Use of MDA in the SIAP Program

Presented at:

MDA Implementers' Workshop:

Succeeding with Model Driven Systems

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Agenda

- Single Integrated Air Picture (SIAP)
- The Integrated Architecture Behavioral Model (IABM) PIM
- From PIM to PSM – Procedure, Verification, Validation
- Issues
- Summary

Problem Definition

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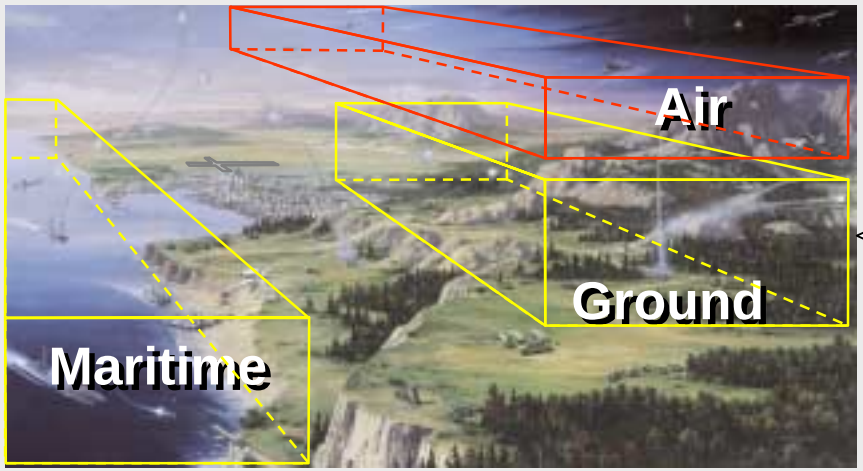

Operational Problem:

- **Engagements constrained by**
  - Procedural controls
  - Target ID
  - Sensor limitations
- **Lack of interoperability among**
  - Weapon Systems
  - Sensors
  - C4I

Operational Elements:

- **Single Integrated Air Picture**
- **Combat Identification**
- **Integrated Fire Control**
- **Automated Battle Management Aids**
- **Attack Operations**
- **Passive Defense / Early Warning**

Process Overview

- Integrated Architecture Behavior Model (IABM) requirements sourced from all Services
- JSSEO outputs test requirements for Joint Interoperability Test Command (JITC)
- JSSEO produces IABM for use by Services
  - PIM developed by industry, university, FFRDC and government team
  - Distributed through Program Offices to primes

SIAP Consortium

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spa

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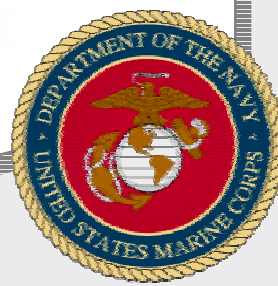

The SIAP Goal

- A federation of peers over the network implementing the same processing logic
  - Each peer is a Platform-Specific Implementation (PSI) of the same IABM PIM
  - Peers are deployed on heterogeneous platforms
- Peers can share consistent information such as Combat ID
  - Common functionality implemented and maintained commonly
- Each peer can generate an improved, more complete, picture of the battlespace by utilizing information received from other peers
- Specifications for the shared behavior are expressed in a form that is not susceptible to human error or interpretation by the contractors
- Verification and validation of correct performance can be accomplished uniformly across all weapons systems

