An Architecture to Promote the Commercialization of Space Mission Monitor and Control

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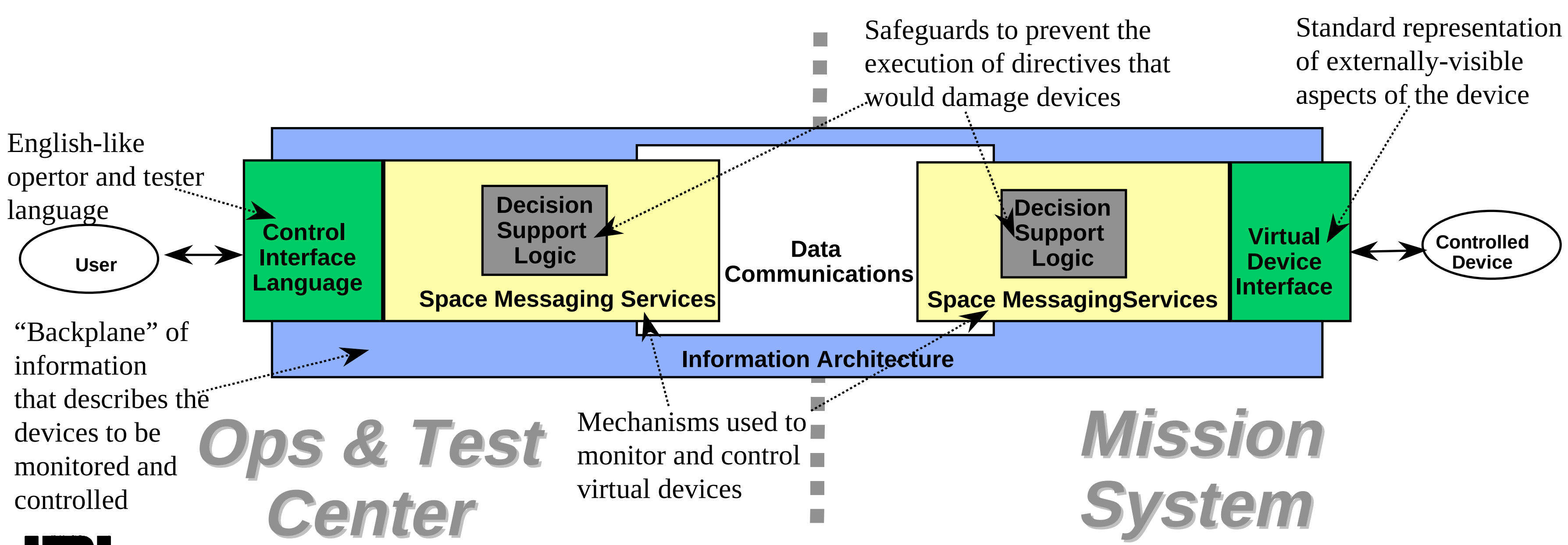
Outline

- An Architecture for Monitor and Control
- Key Features of the Architecture
- Enhancing Portability in Monitor and Control
- Enhancing Interoperability
- Promoting Commercialization
- Space Project Mission Operations Control Architecture (SuperMOCA) - Status
- Lessons and Advice
- An Advertisement

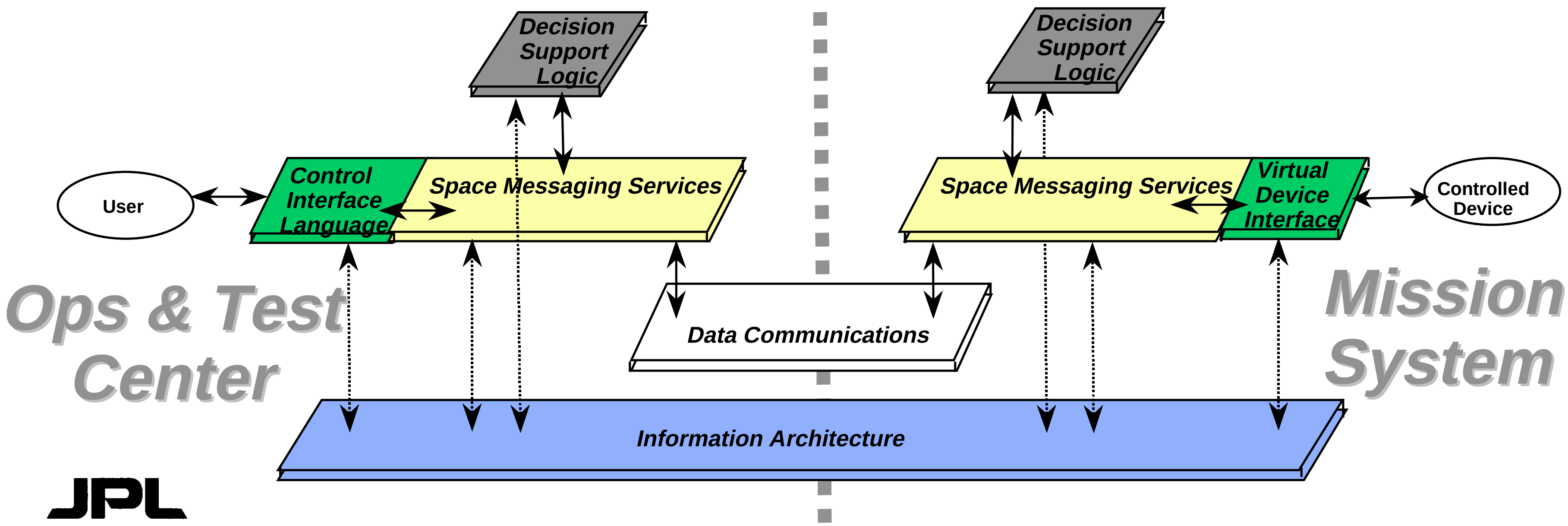
An Architecture for Space Mission Monitor & Control

