Using a Service Oriented Approach in TSAT

GSAW 2008

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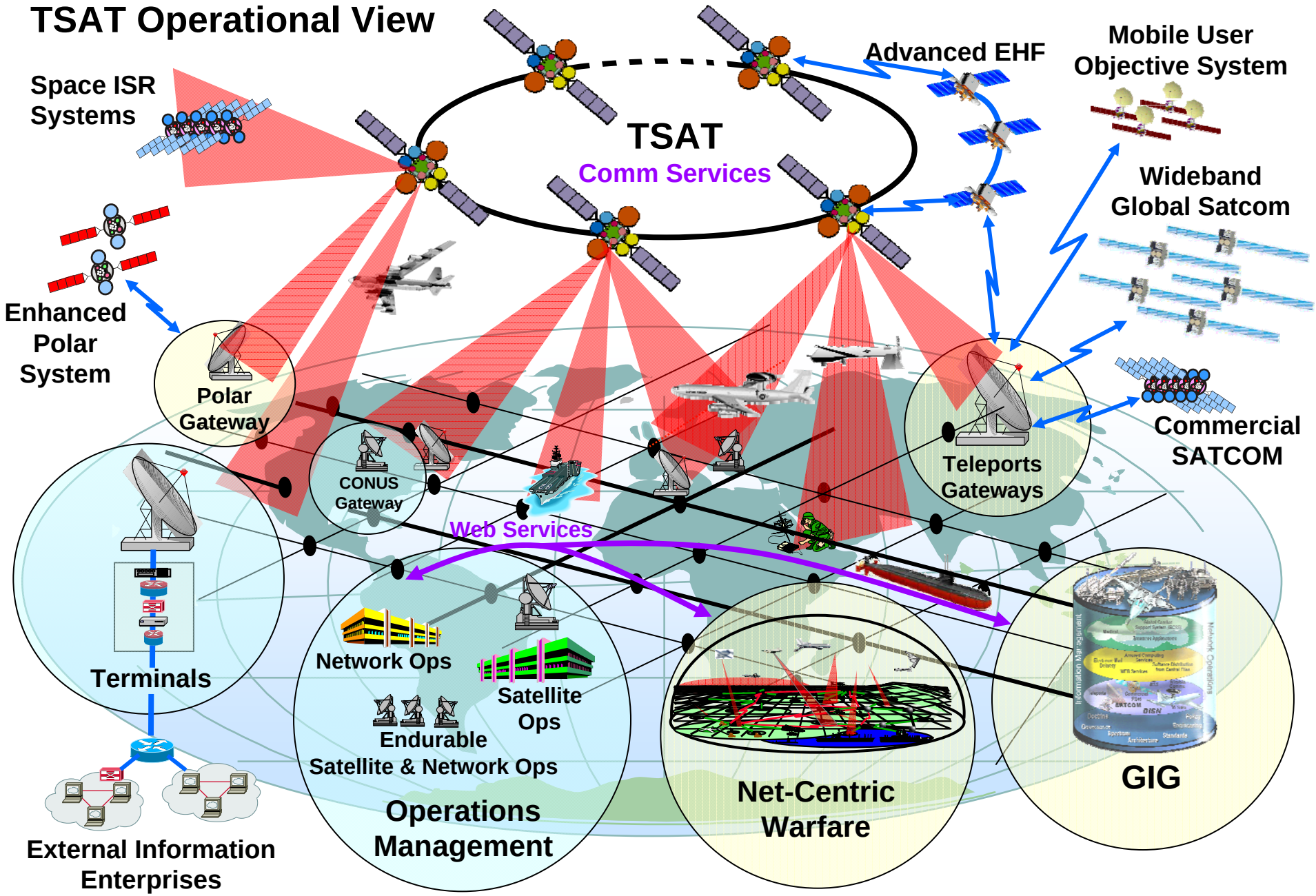
Topics

- TSAT Concept
- Service Identification
- Service Classification
- External Services
- Internal Services
- Service Definition
- The Way Forward


