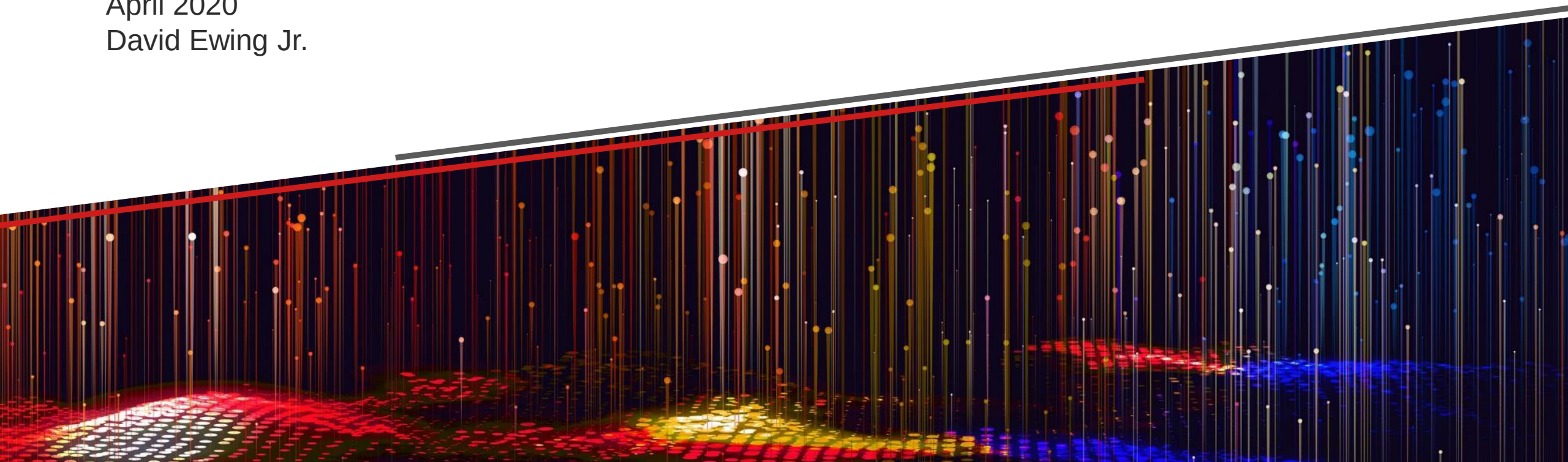
Enabling The Source of Truth

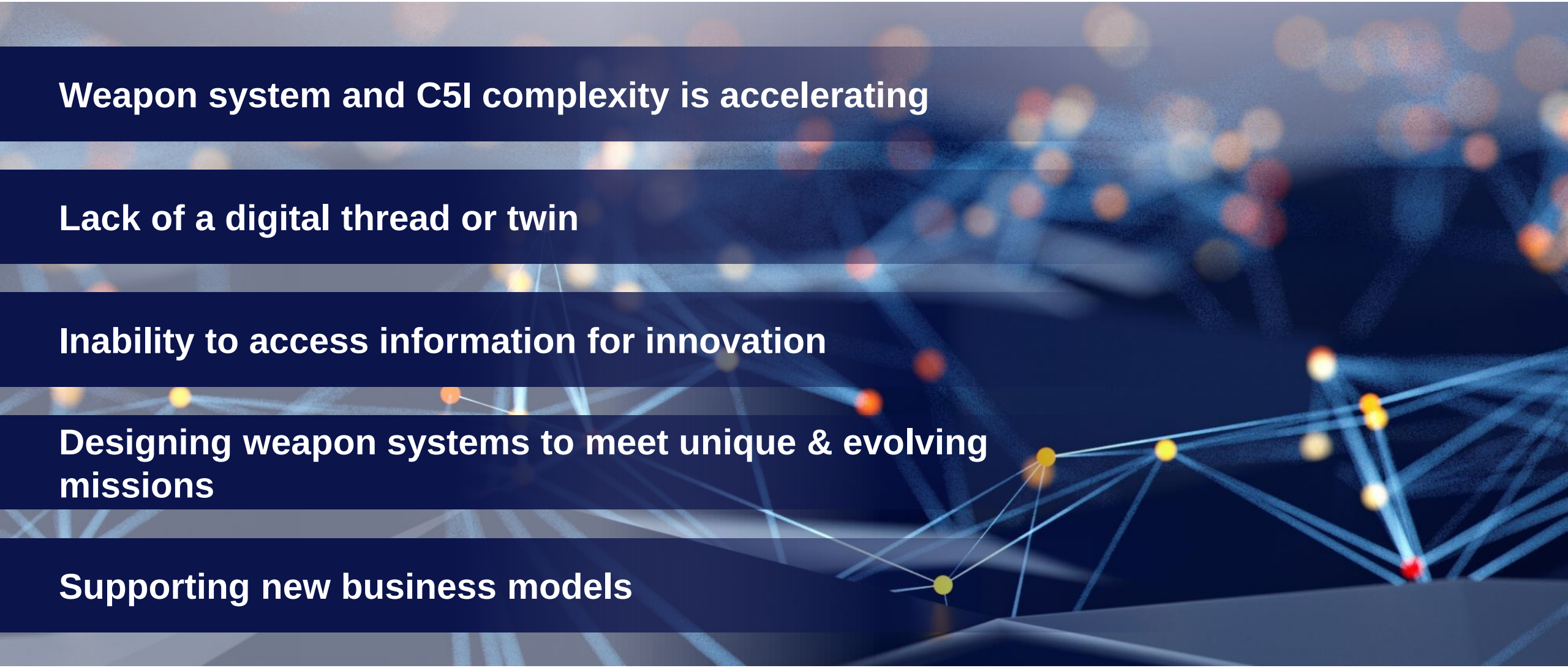
For Model Based System Development

April 2020

David Ewing Jr.



A&D Challenges Today



Weapon system and C5I complexity is accelerating

Lack of a digital thread or twin

Inability to access information for innovation

Designing weapon systems to meet unique & evolving missions

Supporting new business models

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84% of digital transformations fail.
- Forbes, 2016

14% say their (Digital Transformation) efforts have made and sustained performance improvements.
- McKinsey 2018

50% of digital transformation efforts stalled out completely.
- Forrester, 2018

3% report complete success at sustaining their (Digital Transformation) change.
- McKinsey 2018

18% of companies rate their use of digital technology as very effective.
- Harvey-Nash-KPMG COI Survey, 2017

5% of those companies involved in digital transformation had achieved or exceeded the expectations
- Bain, 2017

FRAGMENTED PROCESSES

Disconnected
Overlapping
Tribal Knowledge

Hidden Factories

INCOMPATIBLE TOOLS

Silos
Increasing effort
Hardcoded

Technical Debt

aras

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Digital Engineering Core Tenets

1

Model Based Enterprise

Enterprise Configuration Management
Platform Overlay,
Holistic, Tool Agnostic Approach

2

Authoritative Source of Truth

Platform Overlay:
Connect PDM environments & Tool agnostic
Open - data model & API

3

Technological Innovation

Holistic approach – all domains
Tool agnostic approach
Open – data model & API

4

Infrastructure Environments

Agile methodology
Greenhouse, Cloud, Virtualization
Open – data model & API

5

Transform Culture

KAIZEN 101 > BY THE PEOPLE
Commander's Intent > Empower

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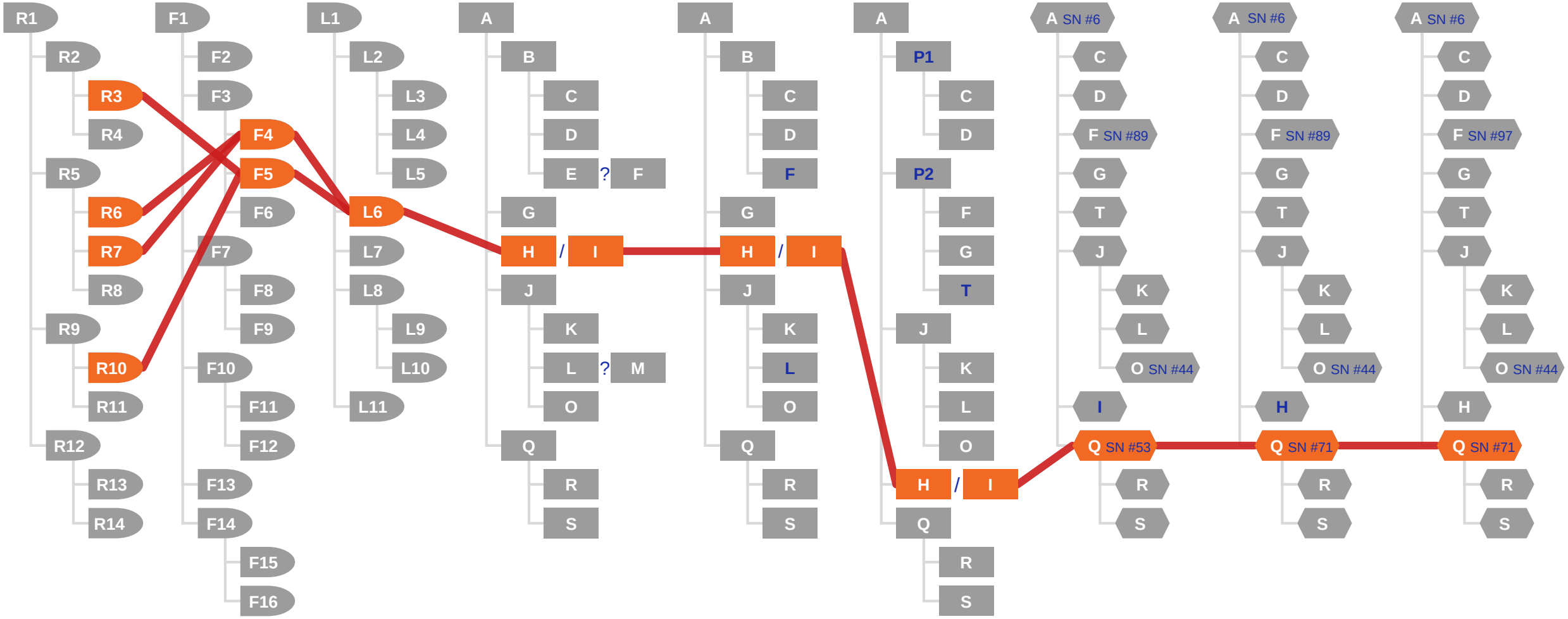
Full Lifecycle Digital Thread



REQUIRED FUNCTIONAL LOGICAL AS DESIGNED **DIGITAL THREAD** PLANNED AS BUILT AS DELIVERED AS SERVICED

DEFINE DEVELOP BUILD OPERATE

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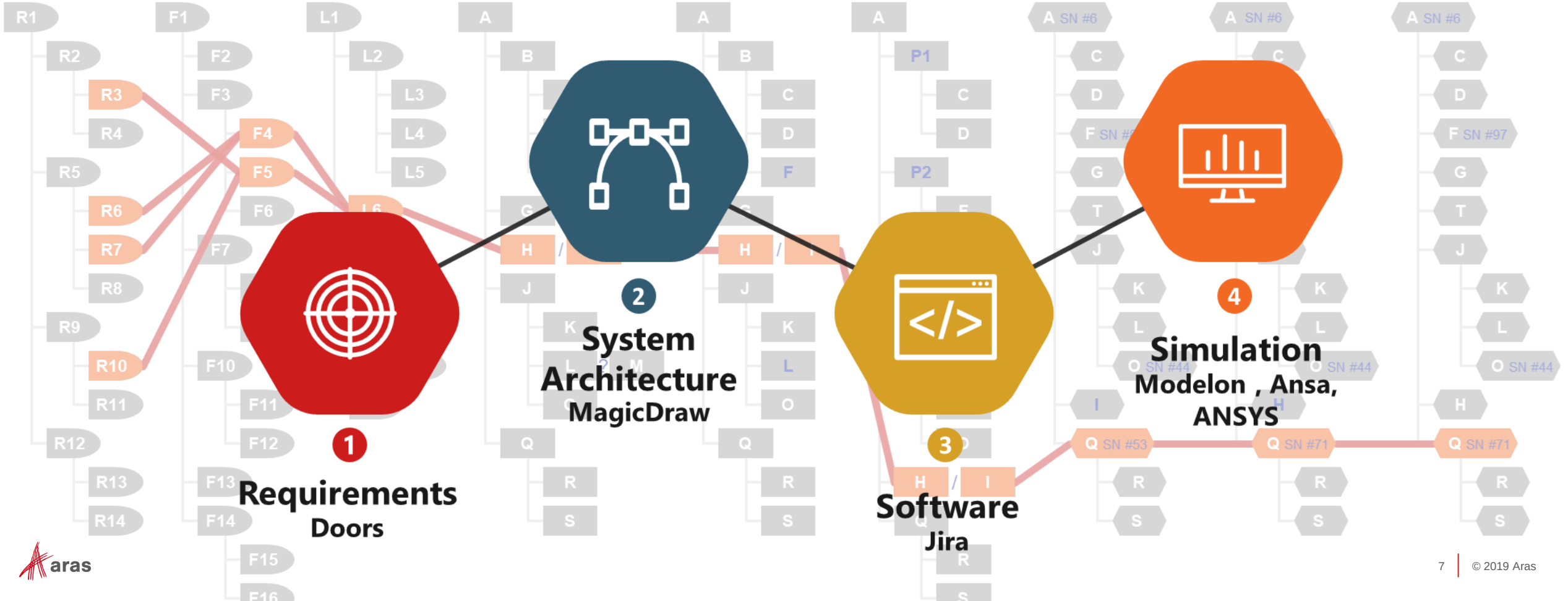
Integrated Product Development

