Operationally
Responsive
Space
Office

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ORS Mission Service Interface
Prototyping a Compatible C2 Framework

GSAW 2010 – March 1

Rico Espindola, Terry Gold, Patricia Klein, Ben Lui, George Moretti

Purpose

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- **Describe Command and Control activities being conducted by the ORS Office to achieve a responsive ground system in support of ORS mission**

- **To identify partner organizations within the broader space and ground enterprise to establish a Compatible C2 Framework**

ORS Mission Essential Tasks

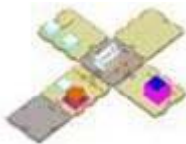*- Assured Space Power Focused on Timely Satisfaction of the Joint Force Commanders' Needs   - ORS OFFICE*

1. Develop End-to-End enablers for USSTRATCOM's 2015 CONOPS

2. Respond to JFCs' Needs from CDRUSSTRATCOM

ORS End-to-End Enablers

Rapid Assembly, Integration & Test

Plug 'n Play

Responsive Busses/Payloads Manufacturing

Minotaur Family of LV's

RAPTOR

Falcon I

Super Strypi

Responsive Launch

Wallops

Vandenberg AFB

Kodiak

Cape

Kwajalein

Responsive Range

Compatible C2 Framework Multi-Service SOC

Tasking and payload planning

DCGS PED

CDL TWISTER

Responsive C2 / TPED

ORS Tiers

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- **Tier-1 (adapt / employ it)**
  - On-demand with existing space and ground assets
    - Commercial, National, DoD, and International
  - Minutes to hours

- **Tier-2 (launch / deploy it)**
  - On-call with ready-to-field DoD assets
  - Days to weeks

- **Tier-3 (develop it)**
  - Rapid transition from development to delivery of new or modified capabilities
  - Months (not years)

The Desired End-State - 2015 and beyond

Enabler for Command and Control (C2)

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- **Establish a compatible C2 framework for ORS operations**

  – Demonstrate and operate with next ORS enabler mission

- **Leverage existing and emerging tools, systems and standards**

  – Goddard Mission Service Evolution Center (GMSEC) middle-ware as key component; reuse portions for ORS "**Mission Service Interface**" (MSI)

  – Consultative Committee for Space Data Systems (CCSDS)

  – XML Telemetry and Command Exchange (XTCE)

  – Extensible Transducer Electronic Datasheet (xTEDS)

  – Ground Systems and Stations

    - Schriever AFB

    - Blossom Point

    - NASA/GSFC

    - Rapid Response Space Works

    - Other

ORS RRSW - "Chileworks"

ORS Mission Service Interface (MSI)

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- **The ORS MSI will provide a transport layer for TT&C functions in support of ORS spacecraft**

- **The MSI objectives are to:**

  – Provide TT&C data across multiple Service and R&D Satellite C2 Systems

  – Provide a capability to pass command and control operations between Satellite C2 Systems

- **Benefits include:**

  – Linking disparate SOCs

  – Situation awareness across C2 systems

  – Affords rapid integration of C2 systems into the ORS enterprise

  – Rapid transition of multiple satellite configurations to different SOCs for operations

  – Possible reduction in training and organization cost

ORS MSI Approach

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- **Four phases from Development to Operations**
  - ORS JumpStart-2 and -3 ground activities as pathfinding events
  - First ORS Enabler Mission to exercise C2 capability

ENVIRONMENT	TIMELINE
Development	Sep 2009 – Dec 2010
Integration	Dec 2009 – Feb 2011
Demonstration	Mar 2011 – Sep 2011
Operational	Jan 2012 – Jan 2014

JumpStart-2

JumpStart-3

ORS Enabler Mission-1

JumpStart-2 Completed Dec 09

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- **Objectives—use the AFRL PnPSat bus and KAFB facilities to develop and demonstrate Tier-2 Enablers and CONOPS**

  - Demonstrate PnP Architecture in ORS mission

  - Identify level of maturity and issues with PnP Architecture

  - Prototype a Rapid Response Space Works (RRSW) facility

  - Ground segment activities to create an ORS test bed to demonstrate capability to rapidly integrate new ground systems

