



SN Ground Segment Sustainment Project



SGSS Customer Forum #2 rev. 1

September 25, 2012





Agenda

Welcome and Project Introduction	Tom Gitlin	8:00 – 8:10
SGSS Project Status	Tom Gitlin	8:10 – 8:30
Scheduling Phases	J.P Chamoun	8:30 – 9:00
Interface Topics		9:00 – 10:00
Customer Interface Overview	Colleen McGraw	
Scheduling Interfaces	J.P. Chamoun	
Data Interfaces	Ryan Turner	
NISN/IP Addressing	Rod Marshburn	
Transition Period and Customer Testing	Cathy Barclay	10:00 – 11:30
SCaN Future Plans	Jim Schier	11:30 – 11:45
Next Customer Forum	Tom Gitlin	11:45 – 12:00
Breakout session (OGA and/or special topics) (Bldg 12/N220)		1:00 – 4:00



Welcome and Project Introduction

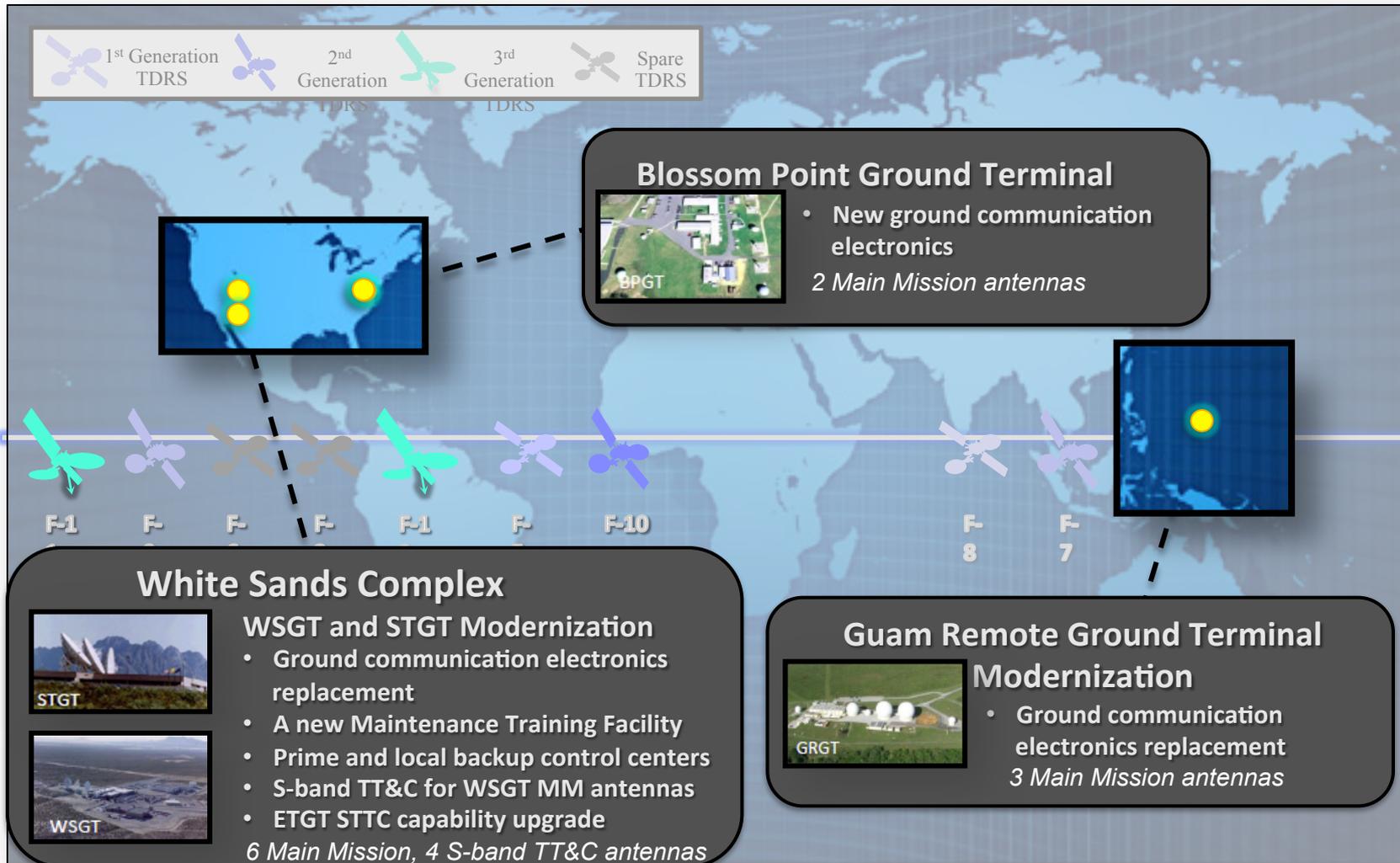


SGSS Background

- **The SGSS Project will develop and deliver a new ground system that will enable the Space Network (SN) to continue safe, reliable, and cost efficient operations for the next several decades**
 - The SN, a designated national resource, provides essential communications and tracking services to NASA human exploration & scientific missions and non-NASA missions
 - The SN space segment will be replenished with three new spacecraft to be launched over the next five years
 - The current SN ground segment, developed in the mid 1990s, is based on obsolete technologies and is becoming increasingly difficult to operate safely and reliably
- **SGSS will allow the SN to support an evolving customer set by:**
 - providing all of the capabilities and capacities required by current SN customer missions
 - expanding the capabilities and capacities of the SN to support new services for new customers in the near to mid term
 - delivering an extensible and expandable system to easily allow future modifications to implement services not yet defined
 - enabling drastic reductions in operations and maintenance costs

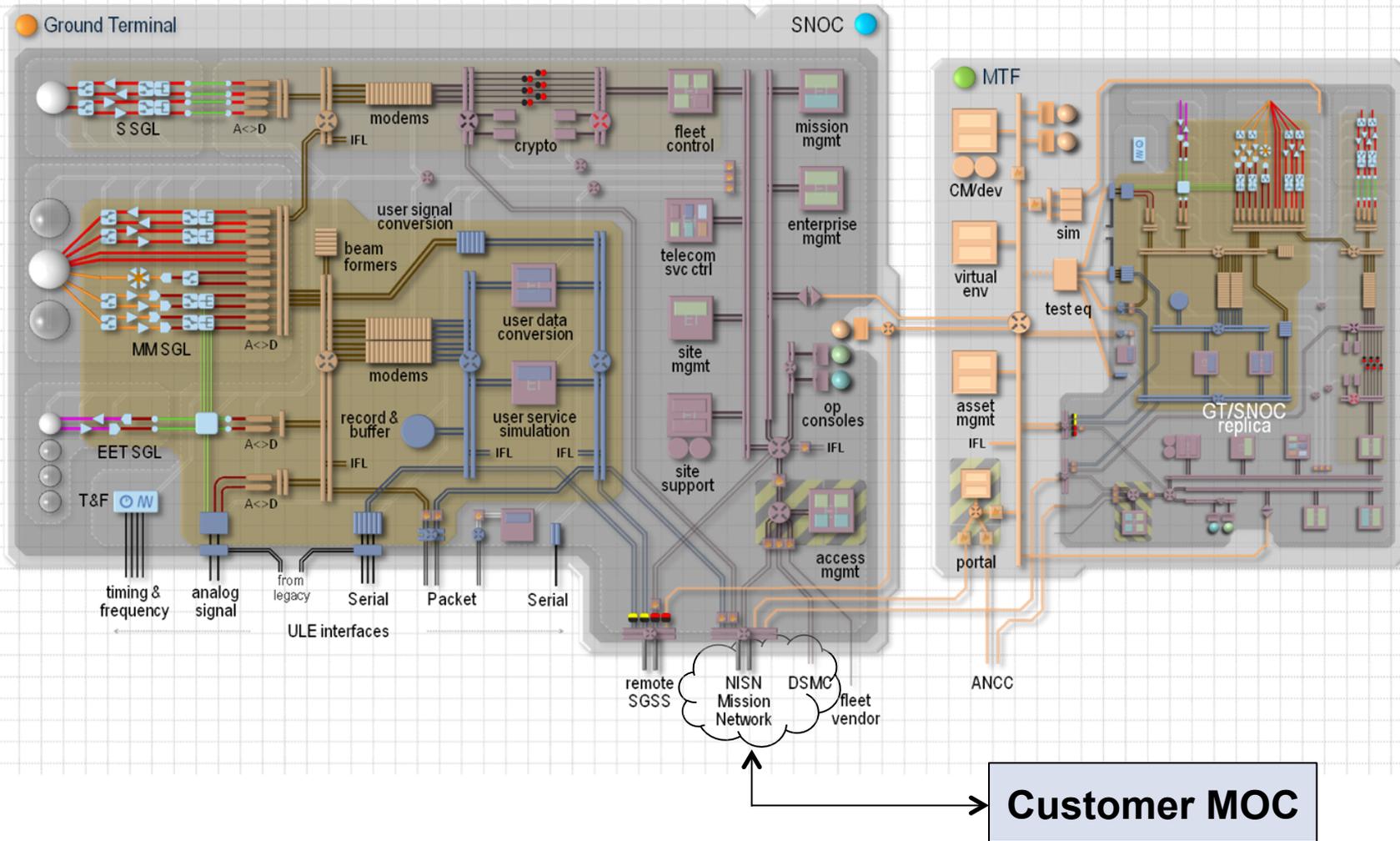


Major Activities Across Diverse Geographies





SGSS Architecture





SGSS Elements

SGL Function:

- Forms the link between the antenna feed and the signal processing equipment, for both forward and return link
- Provide precise timing and frequency references for SGSS

SGL Construction: HW+SW

- Majority components COTS HW
 - Amplifiers, Converters, fiber, switching
 - Timing and Frequency reference
- Embedded control and management logic

DSP Function:

- Convert between analog and digital signal domains (both directions)
- Modulates/demodulates user waveform/data
- High-Speed IF distribution

DSP Construction: HW+FW+SW

- HW-identical COTS, μ TCA components
 - Firmware defines component
 - Rincon Research ADC/DAC, tuner/combiner
 - RT Logic modem waveforms
 - GD AIS Beamformer
- High-performance layer-2 switching fabric

USG Function:

- Implement system external bearer-plane interfaces for forward and return delivery of user information
- Data format and protocol translations
- Signal and baseband data recording and replay
- Implement user service simulation in support of end-to-end testing

USG Construction: HW+SW

- Virtual machine (VM) hosted protocol translations and formatting
- VM-hosted user service simulation
- COTS HW/SW digital signal and data storage

MTF Function:

- Provide an environment supporting system maintenance, debug, and training activities

MTF Construction:

- A reduced copy in accordance with the operational SGSS system (SNOC + GT), populated to support required testing and training activities



Plus...

- Simulators (HW and SW) for external interfaces
- Scripted training scenario generator
- Fully capable SGSS SW development environment, including CM tools
- Connectivity into operational system allows training, testing, or debug using live signal information

FGM Function:

- Fleet Control and Management
- Enterprise Control and Management

FGM Construction: SW

- All SW element, relying on EI-provided processing HW and operating environment
- Deployed over SNOC and GT sites
- Multiple COTS SW packages
 - TT&C, orbit planning, mission planning
 - Enterprise Management
- Custom SW
 - Enterprise control
 - Operator/User interfaces

SM Function:

- Plan, schedule, and execute user service sessions
- Monitor and report user service performance

SM Construction: SW

- All SW element, relying on EI-provided processing HW and operating environment
- Deployed over SNOC and GT sites
- Multiple COTS SW packages
 - Service planning and management
- Custom SW
 - Service execution
 - User and operator interfaces

EI Function:

- high-availability operating environment to host science, management, and control applications system-wide
- Accessible set of common "services" which other elements leverage
- Internal system networking resources

EI Construction: HW+SW

- Commodity servers arranged in redundant clusters, hosting application VMs
- Commodity, high-availability, high-performance IP LANs
- Service-oriented SW framework



Customer Forum Purposes

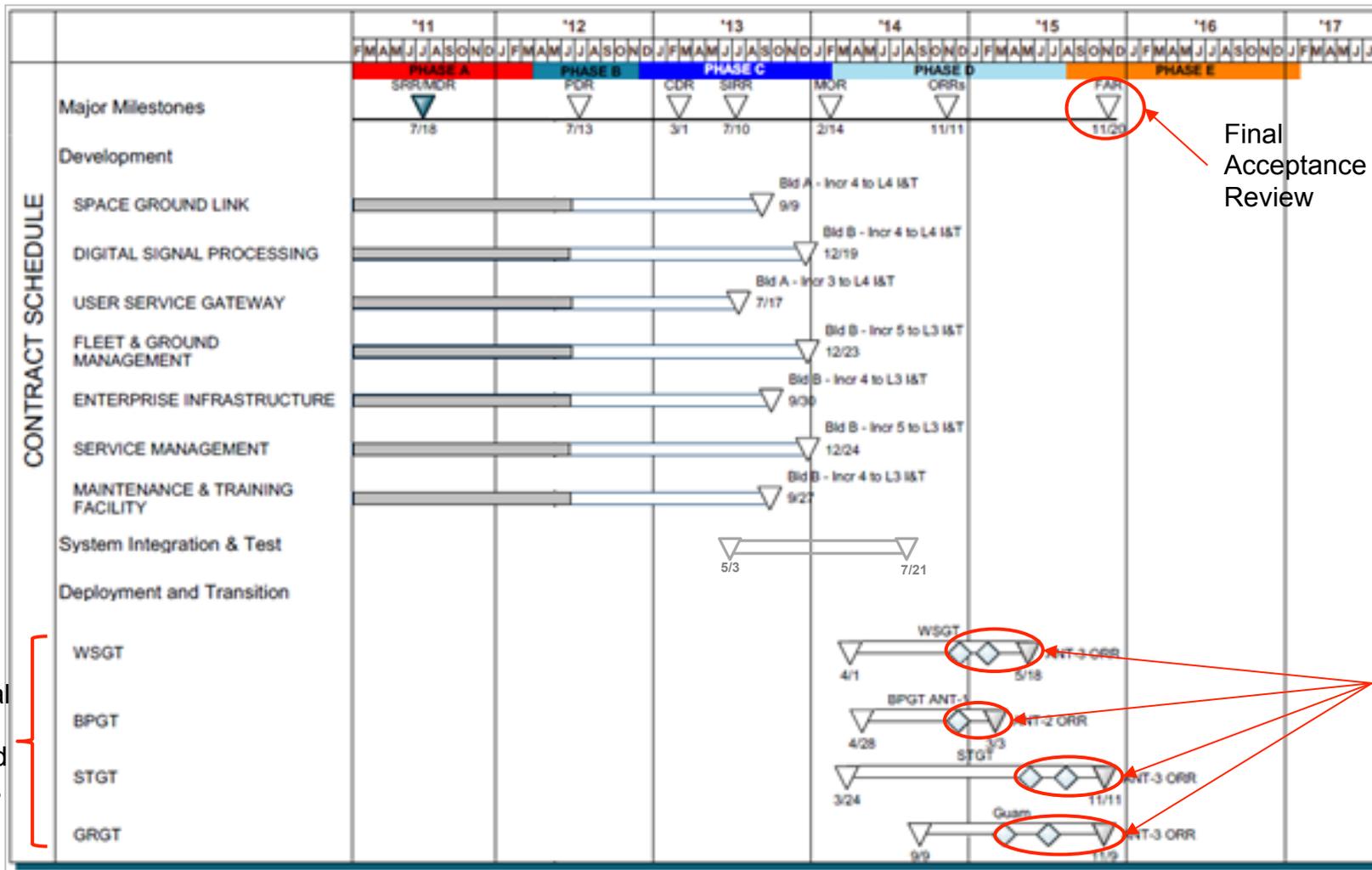
- **The SGSS Project highly values the customers it will serve. This Forum is a key opportunity to share information and receive feedback and engage in candid conversation.**
- **SGSS is committed to keeping the end user community informed about the SGSS strategy, progress, decisions, and changes.**
- **This Forum has the following goals:**
 - Inform customers of key SGSS milestones, events, and important dates
 - Discuss customer interfaces and future changes to interfaces
 - Convey a general concept of the validation approach for customers



SGSS Project Status



SGSS High Level Schedule



Incremental Customer Testing and Operations

Final Acceptance Review

Antenna ORRs



SGSS Documentation Status

<u>Document</u>	<u>Status</u>
SGSS System Requirements	<ul style="list-style-type: none">• Completed
ICDs (SN External ICDs)	<ul style="list-style-type: none">• Preliminary version submitted at PDR• Final version in progress due at CDR
Security Plan	<ul style="list-style-type: none">• Completed
Transition Plan	<ul style="list-style-type: none">• Preliminary version submitted at PDR• Final version in progress due at CDR
Detailed Test Plans	<ul style="list-style-type: none">• Level 5 (on-site system)<ul style="list-style-type: none">• Preliminary version due 150 days before Pre-ship Review• Final version due 90 days before Pre-ship Review• Level 6 (transition)<ul style="list-style-type: none">• Preliminary version due at CDR• Final version due 90 days before Pre-ship Review
Post Test Reports	<ul style="list-style-type: none">• 30 days following test completion

Copies of SGSS documents are available upon request



SGSS Coordination Status

- The SGSS Project has been addressing interfaces as their details have become known
 - JSC's transition to packetized interface
 - JPSS
 - SPM
- A Customer Forum Section has been added to the SGSS website
 - <http://esc.gsfc.nasa.gov/space-communications/sgss.html>
- Successfully launched the SGSS newsletter which can be found on the SGSS website

August 2012, Vol 1 Issue 1

Space Network Ground Segment Sustainment (SGSS) Newsletter

General News P.1
SGSS Profile P.2
Eye on Technology P.3
Knowledge Management P.4

SGSS Goals and Objectives

- Reduce communication costs for our customers
- Implement an extensible, flexible, and scalable ground terminal architecture
- Continue to provide existing Space Network functionality
- Reduce lifecycle costs
- Enhance the continuity of operations posture of the Space Network
- Transition from the legacy system to the new SGSS system in a low risk environment
- Meet or exceed the legacy proficiency, performance, and availability requirements

SGSS Status Update

The SGSS Project successfully completed its System Requirements Review (SRR) in July 2011 and a Preliminary Design Review (PDR) in July 2012. Attention is now shifting to the critical design of the system and its interfaces. The Critical Design Review (CDR) is scheduled for Spring 2013. SGSS is moving forward!

