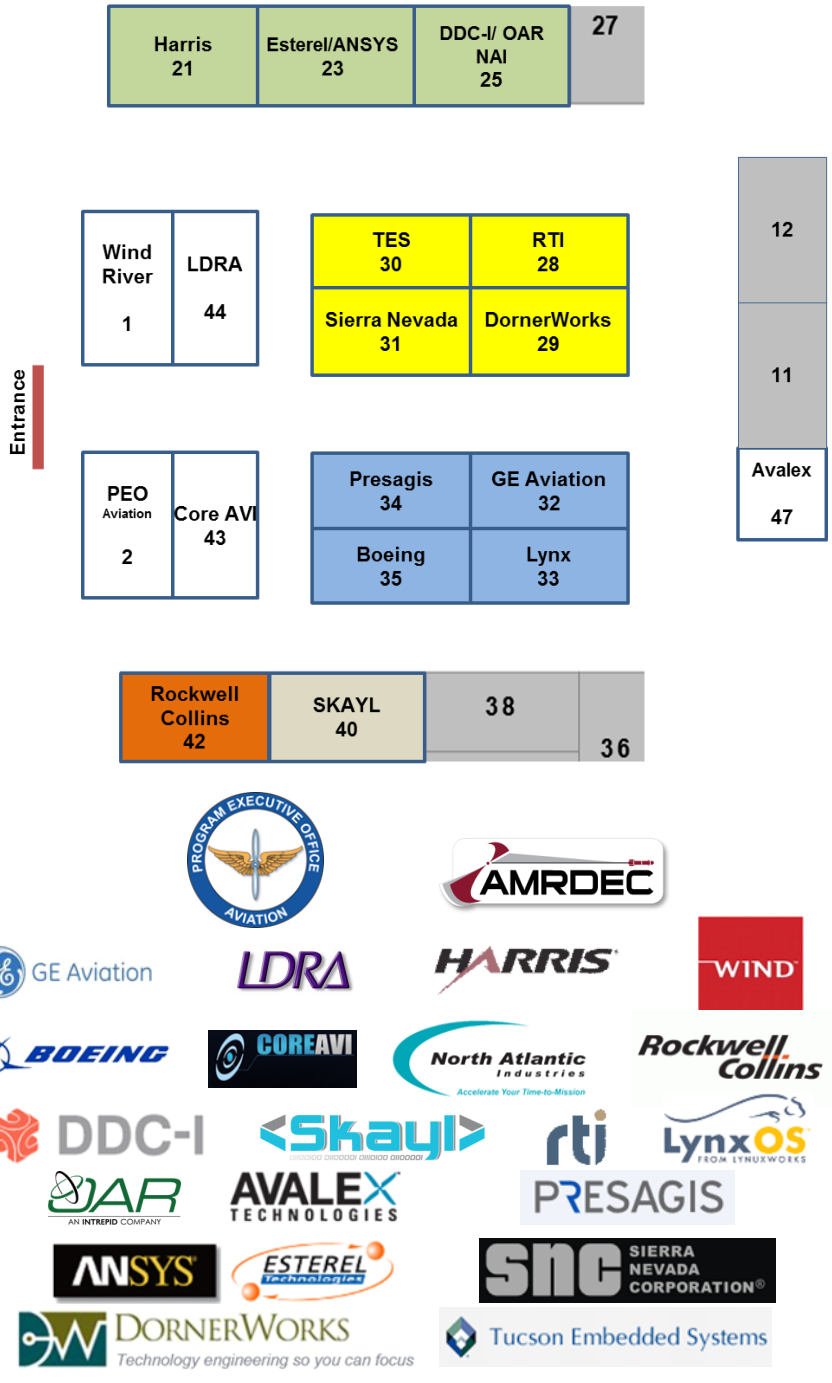
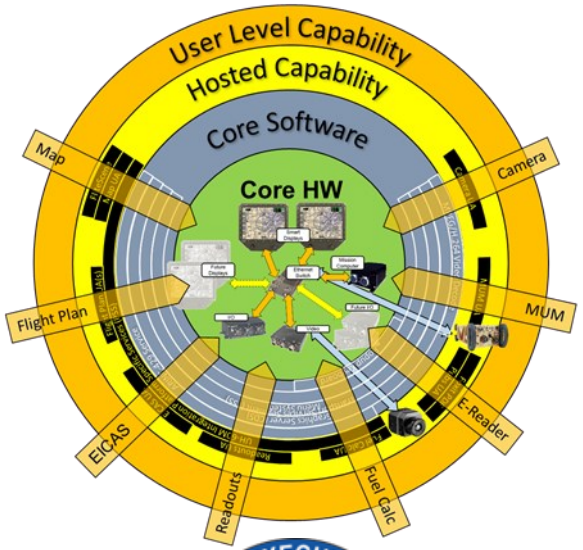
RIF Demonstration Booth Layout



Rapid Integration Framework (RIF)