- **Ground System Development Activities**

  - Adapt AFRL's PnPSat RIMS ground system to the MSI

  - Adapt Harris' OS/COMET to the MSI

- **Ground System Lessons Learned**

  - Disparate ground systems can switch operational control including tasking of the spacecraft in real time, weeks of coding was required to achieve this objective and training of disparate ops crews remains open

  - Adapting ground systems to the ORS MSI is the first step to achieve timeliness in transitioning satellites to operations and bent pipe tasking

  - Common standards and protocols need to be established early to achieve a responsive ground system to meet ORS timelines

  - xTEDS is primarily for bus internal networking but needs further definition and standardization to be exploitable to existing ground architectures

JumpStart-3 On-Going

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- **Objectives**
  - Utilize operational Service C2 systems on the MSI
  - Explore xTEDS and Satellite Data Model conversion to CCSDS
  - Explore XTCE schema with on-orbit asset

- **Development Activities planned to be completed by April 10**
  - Adapt Blossom Point's Common Ground Architecture to the MSI
  - Open portal to NASA's GMSEC to demonstrate additional objectives
  - Adapt Air Force's Multi-Mission Satellite Operations Center (MMSOC) Ground System Architecture to the MSI

- **Integration Activities**
  - Establishing connectivity among SOCs in operational environment is on-going

- **Demonstration Activities**
  - Share TT&C and ephemeris from an on-orbit asset between BP and GSFC
  - Create XTCE databases and exchange data from on-orbit asset
  - Achieve bent pipe tasking of on-orbit asset through the MSI

ORS Enabler Mission #1 Future Tasks

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- **Objective**
  - Mock ORS Tier-2 call-up to launch

- **Development Activities**
  - Prepare ORS Rapid Response Space Works, Blossom Point, and AF SOC to support new ORS asset
  - Evolve XTCE and xTEDS implementation

- **Integration Activities**
  - Finalize connectivity among participating SOCs

- **Demonstration Activities**
  - Transfer of operational control between SOCs
  - Bent pipe tasking of ORS asset

- **Operations**
  - Blossom Point primary C2 system with "lights out" capability
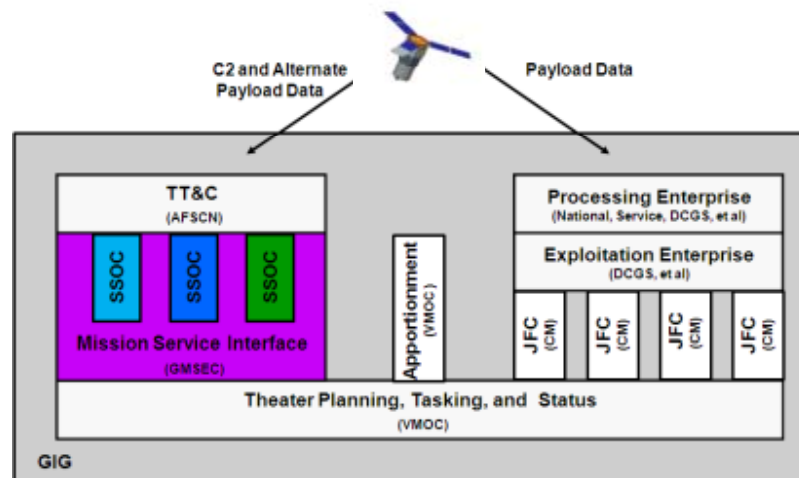 - MMSOC GSA available for time sensitive operations

Future ORS Ground Segment Activities

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- **Lessons learned from JumpStart activities and ORS Enabler Mission #1 to Joint SATOPS Compatibility Committee (JSCC)**

- **Identify / Define additional standards and protocols for broader ORS enterprise**

- **Establish automation in the SOCs and satellite**

- **Expand ORS MSI to other Service SOCs and ground system partners**

- **Adapt additional ORS Ground System Enterprise capability to the ORS MSI**

  - NRL's Virtual Mission Operations Center (VMOC) for tasking of ORS satellites

ORS MSI Partners

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