# BRIDGING GAPS WITH UAF

Transformative Use Cases and Success Stories

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**3D**EXPERIENCE®

# INTRODUCTION

**Enterprise systems engineering (ESE)** **is the application of** **systems| engineering principles**, **concepts, and methods to the planning, design, improvement, and operation of an** **enterprise.**
**-** INCOSE Systems Engineering Handbook, 2023

**Enterprise** **- a purposeful or industrious undertaking (especially one that requires effort or boldness)**
-Enterprise is a strategic term in this case not meaning organization.

**Model Based Enterprise Systems Engineering (MBESE)** **Is a transformative approach to designing, maintaining, and evolving enterprises by creating and using** **digital models** **to represent various aspects of the organization.**
- It includes developing models of business processes, services, products, and systems that make up the enterprise, as well as the individuals and organizations involved in these processes.
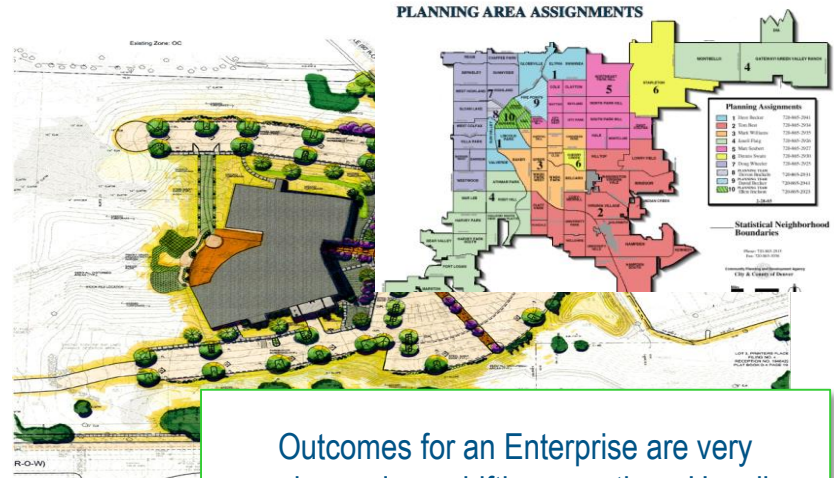
# ENTERPRISE VS. SYSTEM ARCHITECTURE

## System Architecture is Like Blueprints for a Building



Outputs for a System tend to be the same over its lifetime. Results for a system are more readily predicted.
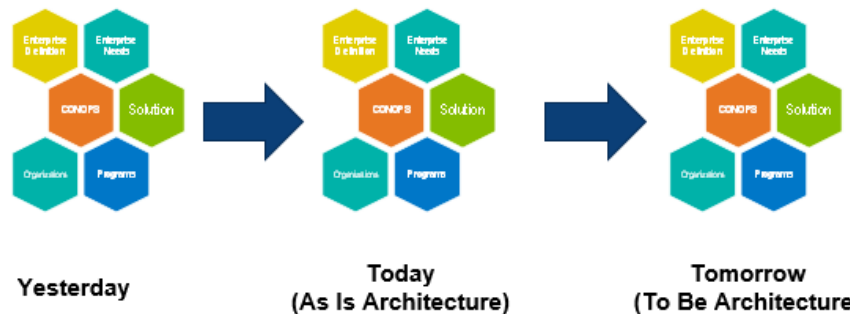
## Enterprise Architecture is More Like Urban Planning



Outcomes for an Enterprise are very complex and are shifting over time. Usually a "sequence" of outcomes is laid out in a roadmap. The Enterprise can even change its own objectives!

# THE ENTERPRISE/ SOS ARCHITECTURE IS MORE THAN JUST THE SOI

- The definition of the Enterprise itself
- Enterprise needs (capabilities)
- CONOPS
- One or more Solution Architectures
- Organizations involved
- Programs that deliver the SOIs



SoS Definition

SoS Needs

CONOPS

Solution

Organizations

Programs



Yesterday

Today
(As Is Architecture)

Tomorrow
(To Be Architecture)

# UAF IS A STANDARD…

- To develop architectural descriptions

  - in **commercial industries**, **federal governments** and **military organizations**

- Has many different use cases from **Enterprise Systems Engineering (ESE)** to **SoS, Mission** and **Cyber-Systems engineering,** or enabler for **Digital Transformation planning**

- Developed by Object Management Group (OMG) with the leadership from Dassault Systemes and Lockheed Martin

