NATIONAL ADVANCED MOBILITY CONSORTIUM

Common Tactical Controller

Presentation to NDIA Robotics Division

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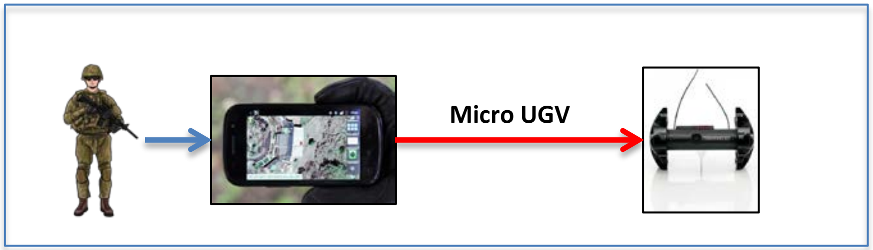
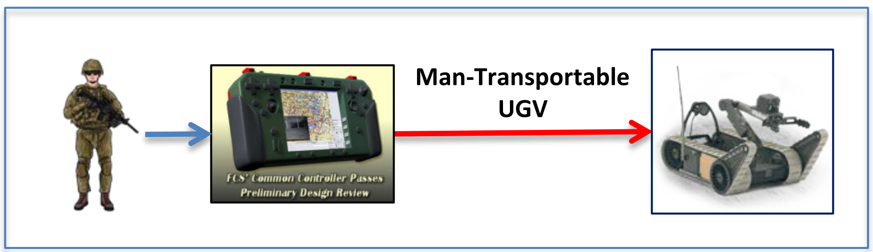
Current Paradigm

One proprietary, operator control station per RAS platform



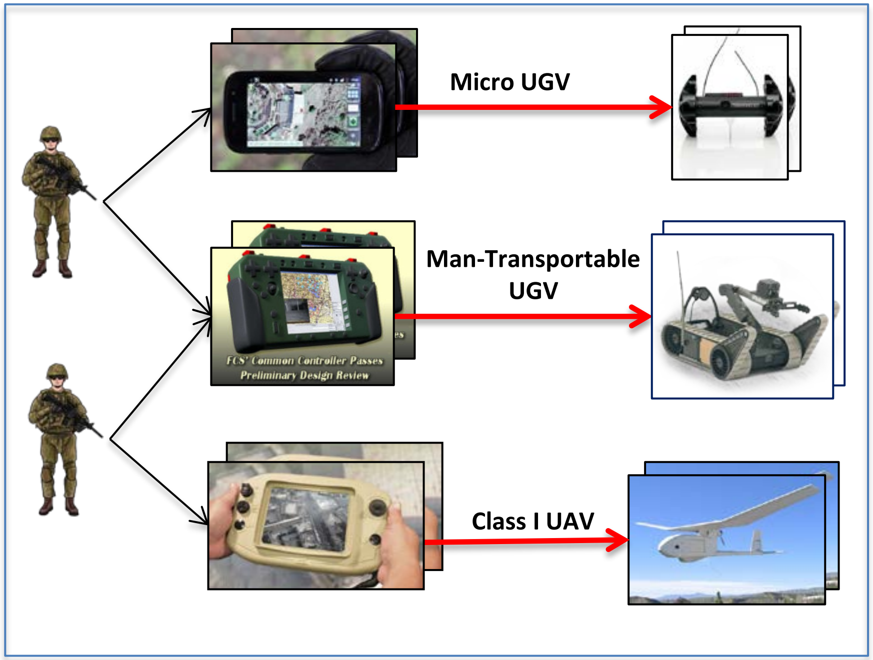


Historically Acceptable

- Minimized program risk
- Operationally not an issue with a single RAS fielded per military unit

The Problem

One proprietary, operator control station per RAS platform



Historically Acceptable

Increasingly Problematic with the Proliferation of Heterogeneous Systems

- Greater Physical Burden on Warfighter
- Growing Logistic Complexity (e.g. incompatible batteries, radios)
- Unnecessary Program Costs for Redundant Equipment

