

DIGITAL ENGINEERING - FACTORY OF THE FUTURE

FoF - Overview & Summary

Arcfield STC Introduction

Providing MBSE and Digital Engineering Services and Solutions to Government and Industry

ARCFIELD™



by the numbers...

100%

security-cleared workforce

200+

expert MBSE engineers

135+

next-gen platforms supported

75+

remote locations

200+

customers supported

Acquired by Arcfield in 2023

STC Digital Transformation Consulting - Background

Industry Experience



Department of Defense

- Army
- Navy
- Airforce
- Defense Contractors



Department of Energy

- Multiple Laboratory Sites
- DOE-supporting prime contractors



Commercial Industries

- Automotive
- Commercial Aerospace
- Artificial Intelligence
- Manufacturing
- Software Design

... and more

Execution Fidelity



Enterprise

- Enterprise Framework modeling
- Needs / Goals / Constraints / Drivers
- Transformation activity prioritization
- Traceability to Standards



Solution / Architecture

- Digital Tool and Capability modeling
- Source of Truth and Digital Thread definition
- Tool-to-tool Interfaces



Implementation / Deployment

- Integration Execution
- Cloud Infrastructure
- Custom Tooling and Plugins
- Digital Tool Expertise
- Digital Tool Deployment and Administration

Scope



Organization



Division / Site



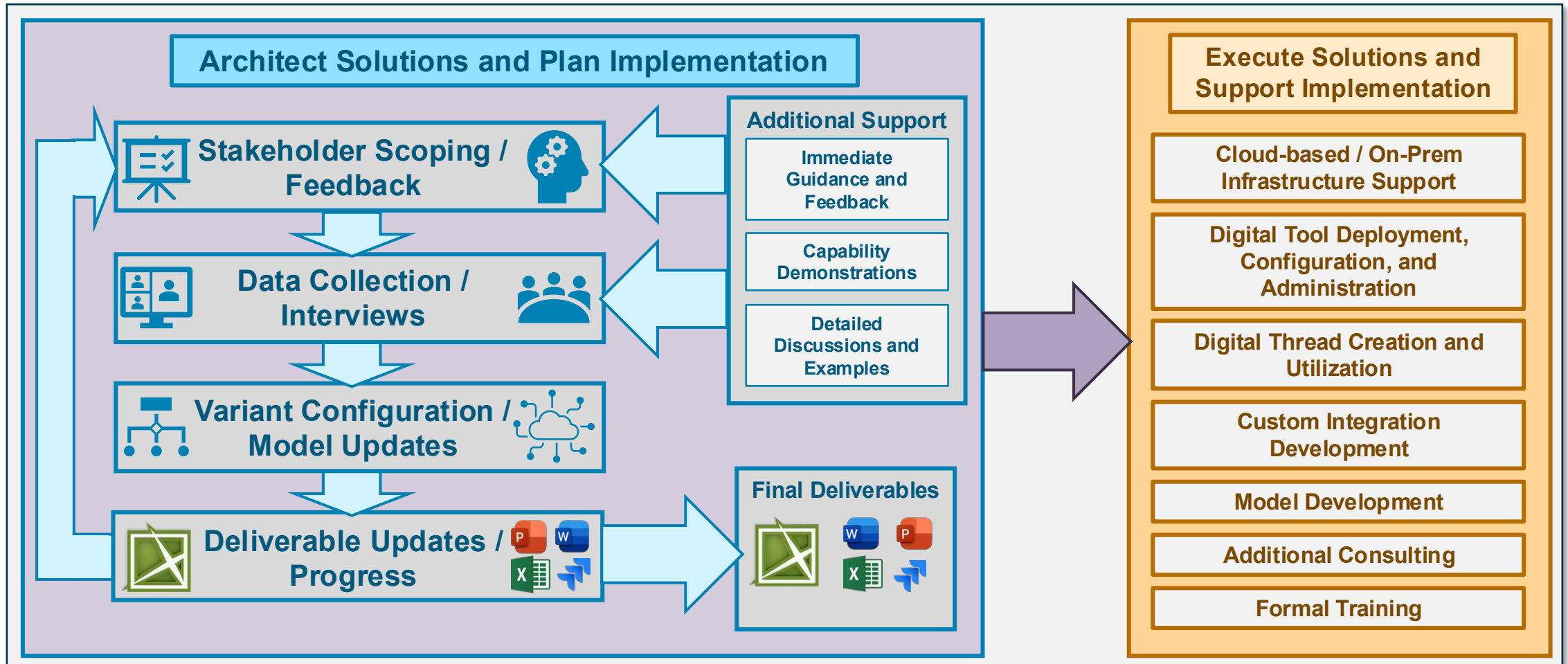
Program / Product

- STC provides digital transformation consulting services across a wide variety of industries
- STC can assist organizations regardless of their current needs, spanning from up-front architectural roadmaps down to implementation of actual solutions on real systems
- Assessments and recommendations can be tailored to specific organizational layers, to provide digestible feedback in languages expected by various stakeholders

STC develops **tailored solutions** for customers based on their **existing tools and processes**.

