Oscar Slotosch, Validas AG

Tool Qualification By Need

Content

▶ **Eclipse Tool Qualification Roadmap 2012**

▶ Tool Qualification By Need

– Standard Needs

– Tool Needs

– Qualification Tools

▶ Summary

Eclipse Roadmap to Tool Qualification

wiki.eclipse.org/Auto_IWG_WP5

1. **Goals: satisfy DO-330 (TQL 1-5)**
2. **Concept: model-based tool qualification**
3. **EMF Tool Qualification Model (TQL 1-5)**
4. **Demonstrate & implement with an Eclipse Project: QPP (Qualifiable Plugin Projects)**
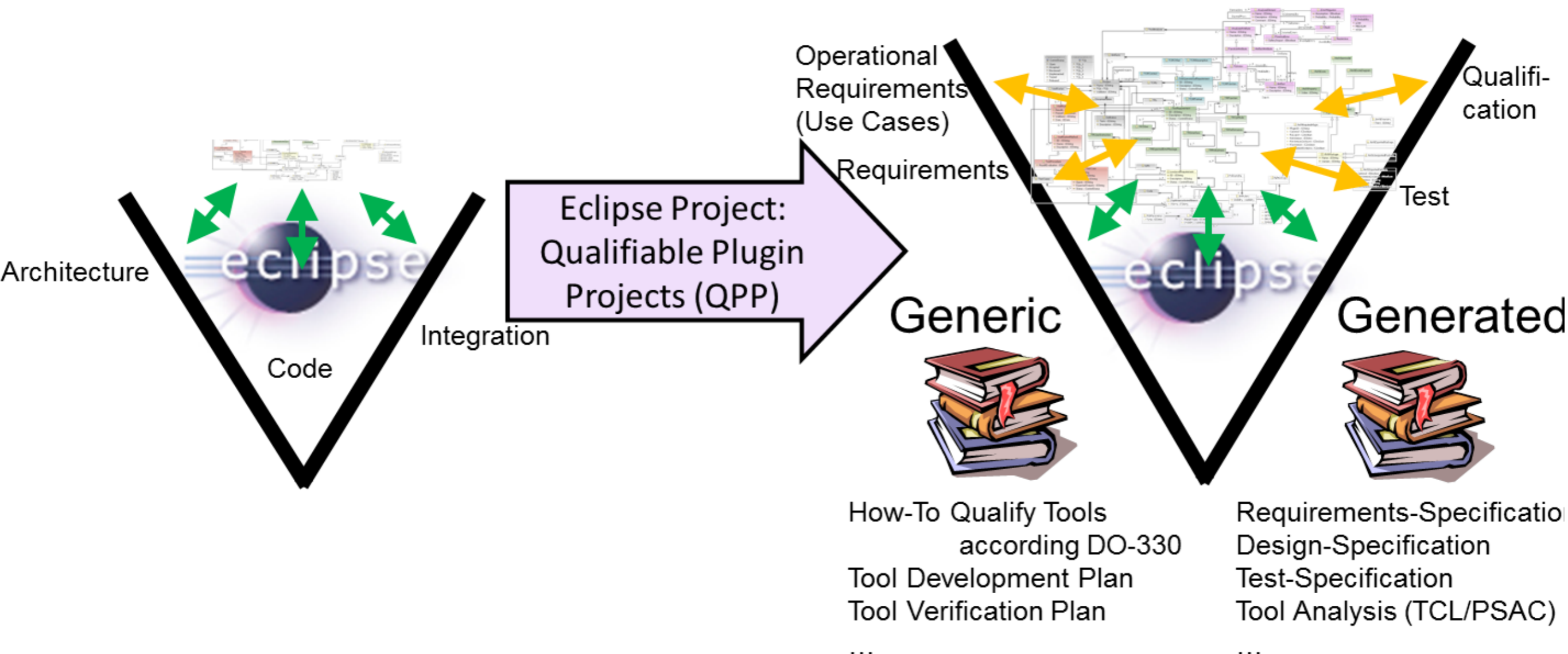5. **Qualify (selected) plugins**

