**Network Management Requirements**

* Fault management
* Configuration management
* Accounting management
* Performance management
* Security management

1. **FAULT MANAGEMENT**

* The facilities that enable the detection, isolation, and correction of abnormal operation of the OSI environment
* What is “a fault”?
  + an abnormal condition that requires management attention (or action) to repair
  + indicated by failure to operate correctly or by excessive errors
    - Communication line is cut
    - A crimp in the cable
    - Certain errors may occur occasionally and are not normally considered to be faults
* When a fault occurs
  + Determine “exactly” where the fault is
  + Isolate the rest of the network from the failure
  + Reconfigure or modify the network to minimize the impact of operation
  + Repair or replace the failed components

**User requirements for Fault Management**

* Fast and reliable problem resolution
  + Receive notification and correct the problem immediately
  + Requires rapid and reliable fault detection and diagnostic management
  + Provides fault tolerance
    - Redundant components and alternate communication routes
    - Fault management capability itself should be redundant
* Keep informed of the network status
  + Reassurance of correct network operation through mechanisms that use tests or analyze dumps, logs, alerts, or statistics
* Problem tracking and control
  + Ensure the problem is truly resolved and no new problems are introduced
* Fault management should have minimal effect on network performance

1. **CONFIGURATION MANAGEMENT**

* Configuration management is concerned with
  + Initializing a network
  + Gracefully shutting down part or all of the network
  + Maintaining, adding, and updating the relationships among components and the status of components themselves during network operation

**Requirements for Configuration Management**

* The network manager needs the capability to
  + Identify initially the components that comprise the network
  + Define and change the connectivity of components
  + Define and modify default attributes, and load the predefined sets of attributes into the specified network components
  + Reconfigure a network for performance evaluation, network upgrade, fault recovery or security checks
    - End users want to inquire about the upcoming status of resources and their attributes before reconfiguration
  + Generate configuration reports
    - Periodic basis
    - Response for a request
  + Only authorized end users can manage and control network operation (software distribution and updating)

1. **ACCOUNTING MANAGEMENT**

* The facilities that enable
  + charges to be established for the use of managed objects
  + costs to be identified for the use of those managed objects
* Network managers track the use of network resources by end user or end-user class
  + An end user or group of end users may be abusing its access privileges and burdening the network at the expense of other users
  + End users may be making inefficient use of the network, and network manager can assist in changing procedures to improve performance
  + The network manager is easier to plan for network growth if end user activity is known in sufficient detail

**Requirements for Accounting Management**

* The network manager can specify
  + the kinds of accounting information to be recorded at various nodes
  + the desired interval between sending the recorded information to higher-level management nodes
  + the algorithms to be used in calculating the charging
* Generate accounting reports
* Provide the capability to verify end users’ authorization to access and manipulate the information

1. **PERFORMANCE MANAGEMENT**

* The facilities needed to evaluate
  + the behavior of managed objects
  + the effectiveness of communication activities
* Functions of performance management
  + Monitoring
    - Tracks activities on the network
  + Controlling
    - Enables performance management to make adjustments to improve network performance

**Issues of Performance Management**

* What is the level of capacity utilization?
* Is there excessive traffic?
* Has throughput been reduced to unacceptable levels?
* Are there bottlenecks?
* Is response time increasing?

**To deal the issues of Performance Management**

* The network manager focus on some initial set of resources to be monitored in order to assess performance levels
  + Appropriate metrics and values with relevant network resources as indicators of different levels of performance
    - The count of retransmission on a transport connection
  + Monitor many resources to provide information in determining network operating level
  + Collect and analyze information, and then using the resultant analysis as feedback to the prescribed set of values

**User Requirements for Performance Management**

* End users want to know
  + the average and worst case response times
  + the reliability of network services
* Performance statistics can help managers
  + Plan, manage and maintain large networks
  + Recognize potential bottlenecks in advance
    - balance or redistribute traffic load by changing routing tables

1. **SECURITY MANAGEMENT**

* The facilities that address those aspects of OSI security essential to
  + Operate OSI network management correctly
  + Protect managed objects
    - network resources
    - end user information
* End users want to know
  + the proper security policies are in force and effective
  + the management of security facilities is itself secure

**Issues of Security Management**

* Managing information protection, and access control facilities
  + Generating, distributing and storing encryption keys
  + Passwords, authorization or access control information must be maintained and distributed
* Monitoring and controlling access to computer networks and to all or part of the network management information
  + SM involves with the collection, storage, and examination of audit records and security logs
  + the enabling and disabling of these logging facilities