

Best Practices and Lessons Learned from the Digital Transformation at General Dynamics Mission Systems

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GENERAL DYNAMICS Mission Systems

LAND



SEA



AIR



SPACE



CYBER



Imagine a world. . .

Imagine a world where your engineering teams can design, test, and iterate faster than ever before, with fewer errors and better collaboration.

By shifting from traditional document-based methods to model-based digital engineering, we can achieve this.

This transformation will enable us to create detailed, interactive models that can be easily updated and shared in real-time, ensuring everyone is on the same page.

It reduces misunderstandings, improves efficiency, and accelerates our development cycles.

Plus, it's not just a best practice—it's a Department of Defense directive, underscoring its importance and necessity.

This positions us ahead of competitors by embracing the future of engineering.

Let's lead the charge into this new era and unlock our full potential.

Who Are You? Why Are You Here?

- This is you
 - You're an engineer!
 - You want to do good work!
 - You want to contribute on a high performing team!
 - You want to be seen as knowledgeable!



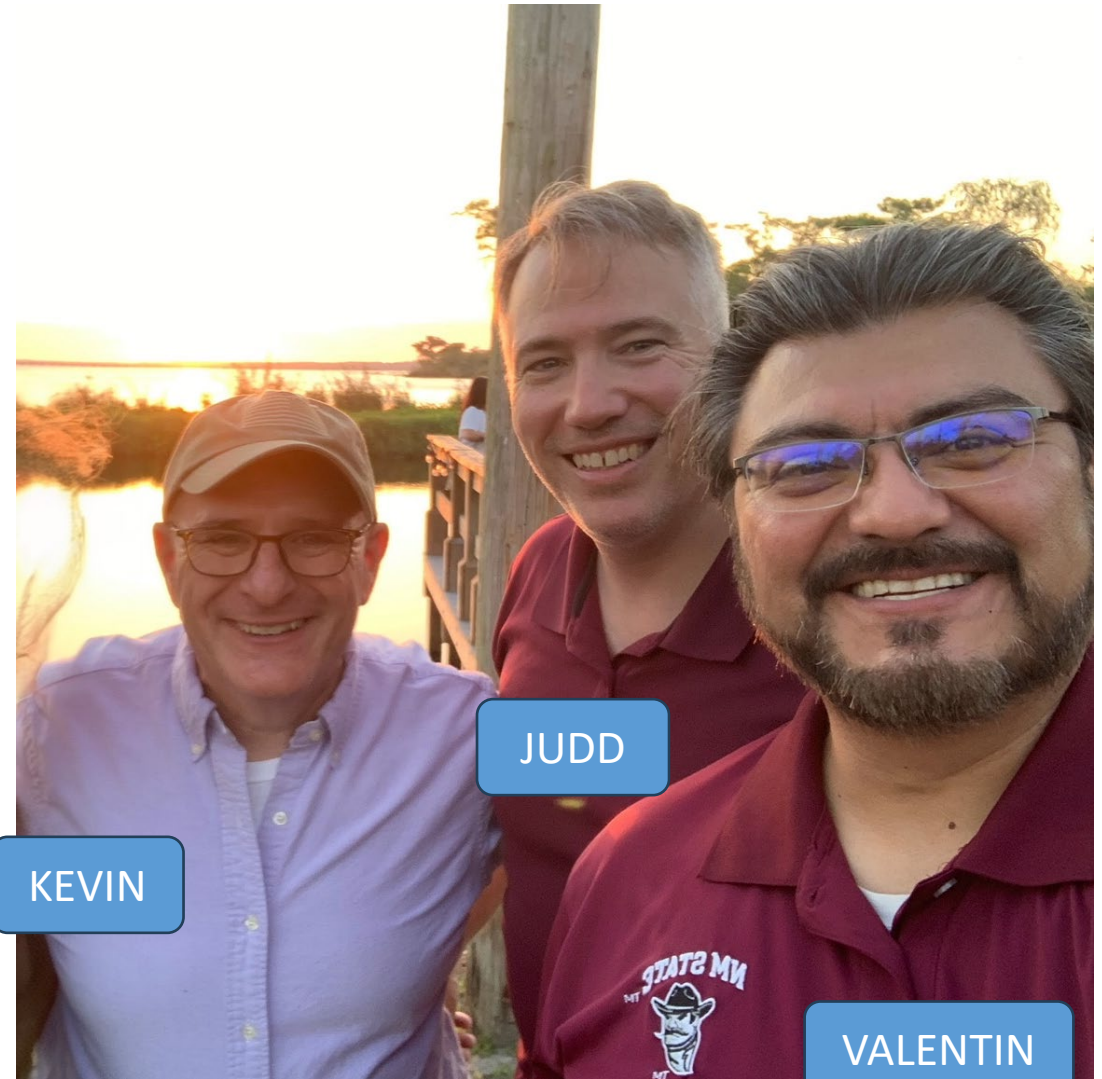
You want to be recognized as a leader at Digital Engineering