- Is an international ISO standard **ISO/IEC 19540:1** and **ISO/IEC 19540:2**

- Current version of UAF specification is 1.2
  https://www.omg.org/spec/UAF/1.2/About-UAF/

# UAF Use Cases

15288 System Lifecycle Processes
Acquisition Decision Making
AOA (Analysis of Alternatives)
Application Portfolio Management
Budget Planning
Business and Mission Analysis - INCOSE
Business Process Reengineering
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Certification Planning
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Mission Criticality
Mission Engineering
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Performance Management
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Program Assessment and Evaluation
Program Formulation
Program Planning
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Risk and Opportunity Management
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Strategic Planning and Execution
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Sustainment Engineering
System Lifecycle Management
System Security Engineering
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Test Planning and Execution
Training

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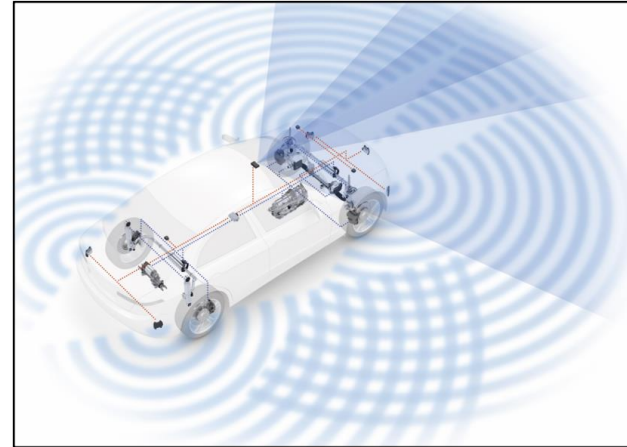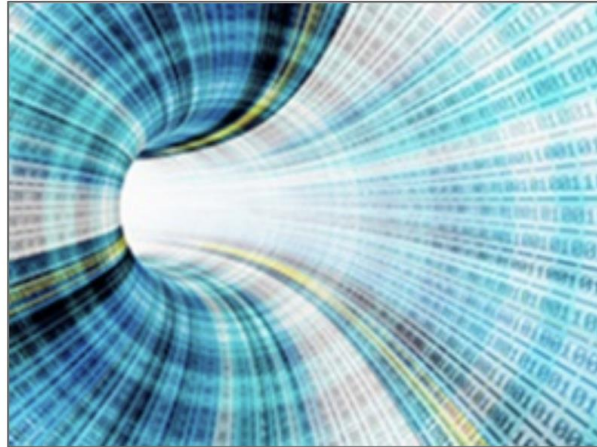# PLM program enables the digital transformation

## Organization
- Strategic Goals
- Agile Methodology
- Manage Complexity

## Processes & Data
- Provide Standard and Harmonized Processes and Data
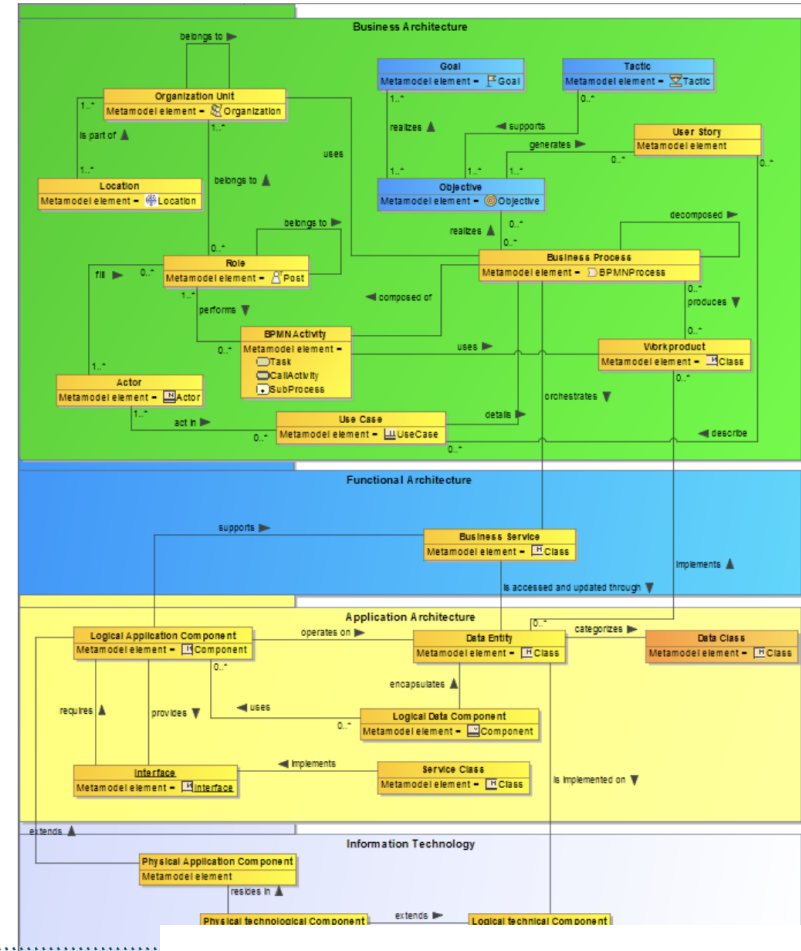- Provide Traceability
- Role based user interface

