

Enabling Multi-Vendor Model Based Application Development Using the FACE™ Technical Standard

Mark Snyder, L3Harris
Mark McBroom, MathWorks
Kirsten McCane, MathWorks



Agenda

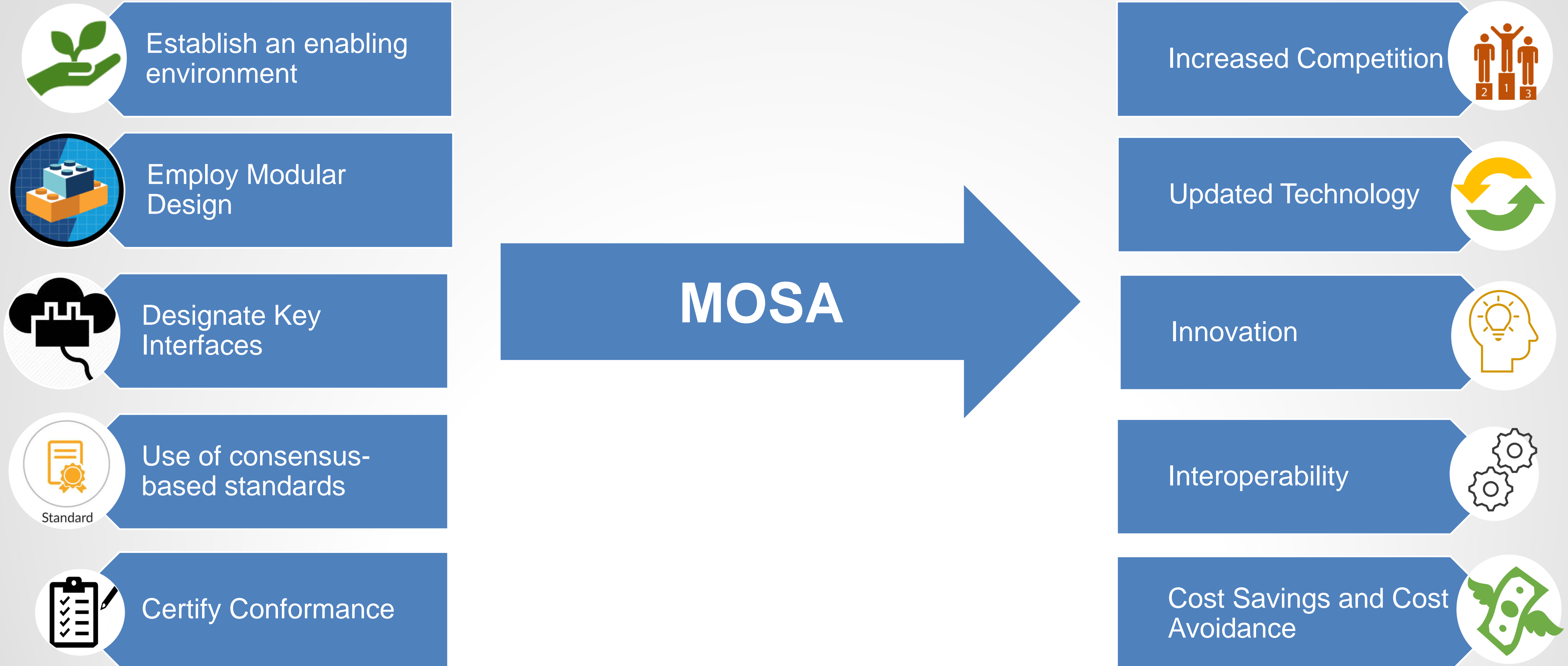
MODULAR OPEN SYSTEMS APPROACH

- Background and Motivation
- Multi-Vendor MOSA Demonstration



MOSA will enable the DoD to rapidly deliver modular and continuously adaptable systems at lower costs

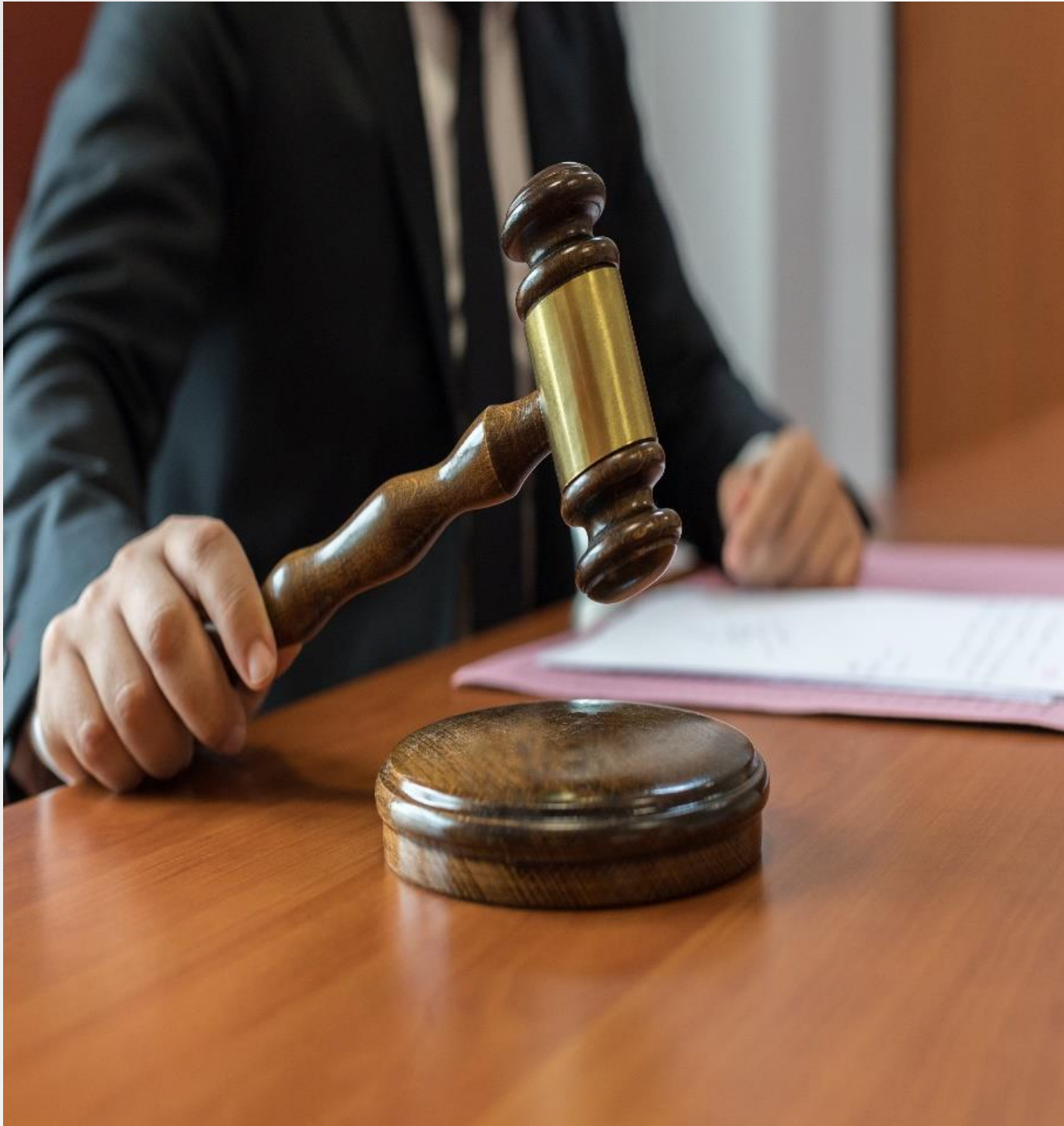
MODULAR OPEN SYSTEMS APPROACH



MOSA is driving and supporting the implementation of open systems.

MODULAR OPEN SYSTEMS APPROACH

US Law: Title 10 U.S.C. 2446a.(b)



MOSA Tri-Service Memo

Office of the Secretary of the Navy
1000 Navy Pentagon
Washington, DC 20350-1000

Office of the Secretary of the Army
101 Army Pentagon
Washington, DC 20310-0101

Office of the Secretary of the Air Force
1670 Air Force Pentagon
Washington, DC 20330-1670

July 7 2019

MEMORANDUM FOR SERVICE ACQUISITION EXECUTIVES AND PROGRAM EXECUTIVE OFFICERS

SUBJECT: Modular Open Systems Approaches for our Weapon Systems is a Warfighting Imperative

Victory in future conflict will in part be determined by our ability to rapidly share information across domains. Sharing information from machine to machine requires common standards.

For the past several years, each of the Services has been developing, demonstrating, and validating common data standards through a cooperative partnership with industry and academia. This work has resulted in the establishment of Open Mission Systems/Universal Command and Control Interface (OMS/UCI), Sensor Open Systems Architecture (SOSA), Future Airborne Capability Environment (FACE) and Vehicular Integration for C4ISR/EW Interoperability (VICTORY) among other standards.

We have reviewed the capabilities of these common standards. We determined the continued implementation of these standards, and further development of Modular Open Systems Approach (MOSA) standards in areas where we lack them is vital to our success. As such, MOSA supporting standards should be included in all requirements, programming and development activities for future weapon system modifications and new start development programs to the maximum extent possible.

In an effort to formalize our approach to MOSA, Service Acquisition Executives will publish specific implementation guidance for our acquisition programs. Additionally, Standardization Executives should continue standards development efforts where we have gaps. Lastly, requirements and programming functions will ensure MOSA is reflected in our requirements and programs to ensure our future weapon systems can communicate and share across domains.

Richard V. Spencer
Secretary of the Navy

Mark T. Esper
Secretary of the Army

Heather Wilson
Secretary of the Air Force

Navy

Air Force

Army

“A major defense acquisition program that receives Milestone A or Milestone B approval after January 1, 2019, shall be designed and developed, to the maximum extent practicable, with a modular open system approach to enable incremental development and enhance competition, innovation, and interoperability.”

