



The Nature of DevSecOps and its Relationship to Digital Engineering: *Competencies and Skills Model*

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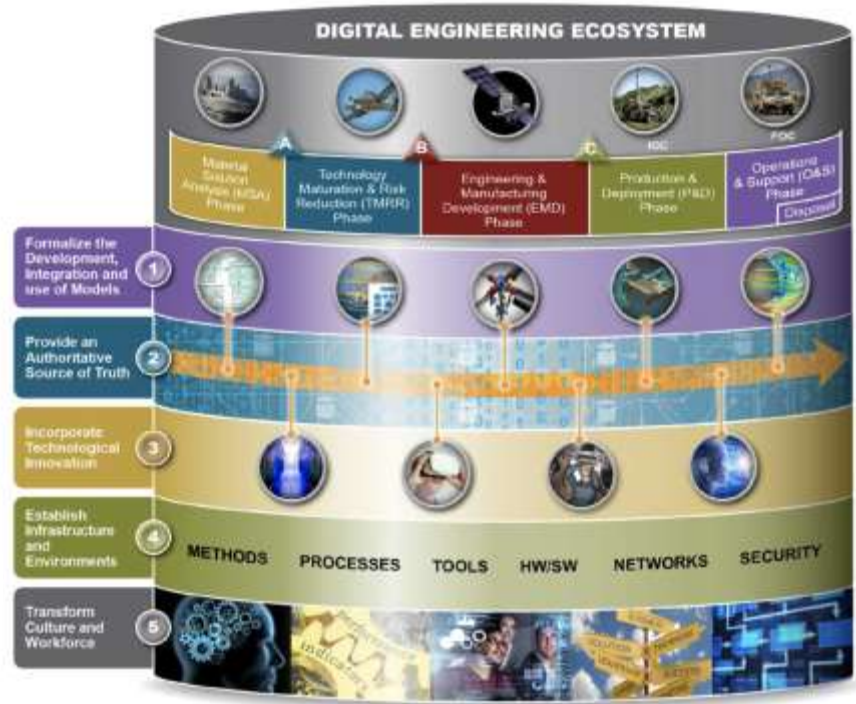
My Digital History...



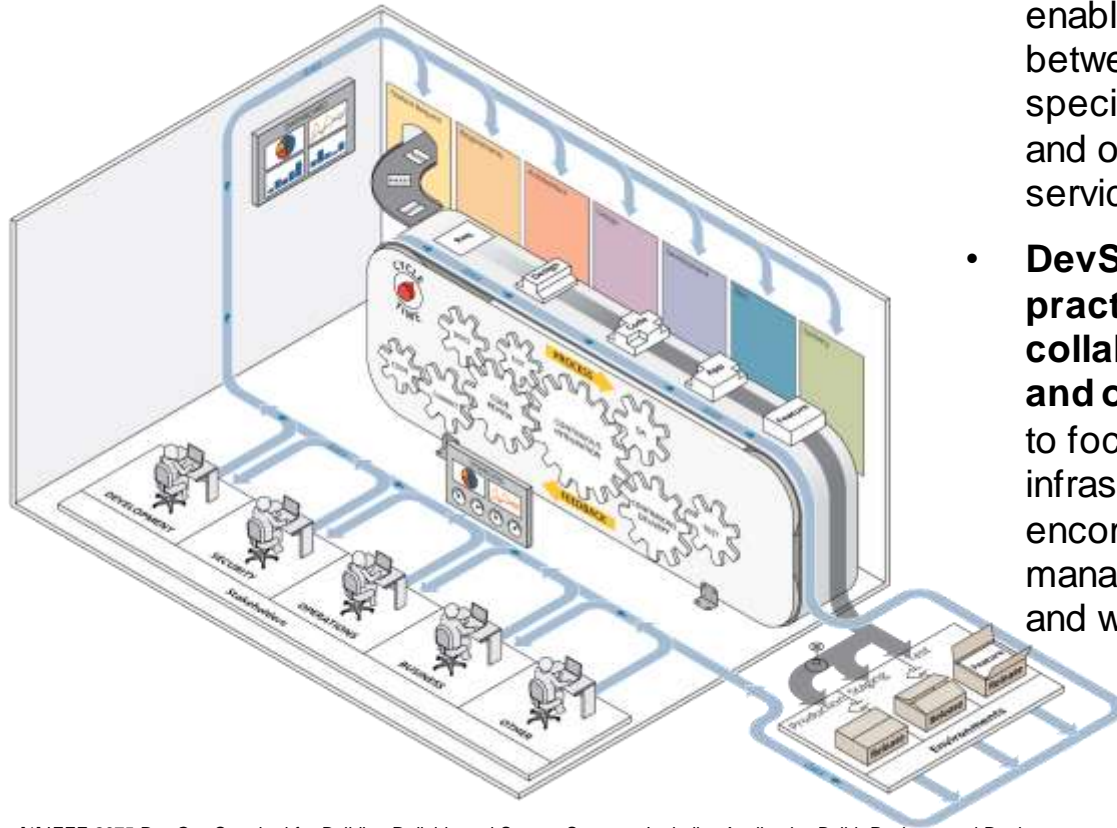
- 25+ years of software development experiences with EE major
- Certified Scrum Practitioner
- Certified Ethical Hacker
- Various roles throughout SDLC ; Manager, Architect, Tester, Developer, QA, IT Manager, Project Manager, VP...
- Started with waterfall in 1990
- Started with agile in 2003
- Started with DevOps in 2010
- Faculty Member on delivering DevOps course at CMU, SEI since 2015
- DevOps, DevSecOps community organizer, frequent Speaker
- PC members in various research conferences,
- Editorial board member, IJSS, AJSE
- Member of IEEE 2675 DevOps, 982.1 SW reliability, ISO WK29 Agile/DevOps WKs

Digital Engineering...

- **Digital Engineering (DE):** An integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines to support life cycle activities from concept through disposal. (DAU)
- Combination of MBSE, Common Practices and Infrastructure
- **Goal:** Using right Digital tools in an efficient way to deliver capabilities to the warfighter at the speed of relevance



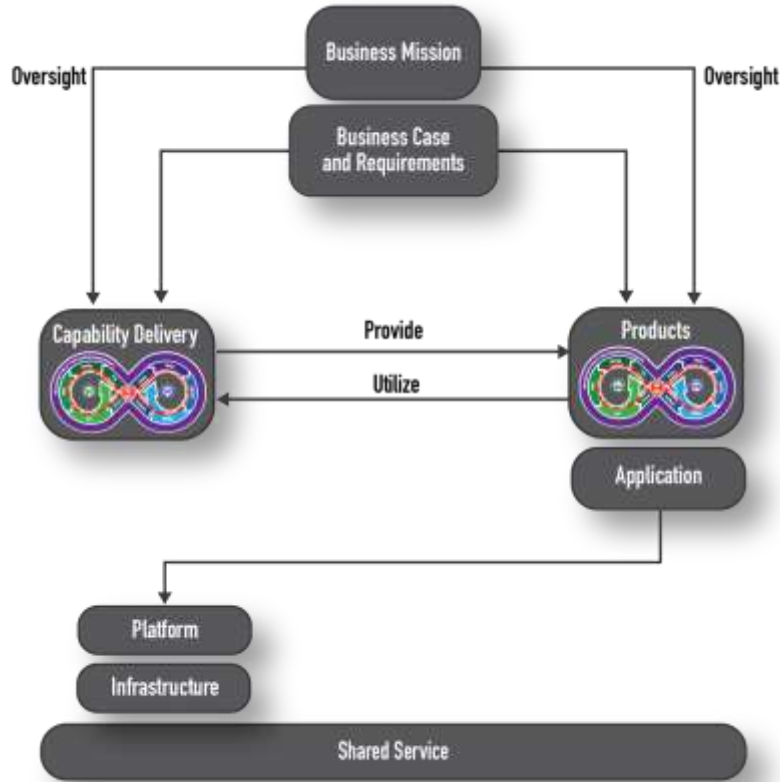
and DevSecOps



- **DevOps** is a set of principles and practices which enable better communication and collaboration between relevant stakeholders for the purpose of specifying, developing, continuously improving, and operating software and systems products and services [1]
- **DevSecOps** is a cultural and **engineering practice** that breaks down barriers and opens **collaboration between development, security, and operations** organizations **using automation** to focus on rapid, frequent delivery of secure infrastructure and software to production. It encompasses intake to release of software and manages those flows predictably, transparently, and with minimal human intervention/effort [2].

