Network Management in Telecommunication

BE EXTC (VIII)

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Data and Telecommunication Network

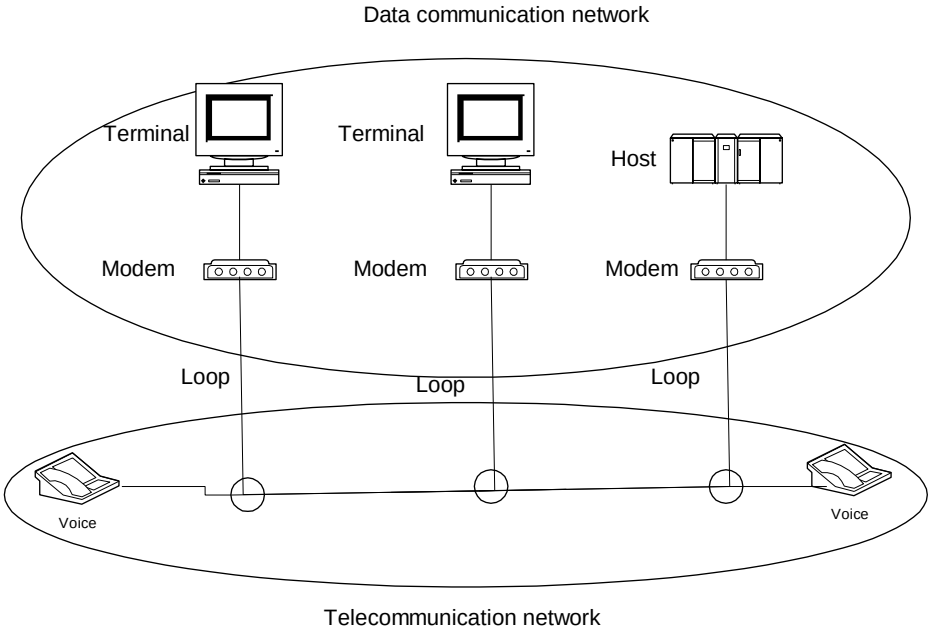


Figure 1.3 Data and Telecommunication Networks

Notes

- Computer data is carried over long distance by telephone (telecommunication network)
- Output of telephone is analog and output of computers is digital
- Modem is used to “modulate” and “demodulate” computer data to analog format and back
- Clear distinction between the two networks is getting fuzzier with modern multimedia networks

Client/Server Model

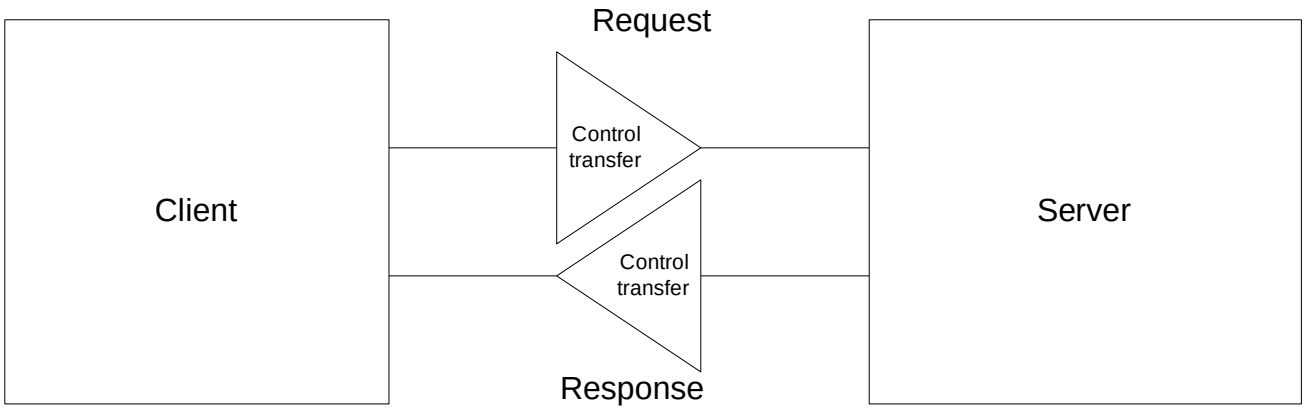


Figure 1.7 Simple Client-Server Model

Notes

- Post office analogy; clerk the server, and the customer the client
- Client always initiates requests
- Server always responds
- Notice that control is handed over to the receiving entity.

