Call for Interest in Mission Planning Services Standardisation

Spring CCSDS Technical Meeting, Darmstadt
18 April 2012
CCSDS MO Services:
- Mission Operations Domain
- Application Level
- End-to-End Services
- Meaningful Information Exchange
- Distributed Systems (Space & Ground)
- Interoperable
  - Between Agencies/Operators
  - Between Systems
  - Open Data / History
- Technology Agnostic
- Extensible Framework
Distributable Functions expose potential MO Services

- M&C (Status, Control)
- Automation (Procedures, Timelines)
- Planning (Tasks, Goals)
- Mission Data (Products)
- Flight Dynamics (Orbit, Attitude)
- On-board Software

Mission Operations Services:

- Organisational Boundaries
- Functional Boundaries
- System Boundaries
- Long-Term Data Persistence

- Space-Ground
- Ground-Ground
- Space-Space
Benefits of Standard Mission Planning Services

• Interoperable Interface between:
  » PIs, Users, Operating Agencies, Spacecraft
  » Allows each to Develop/Integrate own Multi-mission Systems
  » Common Service layer supports rapid Mission Integration
  » One Adapter for all Missions, not many bespoke interfaces

• Common Concepts across Missions / Mission Types
  » Goals, Tasks, Constraints
  » Time-based, Position-based, Event-based
  » Repetitive Operations
  » Discrete and Multi-part (Serial or Survey) Operations

• Services define both Information Exchanged (Static) and Interaction Protocol (Dynamic) [not just a data format]
  » Set of Standard Operations
  » Provides Status Feedback to Initiator
  » Potential to Record Service History
Potential MO Mission Planning Services Scope

- MO Services standardise exposed interfaces between applications
- They do not standardise the applications themselves
- Simplifies Integration and Allows for Evolutionary Change
CCSDS Mission Operations (MO) Services

• **Spacecraft Monitoring & Control (SM&C) Working Group**
  - Part of CCSDS MOIMS Area, Established 2003
  - Active Support from Multiple Agencies
  - Published Specifications for MO Service “Framework”
    - Supports Definition of MO Services
    - Allows Common Binding of Services to multiple Transport and Encoding Technologies (Technology Neutral Specification)
    - Allows Common API Specification for target languages
    - Provides extensible “Template” Service
  - Now working on Core Monitoring & Control Services

• **Specification of other MO Services requires Specialists**
  - Navigation [Flight Dynamics] Services ➔ Navigation WG
  - Mission Planning Services ➔ No Existing Group

• **Proposed Meeting Planned for Spring 2012 CCSDS Technical Meeting to consider potential specification of MO Mission Planning Services**
MO Service Framework

Application A
  e.g. PI or User Gateway

Language Binding (API)

M&C

MO Services
  NAV ...

PLN

MAL: Message Abstraction Layer

Technology Binding

Messaging Layer

Application B:
  e.g. Mission Planning System

Meaningful message exchange between applications – independent of language API or underlying message encoding or transport. Information Model and Service Operations specific to Service

Abstract Message Exchange – standardisation of Message Structures and Interaction Patterns. Can bridge message exchange at this level between different technologies.

Technology binding (message encoding and transport) enables interoperability if standardised. Private implementation can be used if interoperability not required.

• Only the Specific Service [PLN] needs to be Defined
• Language and Technology Bindings specified in terms of MAL apply to all MO Services
Specific MO Service Definition

• Requires:
  » Definition of Information Model (Service Objects)
  » Definition of Service Operations (mapped to Interaction Patterns)
  » Service Configuration (Object Definitions) [for Service Deployment]

• Does not Require:
  » Message Encoding/Binding to Messaging Technology
    *Standard Technology Binding applies to all MO Services*
  » Specific Definition of API
    *Standard Language Transform applies to all MO Services*
  » Definition of Service Discovery, Login, Authentication, etc.
    *Covered by MO Common Service Specifications*
  » Specification of dedicated Service History Model
    *Covered by MO Common Object Model*
MO Planning Services

- Opportunity to Define
- Potential to Standardise
- MO Provides Existing Standardisation Framework

- **What is a Planning Request?**
  - Task or Goal Oriented
  - One-off, Repetitive, or Series
  - Scoped by Time-window; Position/Area; Resource Availability

- **What is a Plan / Schedule?**
  - Operations; Events; Visibility/Contact; Resources; Configuration;
  - Timeline
  - Position Based Schedule
  - To-do List
  - Standing-Orders:
    - Repeat Pattern/Cycle of Operations (Time or Position based)
    - Rules (based on Time, Event, Condition)

- **What other Services would an MPS Use/Provide?**
  - Orbital Events
  - Resource Availability
  - Automation
Further Reading

  » http://public.ccsds.org/publications/archive/520x0g3.pdf

  » http://public.ccsds.org/publications/archive/520x1m1.pdf

  » http://public.ccsds.org/publications/archive/521x0b1.pdf
How Can I Attend?

- **When:** Wed 18 April 2012 from 13:30 to 17:30
- **Where:** Darmstadt, Germany (venue to be confirmed)
- **How:** Register on-line (no cost) for “Call for Interest for Mission Planning Service Standardisation” session of the SM&C working group at the 2012 Spring CCSDS Technical Meetings at

- **Preliminary agenda**
  - Mission Operations Presentation from CCSDS/SM&C
  - Selected presentations from planning community
  - Discussion

- **Do you like the idea and want to contribute?**
  - Ideas? Alternative approaches? Inputs to the discussion? Relevant presentations you would like to deliver? (due to time constrains we cannot guarantee that all material will be presented)
  - Please send any proposal to Mario.Merri@esa.int
Please spread the word in the planning community

SEE YOU IN DARMSADT!