Using MDA to Implement SIAP

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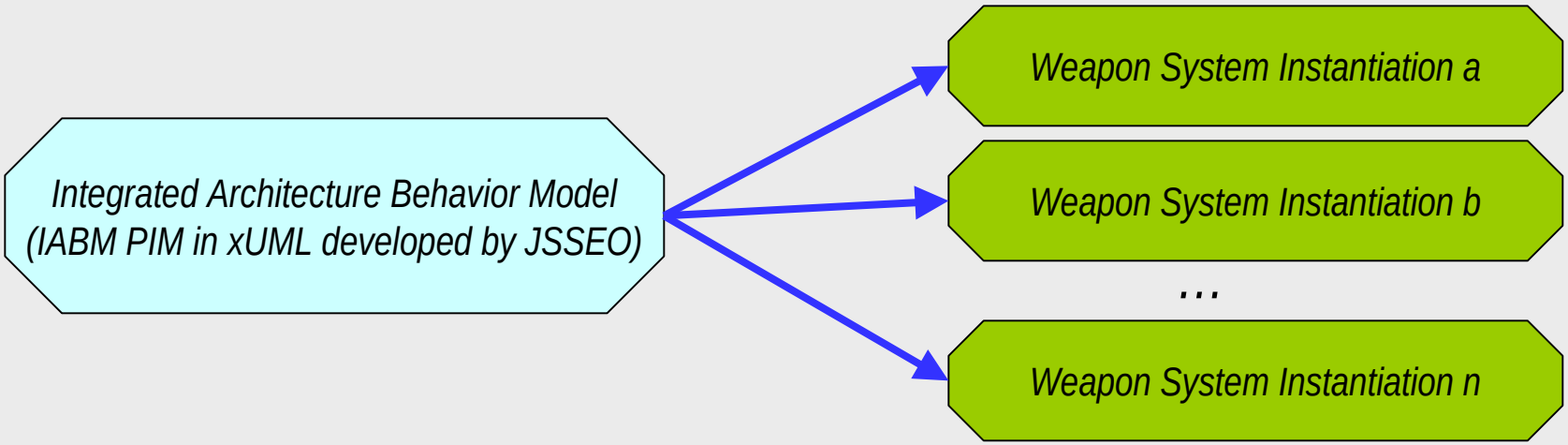

- Critical processing logic (business rules) captured in the IABM (PIM), guaranteed to be applied uniformly across all IABM Peers
- Requirements and specifications encapsulated in the IABM are precise and not subject to interpretation by prime contractors
- Potential n to 1 reduction in the maintenance cost of the core processing logic (n Weapon Systems, 1 IABM)
- Separates functionality and implementation
  - Provides design stability as implementation technologies evolve and improve

Cost Implications of MDA

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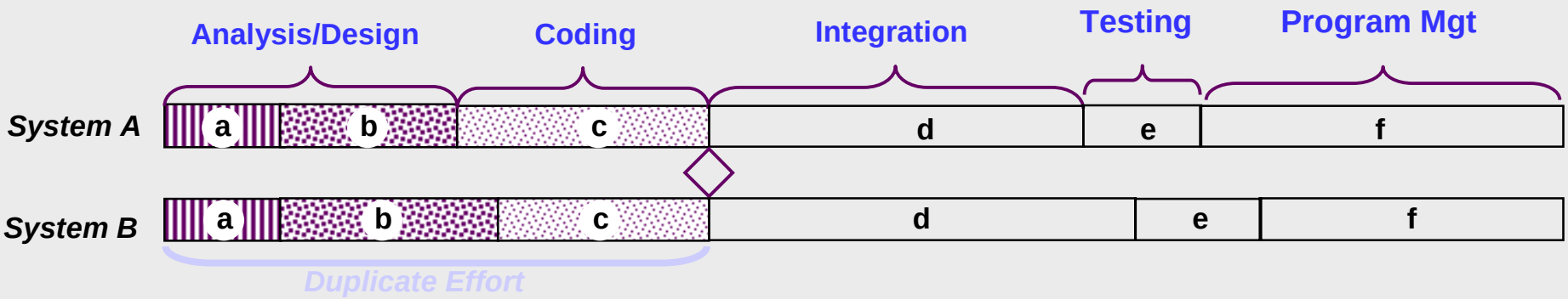
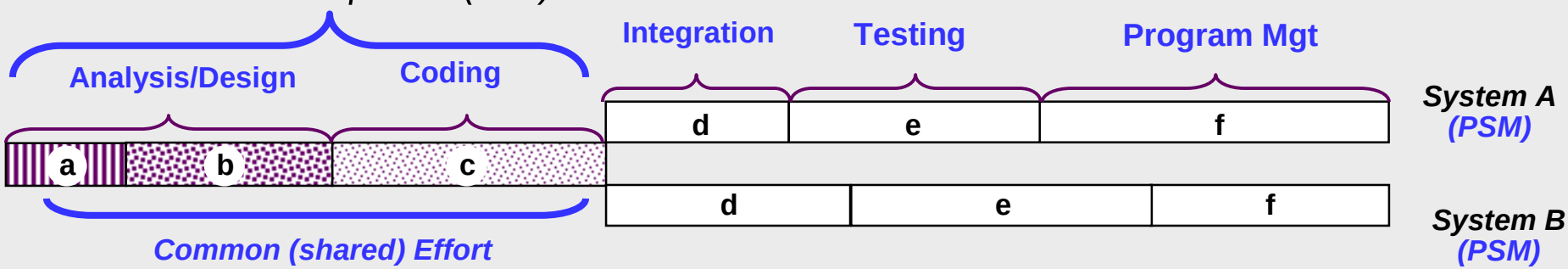
Conventional Development Total Cost = Cost of System A + Cost of System B



