Convergence of Telecoms and Enterprise Management

(TeleManagement Forum & NGOSS Program Overview)

Tony Richardson
TMF Director – Strategic Liaisons
Chair – Industry Group Advisory Board
June 2003
Agenda

- What is the TeleManagement Forum?
- Motivation for NGOSS
- NGOSS Basics
- NGOSS eTOM: Business Processes
- NGOSS SID: Shared Information Data Model
- NGOSS TNA: Technology Neutral Architecture
- NGOSS: Now and the Future
- Industry Group Liaison
- Convergence Telecoms / Enterprise Management
What is TM Forum?

- Non-profit global consortium focused on Operations Support Systems (OSS) and management issues for the communications industry
  - Service providers, software and hardware suppliers, systems integrators
- Source of leadership, knowledge, technical solutions and market awareness for the industry
- 340+ members in 36 countries
- Provides a collaborative environment in which companies can address service provider’s most critical business and technical requirements
- Provides an on-line knowledgebase featuring industry information and potential solutions

The voice of the OSS industry
Create a portal which is a resource center which the industry can use as first port of call for OSS/BSS info.

Communicate

Develop proof of concept solutions to real industry problems that can subsequently be productised and sold.

Demonstrate

Create a collaborative work environment within which competitor can solve problems of mutual interest.

Collaborate

Provide the premier global OSS/BSS environment within which members can conduct business.

A Place to Do Business’

Draw direction and requirements in a market-centric fashion from key industry players.

Market Focus

Market Centers
- Mobile
- Value Chain
- Service Provider interest group

Technical Teams
Business, System & Implementation Architecture

TeleManagement World

Catalyst Showcase

TMF Central Website

TeleManagement FORUM™
What does TM Forum do?

- Provides strategic leadership and guidance on:
  - Business Process Modeling and Automation
  - Managing Next Generation Network Technologies
  - Systems Integration and Implementation
  - Service Management
  - Web-Based Customer Care (E-Care) and Customer Relationship Management (CRM)
  - Managing E-Commerce

- New Generation Operations Systems and Software (NGOSS)

- Enables collaborative, business-driven solutions based on commercially available software and industry standards
NGOSS Agenda

- Motivation for NGOSS
- NGOSS Basics
- NGOSS eTOM: Business Processes
- NGOSS SID: Shared Information Data Model
- NGOSS TNA: Technology Neutral Architecture
- NGOSS: Now and the Future
The Operational Challenges Are Growing...

The market demands that next generation systems provide....

- Rapid service development
- Real-time flow-through service delivery
- Proactive, real-time, content based, location based billing
- Web-based, customer self service
- Service level guarantees across multi-service, multi-technology, multi-provider infrastructures
- Flexible and responsive technology base
...But Yesterday’s Systems Can’t Cope

OSSs Have Become a Roadblock to Innovation
- Not a Business Tool for Competitive Success

- Systems development/integration can take too long, and is too expensive and risky
- Business Processes and Systems are:
  - Slow to evolve - unable to support new services
  - Can’t meet rapid time to market requirements
  - Can’t deliver superior customer service that determines market winners
  - Affecting companies’ bottom line
A Traditional OSS/BSS Environment

External data flow
Internal data flow
Pending data flow

NAME
System appears twice

Planned systems

Key:

Internal data flow
External data flow
Pending data flow

NAME
System appears twice

TeleManagement FORUM
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What is NGOSS?

- NGOSS is a comprehensive, integrated framework for developing, procuring and deploying operational and business support systems.

- Industry-agreed, business & systems framework to guide the implementation of process automation:
  - Defines methodologies for evolving OSS and BSS infrastructure into a lean operations approach.
  - Specifies the key characteristics of OSS/BSS (business processes, data models and integration architectures) that allow high degrees of process integration and automation.
  - Developed by major operators and suppliers worldwide.
  - Driven and managed by TM Forum.
  - Implemented as a set of programs and maps.
Architecture Migration

Legacy –
• poor integration
• stovepipe
• very inflexible

Today -
• loose integration (pair-wise service)
• proprietary
• multiple databases
• multiple user interfaces
• inflexible

Emerging -
• open
• distributed
• components
• soft workflow
• shared data
• policy enabled
NGOSS Pedigree

- Bellcore (now Telcordia) OSCA & INA Architectures
- ANSA Project
- TINA-C Architecture
- ISO / RM-ODP
- ITU-T / TMN
- TM Forum TOM (and eTOM)
- OMG MDA & UML
- HP ISM
- DMTF CIM
- EC FORM Project
Some of the Lead Players in NGOSS Development

- Motorola
- HP
- Telecom Italia
- Intelliden
- Agilent Technologies
- Metasolv Software
- Alcatel
- Cisco Systems
- Telcordia Technologies

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Hitchhiker’s Guide to NGOSS

- **Framework**
  - Supports multiple viewpoints
- **Architecture**
  - Technology-neutral framework
  - Technology-specific implementations defined
- **Methodology**
  - Combination of policy and process management
  - Shared information and data models
- **Interoperability**
  - Contract and component-based
- **Communication**
  - Distributed networking and computing services
- **Compliance**
  - Testable and provable
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A Brief History of eTOM