Year	Q1	Q2	Q3	Q4																
System Requirements Review (SRR)																				
Initial Design Review (IDR)																				
System Requirements Review (SRR)																				
Initial Design Review (IDR)																				
System Requirements Review (SRR)																				
Initial Design Review (IDR)																				

Major SGSS Project Milestones

Second SGSS Customer Forum Scheduled

The second SGSS Customer Forum is scheduled for September 18th, 2012. Topics to be discussed at the forum include customer interfaces, including scheduling and data interface details. A special focus will be placed on the SGSS testing and transition, and how it will be coordinated with customers. This forum will be a great opportunity to ask your questions! Customers should contact Mike Booth (michael.s.booth@nasa.gov) for further information regarding the Forum.

SGSS Newsletter Launched!

The SGSS project is proud to introduce this new, quarterly publication to engage and inform stakeholders regarding:

- Current and upcoming SGSS events
- Insights into the capabilities that SGSS will provide
- Other information that provides context and value to customers and stakeholders

Please let us know how this newsletter can be improved. What content would you like to see in the future? See the last page of this newsletter for contact information for providing comments.

NASA
GENERAL DYNAMICS C4 Systems
HARRIS



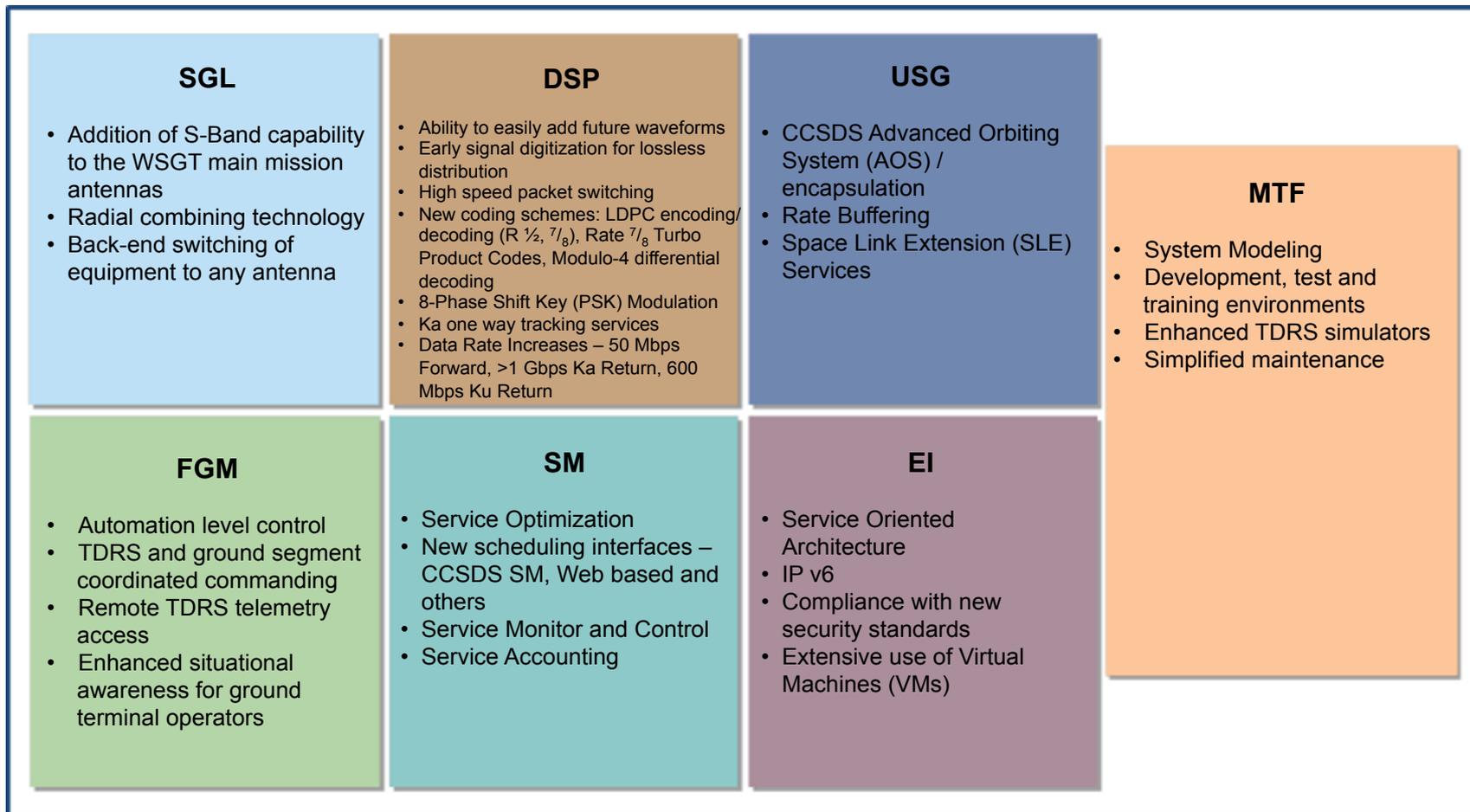
TDRS Naming Convention

- **TDRS Operational Names have been reviewed in recent years and consideration has been given to changing them**
 - Longitudinal References
 - Region References
 - Physical TDRS ID's
 - Co-located TDRS
- **Changes have not yet been made given several issues**
 - System Constraints
 - Existing customer constraints
 - Consensus
 - Current field length constraints
- **Preparing to Change the TDRS Naming Convention**
 - SGSS will be able to support longer TDRS Operational Names
 - SGSS ICD's and the new service management portal will be able to accommodate longer TDRS Operational Names while continuing to support the existing naming convention
- **Request that customers plan future systems and upgrades to enable the new naming convention**
 - DO NOT hardcode TDRS names into your ground systems and software
 - Enable the names to be changed over time

SGSS will meet the current naming convention for existing customers



Changes From Legacy



Details on the changes from legacy will be discussed further in this presentation



Scheduling Phases

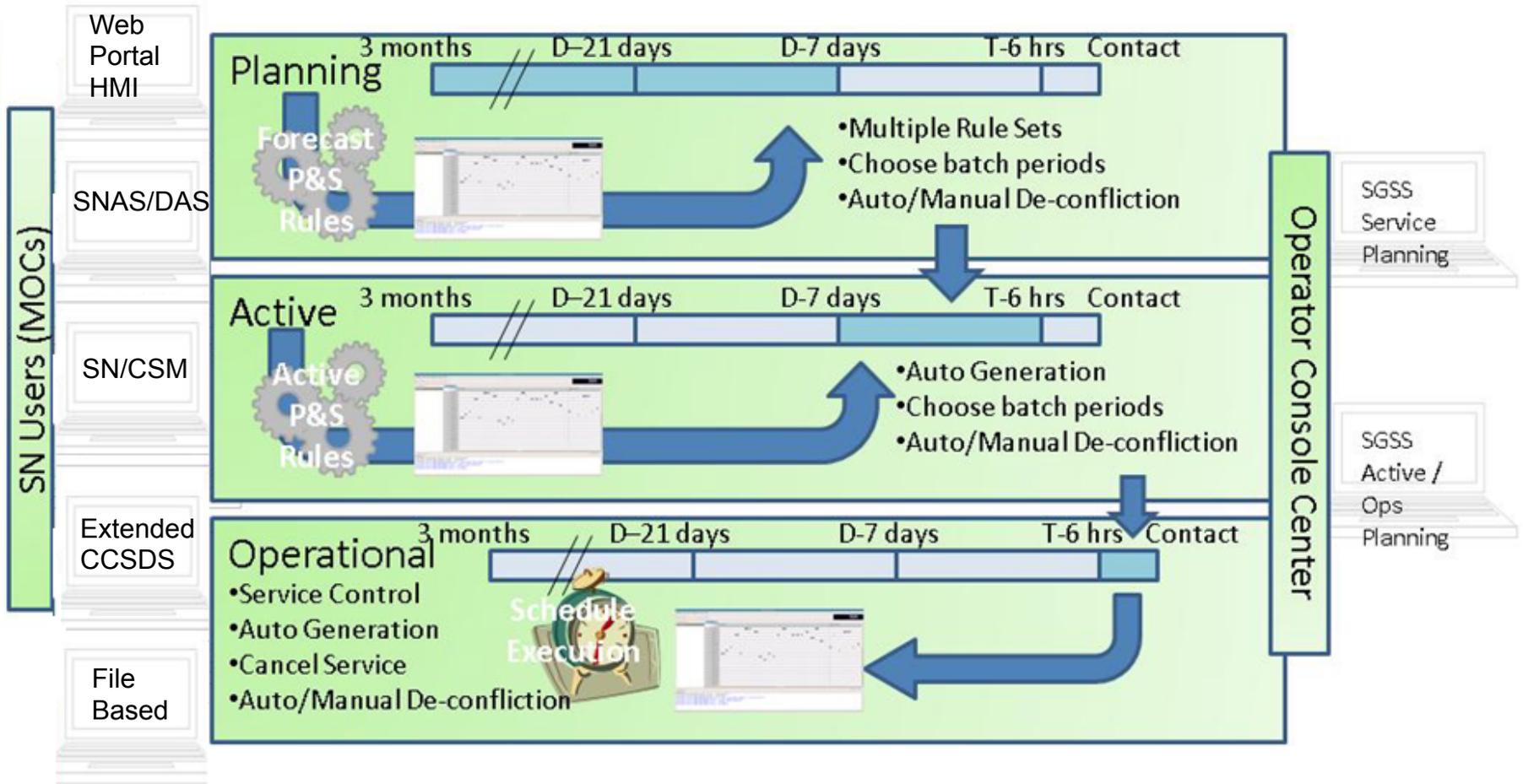


Agenda

- **Compare scheduling periods Today's Vs. SGSS : No significant changes**
- **Planning Period and Planning Schedule**
- **Active Period and Active Schedule**
- **Operational Schedule**



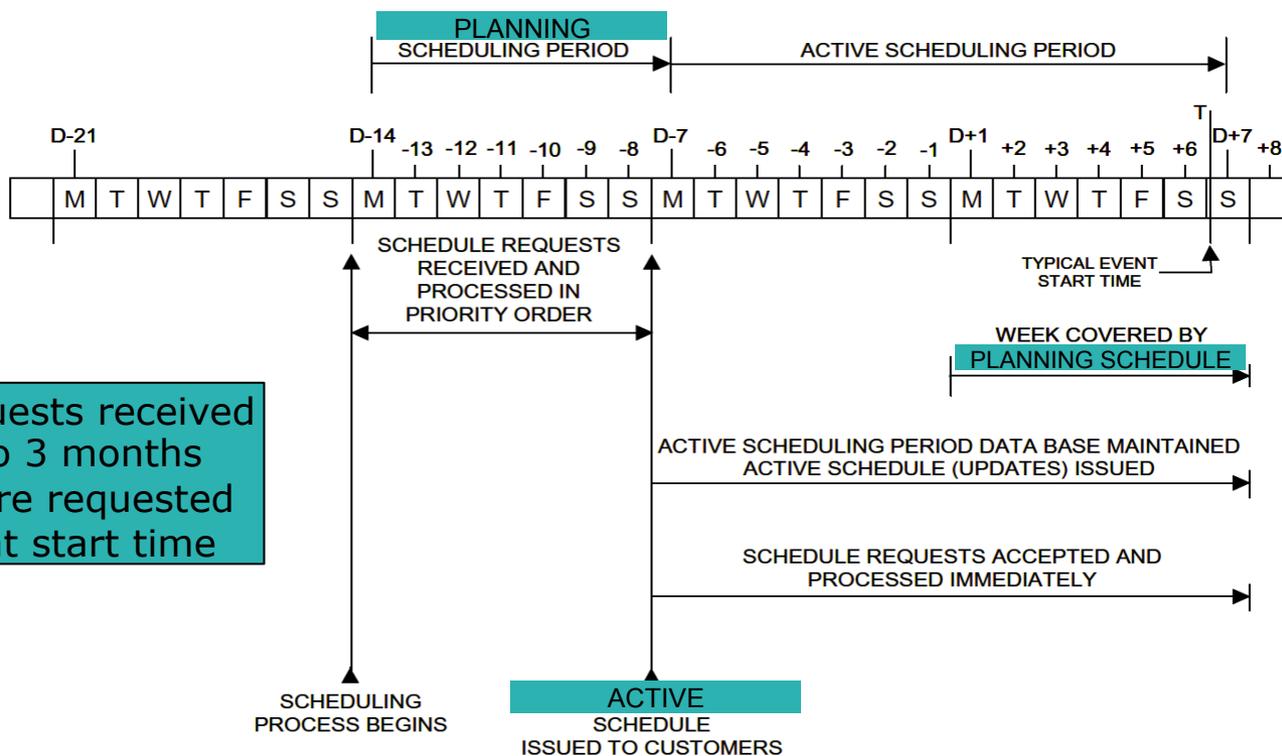
Scheduling Cycle Summary





Scheduling Periods

- Same scheduling time periods as today
- Requests accepted 3 months in advance
- The term “Forecast” is interchangeable with “Planning”



No impact to current customer scheduling timeline



Planning Period and Schedule

- The SGSS Planning period is the same as today's Forecast period
- NEW** • Customer requests are accepted up to 3 months in advance of the time requested. (Currently requests can be submitted up to 21 days in advance)
- Requests are captured, queued and ingested until they are processed into the schedule starting at D - 14 days
- Requests received by a specified cutoff time on D - 14 days are scheduled and de-conflicted according to the priorities and rules to generate a de-conflicted Planning Schedule
- From D - 14 to D - 7 days, any new schedule requests are processed into the Planning Schedule according to priorities and rules
- The Planning period culminates in the Planning Schedule being promoted to Active Schedule on D - 7 days (7 days prior to the beginning of the week covered by that Planning Schedule)

Schedule requests will be accepted by SGSS up to 3 months in advance for added convenience. All requests are queued until D-14 days.



Active Period and Schedule

- **The SGSS Active period is the same as today's Active period**
- **The Active Period Starts with the promotion of the Planning Schedule to the Active state 7 days prior to the beginning of the week covered by that Planning Schedule**
 - The length of the active schedule is 14 days and continually decreases until the active schedule is 7 days in length. This cycle is then repeated each week.
- **The Active Schedule for each customer and TDRS Unused Time (TUT) available to each customer are published**
- **Users can submit requests to add, modify and delete scheduled events. Priority is given to events already scheduled unless the new requests indicate an Absolute Priority of Emergency or Critical.**
- **The active schedule is constantly being changed as a result of additions or deletions of specific schedule events, SN equipment status changes, customer platform emergencies, etc.**

No significant changes from legacy



Operational Schedule

- **The SGSS Operational Schedule is name given to the part of the Active Schedule that is pushed to the GT for execution.**
- **The length of the Operational Period is configurable by the SN and will nominally cover the last two or three days of the Active Schedule.**
- **During this time period, Users can submit requests to add, modify and delete scheduled events up to 10 minutes prior the event (same as today).**

The operational schedule phase does not change from legacy



Customer Interface Overview



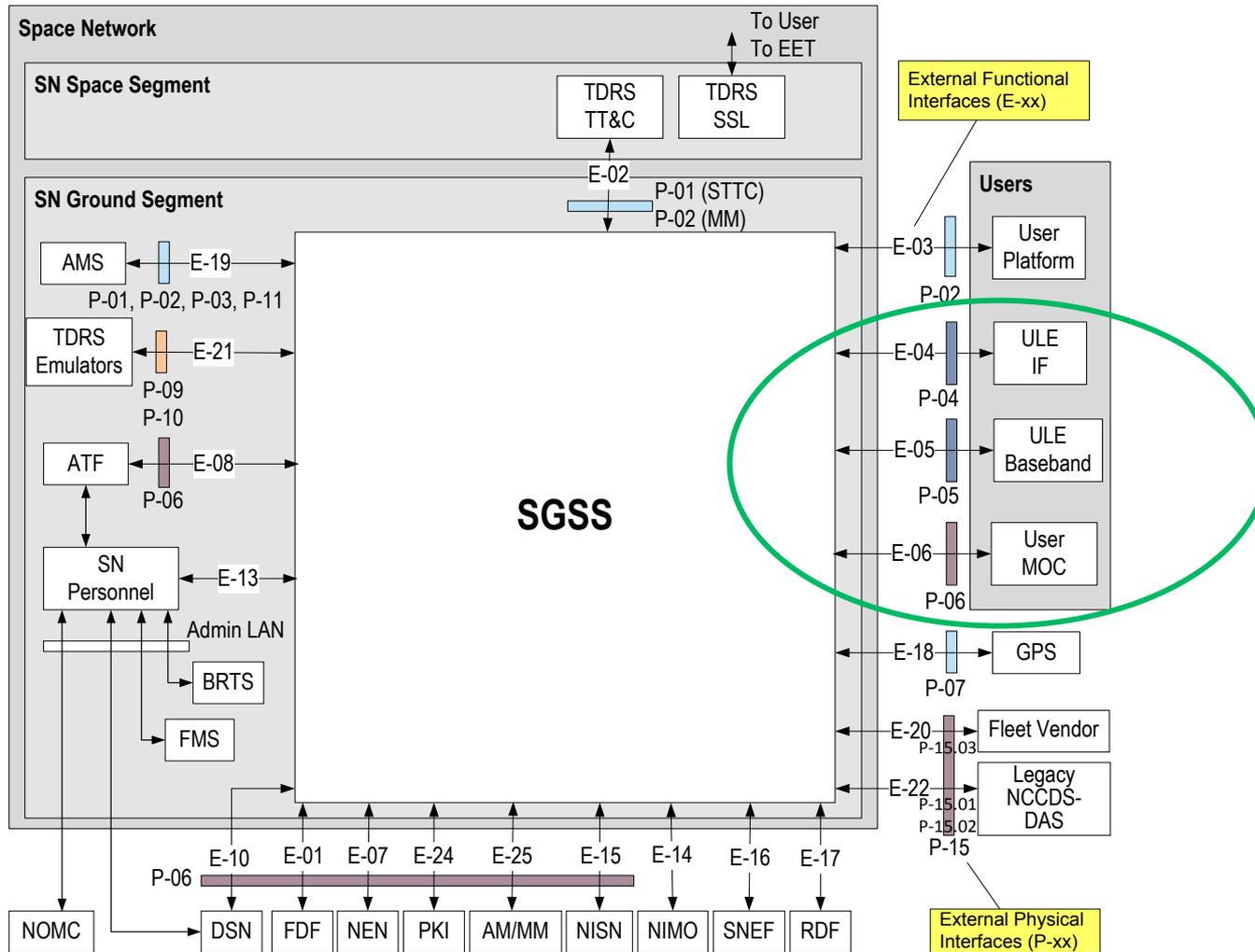
SGSS Customer Interfaces

- **Topics**

- Customer ICD overview
- ICD Schedule and Review Cycle
- Plan forward



SGSS External Interfaces





Customer ICDs

- **Three main functional ICDs related to the Customers**
 - MOC ICD (E-06)
 - User Local Equipment (ULE) Intermediate Frequency (IF) ICD (E-04)
 - ULE Base Band (BB) ICD (E-05)
- **Three main physical ICDs related to Customers**
 - P-06 NISN ICD
 - The ULE BB ICD includes the functional (E-05) and the physical interface (P-05)
 - The ULE IF ICD includes the functional (E-04) and the physical interface (P-04)