- An architecture for the monitor and control during integration, test, and operations of:
  - spacecraft and launch vehicles
  - launch complexes and ground tracking stations
- A set of open standards that are consistent with the above architecture and apply to the devices used in space missions and the products used to monitor and control those devices.



Key Features of the Architecture

- Layering of Monitor and Control Functions (pictured below)
- Open standards for interfaces between functions
  - Decision Support Logic (DSL)
  - Control Interface Language (CIL)
  - Space Messaging Services (SMS) and Virtual Devices
- Information Architecture open standard for device descriptions including:
  - method that captures device descriptions that are used throughout the project life cycle
  - structure that is easily accessible by all monitor and control functions



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Enhancing Portability in Monitor and Control

- Portable - software components developed and used as parts of one system can be used without modification as parts of another system
- Advantages for space mission monitor and control
  - software inheritance from mission to mission
  - moving of monitor and control software from ops & test centers to mission systems (i.e., mission system automation and autonomy)
- Advantages for commercial products - multiple environments where product can be applied
- How the architecture enhances portability
  - separates mission-specific applications from the common infrastructure (architectural layering)
  - standardizes the interface to the common infrastructure (SMS)
  - defines method for mission-specific descriptive information to be captured from the development phase and a structure for that information (Information Architecture)

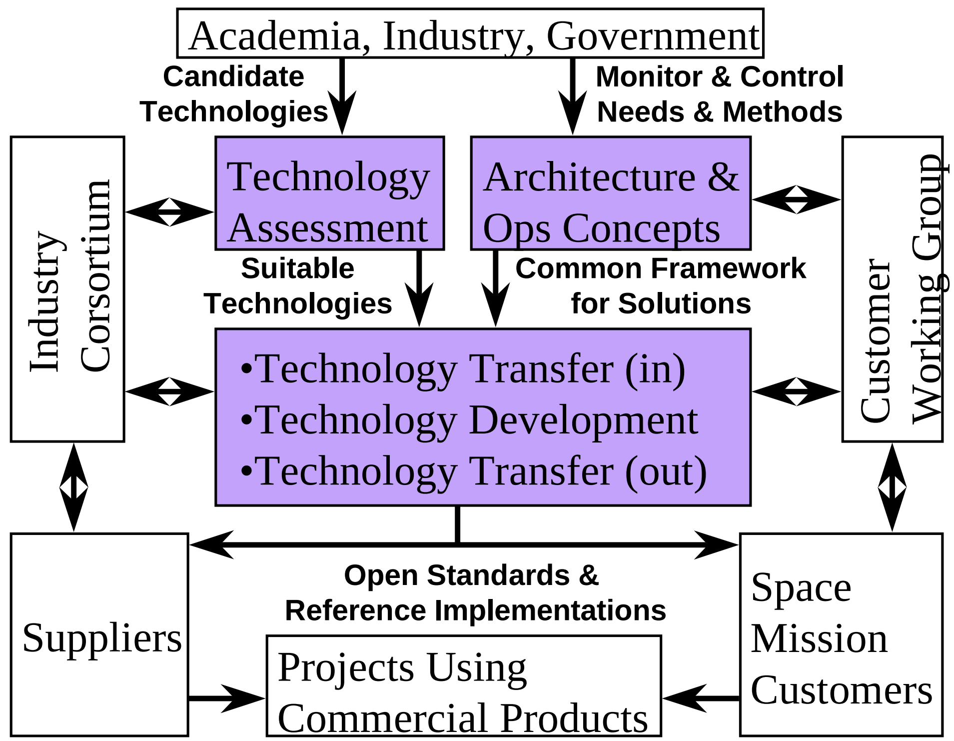
Enhancing Interoperability

- Interoperable - upon establishing data connections, components built by different organizations can operate together to execute an activity by exchanging monitor and control information (i.e., plug and run)
- Advantages for space mission monitor and control
  - simplifies multiple agency cooperative missions
  - shortens system integration and test and training time
  - preserves customer options on component suppliers
- Advantages for commercial products
  - lower customer support costs
  - products are compatible with more systems
- How the architecture enhances interoperability