IABM Development (PIM)



MDA Cost Savings over n Weapon Systems = n * (a + b + c)

The cost of both PIM development and maintenance is amortized across multiple systems.

Overview of IABM Approach

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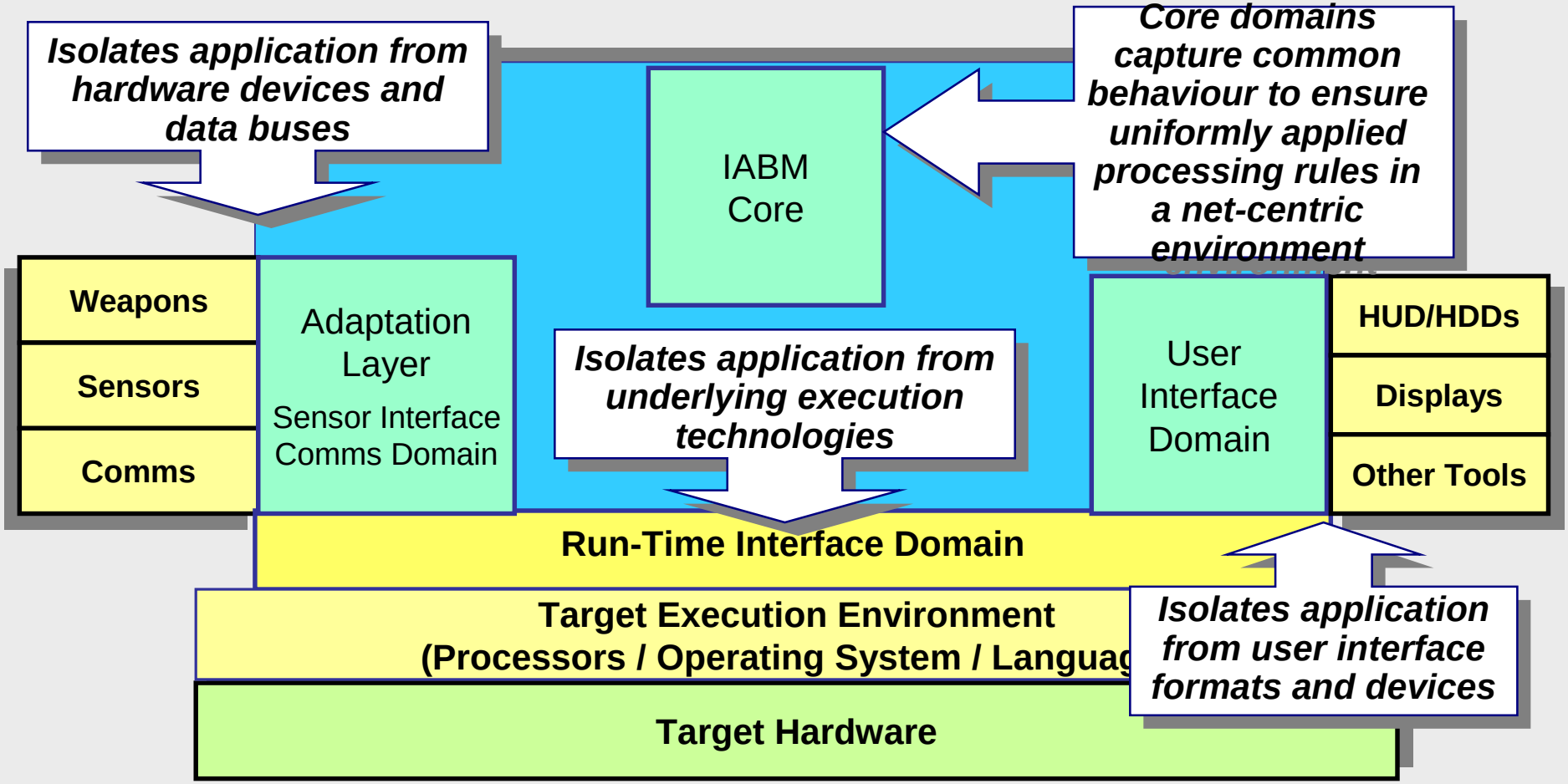
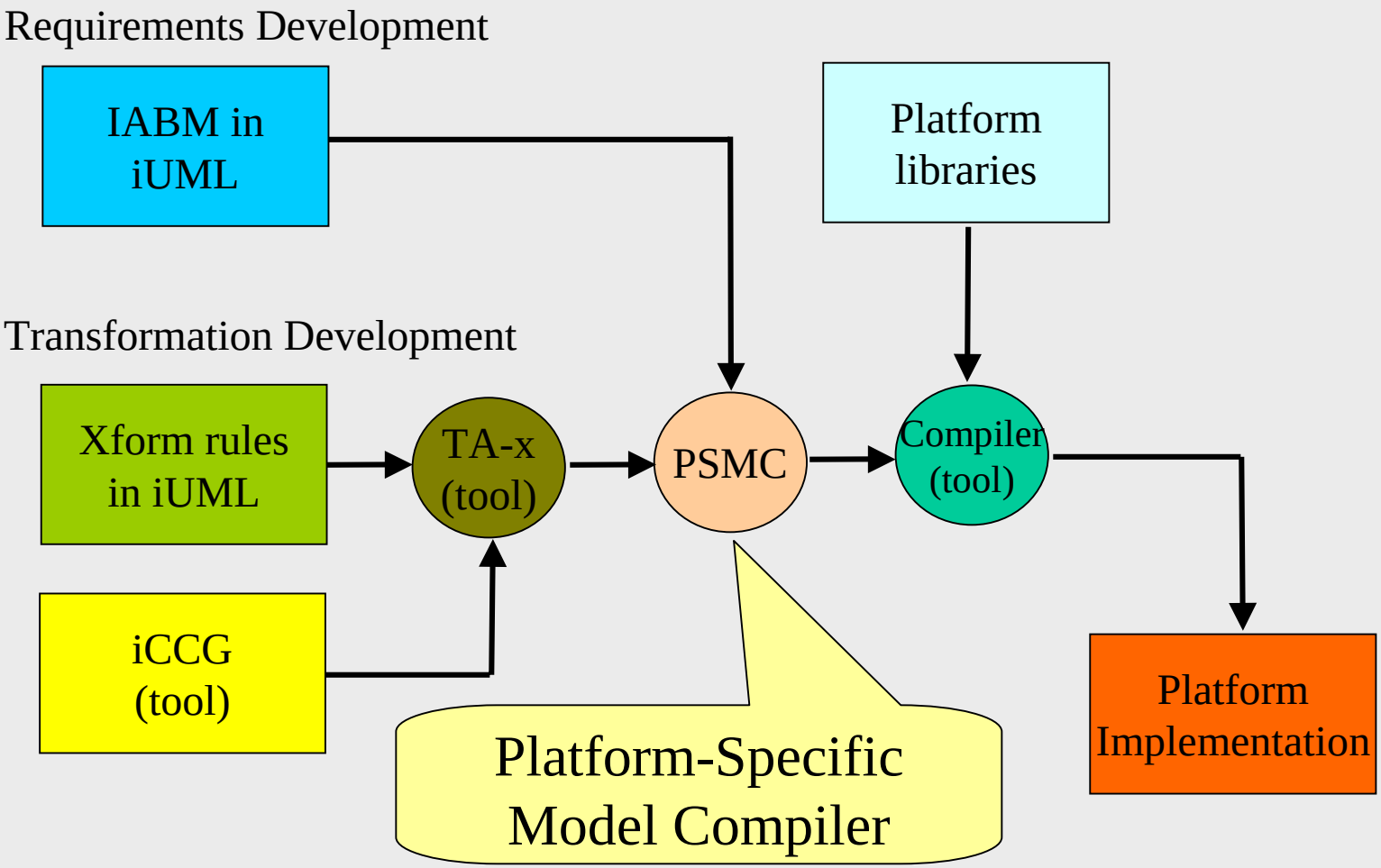
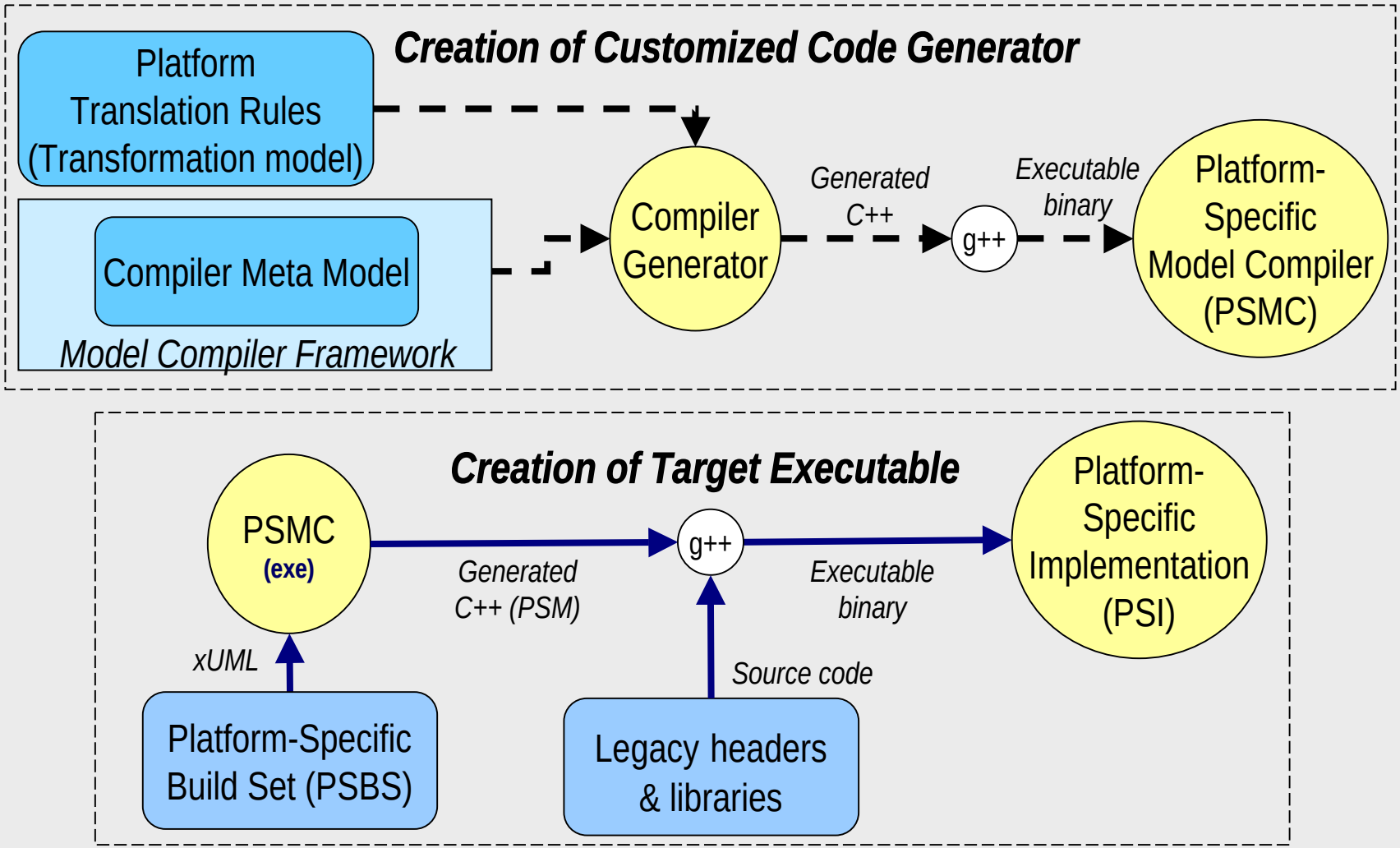