SGSS to MOC ICD

- **Defines the interface between SGSS and User Mission Operations Center**
- **The MOC ICD has three main sections: Service Management, Vector Management, and Bearer Data Interfaces**
- **The MOC ICD describes the messages exchanged between SGSS and Customers**
- **SGSS MOC ICD preserves the legacy interfaces and includes new interfaces**
- **Customers migrating to the new SM interfaces can find information regarding HMIs in the SGSS User Guides**

The MOC ICD replaces some current ICDs



SGSS to MOC ICD Outline

• Service Management Interfaces

– User Service Management

- SN/CSM (Section 3.3)
- SNAS/DAS (Section 3.4)
-  • CCSDS SM (Section 3.5)
-  • File Based (Section 3.6)

– User Service Control/Monitor

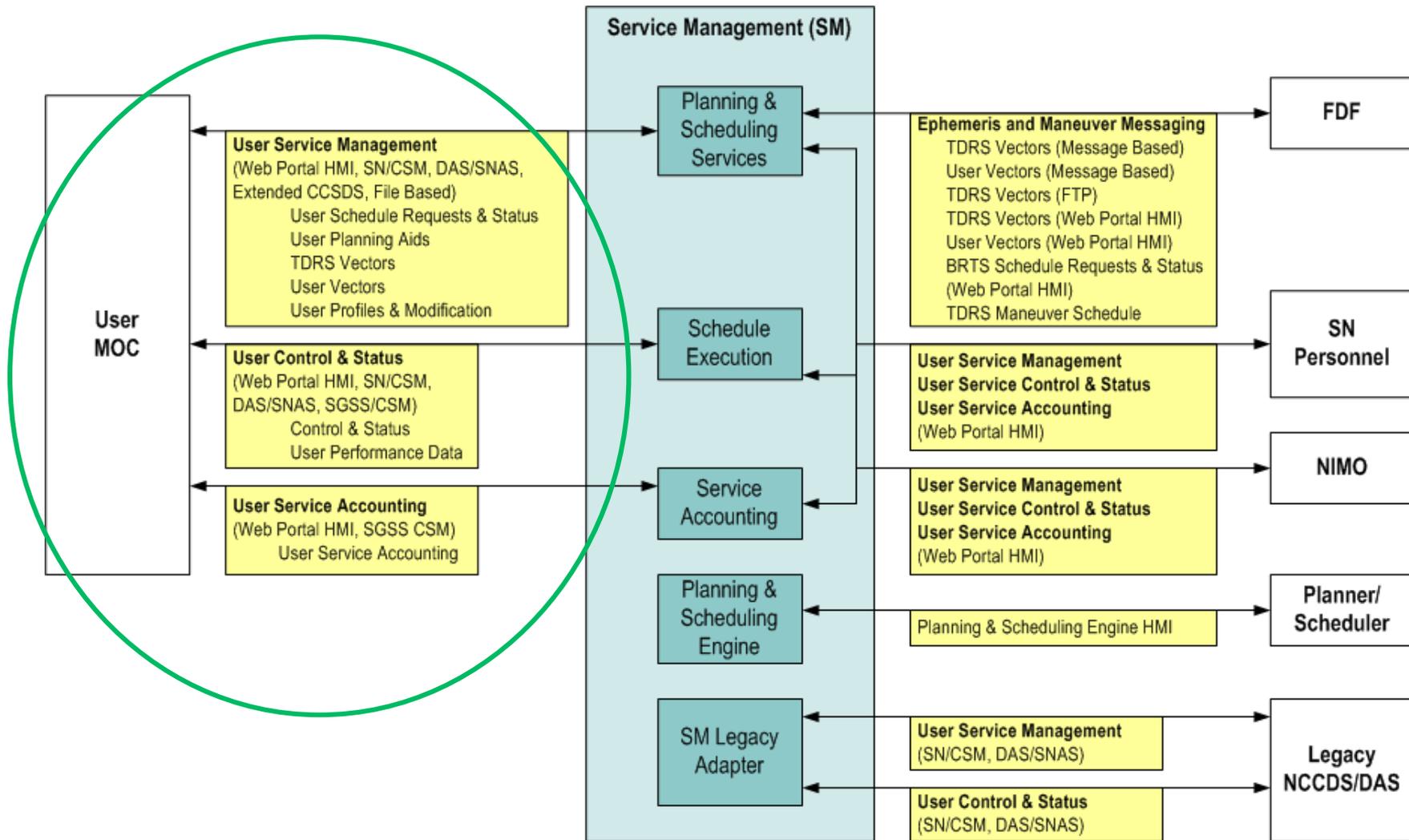
- SN/CSM (3.7)
- SNAS/DAS (3.8)
- CCSDS SM (3.9)
-  • Web Portal HMI Interface*** (This interface is described in the SGSS Users Guide, not included in the MOC ICD)
-  • CCSDS/SLE Embedded Data (Section 3.12)

– User Service Accounting

- CCSDS SM (3.10)
- Web Portal HMI Interface*** (This interface is described in the SGSS Users Guide, not included in the MOC ICD)



SGSS Service Management Functional Interfaces





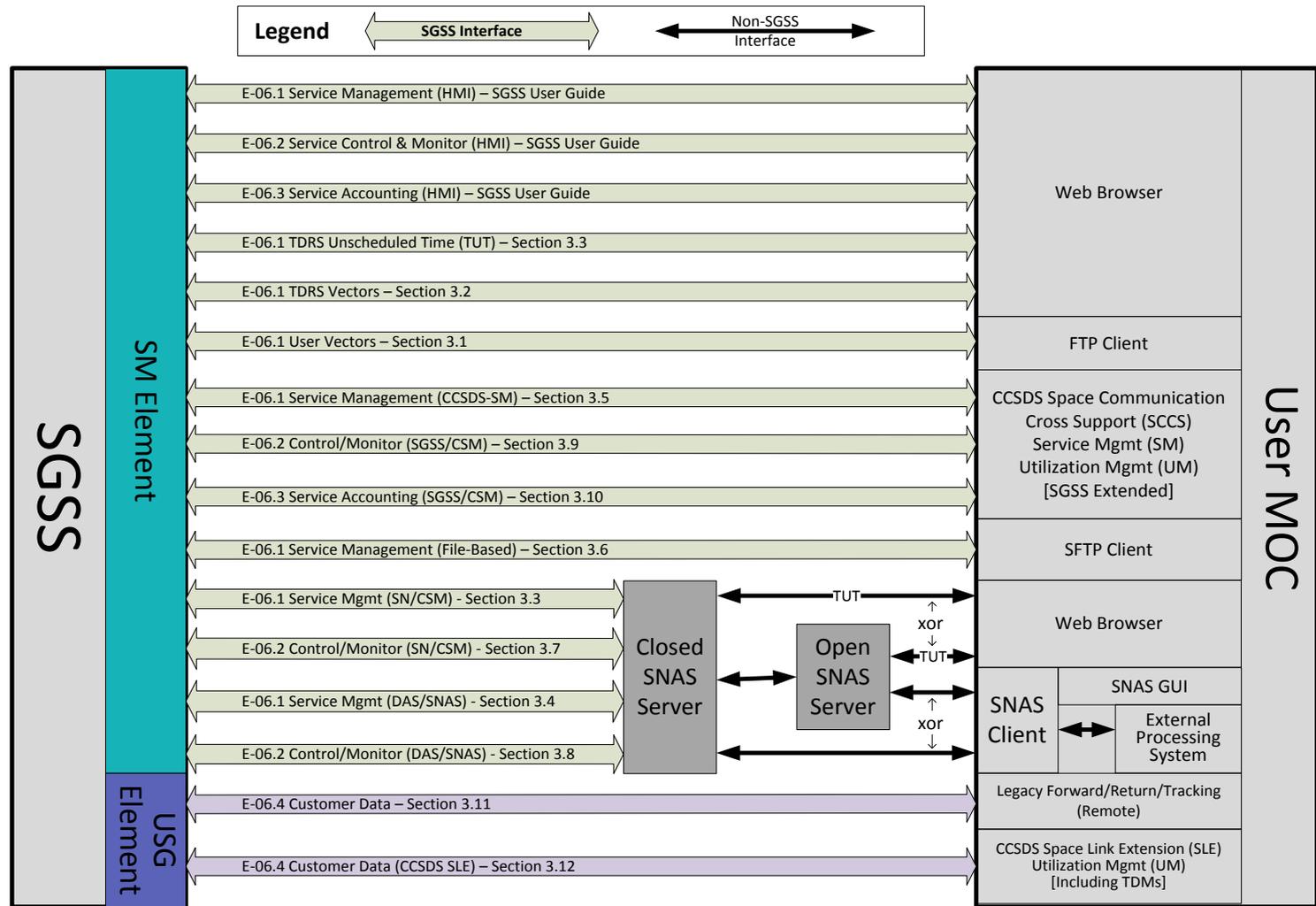
Functions to Interface Mapping

User MOC	<-->	User Service Management	Mgmt
	<-->	User Service Management (Web Portal HMI)	Mgmt
	<-->	User Schedule Requests & Status	Mgmt
	<----	User Planning Aids	Mgmt
	<----	TDRS Vectors	Mgmt
	<-->	User Vectors	Mgmt
	<-->	User Profiles & Modification	Mgmt
	<-->	User Service Management (SN/CSM)	Mgmt
	<-->	User Schedule Requests & Status	Mgmt
	<----	User Planning Aids	Mgmt
	<-->	User Vectors	Mgmt
	<-->	User Service Management (DAS/SNAS)	Mgmt
	<-->	User Schedule Requests & Status	Mgmt
	<----	User Planning Aids	Mgmt
	<----	User Vectors	Mgmt
	<-->	User Service Management (Extended CCSDS)	Mgmt
	<-->	User Schedule Requests & Status	Mgmt
	<----	User Planning Aids	Mgmt
	<-->	User Vectors	Mgmt
	<----	TDRS Vectors	Mgmt
	<-->	User Profiles & Modification	Mgmt
	---->	User Vectors for S/C not supported by FDF (FTP)	Mgmt
	<----	TDRS Elements (HTTP)	Mgmt
	<-->	User Service Management (File Based)	Mgmt
	<-->	User Schedule Requests & Status	Mgmt
	<----	User Planning Aids	Mgmt
	<----	User Vectors	Mgmt

User MOC	<-->	User Service Out-of-Band Control & Monitor	Control
	<-->	User Service Control & Monitor (Web Portal HMI)	Control
	<-->	User Out-of-Band Control & Status	Control
	<----	User Performance Data	Control
	<-->	User Service Control & Monitor (SN/CSM)	Control
	<-->	User Out-of-Band Control & Status	Control
	<----	User Performance Data	Control
	<-->	User Service Control & Monitor (DAS/SNAS)	Control
	<-->	User Out-of-Band Control & Status	Control
	<----	User Performance Data	Control
	<-->	User Service Control & Monitor (SGSS/CSM)	Control
	<-->	User Out-of-Band Control & Status	Control
	<----	User Performance Data	Control
	<-->	User Service Accounting	Mgmt
	<-->	User Service Accounting (Web Portal HMI)	Mgmt
	<-->	User Service Accounting (SGSS/CSM)	Mgmt
	<-->	User Bearer and In-Band Control & Status	Bear/Ctl
	<-->	User non-CCSDS SLE data (e.g., current MDM, DAS,	Bearer
	<-->	User CCSDS SLE data; In-band status and control (incl.	Bear/Ctl



SGSS MOC Physical Interfaces





User and TDRS Vectors

- **Direct interface between FDF and User MOCs remains unchanged**
- **User Vectors from sent from MOC to SGSS (Legacy)**
 - IIRVs via FTP (Section 3.1)
 - State vectors via SNAS (Section 3.4.27) and SN/CSM (Section 3.3.18-19)
- **TDRS Vectors From SGSS to MOC (Legacy) (Section 3.2)**
 - For selected customers
 - File sent via HTTP over TCP/IP
- **Vector information is part of the FDF ICD**



Data Interface

- **All existing Customer MOC data interfaces are supported**
- **Support also provided for emerging CCSDS SLE data interfaces**
- **MOC Data Interfaces**
 - Legacy Customer Data Interface (3.11)
 -  – CCSDS SLE Customer Interface (3.12)
- **More detail provided in Customer Data Interface Section**



Current ICD Status, Schedule

- **Draft ICDs were delivered 3 weeks prior to PDR (delivery was June 2012)**
 - Draft ICDs define interfaces to the message level
 - Draft ICD in NASA internal review cycle now
 - Available for customer review
- **Final ICDs due 3 weeks prior to CDR (delivery expected February 2013)**
 - Final ICDs include the bit level information
 - Include customer specific appendixes
 - Require customer review and signature
- **Updates as required between CDR and FAR**



MOC ICD Review Process

- **The MOC ICD is a generic document and defines all interfaces**
 - The SN CSM ICD and SNAS/DAS ICD were imported into the SGSS MOC ICD
 - The SGSS MOC ICD will supersede the existing SN/CSM and SNAS/DAS ICDs
- **Customer specific information will be included in separated MOC appendices**
 - Not all sections apply to all customers
- **MOC ICD Review Process**
 - Final version will be distributed electronically to customers prior to CDR (February 2013)
 - Nominal 30 calendar day open comment period
 - Customer comments will be dispositioned and forwarded to GD for inclusion into next revision
 - Customers are only required to review their sections
 - Customer concurrence (via signature) will be required for the appendices



Plan Forward

- **Customers to provide comments on the final version of the ICDs**
- **A Customer Matrix detailing high level information on customer configurations, scheduling and data interfaces and other information is being compiled. Customers may be asked to review and comment.**
- **Engage customers one-on-one to review and confirm what legacy data will become obsolete and what data must be migrated into SGSS**
 - Service specification codes (SSC's)
 - PTP desktops
 - UPD / GCMR parameters that were applicable to the legacy system, etc
- **Review new SGSS mission and user profiles**
- **Identify representative customer configurations for use in system testing (e.g. nominal science modes, TT&C only, emergency)**
- **Begin discussions regarding overall testing process and plans**



Scheduling Interfaces



SGSS Scheduling Interfaces

- **SGSS continues to support existing interfaces for existing customers**
 - SN/CSM
 - SNAS/DAS
- **SGSS implements new scheduling interfaces and protocols providing the customer additional flexibility for managing and controlling services.**
 - SGSS Web Portal HMI
 - CCSDS Service Management MMI
 - SGSS/CSM MMI
- **SGSS Service Management interfaces provides the following functionality to the customer:**
 - User and TDRS Vector
 - Service Management
 - Service Control and Monitor
 - **NEW** – Service Accounting

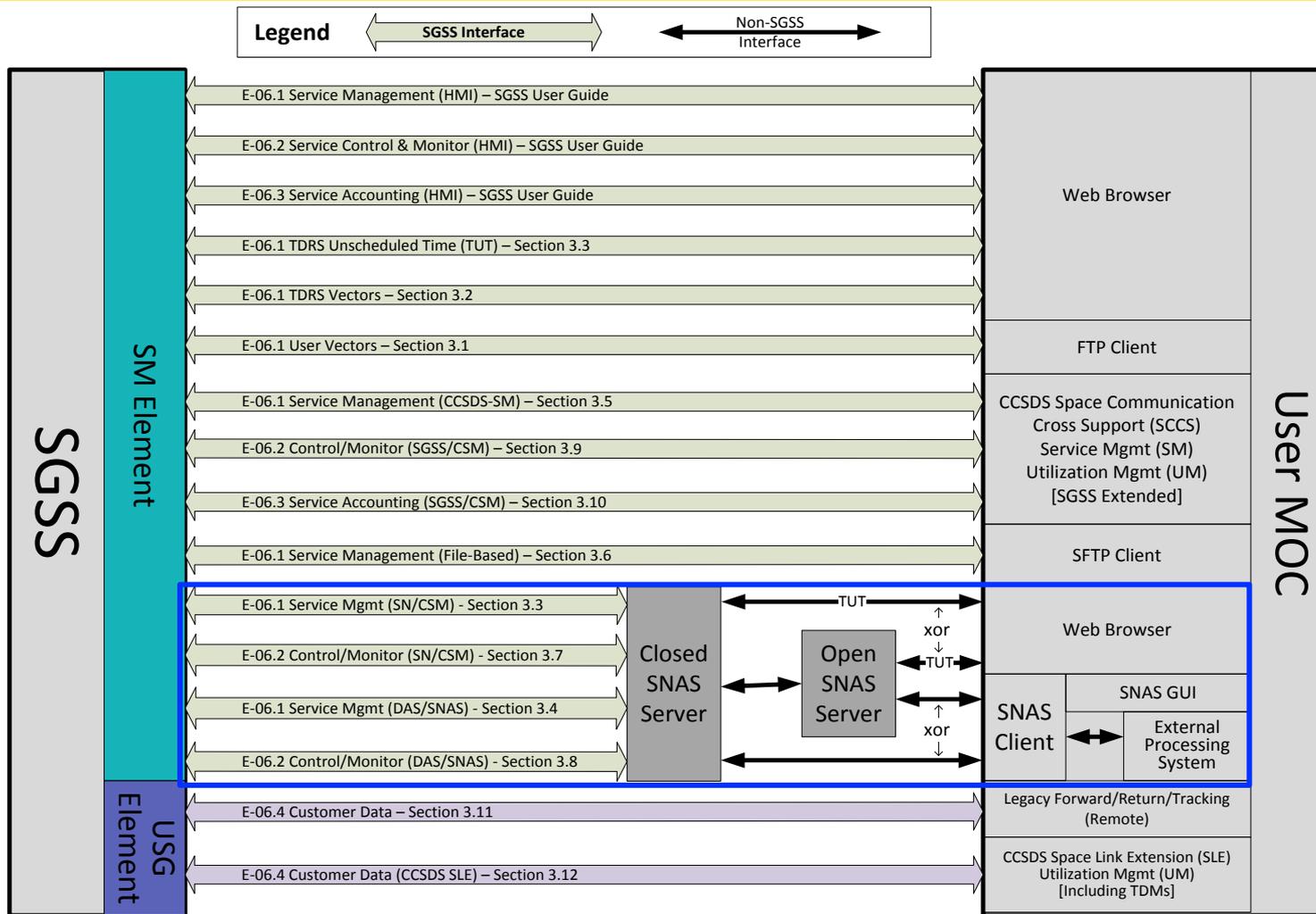


SGSS Service Management Terminology

- **Service Agreement and Mission Profiles:** Formal agreements between NASA and the customer that are defined from existing documents such as the Project Level Service Agreements (PSLA) and Network Requirement Documents (NRD)
 - Define the allowable range values for each User Platform service parameters and is used to ensure all Service Requests are within these limits.
- **Space Communication Service Profiles:** These are the equivalent of today's Service Specification Codes (SSC) with Transfer Service Profile (TSP) information added
- **Human Machine Interfaces (HMI):** this interface type provides graphical displays to input and view scheduling information.
- **Machine Machine Interfaces (MMI):** this interface type provide an electronic connection with customer scheduling systems to receive and provide scheduling information directly to and from the SGSS scheduling system
- **Service Management:** this functionality type is used to describe all systems and information used to create service schedules
- **Control and Monitor:** this functionality type is used to describe all systems and information required to configure, execute, and status User Services