“As such, MOSA supporting standards should be included in all requirements, programming, and development activities for future weapon system modifications and new start development programs to the maximum extent possible”

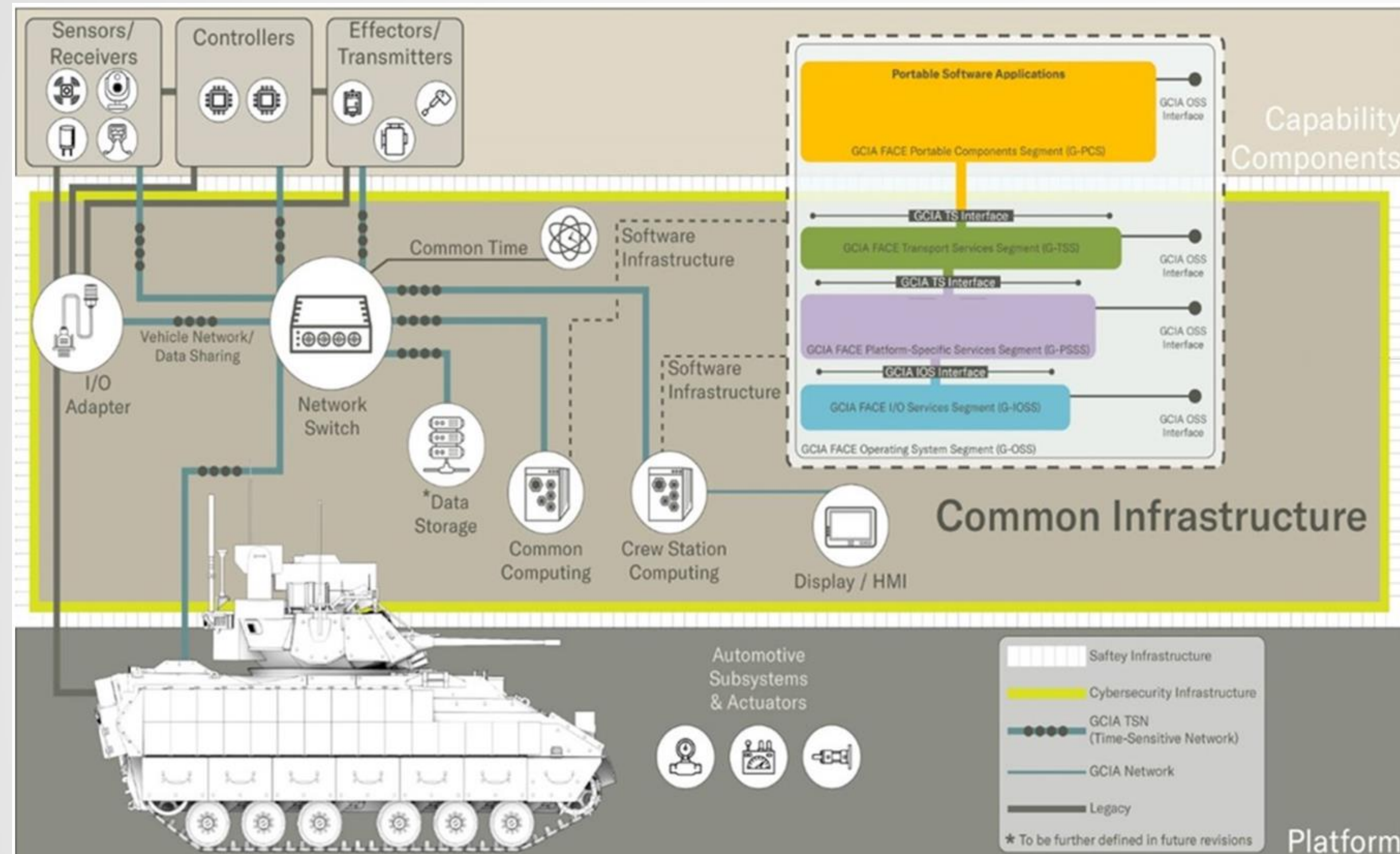


We see MOSA being implemented on Ground Combat Systems (GCS)

MODULAR OPEN SYSTEMS APPROACH

GCS Common Infrastructure Architecture (GCIA)

XM-30 Combat Vehicle



The Ground Combat System Common Infrastructure Architecture follows a MOSA approach with a goal of enabling rapid and continuous upgrades across ground systems

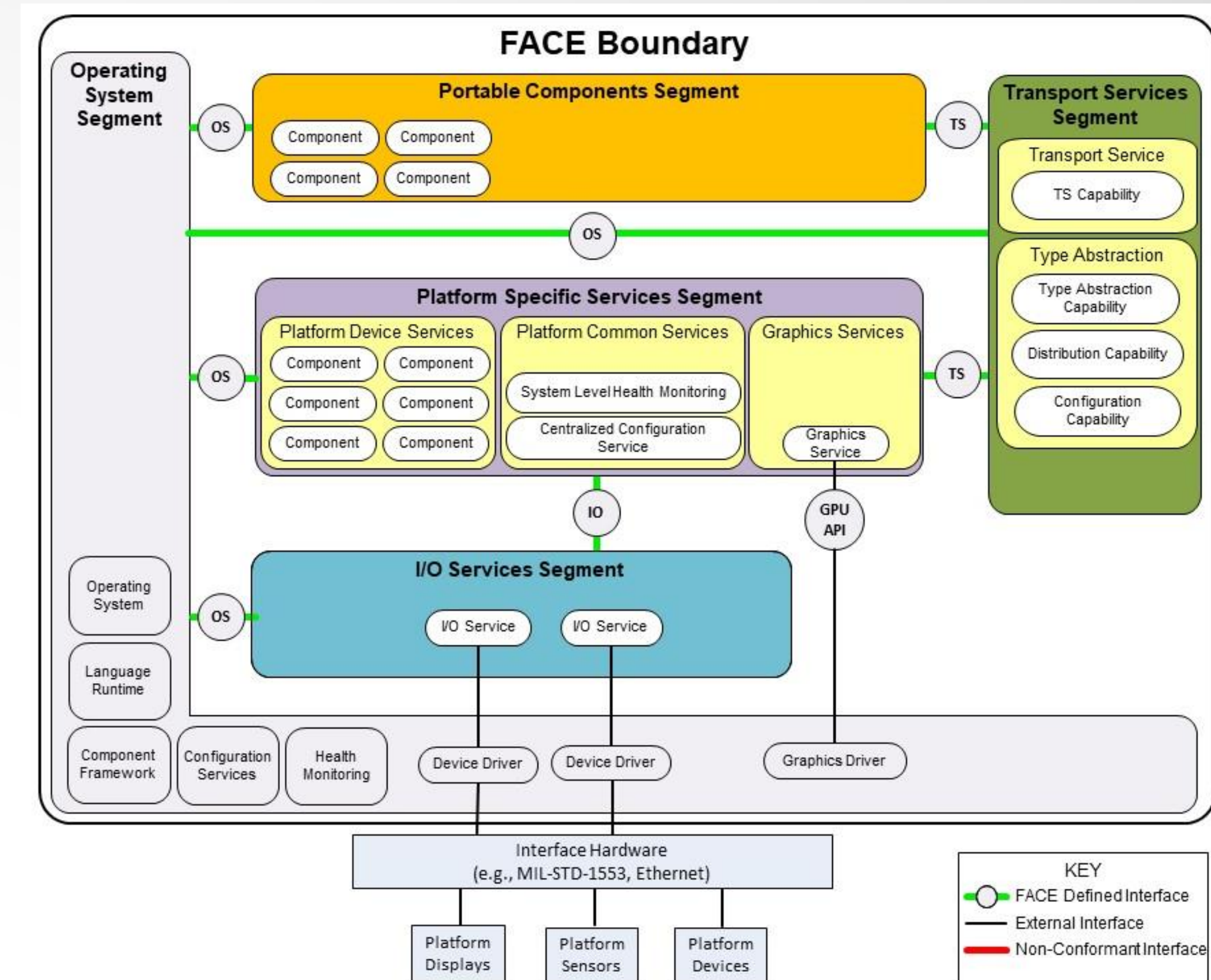
GCIA is a requirement for future systems starting with XM30



GCIA Leverages FACE Software Modularity and Portability Features

MODULAR OPEN SYSTEMS APPROACH

- The Future Airborne Capability Environment (FACE™) Standard describes architectural segments that categorize intended portability and conformance
- FACE portable, reusable software application can be deployed within a software framework providing FACE segment capabilities (OSS, TSS, IOSS, graphics)
- Most Open Systems Interconnect (OSI) concerns that enable MOSA and interoperability fall within the FACE Transport Services Segment (TSS) and the rules governing portable software usage of the TSS APIs
- The Universal Domain Description Language (UDDL) and FACE UoP Data Model work to describe component interfaces at various levels of abstraction



