

Lockheed Martin/CSOC SLE Management Service Request Prototype

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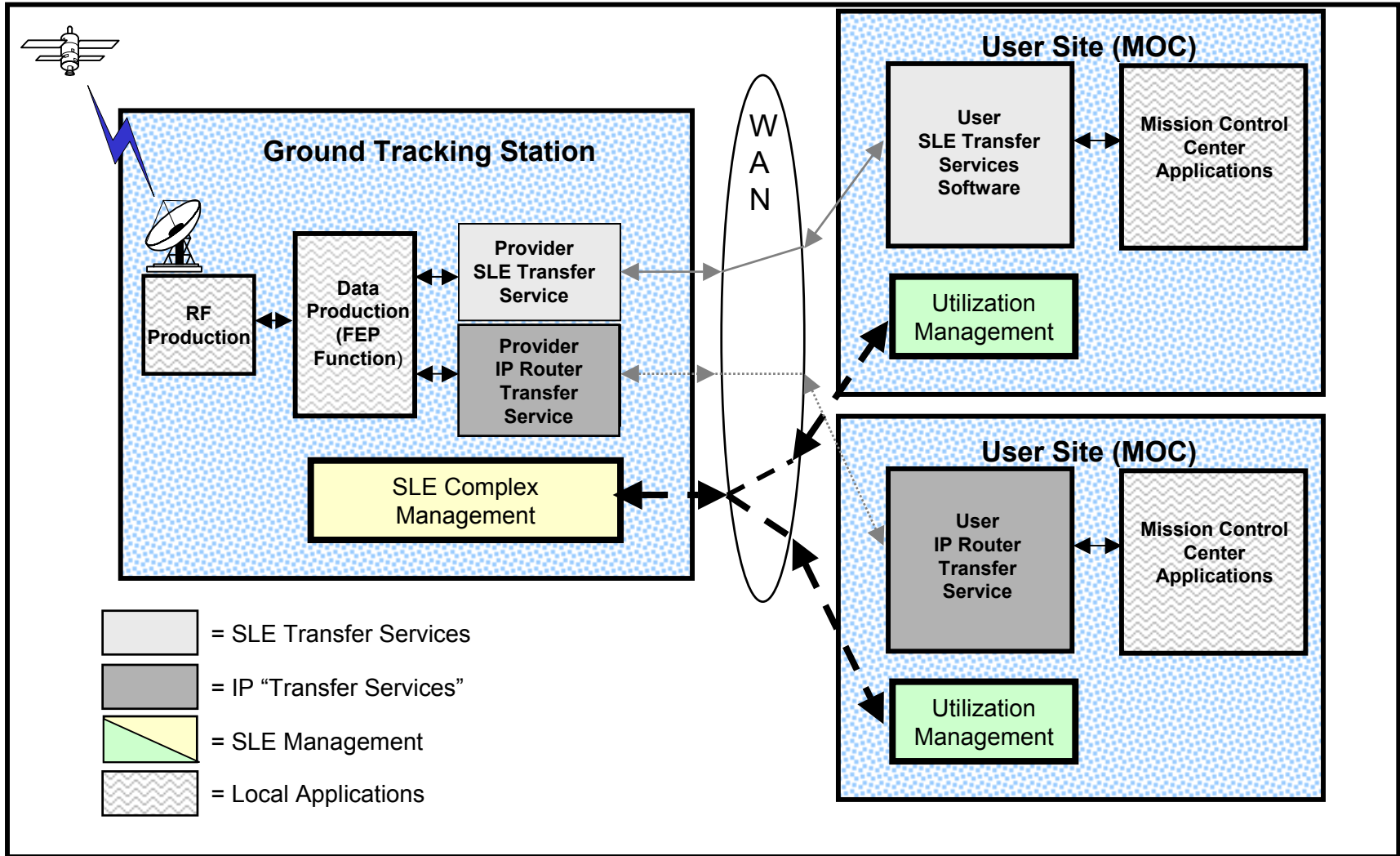
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- Space Link Extension (SLE) Management defines the transactions required to configure and schedule SLE services
 - SLE services include RAF, RCF, and CLTU
- Services are provided by an SLE Complex (a ground tracking station) and are utilized by a space mission including an operations center and end users
- SLE Management is made up of two major functions:
 - The SLE Complex Manager (CM) function is made up of elements which set up and manage ground tracking systems for the delivery of SLE services
 - The SLE Utilization Manager (UM) is a management and administration function that brokers end user requests for SLE services. The SLE UM is part of a Mission Data Operations System (MDOS) or Mission Operations Center (MOC)