[1] IEEE 2675 Dev Ops Standard for Building Reliable and Secure Systems Including Application Build, Package and Deployment
[2] DevSecOps Guide: Standard DevSecOps Platform Framework U.S. General Services Administration. https://tech.gsa.gov/guides/dev_sec_ops_gui.de

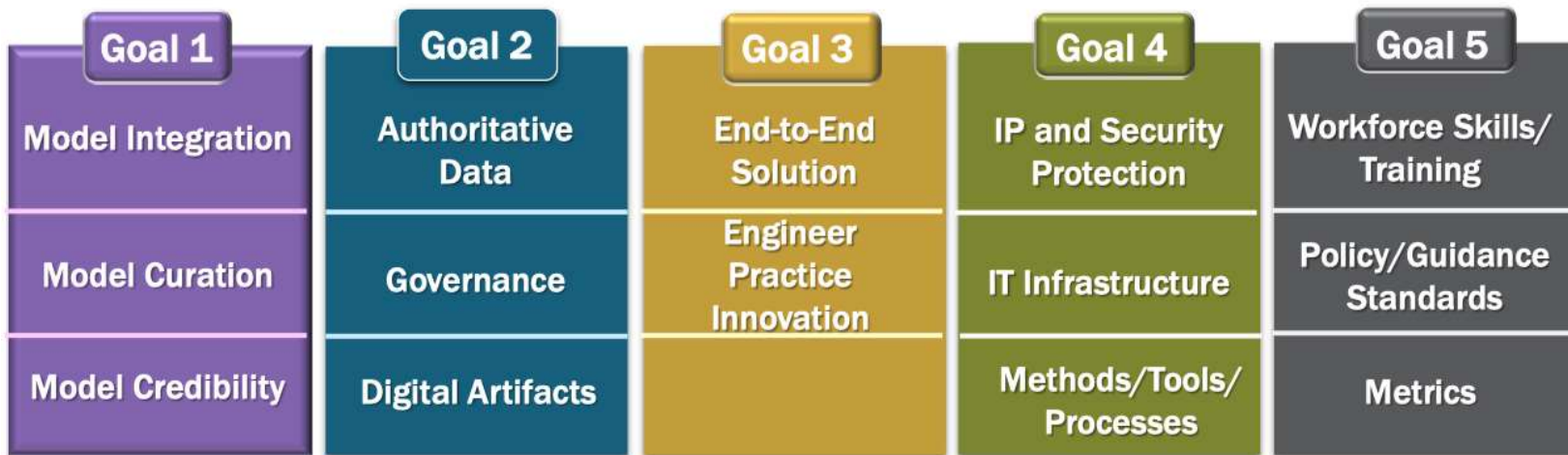
DevSecOps Goal:



DevSecOps-oriented enterprises are driven by three concerns:

- *Business Mission* - captures stakeholder needs and channels the whole enterprise in meeting those needs. It answers the questions Why and For Whom the enterprise exists
- *Capability to Deliver Value* - covers the people, processes, and technology necessary to build, deploy, and operate the enterprise's products
- *Products* - are the units of value delivered by the organization. Products utilize the capabilities delivered by the software factory and operational environments.

Digital Engineering: Implementation Goal and Challenges



Topic	Short Description
Model Integration	Models are not developed or used across domains, acquisition phases, and programs.
Model Curation	Models are not curated such that information can be preserved, discovered and used across the lifecycle.
Model Credibility	Traditional V&A approaches do not account for model credibility and trust in the digital age.

Models

Topic	Short Description
Authoritative Data	Vast amounts of data are scattered across multiple stove-piped systems and organizations in various forms
Governance	Managing and controlling data sources are fragmented or ad hoc
Digital Artifacts	Exchanging digital artifacts in a document-based culture

Authoritative Data

Topic	Short Description
End-to-End Solutions	Digital engineering activities are disjointed across the lifecycle
Engineering Practice Innovation	Transforming the way engineers leverage technology to be responsive to change

Technology Innovation

Topic	Short Description
IP & Critical Technology Protection	Limited strategies for protecting and securing the integrity of classified and proprietary digital data
IT Infrastructure	IT infrastructures not designed for complex digital model-based engineering activities
Methods, Tools, & Processes	Current methods process and tools do not holistically support the digital engineering activities

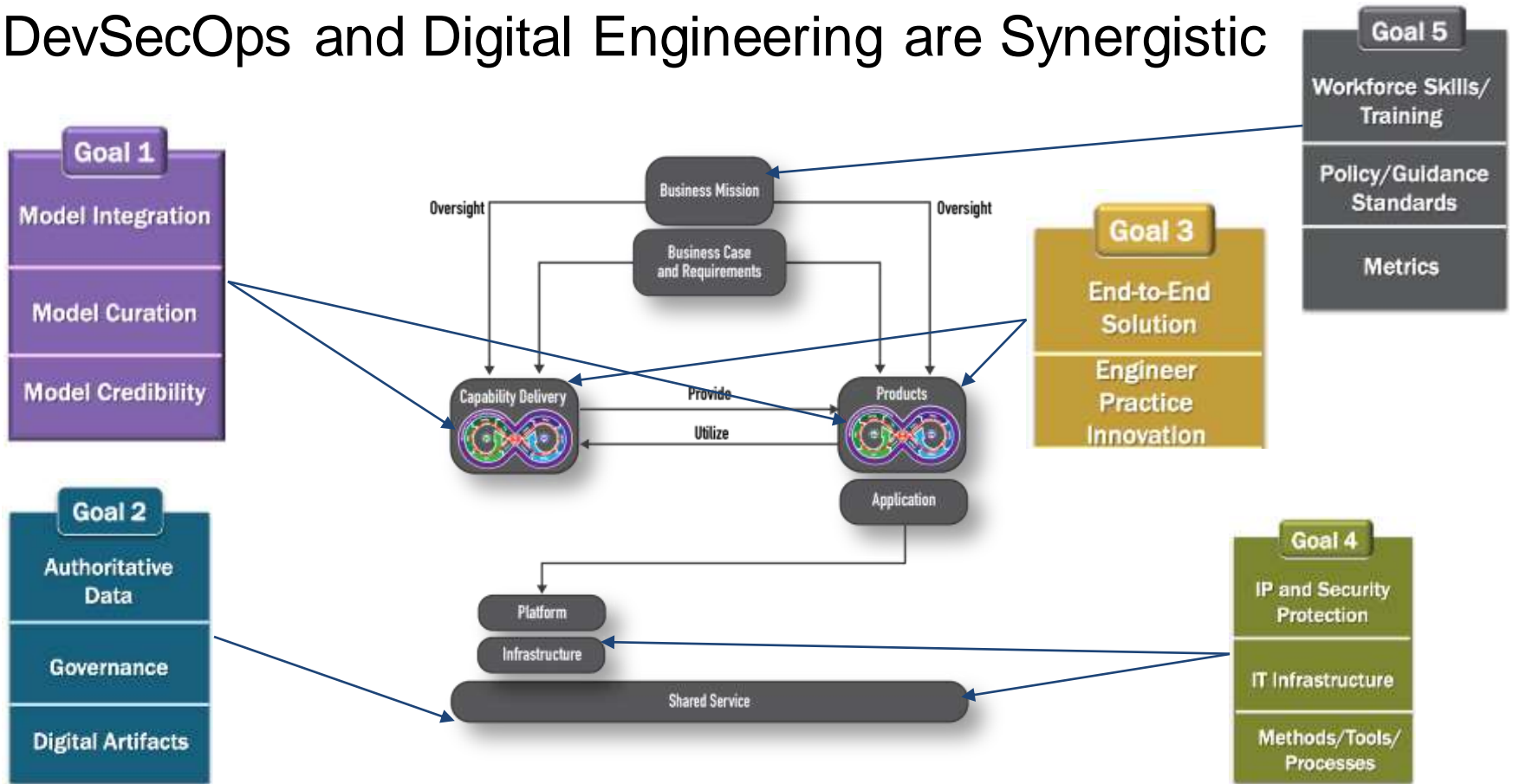
Supporting Architecture

Topic	Short Description
Workforce Skills Training	Limited incentives workforce skills, insufficient training capacity and resources to meet the demand
Policy, Guidance, & Standards	Limited policies, guidance, and standards to comprehensively address digital engineering activities
Metrics	Lack of a common set of metrics that serve as leading indicators of adoption and effectiveness