OSD/JGRE Assigned Task

Phase I Effort

- **Investigate and report on current approaches and efforts to develop a common controller for Group 1 UAS and ground RAS**

- **Determine a potential path forward that leverages current investments**

Common OCS Hardware Platform

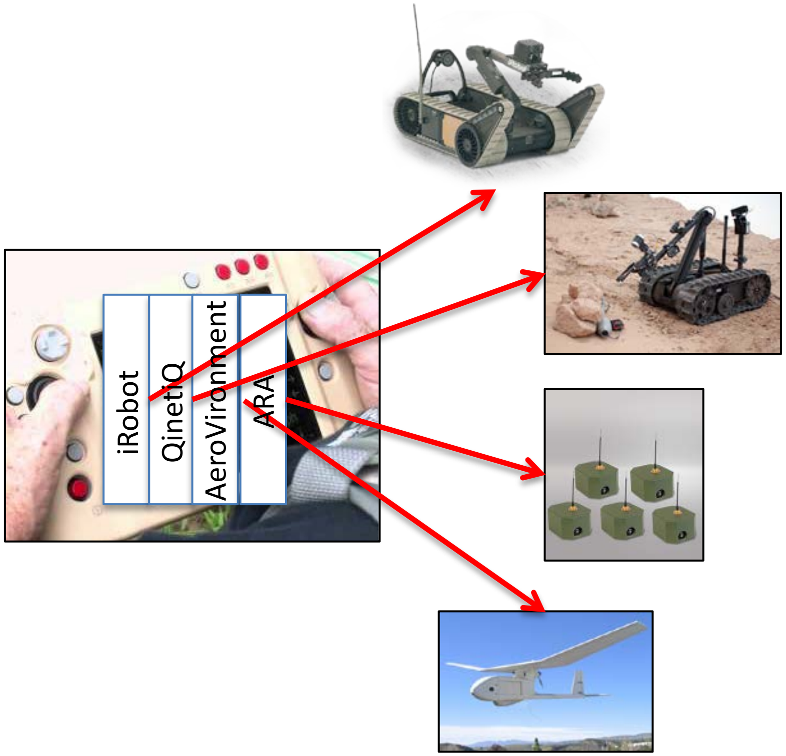
Tactical Robot Controller (TRC)

Addresses the Weight, Cost, and Logistic Issues

- SWaP still an issue
- Radio comms still an issue

Common OCS Hardware Platform

Tactical Robot Controller (TRC)



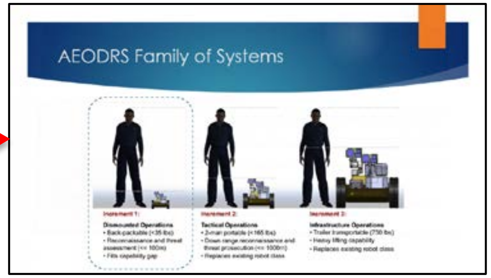
Addresses the Weight, Cost, and Logistic Issues

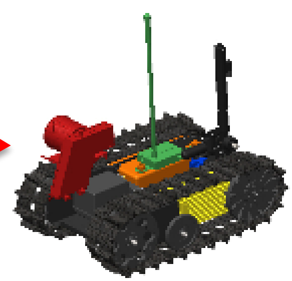
Running Silos of Proprietary Control Software

- Cognitive Burden of Different User Interfaces
- Operational Limitations of Not Being Able To:
  - Effect Collaborative Behaviors
  - Share Data
  - Request Services
  - Dynamically separate / distribute control of the platform and payloads

Government-Owned OCS Software

Modular Operator Control Unit (MOCU)





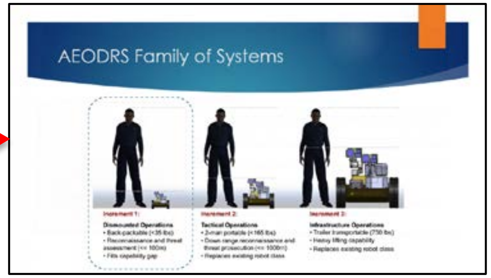
SPAWAR R&D Controller Software

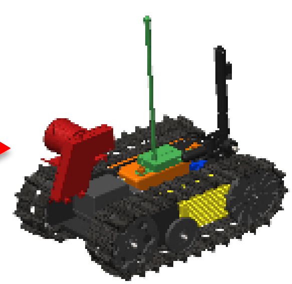
Being Adapted & Customized for Programs of Record