- ~~Rip & Replace~~ | Platform overlay
- Enterprise Configuration Management



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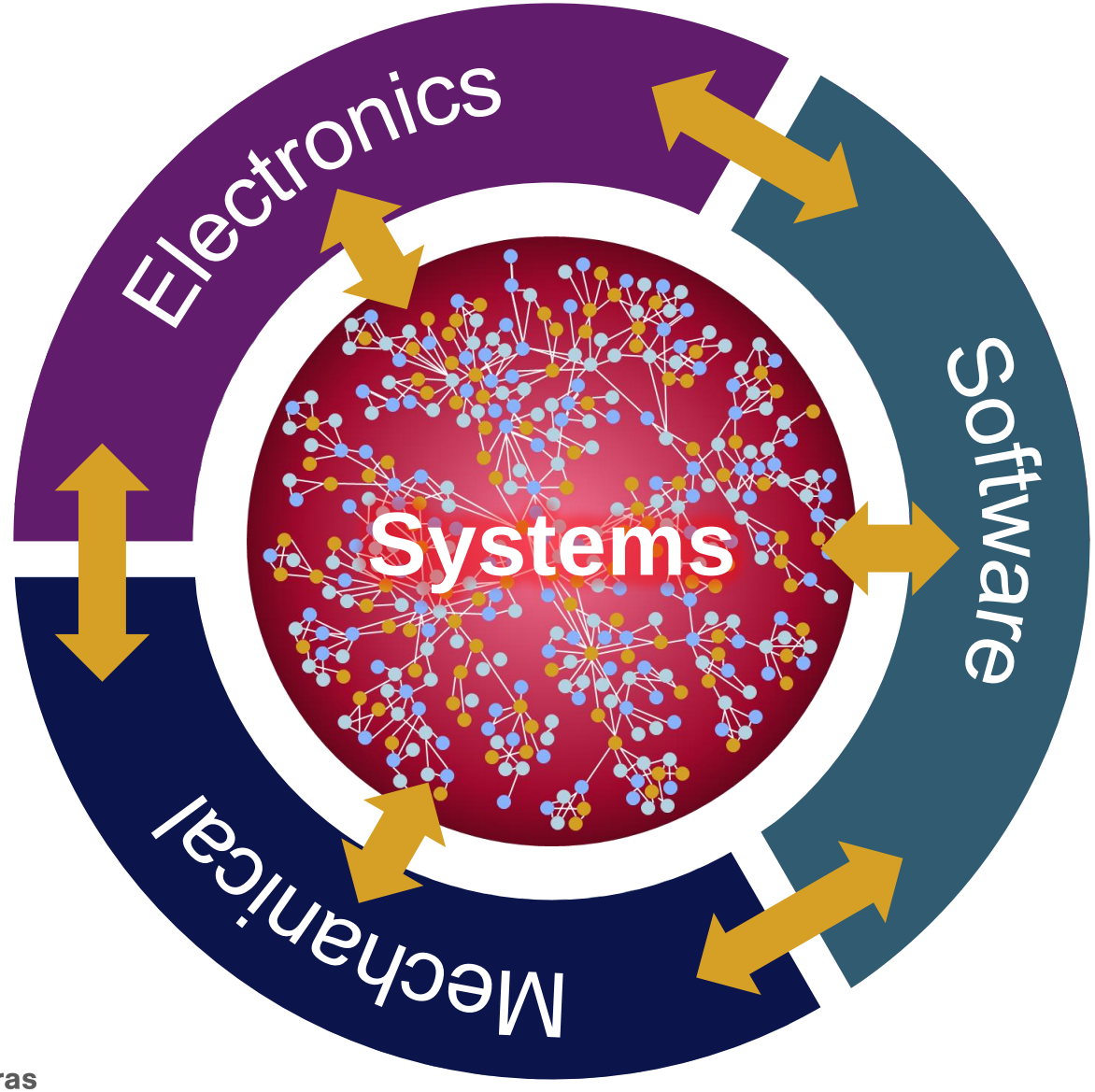
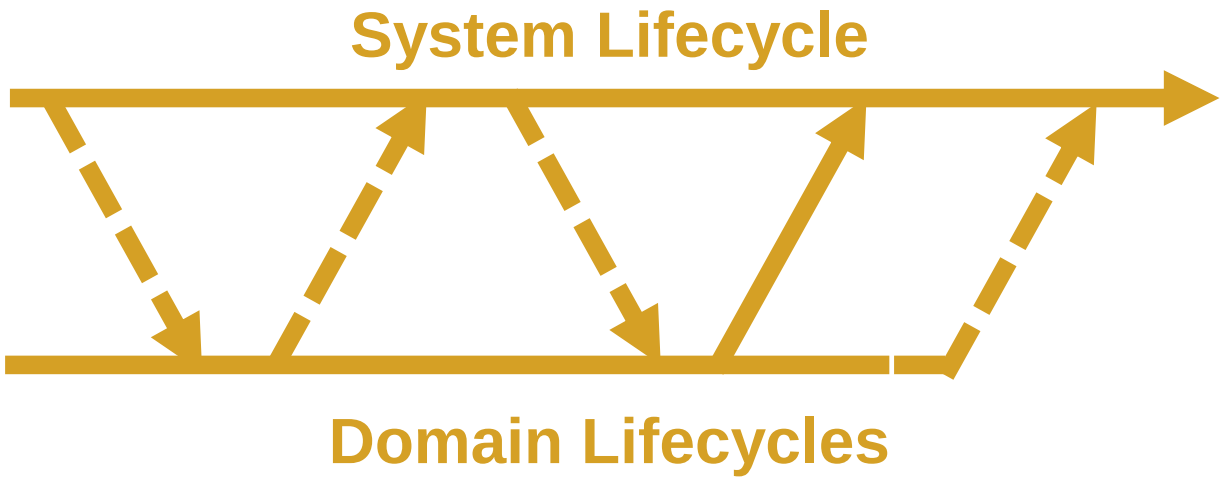
Interdisciplinary Collaboration – Systems Focus





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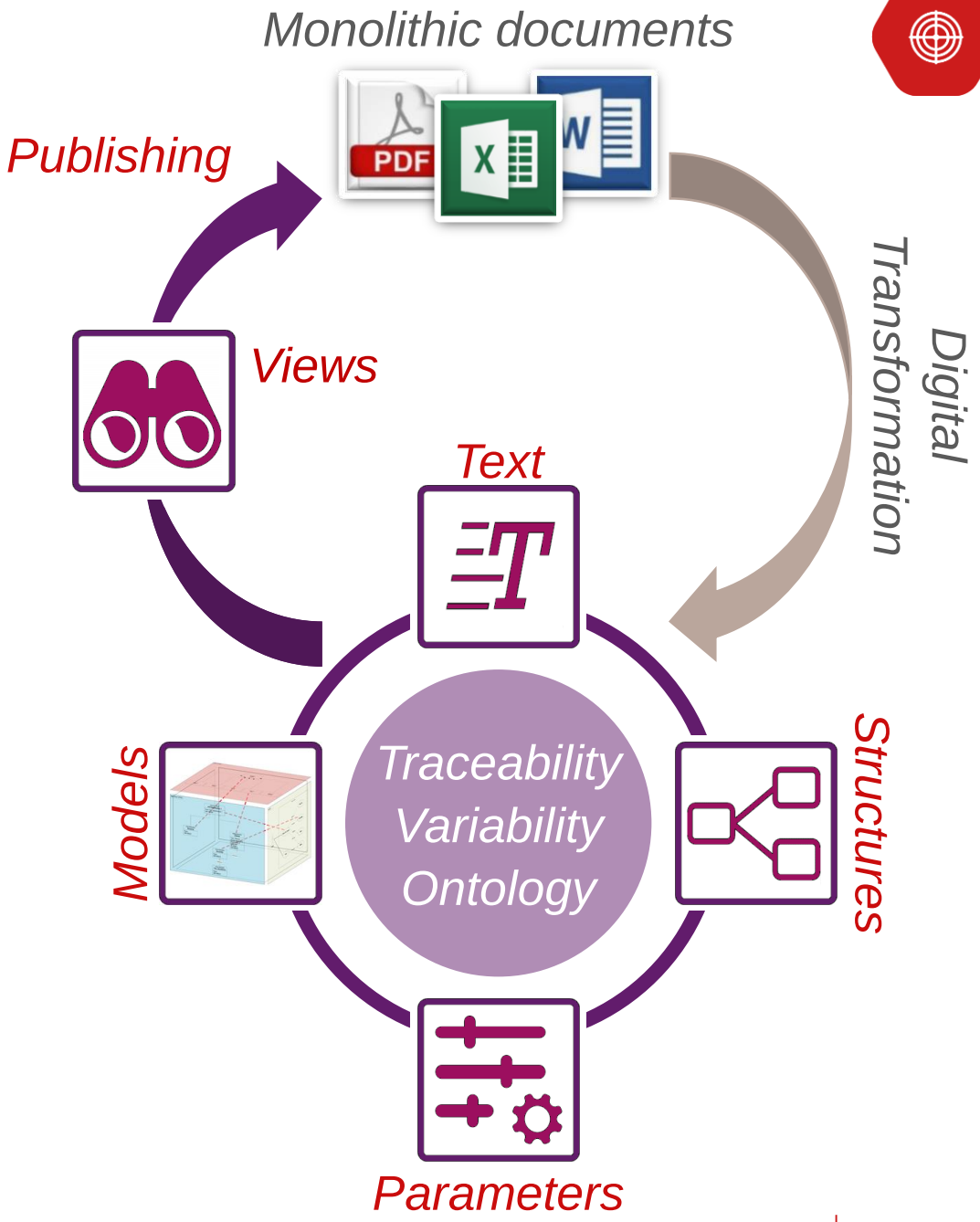
Requirements Engineering

- Move beyond traditional methodology
  - Monolithic, disconnected documents
- Ontologies – meaning & purpose
- Stand alone controlled & reusable items
- Structured, shareable, reusable content
  - Text, Equations, Graph, parameter
- Relatable – RFLP, internal/external
- Requirements Documents allow grouping & reuse



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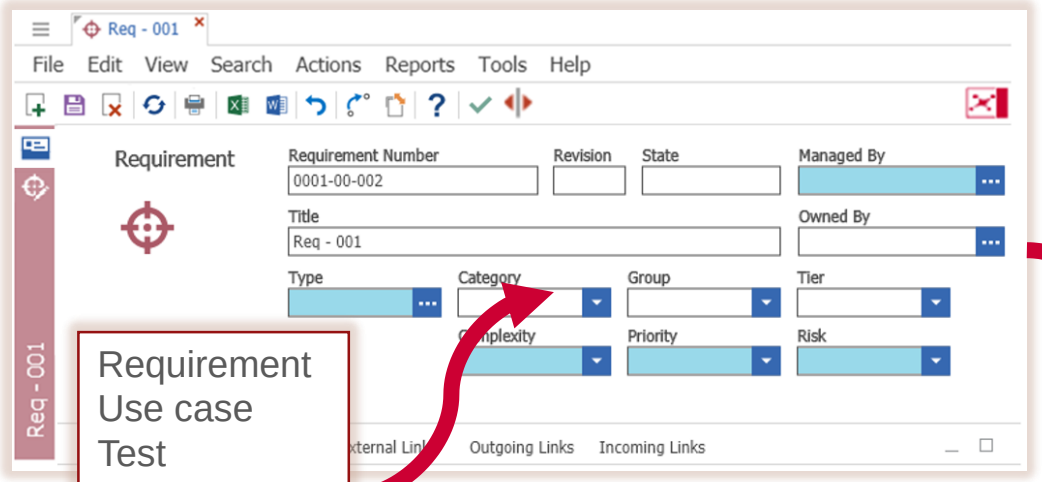
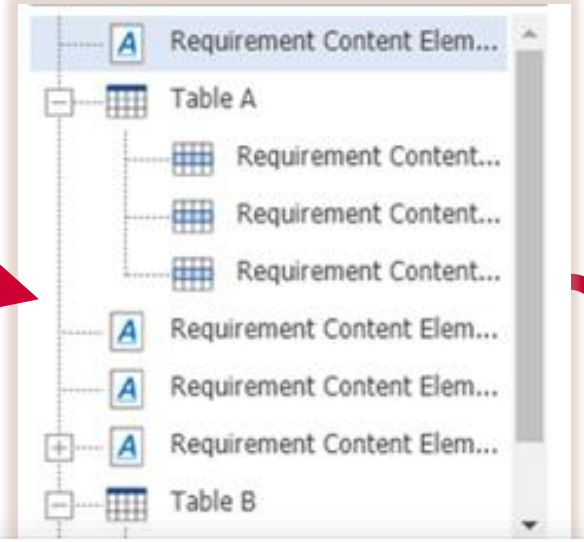
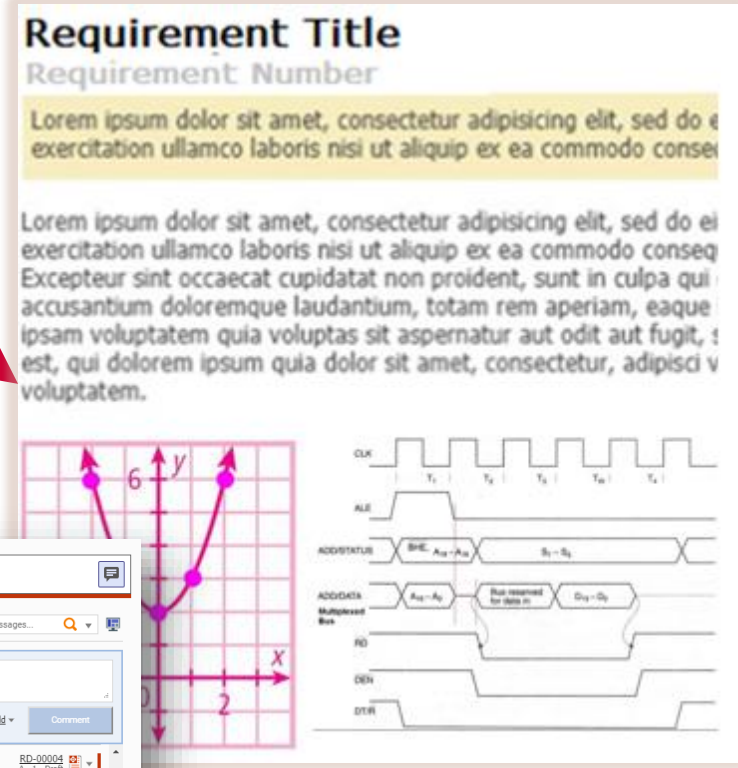
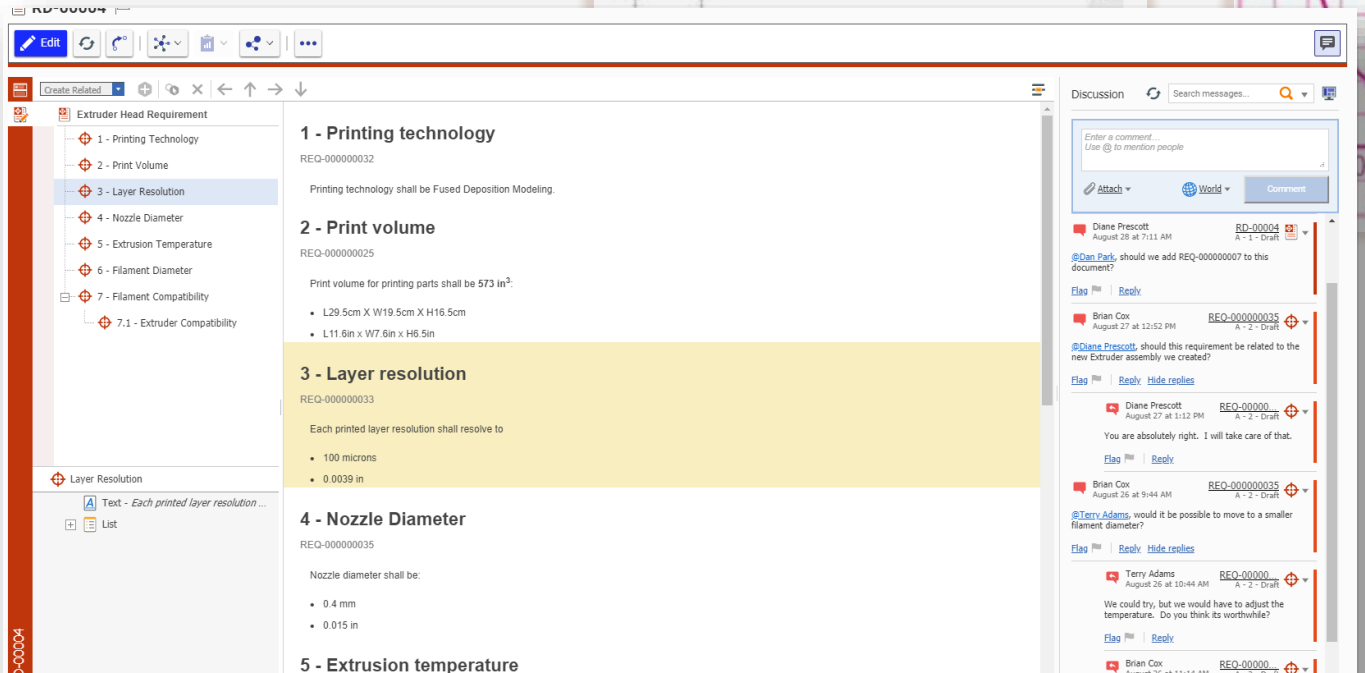
Requirements Engineering