## Technology
- Create Engineering IT standards
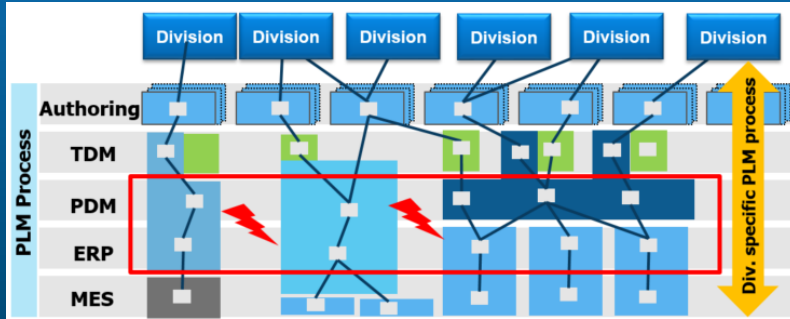- Future-proof IT System Landscape
- Drive Out of the box usage

# ZF Architecture Framework

▶ Metamodel based on UAF and TOGAF principles

▶ Tailored to fit company needs

# Current Situation and Areas for Improvement
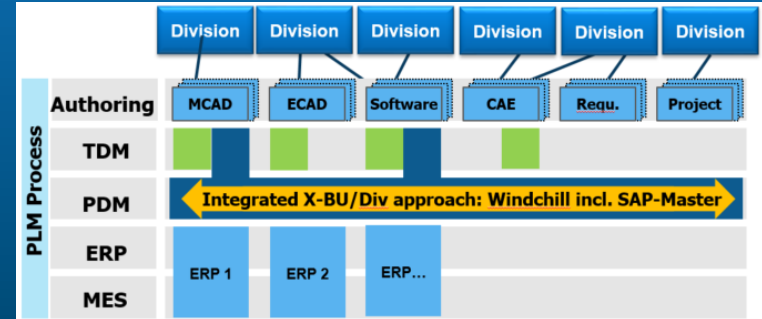
## From division-specific PLM solutions ….



## … to cross-divisional PLM solutions where needed.



Localized solutions

Individual processes, Single optimum

No single source of truth

Not optimized Cross divisional collaboration possible

Data and process harmonization X-BU/Div

IT-System optimization

Basics for one PLM Platform
*(One part – one number , Consistent Material Master, Corporate development process support, Engineering Change Management, Problem & Risk Management, Configuration Management)*