TSAT Operational View
Space ISR Systems
TSAT
Comm Services
Advanced EHF
Mobile User Objective System
Wideband Global Satcom
Enhanced Polar System
Polar Gateway
CONUS Gateway
Teleports Gateways
Commercial SATCOM
Web Services
Terminals
Network Ops
Satellite Ops
Endurable Satellite & Network Ops
Operations Management
Net-Centric Warfare
GIG
External Information Enterprises

Background

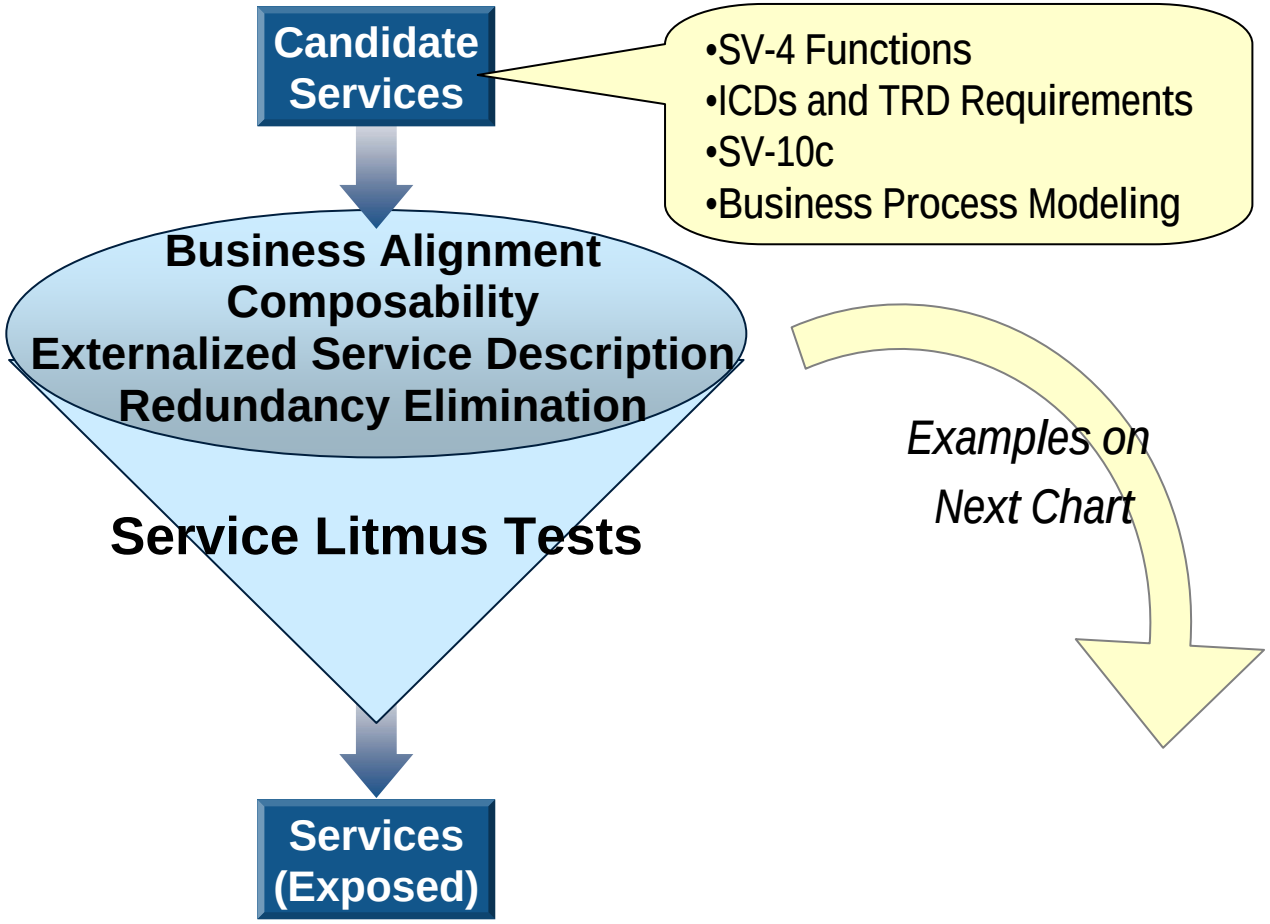
- DoD programs are required to comply with the Network Centric Operations and Warfare Reference Model (NCOW RM) and Service Oriented Architectures (SOA) (CJCSI 6212.01)
  - Applying this emerging technology, while maintaining program performance, budgets and schedules, is a challenge
- Addressing the challenge starts with realizing the concepts and principles of service orientation in the analysis and design approach
- This briefing presents three aspects of the TSAT approach to realize the service orientated approach
  - Service Identification
  - Service Classification
  - Service Definition