- 1999: stabilization of TOM
- 2000 - 2001: evolution of TOM towards eTOM
- May 2001: eTOM v1.0 for TMF Members Evaluation
- Oct 2001: eTOM v2.0 for TMF Members Evaluation
- Jan 2002: eTOM v2.5 for Public Evaluation
- May 2002: eTOM v3.0 is TMF Approved
- July 2002: Addendum to core eTOM released to Members
- Dec 2002: Status update on work in progress to Members

- June 2003: release of eTOM v3.5 (extends v3.0 with further process decompositions and selected flows) for TMF Member Evaluation
The Operations area

Operations

Operations Support & Readiness

Customer Relationship Management

CRM Support & Readiness

Service Management & Operations

SM&O Support & Readiness

Service Configuration & Activation

Service Problem Management

Service Quality Management

Service & Specific Instance Rating

Resource Management & Operations

RM&O Support & Readiness

Resource Provisioning

Resource Trouble Management

Resource Performance Management

Resource Data Collection & Processing

Supplier/Partner Relationship Management

S/PRM Support & Readiness

S/P Buying

S/P Purchase Order Management

S/P Problem Reporting & Management

S/P Performance Management

S/P Settlements & Billing Management

Supplier/Partner Interface Management

Fulfillment

Selling

Marketing Fulfillment Response

Order Handling

Retention & Loyalty

Assurance

Problem Handling

Customer QoS / SLA Management

Billing & Collections Management

Billing

Billing & Collections Management

Customer Interface Management

Resource Data Collection & Processing
Process Decompositions

Level 2: Order Handling

Level 3:
- Preorder Feasibility Determination
  - Receive Pre-Order Feasibility Request
  - Issue Pre-Order Feasibility Study
- Credit Authorization
  - Credit Investigation Determination
  - Obtain Appropriate Approvals
  - Advise and Negotiate Acceptable Terms
- Order Issuance
  - Order Request Validation
    - Order Plan Development
    - Order Creation
  - Order Amendment
  - Order Cancellation
- Order Tracking and Status
  - Status Establishment and Management
    - Status Report
    - Customer Jeopardy Notification
    - Committed Date Re-negotiation with Customer
- Order Completion
  - Manage Customer changes to Agreement
  - Test solution and demonstrate to customer
  - Confirm Order Completion with Customer
  - Train the customer
  - Validate info for Assurance and Billing
  - Report unmet commitments or capabilities
- Customer Satisfaction Validation
  - Confirm Customer Value delivery
  - Billing Satisfaction Validation
  - Follow up on optimal Customer Utilisation
Example Ordering (Fulfillment) Flow

1. **Customer Request received**
   - Customer orders SP offering

2. **Customer Interface Management**
   - Customer Order confirmed
   - Priority Advised requested

3. **Retention & Loyalty**
   - Design Confirmation by Customer Engineering Requested
   - Design Accepted by Customer
   - Completion Advised to Customer

4. **Order Handling**
   - Design Requested
   - Service Completed
   - Service Status
   - Order Update
   - Service Activated

5. **Service Configuration & Activation**
   - Service Order Initiated
   - Service Activated

6. **Service Details for Billing**
   - External Supplier Selection Required

7. **Resource Provisioning & Allocation to Service Instance**
   - Capacity Requested
   - Capacity Reserved

8. **Customer Order Initiated**
   - Design Requested
   - Design Completed
   - Resource Provisioning Requested
   - Resource Provisioning Completed
   - Resource Activated

9. **S/P Buying**
   - External Component Requested
   - S/P Purchase Order Management
Modelling B2B in the context of eTOM

B2B Environment
The Path Ahead: Potential eTOM Applications

- The list below shows many (although not all) the ways in which eTOM can be applied by SPs, vendors, integrators, etc.

- Guiding the design of new Processes, Mapping existing processes, Identifying and analyzing costs of business processes, Enterprise-level analysis of new business initiatives, Communicating Team and Individual accountabilities for projects, Analyzing and comparing project proposals for potential overlap, Framing tactical IT Architectures, Identifying gaps in existing Function Libraries, Assessing Workgroup preparedness for Solution Design, Rationalizing Workgroup roles, Evaluating proposed processes for completeness (checklist), Identifying other processes in an Enterprise, associated with a particular process (context), As an outline for documenting problem scope and requirements, Develop a consolidated view of end-to-end processes, Modeling the structure of Workgroups and Channels, Document Requirements so that they will be accurately understood by Vendors and Partners, A structure for Activity Based Costing elements, OSS development (e.g. in areas like Products, Services and Resources), OSS marketing and sales to identify areas of functionality, OSS partnership, to identify respective areas of functionality

- Many companies have already provided input on their own use of eTOM both internally and externally with Customers. Suppliers and Partners...
### Some eTOM Users...