Existing Customer Interface Support



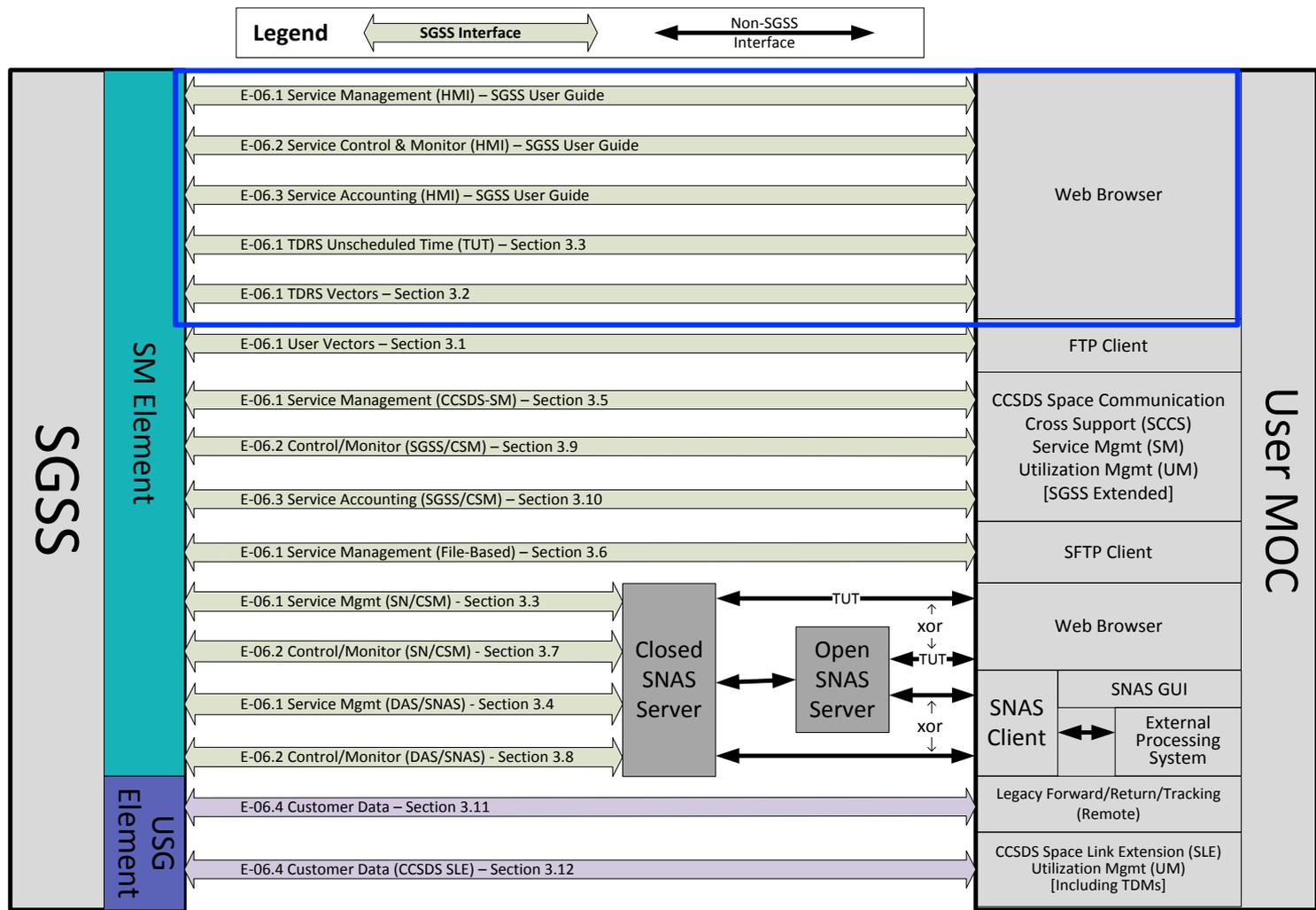


Existing Customer Interface Support

- **SGSS fully implements the existing SN/CSM and SNAS/DAS ICDs**
 - Service Management
 - Control/Monitor
- **SNAS HMI and MMIs unchanged**



New SGSS Web Portal



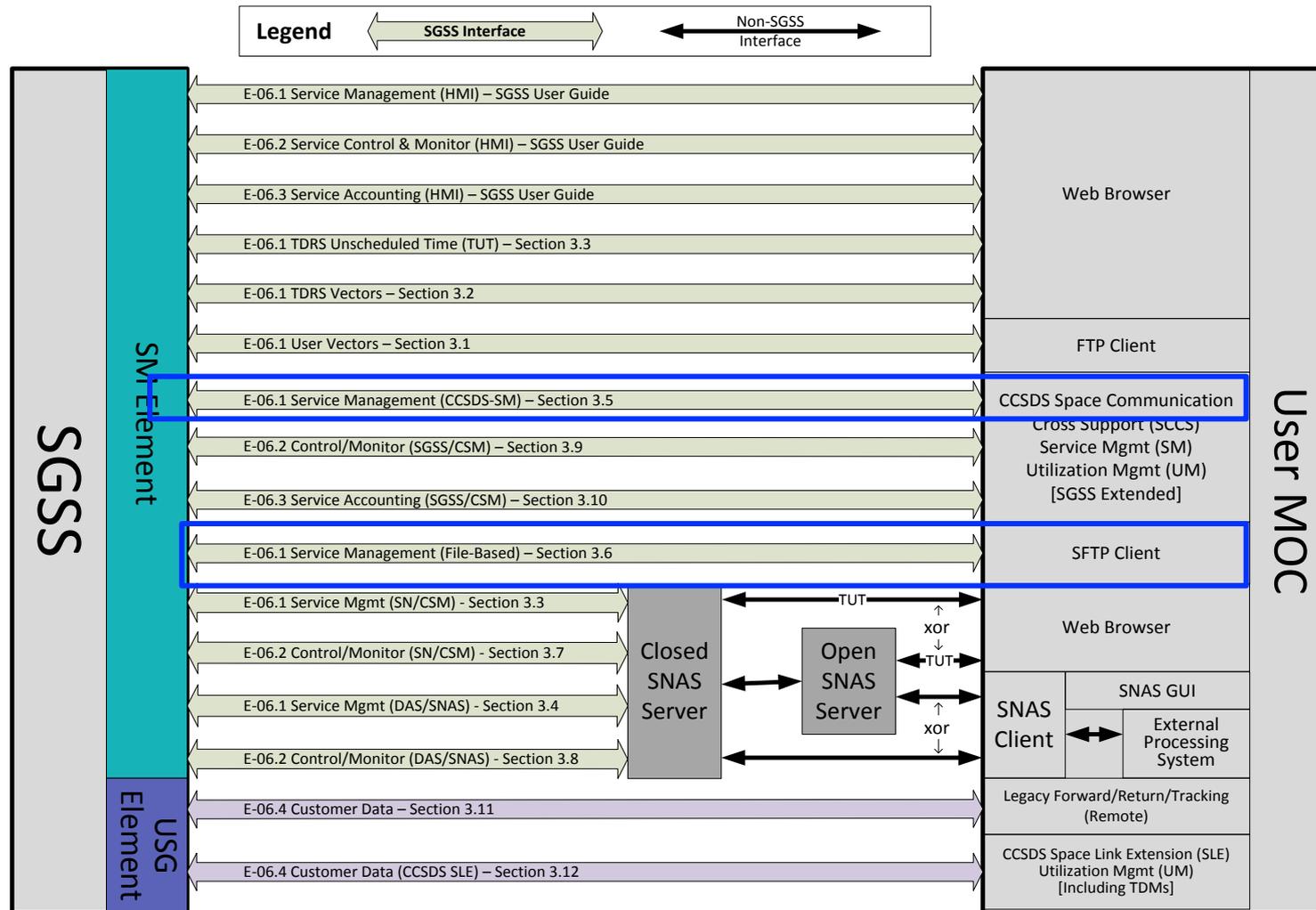


New SGSS Web Portal

-  • **SGSS implements web portal Human Machine Interface (HMI)**
 - No special user client required. Currently several browsers support the web portal:
 - Mozilla/Firefox, Internet Explorer, Safari (and Safari iOS), Chrome
 - Currently plan to guarantee support for Mozilla/Firefox web clients
 - Secure HTTPS and user authentication
 - Modern web based displays
 - Latest scheduling data always available
 - On demand scheduling and service queries
 - Provide the same displays used by the Network Schedulers with the information filtered for the specific user mission or platform
- **Functionality Supported**
 - User and TDRS Vector
 - Service Management
 - Service Control and Monitor
 -  – Service Accounting
- **Interface types provided by Web Portal**
 - HMI



New CCSDS Service Management Interface





CCSDS Service Management Interface

- This SGSS interface with the MOCs was designed to be similar to the message formats and protocols described in CCSDS 910.11 B 1, Space Communication Cross Support—Service Management—Service Specification.
- **Extended CCSDS Service Management:**
 - Flexible Service Package (service requests, data retrieval, etc.)
 - Service Agreement, Mission Profiles, Space Communication Service Profiles
 - SLE Support and Transfer Service Profiles
 - On demand scheduling and service queries
 - Trajectory Support (Flight Dynamics data)
 - Calendar Items
- **Functionality Supported**
 - Service Management
- **Interface types provided by Extended CCSDS Interfaces**
 - MMI

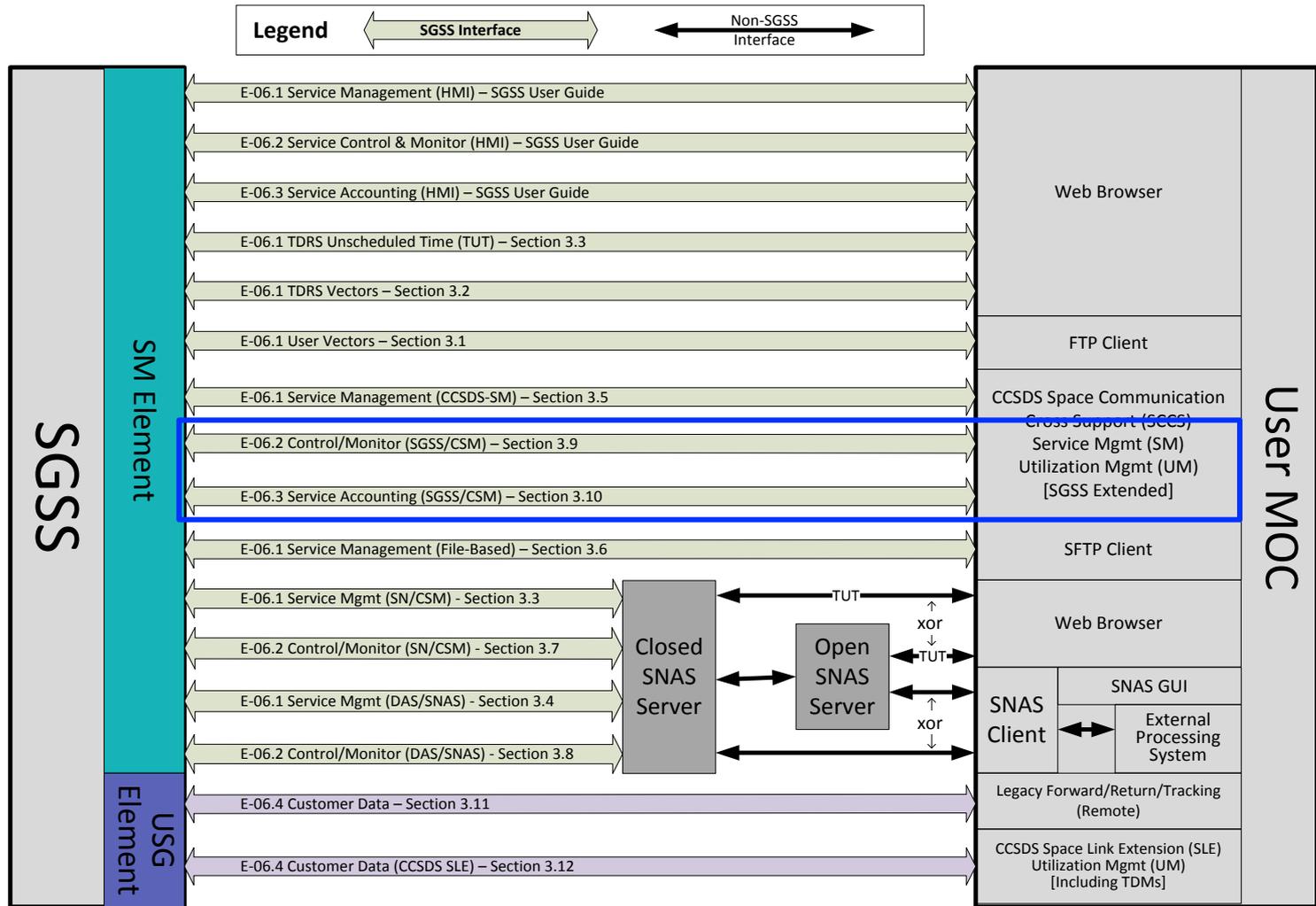


CCSDS Service Management Interface

- **CCSDS Service Management is implemented in XML with the option of two delivery formats/protocols**
 - Message Based CCSDS Service Management
 - XML messages via HTTPS over TCP/IP
 - Users need a client to implement this interface
 - File Based CCSDS Service Management
 - XML file via sFTP over TCP/IP
 - No special client needed



New SGSS Customer SM Interface (SGSS/CSM)



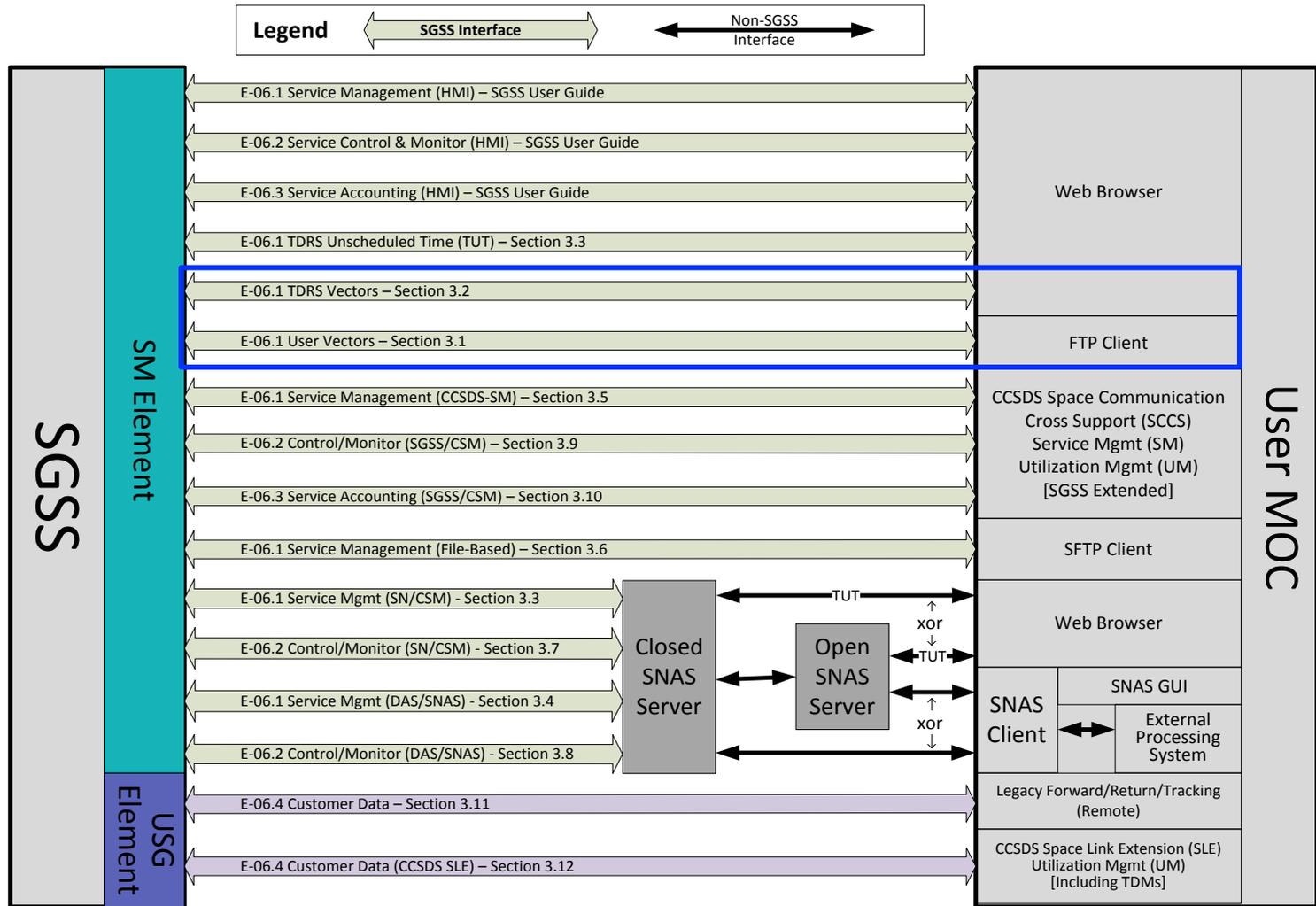


SGSS Customer SM Interface (SGSS/CSM)