The Transformers

Who am I

The Transformers have worked with over 30 Teams for the adoption of DE since 2022

Teams come with different backgrounds and skillsets, and projects ranging from low-level embedded to large, enterprise-level; green field, IRADs, and legacy projects



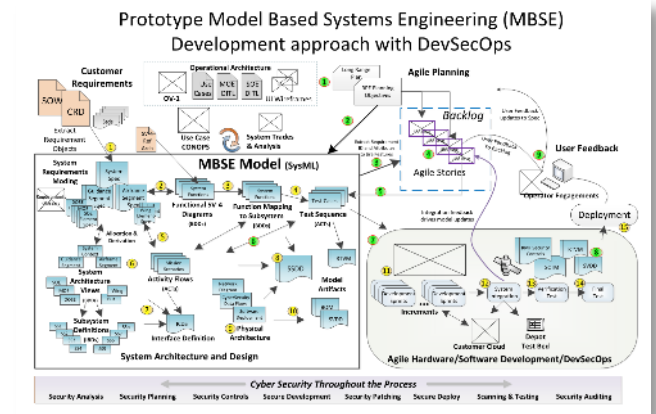
Background

- Teams are choosing to adopt Digital Engineering, or in some cases, *required* to
- Some teams are knocking it out of the park, while others struggle
- Some engineers are eager to jump in, while others aren't
- *My team is sharing our observations, experiences, know-how*

Note: My company's transformation started with Model-Based Systems Engineering (MBSE)

Best Practices - Knocking It Out Of The Park



- Acknowledging there is a lot to learn
- Rolling up your sleeves and getting dirty
- Getting other disciplines in the model
- Collaboration / Communication Tool
- Taking the bull by the horns





Lessons Learned on Struggles

- Recognizing that MBSE is SE (Systems Engineering)
- Strategic, Long-term modeling versus quick modeling
- Starting with the Problem Domain, and no short cuts
- Structuring the model for size; Federated modeling
- Knowing your audience
 - Learn your team's needs, including extended consumers
 - Model for value, for answering questions
 - Avoid over-modeling

