to an objective.

Process [ ISO/IEC 2382 ]: In data processing, the predetermined course of events that occur during the execution of all or part of a program.

## Notes

- In [ISO 9000:2005] the term "activities" covers use of resources. A process may have multiple starting points and multiple end points. The prescribed manner may be a partially ordered sequence. A process specification can be a workflow specification. An enterprise specification may define types of processes and may define process templates. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 2382
- ISO/IEC 15504
- ISO/IEC 15939
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.257. Process Assessment

A disciplined evaluation of an organizational unit's processes against a Process Assessment Model. [ ISO/IEC 15504 ]

## See also

Glossary:

- Process
- Process Assessment Model

Standards:

- ISO/IEC 15504

## 6.258. Process Assessment Model

A model suitable for the purpose of assessing process capability, based on one or more process reference models. [ ISO/IEC 15504 ]

## See also

Glossary:

- Process
- Process Assessment

Standards:

- ISO/IEC 15504

## 6.259. Process Capability

A characterization of the ability of a process to meet current or projected business goals. [ ISO/IEC 15504 ]

### See also

Glossary:

- Process
- Process Capability Determination

Standards:

- ISO/IEC 15504

## 6.260. Process Capability Determination

A systematic assessment and analysis of selected processes within an organization against a target capability, carried out with the aim of identifying the strengths, weaknesses and risks associated with deploying the processes to meet a particular specified requirement. [ ISO/IEC 15504 ]

### See also

Glossary:

- Process
- Process Capability

Standards:

- ISO/IEC 15504

## 6.261. Process Capability Level

A point on the six-point ordinal scale (of process capability) that represents the capability of the process; each level builds on the capability of the level below. [ ISO/IEC 15504 ]

### See also

Glossary:

- Process
- Process Capability

Standards:

- ISO/IEC 15504

## 6.262. Process Context

The set of factors, documented in the assessment input, that influence the judgment, comprehension and comparability of process attribute ratings. [ ISO/IEC 15504 ]



## See also

Glossary:

→ Process

Standards:

→ ISO/IEC 15504

## 6.263. Process Improvement

Actions taken to change an organization's processes so that they more effectively and/or efficiently meet the organization's business goals. [ ISO/IEC 15504 ]

## See also

Glossary:

→ Process

Standards:

→ ISO/IEC 15504

## 6.264. Process Improvement Objective

Set of target characteristics established to guide the effort to improve an existing process in a specific, measurable way, either in terms of resultant product or service characteristics, such as quality, performance, and conformance to standards, or in the way in which the process is executed, such as elimination of redundant process steps, combination of process steps, and improvement of cycle time. [ ISO/IEC 15504 ]

## See also

Glossary:

→ Process

→ Process Improvement

Standards:

→ ISO/IEC 15504

## 6.265. Process Improvement Program

The strategies, policies, goals, responsibilities and activities concerned with the achievement of specified improvement goals. [ ISO/IEC 15504 ]

## Notes

→ A process improvement program can span more than one complete cycle of process improvement. [ ISO/IEC 15504 ]

## See also

Glossary:

- Process
- Process Improvement

Standards:

- ISO/IEC 15504

## 6.266. Process Improvement Project

A subset of the Process Improvement Program that forms a coherent set of actions to achieve a specific improvement. [ ISO/IEC 15504 ]

## See also

Glossary:

- Process
- Process Improvement Program

Standards:

- ISO/IEC 15504

## 6.267. Process Metric

A metric used to measure characteristics of the methods, techniques, and tools employed in developing, implementing, and maintaining the software system. [ IEEE 1061 ]

## See also

Glossary:

- Process
- Metric

Standards:

- IEEE 1061

## 6.268. Process Outcome

An observable result of a process. [ ISO/IEC 15504 ]

## Other Definitions

Process Outcome [ ISO/IEC 12207, ISO/IEC 15288 ]: Observable result of the successful achievement of the process purpose.

## Notes

- An outcome is an artifact, a significant change of state or the meeting of specified constraints. An outcome statement describes one of the following: production of an artifact; a significant change in state; meeting of specified constraints, e.g., requirements, goals. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Process

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC 15504
- ISO/IEC/IEEE 24765

## 6.269. Process Performance

The extent to which the execution of a process achieves its purpose. [ ISO/IEC 15504 ]

## See also

Glossary:

- Performance
- Performance Indicator
- Process

Standards:

- ISO/IEC 15504

## 6.270. Process Purpose

High-level objective of performing the process and the likely outcomes of effective implementation of the process. [ ISO/IEC 15504, ISO/IEC 15288 ]

## Notes

- The implementation of the process should provide tangible benefits to the stakeholders. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Process

Standards:

- ISO/IEC 15288

- ISO/IEC 15504
- ISO/IEC/IEEE 24765

## 6.271. Product

An artifact that is produced, is quantifiable, and can be either an end item in itself or a component item. [ IEEE 1490 ]

### Other Definitions

Product [ ISO/IEC 26514 ]: Complete set of software and documentation.

Product [ IEEE 1074 ]: Output of the software development activities (e.g., document, code, or model).

Product [ ISO/IEC 15939 ]: Result of a process.

Software Product [ ISO/IEC 9126, ISO/IEC 12207, ISO/IEC 15939 ]: Set of computer programs, procedures, and associated documentation and data.

### Notes

- In ISO 9000 there are four agreed generic product categories:
- \* hardware (e.g., engine mechanical part);
- \* software (e.g., computer program);
- \* services (e.g., transport); and
- \* processed materials (e.g., lubricant).

:Hardware and processed materials are generally tangible products, while software or services are generally intangible. Most products comprise elements belonging to different generic product categories. Whether the product is then called hardware, processed material, software, or service depends on the dominant element. [ ISO/IEC/IEEE 24765 ]

- Products include intermediate products, and products intended for users such as developers and maintainers. [ ISO/IEC 9126 ]

### See also

Glossary:

- Work Product

Standards:

- IEEE 1074
- IEEE 1490
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15939
- ISO/IEC 15939
- ISO/IEC 26514

## 6.272. Product Line

Group of products or services sharing a common, managed set of features that satisfy specific needs of a selected market or mission. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Product
- Software Product

Standards:

- ISO/IEC/IEEE 24765

## 6.273. Product Metric

A metric used to measure the characteristics of any intermediate or final product of the software development process. [ IEEE 1061 ]

### See also

Glossary:

- Product
- Metric
- Software Product

Standards:

- IEEE 1061

## 6.274. Productivity

The capability of the software product to enable users to expend appropriate amounts of resources in relation to the effectiveness achieved in a specified context of use. [ ISO/IEC 9126-1 ]

### Notes

- Relevant resources can include time to complete the task, the user's effort, materials or the financial cost of usage. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.275. Programmer Manual

A document that provides the information necessary to develop or modify software for a given computer system. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Document
- Installation Manual
- Maintenance Manual
- Operator Manual
- User Manual

Standards:

- ISO/IEC/IEEE 24765

## 6.276. Project

Endeavor with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements. [ ISO/IEC 15288, ISO/IEC 15939 ]

### Other Definitions

Project [ ISO/IEC 2382 ]: An undertaking with pre-specified objectives, magnitude and duration.

Project [ IEEE 1490 ]: A temporary endeavor undertaken to create a unique product, service, or result.

### Notes

- A project may be viewed as a unique process comprising coordinated and controlled activities and may be composed of activities from the Project Processes and Technical Processes. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- IEEE 1490
- ISO/IEC 2382
- ISO/IEC 15288
- ISO/IEC 15939
- ISO/IEC/IEEE 24765

## 6.277. Project Management

The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. [ IEEE 1490 ]

### Other Definitions

Project Management [ ISO/IEC 2382 ]: The activities concerned with project planning and project control.

## See also

Glossary:

→ Project

Standards:

→ IEEE 1490

→ ISO/IEC 2382

## 6.278. Project Phase

A collection of logically related project activities, usually culminating in the completion of a major deliverable. [ IEEE 1490 ]

### Notes

→ Project phases are mainly completed sequentially, but can overlap in some project situations. A project phase is a component of a project life cycle. A project phase is not a project management process group. [ IEEE 1490 ]

### See also

Glossary:

→ Project

Standards:

→ IEEE 1490

## 6.279. Prototype

Model or preliminary implementation of a piece of software suitable for the evaluation of system design, performance or production potential, or for the better understanding of the software requirements. [ ISO/IEC 15910 ]

### Other Definitions

Prototype [ ISO/IEC/IEEE 24765 ]: A preliminary type, form, or instance of a system that serves as a model for later stages or for the final, complete version of the system.

### Notes

→ A prototype is used to get feedback from users for improving and specifying a complex human interface, for feasibility studies, or for identifying requirements. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Project Phase

Standards:

→ ISO/IEC 15910

→ ISO/IEC/IEEE 24765

## 6.280. Qualification

Process of demonstrating whether an entity is capable of fulfilling specified requirements. [ ISO/IEC 12207, ISO/IEC 15288 ]

### Other Definitions

Qualification [ ISO/IEC/IEEE 24765 ]: The process of determining whether a system or component is suitable for operational use.

### See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.281. Qualification Testing

Testing, conducted by the developer and witnessed by the acquirer (as appropriate), to demonstrate that a software product meets its specifications and is ready for use in its target environment or integration with its containing system. [ ISO/IEC 12207 ]

### Other Definitions

Qualification Testing [ IEEE 829 ]: Testing conducted to determine whether a system or component is suitable for operational use.

### See also

Glossary:

- Acceptance Testing
- Development Testing
- Operational Testing
- Testing

Standards:

- IEEE 829
- ISO/IEC 12207

## 6.282. Quality

The totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs. [ ISO 8402, ISO/IEC 9126-1 ]

### Other Definitions

Quality [ IEEE 829 ]: The degree to which a system, component, or process meets specified requirements.



Quality [ ISO/IEC/IEEE 24765 ]: Ability of a product,service, system, component, or process to meet customer or user needs, expectations, or requirements.

Quality [ IEEE 1490 ]: The degree to which a set of inherent characteristics fulfils requirements.

Quality [ IEEE 829 ]: The degree to which a system, component, or process meets customer or user needs or expectations.

## Notes

- In a contractual environment, or in a regulated environment, such as the nuclear safety field, needs are specified, whereas in other environments, implied needs should be identified and defined. [ ISO 8402 ]
- In ISO/IEC 14598 the relevant entity is a software product. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Quality Assurance
- Software Quality

Standards:

- IEEE 829
- IEEE 1490
- ISO 8402
- ISO/IEC 9126-1
- ISO/IEC 14598
- ISO/IEC/IEEE 24765

## 6.283. Quality Assurance

The planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality. [ ISO/IEC 12207 ]

### Other Definitions

Quality Assurance [ IEEE 610.12, ISO/IEC/IEEE 24765 ]: A planned and systematic pattern of all actions necessary to provide adequate confidence that an item or product conforms to established technical requirements.

Quality Assurance [ IEEE 610.12, ISO/IEC/IEEE 24765 ]: A set of activities designed to evaluate the process by which products are developed or manufactured.

Quality Assurance [ ISO/IEC 15288 ]: Part of quality management focused on providing confidence that quality requirements will be fulfilled.

## Notes

- There are both internal and external purposes for quality assurance: within an organization, quality assurance provides confidence to management; in contractual situations, quality assurance provides confidence to the customer or others. Some quality control and quality assurance actions are interrelated.

Unless requirements for quality fully reflect the needs of the user, quality assurance may not provide adequate confidence. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Quality
- Quality Control
- Quality Management

Standards:

- IEEE 610.12
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.284. Quality Control

A set of activities designed to evaluate the quality of developed or manufactured products. [ IEEE 610.12 ]

### Notes

- This term has no standardized meaning in software engineering at this time. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Quality
- Quality Assurance

Standards:

- IEEE 610.12
- ISO/IEC/IEEE 24765

## 6.285. Quality Evaluation

Systematic examination of the extent to which an entity is capable of fulfilling specified requirements. [ ISO 8402, ISO/IEC 9126-1, ISO/IEC 14598 ]

### Notes

- The requirements may be formally specified, as when a product is developed for a specific user under a contract, or specified by the development organisation, as when a product is developed for unspecified users, such as consumer software, or the requirements may be more general, as when a user evaluates products for comparison and selection purpose. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Quality

Standards:

→ ISO 8402

→ ISO/IEC 9126-1

→ ISO/IEC 14598

## 6.286. Quality Factor

A management-oriented attribute of software that contributes to its quality. [ IEEE 1061 ]

### See also

Glossary:

→ Direct Metric

Standards:

→ IEEE 1061

## 6.287. Quality Management

Coordinated activities to direct and control an organization with regard to quality. [ ISO/IEC 19759 ]

### See also

Glossary:

→ Quality

Standards:

→ ISO/IEC 19759

## 6.288. Quality Measure Element

Base measure or derived measure that is used for constructing software quality measures. [ ISO/IEC 25000 ]

### Notes

→ The software quality characteristics or sub-characteristics of the entity are derived afterwards by calculating a software quality measure. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Quality

Standards:

→ ISO/IEC 25000

- ISO/IEC 25021
- ISO/IEC/IEEE 24765

## 6.289. Quality Metric

a quantitative measure of the degree to which an item possesses a given quality attribute. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Quality Metric [ ISO/IEC/IEEE 24765 ]: A function whose inputs are software data and whose output is a single numerical value that can be interpreted as the degree to which the software possesses a given quality attribute.

### See also

Glossary:

- Quality

Standards:

- ISO/IEC/IEEE 24765

## 6.290. Quality Model

Defined set of characteristics, and of relationships between them, which provides a framework for specifying quality requirements and evaluating quality. [ ISO/IEC 25000 ]

### Other Definitions

Quality Model [ ISO/IEC 9126-1, ISO/IEC 14598-1 ]: The set of characteristics and the relationships between them which provide the basis for specifying quality requirements and evaluating quality.

### See also

Glossary:

- Quality

Standards:

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC 25000

## 6.291. Quality in Use

The capability of the software product to enable specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in specified contexts of use. [ ISO/IEC 9126-1, ISO/IEC/IEEE 24765, ISO/IEC 25000 ]

## Notes

- Quality in use is the user's view of the quality of an environment containing software, and is measured from the results of using the software in the environment, rather than properties of the software itself. [ ISO/IEC 9126-1 ]
- This definition of quality in use is similar to the definition of usability in ISO 9241-11. In ISO/IEC 14598 the term usability is used to refer to the software quality characteristic described in ISO/IEC 9126-1. [ ISO/IEC 9126-1 ]
- The definition of quality in use in ISO/IEC 14598-1 does not currently include the new characteristic of safety. [ ISO/IEC 9126-1 ]
- Usability is defined in ISO 9241-11 in a similar way to the definition of quality in use in this part of ISO/IEC 9126. Quality in use may be influenced by any of the quality characteristics, and is thus broader than usability, which is defined in this part of ISO/IEC 9126 in terms of understandability, learnability, operability, attractiveness and compliance. [ ISO/IEC 9126-1 ]
- Before the product is released, quality in use can be specified and measured in a test environment for the intended users, goals and contexts of use. Once in use, it can be measured for actual users, goals and contexts of use. The actual needs of users may not be the same as those anticipated in requirements, so actual quality in use may be different from quality in use measured earlier in a test environment. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Internal Quality
- External Quality

Standards:

- ISO/IEC 9126-1
- ISO/IEC 9126-4
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.292. Rating

The action of mapping the measured value to the appropriate rating level. Used to determine the rating level associated with the software for a specific quality characteristic. [ ISO/IEC 9126-1, ISO/IEC 14598-1, ISO/IEC 25000 ]

## Notes

- Used to determine the rating level associated with the software for a specific quality characteristic. Rating and rating levels can be applied to characteristics other than quality characteristics. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Rating Level

Standards:

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.293. Rating Level

A scale point on an ordinal scale which is used to categorise a measurement scale. [ ISO/IEC 9126-1, ISO/IEC 14598, ISO/IEC 25000 ]

### Notes

- The rating level enables software to be classified (rated) in accordance with the stated or implied needs. [ ISO/IEC 9126-1 ]
- Appropriate rating levels may be associated with the different views of quality i.e. Users', Managers' or Developers'. [ ISO/IEC 9126-1 ]

### See also

Glossary:

- Rating
- Scale

Standards:

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC 25000

## 6.294. Readability

The ease with which a system's source code can be read and understood, especially at the detailed, statement level. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC/IEEE 24765

## 6.295. Recoverability

The capability of the software product to re-establish a specified level of performance and recover the data directly affected in the case of a failure. [ ISO/IEC 9126-1 ]

### Notes

- Following a failure, a software product will sometimes be down for a certain period of time, the length of which is assessed by its recoverability. [ ISO/IEC 9126-1 ]
- Availability is the capability of the software product to be in a state to perform a required function at a given point in time, under stated conditions of use. Externally, availability can be assessed by the proportion

of total time during which the software product is in an up state. Availability is therefore a combination of maturity (which governs the frequency of failure), fault tolerance and recoverability (which governs the length of down time following each failure). For this reason it has not been included as a separate sub-characteristic. [ ISO/IEC 9126-1 ]

## See also

Glossary:

→ Availability

Standards:

→ ISO/IEC 9126-1

## 6.296. Recovery

The restoration of a system, program, database, or other system resource to a state in which it can perform required functions. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.297. Reengineering

The examination and alteration of software to reconstitute it in a new form, including the subsequent implementation of the new form. [ ISO/IEC 19759 ]

## See also

Glossary:

→ Process

Standards:

→ ISO/IEC 19759

## 6.298. Regression Testing

Selective retesting of a system or component to verify that modifications have not caused unintended effects and that the system or component still complies with its specified requirements. [ ISO/IEC 90003 ]

## Other Definitions

Regression Testing [ ISO/IEC 90003 ]: Testing required to determine that a change to a system component has not adversely affected functionality, reliability or performance and has not introduced additional defects.

## See also

Glossary:

→ Testing

Standards:

→ ISO/IEC 90003

## 6.299. Release

Collection of new and/or changed configuration items which are tested and introduced into the live environment together. [ ISO/IEC 20000 ]

### Other Definitions

Release [ ISO/IEC/IEEE 24765 ]: A software version that is made formally available to a wider community.

Release [ IEEE 829, ISO/IEC 12207 ]: Particular version of a configuration item that is made available for a specific purpose.

Release [ IEEE 829 ]: The formal notification and distribution of an approved version.

### Notes

→ Release management includes defining acceptable quality levels for release, authority to authorize the release, and release procedures. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Process

Standards:

→ IEEE 829

→ ISO/IEC 12207

→ ISO/IEC 20000

→ ISO/IEC/IEEE 24765

## 6.300. Reliability

The capability of the software product to maintain a specified level of performance in cases of software faults or of infringement of its specified interface. [ ISO/IEC 9126-1 ]

### Other Definitions

Reliability [ ISO/IEC/IEEE 24765 ]: The ability of a system or component to perform its required functions under stated conditions for a specified period of time.

Software Reliability [ ISO/IEC/IEEE 24765 ]: The probability<sup>7</sup> that software will not cause the failure of a system for a specified time under specified conditions.

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<sup>7</sup>The probability is a function of the inputs to and use of the system as well as a function of the existence of faults in the software. The inputs to the system determine whether existing faults, if any, are encountered.



## Notes

- ISO/IEC 9126-1 provides the exact same definition for reliability and Fault Tolerance.
- Wear or ageing does not occur in software. Limitations in reliability are due to faults in requirements, design, and implementation. Failures due to these faults depend on the way the software product is used and the program options selected rather than on elapsed time. [ ISO/IEC 9126-1 ]
- The definition of reliability in ISO/IEC 2382-14:1997 is "The ability of functional unit to perform a required function...". In ISO/IEC 9126-1, functionality is only one of the characteristics of software quality. Therefore, the definition of reliability has been broadened to "maintain a specified level of performance..." instead of "...perform a required function". [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Fault
- Fault Tolerance

Standards:

- ISO/IEC 9126-1

## 6.301. Reliability Compliance

The capability of the software product to adhere to standards, conventions or regulations relating to reliability. [ ISO/IEC 9126-1 ]

## See also

Glossary:

- Reliability

Standards:

- ISO/IEC 9126-1

## 6.302. Repeatability of Results of Measurements

Closeness of the agreement between the results of successive measurements of the same measurand carried out under the same conditions of measurement. [ ISO/IEC 14143 ]

## Notes

- These conditions are called repeatability conditions. Repeatability conditions include the same measurement procedure, the same observer, the same measuring instrument, used under the same conditions; the same location; repetition over a short period of time. Repeatability may be expressed quantitatively in terms of the dispersion characteristics of the results. [ ISO/IEC 99 ]

## See also

Glossary:

- Measurement

→ Reproducibility of Results of Measurements

Standards:

→ ISO/IEC 99

→ ISO/IEC 14143

### 6.303. Replaceability

The capability of the software product to be used in place of another specified software product for the same purpose in the same environment. [ ISO/IEC 9126-1 ]

#### Notes

→ For example, the replaceability of a new version of a software product is important to the user when upgrading. [ ISO/IEC 9126-1 ]

→ Replaceability is used in place of compatibility in order to avoid possible ambiguity with interoperability. [ ISO/IEC 9126-1 ]

→ Replaceability may include attributes of both installability and adaptability. The concept has been introduced as a sub-characteristic of its own because of its importance. [ ISO/IEC 9126-1 ]

#### See also

Standards:

→ ISO/IEC 9126-1

### 6.304. Reproducibility of Results of Measurements

Closeness of the agreement between the results of measurements of the same measurand carried out under changed conditions of measurement. [ ISO/IEC 14143 ]

#### Notes

→ A valid statement of reproducibility requires specification of the conditions changed. The changed conditions may include the principle of measurement; method of measurement; observer; measuring instrument; reference standard; location; conditions of use; time. Reproducibility may be expressed quantitatively in terms of the dispersion characteristics of the results. Results are here usually understood to be corrected results. [ ISO/IEC 99 ]

#### See also

Glossary:

→ Measurement

→ Repeatability of Results of Measurements

Standards:

→ ISO/IEC 99

→ ISO/IEC 14143

## 6.305. Request For Change

Form or screen used to record details of a request for a change to any configuration item within a service or infrastructure. [ ISO/IEC 20000 ]

### See also

Standards:

→ ISO/IEC 20000

## 6.306. Request For Information

A type of procurement document whereby the buyer requests a potential seller to provide various pieces of information related to a product or service or seller capability. [ IEEE 1490 ]

### See also

Standards:

→ IEEE 1490

## 6.307. Request For Proposal

A document used by the acquirer as a means to announce intention to potential bidders to acquire a specified system, product, or service. [ ISO/IEC 15288 ]

### Other Definitions

Request for Proposal [ IEEE 1362 ]: A request for services, research, or a product prepared by a customer and delivered to prospective developers with the expectation that prospective developers will respond with their proposed cost, schedule, and development approach.

Request for Proposal [ IEEE 1490 ]: A type of procurement document used to request proposals from prospective sellers of products or services. In some application areas, it may have a narrower or more specific meaning.

Request for Proposal [ ISO/IEC/IEEE 24765 ]: A collection of formal documents that includes a description of the desired form of response from a potential supplier, the relevant statement of work for the supplier, and required provisions in the supplier agreement.

### See also

Standards:

→ IEEE 1362

→ IEEE 1490

→ ISO/IEC 15288

→ ISO/IEC/IEEE 24765

## 6.308. Requirement

A condition or capability that must be met or possessed by a system, system component, product, or service to satisfy an agreement, standard, specification, or other formally imposed documents. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Requirement [ ISO/IEC/IEEE 24765 ]: A condition or capability needed by a user to solve a problem or achieve an objective.

Requirement [ IEEE 1490 ]: A condition or capability that must be met or possessed by a system, product, service, result, or component to satisfy a contract, standard, specification, or other formally imposed document. Requirements include the quantified and documented needs, wants, and expectations of the sponsor, customer, and other stakeholders.

Software Requirement [ ISO/IEC/IEEE 24765 ]: A software capability needed by a user to solve a problem to achieve an objective.

Software Requirement [ ISO/IEC/IEEE 24765 ]: A software capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.

## Notes

- There are design requirement, functional requirement, implementation requirement, interface requirement, performance requirement, physical requirement. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Functional Requirement
- Nonfunctional Requirement
- Nontechnical Requirement
- Optional Requirement
- Technical Requirement

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.309. Requirements Analysis

The process of studying user needs to arrive at a definition of system, hardware, or software requirements. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Requirements Analysis [ ISO/IEC/IEEE 24765 ]: The process of studying and refining system, hardware, or software requirements.

Requirements Analysis [ ISO/IEC 2382 ]: A systematic investigation of user requirements to arrive at a definition of a system.

Requirements Analysis [ ISO/IEC/IEEE 24765 ]: Determination of product- or service-specific performance and functional characteristics based on analyses of customer needs, expectations, and constraints; operational

concept; projected utilization environments for people, products, services, and processes; and measures of effectiveness

### See also

Glossary:

→ Requirement

Standards:

→ ISO/IEC 2382

→ ISO/IEC/IEEE 24765

## 6.310. Requirements Derivation

The changing or translation of a requirement through analysis into a form that is suitable for low-level analysis or design. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Requirement

Standards:

→ ISO/IEC/IEEE 24765

## 6.311. Requirements Document

Document containing any combination of requirements or regulations to be met by a COTS software product. [ ISO/IEC 25051 ]

### Example

→ A technical or ergonomic standard, a requirements list (or model requirements specification) from a group (e.g. a market sector, technical or user association), a law or a decree. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Document

→ Requirement

Standards:

→ ISO/IEC 25051

→ ISO/IEC/IEEE 24765

## 6.312. Requirements Engineering

The science and discipline concerned with analyzing and documenting requirements. [ ISO/IEC/IEEE 24765 ]

## Notes

- It comprises needs analysis, requirements analysis, and requirements specification. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Requirement
- Requirements Analysis
- Requirements Specification

Standards:

- ISO/IEC/IEEE 24765

## 6.313. Requirements Partitioning

The separation or decomposing of a top-level requirement or design into successively lower-level detailed requirements or design. [ ISO/IEC/IEEE 24765 ]

## Notes

- Requirements Decomposition is a synonym for Requirements Partitioning. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.314. Requirements Review

A process or meeting during which the requirements for a system, hardware item, or software item are presented to project personnel, managers, users, customers, or other interested parties for comment or approval. [ ISO/IEC/IEEE 24765 ]

## Notes

- Types of Requirements Review include system requirements review, software requirements review. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Requirement

Standards:

- ISO/IEC/IEEE 24765

## 6.315. Requirements Specification

A document that specifies the requirements for a system or component. [ ISO/IEC/IEEE 24765 ]

## Notes

→ Typically included are functional requirements, performance requirements, interface requirements, design requirements, and development standards. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Requirement

→ Requirements Document

Standards:

→ ISO/IEC/IEEE 24765

## 6.316. Requirements Traceability

Discernible association between a requirement and related requirements, implementations, and verifications. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Requirements Traceability [ ISO/IEC/IEEE 24765 ]: the identification and documentation of the derivation path (upward) and allocation/ flow-down path

(downward) of requirements in the requirements hierarchy.

## See also

Glossary:

→ Requirement

Standards:

→ ISO/IEC/IEEE 24765

## 6.317. Requirements Traceability Matrix

A table that links requirements to their origin and traces them throughout the project life cycle. [ IEEE 1490 ]

## See also

Glossary:

→ Requirement

→ Requirements Traceability

Standards:

→ IEEE 1490

## 6.318. Resource

Skilled human resources (specific disciplines either individually or in crews or teams), equipment, services, supplies, commodities, materiel, budgets, or funds. [ IEEE 1490 ]

### Other Definitions

Resource [ ISO/IEC 12207, ISO/IEC 15288 ]: Asset that is utilized or consumed during the execution of a process.

Resource [ ISO/IEC 15414 ]: A role (with respect to that action) in which the enterprise object fulfilling the role is essential to the action, requires allocation, or may become unavailable.

Resource [ ISO/IEC 15414 ]: An enterprise object which is essential to some behavior and which requires allocation or may become unavailable.

### Example

→ Diverse entities such as funding, personnel, facilities, capital equipment, tools, and utilities such as power, water, fuel and communication infrastructures. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Allocation of a resource may constrain other behaviors for which that resource is essential. Resources may be reusable, renewable or consumable. A consumable resource may become unavailable after some amount of use or after some amount of time (in case a duration or expiry has been specified for the resource). [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC 15414
- ISO/IEC/IEEE 24765

## 6.319. Resource Utilisation

The capability of the software product to use appropriate amounts and types of resources when the software performs its function under stated conditions. [ ISO/IEC 9126-1 ]

### Notes

→ Human resources are included as part of productivity. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.320. Result



An output from performing project management processes and activities. Results include outcomes (e.g., integrated systems, revised process, restructured organization, tests, trained personnel, etc.) and documents (e.g., policies, plans, studies, procedures, specifications, reports, etc.). [ IEEE 1490 ]

## Notes

- May include values as well as status information indicating that exceptional conditions were raised in attempting to perform the requested service. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Deliverable
- Product

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.321. Retirement

Withdrawal of active support by the operation and maintenance organization, partial or total replacement by a new system, or installation of an upgraded system. [ ISO/IEC 12207, ISO/IEC 15288 ]

## Other Definitions

Retirement [ ISO/IEC/IEEE 24765 ]: Removal of support from an operational system or component.

Retirement [ ISO/IEC/IEEE 24765 ]: Permanent removal of a system or component from its operational environment.

## See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.322. Reverse Engineering

Determining what existing software will do and how it is constructed (to make intelligent changes). [ ISO/IEC/IEEE 24765 ]

## Notes

Reverse Engineering [ ISO/IEC/IEEE 24765 ]: Software engineering approach that derives a system's design or requirements from its code.

## See also

Standards:

→ ISO/IEC/IEEE 24765

## 6.323. Risk

An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives. [ IEEE 1490 ]

### Other Definitions

Risk [ IEEE 829 ]: The combination of the probability of an abnormal event or failure and the consequence(s) of that event or failure to a system's components, operators, users, or environment.

Risk [ ISO/IEC 15026 ]: A function of the probability of occurrence of a given threat and the potential adverse consequences of that threat's occurrence.

Risk [ IEEE 829 ]: The combination of the probability of occurrence and the consequences of a given future undesirable event.

### Notes

→ Generally used only when there is at least the possibility of negative consequences. In some situations, risk arises from the possibility of deviation from the expected outcome or event. Risk can be associated with software, systems, products, and projects. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Risk Acceptance

→ Risk Analysis

Standards:

→ IEEE 829

→ IEEE 1490

→ ISO/IEC/IEEE 24765

## 6.324. Risk Acceptance

Acknowledgment of a risk factor's existence along with a decision to accept the consequences if the corresponding problem occurs. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Risk Acceptance [ IEEE 1490 ]: A risk response planning technique that indicates that the project team has decided not to change the project management plan to deal with a risk, or is unable to identify any other suitable response strategy.

## Notes

→ Risk acceptance depends on risk criteria. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Risk

Standards:

→ IEEE 1490

→ ISO/IEC/IEEE 24765

## 6.325. Risk Analysis

The process of examining identified risk factors for probability of occurrence, potential loss, and potential risk-handling strategies. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Risk

Standards:

→ ISO/IEC/IEEE 24765

## 6.326. Robustness

The degree to which a system or component can function correctly in the presence of invalid inputs or stressful environmental conditions. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Fault Tolerance

Standards:

→ ISO/IEC/IEEE 24765

## 6.327. Role

The participation of an entity in a relationship. [ ISO/IEC 15474-1 ]

## Other Definitions

Role [ IEEE 1490 ]: A defined function to be performed by a project team member, such as testing, filing, inspecting, coding.

## Notes

- Each instance of a role has a minimum and maximum cardinality, and may be attributed. The direction of the role indicates how to read the name of the role. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Actor

Standards:

- IEEE 1490
- ISO/IEC 15474
- ISO/IEC/IEEE 24765

## 6.328. Routine

A subprogram that is called by other programs and subprograms. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Risk [ ISO/IEC/IEEE 24765 ]: A function or procedure invocable for a single purpose.

Risk [ ISO/IEC 2382 ]: A program, or part of a program, that may have some general or frequent use.

## Notes

- The terms 'routine,' 'subprogram,' and 'subroutine' are defined and used differently in different programming languages. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Function

Standards:

- ISO/IEC 2382
- ISO/IEC/IEEE 24765

## 6.329. Run

In software engineering, a single, usually continuous, execution of a computer program. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC/IEEE 24765

## 6.330. Safety

The capability of the software product to achieve acceptable levels of risk of harm to people, business, software, property or the environment in a specified context of use. [ ISO/IEC 9126-1 ]

### Other Definitions

Safety [ ISO/IEC/IEEE 24765, ISO/IEC 15026 ]: The expectation that a system does not, under defined conditions, lead to a state in which human life, health, property, or the environment is endangered.

### Notes

- Risks are usually a result of deficiencies in the functionality (including security), reliability, usability or maintainability. [ ISO/IEC 9126-1 ]

### See also

Standards:

- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765
- ISO/IEC 15026

## 6.331. Satisfaction

The capability of the software product to satisfy users in a specified context of use. [ ISO/IEC 9126-1 ]

### Notes

- Satisfaction is the user's response to interaction with the product, and includes attitudes towards use of the product. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.332. Scale

Ordered set of values, continuous or discrete, or a set of categories to which the attribute is mapped. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

### Other Definitions

Scale [ ISO/IEC/IEEE 24765 ]: A set of values with defined properties.

### Notes

- The type of scale depends on the nature of the relationship between values on the scale. Four types of scales are commonly defined:

:: Nominal: The measurement values are categorical. For example, the classification of defects by their type does not imply order among the categories.

; Ordinal: The measurement values are rankings. For example, the assignment of defects to a severity level is a ranking.

; Interval: The measurement values have equal distances corresponding to equal quantities of the attribute. For example, cyclomatic complexity has the minimum value of one, but each increment represents an additional path. The value of zero is not possible.

; Ratio: The measurement values have equal distances corresponding to equal quantities of the attribute where the value of zero corresponds to none of the attribute. For example, the size of a software component in terms of LOC is a ratio scale because the value of zero corresponds to no lines of code and each additional increments represents equal amounts of code.

: These are just examples of the types of scales. Roberts<sup>8</sup> defines more types of scales. [ ISO/IEC 15939 ]

→ The type of scale depends on the nature of the relationship between values on the scale. Metrics using nominal or ordinal scales produce qualitative data, and metrics using interval and ratio scales produce quantitative data. [ ISO/IEC/IEEE 24765 ]

## Example

→ A nominal scale which corresponds to a set of categories; an ordinal scale which corresponds to an ordered set of scale points; an interval scale which corresponds to an ordered scale with equidistant scale points; and a ratio scale which not only has equidistant scale point but also possess an absolute zero. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 99
- ISO/IEC 15939
- ISO/IEC/IEEE 24765

## 6.333. Security

The capability of the software product to protect information and data so that unauthorised persons or systems cannot read or modify them and authorised persons or systems are not denied access to them. [ ISO/IEC 12207, ISO/IEC 9126-1 ]

## Other Definitions

Security [ ISO/IEC 15026 ]: The protection of system items from accidental or malicious access, use, modification, destruction, or disclosure.

Security [ ISO/IEC 15288 ]: All aspects related to defining, achieving, and maintaining confidentiality, integrity, availability, non-repudiation, accountability, authenticity, and reliability of a system.

## Notes

- This also applies to data in transmission. [ ISO/IEC 9126-1 ]
- Safety is defined as a characteristic of quality in use, as it does not relate to software alone, but to a whole system. [ ISO/IEC 9126-1 ]

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<sup>8</sup>F. Roberts. "Measurement Theory with Applications to Decision Making, Utility, and the Social Sciences". Addison-Wesley, 1979

→ Security also pertains to personnel, data, communications, and the physical protection of computer installations. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Safety

Standards:

- ISO/IEC 12207
- ISO/IEC 15026
- ISO/IEC 15288
- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765

## 6.334. Service

Performance of activities, work, or duties associated with a product. [ ISO/IEC 12207, ISO/IEC 15939 ]

### Other Definitions

Software Service [ ISO/IEC 12207, ISO/IEC 15939 ]: Performance of activities, work, or duties connected with a software product, such as its development, maintenance, and operation.

## See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15939

## 6.335. Service Level Agreement

Written agreement between a service provider and a customer that documents services and agreed service levels. [ ISO/IEC 20000 ]

## See also

Standards:

- ISO/IEC 20000

## 6.336. Simplicity

The degree to which a system or component has a design and implementation that is straightforward and easy to understand. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Simplicity [ ISO/IEC/IEEE 24765 ]: Software attributes that provide implementation of functions in the most understandable manner.

## See also

Glossary:

→ Complexity

Standards:

→ ISO/IEC/IEEE 24765

## 6.337. Software

All or part of the programs, procedures, rules, and associated documentation of an information processing system. [ ISO/IEC 2382, ISO/IEC 9126-1 ]

### Other Definitions

Software [ IEEE 829 ]: Computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system.

Software [ ISO/IEC 26514 ]: Program or set of programs used to run a computer.