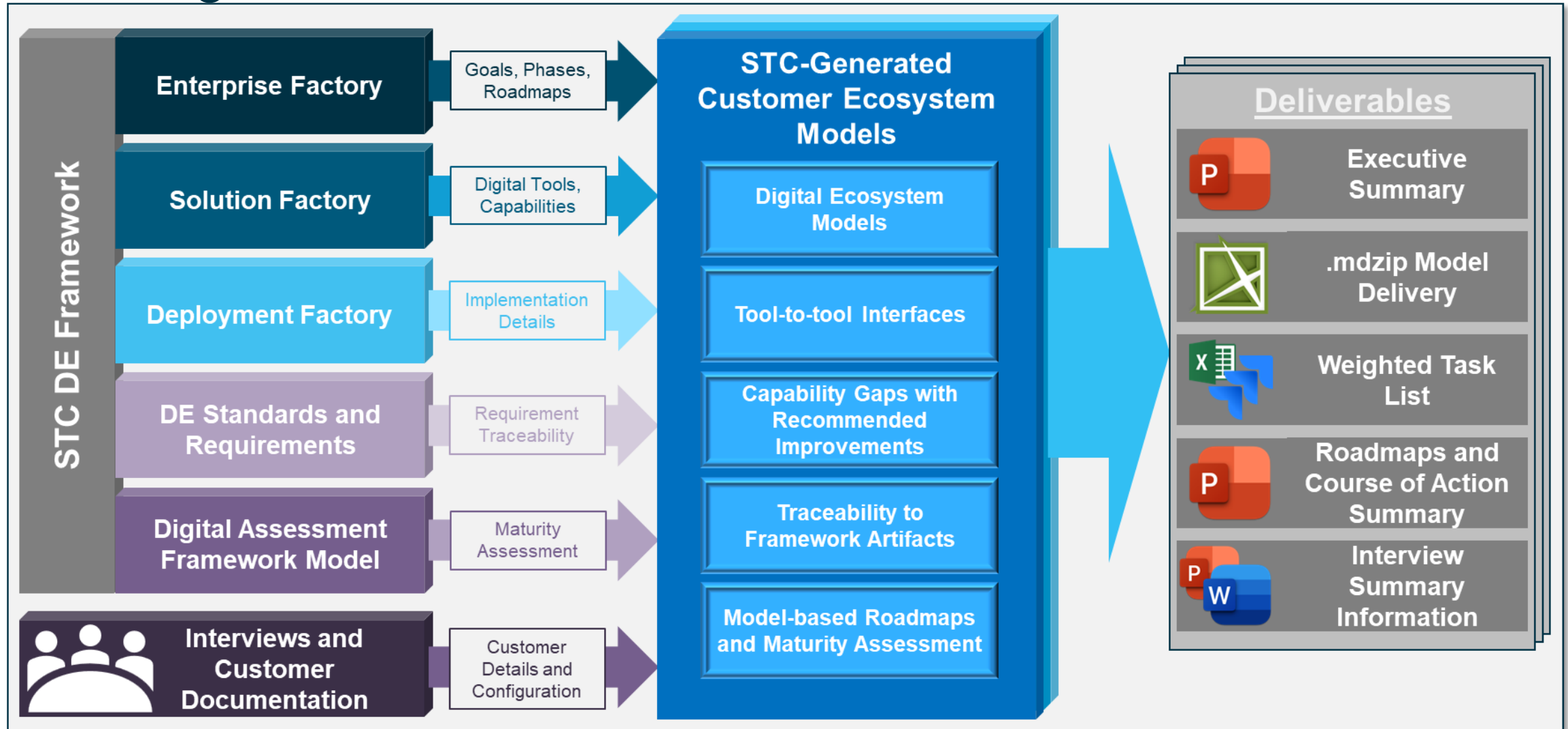
There is no one-size-fits all solution for digital engineering: STC provides expertise in both **commercial digital integration tools** and **proven integration patterns** to increase digital maturity while **minimizing disruption of existing processes**

Ideal Customer Engagement Process



The ideal customer engagement is iterative and collaborative with frequent updates on STC's progress.
Customer feedback should be driving priority areas with STC adjusting deliverables as information is shared.

