Requirements Management & Systems Engineering - ALM Day at MTC

November 8th, 2023, 09:30 - 17:00

The Manufacturing Technology Centre (MTC),
Ansty Park, Coventry, CV7 9JU, UK

Digitalization:

How to Implement ALM Across Your Organisation

GARANTIS IT Solutions

Experts in Polarion ALM

2023.11.08

MTC, United Kingdom

Solution Partner

PLM

SIEMENS

Agenda

1. **What is ALM? Benefits of using ALM**
2. **How to start using ALM in your company ?**
3. **Practical experience**
4. **Closing remarks**
5. **Questions and answers**

Konstantin Klioutchinski
Garantis IT Solutions

Speaker: Konstantin Klioutchinski

GARANTIS IT Solutions

Profile

POLARION ALM Consultant at
GARANTIS IT Solutions

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Industry Experience

- 9yr Garantis
- 6yr Intel
- 1yr Verifone
- 4yr Texas Instruments
- 1yr Telelogic
- 3yr NEC
- 2yr SaM Solutions

Profile

- ALM Consultant
- Stack Software Engineer
- Software Developer & Consultant
- Pre/Post Sales Consulting
- Project Manager

Polarion ALM – Technical Partner

Services on-site/off-site:

- We provide Polarion Administration, Customization
- Rollout of new project, Maintenance, Training
- SLA support

Skills:

- Widgets, Velocity, SQL, HTML, GUI design
- Requirements Management, Process Definition
- Infographics, Reports

Plugins:

- TeamCalendar, AutoDocWikiPagesPolarion

Experience:

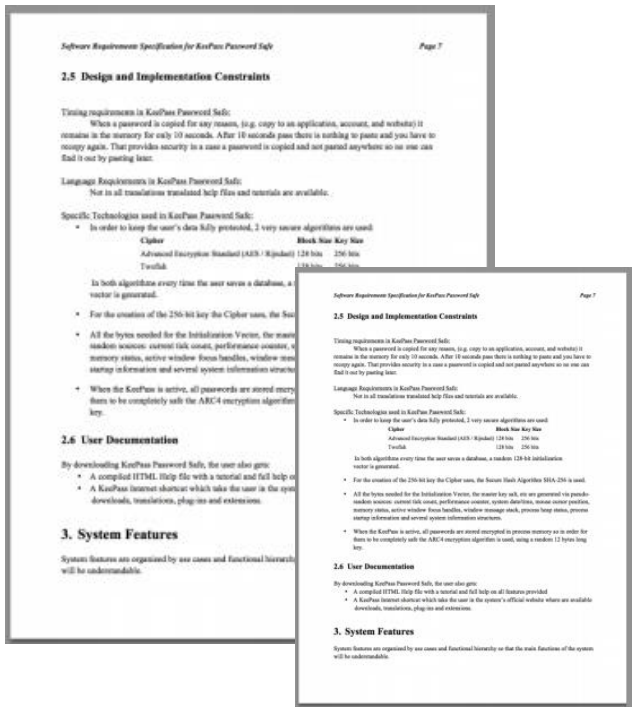
- Since 2014 – 9 years of Polarion ALM experience
- 20+ successful projects

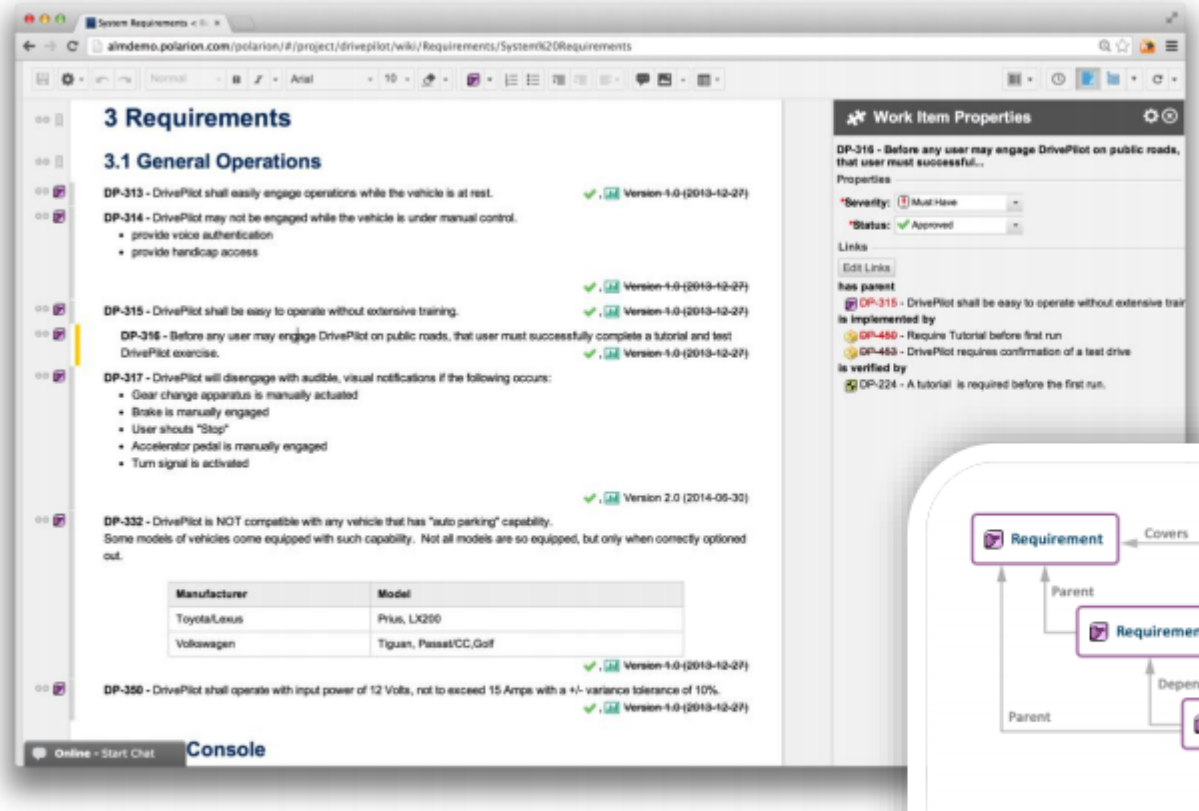
Introduction

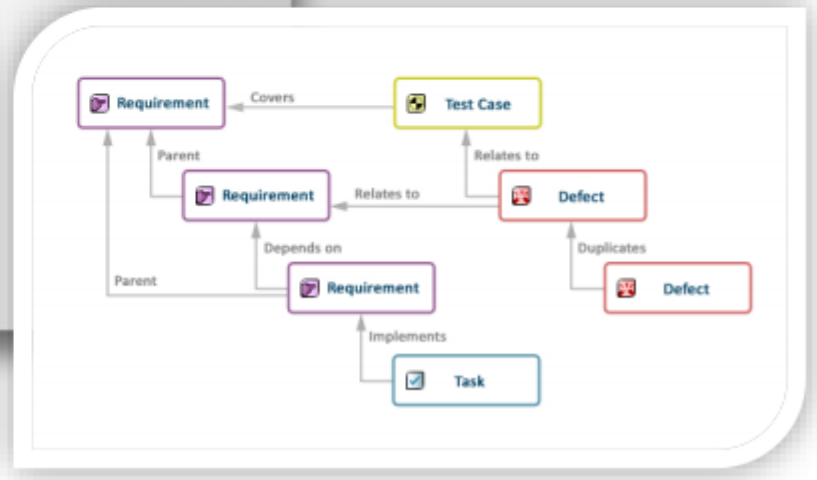
We all have **data** …

To Structured Data

From Word Documents







Everyone uses Documents, everyone has information, which could be structured and linked

Digitalization – is happening !

- Big and small companies
- in any industry sector
- Different ALM solutions
- Same goals – **to structure and manage information better**

What is ALM?

ALM – Application Lifecycle Management

The Importance of ALM

ALM is the process of maintaining a software or product (mechatronics) from idea conception, requirement management, designing, development, testing, and deployment to support and retirement of systems.