## One Platform – Same Process – Same solution

# Deloitte.
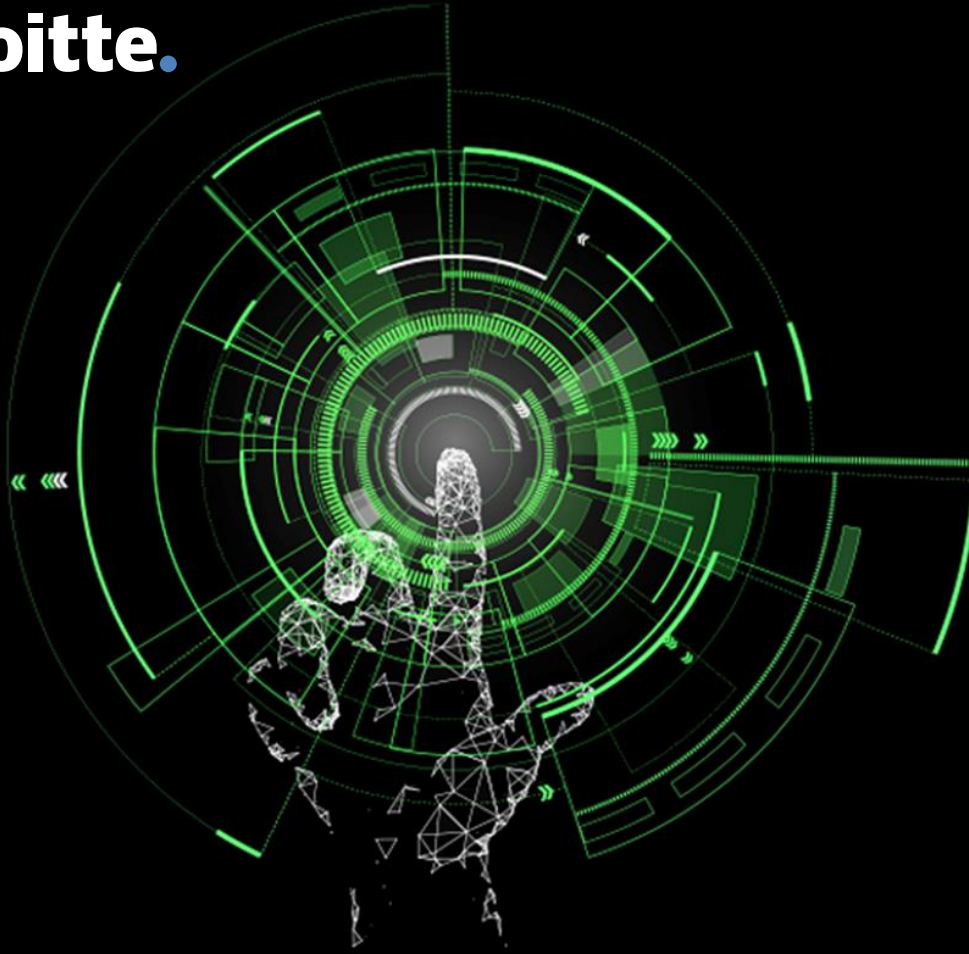
**Going Digital**: Using SysML and UAF to Architect a Transformation

*Organizations are systems with their own capabilities, structure, and processes; and can be modeled in support of a Digital Transformation.*

- ✔ **INNOVATION**
- ✔ **OPEN SYSTEMS**
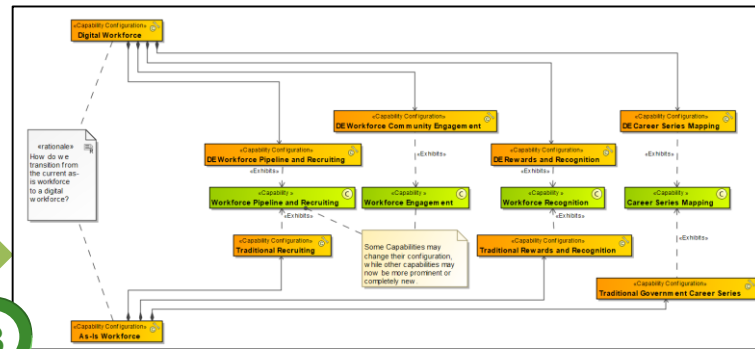- ✔ **SCALABILITY**
- ✔ **ROADMAPPING**
- ✔ **INTEGRATION**

# BRIDGING THE GAP

Using the Unified Architecture Framework to plan an Organization's Digital Transformation