Service Identification

During the Service-Oriented Analysis we make service exposure decisions:
"From all the candidate services, which ones should we expose?"

- **Not all candidate services should be exposed**
- **Every implemented service has costs and risks**
- **Apply a Service Litmus Test to aid decision**

(Derived from IBM's SOMA Methodology)



Litmus Tests promote consistent, service oriented, service exposure decisions

TMOS Service Litmus Tests *(examples)*

Business Alignment

- Does the service provide a required business functionality that supports business processes and goals?
- Is the business willing to fund the service through its lifecycle: provisioning, management, governance and maintenance?
- Does the service meet the QoS attributes, for example runtime performance requirements?

Composability

- Is the service interaction stateless?
- Is the service self-contained? Can the service be deployed independently?
- Is the service's implementation technology neutral? It does not impose support of non-standard (and unknown to the consumer) protocols or devices.

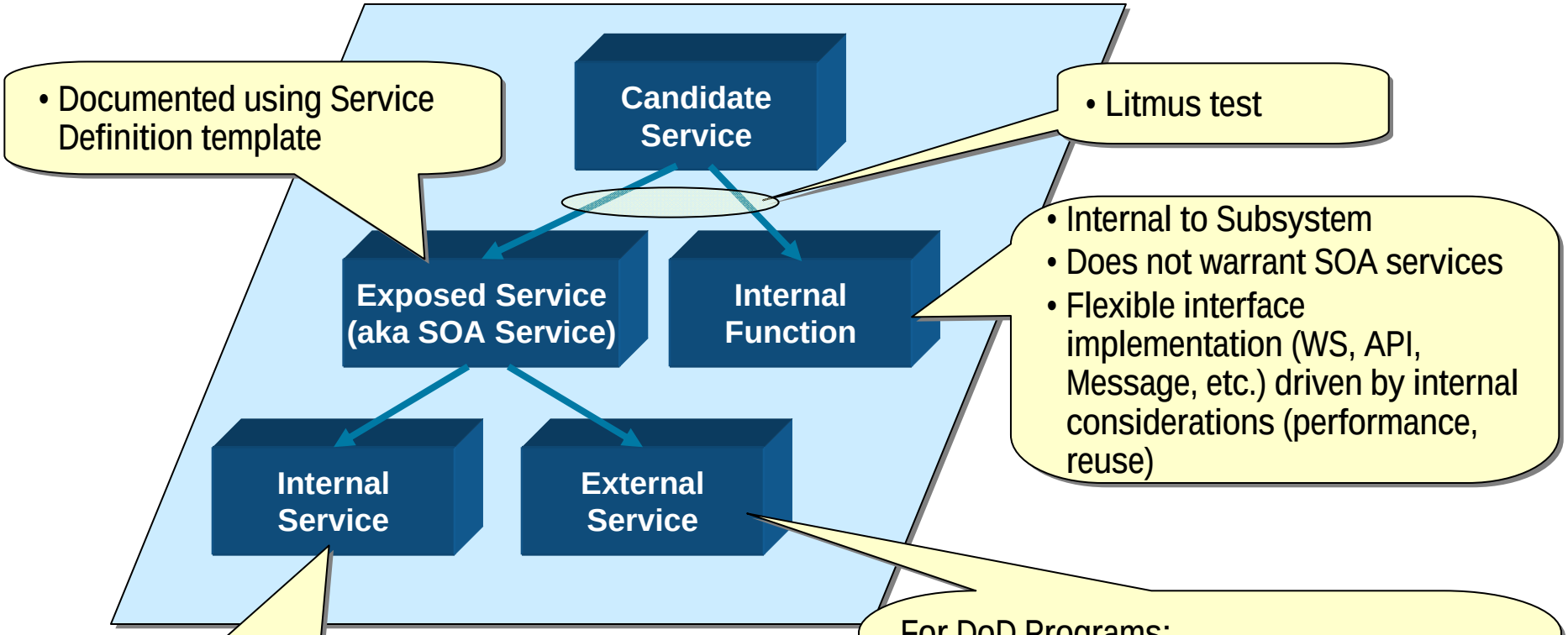
Externalized Service Description

- Does the service have a service description that is distinct and separate from the underlying physical implementation?
- Can the service be discovered and bound using the service description?
- Does the service description contain all of the information necessary to understand the message exchange between consumer and provider of a service.

Redundancy Elimination

- Can this service be used within all processes where its function is required?
- Can the service business goal be realized by other services directly?

Service Classification



- Documented using Service Definition template

- Litmus test

- Internal to Subsystem
- Does not warrant SOA services
- Flexible interface implementation (WS, API, Message, etc.) driven by internal considerations (performance, reuse)

- Exposed as services within the TSAT system, e.g. cross subsystem, exposed interfaces
- Decoupled, asynchronous interaction approaches (e.g. MOM, WS-*)

For DoD Programs:

- Exposed as SOA services on the GIG