- Addresses being locked into a proprietary vendor
- Enables Commonality and Interoperability ***<u>within</u>*** a PoR

Government-Owned OCS Software

Modular Operator Control Unit (MOCU)





SPAWAR R&D Controller Software

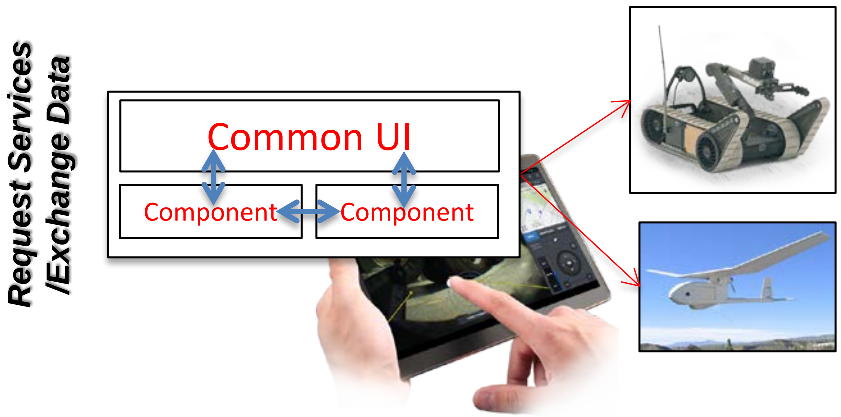
Being Adapted & Customized for Programs of Record

Lacks a True Open Architecture

- Doesn't Allow for Interoperability ***outside*** a PoR
- Difficult to Integrate Proprietary Software: limits competition and stifles innovation
- Increasingly Difficult over Time to Enhance, Extend, and Support
  - Add-on capabilities need to be customized for each variant
  - Entire software needs to be re-tested with each release

Open OCS Software Architecture

UAS Control Segment (UCS)



- Developed for Group 2 – 5 UAS
- Significant DoD Investment and Growing Interest
- Enables plug-n-play, component-level software compatibility

  E.G. seamless integration of Government-owned and proprietary components
- Key Characteristics

  Data-Centric, Service-Oriented, and Model-Driven
- Reduces software development costs
  - Enables writing software one time
  - Unbundles testing and debugging
- Enables true, services and data interoperability locally …