Client/Server Examples

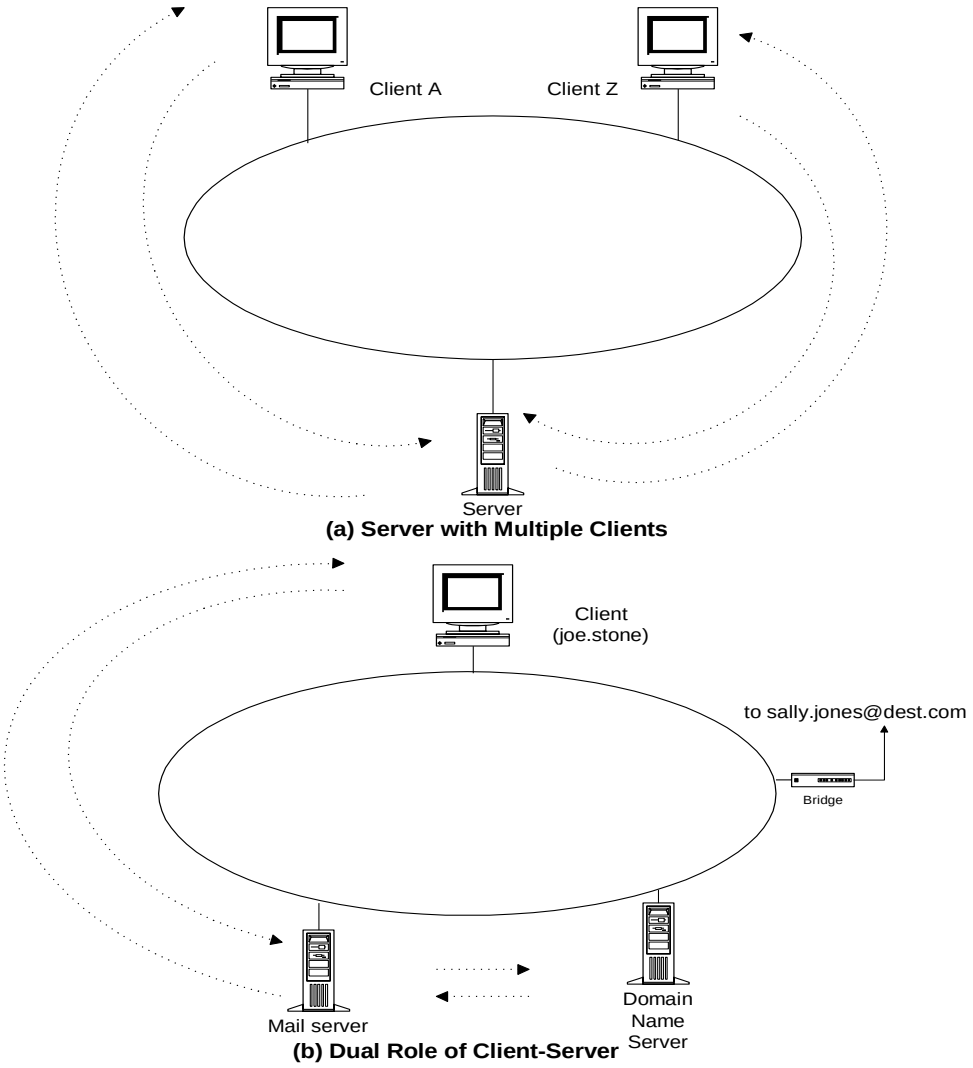
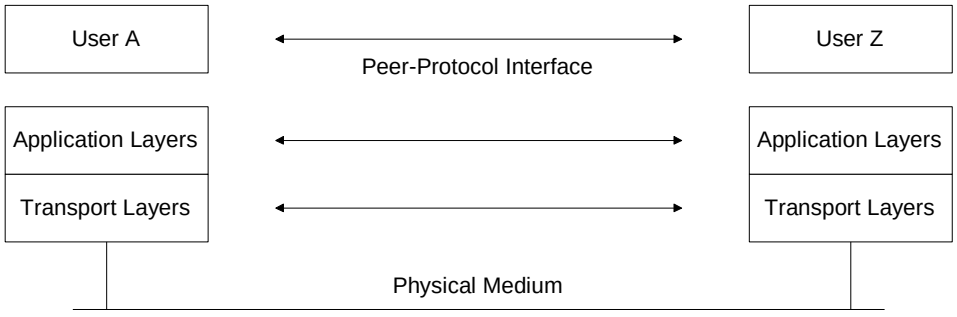