**1** Define your North Star through Enterprise Goals
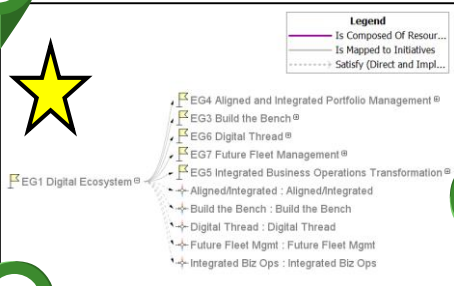


**2** Define your Capabilities and the Digital Workforce
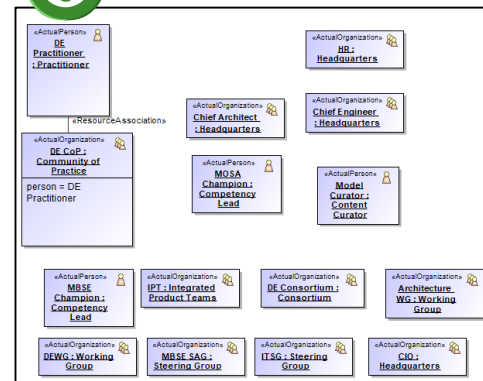
**3**

**4** Build Project views to align specific tasks and projects to Enterprise Goals and Milestones.
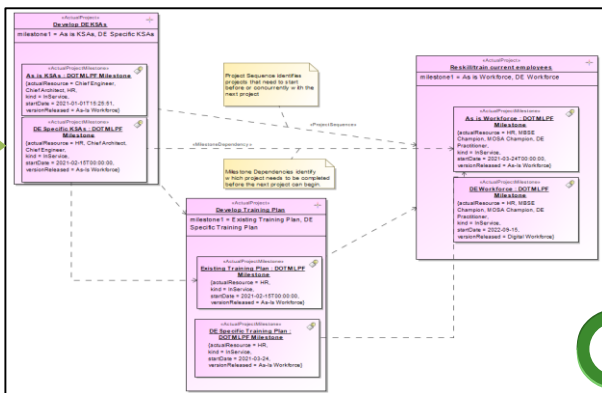
**5** Identify champions, early adopters, skeptics, and blockers using Personnel views. Assign Projects to Personnel to build organizational Roles and Responsibility.

**6** Projects enable Personnel to achieve Organizational Capability

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# THE ELECTRIC ROAD PROJECT CAN BE VIEWED AS REQUIRING THREE DISTINCT STAGES


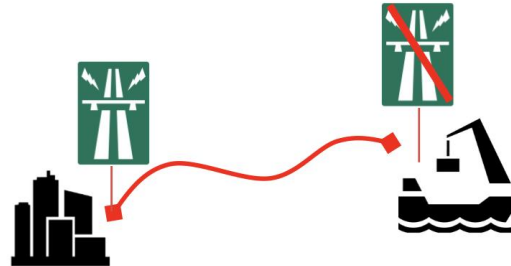
Technology demonstration

Pilot roads

Wire

Rail

Induction

Demonstration → Pilot → Deployment

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# Modeling Architectures in Production System Domain

MBSE in Operations Domain

**MBSE Challenges**

- **Many Customers**

- **Multiple Production systems**

- **Many Operation Scenarios**

- **Multiple Solutions**

**Operational Scenarios**

Operational Requirements        Trade offs

**Solutions Architectures**

VS        VS        VS

System Requirements

**SysML**

**Platform Architectures**

VS        VS

# Modeling Dairy Operational Scenarios

## Adding value beyond Basic Spreadsheet

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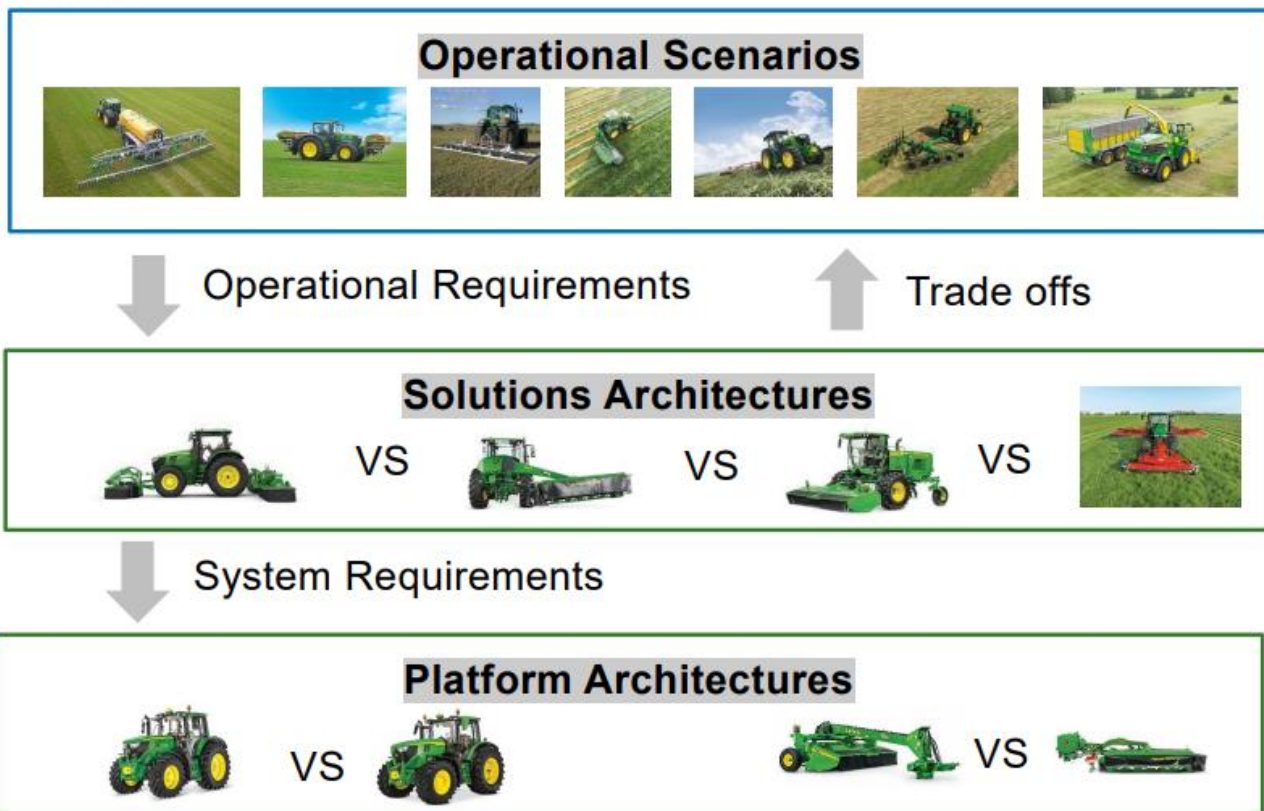Test Planning and Execution
Training