Open OCS Software Architecture

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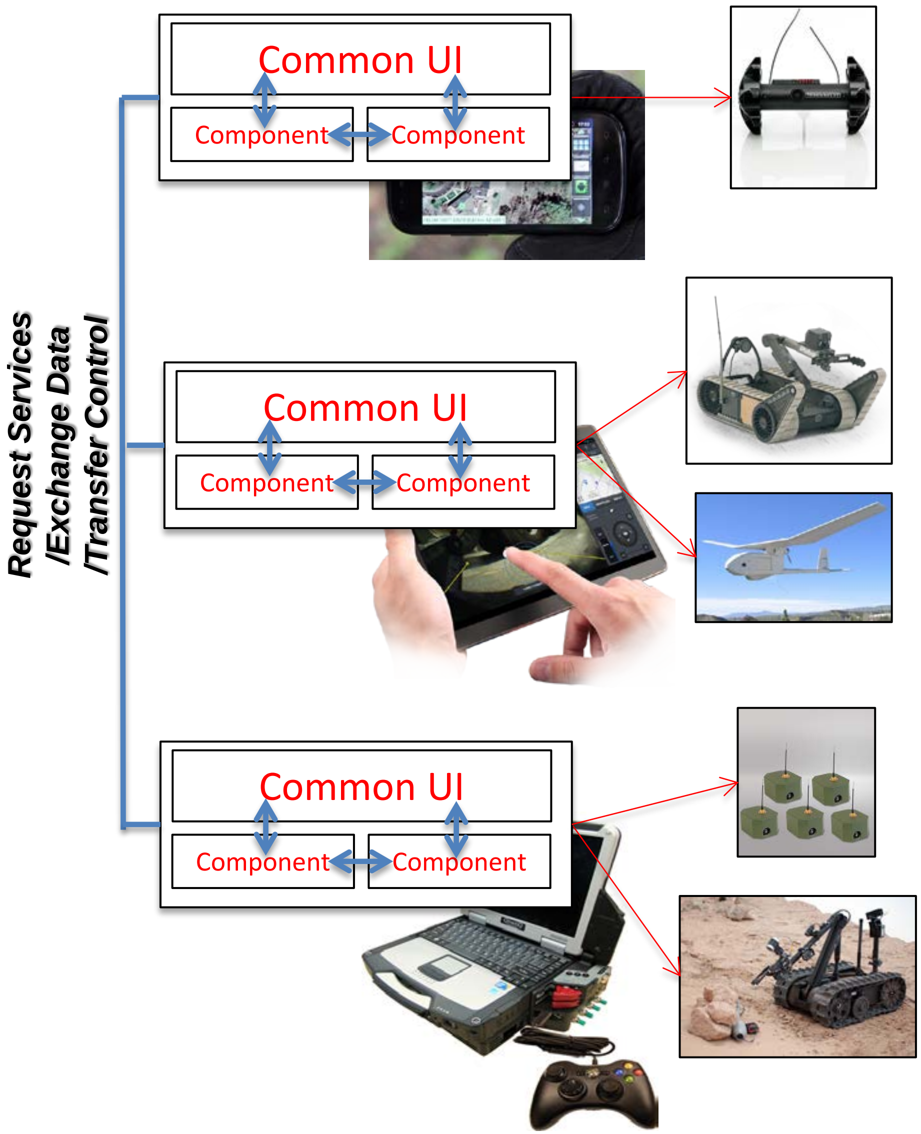

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- Enables true, services and data interoperability locally …
  as well as across the network

UCS Open Architecture

Conceptual Overview

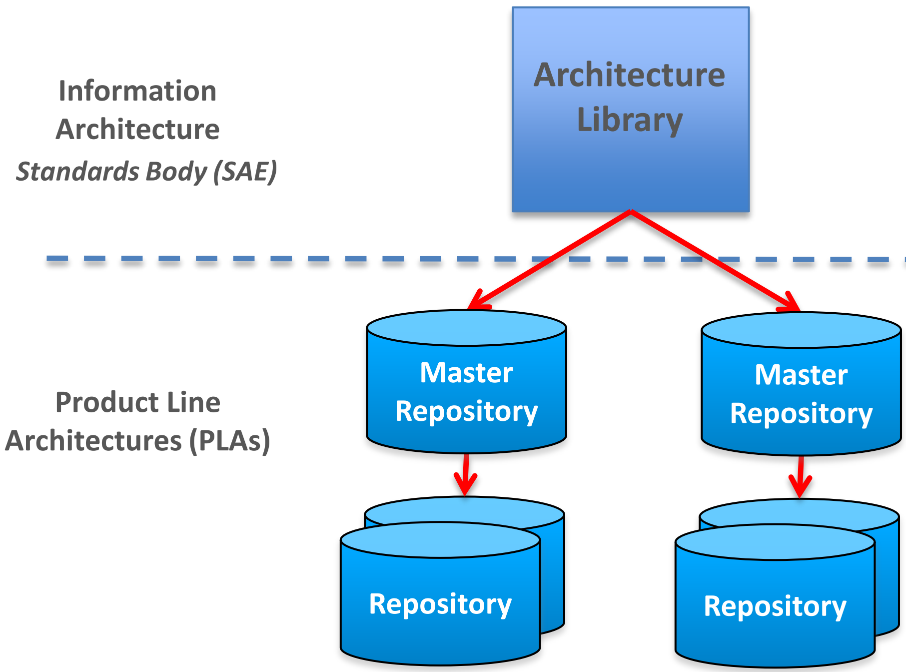
Information Architecture
Standards Body (SAE)