<table>
<thead>
<tr>
<th>Company</th>
<th>Analysis and Competing</th>
<th>Assessing Workgroup</th>
<th>Assessing Workgroup</th>
<th>Managing existing processes</th>
<th>Patenting the business</th>
<th>Mapping existing processes</th>
<th>QoS development</th>
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- NGOSS: Now and the Future
NGOSS – New Generation OSS

Supporting Tools

Systems Analysis & Design

Shared Information & Data Model (SID)

Business Process Map (eTOM)

Business Process Analysis & Design

Contract Interface & Neutral Architecture

Solution Design & Integration

Compliance Tests

Conformance Testing & Deployment

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SID – Artifacts
Example of the Evolving SID Framework

Resource Domain – Level 2

- Resource
  - Network
  - PhysicalResource
  - LogicalResource
- Resource Topology
  - NetworkTopology
  - PhysicalTopology
  - LogicalTopology
- Resource Specification
  - PhysicalResource
  - LogicalResource
  - Network
- Resource Configuration
  - PhysicalConfig
  - LogicalConfig
  - NetworkConfig
- Resource Usage
  - NetworkUsage
  - PhysicalUsage
  - LogicalUsage
- Resource Performance
  - ResourceStatistics
  - ResourcePerformance
  - NetworkPerformance
- Resource Trouble
  - ResourceFault
  - ResourceAlarm
  - ResourceOutage
  - NetworkFault
  - NetworkAlarm
  - NetworkOutage
## SID – Aggregate Business Entities (ABE)

| Description | The Customer ABE is the focus component for customer data and the associated data manipulation services. Customer data is the enterprise’s knowledge of the customer, their accounts and those services to which they subscribe. It also contains all customer/provider/operator agreements and negotiations. |
| Business Entity Name | Customer |
| Contracts | Create customer  
Delete customer  
Search for customer by attributes  
Read customer attributes  
Change customer attributes |
Resource Overview

EntitySpecification \( \rightarrow \) ManagedEntity

ResourceSpecification \( \rightarrow \) Resource

PhysicalResourceSpecification \( \rightarrow \) LogicalResourceSpecification

LogicalResource \( \rightarrow \) LogicalResource

LogicalResource \( \rightarrow \) PhysicalResource

Collection \( \rightarrow \) ReplacementSet

lResSpecBindsToPResSpec \( \rightarrow \) specifiesLogicalResource

pResourceSupportsLResource \( \rightarrow \) replacedBy

specifiesResource

specifiesManagedEntity

specifiesPhysicalResource

collectedEntities

replacedBy
SID Framework – Aligned with eTOM

- Strategy, Infrastructure & Product
  - Market/Sales
  - Product
  - Customer

- Operations

- Service

- Resource

- Supplier/Partner

- Enterprise

- Common Business Entities
Business to System: SID Model Interactions

SID Model captures business and system information.
## SID/eTOM Mapping

<table>
<thead>
<tr>
<th>Domain Name</th>
<th>Product</th>
<th>eTOM Process Groupings</th>
<th>Primary eTOM Level-2 Processes</th>
<th>Secondary eTOM Level-2 Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ABE-3</strong></td>
<td>Product-Offering† Represents tangible and intangible goods and services made available for a certain price to the market in the form of product catalogs. This ABE is also responsible for targeting market segments based on the appropriate market strategy.</td>
<td>CRM: F</td>
<td>Selling†</td>
<td>Marketing, Fulfillment, Response†</td>
</tr>
<tr>
<td><strong>ABE-4</strong></td>
<td>Product† Represents an instance of a product offering subscribed to by a party, such as a customer, the place where the product is in use, as well as configuration characteristics, such as assigned telephone numbers and internet addresses. The Product ABE also tracks the services and/or resources through which the product is realized.</td>
<td>SM&amp;O: F</td>
<td>Service Configuration &amp; Activation†</td>
<td>Selling†, Order Handling†, Problem Handling†</td>
</tr>
<tr>
<td><strong>ABE-5</strong></td>
<td>Product-Usage-Statistics† Represents usage trends of products associated with various demographics, such as market segment.</td>
<td>SM&amp;O: A</td>
<td>Service Quality Analysis, Action &amp; Reporting†</td>
<td>Product: Development &amp; Retirement†, Problem Handling†, Customer: QoS/SLA Management†</td>
</tr>
</tbody>
</table>
SID and the Industry

- SID is a federation of models, not “home-grown”
  - Material mined from company contributions as well as DEN-ng, ITU, IETF and DMTF
- SID is already being used by
  - Vendors (e.g., MetaSolv and Intelliden)
  - Service Providers (e.g., BT and Telstra)
  - TM Forum Catalyst Projects
  - OSS/J Core Business Entity Model
- SID is being considered for use in
  - T1M1 Global Telecom Data Dictionary (GTDD)
  - OMG Telecom Domain Task Force (DTF)
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NGOSS Technology Neutral Architecture:

- OSS Applications
- Components, Services, and Contracts
- Distribution and Transparency Services
- MetaModel
- Behavior and Control - Policy Model
- Security
NGOSS Architectural Concepts

Component

Contains one or more

Service

Contains two or more

Contract

Is realized by (0 or more)

Contract Instance

Unit of Deployment and Manageability

Unit of Manageability

Unit of Functionality within Service

Unit of Binding
What is a Contract ...