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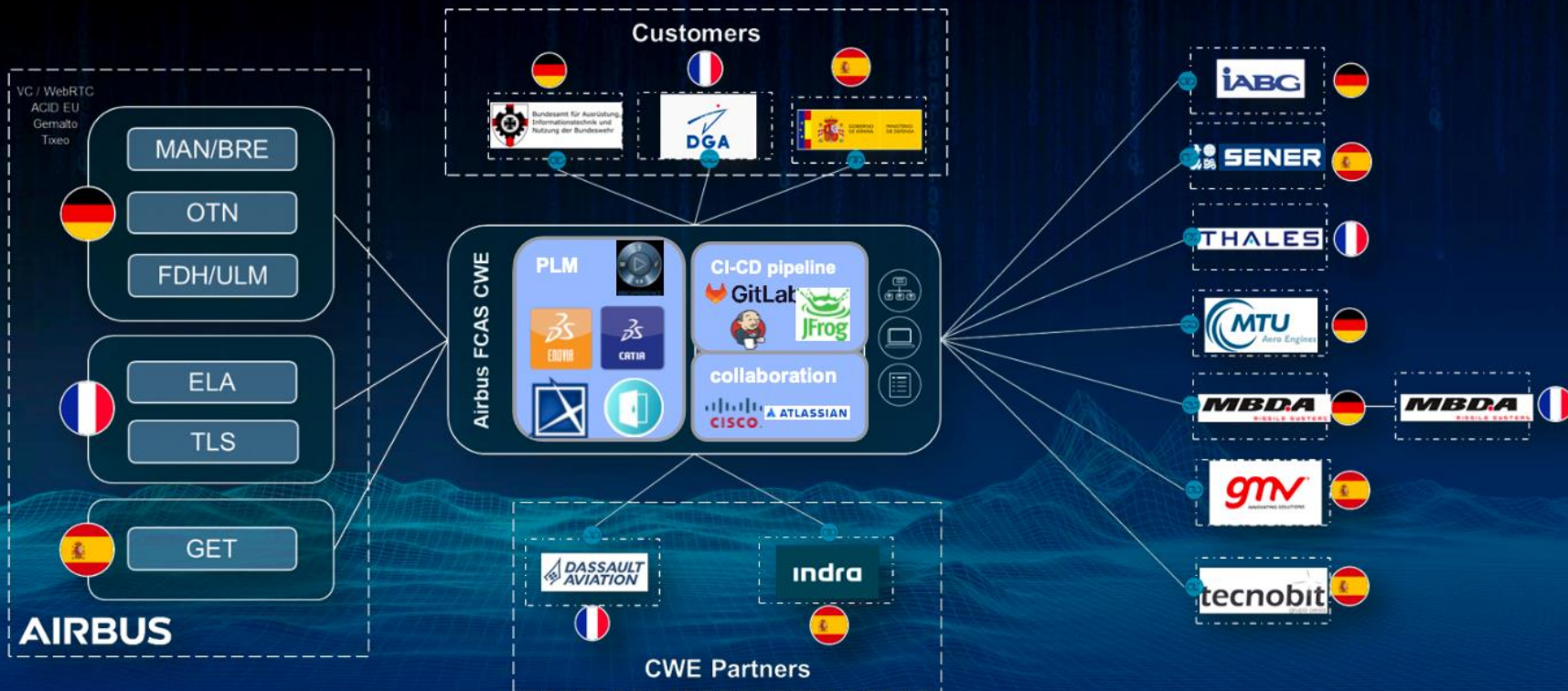**Applying UAF and the Airbus MBSE Framework within Future Combat Air System Development**