Demonstration Information Packet

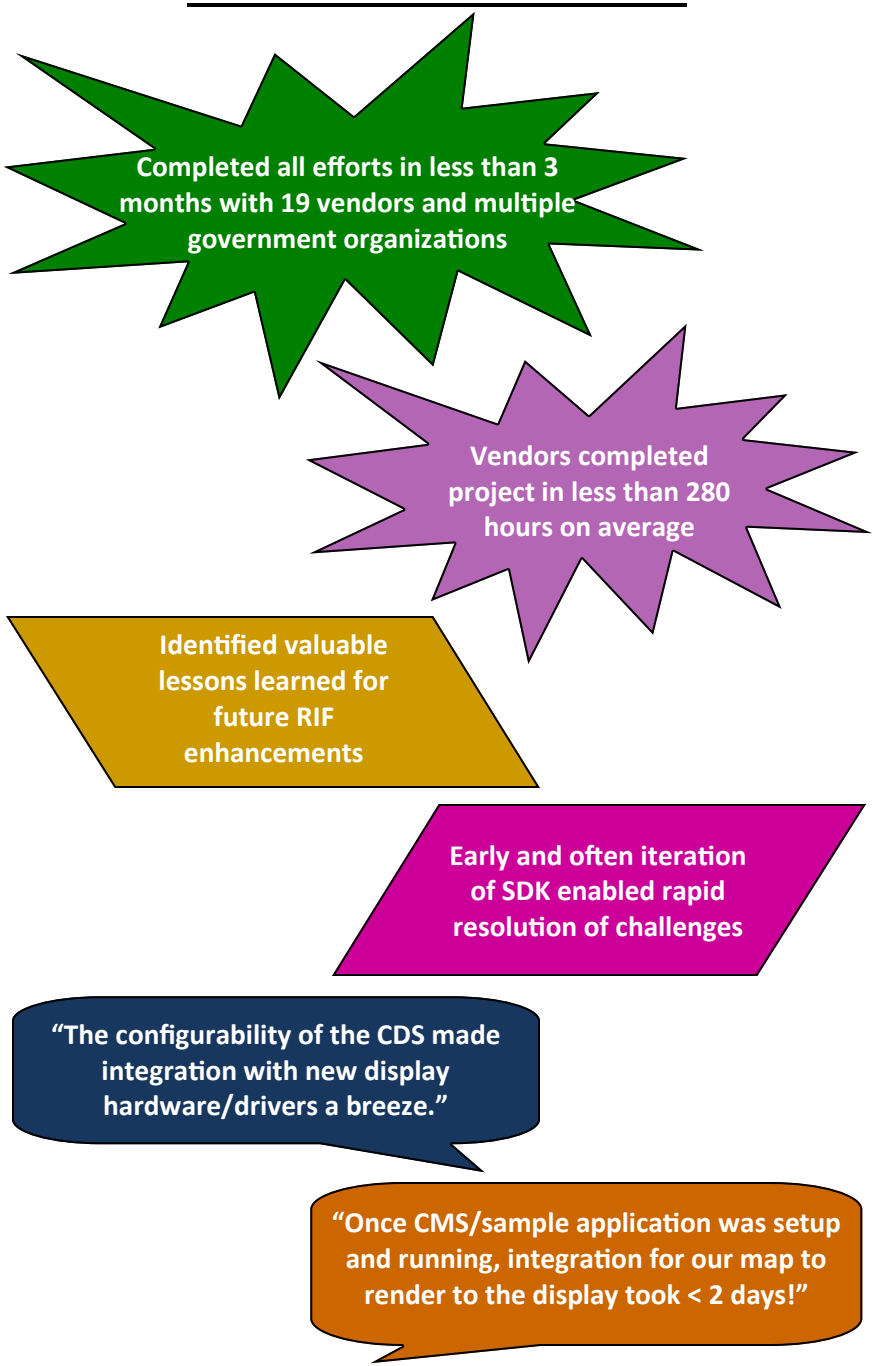


Future Airborne Capability Environment (FACE)
Technical Interchange Meeting (TIM)

18 September 2018

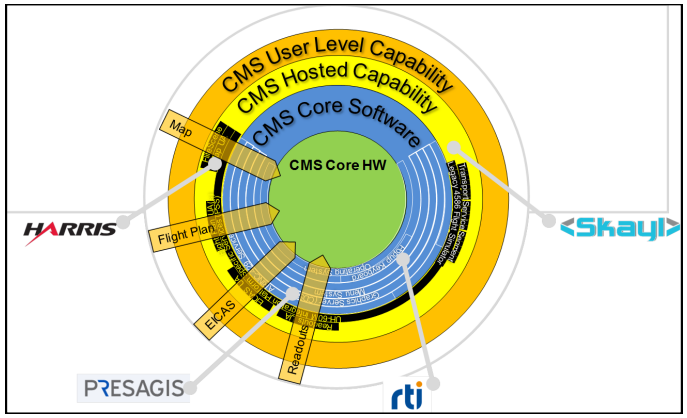
Contents

Demonstration Successes



SKAYL

TSS/Modeling Tooling for Rapid Integration



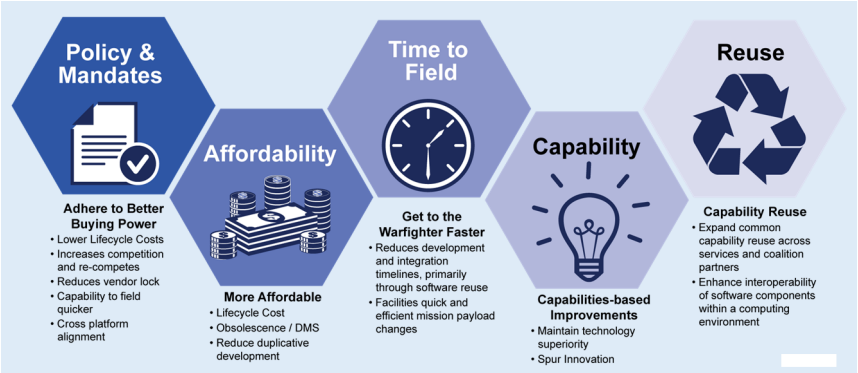
SKAYL Demonstration

- Performs rapid integration of legacy application with CMS utilizing model-based engineering and semantic data model merging
- Integrates legacy STANAG 4586 vehicle simulator with RIF SDK without modification to existing source code
- Generates mediation code among disparate messages and protocols for real-time application
- Performs on-demand, live integration of exemplar user application into RIF through model content updates
- Automatically generates executable PCS application and TSS mediation code
- Demonstrates RTI TSS and Skayl Configurable TSS communication via DDS bus

SKAYL Booth

- Features Skayl's PHENOM™
- Includes Certified DSDM, including traceability to FACE™ SDMs
- Enables multi-model import, merge, manipulation, and maintenance
- Facilitates alignment of interfaces between data models and systems
- Automatically generates executable integration code - no need for hand-coding

RIF Alignment to FACE Objectives



The below section shows how the RIF Demonstration is aligned to the FACE Objectives by mapping each RIF Objective to at least one of the icons above.