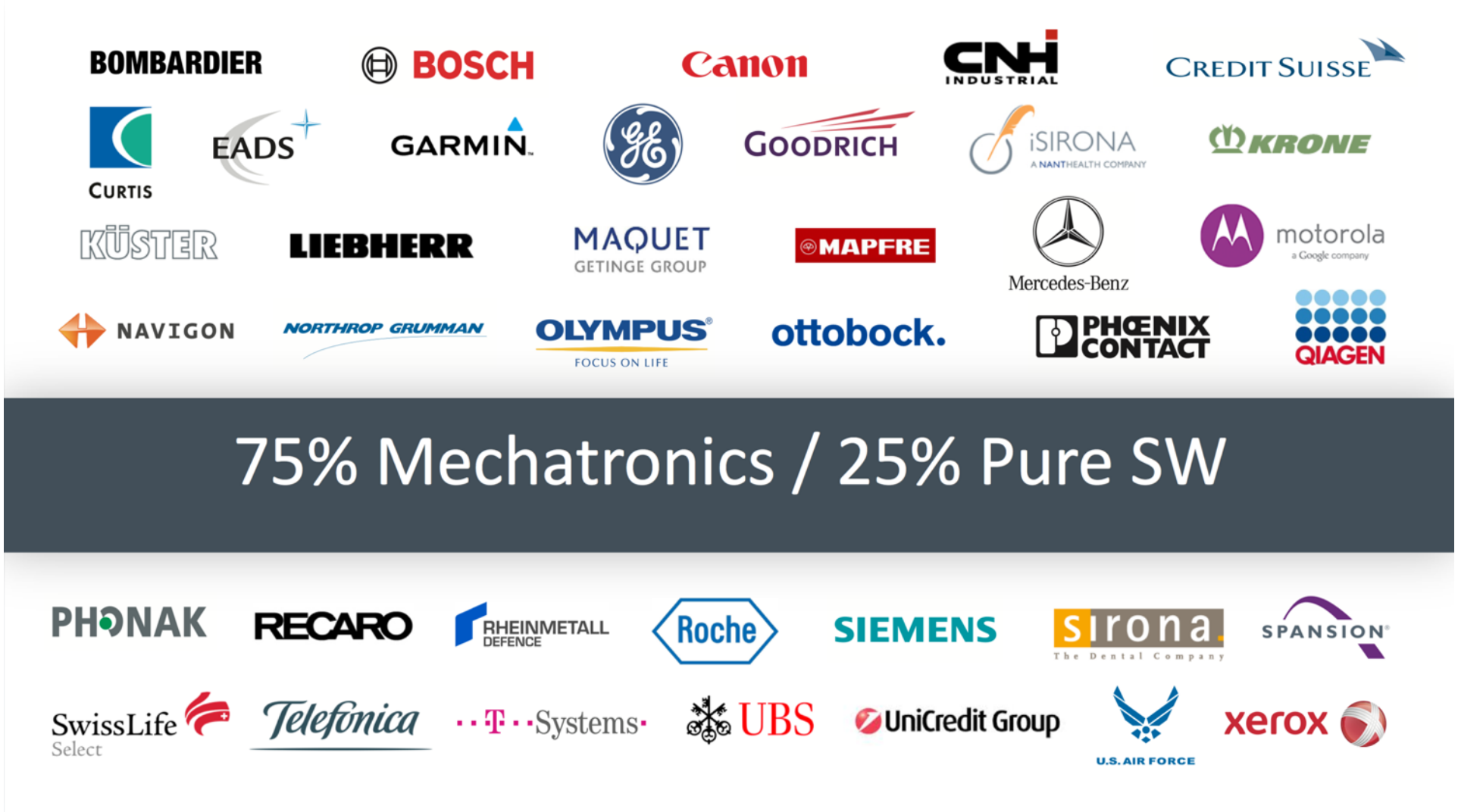
ALM **helps**:

- Ensure compliance throughout the application development phase
- Improve decision-making during application development

Benefits of structured information:

- You can measure the Quality
- Data can be standardized
- Easy management of large amounts of data

Used by many companies



ALM is used in different industries:

Electronics and Engineering

Source: Siemens

- Aerospace and Defence
- Automotive
- Consulting
- Electronics and Engineering
- Energy, Utilities and Materials Process
- Financial Services and Insurance
- Information Technology and Software
- Life Sciences, Healthcare and Pharmaceuticals
- Manufacturing and Production
- Media and Entertainment
- Medical Devices
- Retail and Trading
- Telecommunication
- Travel, Tranportation and Logistics
- Academic and Scientific

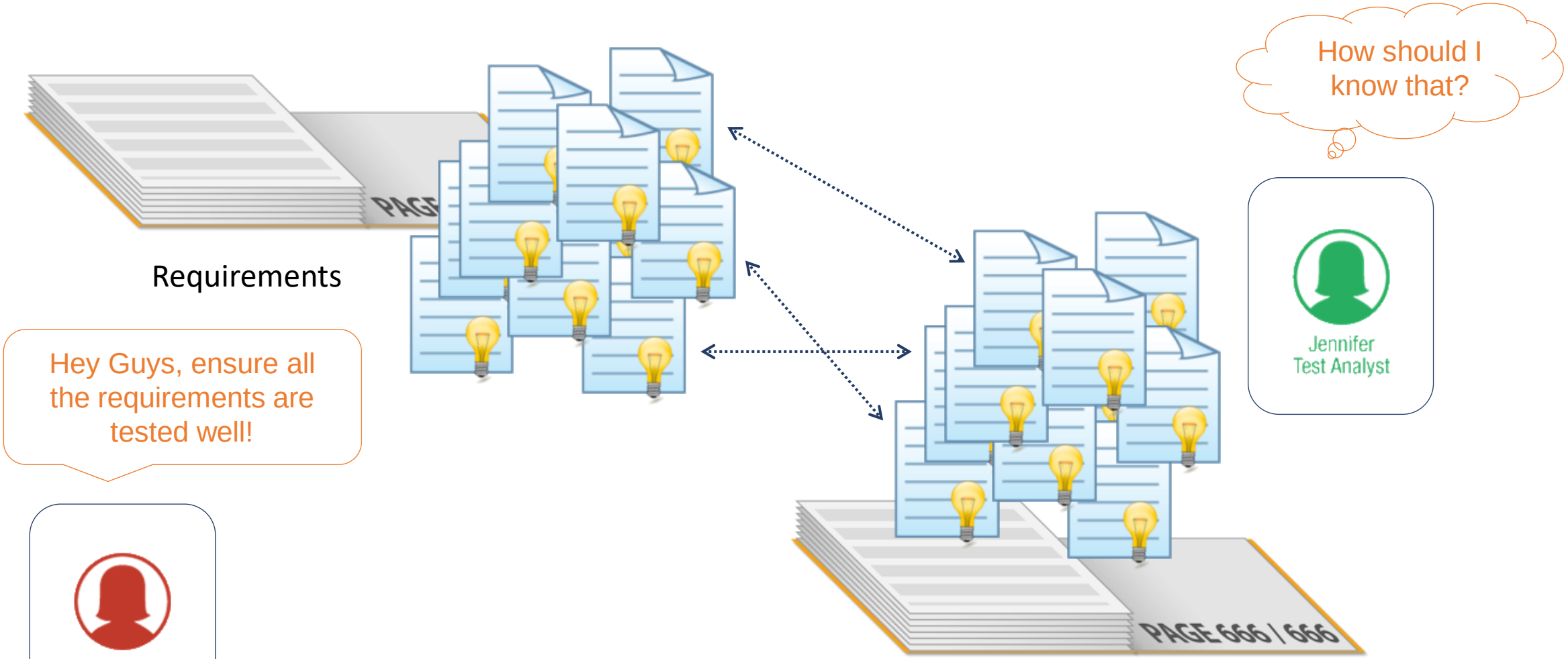
Goals of using ALM

A **successful AML strategy** is part of Digital Transformation. It is one of the easiest steps to take, and it brings **almost immediate results**.
It is not just about regulatory compliance – it simply makes the information management and collaboration better.

To have a successful ALM solution means: to have the **right technologies** in place, optimal **organisation design**, high-quality **data captured** from a wide range of sources, and the widest possible **collaborative approach**.

What we want to achieve ?

Traceability – keep track of dependency between information items



Flexible Solution Solves and **Evolves**

Additional functionality:

Risk Management

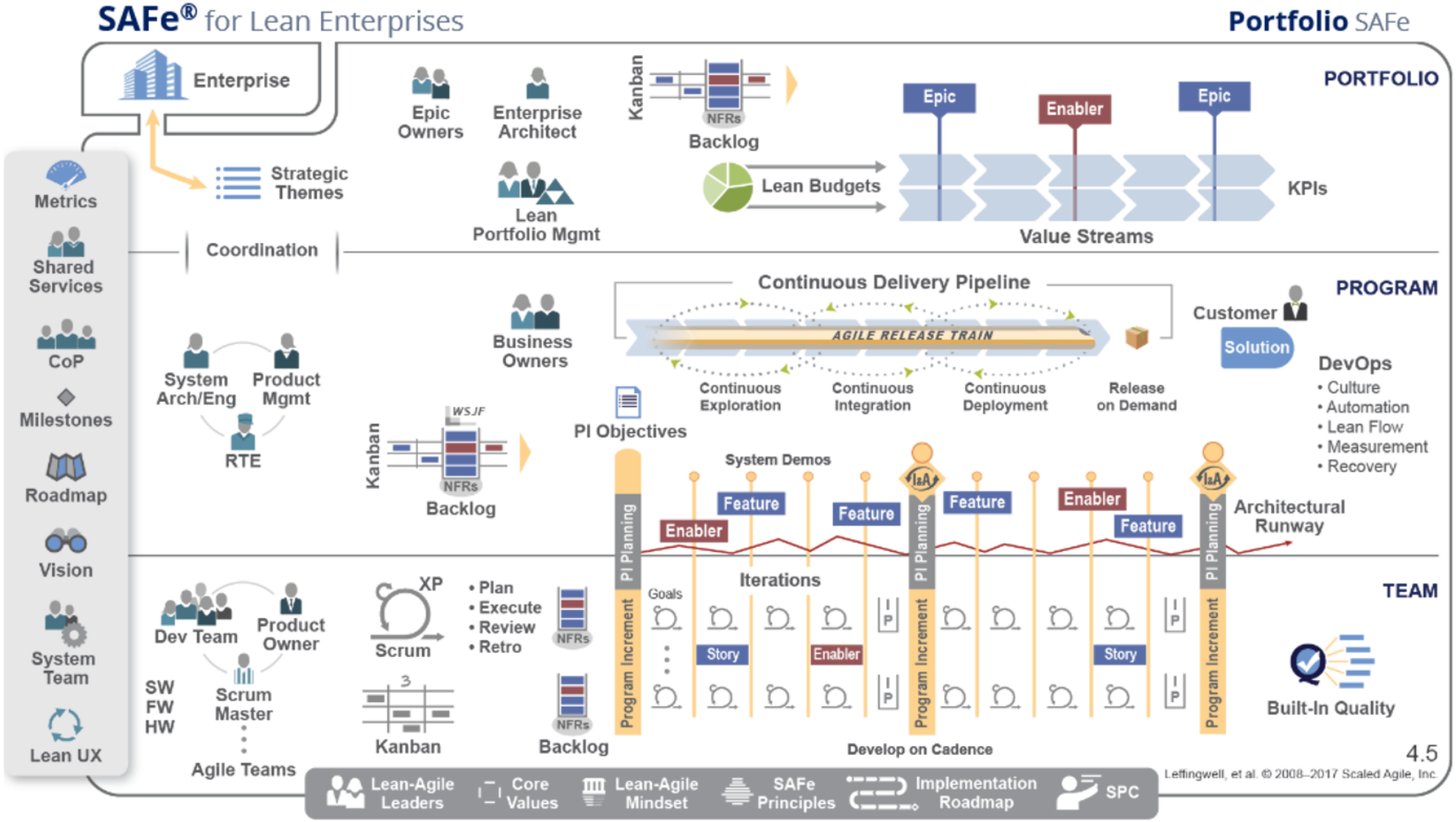
Document Management

Compliance & Standards:
- ISO26262 for Automotive
- DO-178C for Aerospace
- ISO 14971, IEC 62304 for Medical
- and more …