DEFENCE AND SPACE

Lalitha Abhaya, Dr. Dominique Ernadote, Dr. Jörg Wirtz
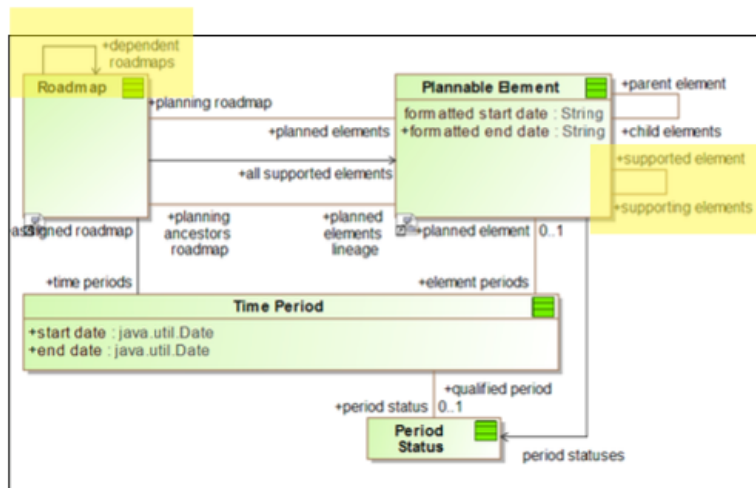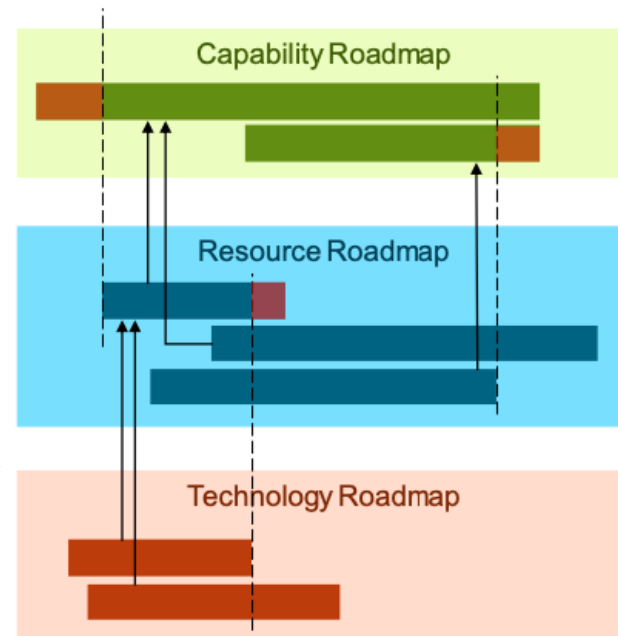
**AIRBUS**

# 3 FCAS Common Working Environment (CWE)



FCAS collaboration between System Development partners based on a military restricted cloud.

**AIRBUS**

# Planning Consistency Check



« OR » support

« AND » support

SO WHY **UAF**® ?