Culture and Workforce

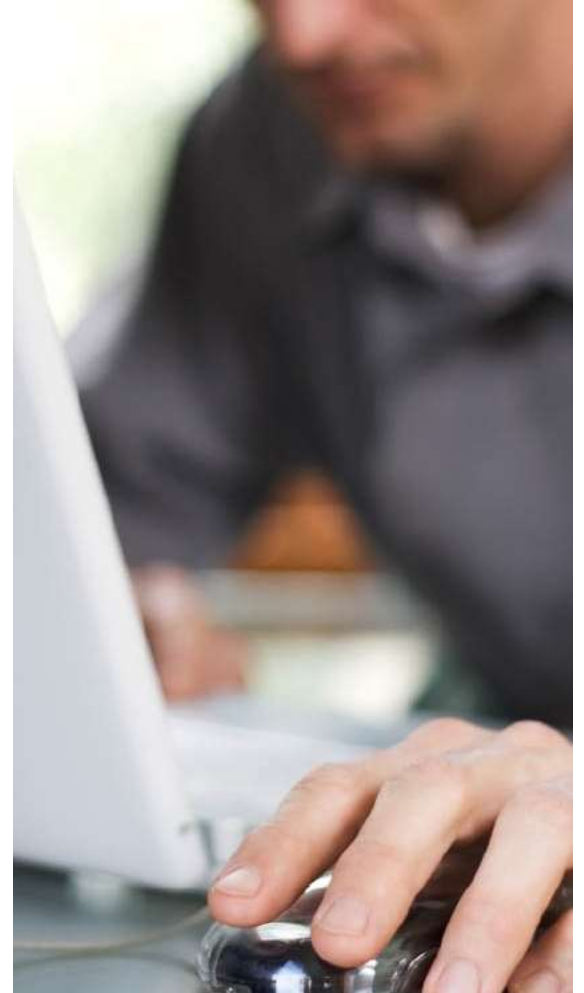
*Digital Engineering Update Ms Zimmerman, March 2020

DevSecOps and Digital Engineering are Synergistic

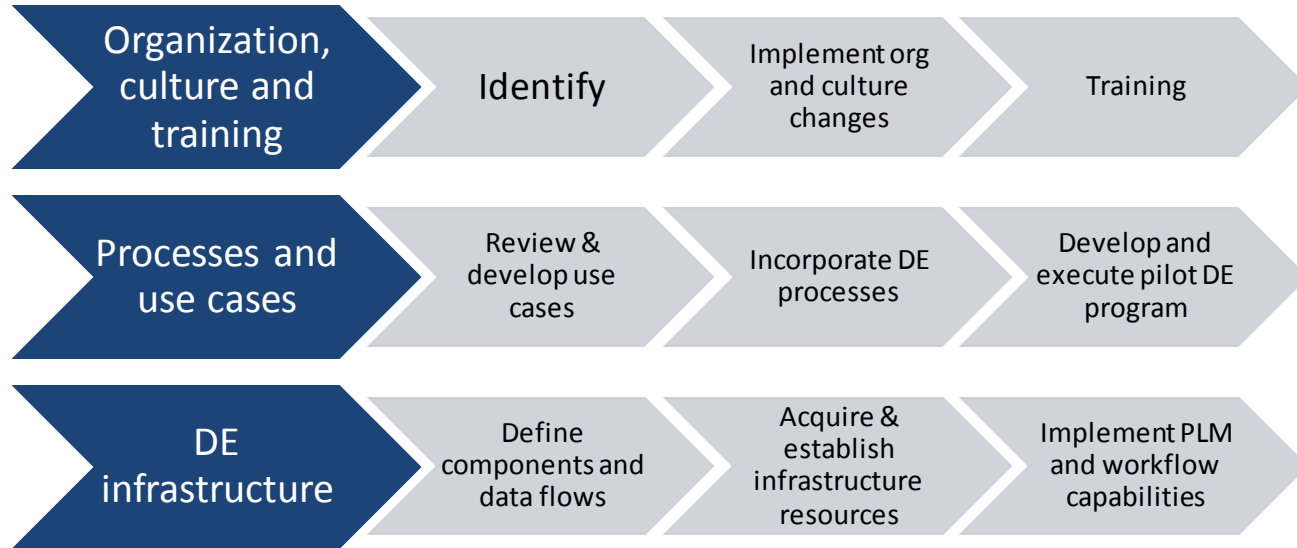


Digital Engineering and DevSecOps

DE Implementation Principles



Overview DE Implementation Principles



Organization, culture and training

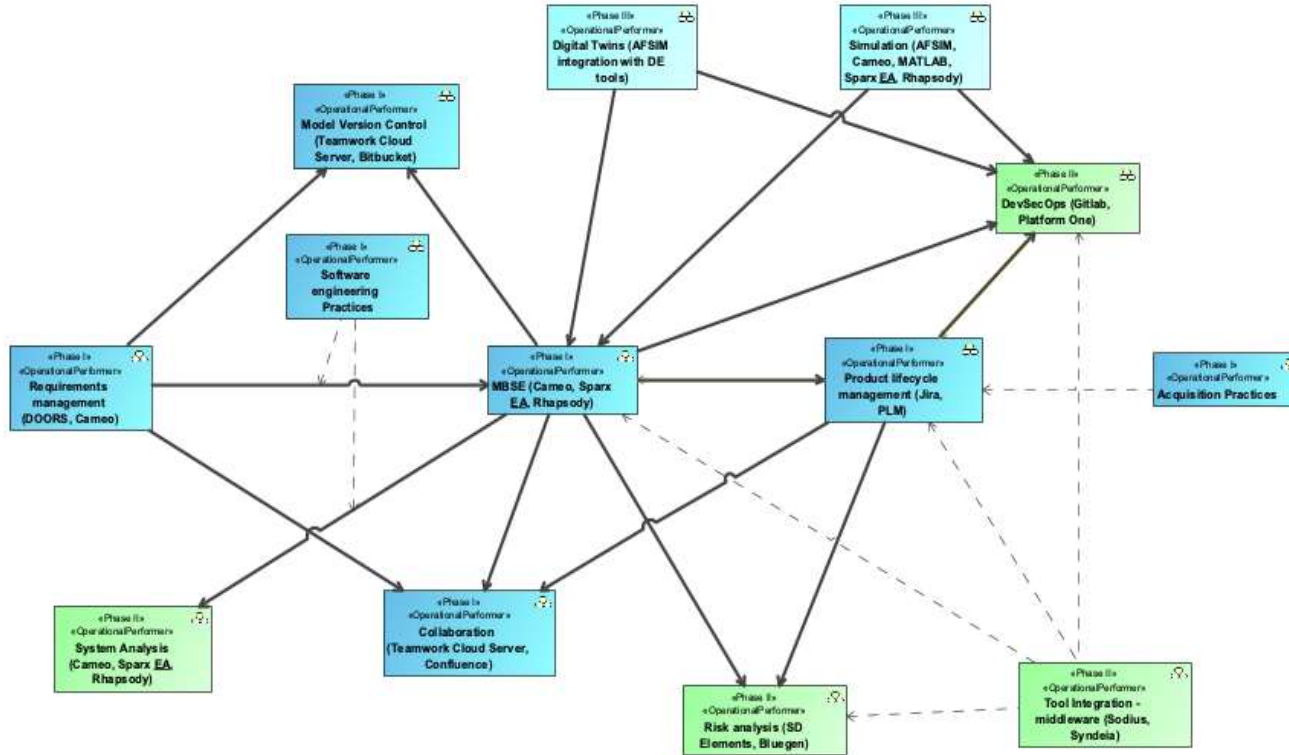
- Information exchange using DE infrastructure
 - Avoid information sharing via spreadsheets and presentations
- Configuration management, review and approvals using DE infrastructure
 - Digital reviews and signatures replacing formal review boards and approvals
 - Enhanced digital revision history tracking
- DE models to support all aspects of program management
 - Architecture, requirements, design, cost
 - Optimization, component definition and integration, risk assessment
 - System development, tradeoff analysis, operational tests, sustainment
- Personnel Training
 - Role focused approach (leadership, developer, IT, “DE” –master*)
 - DE101, DE201
 - Tools (DOORS, CAMEO, RHAPSODY, etc.)
 - Processes (DE, DevSecOps, SAFe, CM/DM)
 - DE infrastructure deployment, configuration and sustainment