Tools can enable MOSA workflows and accelerate its adoption

MODULAR OPEN SYSTEMS APPROACH



Employ Modular Design



Designate Key Interfaces



Use of consensus-based standards

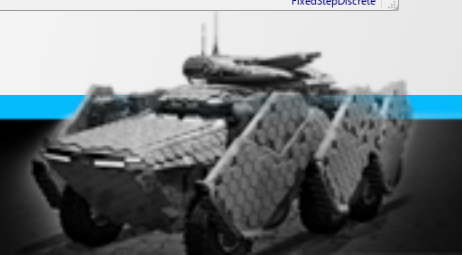
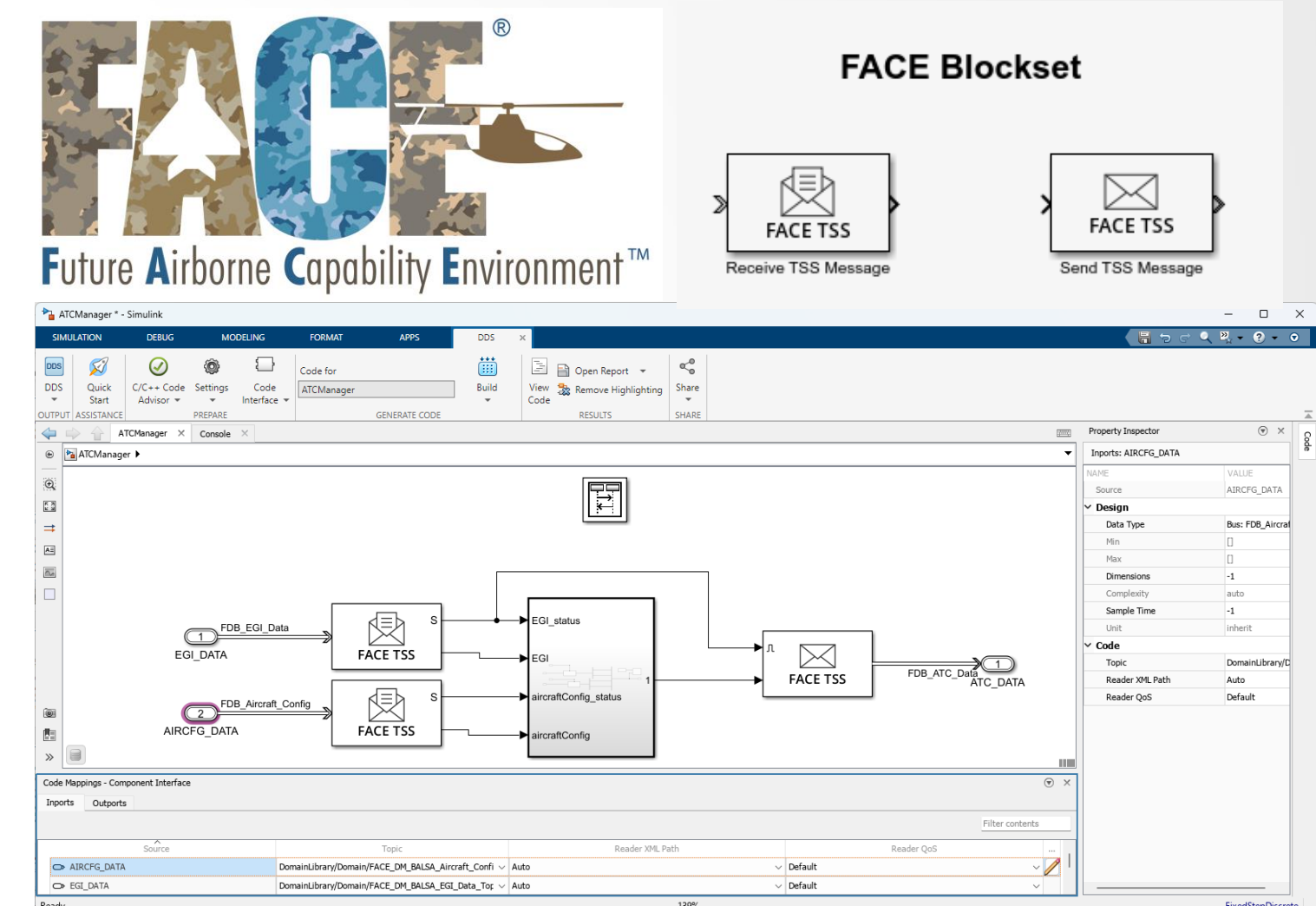
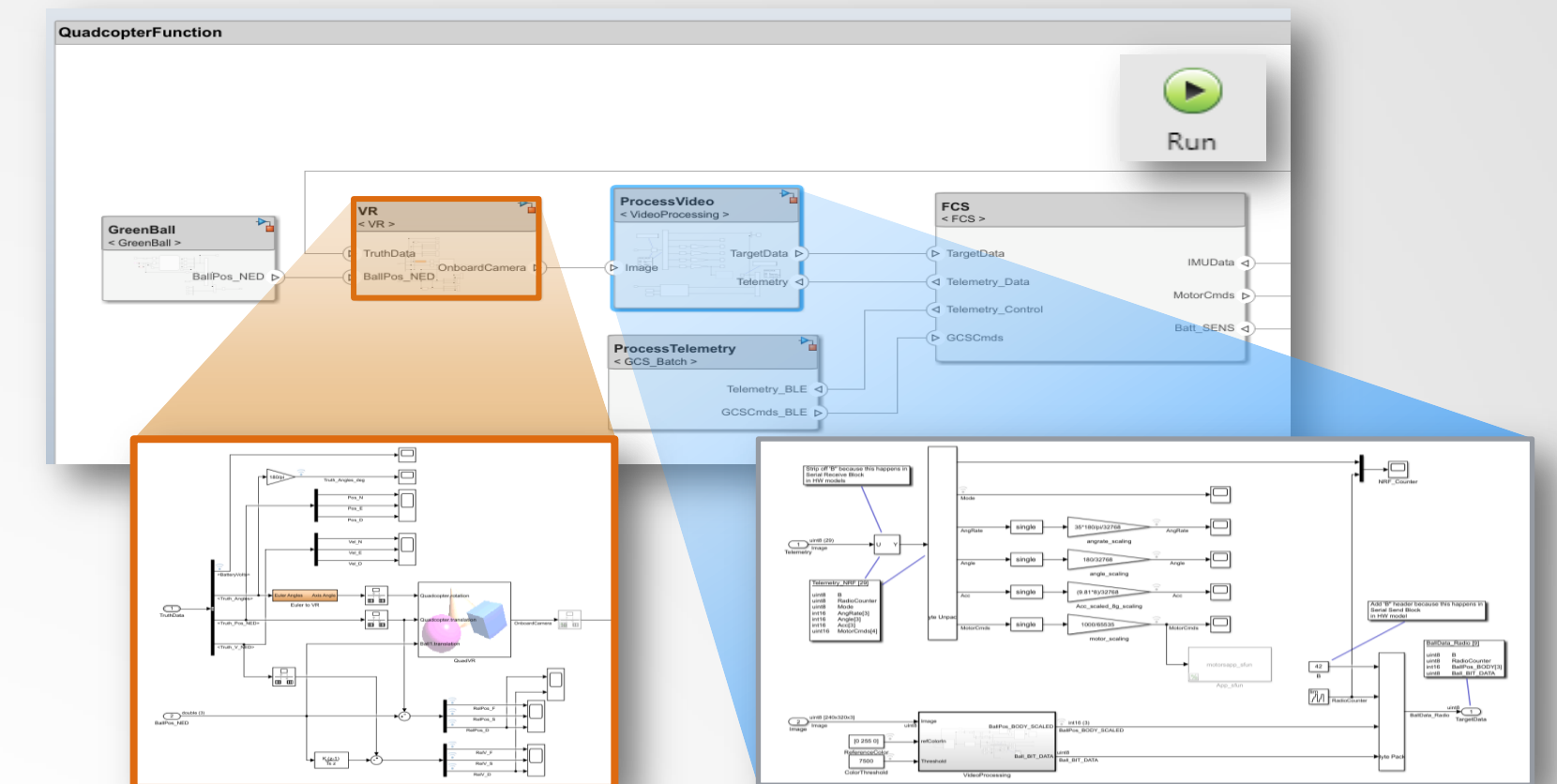
Standard



