DIGITAL ENGINEERING
/ SYSTEMS ENGINEERING

Implementing Model-Based Product Line Engineering (MBPLE) to Manage a Mixed Portfolio of Legacy, Upgrade, & New Development Systems for Self-Propelled Howitzer (SPH)

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The SPHS Challenge

How does a program office implement Digital Engineering (DE) for legacy platforms?

- SPH portfolio includes a mixed portfolio: legacy systems, major upgrades, and new development systems

Must balance several considerations:

- Numerous variants with specific purposes in one portfolio
- Technical data availability
- Various acquisition strategies/plans
- Resource availability
- Managing mandated Government Furnished Equipment

Identifying the appropriate DE implementation level continues to evolve and take shape

- Recommended initial steps follow

The SPHS Approach

Step 1: Develop an integrated Model-based System Engineering (MBSE) model intended to support the entire portfolio.

The integrated model establishes a new SE baseline for the SPHS fleet that will enable the PM to effectively manage and plan upgrades across the portfolio.

- Simplified representation of a complex system
- Authoritative Source of Truth (ASoT)
- Creates a digital thread, linking typically-siloed information
- Increased cross-functional collaboration

The model must accomplish 3 things:

1. Enable definition of multiple variants
2. The ability to add new source requirements (extensibility)
3. Support multiple acquisition strategies (scalability)

The SPHS Approach

Step 2: (Re)Define the system boundary line and take ownership of the performance

Previous System Boundary

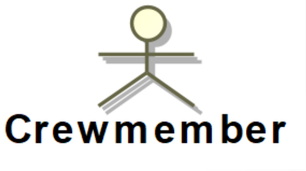
Firing platform

New System Boundary

Firing platform

Resupply platform

Ammunition Suite



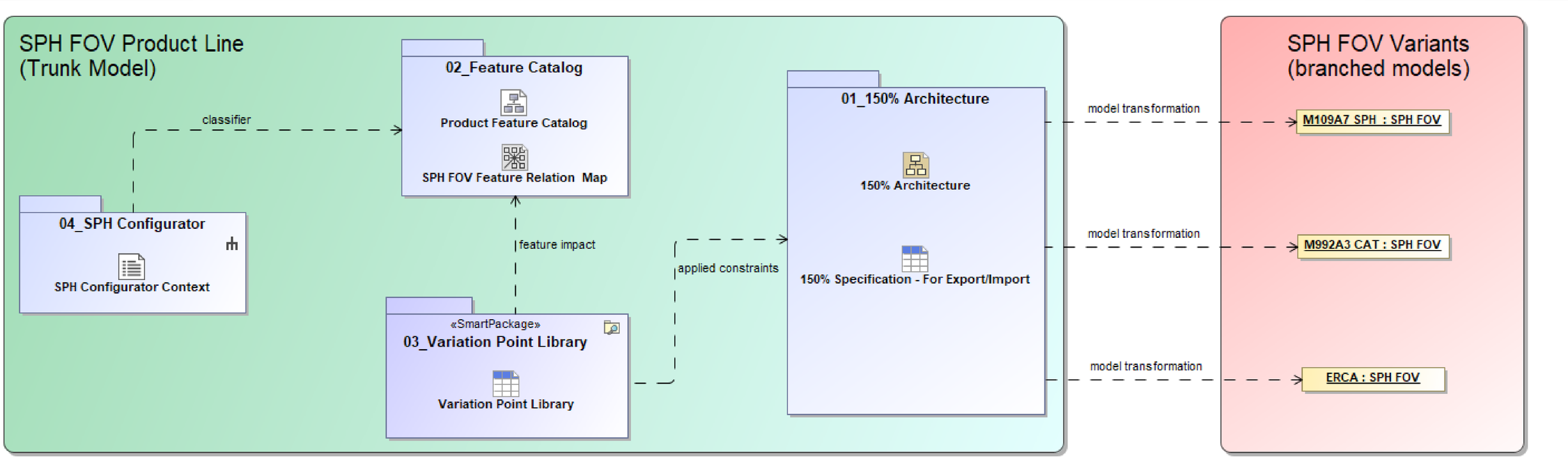
Training Aids, Devices, Simulators and Simulations (TADSS)

GFM – Radios, etc.