*Equivalent to scrum master

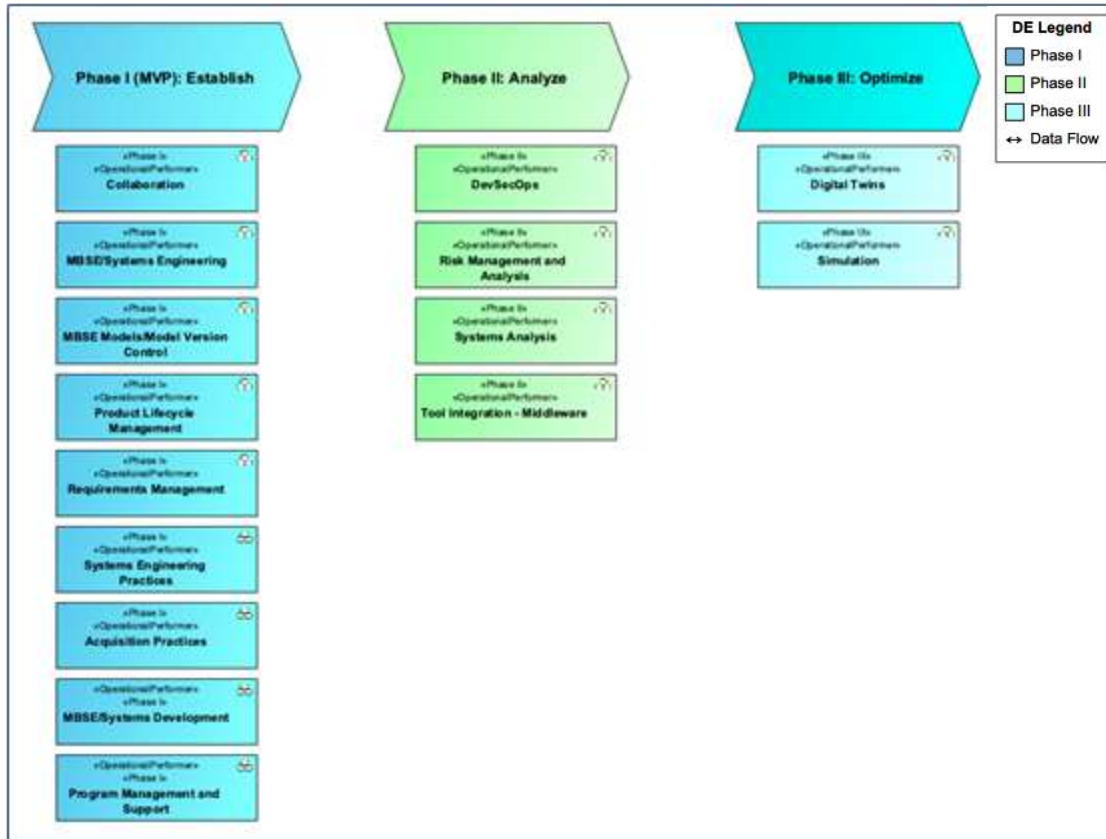
Processes

- Enable digital dashboards to track engineering processes (requirements, approvals, development progress, architecture and design, costs, risks, schedule, etc.) across divisions
- Each team/org defines own dashboards and metrics to reflect their operational needs which feed into division level digital dashboards
- Data flows to support processes defined and implemented with support of all teams/orgs and DE IT
- Institute development style guides
 - Architecture, acquisition, requirements, configuration, data management, DevSecOps, Security, PLM, etc.

Digital Engineering Infrastructure Model



Digital Engineering Roadmap Phases



Phase 1 **Establish** would provide the breadth of activities for DE environment.

Phase 2 **Analyze** focuses on different analysis efforts within the DE environment.

Phase 3 **Optimize** deals with developing the desired artifacts to put in place a digital twin of the weapon system and be able to use it to perform simulations which will help reduce the costs associated with developing and maintaining these systems.

Tailoring DE Implementation Principles

Get started: Understanding organization culture is the first step to success in deployment of DE

- Organization, culture and training
 - Baselining current state of DE tools used
 - Document existing digital threads currently deployed

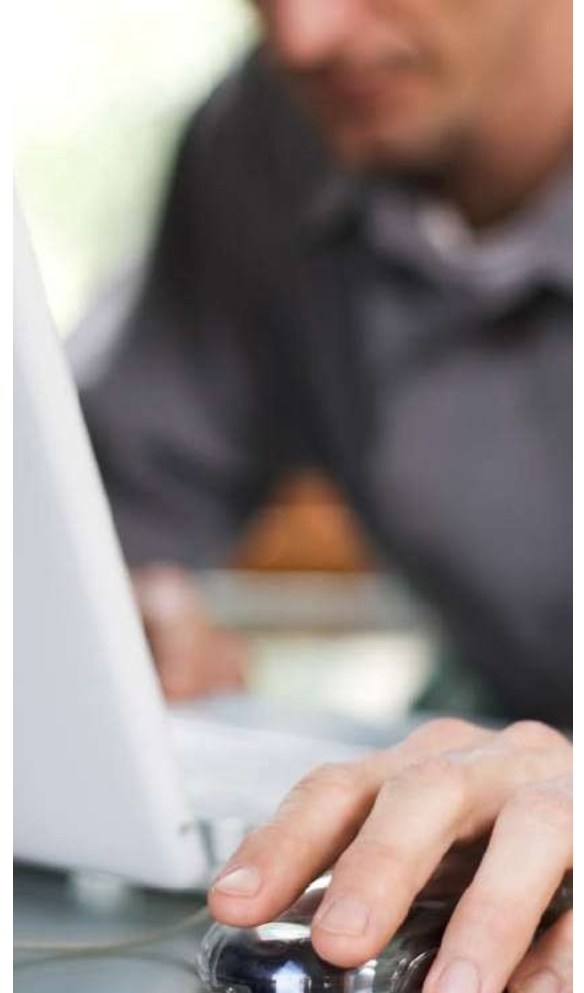
Move forward: Defining how DE will improve current processes and practices

- Processes and use cases
 - Develop DE use cases
 - Review of current processes
 - Mapping use cases to DE tools and practices

Ready to roll:

- Training
- Onboarding support, guidelines, pilots and prototype projects
- Updating of workflows, policies and practices

Digital Engineering and DevSecOps Competencies and Skills model



Digital Engineering (DE)

