

Lecture 18:

Telecommunications Management Network (TMN)

Prof. Shervin Shirmohammadi
SITE, University of Ottawa

Prof. Shervin Shirmohammadi

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TMN

- Necessity for interoperability
- Need for management of more than just the network components
- **Networks / subnetworks** need to be managed
- **Services** - internal and external need management
- **Business** management needs to be addressed
- TMN joint effort by ITU-T and ISO

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Operations System

- Refers to operations support system
- E.g.,
 - Trunk is a logical connection between two switching nodes
 - Periodic measurement of loss and S/N of all trunks
 - Failing threshold set for QoS; failing trunks removed out of service before the customer complains

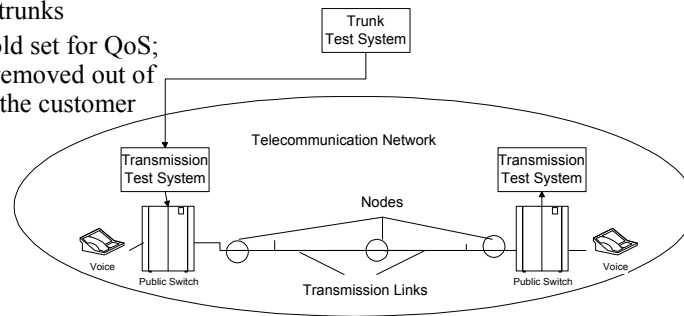


Figure 11.1 Operations System for Network Transmission

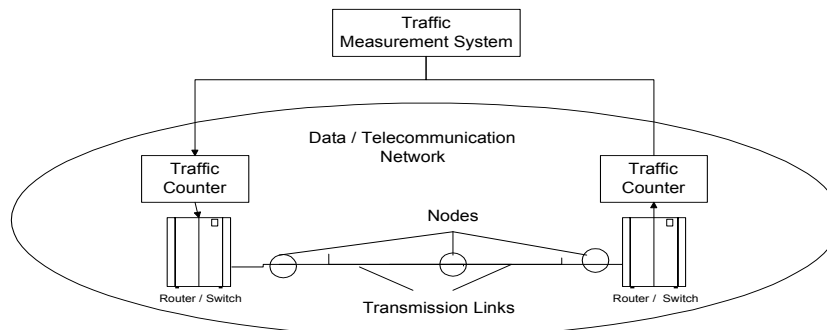
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OS: Telephone Switch Traffic

- Traffic monitored at switch
- Call blocking statistics obtained
- Traffic and call-blocking statistics provide data for planning
- Importance of Operations, administration, maintenance, and provisioning



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Figure 11.2 Operations System for Traffic Measurement

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TMN in Data and Telecom Networks

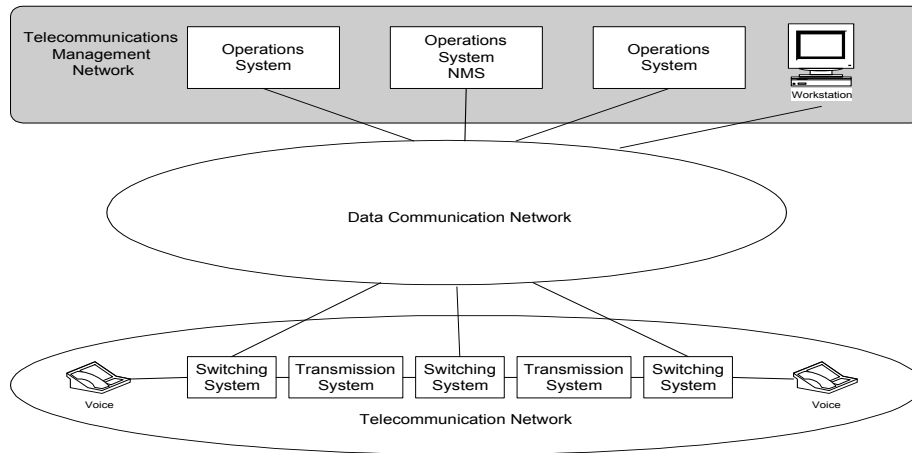


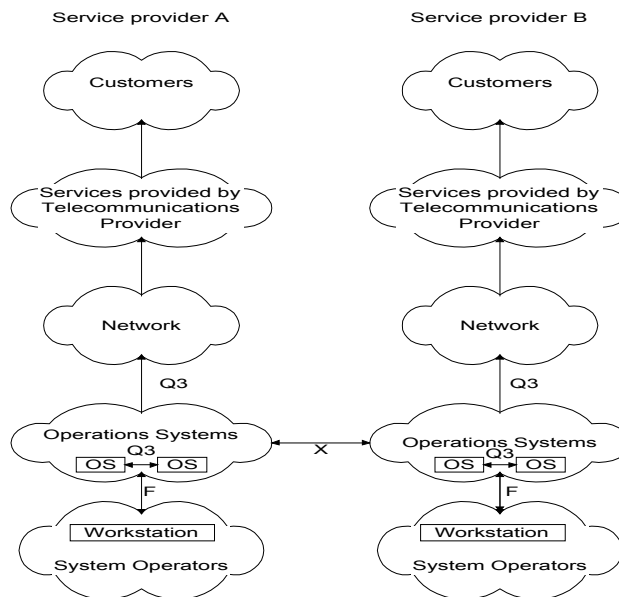
Figure 11.3 TMN Relationship to Data and Telecommunication Network