Requirement
Use case
Test
Verification
Validation
Text
Structure







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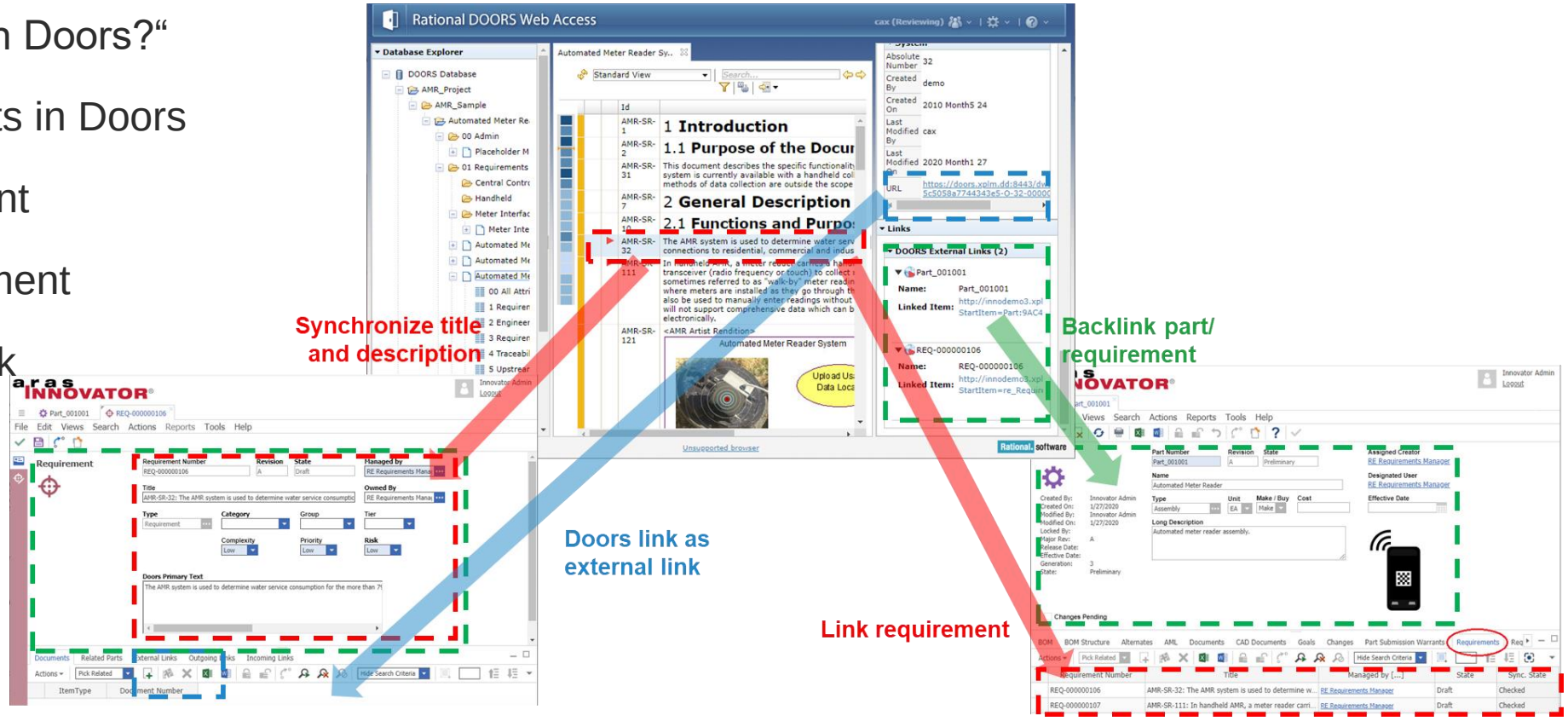
DOORS Integration: Use Cases

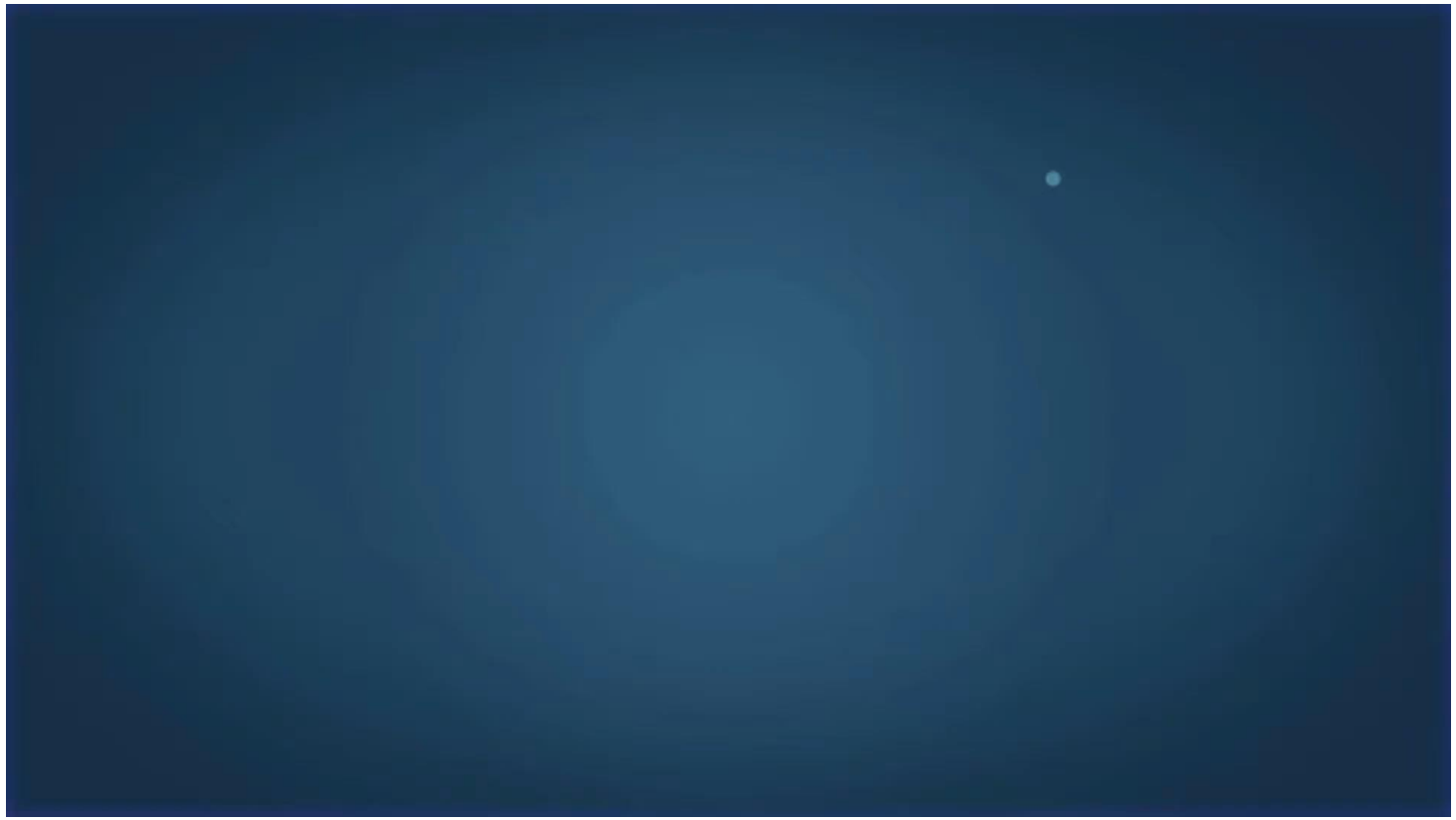
- Select and link requirement to part or other item
- Create and update requirement in Innovator
- Create backlink in Doors to requirement/part
- Identify and visualize suspect state:
  “Has something changed in Doors?“
- Create/update requirements in Doors
- Revise part and requirement
- Navigate to Doors requirement
- Delete part/requirement link
- Display live Doors data



DOORS Integration

Full video online:
https://youtu.be/JIQKevkfReI

- Link DOORS requirement
- DOORS UI from Aras
- Aras Requirement in DOORS
- Multiple links
- Requirement change