STC Digital Transformation Framework

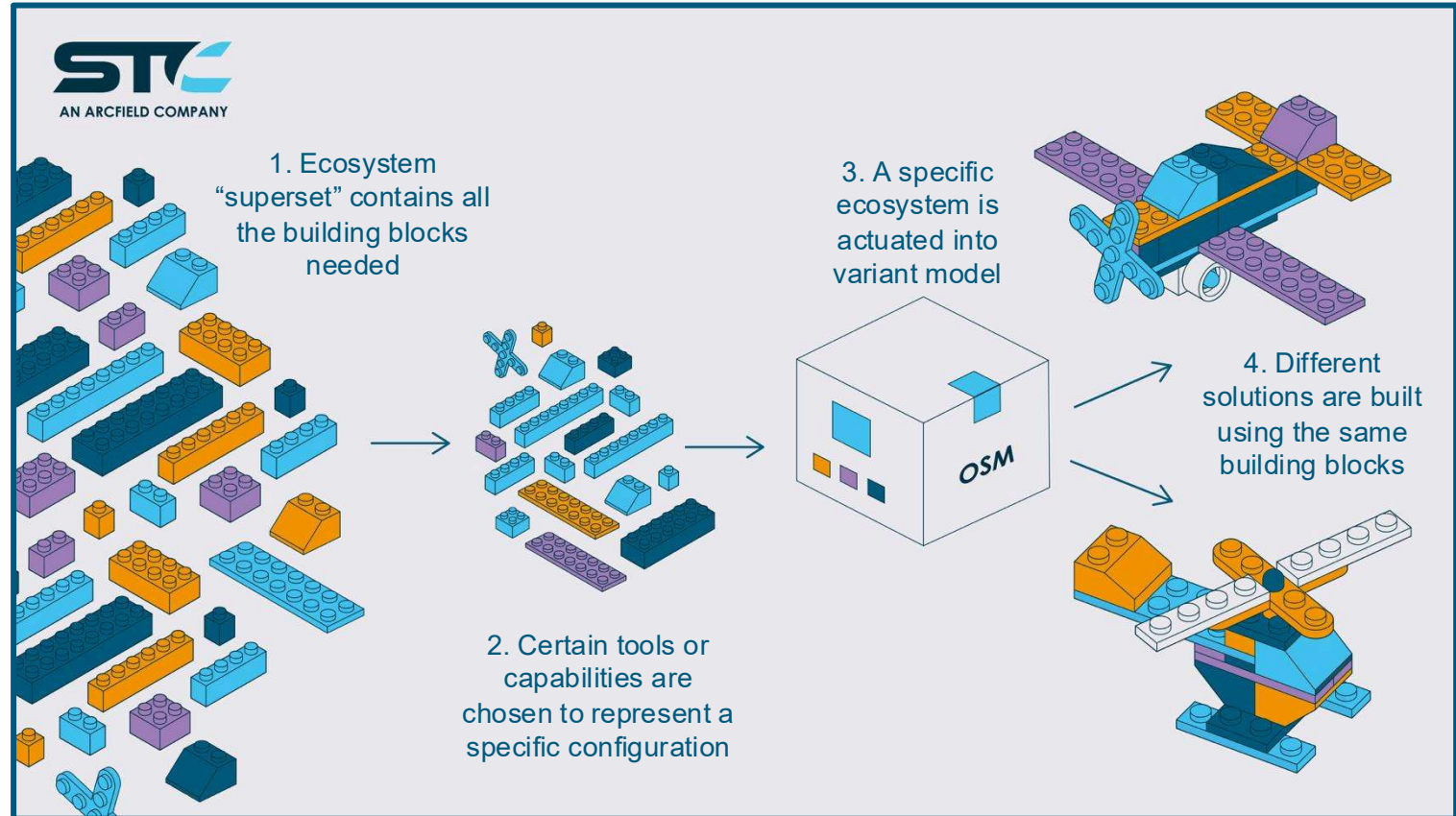


The STC DE Framework allows for a streamlined ingestion of customer data and an agile delivery of in-progress deliverables

Why MBPLE for FoF?

It simply makes sense...

- Managing Complexity Across Customer Ecosystem Configurations
- Supporting Variability across a multitude of customers in various industries (DoD, Medical, DoE, etc.)
- Rapidly produce customer specific instantiations, all while maintaining the integrity of the FoF Framework and data traceability
- Leveraging reuse of ecosystem architectures, processes, digital tools, and workflows to reduce engineering effort and risk
- Enable scalable growth for our DE FoF Ecosystem



MBPLE Method for Implementation

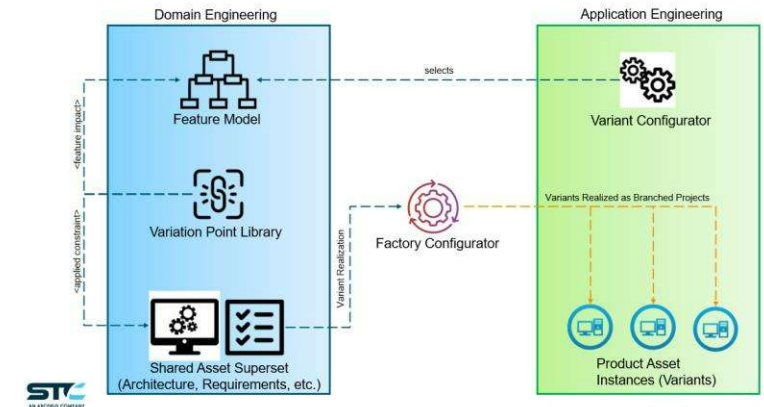
1. Define **150% Shared Asset Superset Model(s)**
 - a. Identify points of Variation throughout your product line architecture (“Family of Systems” Architecture)
2. Define **Feature Model**
 - a. The Feature Model should account for all selections of variations across the Family of Systems architecture
3. Bridge the 150% Shared Asset Superset Model(s) with your Feature Model via **Variation Points**
 - a. Catalog those Variation Points to ensure all appropriate relationships are implemented
 - b. Ensure correct Variation Point Type is implemented
4. Define **Variant Configurations**
 - a. Includes leveraging common configurations and generating unique configurations
5. Instantiate your **Variant Models**
 - a. Also referred to as the “Factory Configurator” process where the PLE plugin realizes the variation points being implemented for a specific variant and actuates the model accordingly

MBPLE Implementation & Strategic Advantages

• STC Implementation

- Experienced in deployment of MBPLE Solution Environment
- Enables leveraging commonality and managing variability efficiently within a Family of Systems Architecture
- Support automated Variant Realizations
- Support engineering impact analysis through feature-driven architecture management
- Demonstrated improved engineering efficiency and lifecycle agility