- Must support DoD mandated standards for service definition and delivery, e.g. WSDL
- Use NCES core services

External Services

- **GIG-exposed services identified in TSAT Technical Requirements Document**
  - **Planning**
    - Submit communications services needs via Mission Service Request (MSR)
    - Receive from TSAT a Service Level Agreement (SLA)
    - Receive configuration products describing how to configure terminals to obtain those services
    - Receive and query MSR status, change notifications, SLA compliance
  - **Situational Awareness**
    - Communication planners and net managers request (or subscribe to) info on current status of TSAT, tailored to needs and authorization
    - Submit Trouble Reports and query status
- **Opportunities to identify additional external services through continuing mission analysis, ICD development, BPM, and service scenarios**
- **Governance**
  - **Service administration provided by TSAT**
  - **TSAT will utilize NCES core services for Registration, Discovery, and Security**

Internal Services

- Adopting an Enterprise Service Bus (ESB) for major internal services within the TMOS segment
  - For functions not involved in real-time communication between terminals
    - Examples: provisioning, fault management, trending
  - SOA technology well suited to identifying and managing the intra-segment interactions between major subsystems
  - TMOS contractor is refining its definition of services and its selection of SOA technology suppliers
- Intersegment interaction technology choice and candidate services deferred until Space Segment contract award

Service Definition

Services defined through a Service Description Template (SDT)

- **Used for all TMOS exposed services**
- **Provides consistent and comprehensive description of service**
  - **Based on standards and industry best practices**
    - **OASIS SOA Reference Model**
    - **TeleManagement Forum NGOSS SOA Methodology**
    - **NCID S300**
  - **Completed incrementally over the development lifecycle**
  - **Enables model driven**
    - **Interface documentation**
    - **Interface code generation**
    - **Linkage to other views, e.g. Business Process, Data Model**

TMOS SDT Content (sample)