SAFe

One Solution – for ALL users

You can cover many teams and users by the same ALM solution



Integrated Embedded SW Development
Process flow example

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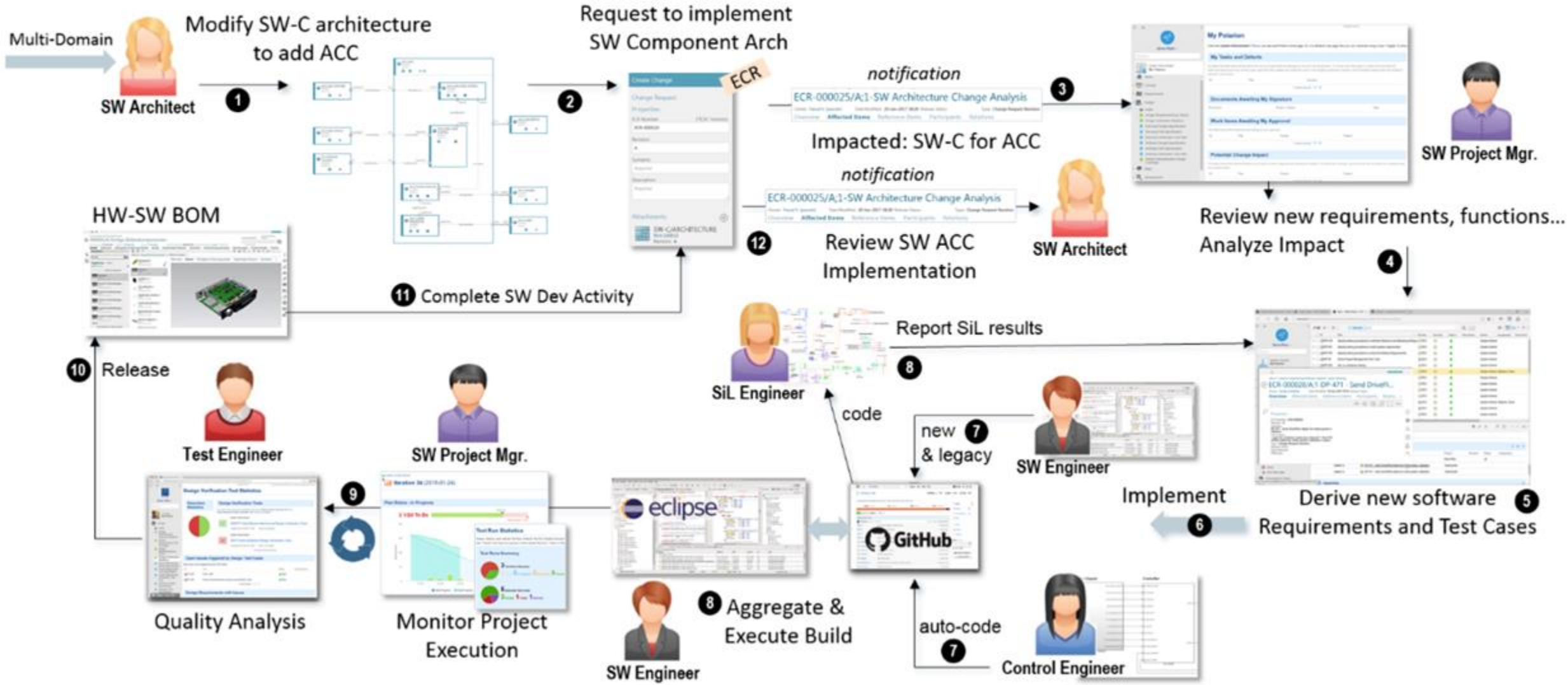


