Unit 3: Telecommunications
Network Management

An Overview of Requirements, Network Resource Models and Architecture

Rob Brennan
What is a Telecommunications Network?

Access Network
- Connects subscribers to their provider

Core Network
- Connects providers to each other

Intelligent Node Network
- Provides advanced services eg mobility

A Business?
That is connected to other businesses and customers

Lots of different transmission networks, technologies, topologies

Must manage all these things

=> Run the business
Example: 3GPP Network Reference Model

OSF Terminal

OSF UTRAN

OSF GSM NSS

OSF GSM BSS

OSF GPRS NE's

UTRAN

NodeB

RNC

GSM BSS

BSC

BTS

Terminal

GPRS Network

HLR

GSM NSS

MSC/VLR

Other GPRS operator

PSTN

SGSN

GGSN

BG

FW

FW

FW

FW

Data network (Intranet)

Data network (Internet)

Data network (K.25)
What is Telecoms Management?

- Full name: Operations, Administration and Management
- Based on **Operations support systems** (OSS), a special purpose IT system for managing a network.
- OSS have functions like:
  - Network management systems
  - Service delivery
  - Service fulfillment, network inventory, activation and provisioning
  - Service assurance
  - Customer care
- Operate on network nodes called network elements (NEs)
Basic Terminology

- Management
- Bearer/Data/Signaling

Operator domain boundary

MIM

OSSs
Some History – OSI Management (1980’s)

• 5 functional areas identified (FCAPS)
  – Fault management
  – Configuration management
  – Accounting management
  – Performance management
  – Security management

• Specified in ITU X.700 Series of recommendations

• Specified the Common Management Information Protocol (CMIP) running on the OSI protocol stack
  – Note that SNMP is a “simple” version of CMIP that runs on TCP/IP
OSI Management Functional Model

- Management activities are effected through the manipulation of managed objects (MO).
- MO = Management view of a resource that is subject to management.
- MIB = The system’s set of managed objects plus their attributes.
- GDMO for standardised MOs => generic Manager Apps.
Still in the past: TMN (late ’80’s-present)

- Based on ITU M.3000 series of recommendations
- Introduced the “Management Network”
- Emphasis on co-ordination of management functions
- Introduced operator-operator OSS inter-working
- Defined 4 management layers plus NE layer:
  - Business
  - Service
  - Network
  - Element
- Defined interfaces (Q, X, R, F) between functional entities
Revisit our first slide to see TMN

Basic Terminology:

- **Management**
- **Bearer/Data/Signal**

![Diagram showing basic terminology and operator domain boundary]

OSSs
Example Layer Functions -1

- **Element Management**
  - detection of equipment errors,
  - measuring power consumption,
  - measuring the temperature of equipment,
  - measuring the resources that are being used, like CPU-time, buffer space, queue length etc.,
  - logging of statistical data,
  - updating firmware.

- **Service Management**
  - Quality of Service management (delay, loss, etc.),
  - Accounting,
  - Addition and removal of users,
  - Address assignment,
  - Maintenance of group addresses.
Example Layer Functions -2

• Network Management
  – creation of the complete network view,
  – creation of dedicated paths through the network to support the QoS demands of end users,
  – modification of routing tables,
  – monitoring of link utilization,
  – optimizing network performance, and
  – detection of faults

• Business Management
  – Subscriber management
  – Provider/partner management
  – Strategic planning
  – Business goal translation to technical goals
TMN Elaboration at the TMF

TMN Layers correspond with TOM horizontals

Customer Interface Management Processes

- Sales
- Order Handling
- Problem Handling
- Customer QoS Management
- Invoicing and Collections

Customer Care Processes

- Service Planning and Development
- Service Configuration
- Service Problem Management
- Service Quality Management
- Rating and Discounting

Service Development and Operations Processes

- Network Planning and Development
- Network Provisioning
- Network Inventory Management
- Network Maintenance & Restoration
- Network Data Management

Network and Systems Management Processes

Network Element Management Processes

Physical Resource and Information Technology
More TMF elaboration (eTOM/NGOSS)

eTOM maps the NGOSS Business View

Customer

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

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

Enterprise Management
- Strategic & Enterprise Planning
- Enterprise Risk Management
- Enterprise Effectiveness Management
- Knowledge & Research Management

Financial & Asset Management
- Stakeholder & External Relations Management
- Human Resources Management

Stakeholder & External Relations Management

Human Resources Management

PA4
Challenges

• Dealing with Network Evolution
  – New access technologies eg GSM, 3G
  – New management protocols eg CORBA (GIOP)
  – New core network technologies eg TCP/IP based MoIP

• Management stovepipes

• Increasing flexibility/reducing OpEx

• The Internet
Additional Information

• TMN Tutorial Document on course page
• TM Forum Homepage
  [https://www.tmforum.org/](https://www.tmforum.org/)