Open Architecture for IVHM

Dimitry Gorinevsky*, Robert Mah†, Ashok Srivastava†, and Azary Smotrich*
*Mitek Analytics LLC and †NASA Ames Research Center

Open architecture for integration and interoperability of IVHM systems

Architecture for IVHM enterprise: operations → functions → systems

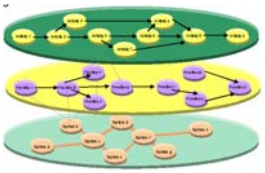
Supports integration, interoperability, verification and validation of IVHM

IVHM testbed: open source system architecture using EE Java framework

Supports evolution of IVHM system, verification and validation of system updates

Architecture Scope

Open Architecture for IVHM Integration
- IVHM Community
  - interoperability
- IVHM System Lifecycle
  - V&V of updates



Open Operational Activities

Open System Functions

Open Systems

IVHM for NextGen aircraft (20-30 years)

↑

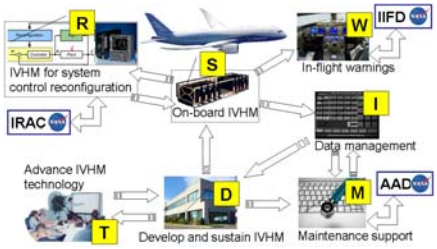
Industry impact: retrofit
Integrated demonstration - RTI
↓ design | integration ↑
AvSP IVHM systems research

Architecture TRL 3-6

AvSP IVHM basic/applied research
– Basic knowledge, no system development

DODAF – DOD Architecture Framework

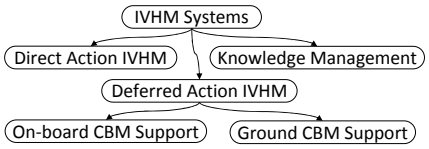
Operational Views: OV
- Nodes
- Needlines

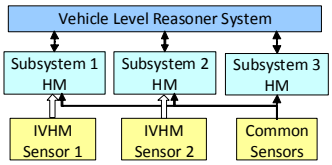


- **Ground to flight path: T→D→M→S→R**

• Component demonstration • Lab integrated demonstration • Ground demo with off-line flight data • Flight demo with a generic computer	NASA IVHM Research TRL 2-6
• Ground system deployment • Non-critical flight system deployment • Flight-critical system deployment	Industry Advanced Systems Developmt TRL 6-9

System Views: SV
- Functions
- Systems





Knowledge Management
- Manage IVHM models
- Data mining
- Data warehousing

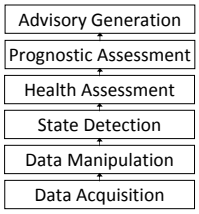
Technical Standard Views: TV
- Operations
- Functions
- System and data interfaces

Standards

DO-178B/DO-254
AI-ESTATE: IEEE 1232, P1522
ARINC 624-1 and ARINC 604
DAVE-ML

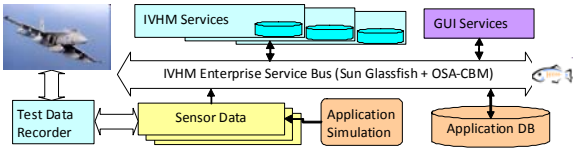
DOD CBM+
MIL-STD-1591
MIL-STD-1629A
MIL-STD-2165

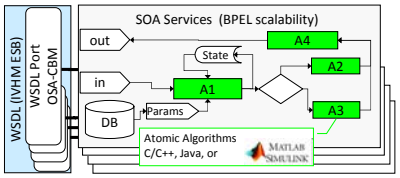
ISO 13374
OSACBM

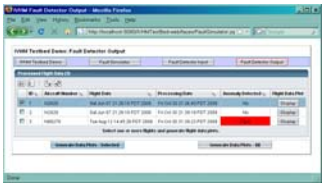


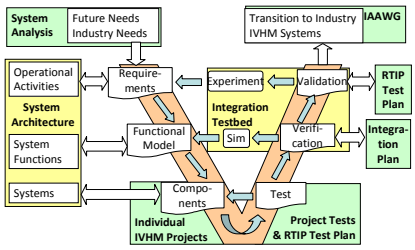
IVHM Testbed

System Views: OS
- On-board critical systems
- On-board non-critical systems
- Ground systems
- Data management systems







The demos will use the IVHM Testbed Platform

Integrated Demonstrations Planned by IVHM RTI
1. Engine Demo
2. Data Mining Demo
3. Vehicle Level Reasoning System (proposed)