RIF Objectives

Support PEO AVN Strategic Goal of Achieving an Interoperable Combat Aviation Brigade through Open Systems Architecture

Provide a Government Controlled Open Systems Architecture

Provide a common objective architecture for use across multiple programs

Enable faster fielding to the Warfighter

Decrease cost and complexity

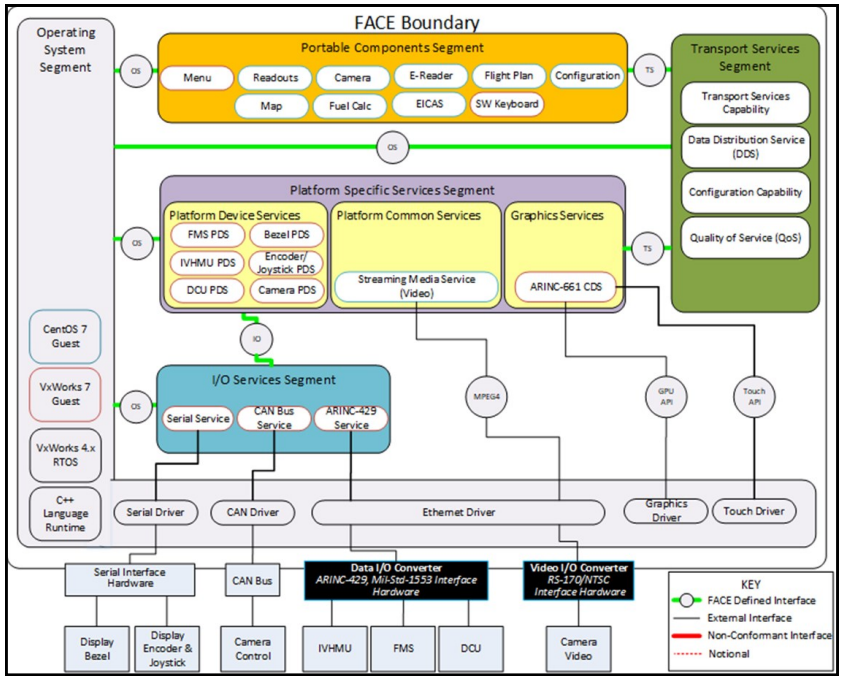
Break vendor lock and increase competition