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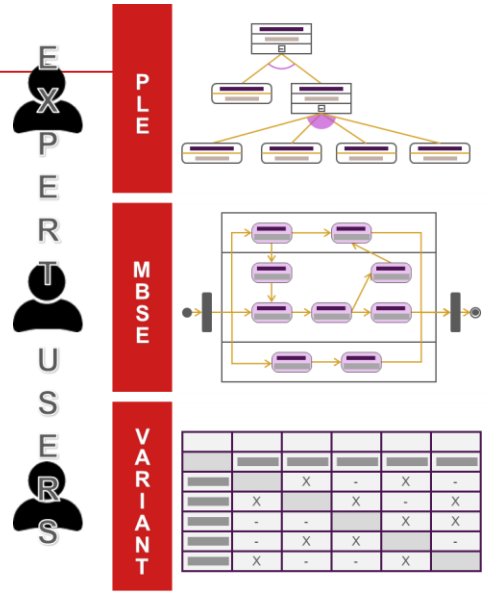
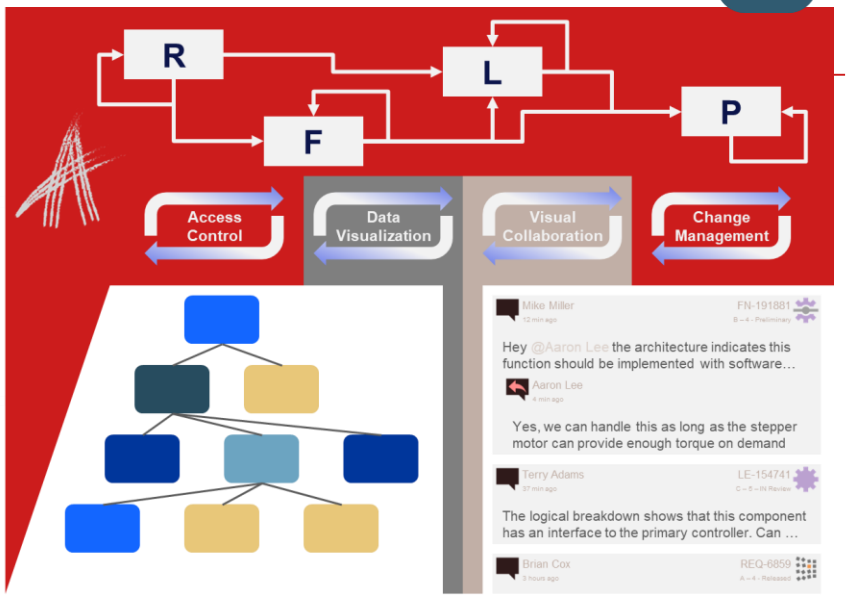
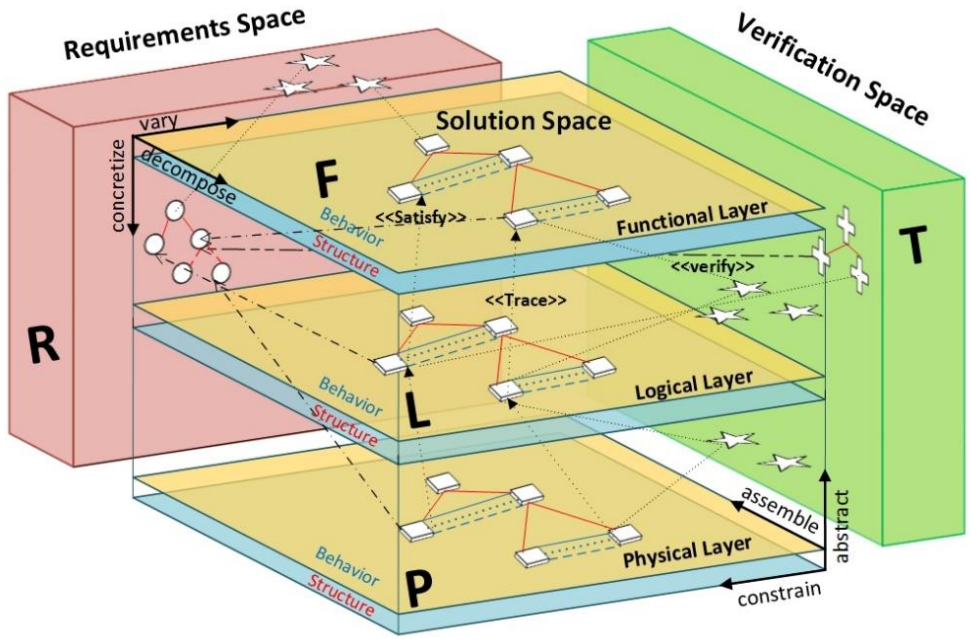
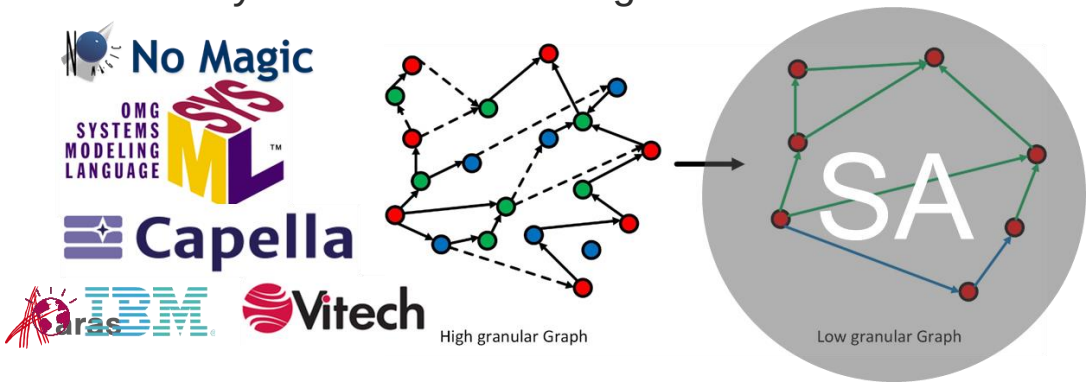
Systems Architecture

- Central System Architecture & Ontology
- Enterprise Configuration Management & traceability
- Model variants and PLE configurability as early as possible
- Enables cross-discipline collaboration with downstream/supplier specialists
- MBSE Integration
  - Model object abstraction - granularity
  - Configuration control of abstraction and models
  - Dynamic data exchange

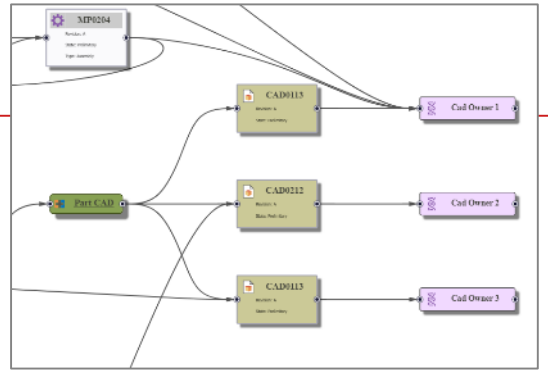


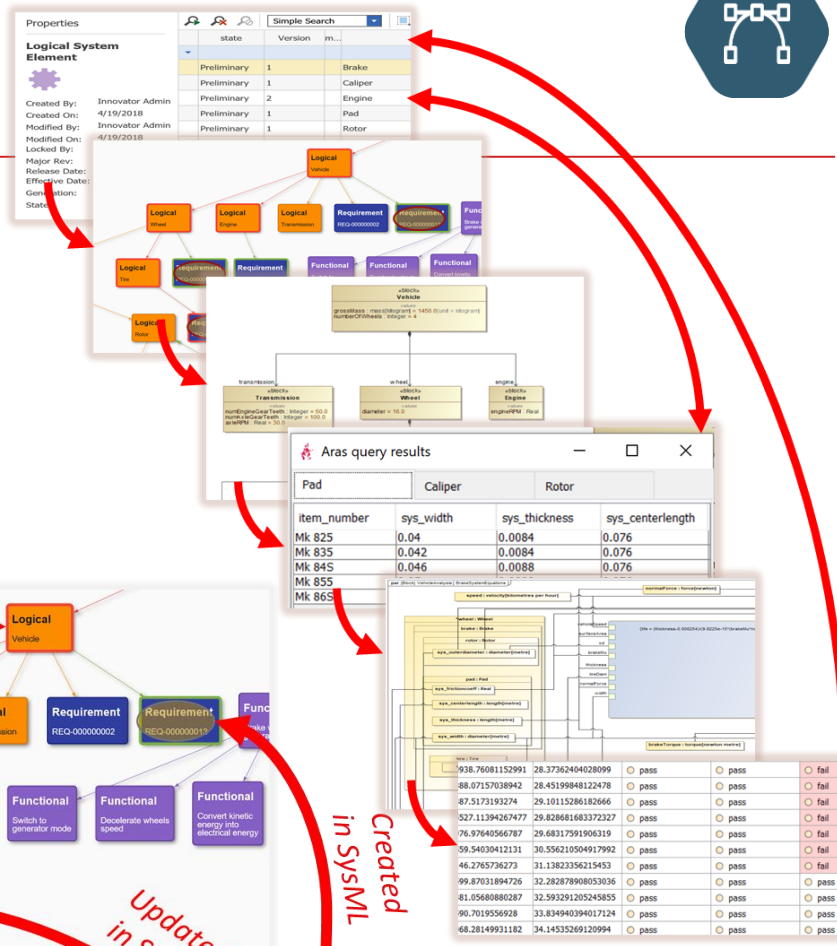






Systems Architecture





Properties

System Model

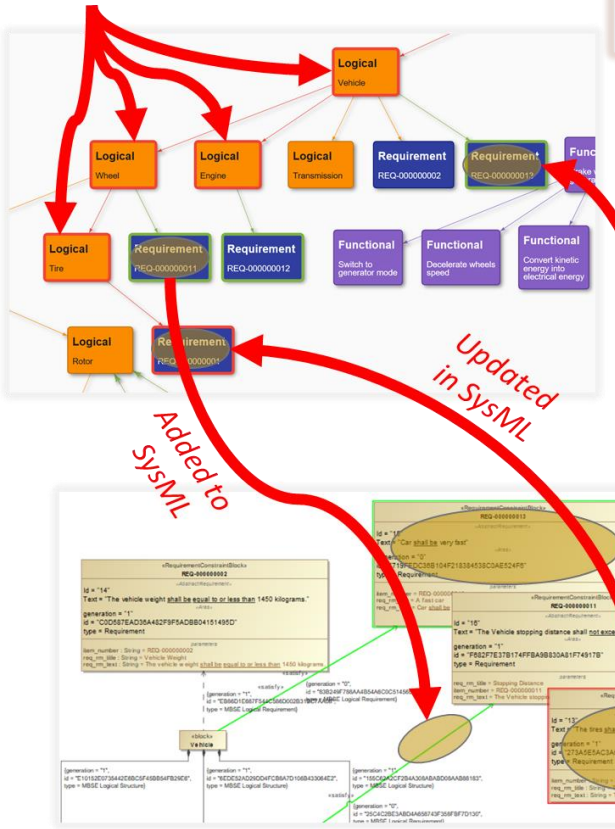
Created By:	Innovator Adm
Created On:	5/19/2017
Modified By:	Innovator Adm
Modified On:	5/25/2017
Locked By:	
Major Rev:	A
Release Date:	
Effective Date:	
Generation:	2
State:	

Simple Search

Name	Version
Vehicle Model LX	2

Function Name	Version	Status
Brake	2	Preliminary
Brake with generator	2	Preliminary
Charge battery	1	Preliminary
Convert kinetic energy into electrical energy	1	Preliminary
Decelerate wheels speed		
Engage friction brake		
Force brake pads to move inwards		
Generate friction brake contacting br		
Move piston inside master cilinder		
Push Brake Pedal		

Logical Name	Version	state
Brake	2	Preliminary
Caliper	1	Preliminary
Engine	1	Preliminary
Pad	2	Preliminary
Rotor	2	Preliminary
Tire	2	Preliminary
Transmission	1	Preliminary
Vehicle	2	Preliminary
Wheel	2	Preliminary



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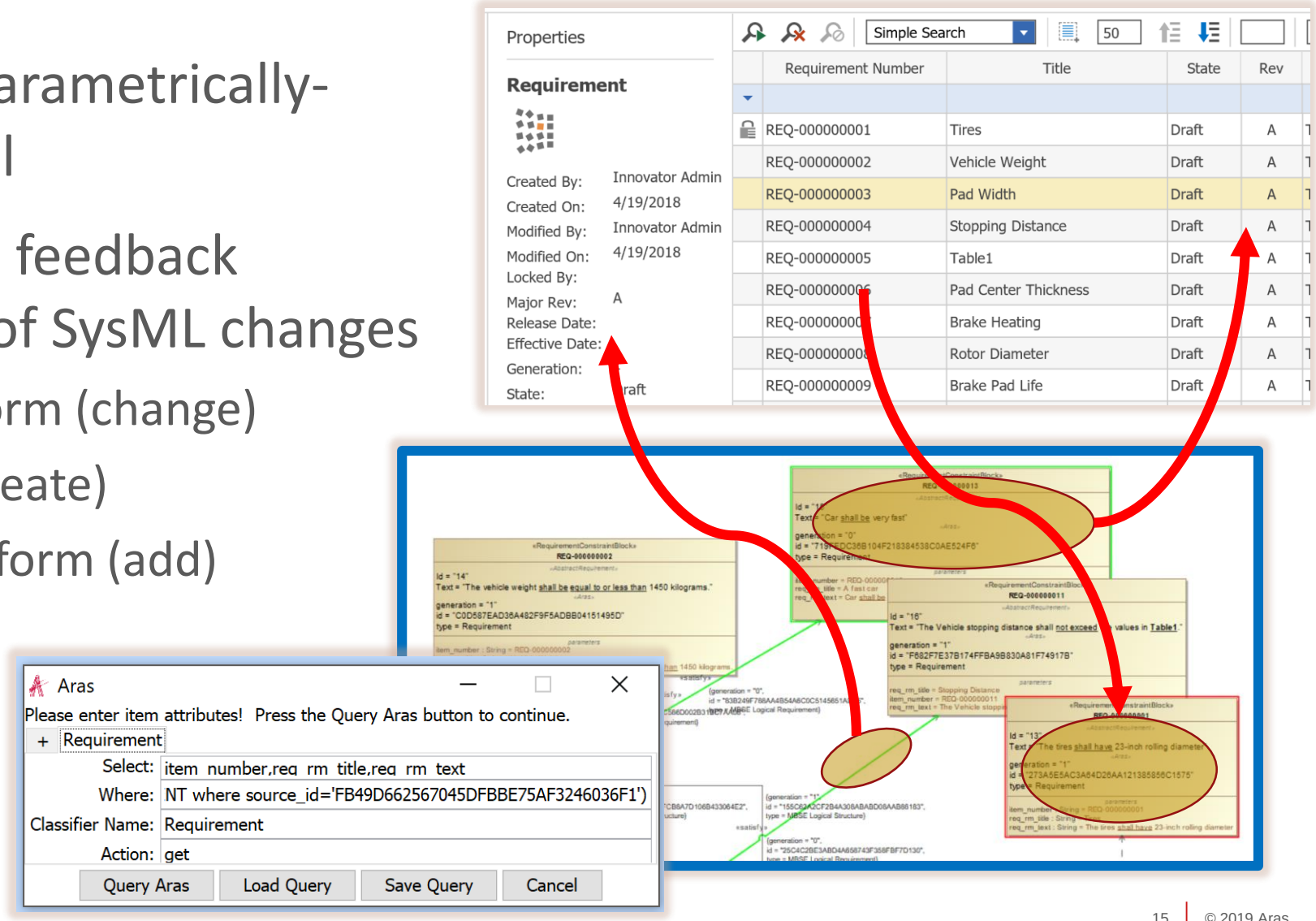
MagicDraw Integration

- SysML user manipulates parametrically-driven requirements at will
- Integration provides visual feedback regarding Platform status of SysML changes
  - Red -> modified from Platform (change)
  - Green -> not in Platform (create)
  - No color -> query from Platform (add)