- A description of functionality to be provided in terms of:
  - The metadata used to describe the interface
  - The metadata used to describe the operations that may be invoked on the Service
  - For each operation, the set of terminations that may be returned by the Service after invocation of the operation

- The behavior of the functionality, some of the behavior that may be specified are:
  - The pre-conditions under which an operation may be invoked (i.e., the set of conditions that must be satisfied in order to invoke the operation)
  - The post-conditions, which define the state that the system is left in for each termination that can be returned when an operation is invoked
Diagram notes:

(1) The entities with no fill color and/or black lines are not addressed by the NGOSS Architecture at this time.
NGOSS Contract

Tech. Neutral Part

Tech. Specific Part

Activation Part

Definition Part

Implement Part

Contract Identifier
Specifier Reference
Contract Description
Arguments
Preconditions
Postconditions
Exceptions
Vendor Info, Name, Version
Technology
Implementation Notes
Implementation Dependencies
Access
Security
Characteristic Attributes
Environmental Attributes

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NGOSS Distribution and Transparency Services Model

Data → Access to other domains

Basic Framework Services ← OSS Apps & Framework Svcs

Client
Distribution and Transparency Services Model

- Derived Repository
- Repository
- Federated Foreign Repository
- Naming Services
- Service Location Services
- Registration Services
- Other NGOSS Supporting Services (e.g. Logging, Transaction)
- Users
- Specifiers, Designers/Devel., & Admin.

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Why do we need an NGOSS Metamodel?

- The NGOSS Metamodel serves as the foundation to the entire series of NGOSS Technology Neutral Architecture Specifications.
- It provides the definitions and UML derived models of fundamental NGOSS concepts:
  - Identifier
  - ExtensibleElement
  - Component
  - Contract
    - Interaction
    - Invocation
    - Termination
  - NGOSSPolicy
  - ...

TeleManagement® FORUM™
Extending the UML Metamodel
Motivation for NGOSS

NGOSS Basics

NGOSS eTOM: Business Processes

NGOSS SID: Shared Information Data Model

NGOSS TNA: Technology Neutral Architecture

NGOSS: Now and the Future
Business Cases: Industry Stakeholders

**OSS User** (Eg. Communications Service Provider)
Faster Business Solutions / Time to Market, Greater Range of Business Services, Less Development / More Re-Use, More Buy / Less Make of OSS Solutions

**OSS Systems Vendor**
More Re-Use of System Solutions / Less Customised Development, Multi-Customer Product Packaging, Reduced Product Portfolio / Maintenance Costs

**OSS Systems Integrator**
More Complete Business Solutions, Faster Integration, More Predictable Integration Approaches / Costs (via Framework)

**Network Equipment Vendor**
Increased up-take of network technology for new services
What Documentation is Available Now?

- GB 921 - eTOM v3.0
- GB 922 and Addendums - SID Phase II
- TMF 050 - Compliance Testing Technical Spec
- TMF 055-057 - Technology Specific Application Notes (CORBA, J2EE, XML/SOAP/UDDI, J2SE and JINI) (need updating; these reflect older version of NGOSS)
- TMF 083x - NGOSS Catalyst Projects
What Documentation is Available Now?

- TMF 053 - Technology Neutral Architecture Series (V3.0):
  - TMF 053: NGOSS Technology Neutral Architecture
  - TMF 053a: Glossary
  - TMF 053b: Contract Specification
  - TMF 053c: Behavior and Control Services
  - TMF 053d: NGOSS Metamodel
  - TMF 053s: Security Framework
What Documentation Will Be Available? (Mid-Summer)

- TMF 053 - Technology Neutral Architecture Series (V3.5):
  - TMF 053f: Distribution and Transparency Services
  - TMF 053m: Process Management
  - TMF 053n: Naming
  - TMF 053p: Policy Management
  - TMF 053u: Use Cases
# NGOSS Release 3

<table>
<thead>
<tr>
<th>NGOSS Element:</th>
<th>Business Process Map - eTOM</th>
<th>Shared Data Model -- SIM/SID</th>
<th>Integration Framework -- TNA, Contract Interface</th>
<th>Conformance -- Compliance Tests</th>
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<td>Document Family:</td>
<td>GB921 GB921 addendum</td>
<td>GB914 GB922 GB922 addenda</td>
<td>TMF 052 TMF 053 TMF 053 addenda</td>
<td>TMF 050 TMF 050 addendum</td>
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<td>Near Term Deliverables</td>
<td>Selected detailed process decompositions</td>
<td>Additional GB922 addenda</td>
<td>Additional addenda TMF 053 F, M, P</td>
<td>Updates and additions to TMF 050,050a</td>
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NGOSS – Integrated “Viewpoints”

- Systems Analysis & Design
- Shared Information & Data Model (SID)
- Business Process Map (eTOM)
- Compliance Tests
- Conformance Testing & Deployment
- Solution Design & Integration
- Contract Interface & Neutral Architecture
- Business Process Analysis & Design
- NGOSS Supporting Tools
TM Forum Working in Cooperation with Other Industry Groups
Industry Group Liaison – Why?

- Principal focus of TM Forum work = OSS for Comms. Industry. But this has wide scope: Business Processes, Systems Framework, Info. Modelling, etc.