- **SGSS/CSM provides a new Service Control and Monitor Interface**
 - XML messages via HTTPS over TCP/IP (similar to CCSDS Service Management)
 - Users need a client to implement this interface
- **SGSS/CSM provides a new Service Accounting Interface**
 - XML messages via HTTPS over TCP/IP (similar to CCSDS Service Management)
 - Users need a client to implement this interface
 - Queries and download of service accounting reports
 - Dynamic definition of Service accounting reports
- **Functionality Supported**
 - Control and Monitor
- **Interface types provided by Legacy Interfaces**
 - MMI



Existing Flight Dynamics Interfaces Support





Flight Dynamics Interfaces Support

- **User Vectors (FTP):** Same as what is already provided today via the SN/CSM FTP interface (IIRV format)
- **TDRS Vectors (HTTP):** Provides TDRS orbital elements
- Customers are encouraged to use the new SGSS provided secure interfaces

While legacy non-secure interfaces are supported, SGSS provides new secure HMI and MMI interfaces



Transition to New Scheduling Interfaces

- **Customers can begin to use the web portal and file based interfaces without having to buy or install special hardware/software.**
- **Web Portal Service Management**
 - Customers can use the web portal to access information more efficiently without impacting operations of their legacy scheduling systems. For example:
 - TUT: access the latest TUT and use the web interface to filter and search for available time for a specific TDRS or service type.
 - Active Schedule: access the latest Active schedule to confirm upcoming activities
 - Calendar: access latest dates for upcoming TDRS/GT transition, outages, etc.
 - Service Profiles: review current definitions (e.g. review service codes)
- **File Based Service Management**
 - Customers can use any sFTP client to take advantage of the file based interface.
 - User MOC ICD defines the file/data format to use (XML schema)
 - File based interface may be used to access scheduling information without impacting operations of their legacy scheduling systems. For example:
 - Periodically/ad-hoc download TUT and Active Schedules
 - Periodically/ad-hoc download TDRS vectors



Data Interfaces



Customer Data Interfaces

- **SGSS will continue to support existing SN Customer data interfaces**
 - **Customer platforms**..... In accordance with current RF ICDs
 - **Customer MOCs**..... In accordance with MOC ICD
 - **User Local Equipment**..... In accordance with legacy Local Interface ICDs
-  • **With the advent of SGSS, new opportunities exist for missions and customer data interfaces**
 - Opportunity for new bandwidth-efficient modulation and coding interfaces to Customer platforms (as described in the SGSS System Requirements Document)
 - Opportunity for reduced cost and improved flexibility through packet data interface
 - Opportunity for IF customers to migrate to digital IF
- **Customers are encouraged to migrate to packet data interfaces to receive greatest benefit from SGSS digital architecture**

Consider adding packet based customer data interface during a future customer equipment refresh



Customer MOC Data Interface – Legacy

• Customer Data (Legacy formats)

Data Types

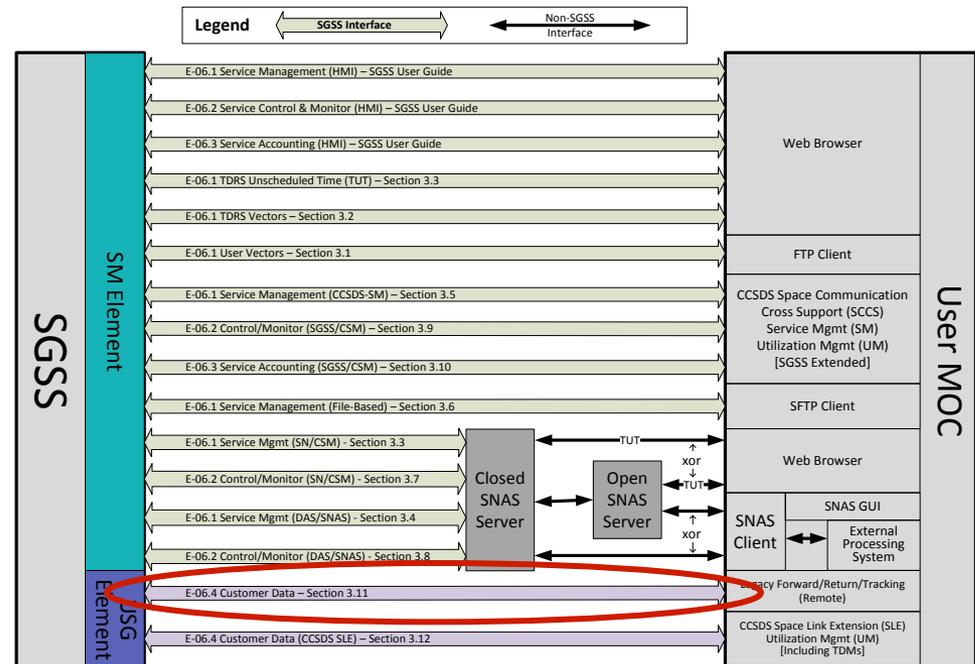
- Bidirectional Bit Stream
- Bidirectional Non-CCSDS Frame
- Return-Link CCSDS Ver.1 Frame (TM)
- Return-Link CCSDS Ver.2 Frame (AOS)
- Forward-Link CLTU
- Forward Link CCSDS Frame (TC)
- UTDF Tracking Data

Encapsulations

- 4800-bit-block
- Low-Earth Orbit –Terminal (LEO-T)
- IPDU
- SFDU
- AXAF-I SFDU (TM)
- ACE SFDU

Transport

- TCP
- UDP
- RTP/UDP



SGSS fully supports all existing Customer MOC data interfaces



Customer MOC Data Interface – CCSDS SLE

NEW CCSDS SLE Customer Data Interface

Return Data

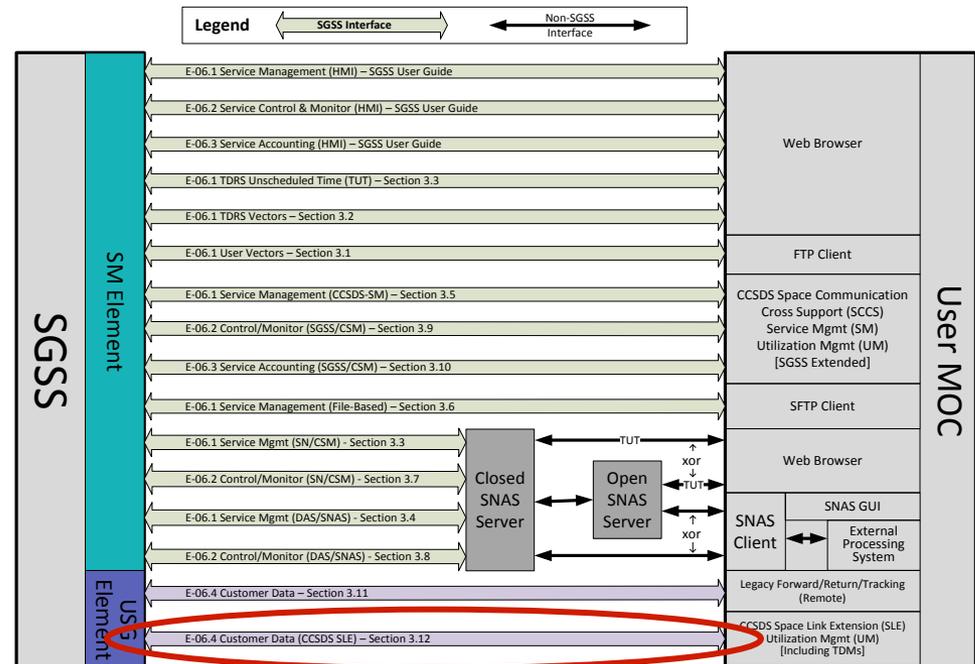
- CCSDS SLE Return All Frames (SLE_RAF) messages
- CCSDS SLE Return Channel Frames (SLE_RCF) messages
- CCSDS SLE Return Operational Control Fields (SLE_ROCF) messages

Forward Data

- CCSDS SLE Forward Communication Link Transmission Unit (SLE_F_CLTU) Operations
- CCSDS SLE Enhanced Forward Communication Link Transmission Unit (SLE_EF_CLTU) Operations

Tracking Data

- CCSDS Tracking Data Messages (TDM)

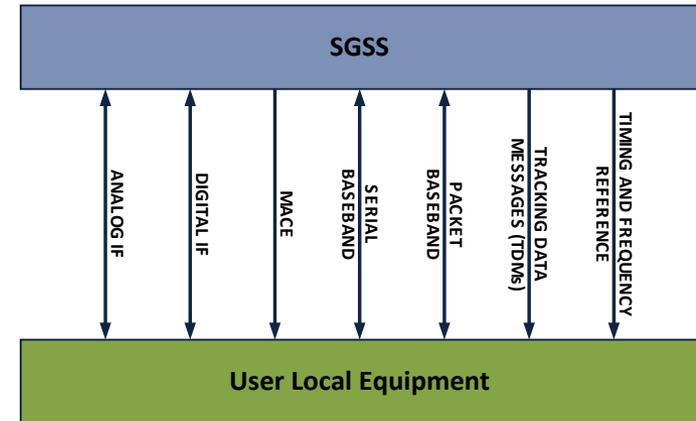


SGSS provides support for emerging CCSDS SLE data interfaces



User Local Equipment (ULE) Data Interfaces

- **SGSS will provide both Intermediate Frequency (IF) and Baseband data to ULE Customers**
- **Multiple types of timing and frequency references provided to ULE Customers**
 - Derived from GPS
 - ± 10 nanosecond accuracy to GPS time
 - Traceable to USNO
 - Analog signals
 - 10 MHz Frequency Reference
 - IRIG-B
 - IRIG-G
 - 1PPS
 - Packet service
 -  Network Time Protocol



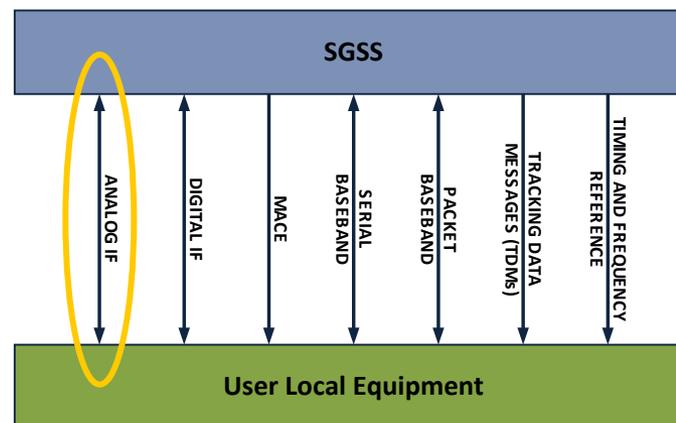


User Local Equipment IF Interfaces (1 of 3)

SGSS will provide both digital and analog IF to ULE

- **Analog IF**

- Non-digitized wideband analog IF (Pol1 and Pol 2)
 - Return service only
 - Up to 800 MHz BW
 - 1345 MHz Center Frequency
- Tuned analog narrowband IF
 - Forward and Return service
 - Up to 240 MHz BW Return
 - Up to 50 MHz BW Forward
 - 370 MHz Center Frequency

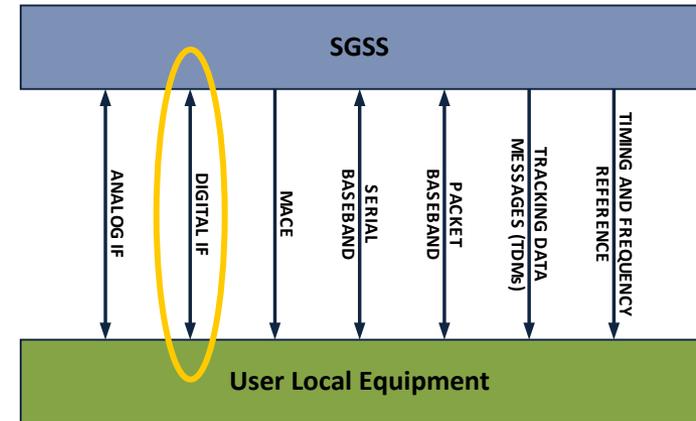




User Local Equipment IF Interfaces (2 of 3)

NEW Digital IF

- Tuned narrowband digital IF
 - Forward and Return service
 - Up to 240 MHz BW Return
 - Up to 50 MHz BW Forward
 - VITA-49.0 Radio Transport (VRT) packet format
 - UDP unicast
 - IPv4; IPv6 can be supported, should new customers require it
 - 10 Gb Ethernet

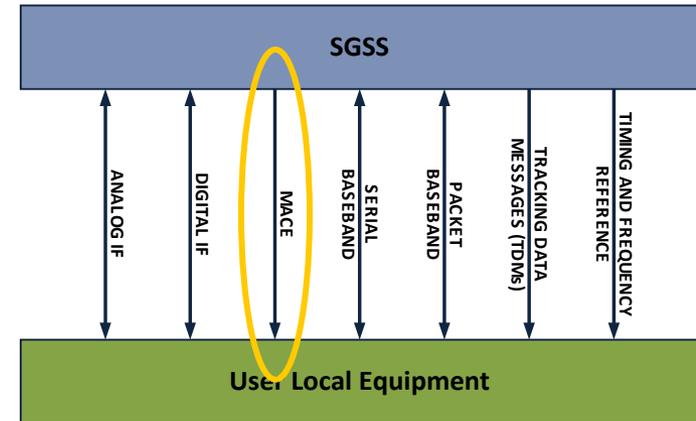




User Local Equipment IF Interfaces (3 of 3)

NEW MA Channel Element (MACE)

- **Corrected Element Data Bus:** VRT-formatted digital IF containing 30 time-equalized and Doppler-corrected MA element channels
 - VITA-49.0 Radio Transport (VRT) packet format
 - UDP multicast
 - IPv4; IPv6 can be supported, should new customers require it
 - 10 Gb Ethernet
- **Common Data Broadcast:** Metadata useful to customer-provided beamformers
 - VITA-49.0 Radio Transport (VRT) packet format
 - UDP multicast
 - IPv4; IPv6 can be supported, should new customers require it
 - 10 Gb Ethernet





ULE Baseband Interface (1 of 2)

- **Two distinct types of data interfaces provided for both Forward and Return services**

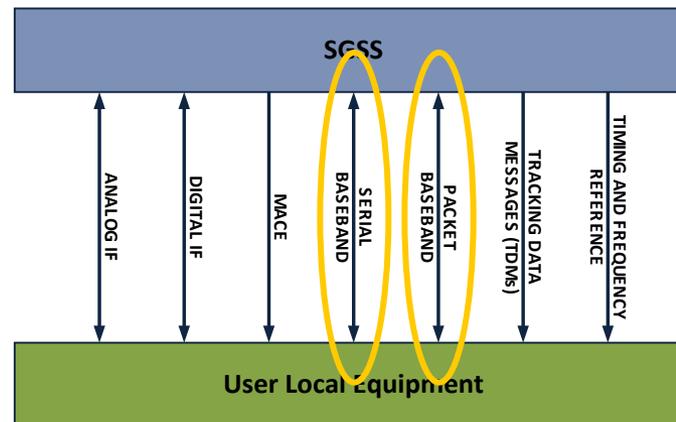
- **Serial interface** – compatible with Legacy interfaces

- Low rate (100 bit/s to 12 Mbit/s)
 - RS-449 balanced differential clock and data
 - Triax Bayonet connector/Twinax cable
- High rate (10 Mbit/s to 300 Mbit/s)
 - ECL differential clock and data
 - TNC connector/Coax cable



Packetized baseband interface

- Any supported data rate (100 bit/s to 1200 Mbit/s)
- VITA-49.0 Radio Transport (VRT) packet format
- UDP unicast
- IPv4; IPv6 can be supported, should new customers require it
- 1 Gb or 10 Gb Ethernet depending on customer data rate





ULE Baseband Interface (2 of 2)

• Tracking Data Messages

– Serial Interface

- UTDF over 4800 BB over RS-422 serial interface



– Packet Interface

- UTDF over 4800 BB over UDP/IP over Ethernet
- CCSDS/XML over TCP/IP over Ethernet

• Timing and Frequency References

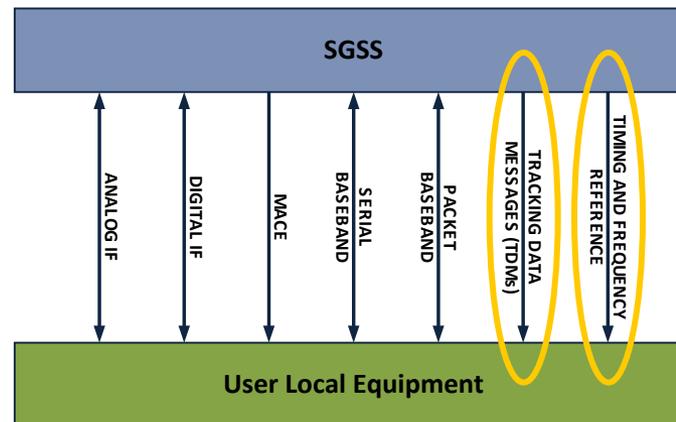
– Analog signals

- 10 MHz Frequency Reference
- IRIG-B
- IRIG-G
- 1PPS

– Packet service



- Network Time Protocol





NISN/IP Addressing



SGSS Network Changes

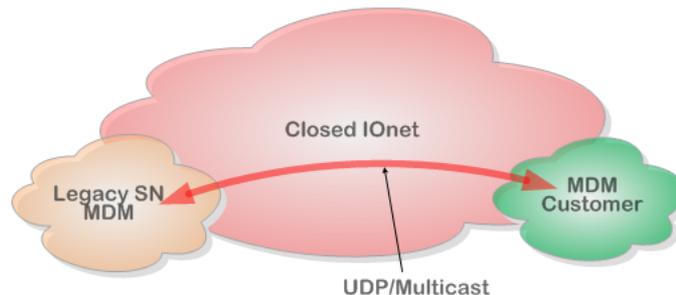
- NEW** • **SGSS will exclusively use the new Mission Network infrastructure for network connectivity**
 - NISN is modernizing the Mission Network to meet emerging requirements
 - Existing customers will not need to move to the new infrastructure to connect to SGSS
- NEW** • **SGSS has been assigned new IP address space**
 - Users will need to make configuration updates (IP address changes, firewall rule changes, etc.) to connect to the SGSS systems
- **Users MOCs whose systems are located on the Open, Restricted, or Closed IONets will be required to submit NISN firewall rule requests to establish connections to SGSS**
 - NISN Policy requires parties located on the IONets to initiate firewall requests
 - SGSS will be required to mirror the firewall rule configuration within their own firewalls.