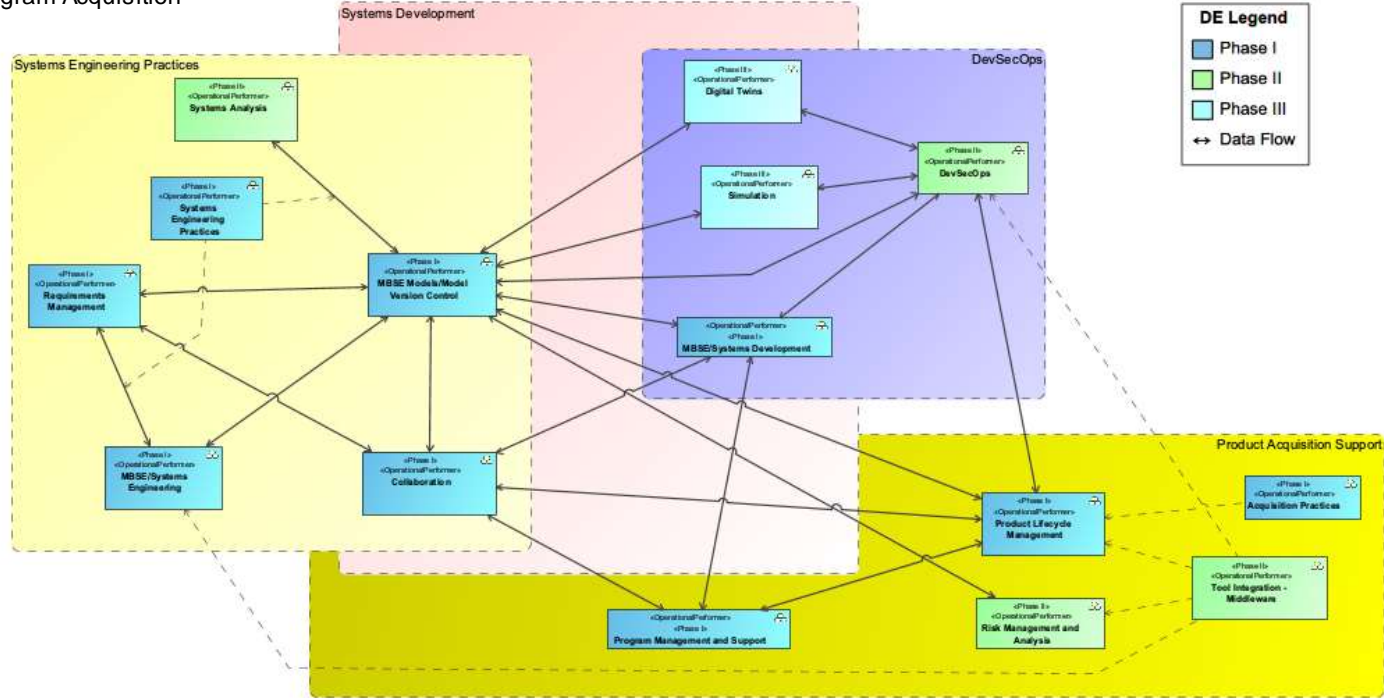
- There are eleven (11) capabilities were defined to be relevant for DE:
 1. Program Management
 2. Analysis
 3. Project Management
 4. Product Lifecycle Management
 5. Requirements Management
 6. Operational/Mission Analysis
 7. Systems Architecture
 8. Electrical Engineering
 9. Mechanical Engineering
 10. Software Development
 11. DevSecOps
- A three-phase DE roadmap to implement the infrastructure needed for a DE environment and tailor it to meet the organization's needs.

DE Technology Infrastructure Ecosystem

- To narrow the initial focus of the work, DE performers were grouped into four (4) DE domains, based on systems life cycle, to investigate competencies necessary to support moving to a DE environment:
 - Systems Engineering Practices
 - Systems Development
 - DevSecOps
 - Product Acquisition Support
- These DE domains can be rolled out independently from each other, if needed.

DE Performers & DE Domains

System Program Acquisition



The DE Technology Infrastructure Ecosystem view

Developing Digital Engineering Competencies - 1

The DE capabilities, organizations and roles within the organizations were defined, and corresponding competencies were identified.

Capability/Performer	Organization	Role
Requirements Management (Mgt)	Requirements Mgt Authority	Requirements Engineer
		Requirements Lead
Product Lifecycle Mgt	Product Lifecycle Mgt Authority	Technical and Programmatic Leader
		Product Developer
		Product Manager

Developing Digital Engineering Competencies - 2

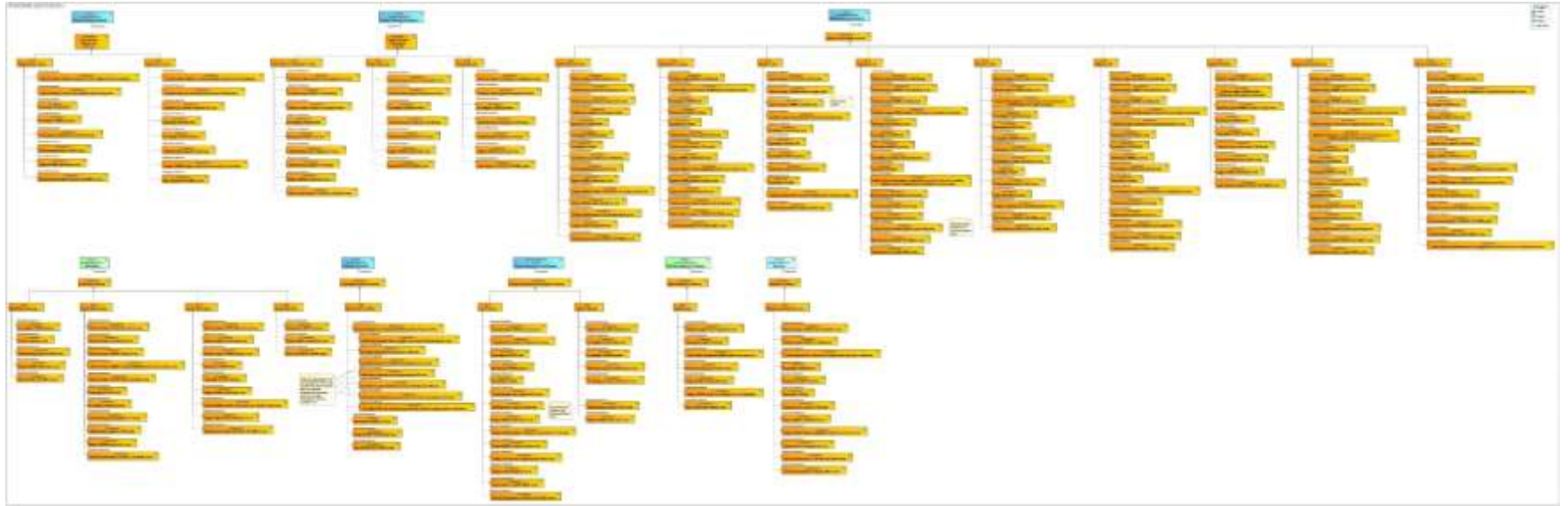
Operational Performer	Organization	Role
MBSE/Systems Engineering	Systems Engineering Authority	Chief Product Architect
		Chief System Engineer
		Chief Data Officer
		Hardware Lead
		Integration Lead
		Production Lead
		Software Lead
		Systems Architect
		Systems Development Lead
		Test and Evaluation Lead

Developing Digital Engineering Competencies - 3

Operational Performer	Organization	Role
DevSecOps	DevSecOps Authority	Build Release Engineer
		DevSecOps Architect
		DevSecOps Engineer
		DevSecOps Tester
Acquisition Practices	Acquisition Practices Authority	Government Contracting Officer
Program Mgt and Support	Program Mgt and Support Authority	Chief Engineer
		Program Manager
Risk Mgt and Analysis	Risk Mgt and Analysis Authority	Risk Manager
Simulation	Simulation Authority	Modeling and Simulation Lead