Figure 1.8 Client-Server in Distributed Computing Environment

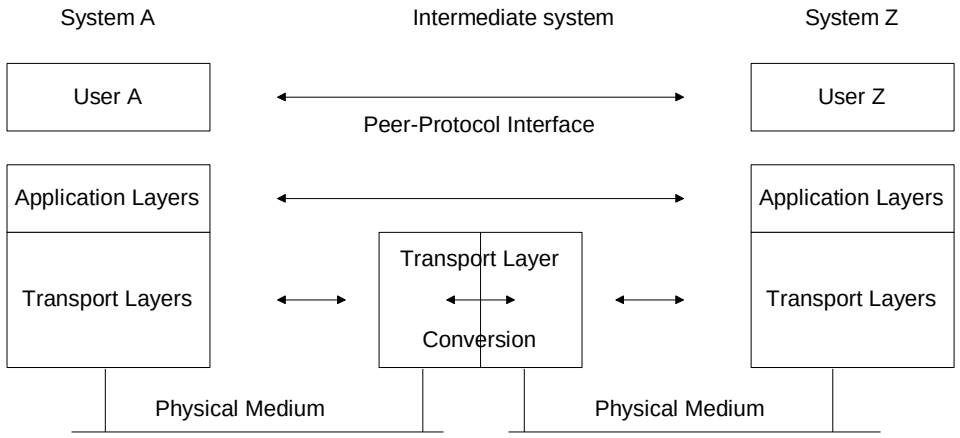
TCP/IP Based Networks

- TCP/IP is a suite of protocols
- Internet is based on TCP/IP
- IP is Internet protocol at the network layer level
- TCP is connection-oriented transport protocol and ensures end-to-end connection
- UDP is connectionless transport protocol and provides datagram service
- Internet e-mail and much of the network mgmt. messages are based on UDP/IP
- ICMP part of TCP/IP suite

Communication Architecture



(a) Direct Communication between End Systems



(b) Communication between End Systems via an Intermediate System

Figure 1.11 Basic Communication Architecture

Notes

- Inter-layer interface: user and service provider
- Peer-layer protocol interface
- Analogy of hearing-impaired student
- Role of intermediate systems
- Gateway: Router with protocol conversion as gateway to an autonomous network or subnet