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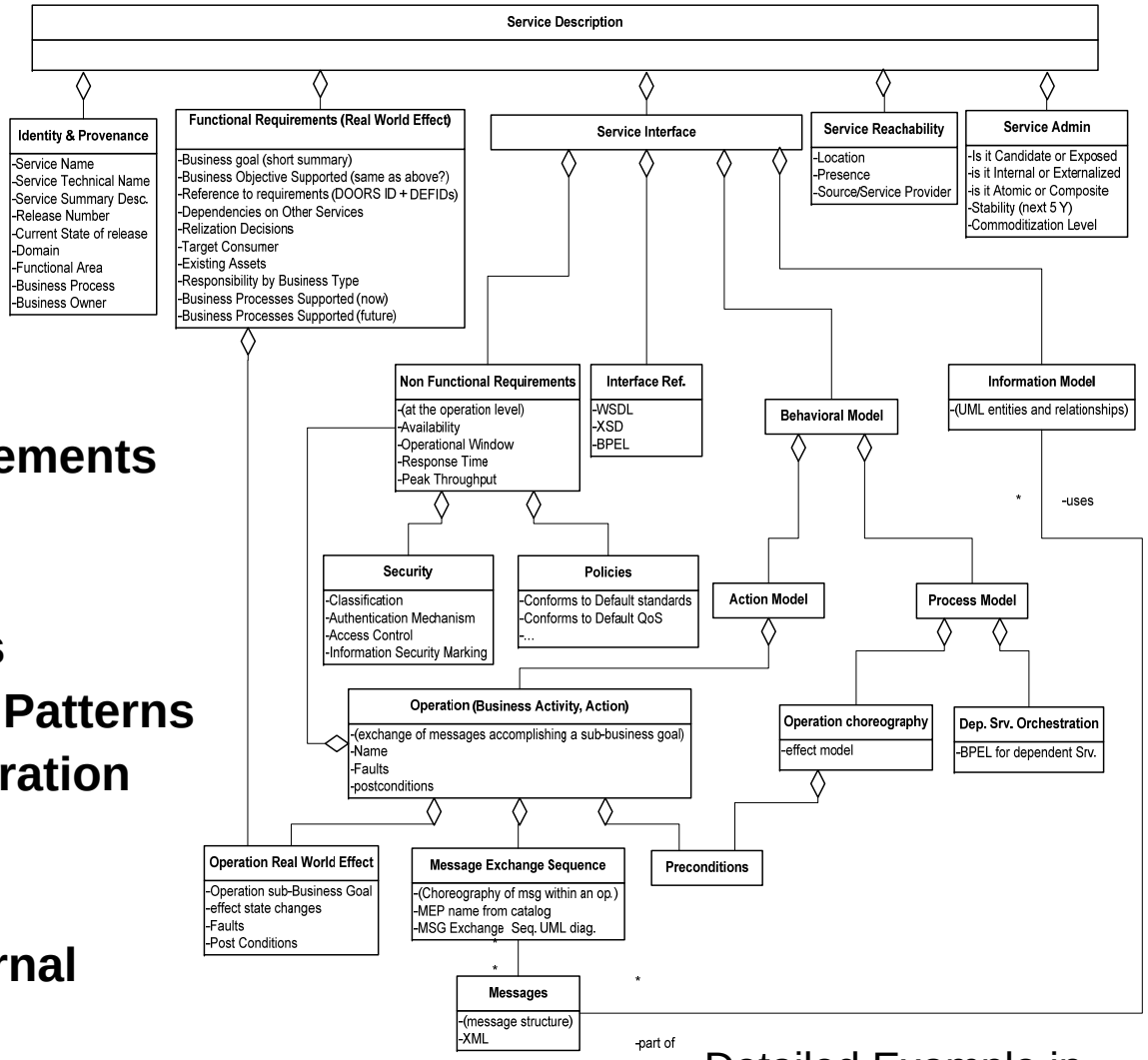
- Identity and Provenance
  - Release
  - State of Release
- Functional Requirements
  - Requirements Linked
  - Business Process
- Service Interface
  - Non Functional Requirements
    - Security, Policies
  - Operations
    - Pre/Post Conditions
    - Message Exchange Patterns
  - Choreography/Orchestration
  - Message Structure
- Service Administration
  - Exposed, External/Internal