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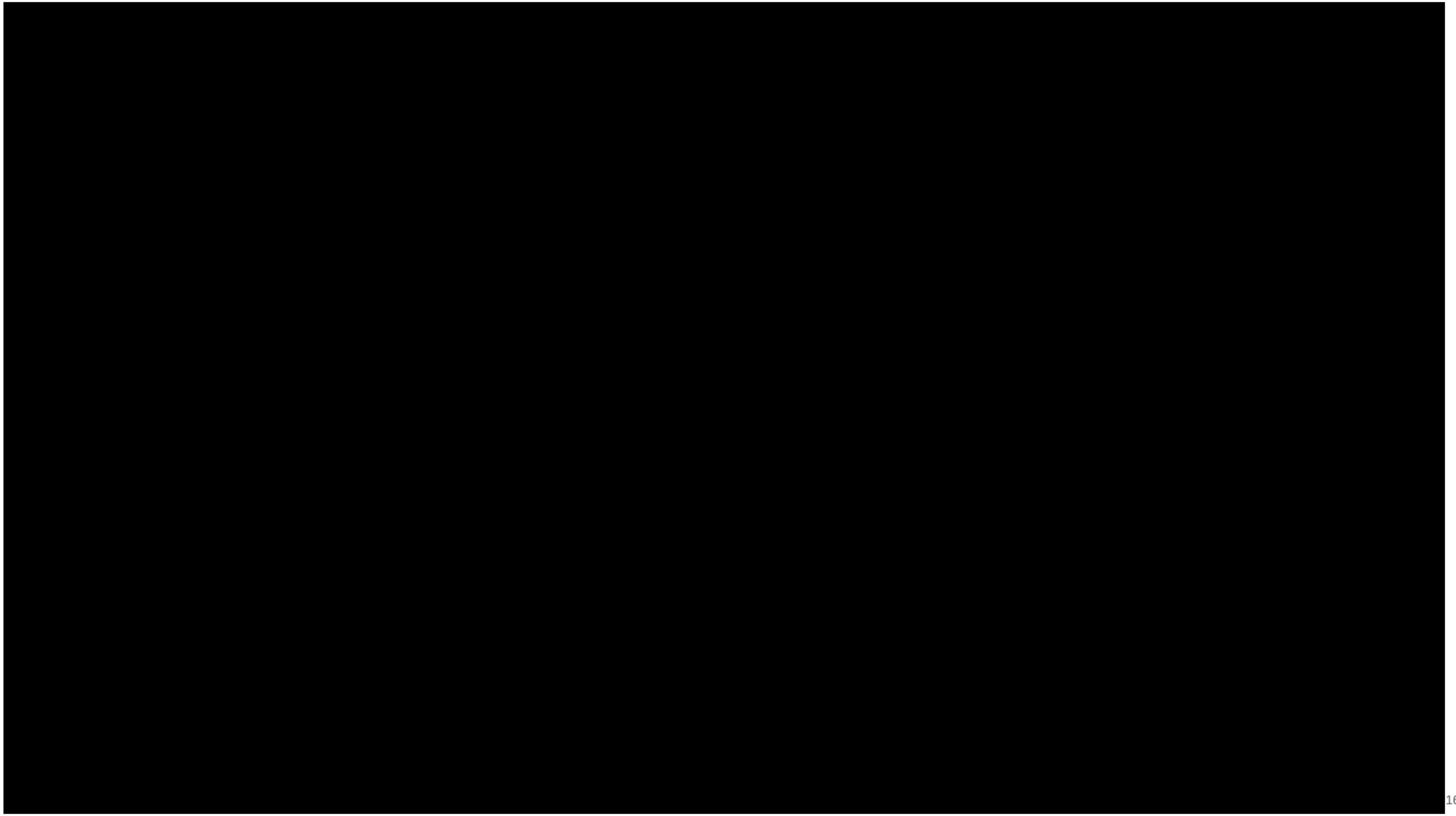
MagicDraw Integration

Full video online:
https://youtu.be/HPIWyS0vgr0



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Embedded Software

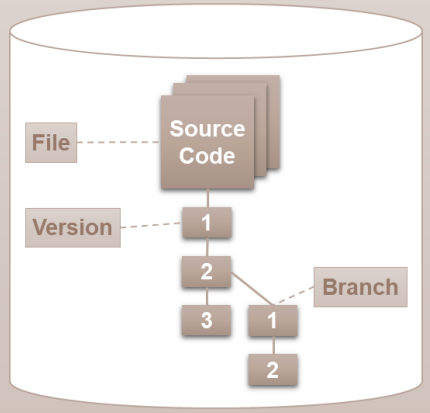
- Integrated Software and Hardware development and operation processes(DevOps)
- Support domain differences
- Tool agnostic approach
- Synchronize master with other systems for visibility and integrity
- Single, cross-discipline problem reporting and change process

JIRA

Issue tracking,
change management, agile planning

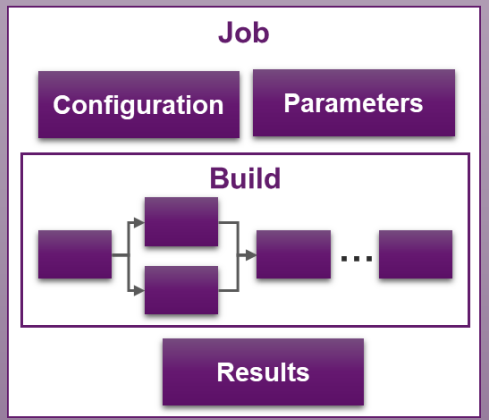
Git

Software configuration management



Jenkins

Automated build –
Creating software binaries from source code



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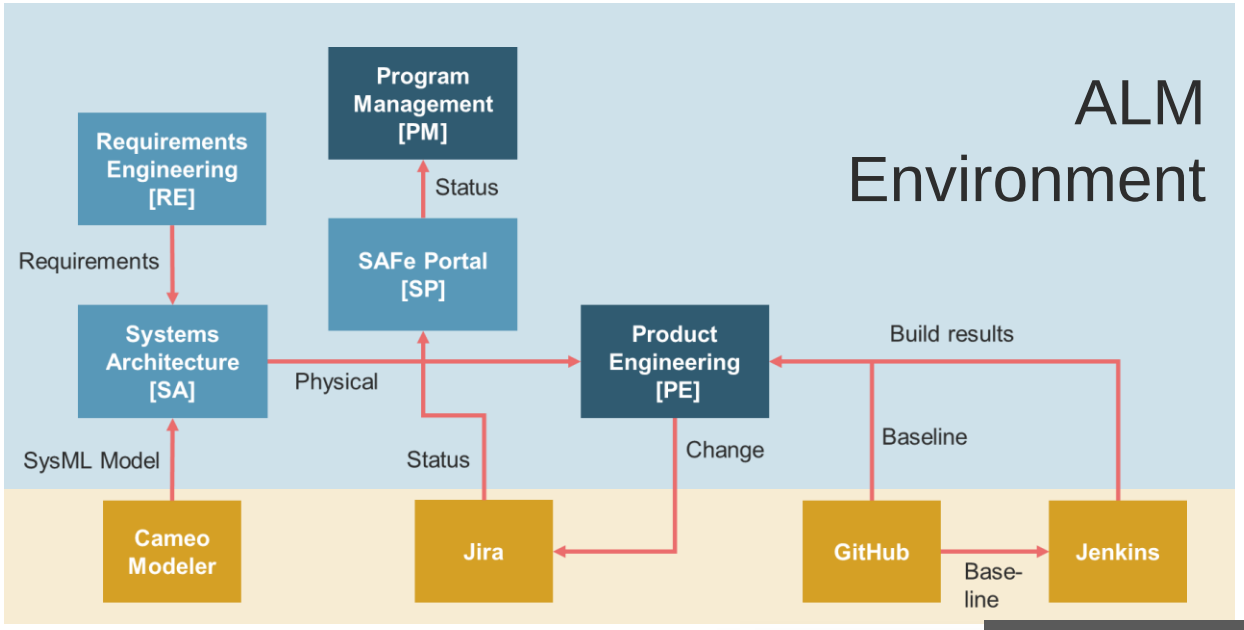
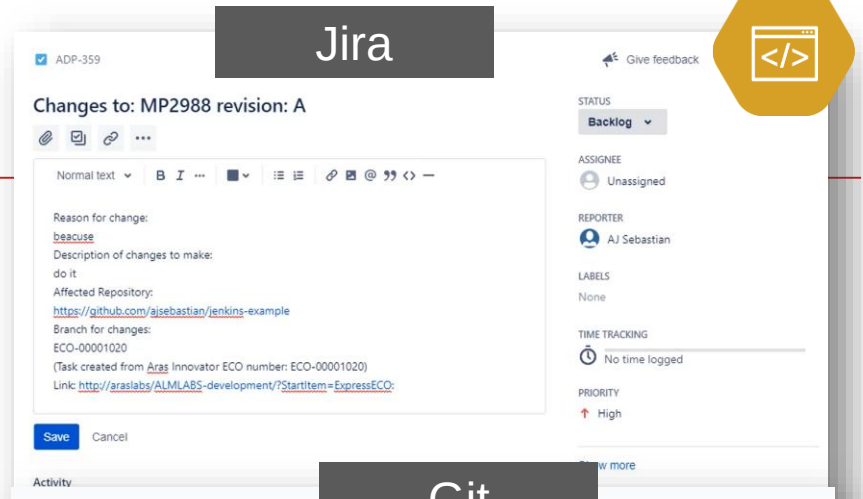
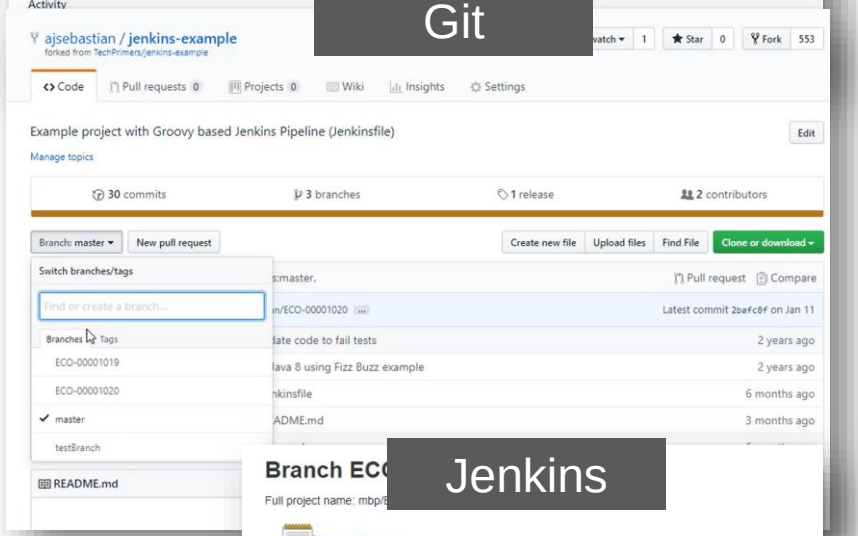
Embedded Software