Digital Engineering Competencies View

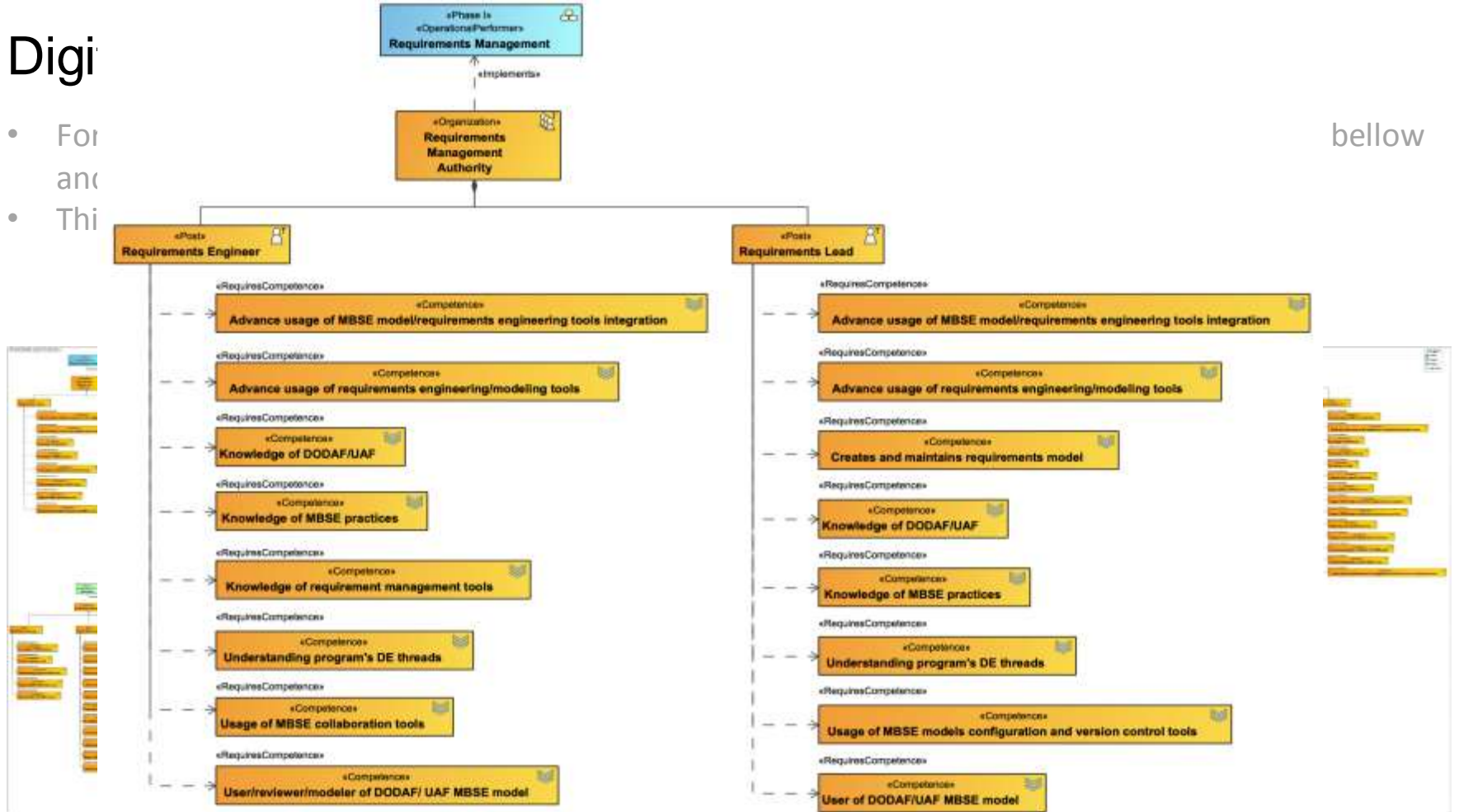
- For each of the roles, a set of competencies were identified which is reflected graphically below and in the DE Competencies Ecosystem table (~50 competencies, ~16 areas, ~24 roles)
- This set of competencies is a good starting point based on our experiences,



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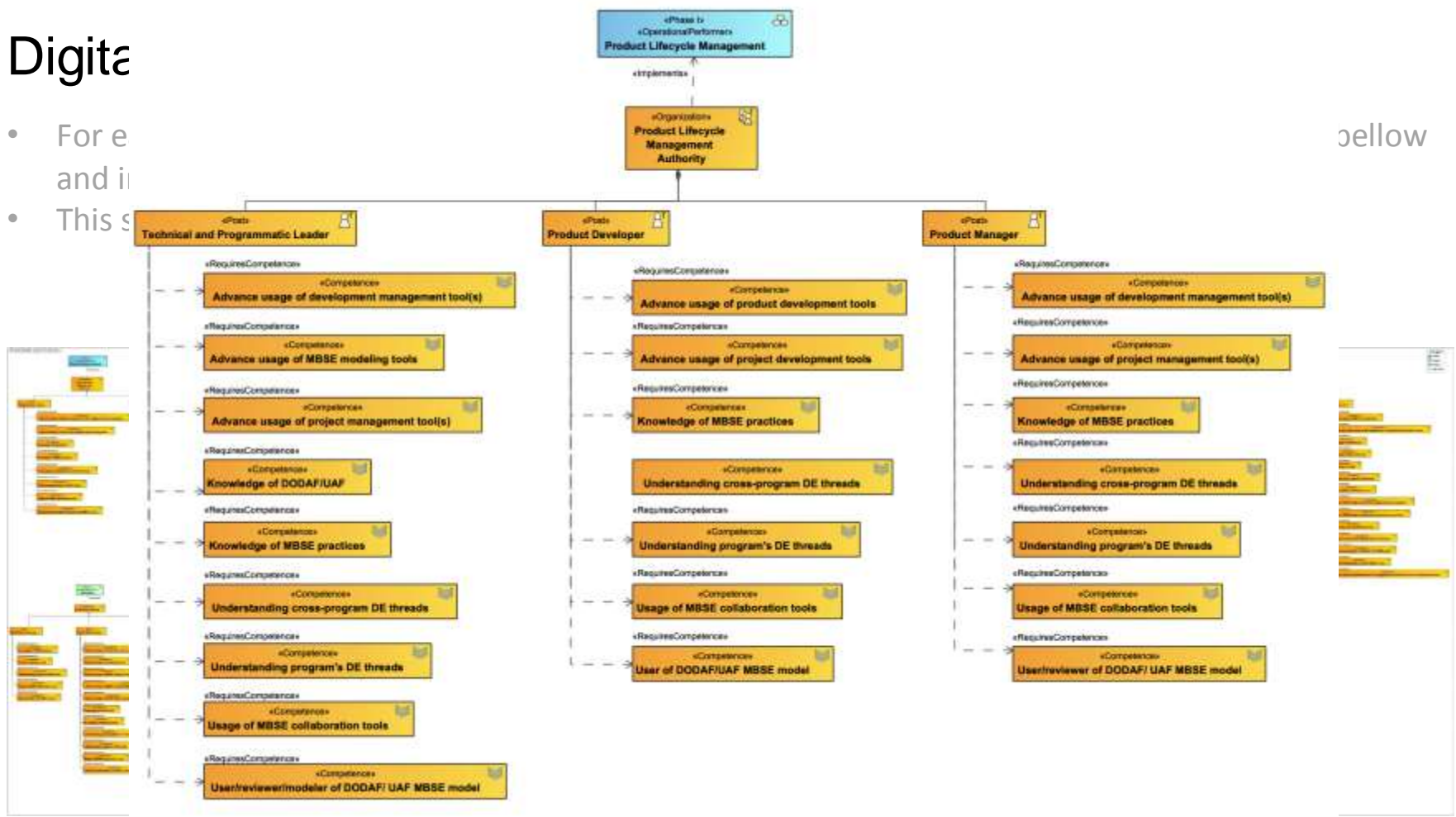
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Digital