### Example

→ Command files, job control language. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Software is an intellectual creation that is independent of the medium on which it is recorded. [ ISO/IEC 9126-1 ]

→ Includes firmware, documentation, data, and execution control statements. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Software Product

Standards:

→ IEEE 829

→ ISO/IEC 2382

→ ISO/IEC 9126

## 6.338. Software Asset Management

Effective management, control and protection of software assets within an organization. [ ISO/IEC 19770 ]

## See also

Standards:

→ ISO/IEC 19770



## 6.339. Software Development Process

The process by which user needs are translated into a software product. [ ISO/IEC/IEEE 24765 ]

### Notes

- The process involves translating user needs into software requirements, transforming the software requirements into design, implementing the design in code, testing the code, and sometimes, installing and checking out the software for operational use. These activities may overlap or be performed iteratively. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Software Life Cycle

Standards:

- ISO/IEC/IEEE 24765

## 6.340. Software Engineering

The systematic application of scientific and technological knowledge, methods, and experience to the design, implementation, testing, and documentation of software. [ ISO/IEC 2382 ]

### Other Definitions

Software Engineering [ ISO/IEC/IEEE 24765 ]: the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.

### See also

Standards:

- ISO/IEC 2382
- ISO/IEC/IEEE 24765

## 6.341. Software Item

Identifiable part of a software product. [ ISO/IEC 90003 ]

### Other Definitions

Software Item [ ISO/IEC/IEEE 24765 ]: An aggregation of software, such as a computer program or database, that satisfies an end use function and is designated for specification, qualification testing, interfacing, configuration management, or other purposes.

Software Item [ ISO/IEC 12207 ]: Source code, object code, control code, control data, or a collection of these items.

## See also

Glossary:

→ Software Configuration Item

Standards:

→ ISO/IEC 12207

→ ISO/IEC 90003

→ ISO/IEC/IEEE 24765

## 6.342. Software Life Cycle

The period of time that begins when a software product is conceived and ends when the software is no longer available for use. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Software Life Cycle [ IEEE 1074 ]: The project-specific sequence of activities that is created by mapping the activities of this standard onto a

selected software life cycle model (SLCM).

Software Life Cycle [ IEEE 1362 ]: The system or product cycle initiated by a user need or a perceived customer need and terminated by discontinued use of the product.

## See also

Glossary:

→ Software Development Process

Standards:

→ IEEE 1074

→ IEEE 1362

→ ISO/IEC/IEEE 24765

## 6.343. Software Product Evaluation

Technical operation that consists of producing an assessment of one or more characteristics of a software product according to a specified procedure. [ ISO/IEC 25000 ]

### Notes

→ This definition can be compared to that of testing in ISO/IEC Guide 2. However, the term evaluation is preferred in order to avoid confusion with the notion of testing widely accepted in the field of software engineering. Software product evaluation is not necessarily conformity testing (as defined in ISO/IEC Guide 2) in the context of a certification scheme. However, conformity testing can be part of an evaluation. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.344. Software Quality

Capability of a software product to satisfy stated and implied needs when used under specified conditions. [ ISO/IEC 25000 ]

### Notes

- This definition differs from the ISO 9000:2000 quality definition mainly because the software quality definition refers to the satisfaction of stated and implied needs, while the ISO 9000 quality definition refers to the satisfaction of requirements. In SQuaRE standards software quality has the same meaning as software product quality. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Software Quality Characteristic
- Software Quality Evaluation

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.345. Software Quality Characteristic

Category of software quality attributes that bears on software quality. [ ISO/IEC 25000 ]

### Notes

- Software quality characteristics may be refined into multiple levels of sub-characteristics and finally into software quality attributes. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Software Quality

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.346. Software Quality Evaluation

Systematic examination of the extent to which a software product is capable of satisfying stated and implied needs. [ ISO/IEC 25000 ]

### See also

Glossary:

- Software Product Evaluation
- Software Quality

Standards:

- ISO/IEC 25000

## 6.347. Software Quality Measure

Measure of internal software quality, external software quality or software quality in use. IEEE 1490 ]

### Notes

- Internal software quality, external software quality and software quality in use are described in the quality model in ISO/IEC 9126-1 [ ISO/IEC 25010, ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- External Quality
- Internal Quality
- Measure
- Quality in Use

Standards:

- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.348. Software Repository

A software library providing permanent, archival storage for software and related documentation. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC/IEEE 24765

## 6.349. Software Unit

Separately compilable piece of code. [ ISO/IEC 12207 ]

## Other Definitions

Software Unit [ ISO/IEC 12207 ]: The lowest element in one or more software components.

### See also

Standards:

→ ISO/IEC 12207

## 6.350. Source Code

Computer instructions and data definitions expressed in a form suitable for input to an assembler, compiler, or other translator. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Product

Standards:

→ ISO/IEC/IEEE 24765

## 6.351. Specification

A document that specifies, in a complete, precise, verifiable manner, the requirements, design, behavior, or other characteristics of a system, component, product, result, or service and, often, the procedures for determining whether these provisions have been satisfied. [ IEEE 1490 ]

## Other Definitions

Specification [ ISO/IEC 2382 ]: A detailed formulation, in document form, which provides a definitive description of a system for the purpose of developing or validating the system.

Specification [ IEEE 1220 ]: A document that fully describes a design element or its interfaces in terms of requirements (functional, performance, constraints, and design characteristics) and the qualification conditions and procedures for each requirement.

### See also

Glossary:

→ Requirement

Standards:

→ IEEE 1220

→ IEEE 1490

→ ISO/IEC 2382

## 6.352. Stability

The capability of the software product to avoid unexpected effects from modifications of the software. [ ISO/IEC 9126-1 ]

### See also

→ ISO/IEC 9126-1

## 6.353. Stage

Period within the life cycle of an entity that relates to the state of its description or realization. [ ISO/IEC 12207, ISO/IEC 15288 ]

### Notes

→ Stages relate to major progress and achievement milestones of the system through its life cycle. Stages may be overlapping. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

→ ISO/IEC 12207

→ ISO/IEC 15288

## 6.354. Stakeholder

Individual or organisation that sponsors measurement, provides data, is a user of the measurement results or otherwise participates in the measurement process. [ ISO/IEC 15939 ]

### Other Definitions

Stakeholder [ ISO/IEC 12207, ISO/IEC 15288, ISO/IEC 15939 ]: Individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations.

Stakeholder [ IEEE 1490 ]: Person or organization (e.g. customer, sponsor, performing organization, or the public) that is actively involved in the project, or whose

interests may be positively or negatively affected by execution or completion of the project. A stakeholder may also exert influence over the project and its deliverables.

### Examples

→ End users, end user organizations, supporters, developers, producers, trainers, maintainers, disposers, acquirers, supplier organizations and regulatory bodies. [ ISO/IEC/IEEE 24765 ]

### Notes

→ The decision-maker is also a stakeholder. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- IEEE 1490
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC 15939

## 6.355. Standard

Set of mandatory requirements established by consensus and maintained by a recognized body to prescribe a disciplined uniform approach or specify a product, that is, mandatory conventions and practices. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Standard [ IEEE 1490 ]: A document that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.

### See also

Standards:

- IEEE 1490
- ISO/IEC/IEEE 24765

## 6.356. Standard Process

The set of definitions of the basic processes that guide all processes in an organization. [ ISO/IEC 15504 ]

### Notes

- These process definitions cover the fundamental process elements (and their relationships to each other) that must be incorporated into the defined processes that are implemented in projects across the organization. A standard process establishes consistent activities across the organization and is desirable for long-term stability and improvement. The organization's set of standard processes describes the fundamental process elements that will be part of the projects' defined processes. It also describes the relationships (for example, ordering and interfaces) between these process elements. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Process

Standards:

- ISO/IEC 15504
- ISO/IEC/IEEE 24765

## 6.357. Statement

In a programming language, a meaningful expression that defines data, specifies program actions, or directs the assembler or compiler. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Statement Testing

Standards:

→ ISO/IEC/IEEE 24765

## 6.358. Statement Testing

Testing designed to execute each statement of a computer program. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Branch Testing

→ Path Testing

→ Statement

→ Testing

Standards:

→ ISO/IEC/IEEE 24765

## 6.359. Statement of Work

Document used by the acquirer to describe and specify the tasks to be performed under the contract. [ ISO/IEC 12207 ]

## Other Definitions

Statement of Work [ IEEE 1490 ]: A narrative description of products, services, or results to be supplied.

## See also

Standards:

→ IEEE 1490

→ ISO/IEC 12207

## 6.360. Static Analysis

The process of evaluating a system or component based on its form, structure, content, or documentation. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

→ Dynamic Analysis



Standards:

→ ISO/IEC/IEEE 24765

## 6.361. Statistical Process Control

Statistically based analysis of a process and measures of process performance, which identify common and special causes of variation in process performance and maintain process performance within limits. [ ISO/IEC/IEEE 24765 ]

### Notes

""Statistical Process Control"" is an effective method of monitoring a process through the use of control charts. In general, if a process exceeds the limits, we assume that it's out of control and the project team should search for special causes to deal with it. There are many kinds of charts, such as the  $\bar{x}$  chart and r-chart, etc.

=== The c-chart ===

The c-chart plots the number of defects in a process. If  $C_i$  denotes the number of defects obtained in the  $i$ th observation, the c-chart plots the data points at the height  $C_1, C_2 \dots C_n$ . The c-chart also has a center line (CL) at height  $\bar{C}$  (the average of  $C_i$ ) and the following  $3\sigma$  lines:

Upper Control Limit:  $UCL = \bar{C} + 3\sqrt{\bar{C}}$

Lower Control Limit:  $LCL = \bar{C} - 3\sqrt{\bar{C}}$

If LCL is negative, it is set to zero. The c-chart assumes the Poisson distribution of defects and is thus approximative.

Use of SPC in software engineering is still under debate. One major issue is that formal SPC requires data to be independent variables from homogeneous sources of variation. As exposed in Software Engineering Metrics: What Do They Measure And How Do We Know [[https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know)], software engineering data is often affected by many variations sources. Furthermore, software engineering is domain-specific (requirements may vary from one domain to another) and limits may vary.

### See also

Glossary:

→ Process

→ Process Performance

Papers:

→ Monitoring Software Quality Evolution for Defects [[https://maisqual.squoring.com/wiki/index.php/Monitoring\\_Software\\_Quality\\_Evolution\\_for\\_Defects](https://maisqual.squoring.com/wiki/index.php/Monitoring_Software_Quality_Evolution_for_Defects)]

→ Software Engineering Metrics: What Do They Measure And How Do We Know [[https://maisqual.squoring.com/wiki/index.php/Software\\_Engineering\\_Metrics:\\_What\\_Do\\_They\\_Measure\\_And\\_How\\_Do\\_We\\_Know](https://maisqual.squoring.com/wiki/index.php/Software_Engineering_Metrics:_What_Do_They_Measure_And_How_Do_We_Know)]

Standards:

→ ISO/IEC/IEEE 24765

## 6.362. Step

One element (numbered list item) in a procedure that tells a user to perform an action (or actions). [ ISO/IEC 26514 ]

### Other Definitions

Step [ ISO/IEC 15414 ]: An abstraction of an action, used in a process, that may leave unspecified objects that participate in that action.

### Notes

→ A step contains one or more actions. Responses by the software are not considered to be steps. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Action
- Procedure
- Process

Standards:

- ISO/IEC 15414
- ISO/IEC 26514
- ISO/IEC/IEEE 24765

## 6.363. Stress Testing

Testing conducted to evaluate a system or component at or beyond the limits of its specified requirements. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.364. Structural Testing

Testing that takes into account the internal mechanism of a system or component. Syn: glass-box testing, white-box testing. [ ISO/IEC/IEEE 24765 ]

## Notes

- Types include branch testing, path testing, statement testing. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Functional Testing
- Testing

Standards:

- ISO/IEC/IEEE 24765

## 6.365. Stub

A skeletal or special-purpose implementation of a software module, used to develop or test a module that calls or is otherwise dependent on it. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Stub [ ISO/IEC/IEEE 24765 ]: A computer program statement substituting for the body of a software module that is or will be defined elsewhere.

Stub [ ISO/IEC/IEEE 24765 ]: Scaffolding code written for the purpose of exercising higher-level code before the lower-level routines that will ultimately be used are available.

## See also

Glossary:

- Mock Object
- Testing

Standards:

- IEEE 1362
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15939

## 6.366. Suitability

The capability of the software product to provide an appropriate set of functions for specified tasks and user objectives. [ ISO/IEC 9126-1 ]

## Notes

- Examples of appropriateness are task-oriented composition of functions from constituent sub-functions, and capacities of tables. [ ISO/IEC 9126-1 ]
- Suitability corresponds to "suitability for the task" in ISO 9241-10. [ ISO/IEC 9126-1 ]
- Suitability also affects operability. [ ISO/IEC 9126-1 ]

## See also

Standards:

- ISO/IEC 9126-1
- ISO 9241-10

## 6.367. Supplier

Organisation that enters into an agreement with the acquirer for the supply of a system, software product or software service under the terms of that agreement. [ ISO/IEC 9126, ISO/IEC 12207, ISO/IEC 15939 ]

### Notes

- The term "supplier" is synonymous with "contractor", "producer", "seller", or "vendor". [ ISO/IEC 15939 ]
- The acquirer may designate a part of its organisation as supplier. [ ISO/IEC 15939 ]

## See also

Glossary:

- Acquirer

Standards:

- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15939

## 6.368. Support

The set of activities necessary to ensure that an operational system or component fulfills its original requirements and any subsequent modifications to those requirements. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Software Support [ ISO 9127 ]: The act of maintaining the software and its associated documentation in a functional state.

### Examples

- Software or hardware maintenance, user training. [ ISO/IEC/IEEE 24765 ]

### Notes

- Software support may be given by the manufacturer, marketing organization, supplier or other organization. In special contractually-agreed cases, consumers may be permitted to maintain or enhance the software themselves. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO 9127

→ ISO/IEC/IEEE 24765

## 6.369. Support Manual

A document that provides the information necessary to service and maintain an operational system or component throughout its life cycle. [ ISO/IEC/IEEE 24765 ]

### Notes

→ Support Manual is synonym for Maintenance Manual. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Document
- Installation Manual
- Maintenance Manual
- Operator Manual
- User Manual

Standards:

- ISO/IEC/IEEE 24765

## 6.370. System

Integrated composite that consists of one or more of the processes, hardware, software, facilities and people, that provides a capability to satisfy a stated need or objective. [ ISO/IEC 9126, ISO/IEC 12207, ISO/IEC 15939 ]

### Other Definitions

Software System [ IEEE 1362 ]: A software-intensive system for which software is the only component to be developed or modified.

### See also

Standards:

- IEEE 1362
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15939

## 6.371. System Testing

Testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. [ IEEE 829 ]

### See also

Glossary:

- Integration Test
- Testing
- Unit Test

Standards:

- IEEE 829

## 6.372. Task

The activities required to achieve a goal. [ ISO/IEC 9126 ]

### Other Definitions

Task [ ISO/IEC 12207, ISO/IEC 15288 ]: Required, recommended, or permissible action, intended to contribute to the achievement of one or more outcomes of a process.

Task [ ISO/IEC/IEEE 24765 ]: In software design, a [[Software Component|software component that can operate in parallel with other software components.

Task [ ISO/IEC/IEEE 24765 ]: A concurrent object with its own thread of control.

Task [ ISO/IEC/IEEE 24765 ]: A sequence of instructions treated as a basic unit of work by the supervisory program of an operating system.

Task [ IEEE 829 ]: Smallest unit of work subject to management accountability; a well-defined work assignment for one or more project members.

### Notes

- Related tasks are usually grouped to form activities. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Activity
- Procedure
- Process

Standards:

- IEEE 829
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765

## 6.373. Technical Requirement

Requirements relating to the technology and environment, for the development, maintenance, support and execution of the software. [ ISO/IEC/IEEE 24765 ]

## Examples

- Programming language, testing tools, operating systems, database technology and user interface technologies. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Nontechnical Requirement
- Requirement

Standards:

- ISO/IEC/IEEE 24765

## 6.374. Technique

Methods and skills required to carry out a specific activity. [ ISO/IEC 25001, ISO/IEC 12207, ISO/IEC 15939 ]

### Other Definitions

Technique [ ISO/IEC/IEEE 24765 ]: Technical or managerial procedure that aids in the evaluation and improvement of the software development process.

Technique [ IEEE 1490 ]: A defined systematic procedure employed by a human resource to perform an activity to produce a product or result or deliver a service, and that may employ one or more tools.

## See also

Standards:

- IEEE 1490
- ISO/IEC 25001
- ISO/IEC/IEEE 24765

## 6.375. Test

An activity in which a system or component is executed under specified conditions, the results are observed or recorded, and an evaluation is made of some aspect of the system or component. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

Test [ IEEE 829 ]: A set of one or more test cases and procedures.

## See also

Glossary:

- Test Case
- Testing

Standards:

- IEEE 1362
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15939

## 6.376. Test Case

A set of inputs, execution preconditions, and expected outcomes developed for a particular objective to exercise a particular program path or to verify compliance with a specific requirement. [ IEEE 1012, SIGIST ]

### Other Definitions

Test Case [ IEEE 610.12 ]: A documented instruction for the tester that specifies how a function or a combination of functions shall or should be tested. A test case includes detailed information on the following issues:

- the test objective;
- the functions to be tested;
- the testing environment and other conditions;
- the test data;
- the procedure;
- the expected behaviour of the system.

### See also

Glossary:

- Requirement
- Test Case Suite
- Testing

Standards:

- IEEE 1012
- IEEE 610.12
- SIGIST

## 6.377. Test Case Suite

A collection of one or more test cases for the software under test. [ SIGIST ]

### See also

- SIGIST

## 6.378. Test Coverage

Extent to which the test cases test the requirements for the system or software product. [ ISO/IEC 12207 ]



## Other Definitions

Test Coverage [ ISO/IEC/IEEE 24765 ]: The degree to which a given test or set of tests addresses all specified requirements for a given system or component.

## See also

Glossary:

- Branch Coverage
- Code Coverage
- Requirement
- Test
- Testing
- Test Case

Standards:

- ISO/IEC 12207
- ISO/IEC/IEEE 24765

## 6.379. Test Documentation

Collection of the documentation inherent to the testing activities. [ ISO/IEC 25051 ]

## Other Definitions

Test Documentation [ ISO/IEC/IEEE 24765 ]: Documentation describing plans for, or results of, the testing of a system or component.

## See also

Glossary:

- Documentation
- Testing

Standards:

- ISO/IEC 25051
- ISO/IEC/IEEE 24765

## 6.380. Test Environment

Hardware and software configuration necessary to conduct the test case. [ ISO/IEC 25051 ]

## See also

Glossary:

- Test Case

→ Testing

Standards:

→ ISO/IEC 25051

## 6.381. Test Objective

Identified set of software features to be measured under specified conditions by comparing actual behavior with the required behavior. [ ISO/IEC 25051, ISO/IEC 25062 ]

### See also

Glossary:

→ Testing

Standards:

→ ISO/IEC 25051

→ ISO/IEC 25062

## 6.382. Test Plan

A document describing the scope, approach, resources, and schedule of intended test activities. [ IEEE 1012, ISO/IEC 12207, ISO/IEC 15939 ]

### Other Definitions

Test Plan [ IEEE 1012 ]: A document that describes the technical and management approach to be followed for testing a system or component.

Test Plan [ ISO/IEC 2382 ]: A plan that establishes detailed requirements, criteria, general methodology, responsibilities, and general planning for test and evaluation of a system.

### Notes

→ It identifies test items, the features to be tested, the testing tasks, who will do each task, and any risks requiring contingency planning. Typical contents identify the items to be tested, tasks to be performed, responsibilities, schedules, and required resources for the testing activity. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

→ Testing

Standards:

→ IEEE 1012

→ ISO/IEC 2382

## 6.383. Test Procedure

Detailed instructions for the setup, execution, and evaluation of results for a given test case. [ IEEE 1012 ]

## Other Definitions

Test Procedure [ IEEE 1012 ]: Documentation that specifies a sequence of actions for the execution of a test.

## See also

Glossary:

→ Testing

Standards:

→ IEEE 1012

## 6.384. Testability

The capability of the software product to enable modified software to be validated. [ ISO/IEC 9126-1 ]

## Other Definitions

Testability [ ISO/IEC 12207 ]: Extent to which an objective and feasible test can be designed to determine whether a requirement is met.

Testability [ IEEE 1233 ]: The degree to which a requirement is stated in terms that permit establishment of test criteria and performance of tests to determine whether those criteria have been met.

Testability [ ISO/IEC/IEEE 24765 ]:

1. The degree to which a system can be unit tested and system tested.
2. The effort required to test software.
3. The degree to which a system or component facilitates the establishment of test criteria and the performance of tests to determine whether those criteria have been met.

## See also

Glossary:

→ Branch Coverage

→ Code Coverage

→ Test Coverage

→ Testing

Standards:

→ IEEE 1233

→ ISO/IEC 9126-1

→ ISO/IEC 12207

→ ISO/IEC/IEEE 24765

## 6.385. Testing

Activity in which a system or component is executed under specified conditions, the results are observed or recorded, and an evaluation is made of some aspect of the system or component. [ IEEE 829 ]

## Other Definitions

Software Testing [ ISO/IEC 19759 ]: The dynamic verification of the behavior of a program on a finite set of test cases, suitably selected from the usually infinite executions domain, against the expected behavior.

## See also

Glossary:

- Acceptance Testing
- Branch Testing
- Development Testing
- Interface Testing
- Interoperability Testing
- Functional Testing
- Operational Testing
- Path Testing
- Performance Testing
- Regression Testing
- Qualification Testing
- Statement Testing
- Stress Testing
- Structural Testing
- System Testing
- Testing Description

Standards:

- IEEE 829
- ISO/IEC 19759

## 6.386. Testing Description

Description of the test execution conditions (i.e. test procedure). [ ISO/IEC 25051, ISO/IEC 25062 ]

## See also

Glossary:

- Testing

Standards:

- ISO/IEC 25051
- ISO/IEC 25062

## 6.387. Time Behaviour

The capability of the software product to provide appropriate response and processing times and throughput rates when performing its function, under stated conditions. [ ISO/IEC 9126-1 ]

### See also

→ ISO/IEC 9126-1

## 6.388. Tool

A software product that provides support for software and system life cycle processes. [ ISO/IEC 15474 ]

### Other Definitions

Tool [ IEEE 1490 ]: Something tangible, such as a template or software program, used in performing an activity to produce a product or result.

### Notes

→ Particularly, but not exclusively, a modeling tool. Also, tool is used as a short form for software tool, and more specifically for CASE tool. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- IEEE 1490
- ISO/IEC 15474
- ISO/IEC/IEEE 24765

## 6.389. Total Quality Management

A holistic approach to quality improvement in all life-cycle phases. [ ISO/IEC/IEEE 24765 ]

### See also

Standards:

- ISO/IEC/IEEE 24765

## 6.390. Traceability

The degree to which a relationship can be established between two or more products of the development process, especially products having a predecessor-successor or master-subordinate relationship to one another. [ IEEE 1233 ]

### Other Definitions

Traceability [ IEEE 1362 ]: The identification and documentation of derivation paths (upward) and allocation or flowdown paths (downward) of work products in the work product hierarchy.

Traceability [ ISO/IEC/IEEE 24765 ]: The degree to which each element in a software development product establishes its reason for existing.

Traceability [ ISO/IEC/IEEE 24765 ]: Discernible association among two or more logical entities, such as requirements, system elements, verifications, or tasks.

## Notes

- The degree to which the requirements and design of a given system element match; the degree to which each element in a bubble chart references the requirement that it satisfies. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- IEEE 1233
- IEEE 1362
- ISO/IEC/IEEE 24765

## 6.391. Traceable

Having components whose origin can be determined. [ ISO/IEC 12207 ]

## See also

Glossary:

- Traceability

Standards:

- ISO/IEC 12207

## 6.392. Trunk

The software's main line of development; the main starting point of most branches. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Branch
- Configuration Management

Standards:

- ISO/IEC/IEEE 24765

## 6.393. Understandability

The capability of the software product to enable the user to understand whether the software is suitable, and how it can be used for particular tasks and conditions of use. [ ISO/IEC 9126-1 ]

## Other Definitions

Understandability [ ISO/IEC/IEEE 24765 ]: The ease with which a system can be comprehended at both the system-organizational and detailed-statement levels.

## Notes

- This will depend on the documentation and initial impressions given by the software. [ ISO/IEC 9126-1 ]
- Understandability has to do with the system's coherence at a more general level than readability does. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

- ISO/IEC 9126-1
- ISO/IEC/IEEE 24765

## 6.394. Unit Test

Testing of individual routines and modules by the developer or an independent tester. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

Unit Test [ ISO/IEC 2382 ]: A test of individual programs or modules in order to ensure that there are no analysis or programming errors.

Unit Test [ ISO/IEC/IEEE 24765 ]: A test of individual hardware or software units or groups of related units.

## See also

Glossary:

- Test
- Testing

Standards:

- ISO/IEC 2382
- ISO/IEC/IEEE 24765

## 6.395. Unit of Measurement

Particular quantity, defined and adopted by convention, with which other quantities of the same kind are compared in order to express their magnitude relative to that quantity. [ ISO/IEC 99, ISO/IEC 15939, ISO/IEC 25000 ]

## Notes

- Units of measurement have conventionally assigned names and symbols. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Measurement

Standards:

- ISO/IEC 99
- ISO/IEC 15939
- ISO/IEC 25000
- ISO/IEC/IEEE 24765

## 6.396. Usability

The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions. [ ISO/IEC 9126-1 ]

### Other Definitions

Usability [ ISO/IEC/IEEE 24765 ]: The ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component.

Usability [ ISO/IEC 25062 ]: The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

### Notes

- Some aspects of functionality, reliability and efficiency will also affect usability, but for the purposes of ISO/IEC 9126 they are not classified as usability. [ ISO/IEC 9126-1 ]
- Users may include operators, end users and indirect users who are under the influence of or dependent on the use of the software. Usability should address all of the different user environments that the software may affect, which may include preparation for usage and evaluation of results. [ ISO/IEC 9126-1 ]
- This term has been deliberately redefined to more properly convey its meaning in the software reuse context. [ ISO/IEC/IEEE 24765 ]

### See also

Glossary:

- Understandability

Standards:

- ISO/IEC 9126
- ISO/IEC 9126-1
- ISO/IEC 25062
- ISO/IEC/IEEE 24765

## 6.397. Usability Compliance

The capability of the software product to adhere to standards, conventions, style guides or regulations relating to usability. [ ISO/IEC 9126-1 ]

### See also

- ISO/IEC 9126-1

## 6.398. User



Individual or organisation that uses the system to perform a specific function. [ ISO/IEC 12207, ISO/IEC 15939 ]

## Other Definitions

User [ ISO/IEC 9126 ]: An individual that uses the software product to perform a specific function.

User [ ISO/IEC 26514 ]: Person who performs one or more tasks with software; a member of a specific audience.

User [ ISO/IEC 25062 ]: Person who interacts with the product.

User [ IEEE 1362 ]: Individual or organization who uses a software-intensive system in daily work activities or recreational pursuits.

User [ ISO/IEC 15288, ISO/IEC 15939 ]: Individual or group that benefits from a system during its utilization.

User [ ISO/IEC 14143, ISO/IEC 29881 ]: Any person or thing that communicates or interacts with the software at any time.

## Notes

- Users may include operators, recipients of the results of the software, or developers or maintainers of software. [ ISO/IEC 9126-1 ]
- The user may perform other roles such as acquirer or maintainer. The role of user and the role of operator may be vested, simultaneously or sequentially, in the same individual or organization. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Developer

Standards:

- IEEE 1362
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 14143
- ISO/IEC 15288
- ISO/IEC 15939
- ISO/IEC 25062
- ISO/IEC 26514
- ISO/IEC 29881
- ISO/IEC/IEEE 24765

## 6.399. User Documentation

Documentation for users of a system, including a system description and procedures for using the system to obtain desired results. [ ISO/IEC/IEEE 24765 ]

## Other Definitions

User Documentation [ ISO/IEC 26514 ]: Information to describe, explain, or instruct how to use software.

## See also

Glossary:

- Documentation
- User

Standards:

- ISO/IEC 26514
- ISO/IEC/IEEE 24765

## 6.400. User Manual

A document that presents the information necessary to employ a system or component to obtain desired results. [ ISO/IEC/IEEE 24765 ]

### Other Definitions

User Manual [ ISO/IEC 2382 ]: A document that describes how to use a functional unit, and that may include description of the rights and responsibilities of the user, the owner, and the supplier of the unit.

### Notes

- Typically described are system or component capabilities, limitations, options, permitted inputs, expected outputs, possible error messages, and special instructions. A user manual is distinguished from an operator manual when a distinction is made between those who operate a computer system (mounting tapes, etc.) and those who use the system for its intended purpose. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Document
- Installation Manual
- Maintenance Manual
- Operator Manual
- Support Manual
- User Documentation

Standards:

- ISO/IEC 2382
- ISO/IEC/IEEE 24765

## 6.401. Validation

Determination of the correctness of the products of software development with respect to the user needs and requirements. [ SIGIST ]

## Other Definitions

Validation [ ISO 8402, ISO/IEC 9126-1 ]: Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

Validation [ ISO/IEC 15288 ]: Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

Validation [ IEEE 1012 ]: The process of providing evidence that the software and its associated products satisfy system requirements allocated to software at the end of each life cycle activity, solve the right problem, and satisfy intended use and user needs.

Validation [ ISO/IEC 12207 ]: In a life cycle context, the set of activities ensuring and gaining confidence that a system is able to accomplish its intended use, goals and objectives.

Validation [ IEEE 1233 ]: The process of evaluating a system or component during or at the end of the development process to determine whether a system or component satisfies specified requirements.

Validation [ IEEE 1490 ]: The assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers.

## Notes

- In design and development, validation concerns the process of examining a product to determine conformity with user needs. [ ISO/IEC 9126-1 ]
- Validation is normally performed on the final product under defined operating conditions. It may be necessary in earlier stages. [ ISO/IEC 9126-1 ]
- "Validated" is used to designate the corresponding status. [ ISO/IEC 9126-1 ]
- Multiple validations may be carried out if there are different intended uses. [ ISO/IEC 9126-1 ]
- Validation demonstrates that the system can be used by the users for their specific tasks. "Validated" is used to designate the corresponding status. [ISO 9000:2005] In design and development, validation concerns the process of examining a product to determine conformity with user needs. Validation is normally performed on the final product under defined operating conditions. It may be necessary in earlier stages. Multiple validations may be carried out if there are different intended uses. [ ISO/IEC/IEEE 24765 ]

## See also

Glossary:

- Verification

Standards:

- IEEE 1012
- IEEE 1233
- IEEE 1490
- ISO 8402
- ISO/IEC 9126
- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 24765
- SIGIST

## 6.402. Value

Number or category assigned to an attribute of an entity by making a measurement. [ ISO/IEC 25000 ]

### Other Definitions

Value [ ISO/IEC 15939 ]: Numerical or categorical result assigned to a base measure, derived measure, or indicator. [ ISO/IEC 15939 ]

### See also

Glossary:

- Base Measure
- Derived Measure
- Indicator
- Measurement

Standards:

- ISO/IEC 15939
- ISO/IEC 25000

## 6.403. Verification

Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled. [ ISO/IEC 12207, ISO/IEC 15288, ISO/IEC 25000 ]

### Other Definitions

Verification [ IEEE 1012, SIGIST ]: The process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase.

Verification [ ISO 8402, ISO/IEC 9126 ]: Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled.

Verification [ ISO/IEC/IEEE 24765 ]: Formal proof of program correctness.

Verification [ IEEE 1490 ]: The evaluation of whether or not a product, service, or system complies with a regulation, requirement, specification, or imposed condition. It is often an internal process.

Verification [ IEEE 829 ]: Process of providing objective evidence that the software and its associated products comply with requirements (e.g., for correctness, completeness, consistency, and accuracy) for all life cycle activities during each life cycle process (acquisition, supply, development, operation, and maintenance), satisfy standards, practices, and conventions during life cycle processes, and successfully complete each life cycle activity and satisfy all the criteria for initiating succeeding life cycle activities (e.g., building the software correctly).

### Notes

- "Verified" is used to designate the corresponding status. In design and development, verification concerns the process of examining the result of a given activity to determine conformity with the stated requirement for that activity. [ ISO/IEC 9126 ]

## See also

Glossary:

→ Validation

Standards:

→ IEEE 829

→ IEEE 1012

→ IEEE 1490

→ ISO 8402

→ ISO/IEC 9126

→ ISO/IEC 12207

→ ISO/IEC 15288

→ ISO/IEC 25000

→ ISO/IEC/IEEE 24765

→ SIGIST

## 6.404. Version

Identified instance of an item. [ ISO/IEC 12207 ]

### Other Definitions

Version [ ISO/IEC/IEEE 24765 ]: An initial release or re- release of a computer software configuration item, associated with a complete compilation or recompilation of the computer software configuration item.

Version [ ISO/IEC/IEEE 24765 ]: An initial release or complete re- release of a document, as opposed to a revision resulting from issuing change pages to a previous release.

Version [ ISO/IEC/IEEE 24765 ]: An operational software product that differs from similar products in terms of capability, environmental requirements, and configuration.

Version [ ISO/IEC/IEEE 24765 ]: An identifiable instance of a specific file or release of a complete system.

### Notes

→ Modification to a version of a software product resulting in a new version requires configuration management action. [ ISO/IEC/IEEE 24765 ]

## See also

Standards:

→ ISO/IEC 12207

→ ISO/IEC/IEEE 24765

## 6.405. Work Breakdown Structure

A deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. [ IEEE 1490 ]

### See also

Standards:

→ IEEE 1490

## 6.406. Work Product

An artifact associated with the execution of a process. [ ISO/IEC 15504 ]

### Other Definitions

Work Product [ IEEE 1058 ]: A tangible item produced during the process of developing or modifying software.

### See also

Glossary:

→ Product

Standards:

→ IEEE 1058

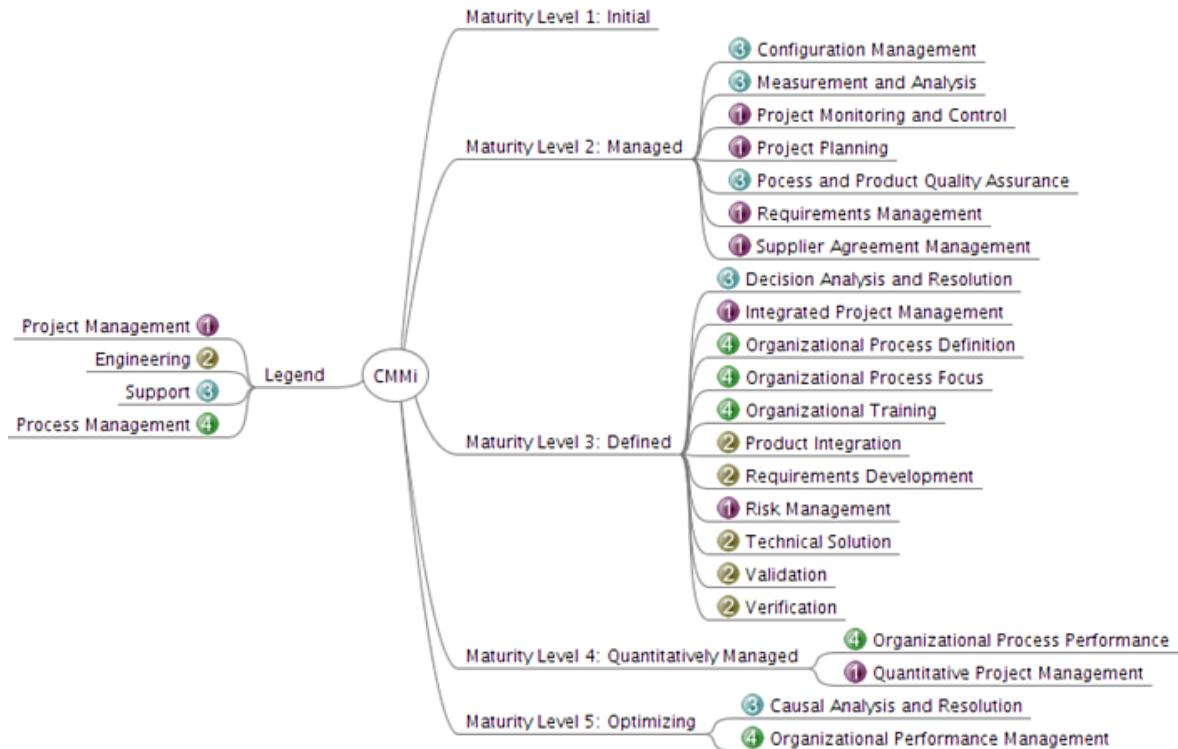
## 7. Standards

### 7.1. CMMi

CMMi stands for "Capability Maturity Model Integration".

CMMi is a process developed by the Carnegie Mellon Software Engineering Institute.

#### Structure



#### See also

Standards:

→ Team Software Process

External Links:

→ The official SEI CMMi web page: [www.sei.cmu.edu/cmmi/](http://www.sei.cmu.edu/cmmi/) [<http://www.sei.cmu.edu/cmmi/>].

### 7.2. DOD-STD-2167A

Military Standard - Defense System Software Development

DOD-STD-2167A.

#### See also

→ The wikipedia article for the DOD-STD-2167: <http://en.wikipedia.org/wiki/DOD-STD-2167A>

## 7.3. IEC 61508

International Standard IEC 61508

Functional safety of electrical / electronic / programmable electronic safety related systems

Year: 1998, 2000, 2002, 2010

### Contents

Part 1: General requirements

Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems

Part 3: Software Requirements

Part 4: Definitions and abbreviations

Part 5: Examples of methods for the determination of safety integrity levels

Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3

Part 7: Overview on techniques and measures

### See also

→ IEC 61508-3.

→ IEC 61508-7.