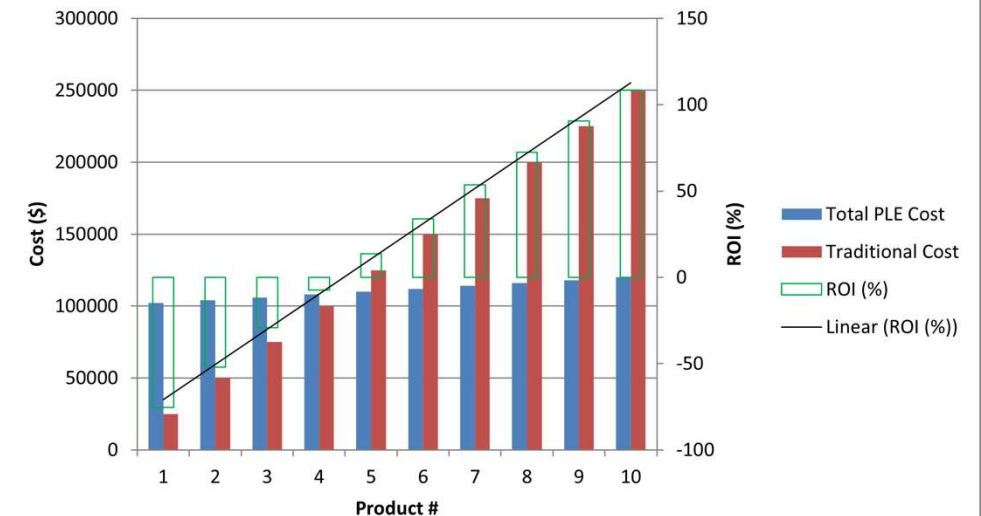
STCs MBPLE Solution Framework



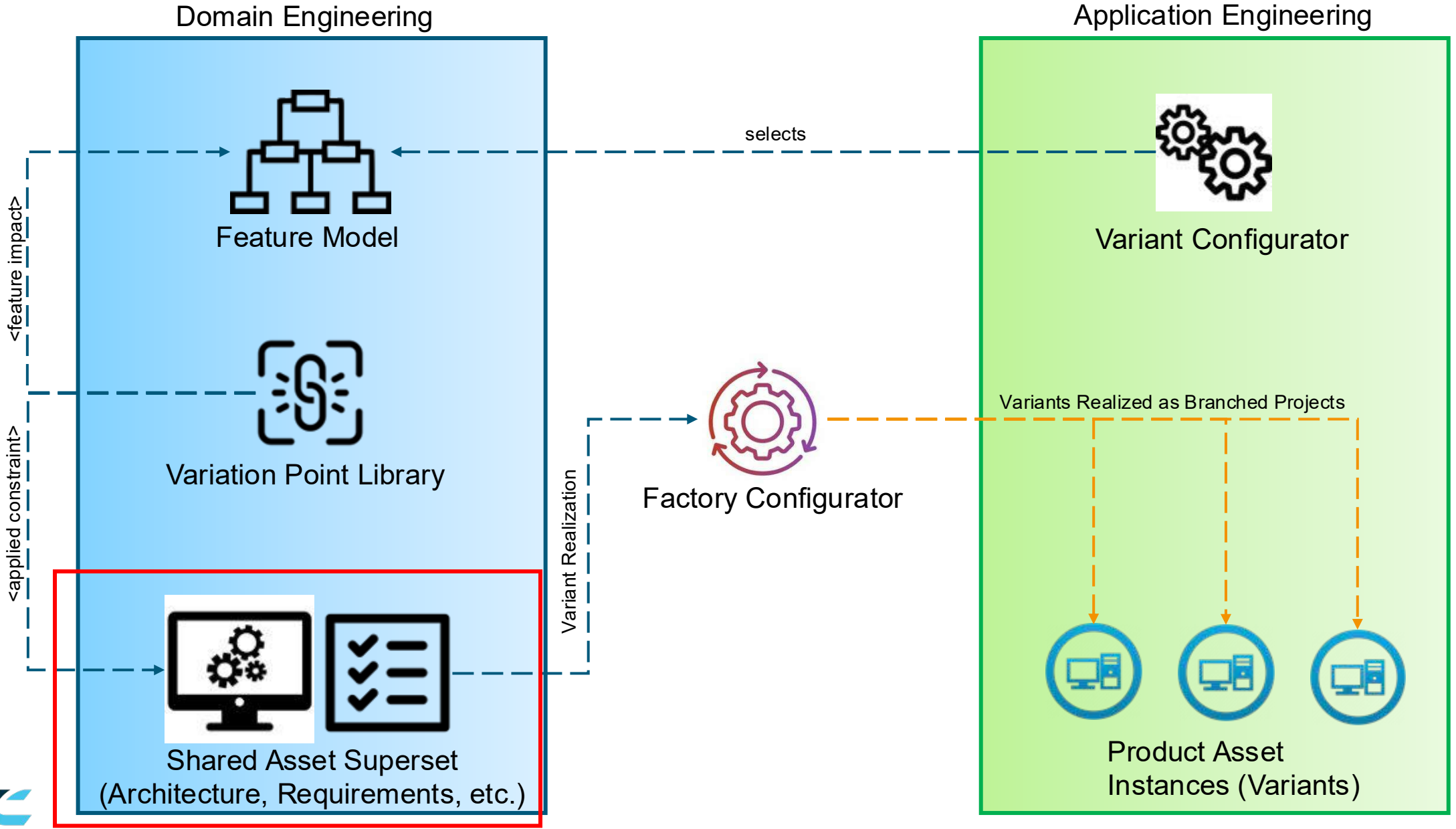
• MBPLE Strategic Advantages

- Eliminates redundant modeling by managing variants within a single, feature-driven architecture
- Accelerates time-to-delivery on engineering deliverables