Address obsolescence issues by decreasing downtime and cost

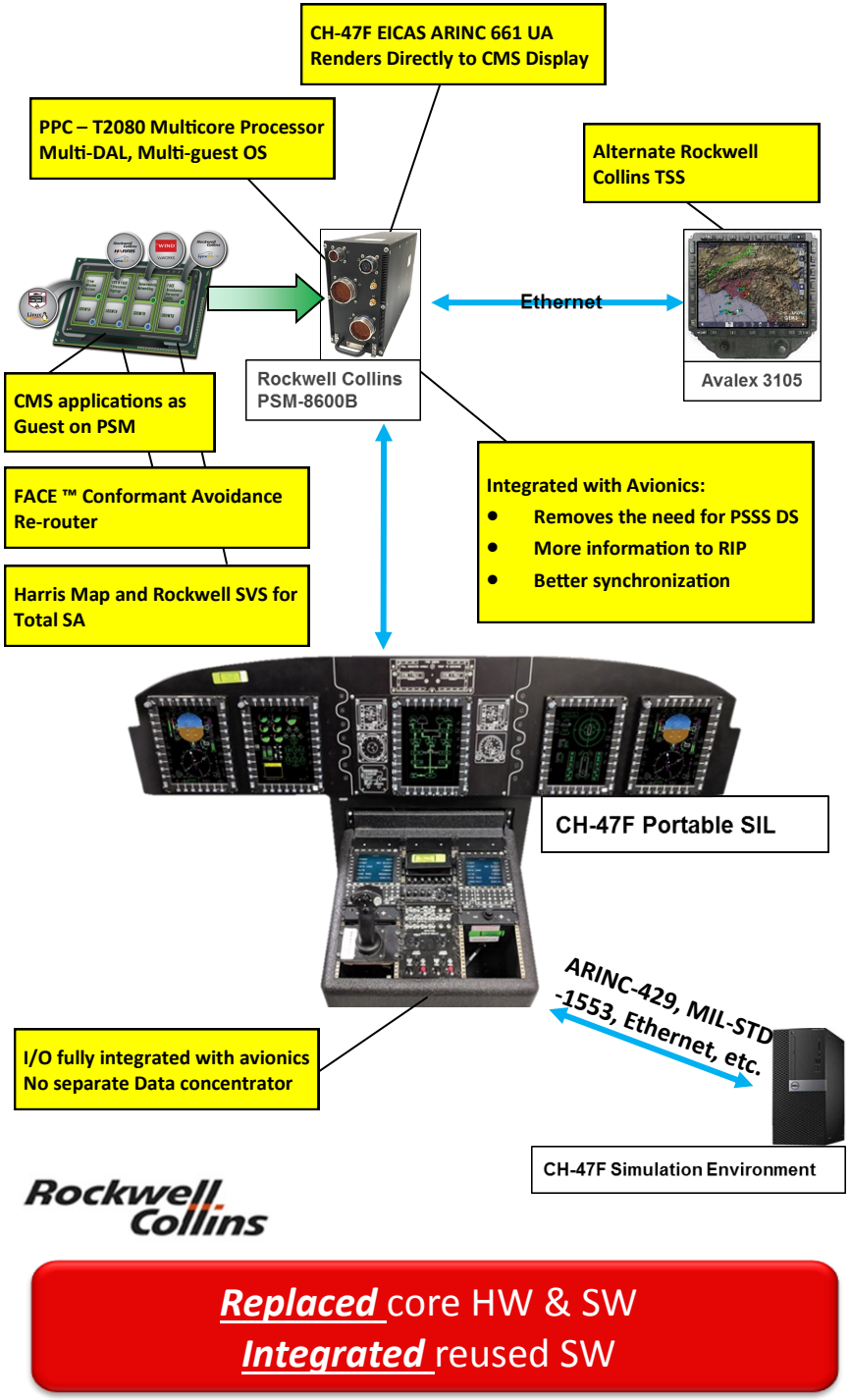
CMS Overview

The Crew Mission Station (CMS) was initiated by the UH-60 PO to:

- Add situational awareness for the Crew Chief on the UH-60 Blackhawk
- Provide a means to deploy new capabilities as rapidly as possible
- Produce a government owned open systems architecture
- Promote independence for the system integrator

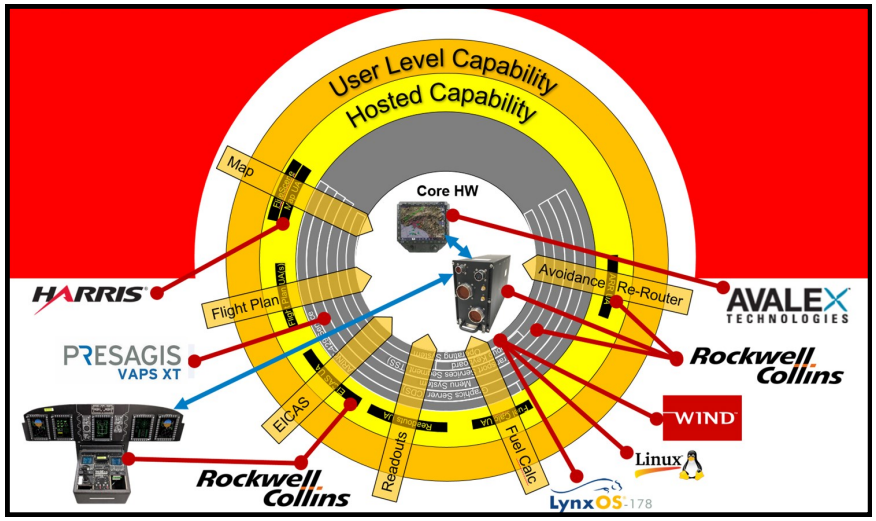


The above figure shows the White Platform (CMS) alignment to the FACE Architecture segments. Each platform has a corresponding diagram available for review at the vendor booths.



Red Platform Overview

Tighter Integration, Chinook Variations



Features

- Features an Army led CMS integration effort onto a civil certifiable multicore mission computer that provides more computing with less SWAP
- Mission computer shows separation of safety critical and mission processing for hosting applications at different DAL levels lowering the recertification impact of incremental software upgrades
- Demonstrates integration with a Chinook system and access to the avionics LAN to increase connectivity between FACE™ applications
- The system utilizes an alternative to the TSS used on CMS, giving additional proof of RIF open architecture portability
- Shows graphical applications running on the Mission Computer to reduce processing needs on the individual displays
- Shows use of CH-47F native ARINC 661 user applications to remotely render graphics on CMS displays without the need to recode

CMS Details

The successes of the CMS led to:

- Placement of CMS into a Limited User Evaluation (LUE)
- Continued funding to assess a production version
- Use of CMS as an integration platform for testing
- Possible variations for other platforms

For each use of CMS there are different goals, these goals can manifest in variations in capabilities, hardware selection, and interfaces.

The CMS Objective Architecture can be evolved to cover all of the potential variations in the resulting system.

Evolution to a RIF

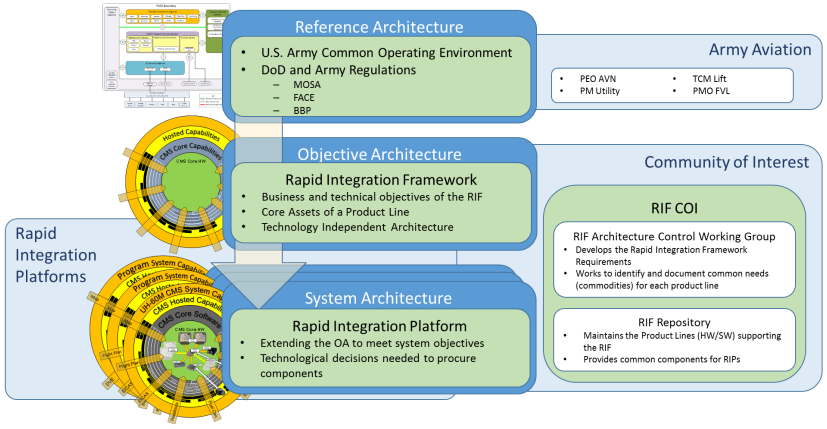
The RIF concept is built upon well accepted architecture principles, such as Integrated Modular Avionics (IMA), Modular Open Systems Approach (MOSA), and the AMRDEC Comprehensive Architecture Strategy (CAS). It utilizes architectural principles defined by the PM Utility CMS project, including viewing the CMS system as a core system that hosts capabilities. This core system allows rapid deployment of new capabilities without modification to the core system, thereby reducing time-consuming qualification efforts. The RIF expands the CMS principles by defining the core components, both hardware and software, needed to create a system capable of rapidly integrating and hosting FACE conformant software.