Intelligent Design Control

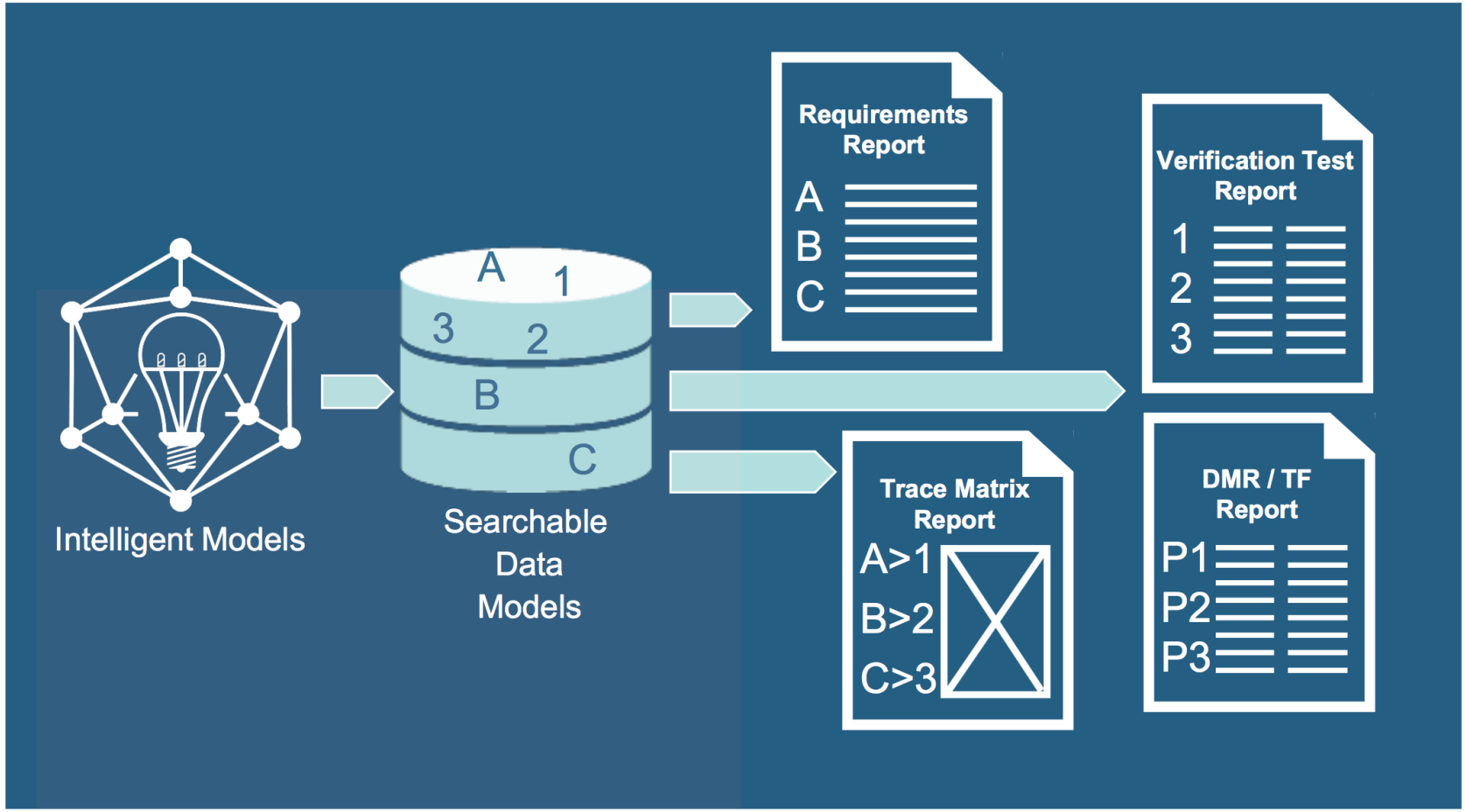
Reduces copy mistakes

Maintains data integrity

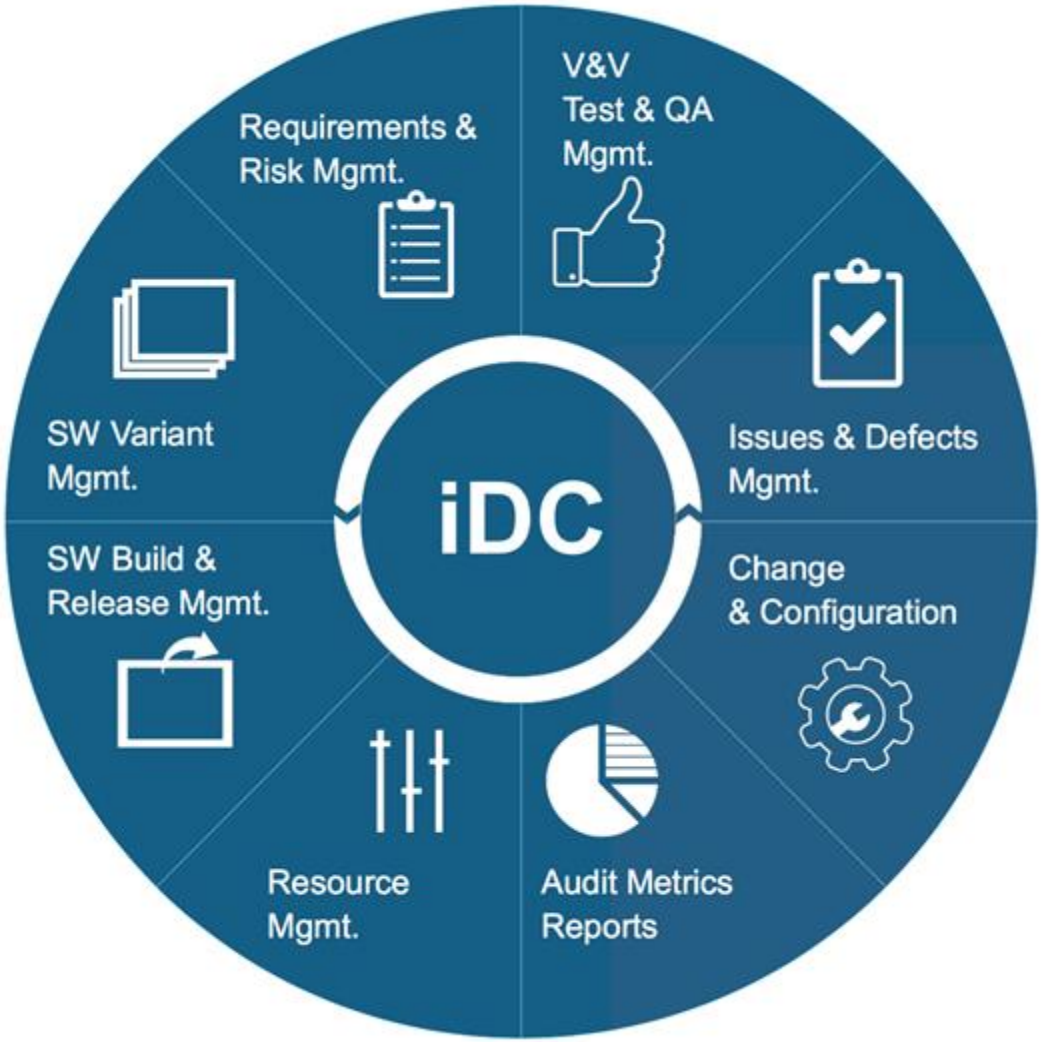
Enables extensive search, re-use, analysis

Links design elements, e.g., hazard situations to requirements to test cases

Creates trace reports



Re-organize design elements for presentation to different stakeholders



Easy automated linking
Traceability from initial requirements to production release

Impact trees
Easy assessment of impact of any change

Collaborative traceability & versioning
Who, what, when, and why?

Fully auditable and secure
Compliance, templates, workflows, versioning, data-security

Reuse and variants
Reuse "standard" specifications across projects without copy/paste

Using ALM to achieve strict Control

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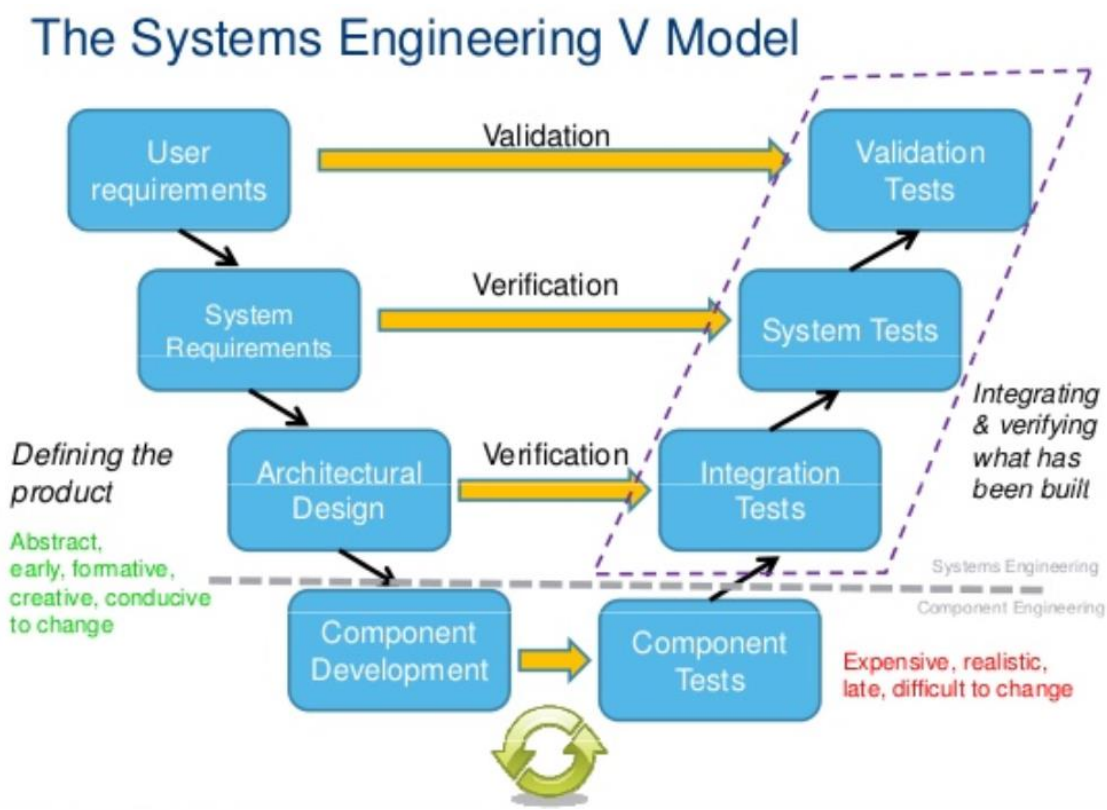
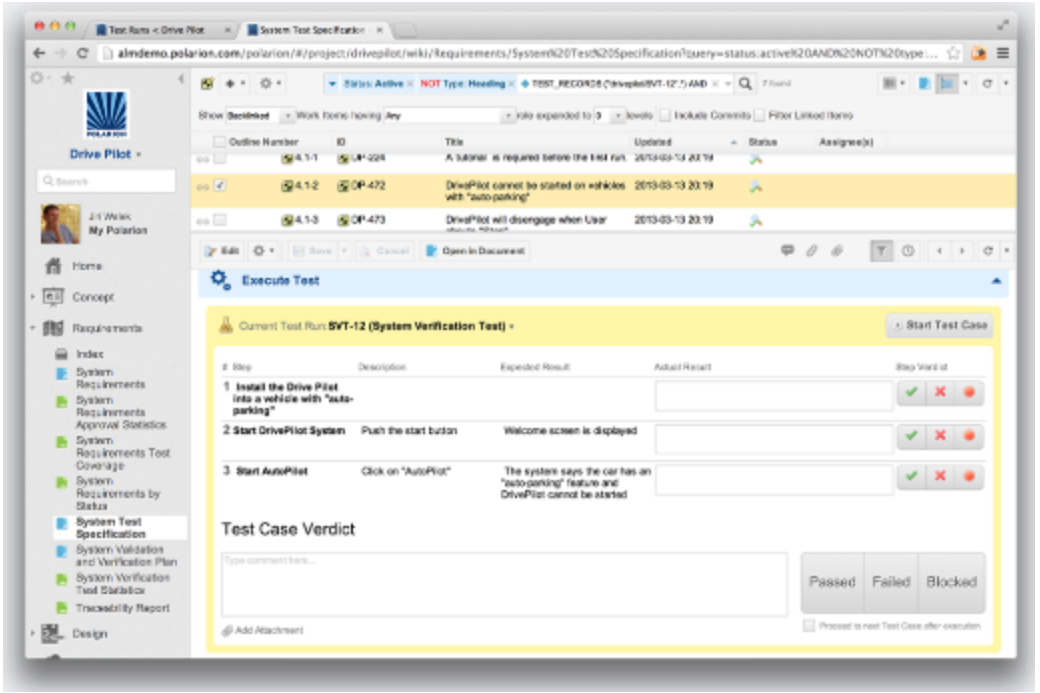