Certify Conformance

Tools that can support Open Architectures and a Model Based Workflows

Tools that can support commercial and industry open standards



The MOSA Digital Thread is Enabled by an Ecosystem

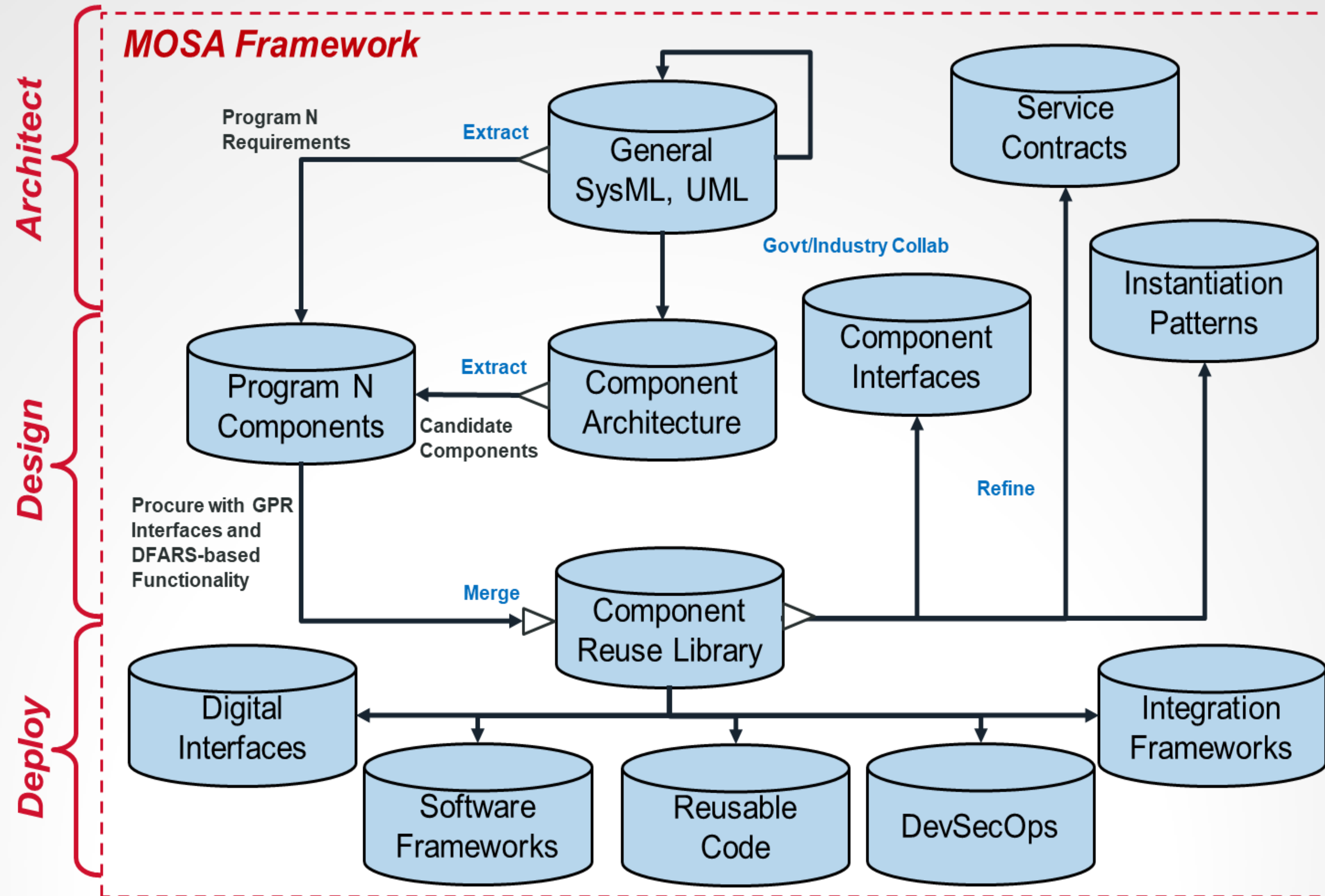
MODULAR OPEN SYSTEMS APPROACH

Mission use cases, simulations, data models, cost and business models

Semantic Data Models and digital ICDs

Architectures and Models

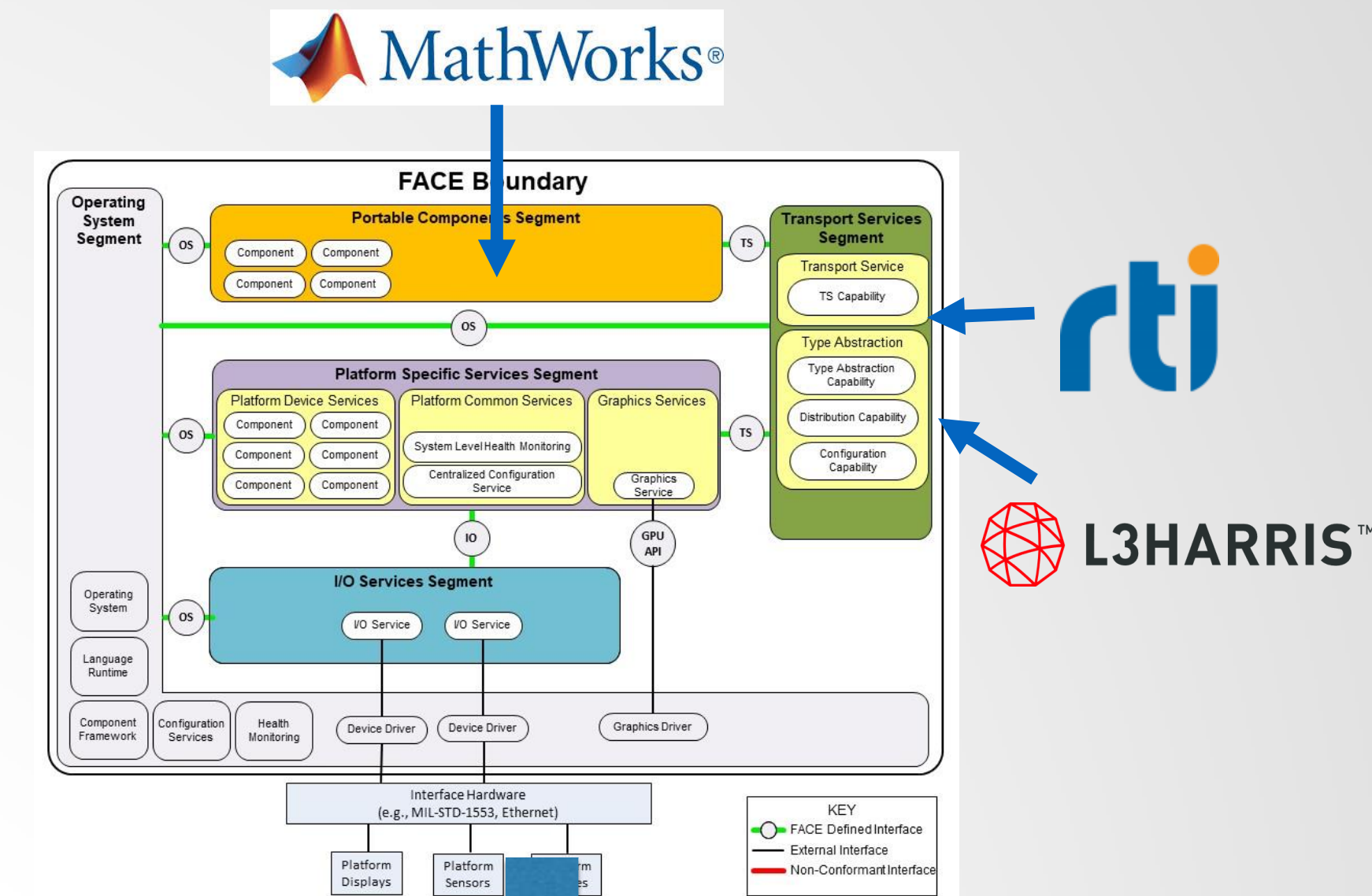
Reuse Platforms, tools, code generation



Challenge: MathWorks and L3Harris partner to demonstrate rapid integration using FACE™ across multiple vendors