Goals,
Requirements
& Concept

Qualification
Model (EMF)
for TQL 1-5

Demonstrate
& Implement
QPP

Qualify
Plugins with
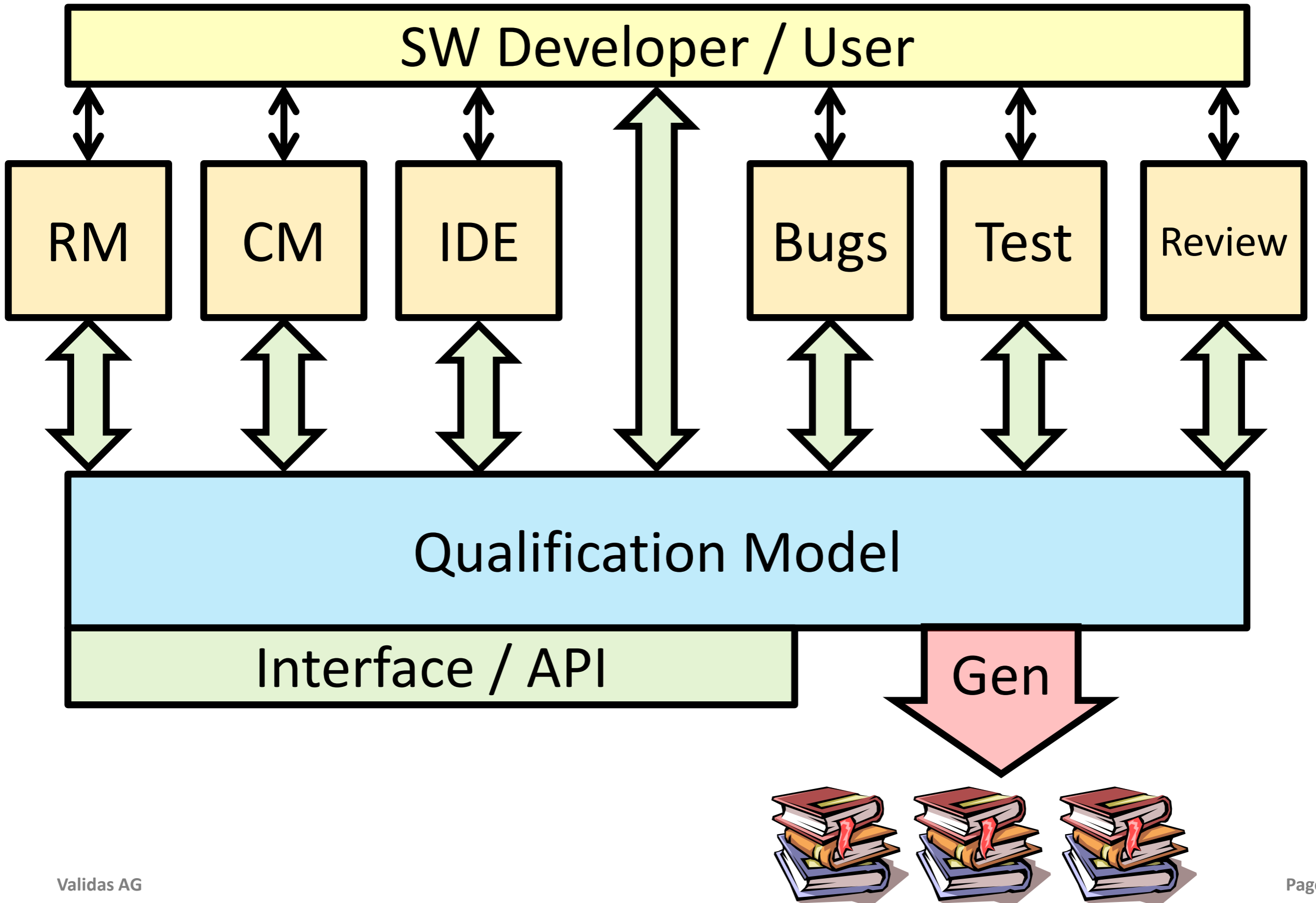QPP

Tool Qualification Model for Eclipse

▶ **Currently Eclipse does not support qualification**

▶ **Extended meta-model (and documentation)
   covers 100% (~ 450 Requirements) of DO-330**
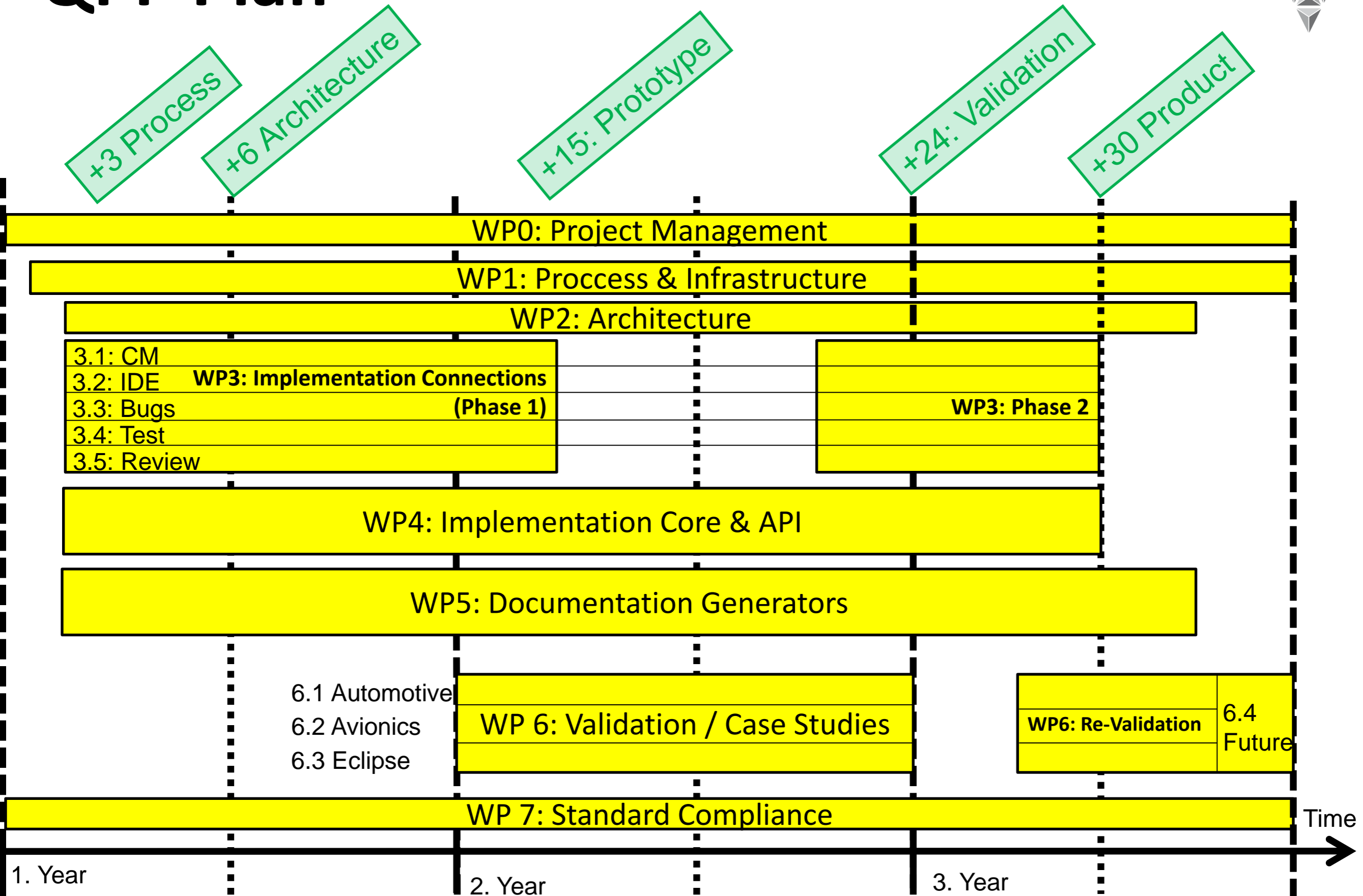
Current Metamodel

New Extended Metamodel

Architecture

Code

Integration

Eclipse Project:
Qualifiable Plugin
Projects (QPP)

Operational
Requirements
(Use Cases)

Requirements

Qualifi-
cation

Test

Generic

Generated

How-To Qualify Tools
          according DO-330
Tool Development Plan
Tool Verification Plan
…

Requirements-Specification
Design-Specification
Test-Specification
Tool Analysis (TCL/PSAC)
…

QPP Architecture

QPP Plan

+3 Process

+6 Architecture

+15: Prototype

+24: Validation

+30 Product

WP0: Project Management

WP1: Proccess & Infrastructure

WP2: Architecture

3.1: CM	WP3: Implementation Connections	
3.2: IDE		
3.3: Bugs	(Phase 1)	WP3: Phase 2
3.4: Test		
3.5: Review		