## 7.4. IEC 61508-3

International Standard IEC 61508-3

Functional safety of electrical / electronic / programmable electronic safety related systems

Part 3: Software requirements

Year: 1998

### See also

→ IEC 61508

→ IEC 61508-7

## 7.5. IEC 61508-7

International Standard IEC 61508-7

Functional safety of electrical / electronic / programmable electronic safety related systems

Part 7: Overview on techniques and measures

Year: 2000



## See also

- IEC 61508
- IEC 61508-3

## 7.6. IEEE 1012

International Standard IEEE 1012

IEEE Standard for Software Verification and Validation

Year: 1986

This standard has been superseded.

### Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1012-1998.html>

## 7.7. IEEE 1058

International Standard IEEE 1058

IEEE Standard for Software Project Management Plans

Year: 1998

### Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1058-1998.html>

## 7.8. IEEE 1061

International Standard IEEE 1061

Standard for a Software Quality Metrics Methodology

Year: 1998

### Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1061-1998.html>

## 7.9. IEEE 1074

International Standard IEEE 1074

IEEE Standard for Developing Software Life Cycle Processes

Year: 1997

This standard has been superseded.

## Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1074-1997.html>

## 7.10. IEEE 1220

International Standard IEEE 1220-2005

1220-2005 - IEEE Standard for Application and Management of the Systems Engineering Process

Year: 2005

## Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1220-2005.html>

## 7.11. IEEE 1233

International Standard IEEE 1233

IEEE Guide for Developing System Requirements Specifications

Year: 1996

## Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1233-1996.html>

## 7.12. IEEE 1320

International Standard IEEE 1320.2

IEEE Standard for Conceptual Modeling Language - Syntax and Semantics for IDEF1X97 (IDEFobject)

Years: 1998

## Access

Online IEEE Catalog:

→ <http://standards.ieee.org/findstds/standard/1320.2-1998.html>

## 7.13. IEEE 1362

International Standard IEEE 1362

IEEE Guide for Information Technology - System Definition - Concept of Operations (ConOps) Document

Year: 1998

## Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1362-1998.html>

## 7.14. IEEE 1490

International Standard IEEE 1490

IEEE Guide Adoption of PMI Standard - A Guide to the Project Management Body of Knowledge

Year: 2003

This standard has been withdrawn.

### Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/1490-2003.html>

## 7.15. IEEE 610.12

International Standard IEEE 610.12

Standard Glossary of Software Engineering Terminology

Year: 1990

### Access

Online IEEE Catalog: <http://standards.ieee.org/findstds/standard/610.12-1990.html>

## 7.16. IEEE 829

International Standard IEEE 829

IEEE Standard for Software Test Documentation

Year: 1983.

This standard has been superseded.

### Access

Online IEEE catalog:

→ <http://standards.ieee.org/findstds/standard/829-1983.html>

## 7.17. IEEE 830

International Standard IEEE 830

IEEE Recommended Practice for Software Requirements Specifications

Year: 1998.

### Access

Online IEEE catalog:

→ <http://standards.ieee.org/findstds/standard/830-1998.html>

## 7.18. IEEE 982

International Standard IEEE 982

IEEE Standard Dictionary of Measures to Produce Reliable Software

Year: 1988.

### Access

Online IEEE catalog:

→ <http://standards.ieee.org/findstds/standard/982.1-1988.html>

## 7.19. ISO 5806

International Standard ISO 5806

Information processing -- Specification of single-hit decision tables

Year: 1984

### Access

Online ISO Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=11954](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=11954)

## 7.20. ISO 8402

Quality management and quality assurance - Vocabulary

Year: 1994

## 7.21. ISO 9001

International Standard ISO 9001.

Quality systems - Model for quality assurance in design, development, production, installation and servicing

Year: 1994, 2000, 2008.

### Access

Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=46486](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=46486)

## 7.22. ISO 9127

International Standard ISO 9127

Information processing systems -- User documentation and cover information for consumer software packages

Year: 1988.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16723](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16723)

## 7.23. ISO 9241

International Standard ISO 9241

Ergonomic requirements for office work with visual display terminals (VDTs)

Years: 1992-2011.

## Contents / Access

The following parts link to the online ISO catalog:

- Part 1: General introduction [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=21922](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=21922)]
- Part 2: Guidance on task requirements [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16874](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16874)]
- Part 4: Keyboard requirements [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16876](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16876)]
- Part 5: Workstation layout and postural requirements [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16877](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16877)]
- Part 6: Guidance on the work environment [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16878](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16878)]
- Part 9: Requirements for non-keyboard input devices [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=30030](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=30030)]
- Part 11: Guidance on usability [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16883](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16883)]
- Part 12: Presentation of information [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16884](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16884)]
- Part 13: User guidance [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16885](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16885)]
- Part 14: Menu dialogues [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16886](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16886)]
- Part 15: Command dialogues [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16887](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16887)]
- Part 16: Direct manipulation dialogues [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16888](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16888)]
- Part 17: Form filling dialogues [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16889](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16889)]
- Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40727](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40727)]
- Part 100: Introduction to standards related to software ergonomics [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=52712](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=52712)]

- Part 110: Dialogue principles [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=38009](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38009)]
- Part 129: Guidance on software individualization [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=50014](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50014)]
- Part 151: Guidance on World Wide Web user interfaces [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37031](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37031)]
- Part 171: Guidance on software accessibility [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=39080](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39080)]
- Part 210: Human-centred design for interactive systems [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=52075](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=52075)]
- Part 300: Introduction to electronic visual display requirements [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40096](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40096)]
- Part 302: Terminology for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40097](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40097)]
- Part 303: Requirements for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40098](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40098)]
- Part 304: User performance test methods for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40099](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40099)]
- Part 305: Optical laboratory test methods for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40100](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40100)]
- Part 306: Field assessment methods for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40101](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40101)]
- Part 307: Analysis and compliance test methods for electronic visual displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=40102](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40102)]
- Part 308: Surface-conduction electron-emitter displays (SED) [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=44843](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=44843)]
- Part 309: Organic light-emitting diode (OLED) displays [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51308](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51308)]
- Part 310: Visibility, aesthetics and ergonomics of pixel defects [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=54117](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=54117)]
- Part 400: Principles and requirements for physical input devices [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=38896](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38896)]
- Part 410: Design criteria for physical input devices [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=38899](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38899)]
- Part 420: Selection of physical input devices [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=52938](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=52938)]
- Part 910: Framework for tactile and haptic interaction [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51097](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51097)]
- Part 920: Guidance on tactile and haptic interactions [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=42904](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42904)]

## See also

- ISO 9241-10
- ISO 9241-11

## 7.24. ISO 9241-10

International Standard ISO 9241-10

Ergonomic requirements for office work with visual display terminals (VDTs)

Part 10: Dialogue principles

Year: 1996.

This standard is withdrawn, and revised by ISO 9241-110:2006

## Access

Online ISO Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16882](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16882)

## See also

→ ISO 9241

## 7.25. ISO 9241-11

International Standard ISO 9241-11

Ergonomic requirements for office work with visual display terminals (VDTs)

Part 11: Guidance on usability

Year: 1998.

## Contents

Extract from [www.ansi.org](http://www.ansi.org) [<http://webstore.ansi.org/RecordDetail.aspx?sku=ISO+9241-11%3a1998&source=google&adgroup=iso8&keyword=ISO%209241-11&gclid=CJiXjPD8jKoCFcEJtAodkmmDyQ>]:

ISO 9241-11 defines usability and explains how to identify the information which is necessary to take into account when specifying or evaluating usability of a visual display terminal in terms of measures of user performance and satisfaction. Guidance is given on how to describe the context of use of the product (hardware, software or service) and the relevant measures of usability in an explicit way. The guidance is given in the form of general principles and techniques, rather than in the form of requirements to use specific methods.

The guidance in ISO 9241-11 can be used in procurement, design, development, evaluation, and communication of information about usability. ISO 9241-11 includes guidance on how the usability of a product can be specified and evaluated. It applies both to products intended for general application and products being acquired for or being developed within a specific organization.

ISO 9241-11 also explains how measures of user performance and satisfaction can be used to measure how any component of a work system affects the whole work system in use. The guidance includes procedures for measuring usability but does not detail all the activities to be undertaken. Specification of detailed user-based methods of measurement is beyond the scope of ISO 9241-11, but further information can be found in Annex B and the bibliography in Annex E.

ISO 9241-11 applies to office work with visual display terminals. It can also apply in other situations where a user is interacting with a product to achieve goals. ISO 9241 parts 12 to 17 provide conditional recommendations which are applicable in specific contexts of use. The guidance in this Part of ISO 9241 can

be used in conjunction with ISO 9241 Parts 12 to 17 in order to help identify the applicability of individual recommendations.

ISO 9241-11 focuses on usability and does not provide comprehensive coverage of all objectives of ergonomic design referred to in ISO 6385. However, design for usability will contribute positively to ergonomic objectives, such as the reduction of possible adverse effects of use on human health, safety and performance.

ISO 9241-11 does not cover the processes of system development. Human-centred design processes for interactive systems are described in ISO 13407.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=16883](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16883)

## See also

→ ISO 9241

## 7.26. ISO/IEC 12119

Information technology - Software packages - Quality requirements and testing

Year: 1994

## 7.27. ISO/IEC 12207

International Standard ISO/IEC 12207

Information technology -- Software lifecycle processes

Year: 1995, 2008.

## Access

Online ISO/IEC Catalog: [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=43447](http://www.iso.org/iso/catalogue_detail.htm?csnumber=43447)

## 7.28. ISO/IEC 14143

International Standard ISO/IEC 14143

Information technology -- Software measurement -- Functional size measurement

## Contents

- Part 1: Definition of concepts
- Part 2: Conformity evaluation of software size measurement methods to ISO/IEC 14143-1:1998
- Part 3: Verification of functional size measurement methods
- Part 4: Reference model
- Part 5: Determination of functional domains for use with functional size measurement
- Part 6: Guide for use of ISO/IEC 14143 series and related International Standards



## See also

Standards:

→ ISO/IEC 14143-1

→ ISO/IEC 14143-3

## 7.29. ISO/IEC 14143-1

International Standard ISO/IEC 14143-1

Information technology -- Software measurement -- Functional size measurement

Part 1: Definition of concepts

Years: 1998, 2007.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=38931](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38931)

## See also

Standards:

→ ISO/IEC 14143

→ ISO/IEC 14143-3

## 7.30. ISO/IEC 14143-3

International Standard ISO/IEC 14143-1

Information technology -- Software measurement -- Functional size measurement

Part 3: Verification of functional size measurement methods

Year: 2003.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=31918](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=31918)

## See also

Standards:

→ ISO/IEC 14143

→ ISO/IEC 14143-1

## 7.31. ISO/IEC 14598

International Standard ISO/IEC 14598.

Information technology -- Software product evaluation

### Contents / Access

Online ISO/IEC catalog:

- Part 1: General overview [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24902](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24902)]
- Part 2: Planning and management [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24903](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24903)]
- Part 3: Process for developers [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24904](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24904)]
- Part 4: Process for acquirers [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24905](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24905)]
- Part 5: Process for evaluators [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24906](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24906)]
- Part 6: Documentation of evaluation modules [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24907](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24907)]

### See also

- ISO/IEC 14598-1
- ISO/IEC 14598-2
- ISO/IEC 14598-3
- ISO/IEC 14598-4
- ISO/IEC 14598-5
- ISO/IEC 14598-6

## 7.32. ISO/IEC 14598-1

International Standard ISO/IEC 14598-1

Information technology - Software product evaluation

Part 1: General overview

Year: 1999

This standard is revised by the ISO/IEC 25040:2011 standard.

### Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24902](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24902)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-2
- ISO/IEC 14598-3
- ISO/IEC 14598-4
- ISO/IEC 14598-5
- ISO/IEC 14598-6

## 7.33. ISO/IEC 14598-2

International Standard ISO/IEC 14598-2

Information technology - Software product evaluation

Part 2: Planning and management

Year: 2000.

This standard is revised by the ISO/IEC 25001:2007 standard.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24903](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24903)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-1
- ISO/IEC 14598-3
- ISO/IEC 14598-4
- ISO/IEC 14598-5
- ISO/IEC 14598-6

## 7.34. ISO/IEC 14598-3

International Standard ISO/IEC 14598-3

Information technology - Software product evaluation

Part 3: Process for developers

Year: 2000.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24904](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24904)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-1
- ISO/IEC 14598-2
- ISO/IEC 14598-4
- ISO/IEC 14598-5
- ISO/IEC 14598-6

## 7.35. ISO/IEC 14598-4

International Standard ISO/IEC 14598-4

Information technology - Software product evaluation

Part 4: Process for acquirers

Year: 1999.

### Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24905](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24905)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-1
- ISO/IEC 14598-2
- ISO/IEC 14598-3
- ISO/IEC 14598-5
- ISO/IEC 14598-6

## 7.36. ISO/IEC 14598-5

International Standard ISO/IEC 14598-5

Information technology - Software product evaluation

Part 5: Process for evaluators

Year: 1998

### Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24906](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24906)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-1
- ISO/IEC 14598-2
- ISO/IEC 14598-3
- ISO/IEC 14598-4
- ISO/IEC 14598-6

## 7.37. ISO/IEC 14598-6

International Standard ISO/IEC 14598-6

Information technology - Software product evaluation

Part 6: Documentation of evaluation modules

Year: 2001.

This standard is revised by the ISO/IEC DIS 25041 standard.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=24907](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=24907)

## See also

- ISO/IEC 14598
- ISO/IEC 14598-1
- ISO/IEC 14598-2
- ISO/IEC 14598-3
- ISO/IEC 14598-4
- ISO/IEC 14598-5

## 7.38. ISO/IEC 14756

International Standard ISO/IEC 14756

Information technology -- Measurement and rating of performance of computer-based software systems

Year: 1999

## Access

Online IEEE Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=25492](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=25492)

## 7.39. ISO/IEC 14764

International Standard ISO/IEC 14764

Software Engineering -- Software Life Cycle Processes -- Maintenance

Years: 1999, 2006.

### Access

Online IEEE Catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=39064](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39064)

## 7.40. ISO/IEC 15026

International Standard ISO/IEC 15026

Information technology -- System and software integrity levels

Year: 1998, 2010, 2011.

### Access

Online ISO Catalog:

→ Part 1: Concepts and vocabulary [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=50520](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50520)]

→ Part 2: Assurance case [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=52926](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=52926)]

### See also

→ ISO/IEC 15026-1

→ ISO/IEC 15026-2

## 7.41. ISO/IEC 15026-1

International Standard ISO/IEC 15026-1

Systems and software engineering -- Systems and software assurance -- Part 1: Concepts and vocabulary

Year: 2010.

### See also

→ ISO/IEC 15026

→ ISO/IEC 15026-2

## 7.42. ISO/IEC 15026-2

International Standard ISO/IEC 15026-2

Systems and software engineering -- Systems and software assurance -- Part 2: Assurance case

Year: 2011.

## See also

- ISO/IEC 15026
- ISO/IEC 15026-1

## 7.43. ISO/IEC 15288

International Standard ISO/IEC 15288.

Systems and software engineering -- System life cycle processes

Years: 2002.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/catalogue\\_detail?csnumber=43564](http://www.iso.org/iso/catalogue_detail?csnumber=43564)

## See also

Standards:

- ISO/IEC 12207

External Links:

- ISO/IEC 15288 association home page: <http://www.15288.com>

## 7.44. ISO/IEC 15289

International Standard ISO/IEC 15289.

Systems and software engineering -- Content of systems and software life cycle process information products (Documentation)

Year: 2006.

This standard is revised by the ISO/IEC/IEEE 15289 standard.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/catalogue\\_detail?csnumber=43790](http://www.iso.org/iso/catalogue_detail?csnumber=43790)

## See also

Standards:

- ISO/IEC 12207
- ISO/IEC 15288
- ISO/IEC/IEEE 15289

## 7.45. ISO/IEC 15414

International Standard ISO/IEC 15414

Information technology -- Open distributed processing -- Reference model -- Enterprise language

Years: 2002, 2006.

### Access

Online IEEE Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=43767](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43767)

## 7.46. ISO/IEC 15474

International Standard ISO/IEC 15474

Information technology -- CDIF framework

### Contents

- Part 1: Overview
- Part 2: Modelling and extensibility

### See also

- ISO/IEC 15474-1
- ISO/IEC 15474-2

## 7.47. ISO/IEC 15474-1

International Standard 15474-1

Information technology -- CDIF framework

Part 1: Overview

Year: 2002.

### Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=27825](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=27825)

### See also

Standards:

- ISO/IEC 15474
- ISO/IEC 15474-2



## 7.48. ISO/IEC 15474-2

International Standard 15474-2

Information technology -- CDIF framework

Part 2: Modelling and extensibility

Year: 2002.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=29029](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=29029)

### See also

Standards:

- ISO/IEC 15474
- ISO/IEC 15474-1

## 7.49. ISO/IEC 15504

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Also known as SPICE -- Software Process Improvement and Capability dEtermination.

Years: 1998, 2003, 2004, 2008.

### Contents

- Part 1: Concepts and vocabulary
- Part 2: Performing an assessment
- Part 3: Guidance on performing an assessment
- Part 4: Guidance on use for process improvement and process capability determination
- Part 5: An exemplar Process Assessment Model
- Part 6: An exemplar system life cycle process assessment model
- Part 7: Assessment of organizational maturity

### See also

Standards:

- ISO/IEC 15504-1
- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-4

- ISO/IEC 15504-5
- ISO/IEC 15504-6
- ISO/IEC 15504-7

External Links:

- SPICE User Group home page: <http://www.spiceusergroup.org>

## 7.50. ISO/IEC 15504-1

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 1: Concepts and vocabulary

Year: 1998, 2004.

This standard revises the ISO/IEC TR 15504-1:1998 and ISO/IEC TR 15504-9:1998 standards.

### Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=38932](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38932)

### See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-4
- ISO/IEC 15504-5
- ISO/IEC 15504-6
- ISO/IEC 15504-7

## 7.51. ISO/IEC 15504-2

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 2: Performing an assessment

Year: 1998, 2003.

This standard revises the ISO/IEC TR 15504-2:1998 and ISO/IEC TR 15504-3:1998 standards.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37458](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37458)

## See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1
- ISO/IEC 15504-3
- ISO/IEC 15504-4
- ISO/IEC 15504-5
- ISO/IEC 15504-6
- ISO/IEC 15504-7

## 7.52. ISO/IEC 15504-3

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 3: Guidance on performing an assessment

Year: 1998, 2004.

This standard revises the ISO/IEC TR 15504-4:1998 and ISO/IEC TR 15504-6:1998 standards.

## Access

Online ISO catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37454](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37454)

## See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1
- ISO/IEC 15504-2
- ISO/IEC 15504-4
- ISO/IEC 15504-5
- ISO/IEC 15504-6
- ISO/IEC 15504-7

## 7.53. ISO/IEC 15504-4

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 4: Guidance on use for process improvement and process capability determination

Year: 1998, 2004.

This standard revises the ISO/IEC TR 15504-7:1998 and ISO/IEC TR 15504-8:1998 standards.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37462](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37462)

## See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1
- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-5
- ISO/IEC 15504-6
- ISO/IEC 15504-7

## 7.54. ISO/IEC 15504-5

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 5: An exemplar Process Assessment Model

Year: 1998, 2006.

This standard revises the ISO/IEC TR 15504-5:1998 standard.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37462](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37462)

## See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1
- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-4
- ISO/IEC 15504-6

→ ISO/IEC 15504-7

## 7.55. ISO/IEC 15504-6

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 6: An exemplar system life cycle process assessment model

Year: 1998, 2008.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=43446](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43446)

### See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1
- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-4
- ISO/IEC 15504-5
- ISO/IEC 15504-7

## 7.56. ISO/IEC 15504-7

International Standard ISO/IEC 15504.

Information technology - Software Process Assessment

Part 7: Assessment of organizational maturity

Year: 1998, 2008.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=50519](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50519)

### See also

Standards:

- ISO/IEC 15504
- ISO/IEC 15504-1

- ISO/IEC 15504-2
- ISO/IEC 15504-3
- ISO/IEC 15504-4
- ISO/IEC 15504-5
- ISO/IEC 15504-6

## 7.57. ISO/IEC 15846

International Standard ISO/IEC 15846

Information technology -- Software life cycle processes -- Configuration Management

Year: 1998.

This standard has been withdrawn.

### Access

Online ISO Catalog:

- [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=30516](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=30516)

### See also

Standards:

- ISO/IEC 12207

## 7.58. ISO/IEC 15910

International Standard ISO/IEC 15910.

Information technology -- Software user documentation process

Year:1999.

This standard is revised by the ISO/IEC 26512:2011 standard.

### Notes

Extract from [www.techstreet.com](http://www.techstreet.com) [[http://www.techstreet.com/cgi-bin/detail?doc\\_no=iso\\_iec15910\\_1999&product\\_id=862851](http://www.techstreet.com/cgi-bin/detail?doc_no=iso_iec15910_1999&product_id=862851)]:

This International Standard specifies the minimum process for creating all forms of user documentation for software which has a user interface. Such forms of documentation include printed documentation (e.g. user manuals and quick-reference cards), on-line documentation, help text and on-line documentation systems.

This International Standard conforms with ISO/IEC 12207:1995, Information technology Software life cycle processes, as an implementation of the user documentation part of 6.1: Documentation.

If effectively applied, this International Standard will support the development of documentation which meets the needs of the users.

This International Standard is intended for use by anyone who produces or buys user documentation.

This International Standard is applicable to not only printed documentation, but also help screens, the help delivery system, and the on-line text and delivery system.

This International Standard is intended for use in a two-party situation and may be equally applied where the two parties are from the same organization. The situation may range from an informal agreement up to a legally binding contract. This International Standard may be used by a single party as self-imposed tasks.

## 7.59. ISO/IEC 15939

International Standard ISO/IEC 15939

Software engineering - Software measurement process

Year: 2002, 2007.

### Access

Online ISO Catalog:

→ ISO/IEC 15939:2007 [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=44344](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=44344)]

### See also

## 7.60. ISO/IEC 19759

International Standard ISO/IEC 19759

Software Engineering -- Guide to the Software Engineering Body of Knowledge (SWEBOK)

Year: 2005.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=33897](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=33897)

### See also

External Links:

→ The Official SWEBOK webpage: <http://www.computer.org/portal/web/swebok>

## 7.61. ISO/IEC 19770

International Standard ISO/IEC 19770

Information technology -- Software asset management

### Contents

- Part 1: Processes
- Part 2: Software identification tag

## See also

Standards:

→ ISO/IEC 19770-1

→ ISO/IEC 19770-2

External Links:

→ The SAM standard Working Group website: <http://www.19770.org>

## 7.62. ISO/IEC 19770-1

International Standard ISO/IEC 19770-1

Information technology -- Software asset management

Part 1: Processes

Year: 2006.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/catalogue\\_detail?csnumber=33908](http://www.iso.org/iso/catalogue_detail?csnumber=33908)

## See also

→ ISO/IEC 19770

→ ISO/IEC 19770-2

## 7.63. ISO/IEC 19770-2

International Standard ISO/IEC 19770-2

Information technology -- Software asset management

Part 2: Software identification tag

Year: 2009.

### Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=53670](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=53670)

## See also

→ ISO/IEC 19770

→ ISO/IEC 19770-1



## 7.64. ISO/IEC 20000

International Standard ISO/IEC 20000

Information technology -- Service management

### Contents/Access

This list links to the online ISO catalog:

- Part 1: Specification [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51986](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51986)]
- Part 2: Code of practice [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=41333](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=41333)]
- Part 3: Guidance on scope definition and applicability of ISO/IEC 20000-1 [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51235](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51235)]
- Part 4: Process reference model [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=50624](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50624)]
- Part 5: Exemplar implementation plan for ISO/IEC 20000-1 [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51988](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51988)]

## 7.65. ISO/IEC 2382

International Standard ISO/IEC 2382

Information processing systems -- Vocabulary

### Contents

- Part 1: Quality Model [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7229](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7229)]
- Part 2: Arithmetic and logic operations [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7230](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7230)]
- Part 3: Equipment technology [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7232](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7232)]
- Part 4: Organization of data [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=27922](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=27922)]
- Part 5: Representation of data [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=30851](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=30851)]
- Part 6: Preparation and handling of data [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7238](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7238)]
- Part 7: Computer programming [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7241](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7241)]
- Part 8: Security [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7243](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7243)]
- Part 9: Data communication [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=20929](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=20929)]
- Part 10: Operating techniques and facilities [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7247](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7247)]
- Part 12: Peripheral equipment [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7251](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7251)]

- Part 13: Computer graphics [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7253](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7253)]
- Part 14: Reliability, maintainability and availability [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7255](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7255)]
- Part 15: Programming languages [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7257](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7257)]
- Part 16: Information theory [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7259](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7259)]
- Part 17: Databases [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=30853](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=30853)]
- Part 18: Distributed data processing [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=26734](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=26734)]
- Part 19: Analog computing [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7263](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7263)]
- Part 20: System development [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7264](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7264)]
- Part 21: Interfaces between process computer systems and technical processes [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7265](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7265)]
- Part 23: Text processing [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7267](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7267)]
- Part 24: Computer-integrated manufacturing [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7268](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7268)]
- Part 25: Local area networks [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7269](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7269)]
- Part 26: Open systems interconnection [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7270](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7270)]
- Part 27: Office automation [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7271](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7271)]
- Part 28: Artificial intelligence -- Basic concepts and expert systems [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7272](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7272)]
- Part 29: Artificial intelligence -- Speech recognition and synthesis [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7273](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7273)]
- Part 31: Artificial intelligence -- Machine learning [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=21845](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=21845)]
- Part 32: Electronic Mail [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=21846](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=21846)]
- Part 34: Artificial intelligence -- Neural networks [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=21848](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=21848)]
- Part 36: Learning, education and training [[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=46152](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=46152)]

## See also

- ISO/IEC 2382-1

## 7.66. ISO/IEC 2382-1

International Standard ISO/IEC 2382

Information technology - Vocabulary

Part 1: Fundamental terms

Year: 1993.

## Access

Online ISO Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=7229](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=7229)

## See also

Standards:

→ ISO/IEC 2382

## 7.67. ISO/IEC 25000

International Standard ISO/IEC 25000

Software Engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Guide to SQuaRE.

year: 2005.

This series of standards revises the ISO/IEC 9126 and ISO/IEC 14598 series.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35683](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35683)

## See also

→ ISO/IEC 9126

→ ISO/IEC 14598

→ ISO/IEC SQuaRE

## 7.68. ISO/IEC 25001

International Standard ISO/IEC 25001

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Planning and management

year: 2007.

This standard revises the ISO/IEC 14598-2.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35724](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35724)

## See also

Standards:

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC SQuaRE

## 7.69. ISO/IEC 25010

International Standard ISO/IEC 25010

Systems and software engineering -- Systems and software Quality Requirements and Evaluation (SQuaRE) -- System and software quality models

year: 2011.

### Access

- Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35733](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35733)

## See also

- ISO/IEC 9126
- ISO/IEC 25000

## 7.70. ISO/IEC 25012

International Standard ISO/IEC 25012

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Data quality model

year: 2008.

### Access

- Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35736](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35736)

## See also

- ISO/IEC 9126
- ISO/IEC 25010
- ISO/IEC SQuaRE

## 7.71. ISO/IEC 25020

International Standard ISO/IEC 25020

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Measurement reference model and guide

Year: 2007.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35744](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35744)

## See also

- ISO/IEC 25010
- ISO/IEC 25030
- ISO/IEC 25040
- ISO/IEC SQuaRE

## 7.72. ISO/IEC 25021

International Standard ISO/IEC 25021

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Quality measure elements

Year: 2007.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35745](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35745)

## See also

- ISO/IEC 9126
- ISO/IEC 25030
- ISO/IEC 25040
- ISO/IEC SQuaRE

## 7.73. ISO/IEC 25030

International Standard ISO/IEC 25030

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Quality requirements

year: 2007.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35765](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35765)

## See also

- ISO/IEC 9126-1

- ISO/IEC 25010
- ISO/IEC SQuaRE

## 7.74. ISO/IEC 25040

International Standard ISO/IEC 25040

Systems and software engineering -- Systems and software Quality Requirements and Evaluation (SQuaRE) -- Evaluation process

year: 2011.

This standard revises the ISO/IEC 14598-1 standard.

### Access

- Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35765](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35765)

### See also

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC SQuaRE

## 7.75. ISO/IEC 25045

International Standard ISO/IEC 25045

Systems and software engineering -- Systems and software Quality Requirements and Evaluation (SQuaRE) -- Evaluation module for recoverability

Year: 2010.

### Access

- Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35683](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35683)

### See also

- ISO/IEC SQuaRE

## 7.76. ISO/IEC 25051

International Standard ISO/IEC 25000

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Requirements for quality of Commercial Off-The-Shelf (COTS) software product and instructions for testing

year: 2006, 2007.

This standard revises the ISO/IEC 12119 standard.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37457](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37457)

## See also

Glossary:

→ COTS

Standards:

→ ISO/IEC 9126

→ ISO/IEC 14598

→ ISO/IEC SQuaRE

## 7.77. ISO/IEC 25060

International Standard ISO/IEC 25060

Systems and software engineering -- Systems and software product Quality Requirements and Evaluation (SQuaRE) -- Common Industry Format (CIF) for usability: General framework for usability-related information

Year: 2010.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=35786](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35786)

## See also

→ ISO/IEC 9126

→ ISO/IEC SQuaRE

## 7.78. ISO/IEC 25062

International Standard ISO/IEC 25062

Software engineering -- Software product Quality Requirements and Evaluation (SQuaRE) -- Common Industry Format (CIF) for usability test reports

Year: 2006.

## Access

→ Online ISO catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=43046](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43046)

## See also

→ ISO/IEC SQuaRE

## 7.79. ISO/IEC 26514

International Standard ISO/IEC 26514

Systems and software engineering -- Requirements for designers and developers of user documentation

Year: 2008

### Access

Online IEEE Catalog: [http://www.iso.org/iso/catalogue\\_detail?csnumber=43073](http://www.iso.org/iso/catalogue_detail?csnumber=43073)

## 7.80. ISO/IEC 29881

International Standard ISO/IEC/IEEE 29881

Information Technology — Software and Systems Engineering

Year: 2008, 2010

### Access

Online IEEE Catalog: [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=56418](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=56418)

## 7.81. ISO/IEC 90003

International Standard ISO/IEC 90003

Software engineering -- Guidelines for the application of ISO 9001:2000 to computer software

Year: 2004

### Access

Online IEEE Catalog: [http://www.iso.org/iso/catalogue\\_detail?csnumber=35867](http://www.iso.org/iso/catalogue_detail?csnumber=35867)

## 7.82. ISO/IEC 9126

International Standard ISO/IEC 9126

Software engineering -- Product quality

Years: 1991, 2001

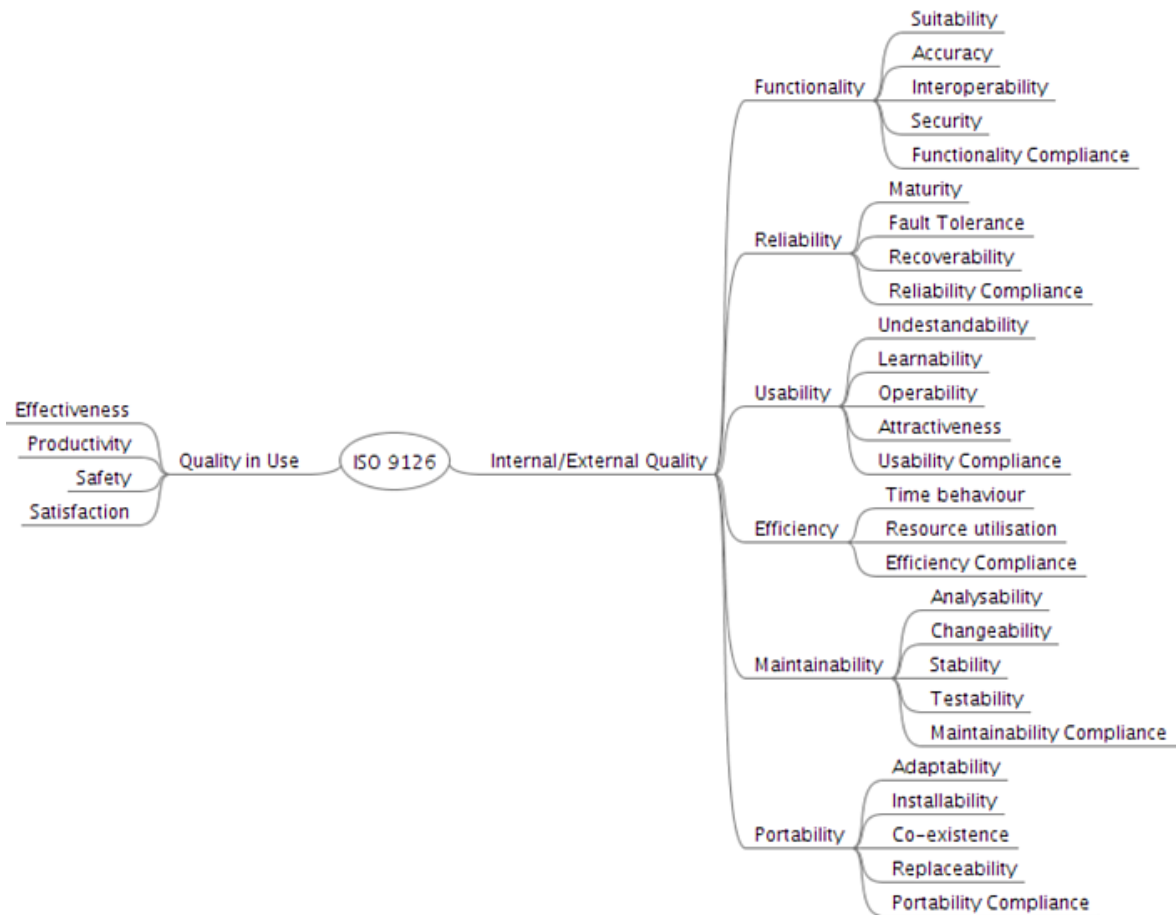
This standard is revised by ISO/IEC 25010:2011.

### Contents

- Part 1: Quality Model
- Part 2: External metrics
- Part 3: Internal metrics
- Part 4: Quality in use metrics



## Structure



## See also

- ISO/IEC 9126-1
- ISO/IEC 9126-2
- ISO/IEC 9126-3
- ISO/IEC 9126-4
- ISO/IEC 25000
- ISO/IEC 25010

## 7.83. ISO/IEC 9126-1

International Standard ISO/IEC 9126-1

Software engineering -- Product quality

Part 1: Quality Model

Years: 1991, 2001.

This standard is revised by ISO/IEC 25010:2011.

## Access

Online ISO Catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_ics/catalogue\\_detail\\_ics.htm?csnumber=22749](http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=22749)

## See also

- ISO 9001
- ISO/IEC 9126
- ISO/IEC 9126-2
- ISO/IEC 9126-3
- ISO/IEC 9126-4
- ISO/IEC 12207
- ISO/IEC 15504
- ISO/IEC 14598

## 7.84. ISO/IEC 9126-2

International Standard ISO/IEC 9126-2

Software engineering -- Product quality

Part 2: External metrics

Years: 1991, 2001.

This standard is revised by ISO/IEC 25010:2011.

## Access

Online ISO Catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=22750](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=22750)

## See also

- ISO/IEC 9126
- ISO/IEC 9126-1
- ISO/IEC 9126-3
- ISO/IEC 9126-4

## 7.85. ISO/IEC 9126-3

International Standard ISO/IEC 9126-3

Software engineering -- Product quality

Part 3: Internal metrics

Years: 1991, 2001.

This standard is revised by ISO/IEC 25010:2011.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=22891](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=22891)

## See also

- ISO/IEC 9126
- ISO/IEC 9126-1
- ISO/IEC 9126-2
- ISO/IEC 9126-4

## 7.86. ISO/IEC 9126-4

International Standard ISO/IEC 9126-4

Software engineering -- Product quality

Part 4: Quality in use metrics

Years: 1991, 2001, 2004.

This standard is revised by ISO/IEC 25010:2011.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=39752](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39752)

## See also

- ISO/IEC 9126
- ISO/IEC 9126-1
- ISO/IEC 9126-2
- ISO/IEC 9126-3

## 7.87. ISO/IEC 9294

International Standard ISO/IEC 9294

Information technology -- Guidelines for the management of software documentation

Years: 1990, 2005.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=37460](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37460)

## See also

Glossary:

- Document
- Documentation

## 7.88. ISO/IEC 99

International Standard ISO/IEC 99

International vocabulary of metrology -- Basic and general concepts and associated terms

Years: 1993, 2007.

## See also

- The Joint Committee for Guides in Metrology [<http://www.iso.org/sites/JCGM/JCGM-introduction.htm>] has an online version of a document presenting the main points of the ISO/IEC 99: [http://www.iso.org/sites/JCGM/VIM/JCGM\\_200e.html](http://www.iso.org/sites/JCGM/VIM/JCGM_200e.html).