		PILAR			
DOMAIN		REQUIREMENTS 1.1	BEHAVIOR 1.2	STRUCTURE 1.3	PARAMETERS 1.4
	PROBLEM (Black Box)	01.M1 Stakeholder Needs 1.1 Model Section	02.M2 Use Cases 1.2 Model Section	03.M3 System Context 1.3 Model Section	04.M4 Measures of Effectiveness 1.4 Model Section
	1.X	 Stakeholder Needs Objectives	Use Cases	System Context	MOE1
	PROBLEM (White Box)	02.M5 Functional Analysis 2.2 Model Section	02.M6 Logical Subsystem Configuration 2.3 Model Section	04.M7 Models for Subsystems 2.4 Model Section	04.M8 Models for Subsystems 2.4 Model Section
	2.X	 White Box Requirements	Functional Analysis	Logical Subsystem Structure	Models for Subsystems
	SOLUTION	01.S1 System Requirements 3.1 Model Section	02.S2 System Behavior 3.2 Model Section	03.S3 System Structure 3.3 Model Section	04.S4 System Parameters 3.4 Model Section
	3.X	System Requirements	System Behavior	System Structure	System Parameters
	4.X	01.S5 Subsystem Requirements 4.1 Model Section	02.S6 Subsystem Behavior 4.2 Model Section	03.S7 Subsystem Structure 4.3 Model Section	04.S8 Subsystem Parameters 4.4 Model Section
	4.1 Subsystem Requirements	Subsystem Requirements	Subsystem Behavior	Subsystem Structure	Subsystem Parameters
	01.H1 Requirements 5.1 Model Section	02.H2 Use Cases 5.2 Model Section	03.H3 Box Configurable Item 5.3 Model Section	04.H4 Box Parameters 5.4 Model Section	
5.X	—	—	—	—	
6.X	01.I1 Board Requirements 6.1 Model Section	02.I2 Board Level Logic 6.2 Model Section	03.I3 Board Level Configurable 6.3 Model Section	04.I4 Board Level Parameters 6.4 Model Section	
7.X	—	—	—	—	
PP1 Part Requirements 7.1 Model Section	PP4 Piece-Part Configuration 7.2 Model Section	PP4 Piece-Part Configuration 7.3 Model Section	PP4 Piece-Part Parameters 7.4 Model Section		
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VERIFICATION	REQUIREMENTS	ANALYSIS	DEMONTSTRATION INSPECTION	TEST	

Note: My company's transformation started with MBSE

Warning! Short cuts can often lead the appearance that MBSE is wasteful

Play-Actors

Talking the Talk.. But when you peel back the layers, seeing the team is going down the wrong path.

- Bad Model Organization; not modeling for reusability
- Not connecting the design model and its implementation (giving the impression modeling is great)
- Creating diagrams in drawing tools like Visio or using PowerPoint only to have them re-created in the model
- Commonly heard from these teams:
 - *“We don’t need any help. Thank you”*



Warning! This can often lead to propagating bad or unsustainable patterns

Leaning Forward

- Drive. Personalities. Leadership
- Listening to the customer
- Observing the changing landscape
- Look outward to industry.
 - Conferences, Local gatherings, INCOSE
- Acknowledging areas for growth or short comings
- Pushing others to get excited!

Transformation

- My organization has recognized the subtle difference between Adoption and Transformation
- Adoption – incorporating new tools and practices; *Learning*
- Transforming into a Digital Engineering Enterprise; *Growing*
 - Leadership support
 - Celebrating quick wins
 - Metrics and showing value
 - Adding and Integrating Digital Threading and Twinning into the Enterprise

The Takeaways

- Digital Engineering isn't an island
 - Feel safe in asking for help
 - Avoid spin
 - Share with others
- Roll up your sleeves; know you'll make mistakes
 - Model for value
 - Avoid check-the-box modeling
 - Get your peer disciplines in the model!
- Lots to learn, even for SMEs
- Having leadership not only buy in, *but committed*

Enterprise Resources

- My company maintains shared repository of documents, manuals, tips and tricks
- My company is investing in new threading and twinning infrastructure
- My company supports the notion of having Coaches and Champions. Mentors, SMEs, and Advocates
- Outreach activities, both Internal and External
- Kick-start Workshops and Internal Training

Connecting to GDMS' Mission, What does it mean to our customers

- By shifting from traditional document-based methods to model-based Digital Engineering
 - We can design, test, and iterate faster than ever before, with fewer errors and better collaboration.
 - It enables us to create detailed, interactive models that can be easily updated and shared in real-time, ensuring everyone is on the same page, reducing misunderstandings, improving efficiency, and accelerating our development cycles.

This positions us ahead of competitors by embracing the future of engineering and show our customers how we are leaning forward and embracing new technologies and tools that make our world safer and more secure

- Any questions?
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