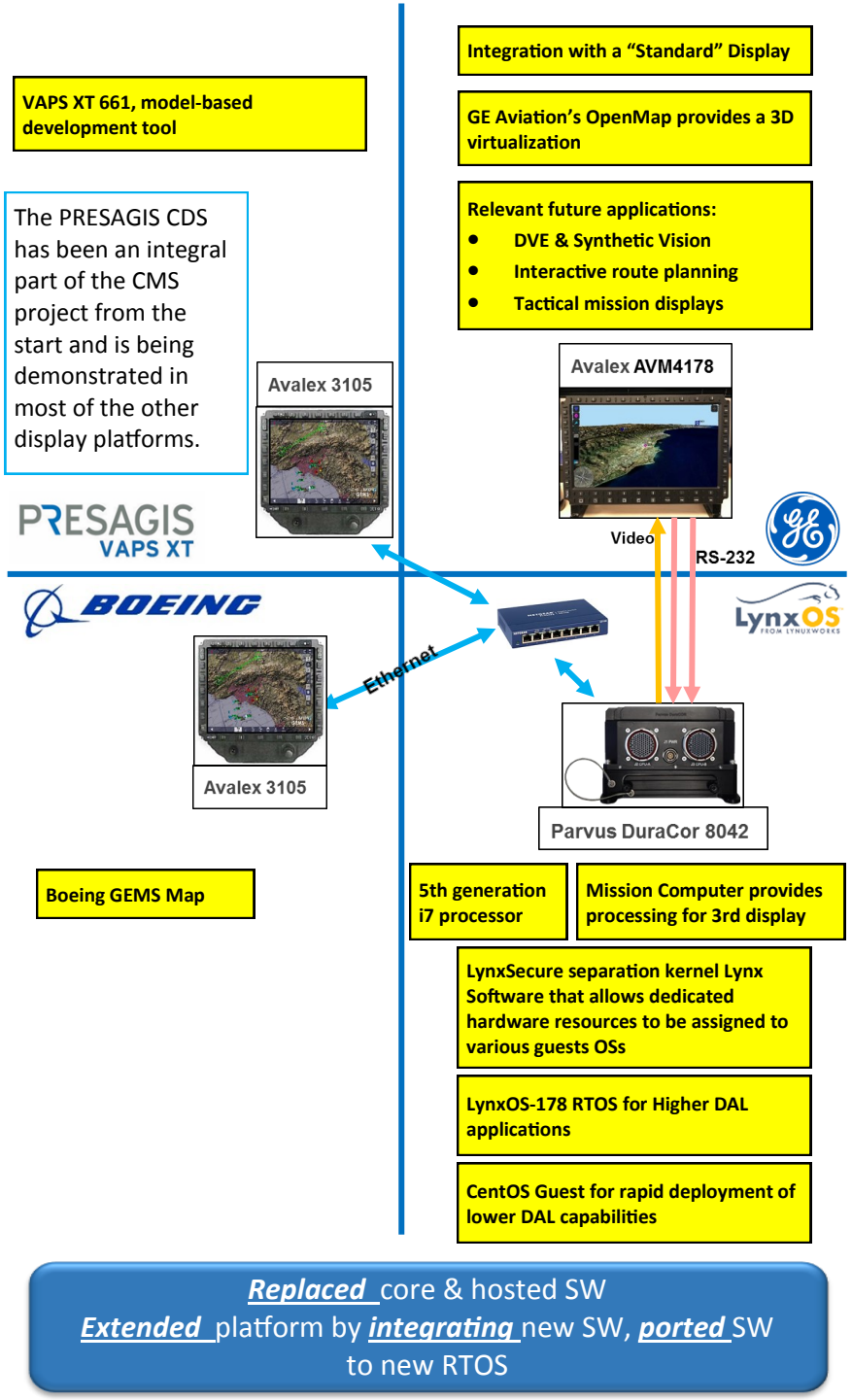
The Rapid Integration Framework:

- Based on the Objective Architecture for CMS
- Defines an Open Systems Architecture for a Core System
- Includes Hosted Capability definitions as extensions to the architecture

A Rapid Integration Platform:

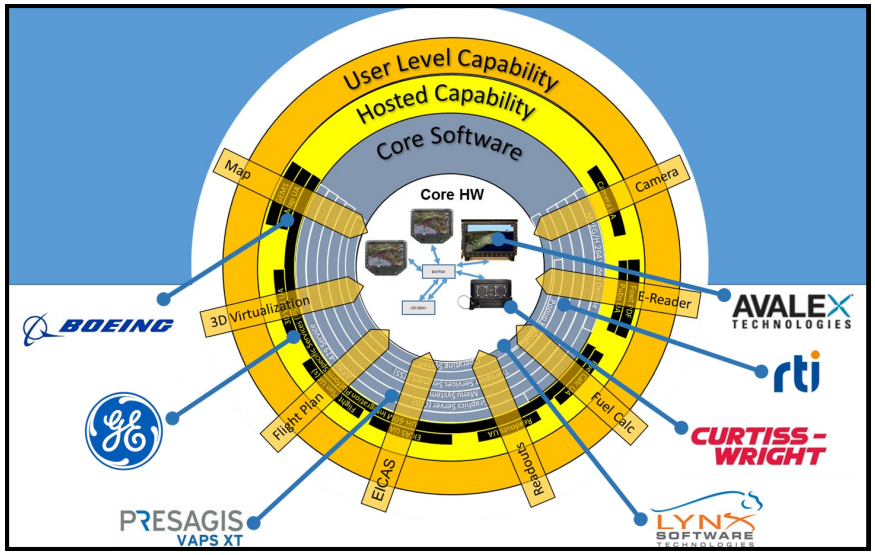
- Includes the Systems Architecture as well as the resulting system for a specific implementation of the RIF
- CMS is a Rapid Integration Platform