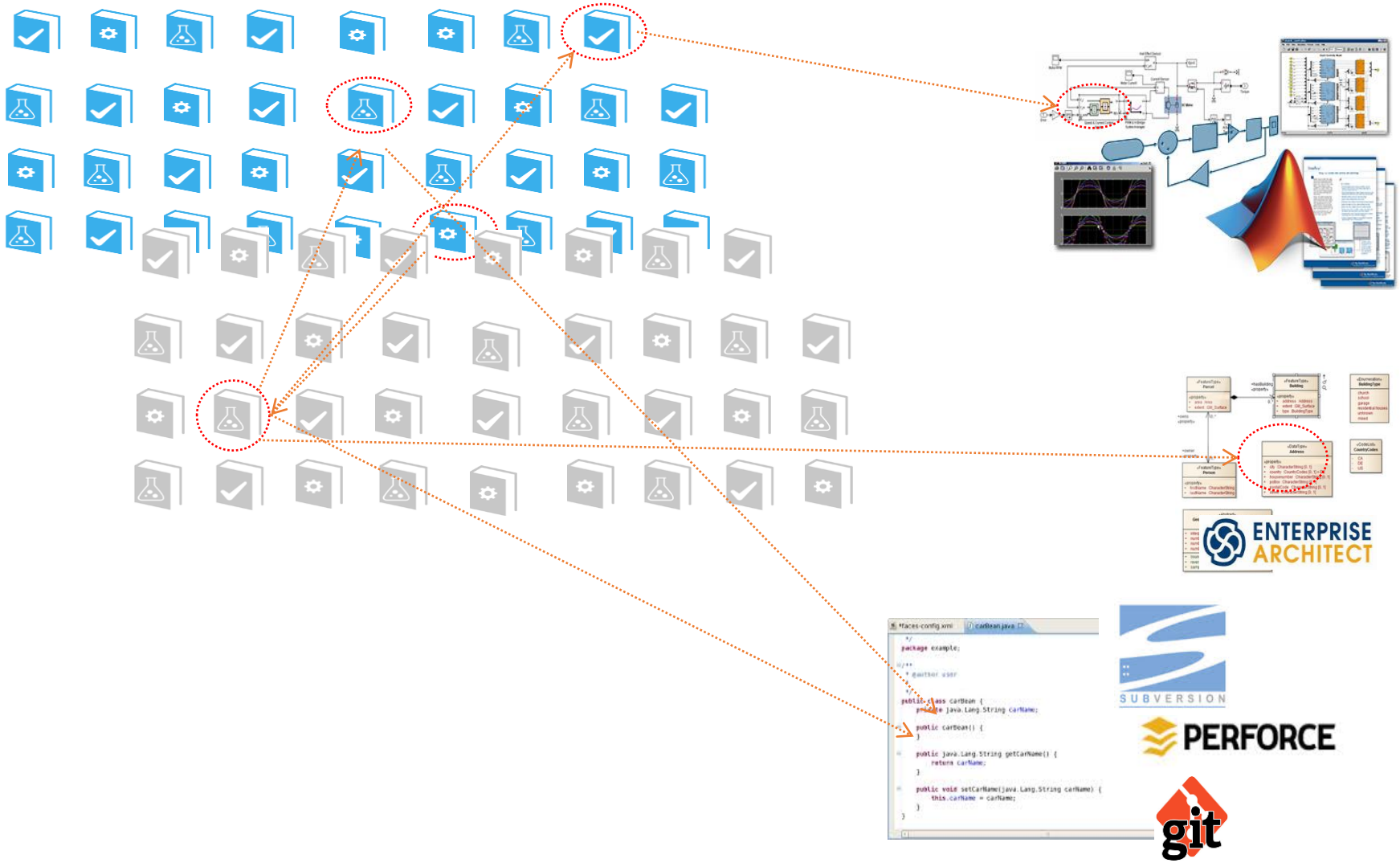
Commercial Projects

(Driven by Industry & Market)

- **Strict** Process management
- **Strict** Time/Plan management
- **Strict** Requirements management

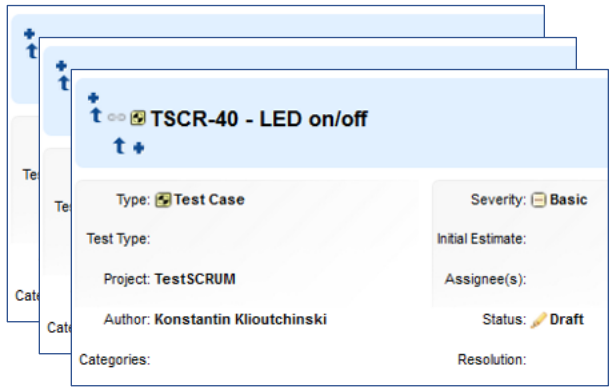


Traceability – integrate with other systems

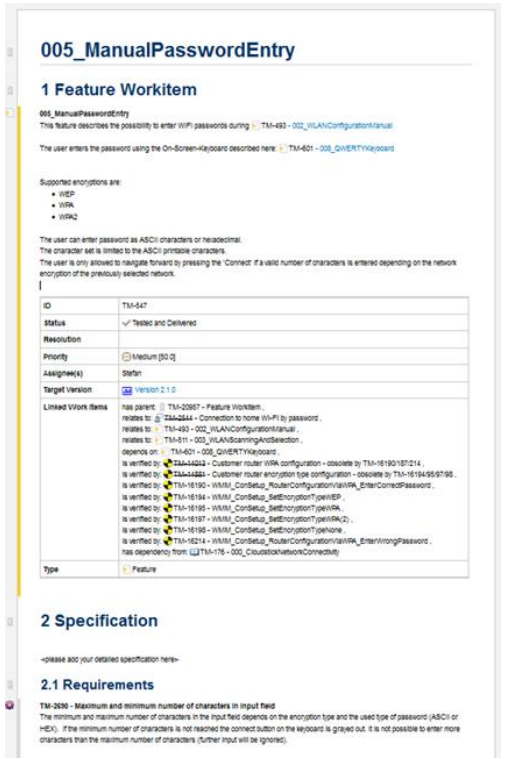


Elements of Polarion ALM

- Work Items : Requirements, User Story, Task, Test Case, Defect/Bug, WorkPackage, Risk, … define own items
- Documents : like Word files with Text and Workitems inside, queries, workflows
- Workflows : for Work Item, for Document