- Increased Convergence with the work of other Industry Groups

- TM Forum wants:
  - Cost-effective solutions that receive wide industry support
  - Reduced industry duplication and confusion

- Hence TM Forum must:
  - Build upon work of other Industry Groups – where applicable
  - Influence the work of other Industry groups – where necessary

- Objectives achieved through Liaison Programme
TM Forum - Liaison Program

- Business Relationship – Liaison Agreement
- Technical Detail – Work Register

Example Liaison Areas:
- Management (DMTF, T1M1)
- Network Technology (MSF, OIF)
- Internet (IETF, IPDR.org)
- System (OSS/J, Open Group)
- eBusiness (UN/CFACT – ebXML, RosettaNet)
- Mobility (3GPP, OMA)
- “Standards Bodies” (ITU-T, ATIS, ETSI, TTC)
Liaison Partnership in Action

Examples of co-operative work:

- Input into 3GPP Releases 5&6
- Wireless Services Measurements - Key Performance Indicators
- Involvement in Catalyst projects
- Information model input into SID, use of eTOM
- Convergence of Telecoms / Enterprise Management
- Convergence of Information Models (SID / CIM)
- Membership swap
- Joint development of SLA / QoS Handbook
- Membership swap
- Extensions to UML MetaModel
- MDA / NGOSS – White paper
Telecoms / Enterprise Convergence

Why?

- Services increasing involve integration of Telecom / Enterprise technologies (Eg VoIP, Multi-Media)

- Increased need to manage services to customers through multiple Service Level Agreements (SLAs)
  - SLA jeopardised equally by failure of Telecom / Network resource (eg SDH cross-connect) as by failure of Enterprise / IT resource (eg computer)

- Hence need to manage the complete Telecoms / Enterprise environment in a more integrated fashion
TMF / DMTF Information Models
(CIM and SID)

Similarities:
- Broad-reaching, technology-neutral, object-oriented model
- Describes Service, Network, Resource, Policy (albeit differently)
- “Federates” information from multiple sources (ITU-T, vendors etc)

Differences:
- Scope
  - SID = Telecoms, NGOSS / Multiple “Viewpoints”
  - CIM = Enterprise / IT, Comprehensive Information Model
- MetaModel / Standards
  - SID = Full UML + extensions, ODP, Rational Rose + HTML
  - CIM = MoF, UML / Visio, Web (SOAP, XML etc)
- Start Dates
  - SID = 2 years
  - CIM = 8 years
  (Different tool sets / techniques available)
Deliverables

- TMF analysis of CIM from SID perspective (June 2002) (Used in potential harvesting of CIM information into SID)

- TMF / DMTF Joint Industry Positioning Statement (June 2003) on Telecoms / Enterprise Management Convergence
More Details:

- eTOM
- SID / UML Models
- TNA - Contract Definition etc
- NGOSS MetaModel
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Thanks for Listening!!

Questions?
eTOM: the Big Picture

Customer

Strategy, Infrastructure & Product
- Strategy & Commit
- Infrastructure Lifecycle Management
- Product Lifecycle Management
- Marketing & Offer Management
- Service Development & Management
- Resource Development and Management (Application, Computing and Network)
- Supply Chain Development and Management

Operations
- Operations Support and Readiness
  - Customer Relationship Management
- Fulfillment
  - Service Management & Operations
- Assurance
  - Resource Management & Operations (Application, Computing and Network)
- Billing
  - Supplier/Partner Relationship Management

Enterprise Management
- Strategic & Enterprise Planning
- Brand Management, Market Research & Advertising
- Stakeholder & External Relations Management
- Disaster Recovery, Security & Fraud Management
- Financial & Asset Management
- Human Resources Management
- Research & Development, Technology Acquisition
- Enterprise Quality Mgt., Process & IT Planning & Architecture
The Operations area

“FAB” remains the core of the Operations area

Operations Support & Readiness is separated from FAB

“OPS” also supports functional process groupings shown as horizontal layers
“SIP” encompasses strategy and lifecycle management processes in support of operations
- Strategy & Commit
- Infrastructure Lifecycle Management
- Product Lifecycle Management

“SIP” also has functional groupings, aligned with those in “OPS”
The Enterprise Management area

Enterprise Management

- Strategic & Enterprise Planning
- Financial & Asset Management
- Brand Management, Market Research & Advertising
- Human Resources Management
- Stakeholder & External Relations Management
- Research & Development, Technology Acquisition
- Disaster Recovery, Security & Fraud Management
- Enterprise Quality Management, Process & IT Planning & Architecture
**Operations**

All operations processes that support the customer operations and management, as well those that enable direct customer operations with the customer. These processes include both day-to-day, and operations support and readiness processes.

**Fulfillment:** provides customers with their requested products in a timely and correct manner

**Assurance:** executes proactive and reactive maintenance activities to ensure service to customers

**Billing:** produces timely and accurate bills, processes and collects payments, and handles billing enquiries.

**Operations Support & Readiness:** supports the "FAB" processes. In general, the processes are concerned with activities that are less "real-time" than those in FAB, and which are typically concerned less with individual customers and services and more with groups of these.
Customer Relationship Management: handles customers' needs, including the acquisition, enhancement, and retention of a relationship with a customer.

Service Management & Operations: handles services (Access, Connectivity, Content, etc.), and the provision of communications and information services required by or proposed to customers.

Resource Management & Operations: handles resources (application, computing, and network infrastructures), utilized to deliver and support services required by or proposed to customers.