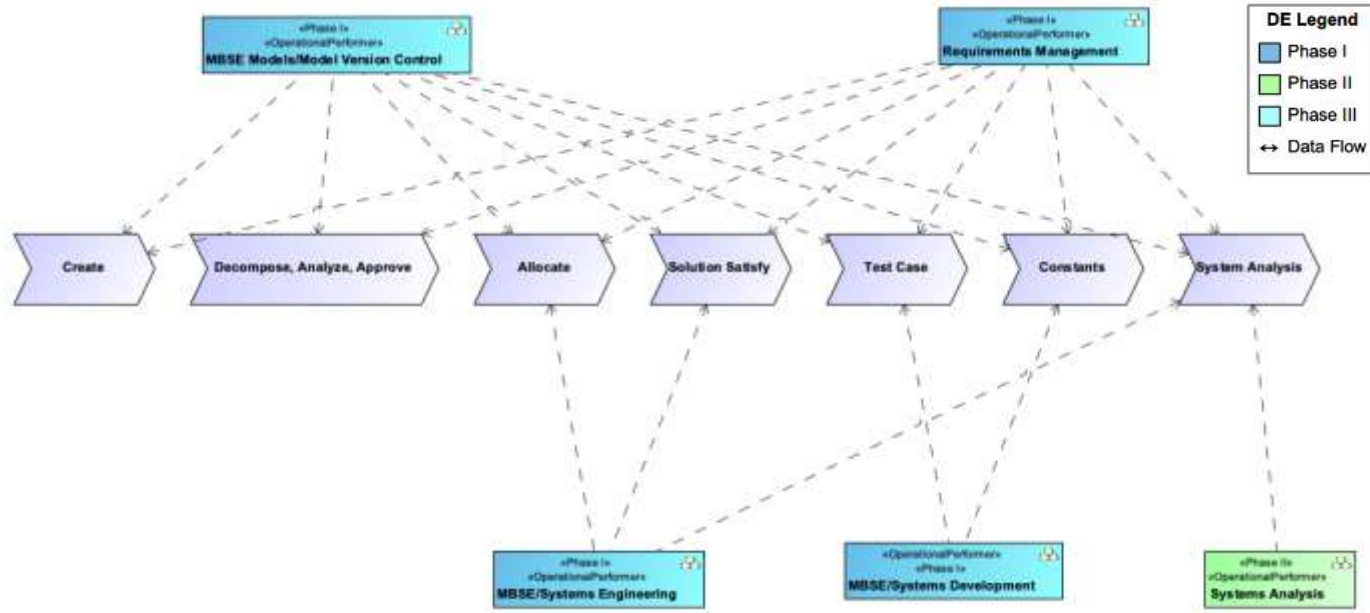
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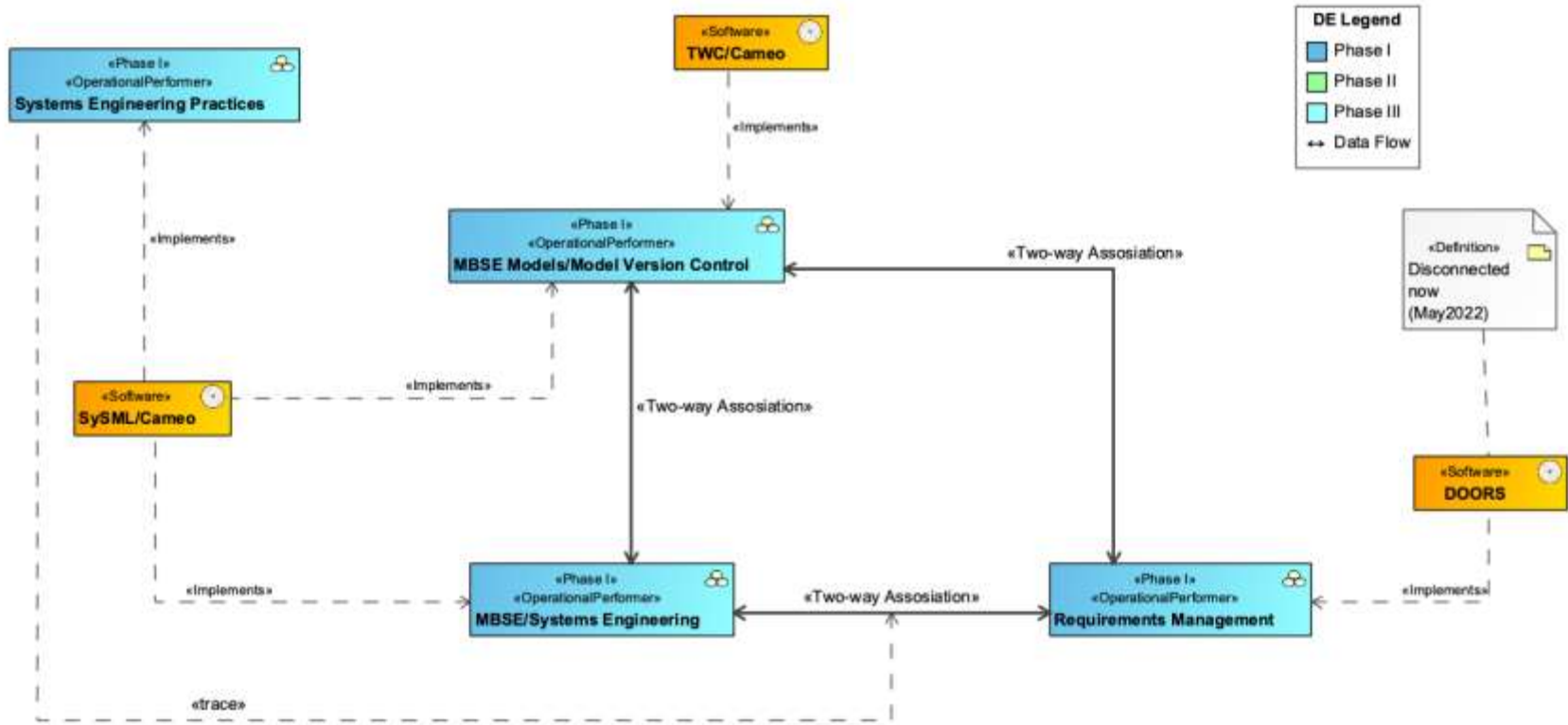
Developing Digital Threads

As an example, we modeled requirements life cycle and mapped its steps/phases to DE performers.

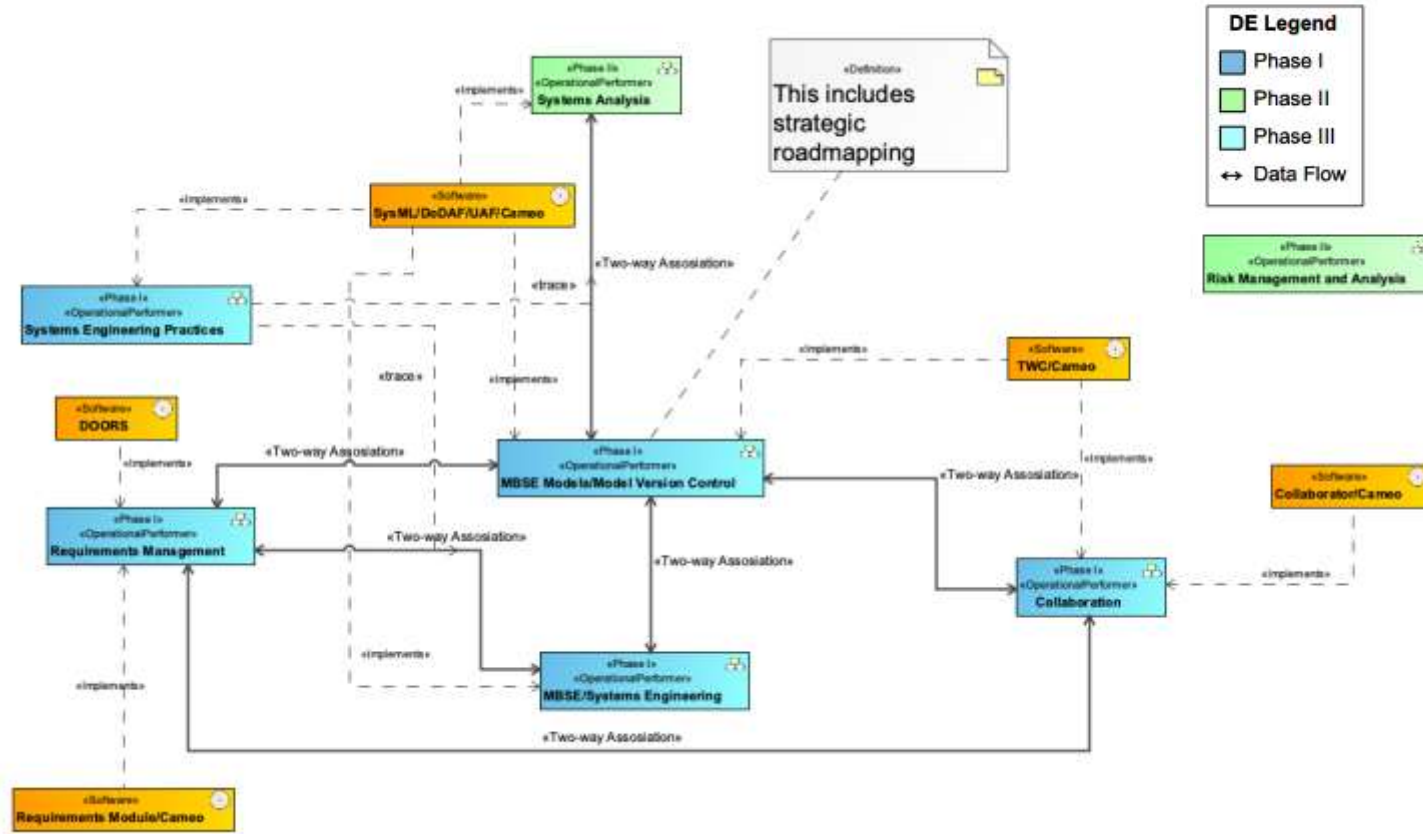


*Modeling of System Acquisition process's digital thread is not finished.