| | Motivation Mv | Taxonomy Tx | Structure Sr | Connectivity Cn | Processes Pr | States St | Sequences Sq | Information[c] If | Parameters[d] Pm | Constraints Ct | Roadmap Rm | Traceability Tr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Architecture Management[a] Am** | Architecture Principles Am-Mv | Architecture Extensions Am-Tx[e] | Architecture Views Am-Sr | Architecture References Am-Cn | Architecture Development Method Am-Pr | Architecture Status Am-St | | Dictionary Am-If | Architecture Parameters Am-Pm | Architecture Constraints Am-Ct | Architecture Roadmap Am-Rm | Architecture Traceability Am-Tr |
| **Summary & Overview Sm-Ov** | | | | | | | | | | | | |
| **Strategic St** | Strategic Motivation St-Mv | Strategic Taxonomy St-Tx | Strategic Structure St-Sr | Strategic Connectivity St-Cn | Strategic Processes St-Pr | Strategic States St-St | | Strategic Information St-If | Environment En-Pm-E and Measurements Me-Pm-M and Risks Rk-Pm-R | Strategic Constraints St-Ct | Strategic Deployment, St-Rm-D; Strategic Phasing St-Rm-P | Strategic Traceability St-Tr |
| **Operational Op** | Requirements Rq-Mv | Operational Taxonomy Op-Tx | Operational Structure Op-Sr | Operational Connectivity Op-Cn | Operational Processes Op-Pr | Operational States Op-St | Operational Sequences Op-Sq | Operational Information Op-If | | Operational Constraints Op-Ct | | Operational Traceability Op-Tr |
| **Services Sv** | | Services Taxonomy Sv-Tx | Services Structure Sv-Sr | Services Connectivity Sv-Cn | Services Processes Sv-Pr | Services States Sv-St | Services Sequences Sv-Sq | Operational Information Op-If | | Services Constraints Sv-Ct | Services Roadmap Sv-Rm | Services Traceability Sv-Tr |
| **Personnel Ps** | | Personnel Taxonomy Ps-Tx | Personnel Structure Ps-Sr | Personnel Connectivity Ps-Cn | Personnel Processes Ps-Pr | Personnel States Ps-St | Personnel Sequences Ps-Sq | Resources Information Rs-If | | Competence, Drivers, Performance Ps-Ct | Personnel Availability Ps-Rm-A; Personnel Evolution PS-Rm-E; Personnel Forecast Ps-Rm-F | Personnel Traceability Ps-Tr |
| **Resources Rs** | | Resources Taxonomy Rs-Tx | Resources Structure Rs-Sr | Resources Connectivity Rs-Cn | Resources Processes Rs-Pr | Resources States Rs-St | Resources Sequences Rs-Sq | Resources Information Rs-If | | Resources Constraints Rs-Ct | Resources evolution Rs-Rm-E; Resources forecast Rs-Rm-F | Resources Traceability Rs-Tr |
| **Security Sc** | Security Controls Sc-Mv | Security Taxonomy Sc-Tx | Security Structure Sc-Sr | Security Connectivity Sc-Cn | Security Processes Sc-Pr | | | | | Security Constraints Sc-Ct | | Security Traceability Sc-Tr |
| **Projects Pj** | | Projects Taxonomy Pj-Tx | Projects Structure Pj-Sr | Projects Connectivity Pj-Cn | Projects Processes Pj-Pr | | | | | | Projects Roadmap Pj-Rm | Projects Traceability Pj-Tr |
| **Standards Sd** | | Standards Taxonomy Sd-Tx | Standards Structure Sd-Sr | | | | | | | | Standards Roadmap Sd-Rm | Standards Traceability Sd-Tr |
| **Actual Resources Ar** | | | Actual Resources Structure, Ar-Sr | Actual Resources Connectivity, Ar-Cn | Simulation[b] | | | | | Parametric Execution/ Evaluation[b] | | |

UAF OMG UNIFIED ARCHITECTURE FRAMEWORK™

# But isn't this all we need?

Can we use just these domains and models?

| | Taxonomy Tx | Structure Sr | Connectivity Cn | Processes Pr | States St | Interaction Scenarios Is | Information If | Parameters Pm |
|---|---|---|---|---|---|---|---|---|
| **Operational Op** | Operational Taxonomy Op-Tx | Operational Structure Op-Sr | Operational Connectivity Op-Cn | Operational Processes Op-Pr | Operational States Op-St | Operational Interaction Scenarios Op-Is | Conceptual Data Model, | Environment Pm-En |
| **Services Sv** | Service Taxonomy Sv-Tx | Service Structure Sv-Sr | Service Connectivity Sv-Cn | Service Processes Sv-Pr | Service States Sv-St | Service Interaction Scenarios Sv-Is | | |
| **Personnel Pr** | Personnel Taxonomy Pr-Tx | Personnel Structure Pr-Sr | Personnel Connectivity Pr-Cn | Personnel Processes Pr-Pr | Personnel States Pr-St | Personnel Interaction Scenarios Pr-Is | Logical Data Model, | |
| **Resources Rs** | Resource Taxonomy Rs-Tx | Resource Structure Rs-Sr | Resource Connectivity Rs-Cn | Resource Processes Rs-Pr | Resource States Rs-St | Resource Interaction Scenarios Rs-Is | Physical schema, real world results | Measurements Pm-Me |
| | Dictionary * Dc | | | | | | | |
| | Summary & Overview SmOv | | | | | | | |
| | Requirements Rq | | | | | | | |

https://www.omgwiki.org/uaf/lib/exe/fetch.php?media=uaf_grid.png