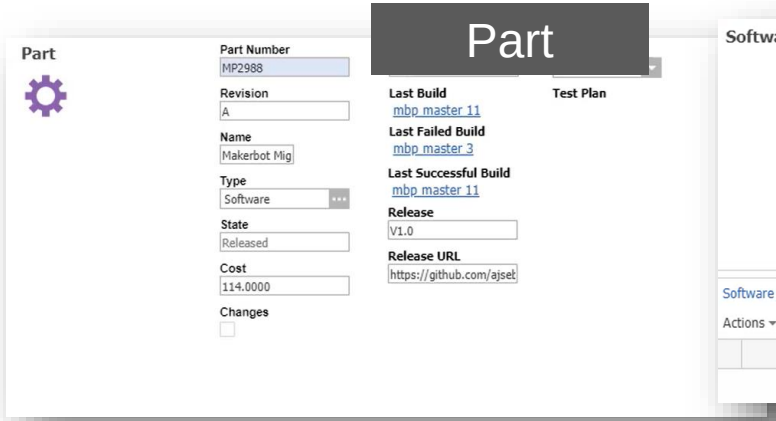
Jira



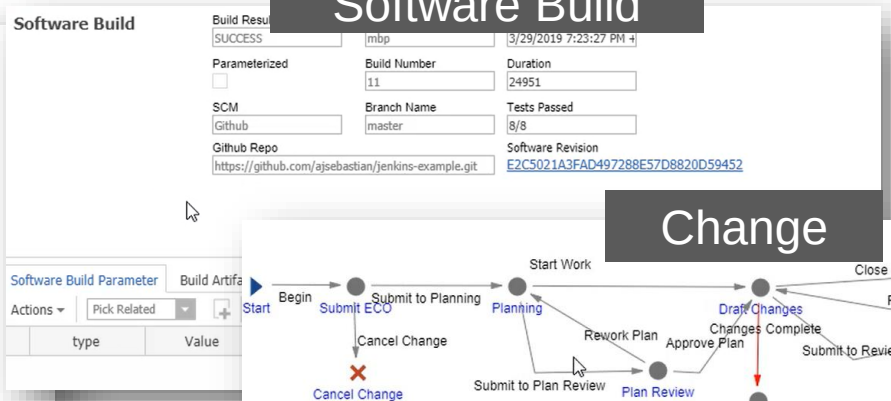
Git



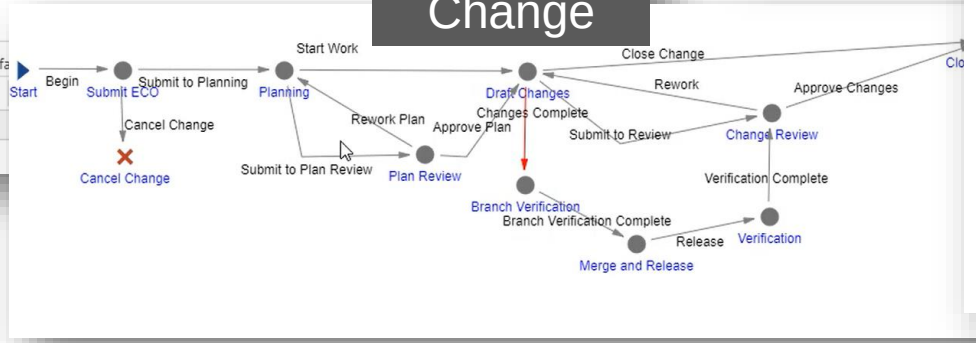
Part



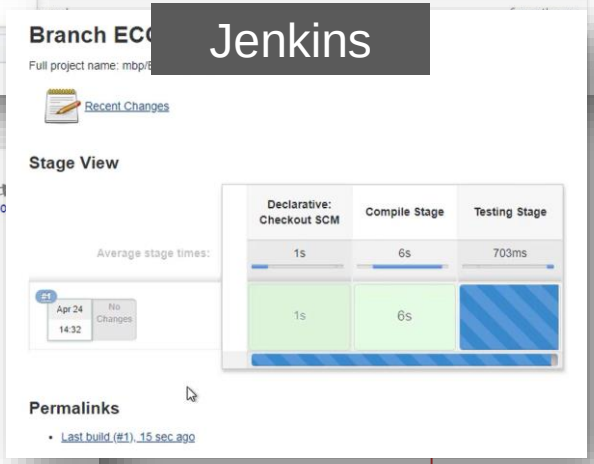
Software Build



Change



Jenkins



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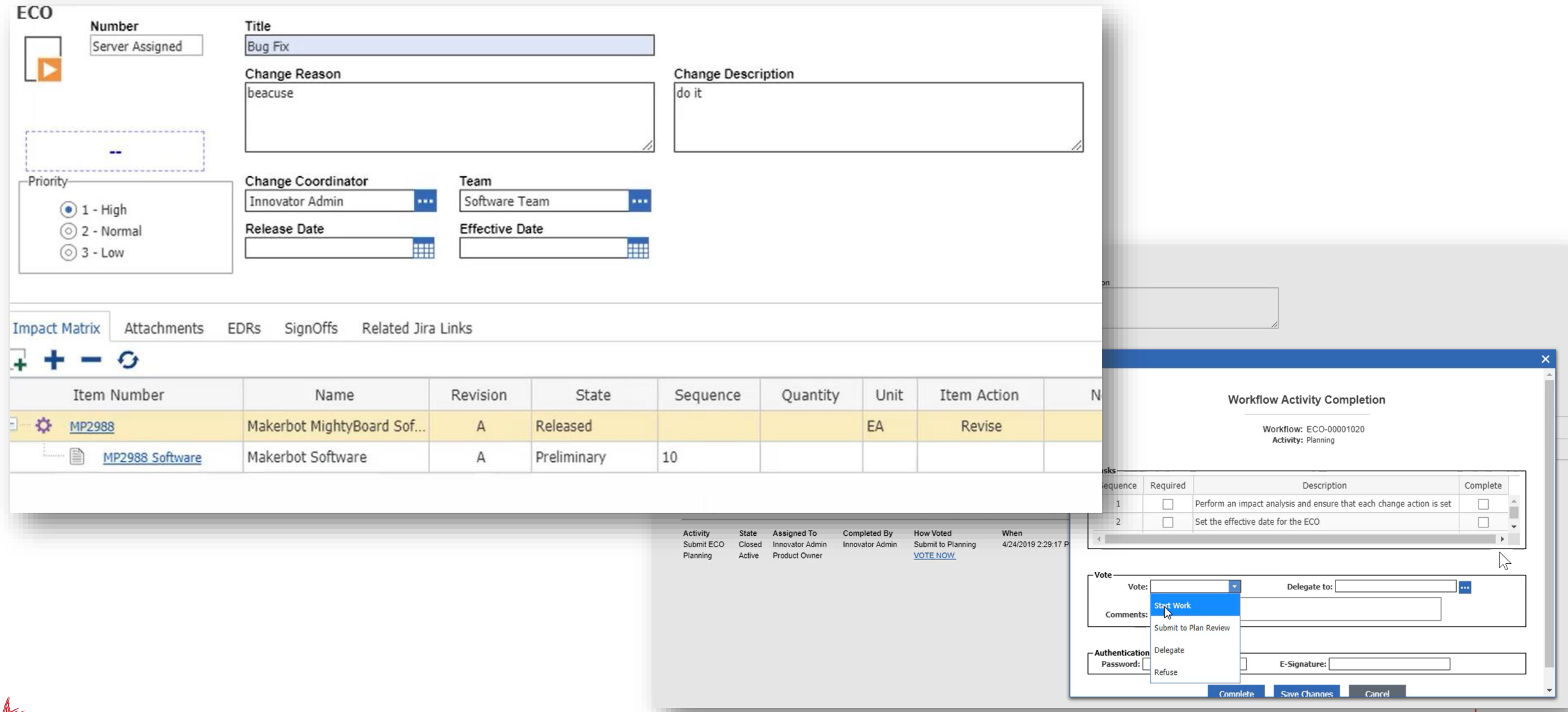
Jira & Git Integration: Aras ECO



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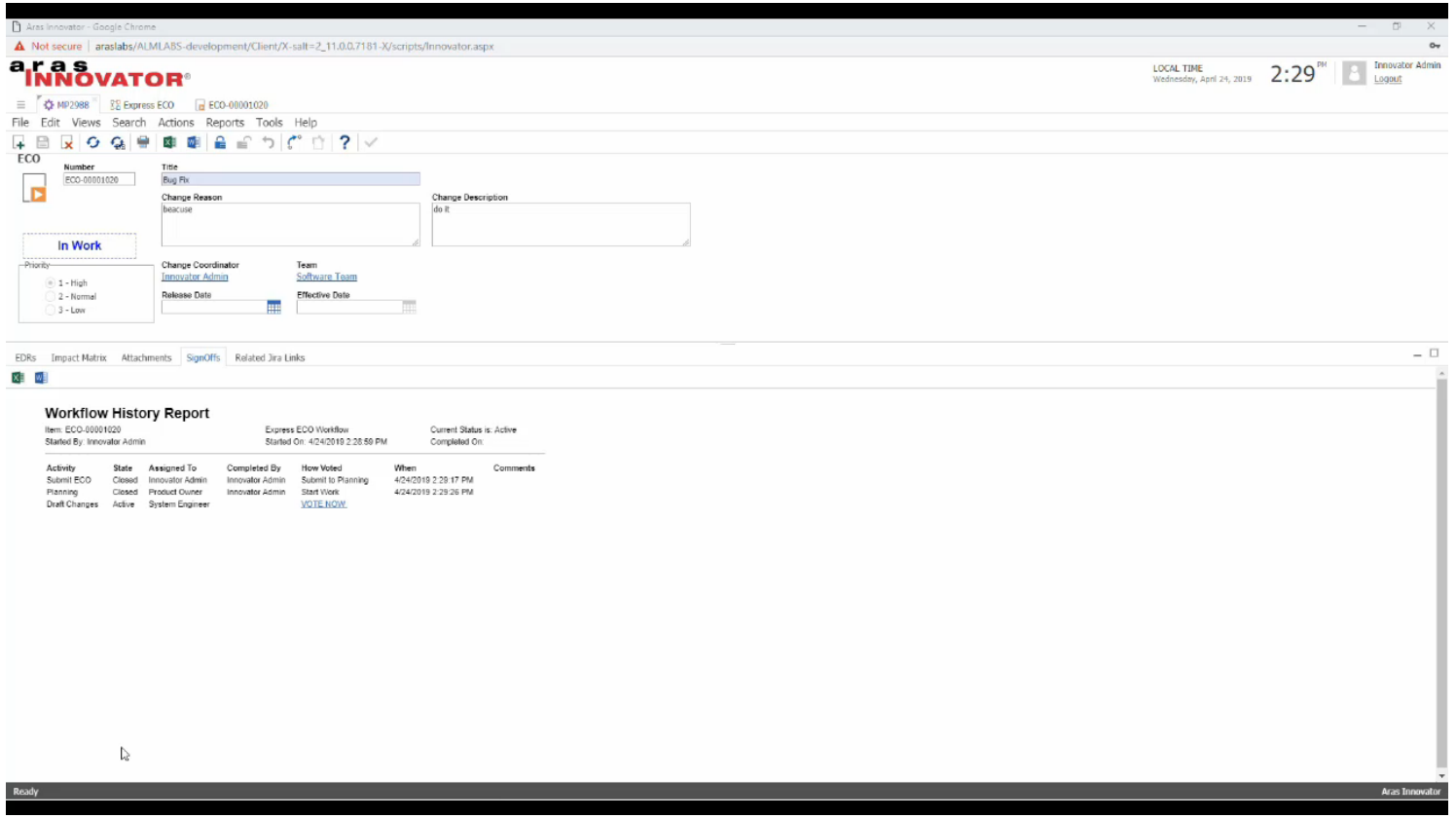
Jira & Git Integration

Contact us for full video

- Kanban ticket from Innovator ECO - Aras info on Card, Jira info on ECO
- New Git branch auto created
- Software engineer takes Jira task/ ticket
- Perform work (code)



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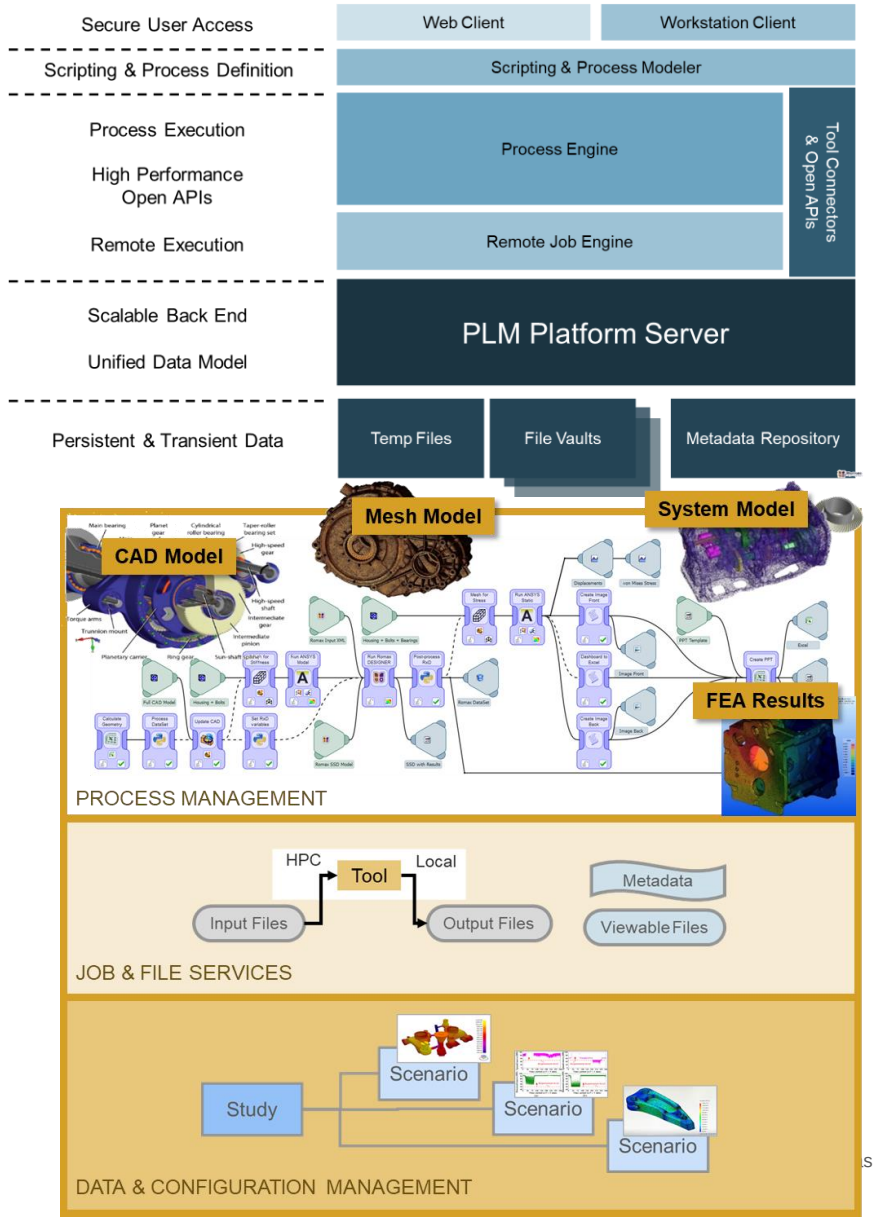
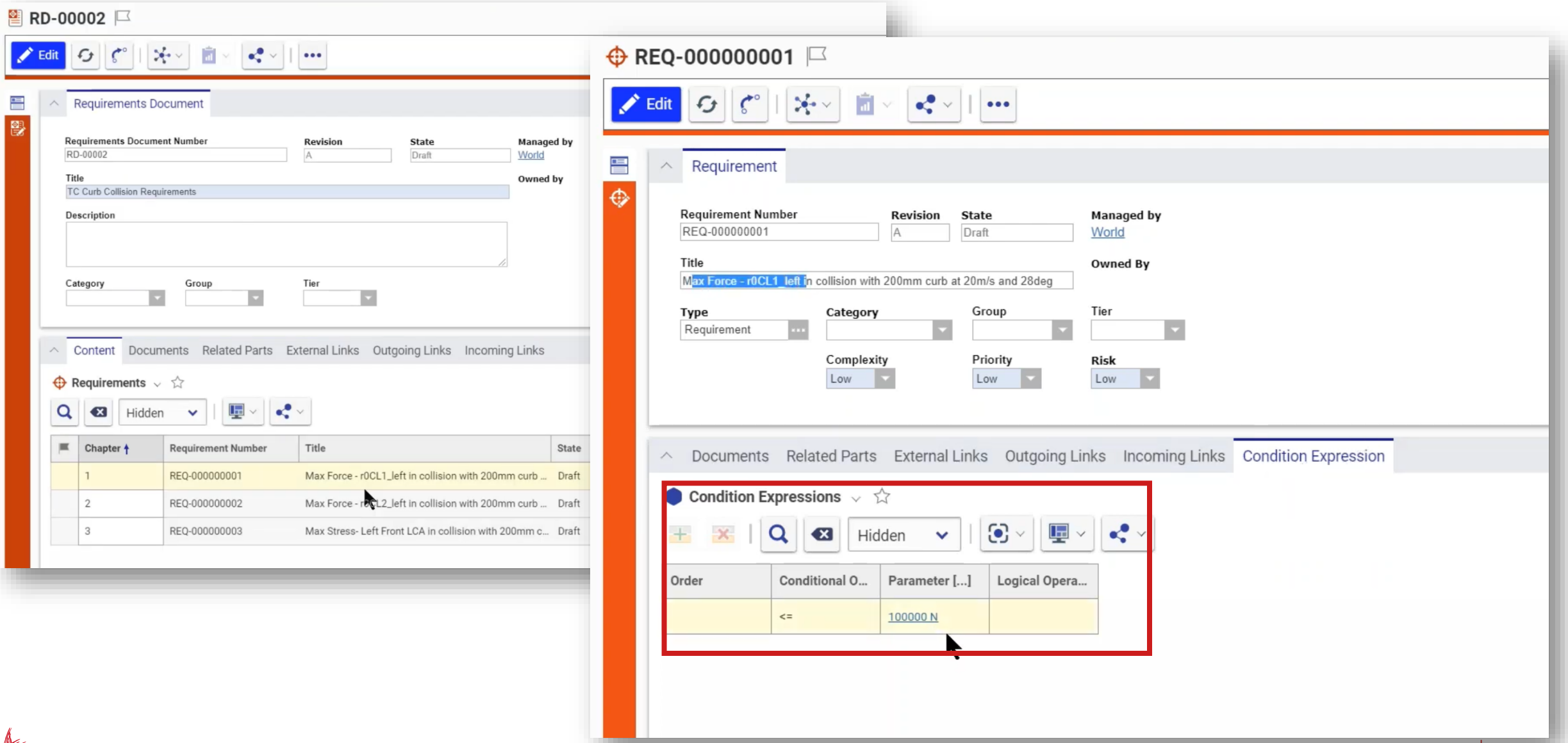
Simulation Data Management