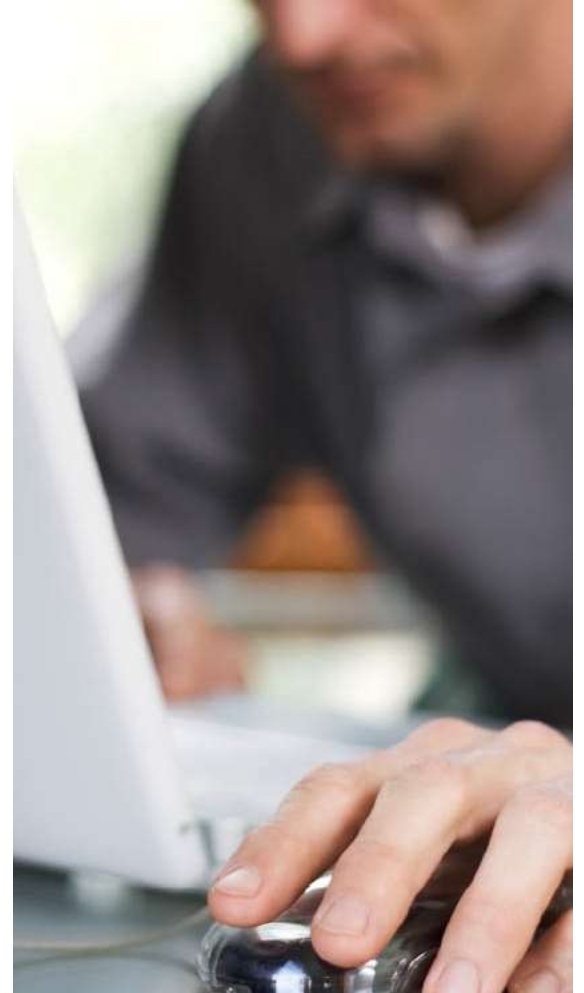
Example - Digital Engineering Environment - 1



Example - Digital Engineering Environment - 2

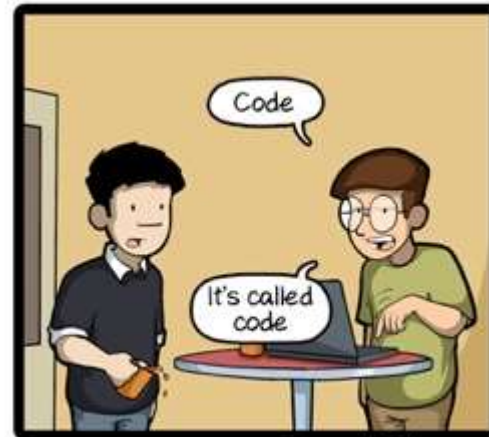
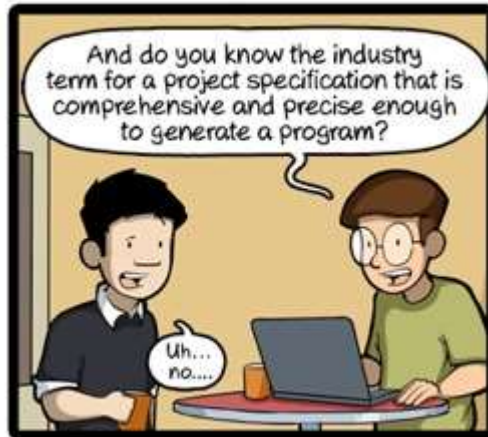


Digital Engineering and DevSecOps Next Steps to implement DE & DSO



What is Next?

- Develop your Digital Engineering processes and workflows.
- Identify and map performers including all stakeholders.
- Define the work products and tools, and how they support the acquisition, technical development and testing, and lifecycle support aspects to build/integrate into your DecSecOps ecosystem
- Study what would be considered success factors for developing a digital twin and the envisioned modeling efforts from idea to product (complete System Development Lifecycle-SDLC)
- Identify the training that will be needed for the Manager, Engineers contractors, and others as a part of the necessary throughout SDLC



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For more information...

Our work @ SEI: <https://www.sei.cmu.edu/our-work/index.cfm>

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DevSecOps Blog: <https://insights.sei.cmu.edu/blog/topics/devsecops/>

Webinar : <https://www.sei.cmu.edu/publications/webinars/index.cfm>

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Thank You

Hasan Yasar

Technical Director, Adjunct Faculty Member
Continuous Deployment of Capability

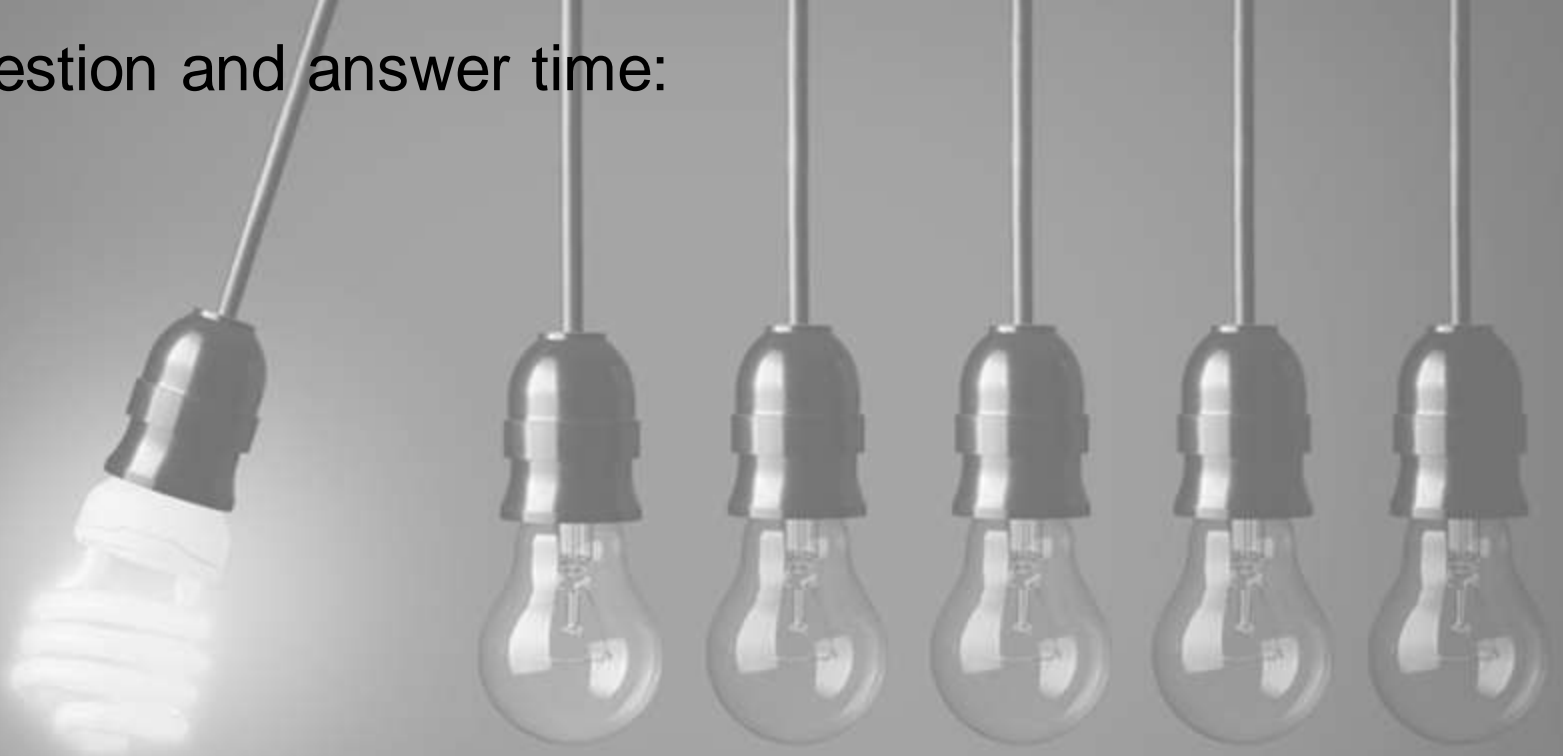
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It is question and answer time:



What does this mean to you?

How can we put these ideas into action?