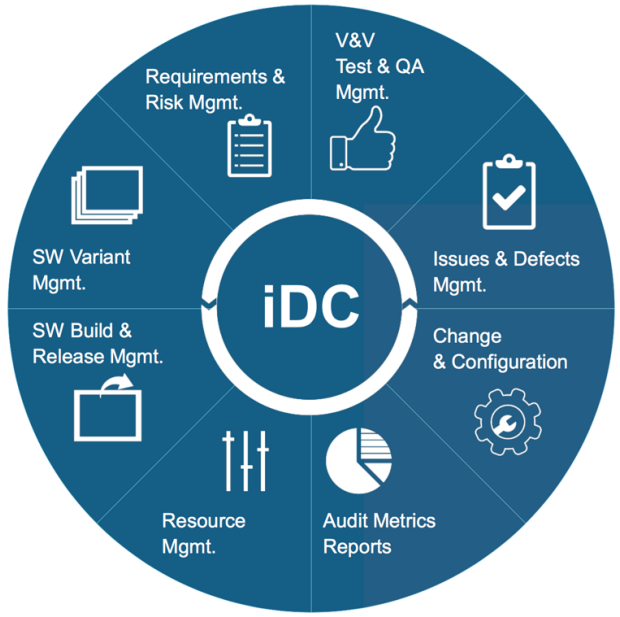
Live Documents



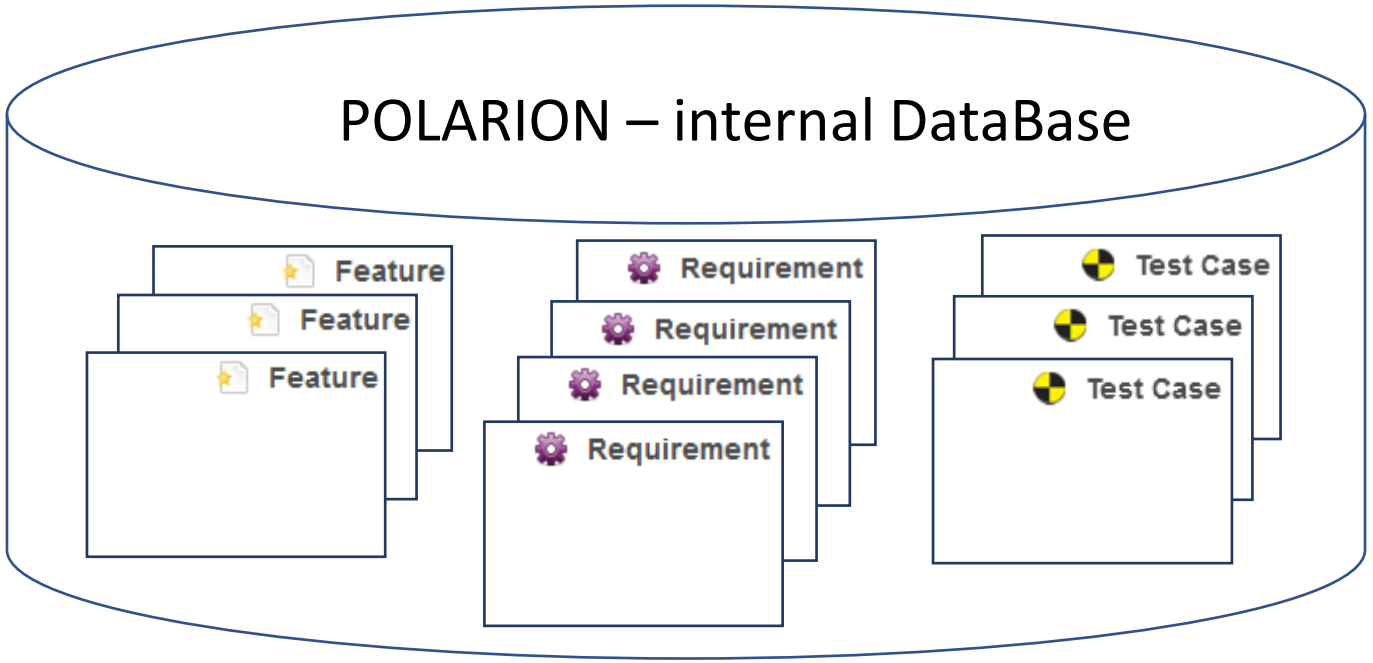
Workflow

- No CAD inside Polarion

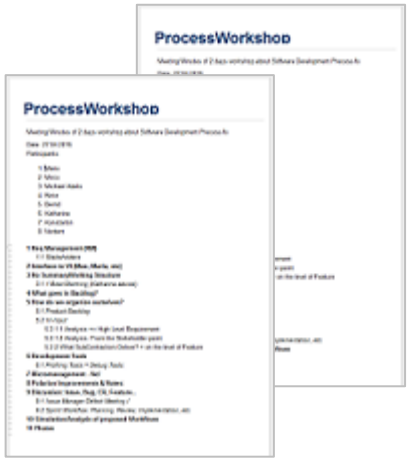
Extensive Functionality for ALM



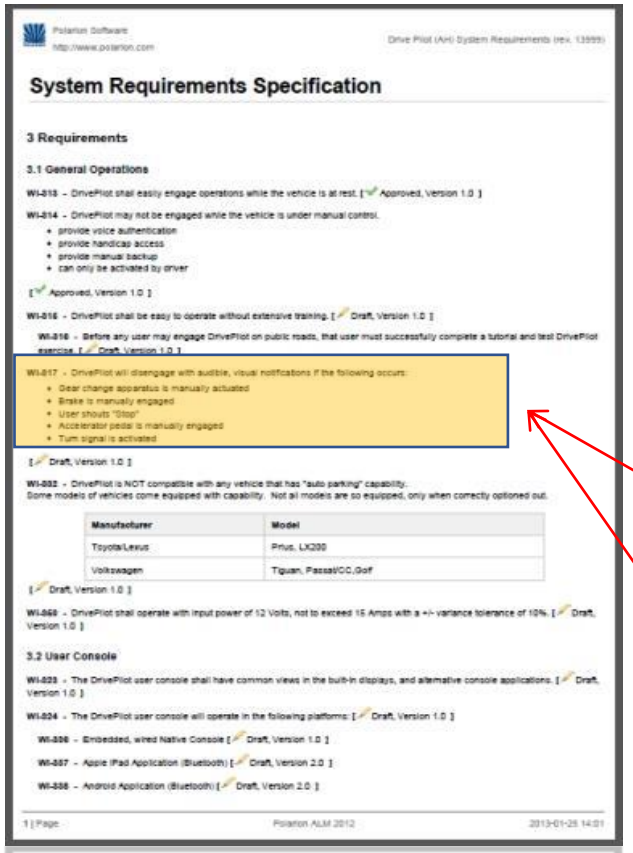
Data Model in Polarion



PLAN(s)



Traceability



Polarion Software
http://www.polarion.com

Drive Pilot (AH) System Requirements (rev. 13999)

System Requirements Specification

3 Requirements

3.1 General Operations

WI-813 - DrivePilot shall easily engage operations while the vehicle is at rest. [Approved, Version 1.0]

WI-814 - DrivePilot may not be engaged while the vehicle is under manual control.

- provide voice authentication
- provide handicap access
- provide manual backup
- can only be activated by driver

[Approved, Version 1.0]

WI-816 - DrivePilot shall be easy to operate without extensive training. [Draft, Version 1.0]

WI-818 - Before any user may engage DrivePilot on public roads, that user must successfully complete a tutorial and test DrivePilot exercise. [Draft, Version 1.0]

WI-817 - DrivePilot will disengage with audible, visual notifications if the following occurs:

- Gear change apparatus is manually actuated
- Brake is manually engaged
- User shouts "Stop"
- Accelerator pedal is manually engaged
- Turn signal is activated

[Draft, Version 1.0]

WI-802 - DrivePilot is NOT compatible with any vehicle that has "auto parking" capability.
Some models of vehicles come equipped with capability. Not all models are so equipped, only when correctly optioned out.

Manufacturer	Model
Toyota/Lexus	Prius, LX200
Volkswagen	Tiguan, Passat/CC,Golf

[Draft, Version 1.0]

WI-868 - DrivePilot shall operate with input power of 12 Volts, not to exceed 15 Amps with a +/- variance tolerance of 10%. [Draft, Version 1.0]

3.2 User Console

WI-823 - The DrivePilot user console shall have common views in the built-in displays, and alternative console applications. [Draft, Version 1.0]

WI-824 - The DrivePilot user console will operate in the following platforms: [Draft, Version 1.0]

WI-806 - Embedded, wired Native Console [Draft, Version 1.0]

WI-807 - Apple iPad Application (Bluetooth) [Draft, Version 2.0]

WI-808 - Android Application (Bluetooth) [Draft, Version 2.0]

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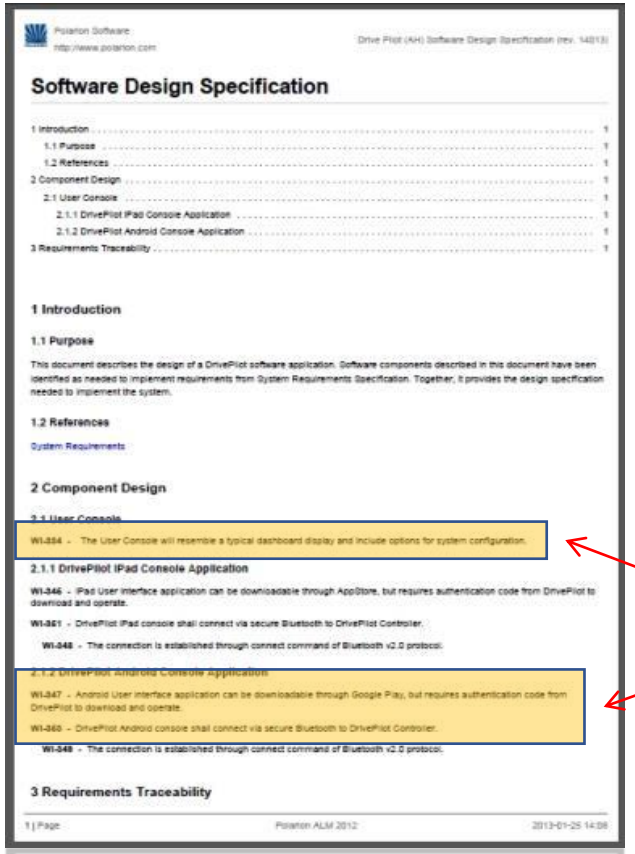

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Drive Pilot (AH) Software Design Specification (rev. 14013)

Software Design Specification

1 Introduction 1
1.1 Purpose 1
1.2 References 1
2 Component Design 1
2.1 User Console 1
2.1.1 DrivePilot iPad Console Application 1
2.1.2 DrivePilot Android Console Application 1
3 Requirements Traceability 1

1 Introduction

1.1 Purpose

This document describes the design of a DrivePilot software application. Software components described in this document have been identified as needed to implement requirements from System Requirements Specification. Together, it provides the design specification needed to implement the system.

1.2 References

System Requirements

2 Component Design

2.1 User Console

WI-854 - The User Console will resemble a typical dashboard display and include options for system configuration.

2.1.1 DrivePilot iPad Console Application

WI-846 - iPad User interface application can be downloadable through AppStore, but requires authentication code from DrivePilot to download and operate.

WI-861 - DrivePilot iPad console shall connect via secure Bluetooth to DrivePilot Controller.

WI-848 - The connection is established through connect command of Bluetooth v2.0 protocol.

2.1.2 DrivePilot Android Console Application

WI-847 - Android User interface application can be downloadable through Google Play, but requires authentication code from DrivePilot to download and operate.

WI-860 - DrivePilot Android console shall connect via secure Bluetooth to DrivePilot Controller.

WI-848 - The connection is established through connect command of Bluetooth v2.0 protocol.

3 Requirements Traceability

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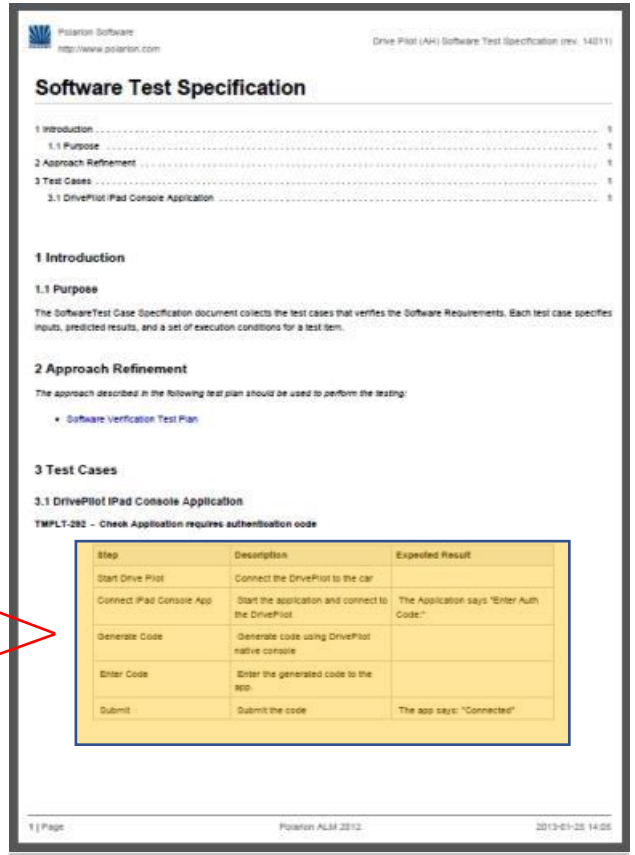

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Drive Pilot (AH) Software Test Specification (rev. 14011)

Software Test Specification

1 Introduction 1
1.1 Purpose 1
2 Approach Refinement 1
3 Test Cases 1
3.1 DrivePilot iPad Console Application 1

1 Introduction

1.1 Purpose

The SoftwareTest Case Specification document collects the test cases that verifies the Software Requirements. Each test case specifies inputs, predicted results, and a set of execution conditions for a test item.