Full video online:
https://youtu.be/SaY2NdJrjJ4

- **Manage simulation in the digital thread:** Connect processes and results to configurations and requirements for traceability
- **Improve visibility:** More teams can access simulation processes and results in context with their work
- **Leverage existing tools while supporting reuse:** Simulation experts use their preferred tools and best practices
- **Accelerate innovation:** Drive new value as more lifecycle teams can access repeatable, multi-physics simulations



Simulation: Drive From Requirements



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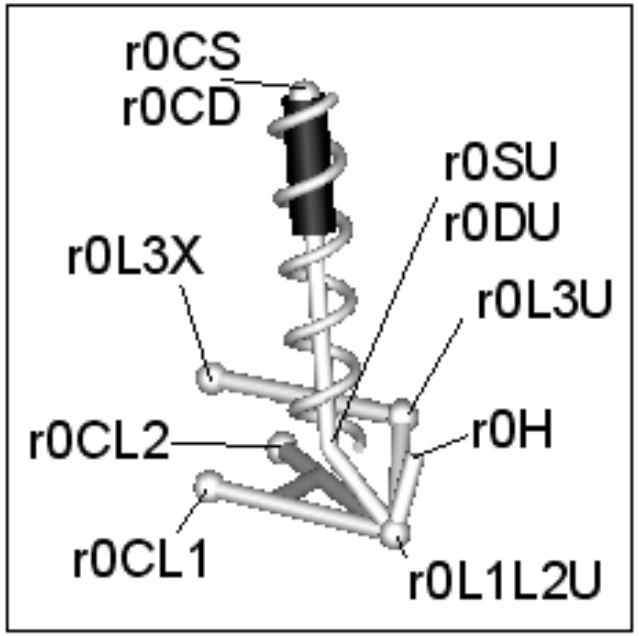
Simulation: Modelica Integration

Hard points

r0H	{0.0,0.7,0.0}	m	Position of hub center, resolved in vehicle frame
r0A	r0H	m	Position of origin of stabilizerFrame, resolved in vehicleFrame
r0X	steering.r0R_1	m	Position of origin of steerLinkFrame, resolved in vehicleFrame
r0CL1	{-0.008,0.375,-0.051}	m	Position of front link mount in chassis, resolved in vehicleFrame
r0CL2	{-0.318,0.354,-0.035}	m	Position of rear link mount in chassis, resolved in vehicleFrame
r0CS	{0.025,0.541,0.4}	m	Position of spring mount in chassis, resolved in vehicleFrame
r0CD	r0CS	m	Position of strut/damper mount in chassis, resolved in vehicleFrame
r0SU	{0,0.579,0.042}	m	Position of spring mount in upright, resolved in vehicleFrame
r0DU	r0SU	m	Position of damper mount in upright, resolved in vehicleFrame
r0L1L2U	{0.015,0.675,-0.072}	m	Position of upright-strut joint, resolved in vehicleFrame
r0L3X	r0X	m	Position of steer link inner joint, resolved in vehicleFrame
r0L3U	{-0.128,0.643,0.073}	m	Position of steer link outer joint, resolved in vehicleFrame



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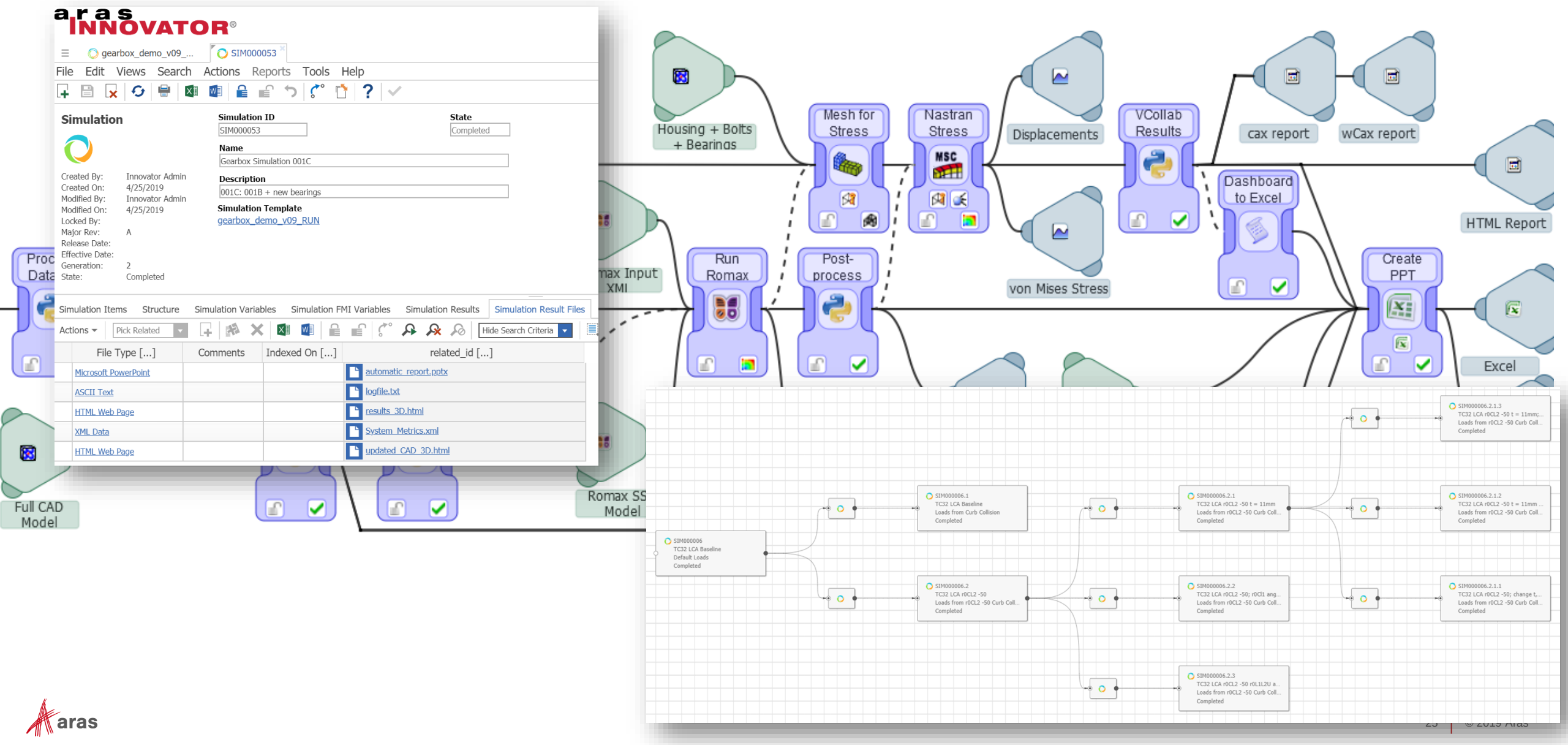
Simulation: Manage Simulation Process



Simulation: Integrated Demo

Full video online:
https://youtu.be/SaY2NdJrjJ4

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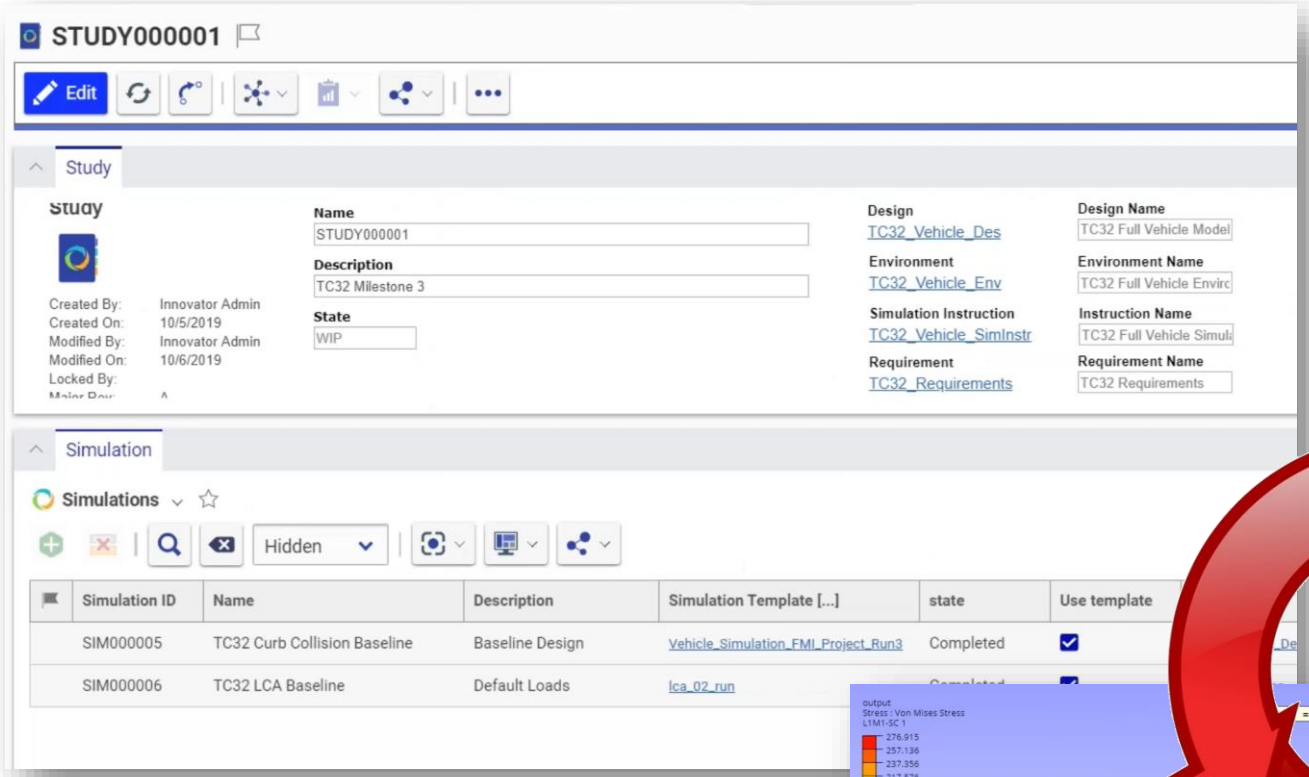
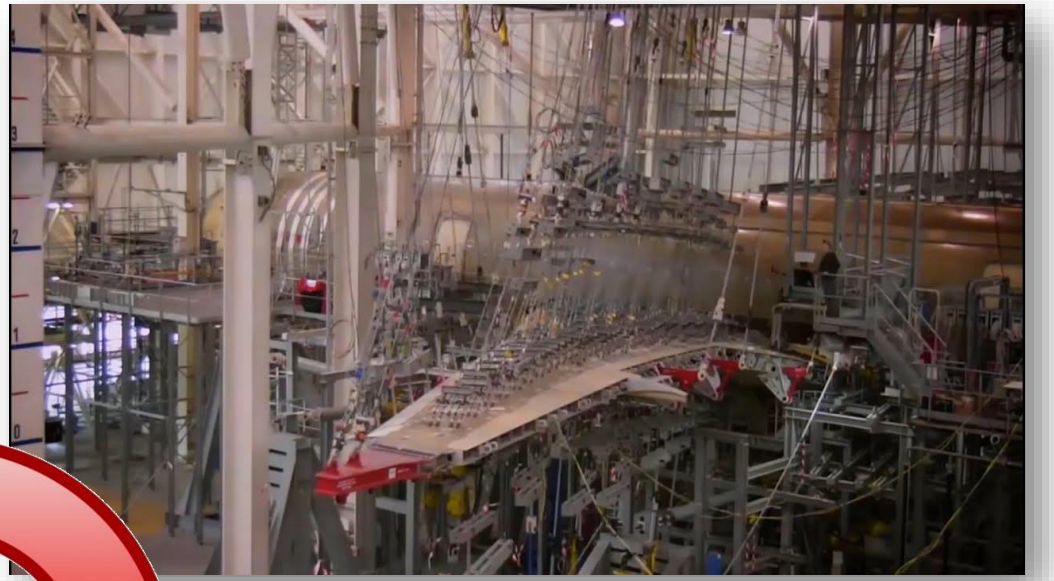
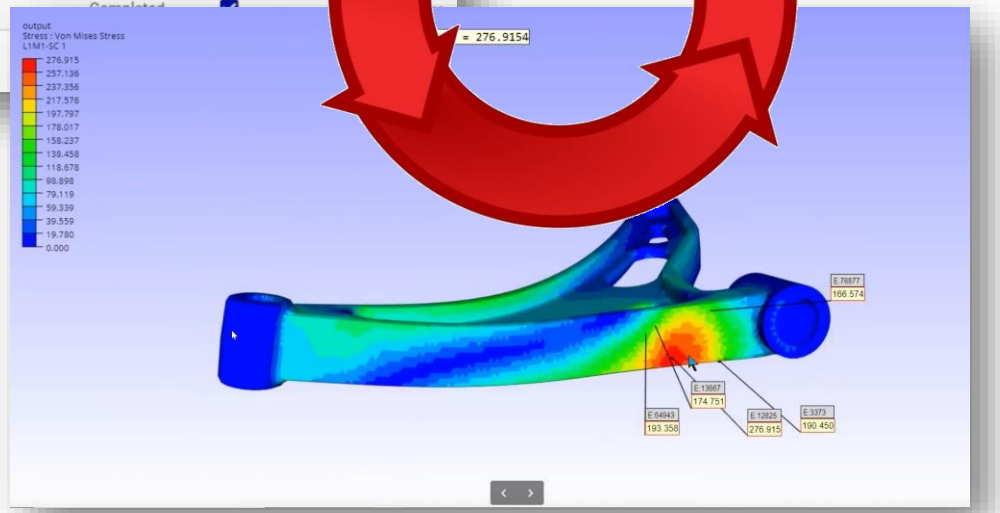
Simulation Studies Correlate Testing