All configuration modifications required by customers to connect to SGSS will be coordinated using one on one meetings

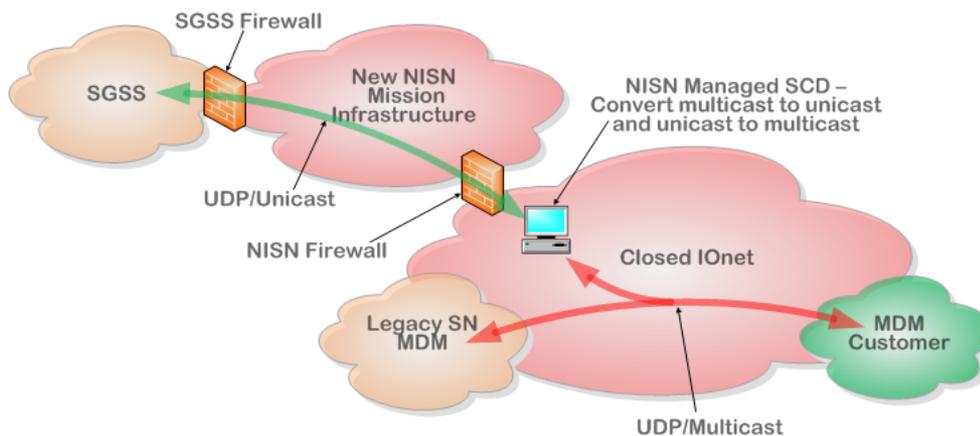


Notional MDM Transition

Current MDM Flows



MDM Flows during SGSS Transition



No Expected Changes for MDM customers



Transition and Customer Testing



Transition and Customer Testing

- **AGENDA**

- Transition Architecture and Concept (High Level)
- Transition and Customer Participation in Testing
 - Transition and Test Schedule
- Customer Operations and Legacy Adapters
- Future topics
- Summary



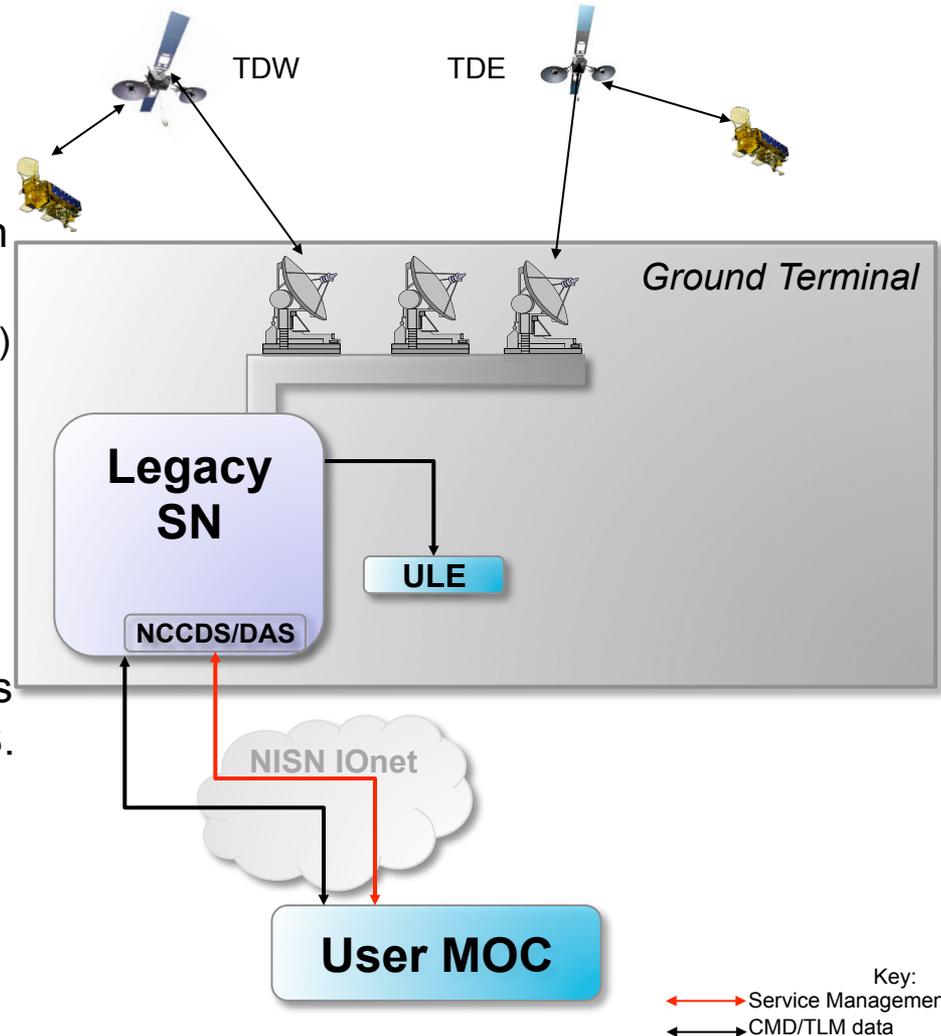
Transition Architecture and Concept

Initial Architecture

- All ground terminals and antennas configured with legacy SN systems
- Service management interfaces through
 - Network Control Center Data System (NCCDS)/Demand Access System (DAS)
 - SNAS and other customer unique systems
- CMD/TLM data interfaces through
 - User Local Equipment (ULE)*
 - NISN

Concept

- Events supported by operational TDRSs assigned to legacy SN SGLTs and DAS.
- SGLTs have some differences, yet they effectively provide equivalent MA, SSA, Ku/Ka SA services.



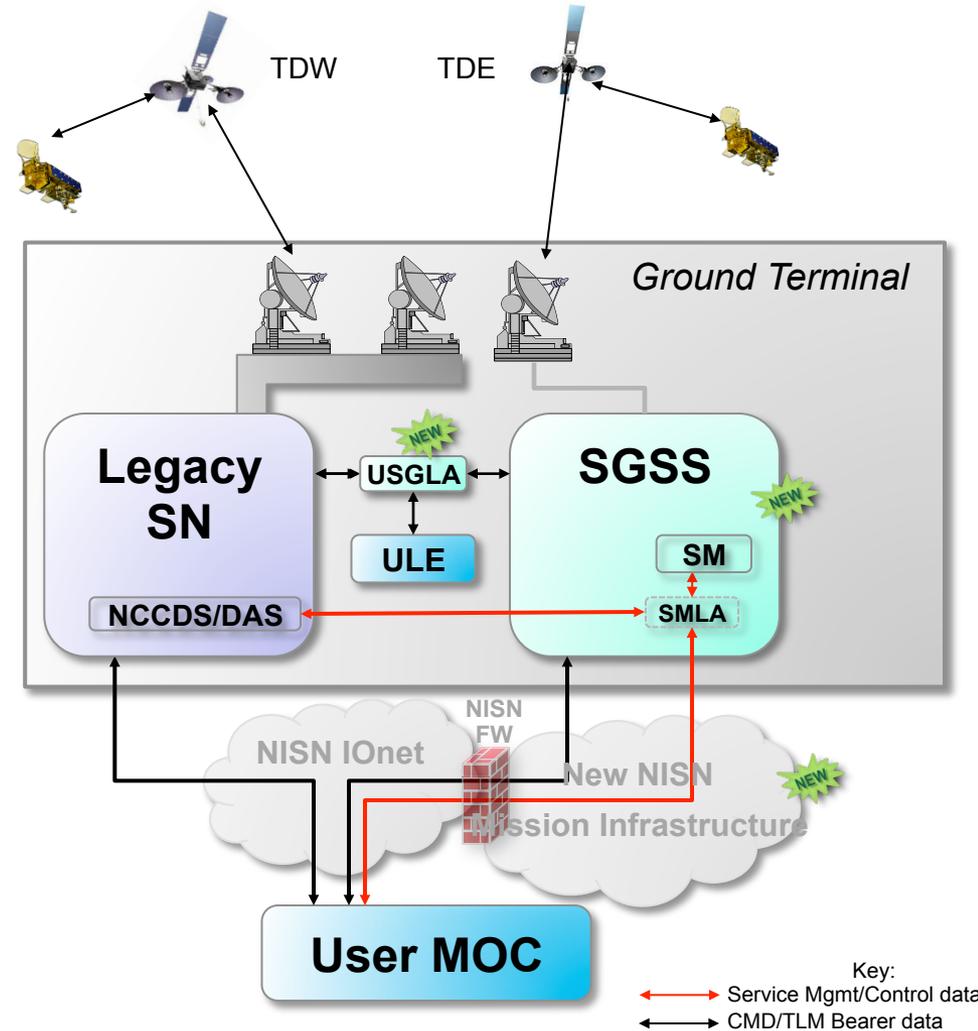
- ULE is referred to as Local Interface (LI) Equipment currently. Customers manage the NISN interface from the ULE back to their User MOC



Transition Architecture and Concept

Transition Architecture

- Ground terminal antennas configured with Legacy SN systems and SGSS
 - Antennas and Operational TDRSs incrementally transitioned to SGSS
- Service management/control interfaces routed to NCCDS or SM by the Service Management Legacy Adapter (SMLA) based on operational TDRS assignments.
 - Vectors and TDRS Scheduling Windows (TSW) routed to both systems
- CMD/TLM *Bearer* data is routed to customers via ULE or NISN
 - User Services Gateway Legacy Adapter (USGLA) switching provides interface to customer ULE per schedule
 - New IP Addressing and firewall rules to SGSS enables routing





Transition Architecture and Concept

• Transition Architecture (continued)

- SGSS pooled equipment will provide MA, SSA, Ku/Ka SA services, plus several new service capabilities
 - Existing Service Management interfaces will continue to be provided during transition and after via SNAS and customers can continue to use systems compliant with the NCCDS/CSM ICD
 -  • SGSS provides a new Service Management Portal
 - Customers participating in HMI reviews
 - To access new SGSS service capabilities, customers need to use the new Service Management Portal.
 - Once a ground terminal antenna is modified to interface with SGSS it will not be reconfigurable to the SN legacy systems any longer.
 - TDRSs will be assignments will be dynamic between SN legacy and SGSS during the testing to test multiple generations of TDRS spacecraft.



Transition Architecture and Concept

• Transition Concept

- Goal is to minimize changes that affect the customers during the transition period, however some change is unavoidable.
- Successive customer events will occur on the legacy SN equipment and the SGSS equipment. (e.g. TDW event on legacy SN, the next event on TDE would be on SGSS)
 - Concept is to enable the existing customers to use the same Schedule Add Requests (SARs) and Service Specification Codes (SSCs) for both legacy SN and SGSS supported events
 - SGSS will ensure mapping between the legacy SSC identifiers (e.g. H01, I01, T01) to SGSS user profiles/recipes
-  – On SGSS, DAS support will be scheduled as very long duration events (years), and SGSS will determine the customer views.
- Given there will be two scheduling systems in place (NCCDS and SM) , there will be some operational constraints during the transition period
 - Will cover in the results of the analysis and initial operational survey



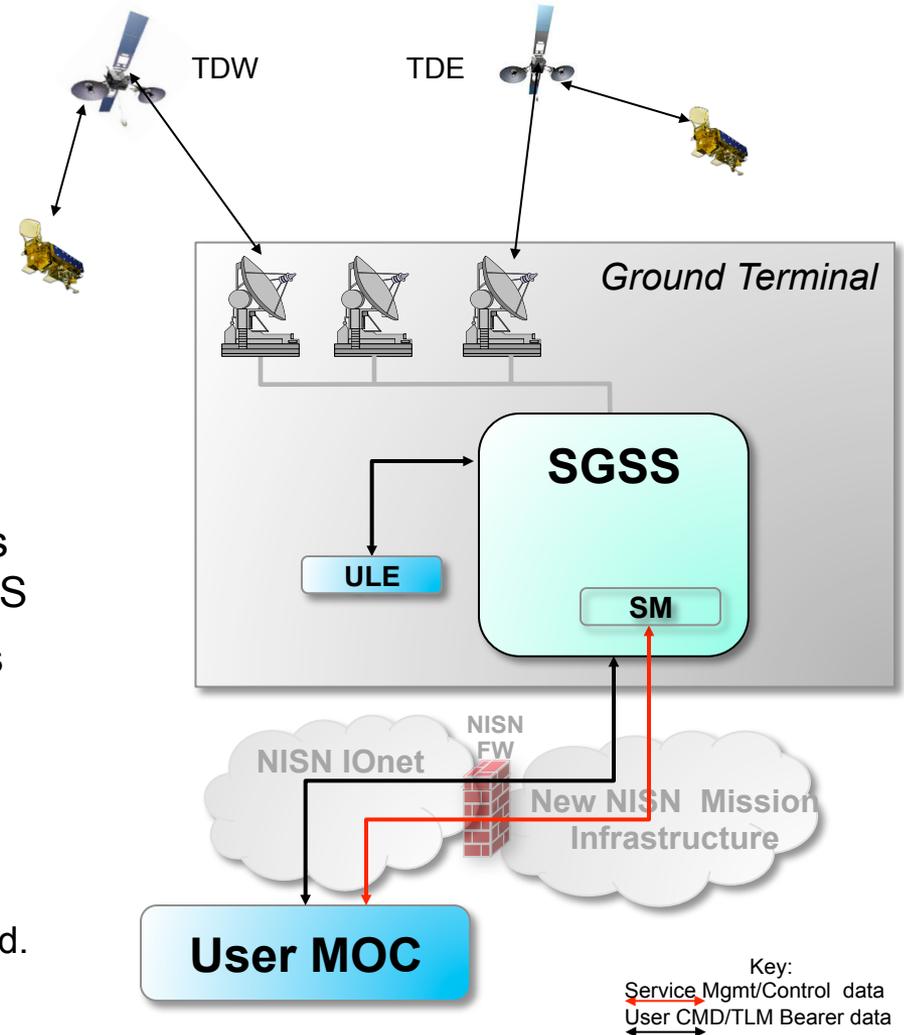
Transition Architecture and Concept

• End State Architecture

- All ground terminals and antennas configured with SGSS
- USGLA and SMLA decommissioned
- Legacy SN systems decommissioned and removed.

• Concept

- All events supported by SGSS
- Existing Service Management interfaces will continue to be provided during via SNAS
- Customers can continue to use systems compliant with the NCCDS/CSM ICD
- Over time all customers will be encouraged to move to the new Service Management portal.
 - Eventually, SNAS will be decommissioned.





Transition and Customer Participation in Testing



Transition and Associated Testing

• Transition Risk and Customer Involvement in Testing

- Transitioning: 4 SN Ground Terminals, 11 Main Mission Antennas and 7 Operational TDRSs
 - Several other antenna transitions involve SN assets for TDRS TT&C or testing only and don't involve customers.
- Goal is to involve customers in testing to ensure successful support and minimize risk, yet not “burden” customers
- The transition and related test approach involves a varying degree of complexity/risk and therefore customer involvement in the testing

		Transition Complexity and Risk / Customer Involvement			
Start Order*	Ground Terminal	1st Antenna	2nd Antenna	3rd Antenna	# Operational TDRSs
1st	<i>WSGT</i>	High / Significant	Low / Minimal	Low / Minimal	2
2nd	<i>BPGT**</i>	Medium / Moderate	Low / Minimal	N/A (only 2 antenna's)	1
3rd	<i>STGT</i>	Medium / Moderate	Low / Minimal	Low / Minimal	2
4th	<i>GRGT**</i>	Medium / Moderate	Low / Minimal	Low / Minimal	2
Total	4	11			7

Customer Participation Tailored Based on Complexity and Risk

*Ground Terminal order subject to change

**Selected Customers involved in BPGT and GRGT testing.



Transition and Customer Participation in Testing

• Customer Participation Levels

- Estimation of Participation Levels
 - Significant (estimated ~4-8 test activities per customer)
 - Testing of all aspects of the service management interface
 - Testing of operational events that cover key customer scenarios (e.g. nominal, TT&C only, emergency/contingency)
 - Moderate (estimated ~2-3 test activities per customer)
 - Regression testing of the service management interfaces
 - Testing of one representative customer scenarios (e.g. nominal)
 - Minimal (estimated ~1 test activity per selected customer)
 - Testing representative customer configuration
- Customer interchange meetings will be planned to further define the test plans, customer scenarios, test/operational constraints and other special considerations.
- On a case by case basis exceptions will be made, and testing will be accomplished using alternate test resources (e.g. End to End tests, SCan Test bed, ESTL).
- Customers will be invited to participate in the ORR's

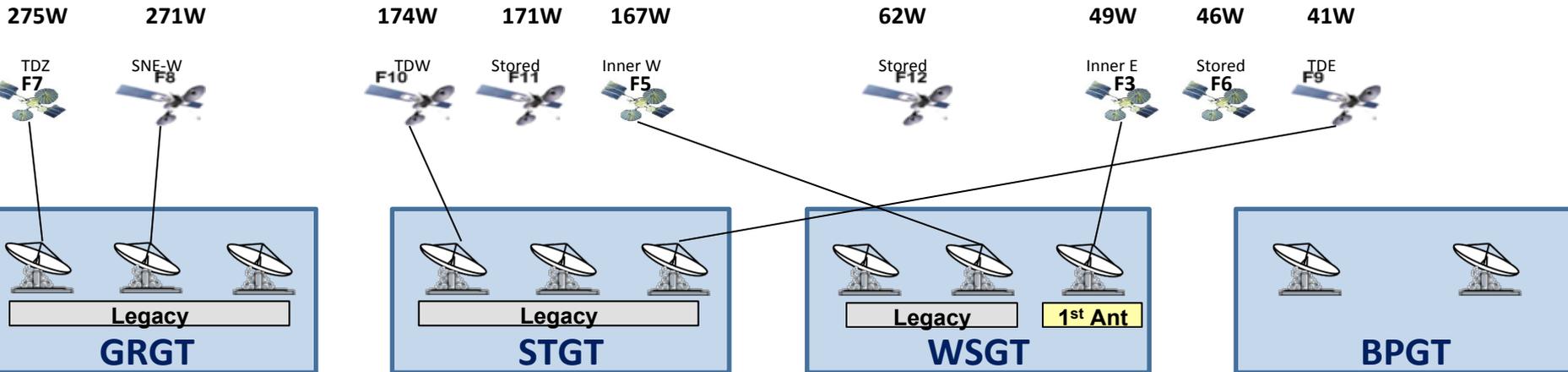
Test Activities include:

- SM/M&C Engineering Interface Tests
- Ping tests
- Data flows
- Customer event supports

Test plans are in development and will be further refined as the project prepares for CDR

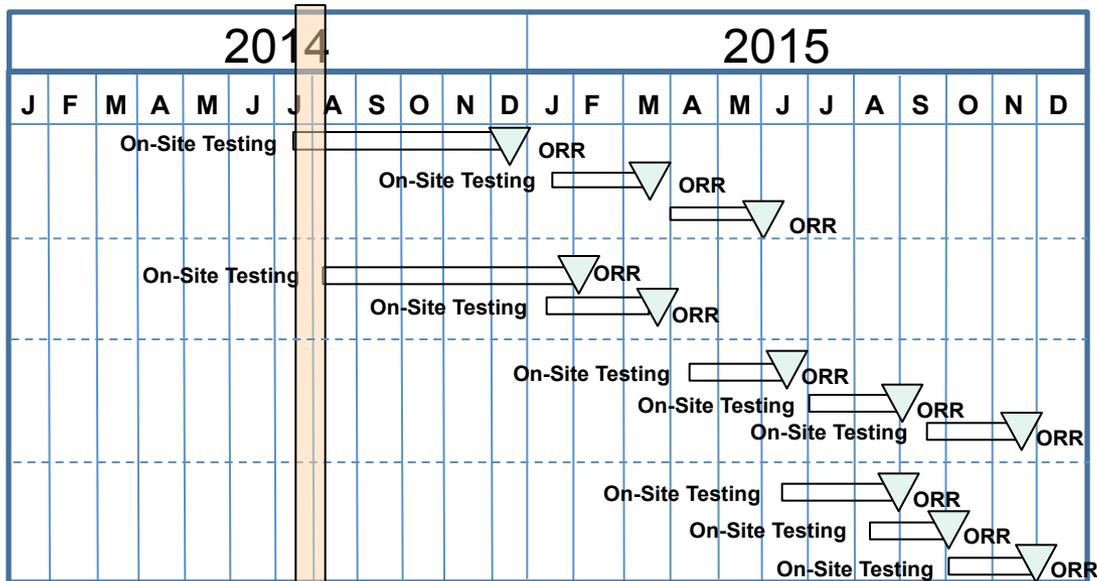


Transition and Test Schedule First Ground Terminal and Antenna



- Legacy
- SGSS in I&T
- SGSS OPS/I&T
- SGSS-Operational

- WSGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- BPGT**
 - 1st Antenna
 - 2nd Antenna
- GRGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- STGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna

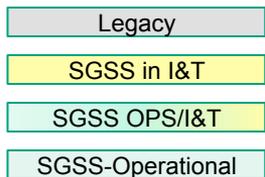
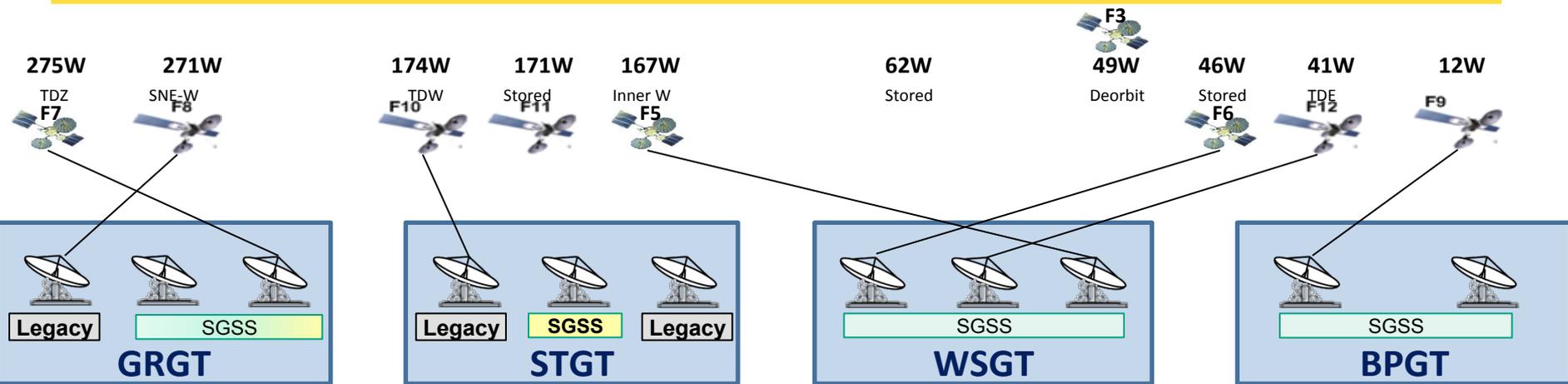


Onsite Testing involves Customer Participation

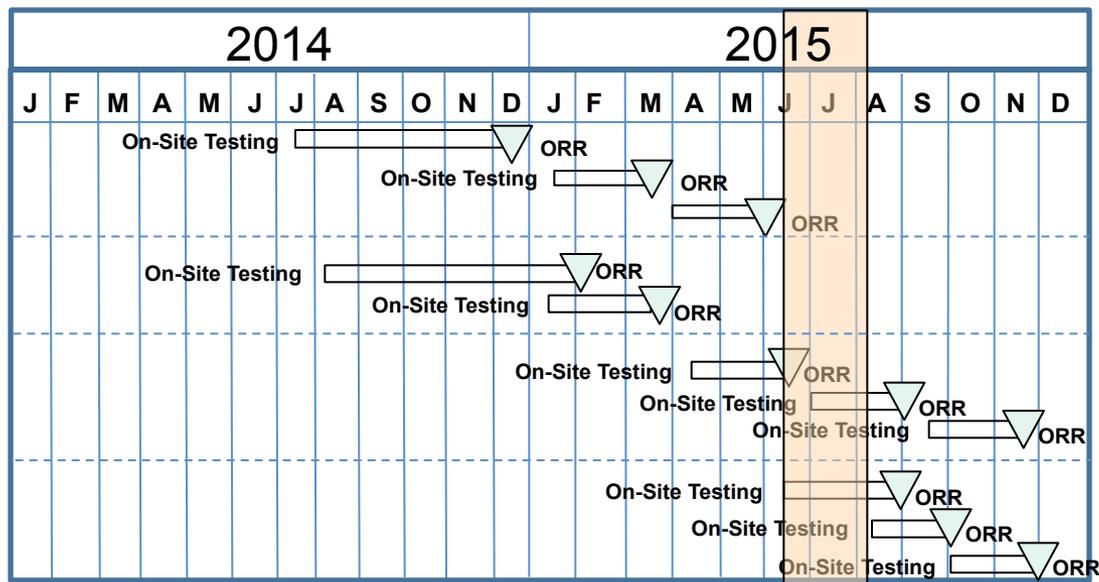


Transition and Test Schedule

Interim State (2 GT complete 2 in process)

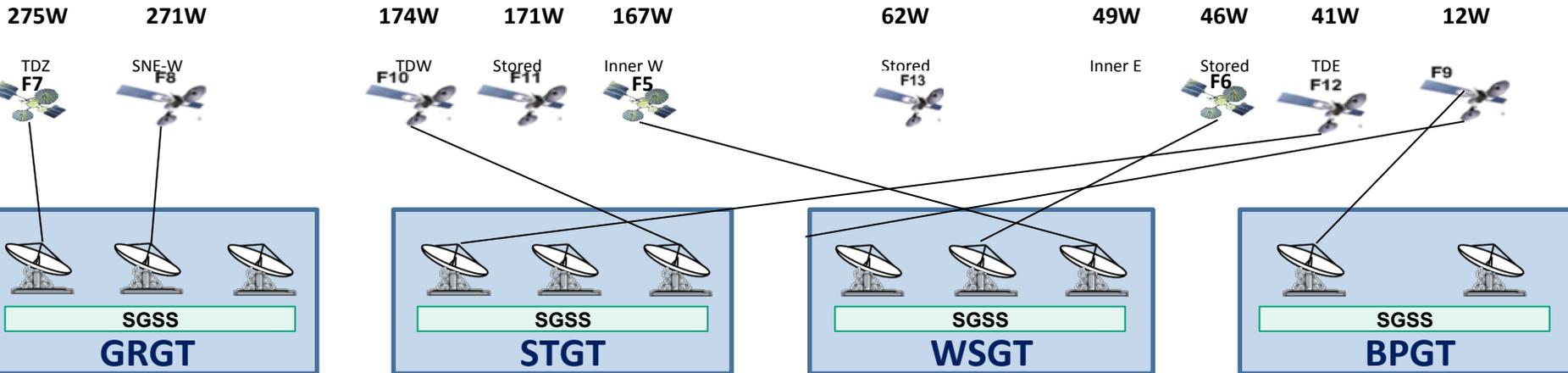


- WSGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- BPGT**
 - 1st Antenna
 - 2nd Antenna
- GRGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- STGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna



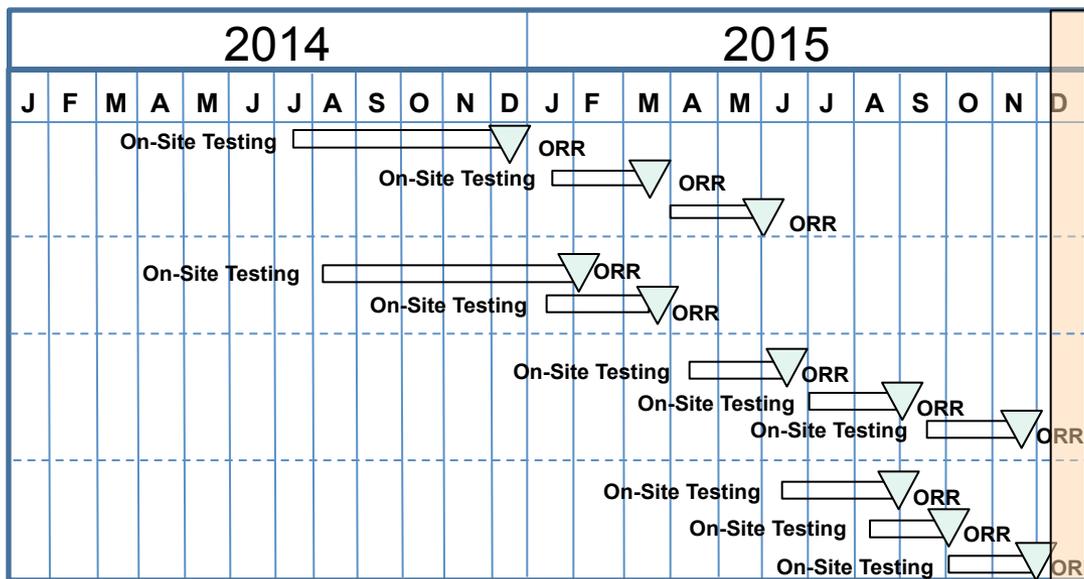


Transition and Test Schedule Final State



- Legacy
- SGSS in I&T
- SGSS OPS/I&T
- SGSS-Operational

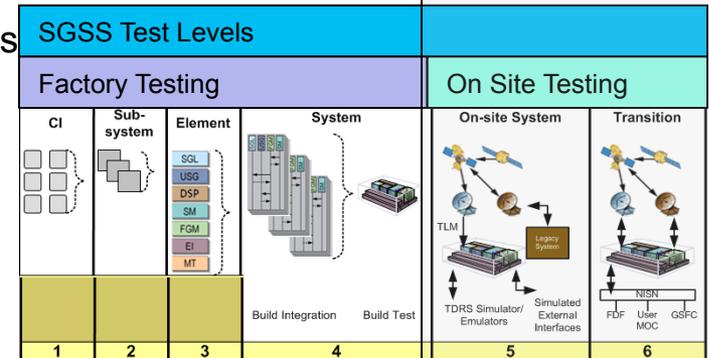
- WSGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- BPGT**
 - 1st Antenna
 - 2nd Antenna
- GRGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna
- STGT**
 - 1st Antenna
 - 2nd Antenna
 - 3rd Antenna





Customer Participation in Level 5 & 6 Testing

- **SGSS uses a progressive buildup of test levels similar to what's been done for other SN development projects**
 - Level 1-4 involves lower level factory testing and does not involve direct interfaces with the customers
 - If Customers have MOC simulators they are invited to participate during level 4 testing.
 - Level 5 On Site Verification Testing
 - Re-verifies the system after relocation to the operational site
 - Customer Participation begins to verify interfaces
 - Level 6 On Site Validation Testing
 - Navigation certification testing conducted with FDF
 - Will work with each customer to establish validation criteria for Level 6
 - Project initial criteria is one successful test per customer scenario
- **Level 5 and 6 Testing conducted for each ground terminal antenna and tailored as described previously**



- External Interface Data Flow Tests
 - SM
 - CMD/TLM bearer data
- End to End Tests with customer spacecraft and MOC
- Shadow Tests

Successful customer interfaces verification and operational support validation a key focus of on site testing



Customer Operations and Legacy Adapters



Customer Operations and Legacy Adapters

- **Transitioning to new SM and CMD/TLM bearer data interfaces involves some complexities.**
- **Analysis was conducted to explore the differences, potential impacts, workarounds and ways to minimize complexity of the SMLA**
 - Customers were surveyed on the impact of these differences
 - The impact was assessed as minimal.
 - Customers should bring any concerns that remain to our attention
- **Customers with ULE at the ground terminals also have special considerations**
 - The User Services Gateway (USG) Element provides functionality in the USGLA to switch inputs/outputs to SN Legacy when SGSS is not supporting a scheduled event.
 - Some customer ULE can accommodate multiple inputs/outputs and so can interface directly to SGSS in parallel with the SN legacy inputs/outputs and won't need to interface via the USGLA.
 - Customer Interchange meetings are planned to confirm details and results will be available at the next customer forum.



Customer Operations and Legacy Adapters

- **SM Legacy adapter (SMLA)**

- SMLA to route messaging between Legacy and SGSS based on assigned operational TDRSs
- SMLA does not coordinate schedules between the Legacy and SGSS systems resulting in some operational scheduling challenges
 - Generally a result of scheduling using two independent scheduling systems
 - NCCDS/DAS schedules only SN Legacy assigned TDRSs
 - SM schedules only SGSS assigned TDRSs
 - Some scheduling flexibilities and resources involve multiple TDRSs that may be assigned to different systems during transition
- General Dynamics engaged the SN customer community (current and future) to assess potential impact
 - Conducted customer interchange meetings and surveyed customers to determine approach feasibility
 - Isolate areas of concern during the Transition Period
 - Identify potential impact to individual customers
 - Identify proposed restrictions
 - Gauge acceptability of proposed workarounds

Sensitive to all customers – current and future



Results of Initial Customer Interchange Meetings

- **Responses received from all customers:**

- Based on the survey results (in backup), discovered that the use of scheduling flexibilities is currently limited. Customer should review and ensure we captured your response correctly.

Scheduling Feature	Current customers responding “yes” they use the feature	Current customers responding maybe/ seldom	Future customers expressing possible use
Alternate SARs (ASAR)	0	0	1
TDRS Sets	1	0	2
Replace Request (RR)	9	4	4
DAS Any	3	0	1

- Interchange meetings indicated customers are willing and able to operate with operational restrictions
- Post transition, customers are actively encouraged to resume full use of scheduling flexibilities to increase efficiency in the scheduling process

Enabled SGSS to plan for a more simple SMLA



SMLA Operational Scheduling Constraints

- **Scheduling Features impacted during Transition**

- Alternate Schedule Add Request (ASAR)
 - ASAR request may be declined
 - Workaround is to resubmit ASARs without referencing a TDRS assigned to the other system (SGSS, SN Legacy)
- TDRS Sets (ANY, TES, TW7, TWE, etc.)
 - Discovered very limited use
 - Schedule requests using cross-system TDRS Sets will be processed but may result in increased declines
 - Workaround is to resubmit declined requests using specific TDRS
- Replace Request (RR)
 - RR request may be declined if the replacement is for a TDRS on the other system
 - Workaround is to resubmit RR as a SAR (on other system) and SDR (on current)
 - » Submit SAR first to assure acceptance before delete

Workarounds were expressed to be acceptable to customers

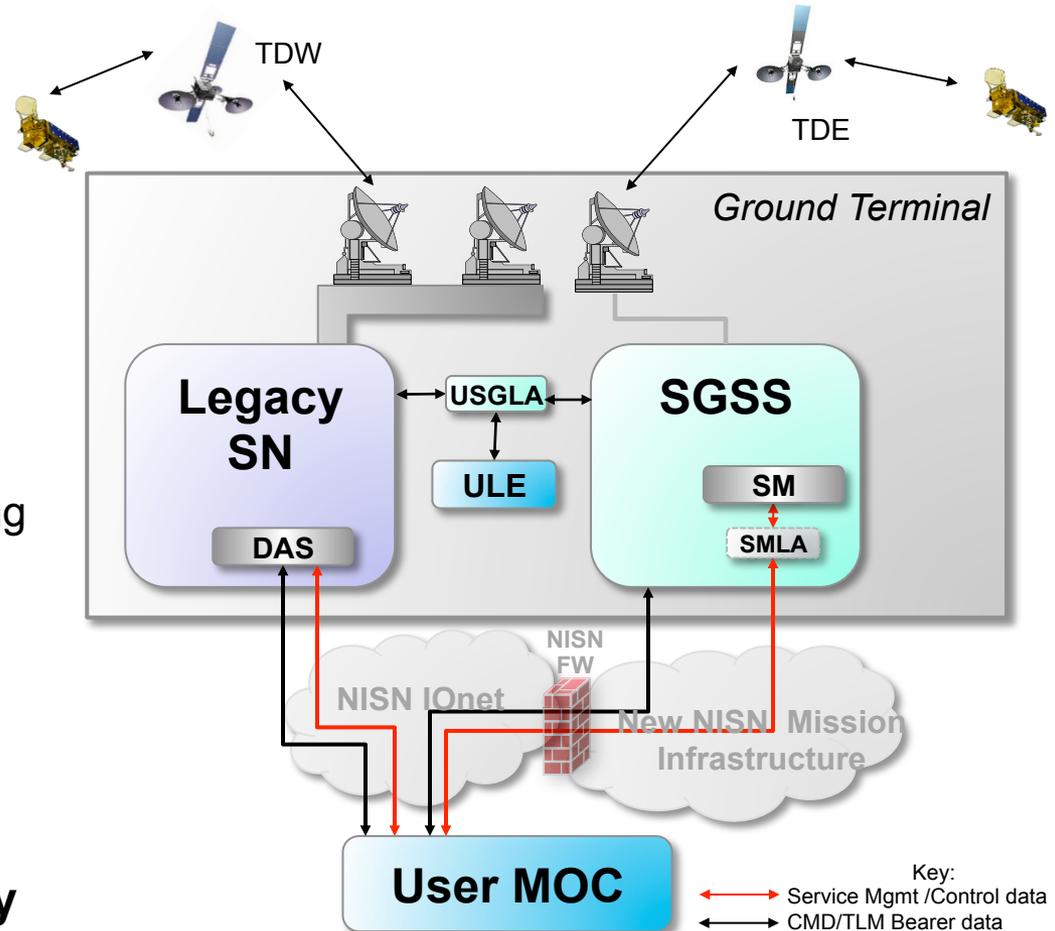


SMLA Operational Scheduling Constraints Continued

• DAS Scheduling

- “DAS ANY” will not be available during periods when all TDRSS providing DAS support to a customer are not on the same system (Legacy or SGSS)
 - “DAS ALL” and DAS Specific are fully supported during transition
- Workaround for “DAS ANY” during the Transition Period
 - Use of DAS Specific if customer has only one data port
 - Use of “DAS ALL” if User has multiple data ports