Architecture Library

- Master Library controlled by the standards committee
- Contains a master list of defined platform independent services
- Separated into domains and sub-domains

UCS Open Architecture

Conceptual Overview



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- "Master" repositories can be established to contain descriptions, assumptions, supported services, and other characteristics for a specific system
- One or more other, "subordinate" repositories contain representations (description, attributes, metadata, source code, and/or object code) of software components, including UIs, available to be integrated for a specific system implementation

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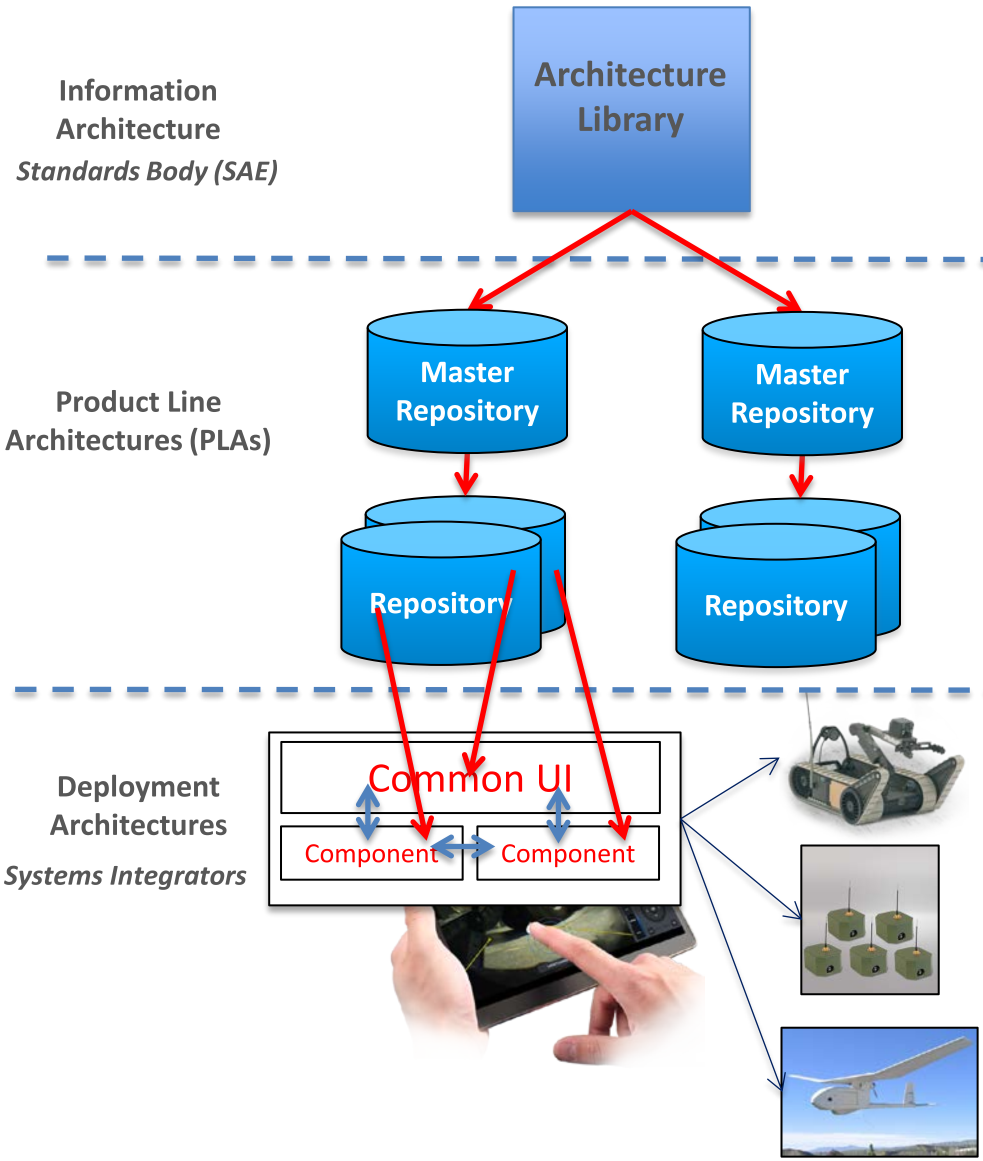