Supplier/Partner Relationship Management: supports the core operational processes through interaction with external suppliers and/or partners. These processes align closely with a supplier’s or partner’s Customer Relationship Management processes.
The Operations area

“FAB” remains the core of the Operations area

Operations Support & Readiness is separated from FAB

“OPS” also supports functional process groupings shown as horizontal layers
The Operations area

Operations

Operations Support & Readiness
Customer Relationship Management
- CRM Support & Readiness
- Selling
- Order Handling
- Problem Handling
- Customer QoS / SLA Management
- Billing & Collections Management
- Customer Interface Management
- Retention & Loyalty

Service Management & Operations
- Service Configuration & Activation
- Service Problem Management
- Service Quality Management
- Service & Specific Instance Rating
- SM&O Support & Readiness

Resource Management & Operations
- Resource Provisioning
- Resource Trouble Management
- Resource Performance Management
- Resource Data Collection & Processing
- RM&O Support & Readiness

Supplier/Partner Relationship Management
- S/P Buying
- S/P Purchase Order Management
- S/P Problem Reporting & Management
- S/P Performance Management
- S/P Settlements & Billing Management
- S/PRM Support & Readiness
- Supplier/Partner Interface Management
Ref: GB921 v3.0 Operations area

Operations

Operations Support & Readiness

Fulfillment

Assurance

Billing

Customer Relationship Management

CRM Operations Support & Process Management
CRM Operations Readiness

Sales & Channel Management

Fulfillment & Activation

Problem Handling

Customer Interface Management

Retention & Loyalty

Service Management & Operations

SM&O Support & Process Management
Service Management & Operations Readiness

Service Configuration & Activation

Service Problem Management

Service Quality Analysis, Action & Reporting

Service & Specific Instance Rating

Resource Management & Operations

RM&O Support & Process Management
Resource Management & Operations Readiness

Resource Provisioning & Allocation to Service Instance

Resource Problem Management

Resource Quality Analysis, Action & Reporting

Resource Data Collection, Analysis & Control

Supplier/Partner Relationship Management

S/PRM Operations Support & Process Management
S/P Relationship Management Operations Readiness

S/P Buying

S/P Purchase Order Management

S/P Problem Reporting & Management

S/P Performance Management

S/P Settlements & Billing Management

Supplier/Partner Interface Management
The Operations area

“FAB” remains the core of the Operations area

Operations Support & Readiness is separated from FAB

“OPS” also supports functional process groupings shown as horizontal layers
OPS-FAB

Operations

Operations Support & Readiness

Customer Relationship Management

CRM Support & Readiness

Fulfillment

Service Management & Operations

SM&O Support & Readiness

Service Configuration & Activation

Service Problem Management

Service Quality Management

Service & Specific Instance Rating

Assurance

Resource Management & Operations

RM&O Support & Readiness

Resource Provisioning

Resource Trouble Management

Resource Performance Management

Resource Data Collection & Processing

Billing

Supplier/Partner Relationship Management

S/PRM Support & Readiness

S/P Buying

S/P Problem Reporting & Management

S/P Settlements & Billing Management

Supplier/Partner Interface Management

S/P Purchase Order Management

S/P Performance Management

Retention & Loyalty
eTOM “Level 0 view of Level 1”

Customer

Strategy, Infrastructure & Product
- Strategy & Commit
- Marketing & Offer Management
- Service Development & Management
- Resource Development & Management
  (Application, Computing and Network)
- Supply Chain Development & Management

Operations
- Fulfillment
- Assurance
- Billing
  - Customer Relationship Management
  - Service Management & Operations
  - Resource Management & Operations
  - Supplier/Partner Relationship Management

Enterprise Management
- Strategic & Enterprise Planning
- Brand Management, Market Research & Advertising
- Financial & Asset Management
- Human Resources Management
- Stakeholder & External Relations Management
- Research & Development, Technology Acquisition
- Disaster Recovery, Security & Fraud Management
- Enterprise Quality Management, Process & IT Planning & Architecture
Marketing & Offer Management: focuses on running and developing the Core Business for an ICSP Enterprise; including defining strategies, developing new products, managing existing products and implementing marketing and offering strategies.

Service Development & Management: plans, develops and delivers services to the Operations domain; including defining strategies for service creation and design, assessing service performance, and anticipating future service demand.

Resource Development & Management: plans, develops and delivers the resources needed to support services and products to the Operations domain; including defining strategies for development of network and other resources, interworking of new and existing technologies, assessing resource performance, and anticipating resource needs for future service demand.

Supply Chain Development & Management: focuses on the external interactions required with the supply chain to ensure that the best suppliers and partners are chosen; including support for sourcing decisions made by the enterprise, and ensuring that contribution of suppliers and partners to the supply chain is timely and to the required performance.
Strategy & Commit: generates strategies in support of the Infrastructure and Product Lifecycle processes. It is also responsible for establishing business commitment within the enterprise to support these strategies.

Infrastructure Lifecycle Management: defines, plans and implements all necessary infrastructures (application, computing and network), as well as all other support infrastructures and business capabilities (operations centers, architectures, etc.).