Detailed Example in Backup Charts

The Way Forward

Evaluation and Design Underway

- Evaluate both GIG standards and vendor-specific products for SOA technology
  - Determine completeness, suitability for delivering TSAT capabilities
  - Examples: WS-* Standards, security services, DoD community of interest "vocabularies"
  - Both contractor and program office assessment and prototyping efforts are underway

- Evaluate TMOS-to-Space Segment Interfaces for Service Opportunities
  - After TSAT Space Segment Award

- Confirm proper choices of GIG-exposed SOA services, internal SOA services, and other methods for real-time communication services
  - To provide the interoperability and flexibility desired from SOA technology
  - Balanced by the efficiency and performance needed for real-time communications services

Questions?

Thank You

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Backup

Service Description Template Detailed Example

Service Description Template Details

- **Following slides**
  - **Describe elements of service description template (sample)**
  - **Provide example for each element**
- **Identify what needs to be populated at SDR, PDR, later**
  - **Rows are color coded indicating the phase when information is expected to be complete**
  - **Note that preliminary information may be entered earlier than required**

SDR	PDR	Later

i.e. downstream lifecycle activity

Identity & Provenance

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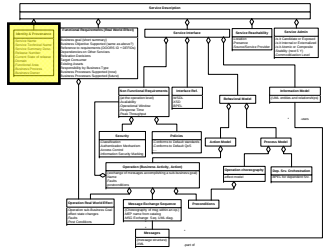
Identifies the service by name, provides various classification dimensions (such as by domain, functional area, or business process area), identifies the owner/provider of the service.

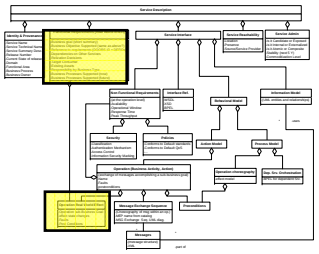


Service Description Item	Service Description Content
Service Identity & Provenance	
Service Name	Network Resource Configuration
Service Technical Name	TMOS.CMP.NetworkResourceConfiguration_svc
Service Summary Description	Support the realization of service orders in TSAT
Current Release Number	1.0 (TBD)
Current Phase of Release	Design
Prior Versions Supported	
Domain	TMOS
Functional Area	CMP
Business Owner	TMOS

SDR PDR Later

Functional Requirements

The observable and measurable effects of invoking the service, referred to as the "Real World Effect" in the OASIS RM. Functional requirements may be defined at the service level or at the service operation level. Provides traceability to requirements.

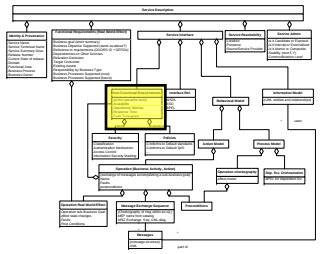


Service Description Item	Service Description Content
Service Functional Requirements	
Business Goal	Provision Network for Mission Services
Ref. to Requirements	*(Extract from DOORS or RSA)*
Dependencies on other Services	Order Management, Order Fulfillment, Network Provisioning *(Derived from Service Composition and Dependency diagram)*
Realization Decisions	New code
Target Consumer	Transformational Planning
Existing Assets	NA
Business processes supported (now)	Provision Network for Mission Services
Business processes supported (future)	NA

SDR PDR Later

Non-Functional Requirements

Specify quality of service attributes addressing how the service is to be delivered. Some QoS attributes are relevant for the entire service, others for specific service operations. Note that list identified below is not exhaustive and not all items may apply.

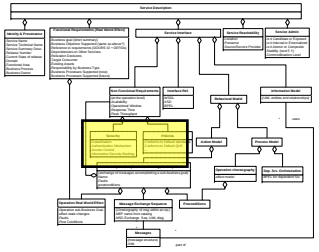


Service Description Item	Service Description Content
Service Non-Functional Requirements	
Availability	Identifies percentage of time service must be available, including scheduled maintenance (e.g., 99.99%). May also include MTBF and MTTR.
Capacity	Identifies maximum number of concurrent users of the service
Operational Window	Identifies time window when service is expected to be available (e.g., 24x7)

SDR PDR Later

Security & Policies

Specify security and other policies that affect how the service is to be delivered. Note that list identified below is not exhaustive and not all items may be applicable.