OSI Reference Model

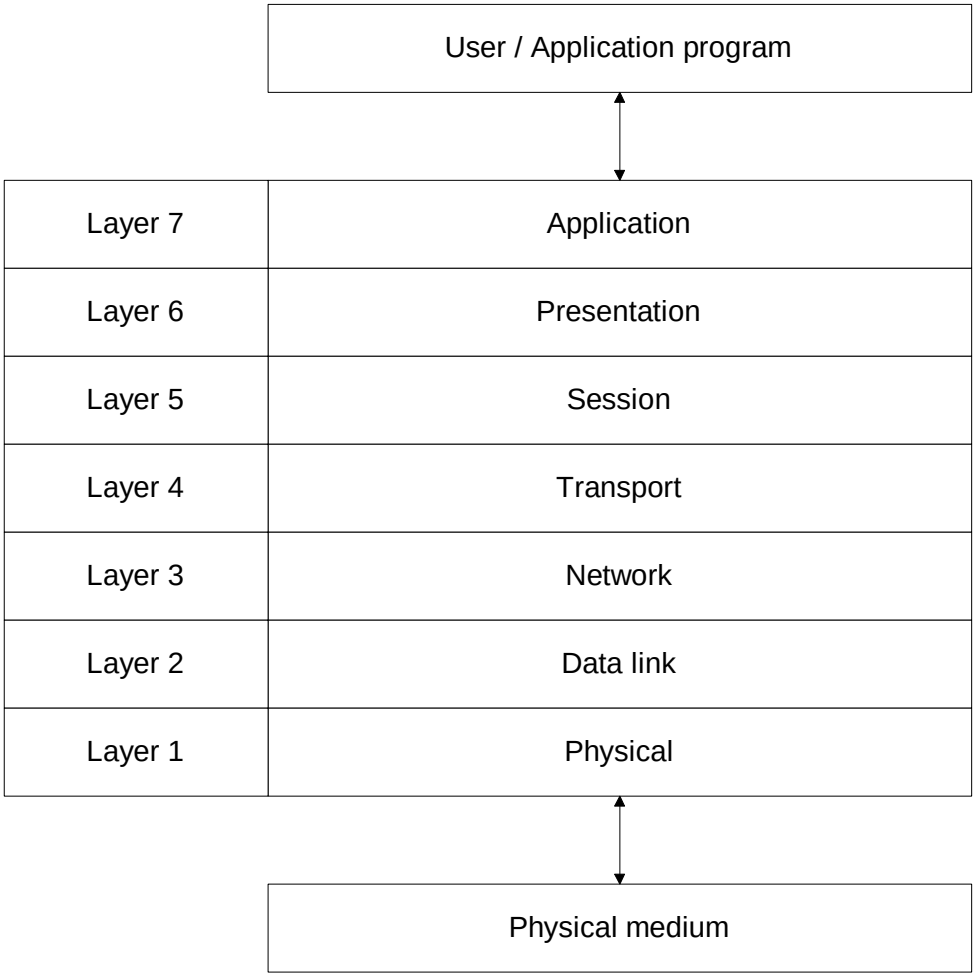


Figure 1.12 OSI Protocol Layers

Notes

- Importance of the knowledge of layer structure in NM

OSI Layers and Services

Layer No.	Layer Name	Salient services provided by the layer
1	Physical	-Transfers to and gathers from the physical medium raw bit data -Handles physical and electrical interfaces to the transmission medium
2	Data link	-Consists of two sublayers: Logical link control (LLC) and Media access control (MAC) -LLC: Formats the data to go on the medium; performs error control and flow control -MAC: Controls data transfer to and from LAN; resolves conflicts with other data on LAN
3	Network	Forms the switching / routing layer of the network
4	Transport	-Multiplexing and de-multiplexing of messages from applications -Acts as a transparent layer to applications and thus isolates them from the transport system layers -Makes and breaks connections for connection-oriented communications -Flow control of data in both directions
5	Session	-Establishes and clears sessions for applications, and thus minimizes loss of data during large data exchange
6	Presentation	-Provides a set of standard protocols so that the display would be transparent to syntax of the application -Data encryption and decryption
7	Application	-Provides application specific protocols for each specific application and each specific transport protocol system

Notes

- Importance of services offered by different layers and the protocol conversion at different layers in NM