Product Lifecycle Management: defines, plans, designs and implements all products in the enterprise’s portfolio.
The Enterprise Management Hierarchy

Enterprise Management

- Strategic & Enterprise Planning
- Financial & Asset Management
- Brand Management, Market Research & Advertising
- Human Resources Management
- Stakeholder & External Relations Management
- Research & Development, Technology Acquisition
- Enterprise Quality Management, Process & IT Planning & Architecture
- Disaster Recovery, Security & Fraud Management

- Group Enterprise Management
- Business Development
- Enterprise Architecture Planning
- Brand Management
- Financial Management
- Market Research & Analysis
- Procurement Management
- Real Estate Management
- Advertising
- Workforce Strategy
- HR Policies & Practices
- Workforce Development
- Employee & Labor Relations Management
- PR & Community Relations Management
- Regulatory Management
- Shareholder Relations Management
- Technology Acquisition
- Knowledge Management
- Research & Development
- Process Architecture Management & Support
- Information Systems Strategy & Planning
- Enterprise Quality Management
- Security Management
- Fraud Management
- Sustainability Management
eTOM in a B2B Context

Customer

Operations
- Customer Relationship Management
- Service Management & Operations
- Resource Management & Operations
- Supplier/Partner Relationship Management

Operations Support & Readiness
- Fulfillment
- Assurance
- Billing

Strategy & Commit
- Infrastructure Lifecycle Mgmt
- Product Lifecycle Mgmt

Marketing and Offer Management
- Service Development & Management
- Resource Development & Management
- Supply Chain Development & Management

Infrastructure Lifecycle Mgmt
Product Lifecycle Mgmt

Business Management
- Strategy, Infrastructure & Product
- Enterprise Management

B2B Environment

Sell Side

Buy Side

Strategic & Enterprise Planning
Brand Management, Market Research & Advertising
Enterprise Quality Mgmt, Process & IT Planning & Architecture
Research & Development & Technology Acquisition

Financial & Asset Management
Stakeholder & External Relations Management
Human Resource Management
Disaster Recovery Security & Fraud Management

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TMN Layers correspond with TOM horizontals

TOM processes are captured in “FAB” area of eTOM Operations

eTOM maps the NGOSS Business View
Party – Basic Model

**Party**

- **Organization**
- **Individual**
- **ValueNetworkRole**
- **Employee**
  - **Customer**
  - **Intermediary**
  - **ServiceProvider**
  - **Vendor**
    - **ThirdPartyService Provider**
    - **Complementary Provider**

**PartyRole Details**

- **involvedPartyRoles**
  - **0..n**

- **hasPartyRoles**
  - **1**
  - **0..n**
Domain Model Status

- Enhancements to existing work
  - Party, Business Interaction, Location, Customer

- New work in Phase III
  - Calendar (part of Project)
  - Product Price
  - Policy
  - Logical Resource
  - Extended Service Domain ABEs
Project
Product Pricing
Policy Overview

Policy

PolicySet

PolicyCondition

PolicyGroup

PolicyRule

PolicyStatement

PolicyAction

PolicyEvent

PolicyEventSet

PolicyConditionInPolicyRule

containedPolicySets

PolicyStatement is used by PolicyCondition and PolicyAction subclasses

hasEvents

policyConditionInPolicyRule

controlsExecutionOf

isTriggeredBy

policyActionInPolicyRule

{filled in by triggerConstraints}

{ordered}

{filled in by executionConstraints}

{ordered}

0..n

0..1

1..n

1..n

0..n

0..1

1..n
PhysicalResource Highlights

PhysicalResource

PhysicalDevice

Hardware

ManagedHardware

PhysicalConnector

PhysicalPort

PhysicalContainer

AuxiliaryComponent

EquipmentHolder

Equipment

PhysicalComponent
LogicalResource Highlights

Diagram:
- ManagedEntity
  - Software (1..n)
  - DeviceInterface (1..n)
  - Protocol (0..n)
  - FCAPS Entity (0..n)
  - Resource
    - LogicalResource
      - LogicalDevice
        - ManagedTransmissionEntity

Relationships:
- logicalDeviceHasDeviceInterfaces
- hasSoftwareFeatures
- supportsProtocol
- hasFCAPSEntity
Example: Business to Network Model

Changes to Service Level Agreement

Customer \( \rightarrow \) Device \( \rightarrow \) Service \( \rightarrow \) Configuration

SLA \( \rightarrow \) Product

Changes to Product

Changes to Service

Changes to Configuration
Decomposition of NGOSS Component

- Component
  - contains one or more
    - Service
      - management is defined by
        - Component Mgmt. Contract
          - is implemented by
            - Component Mgmt. Contract Instance
        - Service Mgmt. Contract
          - is implemented by
            - Service Mgmt. Contract Instance
      - functionality is defined by one or more
        - Service Functional Contract
          - is implemented by
            - Service Func. Contract Instance
Component Concepts

- An architectural element that represents the delivery mechanism services.
- A Component represents the unit of deployment in the technology-neutral architecture and offers one or more services.
- A unit of manageability within the technology-neutral architecture.
Service Concepts

- A collection of functionality described by one or more contracts.
- A service is a unit of manageability.
- The functionality comprising the service is described by contracts.
- The functionality comprising the service is accessed through contract instances.
The NGOSS Technology Neutral Component Model

- An implementation of functionality,
- Subject to 3rd party composition,
- Conformant to a component model
- Contractually specified
  - i.e., containers for contract instances
- For high availability environments ...
  - A component instance may not have persistent state
Component Characteristics