Step 3: Implement PLE principles

- Moving away from “clone and own”
- PLE allows for only one version of any “part” to ever exist in the model
  - (i.e. function, requirement, architectural element, widget, etc.)

MBPLE Framework



Model Federation for Government – Industry Collaboration

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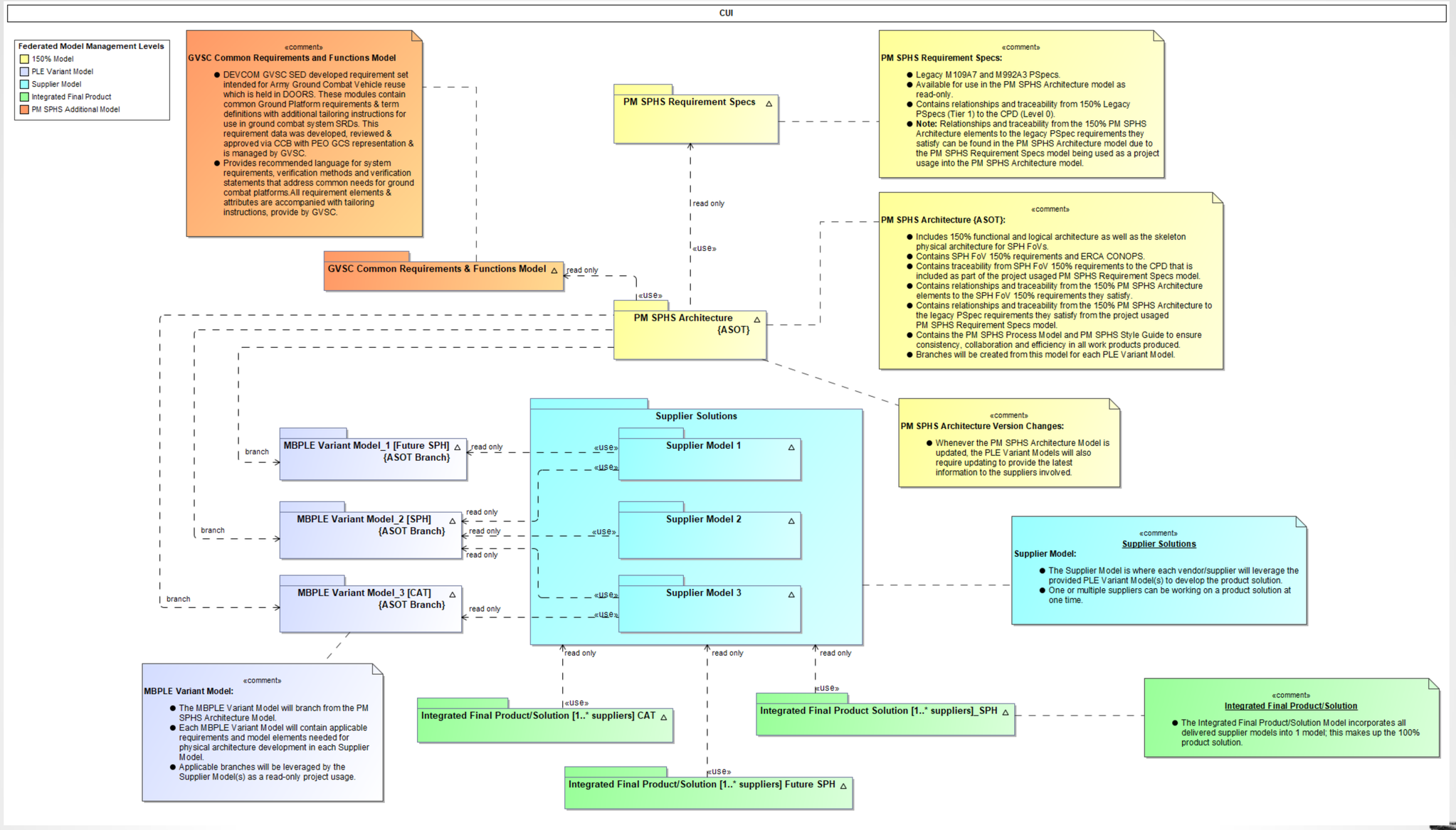
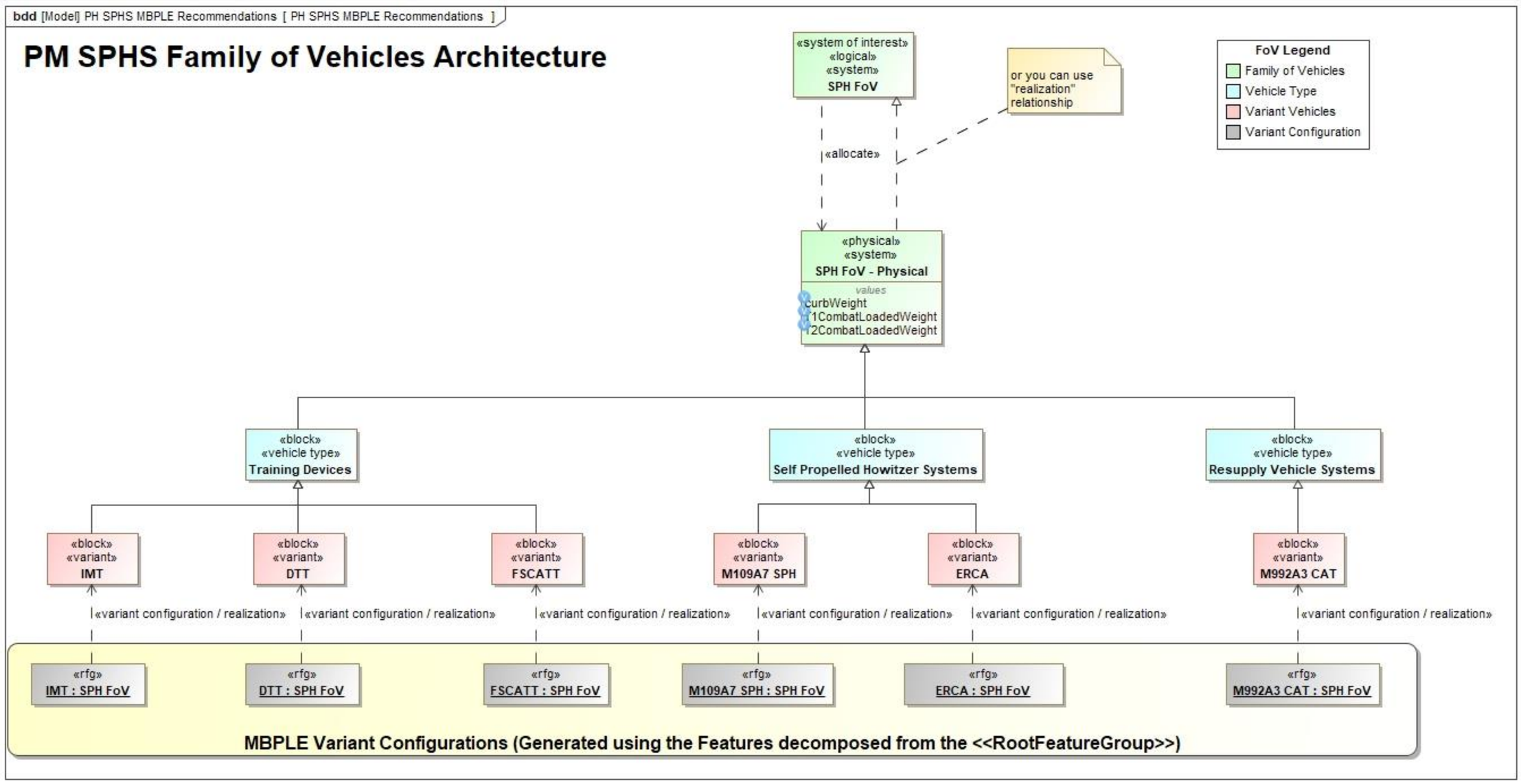
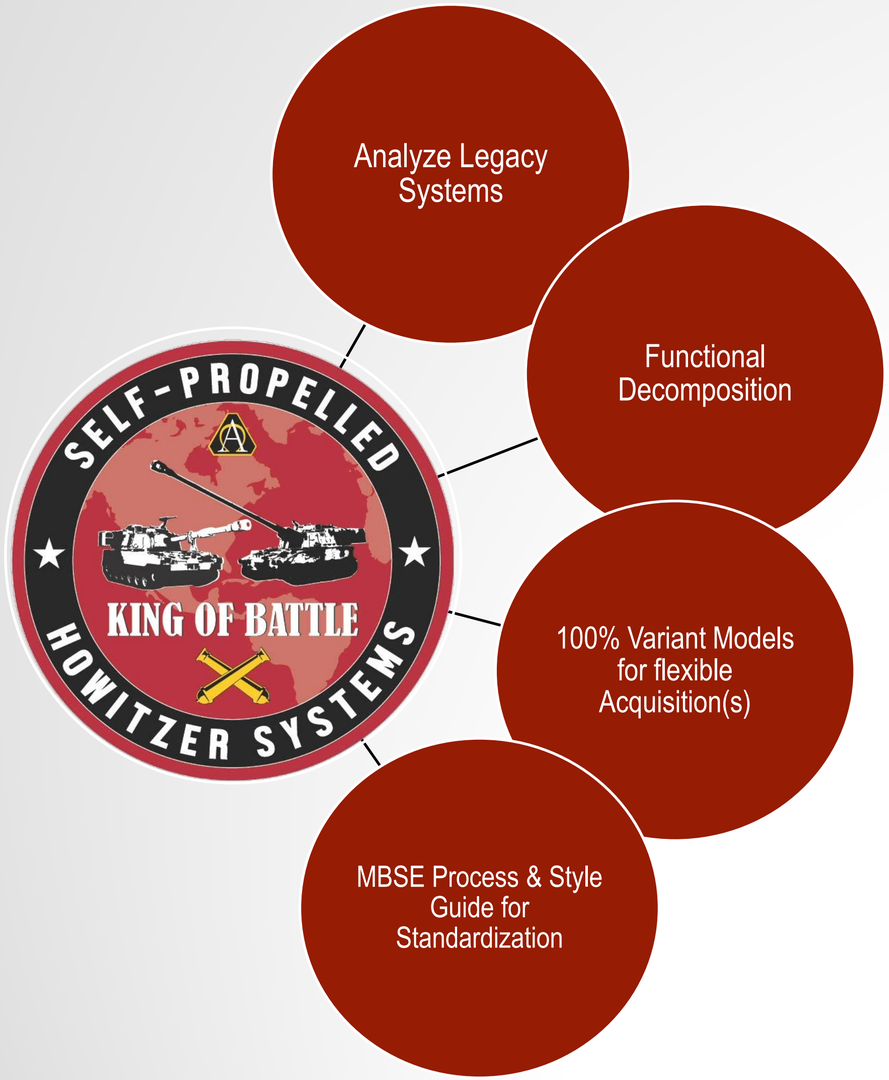


MBPLE Technical Approach & Benefits



Legacy, Upgrade, & New Development



- Analysis of Legacy Systems' requirements & documentation to enable MBPLE Capabilities for Common, Unique, & Modified system model elements & associated requirements
- Functional Decomposition developed for New SPH derives additional functional requirements for evolving SPH FoV capabilities
- Government-defined Functional & Logical Architecture and 150% Requirements Set
- **Enforcing Standardization**: MBSE Strategy & Implementation Guide, MBSE Style Guide, Metamodel, Process Model & How-To Guides via Model Federation Plan

Lessons Learned

- **Adaptive Acquisition Strategy**
- Flexible approach provides the ability to assess physical solutions that are viable options within changing budget & contracting constraints in each FY

- **Commonality & Standardization**
- Technical analysis through functional decomposition of SPH FoV, requirements traceability & gap analysis to inform future SPH variants

- **Modularity, Interoperability & Standardization**
- Identifying functionality, interfaces & requirements that support modularity & interoperability leveraging MBPLE variation points & variant development