PDU Communication Model

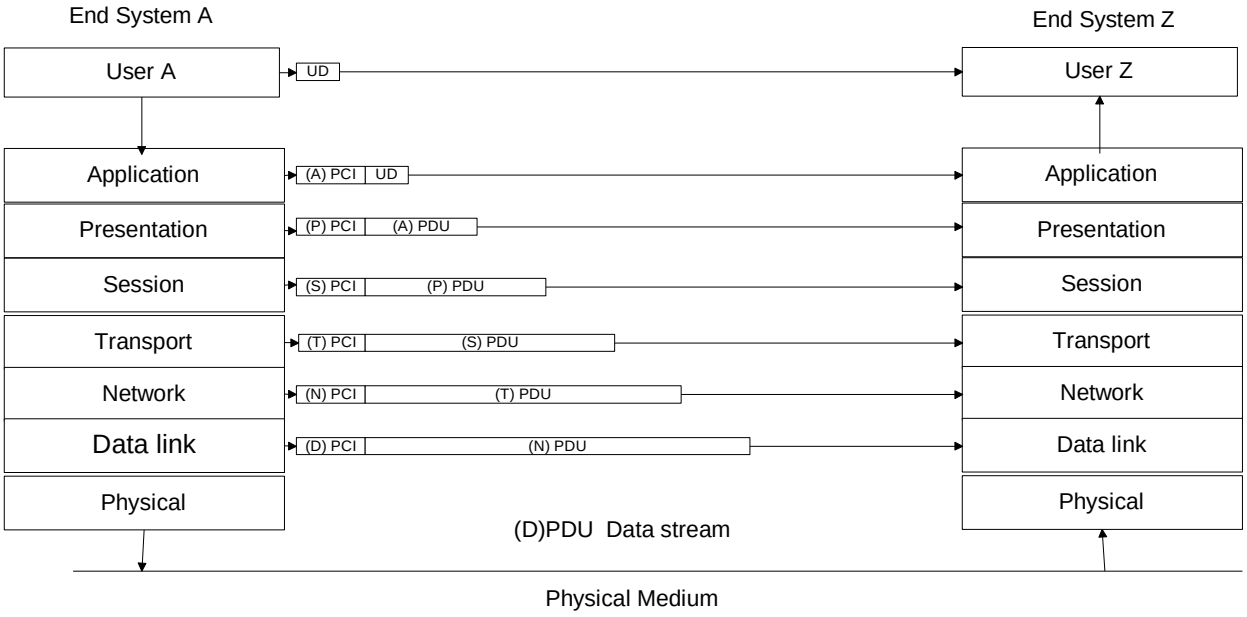


Figure 1.14 PDU Communication Model between End Systems

Notes

- What is the relevance of PDU model in NM?

SNA, OSI, and Internet

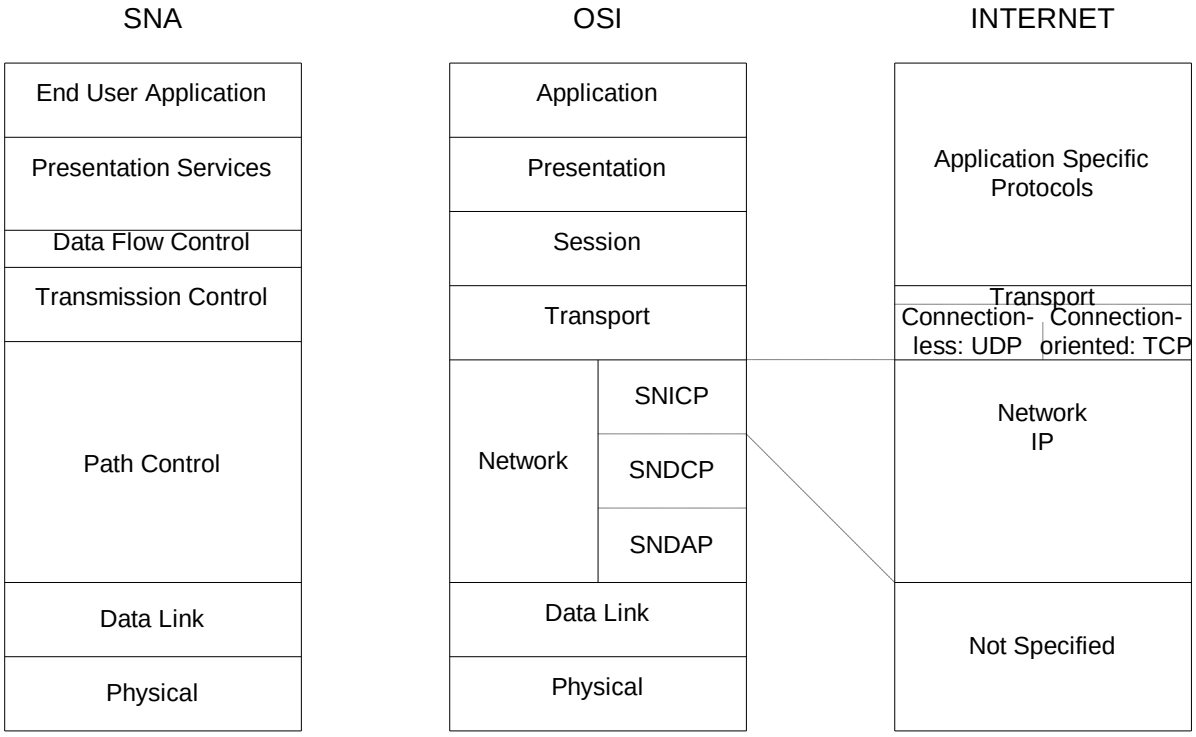


Figure 1.18 Comparison of OSI, Internet, and SNA Protocol Layer Models

Notes

- Similarity between SNA and OSI
- Simplicity of Internet; specifies only layers 3 and 4
- Integrated application layers over Internet
- Commonality of layers 1 and 2 - IEEE standard