WP4: Implementation Core & API

WP5: Documentation Generators

6.1 Automotive
6.2 Avionics
6.3 Eclipse

WP 6: Validation / Case Studies

WP6: Re-Validation

6.4 Future

WP 7: Standard Compliance

Time

1. Year

2. Year

3. Year

Roadmap Vision 2012

- **Highway for TQL-1 with 5 lines**
- **High invest for Eclipse tooling and research?**
- **Do we need big highways to get to nice places?**

TQL: 1 2 3 4 5

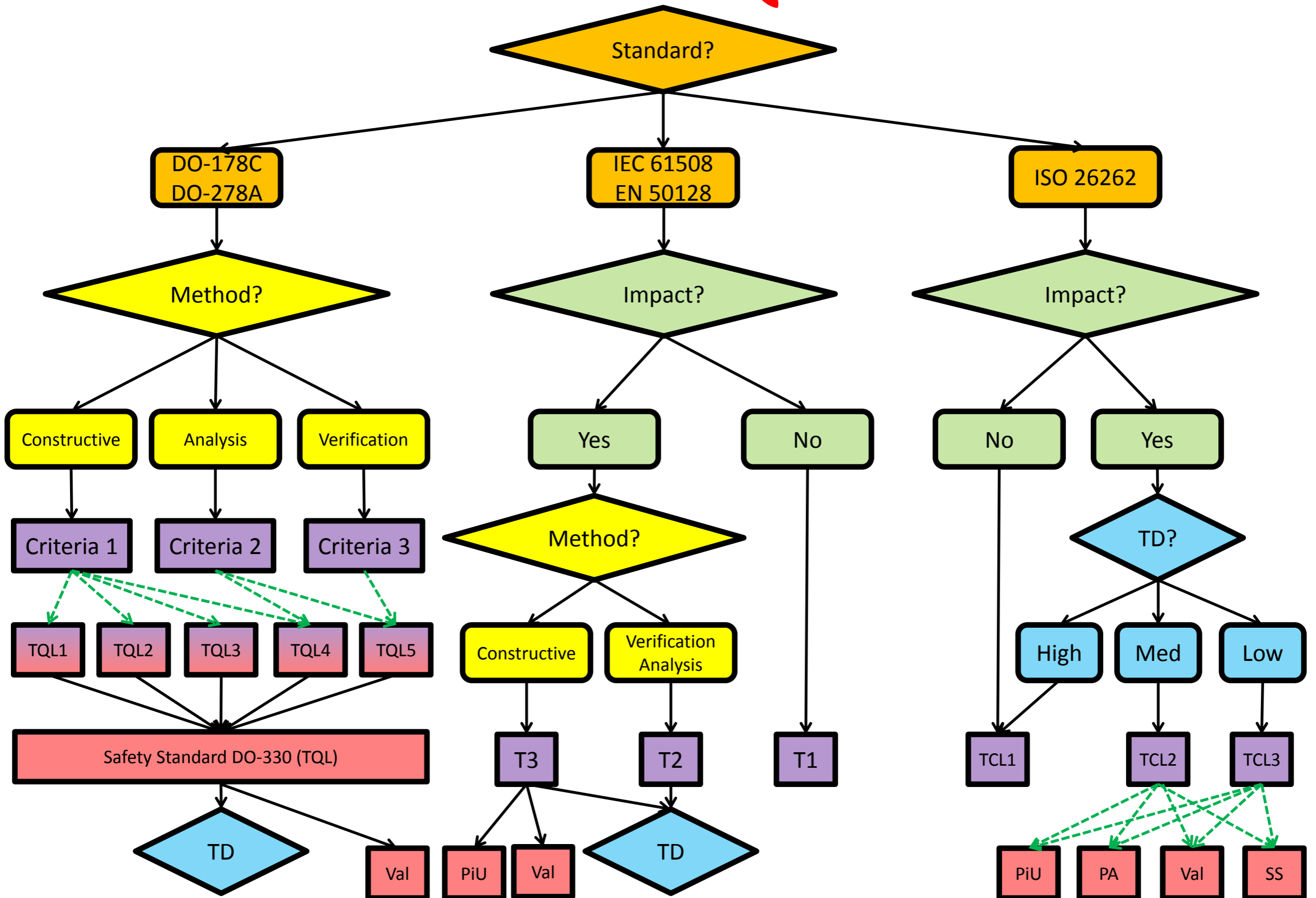Still a future option for those requiring a highway (and still in business discussions)

Content

- Eclipse Tool Qualification Roadmap 2012
- **Tool Qualification By Need**
  - **Standard Needs**
  - Tool Needs
  - Qualification Tools
- Summary