## 7.89. ISO/IEC SQuaRE

International Standard ISO/IEC SQuaRE

Systems and software Quality Requirements and Evaluation (SQuaRE)

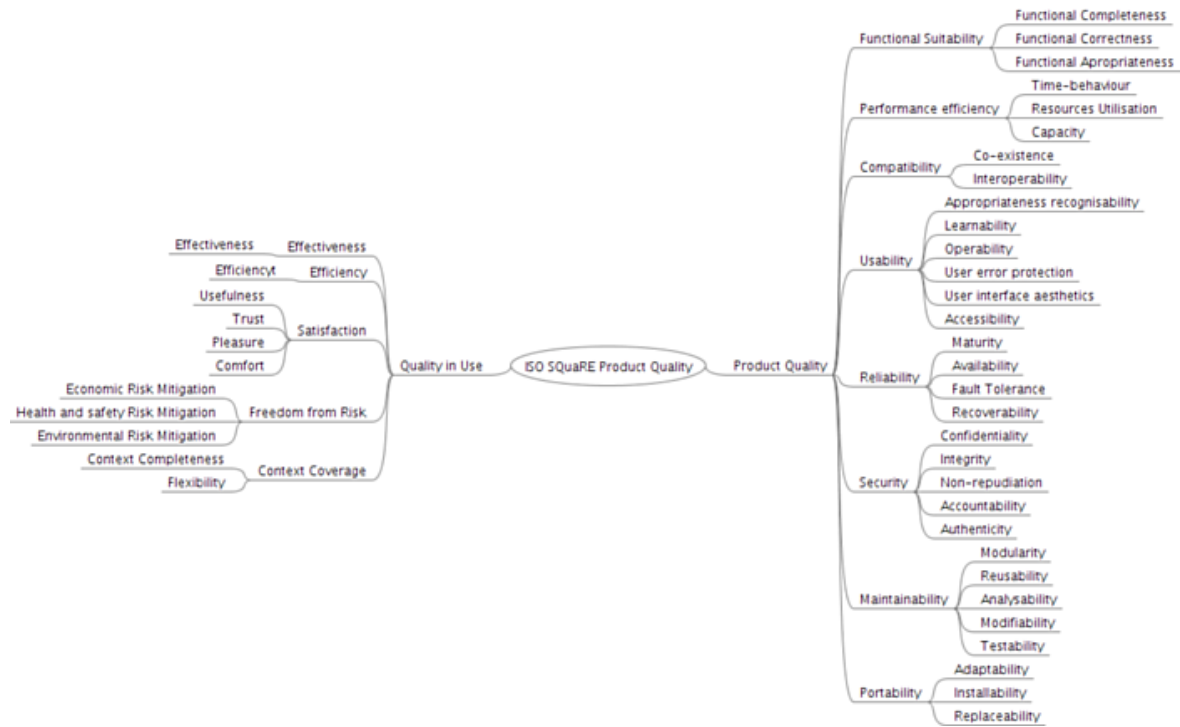
SQuaRE is a series of International Standards (25000-25099) edited by the ISO/IEC organisation and related to Systems and Software Quality.

It is composed of the following ISO/IEC standards:

- ISO/IEC 25000 -- Guide to SQuaRE
- ISO/IEC 25001 -- Planning and management
- ISO/IEC 25010 -- System and software quality models
- ISO/IEC 25012 -- Data quality model
- ISO/IEC 25020 -- Measurement reference model and guide
- ISO/IEC 25021 -- Quality measure elements
- ISO/IEC 25030 -- Quality requirements
- ISO/IEC 25040 -- Evaluation process
- ISO/IEC 25045 -- Evaluation module for recoverability
- ISO/IEC 25051 -- Requirements for quality of Commercial Off-The-Shelf (COTS) software product and instructions for testing
- ISO/IEC 25060 -- Common Industry Format (CIF) for usability: General framework for usability-related information
- ISO/IEC 25062 -- Common Industry Format (CIF) for usability test reports

They are meant to replace older standards addressing the same topics, mainly (but not only) ISO/IEC 9126 and ISO/IEC 14598.

## Structure



## See also

- ISO/IEC 9126
- ISO/IEC 14598
- ISO/IEC 25000
- ISO/IEC 25001
- ISO/IEC 25010
- ISO/IEC 25012
- ISO/IEC 25020
- ISO/IEC 25021
- ISO/IEC 25030
- ISO/IEC 25040
- ISO/IEC 25045
- ISO/IEC 25051
- ISO/IEC 25060
- ISO/IEC 25062

## 7.90. ISO/IEC/IEEE 15289

International Standard ISO/IEC/IEEE 15289.

Systems and software engineering -- Content of life-cycle information products (documentation)

Years: 2006, 2011.

This standard revises the ISO/IEC 15289 standard.

## Access

Online ISO catalog:

→ [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_ics/catalogue\\_detail\\_ics.htm?csnumber=54388](http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=54388)

## See also

Standards:

→ ISO/IEC 12207

→ ISO/IEC 15288

→ ISO/IEC 15289

→ ISO/IEC 20000

## 7.91. ISO/IEC/IEEE 24765

International Standard ISO/IEC/IEEE 24765

Systems and software engineering — Vocabulary

First edition: 2010-12-15

## Access

Online IEEE Catalog: [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=50518](http://www.iso.org/iso/catalogue_detail.htm?csnumber=50518)

## 7.92. RTCA/EUROCAE

Software Considerations in Airborne Systems and Equipments Certification

Requirements and Technical Concepts for Aviation - RTCA SC167/DO-178B

European Organization for Civil Aviation Electronics - EUROCAE ED-12B

## 7.93. SIGIST

Glossary of terms used in Software testing

British Computer Society - Specialist Interest Group In Software Testing

## 7.94. Team Software Process

Team Software Process is a process developed by the Carnegie-Mellon Software Engineering Institute.

The Team Software Process (TSP) helps engineering teams develop and deliver high-quality software-intensive systems within planned cost and schedule commitments. TSP integrates software engineering, estimating,

planning and tracking, quality management, and self-directed teaming concepts into a defined process and measurement framework. TSP was designed to be easily integrated with an organization's existing practices, and complements CMMI.

= See also =

→ CMMi

→ The official SEI website for TSP: [www.sei.cmu.edu/tsp/](http://www.sei.cmu.edu/tsp/) [<http://www.sei.cmu.edu/tsp/>].

## Appendix A. Data Provider Frameworks

### A.1. Current Frameworks

The following Data Provider frameworks support importing all kinds of data into Squore. Whether you choose one or the other depends on the ability of your script or executable to produce CSV or XML data. Note that these frameworks are recommended over the legacy frameworks described in Section A.2, "Legacy Frameworks", which are deprecated as of Squore 18.0.11.

```
=====
= csv_import =
=====
```

The `csv_import` framework allows you to create Data Providers that produce CSV files that the framework will translate into XML files that can be imported in your analysts results. This framework is useful if writing XML files directly from your script is not practical.

Using `csv_import`, you can import metrics, findings (including relaxed findings), textual information, and links between artefacts (including to and from source code artefacts).

This framework replaces all the legacy frameworks that wrote CSV files in previous versions.

Note that this framework can be called by your Data Provider simply by creating an `exec-tool` phase that calls the part of the framework located in the configuration folder:

```
<exec-tool name="csv_import">
  <param key="csv" value="{getOutputFile(output.csv)}" />
  <param key="separator" value=";" />
  <param key="delimiter" value=""" />
</exec-tool>
```

For a full description of all the parameters that can be used, consult the section called "CSV Import" in the "Data Providers" chapter of this manual.

```
=====
= CSV format expected by the data provider =
=====
```

- Line to define an artefact (like a parent artefact for instance):  
Artefact
- Line to add n metrics to an artefact:  
Artefact;(MetricId;Value)\*
- Line to add n infos to an artefact:  
Artefact;(InfoId;Value)\*
- Line to add a key to an artefact:  
Artefact;Value
- Line to add a finding to an artefact:  
Artefact;RuleId;Message;Location
- Line to add a relaxed finding to an artefact:



```
Artefact;RuleId;Message;Location;RelaxStatus;RelaxMessage
```

```
- Line to add a link between artefacts:
```

```
Artefact;LinkId;Artefact
```

```
where:
```

- MetricId is the id of the metric as declared in the Analysis Model
- InfoId is the id of the information to import
- Value is the value of the metric or the information or the key to import (a key is a UUID used to reference an artefact)
- RuleId is the id of the rule violated as declared in the Analysis Model
- Message is the message of the finding, which is displayed after the rule description
- Location is the location of the finding (a line number for findings attached source code artefacts, a url for findings attached to any other kind of artefact)
- RelaxStatus is one of DEROGATION, FALSE\_POSITIVE or LEGACY and defines the relaxation stat of the imported finding
- RelaxMessage is the justification message for the relaxation state of the finding
- LinkId is the id of the link to create between artefacts, as declared in the Analysis Model

```
=====  
= Manipulating Artefacts =  
=====
```

The following functions are available to locate and manipulate source code artefacts in the project:

- `${artefact(type,path)}` ==> Identify an artefact by its type and full path
- `${artefact(type,path,uid)}` ==> Identify an artefact by its type and full path and assign it the unique identifier uid
- `${uid(value)}` ==> Identify an artefact by its unique identifier (value)
- `${file(path)}` ==> Tries to find a source code file matching the "path" in the project
- `${function(fpath,line)}` ==> Tries to find a source code function at line "line" in file matching the "fpath" in the project
- `${function(fpath,name)}` ==> Tries to find a source code function whose name matches "name" in the file matching the "fpath" in the project
- `${class(fpath,line)}` ==> Tries to find a source code class at line "line" in the file matching the "fpath" in the project
- `${class(fpath,name)}` ==> Tries to find a source code class whose name matches "name" in the file matching the "fpath" in the project

```
=====  
= Input Files =  
=====
```

The data provider accepts the following files:

Metrics file accepts:

```
Artefact definition line  
Metrics line
```

Findings file accepts:

```
Artefact definition line  
Findings line
```

Keys file accepts:

```
Artefact definition line
```

Keys line

Information file accepts:  
 Artefact definition line  
 Information line

Links file accepts:  
 Artefact definition line  
 Links line

It is also possible to mix every kind of line in a single csv file, as long as each line is prefixed with the kind of data it contains.

In this case, the first column must contain one of:

DEFINE (or D): when the line is used to define an artefact

METRIC (or M): to add a metric

INFO (or I): to add an information

KEY (or K): to add a key

FINDING (or F): to add a finding, relaxed or not

LINK (or L): to add link between artefacts

The following is an example of a csv file containing mixed lines:

```
D;${artefact(CR_FOLDER,/CRsCl)}
M;${artefact(CR,/CRsCl/cr2727,2727)};NB;2
M;${artefact(CR,/CRsCl/cr1010,1010)};NB;4
I;${uid(1010)};NBI;Bad weather
K;${artefact(CR,/CRsCl/cr2727,2727)};#CR2727
I;${artefact(CR,/CRsCl/cr2727,2727)};NBI;Nice Weather
F;${artefact(CR,/CRsCl/cr2727,2727)};BAD;Malformed
M;${uid(2727)};NB_EXT;3
I;${uid(2727)};NBI_EXT;Another Info
F;${uid(2727)};BAD_EXT;Badlyformed
F;${uid(2727)};BAD_EXT1;Badlyformed1;;FALSE_POSITIVE;Everything is in the
title]]>
F;${function(machine.c,41)};R_GOTO;"No goto; neither togo;";41
F;${function(machine.c,42)};R_GOTO;No Goto;42;LEGACY;Was done a long time ago
L;${uid(1010)};CR2CR;${uid(2727)}
L;${uid(2727)};CR2CR;${uid(1010)}
```

```
=====
= xml =
=====
```

The xml framework is an implementation of a data provider that allows to import an xml file, potentially after an xsl transformation. The transformed XML file is expected to follow the syntax expected by other data providers (see input-data.xml specification).

This framework can be extended like the other frameworks, by creating a folder for your data provider in your configuration/tools folder and creating a form.xml. Following are three examples of the possible uses of this framework.

Example 1 - User enters an xml path and an xsl path, the xml is transformed using the xsl and then imported

```
=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="xml">
  <tag type="text" key="xml" />
  <tag type="text" key="xslt" />
</tags>
```

```
<exec-phase id="add-data">
  <exec name="javascript" failOnError="true" failOnStdErr="true">
    <arg value="main.js" />
    <arg value="--" />
    <arg value="{outputDirectory}" />
    <arg tag="xml" />
    <arg tag="xslt" />
  </exec>
</exec-phase>
</tags>
```

Example 2 - The user enter an xml path, the xsl file is predefined (input-data.xsl) and present in the same directory as form.xml

=====

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="xml">
  <tag type="text" key="xml" />

  <exec-phase id="add-data">
    <exec name="javascript" failOnError="true" failOnStdErr="true">
      <arg value="main.js" />
      <arg value="--" />
      <arg value="{outputDirectory}" />
      <arg tag="xml" />
      <arg value="{getToolConfigDir(input-data.xsl)}" />
    </exec>
  </exec-phase>
</tags>
```

Example 3 - The user enter an xml path of a file already in the expected format

=====

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="xml">
  <tag type="text" key="xml" />

  <exec-phase id="add-data">
    <exec name="javascript" failOnError="true" failOnStdErr="true">
      <arg value="main.js" />
      <arg value="--" />
      <arg value="{outputDirectory}" />
      <arg tag="xml" />
    </exec>
  </exec-phase>
```

&lt;/tags&gt;

## A.2. Legacy Frameworks

	Import Metrics	Import Textual Information	Import Findings	Import Links	Create Artefacts	Parse Subfolders
<b>CSV</b>	✓	✓	✗	✗	✓	✓
<b>csv_findings</b>	✗	✗	✓	✗	✗	✗
<b>CSVPerl</b>	✓	✓	✗	✗	✓	✓
<b>Generic</b>	✓	✓	✓	✓	✓	✗
<b>GenericPerl</b>	✓	✓	✓	✓	✓	✓
<b>FindingsPerl</b>	✗	✗	✓	✗	✗	✓
<b>ExcelMetrics</b>	✓	✓	✓	✗	✓	✓

✓ Supported

✓ Your Perl script needs to handle subfolder parsing

✗ Not Supported

Legacy Data Provider frameworks and their capabilities

### 1. Csv

The Csv framework is used to import metrics or textual information and attach them to artefacts of type Application or File. While parsing one or more input CSV files, if it finds the same metric for the same artefact several times, it will only use the last occurrence of the metric and ignore the previous ones. Note that the type of artefacts you can attach metrics to is limited to Application and File artefacts. If you are working with File artefacts, you can let the Data Provider create the artefacts by itself if they do not exist already. Refer to the full Csv Reference for more information.

### 2. csv\_findings

The csv\_findings framework is used to import findings in a project and attach them to artefacts of type Application, File or Function. It takes a single CSV file as input and is the only framework that allows you to import relaxed findings directly. Refer to the full csv\_findings Reference for more information.

### 3. CsvPerl

The CsvPerl framework offers the same functionality as Csv, but instead of dealing with the raw input files directly, it allows you to run a perl script to modify them and produce a CSV file with the expected input format for the Csv framework. Refer to the full CsvPerl Reference for more information.

### 4. FindingsPerl

The FindingsPerl framework is used to import findings and attach them to existing artefacts. Optionally, if an artefact cannot be found in your project, the finding can be attached to the root node of the project instead. When launching a Data Provider based on the FindingsPerl framework, a perl script is run first. This perl script is used to generate a CSV file with the expected format which will then be parsed by the framework. Refer to the full FindingsPerl Reference for more information.

### 5. Generic

The Generic framework is the most flexible Data Provider framework, since it allows attaching metrics, findings, textual information and links to artefacts. If the artefacts do not exist in your project, they will be created automatically. It takes one or more CSV files as input (one per type of information you want to import) and works with any type of artefact. Refer to the full Generic Reference for more information.

### 6. GenericPerl

The GenericPerl framework is an extension of the Generic framework that starts by running a perl script in order to generate the metrics, findings, information and links files. It is useful if you have an input file

whose format needs to be converted to match the one expected by the Generic framework, or if you need to retrieve and modify information exported from a web service on your network. Refer to the full GenericPerl Reference for more information.

## 7. ExcelMetrics

The ExcelMetrics framework is used to extract information from one or more Microsoft Excel files (.xls or .xlsx). A detailed configuration file allows defining how the Excel document should be read and what information should be extracted. This framework allows importing metrics, findings and textual information to existing artefacts or artefacts that will be created by the Data Provider. Refer to the full ExcelMetrics Reference for more information.

After you choose the framework to extend, you should follow these steps to make your custom Data Provider known to Squore:

1. Create a new configuration `tools` folder to save your work in your custom configuration folder: `MyConfiguration/configuration/tools`.
2. Create a new folder for your data provider inside the new `tools` folder: **CustomDP**. This folder needs to contain the following files:
  - **form.xml** defines the input parameters for the Data Provider, and the base framework to use, as described in Section 4.74.1, "Data Provider Parameters"
  - **form\_en.properties** contains the strings displayed in the web interface for this Data Provider, as described in Section 4.74.2, "Localising your Data Provider"
  - **config.tcl** contains the parameters for your custom Data Provider that are specific to the selected framework
  - **CustomDP.pl** is the perl script that is executed automatically if your custom Data Provider uses one of the \*Perl frameworks.
3. Edit Squore Server's configuration file to register your new configuration path, as described in the Installation and Administration Guide.
4. Log into the web interface as a Squore administrator and reload the configuration.

Your new Data Provider is now known to Squore and can be triggered in analyses. Note that you may have to modify your Squore configuration to make your wizard aware of the new Data Provider and your model aware of the new metrics it provides. Refer to the relevant sections of the Configuration Guide for more information.

```
=====
= Csv =
=====

The Csv framework is used to import metrics or textual information and attach
them to artefacts of type Application, File or Function. While parsing one
or more input CSV files, if it finds the same metric for the same artefact
several times, it will only use the last occurrence of the metric and ignore
the previous ones. Note that the type of artefacts you can attach metrics to
is limited to Application, File and Function artefacts. If you are working with
File artefacts, you can let the Data Provider create the artefacts by itself if
they do not exist already.

=====
= form.xml =
=====

You can customise form.xml to either:
- specify the path to a single CSV file to import
- specify a pattern to import all csv files matching this pattern in a directory
```

In order to import a single CSV file:

```
=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="Csv" needSources="true">
  <tag type="text" key="csv" defaultValue="/path/to/mydata.csv" />
</tags>
```

Notes:

- The csv key is mandatory.
- Since Csv-based data providers commonly rely on artefacts created by Squan Sources, you can set the needSources attribute to force users to specify at least one repository connector when creating a project.

In order to import all files matching a pattern in a folder:

```
=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="Csv" needSources="true">
  <!-- Root directory containing Csv files to import-->
  <tag type="text" key="dir" defaultValue="/path/to/mydata" />
  <!-- Pattern that needs to be matched by a file name in order to import it-->
  <tag type="text" key="ext" defaultValue="*.csv" />
  <!-- search for files in sub-folders -->
  <tag type="booleanChoice" defaultValue="true" key="sub" />
</tags>
```

Notes:

- The dir and ext keys are mandatory
- The sub key is optional (and its value set to false if not specified)

```
=====
= config.tcl =
=====
```

Sample config.tcl file:

```
=====
# The separator used in the input CSV file
# Usually \t or ;
set Separator "\t"

# The delimiter used in the input CSV file
# This is normally left empty, except when you know that some of the values in
# the CSV file
# contain the separator itself, for example:
# "A text containing ; the separator";no problem;end
# In this case, you need to set the delimiter to \" in order for the data
# provider to find 3 values instead of 4.
# To include the delimiter itself in a value, you need to escape it by
# duplicating it, for example:
# "A text containing \" the delimiter";no problemo;end
# Default: none
set Delimiter \"

# ArtefactLevel is one of:
#   Application: to import data at application level
#   File: to import data at file level. In this case ArtefactKey has to be set
#         to the value of the header (key) of the column containing the file
# path
# in the input CSV file.
```

```

#      Function : to import data at function level, in this case:
#      ArtefactKey has to be set to the value of the header (key) of
the column containing the path of the file
#      FunctionKey has to be set to the value of the header (key) of
the column containing the name and signature of the function
# Note that the values are case-sensitive.
set ArtefactLevel File
set ArtefactKey File

# Should the File paths be case-insensitive?
# true or false (default)
# This is used when searching for a matching artefact in already-existing
artefacts.
set PathsAreCaseInsensitive "false"

# Should file artefacts declared in the input CSV file be created automatically?
# true (default) or false
set CreateMissingFile "true"

# FileOrganisation defines the layout of the input CSV file and is one of:
#   header::column: values are referenced from the column header
#   header::line: NOT AVAILABLE
#   alternate::line: lines are a sequence of {Key Value}
#   alternate::column: columns are a sequence of {Key Value}
# There are more examples of possible CSV layouts later in this document
set FileOrganisation header::column

# Metric2Key contains a case-sensitive list of paired metric IDs:
#   {MeasureID KeyName [Format]}
# where:
#   - MeasureID is the id of the measure as defined in your analysis model
#   - KeyName, depending on the FileOrganisation, is either the name of the
column or the name
#       in the cell preceding the value to import as found in the input CSV file
#   - Format is the optional format of the data, the only accepted format
#       is "text" to attach textual information to an artefact, for normal metrics
omit this field
set Metric2Key {
{BRANCHES Branchs}
{VERSIONS Versions}
{CREATED Created}
{IDENTICAL Identical}
{ADDED Added}
{REMOV Removed}
{MODIF Modified}
{COMMENT Comment text}
}

=====
= Sample CSV Input Files =
=====

Example 1:
=====
FileOrganisation : header::column
ArtefactLevel : File
ArtefactKey      : Path

```

```
Path Branchs Versions
```

```
./foo.c 15 105  
./bar.c 12 58
```

```
Example 2:
```

```
=====
```

```
FileOrganisation : alternate::line  
ArtefactLevel : File  
ArtefactKey : Path
```

```
Path ./foo.c Branchs 15 Versions 105  
Path ./bar.c Branchs 12 Versions 58
```

```
Example 3:
```

```
=====
```

```
FileOrganisation : header::column  
ArtefactLevel : Application
```

```
ChangeRequest Corrected Open  
27 15 11
```

```
Example 4:
```

```
=====
```

```
FileOrganisation : alternate::column  
ArtefactLevel : Application
```

```
ChangeRequest 15  
Corrected 11
```

```
Example 5:
```

```
=====
```

```
FileOrganisation : alternate::column  
ArtefactLevel : File  
ArtefactKey : Path
```

```
Path ./foo.c  
Branchs 15  
Versions 105  
Path ./bar.c  
Branchs 12  
Versions 58
```

```
Example 6:
```

```
=====
```

```
FileOrganisation : header::column  
ArtefactLevel : Function  
ArtefactKey : Path  
FunctionKey : Name
```

```
Path Name Decisions Tested  
./foo.c end_game(int*,int*) 15 3  
./bar.c bar(char) 12 6
```

```
Working With Paths:
```

```
=====
```

```
- Path separators are unified: you do not need to worry about handling  
differences between Windows and Linux
```



- With the option `PathsAreCaseInsensitive`, case is ignored when searching for files in the Squore internal data
- Paths known by Squore are relative paths starting at the root of what was specified in the repository connector during the analysis. This relative path is the one used to match with a path in a csv file.

Here is a valid example of file matching:

1. You provide `C:\A\B\C\D` as the root folder in a repository connector
2. `C:\A\B\C\D` contains `E\e.c` then Squore will know `E/e.c` as a file
3. You provide a csv file produced on linux and containing `/tmp/X/Y/E/e.c` as path, then Squore will be able to match it with the known file.

Squore uses the longest possible match.

In case of conflict, no file is found and a message is sent to the log.

```
=====
= csv_findings =
=====
```

The `csv_findings` data provider is used to import findings (rule violations) and attach them to artefacts of type `Application`, `File` or `Function`.  
The format of the csv file given as parameter has to be:

```
FILE;FUNCTION;RULE_ID;MESSAGE;LINE;COL;STATUS;STATUS_MESSAGE;TOOL
```

where:

```
=====
```

`FILE` : is the full path of the file where the finding is located  
`FUNCTION` : is the name of the function where the finding is located  
`RULE_ID` : is the Squore ID of the rule which is violated  
`MESSAGE` : is the specific message of the violation  
`LINE`: is the line number where the violation occurs  
`COL`: (optional, leave empty if not provided) is the column number where the violation occurs  
`STATUS`: (optional, leave empty if not provided) is the status of the relaxation if the violation has to be relaxed (`DEROGATION`, `FALSE_POSITIVE`, `LEGACY`)  
`STATUS_MSG`: (optional, leave empty if not provided) is the message for the relaxation when relaxed  
`TOOL`: is the tool providing the violation

The header line is read and ignored (it has to be there)

The separator (semicolon by default) can be changed in the `config.tcl` file (see below)

The delimiter (no delimiter by default) can be changed in the `config.tcl` (see below)

```
=====
= config.tcl =
=====
```

Sample `config.tcl` file:

```
=====
```

```
# The separator used in the input CSV file
# Usually ; or \t
set Separator \;
```

```
# The delimiter used in the CSV input file
```

```

# This is normally left empty, except when you know that some of the values in
the CSV file
# contain the separator itself, for example:
# "A text containing ; the separator";no problem;end
# In this case, you need to set the delimiter to \" in order for the data
provider to find 3 values instead of 4.
# To include the delimiter itself in a value, you need to escape it by
duplicating it, for example:
# "A text containing \" the delimiter";no problemo;end
# Default: none
set Delimiter \"

```

```

=====
= CsvPerl =
=====

```

The CsvPerl framework offers the same functionality as Csv, but instead of dealing with the raw input files directly, it allows you to run a perl script to modify them and produce a CSV file with the expected input format for the Csv framework.

```

=====
= form.xml =
=====

```

In your form.xml, specify the input parameters you need for your Data Provider. Our example will use two parameters: a path to a CSV file and another text parameter:

```

<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="CsvPerl" needSources="true">
  <tag type="text" key="csv" defaultValue="/path/to/csv" />
  <tag type="text" key="param" defaultValue="MyValue" />
</tags>

```

- Since Csv-based data providers commonly rely on artefacts created by Squan Sources, you can set the needSources attribute to force users to specify at least one repository connector when creating a project.

```

=====
= config.tcl =
=====

```

Refer to the description of config.tcl for the Csv framework.

For CsvPerl one more option is possible:

```

# The variable NeedSources is used to request the perl script to be executed once
for each
# repository node of the project. In that case an additional parameter is sent to
the
# perl script (see below for its position)
#set ::NeedSources 1

```

```

=====

```

```
= Sample CSV Input Files =  
=====
```

Refer to the examples for the Csv framework.

```
=====  
= Perl Script =  
=====
```

The perl script will receive as arguments:

- all parameters defined in form.xml (as `-${key} $value`)
- the input directory to process (only if `::NeedSources` is set to 1 in the config.tcl file)
- the location of the output directory where temporary files can be generated
- the full path of the csv file to be generated

For the form.xml we created earlier in this document, the command line will be:  
perl <configuration\_folder>/tools/CustomDP/CustomDP.pl -csv /path/to/csv -param MyValue <output\_folder> <output\_folder>/CustomDP.csv

Example of perl script:

```
=====  
#!/usr/bin/perl  
use strict;  
use warnings;  
$|=1 ;  
  
($csvKey, $csvValue, $paramKey, $paramValue, $output_folder, $output_csv) =  
@ARGV;  
  
# Parse input CSV file  
# ...  
  
# Write results to CSV  
open(CSVFILE, ">" . ${output_csv}) || die "perl: can not write: $!\n";  
binmode(CSVFILE, ":utf8");  
print CSVFILE "ChangeRequest;15";  
close CSVFILE;  
  
exit 0;
```

```
=====  
= Generic =  
=====
```

The Generic framework is the most flexible Data Provider framework, since it allows attaching metrics, findings, textual information and links to artefacts. If the artefacts do not exist in your project, they will be created automatically. It takes one or more CSV files as input (one per type of information you want to import) and works with any type of artefact.

```
=====  
= form.xml =  
=====
```

In form.xml, allow users to specify the path to a CSV file for each type of data you want to import.

You can set `needSources` to true or false, depending on whether or not you want to require the use of a repository connector when your custom Data Provider is used.

Example of `form.xml` file:

```

=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="Generic" needSources="false">
  <!-- Path to CSV file containing Metrics data -->
  <tag type="text" key="csv" defaultValue="mydata.csv" />
  <!-- Path to CSV file containing Findings data: -->
  <tag type="text" key="fdg" defaultValue="mydata_fdg.csv" />
  <!-- Path to CSV file containing Information data: -->
  <tag type="text" key="inf" defaultValue="mydata_inf.csv" />
  <!-- Path to CSV file containing Links data: -->
  <tag type="text" key="lnk" defaultValue="mydata_lnk.csv" />
</tags>

```

Note: All tags are optional. You only need to specify the tag element for the type of data you want to import with your custom Data Provider.

```

=====
= config.tcl =
=====

```

Sample `config.tcl` file:

```

=====
# The separator used in the input csv files
# Usually \t or ; or ,
# In our example below, a space is used.
set Separator " "

# The delimiter used in the input CSV file
# This is normally left empty, except when you know that some of the values in
# the CSV file
# contain the separator itself, for example:
# "A text containing ; the separator";no problem;end
# In this case, you need to set the delimiter to \" in order for the data
# provider to find 3 values instead of 4.
# To include the delimiter itself in a value, you need to escape it by
# duplicating it, for example:
# "A text containing \" the delimiter\";no problemo;end
# Default: none
set Delimiter \"

# The path separator in an artefact's path
# in the input CSV file.
# Note that artefact is spelled with an "i"
# and not an "e" in this option.
set ArtifactPathSeparator "/"

# If the data provider needs to specify a different toolName (optional)
set SpecifyToolName 1

# Metric2Key contains a case-sensitive list of paired metric IDs:
#   {MeasureID KeyName [Format]}
# where:
# - MeasureID is the id of the measure as defined in your analysis model

```

```
# - KeyName is the name in the cell preceding the value to import as found in
the input CSV file
# - Format is the optional format of the data, the only accepted format
#   is "text" to attach textual information to an artefact. Note that the same
result can also
#   be achieved with Info2Key (see below). For normal metrics omit this
field.
set Metric2Key {
  {CHANGES Changed}
}

# Finding2Key contains a case-sensitive list of paired rule IDs:
#   {FindingID KeyName}
# where:
# - FindingID is the id of the rule as defined in your analysis model
# - KeyName is the name in the finding name in the input CSV file
set Finding2Key {
  {R_NOTLINKED NotLinked}
}

# Info2Key contains a case-sensitive list of paired info IDs:
#   {InfoID KeyName}
# where:
# - InfoID is the id of the textual information as defiend in your analysis
model
# - KeyName is the name of the information name in the input CSV file
set Info2Key
  {SPECIAL_LABEL Label}
}

# Ignore findings for artefacts that are not part of the project (orphan
findings)
# When set to 1, the findings are ignored
# When set to 0, the findings are imported and attached to the APPLICATION node
# (default: 1)
set IgnoreIfArtefactNotFound 1

# If data in csv concerns source code artefacts (File, Class or Function), the
way to
# match file paths can be case-insensitive
# true or false (default)
# This is used when searching for a matching artefact in already-existing
artefacts.
set PathsAreCaseInsensitive "false"

# For findings of a type that is not in your ruleset, set a default rule ID.
# The value for this parameter must be a valid rule ID from your analysys model.
# (default: empty)
set UnknownRuleId UNKNOWN_RULE

# Save the total count of orphan findings as a metric at application level
# Specify the ID of the metric to use in your analysys model
# to store the information
# (default: empty)
set OrphanArteCountId NB_ORPHANS

# Save the total count of unknown rules as a metric at application level
# Specify the ID of the metric to use in your analysys model
# to store the information
```

```
# (default: empty)
set OrphanRulesCountId NB_UNKNOWN_RULES

# Save the list of unknown rule IDs as textual information at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanRulesListId UNKNOWN_RULES_INFO
```

```
=====
= CSV File Format =
=====
```

All the examples listed below assume the use of the following config.tcl:

```
set Separator ","
set ArtifactPathSeparator "/"
set Metric2Key {
  {CHANGES Changed}
}
set Finding2Key {
  {R_NOTLINKED NotLinked}
}
set Info2Key
  {SPECIAL_LABEL Label}
}
```

How to reference an artefact:

```
=====  
==> artefact_type artefact_path  
Example:  
REQ_MODULES,Requirements  
REQ_MODULE,Requirements/Module  
REQUIREMENT,Requirements/Module/My_Req
```

References the following artefact

```
Application
  Requirements (type: REQ_MODULES)
  Module (type: REQ_MODULE)
  My_Req (type: REQUIREMENT)
```

Note: For source code artefacts there are 3 special artefact kinds:

```
==> FILE file_path  
==> CLASS file_path (Name|Line)  
==> FUNCTION file_path (Name|Line)
```

Examples:

```
FUNCTION src/file.c 23  
references the function which contains line 23 in the source file src/file.c, if  
no  
function found the line whole line of the csv file is ignored.
```

```
FUNCTION src/file.c foo()  
references a function named foo in source file src/file.c. If more than one  
function foo  
is defined in this file, then the signature of the function (which is optional)  
is used  
to find the best match.
```

Layout for Metrics File:

=====

```
==> artefact_type artefact_path (Key Value)*
```

When the parent artefact type is not given it defaults to <artefact\_type>\_FOLDER.

Example:

```
REQ_MODULE,Requirements/Module
REQUIREMENT,Requirements/Module/My_Req,Changed,1
```

will produce the following artefact tree:

```
Application
  Requirements (type: REQ_MODULE_FOLDER)
    Module (type: REQ_MODULE)
      My_Req : (type: REQUIREMENT) with 1 metric CHANGES = 1
```

Note: the key "Changed" is mapped to the metric "CHANGES", as specified by the Metric2Key parameter, so that it matches what is expected by the model.

Layout for Findings File:

=====

```
==> artefact_type artefact_path key message
```

When the parent artefact type is not given it defaults to <artefact\_type>\_FOLDER.

Example:

```
REQ_MODULE,Requirements/Module
REQUIREMENT,Requirements/Module/My_Req,NotLinked,A Requirement should always
been linked
```

will produce the following artefact tree:

```
Application
  Requirements (type: REQ_MODULE_FOLDER)
    Module (type: REQ_MODULE)
      My_Req (type: REQUIREMENT) with 1 finding R_NOTLINKED whose
description is "A Requirement should always been linked"
```

Note: the key "NotLinked" is mapped to the finding "R\_NOTLINKED", as specified by the Finding2Key parameter, so that it matches what is expected by the model.

Layout for Textual Information File:

=====

```
==> artefact_type artefact_path label value
```

When the parent artefact type is not given it defaults to <artefact\_type>\_FOLDER.

Example:

```
REQ_MODULE,Requirements/Module
REQUIREMENT,Requirements/Module/My_Req,Label,This is the label of the req
```

will produce the following artefact tree:

```
Application
  Requirements (type: REQ_MODULE_FOLDER)
    Module (type: REQ_MODULE)
      My_Req (type: REQUIREMENT) with 1 information of type SPECIAL_LABEL
whose content is "This is the label of the req"
```

Note: the label "Label" is mapped to the finding "SPECIAL\_LABEL", as specified by the Info2Key parameter, so that it matches what is expected by the model.

Layout for Links File:

=====

```
==> artefact_type artefact_path dest_artefact_type dest_artefact_path link_type
```

When the parent artefact type is not given it defaults to <artefact\_type>\_FOLDER

Example:

```
REQ_MODULE Requirements/Module
```

```
TEST_MODULE Tests/Module
```

```
REQUIREMENT Requirements/Module/My_Req TEST Tests/Module/My_test TESTED_BY
```

will produce the following artefact tree:

```
Application
```

```
Requirements (type: REQ_MODULE_FOLDER)
```

```
  Module (type: REQ_MODULE)
```

```
    My_Req (type: REQUIREMENT) ----->
```

```
Tests (type: TEST_MODULE_FOLDER)      |
```

```
  Module (type: TEST_MODULE)          |
```

```
    My_Test (type: TEST) <-----+ link (type: TESTED_BY)
```

The TESTED\_BY relationship is created with My\_Req as source of the link and My\_test as the destination

CSV file organisation when SpecifyToolName is set to 1

=====

When the variable SpecifyToolName is set to 1 (or true) a column has to be added at the beginning of each line in each csv file. This column can be empty or filled with a different toolName.

Example:

```
,REQ_MODULE,Requirements/Module
```

```
MyReqChecker,REQUIREMENT,Requirements/Module/My_Req Label,This is the label of the req
```

The finding of type Label will be set as reported by the tool "MyReqChecker".

=====

```
= GenericPerl =
```

=====

The GenericPerl framework is an extension of the Generic framework that starts by running a perl script in order to generate the metrics, findings, information and links files. It is useful if you have an input file whose format needs to be converted to match the one expected by the Generic framework, or if you need to retrieve and modify information exported from a web service on your network.

=====

```
= form.xml =
```

=====

In your form.xml, specify the input parameters you need for your Data Provider. Our example will use two parameters: a path to a CSV file and another text parameter:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<tags baseName="CsvPerl" needSources="false">
```



```
<tag type="text" key="csv" defaultValue="/path/to/csv" />
<tag type="text" key="param" defaultValue="MyValue" />
</tags>

=====
= config.tcl =
=====

Refer to the description of config.tcl for the Generic framework for the basic
options.
Additionally, the following options are available for the GenericPerl framework,
in order to know which type of information your custom Data Provider should try
to import.