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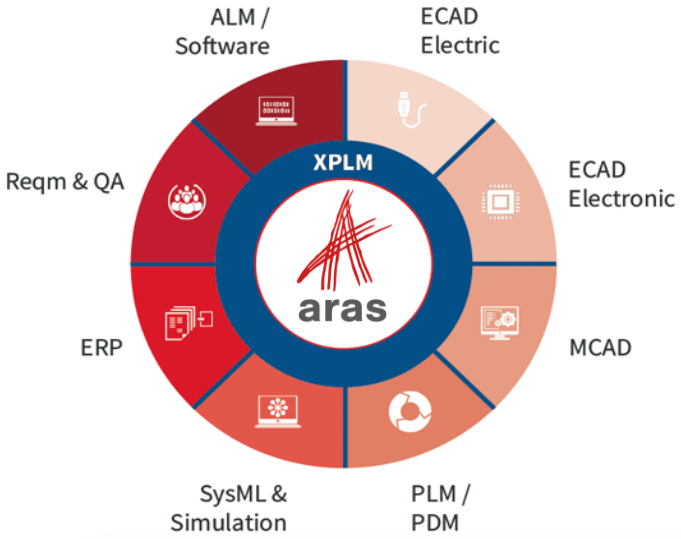
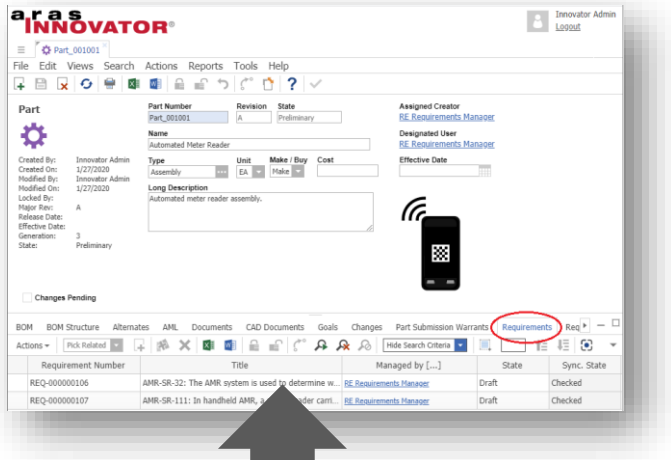
Aras | XPLM Integrations





XSPHERE Web Services

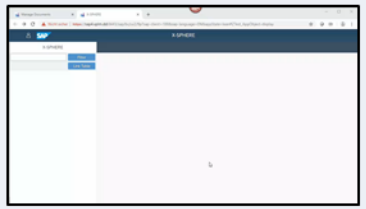
XSPHERE UI Services

XPLM WebServices (IIS Server) REST/SOAP

XPLM Connectors

Oracle | Team center | Wind chill | ARAS | Jira, Doors | SAP | . . .

XSPHERE Link Repository



XSPHERE Satellite Connectivity Repository

XSPHERE Satellite Action Repository (extensible Methods)

XSPHERE Satellite Systems

aras | ORACLE | SIEMENS Teamcenter | windchill | Jira Software | SAP

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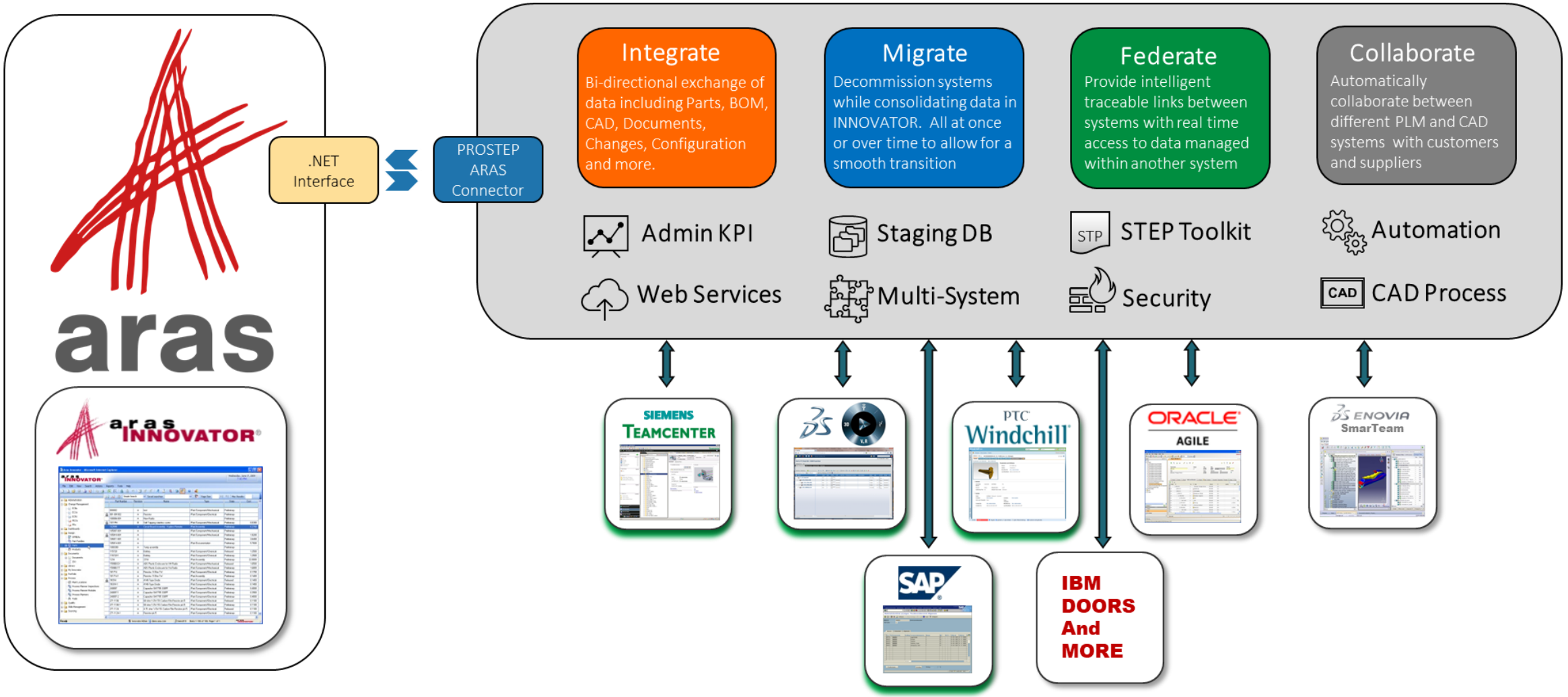
Aras | Prostep Integrations



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Interaction between the PLM systems and ARAS Innovator (data view)

Middelware Architecture IBIS with OpenPDM Connectors

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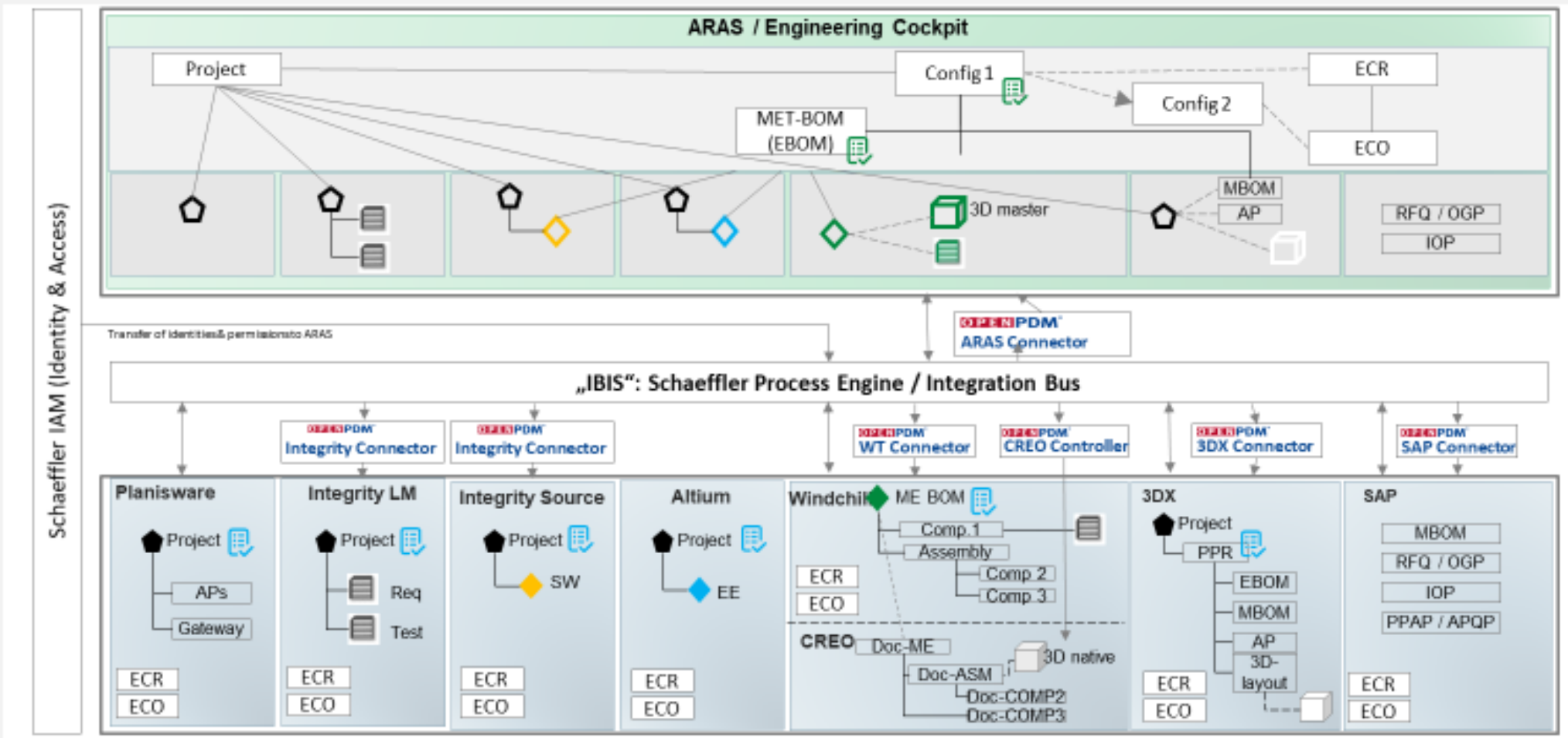

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Thank You

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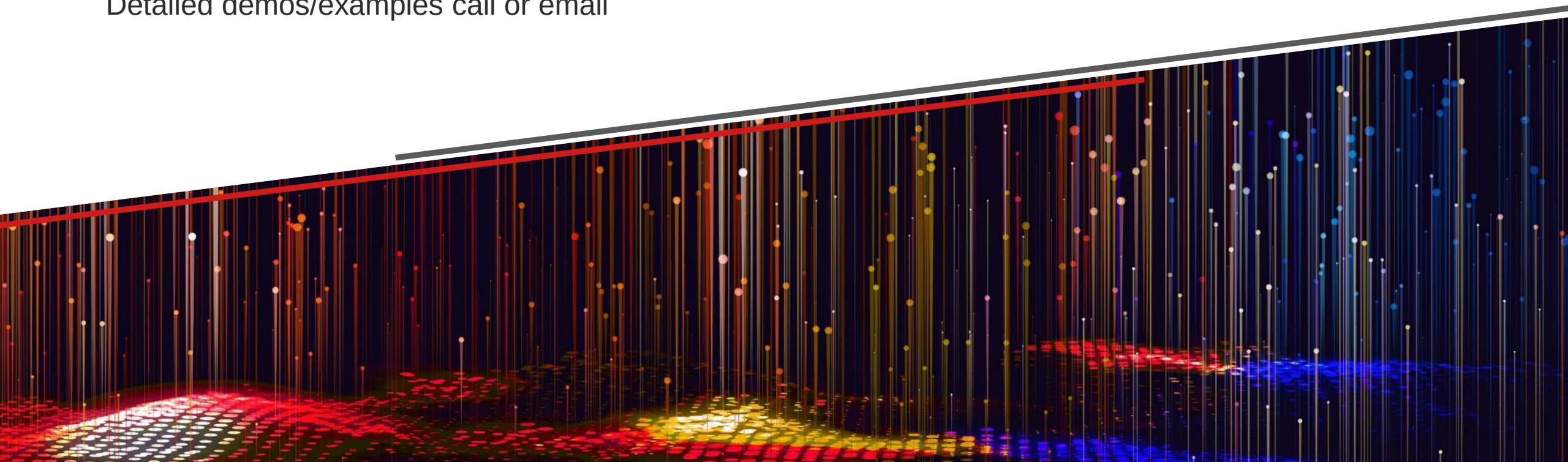
Detailed demos/examples call or email