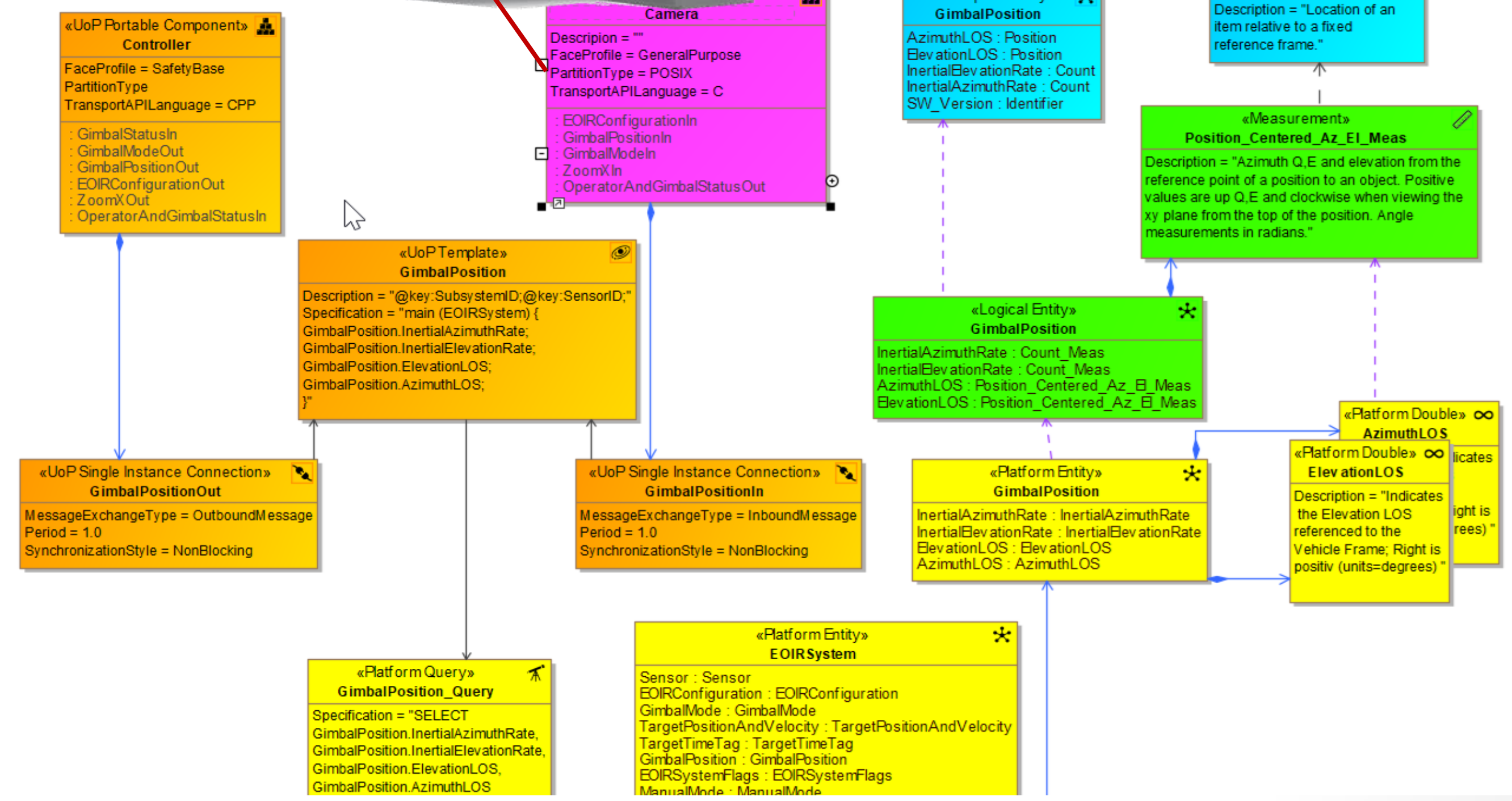
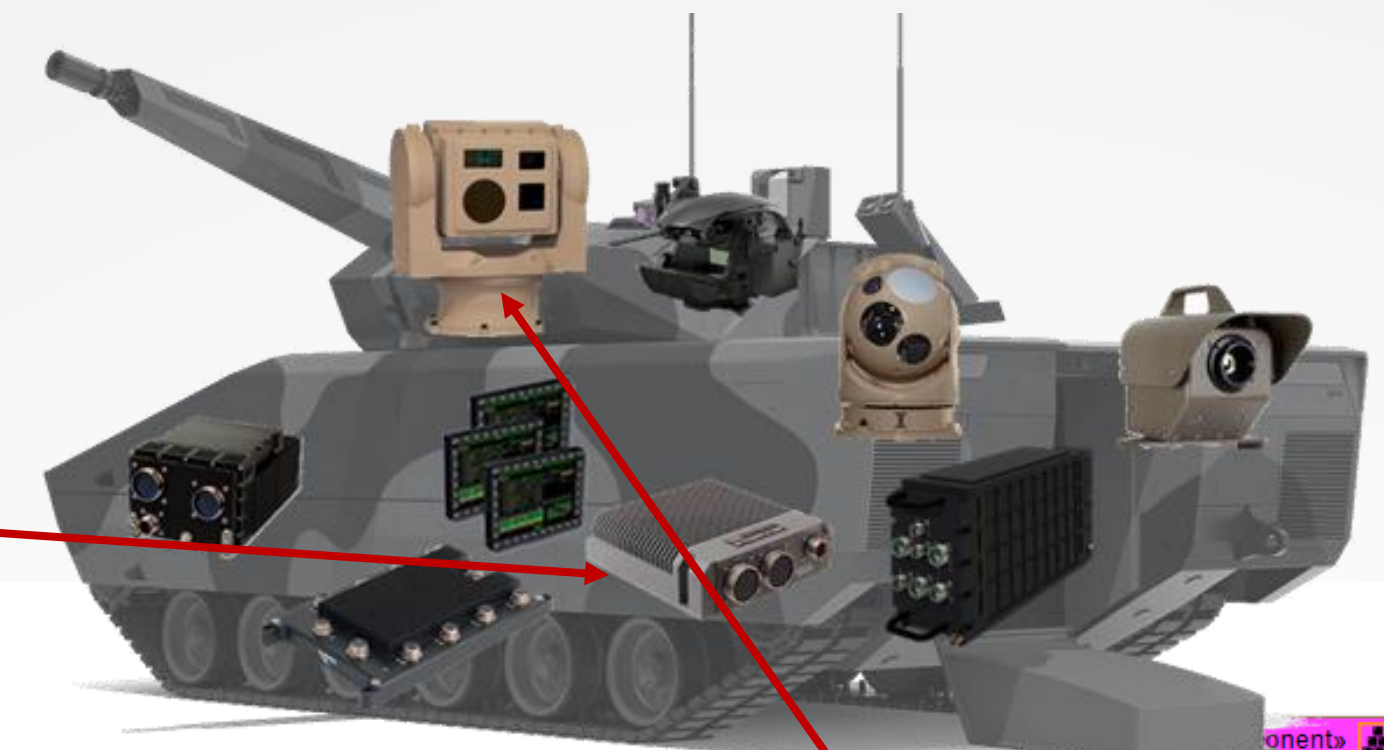
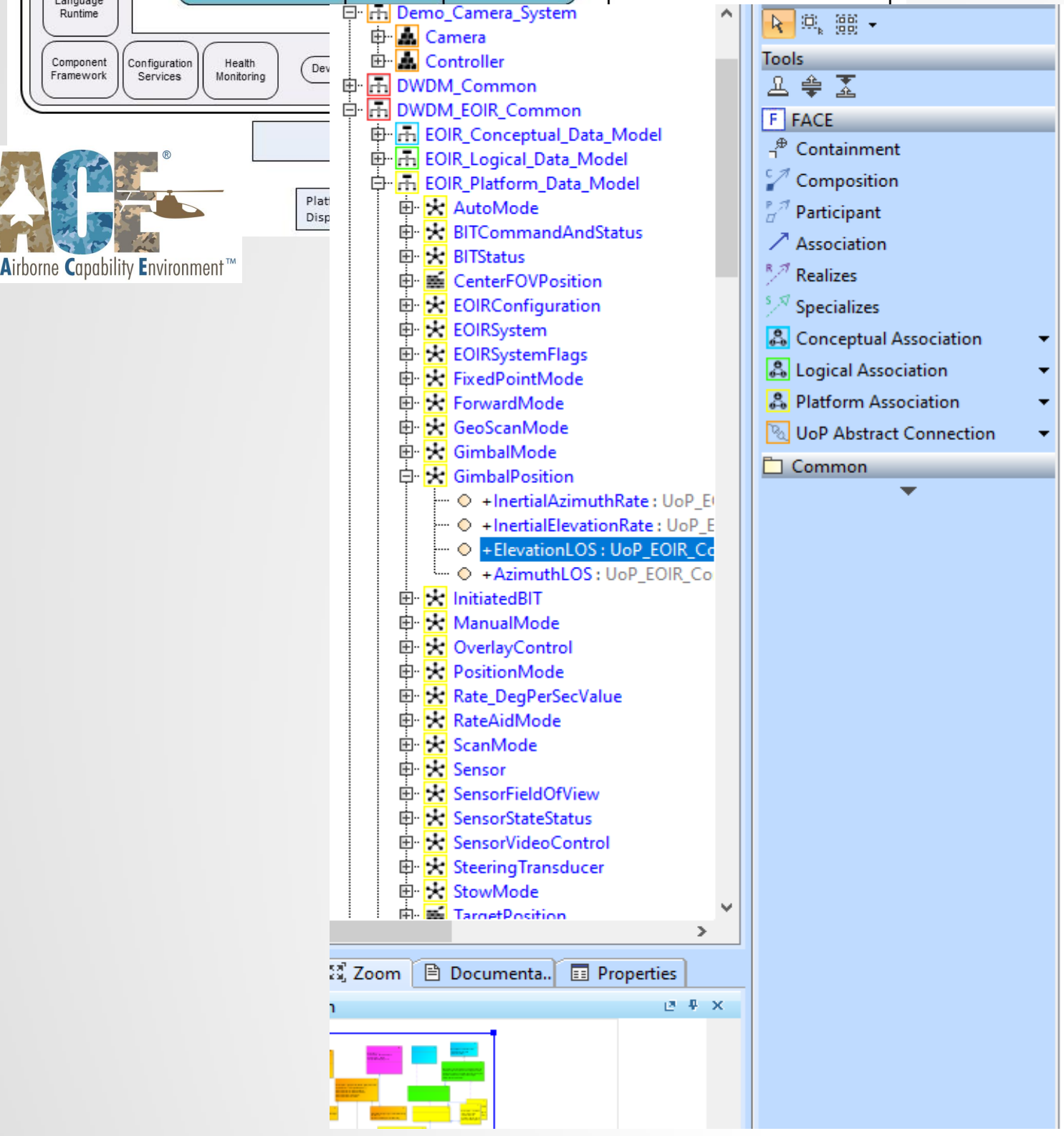
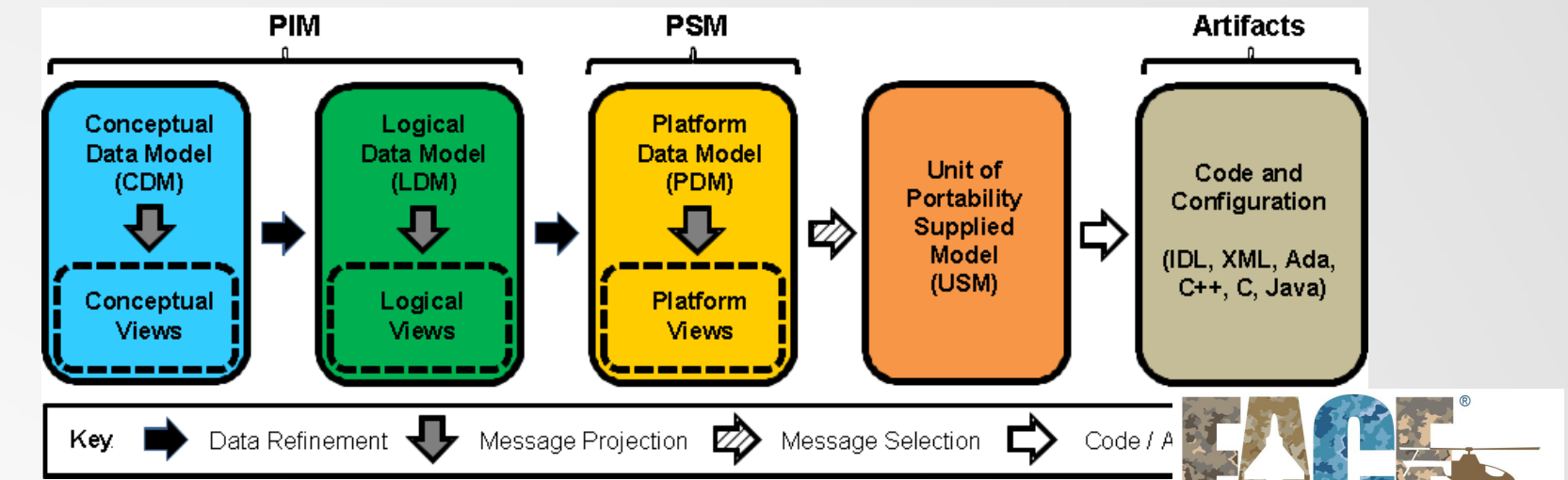
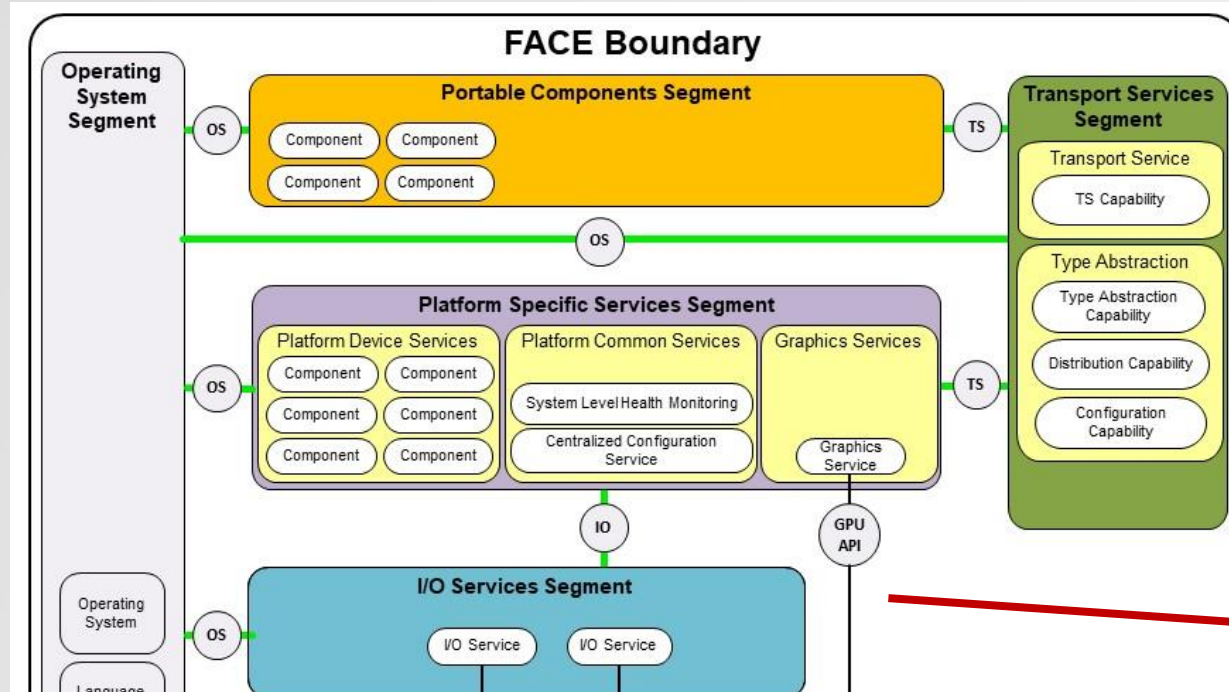
MODULAR OPEN SYSTEMS APPROACH