Blue Platform Overview

Alternative Maps, Displays, Processing



Features

- Features an alternative map in the GEMS product from Boeing
- Features a new capability in OpenMap from GE Aviation
- Shows an additional display in a larger format for a crew member serving in a mission specialist role
- Processing for this larger display is performed on the mission computer in a separate CentOS guest showing further flexibility in display solutions
- Alternative Mission Computer with a next generation processor from the one used in CMS
- The Mission Computer is running LynxSecure, a multicore separation kernel / hypervisor
- A LynxOS 178 RTOS guest on the mission computer runs the PSSS components, including the IVHMU, the FMS, and the DCU

Demonstration Objectives

- Rapidly ***integrate*** new hardware and software to support technology refresh, i.e. ***replace*** suppliers' products
- Provide government managed architecture for Industry to ***extend*** and show ***integration and interoperability*** of new/innovative capabilities
- Enable Industry to ***port*** and ***reuse*** software and artifacts across platforms
- Enable learning and outreach for PEO AVN

The RIF provides a path for rapid integration of new capabilities:

- Based on the Objective Architecture for CMS
- Envisioned 6 months ago
- Kicked off 3 months ago
- New products rapidly integrated following the framework architecture

The architecture is flexible to meet the needs of a variety of platforms

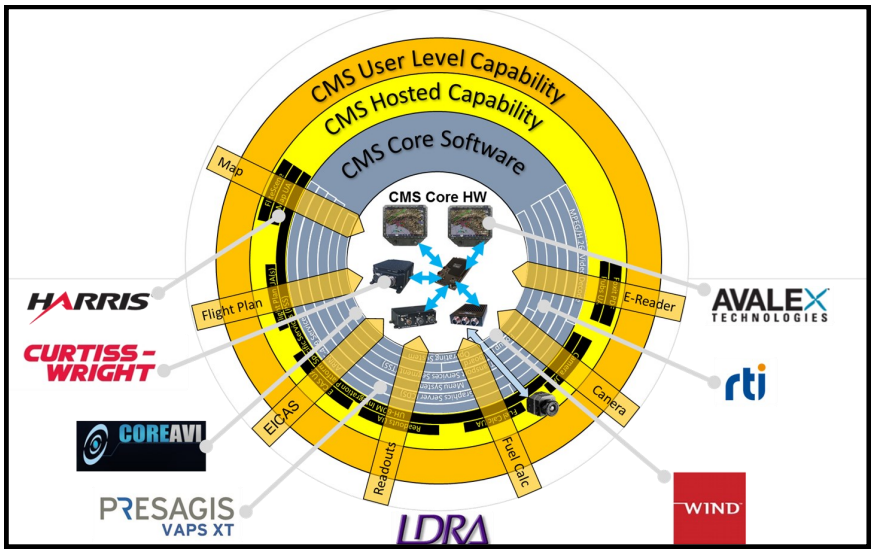
- Hardware Variations
- I/O Variations
- Integration variations
- Software ported to multiple target hardware and operating systems

This architecture and these components are not bound to any single vendor or product

- 19 participating suppliers
- All core components procured for CMS are demonstrated with alternative hardware and software