  - provides a pathway from operator to procedure automation (CIL)
  - makes mission-specific descriptive information available to monitor and control applications in a standard structure (Information Architecture)
  - decouples device design from monitor and control application design (SMS and virtual device concepts)

Promoting Commercialization

If we (government customers) want to benefit soon from a commercial market, the we need to participate in creating it. An architecture that helps to create a commercial market should:

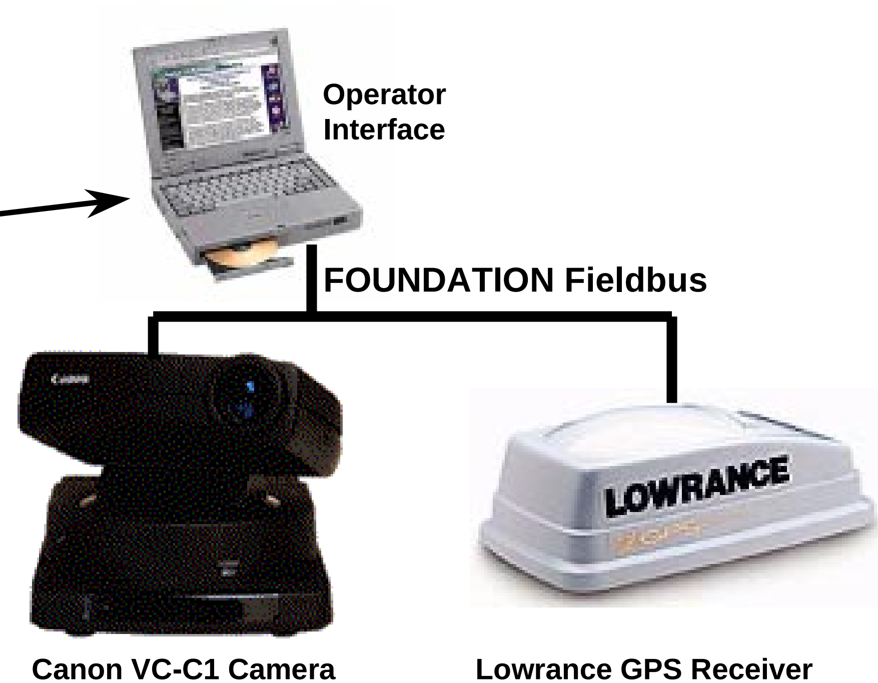
- ❖ Provide an understanding of the common cost drivers among government and commercial space missions
- ❖ Reduce costs for both government and commercial operators throughout the project life cycle
- ❖ Provide business opportunities to a large set of companies
- ❖ Promote commerical competition



Path to a Commercial Market

Status of Space Project Mission Operations Control Architecture (SuperMOCA) Task

- Overview Documents Available
  - Summary - Why SuperMOCA is important
  - Architecture - What SuperMOCA is
  - Operations Concept - How SuperMOCA is applied
- Current Focus is on Information Architecture and SMS
- Standards Documents (drafts) Available
  - Information Architecture
  - SMS
  - CIL
- Road Show Demo
  - Commercial messaging system
  - ISA Show in Anaheim in Oct. 97
- JPL Demo
  - Commercial messaging system
  - Simulated S/C and ground station



Lessons Learned (Free Advice!)

- Get us customers together - e.g., GSAW, Spacecraft Control Working Group
- Use or adapt commercial standards wherever possible
  - Investigate analogous commercial markets and their technologies and standards
  - Use existing industry consortia (e.g., Fieldbus Foundation)
  - Space business is interesting; use that to your advantage
- Use ops concepts and scenarios
  - to configure testbeds
  - to see where the best bang for the buck is
  - to communicate with suppliers, analogous domain experts, other agencies, commerial space operators
- Testbed technologies, standards, system architectures, and operational concepts as early as possible
- Develop and adopt standards that allow suppliers to develop products that fit into most private and government ground systems for space missions

SuperMOCA Homepage

- http://supermoca.jpl.nasa.gov/supermoca

- You can access:
  - News & Announcements
  - Papers
  - Documents
  - Explanation of Demos
  - Points of Contact
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