NM Case Histories

- Importance of Topology
- Centrally managed Network issues
- Transaction delays in client server nw
- Service impact in end to end service of customers

Notes

Common Network Problems

- Loss of connectivity
- Duplicate IP address
- Intermittent problems ex. traffic overload
- Network configuration issues
- Non-problems
- Performance problems

Notes

Challenges of IT Managers

- Reliability
- Non-real time problems
- Rapid technological advance
- Managing client/server environment
- Troubleshooting tools and systems
- Trouble prediction
- Standardization of operations - NMS helps
- Centralized management vs “sneaker-net”

Network Management

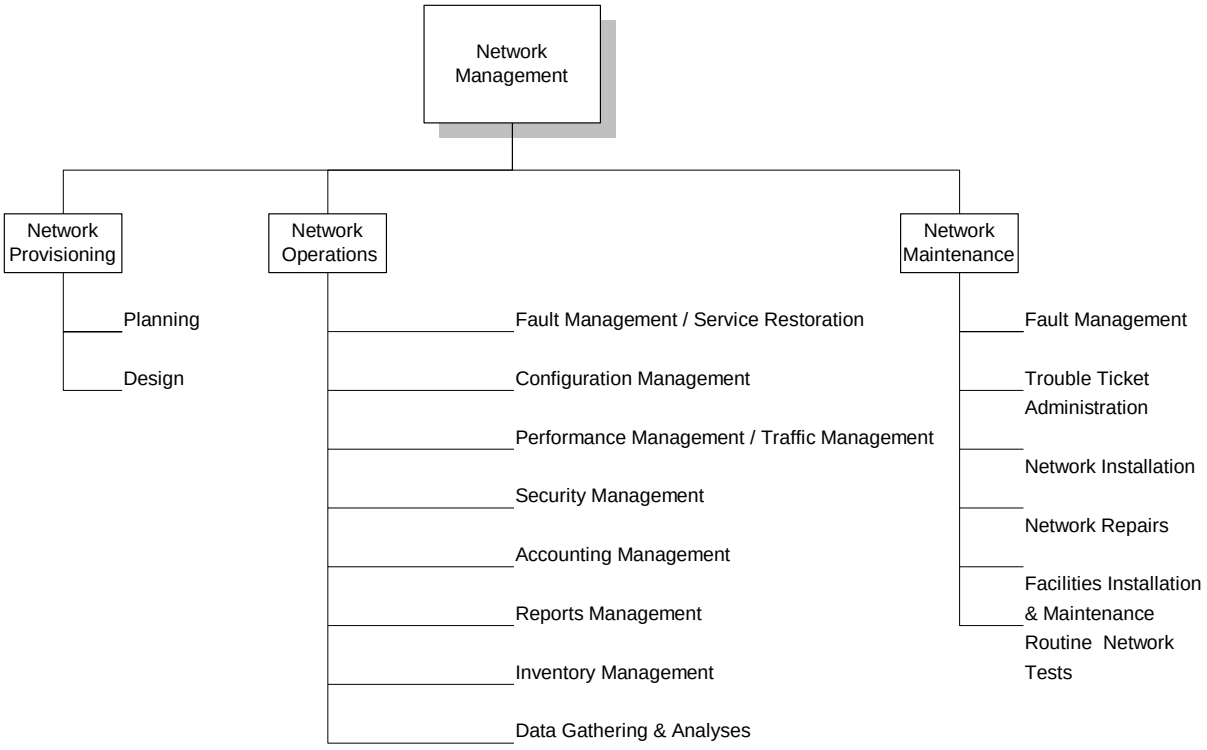


Figure 1.21 Network Management Functional Groupings

Notes

- OAM&P
  - Operations
  - Administration
  - Maintenance
  - Provisioning

NM Functional Flow Chart

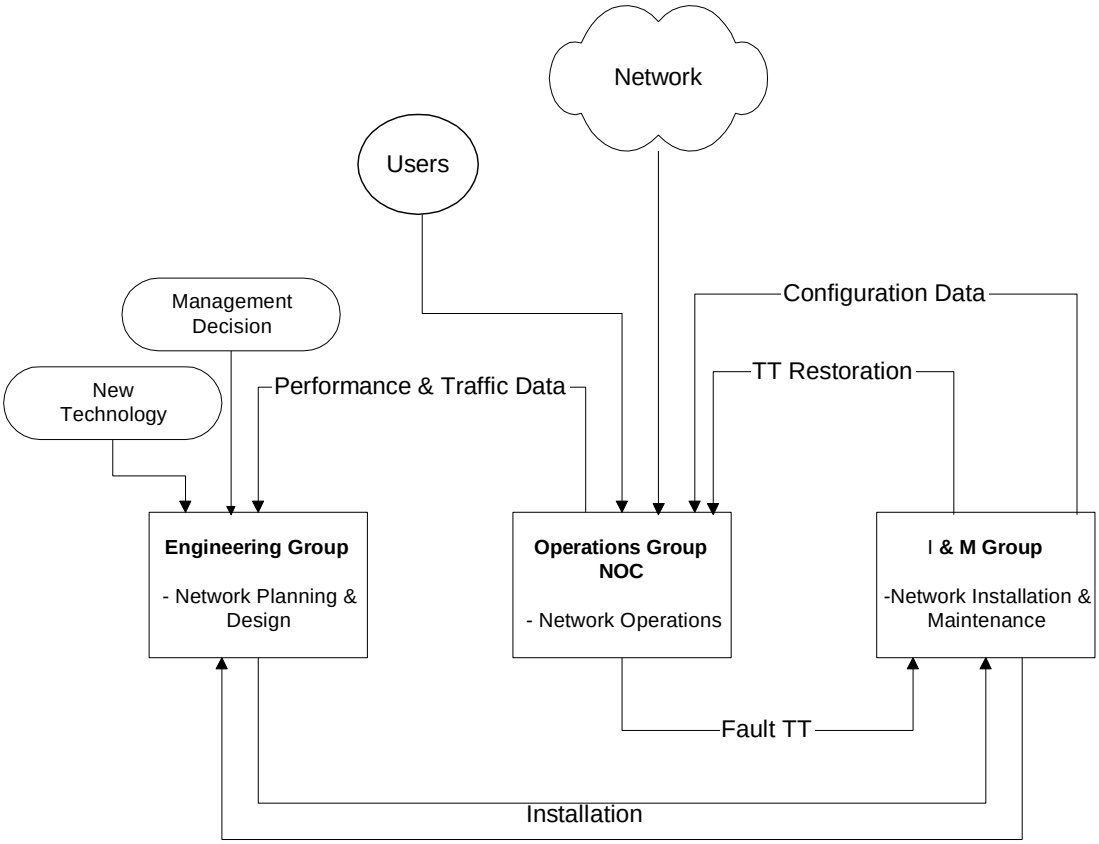


Figure 1.22. Network Management Functional Flow Chart

NM Components

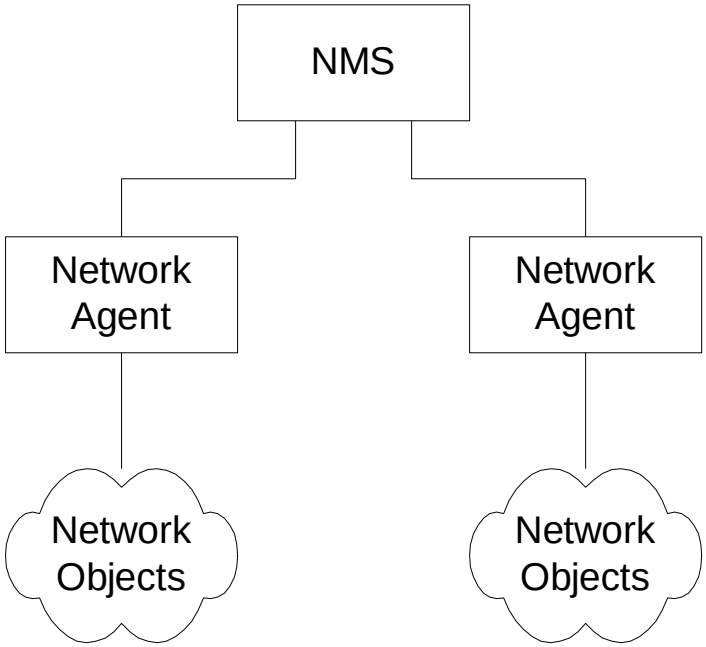