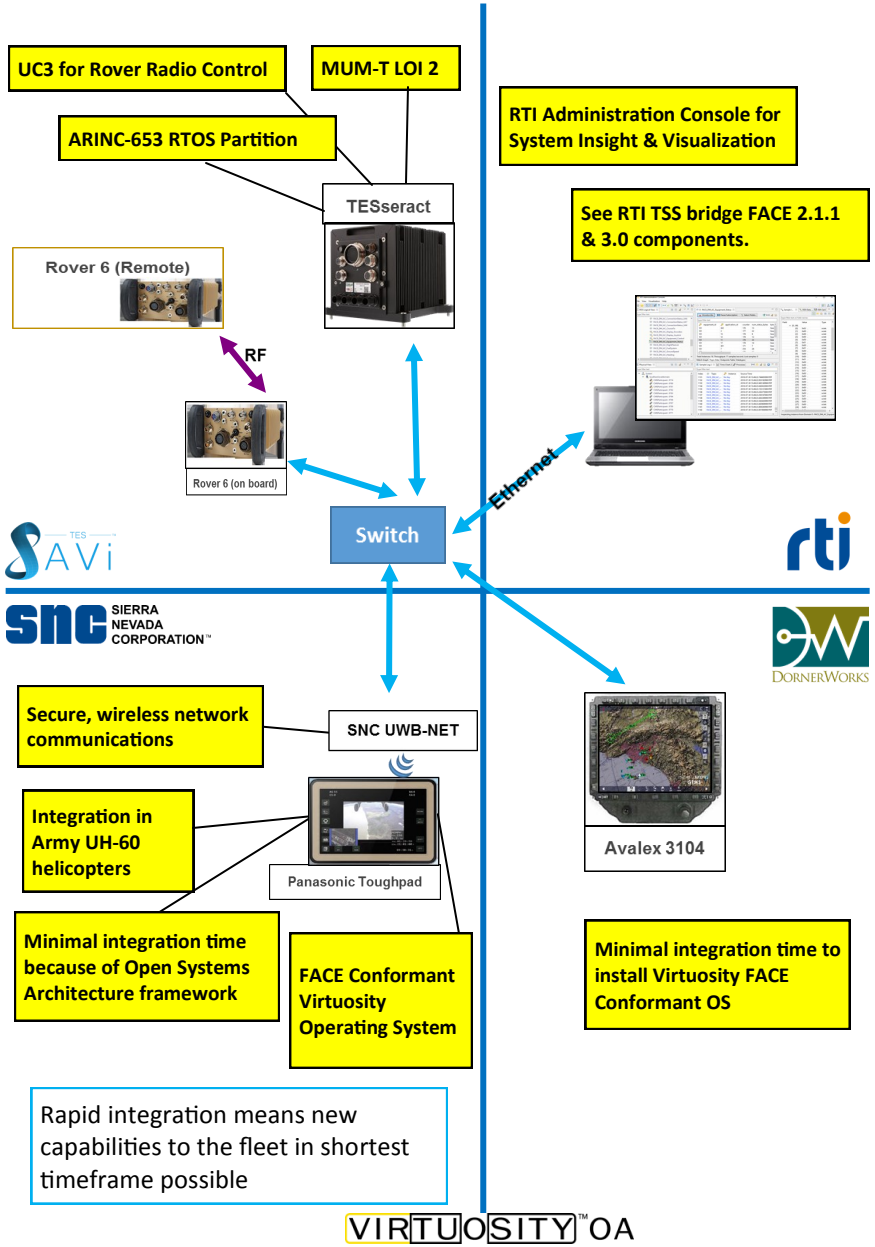
White Platform Overview

UH-60 Blackhawk CMS



Features

- CMS LUE Version
- Government Owned Architecture
- Designed for Rapid Deployment of New Capabilities
- Utilizes the FACE Technical Standard to provide access to FACE Conformant software developed for other platforms
- Logically Separates the Core System from the Hosted Capabilities
- Features Smart Displays for expandability to additional stations
- Features I/O distributed through Ethernet to reduce wiring and equipment costs

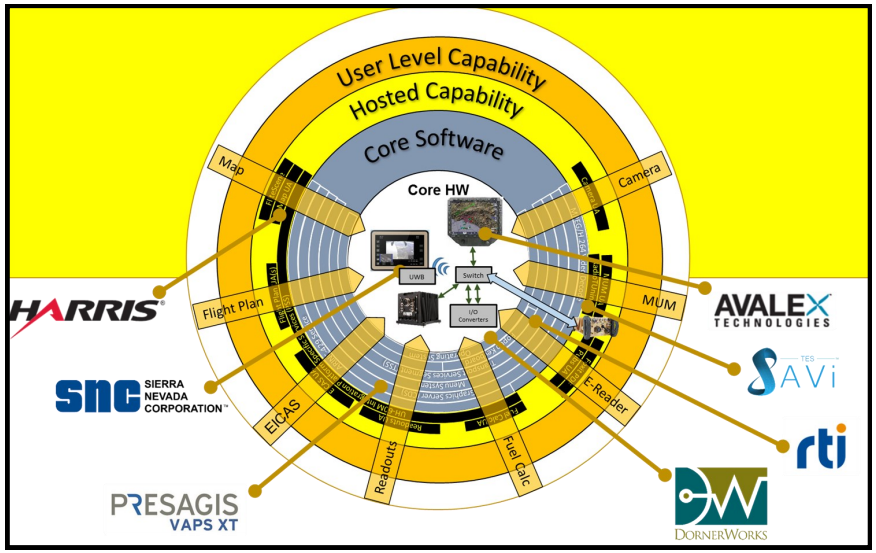


Replaced *and* ***extended*** *core HW and* ***ported*** *SW*

Showed ***Integration and Interoperability*** *of 2.1 & 3.0 FACE Technical Standard*