- Demonstrate ability to quickly develop components for the PCS in Simulink that can rapidly integrate and talk to multiple TSSs with no changes
- Generate code for PCS components that passes the CTS for conformance and functional tests of demonstration simulation
- Use Multiple FACE TSS implementations (RTI and L3Harris FACE TSS demonstrated)
- Integrate and test in larger existing L3 EOIR demonstration



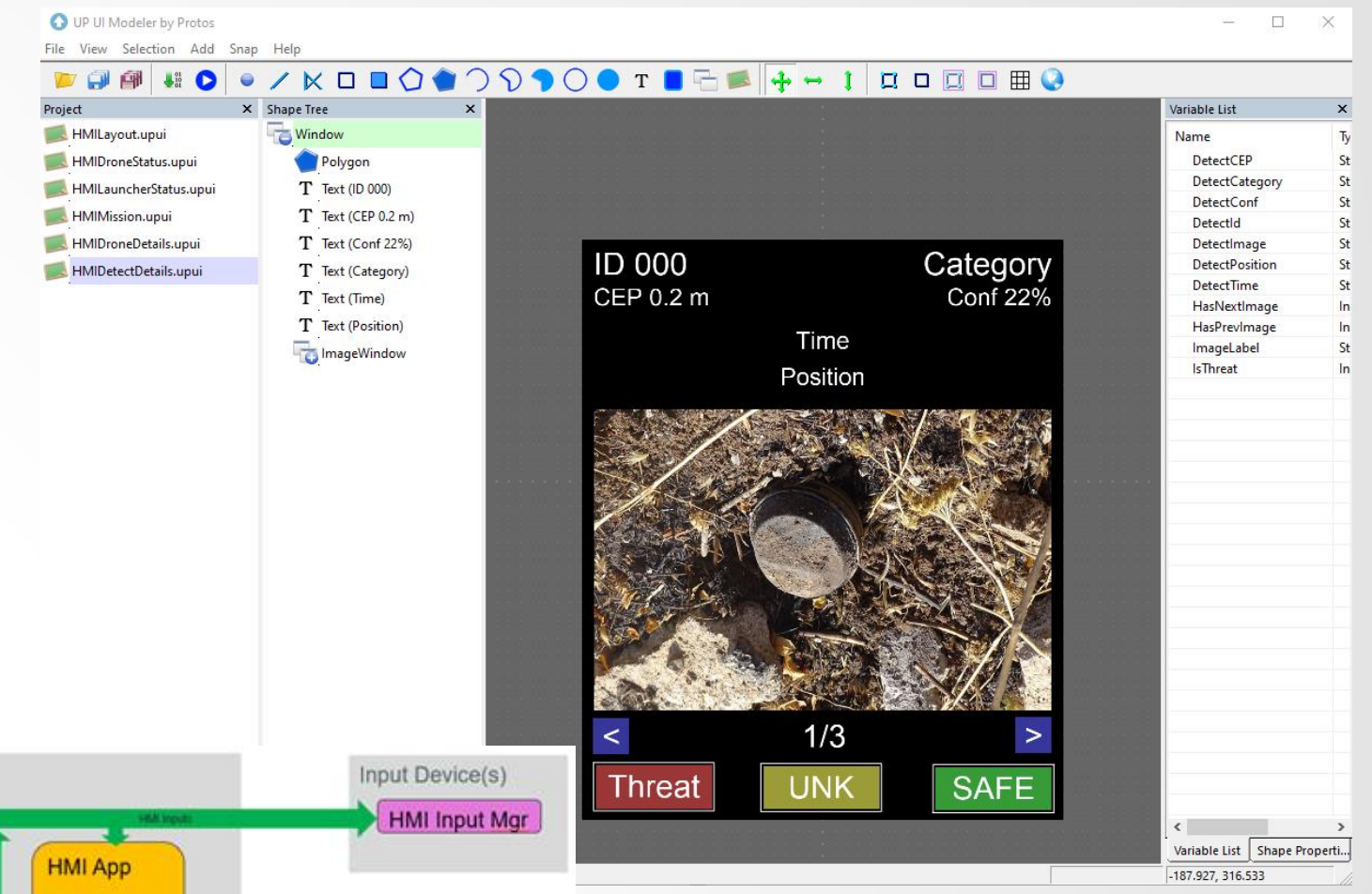