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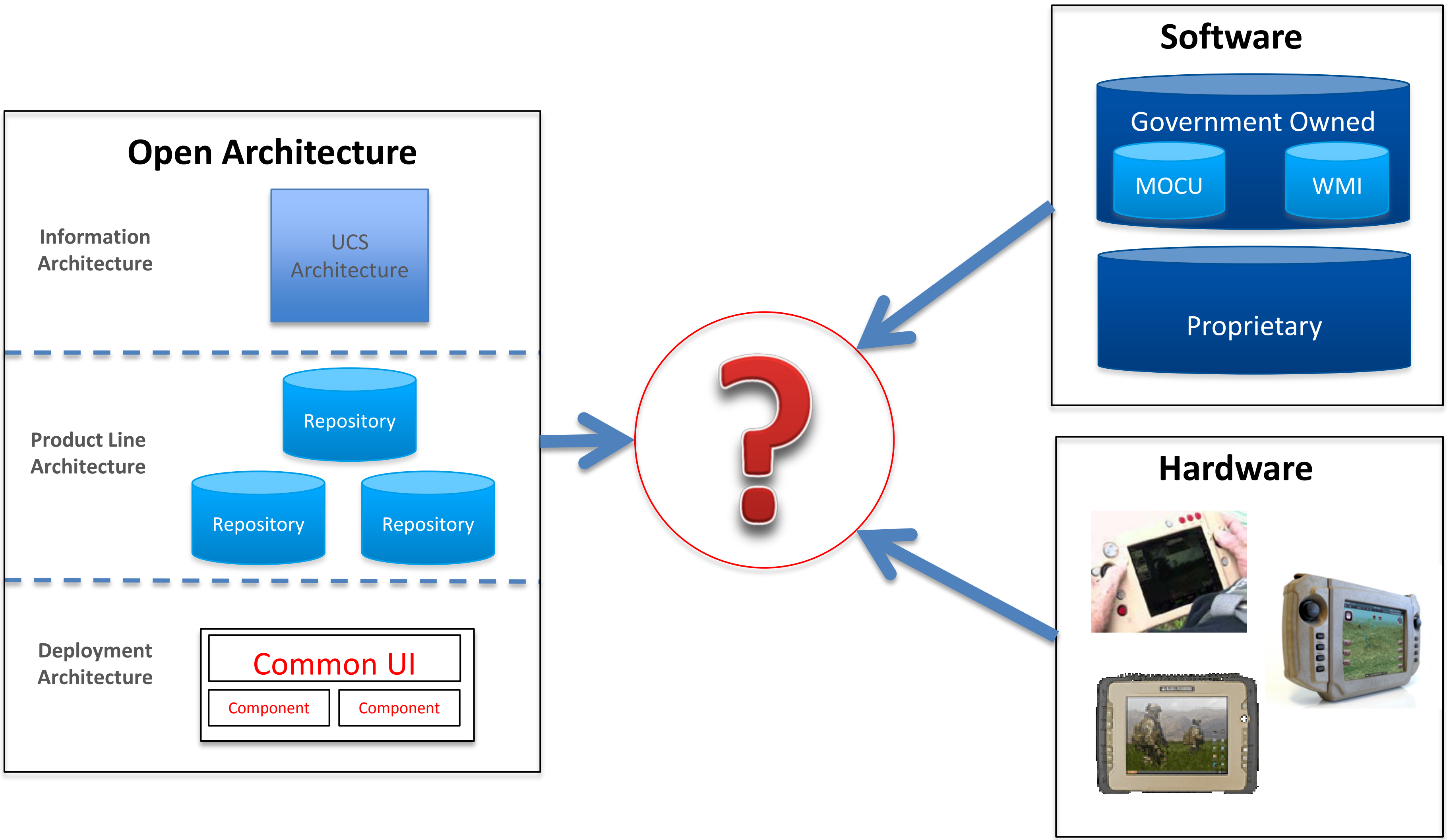
- User Interfaces and software components are selected from the repositories and integrated to create the control software that runs on a hardware platform