- Improves decision agility with faster analysis of feature impacts and trade-offs
- Maximizes reuse and investment value of digital engineering assets
- Enhance competitiveness by enabling quicker adaptation to new missions, technologies and customer needs

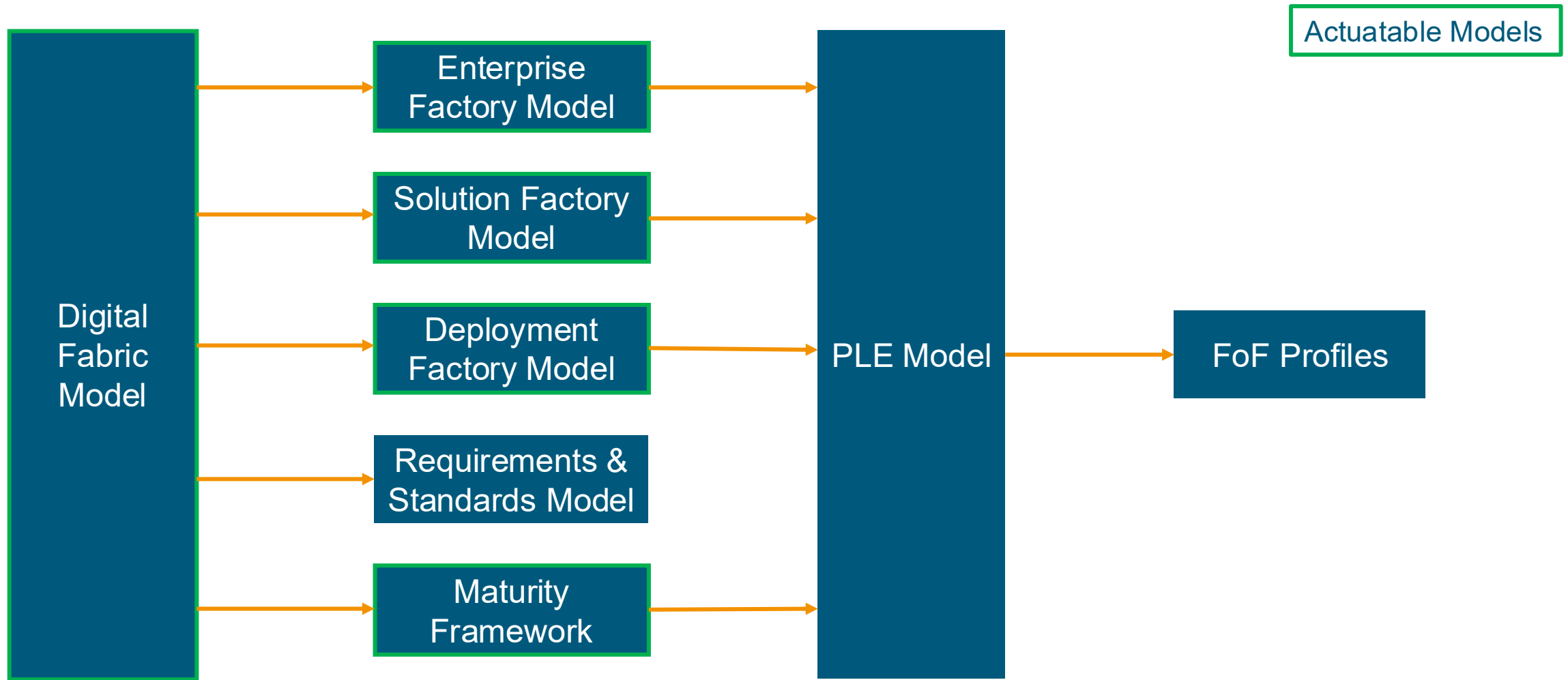
PLE vs Traditional Cost with ROI Overlay