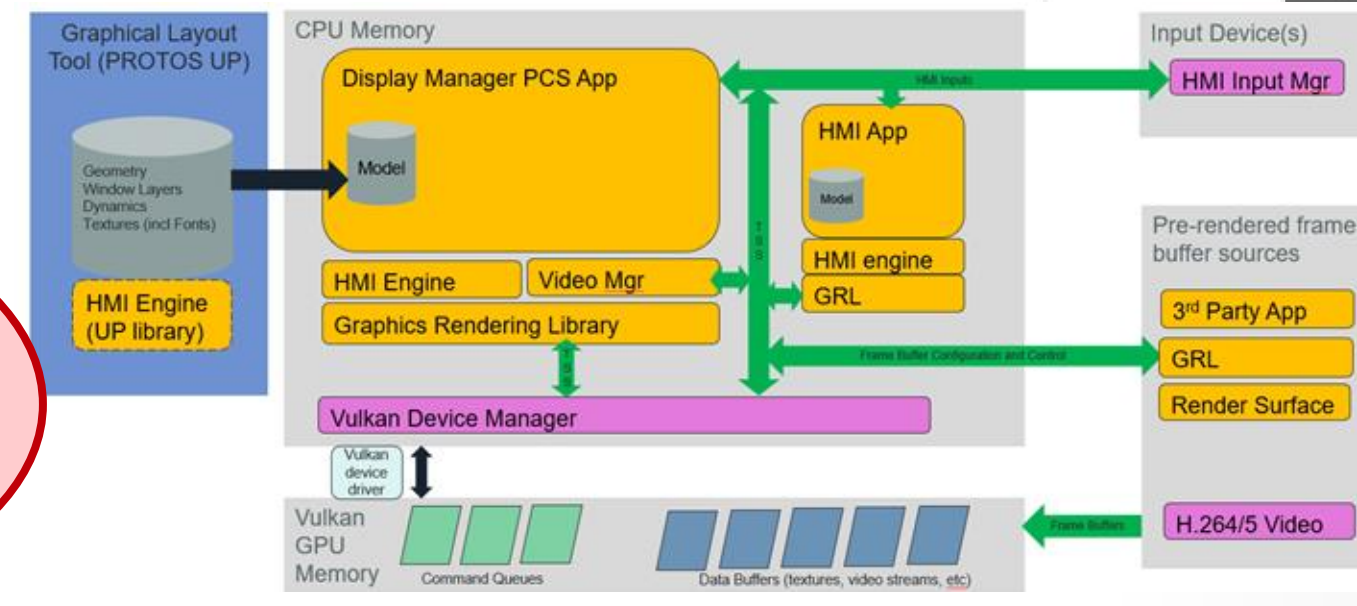
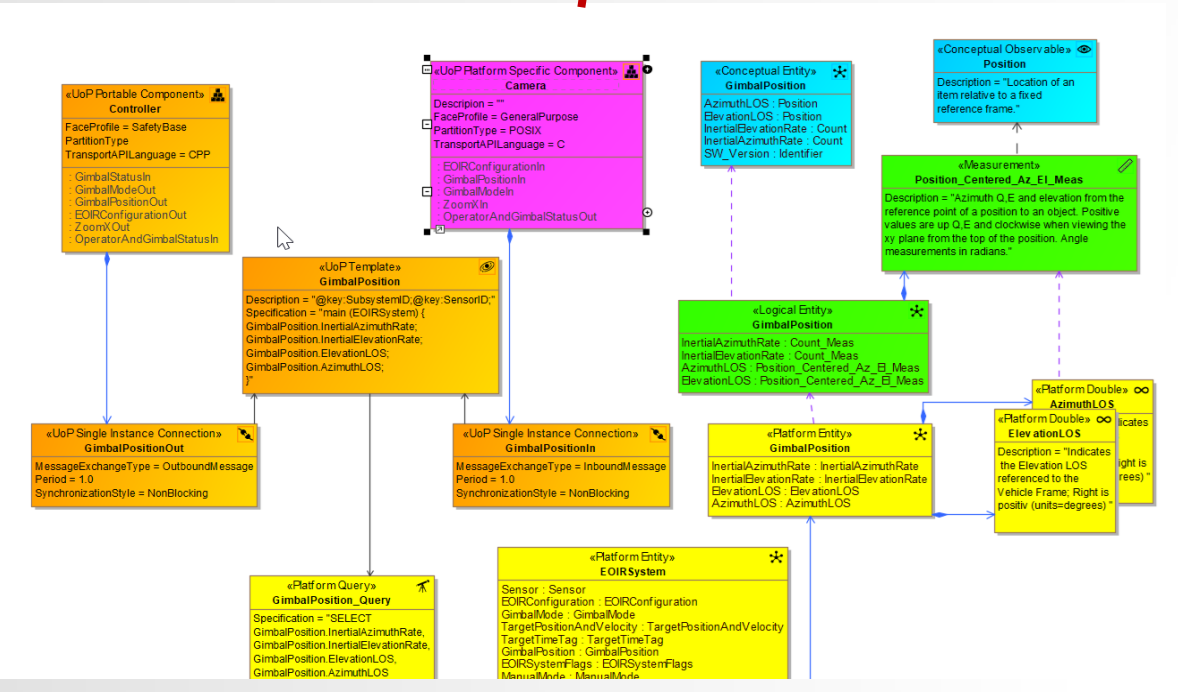
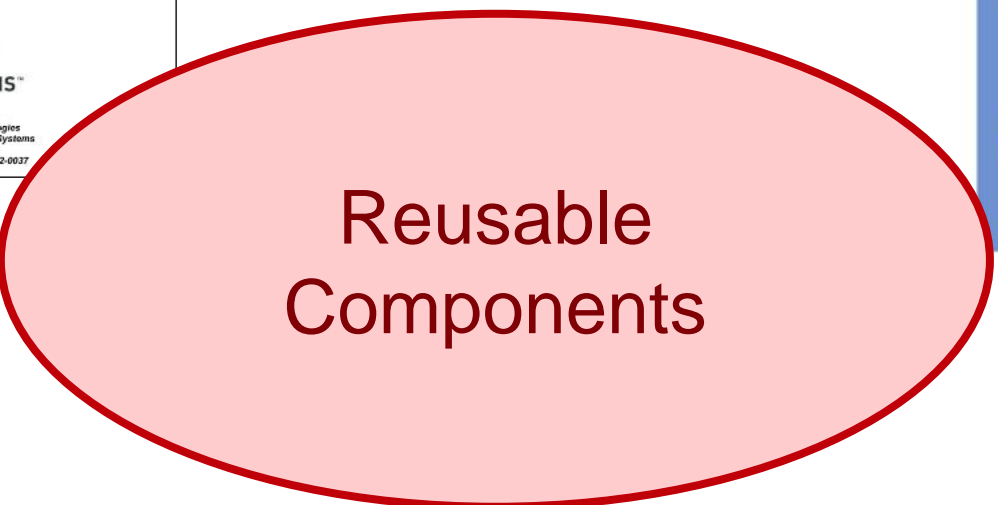
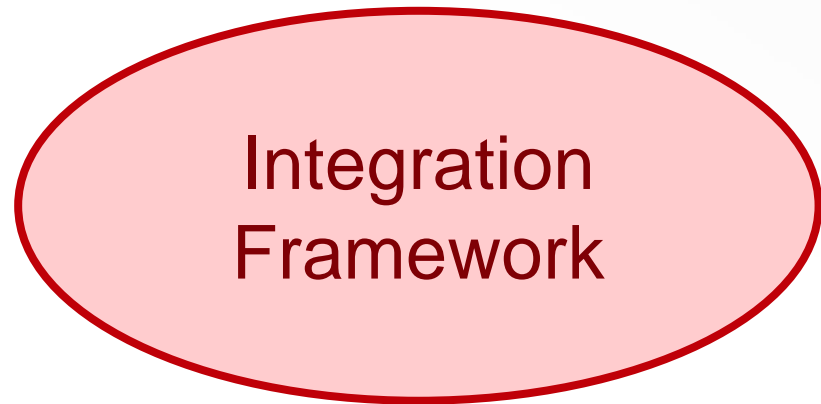
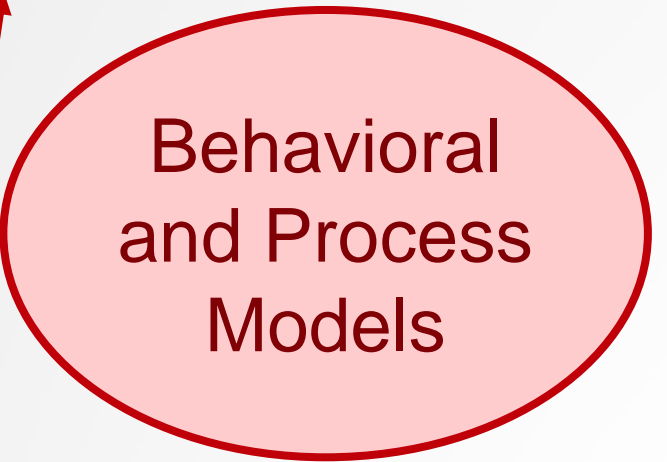
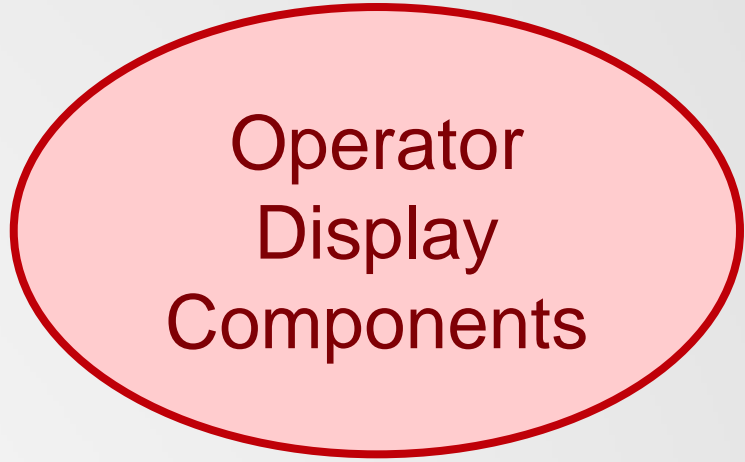
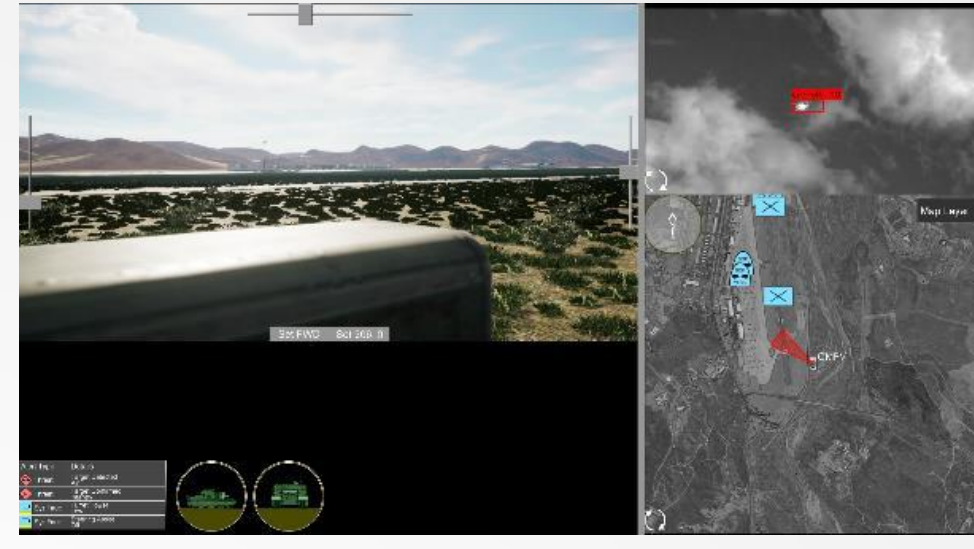
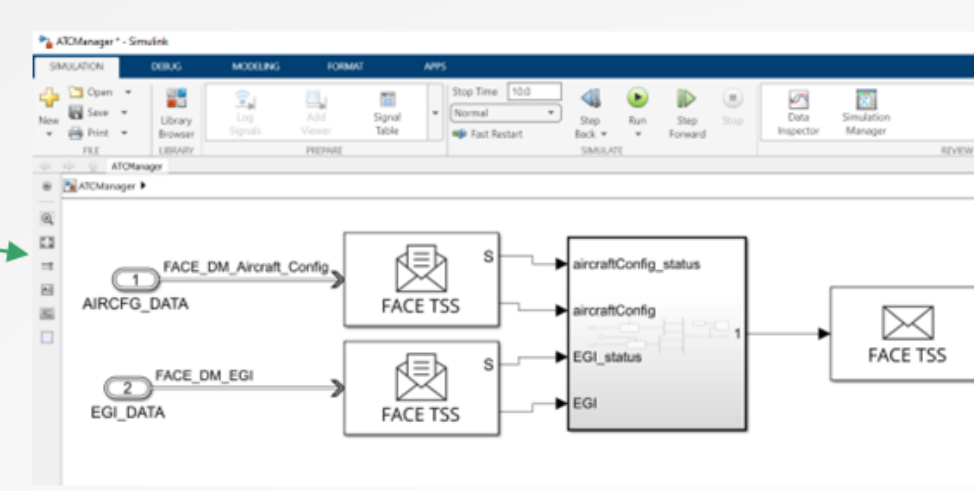
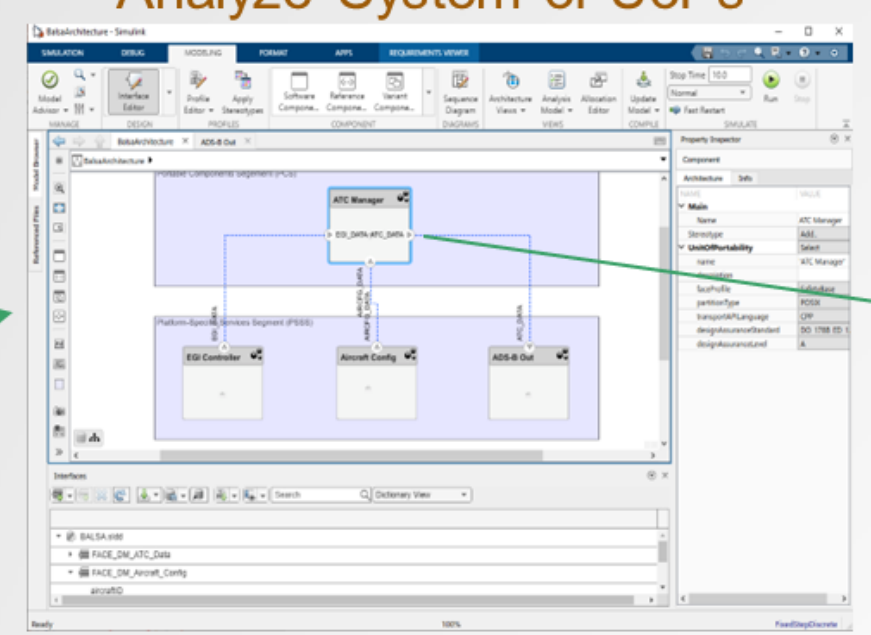
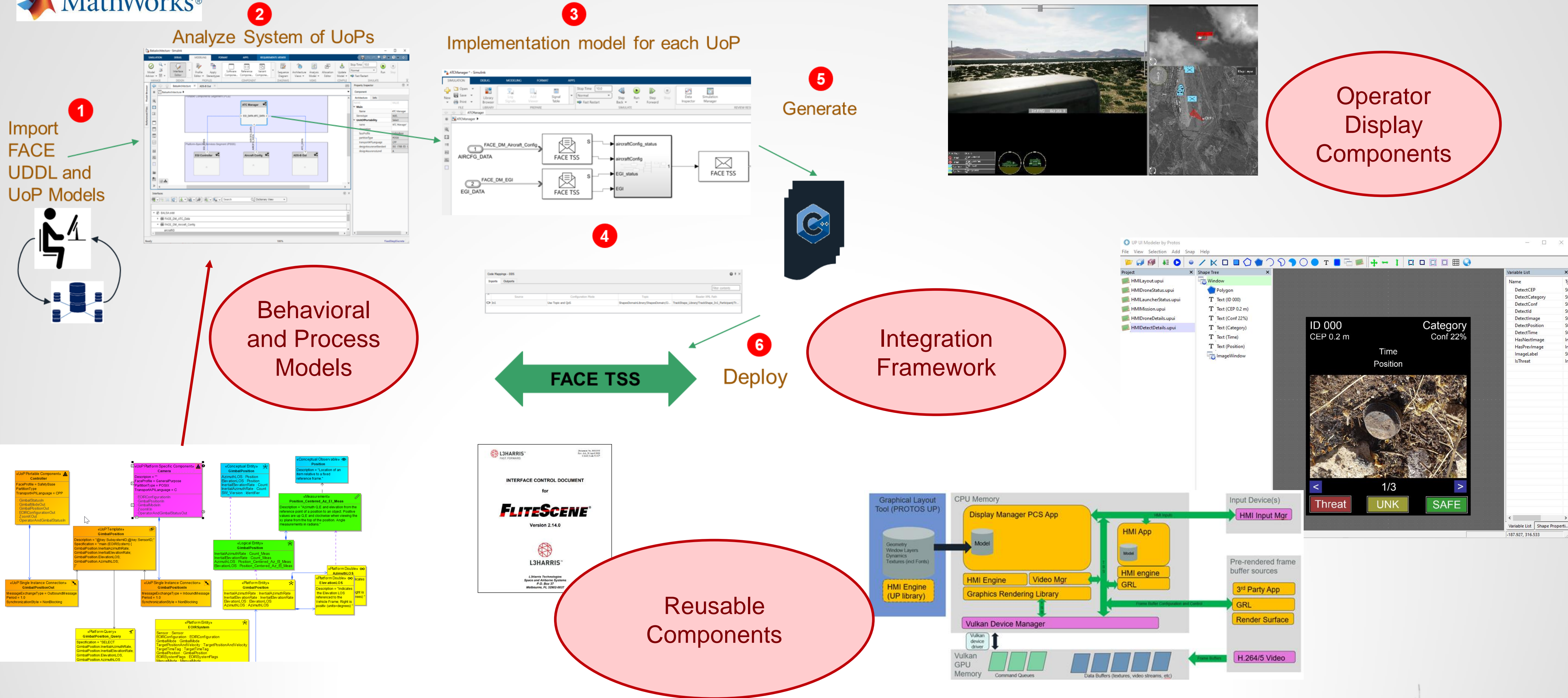
Architecture-Driven Design – What are we Building and How Do we Model It?

