MODULAR OPEN
SYSTEMS APPROACH

Lessons Learned from Applying the FACE™ Technical Standard in Military Ground Vehicle Architectures

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GCIA and MOSA

The ***Ground Combat Systems Common Infrastructure Architecture (GCIA)*** is the U.S. Army's primary means of achieving MOSA in new ground vehicle programs.

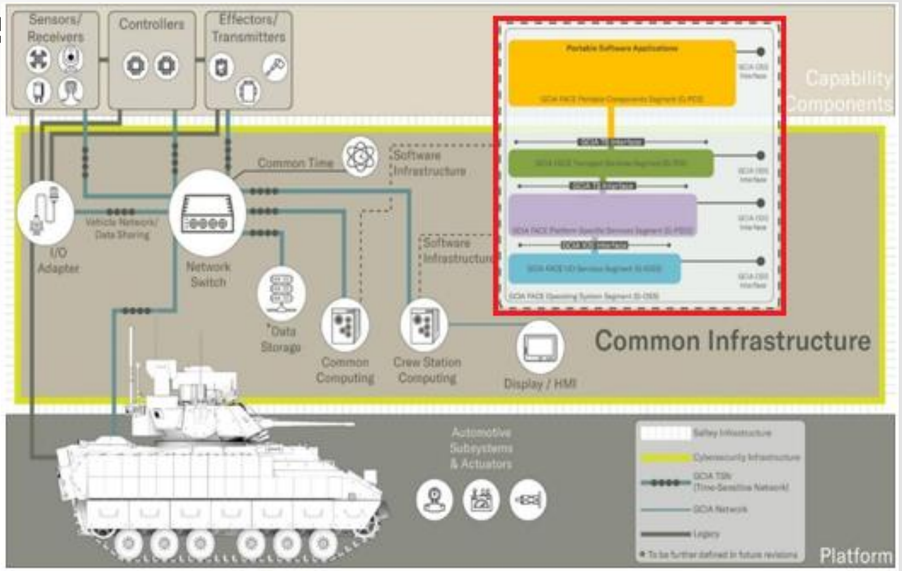
Challenges concerning MOSA:

1. Modularity, reuse, and vendor-neutrality are relatively new concepts when it comes to mission/safety critical software.
2. Guidance to achieving MOSA goals within the software domain is very limited.
3. Lack of clarity in how various MOSA technical approaches relate to each other.

GCIA Leveraging the FACE Technical Standard

The Future Airborne Capability Environment (FACE) Technical Standard was an optimal choice for GCIA software based on the following principles:

1. It is an open, consensus-based standard with participation of three DoD entities, plus most major defense contractors.
2. Focus of the standard is modular software components which foster portability and reusability via defined interfaces.
3. Safety is one of the key drivers of the standard.
4. Use of the standard does not require a fee.
5. Use of the standard does not require consortium membership.



A little about the FACE Technical Standard

The FACE Technical Standard defines rules and requirements for designing modular software components. These software components include:

- Software components that provide capabilities or business logic.
- Software components that implement interfaces defined by the FACE Technical Standard (FACE Computing Environment)

It also defines:

- Programming language mappings for C, C++, Java, and Ada.
- A data modeling language for defining data exchanged by FACE software components.
- OS Profiles based on levels of criticality that standardize use of OS-level capabilities (leverages POSIX APIs and ARINC 653)

A little about the FACE Technical Standard

Conformance to the FACE Technical Standard is binary.

- There are no compliance levels
- Conformance certification requires third-party verification using a FACE Consortium sanctioned Verification Authority (VA).
- Software Suppliers implementing FACE components must show evidence that FACE requirements are met.
- The FACE Conformance Test Suite (CTS) is freely available.
- The conformance program is one of the pillars of the standard that make it an optimal MOSA solution for software.

Adoption of the FACE Technical Standard by VEA

First impressions:

1. The FACE Technical Standard was originally founded to address avionics software. However, many of its features and options are applicable across different domains.
2. Engineers had a learning curve when it came to understanding the OS Profiles and their programming language restrictions
   (e.g., STL use in C++ only allowed in General Purpose profile)
3. Certain aspects of the FACE Technical Standard left room for interpretation, requiring education and guidance from a 3rd party.
4. Aside from the FACE Registry (which lists a small subset of available FACE components), there is little information in the public domain as to what FACE components exist for procurement.

Initial Integration Activities

One of the first components built for GCIA was the State Management Service/Entity Index, designed and built by OAR Corporation.

- Once distributed, feedback indicated that the software was easy to use and integrate.

In addition, FACE activities on another ground vehicle subsystem project led to the conclusion that integration activities were reduced via use of the FACE Technical Standard.

Impact on Software Engineering

Both the FACE Technical Standard and GCIA define a data modeling approach. However, they are different when it comes to the modeling approach and the two do not align. This resulted in another learning curve for engineers.

In FACE Data Modeling…

- The focus is on data entities, their semantics, and their relationships.
- Goal is to define the data contract between a FACE software component and the FACE Transport Services so that its data needs are understood using a common syntax.
- The XMI representation of the model serves as input when generating the Typed interfaces for FACE components to use to transmit and receive their data.

Future Work

Bridging the FACE Data Modeling and GCIA Data Modeling approaches.

- More work is needed to know how the two relate to one another and how information in one impacts another.
- Goal is to be able to foster both as part of the MBSE environment

Encouraging the use of the FACE Registry and communication among the services to share FACE component information.

Overall Takeaway

Using the FACE Technical Standard…

- Requires an up-front investment to learn about the standard, particularly the data modeling aspect.
- Appears to ease most integration challenges by fostering modularity, portability, and conformance.

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