SLE Services and Management Components



- SLE management transactions are expressed as eXtensible Markup Language (XML) document exchanges
 - XML documents are exchanged across a network between the Configuration and Utilization Managers
 - All transactions required to configure and schedule SLE services are defined in XML schemas
 - Implementation advantages include:
 - **Portable across operating systems, programming languages, and Commercial-Off-The-Shelf (COTS) products**
 - **Enables implementations to leverage a broad set of tools and web-based technologies**

- Support the CCSDS Panel 3 committee by providing specific and timely ‘lessons learned’ from the implementation of proposed SLE Management XML Schemas and Operations Concepts in a state-of-the-practice mainstream environment
- Support NASA evaluation of SLE Management through installation at the NASA GSFC Wallops Flight Facility (WFF) ground station using the Wide-Field Infrared Explorer (WIRE) spacecraft as a test vehicle

Provide feedback on functionality, usability, and performance of proposed standards

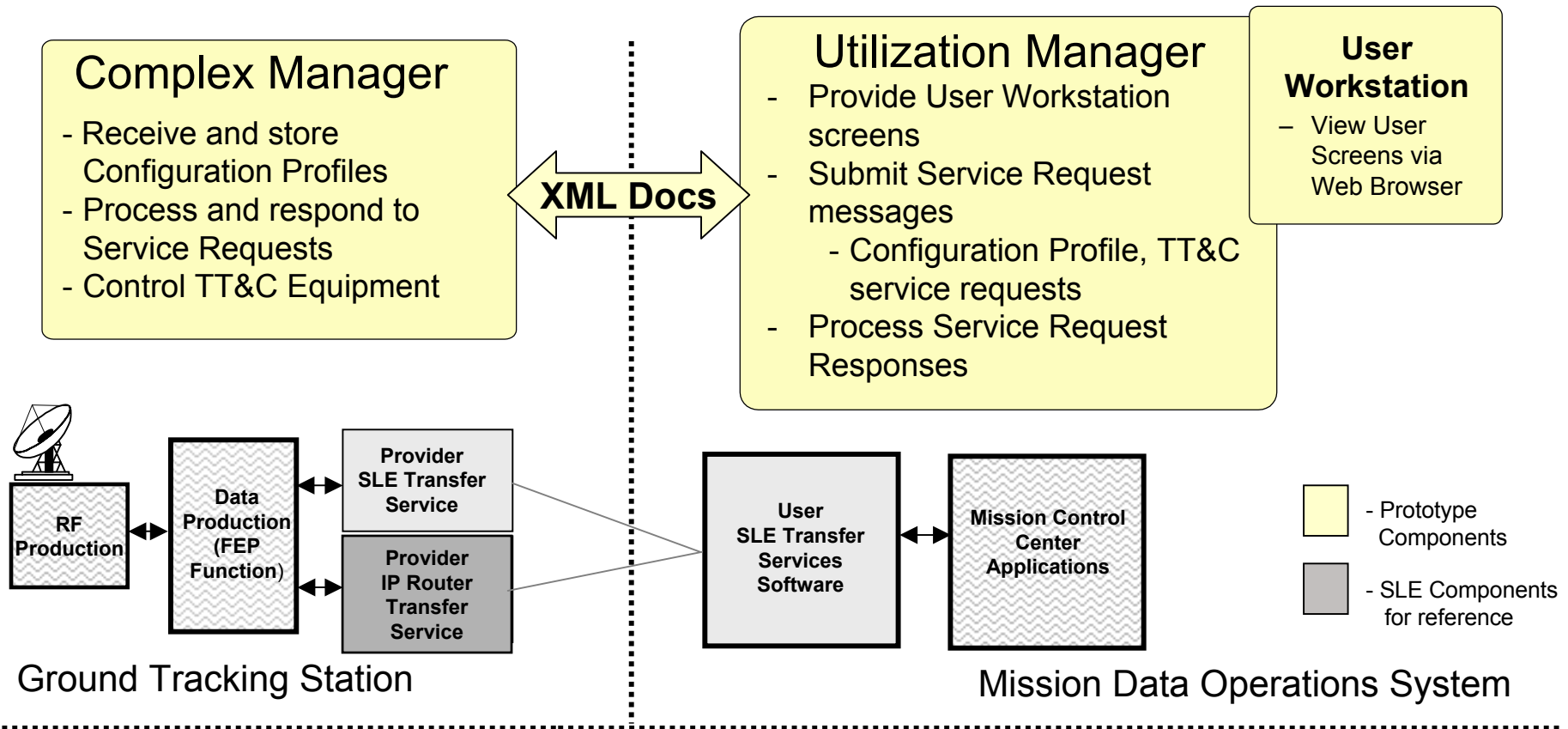
Develop a flexible infrastructure that can be used to prototype and evaluate further CCSDS Panel 3 proposals and recommendations