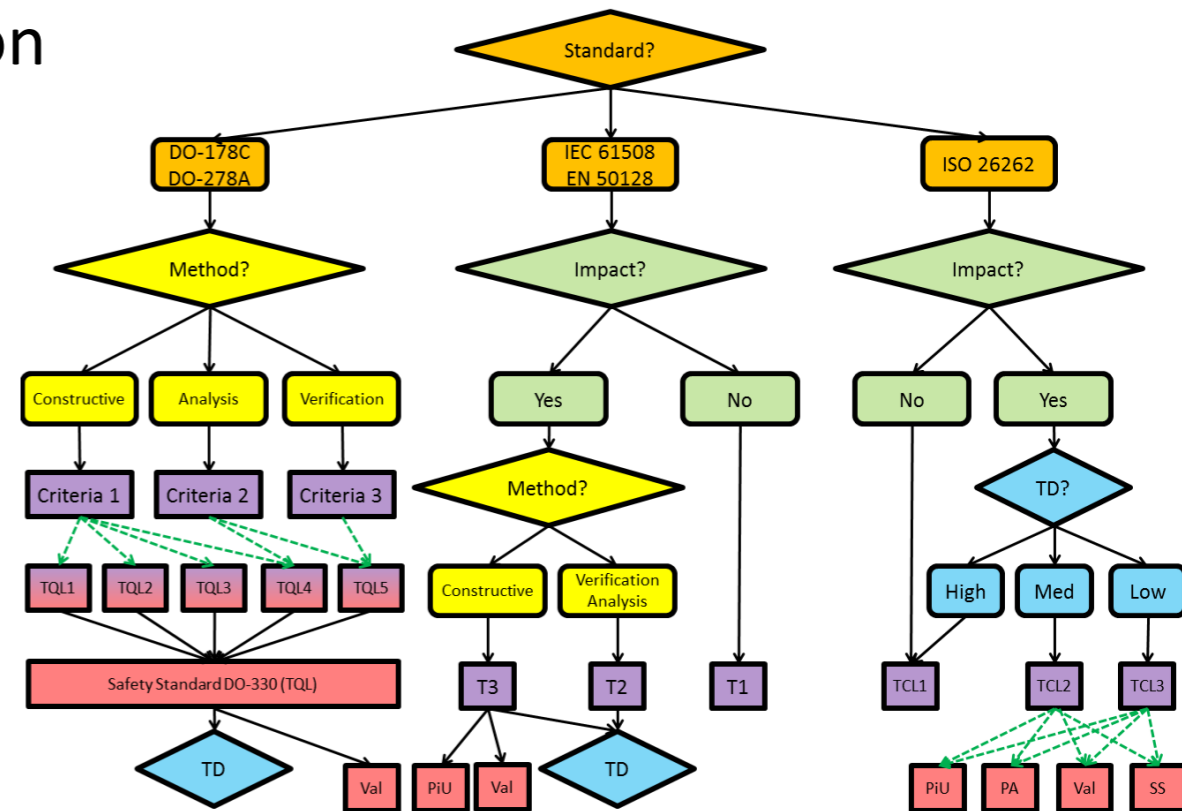# Tool Classification & Qualification

The verification objectives of the tool operational verification and validation process consist of the detection and reporting of errors that may have been introduced during the tool development processes.

Standard Needs

- **Eclipse highway satisfies relevant standards**
- **It includes**
  - DO-330 compliance
  - Potential tool error analysis & detection
  - Validation
- **TQL 1 is only needed in avionics for constructive tools without output verification**
- **TQL 2-4 is cheaper**
- **For TQL 5 Validas has tool support**
  - No need to invest in infrastructure
  - Pay only per creation of qualification kit
- **We can start with Validas tools (TQL-5) and**
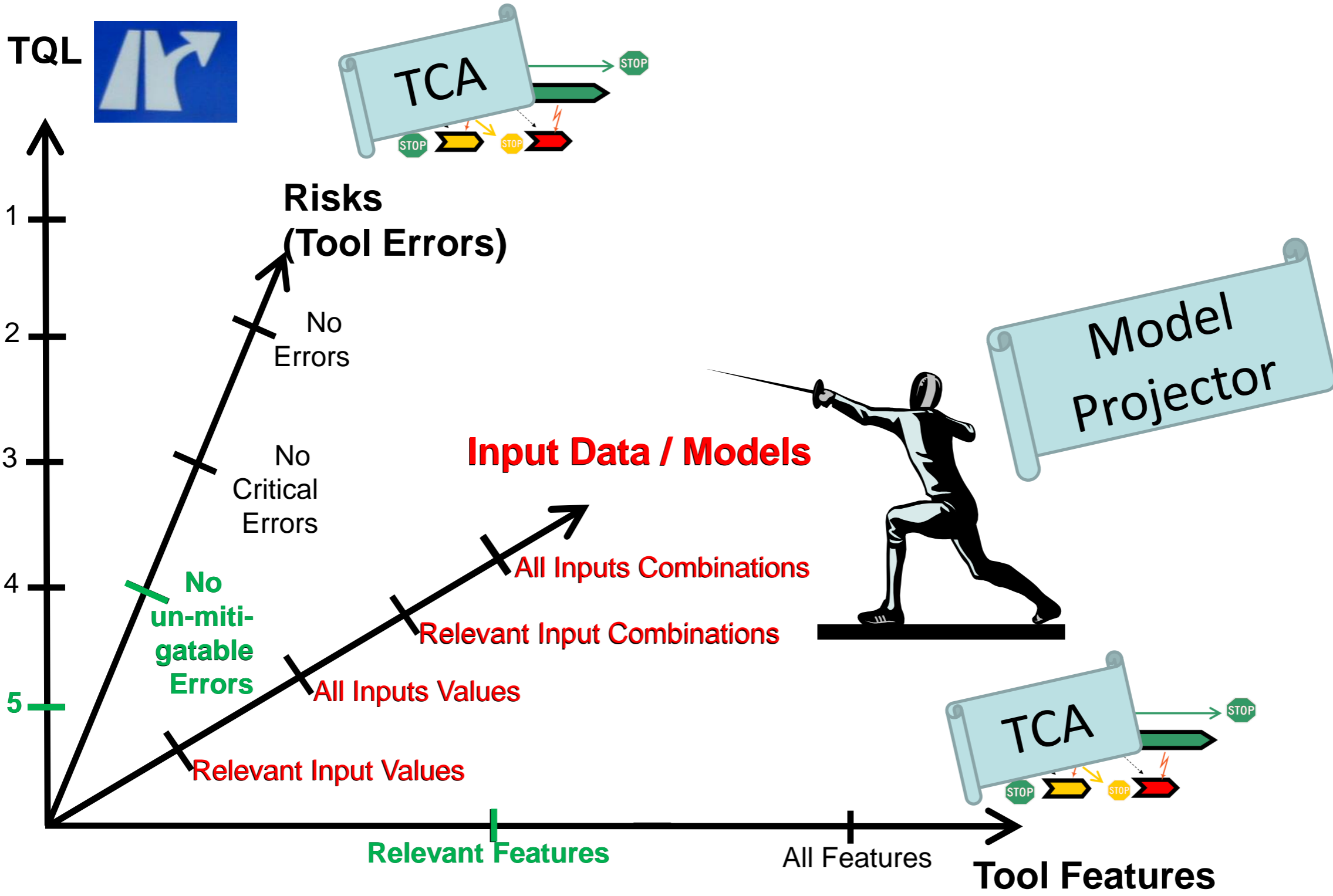- **build the Eclipse highway (TQL-1) line by line when needed**

Content

▸ Eclipse Tool Qualification Roadmap 2012

▸ Tool Qualification By Need

- – Standard Needs

- – **Tool Qualification Needs**

- – Qualification Tools

▸ Summary

Minimizing Tool Qualification Needs

TQL

Risks (Tool Errors)

TCA

1
2 — No Errors
3 — No Critical Errors
4 — No un-miti-gatable Errors
5

Input Data / Models

All Inputs Combinations
Relevant Input Combinations
All Inputs Values
Relevant Input Values

Model Projector

TCA

Relevant Features   All Features   **Tool Features**

Model Projection

▶ **"Model Projection" shows the content of all selected (and contained) elements**