Notional PIM-to-PSI Transformation



PSM Generation



PSI Verification and Validation

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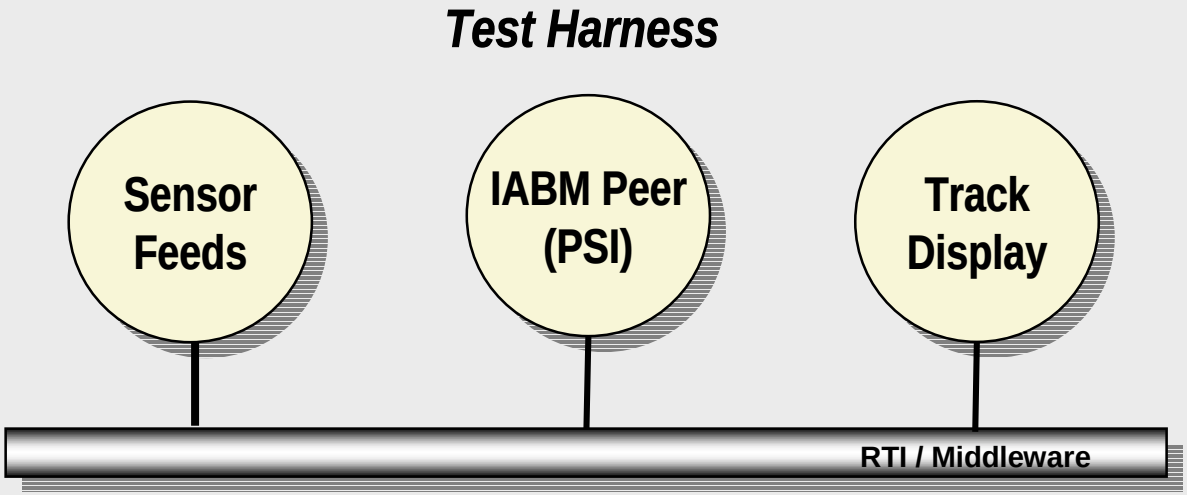

Simulation Test Objectives

- Does PSI behave as an expected instance of the IABM?
  - Can be verified using stub interface code
- Does PSI behave as expected by weapon system platform?
  - Initial stub testing can reveal early performance numbers
  - Final testing requires fully populated platform library code

