ALM and PLM in a secure process framework for innovative product platforms

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Agenda

▪ Introduction
  ▪ Aras
  ▪ How can connected and automated vehicles (CAV) complexity be reduced?

▪ How will ALM/PLM development and integration be done?
  ▪ Examples of ALM & PLM platforms
  ▪ How will traceability for the product lifecycle be done?
  ▪ How can ALM integrate with PLM platform?

▪ What happens when ALM/PLM isn’t properly properly?

▪ What ALM/PLM standards and releasing features are important?

▪ More information desired?
Aras Overview

Founded and Staffed by Experienced PLM Industry Veterans

Global Operations

Focus on Markets with Complex Products and Processes
## Business Summary

### Focus on Innovation and Customer Success

- **400+** employees and hiring
- **>50%** Product Development
- **20%+** Support

### Growing Community

- **300+** Subscriber Companies Worldwide
- **1,000+** Companies running Aras Open
- **125+** Partners
- **250K+** Enabled Users

### Business Momentum

- **Sales by Region**
  - **50%** Americas
  - **30%** EMEA / **20%** Asia
- **46%** 3 year compounded annual growth
- **96%** Of subscribers RENEW annually

96% Of subscribers RENEW annually
CAV System Impact Assessment

Vehicle portfolio

Vehicle features & requirements

IT portfolio

IT objectives & requirements

Government, industry, and standards organizations

Security objectives & requirements

Regulatory, compliance & audit objectives & requirements

Vehicle (including In-vehicle) systems

Vehicle (including In-vehicle) support systems

Vehicle systems

In-vehicle systems

Vehicle support systems

In-vehicle support systems

Product management (e.g., PLM) platform(s)

Application management (e.g., ALM) platform(s)
How can CAV complexity be reduced?

- Integrate vehicle processes & data within a defined, secure framework
  - Organize/optimize vehicle, IT, security, compliance & digital audit processes
  - Consolidate program/project management platforms to one vehicle program management platform
  - Consolidate change management processes to one platform with a closed-loop change process
  - Consolidate vehicle BoM and configuration data into one integrated product management platform
  - Ensure security of data and processes is embedded at defined steps within the vehicle lifecycle
  - Measure quality of released products with feedback improvement loops
  - Comply with defined standards for vehicle, IT, security, compliance, and audit
  - Emphasize reuse of process, application, security, and data structures
  - Adopt machine learning techniques to determine lifecycle business and technical patterns

- Integrate ALM & PLM platforms into one system platform that supports vehicle management needs
  - Optimize ALM & PLM data and processes to work efficiently across vehicle lifecycle stages
  - Provide gapless traceability across hardware/software parts and assemblies for the vehicle lifecycle
How will ALM/PLM development and integration be done?
codeBeamer – example of an ALM platform*

*Intland Software
Innovator – example of a PLM platform
How will traceability for the product lifecycle be done?

- System architecture models created & integrated as functional and logical assemblies
- Process, software, mechanical, electrical and data development
- Process & data integrated with traditional BoM elements
- Disciplines synchronized
- Virtual Tests
- Improved traceability
- Fewer late-stage system issues
- Audit & compliance
- Verification & validation

Source: VPE TU Kaiserslautern (modified)
How can ALM integrate with a PLM platform?

ALM is integrated with the PLM platform through web services as an authoring package whose product is a released software stack.

ALM is directly connected to the PLM Platform to access processes, functionality and data from the ALM system.
What happens when ALM/PLM isn’t integrated properly?
Definition: digital thread*

- **Digital thread** is a communication framework that:
  - Connects traditionally siloed elements in manufacturing processes
  - Provides an integrated view of an asset throughout the product lifecycle
  - Digital thread provides gapless links with capability to retrace decisions, release notes, and associated data for auditing purposes

- Reference – Techtarget
Pulling the thread through software

Create Software & Data Model in Rhapsody/RDM

Manage/Track Changes in RTC

RDM = Jazz Rhapsody Design Manager

RTC = Jazz Rhapsody Team Concert

RQM = Jazz Rhapsody Quality Manager

DNG = Jazz DOORS Next Generation

Code Generated from Model

Trace to Model

Continuous IV&V

Validated by Test Case

Requirements in DNG

Test Cases & Execution Results in RQM
Pulling the thread through hardware

Create ME/EE Design Models

Model Based Peer Reviews

Derivative Artifacts Generated from Model

Trace to Model

Design Analysis and Optimization

Validated by Test Case

HW Requirements in DNG

Analysis Models Linked and Sourced to Design Model
Undesired results of bad integrations

- Incapable of connecting ALM/PLM process and data:
  - Across multiple domains
  - Up and down the product structure
  - Across the supply chain

- ALM/PLM process and data is not managed under one integrated security model

- Audit & compliance data is not managed under an integrated process

- Virtual collaboration is not performed in under one integration collaboration environment
Digital integration threads will be composed of both primary threads as well as “sub-threads”.

- Define granularity for thread identity and continuity for released product management (e.g., do not include work-in-process processes/data, trial simulation data, etc.).
- Ensure granularity encompasses ALL hard and soft parts, assemblies, and data to provide end-to-end continuity of released products and processes.

Digital integration threads should be uniquely identifiable such that searches can be easily accomplished.

Ensure security model for data & process usage encompasses both ALM and PLM systems.

Ensure standards, compliance, and audit data/processes are defined and implemented from the beginning of the program.
What ALM/PLM standards and releasing features are important?
ALM/PLM standards and compliance

- Standards compliance
  - Integrated vehicle (software & hardware) packages comply with following standards:
    - Autospice 3.1
    - AutoSAR release 4.3.X
    - ISO 26262
    - IEC 61508
    - SAE J3061
    - ISO/SAE 21434

- Audit compliance
  - ALM/PLM packages have full traceability of released items (gapless links with capability to retrace decisions, release notes, and associated data) for auditing purposes
  - ALM/PLM packages satisfy ISO-compatible reports

- Safety assessment and regulation
  - NHTSA NCAP
  - Euro NCAP
  - CN-NCAP
  - KNCAP
ALM/PLM package release and distribution

- Integrated ALM & PLM “packages” released through a release management system reflecting approved vehicle configurations on a global basis.

- Release “packages” support full BoM capabilities (multi-layer, multi-asset) including options and resultant variants and configuration files/parameters.

- Release “packages” consist of two bundles:
  - Product development to manufacturing
  - Manufacturing to aftersales service and support

- Updated release “packages” can be distributed using two execution systems:
  - Service/aftermarket dealerships and service centers
  - “Over the air” using Devops capabilities

- Release packages will be digitally traceable (providing auditability) as well as compliant to industry and OEM policies.

- Release packages, including the primary load and update packages, will be secure, encrypted, and meet ISO, NHTSA, and OEM security standards and protocols.
More information desired?

- **Automotive cybersecurity**
  - Automotive cybersecurity silicon valley
  - Best practices – Auto-ISAC
  - Automotive cybersecurity | NHTSA
  - Cybersecurity automotive - Learn about SAE cybersecurity

- **Functional safety**
  - Autonomous vehicle safety - Official Government Site
  - Assessment of the ISO 26262 - volpe.dot.gov
Next MeetUP!

December 6th

Want to Sponsor our Holiday MeetUP? Come talk to us!
Thank You

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# SAE Automotive Automation Levels

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<thead>
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<th>Level</th>
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<tr>
<td>0</td>
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<td>1</td>
<td>Driver Assistance</td>
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