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TMN Conceptual Model



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Figure 11.4 TMN Conceptual Model

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TMN Architecture

- **Functional** architecture:
 - Functional modules or blocks
 - Reference points between modules
- **Physical** architecture:
 - Physical blocks
 - Physical interfaces between the blocks
- **Informational** architecture:
 - Information exchange between entities
 - Object oriented

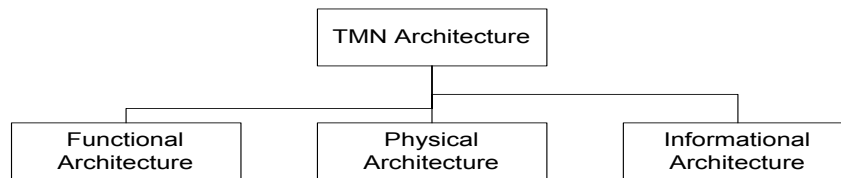


Figure 11.6 TMN Architecture

Functional Architecture

- **OSF**: Functions performed by Operations systems
- E.g., NMS, testing, accounting, trouble tracking
- **NEF**: Functions needed to support network elements; network elements themselves are not part of TMN: e.g., NM agent, MIB, collision rate
- **MF**: Operations on the information between network elements; e.g. filtering, protocol conversion
- MF can be shared between multiple OSSs; e.g. RMON
- **WSF**: Human-TMN activities interface; e.g., GUI
- **QAF**: Adapter function to accommodate non-TMN entities; e.g. proxy server, SNMP-to-CMIP

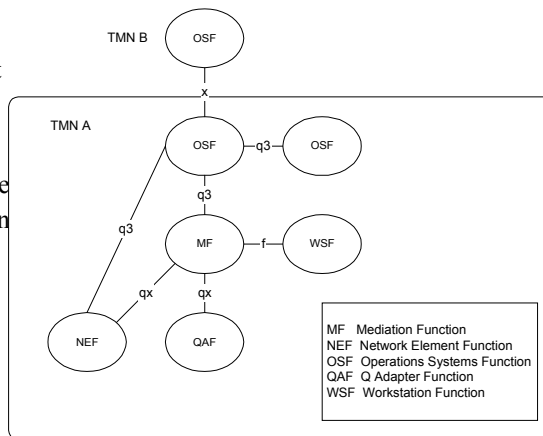


Figure 11.7 TMN Functional Architecture

TMN Reference Point

- Function blocks connected by **conceptual interfaces**, called *reference point*
- Designated by lower case letters (upper case letter for physical interfaces)
- **x**: Interface between operations systems that belong to different domains; e.g., interface between two NMSs belonging to two different domains
- **q3**: Interface between two OSFs in the same domain
- **qx**: Interface between mediation function such as RMON and agent in the network element
- **f**: Interface to the workstation

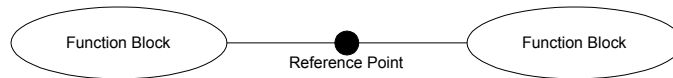
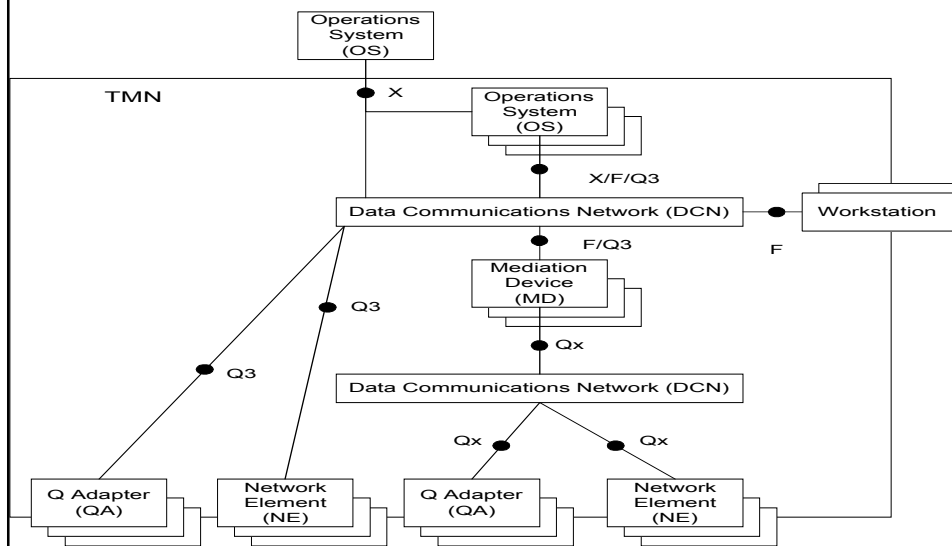