SIAP System Development Process

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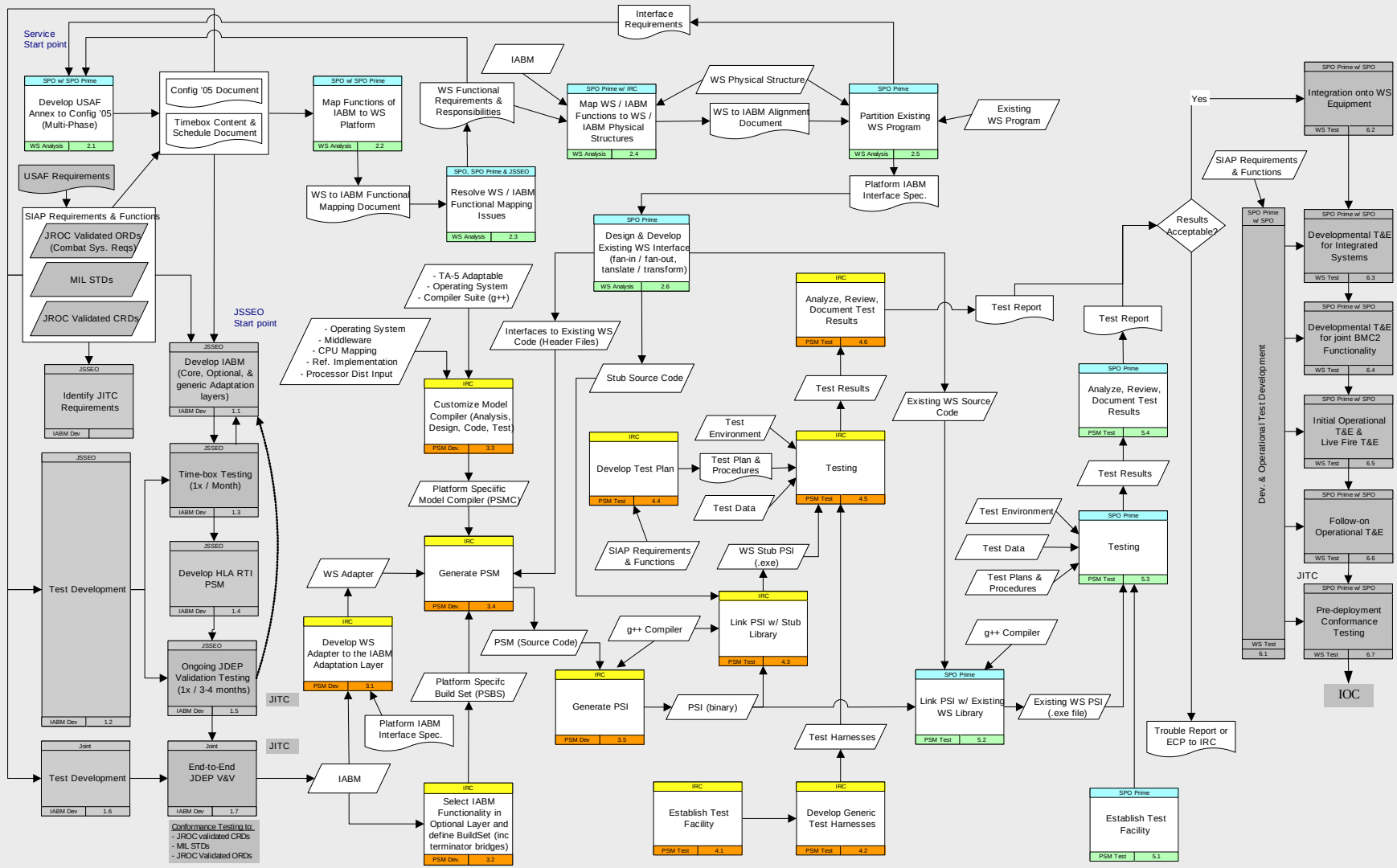

Challenges

- Tools supporting MDA are still evolving
  - UML standards for interchange and transformations being defined
- Configuration Management unique to the MDA process
  - See Wednesday's "Practical MDA" sessions
- Horizontal acceptance
  - New government procurement paradigm
  - Affects prime's business model

Summary

- SIAP is an important goal of the DoD that is now being addressed using a novel approach both in terms of development as well as government procurement
- The Joint SIAP System Engineering Organization has adopted Model Driven Architecture with xUML as their development and deployment methodology
- Shared processing logic is captured in JSSEO's Integrated Architecture Behavior Model (IABM) – an xUML model can be deployed in multiple weapons systems