# If the data provider needs to specify a different toolName (optional)
#set SpecifyToolName 1

# Set to 1 to import metrics csv file, 0 otherwise

# ImportMetrics
# When set to 1, your custom Data Provider (CustomDP) will try to import
# metrics from a file called CustomDP.mtr.csv that your perl script
# should generate according to the expected format described in the
# documentation of the Generic framework.
set ImportMetrics 1

# ImportInfos
# When set to 1, your custom Data Provider (CustomDP) will try to import
# textual information from a file called CustomDP.inf.csv that your perl script
# should generate according to the expected format described in the
# documentation of the Generic framework.
set ImportInfos 0

# ImportFindings
# When set to 1, your custom Data Provider (CustomDP) will try to import
# findings from a file called CustomDP.fdg.csv that your perl script
# should generate according to the expected format described in the
# documentation of the Generic framework.
set ImportFindings 1

# ImportLinks
# When set to 1, your custom Data Provider (CustomDP) will try to import
# artefact links from a file called CustomDP.lnk.csv that your perl script
# should generate according to the expected format described in the
# documentation of the Generic framework.
set ImportLinks 0

# Ignore findings for artefacts that are not part of the project (orphan
findings)
# When set to 1, the findings are ignored
# When set to 0, the findings are imported and attached to the APPLICATION node
# (default: 1)
set IgnoreIfArtefactNotFound 1

# For findings of a type that is not in your ruleset, set a default rule ID.
# The value for this parameter must be a valid rule ID from your analysys model.
# (default: empty)
```

```
set UnknownRuleId UNKNOWN_RULE

# Save the total count of orphan findings as a metric at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanArteCountId NB_ORPHANS

# Save the total count of unknown rules as a metric at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanRulesCountId NB_UNKNOWN_RULES

# Save the list of unknown rule IDs as textual information at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanRulesListId UNKNOWN_RULES_INFO

=====
= CSV File Format =
=====

Refer to the examples in the Generic framework.

=====
= Perl Script =
=====

The perl script will receive as arguments:
- all parameters defined in form.xml (as -${key} $value)
- the location of the output directory where temporary files can be generated
- the full path of the metric csv file to be generated (if ImportMetrics is set
  to 1 in config.tcl)
- the full path of the findings csv file to be generated (if ImportFindings is
  set to 1 in config.tcl)
- the full path of the textual information csv file to be generated (if
  ImportInfos is set to 1 in config.tcl)
- the full path of the links csv file to be generated (if ImportLinks is set to 1
  in config.tcl)
- the full path to the output directory used by this data provider in the
  previous analysis

For the form.xml and config.tcl we created earlier in this document, the command
line will be:
perl <configuration_folder>/tools/CustomDP/CustomDP.pl -csv /path/to/csv -
param MyValue <output_folder> <output_folder>/CustomDP.mtr.csv <output_folder>/
CustomDP.fdg.csv <previous_output_folder>

The following perl functions are made available in the perl environment so you
can use them in your script:
- get_tag_value(key) (returns the value for $key parameter from your form.xml)
- get_output_metric()
- get_output_finding()
- get_output_info()
- get_output_link()
- get_output_dir()
```

```
- get_input_dir() (returns the folder containing sources if needSources is set to
1)
- get_previous_dir()
```

Example of perl script:

```
=====
#!/usr/bin/perl
use strict;
use warnings;
$|=1 ;

# Parse input CSV file
my $csvFile = get_tag_value("csv");
my $param = get_tag_value("param");
# ...

# Write metrics to CSV
open(METRICS_FILE, ">" . get_output_metric()) || die "perl: can not write: $!
\n";
binmode(METRICS_FILE, ":utf8");
print METRICS_FILE "REQUIREMENTS;Requirements/All_Requirements;NB_REQ;15";
close METRICS_FILE;

# Write findings to CSV
open(FINDINGS_FILE, ">" . get_output_findings()) || die "perl: can not write: $!
\n";
binmode(FINDINGS_FILE, ":utf8");
print FINDINGS_FILE "REQUIREMENTS;Requirements/All_Requirements;R_LOW_REQS;
\n\"The minimum number of requirement should be at least 25.\n\"";
close FINDINGS_FILE;

exit 0;
```

```
=====
= FindingsPerl =
=====
```

The FindingsPerl framework is used to import findings and attach them to existing artefacts. Optionally, if an artefact cannot be found in your project, the finding can be attached to the root node of the project instead. When launching a Data Provider based on the FindingsPerl framework, a perl script is run first. This perl script is used to generate a CSV file with the expected format which will then be parsed by the framework.

```
=====
= form.xml =
=====
```

In your form.xml, specify the input parameters you need for your Data Provider. Our example will use two parameters: a path to a CSV file and another text parameter:

```
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="CsvPerl" needSources="true">
  <tag type="text" key="csv" defaultValue="/path/to/csv" />
  <tag type="text" key="param" defaultValue="MyValue" />
</tags>
```

- Since FindingsPerl-based data providers commonly rely on artefacts created by Squan Sources, you can set the needSources attribute to force users to specify at least one repository connector when creating a project.

```
=====
= config.tcl =
=====
```

Sample config.tcl file:

```
=====
# The separator to be used in the generated CSV file
# Usually \t or ;
set Separator ";"

# The delimiter used in the input CSV file
# This is normally left empty, except when you know that some of the values in
# the CSV file
# contain the separator itself, for example:
# "A text containing ; the separator";no problem;end
# In this case, you need to set the delimiter to \" in order for the data
# provider to find 3 values instead of 4.
# To include the delimiter itself in a value, you need to escape it by
# duplicating it, for example:
# "A text containing \" the delimiter";no problemo;end
# Default: none
set Delimiter \"

# Should the perl script executed once for each repository node of the project ?
# 1 or 0 (default)
# If true an additional parameter is sent to the
# perl script (see below for its position)
set ::NeedSources 0

# Should the violated rules definitions be generated?
# true or false (default)
# This creates a ruleset file with rules that are not already
# part of your analysis model so you can review it and add
# the rules manually if needed.
set generateRulesDefinitions false

# Should the File paths be case-insensitive?
# true or false (default)
# This is used when searching for a matching artefact in already-existing
# artefacts.
set PathsAreCaseInsensitive false

# Should file artefacts declared in the input CSV file be created automatically?
# true (default) or false
set CreateMissingFile true

# Ignore findings for artefacts that are not part of the project (orphan
# findings)
# When set to 0, the findings are imported and attached to the APPLICATION node
# instead of the real artefact
# When set to 1, the findings are not imported at all
# (default: 0)
```

```
set IgnoreIfArtefactNotFound 0

# For findings of a type that is not in your ruleset, set a default rule ID.
# The value for this parameter must be a valid rule ID from your analysis model.
# (default: empty)
set UnknownRuleId UNKNOWN_RULE

# Save the total count of orphan findings as a metric at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanArteCountId NB_ORPHANS

# Save the total count of unknown rules as a metric at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanRulesCountId NB_UNKNOWN_RULES

# Save the list of unknown rule IDs as textual information at application level
# Specify the ID of the metric to use in your analysis model
# to store the information
# (default: empty)
set OrphanRulesListId UNKNOWN_RULES_INFO

# The tool version to specify in the generated rules definitions
# The default value is ""
# Note that the toolName is the name of the folder you created
# for your custom Data Provider
set ToolVersion ""

# FileOrganisation defines the layout of the CSV file that is produced by your
perl script:
#   header::column: values are referenced from the column header
#   header::line: NOT AVAILABLE
#   alternate::line: NOT AVAILABLE
#   alternate::column: NOT AVAILABLE
set FileOrganisation header::column

# In order to attach a finding to an artefact of type FILE:
# - Tool (optional) if present it overrides the name of the tool providing the
finding
# - Path has to be the path of the file
# - Type has to be set to FILE
# - Line can be either empty or the line in the file where the finding is
located
# Rule is the rule identifier, can be used as is or translated using Rule2Key
# Descr is the description message, which can be empty
#
# In order to attach a finding to an artefact of type FUNCTION:
# - Tool (optional) if present it overrides the name of the tool providing the
finding
# - Path has to be the path of the file containing the function
# - Type has to be FUNCTION
# - If line is an integer, the system will try to find an artefact function
# at the given line of the file
# - If no Line or Line is not an integer, Name is used to find an artefact in
# the given file having name and signature as found in this column.
# (Line and Name are optional columns)
```

```
# Rule2Key contains a case-sensitive list of paired rule IDs:
#   {RuleID KeyName}
# where:
#   - RuleID is the id of the rule as defined in your analysis model
#   - KeyName is the rule ID as written by your perl script in the produced CSV
file
# Note: Rules that are not mapped keep their original name. The list of unmapped
rules is in the log file generated by your Data Provider.
set Rule2Key {
  { ExtractedRuleID_1 MappedRuleId_1 }
  { ExtractedRuleID_2 MappedRuleId_2 }
}
```

```
=====
= CSV File Format =
=====
```

According to the options defined earlier in config.tcl, a valid csv file would be:

```
Path;Type;Line;Name;Rule;Descr
/src/project/module1/f1.c;FILE;12;;R1;Rule R1 is violated because variable v1
/src/project/module1/f1.c;FUNCTION;202;;R4;Rule R4 is violated because function
f1
/src/project/module2/f2.c;FUNCTION;42;;R1;Rule R1 is violated because variable v2
/src/project/module2/f2.c;FUNCTION;;skip_line(int);R1;Rule R1 is violated because
variable v2
```

Working With Paths:

```
=====
```

- Path separators are unified: you do not need to worry about handling differences between Windows and Linux
- With the option PathsAreCaseInsensitive, case is ignored when searching for files in the Squore internal data
- Paths known by Squore are relative paths starting at the root of what was specified in the repository connector during the analysis. This relative path is the one used to match with a path in a csv file.

Here is a valid example of file matching:

1. You provide C:\A\B\C\D as the root folder in a repository connector
2. C:\A\B\C\D contains E\e.c then Squore will know E/e.c as a file
3. You provide a csv file produced on linux and containing /tmp/X/Y/E/e.c as path, then Squore will be able to match it with the known file.

Squore uses the longest possible match.

In case of conflict, no file is found and a message is sent to the log.

```
=====
= Perl Script =
=====
```

The perl script will receive as arguments:

- all parameters defined in form.xml (as `-${key} $value`)

- the input directory to process (only if ::NeedSources is set to 1)
- the location of the output directory where temporary files can be generated
- the full path of the findings csv file to be generated

For the form.xml and config.tcl we created earlier in this document, the command line will be:

```
perl <configuration_folder>/tools/CustomDP/CustomDP.pl -csv /path/to/csv -
param MyValue <output_folder> <output_folder>/CustomDP.fdg.csv <output_folder>/
CustomDP.fdg.csv
```

Example of perl script:

```
=====
#!/usr/bin/perl
use strict;
use warnings;
$|=1 ;

($csvKey, $csvValue, $paramKey, $paramValue, $output_folder, $output_csv) =
@ARGV;

# Parse input CSV file
# ...

# Write results to CSV
open(CSVFILE, ">" . ${output_csv}) || die "perl: can not write: $!\n";
binmode(CSVFILE, ":utf8");
print CSVFILE "Path;Type;Line;Name;Rule;Descr";
print CSVFILE "/src/project/module1/fl.c;FILE;12;;R1;Rule R1 is violated because
variable v1";
close CSVFILE;

exit 0;
```

```
=====
= ExcelMetrics =
=====
```

The ExcelMetrics framework is used to extract information from one or more Microsoft Excel files (.xls or .xlsx). A detailed configuration file allows defining how the Excel document should be read and what information should be extracted. This framework allows importing metrics, findings and textual information to existing artefacts or artefacts that will be created by the Data Provider.

```
=====
= form.xml =
=====
```

You can customise form.xml to either:

- specify the path to a single Excel file to import
- specify a pattern to import all Excel files matching this pattern in a directory

In order to import a single Excel file:

```
=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="ExcelMetrics" needSources="false">
  <tag type="text" key="excel" defaultValue="/path/to/mydata.xlsx" />
```

```
</tags>
```

Notes:

- The excel key is mandatory.

In order to import all files matching a patter in a folder:

```
=====
<?xml version="1.0" encoding="UTF-8"?>
<tags baseName="ExcelMetrics" needSources="false">
  <!-- Root directory containing Excel files to import-->
  <tag type="text" key="dir" defaultValue="/path/to/mydata" />
  <!-- Pattern that needs to be matched by a file name in order to import it-->
  <tag type="text" key="ext" defaultValue="*.xlsx" />
  <!-- search for files in sub-folders -->
  <tag type="booleanChoice" defaultValue="true" key="sub" />
</tags>
```

Notes:

- The dir and ext keys are mandatory
- The sub key is optional (and its value set to false if not specified)

```
=====
= config.tcl =
=====
```

Sample config.tcl file:

```
=====
# The separator to be used in the generated csv file
# Usually \t or ; or ,
set Separator ";"

# The delimiter used in the input CSV file
# This is normally left empty, except when you know that some of the values in
the CSV file
# contain the separator itself, for example:
# "A text containing ; the separator";no problem;end
# In this case, you need to set the delimiter to \" in order for the data
provider to find 3 values instead of 4.
# To include the delimiter itself in a value, you need to escape it by
duplicating it, for example:
# "A text containing \" the delimiter\";no problemo;end
# Default: none
set Delimiter \"

# The path separator in an artefact's path
# in the generated CSV file.
set ArtefactPathSeparator "/"

# Ignore findings for artefacts that are not part of the project (orphan
findings)
# When set to 1, the findings are ignored
# When set to 0, the findings are imported and attached to the APPLICATION node
# (default: 1)
set IgnoreIfArtefactNotFound 1

# For findings of a type that is not in your ruleset, set a default rule ID.
# The value for this parameter must be a valid rule ID from your analysys model.
```



```

# (default: empty)
set UnknownRuleId UNKNOWN_RULE

# Save the total count of orphan findings as a metric at application level
# Specify the ID of the metric to use in your analysys model
# to store the information
# (default: empty)
set OrphanArteCountId NB_ORPHANS

# Save the total count of unknown rules as a metric at application level
# Specify the ID of the metric to use in your analysys model
# to store the information
# (default: empty)
set OrphanRulesCountId NB_UNKNOWN_RULES

# Save the list of unknown rule IDs as textual information at application level
# Specify the ID of the metric to use in your analysys model
# to store the information
# (default: empty)
set OrphanRulesListId UNKNOWN_RULES_INFO

# The list of the Excel sheets to read, each sheet has the number of the first
  line to read
# A Perl regexp pattern can be used instead of the name of the sheet (the first
  sheet matching
# the pattern will be considered)
set Sheets {{Baselines 5} {ChangeNotes 5}}

# #####
# # COMMON DEFINITIONS #
# #####
#
# - <value> is a list of column specifications whose values will be concatenated.
  When no column name is present, the
#     text is taken as it appears. Optional sheet name can be added (with !
  char to separate from the column name)
# Examples:
#     - {C:} the value will be the value in column C on the current row
#     - {C: B:} the value will be the concatenation of values found in
  column C and B of the current row
#     - {Deliveries} the value will be Deliveries
#     - {BJ: " - " BL:} the value will be the concatenation of value found
  in column BJ,
#         string " - " and the value found in column BL fo the current row
#     - {OtherSheet!C:} the value will be the value in column C from the
  sheet OtherSheet on the current row
#
# - <condition> is a list of conditions. An empty condition is always true. A
  condition is a column name followed by colon,
#     optionally followed by a perl regexp. Optional sheet name can be
  added (with ! char to separate from the column name)
# Examples:
#     - {B:} the value in column B must be empty on the current row
#     - {B:.*} the value in column B can not be empty on the current row
#     - {B:R_.+} the value in column B is a word starting by R_ on the current
  row
#     - {A: B:.* C:R_.+} the value in column A must be empty and the value in
  column B must contain something and
#     the column C contains a word starting with R_ on the current row

```

```

#       - {OtherSheet!B:.*} the value in column B from sheet OtherSheet on the
current row can not be empty.

# #####
# # ARTEFACTS #
# #####
# The variable is a list of artefact hierarchy specification:
# {ArtefactHierarchySpec1 ArtefactHierarchySpec2 ... ArtefactHierarchySpecN}
# where each ArtefactHierarchySpecx is a list of ArtefactSpec
#
# An ArtefactSpec is a list of items, each item being:
# {<(sheetName!)?artefactType> <conditions> <name> <parentType>? <parentName>?}
# where:
#   - <(sheetName!)?artefactType>: allows specifying the type. Optional
sheetName can be added (with ! char to separate from the type) to limit
#                                     the artefact search in one specific sheet.
When Sheets are given with regexp, the same regexp has to be used
#                                     for the sheetName.
#                                     If the type is followed by a question mark
(?) , this level of artefact is optional.
#                                     If the type is followed by a plus char (+) ,
this level is repeatable on the next row
#   - <condition>: see COMMON DEFINITIONS
#   - <value>: the name of the artefact to build, see COMMON DEFINITIONS
#
#   - <parentType>: This element is optional. When present, it means that the
current element will be attached to a parent having this type
#   - <parentValue>: This is a list like <value> to build the name of the
artefact of type <parentType>. If such artefact is not found,
#                                     the current artefact does not match
#
# Note: to add metrics at application level, specify an APPLICATION artefact
which will match only one line:
#   e.g. {APPLICATION {A:.*} {}} will recognize as application the line
having column A not empty.
set ArtefactsSpecs {
{
{DELIVERY {} {Deliveries}}
{RELEASE {E:.*} {E:}}
{SPRINT {O:SW_Software} {Q:}}
}
{
{DELIVERY {} {Deliveries}}
{RELEASE {O:SY_System} {Q:}}
}
{
{WP {BL:.* AF:.*} {BJ: " - " BL:} SPRINT {AF:}}
{ChangeNotes!TASK {D:(added|changed|unchanged) T:imes} {W: AD:}}
}
{
{WP {} {{Unplanned imes}} SPRINT {AF:}}
{TASK {BL: D:(added|changed|unchanged) T:imes W:.*} {W: AD:}}
}
}

# #####
# # METRICS #
# #####
# Specification of metrics to be retrieved
    
```

```

# This is a list where each element is:
# {<artefactTypeList> <metricId> <condition> <value> <format>}
# Where:
#   - <artefactTypeList>: the list of artefact types for which the metric has
#     to be used
#           each element of the list is (sheetName!)?artefactType
#     where sheetName is used
#           to restrict search to only one sheet. sheetName is
#     optional.
#   - <metricId>: the name of the MeasureId to be injected into Squore, as
#     defined in your analysis model
#   - <condition>: see COMMON DEFINITIONS above. This is the condition for the
#     metric to be generated.
#   - <value> : see COMMON DEFINITIONS above. This is the value for the metric
#     (can be built from multi column)
#   - <format> : optional, defaults to NUMBER
#           Possible format are:
#           * DATE_FR, DATE_EN for date stored as string
#           * DATE for cell formatted as date
#           * NUMBER_FR, NUMBER_EN for number stored as string
#           * NUMBER for cell formatted as number
#           * LINES for counting the number of text lines in a
#     cell
#   - <formatPattern> : optional
#           Only used by the LINES format.
#           This is a pattern (can contain perl regexp) used to filter lines to count
set MetricsSpecs {
  {{RELEASE SPRINT} TIMESTAMP {} {A:} DATE_EN}
  {{RELEASE SPRINT} DATE_ACTUAL_RELEASE {} {S:} DATE_EN}
  {{RELEASE SPRINT} DATE_FINISH {} {T:} DATE_EN}
  {{RELEASE SPRINT} DELIVERY_STATUS {} {U:}}
  {{WP} WP_STATUS {} {BO:}}
  {{ChangeNotes!TASK} IS_UNPLAN {} {BL:}}
  {{TASK WP} DATE_LABEL {} {BP:} DATE_EN}
  {{TASK WP} DATE_INTEG_PLAN {} {BD:} DATE_EN}
  {{TASK} TASK_STATUS {} {AE:}}
  {{TASK} TASK_TYPE {} {AB:}}
}

# #####
# # FINDINGS #
# #####
# This is a list where each element is:
# {<artefactTypeList> <findingId> <condition> <value> <localisation>}
# Where:
#   - <artefactTypeList>: the list of artefact type for which the metric has to
#     be used
#           each element of the list is (sheetName!)?artefactType
#     where sheetName is used
#           to restrict search to only one sheet. sheetName is
#     optional.
#   - <findingId>: the name of the FindingId to be injected into Squore, as
#     defined in your analysis model
#   - <condition>: see COMMON DEFINITIONS above. This is the condition for the
#     finding to be triggered.
#   - <value>: see COMMON DEFINITIONS above. This is the value for the message
#     of the finding (can be built from multi column)
#   - <localisation>: this a <value> representing the localisation of the
#     finding (free text)

```

```

set FindingsSpecs {
  {{WP} {BAD_WP} {BL:.+ AF:.+} {{This WP is not in a correct state } AF:.+} {A:}}
}

#####
# # TEXTUAL INFORMATION #
#####
# This is a list where each element is:
# {<artefactTypeList> <infoId> <condition> <value>}
# Where:
#   - <artefactTypeList> the list of artefact types for which the info has to
#     be used
#   - <infoId> each element of the list is (sheetName!)?artefactType
#     where sheetName is used
#   - <condition> to restrict search to only one sheet. sheetName is
#     optional.
#   - <infoId> : is the name of the Information to be attached to the artefact,
#     as defined in your analysis model
#   - <condition> : see COMMON DEFINITIONS above. This is the condition for the
#     info to be generated.
#   - <value> : see COMMON DEFINITIONS above. This is the value for the info
#     (can be built from multi column)
set InfosSpecs {
  {{TASK} ASSIGN_TO {} {XB:}}
}

#####
# # LABEL TRANSFORMATION #
#####
# This is a list value specification for MeasureId or InfoId:
# <MeasureId|InfoId> { {<LABEL1> <value1>} ... {<LABELn> <valuen>}}
# Where:
#   - <MeasureId|InfoId> : is either a MeasureId, an InfoId, or * if it is
#     available for every measureid/infoid
#   - <LABELx> : is the label to match (can contain perl regexp)
#   - <valuen> : is the value to replace the label by, it has to match the
#     correct format for the metrics (no format for infoid)
#
# Note: only metrics which are labels in the excel file or information which need
# to be rewritten, need to be described here.
set Label2ValueSpec {
  {
    STATUS {
      {OPENED 0}
      {ANALYZED 1}
      {CLOSED 2}
      {.* -1}
    }
  }
  {
    * {
      {FATAL 0}
      {ERROR 1}
      {WARNING 2}
      {{LEVEL:\s*0} 1}
      {{LEVEL:\s*1} 2}
      {{LEVEL:\s*[2-9]+} 3}
    }
  }
}
    
```

```
}
```

Note that a sample Excel file with its associated config.tcl is available in `$$SQUORE_HOME/addons/tools/ExcelMetrics` in order to further explain available configuration options.

## Appendix B. Squore XML Schemas

Download input-data-2.xsd [../shared\_manual/input-data-2.xsd]

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:simpleType name="id">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z_][A-Z0-9_]+" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="relax-status">
<xs:restriction base="id">
  <xs:enumeration value="RELAXED_DEROGATION"/>
  <xs:enumeration value="RELAXED_LEGACY"/>
  <xs:enumeration value="RELAXED_FALSE_POSITIVE"/>
</xs:restriction>
</xs:simpleType>

  <xs:element name="bundle">
    <xs:complexType>
      <xs:choice maxOccurs="unbounded">
        <xs:element ref="artifact"/>
        <xs:element ref="finding"/>
        <xs:element ref="info"/>
        <xs:element ref="link"/>
        <xs:element ref="metric"/>
      </xs:choice>
      <xs:attribute name="version" use="required" type="xs:integer" fixed="2"/>
    </xs:complexType>
  </xs:element>

  <xs:element name="artifact">
    <xs:complexType>
      <xs:sequence>
        <xs:choice minOccurs="0" maxOccurs="unbounded">
          <xs:element ref="artifact"/>
        </xs:choice>
        <xs:element ref="finding"/>
        <xs:element ref="metric"/>
        <xs:element ref="key"/>
        <xs:element ref="info"/>
        <xs:element ref="link"/>
        <xs:element ref="milestone"/>
      </xs:sequence>
      <xs:attribute name="alias"/>
      <xs:attribute name="art-location"/>
      <xs:attribute name="id"/>
      <xs:attribute name="local-art-location"/>
      <xs:attribute name="local-key"/>
      <xs:attribute name="local-parent"/>
      <xs:attribute name="location"/>
      <xs:attribute name="name"/>
      <xs:attribute name="parent"/>
      <xs:attribute name="path"/>
      <xs:attribute name="type" use="required" type="id"/>
    </xs:complexType>
  </xs:element>

```

```
<xs:attribute name="view-path"/>
</xs:complexType>
</xs:element>

<xs:element name="info">
  <xs:complexType>
    <xs:attribute name="local-ref"/>
    <xs:attribute name="name" use="required" type="id"/>
    <xs:attribute name="ref"/>
    <xs:attribute name="tool"/>
    <xs:attribute name="value" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="key">
  <xs:complexType>
    <xs:attribute name="value" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="metric">
  <xs:complexType>
    <xs:attribute name="local-ref"/>
    <xs:attribute name="name" use="required" type="id"/>
    <xs:attribute name="ref"/>
    <xs:attribute name="tool"/>
    <xs:attribute name="value" type="xs:decimal" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="link">
  <xs:complexType>
    <xs:attribute name="dst"/>
    <xs:attribute name="local-dst" type="xs:integer"/>
    <xs:attribute name="local-src" type="xs:integer"/>
    <xs:attribute name="name" use="required" type="id"/>
    <xs:attribute name="src"/>
  </xs:complexType>
</xs:element>

<xs:element name="finding">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="location"/>
      <xs:element minOccurs="0" maxOccurs="1" ref="relax"/>
    </xs:sequence>
    <xs:attribute name="descr"/>
    <xs:attribute name="local-ref"/>
    <xs:attribute name="location" use="required"/>
    <xs:attribute name="name" use="required" type="id"/>
    <xs:attribute name="p0"/>
    <xs:attribute name="p1"/>
    <xs:attribute name="p2"/>
    <xs:attribute name="p3"/>
    <xs:attribute name="p4"/>
    <xs:attribute name="p5"/>
    <xs:attribute name="p6"/>
    <xs:attribute name="p7"/>
    <xs:attribute name="p8"/>
  </xs:complexType>
</xs:element>
```

```

        <xs:attribute name="p9" />
        <xs:attribute name="ref" />
        <xs:attribute name="tool" />
    </xs:complexType>
</xs:element>

<xs:element name="location">
    <xs:complexType>
        <xs:attribute name="local-ref" />
        <xs:attribute name="location" use="required" />
        <xs:attribute name="ref" />
    </xs:complexType>
</xs:element>

<xs:element name="relax">
    <xs:complexType>
        <xs:simpleContent>
            <xs:extension base="xs:string">
                <xs:attribute name="status" type="relax-status" />
            </xs:extension>
        </xs:simpleContent>
    </xs:complexType>
</xs:element>

<xs:element name="milestone">
    <xs:complexType>
        <xs:sequence>
            <xs:element minOccurs="0" maxOccurs="unbounded" ref="goal" />
        </xs:sequence>
        <xs:attribute name="date" type="xs:integer" />
        <xs:attribute name="name" use="required" type="id" />
    </xs:complexType>
</xs:element>

<xs:element name="goal">
    <xs:complexType>
        <xs:attribute name="name" use="required" type="id" />
        <xs:attribute name="value" use="required" type="xs:decimal" />
    </xs:complexType>
</xs:element>
</xs:schema>

```

Download form.xsd [../shared\_manual/form.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">

    <xs:simpleType name="id">
        <xs:restriction base="xs:string">
            <xs:pattern value="[A-Z_][A-Z0-9_]+" />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="project-status">
        <xs:restriction base="id">
            <xs:enumeration value="IGNORE" />
            <xs:enumeration value="WARNING" />
            <xs:enumeration value="ERROR" />
        </xs:restriction>
    </xs:simpleType>

```



```
</xs:restriction>
</xs:simpleType>

<xs:element name="tags">
  <xs:complexType>
    <xs:sequence>
      <xs:element maxOccurs="0" ref="tag"/>
      <xs:element maxOccurs="0" ref="exec-phase"/>
    </xs:sequence>
    <xs:attribute name="baseName"/>
    <xs:attribute name="deleteTmpSrc" type="xs:boolean"/>
    <xs:attribute name="image"/>
    <xs:attribute name="needSources" type="xs:boolean"/>
    <xs:attribute name="projectStatusOnFailure" type="project-status"/>
  </xs:complexType>
</xs:element>

<xs:element name="tag">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="value"/>
    </xs:sequence>
    <xs:attribute name="changeable" type="xs:boolean"/>
    <xs:attribute name="credentialType"/>
    <xs:attribute name="defaultValue"/>
    <xs:attribute name="displayType"/>
    <xs:attribute name="key" use="required"/>
    <xs:attribute name="optionTitle"/>
    <xs:attribute name="required" type="xs:boolean"/>
    <xs:attribute name="style"/>
    <xs:attribute name="type" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="value">
  <xs:complexType>
    <xs:attribute name="key" use="required"/>
    <xs:attribute name="option"/>
  </xs:complexType>
</xs:element>

<xs:element name="exec-phase">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" ref="exec"/>
      <xs:element minOccurs="0" ref="exec-tool"/>
    </xs:sequence>
    <xs:attribute name="id" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="exec">
  <xs:complexType>
    <xs:sequence>
      <xs:element maxOccurs="0" ref="arg"/>
    </xs:sequence>
    <xs:attribute name="name" use="required"/>
  </xs:complexType>
</xs:element>
```

```

<xs:element name="arg">
  <xs:complexType>
    <xs:attribute name="tag"/>
    <xs:attribute name="value"/>
    <xs:attribute name="defaultValue"/>
  </xs:complexType>
</xs:element>

<xs:element name="exec-tool">
  <xs:complexType>
    <xs:sequence>
      <xs:element maxOccurs="0" ref="param"/>
    </xs:sequence>
    <xs:attribute name="name" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="param">
  <xs:complexType>
    <xs:attribute name="key" use="required"/>
    <xs:attribute name="tag"/>
    <xs:attribute name="value"/>
    <xs:attribute name="defaultValue"/>
  </xs:complexType>
</xs:element>
</xs:schema>

```

Download properties-1.2.xsd [../shared\_manual/properties-1.2.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" version="1.0">

  <xs:element name="Bundle" type="bundleType"/>

  <xs:complexType name="bundleType">
    <xs:sequence>
      <xs:choice minOccurs="0" maxOccurs="unbounded">
        <xs:element name="help" type="helpType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="hideObsoleteModels" type="obsoleteType" minOccurs="0"
maxOccurs="1"/>
        <xs:element name="hideModel" type="hiddenType" minOccurs="0"
maxOccurs="unbounded"/>
        <xs:element name="explorerTabs" type="tabsType" minOccurs="0" maxOccurs="1"/>
        <xs:element name="explorerTrees" type="treesType" minOccurs="0"
maxOccurs="1"/>
        <xs:element name="option" type="optionType" minOccurs="0"
maxOccurs="unbounded"/>
      </xs:choice>
    </xs:sequence>
    <xs:attribute name="version" use="required" type="xs:string"/>
  </xs:complexType>

  <xs:complexType name="helpType">
    <xs:attribute name="label" use="required" type="xs:string"/>
    <xs:attribute name="url" use="required" type="xs:anyURI"/>
    <xs:attribute name="profiles" use="optional" type="xs:string"/>
  </xs:complexType>

  <xs:complexType name="optionType">

```

```

<xs:attribute name="name" use="required" type="xs:string"/>
<xs:attribute name="value" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="obsoleteType">
  <xs:attribute name="value" use="optional" default="false" type="xs:boolean"/>
</xs:complexType>

<xs:complexType name="hiddenType">
  <xs:attribute name="name" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="tabsType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="tab" type="tabType" maxOccurs="unbounded" />
  </xs:sequence>
  <xs:attribute name="hideSettings" use="optional" default="false"
type="xs:boolean"/>
</xs:complexType>

<xs:complexType name="tabType">
  <xs:attribute name="name" use="required" type="xs:string"/>
  <xs:attribute name="default" use="optional" default="false" type="xs:boolean"/>
  <xs:attribute name="mandatory" use="optional" default="false"
type="xs:boolean"/>
  <xs:attribute name="rendered" use="optional" default="true" type="xs:boolean"/>
</xs:complexType>

<xs:complexType name="treesType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="tree" type="treeType" maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>

<xs:complexType name="treeType">
  <xs:attribute name="name" use="required" type="xs:string"/>
  <xs:attribute name="rendered" use="optional" default="true" type="xs:boolean"/>
</xs:complexType>
</xs:schema>

```

Download config-1.3.xsd [../shared\_manual/config-1.3.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" version="1.0">

  <xs:element name="squore" type="squoreType"/>

  <xs:complexType name="squoreType">
    <xs:sequence>
      <xs:element name="paths" type="pathsType"/>
      <xs:element name="database" type="databaseType" minOccurs="0"/>
      <xs:element name="phantomjs" type="phantomjsType" minOccurs="0"/>
      <xs:element name="configuration" type="directoriesType"/>
      <xs:element name="addons" type="directoriesType"/>
      <xs:element name="client" type="dataDirectoriesType" minOccurs="0"/>
      <xs:element name="tmp" type="directoryType" minOccurs="0"/>
      <xs:element name="projects" type="projectType" minOccurs="0"/>
      <xs:element name="sources" type="directoryType" minOccurs="0"/>
      <xs:element name="workspace" type="directoryType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>

```

```
</xs:sequence>
<xs:attribute name="type" use="required" type="xs:string"/>
<xs:attribute name="version" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="pathsType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="path" type="pathType"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="pathType">
  <xs:attribute name="name" use="required" type="xs:string"/>
  <xs:attribute name="path" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="directoriesType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="path" type="directoryType"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="directoryType">
  <xs:attribute name="directory" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="databaseType">
  <xs:sequence>
    <xs:element name="postgresql" type="directoryType" minOccurs="0"/>
    <xs:element name="cluster" type="directoryType" minOccurs="0"/>
    <xs:element name="backup" type="directoryType"/>
    <xs:element name="security" type="securityType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="phantomjsType">
  <xs:sequence>
    <xs:element name="socket-binding" type="socketBindingType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="socketBindingType">
  <xs:attribute name="address" type="xs:string" default="127.0.0.1"/>
  <xs:attribute name="port" type="xs:short" default="3003"/>
  <xs:attribute name="square-url" type="xs:string" default=""/>
  <xs:attribute name="distant-url" type="xs:string" default=""/>
</xs:complexType>

<xs:complexType name="securityType">
  <xs:sequence>
    <xs:element name="user-name" type="xs:string"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="dataDirectoriesType">
  <xs:sequence>
    <xs:element name="tmp" type="directoryType" minOccurs="0"/>
    <xs:element name="projects" type="projectType" minOccurs="0"/>
    <xs:element name="sources" type="directoryType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

```

</xs:sequence>
</xs:complexType>

<xs:complexType name="projectType">
  <xs:sequence>
    <xs:element name="data-providers" type="dpType" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="directory" use="required" type="xs:string"/>
</xs:complexType>

<xs:complexType name="dpType">
  <xs:attribute name="keep-data-files" use="required" type="xs:boolean"/>
</xs:complexType>

</xs:schema>

```

Download analysis.xsd [../shared\_manual/analysis.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:simpleType name="id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="list-id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]+)*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="families">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z0-9_]+(;[A-Z_][A-Z0-9_]+)*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="categories">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+\.[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]+\.[A-Z_][A-Z0-9_]+)*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="measure-type">
    <xs:restriction base="id">
      <xs:enumeration value="METRIC"/>
      <xs:enumeration value="RULE"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="format">
    <xs:restriction base="id">
      <xs:enumeration value="NUMBER"/>
      <xs:enumeration value="PERCENT"/>
      <xs:enumeration value="INTEGER"/>
      <xs:enumeration value="DATE"/>
    </xs:restriction>
  </xs:simpleType>

```

```

<xs:enumeration value="DATETIME" />
<xs:enumeration value="TIME" />
<xs:enumeration value="DAYS" />
<xs:enumeration value="HOURS" />
<xs:enumeration value="MINUTES" />
<xs:enumeration value="SECONDS" />
<xs:enumeration value="MILLISECONDS" />
<xs:enumeration value="MAN_DAYS" />
<xs:enumeration value="MAN_HOURS" />
<xs:enumeration value="MAN_MINUTES" />
<xs:enumeration value="MAN_SECONDS" />
<xs:enumeration value="MAN_MILLISECONDS" />
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="datetime-style">
<xs:restriction base="id">
<xs:enumeration value="DEFAULT" />
<xs:enumeration value="SHORT" />
<xs:enumeration value="MEDIUM" />
<xs:enumeration value="LONG" />
<xs:enumeration value="FULL" />
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="rounding-mode">
<xs:restriction base="id">
<xs:enumeration value="UP" />
<xs:enumeration value="DOWN" />
<xs:enumeration value="CEILING" />
<xs:enumeration value="FLOOR" />
<xs:enumeration value="HALF_UP" />
<xs:enumeration value="HALF_DOWN" />
<xs:enumeration value="HALF_EVEN" />
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="bounds-type">
<xs:restriction base="xs:string">
<xs:pattern value='[\[\]]((-)*[0-9](\.[0-9]+)?)*;((-)*[0-9](
[0-9]+)?)*[\[\]]' />
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="path-scope">
<xs:restriction base="id">
<xs:enumeration value="CHILDREN" />
<xs:enumeration value="DESCENDANTS" />
</xs:restriction>
</xs:simpleType>

<xs:complexType name="elements">
<xs:sequence>
<xs:choice minOccurs="0" maxOccurs="unbounded">
<xs:element ref="ArtefactType" />
<xs:element ref="Indicator" />
<xs:element ref="Measure" />
<xs:element ref="Package" />
<xs:element ref="package" />

```