• Assistance will be available to assist in scheduling if necessary



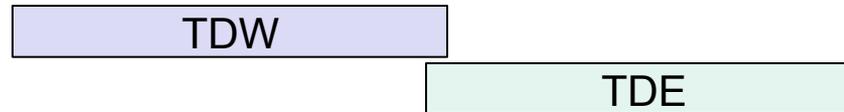
Minor change in DAS scheduling still provides on-demand support



SMLA Scheduling Constraints Continued

- **Event/Service overlap between TDRSs**

- For customers that schedule overlapping events between two TDRSs, the customer must ensure that unique interface ID's for CMD/TLM bearer data are scheduled to avoid conflict



- CMD/TLM bearer data channel conflict checking performed within SN legacy scheduling system and separately in SGSS, but not across both systems.
 - If the overlap is between two TDRSs on different systems (SN Legacy and SGSS), the SAR will not be declined
 - The team is conducting further analysis on the impact if this is inadvertently scheduled by the customer.
- The results of the survey indicated customers currently police overlaps internally

Further updates on operational scheduling will be provided at the next customer forum



Future Topics

- **Transition Plan Update**
- **USGLA/ULE Survey results**
- **More on the new Service Management Portal**
- **Additional detail on the Level 5 and 6 Plans**
 - Test Process details
 - Procedures, TRRs, Briefing Messages, Results, Discrepancy Reporting
 - ORR participation
- **SN operations interface changes**
 - Updates on operational processes
 - SN staffing streamlining drives some changes in operations contacts and responsibilities
- **Customer Training Plans**



Summary

- **During the 1-2 year test and operational transition period planned for late 2014 through late 2015, customers will be supported on both legacy SN and SGSS systems**
 - This results in some changes that will require some adjustment
 - There are some complexities during transition that result in some minor, temporary constraints with simple workarounds
 - Additional planning will be accomplished through one on one Technical Interchange Meetings with customers and future Customer Forums
- **Customer participation, especially in the first ground terminal antenna/TDRS testing is key**
- **Next customer forum will focus more on Transition and Testing**

The SGSS team will proactively work with customers to make this a successful transition



BACKUP



SMLA Survey/Questionnaire Results

- **Questionnaire results from all SN customers are provided as they relate to the following subjects :**
 - Use of SETs and amenability to using TDRS specific instead
 - Use of RR and ASARs and amenability to refrain or using SDR/SAR
 - Use of DAS ANY and amenability to using DAS specific instead
- **The list includes customers that plan to only have limited or Infrequent SN support (launch activities, once-a-month proficiency passes, etc) and will continue to rely on manual scheduling support. These include: TIMED, OCO-2, GOES-R, GEMS, NPP, LADEE, RBSP, ICESAT-2, SORCE, ELVs, THEMIS, SMAP, and LDCM**
- **The list also includes customers that do not have current expectations to use the SN during the currently planned transition period (~2015) such as LRO, WISE, GALEX, XTE, LSAT5, P3, JPSS, JWST, DesDynI, IRIS, Pegasus, and EO-1**



Survey/Questionnaire Results 1 of 3

Customer	SETS	Specific instead?	RR	SDR/SAR instead?	ASAR	Refrain from?	DAS ANY	Specific instead?	Comments/Notes
AIM	N		S	Y	N		N		
AQUA	N		N		N		N		
AURA	N		N		N		N		
TERRA	N		N		N		N		
LDBP	N		S	Y	N		Y	Y	
C/NOFS	N		N		N		N		
FERMI	N		Y	Y	N		N		
GPM	N		M	Y	N		Y	Y	
ISS	N		Y	Y	N		N		See footnote ** TIM held
ScaN	Y	Y	M	Y	Y	Y	N		
SWIFT	N		S	Y	N		Y	Y	
TRMM	Y	Y	Y	Y	N		N		
SPTR	N		Y	Y	N		Y	Y	
HST	N		Y	Y	N		N		
LSAT-7	N		S	Y	N		N		
NuSTAR	N		Y	Y	N		N		
SPM	N		N		N		N		
MMS	M	Y	M	Y	N		N		See footnote *, TIM held - Awaiting SN, decisions on scheduling methodology
NPP	N		Y	Y	N		N		1 event per week
OCO-2	N		N		N		N		Launch 7/2014 –LEOP and contingencies
RBSP	N		Y	Y	N		N		Mainly a GN customer - 1 TDRS event/month



Survey/Questionnaire Results 2 of 3

Customer	SETS	Specific instead?	RR	SDR/SAR instead?	ASAR	Refrain from?	DAS ANY	Specific instead?	Comments/Notes
ICESAT-2	N		N		N		N		Launch 3/2016 – Testing in 2014 - A GN customer - Use of TDRS in contingencies
ELVs	N		N		N		N		Per Conwell and Schwartz – these customers rely on the NOM or SN scheduler to schedule
SORCE	N		Y	Y	N		N		RR - Very infrequently – use TDRS only for contingencies/recovery and special operations
LDCM	N		N		N		N		1 event per month and emergency ops as required
EO-1	N		N		N		N		Decommissioning 2015-2016 – infrequent use of TDRS – schedule 1 event 1-3 days in advance
THEMIS	N		Y	Y	N		N		Stated RR feature not currently functional on their SNAS installation
TIMED	N		N		N		N		Rarely use TDRS – one or two hours every 2 to 3 months during attitude maneuvers
SMAP	N		N		N		N		Expect TDRS use of once per month after LEOP (first 90 days of mission)
GEMS	N		N		N		N		Expect use of TDRS for launch contingency, and proficiency only
LADEE	N		N		N		N		Launch in 07/2013 - Use of TDRS twice – once at perigee and once at LOI (both occur at L+30 days)
GOES-R	N		N		N		N		Geosync - TDRS use maybe for launch and transfer – schedule by NIMO



Survey/Questionnaire Results 3 of 3

Customer	SETS	Specific instead?	RR	SDR/SAR instead?	ASAR	Refrain from?	DAS ANY	Specific instead?	Comments/Notes
JWST	NA		NA		NA		NA		Too early to tell – compatibility tests to start 9/2016
JPSS	NA		NA		NA		NA		No decisions yet for scheduling - Testing in 2015 - Launch in 2017
IRIS	NA		NA		NA		NA		Testing 2012 – SN use over by 1/2013
P3	NA		NA		NA		NA		Mission ends prior to 2014
LRO	NA		NA		NA		NA		LRO MD stated his mission does not and has no plan to use SN resources
WISE	NA		NA		NA		NA		WISE MM states project is no longer operating
GALEX	NA		NA		NA		NA		End of mission – may be transferred to Cal Tech
XTE	NA		NA		NA		NA		EOM
LSAT-5	NA		NA		NA		NA		EOM prior to 2014
DesDynI	NA		NA		NA		NA		Launch in 2018
Pegasus	NA		NA		NA		NA		MM states mission does not use TDRS

Y	Yes, I utilize the flexibility or plan to use this flexibility
M	Mission might or don't currently but could use this flexibility
S	Seldom use this flexibility
Y	Workaround acceptable during transition

* MMS to launch summer of 2014 and is still in discussion with NASA as to allowable scheduling methodology and EEFOV use.
 ** HTV, ATV, OSC/Cygnus, Space-x/Dragon are all Visiting Vehicles (VV) under the purview of the ISS schedulers.



Keeping the universe connected.

SGSS Customer Forum:
SCaN Future Plans
Jim Schier, Chief Architect
September 18, 2012



SGSS is Phase 1...



- ...of integrating 3 networks into the SCaN Network
- SCaN “Level 0” requirements approved at Agency SMC in August 2008; PCA updated in July 2011
 - “SCaN’s objectives are:
 - “1. To develop a unified space communications and navigation network infrastructure capable of meeting both robotic and human exploration mission needs.
 - “2. To implement a networked communication and navigation infrastructure across space.
 - “4. To assure data communication protocols for space exploration missions are internationally interoperable.”

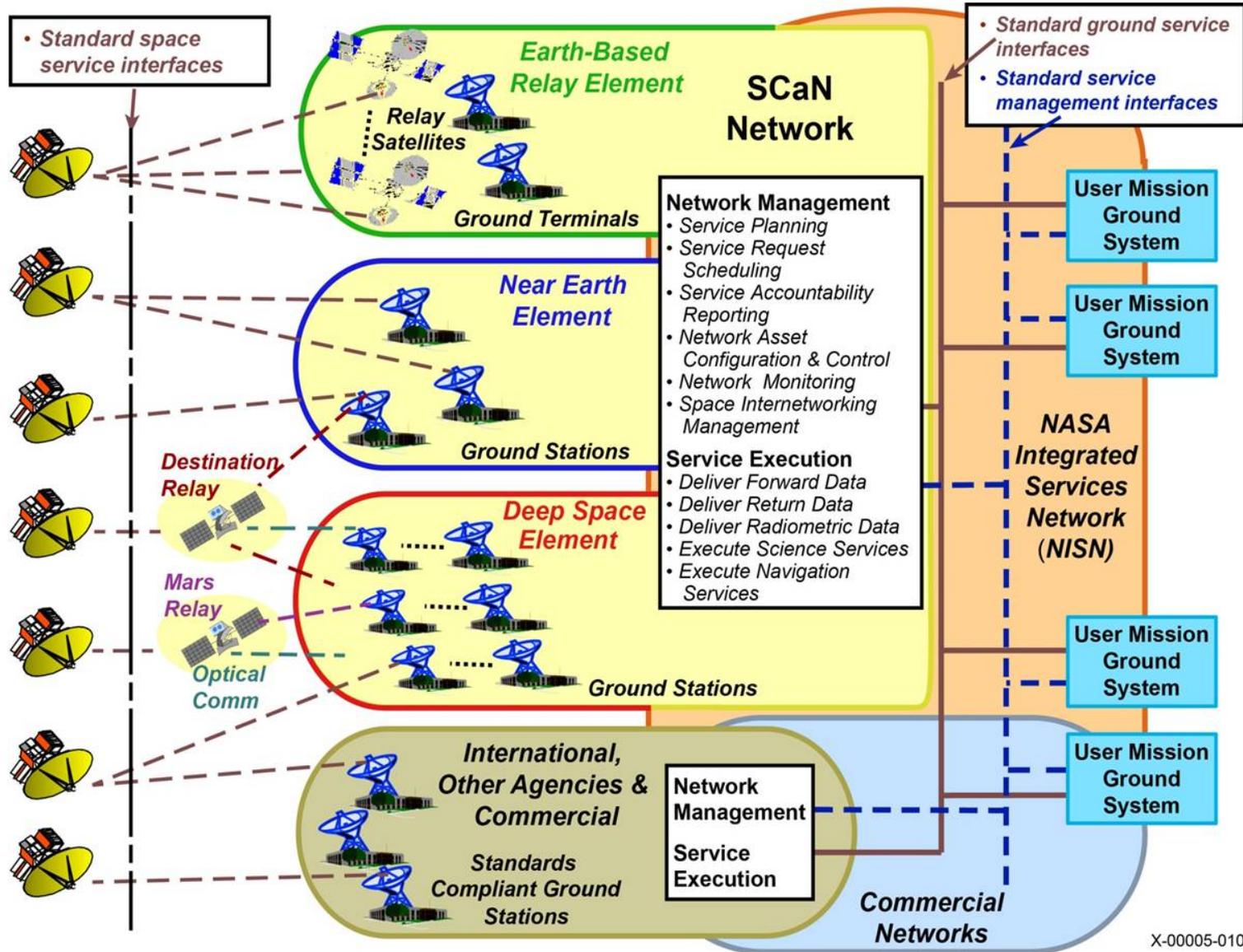


NPD 8074.1



- *Management and Utilization of NASA's Space Communication and Navigation Infrastructure (NPD 8074.1) approved & effective 11 August 2009*
 - “It is NASA's policy to maintain a single process for the development and utilization of Agency space communications and navigation (C&N) infrastructure and for the enhancement of this infrastructure to enable new capabilities for the future.
 - “NASA's Space Operations Mission Directorate shall manage the space C&N infrastructure through the Space Communications and Navigation (SCaN) Program Office, as prescribed by NPD 1000.0A, NASA Governance and Strategic Management Handbook...
 - “The SCaN Program Office shall:
 - “1) Be the Agency's central authority for designing, developing, and implementing a single unified process for the Agency's space C&N infrastructure.
 - “(2) Work with the Mission Directorates to identify future C&N requirements and resolve capability gaps.
 - “(3) Develop the space C&N capabilities in anticipation of future requirements.
 - “(6) Develop the architecture and standards necessary to enable the Agency's C&N infrastructure to be interoperable with those of other agencies and international partners.”

Phase 2 Architecture Vision





Phase 2 Architecture Features



- Externally standardized – Users see one Integrated Network
 - Single process for all missions to request services from all networks
 - Services compliant with open, international standards that can be adopted by international partners and commercial providers for global interoperability
 - Service management for scheduling and monitoring requested service
 - Ground (mission control center to ground station) and space (mission spacecraft to ground station) services for communication & tracking
- Internally integrated – Lower O&M cost & higher availability
 - Apply investment in SN Ground Segment Sustainment (SGSS) to NEN and DSN converting to digital signal processing end-to-end
 - Standardize equipment strings and processing; partially standardize antennas
 - Consolidate ground sites, vendors, network control, projects
 - Enable incremental automation for steady O&M reduction
 - Set the stage for lower next generation sustainment costs



Progress



- Established program technical baseline for Phase 1 for SN, NEN & DSN
- Completed commonality studies looking for “low hanging fruit”
 - TT&C, COOP, Mission Services Planning, Facilities, Scheduling, Metrics and Reporting
- Completed 10 of 14 architecture trade studies



Plans



- Hold Program System Requirements Review (P/SRR) to baseline Phase 2 SCaN Network requirements (May 2013)
- Hold Program SDR (P/SDR) to baseline Phase 2 SCaN Network technical approach & management plans (September 2013)
- Initiate formulation of integrated Mission Commitment Office in FY13
- Initiate network integration on completion of SGSS



Next Customer Forum



Next Customer Forum

- **Next Customer Forum will focus on:**
 - Interface Definitions
 - Closure of ICDs
 - Focused on deployment and test activities
- **Targeting 2nd quarter of 2013**



Customer Action Items

- **Plan to review and comment on the MOC ICD**
- **Periodically check the website (below) for this presentation package as well as SGSS newsletters**

Discipline	Contact	Phone
Interfaces and All Other Questions	Colleen McGraw - colleen.a.mcgraw@nasa.gov	301.286.9941
Integration and Test	Cathy Barclay – catherine.b.barclay@nasa.gov	301.286.8626
Scheduling	JP Chamoun – jean-pierre.chamoun@nasa.gov	301.286.5053

<http://esc.gsfc.nasa.gov/space-communications/sgss.html>



Acronyms

ADC	Analog to Digital Converter
Amp	Amplifier
ANT	Antenna
ATF	Australian TDRSS Facility
BPGT	Blossom Point Ground Terminal
BRTS	Bilateration Ranging Transponder System
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
COTS	Commercial Off the Shelf
CSM	Customer Service Management
DAC	Digital to Analog Converter
DAS	Demand Access Service
DSP	Digital Signal Processing
EET	End to End Test
EI	Enterprise Infrastructure
ETGT	Extended TDRSS Ground Terminal
FAR	Final Acceptance Review
FDf	Flight Dynamics Facility
FGM	Fleet and Ground Management
FTP	File Transfer Protocol
FW	Firmware
GHz	Gigahertz
GRGT	Guam Remote Ground Terminal
GSFC	Goddard Space Flight Center
GT	Ground Terminal
HMI	Human-Machine Interface
HTTP	Hypertext transfer Protocol
HW	Hardware
ICD	Interface Control Document
IF	Intermediate Frequency
IP	Internet Protocol
IRD	Interface Requirements Document
LAN	Local Area Network
M&C	Monitor and Control
MMI	Machine-Machine Interface
MOC	Mission Operations Center
MTF	Maintenance and Training Facility
NCCDS	Network Control Center Data System
NISN	NASA Integrated Services Network
PDR	Preliminary Design Review
PSNOC	Primary Space Network Operations Center
SGL	Space Ground Link
SGSS	Space Network Ground Segment Sustainment
SLE	Space Link Extension
SM	Service Management
SN	Space Network
SNAS	Space Network Access System
SNGS	Space Network Ground Segment

SNOC	Space Network Operations Center
SSC	Service Specification Code
STGT	Second TDRSS Ground Terminal
SW	Software
TCP	Transmission Control Protocol
TDRS	Tracking Data Relay Satellite
TTC	Tracking Telemetry and Command
TUT	TDRS Unscheduled Time
UDP	User Datagram Protocol
ULE	User Local Equipment
USG	User Services Gateway
VITA-49	VITA Technologies Radio Transport Standard V49
VM	Virtual Machine
WSGT	White Sands Ground Terminal
XML	Extensible Markup Language
μTCA	MicroTelecommunications Core Applications (MicroTCA)