STC's MBPLE Framework

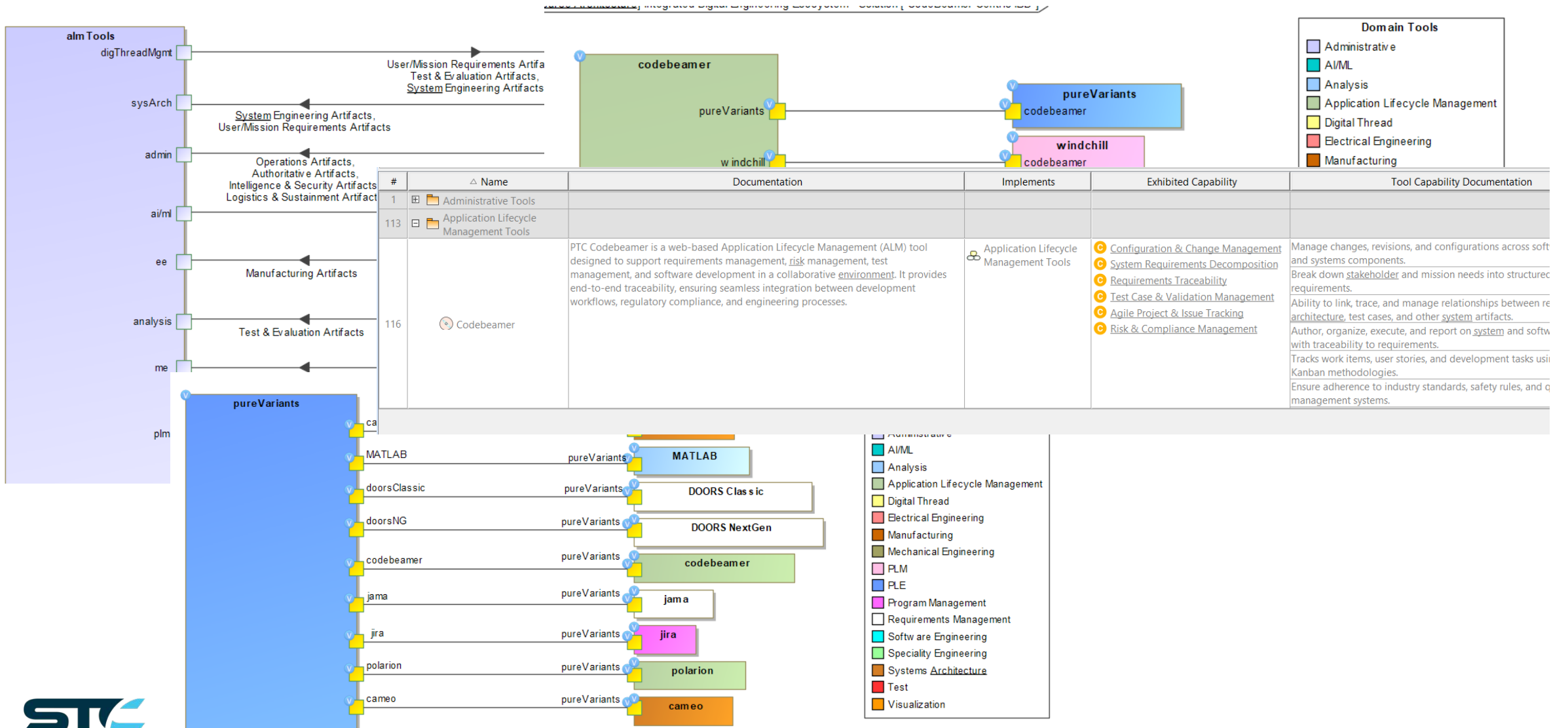


Factory of the Future – Solution Architecture



What do our superset views look like?

Solution Factory



Maturity Framework

#	△ Name	Documentation	Assessment Preview	Default Value
1	☐ Organizational Readiness			
2	☒ Change Management Adoption			
4	☒ Cross Disciplinary Collaboration			
6	☒ Governance and Policy Alignment			
8	☒ Maturity Monitoring and Feedback Loops			
10	☐ OR-1 Workforce Enablement			
11	☐ <input checked="" type="checkbox"/> Accessibility of Training & DE Resources	Ensures that personnel have access to relevant training, documentation, and support resources for DE processes.		
12	☑ Assessor			
13	☑ Measurement Approach			
14	☑ Measurement Value			
15	☑ Measurement Value Justification			
16	☑ MVP Item			☐ <undefined>
17	☑ Weight - Summed to <10			
18	☐ <input checked="" type="checkbox"/> Knowledge Management & Digital Engineering Repositories	Determines the extent to which DE best practices, lessons learned, and key resources are documented and shared.		
19	☑ Assessor			
20	☑ Measurement Approach			
21	☑ Measurement Value			
22	☑ Measurement Value Justification			
23	☑ MVP Item			☐ <undefined>
24	☑ Weight - Summed to <10			
25	☒ <input checked="" type="checkbox"/> Workforce Training & DE Competency Management	Evaluates how well personnel are trained in digital engineering policies and compliance requirements.		
32	☒ OR-2 Change Management Adoption			
89	☒ OR-3 Cross Disciplinary Collaboration			
146	☒ OR-4 Governance and Policy Alignment			

