

SQALE for Ada Language

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Agenda

- ▶ Quality Requirements
- ▶ SQALE Quality model for ADA
- ▶ Remediation Factor
- ▶ Quality Rating

Rrequirements

- ▶ SQALE quality requirements related to the Ada languages are listed out first before starting the analyze.
- ▶ Some requirements are taken directly from the Quality model for example cyclomatic complexity, duplication code level. some requirements are not directly mapped.
- ▶ Efficiency is measured by two sub characteristics CPU performance, memory(RAM), memory (ROM) related.
- ▶ ROM related Efficiency is mapped to number of dead codes, But in other languages efficiency is not measured in terms of this, it is measured in terms absence of certain statements and library functions.

SQALE Quality model for ADA

No	Characteristic	Sub-Characteristic	Generic Requirement Description	Ada Requirement
1	Testability	Unit testability	Acceptable number of parameters in a call (NOP)	$NOP \leq 5$
2	Testability	Unit testability	Acceptable number of test paths in a module (V(G))	$V(G) \leq 15$
3	Testability	Unit testability	Tolerable number of test paths in a module (v(G))	$V(G) \leq 60$
4	Testability	Unit testability	Acceptable number of different called modules from a module (FANOUT)	Efferent coupling ≤ 20
5	Testability	Unit testability	Acceptable duplication within a module (CPRR100)	Number of CPRR100 violations
6	Testability	Unit testability	All code paths within a module are reachable	All code is reachable
7	Testability	Unit testability	All modules are reachable	All modules are reachable
8	Testability	Unit testability	No module calling itself recursively	No recursion
9	Testability	Integration testability	Acceptable coupling between objects (CBO)	$CBO \leq 7$
10	Testability	Integration testability	No public data within classes	No directly accessed globals, all public (tagged) types are private.
11	Testability	Integration testability	Acceptable number of direct declared required files	With count < 50
16	Reliability	Data reliability	All types are safely converted	No unchecked conversions
17	Reliability	Data reliability	No use of uninitialized variables	No use of uninitialized variables
19	Reliability	Logic reliability	One single point of exit per module	No multiple exits
25	Reliability	Statement reliability	Reproducible floating point computations	No equality comparison between reals

Figure :

Remediation Factor

Each Non-compliance requirement was assigned a remediation factor, based on the estimated work units required to correct the defect.

Non-Compliance Type Name	Description	Remediation Factor	Sample
Type0	Undefined	0	Not applicable
Type1	Fixable by automated tool, no risk	0.01	Change in capitalization
Type2	Manual remediation, but no impact on compilation	0.1	Add comments
Type3	Local impact, need only unit testing	1	Replace an instruction by another
Type4	Medium impact, need integration testing	5	Split a big function in two
Type5	Large impact, need a complete validation	20	Architectural change

Figure :

Quality Rating

- ▶ Work units are nothing but the effort to write it from the scratch.
- ▶ For example, a package with 25 work units and a remediation index of 30 would be rated as E, very bad.
- ▶ The package with a remediation index of 7 would be rated as a C, medium

Table 4. The SQALE Ada rating thresholds

Class Name	Class Letter	Rating Interval	Color
Excellent	A	$[0, 0.03]$	green
Good	B	$]0.03, 0.1]$	light green
Medium	C	$]0.1, 0.3]$	yellow
Bad	D	$]0.3, 1]$	orange
Very Bad	E	$]1, +\infty[$	red

References I

- [1] Thierry Coq , Jean-Pierre Rosen "*The SQALE Quality and Analysis Models for Assessing the Quality of Ada Source Code*"
- [2] Jean-Louis Letouzey, "*The SQALE Method*"

Thank you