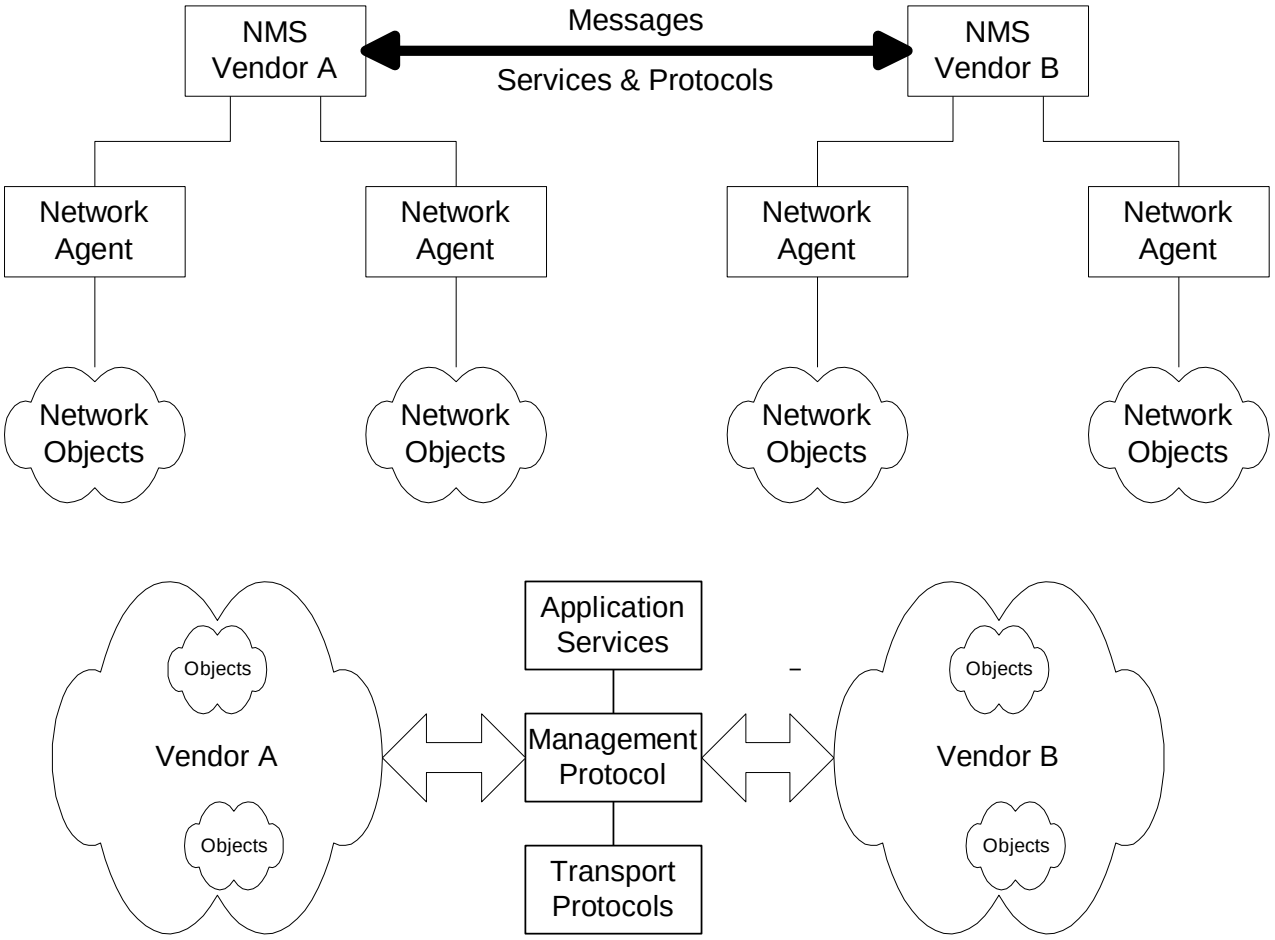


Figure 1.24 Network Management Components

Notes

Interoperability



(b) Services and Protocols

Figure 1.23 Network Management Dumbbell Architecture

Notes

- Message exchange between NMSs managing different domains

Status and Future Trends

- Status:
  - SNMP management
  - Limited CMIP management
  - Operations systems
  - Polled systems
- Future trends:
  - Object-oriented approach
  - Service and policy management
  - Business management
  - Web-based management

Notes