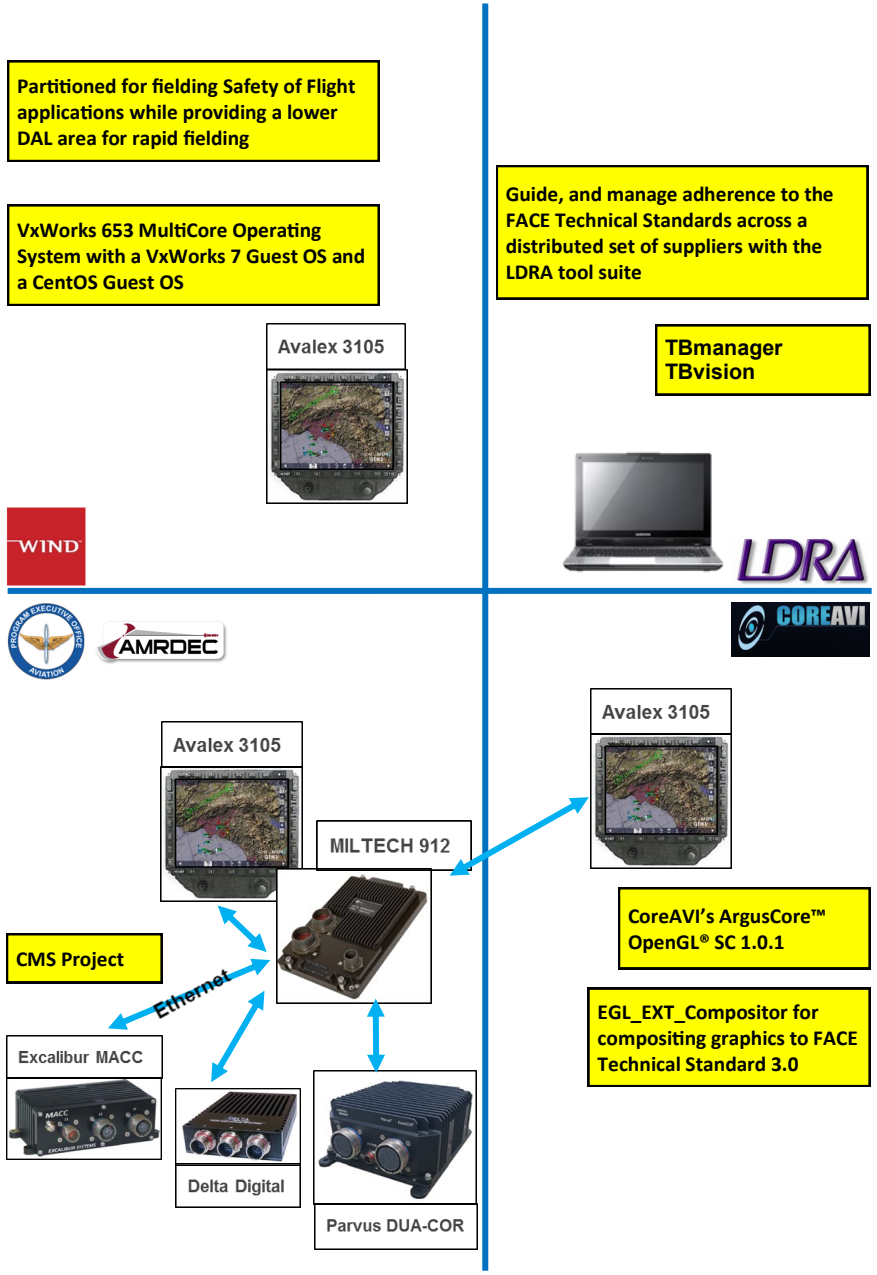
Yellow Platform Overview

Wireless, Tablet Displays, MUM, FACE 3.0



Features

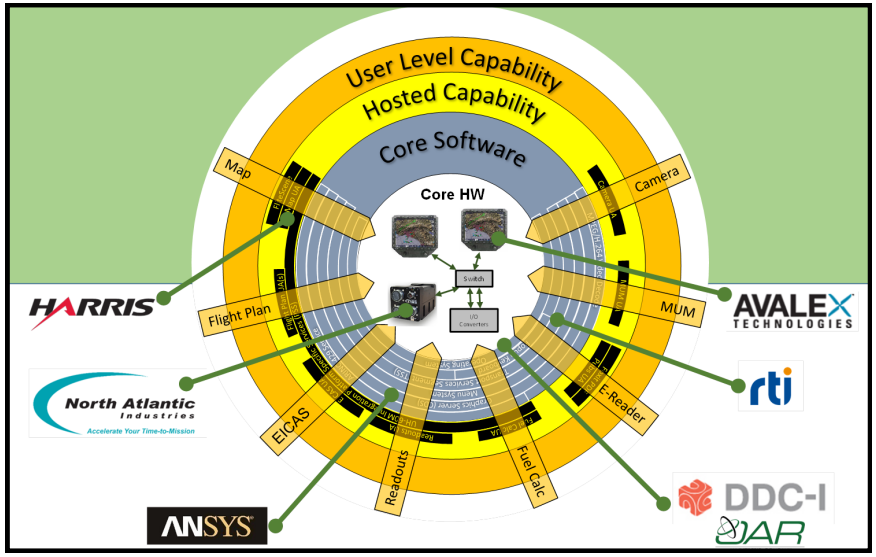
- Features applications running on a Panasonic Toughpad as an alternative display
- Utilizes an Ultra-Wideband wireless network capability provided by SNC to reduce the need for wires within the cabin
- Shows the applications running on the DornerWorks Virtuosity FACE Conformant OS
- Shows an implementation of MUM-T LOI2 through a Rover6 radio
- Shows an integration with components developed to the FACE 3.0 Technical Standard interoperating with components developed to the 2.1 Technical Standard; achieved through a common TSS provided by RTI
- Shows an integration of CMS and BALSA



Government Managed Architecture; Partitioned for Airworthiness and Rapid Fielding

Green Platform Overview

Lower SWAP, Increased Functionality



Features

- Enhancement to the map showcasing a 3D virtualization and other features not selected for the initial LUE (planned additions to CMS)
- ANSYS SCADE Replacement CDS Graphics Server replaces one of the core software components
- Features a mission computer from NAI that integrates I/O functions to reduce SWaP
- PSSS Device Services run in the mission computer, with the I/O processing to reduce redundant processing
- RTEM's Deos RTOS with POSIX partition shows redeployment of components on another OS
- Use of Synchro demonstrates ease of expanding the platform to accommodate new sensors/effectors without impacting other components

SCADE 661 Solutions for ARINC 661 Compliant Systems

Deos Embedded With RTEMS www.rtems.com

DO-178C DAL A certifiable RTOS

FACE Aligned (safety base) Deos+RTEMS supports ARINC653 and POSIX APIs.

Scalable, Reconfigurable LRU supporting I/O and application processing.

COTS standards, MIL qualified, DO-254 & DO-178

Quad Core T2080 With Integrated I/O

ANSYS SCADE CDS Graphics Server:
- **Model-Based,**
- **Certifiable,**
- **Extensible,**
- **Platform-Portable**

ARINC 661 Solution

The Harris FliteScene map was an initial requirement for the CMS map capability and is used by pilots on UH-60M as well as other Army aircraft. It is shown in most of the platforms demonstrated today.

Avalex 3105

Avalex 3105

NAI SIU33

ARINC 429 Synchro

NAI NIU-1A (Simulation Input)

Ethernet

Switch

Map UA based on the FACE Conformant Harris FliteScene

DDC-I

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HARRIS

ANSYS

North Atlantic Industries Accelerate Your Time-to-Mission

Replaceability *of HW and SW*

Portability *of SW*