Modeling Tool

Projection View

Example Projection

Artifact 1: Executable

Property	Value
Name	Executable
Description	
Format	
Created By	Use Case Target Compiler
Used By	Use Case Debugger:Flash
Modified By	
Is A	
Occurrences	
Is Assumption	false
Long Description	
Created By Tool	
Used By Tool	
Modified By Tool	
Deactivated	false
Artifact Attributes	
Variant	
Comment	
Is Part Of Product	true
ID	
Internal Reference	

Artifact 2: Test Report

Property	Value
Name	Test Report
Description	
Format	
Created By	Feature Modeling Tool:Test
Used By	
Modified By	
Is A	
Occurrences	
Is Assumption	true
Long Description	
Created By Tool	
Used By Tool	
Modified By Tool	
Deactivated	false
Artifact Attributes	
Variant	
Comment	
Is Part Of Product	true
ID	
Internal Reference	

Projection:

Artifact 3: Test Stimuli

Projected element: Artifact

Projection:

- 3 : metamodel.de.validas.iso26262.toolchainanalyzer.Artifact
  - Properties of selected metamodel.de.validas.iso26262.too
    - 3 : Deactivated
      - Values
        - 3 : false
          - Artifact : Executable
          - Artifact : Test Report
          - Artifact : Test Stimuli
    - 3 : IsAssumption
      - Values
        - 2 : false
          - Artifact : Executable
          - Artifact : Test Stimuli
        - 1 : true
          - Artifact : Test Report
    - 3 : IsPartOfProduct
      - Values
        - 2 : true
          - Artifact : Executable
          - Artifact : Test Report
        - 1 : false
          - Artifact : Test Stimuli
    - 3 : Name
    - 3 : Reference ToolChain to ToolChain
    - 2 : Reference UsedBy to Feature
    - 2 : Reference UsedBy to UseCase
    - 1 : ID
    - 1 : Reference CreatedBy to Feature
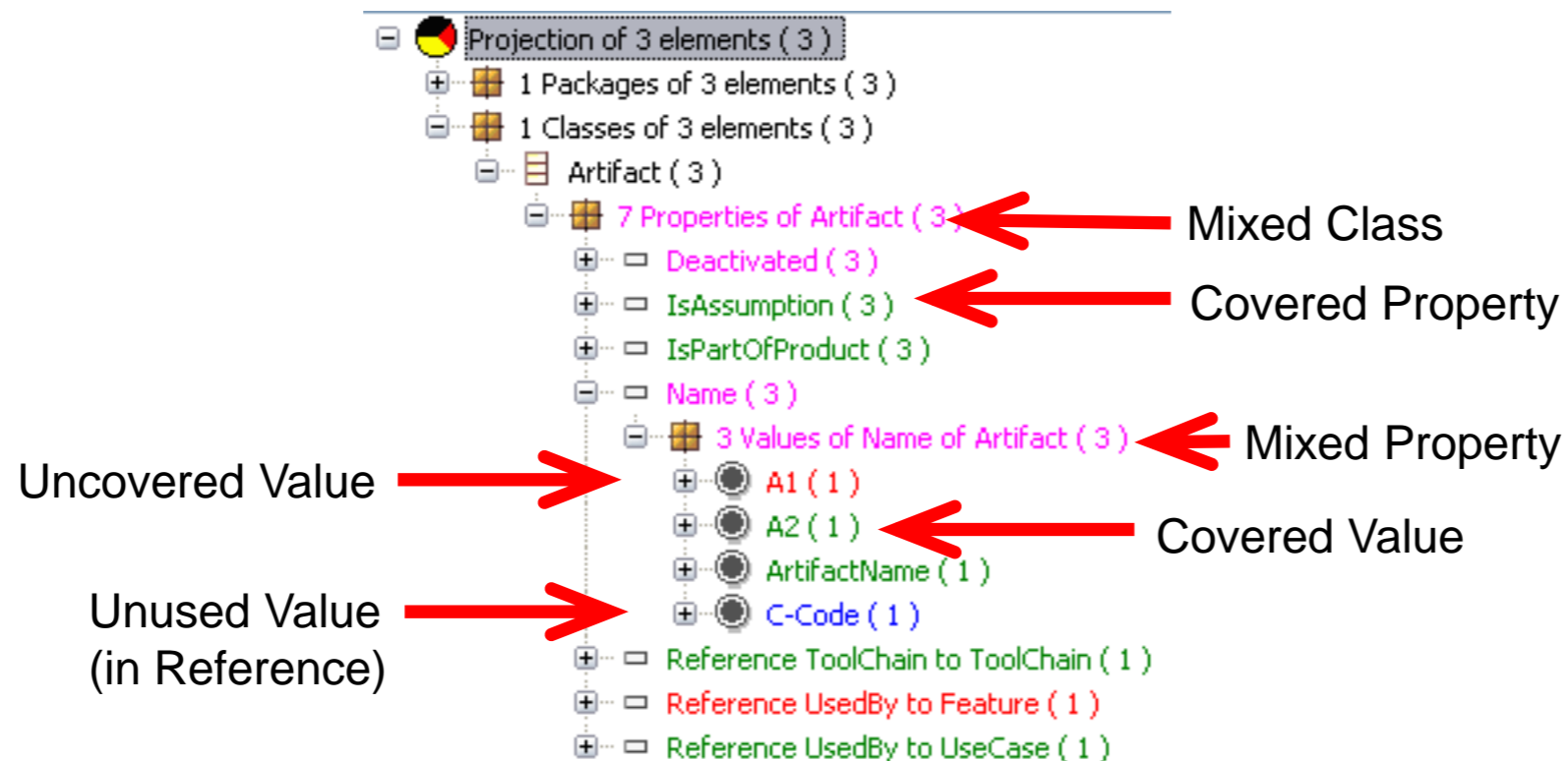   - 1 : Reference CreatedBy to UseCase