Provide inputs on areas for future work including security, fault management, and accounting services

Support SLE Transfer Service prototypes through the early delivery of a web based service parameter exchange and basic scheduling capability

Prototype Approach - Functions

- Implement major functions of SLE Management components
- Support transactions using currently available SLE Management XML schemas
 - Store a configuration profile with mission parameters (RF, framing)
 - Request RAF service (including start/stop times)



Prototype Approach – System Components

- System represents a notional, but realistic, SLE Management environment
- System can demonstrate SLE Management transactions using the SLE Transfer Service prototype configuration



Avtec TT&C
Equipment

TCP/IP Network

Complex Manager

- Oracle 9i database
- Windows 2000
- Web Services (SOAP)
- JAVA/DOM

Utilization Manager

- Windows 2000
- Apache Web Server
- Web Services (SOAP)
- JAVA/DOM

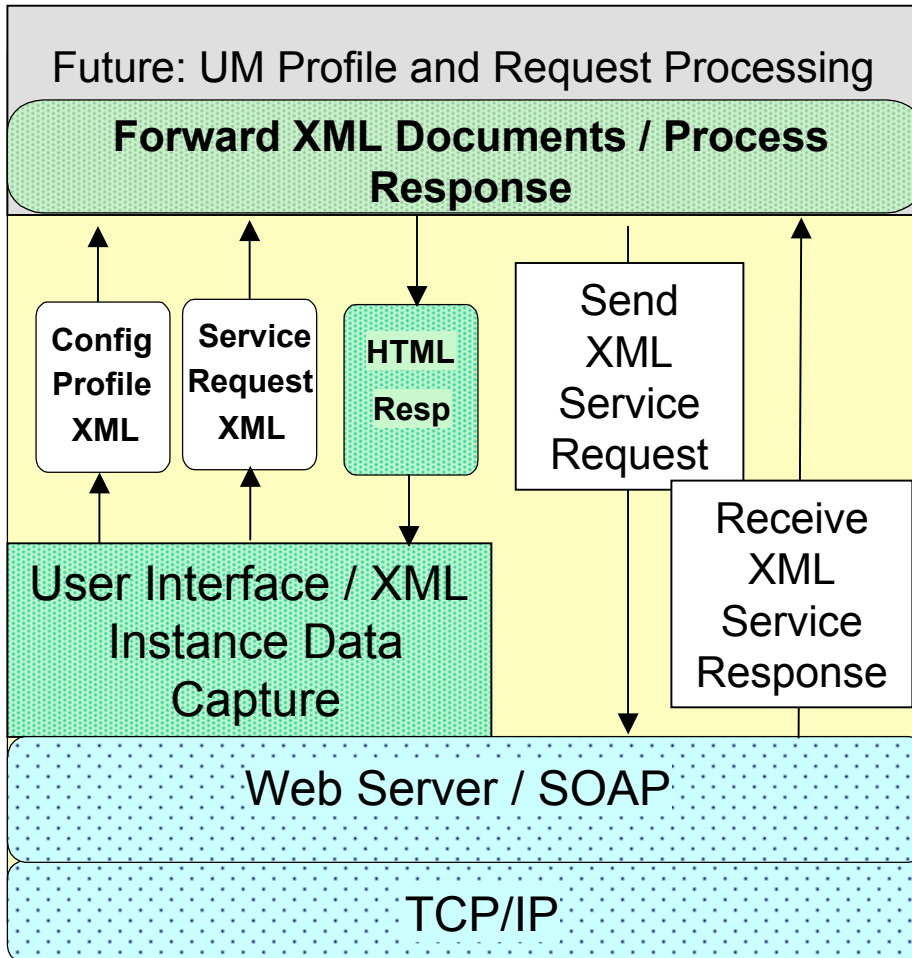
User Workstation

- Web Browser





Ground Tracking Station

Mission Data Operations System

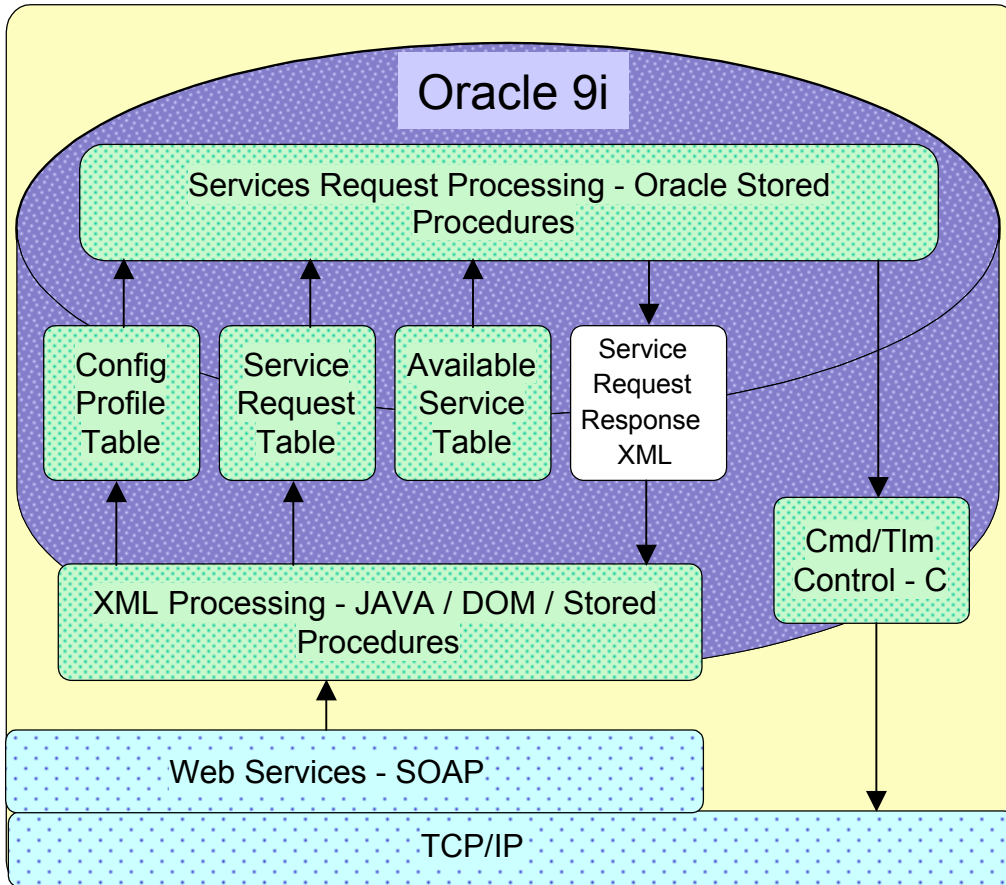
Software Components – Utilization Manager








- Provide User Workstation Screens and collect user input
- Build Service Request messages and send to the Complex Manager
 - Configuration Profile, TT&C service requests
- Process Service Request Responses from the Complex Manager

-  - COTS Communications and Web Services
-  - SLE SM Prototype Developed Software
-  - CCSDS P3 Defined XML Data Formats
-  - COTS client and server platforms