```
<xs:element ref="Scale"/>
<xs:element ref="ScaleMacro"/>
<xs:element ref="Constant"/>
<xs:element ref="RootIndicator"/>
<xs:element ref="UpdateRules"/>
<xs:element ref="UpdateRule"/>
<xs:element ref="Link"/>
<xs:element ref="ComputedLink"/>
</xs:choice>
</xs:sequence>
<xs:attribute name="providedBy"/>
<xs:attribute name="name"/>
</xs:complexType>

<xs:element name="Bundle" type="elements" />

<xs:element name="Package" type="elements"/>
<xs:element name="package" type="elements"/>

<xs:element name="Constant">
  <xs:complexType>
    <xs:attribute name="id" use="required" type="id"/>
    <xs:attribute name="value" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="RootIndicator">
  <xs:complexType>
    <xs:attribute name="artefactTypes" use="required" type="list-id"/>
    <xs:attribute name="indicatorId" use="required" type="id"/>
  </xs:complexType>
</xs:element>

<xs:element name="UpdateRules">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="UpdateRule"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>

<xs:element name="UpdateRule">
  <xs:complexType>
    <xs:attribute name="categories" type="categories"/>
    <xs:attribute name="disabled" type="xs:boolean"/>
    <xs:attribute name="measureId" use="required" type="id"/>
  </xs:complexType>
</xs:element>

<xs:element name="Measure">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="Computation"/>
    </xs:sequence>
    <xs:attribute name="acceptMissingValue" type="xs:boolean"/>
    <xs:attribute name="categories" type="categories"/>
    <xs:attribute name="dataBounds" type="bounds-type"/>
    <xs:attribute name="dateStyle" type="datetime-style"/>
    <xs:attribute name="decimals" type="xs:integer"/>
  </xs:complexType>
</xs:element>
```

```

<xs:attribute name="defaultValue" type="xs:decimal"/>
<xs:attribute name="excludingTypes" type="list-id"/>
<xs:attribute name="invalidValue"/>
<xs:attribute name="families" type="families"/>
<xs:attribute name="format" type="format"/>
<xs:attribute name="manual" type="xs:boolean"/>
<xs:attribute name="measureId" use="required" type="id"/>
<xs:attribute name="noValue"/>
<xs:attribute name="pattern"/>
<xs:attribute name="roundingMode" type="rounding-mode"/>
<xs:attribute name="suffix"/>
<xs:attribute name="targetArtefactTypes"/>
<xs:attribute name="timeStyle" type="datetime-style"/>
<xs:attribute name="toolName"/>
<xs:attribute name="toolVersion"/>
<xs:attribute name="type" type="measure-type"/>
<xs:attribute name="usedForRelaxation" type="xs:boolean"/>
</xs:complexType>
</xs:element>

<xs:element name="Computation">
  <xs:complexType>
    <xs:attribute name="continueOnRelaxed" type="xs:boolean"/>
    <xs:attribute name="excludingTypes" type="list-id"/>
    <xs:attribute name="result" use="required"/>
    <xs:attribute name="stored" type="xs:boolean"/>
    <xs:attribute name="targetArtefactTypes" use="required" type="list-id"/>
  </xs:complexType>
</xs:element>

<xs:element name="Indicator">
  <xs:complexType>
    <xs:attribute name="displayedScale" type="id"/>
    <xs:attribute name="displayedValue" type="id"/>
    <xs:attribute name="displayTypes" type="list-id"/>
    <xs:attribute name="excludingTypes" type="list-id"/>
    <xs:attribute name="families" type="families"/>
    <xs:attribute name="indicatorId" use="required" type="id"/>
    <xs:attribute name="measureId" type="id"/>
    <xs:attribute name="scaleId" type="id"/>
    <xs:attribute name="targetArtefactTypes" type="list-id"/>
  </xs:complexType>
</xs:element>

<xs:element name="Scale">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="ScaleLevel"/>
    </xs:sequence>
    <xs:attribute name="isDynamic" type="xs:boolean"/>
    <xs:attribute name="macro" type="id"/>
    <xs:attribute name="scaleId" use="required" type="id"/>
    <xs:attribute name="targetArtefactTypes" type="list-id"/>
    <xs:attribute name="vars"/>
  </xs:complexType>
</xs:element>

<xs:element name="ScaleMacro">
  <xs:complexType>

```



```
<xs:sequence>
  <xs:element maxOccurs="unbounded" ref="ScaleLevel" />
</xs:sequence>
<xs:attribute name="id" use="required" type="id" />
<xs:attribute name="isDynamic" type="xs:boolean" />
</xs:complexType>
</xs:element>

<xs:element name="ArtefactType">
  <xs:complexType>
    <xs:attribute name="heirs" type="list-id" />
    <xs:attribute name="id" use="required" type="id" />
    <xs:attribute name="manual" type="xs:boolean" />
    <xs:attribute name="parents" type="list-id" />
  </xs:complexType>
</xs:element>

<xs:element name="ScaleLevel">
  <xs:complexType>
    <xs:attribute name="bounds" use="required" />
    <xs:attribute name="levelId" use="required" type="id" />
    <xs:attribute name="rank" use="required" />
  </xs:complexType>
</xs:element>

<xs:element name="Link">
  <xs:complexType>
    <xs:attribute name="id" use="required" type="id" />
    <xs:attribute name="inArtefactTypes" type="list-id" />
    <xs:attribute name="outArtefactTypes" type="list-id" />
    <xs:attribute name="srcArtefactTypes" type="list-id" />
    <xs:attribute name="dstArtefactTypes" type="list-id" />
  </xs:complexType>
</xs:element>

<xs:element name="ComputedLink">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="1" maxOccurs="1" ref="StartPath" />
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="NextPath" />
    </xs:sequence>
    <xs:attribute name="id" use="required" type="id" />
  </xs:complexType>
</xs:element>

<xs:element name="StartPath">
  <xs:complexType>
    <xs:attribute name="link" type="id" />
    <xs:attribute name="scope" type="path-scope" />
    <xs:attribute name="srcArtefactTypes" type="list-id" />
    <xs:attribute name="dstArtefactTypes" type="list-id" />
    <xs:attribute name="srcCondition" />
    <xs:attribute name="dstCondition" />
    <xs:attribute name="recurse" type="xs:boolean" />
    <xs:attribute name="keepIntermediateLinks" type="xs:boolean" />
  </xs:complexType>
</xs:element>

<xs:element name="NextPath">
```

```

<xs:complexType>
  <xs:attribute name="link" type="id"/>
  <xs:attribute name="scope" type="path-scope"/>
  <xs:attribute name="dstArtefactTypes" type="list-id"/>
  <xs:attribute name="dstCondition"/>
  <xs:attribute name="recurse" type="xs:boolean"/>
  <xs:attribute name="keepIntermediateLinks" type="xs:boolean"/>
</xs:complexType>
</xs:element>
</xs:schema>

```

Download decision.xsd [../shared\_manual/decision.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:simpleType name="id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="list-id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]*)*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="categories">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z_][A-Z0-9_]+\.[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]+"\.[A-Z_][A-Z0-9_]*)*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="elements">
    <xs:sequence>
      <xs:choice minOccurs="0" maxOccurs="unbounded">
        <xs:element ref="Package"/>
        <xs:element ref="package"/>
        <xs:element ref="DecisionCriteria"/>
        <xs:element ref="DecisionCriterion"/>
      </xs:choice>
    </xs:sequence>
  </xs:complexType>

  <xs:element name="Bundle" type="elements"/>
  <xs:element name="Package" type="elements"/>
  <xs:element name="package" type="elements"/>
  <xs:element name="DecisionCriteria" type="elements"/>

  <xs:element name="DecisionCriterion">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Triggers"/>
      </xs:sequence>
      <xs:attribute name="categories" type="categories"/>
      <xs:attribute name="dcId" use="required" type="id"/>
      <xs:attribute name="excludingTypes" type="list-id"/>
    </xs:complexType>
  </xs:element>

```

```

<xs:attribute name="families" type="list-id"/>
<xs:attribute name="roles" type="list-id"/>
<xs:attribute name="targetArtefactTypes" use="required" type="list-id"/>
</xs:complexType>
</xs:element>

<xs:element name="Triggers">
  <xs:complexType>
    <xs:sequence>
      <xs:element maxOccurs="unbounded" ref="Trigger"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>

<xs:element name="Trigger">
  <xs:complexType>
    <xs:sequence>
      <xs:element maxOccurs="unbounded" ref="Test"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>

<xs:element name="Test">
  <xs:complexType>
    <xs:attribute name="bounds"/>
    <xs:attribute name="descrId" type="id"/>
    <xs:attribute name="expr" use="required"/>
    <xs:attribute name="p0"/>
    <xs:attribute name="p1"/>
    <xs:attribute name="p2"/>
    <xs:attribute name="p3"/>
    <xs:attribute name="p4"/>
    <xs:attribute name="p5"/>
    <xs:attribute name="p6"/>
    <xs:attribute name="p7"/>
    <xs:attribute name="p8"/>
    <xs:attribute name="p9"/>
    <xs:attribute name="suspect"/>
  </xs:complexType>
</xs:element>
</xs:schema>

```

Download description.xsd [../shared\_manual/description.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:complexType name="elements">
    <xs:sequence>
      <xs:choice minOccurs="0" maxOccurs="unbounded">
        <xs:element ref="Package"/>
        <xs:element ref="package"/>
        <xs:element ref="Properties"/>
      </xs:choice>
    </xs:sequence>
  </xs:complexType>

  <xs:element name="Bundle">
    <xs:complexType>

```

```

<xs:sequence>
  <xs:choice minOccurs="0" maxOccurs="unbounded">
    <xs:element ref="Package" />
    <xs:element ref="package" />
    <xs:element ref="Properties" />
  </xs:choice>
</xs:sequence>
<xs:attribute name="available" />
<xs:attribute name="default" />
</xs:complexType>
</xs:element>

<xs:element name="Package" type="elements" />
<xs:element name="package" type="elements" />

<xs:element name="Properties">
  <xs:complexType>
    <xs:attribute name="src" use="required" />
  </xs:complexType>
</xs:element>
</xs:schema>
    
```

Download exports.xsd [../shared\_manual/exports.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:simpleType name="type-id">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z0-9_]*" />
    </xs:restriction>
  </xs:simpleType>

  <xs:element name="Bundle">
    <xs:complexType>
      <xs:sequence minOccurs="0" maxOccurs="unbounded">
        <xs:element ref="Role" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>

  <xs:element name="Role">
    <xs:complexType>
      <xs:sequence minOccurs="0" maxOccurs="unbounded">
        <xs:element ref="Export" />
      </xs:sequence>
      <xs:attribute name="name" use="required" type="xs:string" />
    </xs:complexType>
  </xs:element>

  <xs:element name="Export">
    <xs:complexType>
      <xs:sequence maxOccurs="unbounded">
        <xs:element ref="ExportScript" />
      </xs:sequence>
      <xs:attribute name="type" use="required" type="type-id" />
    </xs:complexType>
  </xs:element>
    
```

```

<xs:element name="ExportScript">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="arg" />
    </xs:sequence>
    <xs:attribute name="name" use="required" type="xs:string" />
    <xs:attribute name="script" use="required" type="xs:string" />
  </xs:complexType>
</xs:element>

<xs:element name="arg">
  <xs:complexType>
    <xs:attribute name="value" use="required" type="xs:string" />
    <xs:attribute name="optional" use="optional" type="xs:boolean"
default="false" />
  </xs:complexType>
</xs:element>

</xs:schema>

```

Download highlights.xsd [../shared\_manual/highlights.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:simpleType name="id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z0-9_]*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="measure-id">
    <xs:restriction base="xs:string">
      <xs:pattern value='([BD].)?[A-Z0-9_]*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="info-id">
    <xs:restriction base="xs:string">
      <xs:pattern value='[A-Z0-9_]*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="indicator-id">
    <xs:restriction base="xs:string">
      <xs:pattern value='([I].)?[A-Z0-9_]*' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="bounds-type">
    <xs:restriction base="xs:string">
      <xs:pattern value='[\\[\\]]((-)*[0-9](\\. [0-9]+)?)*;((-)*[0-9](.
[0-9]+)?)*[\\[\\]]' />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="top-order">
    <xs:restriction base="xs:string">
      <xs:enumeration value="ASC" />
      <xs:enumeration value="DESC" />
    </xs:restriction>
  </xs:simpleType>

```

```
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="result-size">
  <xs:union>
    <xs:simpleType>
      <xs:restriction base="xs:positiveInteger" />
    </xs:simpleType>
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:enumeration value="*" />
      </xs:restriction>
    </xs:simpleType>
  </xs:union>
</xs:simpleType>

<xs:simpleType name="header-display-type">
  <xs:restriction base="xs:string">
    <xs:enumeration value="MNEMONIC" />
    <xs:enumeration value="NAME" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="display-type">
  <xs:restriction base="xs:string">
    <xs:enumeration value="VALUE" />
    <xs:enumeration value="RANK" />
    <xs:enumeration value="ICON" />
    <xs:enumeration value="DATE" />
    <xs:enumeration value="DATETIME" />
    <xs:enumeration value="TIME" />
    <xs:enumeration value="NAME" />
    <xs:enumeration value="MNEMONIC" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="date-style">
  <xs:restriction base="xs:string">
    <xs:enumeration value="SHORT" />
    <xs:enumeration value="MEDIUM" />
    <xs:enumeration value="DEFAULT" />
    <xs:enumeration value="LONG" />
    <xs:enumeration value="FULL" />
  </xs:restriction>
</xs:simpleType>

<xs:element name="Bundle">
  <xs:complexType>
    <xs:sequence maxOccurs="unbounded">
      <xs:element ref="Role" />
    </xs:sequence>
  </xs:complexType>
</xs:element>

<xs:element name="Role">
  <xs:complexType>
    <xs:sequence maxOccurs="unbounded">
      <xs:element ref="Filters" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

```

<xs:attribute name="name" use="required" type="xs:string" />
<xs:attribute name="preSelectedType" use="optional" type="xs:string" />
</xs:complexType>
</xs:element>

<xs:element name="Filters">
  <xs:complexType>
    <xs:sequence maxOccurs="unbounded">
      <xs:choice>
        <xs:element ref="TopArtefacts" />
        <xs:element name="TopDeltaArtefacts" type="top-artefacts" />
        <xs:element name="TopNewArtefacts" type="top-artefacts" />
      </xs:choice>
    </xs:sequence>
    <xs:attribute name="type" use="required" type="xs:string" />
  </xs:complexType>
</xs:element>

<xs:element name="TopArtefacts">
  <xs:complexType>
    <xs:sequence maxOccurs="unbounded">
      <xs:choice>
        <xs:element minOccurs="0" maxOccurs="unbounded" ref="Column" />
        <xs:element minOccurs="0" maxOccurs="unbounded" ref="Where" />
        <xs:element minOccurs="0" maxOccurs="unbounded" ref="OrderBy" />
      </xs:choice>
    </xs:sequence>
    <xs:attribute name="id" use="required" type="id" />
    <xs:attribute name="name" use="optional" type="xs:string" />
    <xs:attribute name="artefactTypes" use="optional" type="xs:string" />
    <xs:attribute name="excludingTypes" use="optional" type="xs:string" />
    <xs:attribute name="measureId" use="optional" default="LEVEL" type="measure-
id" />
    <xs:attribute name="order" use="optional" default="ASC" type="top-order" />
    <xs:attribute name="altMeasureId" use="optional" type="measure-id" />
    <xs:attribute name="altOrder" use="optional" type="top-order" />
    <xs:attribute name="resultSize" use="required" type="result-size" />
  </xs:complexType>
</xs:element>

<xs:element name="Column">
  <xs:complexType>
    <xs:attribute name="measureId" use="optional" type="measure-id" />
    <xs:attribute name="infoId" use="optional" type="info-id" />
    <xs:attribute name="indicatorId" use="optional" type="indicator-id" />
    <xs:attribute name="artefactTypes" use="optional" type="xs:string" />
    <xs:attribute name="excludingTypes" use="optional" type="xs:string" />
    <xs:attribute name="headerDisplayType" use="optional" default="NAME"
type="header-display-type" />
    <xs:attribute name="displayType" use="optional" default="VALUE" type="display-
type" />
    <xs:attribute name="decimals" use="optional" default="2" type="xs:integer" />
    <xs:attribute name="dateStyle" use="optional" default="DEFAULT" type="date-
style" />
    <xs:attribute name="timeStyle" use="optional" default="DEFAULT" type="date-
style" />
    <xs:attribute name="datePattern" use="optional" type="xs:string" />
    <xs:attribute name="suffix" use="optional" type="xs:string" />
    <xs:attribute name="useBackgroundColor" use="optional" type="xs:boolean" />

```

```

</xs:complexType>
</xs:element>

<xs:element name="Where">
  <xs:complexType>
    <xs:attribute name="measureId" use="optional" type="measure-id" />
    <xs:attribute name="infoId" use="optional" type="info-id" />
    <xs:attribute name="value" use="optional" type="xs:string" />
    <xs:attribute name="bounds" use="optional" type="bounds-type" />
  </xs:complexType>
</xs:element>

<xs:element name="OrderBy">
  <xs:complexType>
    <xs:attribute name="measureId" use="required" type="measure-id" />
    <xs:attribute name="order" use="optional" default="ASC" type="top-order" />
  </xs:complexType>
</xs:element>

<xs:complexType name="top-artefacts">
  <xs:sequence maxOccurs="unbounded">
    <xs:choice>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="Column" />
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="Where" />
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="OrderBy" />
    </xs:choice>
  </xs:sequence>
  <xs:attribute name="id" use="required" type="id" />
  <xs:attribute name="name" use="optional" type="xs:string" />
  <xs:attribute name="artefactTypes" use="optional" type="xs:string" />
  <xs:attribute name="excludingTypes" use="optional" type="xs:string" />
  <xs:attribute name="measureId" use="optional" default="LEVEL" type="measure-
id" />
  <xs:attribute name="order" use="optional" default="ASC" type="top-order" />
  <xs:attribute name="resultSize" use="required" type="result-size" />
</xs:complexType>
</xs:schema>

```

#### Download properties.xsd [../shared\_manual/properties.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <xs:simpleType name="id">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z_][A-Z0-9_]+" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="list-id">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]+)*" />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="elements">
    <xs:sequence>
      <xs:choice minOccurs="0" maxOccurs="unbounded">

```



```

    <xs:element ref="package" />
    <xs:element ref="hideMeasure" />
    <xs:element ref="findingsTab" />
    <xs:element ref="actionItemsTab" />
    <xs:element ref="rulesEdition" />
  </xs:choice>
</xs:sequence>
</xs:complexType>

<xs:element name="bundle" type="elements" />
<xs:element name="package" type="elements" />

<xs:element name="hideMeasure">
  <xs:complexType>
    <xs:attribute name="path" use="required" />
    <xs:attribute name="targetArtefactTypes" type="list-id" />
  </xs:complexType>
</xs:element>

<xs:element name="findingsTab">
  <xs:complexType>
    <xs:attribute name="orderBy" type="list-id" />
    <xs:attribute name="hideColumns" type="list-id" />
    <xs:attribute name="hideCharacteristicsFilter" type="xs:boolean" />
  </xs:complexType>
</xs:element>

<xs:element name="actionItemsTab">
  <xs:complexType>
    <xs:attribute name="orderBy" type="list-id" />
    <xs:attribute name="hideColumns" type="list-id" />
  </xs:complexType>
</xs:element>

<xs:element name="rulesEdition">
  <xs:complexType>
    <xs:attribute name="scales" use="required" type="list-id" />
  </xs:complexType>
</xs:element>
</xs:schema>

```

Download tutorials.xsd [../shared\_manual/tutorials.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:simpleType name="external-id">
    <xs:restriction base="xs:string">
      <xs:pattern value="[A-Z]{1}[A-Z0-9_]*" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="positive-integer">
    <xs:restriction base="xs:string">
      <xs:pattern value="[0-9]+" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="opacity">
    <xs:restriction base="xs:string">

```

```

<xs:pattern value='(0|1){1}\.?[0-9]{0,2}' />
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="actions">
  <xs:restriction base="xs:string">
    <xs:enumeration value="EXPAND_PORTFOLIO_TREE" />
    <xs:enumeration value="EXPAND_ARTEFACT_TREE" />
    <xs:enumeration value="EXPAND_MEASURE_TREE" />
    <xs:enumeration value="COLLAPSE_PORTFOLIO_TREE" />
    <xs:enumeration value="COLLAPSE_ARTEFACT_TREE" />
    <xs:enumeration value="COLLAPSE_MEASURE_TREE" />
    <xs:enumeration value="SELECT_MODEL" />
    <xs:enumeration value="SELECT_PROJECT" />
    <xs:enumeration value="SELECT_ARTEFACT" />
    <xs:enumeration value="SELECT_ARTEFACT_LEAF" />
    <xs:enumeration value="CLOSE_MEASURE_POPUP" />
    <xs:enumeration value="SELECT_MEASURE" />
    <xs:enumeration value="SHOW_REVIEW_SET" />
    <xs:enumeration value="SHOW_PORTFOLIO_TREE" />
    <xs:enumeration value="SHOW_DASHBOARD_TAB" />
    <xs:enumeration value="SHOW_ACTION_ITEMS_TAB" />
    <xs:enumeration value="SHOW_HIGHLIGHTS_TAB" />
    <xs:enumeration value="SHOW_FINDINGS_TAB" />
    <xs:enumeration value="SHOW_REPORTS_TAB" />
    <xs:enumeration value="SHOW_FORMS_TAB" />
    <xs:enumeration value="SHOW_INDICATORS_TAB" />
    <xs:enumeration value="SHOW_MEASURES_TAB" />
    <xs:enumeration value="SHOW_COMMENTS_TAB" />
    <xs:enumeration value="SHOW_ACTION_ITEMS_ADVANCED_SEARCH" />
    <xs:enumeration value="EXPAND_ACTION_ITEM" />
    <xs:enumeration value="SHOW_FINDINGS_ADVANCED_SEARCH" />
    <xs:enumeration value="SELECT_FINDING" />
    <xs:enumeration value="SELECT_FINDING_ARTEFACT" />
    <xs:enumeration value="EXPAND_FINDING" />
    <xs:enumeration value="EXPAND_ATTRIBUTE" />
    <xs:enumeration value="SWITCH_INDICATORS_PAGE" />
    <xs:enumeration value="SWITCH_MEASURES_PAGE" />
    <xs:enumeration value="SWITCH_COMMENTS_PAGE" />
    <xs:enumeration value="CLOSE_CHART_POPUP" />
    <xs:enumeration value="OPEN_CHART_POPUP" />
    <xs:enumeration value="OPEN_MODEL_CHART_POPUP" />
    <xs:enumeration value="SELECT_DESCR_TAB" />
    <xs:enumeration value="SELECT_COMMENTS_TAB" />
    <xs:enumeration value="SELECT_FAVORITES_TAB" />
    <xs:enumeration value="COMPARE_CHART" />
    <xs:enumeration value="QUIT_COMPARATIVE_MODE" />
    <xs:enumeration value="QUIT_FULLDISPLAY_MODE" />
    <xs:enumeration value="CLOSE_ARTEFACT_TREE_FILTER" />
    <xs:enumeration value="SHOW_ARTEFACT_TREE_FILTER" />
    <xs:enumeration value="OPEN_TABLE" />
    <xs:enumeration value="CHANGE_PAGE" />
    <xs:enumeration value="CREATE_NEW_PROJECT" />
    <xs:enumeration value="SELECT_WIZARD" />
    <xs:enumeration value="VALIDATE_WIZARD" />
    <xs:enumeration value="VALIDATE_INFORMATION" />
    <xs:enumeration value="VALIDATE_DP_OPTIONS" />
    <xs:enumeration value="RUN_PROJECT_CREATION" />
    <xs:enumeration value="OPEN_SUB_MENU_HELP" />
  
```

```
<xs:enumeration value="CLOSE_TUTORIAL_POPUP" />
<xs:enumeration value="OPEN_TUTORIAL_POPUP" />
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</xs:simpleType>

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<xs:enumeration value="BREADCRUMBS" />
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<xs:enumeration value="TUTORIAL_POPUP_MODEL" />
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<xs:enumeration value="MEASURE_TREE" />
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<xs:enumeration value="REVIEW_SET" />
<xs:enumeration value="PORTFOLIO_TREE" />
<xs:enumeration value="PORTFOLIO_TREE_PROJECT" />
<xs:enumeration value="PORTFOLIO_TREE_PROJECT_FIRST" />
<xs:enumeration value="MODEL_DASHBOARD" />
<xs:enumeration value="MODEL_CHARTS" />
<xs:enumeration value="MODEL_CHART_FIRST" />
<xs:enumeration value="MODEL_TABLE" />
<xs:enumeration value="MODEL_TABLE_ROW_FIRST" />
<xs:enumeration value="MODEL_CHART" />
<xs:enumeration value="MODEL_TABLE_ROW" />
<xs:enumeration value="MODEL_CHART_POPUP" />
<xs:enumeration value="MODEL_CHART_POPUP_GRAPH" />
<xs:enumeration value="MODEL_CHART_POPUP_PREVIOUS_ARROW" />
<xs:enumeration value="MODEL_CHART_POPUP_NEXT_ARROW" />
<xs:enumeration value="MODEL_CHART_POPUP_NAV_BAR" />
<xs:enumeration value="MODEL_CHART_POPUP_ASIDE" />
<xs:enumeration value="MODEL_CHART_POPUP_ASIDE_HEAD" />
<xs:enumeration value="MODEL_CHART_POPUP_DESCR" />
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<xs:enumeration value="FILTER_TYPE" />
<xs:enumeration value="FILTER_EVOLUTION" />
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<xs:enumeration value="ARTEFACT_TREE_LEAF" />
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```

```
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<xs:enumeration value="KPI" />
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<xs:enumeration value="CHART_FIRST" />
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<xs:enumeration value="MEASURE_POPUP" />
<xs:enumeration value="MEASURE_POPUP_CONTENT" />
<xs:enumeration value="MEASURE_POPUP_LEVELS" />
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<xs:enumeration value="CHART_POPUP" />
<xs:enumeration value="CHART_POPUP_GRAPH" />
<xs:enumeration value="CHART_POPUP_COMPARE_OPTION" />
<xs:enumeration value="CHART_POPUP_PREVIOUS_ARROW" />
<xs:enumeration value="CHART_POPUP_NEXT_ARROW" />
<xs:enumeration value="CHART_POPUP_NAV_BAR" />
<xs:enumeration value="CHART_POPUP_ASIDE" />
<xs:enumeration value="CHART_POPUP_ASIDE_HEAD" />
<xs:enumeration value="CHART_POPUP_DESCR" />
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<xs:enumeration value="ACTION_ITEMS_TABLE_HEAD_CHECK" />
<xs:enumeration value="ACTION_ITEMS_ADD_REVIEW_SET" />
<xs:enumeration value="ACTION_ITEMS_EXPORT_LIST" />
<xs:enumeration value="ACTION_ITEMS_EXPORT_BUTTON" />
<xs:enumeration value="ACTION_ITEMS_SEARCH" />
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<xs:enumeration value="ACTION_ITEMS_ADVANCED_SEARCH" />
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<xs:enumeration value="ACTION_ITEMS_ADVANCED_SEARCH_SELECT" />
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<xs:enumeration value="HIGHLIGHTS_TABLE_HEAD" />
<xs:enumeration value="HIGHLIGHTS_TABLE_HEAD_CHECK" />
<xs:enumeration value="HIGHLIGHTS_SEARCH" />
<xs:enumeration value="HIGHLIGHTS_SEARCH_FILTER" />
<xs:enumeration value="HIGHLIGHTS_SEARCH_TYPE" />
<xs:enumeration value="HIGHLIGHTS_EXPORT_BUTTON" />
<xs:enumeration value="HIGHLIGHTS_ADD_REVIEW_SET" />
<xs:enumeration value="HIGHLIGHTS_ROW_FIRST" />
<xs:enumeration value="FINDINGS" />
<xs:enumeration value="FINDINGS_TABLE" />
<xs:enumeration value="FINDINGS_TABLE_HEAD" />
<xs:enumeration value="FINDINGS_SEARCH" />
<xs:enumeration value="FINDINGS_INFO" />
<xs:enumeration value="FINDINGS_RULE" />
<xs:enumeration value="FINDINGS_ARTEFACT" />
<xs:enumeration value="FINDINGS_ROW_FIRST" />
<xs:enumeration value="FINDINGS_ADVANCED_SEARCH" />
```

```

<xs:enumeration value="FINDINGS_ADVANCED_SEARCH_SELECT_FIRST" />
<xs:enumeration value="FINDINGS_ADVANCED_SEARCH_SELECT" />
<xs:enumeration value="REPORTS" />
<xs:enumeration value="REPORTS_REGION" />
<xs:enumeration value="REPORTS_OPTIONS" />
<xs:enumeration value="REPORTS_OPTION_TEMPLATE" />
<xs:enumeration value="REPORTS_OPTION_FORMAT" />
<xs:enumeration value="REPORTS_OPTION_SYNTHETIC_VIEW" />
<xs:enumeration value="REPORTS_CREATE" />
<xs:enumeration value="EXPORT_REGION" />
<xs:enumeration value="EXPORT_OPTIONS" />
<xs:enumeration value="EXPORT_CREATE" />
<xs:enumeration value="FORMS" />
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<xs:enumeration value="FORMS_ATTRIBUTE_FIELD" />
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<xs:enumeration value="FORMS_BLOCK" />
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<xs:enumeration value="INDICATORS_TABLE_HEAD" />
<xs:enumeration value="INDICATORS_ROW" />
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<xs:enumeration value="MEASURES_TABLE" />
<xs:enumeration value="MEASURES_TABLE_HEAD" />
<xs:enumeration value="MEASURES_ROW" />
<xs:enumeration value="COMMENTS" />
<xs:enumeration value="COMMENTS_TABLE" />
<xs:enumeration value="COMMENTS_TABLE_HEAD" />
<xs:enumeration value="COMMENTS_ROW" />
<xs:enumeration value="CREATE_PROJECT_BUTTON" />
<xs:enumeration value="WIZARD_PANEL" />
<xs:enumeration value="WIZARD_ROW" />
<xs:enumeration value="WIZARD_ROW_FIRST" />
<xs:enumeration value="WIZARD_NEXT_BUTTON" />
<xs:enumeration value="GENERAL_INFORMATION" />
<xs:enumeration value="PROJECT_IDENTIFICATION_BLOCK " />
<xs:enumeration value="GENERAL_INFO_BLOCK" />
<xs:enumeration value="GENERAL_INFO_ROW" />
<xs:enumeration value="PROJECT_NEXT_BUTTON" />
<xs:enumeration value="DP_PANEL" />
<xs:enumeration value="DP_PANEL_BLOCK" />
<xs:enumeration value="DP_PANEL_ROW" />
<xs:enumeration value="DP_PANEL_NEXT_BUTTON" />
<xs:enumeration value="CONFIRMATION_PANEL" />
<xs:enumeration value="SUMMARY" />
<xs:enumeration value="CONFIRMATION_PANEL_PARAMETERS" />
<xs:enumeration value="RUN_NEW_PROJECT_BUTTON" />
</xs:restriction>
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<xs:simpleType name="colors">
<xs:union>
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<xs:pattern value="#"[A-Fa-f0-9]{6}" />
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
    
```

```
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  <xs:pattern value="(rgb|RGB)\{3}\{3}\{3}" />
</xs:restriction>
</xs:simpleType>
<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:enumeration value="aqua" />
    <xs:enumeration value="black" />
    <xs:enumeration value="blue" />
    <xs:enumeration value="gray" />
    <xs:enumeration value="lime" />
    <xs:enumeration value="green" />
    <xs:enumeration value="maroon" />
    <xs:enumeration value="navy" />
    <xs:enumeration value="olive" />
    <xs:enumeration value="orange" />
    <xs:enumeration value="purple" />
    <xs:enumeration value="red" />
    <xs:enumeration value="silver" />
    <xs:enumeration value="teal" />
    <xs:enumeration value="white" />
    <xs:enumeration value="yellow" />
    <xs:enumeration value="transparent" />
  </xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>

<xs:simpleType name="text-positions">
  <xs:restriction base="xs:string">
    <xs:enumeration value="INTERNAL" />
    <xs:enumeration value="EXTERNAL" />
    <xs:enumeration value="LEFT" />
    <xs:enumeration value="RIGHT" />
    <xs:enumeration value="TOP" />
    <xs:enumeration value="BOTTOM" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="phase-type">
  <xs:restriction base="xs:string">
    <xs:enumeration value="PARALLEL" />
    <xs:enumeration value="PROGRESSIVE" />
    <xs:enumeration value="SEQUENTIAL" />
    <xs:enumeration value="FREE" />
  </xs:restriction>
</xs:simpleType>

<xs:complexType name="elements">
  <xs:sequence minOccurs="0" maxOccurs="unbounded">
    <xs:element ref="help"/>
  </xs:sequence>
</xs:complexType>

<xs:element name="Bundle" type="elements" />
<xs:element name="Package" type="elements" />

<xs:element name="item">
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```

```

<xs:attribute name="element" use="required" type="external-id" />
<xs:attribute name="param" use="optional" type="xs:string" />
<xs:attribute name="descrId" use="required" type="xs:string" />
<xs:attribute name="textPosition" use="optional" default="EXTERNAL"
type="text-positions" />
<xs:attribute name="maskColor" use="optional" default="#2aa0d5"
type="colors" />
<xs:attribute name="maskOpacity" use="optional" default="0.8" type="opacity" /
>
<xs:attribute name="textSize" use="optional" default="25" type="positive-
integer" />
<xs:attribute name="textColor" use="optional" default="white" type="colors" />
</xs:complexType>
</xs:element>

<xs:element name="preAction">
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<xs:attribute name="param" use="optional" default="" type="xs:string" />
<xs:attribute name="clickIndicator" use="optional" default="false"
type="xs:boolean" />
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</xs:element>

<xs:element name="phase">
<xs:complexType>
<xs:sequence maxOccurs="unbounded">
<xs:choice>
<xs:element minOccurs="0" maxOccurs="unbounded" ref="item" />
<xs:element minOccurs="0" maxOccurs="unbounded" ref="preAction" />
</xs:choice>
</xs:sequence>
<xs:attribute name="element" use="required" type="external-id" />
<xs:attribute name="param" use="optional" type="xs:string" />
<xs:attribute name="type" use="optional" default="PARALLEL" type="phase-
type" />
<xs:attribute name="textPosition" use="optional" default="EXTERNAL"
type="text-positions" />
<xs:attribute name="textSize" use="optional" default="25" type="positive-
integer" />
<xs:attribute name="textColor" use="optional" default="white" type="colors" />
<xs:attribute name="maskColor" use="optional" default="#2aa0d5"
type="colors" />
<xs:attribute name="maskOpacity" use="optional" default="0.6" type="opacity" /
>
</xs:complexType>
</xs:element>

<xs:element name="help">
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<xs:sequence minOccurs="1" maxOccurs="unbounded">
<xs:choice>
<xs:element ref="phase" />
<xs:element ref="item" />
</xs:choice>
</xs:sequence>
<xs:attribute name="id" use="required" type="external-id" />
<xs:attribute name="opacity" use="optional" default="0.4" type="opacity" />

```

```

        <xs:attribute name="textPosition" use="optional" default="EXTERNAL"
        type="text-positions" />
        <xs:attribute name="textSize" use="optional" default="25" type="positive-
        integer" />
        <xs:attribute name="textColor" use="optional" default="white" type="colors" />
        <xs:attribute name="maskColor" use="optional" default="#2aa0d5"
        type="colors" />
        <xs:attribute name="maskOpacity" use="optional" default="0.6" type="opacity" /
    >
        <xs:attribute name="firstConnexionGroup" use="optional" type="xs:string" />
        <xs:attribute name="icon" use="optional" type="xs:string" />
    </xs:complexType>
</xs:element>
</xs:schema>
    
```

Download wizards.xsd [../shared\_manual/wizards.xsd]

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">

    <xs:simpleType name="id">
        <xs:restriction base="xs:string">
            <xs:pattern value='[A-Z_][A-Z0-9_]+' />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="list-id">
        <xs:restriction base="xs:string">
            <xs:pattern value='[A-Z_][A-Z0-9_]+(;[A-Z_][A-Z0-9_]*)*' />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="alignment">
        <xs:restriction base="id">
            <xs:enumeration value="LEFT" />
            <xs:enumeration value="RIGHT" />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="project-status">
        <xs:restriction base="id">
            <xs:enumeration value="IGNORE" />
            <xs:enumeration value="WARNING" />
            <xs:enumeration value="ERROR" />
        </xs:restriction>
    </xs:simpleType>

    <xs:element name="Bundle">
        <xs:complexType>
            <xs:sequence>
                <xs:choice minOccurs="0" maxOccurs="unbounded">
                    <xs:element ref="tags"/>
                    <xs:element ref="wizard"/>
                </xs:choice>
            </xs:sequence>
        </xs:complexType>
    </xs:element>

    <xs:element name="tags">
    
```



```

<xs:complexType>
  <xs:sequence>
    <xs:element minOccurs="0" maxOccurs="unbounded" ref="tag"/>
  </xs:sequence>
  <xs:attribute name="textAlign" type="alignment"/>
  <xs:attribute name="valueAlign" type="alignment"/>
</xs:complexType>
</xs:element>

<xs:element name="tag">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="value"/>
    </xs:sequence>
    <xs:attribute name="defaultValue"/>
    <xs:attribute name="displayType"/> <!-- Not display-type because it is case
insensitive -->
    <xs:attribute name="group"/>
    <xs:attribute name="groupId" type="id"/>
    <xs:attribute name="measureId" use="required" type="id"/>
    <xs:attribute name="name"/>
    <xs:attribute name="placeholder"/>
    <xs:attribute name="required" type="xs:boolean"/>
    <xs:attribute name="review" type="xs:boolean"/>
    <xs:attribute name="suffix"/>
    <xs:attribute name="targetArtefactTypes" type="list-id"/>
    <xs:attribute name="textAlign" type="alignment"/>
    <xs:attribute name="type" use="required"/> <!-- Not tag-type because it is
case insensitive -->
    <xs:attribute name="valueAlign" type="alignment"/>
  </xs:complexType>
</xs:element>