Model Projector for Input Data

▶ **Can be used for every EMF modeling tool**

▶ **Has difference view**

▶ **Allows filtering**

▶ **Allows properties & combinations**

▶ **Works also for big models (AUTOSAR) models**

Difference View

Example: AUTOSAR Overview

- Projection of AUTOSARImpl (164731)
  - 49 Packages of AUTOSARImpl (164731)
  - 129 Classes of AUTOSARImpl (164731)
    - ARPackage (1662)
    - AUTOSAR (1)
    - AdminData (28)
    - AliasNameAssignment (5514)
    - AliasNameSet (1)
    - Annotation (6)
    - AnyInstanceRef (2817)
    - ApplicationArrayDataType (94)
      - 17 Properties of ApplicationArrayDataType (94)
        - Containment desc to MultiLanguageOverviewParagraph (1)
        - Containment element to ApplicationArrayElement (94)
          - Projection of 94 elements (188)
            - 2 Packages of 94 elements (188)
            - 2 Classes of 94 elements (188)
              - ApplicationArrayElement (94)
                - 17 Properties of ApplicationArrayElement (94)
                  - Containment maxNumberOfElements to PositiveIntegerValueVariationPoint (94)
                  - Reference applicationArrayDataType to ApplicationArrayDataType (94)
                  - Reference gElementType to ApplicationPrimitiveDataType (22)
                  - Reference gElementType to ApplicationRecordDataType (33)
                  - Reference type to ApplicationPrimitiveDataType (22)
                  - Reference type to ApplicationRecordDataType (33)
                  - arraySizeSemantics (94)
                  - category (94)
                    - 2 Values of category of ApplicationArrayElement (94)
                      - ARRAY (1)
                        - ApplicationArrayElement : CcExtData_elements
                      - TYPE_REFERENCE (93)
                  - checksum (94)
                  - gCategory (94)
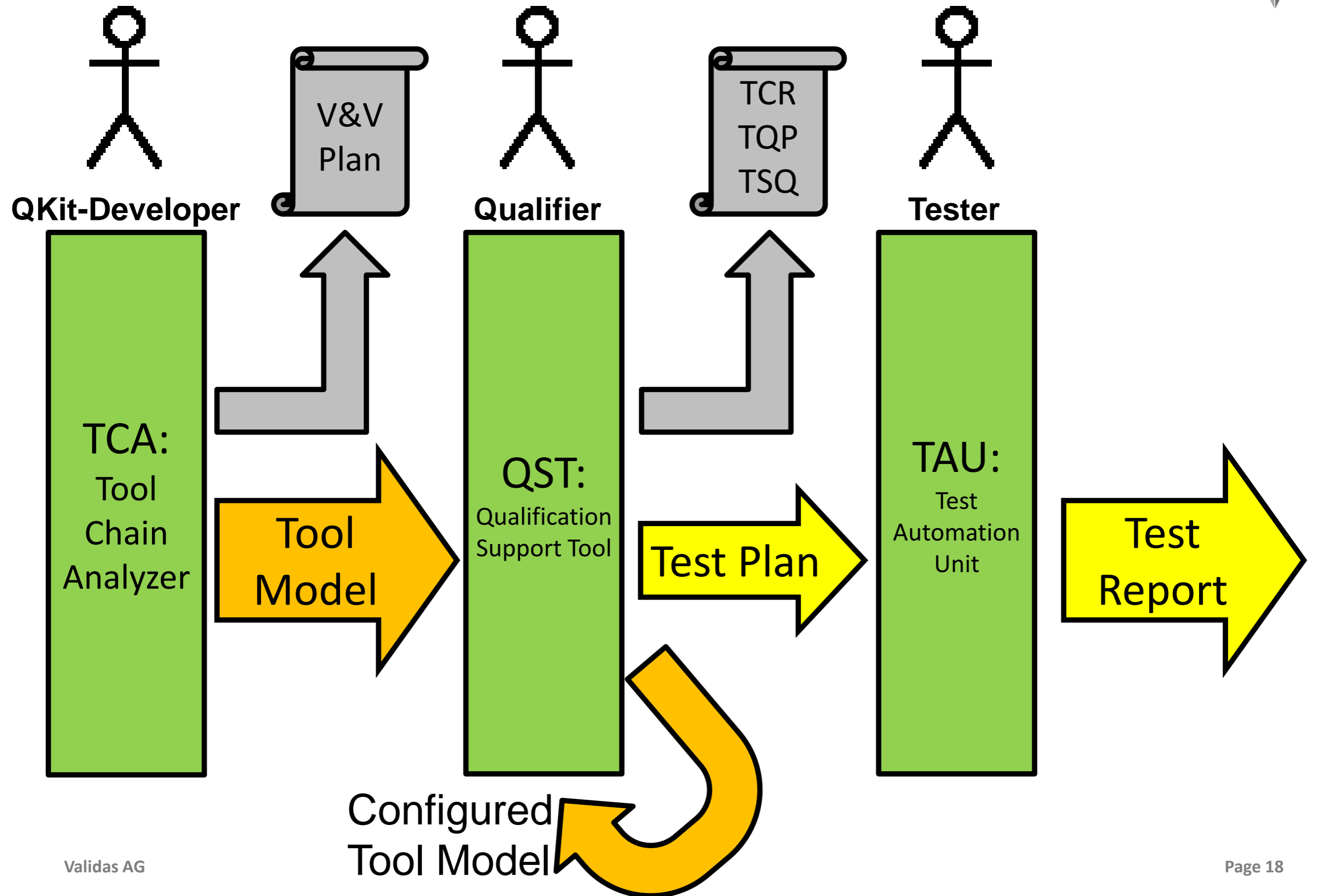   - gChecksum (94)