2 Approach Refinement

The approach described in the following test plan should be used to perform the testing:

- Software Verification Test Plan

3 Test Cases

3.1 DrivePilot iPad Console Application

TMPLT-292 - Check Application requires authentication code

Step	Description	Expected Result
Start Drive Pilot	Connect the DrivePilot to the car	
Connect iPad Console App	Start the application and connect to the DrivePilot	The Application says "Enter Auth Code:"
Generate Code	Generate code using DrivePilot native console	
Enter Code	Enter the generated code to the app	
Submit	Submit the code	The app says: "Connected"

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Example #1

Using ALM in different projects / different industries

Thermomix TM5 Eco System

Components of the Eco System:

- Device
- Mobile Application
- Website
- Recepies Database

PRD SYS SW HW MEC WEB APP RCP

GROWTH of projects

HISTORY:

- From 1 project to many
- From **„Software Project“** we moved to:

  „System“ + „Software“ + „Mechanics“ + „Electronics“ projects

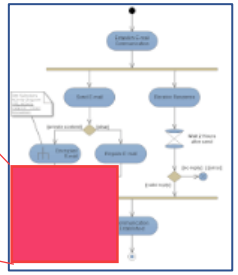
(2) Now we are moving towards - Complete Thermomix product to be described in Polarion:

- System
- Software
- Mechanics
- Electronics

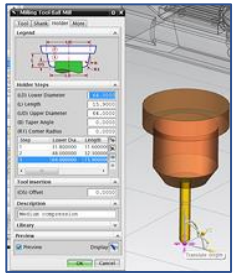
(1) We started here: FDD for IoT functionality of Thermomix

SYSTEM

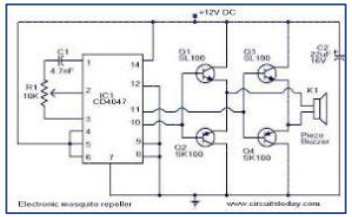
Software



Mechanics



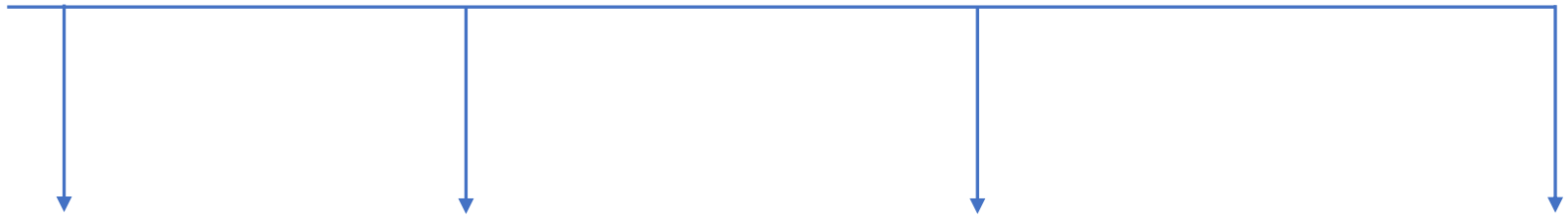
Electronics



Project Data Model in Polarion

Template for any **PRODUCT**

- **SYSTEM**
- **Software**
- **Mechanics**
- **Electronics**



SYSTEM

- Product Use Case
- System Requirement
- System Component
- Interface
- System Test Case
- Issue

Software

- Software Requirement
- Feature
- Work Package
- Component Design Item
- Review
- Task
- Issue
- Change Request
- Defect
- Release
- Build Record
- SmokeTest

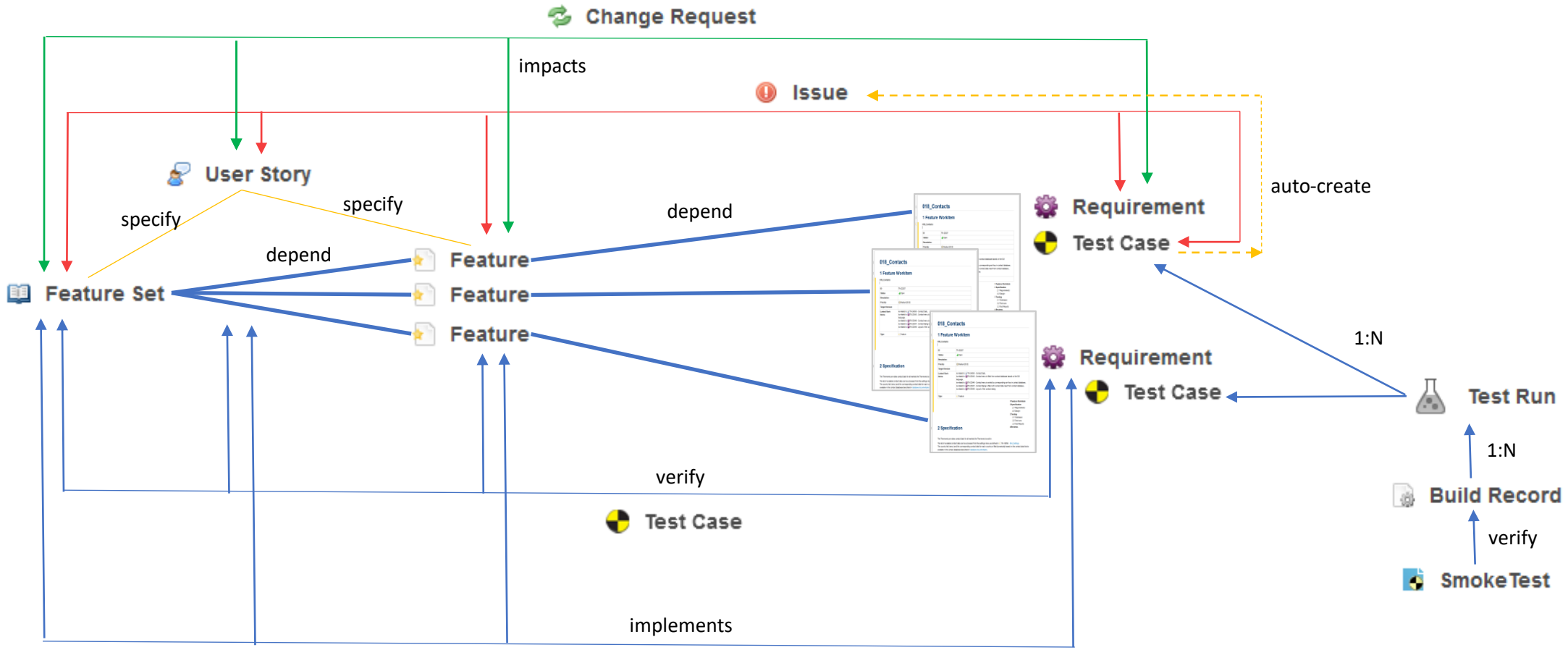
Mechanics

- Mechanical Requirement
- Mechanical Test Case
- Change Request
- Work Package
- Task
- Issue

Electronics

- Electronic Requirement
- Electronic Test Case
- Software Requirement
- Software Test Case
- Hardware Requirement
- Hardware Test Case
- Change Request
- Issue
- Work Package
- Task

Data Model in Polarion



Level 1	Level 2	Level 3
User Story	Task	Build Record
Feature Set	Change Request	SmokeTest
Feature	Issue	News & Announcements
Requirement	Test Case	

Task

Change Type To

News & Announcements

Example #2

Using ALM in different projects / different industries

Managing your Data according to your Process

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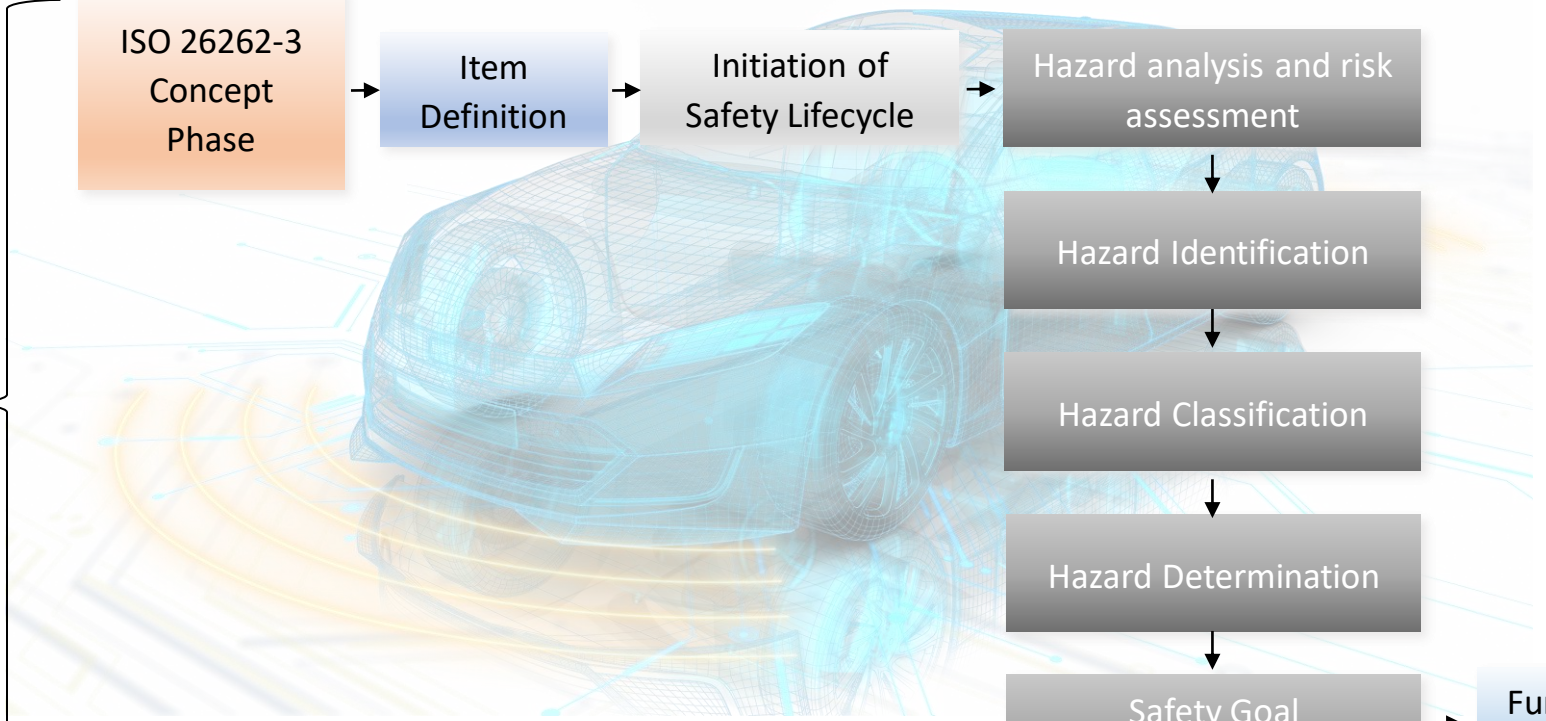
(1) Data