<xs:element name="value">
  <xs:complexType>
    <xs:attribute name="key" use="required"/>
    <xs:attribute name="value" use="required" type="xs:decimal"/>
  </xs:complexType>
</xs:element>

<xs:element name="wizard">
  <xs:complexType>
    <xs:sequence>
      <xs:choice minOccurs="0" maxOccurs="unbounded">
        <xs:element ref="tags"/>
        <xs:element ref="milestones"/>
        <xs:element ref="repositories"/>
        <xs:element ref="tools"/>
      </xs:choice>
    </xs:sequence>
    <xs:attribute name="autoBaseline" type="xs:boolean"/>
    <xs:attribute name="group"/>
    <xs:attribute name="groups"/>
    <xs:attribute name="hideRulesEdition" type="xs:boolean"/>
    <xs:attribute name="img"/>
    <xs:attribute name="users"/>
    <xs:attribute name="versionPattern"/>
    <xs:attribute name="wizardId" use="required" type="id"/>
    <xs:attribute name="projectsSelection" type="xs:boolean"/>
  </xs:complexType>
</xs:element>

```

```
<xs:attribute name="name" />
</xs:complexType>
</xs:element>

<xs:element name="milestones">
  <xs:complexType>
    <xs:sequence minOccurs="0">
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="goals" />
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="milestone" />
    </xs:sequence>
    <xs:attribute name="canCreateMilestone" type="xs:boolean" />
    <xs:attribute name="canCreateGoal" type="xs:boolean" />
    <xs:attribute name="hide" type="xs:boolean" />
  </xs:complexType>
</xs:element>

<xs:element name="goals">
  <xs:complexType>
    <xs:sequence minOccurs="0">
      <xs:element ref="goal" />
    </xs:sequence>
    <xs:attribute name="displayableFamilies" use="required" type="list-id" />
  </xs:complexType>
</xs:element>

<xs:element name="goal">
  <xs:complexType>
    <xs:attribute name="mandatory" use="required" type="xs:boolean" />
    <xs:attribute name="measureId" use="required" type="id" />
  </xs:complexType>
</xs:element>

<xs:element name="milestone">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="defaultGoal" />
    </xs:sequence>
    <xs:attribute name="id" use="required" type="id" />
    <xs:attribute name="mandatory" type="xs:boolean" />
  </xs:complexType>
</xs:element>

<xs:element name="defaultGoal">
  <xs:complexType>
    <xs:attribute name="measureId" use="required" type="id" />
    <xs:attribute name="value" use="required" type="xs:integer" />
  </xs:complexType>
</xs:element>

<xs:element name="repositories">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="repository" />
    </xs:sequence>
    <xs:attribute name="all" use="required" type="xs:boolean" />
    <xs:attribute name="hide" use="required" type="xs:boolean" />
  </xs:complexType>
</xs:element>
```

```
<xs:element name="repository">
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    <xs:sequence>
      <xs:element minOccurs="0" ref="param"/>
    </xs:sequence>
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    <xs:attribute name="name" use="required"/>
  </xs:complexType>
</xs:element>

<xs:element name="tools">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="tool"/>
    </xs:sequence>
    <xs:attribute name="all" type="xs:boolean"/>
    <xs:attribute name="expandedInUI" type="xs:boolean"/>
  </xs:complexType>
</xs:element>

<xs:element name="tool">
  <xs:complexType>
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="unbounded" ref="param"/>
    </xs:sequence>
    <xs:attribute name="checkedInUI" type="xs:boolean"/>
    <xs:attribute name="expandedInUI" type="xs:boolean"/>
    <xs:attribute name="name" use="required"/>
    <xs:attribute name="optional" type="xs:boolean"/>
    <xs:attribute name="projectStatusOnFailure" type="project-status"/>
    <xs:attribute name="projectStatusOnWarning" type="project-status"/>
  </xs:complexType>
</xs:element>