- A component is an artifact.
- The service(s) provided by a component must be specified by NGOSS Contract(s).
- Must be manageable through a contract.
- A component must be specified and constructed in such a way as to enable it to be deployed and installed into a system without the need for the use of a trial-and-error process.
- A component must have all of its external (contextual) dependencies explicitly defined.
Component Characteristics (2)

- Given the contractually defined services, and the explicitly defined external (contextual) dependencies,
  - a component can be combined in a system with other components to deliver a service that is then available to all other components (and client applications) within the system.
- Conforms to a technology specific component model to enable a component execution environment to activate and thus make available for use, the contract implementations within a component.
**Contract Concepts**

**Basics**

- **Interface**
  - a coherent set of operations on a component that clients of that component can depend on using

- **Contract**
  - the rules and constraints for interaction via the Interface associated with the Contract
  - a Contract represents the unit of binding in the technology-neutral architecture

- **Contract instance**
  - a runtime manifestation of a contract-defined interface
An Operation is defined as:

- an interaction between a client component and a server component
- Two types of operations:

- **Announcement Operations (one-way)**
  - Invocation (client to server)
  - Action (server)

- **Interrogation Operations (two-way)**
  - Invocation (client to server)
  - Action (server)
  - Termination (server to client) (maybe more than one per Operation)
Contract Concepts (3)
Operations

- Announcement Operation
  - an interaction - the invocation - initiated by a client component instance
  - resulting in the conveyance of information from that client component instance to a server component instance,
  - requesting a function to be performed by that server component instance.
Contract Concepts (4) Operations

- Interrogation Operation
  - An interaction consisting of:
    - The initial interaction - the invocation - initiated by a client component instance
      - resulting in the conveyance of information from that client component instance to a server component instance,
      - requesting a function to be performed by that server component instance
    - A second interaction - the termination -
      - initiated by the server component instance
      - resulting in the conveyance of information from the server component instance to the client component instance in response to the invocation
Interface signatures:

- an interface signature comprises a set of announcement and interrogation signatures
- one for each operation type in the interface.

- Announcement signature:
  - A definition of the name of the invocation
  - The number, names and types of its parameters.

- Interrogation signature:
  - A definition of the following elements:
    - The name of the invocation;
    - The number, names and types of the invocation parameters
    - A finite, non-empty set of definitions, one for each possible termination type of the invocation;
      - each definition contains the name of the termination and the number, names and types of its parameters.
Contract Concepts (6)
Binding

- Binding mechanism:
  - an infrastructure mechanism that enables a client component to establish a binding to a server component
NGOSS Policies

The NGOSS Policy Sub-system is the “Supervisor of Operations”. For example, policies can be used to:

- Define standard values (assures consistent values as function of defined environmental factors)
- Define peering relationships that must be maintained
- Identify (or change) the set of services available based on environmental factors
Proposed Policy Architecture

Policy Definition Tool
- Policy Entry Console
- Policy Entry API

Policy Broker
(Including Validation and Conflict Detection Logic)

Policy Repository

Global policy decisions
Coordination within a Policy Server
Policy decision local to a policy server
Policy decision local to the device

Policy Server
- Policy Controller
- Policy Decision Point – Tech 1
- Policy Decision Point – Tech 2
- Proxy

Multiple types of PDPs for multiple technologies

Policy Enforcement Points
The Policy Continuum

Business View: SLAs, Processes, Guidelines, and Goals

System View: Device- and Technology-Independent Operation

Administrator View: Device- Independent, Technology-Specific Operation

Device View: Device- and Technology-Specific Operation

Instance View: Device-Specific MIBs, PIBs, CLI, etc. Implementation
Configuration Management Process

Policy Feeds Process Which Selects Policy

Business Rules

Construct Configuration Changes

Deploy Configuration Changes

Approval Process

Installation Process

Validation Process

Policy Selects Who Performs Which Tasks When

Policy Defines Who and How Many Approvals Are Needed Per Change

Policy Defines How the Changes are Installed

Policy Defines How the Changes are Validated
Security Contexts

- Identity and Authentication
- Authorization (access control)
- Privacy
- Integrity
- Attribution (non-repudiation)
- Availability
NGOSSExtensibleElement

Element

ModelElement
  name : Name

GeneralizableElement
  isRoot : Boolean
  isLeaf : Boolean
  isAbstract : Boolean

Namespace

Classifier

BehavioralFeature

StructuralFeature
  multiplicity : Multiplicity
  changeability : ChangeableKind
  targetScope : ScopeKind
  ordering : OrderingKind

Feature
  ownerScope : ScopeKind
  visibility : VisibilityKind

Attribute

NGOSSIdentifier
  tnaVersion : String
  authority : String

NGOSSExtensibleElement
  identifies
  ngossFeatures

TeleManagement FORUM
Using NGOSS Data Types

- UML Meta Model
- NGOSS Meta Model
- NGOSS Domain Specific Meta Model
- NGOSS Data Type
- NGOSS Domain Specific Data Model
- Information Type
- OMG Standards
- TMF Standards
- TMF Working Group Standards
- TMF Domain Neutral Info Model
- TMF Domain Specific Data Model
- TMF Domain Specific Implementation
- Technology Specific Data Type
- Technology Specific Encoding
- NGOSS Domain Specific Encoding
- NGOSS Domain Specific Information Model

Relationships:
- built from
- realizes
- represents
- implements
- encodes