Digital Fabric Model

#	Name	Exhibited Tool Capability	Owned Domain Capability	Owned Enterprise Capability	DoD 5000.97 Refinement
10	Analysis Tools				
62	Application Lifecycle Management Tools				
63	Codebeamer	<ul style="list-style-type: none"> C Configuration & Change Management C System Requirements Decomposition C Requirements Traceability C Test Case & Validation Management C Agile Project & Issue Tracking C Risk & Compliance Management 	<ul style="list-style-type: none"> C Platform Tooling & Packaging Support C Lifecycle Governance & Configuration Management C Integrated Requirements, Test, & Change Lifecycle Management C Requirements Engineering & Traceability C Requirements Development, Traceability & Verification C Software & System-Level Test Management C Project Scheduling, Tracking & Resource Planning C Security, Risk & Compliance Assurance 	<ul style="list-style-type: none"> C Deployment Management C Maturity-Based Framework C Change Management C Digital Engineering Source of Truth C Digital Engineering Standards Adoption & Governance C Regulatory Compliance & Certification Traceability C Tool Interoperability C Requirements Validation C Quality Assurance C Organizational Strategic Alignment C Roadmap C Risk Management 	<ul style="list-style-type: none"> R 12 Risk Management Framework Guidance Provision R 1 Digital Engineering Program Conduct R 49 Configuration Management Process Implementation R 38 Digital Model Maintenance and Configuration Management R 32 Red Team Testing Requirement R 8 Digital Engineering Guidance Establishment R 13 Digital Engineering Practice Development Support R 23 Distributed Developmental Testing Methodology Development R 17 Digital Capabilities Modernization Guidance R 18 Digital Engineering Practices for IT Systems R 27 Digital Twin Fidelity Variation R 31 Digital Models Maintenance R 36 Interoperable Digital Model Development R 37 Standard Approach for Digital Model Development R 34 Digital Model Evaluation R 39 Digital Model Verification, Validation, and Accreditation R 19 DoD Intellectual Property Policy Development R 26 Digital Artifacts Generation R 42 Digital Models and Data Sets as Contract Deliverables R 21 Adaptive Acquisition Framework Pathways Leadership R 33 Infrastructure Selection and Maintenance R 6 Digital Engineering Ecosystem Security R 4 Operational Security Compliance R 45 Digital Engineering Implementation for Major Capability Acquisition R 43 Digital Engineering Procedures in Software Acquisition R 46 Digital Engineering Reporting in Defense Business Systems Acquisition R 44 Digital Engineering Assessment for Urgent Capability Acquisition R 40 Digital Engineering in Acquisition of Services

How we leverage MBPLE to Assess Architectural Impacts across FoF

Previews

	#	Name	Exhibited Tool Capability	Owned Domain Capability	Owned Enterprise Capability	DoD 5000.97 Refinement								
	349	Modeler	SysML V2 Metrics Collection and Reporting			<ul style="list-style-type: none"> 39 Digital Model Maintenance and Configuration Management 2 Digital Engineering Implementation Plan 3 Digital Engineering in Acquisition Strategy 10 Digital Engineering Adoption for Existing Programs 9 USD (R&E) Digital Engineering Responsibilities 15 Digital Engineering Practices Incorporation Guidance 24 Digital Engineering Practices for Operational Test and Evaluation 1 Digital Engineering Program Conduct 6 Digital Engineering Ecosystem Security 9 Support DoD Data Strategy Goals 7 Digital Engineering Data Standards 14 Digital Engineering Strategy and Policy Leadership 26 Digital Artifacts Generation 42 Digital Models and Data Sets as Contract Deliverables 50 Technical Data Management Process Implementation 47 Decision Analysis Process Implementation 		Preview	Default Value					
	350	Rhapsody	<ul style="list-style-type: none"> MBSE Modeling & Architecture Version-Controlled Diagramming & Architecture Automated Document Generation 	<ul style="list-style-type: none"> Model-Based Systems Architecture & MBSE Enablement Architecture Visualization & Controlled Diagramming Collaboration, Publishing & Knowledge Integration Integrated Requirements, Test, & Change Lifecycle Management 	<ul style="list-style-type: none"> Automated Generation and Assessment of DE Ecosystems Methodology Exploration Digital Engineering Source of Truth Feature Integration Flexible Knowledge Management Repository Tool Interoperability Change Management Digital Engineering Standards Adoption & Governance 	<ul style="list-style-type: none"> 27 Digital Twin Fidelity Variation 26 Interoperable Digital Model Development 48 Technical Assessment Process Implementation 2 Digital Engineering Implementation Plan 3 Digital Engineering in Acquisition Strategy 10 Digital Engineering Adoption for Existing Programs 9 USD (R&E) Digital Engineering Responsibilities 15 Digital Engineering Practice Development Support 19 Digital Engineering Practices Incorporation Guidance 24 Digital Engineering Practices for Operations, Test, and Evaluation 18 Digital Engineering Practices for IT Systems 8 Digital Engineering Guidance Establishment 23 Distributed Developmental Testing Methodology Development 17 Digital Capabilities Modernization Guidance 31 Digital Models Maintenance 37 Standard Approach for Digital Model Development 38 Digital Model Maintenance and Configuration Management 1 Digital Engineering Program Conduct 	access to							
							g programs.							
							l Engineering							

Instantiated Variant Model Views

Domain Tools


- Administrative
- AIML
- Analysis
- Application Lifecycle Management
- Digital Thread
- Electrical Engineering
- Manufacturing

#	△ Name	Documentation	Implements	Exhibited Capability
1	Administrative Tools			
3	Analysis Tools			
7	Application Lifecycle Management Tools			
8	Codebeamer	PTC Codebeamer is a web-based Application Lifecycle Management (ALM) tool designed to support requirements management, risk management, test management, and software development in a collaborative environment. It provides end-to-end traceability, ensuring seamless integration between development	Application Lifecycle Management Tools	<ul style="list-style-type: none"> ● Configuration & Change Management ● System Requirements Decomposition ● Requirements Traceability ● Test Case & Validation Management
9	Digital Thread Management Tools			
13	Mechanical Engineering Tools			

