Why Choose CCSDS SM&C for your next Ground Segment?

GSAW, Redondo Beach, 2 Apr 2008

CCSDS Spacecraft Monitor & Control Working Group (SM&C)
Mario Merri (ESA), Chair
Agenda

- Consultative Committee on Space Data Systems (CCSDS)
- Spacecraft Monitoring & Control (SM&C) state-of-the-art
- Why choose CCSDS SM&C?
Why Choose CCSDS SM&C for your next Ground Segment?
SM&C: Spacecraft Monitoring & Control

- **CCSDS working group**
  - 4 year lifetime (started in Dec 2003)
  - 10 Space Agencies actively involved
  - very active (9 workshops, 50 telecons)
  - very productive
    - 2 green books published
    - 1 blue book published
    - 3 red books almost published
    - 3 magenta books under finalisation
    - several white books in early draft
  - excellent team work among agencies!

- **Goal**
  - Standardize the **Mission Operations Services** to enable the build up M&C systems by using “plug & play” components
Wider “Interoperability” Scope in SM&C

- **Before**: strictly inter-organization
  - closely related to the notion of administratively separate domains

- **Now**: inter- and intra-organization
  - i.e. added the ability to identify functionality that allows for swappable components that agencies may choose to exchange or “contract-out”
We had this …
... were promised this ...
... but ended up with this!
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Service-Oriented Architecture: Plug-in Components

Components

SM&C infrastructure framework

Services
SM&C Mission Operations (MO) Services

- Coherent set of application level services needed to monitor, control and operate a remote system:
  - Classical TM, Event monitoring & TC generation (Core)
  - Remote software management
  - Time management
  - Mission product data management
  - Mission planning and automation
  - Orbit, Attitude and Position determination
  - Standard interaction with the operator
  - … more to come

- A SM&C infrastructure framework where MO services plug-in
SM&C Architecture and Books

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SM&C Core Services: Classical TM and TC

The SM&C Core Service Menu:
- Standard Core services
  - Parameter Service
  - Action Service
  - Alert Service
- Enhanced Core services
  - Check Service
  - Statistic Service
  - Aggregation Service
  - Conversion Service

SM&C Infrastructure Framework
SM&C Common Services

The SM&C Common Service Menu:

- Directory Service
- Login Service
- Configuration Service
- Interaction Service
- Retrieval Service
- Replay Service

SM&C Infrastructure Framework

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Why Choose CCSDS SM&C for your next Ground Segment?
We want to …

- be ready for the future
- more complex missions
- protection from technology evolution
- more collaboration across organisations
- scalability
- expandable systems

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... and to reduce cost (i.e. schedule, risks, …) of

Systems’ Development

- more generic software infrastructure
- more plug-in components

*Re-use*

- Infrastructure
- Components
- Legacy systems
- Operational concepts
- People (expertise)

Operations

- less variability across operational concepts
- less variability across systems

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Why Choose CCSDS SM&C for your next Ground Segment?
It is about using what you already have

Your Systems

Your Data

Your Processes

and only adding enabling technology
Why Choose CCSDS SM&C?

Old Way

Designed to last

New Way

Designed for change
Why Choose CCSDS SM&C?

Old Way

Tightly Coupled

New Way

Agile and Adaptive

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Why Choose CCSDS SM&C for your next Ground Segment?
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Old Way
Build in isolation

New Way
Build Services
Why Choose CCSDS SM&C?

Old Way

Code is King

New Way

Metadata Princess
Why Choose CCSDS SM&C?

Old Way  New Way

Takes time to complete  Interactive progressive development
Why Choose CCSDS SM&C?

Old Way

Middleware Focus

New Way

Architecture Focus
Why Choose CCSDS SM&C?

Old Way

Homogeneous

New Way

Heterogeneous
Conclusion: the SM&C Key Design Driver

What few things must be the same, so that everything else can be different

- Eliot Christian

Let SM&C do the boring part of the job so that you can focus on the smart part

- Mario Merri