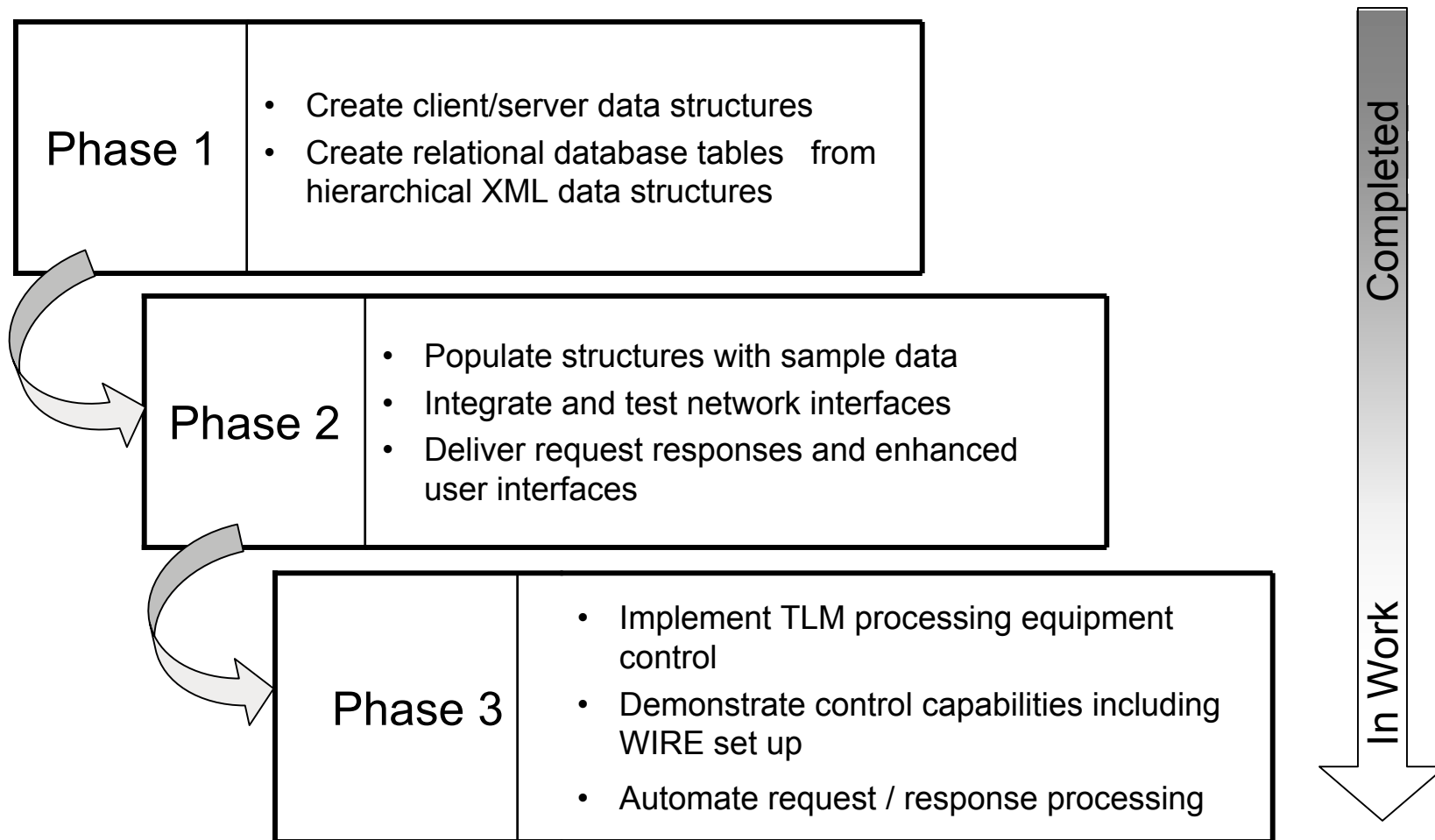
Software Components – Complex Manager



- Receive and store Configuration Profiles
- Process and respond to Service Requests
- Control TT&C Equipment

-  - COTS Communications and Web Services
-  - SLE SM Prototype Developed Software
-  - CCSDS P3 Defined XML Data Formats
-  - Oracle 9i Relational Database
-  - COTS Client and Server Platforms

Phased Implementation Content



Standards and Requirements

- While CCSDS is proceeding rapidly towards finalized revisions, the XML schemas are still a moving target
 - Available schemas are well thought out and workable, but different versions do not interoperate
 - A plan to converge multiple prototype activities is being developed

Development

- There are many tools available to develop and deliver XML based systems
 - More capabilities are becoming available on a regular basis
 - COTS XML features from Oracle, Microsoft, and within JAVA have been more than adequate
- Minor differences between COTS systems (e.g. Microsoft vs. Apache SOAP implementations) have been an annoyance, but not yet an issue
- Translation of SLE XML Schemas to Oracle tables was fairly straightforward

- SLE Management standards address requirements that have required inflexible and expensive solutions in the past
- XML allows this standard to be independent of proprietary products, operating systems, and programming languages
 - XML has also allowed SLE Management prototypes and early implementations are proceeding at a rapid pace
- SLE Management can, and should be, extended to meet the needs of a broader community, including manned space initiatives
 - Security, service accounting, and fault management require definition
 - The addition of general Ground Network system status and control could standardize disparate approaches with a viable and flexible alternative
 - Interfaces to existing scheduling systems could bridge the transition gap as systems evolve