Figure 11.8 TMN Reference Point

Physical Architecture



Information Architecture

- Initially adopted the OSI architecture: CMIP/CMIS
- Later, SNMP also supported
- two types of communication services:
 - Interactive
 - ROSE used by CMISE
 - RPC in the Internet world
 - File-oriented
 - OSI File Transfer Access Management (FTAM)
 - Internet File Transfer Protocol (FTP)

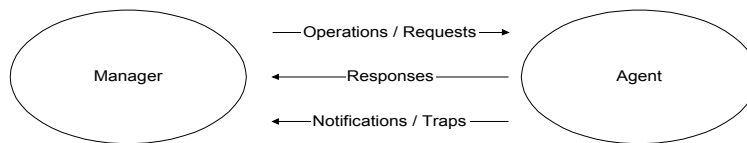


Figure 11.10 TMN Information Architecture

Management Service Architecture

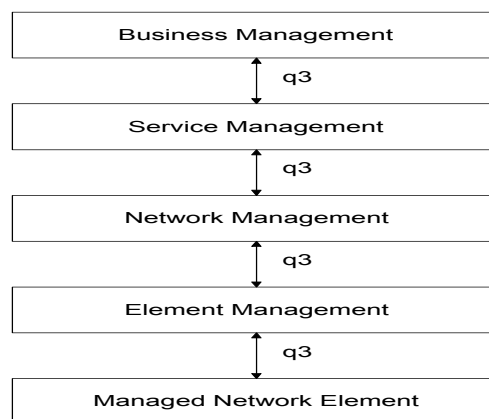


Figure 11.11 TMN Service Architecture

TMN Services & Functions

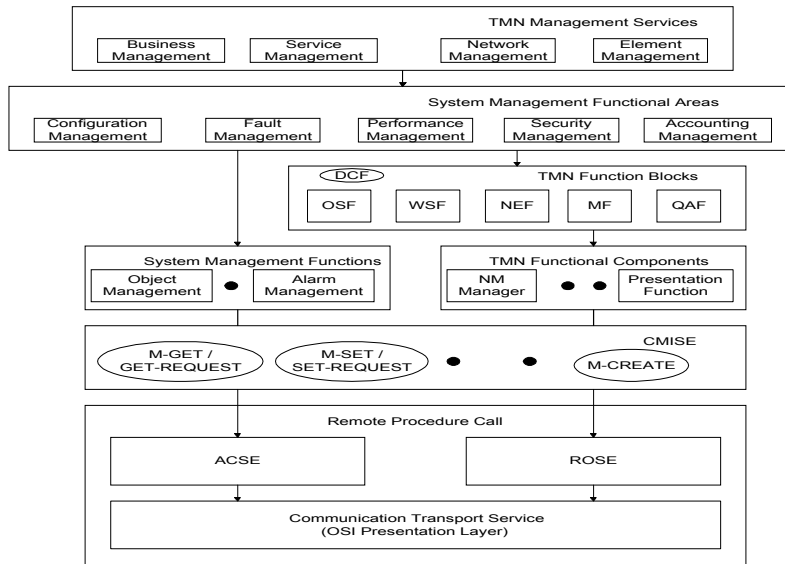


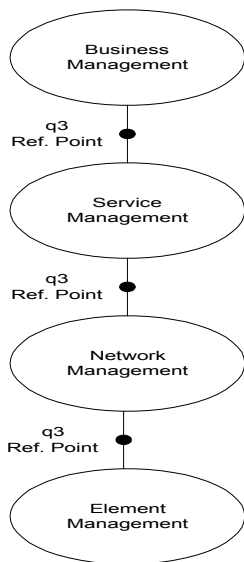
Figure 11.13 TMN Services and Functions

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TMN Logical Layered Architecture



Physical Realization of TMN Architecture

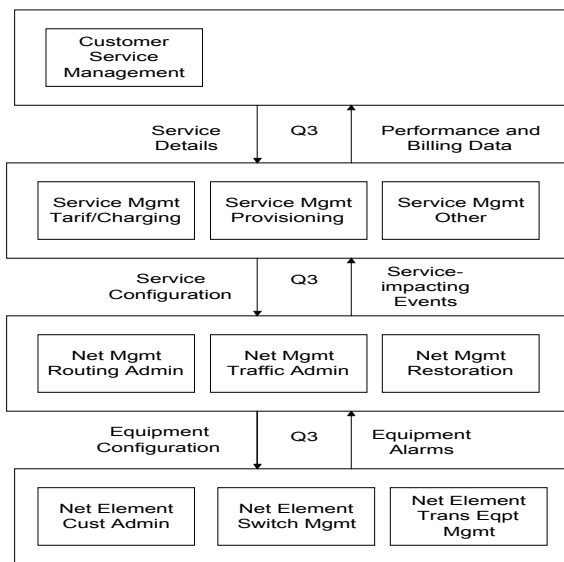


Figure 11.14 TMN Realization Example (NMF)