<xs:element name="param">
  <xs:complexType>
    <xs:attribute name="availableChoices"/>
    <xs:attribute name="name" use="required"/>
    <xs:attribute name="value"/>
    <xs:attribute name="hide" type="xs:boolean"/>
  </xs:complexType>
</xs:element>
</xs:schema>
```

## Appendix C. Licences

### Squoring Software

#### End-User License and Support Agreement

Please read this document carefully. This is a legal agreement by which Squoring Technologies SAS ("Squoring") permits use of its Software products ("Squoring Software"). The user ("Customer") accepts the terms of this Agreement by taking any or all of the following actions: (a) by signing an order form or purchase order referencing either this Agreement or a Technical and Financial proposal issued by Squoring (an "Order Form"), (b) by opening the package containing the Software, and/or (c) by installing the Software on a computer ("Target Hardware").

CUSTOMER CONSENTS TO BE LEGALLY BOUND BY THESE TERMS. IF CUSTOMER DOES NOT AGREE TO ALL OF THE TERMS OF THIS AGREEMENT, CUSTOMER MUST NOT USE THE SOFTWARE AND MUST RETURN IT, INCLUDING ANY PRINTED ASSOCIATED DOCUMENTATION, TO SQUORING WITHIN FOURTEEN (14) DAYS TO RECEIVE A FULL REFUND OF THE PURCHASE PRICE.

#### 1) DEFINITION

- (a) "Squoring Software" includes (i) the Software identified in an Order Form or delivered with this Agreement; (ii) any authorized copies thereof; (iii) all related documentation ("Documentation") delivered with or included in that software; and (iv) any update to that software that Customer may receive from Squoring.
- (b) Squoring Software is based on a traditional 3-tier architecture consisting of:
- . a database and a data folder for storing project and user management data
  - . an application server running the "Squore Server Software" and the "License Server Software"
  - . a client front-end accessible through a Web Browser and a Command Line Interface to interact with the application server from a client machine
- (c) Target hardware ("Target Hardware") is uniquely identified by the hardware specification and the operating system running on it.

#### 2) LICENSE

Squoring grants to Customer, and Customer accepts from Squoring, a non-exclusive and non-transferable right and license to use the Squoring Software that is specified in the Order Form and/or that accompanies this Agreement, but only (i) in accordance with the related Documentation, (ii) subject to Customer's payment of applicable license fees and (iii) subject to the terms and conditions specified below.

Customer agrees that Customer does not have, and does not hereby acquire, any title or rights of ownership in any Squoring Software or, except for the license rights hereby granted, any right to use, copy, transfer or disclose all or any portion of any Squoring Software. The Squoring Software is protected by copyright laws and international treaties.

#### 3) FEES

The fees for the license under this Agreement are set forth in the applicable Order Form or, if no Order Form exists, in the applicable Technical and Financial proposal issued by Squoring, or, if no proposal exists, then in accordance with Squoring current list prices.

#### 4) USE

- (a) Unless otherwise stated in a special agreement, all dissemination or commercial exploitation of Squoring Software results is strictly forbidden.
- (b) The license granted by this Agreement is a license under which a maximum number of active users and projects specified in the Order Form may use the Squoring Software. An "Active User" is a physical user registered in the Squoring Software database. Active Users are not shared among several Squoring software databases. A user is active if any activity has been recorded by the Squore Server Software in the past 6 months. Activities include remote project creation, viewing of analysis results, and e-mail notification.
- (c) The management and regulation of Active Users is managed by the License Server Software hosted on the Target hardware designated by the Customer.
- (d) Except for continuous integration purpose, it is strictly forbidden to share the same Squoring Software login between different physical users.
- (e) Customer will ensure that at least one of its employees has completed the two days on-site training course "Administrating Squoring software" given by a Squoring Software certified trainer, and that such trained employee(s) are the people within Customer's organization who are responsible for interactions with Squoring on maintenance and support matters.
- (f) Customer may make a reasonable number of back-up or archival copies of the Software. Customer will reproduce all confidentiality and proprietary notices on each of these copies and maintain an accurate record of the location of each of these copies.
- (g) Customer will not:
  - . Reverse compile, disassemble, or otherwise reverse engineer any Squoring Software, or allow anyone else to do so (except only to the extent such prohibition is contrary to applicable law).
  - . Remove or destroy any proprietary markings or legends or any encrypted license keys or similar security devices placed upon or contained in any Squoring Software.
  - . Modify or adapt the Squoring Software or create a derivative work based on or incorporate the Squoring Software into or with other software.
  - . Unless otherwise stated in a special agreement, distribute, sublicense, share, display, or in any manner make the Squoring Software available to any third party, with or without compensation.
  - . Use all or any part of the Squoring Software to create other software a principal purpose of which is to perform the same or similar functions as, or to replace any component of, the Squoring Software.

#### 5. MAINTENANCE AND SUPPORT

- (a) Depending on the type of licenses bought by the Customer, Squoring will provide support and maintenance services according to the following schedule:
  - i. In case of perpetual licenses bought by Customer
    - . Maintenance fees will be charged in addition to the price of the purchase of the Squoring Software licenses. The annual initial amount of maintenance fees will be calculated on the basis of a 20% percentage of the net list price of the software licenses purchased by the Customer.
    - . After one year, Maintenance and Support services will be renewed by tacit agreement of the parties, for annual periods. Before the anniversary date of each license for which Support Services are in effect, Squoring shall advise the Customer of the applicable Maintenance and Support Service fees for the coming year.
    - . The termination of maintenance contract will be effective only by sending a registered letter with acknowledgement of receipt denouncing the contract at least 60 days before the end of the period of validity.
  - ii. In case of software licenses subscription

If the license to use the software is subject to a periodic subscription, the maintenance cost for these licenses is included in the subscription price. The maintenance is so provided during all the duration of the subscription, and stops automatically at the end of the subscription validity.

(b) Conditions. Maintenance and support services as defined hereafter in paragraph 5-(c) are applicable subject to the following conditions:

- . Squoring Software is covered by a valid maintenance contract for all acquired Squoring software licenses.
- . Squoring Software was not modified by the Customer.
- . The version of the installed Squoring Software corresponds to one of the two latest annual major updates distributed by Squoring Technologies.
- . Customer engages to comply with the normal use of the software, strictly comply with the instructions given by the Squoring Technologies and to respect all provisions in the present agreement.
- . Customer shall nominate from among its staff a technical coordinator and an alternate coordinator at the Customer Site(s), with up to date knowledge of Squoring licensed products usage and sufficient technical knowledge to interact with Squoring support staff. In case of change of the coordinators, the Customer will provide written notification to Squoring Technologies.

(c) Maintenance and support services include:

- . Assistance from support: the online support (hot line) is available during Squoring normal business hours from 9 am to 6 pm (Central European Time) to answer the questions of the technical coordinator when technical facts encountered in the use of the Squoring Software. Support will help to identify problems and provide, where appropriate, temporary fixing patches. Contact information for support is:
  - support site: <https://support.squoring.com>
  - email: [support@squoring.com](mailto:support@squoring.com)
- . Corrective maintenance: the corrective maintenance includes the development, to the extent commercially reasonable, of workarounds or program fixes for malfunctions submitted by Customer. Are considered as malfunctions recognized or reproducible defects resulting in distorted results compared to those defined in the software Manual and not coming from non-observance of the instructions of the said Manual.
- . Updates: updates include the delivery of successive versions of the software, being either due to bug fixes or to enhancements of performances or features (this delivery does not necessarily provide new additional features). Customer will destroy any prior version before installing a new update.
- . Rehost: any change of "Target hardware" implies a change of license keys and shall be subject to the prior written authorization of Squoring and to the signature by the Customer of a letter of destruction of all the license files already installed.

d) Maintenance and support services do not include:

- . Time spent, after request of the Customer by Squoring Technologies staff not directly attributable to maintenance services: search for non-reproducible anomalies, malfunction due to non-compliance with the Manual without the Software itself being an issue, unavailability of the system, operating activities prior to the intervention (such as preliminary backup ...).
- . Installation of the Software by Squoring Technologies.
- . Additional services which do not fall within the scope of maintenance services as defined above in paragraph 5-(c).
- . On-site support: Squoring may offer on-site support to Customer at additional charges

e) Procedure for the submission of requests:

- . To be taken into account, Customer requests shall be sent using the support site at <https://support.squoring.com>
- . Customer agrees to give, in support of a request for correction due to an anomaly, any information likely to facilitate the search for the causes of this anomaly, and to give for free to Squoring Technologies an open access to its

premises and development stations in the day and hours necessary to perform the contract, and to ensure the conservation, under the conditions of appropriate security and condition of the latest version, of the sources of programs in case of this is necessary to enable Squoring Technologies to perform its maintenance services.

- . Regarding correction of anomalies, Squoring is committed to act as soon as possible to correct the anomalies detected. Squoring will transfer to the Customer either a technique to bypass the anomaly or a patch of necessary corrections or a new version of the software.
  - . Any issues not resolved with the initial response will be investigated using the data provided. Below are the targeted response times for continued investigations.
    - Blocker: 1 day, daily update. A request is "blocking" when the incident has a significant impact with a risk of operating loss or when data are corrupted. The significant impact is appreciated by Squoring Technologies.
    - Serious: 2 days, weekly update
    - Major: 3 days, monthly update
    - Minor: 1 week, monthly update
- (f) Limitations
- . Squoring is expressly subject to an obligation of means.
  - . Squoring is not required to (i) develop and release any, or any particular type of enhancements or (ii) customize the enhancements to satisfy Customer's particular requirements.
  - . The Updates will not include any upgrade or new version of the Products that Squoring decides, in its sole discretion, to make generally available as a separately priced item.
  - . Squoring will be released from any responsibility in case of breach by the Customer of any provision of this maintenance terms and conditions.

## 6. WARRANTIES AND REMEDIES

- (a) Limited Warranty. Squoring warrants that it has the right to (i) enter into this Agreement and (ii) grant the licenses hereunder. Squoring also warrants that the Squoring Software will perform substantially as described in the Documentation during a 90 days Warranty Period. Customer acknowledges that (i) the Products may not satisfy all of Customer's requirements and (ii) the use of the Products may not be uninterrupted or error-free.
- (b) Remedies. Squoring or its representative will correct or replace any defective Software. Customer acknowledges that this paragraph sets forth Customer's exclusive remedy, and Squoring exclusive liability, for any breach of warranty or other duty related to the quality of the Products.
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- IN NO EVENT SHALL THE AGGREGATE LIABILITY OF SQUORING TO CUSTOMER ON ACCOUNT OF ANY MATTER ARISING WITH RESPECT TO THE SQUORING SOFTWARE EXCEED THE LICENSE FEES PAID BY CUSTOMER UNDER THIS AGREEMENT.
- (d) Infringement Indemnity. If an action is brought against Customer claiming that the Product infringes a patent, trade secret or copyright, Squoring will defend Customer at Squoring expense and, subject to this Section, pay the damages and costs finally awarded against Customer in the infringement action, but only if (i) Customer notifies Squoring promptly upon learning that the claim might be asserted, (ii) Squoring has sole control over the defense of the claim and any negotiation for its settlement or compromise, and (iii) Customer takes no action that is contrary to Squoring interest. If a claim described above may

be or has been asserted, Customer will permit Squoring, at Squoring option and expense, to (A) procure the right to continue using the Product, (B) replace or modify the Product to eliminate the infringement while providing functionally equivalent performance, or (C) accept the return of the Product and refund to Customer the License Fee actually paid to Squoring for such Product, less depreciation based on a 5-year straight-line-depreciation schedule.

Squoring shall have no indemnity obligation to Customer under this Section if the patent or copyright infringement claim results from (i) a correction or modification of the Product not provided by Squoring, (ii) the failure to promptly install an Update or Enhancement at Squoring direction with knowledge that installation thereof would have avoided the infringement or (iii) the combination of the Product with other non-Squoring software or (iv) any unauthorized use of the Squoring Software, or (v) any version of the Software other than the latest update offered by Squoring to Customer at no additional charge.

#### 7. LIMITATION OF LIABILITY

UNDER NO CIRCUMSTANCES WILL SQUORING OR ITS SQUORINGS BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, PUNITIVE OR INCIDENTAL DAMAGES OR LOST PROFITS, WHETHER FORESEEABLE OR UNFORESEEABLE, BASED ON CUSTOMER'S CLAIMS OR THOSE OF ITS CUSTOMERS (INCLUDING, BUT NOT LIMITED TO, CLAIMS FOR LOSS OF DATA, GOODWILL, USE OF MONEY OR USE OF THE PRODUCTS, INTERRUPTION IN USE OR AVAILABILITY OF DATA, STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS), ARISING OUT OF BREACH OR FAILURE OF EXPRESS OR IMPLIED WARRANTY, BREACH OF CONTRACT, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE. IN NO EVENT WILL THE AGGREGATE LIABILITY WHICH SQUORING OR ITS SQUORINGS MAY INCUR IN ANY ACTION OR PROCEEDING EXCEED THE LICENSE FEES ACTUALLY PAID BY CUSTOMER FOR THE SPECIFIC PRODUCT THAT DIRECTLY CAUSED THE DAMAGE. THIS SECTION WILL NOT APPLY ONLY WHEN AND TO THE EXTENT THAT APPLICABLE LAW SPECIFICALLY REQUIRES LIABILITY, DESPITE THE FOREGOING EXCLUSION AND LIMITATION.

#### 8. OWNERSHIP

All trademarks, service marks, patents, copyrights, trade secrets and other proprietary rights in or related to the Products are and will remain the exclusive property of Squoring, whether or not specifically recognized or perfected under local applicable law. Customer will not take any action that jeopardizes Squoring proprietary rights or acquire any right in the Products, except the limited use rights specified in Section 4. Squoring will own all rights in any copy, translation, modification, adaptation or derivation of the Products, including any improvement or development thereof.

#### 9. CONFIDENTIALITY

(a) Confidentiality. Customer acknowledges that the Products constitute and incorporate confidential and proprietary information developed or acquired by or licensed to Squoring. Customer will take all reasonable precautions necessary to safeguard the confidentiality of the Products, including at a minimum those taken by Customer to protect Customer's own confidential information. Customer will not allow the removal or defacement of any confidentiality or proprietary notice placed on the Products. The placement of copyright notices on these items will not constitute publication or otherwise impair their confidential nature.

(b) Disclosure. Customer will not disclose, in whole or in part, the Products or any portion thereof or other information that has been designated as confidential to any individual, entity or other person, except to those of Customer's employees or consultants who require access for Customer's authorized use of the Products, provided such consultants agree in writing to comply with the use and non-disclosure restrictions applicable to the Products under this



Agreement. Customer acknowledges that any unauthorized use or disclosure of the Products may cause irreparable damage to Squoring. If an unauthorized use or disclosure occurs, Customer will immediately notify Squoring and take, at Customer's expense, all steps which may be available to recover the Products and to prevent their subsequent unauthorized use or dissemination. Squoring agrees to take the same action regarding any information designated in writing as proprietary which it receives from Customer ("Customer Information").

(c) Limitation. Neither Squoring nor Customer will have any confidentiality obligation with respect to any portion of the Products or Customer Information that (i) the receiving party knew or independently developed before receiving such Products or Customer Information under this Agreement, (ii) the receiving party lawfully obtained from a third party under no confidentiality obligation, or (iii) became available to the public other than as a result of any act or omission by the receiving party or any of receiving party's employees or consultants.

#### 10. TERMINATION

Customer may terminate this Agreement or any Order Form, without right to refund, by notifying Squoring of such termination and returning the Product and copies thereof to Squoring. Squoring may terminate this Agreement, upon reasonable notice and without judicial or administrative resolution, if Customer or any of Customer's employees or consultants breach any material term or condition hereof. This Agreement will terminate automatically if Customer becomes insolvent or enters into bankruptcy, suspension of payments, moratorium, or any other proceeding that relates to insolvency or protection or creditors' rights.

Upon the termination of this Agreement for any reason, all rights granted to Customer hereunder will cease, and Customer will stop using Squoring Software, return or destroy all copies and so certify to Squoring in writing. The provisions of Sections 6-8 will survive the termination of this Agreement.

#### 11. INSPECTION

During the term of this Agreement, Squoring or its representative, if in receipt of credible evidence of non-compliance, may, upon prior notice to Customer, inspect the files, computer processors, equipment and facilities of Customer during normal working hours to verify Customer's compliance with this Agreement. While conducting such inspection, Squoring or its representative will be entitled to copy any item that Customer may possess in violation of this Agreement, without disruption of Squoring business and violation of Laws and Regulations.

#### 12. ASSIGNMENT

Customer shall not assign, delegate or otherwise transfer this Agreement or any of its rights or obligations hereunder without Squoring prior approval which shall not be unreasonably withheld.

#### 13. MISCELLANEOUS

. Any terms and conditions of any unilateral letter, memorandum, purchase order or other writing issued by Customer shall not be binding on Squoring. Any waiver or modification of this Agreement will not be effective unless executed in writing and signed by an authorized representative of Squoring and Customer. This Agreement will bind Customer's successors-in-interest.

. This Agreement will be governed by and interpreted in accordance with the laws of France. If any provision of this Agreement is held to be unenforceable, in whole or in part, such holding will not affect the validity of the other

provisions of this Agreement, unless the Parties in good faith deem the unenforceable provision to be essential, in which case either Party may terminate this Agreement effective immediately upon notice to the other Party. This Agreement constitutes the complete and entire statement of all conditions and representations of the agreement between Squoring and Customer with respect to its subject matter and supersedes all prior writings or understandings.

Redistributed Software	Version	License File
-----		
Wildfly	10.1.0.Final	lgpl-2.1.txt
PostgreSQL	8.4	postgresql-bsd.txt
Perl	5.12.3	al.txt
TCL	8.5	tcltkl.txt,tcllib.txt
PhantomJS	2.1.1	bsd3.txt
Components	Sub component	Version License File
-----		
Richfaces	4.5.17	lgpl-2.1.txt
PostgreSQL JDBC Driver	42.0.0	bsd2.txt
Oracle JDBC driver	12.1.02	otn.txt
Omnifaces	2.6	apache-2.0.txt
ANTLR	3.1	antlr3.txt
JasperReports Library	4.8	lgpl-2.1.txt
Checkstyle	5.6	lgpl-2.1.txt
JTcl	2.8	jtcl.txt, amd.txt, itcl.txt, janino.txt, tcllib.txt, tcltk.txt, ucb.txt
log4j	1.2.17	apache-2.0.txt
Apache Commons	commons-lang3 3.1	apache-2.0.txt
Apache HttpComponents	httpclient 4.1.2	apache-2.0.txt
Apache HttpComponents	httpmime 4.1.2	apache-2.0.txt
Apache XML Graphics	batik-transcoder 1.7	apache-2.0.txt
Bouncy Castle	bcmail-jdk16 1.46	bouncy-castle.txt
com.beust	jcommander 1.48	apache-2.0.txt
com.google.collections	google-collections 1.0	apache-2.0.txt
com.googlecode.juniversalchardet	juniversalchardet 1.0.3	mpl1.1.txt
com.sun.mail	javax.mail 1.5.3	gf.txt
commons-cli	commons-cli 1.2	apache-2.0.txt
commons-collections	commons-collections 3.2.2	apache-2.0.txt
javax.enterprise	cdi-api 1.2	apache-2.0.txt
javax.validation	validation-api 1.1.0.Final	apache-2.0.txt
net.java.dev.jna	jna 4.1.0	lgpl-2.1.txt
net.sf.jsci	jsci 1.2	lgpl-2.1.txt
net.sf.saxon	saxon-xom 8.7	mpl1.0.txt
nux	nux 1.6	nux.txt
org.glassfish	javax.json 1.0.4	gf.txt
org.jdom	jdom2 2.0.5	jdom.txt
Resources	Version	License File
-----		
CodeMirror	4.4.0	mit.txt
font-awesome	4.7.0	mit.txt, ofl-1.1.txt
JavaScript InfoVis Toolkit	2.0.1	mit.txt
jquery	1.12.3	jquery.txt
jquery-mobile	1.4.2	jquery-mobile.txt
jquery-ui-resizable	1.11.4	mit.txt, jquery.txt
notify.js	0.4.2	mit.txt
splitter.js	1.51	mit.txt
gridstack.js	1.0.0	mit.txt
spectrum.js	1.8.0	mit.txt

## al

The "Artistic License"

Preamble

The intent of this document is to state the conditions under which a Package may be copied, such that the Copyright Holder maintains some semblance of artistic control over the development of the package, while giving the users of the package the right to use and distribute the Package in a more-or-less customary fashion, plus the right to make reasonable modifications.

Definitions:

"Package" refers to the collection of files distributed by the Copyright Holder, and derivatives of that collection of files created through textual modification.

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b) use the modified Package only within your corporation or organization.

c) rename any non-standard executables so the names do not conflict with standard executables, which must also be provided, and provide a separate manual page for each non-standard executable that clearly documents how it differs from the Standard Version.

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4. You may distribute the programs of this Package in object code or executable form, provided that you do at least ONE of the following:

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b) accompany the distribution with the machine-readable source of the Package with your modifications.

c) give non-standard executables non-standard names, and clearly document the differences in manual pages (or equivalent), together with instructions on where to get the Standard Version.

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The End

## amd

license.amd

The following license terms apply to the TJC compiler source and test files located in the src/tjc, src/tests/tjc, and tests/tjc directories.

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## antlr3

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## apache-2.0

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*/
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## jdom2

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## mpl1.0

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## Index

### Symbols

#### \*\*\* What's New in Squore 18.0?

A new CSV format for importing information into Squore is available in the csv\_import Data Provider framework, 231

A sample implementation of a Data Provider now allows to import XML directly into Squore, 231

Create data providers in your own language that generate data in more than one step, 225

Create support for new languages in Squan Sources to create artefacts in your project, 215

Hybrid SVN mode saves you an extra checkout of your source tree, 180

Improved cloning detection tool now allows ignoring comments and blank lines and setting a minimum size for duplicated blocks, 198

Improved code stability computation allows tracking findings when artefacts have moved, 198

JUnit Data Provider produces test artefacts and links instead of findings, 191

New Data Provider: CPU Data Import, 206

New Data Provider: ESLint, 188

New Data Provider: Jira, 210

New Data Provider: JSHint, 191

New Data Provider: Mantis, 211

New Data Provider: Memory Data Import, 207

New Data Provider: MSTest, 193

New Data Provider: SonarQube, 215

New Data Provider: Stack Data Import, 207

New Data Provider: Ticket Data Import, 208

New metric: CCLC, 232

RTRT can now create test artefacts in your project tree, 197

VectorCAST can now create test artefacts in your project tree, 203

XML Schema published for form.xml , 221

XML Schema published for input-data.xml , 226

You can use a required tag of type booleanchoice to ensure that users must check a box in the web UI or set the parameter to true when building from the command line in order to proceed with the analysis., 223

#### \*\* Deprecated Functionality

The Data Provider frameworks available in previous versions of Squore are still available and supported, however new Data Provider frameworks have been introduced and should be considered when creating new Data Providers, 231

## A

ABAP, 3

Acceptance Testing, 235

Accessibility, 235

Accuracy, 235

Accuracy of Measurement, 236

Acquirer, 236

Action, 237

Activity, 237

Actor, 238

ADA, 13

Adaptability, 238

additional\_param, 200, 216

Agreement, 239

Analysability, 239

Analysis Model, 239

api\_token, 212

Architecture, 239

arg, 226

artefact\_filters, 208, 210

artefact\_groups, 208, 210

artefact\_id, 208

artefact\_name, 208

artefact\_uid, 208

Attractiveness, 240

Attribute, 240

auxiliarypath, 189

Availability, 241

## B

Baseline, 242

Base Measure, 241

baseName, 221

branch, 174

Branch, 242

Branch Coverage, 243

Branch Testing, 243

Budget, 244

Build, 244

## C

C, 23

Call Graph, 244

Capability Maturity Model, 245

Certification, 245

Certification Criteria, 245

Changeability, 247

changeable, 222

Change Control Board, 246

Change Control System, 246

Change Management, 246

clAlg, 200

clAlgFR, 200

class\_dir, 189  
clFR, 200  
clIgnBlk, 200  
clIgnCmt, 200  
closure\_date, 209  
clRen, 200  
clRSlen, 200  
clTxt, 200  
CMMi, 396  
COBOL, 35, 218  
Code, 247  
Code Coverage, 248  
Code Freeze, 248  
Code Review, 248  
Code Verification, 248  
Coding, 249  
Co-existence, 247  
Cohesion, 249  
Commercial-Off-The-Shelf (COTS), 250  
commit, 176  
Commit, 250  
Commitment, 250  
compact\_folder, 199  
Compatibility, 251  
Complexity, 251  
Component, 252  
Conciseness, 252  
Condition, 253  
configFile, 185, 186, 196  
Configuration, 253  
Configuration Control, 253  
Configuration Item, 254  
Configuration Management, 255  
Configuration Management System, 255  
Conflict, 256  
Conformance, 256  
Connectivity, 257  
Consistency, 257  
Constraint, 257  
Content Coupling, 258  
Context of Use, 258  
Contract, 258  
Control Coupling, 259  
Control Flow, 259  
Control Flow Diagram, 259  
Convention, 260  
Correctability, 260  
Correctness, 260  
Coupling, 261  
Coverage, 261  
CPP, 48  
cpu\_idle\_column\_name, 206  
cpu\_loop\_column\_name, 206

cpu\_worst\_column\_name, 206  
createMissingFile, 205  
createOutput, 206, 207, 208, 209  
creation\_date, 209, 210  
Criteria, 262  
Criticality, 262  
CSHARP, 60  
csv, 181, 182, 189, 193, 204, 204, 205, 206, 212, 214  
csv\_separator, 206, 207, 208, 209  
Customer, 263  
Custom Software, 262

## D

Data, 263  
Database, 267  
Data Coupling, 264  
Data Flow, 264  
Data Flow Diagram, 265  
Data Management, 265  
Data Model, 265  
Data Processing, 266  
Data Provider, 266  
Data Providers  
    AntiC, 181  
    Automotive Coverage Import, 181  
    Automotive Tag Import, 181  
    BullseyeCoverage Code Coverage Analyzer, 182  
    Cantata, 184  
    CheckStyle, 184  
    CheckStyle (plugin), 185  
    CheckStyle for SQALE (plugin), 185  
    Cobertura format, 186  
    CodeSniffer, 203  
    CodeSonar, 186  
    Compiler, 187  
    Configuration Checker, 203  
    Coverity, 187  
    CPD, 182  
    Cppcheck, 183  
    Cppcheck (plugin), 183  
    CPPTest, 183  
    CPU Data Import, 206  
    Csv, 220, 442  
    csv\_findings, 220, 446  
    csv\_import, 220, 437  
    Csv Coverage Import, 204  
    CSV Findings, 204  
    CSV Import, 205  
    CsvPerl, 220, 447  
    Csv Tag Import, 206  
    ESLint, 187  
    ExcelMetrics, 220, 460  
    FindBugs, 188

- FindBugs (plugin), 188
- FindingsPerl, 220, 456
- Frameworks, 220
- Function Relaxer, 189
- FxCop, 189
- GCov, 190
- Generic, 220, 448
- GenericPerl, 220, 453
- GNATcheck, 190
- GNATCompiler, 190
- JaCoCo, 192
- Jira, 210
- JSHint, 191
- JUnit Format, 191
- Klocwork, 192
- Mantis, 211
- Memory Data Import, 207
- MemUsage, 193
- MISRA Rule Checking using PC-lint, 195
- MISRA Rule Checking with QAC, 196
- MSTest, 193
- NCover, 194
- Oracle PLSQL compiler Warning checker, 194
- OSLC, 212
- pep8, 212
- PHP Code Coverage, 213
- PMD, 195
- PMD (plugin), 195
- Polyspace, 196
- pycodestyle / pep8 (plugin), 213
- pylint, 213
- pylint (plugin), 214
- Qac\_8\_2, 214
- Qac\_8\_2 CERT Import, 214
- Rational Logiscope, 193
- ReqIF, 197
- SonarQube, 215
- SQL Code Guard, 198
- Squan Sources, 198
  - Adding More File Types, 215
  - Advanced COBOL parsing, 218
- Squore Import, 201
- Squore Virtual Project, 201
- Stack Data Import, 207
- StyleCop, 201
- StyleCop (plugin), 202
- Tessy, 202
- Ticket Data Import, 208
- Unit Test Status from Rational Test RealTime, 197
- VectorCAST, 203
  - xml, 220, 439
- Data Store, 267
- Data Type, 267
- db, 179
- Decision Criteria, 268
- Decoupling, 268
- defaultValue, 216, 222, 227, 228
- Defect, 268
- definition\_close, 209, 211
- definition\_defect, 209, 211
- definition\_enhancement, 209, 211
- definition\_open, 209, 210
- definition\_rd\_progress, 209, 211
- definition\_vv\_progress, 209, 211
- Degree of Confidence, 269
- delimiter, 205
- Deliverable, 269
- Delivery, 269
- Dependability, 270
- Deployment, 270
- depot, 175
- depth, 199
- Derived Measure, 270
- description, 209
- Design, 271
- Design Pattern, 271
- Developer, 272
- Development, 272
- Development Testing, 273
- dir, 181, 183, 190, 198, 213, 214
- dir\_choice, 200
- Direct Measure, 273
- Direct Metric, 274
- displayType, 222
- Document, 274
- Documentation, 275
- DOD-STD-2167A, 396
- due\_date, 209, 210
- Dynamic Analysis, 276

## E

- Earned Value, 276
- Effectiveness, 276
- Efficiency, 276
- Efficiency Compliance, 277
- Effort, 277
- Encapsulation, 277
- End User, 278
- Entity, 278
- Entry Point, 279
- env, 226
- Environment, 279
- Error, 280
- Error Tolerance, 280
- Evaluation, 280
- Evaluation Activity, 281

Evaluation Group, 281  
Evaluation Method, 282  
Evaluation Module, 282  
Evaluation Technology, 283  
Evaluation Tool, 283  
excel, 194  
excludedDirectoryPattern, 185  
excludedExtensions, 195, 197  
exec, 226, 227, 230  
exec-phase, 221, 226, 226, 226, 227, 228, 229, 230  
exec-tool, 228, 228  
Execute, 283  
Execution Efficiency, 284  
Execution Time, 284  
Exit, 284  
Expandability, 284  
ext, 190, 197  
Extendability, 285  
External Attribute, 285  
External Measure, 285  
External Quality, 286  
externals, 180  
External Software Quality, 286

## F

Facility, 287  
Failure, 287  
Failure Rate, 288  
Fault, 289  
Fault Tolerance, 289  
Feasibility, 290  
Feature, 290  
Feature Freeze, 290  
filePattern, 192, 193  
files\_choice, 199  
findings, 205  
Finite State Machine, 291  
Flexibility, 291  
FORTRAN, 72  
Frozen Branch, 291  
Function, 291  
Functional Analysis, 292  
Functionality, 293  
Functionality Compliance, 294  
Functional Requirement, 292  
Functional Size, 293  
Functional Testing, 293  
Functional Unit, 293

## G

genAs, 200  
genCG, 199  
Generality, 294

generateTests, 197, 203  
Generic Practice, 294  
genTs, 200  
Glossary, 295  
Goal, 295  
Granularity, 295

## H

handler, 209  
hide, 222  
Historical Information, 295  
hostname, 177  
html, 182  
html\_report, 203, 213  
Hybrid Coupling, 295

## I

id="add-data", 226, 229  
id="display", 229  
id="import", 229  
id="repo-add-data", 229  
IEC 61508, 397  
IEC 61508-3, 397  
IEC 61508-7, 397  
IEEE 1012, 398  
IEEE 1058, 398  
IEEE 1061, 398  
IEEE 1074, 398  
IEEE 1220, 399  
IEEE 1233, 399  
IEEE 1320, 399  
IEEE 1362, 399  
IEEE 1490, 400  
IEEE 610.12, 400  
IEEE 829, 400  
IEEE 830, 400  
IEEE 982, 401  
ignoreIfArtefactNotFound, 205  
ignores, 183  
ignoreSourceFilePath, 196, 205  
image, 221  
Impact Analysis, 296  
Implementation, 296  
Implied Needs, 297  
in\_todo\_list, 209, 211  
Incremental Development, 297  
Indicator, 297  
Indicator Value, 298  
Indirect Measure, 298  
Indirect Metric, 299  
Information, 299  
Information Analysis, 299  
Information Management, 299



Information Need, 300  
Information Product, 300  
informations, 209, 211  
infos, 205  
input\_file, 208  
inputDir, 201  
Inspection, 300  
Installability, 301  
Installation Manual, 301  
Integration, 301  
Integration Test, 302  
Integrity, 302  
Interface Testing, 302  
Intermediate Software Product, 302  
Internal Attribute, 303  
Internal Measure, 303  
Internal Quality, 304  
Internal Software Quality, 304  
Interoperability, 305  
Interoperability Testing, 305  
Interval Scale, 305  
ISO/IEC/IEEE 15289, 434  
ISO/IEC/IEEE 24765, 435  
ISO/IEC 12119, 405  
ISO/IEC 12207, 405  
ISO/IEC 14143, 405  
ISO/IEC 14143-1, 406  
ISO/IEC 14143-3, 406  
ISO/IEC 14598, 407  
ISO/IEC 14598-1, 407  
ISO/IEC 14598-2, 408  
ISO/IEC 14598-3, 408  
ISO/IEC 14598-4, 409  
ISO/IEC 14598-5, 409  
ISO/IEC 14598-6, 410  
ISO/IEC 14756, 410  
ISO/IEC 14764, 410  
ISO/IEC 15026, 411  
ISO/IEC 15026-1, 411  
ISO/IEC 15026-2, 411  
ISO/IEC 15288, 412  
ISO/IEC 15289, 412  
ISO/IEC 15414, 413  
ISO/IEC 15474, 413  
ISO/IEC 15474-1, 413  
ISO/IEC 15474-2, 414  
ISO/IEC 15504, 414  
ISO/IEC 15504-1, 415  
ISO/IEC 15504-2, 415  
ISO/IEC 15504-3, 416  
ISO/IEC 15504-4, 416  
ISO/IEC 15504-5, 417  
ISO/IEC 15504-6, 418  
ISO/IEC 15504-7, 418  
ISO/IEC 15846, 419  
ISO/IEC 15910, 419  
ISO/IEC 15939, 420  
ISO/IEC 19759, 420  
ISO/IEC 19770, 420  
ISO/IEC 19770-1, 421  
ISO/IEC 19770-2, 421  
ISO/IEC 20000, 422  
ISO/IEC 2382, 422  
ISO/IEC 2382-1, 423  
ISO/IEC 25000, 424  
ISO/IEC 25001, 424  
ISO/IEC 25010, 425  
ISO/IEC 25012, 425  
ISO/IEC 25020, 425  
ISO/IEC 25021, 426  
ISO/IEC 25030, 426  
ISO/IEC 25040, 427  
ISO/IEC 25045, 427  
ISO/IEC 25051, 427  
ISO/IEC 25060, 428  
ISO/IEC 25062, 428  
ISO/IEC 26514, 429  
ISO/IEC 29881, 429  
ISO/IEC 90003, 429  
ISO/IEC 9126, 429  
ISO/IEC 9126-1, 430  
ISO/IEC 9126-2, 431  
ISO/IEC 9126-3, 431  
ISO/IEC 9126-4, 432  
ISO/IEC 9294, 432  
ISO/IEC 99, 433  
ISO/IEC SQuaRE, 433  
ISO 5806, 401  
ISO 8402, 401  
ISO 9001, 401  
ISO 9127, 401  
ISO 9241, 402  
ISO 9241-10, 403  
ISO 9241-11, 404  
Item, 306  
Iteration, 306

**J**  
JAVA, 80  
JAVASCRIPT, 89  
jql\_request, 210

**K**  
key, 215, 222, 222, 223, 228  
Key Practices, 306  
Key Process Area, 307

keys, 205  
Knowledge Base, 307

## L

label, 175  
Languages  
  ABAP, 3  
  ADA, 13  
  Adding New Languages, 215  
  C, 23  
  COBOL, 35, 218  
  CPP, 48  
  CSHARP, 60  
  FORTRAN, 72  
  JAVA, 80  
  JAVASCRIPT, 89  
  MINDC, 97  
  OBJECTIVEC, 109  
  PHP, 120  
  PYTHON, 130  
  SQL, 138  
  TSQL, 146  
  VBNET, 152  
  XAML, 164  
languages, 199  
last\_updated\_date, 209, 210  
Learnability, 307  
Lessons Learned, 308  
level, 205  
Level of Performance, 308  
Licences, 497  
Life Cycle, 308  
Life Cycle Model, 309  
links, 205  
local\_path, 180, 180  
log, 191, 194  
logDir, 195, 197, 197  
login, 210, 212, 215

## M

Maintainability, 309  
Maintainability Compliance, 310  
Maintainer, 310  
Maintenance, 310  
Maintenance Manual, 311  
Maturity, 312  
max\_results, 210, 212  
Measurable Concept, 312  
Measurand, 312  
Measure, 312  
Measurement, 313  
Measurement Analyst, 314  
Measurement Experience Base, 314

Measurement Function, 314  
Measurement Method, 315  
Measurement Procedure, 315  
Measurement Process, 316  
Measurement Process Owner, 316  
Measurement Sponsor, 316  
Measurement User, 316  
memory\_size\_column\_name, 207  
memory\_type\_column\_name, 207  
memory\_used\_column\_name, 207  
Metric, 317  
Metrics  
  % of parsed tokens, 76, 134, 159  
  AND operators, 17  
  Andthen Operators, 3, 13, 23, 49, 60, 72, 80, 89,  
  97, 109, 121, 138, 152, 164  
  Arithmetic Operators, 35  
  Assignment Operators, 23, 49, 60, 80, 97, 110  
  Blank Lines, 3, 14, 23, 35, 49, 61, 73, 81, 90, 98,  
  110, 121, 130, 138, 146, 153, 165  
  Brace Lines, 3, 14, 24, 50, 61, 73, 81, 90, 98, 110,  
  121, 130, 138, 146, 153  
  Break in Loop, 24, 50, 61, 73, 81, 90, 98, 110, 131,  
  138, 146, 153, 165  
  Break in Switch, 24, 50, 61, 81, 90, 98, 110, 154,  
  165  
  Called Depth, 25, 99  
  Called External Functions, 24, 98  
  Called Functions, 24, 98  
  Call Graph Depth, 4, 14, 25, 36, 50, 62, 73, 82, 91,  
  99, 111, 122, 131, 139, 147, 154, 165  
  Calling Depth, 25, 99  
  Calling Functions, 24, 98  
  Calls From, 24, 98  
  CALL Statements, 35  
  Calls To, 24, 98  
  Call to exit, 5, 37, 123, 132, 156  
  Case Blocks, 3, 14, 24, 50, 61, 73, 81, 90, 98, 111,  
  139, 154, 165  
  Case Labels, 3, 14, 24, 50, 61, 73, 81, 90, 98, 111,  
  122, 139, 154, 165  
  Catch Statements, 3, 50, 61, 81, 90, 111, 122, 131,  
  139, 146, 154, 165  
  Cloned Code, 6, 16, 27, 38, 52, 64, 75, 83, 92, 101,  
  113, 124, 133, 141, 148, 157, 167  
  Cloned Control Flow Tokens, 6, 16, 27, 38, 52, 64,  
  75, 83, 92, 101, 113, 124, 133, 141, 148, 157, 167  
  Code Cloning Line Counting, 3, 14, 24, 35, 50, 62,  
  73, 81, 90, 99, 111, 122, 131, 139, 146, 154, 165  
  Commented Statements, 4, 15, 25, 36, 51, 62, 74,  
  82, 91, 100, 111, 122, 131, 139, 147, 154, 166  
  Comment Lines, 4, 14, 25, 36, 50, 62, 73, 82, 91,  
  99, 111, 122, 131, 139, 147, 154, 165

Comment lines with code, 36  
Comment lines without alphabetic characters, 36  
Comparison Operators, 25, 51, 62, 82, 99, 111  
Compiler FLAG Nested Level, 29, 55, 67, 103, 116, 142  
Conditions, 36  
Constant Data, 48, 60, 80, 109, 120, 152  
Constant Methods, 124  
Constant Properties, 66  
Constants, 17  
Continue Statements, 4, 25, 51, 62, 74, 82, 91, 99, 111, 122, 131, 139, 147, 154, 166  
Control Flow Token, 4, 14, 25, 36, 50, 62, 73, 82, 90, 99, 111, 122, 131, 139, 147, 154, 165  
Cyclomatic Complexity, 4, 14, 25, 35, 50, 62, 73, 81, 90, 99, 111, 122, 131, 139, 147, 154, 165  
Data Declarations, 39  
Data Used, 39  
Debug lines, 36  
Declared functions, 17  
Declare Members, 157  
Declare operators, 15  
Default Statement, 5, 15, 26, 51, 62, 74, 82, 91, 100, 112, 123, 140, 155, 166  
Delegate Members, 157  
Delete Statements, 147  
Depth of Descendant Tree, 51, 62, 82, 112, 122, 132, 155  
Depth of Inheritance Tree, 51, 63, 82, 112, 123, 132, 155  
Derived types, 18  
DISPLAY statements, 36  
Distinct Operands, 5, 15, 26, 37, 51, 63, 74, 82, 91, 100, 112, 123, 132, 140, 147, 155, 166  
Distinct Operands in Data Div., 37  
Distinct Operands in Procedure Div., 37  
Distinct Operators, 5, 15, 26, 37, 51, 63, 74, 83, 91, 100, 112, 123, 132, 140, 147, 155, 166  
Distinct Operators in Data Div., 37  
Distinct Operators in Procedure Div., 37  
Do While Statements, 26, 51, 63, 74, 83, 91, 100, 112, 123, 155, 166  
Else Statements, 5, 15, 26, 37, 51, 63, 74, 83, 91, 100, 112, 123, 132, 140, 147, 155, 166  
End Statements, 157  
Entry Statements, 15  
EVALUATE Statements, 37  
Events, 155  
Exception handlers, 15  
Exceptions, 17  
Exception When blocks, 15  
Executable Statements, 7, 20, 30, 39, 56, 68, 76, 86, 93, 104, 116, 126, 134, 143, 149, 160, 168  
Fiend Attributes, 152  
File Declarations, 37  
Files Used, 37  
File Type Count, 5  
Foreach Statements, 63, 123  
For Statements, 5, 15, 26, 52, 63, 74, 83, 92, 100, 112, 123, 132, 140, 156, 166  
Friend Events, 155  
Friend Members, 157  
Friend Properties, 159  
Generic object, 16  
Goto Statements, 16, 26, 38, 52, 63, 75, 101, 113, 124, 140, 148, 156, 167  
Header Blocks Of Comment, 3, 14, 23, 49, 61, 72, 81, 89, 97, 110, 121, 130, 138, 146, 153  
Header Lines Of Code, 6, 16, 27, 52, 64, 75, 83, 92, 101, 113, 124, 133, 141, 148, 157  
Header Lines Of Comment, 6, 16, 27, 52, 64, 75, 83, 92, 101, 113, 124, 133, 140, 148, 156  
HTML Lines of Code, 124  
IDMS calls for modification, 38  
IDMS calls for reading/searching, 38  
IDMS instructions called, 38  
IDMS records called, 38  
IDMS subschema definition, 38  
If Statements, 6, 16, 27, 38, 52, 64, 75, 84, 92, 101, 113, 124, 133, 141, 148, 157, 167  
Insert Statements, 148  
Internal Data, 60  
Internal Methods, 64  
Internal Properties, 66  
IO Functions, 30, 104  
Is IDMS active, 38  
Label Statements, 16, 148  
Line Count, 6, 17, 27, 38, 52, 64, 75, 84, 92, 101, 113, 124, 133, 141, 149, 157, 167  
Lines Added, 8, 20, 31, 40, 56, 69, 77, 86, 94, 105, 117, 127, 135, 143, 150, 161, 169  
Lines Modified, 8, 20, 31, 40, 56, 69, 77, 86, 94, 105, 117, 127, 135, 144, 150, 161, 169  
Lines Removed, 8, 20, 31, 40, 56, 69, 77, 86, 94, 105, 117, 127, 135, 144, 150, 161, 169  
Loop Statements, 6, 17, 27, 53, 64, 75, 84, 92, 101, 113, 124, 133, 141, 157, 167  
Maximum Nested Structures, 6, 19, 28, 39, 53, 65, 76, 85, 93, 102, 114, 125, 134, 141, 149, 159, 167  
Max Nested Functions, 91  
Memory Allocation, 27, 101  
Memory Freeing, 27, 101  
Methods without Accessibility, 53, 64, 84, 114, 125, 158  
Minimum Number of Cycles, 4, 15, 26, 36, 51, 62, 74, 82, 91, 100, 112, 122, 131, 140, 147, 155, 166

Minimum Number of Indirect Cycles, 25, 99  
Mixed Lines, 6, 17, 27, 53, 64, 75, 84, 93, 102, 113, 125, 133, 141, 149, 158  
Multiple Inheritance Indicator, 53, 64, 84, 113, 125, 133, 157  
Must Members, 158  
Must Properties, 159  
Non-Cyclic Paths, 7, 19, 28, 54, 65, 76, 85, 93, 102, 114, 126, 134, 141, 149, 159, 167  
Number of #DEFINE, 28, 54, 67, 102, 115, 142  
Number of #ELIF, 28, 54, 67, 102, 115, 142  
Number of #ELSE, 28, 54, 67, 102, 115, 142  
Number of #ENDIF, 28, 54, 67, 102, 115, 142  
Number of #ENDREGION, 67  
Number of #ERROR, 28, 54, 67, 102, 115, 142  
Number of #IF, 28, 54, 67, 103, 115, 142  
Number of #IFDEF, 29, 54, 67, 103, 115, 142  
Number of #IFNDEF, 29, 55, 67, 103, 115, 142  
Number of #PRAGMA, 29, 55, 68, 103, 116, 142  
Number of #REGION, 68  
Number of #UNDEF, 29, 55, 68, 103, 116, 143  
Number of #WARNING, 29, 55, 68, 103, 116, 143  
Number of Ancestors, 53, 65, 84, 114, 125, 133, 158  
Number of arithmetic if, 72  
Number of Attributes, 48, 60, 80, 109, 121, 152  
Number of attributes, 164  
Number of Check instruction, 4  
Number Of Children, 54, 65, 85, 114, 126, 134, 159  
Number of comment blocks, 3, 14, 23, 49, 61, 72, 81, 89, 97, 110, 121, 130, 138, 146, 153, 164  
Number of data without accessibility, 49, 60, 80, 109, 121  
Number of declarative statements, 74  
Number of Descendants, 53, 65, 85, 114, 125, 133, 158  
Number of DocString lines, 132  
Number of Include, 29, 55, 103, 115, 142  
Number of Methods, 159  
Number of paragraphs, 39  
Number of Parameters, 28, 54, 65, 85, 93, 102, 114, 141, 159, 167  
Number of Sections, 39  
Number of text blocks, 168  
Number of XML elements, 166  
Operand Occurrences, 7, 20, 30, 40, 56, 69, 76, 86, 94, 105, 117, 127, 134, 143, 150, 161, 168  
Operand Occurrences in Data Div., 40  
Operand Occurrences in Procedure Div., 40  
Operator Occurrences, 7, 20, 31, 40, 56, 69, 77, 86, 94, 105, 117, 127, 135, 143, 150, 161, 168  
Operator Occurrences in Data Div., 40  
Operator Occurrences in Procedure Div., 40  
Or else operators, 7, 19, 28, 54, 66, 76, 85, 93, 102, 115, 126, 141, 159, 168  
OR operators, 18  
Partial Members, 158  
PERFORM Statements, 39  
PHP/HTML Mixed Lines, 125  
PHP Lines of Code, 126  
Private Constant, 4  
Private constant, 17  
Private Data, 5  
Private data, 49, 60, 80, 110, 121, 153  
Private Events, 156  
Private exceptions, 18  
Private functions/Procedures, 17  
Private Methods, 53, 65, 84, 114, 125, 158  
Private Properties, 66, 160  
Private types, 19  
Private variables, 19  
Properties, 66, 115, 159  
Properties with Get, 66  
Properties without Accessibility, 66  
Properties with Set, 66  
Protected Constant, 4  
Protected Data, 5, 49, 60, 80, 110, 121, 153  
Protected Events, 156  
Protected Internal Data, 60  
Protected Internal Methods, 65  
Protected Internal Properties, 66  
Protected Methods, 53, 65, 84, 114, 125, 158  
Protected objects, 18  
Protected Properties, 66, 160  
Public Constant, 4  
Public constants, 17  
Public Data, 5, 49, 60, 80, 109, 121, 152  
Public Events, 155  
Public exceptions, 18  
Public functions, 17  
Public Methods, 53, 65, 84, 114, 125, 158  
Public Properties, 66, 159  
Public types, 19  
Public variables, 19  
Raise statements, 19  
Real comment lines with alphabetic characters, 36  
Recursive Calls, 25, 99  
Renamed objects, 18  
Repeated Code Blocks, 7, 20, 29, 39, 55, 68, 76, 85, 93, 103, 116, 126, 134, 143, 149, 160, 168  
Return Statements, 7, 19, 29, 55, 68, 76, 85, 93, 103, 116, 126, 134, 143, 149, 160, 168  
Select Statements, 149  
Separate functions/procedures, 18  
Separate packages, 18  
Separate tasks, 18

- Shadowed Attributes, 153
  - Shadowed Events, 156
  - Shadowed Members, 158
  - Shadowed Properties, 160
  - Shared Attributes, 153
  - Shared Events, 156
  - Shared Members, 158
  - Shared Properties, 160
  - Signal Functions, 29, 104
  - Skipped Lines of Comment code, 7, 20, 30, 55, 68, 76, 85, 93, 104, 116, 126, 134, 143, 149, 160
  - Source Lines Of Code, 7, 20, 30, 39, 55, 68, 76, 85, 93, 104, 116, 126, 134, 143, 149, 160, 168
  - Special Operators, 30, 55, 68, 85, 104, 116
  - Static Data, 49, 61, 80, 110, 121
  - Static Methods, 53, 65, 84, 114, 125
  - Static Properties, 67
  - STOP Statements, 39
  - Stop Statements, 153
  - String Conversions, 30, 104
  - Structures Added, 5, 16, 26, 52, 63, 74, 83, 92, 100, 112, 123, 132, 140, 148, 156, 166
  - Structures Modified, 6, 16, 26, 52, 63, 75, 83, 92, 100, 112, 123, 132, 140, 148, 156, 167
  - Structures Removed, 6, 16, 26, 52, 63, 75, 83, 92, 100, 113, 124, 132, 140, 148, 156, 167
  - Subtypes, 18
  - Switch Statements, 7, 20, 30, 56, 68, 76, 86, 93, 104, 116, 126, 143, 160, 168
  - System Functions, 30, 104
  - Ternary operators, 30, 56, 69, 86, 94, 104, 117, 126, 160, 168
  - Throw Statements, 7, 56, 69, 86, 94, 117, 127, 134, 149, 161, 168
  - Time Handling, 30, 104
  - TIMES Clauses, 39
  - Try Statements, 8, 56, 69, 86, 94, 117, 127, 135, 150, 161, 169
  - Types, 18
  - UNTIL Clauses, 40
  - Update Statements, 150
  - Use of longjump, 27, 101
  - Use of offsetof, 28, 102
  - Use of setjump, 29, 103
  - Variables, 19
  - VARYING Clauses, 40
  - Weighted Method per Class, 57, 117
  - WHEN Clauses, 41
  - While Statements, 8, 20, 31, 56, 69, 87, 94, 105, 117, 127, 135, 144, 150, 161, 169
  - With statements, 19
  - metrics, 205
  - Milestone, 317
  - MINDC, 97
  - Mock Object, 318
  - Model, 318
  - Modifiability, 318
  - Modifiable, 319
  - Modularity, 319
  - Module, 319
  - Moke Object, 320
  - Multidimensional Analysis, 320
  - multipleChoice, 222
- ## N
- name, 179, 228
  - needSources, 221
  - Network, 320
  - Nonfunctional Requirement, 321
  - Nontechnical Requirement, 321
- ## O
- Object, 321
  - OBJECTIVEC, 109
  - Object Model, 322
  - Object Oriented Design, 322
  - objType, 198
  - Observation, 322
  - Observation Period, 323
  - Operability, 323
  - Operand, 323
  - Operational Testing, 324
  - Operator, 324
  - Operator Manual, 325
  - option, 222, 222
  - Optional Attribute, 325
  - Optional Requirement, 325
  - optionTitle, 222
  - Organisational Unit, 326
  - orphanArteCountId, 205
  - orphanRulesCountId, 205
  - orphanRulesListId, 205
  - output, 201
- ## P
- p, 204
  - p4port, 175
  - param, 228
  - password, 175, 176, 177, 178, 179, 180, 212, 215
  - path, 178
  - Path, 326
  - Path Analysis, 326
  - pathAreCaseSensitive, 205
  - Pathological Coupling, 327
  - pathSeparator, 205
  - Path Testing, 327

pattern, 199  
pattern\_dir, 200  
pattern\_files, 199  
Peer Review, 327  
Performance, 328  
Performance Indicator, 328  
Performance Testing, 329  
PHP, 120  
Pilot Project, 329  
port, 177  
Portability, 329  
Portability Compliance, 329  
Practice, 330  
Precision, 330  
Predictive Metric, 331  
prefix, 194  
priority, 209  
Procedure, 331  
Process, 331  
Process Assessment, 332  
Process Assessment Model, 332  
Process Capability, 333  
Process Capability Determination, 333  
Process Capability Level, 333  
Process Context, 333  
Process Improvement, 334  
Process Improvement Objective, 334  
Process Improvement Program, 334  
Process Improvement Project, 335  
Process Metric, 335  
Process Outcome, 335  
Process Performance, 336  
Process Purpose, 336  
Product, 337  
Productivity, 338  
Product Line, 338  
Product Metric, 338  
Programmer Manual, 338  
project, 174, 177  
Project, 339  
Project Management, 339  
Project Phase, 340  
projectSpec, 179  
projectStatusOnFailure, 221  
projectStatusOnWarning, 222  
properties, 212  
Prototype, 340  
pwd, 210  
PYTHON, 130

## Q

Qualification, 341  
Qualification Testing, 341

qualified, 199  
Quality, 341  
Quality Assurance, 342  
Quality Control, 343  
Quality Evaluation, 343  
Quality Factor, 344  
Quality in Use, 345  
Quality Management, 344  
Quality Measure Element, 344  
Quality Metric, 345  
Quality Model, 345  
query, 212

## R

Rating, 346  
Rating Level, 347  
Readability, 347  
rebuild\_all, 199  
Recoverability, 347  
Recovery, 348  
Redistributed Software, 497  
Reengineering, 348  
Regression Testing, 348  
Release, 349  
Reliability, 349  
Reliability Compliance, 350  
Repeatability of Results of Measurements, 350  
Replaceability, 351  
reporter, 209  
repository, 174  
Repository Connectors, 220  
    ClearCase, 174  
    CVS, 173  
    Folder Path, 173  
    Git, 176  
    Multiple Source Nodes, 180  
    Perforce, 175  
    PTC Integrity, 176  
    SVN, 179  
    Synergy, 178  
    TFS, 177  
    Zip Upload, 173  
Reproducibility of Results of Measurements, 351  
Request For Change, 352  
Request For Information, 352  
Request For Proposal, 352  
required, 222  
Requirement, 352  
Requirements Analysis, 353  
Requirements Derivation, 354  
Requirements Document, 354  
Requirements Engineering, 354  
Requirements Partitioning, 355

- Requirements Review, 355
- Requirements Specification, 355
- Requirements Traceability, 356
- Requirements Traceability Matrix, 356
- Resource, 357
- Resource Utilisation, 357
- Result, 357
- resultDir, 192, 193, 203
- Retirement, 358
- rev, 180
- Reverse Engineering, 358
- revision, 177
- Risk, 359
- Risk Acceptance, 359
- Risk Analysis, 360
- Robustness, 360
- Role, 360
- root, 192
- root\_node, 206, 207, 207, 208
- Routine, 361
- RTCA/EUROCAE, 435
- Ruleset
  - 'abort, exit, getenv or system' shall not be used, 35, 109
  - 'atof, atoi or atol' shall not be used, 35, 109
  - 'cycle' shall not be used, 79
  - 'star' parameter shall not be used., 137
  - 'stop' shall not be used, 79
  - Abort shall not be used, 21
  - ALTER shall not be used, 45
  - Assignment in Boolean, 32, 57, 70, 87, 95, 106, 118, 128, 136, 170
  - Assignment without Comparison, 32, 58, 70, 87, 95, 106, 118, 128, 136, 170
  - Avoid accessing data by using the position and length, 47
  - Avoid calling a function module without handling exceptions, 11
  - Avoid Duplicated Blocks in Function, 13, 22, 34, 47, 59, 71, 79, 89, 96, 108, 120, 129, 137, 145, 152, 163, 171
  - Avoid GOTO jumps out of PERFORM range, 47
  - Avoid mixing paragraphs and sections, 47
  - Avoid obsolete DATA BEGIN OF OCCURS statement, 9
  - Avoid OPEN/CLOSE inside loops, 47
  - Avoid SELECT SQL statement with a WHERE clause containing the NOT EQUAL operator, 9
  - Avoid SELECT SQL statement without a WHERE clause, 9
  - Avoid UPDATE or DELETE SQL Statement without a WHERE clause, 10
  - Avoid using APPEND in SQL SELECT statements, 8
  - Avoid using APPEND statements in loops, 8
  - Avoid using BREAK-POINT, 8
  - Avoid using CHECK in SQL SELECT statements, 8
  - Avoid using COMMIT WORK statements in loops, 8
  - Avoid using GROUP BY in queries, 10
  - Avoid using inline PERFORM with too many lines of code, 43
  - Avoid using INSERT in SQL SELECT statements, 9
  - Avoid using INSERT statements in loops, 9
  - Avoid using LIKE in SQL queries, 10
  - Avoid using READ statement without AT END clause, 48
  - Avoid using SELECT \*, 9
  - Avoid using SELECT DISTINCT Statement, 9
  - Avoid using SQL Aggregate Functions, 9
  - Avoid using SQL INTO statements in loops, 9
  - Avoid using SUBMIT statements in loops, 9
  - Avoid using the JOIN SQL clause, 10
  - Avoid using the SQL "BYPASSING BUFFER" clause, 9
  - Avoid using the WAIT statement, 10
  - Avoid using UPDATE, MODIFY, DELETE statements in loops, 10
  - Backward Goto shall not be used, 21, 31, 57, 69, 77, 105, 118, 127, 144, 150, 161, 169
  - Bad indentation of scope terminator, 42
  - Bad paragraph position used in PERFORM, 48
  - Bad statement indentation, 41
  - BLOCK Clause, 41
  - Cloned Algorithmic, 12, 22, 33, 46, 58, 71, 78, 88, 96, 107, 119, 129, 137, 145, 151, 163, 171
  - Cloned Classes, 12, 22, 33, 45, 58, 71, 78, 88, 96, 107, 119, 129, 136, 145, 151, 163, 171
  - Cloned Files, 12, 22, 33, 45, 58, 71, 78, 88, 96, 107, 119, 129, 136, 145, 151, 163, 171
  - Cloned Functions, 12, 22, 33, 46, 58, 71, 78, 88, 96, 107, 119, 129, 136, 145, 151, 163, 171
  - Close file once, 42
  - Close open file, 42
  - Column 7 for \* and D Only, 41
  - Comment Before Paragraph, 169
  - Comment Division, 41
  - Commented-out Source Code is not allowed, 10, 21, 32, 57, 70, 87, 95, 106, 118, 128, 144, 150, 170
  - Comment FD, 41
  - Comment First Level, 41
  - Comment Variable 01 and 77, 41
  - Commit Used, 145
  - COMPUTE instead of ADD, 46
  - COMPUTE instead of DIVIDE, 46
  - COMPUTE instead of MULTIPLY, 46
  - COMPUTE instead of SUBTRACT, 46
  - Continue shall not be used, 12, 33, 58, 71, 78, 88, 96, 107, 119, 129, 137, 151, 163, 171

- Delay shall not be used, 22
- Do not use "Native SQL" instructions, 13
- Dynamic Memory Allocation shall not be used, 32, 106
- Each loop shall be named, 21
- Empty line after EXIT, 41
- Empty line after SECTION, 42
- Empty lines around DIVISION, 41
- Exec shall not be used., 137
- Exit Label shall be named, 21
- EXIT PROGRAM shall not be used, 137
- Factorizable Classes, 12, 21, 32, 45, 58, 70, 78, 87, 95, 106, 118, 128, 136, 144, 151, 162, 170
- Factorizable Files, 12, 21, 32, 45, 58, 70, 78, 88, 95, 106, 118, 128, 136, 144, 151, 162, 170
- Factorizable Functions, 12, 21, 32, 45, 58, 70, 78, 88, 95, 107, 119, 128, 136, 144, 151, 162, 170
- Factorizable Packages, 12, 22, 33, 45, 58, 70, 78, 88, 96, 107, 119, 128, 136, 144, 151, 163, 170
- Fallthrough shall be avoided, 33, 59, 71, 88, 96, 107, 119, 129, 171
- FIXME shall not be committed in sources code, 13, 22, 33, 46, 59, 71, 79, 88, 96, 107, 119, 129, 137, 145, 151, 163, 171
- Forbid calls to dialog transactions, 11
- Forbid calls to GET RUN TIME., 11
- Forbid call to a system function, 11
- Forbid use of GENERATE REPORT / SUBROUTINE POOL / DYNPRO, 11
- Forbid use of INSERT/DELETE REPORT/TEXTPOOL, 11
- Forbid use of SYSTEM-CALL, 11
- Forbid uses of OFFSET in ASSIGN, 11
- GOTO shall not be used, 22, 33, 59, 71, 79, 107, 119, 129, 145, 151, 163, 171
- Homonymous variable shall not be used, 48
- IDMS FIND CURRENT, 42
- IDMS One modify by PERFORM, 43
- IDMS One same call, 43
- IDMS Ready Protected Update, 43
- IDMS Return Code, 43
- Incorrect Function Name, 77
- Incorrect Module Name, 77
- Incorrect Program Name, 77
- Incorrect Subroutine Name, 78
- IO Functions shall not be used, 35, 109
- Label out a switch, 33, 59, 71, 79, 96, 108, 120, 129, 137, 171
- Macro longjmp or setjmp shall not be used, 32, 106
- Macro offsetof shall not be used, 34, 108
- Method should have "self" as first argument, 136
- Method without parameter, 136
- Missing Break, 31, 57, 87, 94, 105, 117, 127, 169
- Missing Case Else clause, 161
- Missing case in switch, 13, 23, 34, 59, 72, 79, 89, 97, 108, 120, 130, 146, 172
- Missing compound if, 31, 57, 70, 87, 95, 105, 118, 128, 135, 169
- Missing compound statement, 31, 57, 69, 87, 95, 105, 118, 127, 135, 169
- Missing Default, 10, 32, 57, 70, 77, 87, 95, 106, 118, 128, 144, 170
- Missing END-ADD, 43
- Missing END-CALL, 43
- Missing END-COMPUTE, 43
- Missing END-DELETE, 43
- Missing END-DIVIDE, 44
- Missing END-EVALUATE, 42
- Missing END-IF, 43
- Missing END-MULTIPLY, 44
- Missing END-READ, 44
- Missing END-RETURN, 44
- Missing END-REWRITE, 44
- Missing END-SEARCH, 44
- Missing END-START, 44
- Missing END-STRING, 44
- Missing END-SUBTRACT, 44
- Missing END-UNSTRING, 44
- Missing END-WRITE, 45
- Missing FILLER, 45
- Missing final else, 10, 21, 32, 57, 70, 77, 87, 95, 106, 118, 128, 135, 144, 150, 161, 170
- Multiple break in loop are not allowed, 34, 59, 72, 89, 97, 108, 120, 130, 138, 152, 172
- Multiple exit, 80
- Multiple Exit (Function, Sub or Property) statement, 164
- Multiple Exit Do statement, 164
- Multiple Exit For statement, 164
- Multiple Exit in loop, 23
- Multiple exits are not allowed, 13, 23, 34, 59, 72, 79, 89, 97, 108, 120, 130, 138, 146, 152, 164, 172
- Multiple Exit While statement, 164
- Nested Program, 45
- Nesting Level of Preprocessing directives is too high, 32, 57, 106
- No case in Select, 164
- No Conditional GOTO, 46
- No DEBUG MODE, 46
- No INITIALIZE, 46
- No more than 3 nested IF, 45
- No MOVE CORRESPONDING, 46
- No procedural COPY, 47
- No RENAMES, 47
- No Resources, 170
- No Variables S9(9), 47



- Open file once, 42
  - Paragraphs having exact same name, 42
  - Parameters shall be ordered: 'IN', 'OUT', 'IN OUT', 23
  - Perform with no THRU, 47
  - Prevent use of EDITOR-CALLS, 13
  - Print shall not be used., 137
  - READ-WRITE Instruction, 48
  - Recursion are not allowed, 34, 108
  - Relaxed violation, 13, 23, 34, 48, 59, 72, 79, 89, 97, 108, 120, 130, 138, 146, 152, 164, 172
  - Resources Filename, 172
  - Resources Folder, 170
  - Risky Empty Statement, 34, 59, 72, 89, 97, 108, 120, 130, 138, 172
  - Rollback Used, 145
  - Signal or Raise shall not be used, 34, 108
  - Single GOBACK, 42
  - Standard Label, 43
  - Statement shall be in uppercase, 48
  - The class name should conform to the defined standard, 10
  - The form name should conform to the defined standard, 11
  - The function name should conform to the defined standard, 11
  - The macro name should conform to the defined standard, 12
  - The method name should conform to the defined standard, 12
  - The program or report name should conform to the defined standard, 13
  - There shall be a `__init__` method in the class., 135
  - There shall be a no code before first case, 33, 58, 71, 88, 96, 107, 119, 129, 171
  - There shall be no 'when others' in exception handler, 22
  - There shall be only one Statement per line, 137
  - Time Handling Functions shall not be used, 35, 109
  - TODO shall not be committed in sources code, 13, 22, 34, 47, 59, 72, 79, 89, 97, 108, 120, 130, 137, 145, 152, 163, 172
  - Use 'exit when' instead of if... exit syntax, 21
  - Use COMP for OCCURS, 47
  - Use FILE STATUS, 42
  - Use of continue is deprecated (Fortran), 77
  - Use of Exit Do statement, 162
  - Use of Exit For statement, 162
  - Use of Exit Function statement, 162
  - Use of Exit Property statement, 162
  - Use of Exit Select statement, 162
  - Use of Exit Sub statement, 162
  - Use of Exit Try statement, 162
  - Use of Exit While statement, 162
  - Use of SAVE and DATA, 79
  - Use SYNCHRONIZED, 48
  - Use WHEN OTHER, 48
  - Variable declaration format, 42
  - Run, 361
- ## S
- s, 204
  - Safety, 362
  - Satisfaction, 362
  - Scale, 362
  - scnode, 199
  - scnode\_name, 199
  - scope, 177
  - Security, 363
  - separator, 205
  - server, 179, 212
  - server\_display\_view, 174
  - Service, 364
  - Service Level Agreement, 364
  - severity, 209
  - SIGIST, 435
  - Simplicity, 364
  - size\_limit, 200
  - sln, 202
  - Software, 365
  - Software Asset Management, 365
  - Software Development Process, 366
  - Software Engineering, 366
  - Software Item, 366
  - Software Licence Agreement, 497
  - Software Life Cycle, 367
  - Software Product Evaluation, 367
  - Software Quality, 368
  - Software Quality Characteristic, 368
  - Software Quality Evaluation, 368
  - Software Quality Measure, 369
  - Software Repository, 369
  - Software Unit, 369
  - sonar, 215
  - Source Code, 370
  - Specification, 370
  - SQL, 138
  - Stability, 370
  - stack\_average\_column\_name, 208
  - stack\_size\_column\_name, 208
  - stack\_worst\_column\_name, 208
  - Stage, 371
  - Stakeholder, 371
  - Standard, 372
  - Standard Process, 372
  - Statement, 372

Statement of Work, 373  
Statement Testing, 373  
Static Analysis, 373  
Statistical Process Control, 374  
Step, 375  
Stress Testing, 375  
Structural Testing, 375  
Stub, 376  
style, 222  
sub\_path, 174  
subDir, 176  
subFolder, 179  
Suitability, 376  
Supplier, 377  
Support, 377  
Support Manual, 378  
susp, 200  
System, 378  
System Testing, 378

## T

tag, 222, 222, 222, 227, 228  
tags, 221  
Task, 379  
Team Software Process, 435  
Technical Requirement, 379  
Technique, 380  
Test, 380  
Testability, 384  
Test Case, 381  
Test Case Suite, 381  
Test Coverage, 381  
Test Documentation, 382  
Test Environment, 382  
Testing, 384  
Testing Description, 385  
Test Objective, 383  
Test Plan, 383  
Test Procedure, 383  
Time Behaviour, 385  
Tool, 386  
tools, 224  
Total Quality Management, 386  
Traceability, 386  
Traceable, 387  
Trunk, 387  
TSQL, 146  
txt, 187, 190, 214, 215  
type, 222

## U

Understandability, 387  
Unit of Measurement, 388

Unit Test, 388  
unknownRuleId, 205  
url, 176, 180, 209, 210, 211  
URL, 178  
Usability, 389  
Usability Compliance, 389  
useAccountCredentials, 175, 176, 177, 178, 179, 180  
User, 389  
User Documentation, 390  
User Manual, 391  
username, 175, 176, 177, 178, 180

## V

Validation, 391  
value, 222, 227, 228  
Value, 393  
VBNET, 152  
Verification, 393  
version, 178, 215  
Version, 394  
view, 174  
view\_root\_path, 174  
vob\_root\_path, 174

## W

Work Breakdown Structure, 394  
Work Product, 395

## X

XAML, 164  
xls\_file, 206, 207, 207  
xls\_filters, 206, 207, 208  
xls\_groups, 206, 207, 208  
xls\_key, 206, 207, 208  
xls\_sheetname, 206, 207, 208, 208  
xml, 182, 183, 184, 184, 184, 186, 187, 187, 188, 188,  
189, 191, 192, 192, 194, 195, 196, 198, 202, 203  
XML Catalog, 219  
XML Format Reference, 225  
XML Schema  
    analysis.xsd, 474  
    config-1.3.xsd, 472  
    decision.xsd, 479  
    description.xsd, 480  
    exports.xsd, 481  
    form.xsd, 469  
    highlights.xsd, 482  
    input-data-2.xsd, 467  
    properties.xsd, 485  
    properties-1.2.xsd, 471  
    tutorials.xsd, 486  
    wizards.xsd, 493  
xmx, 185, 186, 189