MODULAR OPEN SYSTEMS APPROACH



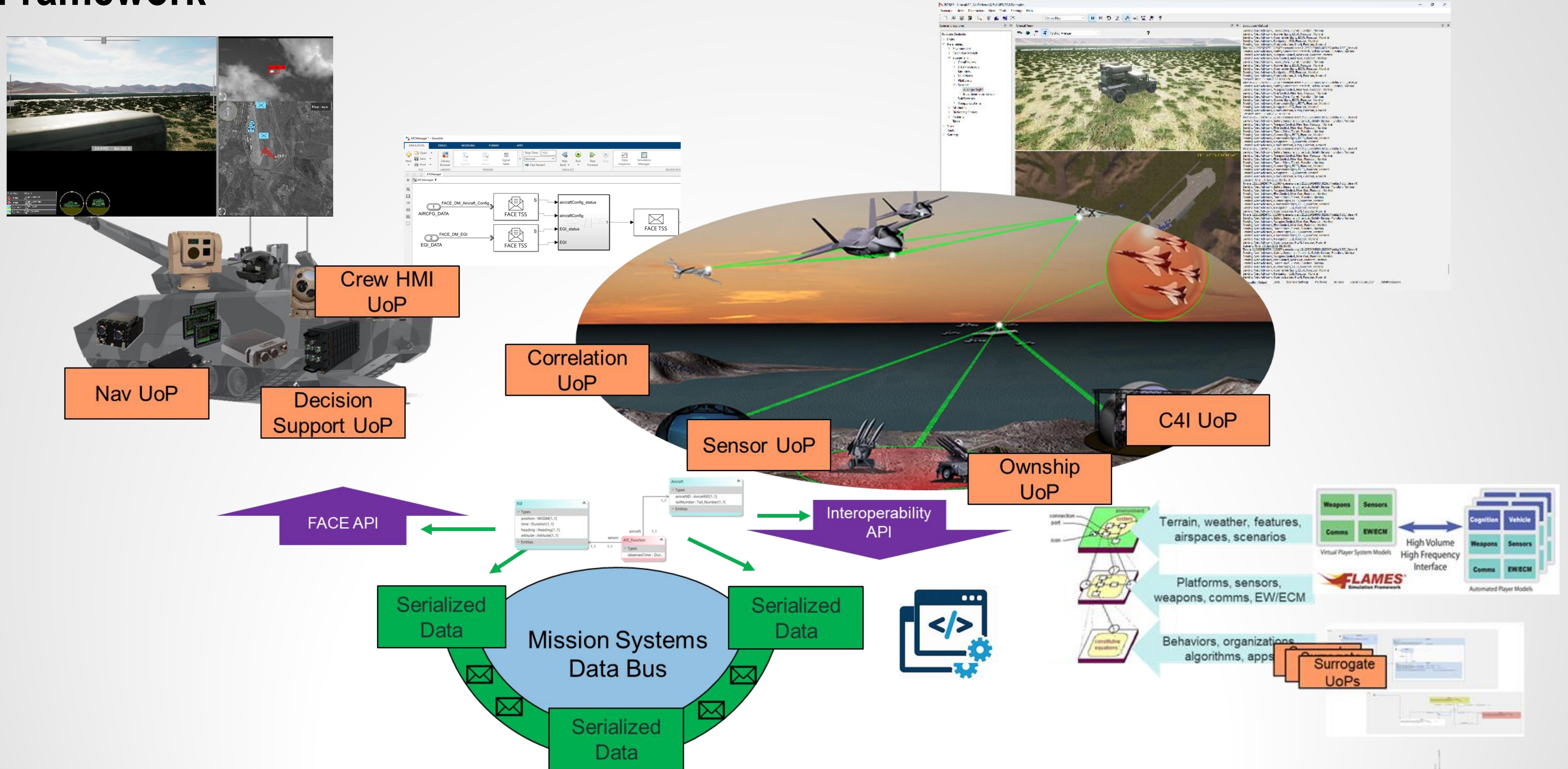
Next Level Down – Model Based Based Software Engineering

MODULAR OPEN SYSTEMS APPROACH






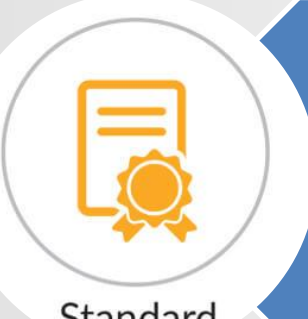

Proving the Process – Mission Systems Integration Framework

MODULAR OPEN SYSTEMS APPROACH



MOSA Enabling Technologies Demonstrated

MODULAR OPEN SYSTEMS APPROACH

-  Establish an enabling environment
-  Employ Modular Design
-  Designate Key Interfaces
-  Use of consensus-based standards
-  Certify Conformance