OSD/JGRE Assigned Task

Path Forward that Leverages Current Investments



OSD/JGRE Assigned Task

Key Developments & Considerations

UCS

- Transitioning to SAE
- Agreement with the Open Group to align with the FACE standard
- Information architecture being extended to the ground domain
- Software development tools are starting to become available

MOCU 4

- UCS compatible system for developing and maintaining a graphical user interface, plug-n-play modular components that connect over a DDS communications bus, and vehicle/device interfaces
- Runs on Windows, Ubuntu, and Red Hat platforms

OSD/JGRE Assigned Task

Recommend Strategy

Pursue an Open Architecture and Open Business Model based on UCS that leverages Government-owned software (e.g. MOCU 4) in order to meet upcoming program of record (e.g. CRS-I) needs in the near term; and serve as the basis for the proposed common controller in the long term

OSD/JGRE Assigned Task

Phase II Effort

- Track UCS transition to SAE and the development and adoption of UCS Ground Domain services
- Work with SPAWAR to vet MOCU V4.0 and whether/how the software could be transitioned into a UCS repository
- Develop the framework for an open business model
- Work with the Government to determine whether/how the proposed strategy might align with the CRS-I PoR and identify milestones that would need to be met
- Vetting proposed approach with PM-SUAS to socialize future migration of TOGA controller software to common controller architecture
- Develop a detailed, path forward implementation plan & proposal
- Identify and resolve other details that arise

Path Forward

Potential Multi Stage Approach

Stage 1 – CRS-I PoR defines a UCS PLA for the CRS-I controller, compliance with which would be a CRS-I KPP or requirement

Stage 2 – if/when a common controller PoR is established, the CRS-I PLA can be seamlessly transitioned to be the initial PLA for the common tactical controller

Stage 3 – the common tactical controller PLA can be extended and/or new common controller PLAs defined to support:

- current PoR platforms (e.g. MTRS Increment 2, TOGA, AEODRS, etc.), enabling their controller software to be later upgraded for compliance
- new PoRs whose platforms and payloads will be developed from the get-go to be compliant with the common controller PLAs

Path Forward

Potential "Lead-In" Prototype Effort

Stage 0 – NAMC, in partnership with the Government, develops and supports a prototype PLA for a tactical handheld controller to operate MT/1* platforms and payloads

Stage 1 – CRS-I PoR defines a PLA for the CRS-I controller, compliance with which would be a CRS-I KPP, requirement, or objective

Stage 2 – if/when the common controller PoR is established, the CRS-I PLA can be seamlessly transitioned to become the initial PLA for the common tactical controller

Stage 3 – the common tactical controller PLA can be extended and/or new common controller PLAs defined to support:

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** Man-transportable, ground RAS, platforms and payloads compliant with the open, MT/1 standardized baseline instantiation developed and supported by NAMC in partnership with the Government*

Prototype Tactical Controller PLA

"Strawman" SOW

- Define and establish a master repository specifying the system description, operating system and middleware, and other system level requirements, characteristics, etc.
- Use a core version of MOCU 4 to implement a Government-owned software repository
- Develop procedures for registering and describing available proprietary software components in a repository
- Make GFE TRCs available to software system integrators for prototype development and demonstration purposes
- Develop a Web portal & provide baseline support functions

Prototype Tactical Controller PLA

Benefits to Government & Industry

- Informs Government decision whether/how to specify UCS compatibility for the CRS-I PoR controller
- Provides a baseline for defining the CRS-I PoR PLA
- Provides an interim standard to develop and test against
- Facilitates innovation and partnering
- Grows the industry base
- Increases competition
- Lowers risk and cost

Questions / Discussion