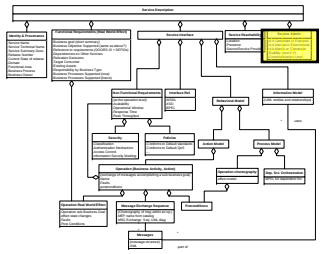


Service Description Item	Service Description Content
Service Security	
Classification	S
Service Policies	
Applicable Standards	Identifies standards that the service must comply to
Additional Policies	Any other applicable policies for the service

SDR PDR Later

Service Admin Info

Administrative information for the service (e.g., service litmus test status)



Service Description Item	Service Description Content
Service Administration Info	
Is Candidate or Exposed?	EXP
Is Externalized or Internal?	INT
Is Atomic or Composite?	*(Derive from Service Composition and Dependency*
Stability (next 5 years)	
Commoditization level	

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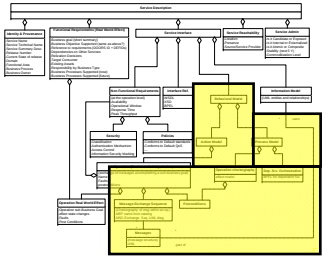
Behavioral Model

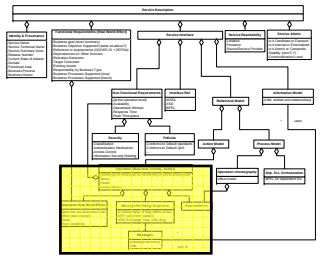
Identifies operations in the action model, and operation choreography and dependent service orchestration in the process model.



Service Description Item	Service Description Content
Action Model	
Operation 1 Name	Process Service Order
Operation 2 Name	Query Service Order
Process Model	
Operation Choreography	Service consumer submits a service order using the process service order operation. The service order may be completed in stages over an extended time. The service consumer may query the status of the service order using the Query Service Order.
Effect Model	Service Order transitions between New, Pending, Scheduled, Partial and Active states.
Dependent Process Orchestration	BPMN or BPEL diagram

Operations

Sequence of messages to accomplish a business activity, based on a Message Exchange Pattern (MEP). The message definitions are based on a common information model to promote semantic interoperability. A catalog of MEPs for TMOS will be provided.

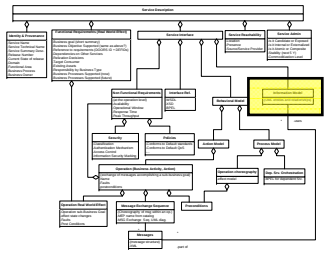


Service Description Item	Service Description Content
Operation	
Operation Name	Process Service Order
Operation Sub-Goal	Accept and validate service orders; decompose and schedule service order items; generate and distribute configuration products
Pre-Condition	CMP instantiated, TP bound to NetworkResourceConfiguration_svc
Message Exchange Sequence	Request, Response, Notification
Faults	InvalidServiceOrder, ConfigurationProdcutGenerationFailure; ElementConfiguraitonFailure
Post-conditions	Network configured as specified in the service order

SDR | PDR | Later

Information Model

Characterization of the information that is exchanged with the business service. Defined in terms of the logical data model.



Service Description Item	Service Description Content
Non-Functional Requirements	
Message Delivery	Guaranteed
Response Time	Validation and response in x sec
Peak Throughput	Y1 requests per hour, y2 requests per day
Capacity	Z pending service orders
Information Model	
Information Exchange Model	processServiceOrderRequest; processServiceOrderResponse; processServiceOrderNotification
Message 1 Data Model	TBD
Message n Data Model	…

SDR PDR Later