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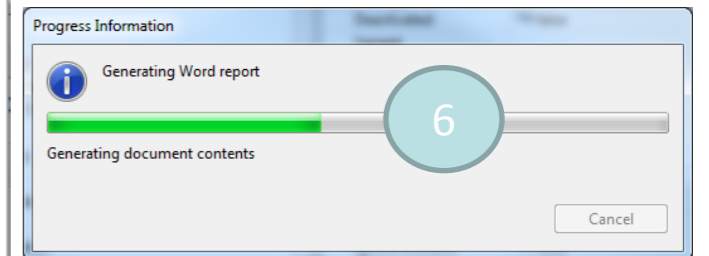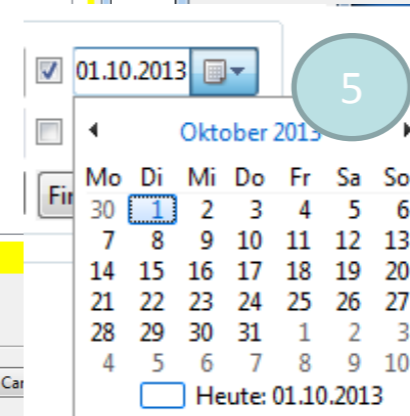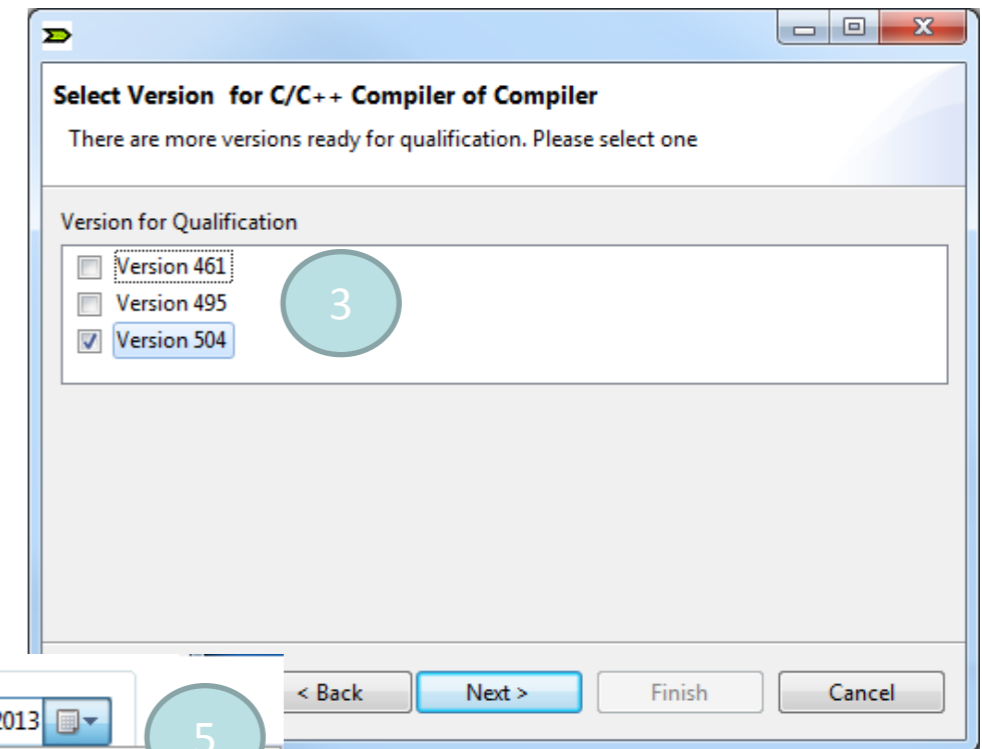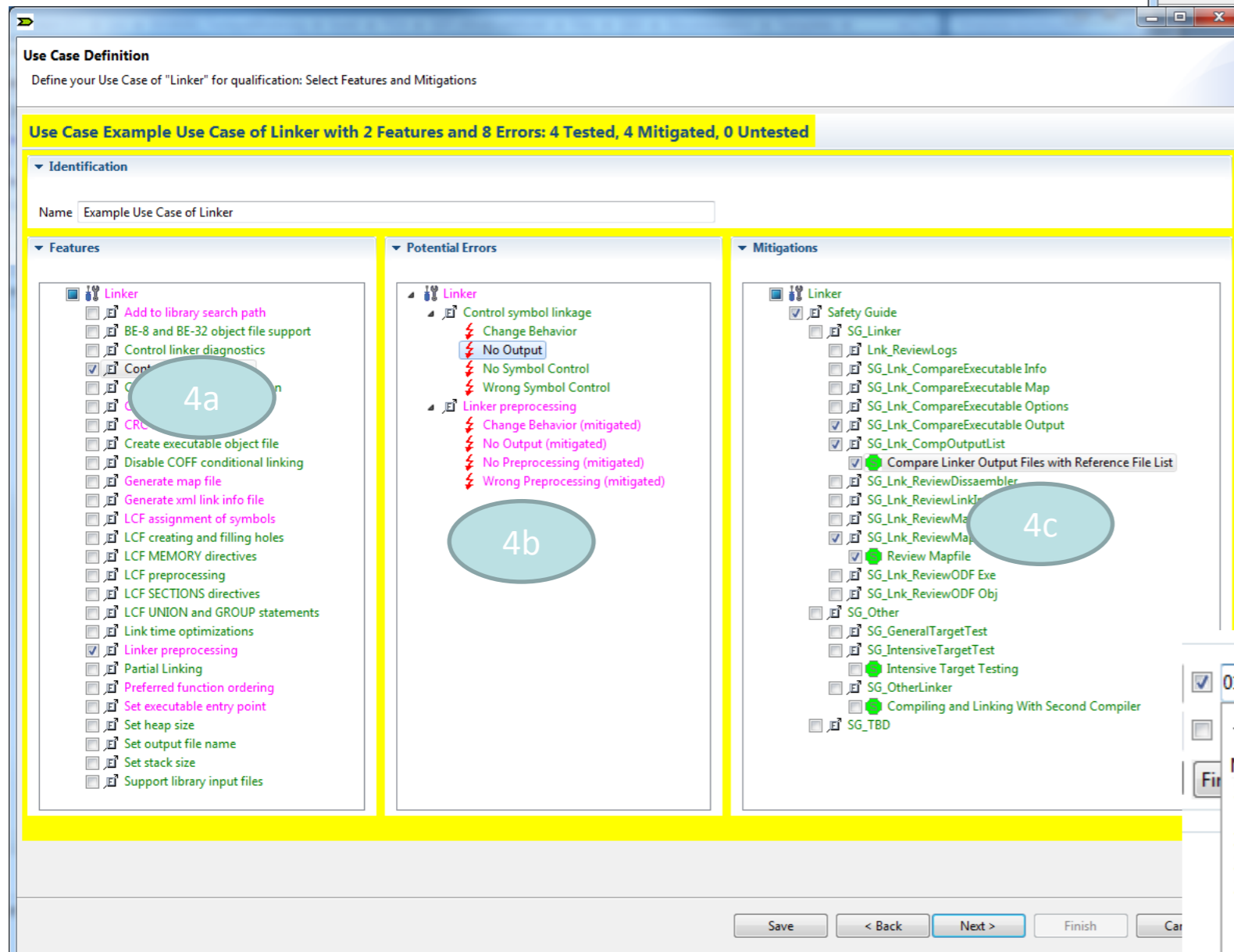 - – Tool Qualification Needs
  - – **Qualification Tools**
- ▶ Summary