Safety Goal → Functional Safety Requirements → Technical Safety Requirements → H/W Safety Req. / S/W Safety Req.

Project template
ISO26262

(2) Processes

ISO 26262-3 Concept Phase → Item Definition → Initiation of Safety Lifecycle → Hazard analysis and risk assessment → Hazard Identification → Hazard Classification → Hazard Determination → Safety Goal Determination → Functional Safety Concept



Managing your Data according to your Process

Example from Automotive Industry

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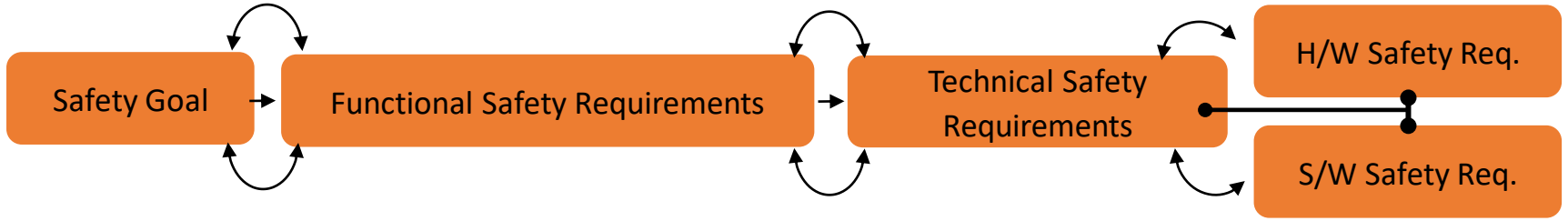
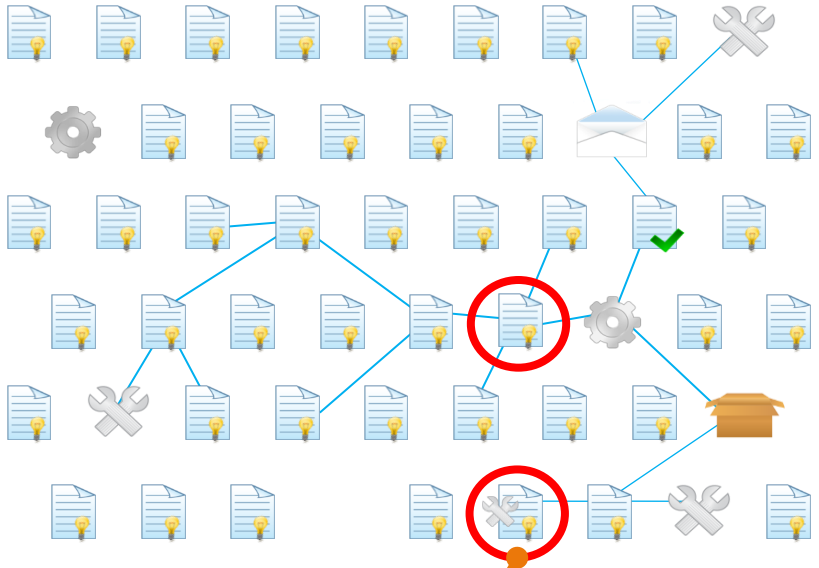
1 **Standards**



2 **Traceability**

- Who?
- What?
- When?
- Why?



3 **Collaboration**

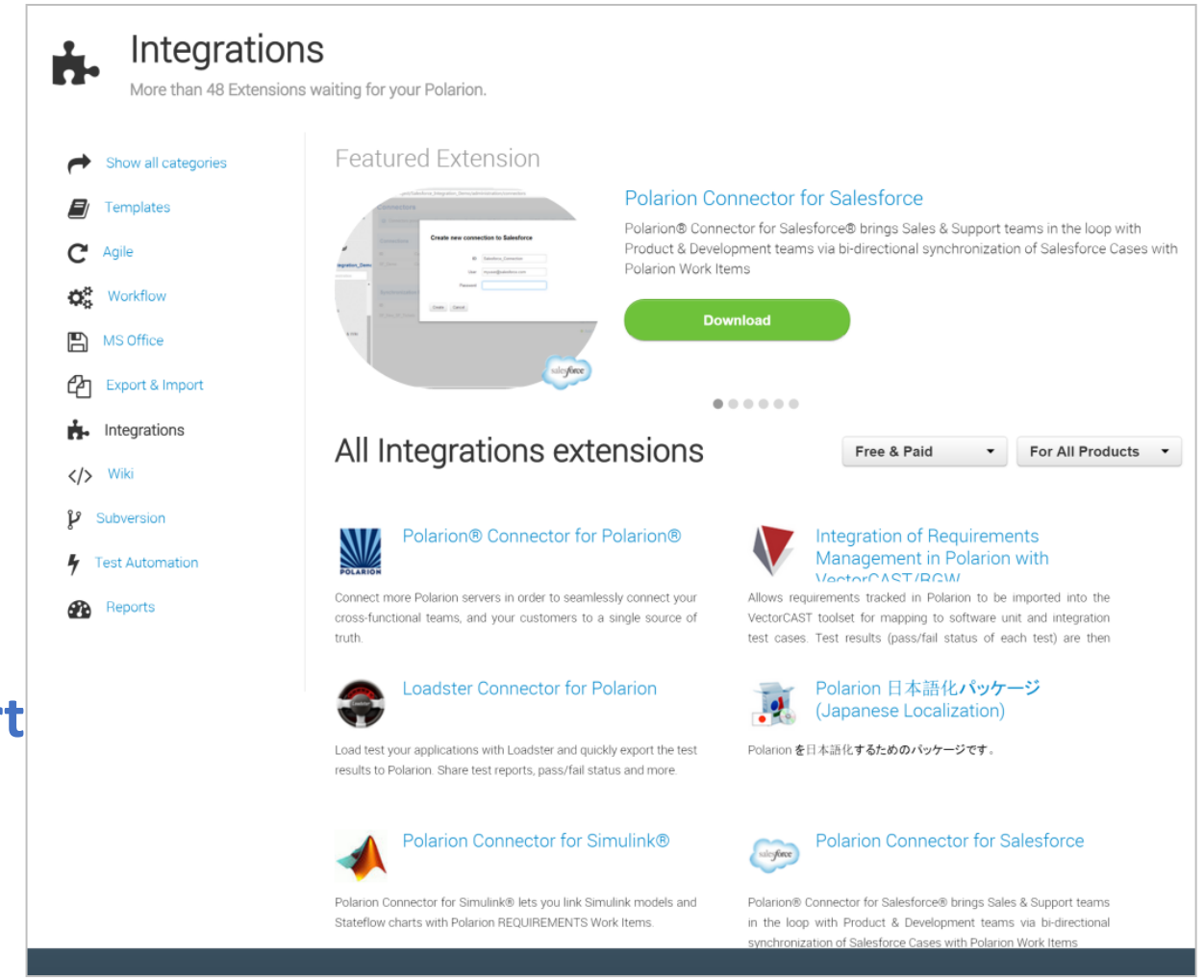
Integrations

ALM

Simulation

Customer Support

Modelling



Continuous Integration

Source Code Analysis

Test Automation

Version Control

Recommendations

How to achieve the best results?

ALM – from First Steps to Success

Common Challenges (before introducing ALM)

- Documentation of requirements did not have Linking & Traceability. Documentation & Linking were separated.
- Regular manual work was required to setup, maintain, analyse and correct Linking & Traceability
- Reporting tools were not integrated, manual work was needed to create reports

Strategies Applied

- Created own TEMPLATE for SYSTEM, SW, ELECTRONIC, MECHANIC project
- Polarion was chosen as ALM Platform (for managing Requirements, Specifications, Tests, Plans, Reports, Documents, Tasks, Builds, etc)
- Customizaton of Polarion was done

Benefits and Success

- Reduced Errors
- Saved Time & Effort, reduced errors for Linking & Traceability
- Reporting gave good instant overview of differnet aspects of the project (testing, defect management, progress and completness of specification)
- Optimizing the cooperation of the team
- Full Control of changes.

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SIEMENS Ingenuity for life

Thank you!

Questions & Answers

www.garantis-solutions.com