#	△ Name	Documentation	Assessment Preview	Default Value
1	Organizational Readiness			
2	Change Management Adoption			
4	Cross Disciplinary Collaboration			
6	Governance and Policy Alignment			
8	Maturity Monitoring and Feedback Loops			
10	OR-1 Workforce Enablement			
11	Accessibility of Training & DE Resources	Ensures that personnel have access to relevant training, documentation, and support resources for DE processes.		
12	Assessor			Jake Engle
13	Measurement Approach			% of workforce with access
14	Measurement Value			1. Initial (Ad Hoc & Fragmented)
15	Measurement Value Justification			No formalized Digital Engineering
16	MVP Item			<input checked="" type="checkbox"/> true
17	Weight - Summed to <10			0.05
18	Knowledge Management & Digital Engineering Repositories	Determines the extent to which DE best practices, lessons learned, and key resources are documented and shared.		
	Workforce Training & DE Competency	Evaluates how well personnel are trained in digital engineering policies		

Visualization Dashboards for FoF

Tool Configurator



STC Tool Feature Catalog

This dashboard provides an evaluation of tools documented by STC. Use the filters to focus on a specific domain and view the tools relevant to that area. You can also explore how each potential tool selection aligns with and satisfies DoD 5000.97 Requirements

Project(s) Viewing

 BPMI
 STC Enterprise Arc...

Navigation Pane

- Welcome to FoF
- Tool Selection
- Tool Capability Selection
- Domain Selection
- DE Capability Selection
- STC Service Catalog
- Project Comparison
- Output Report

Select Tool(s):

- 3D Expert
- 3DCS
- 3DEXPERIENCE
- 3DPlay
- 7-ZIP
- Abacus CAE
- ABAQUS
- Accent
- AcqBot
- AD Mgmt Tools
- Adobe
- AFSIM
- Agent Ransack
- AimSim
- Allegro
- Altium Designer
- Amazon Web Services
- Anaconda
- Android
- Ansible
- Ansible Tower
- Ansys
- Ansys Additive Suite
- Ansys CFD
- Ansys CFX
- Ansys Chemkin

Select Domain

- Mechanical Engineering Domain
- Product Lifecycle Management Domain
- Product Line Engineering Domain
- Program Management Domain
- Requirements Management Domain
- Software Engineering Domain
- Specialty Domain

Domains Selected

- Application Lifecycle Management Domain
- Product Lifecycle Management Domain
- Product Line Engineering Domain
- Systems Architecture Domain

Domain Capability List

- Domain Capability
- Architecture Visualization & Controlled Diagramming
- Integrated Requirements, Test, & Change Lifecycle Management
- Lifecycle Governance & Configuration Management
- Platform Tooling & Packaging Support

Selected Tool List

- Codebeamer
- Modeler
- PureVariants
- Windchill

4

Count of Tools

Capabilities List

- Exhibited Tool Capability
- Configuration & Change Management
- Diagramming & Concept Modeling
- Feature-based Product Line Engineering
- Orthogonal Variability Modeling
- Product Lifecycle Management (PLM)
- Requirements Traceability
- System Requirements Decomposition
- Version-Controlled Diagramming & Architecture

8

Count of Tool Capabilities

Requirement Coverage Based on Selected Tools

Tool	DoD 5000.97 Refinement
Codebeamer	Adaptive Acquisition Framework Pathways Leadership
Codebeamer	Configuration Management Process Implementation
Codebeamer	Digital Artifacts Generation
Codebeamer	Digital Capabilities Modernization Guidance
Codebeamer	Digital Engineering Assessment for Urgent Capability Ac
Codebeamer	Digital Engineering Ecosystem Security
Codebeamer	Digital Engineering Guidance Establishment
Codebeamer	Digital Engineering Implementation for Major Capability
Codebeamer	Digital Engineering in Acquisition of Services

Tool Domains Usage Based on Tool Selection

Domain	Count	Percentage
Application Lifecycle Management Domain	3	33.33%
Systems Architecture Domain	3	33.33%
Product Lifecycle Management Domain	2	22.22%
Product Line Engineering Domain	1	11.11%

Redundant Capabilities Based On Tool Selection


- Exhibited Tool Capability
- Configuration & Change Management

1

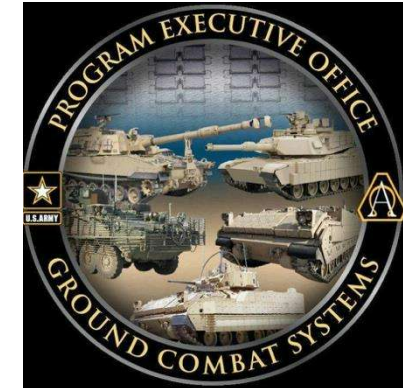
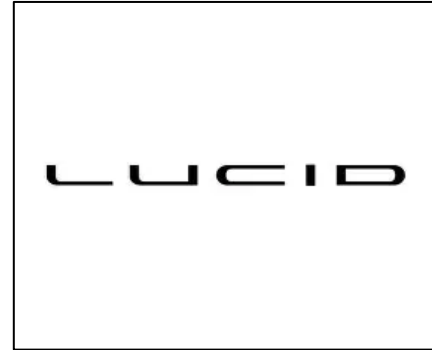
Redundant Capabilities

80

Requirement Coverage %



Customer Success Stories



THANK YOU



AN ARCFIELD COMPANY

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