Validas Tools & Generated Artifacts

QKit-Developer

V&V Plan

Qualifier

TCR
TQP
TSQ

Tester

TCA: Tool Chain Analyzer

Tool Model

QST: Qualification Support Tool

Test Plan

TAU: Test Automation Unit

Test Report

Configured Tool Model

Qualification Support Tool

- ▶ **Guides you through the qualification process**
- ▶ **Select standards and variants of the tools (1)**
- ▶ **Helps select tool features (2) & versions (3)**
- ▶ **Shows mitigations for known & potential errors (4)**
- ▶ **Supports qualification planning (5)**
- ▶ **Generates validation test list for TAU**
- ▶ **Generates documents based on selections (6)**
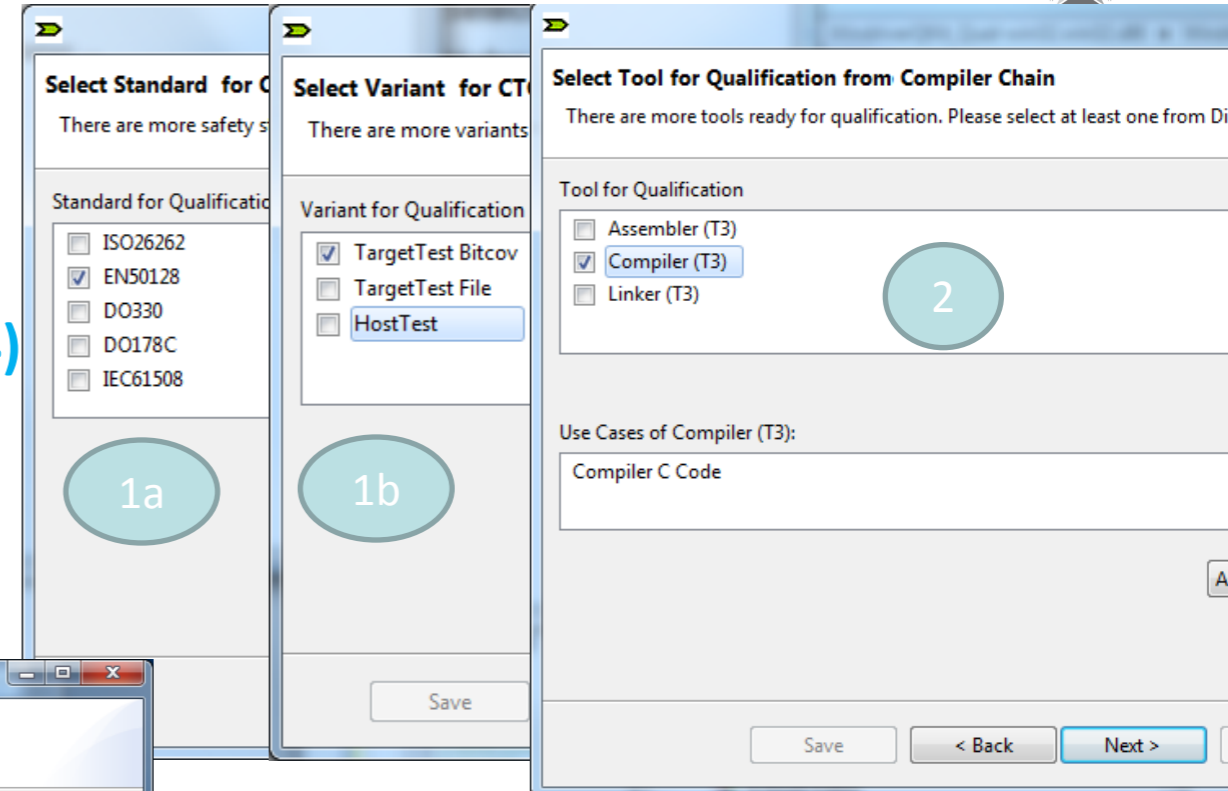
Summary

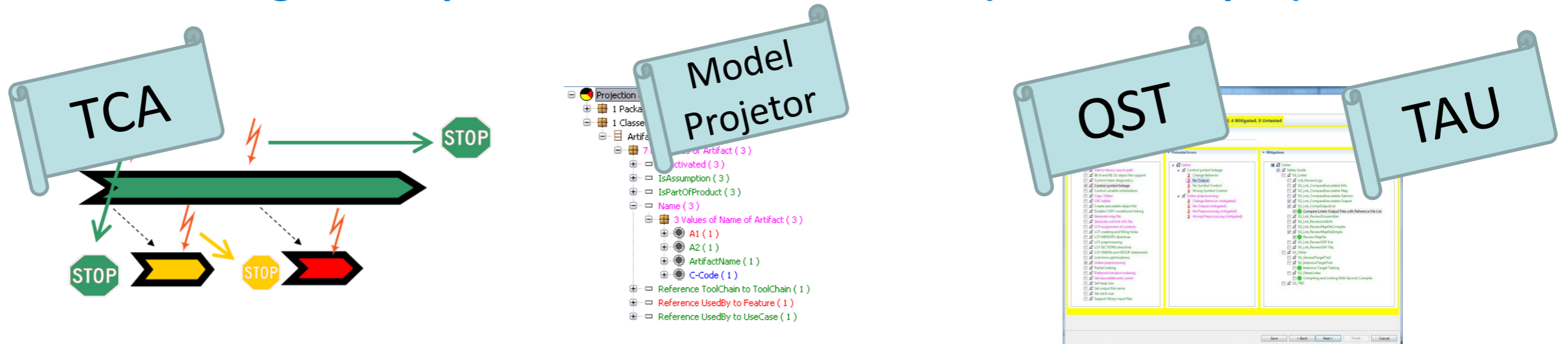▶ **Eclipse Tool Qualification Roadmap 2012 is a costly TQL-1 highway**

▶ **Eclipse Tool Qualification 2013 is no invest TQL-5 path: Ready to use**

▶ **Validas can qualify (Eclipse-based) tools for**

  – ISO 26262, IEC 61508, EN 50128

  – DO-178C, DO-278A, DO-330 (TQL-5)

▶ **Validas uses generic qualification model & tools (also for Eclipse)**

Second Tool Qualification Symposium

Over 70 participants on First TQS from 8 countries

- ▶ **Presentations**
  - Tool user & tool provider
  - Qualification requirements & qualification kits
  - Experiences from different domains & different industries
  - Practical experiences & practical support
  - Tutorials

**2014: Second TQS
9th – 10th April 2014**

- ▶ **Location: Munich City**
- ▶ **Registration: http://toolqualification2014.eventbrite.com**
- ▶ **Deadline for presentation submission:
  10th November 2013**
- ▶ **Organization: Validas AG,
  tqs@validas.de**

**New:
- Tool Exhibition
- Call for Presentations
  10th November 2013
- Location: Munich City**

Thank You!

VALIDAS

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