Configuration and named Management

- The process of obtaining information from the network and setting up devices accordingly.
- Allows centralized control over the configuration of devices.
- From a single management station, network engineers can determine and set a variety of hardware and software components — routers, hubs, etc.
- Network as composed of many different components including logical component which should be configure so that n/w application can run properly. For example, we can set different attributes values to device driver of OS for support of different application.
- In come cases same components can act as different component. For example, we can set Linux machine to work as end user' stations, a router or a bridge.
- Configuration management is also considered with maintaining, adding and updating the relationships amoung components and the status of components themselves during network operation.
- For example, a router which is set for dynamic routing can set it's cost to other routers as per the change in status of network components.
- User requirement
  - Startup and shutdown operation on a network are the specific responsibilities of network manager.
  - Some device should not be restart unless very important (for example network interfaces).
  - Default configuration should be set who regularly configure the network with same configuration.
  - Manager should be capable to change the connectivity status as per request of users.
  - Reconfiguration of a network is often desired in response to performance evaluation or in support of network upgrade, fault recovery, or security checks.
  - On change of configuration notification should be given to users.
  - Configuration reports can be generated either on some routing periodic basic or in response to request for such a report.

Fault Management

- The process of detecting, isolating and correcting network failures. Goal — quick recovery from failure.
- Includes the hardware, software and procedures that network engineers use to diagnosis, test and repair network failures.
- Most fault handling system also alert engineers of the fault occurrence.
- The major tasks in fault management:
  - Determine exactly where the fault is.
  - Isolate the rest of the network form the failure so that it can continue to function without interference.
  - Reconfigure or modify the network in such a way as to minimize the impark of operation without the failed component or components.
  - Repair or replace the failed components to restore the network to its initial state.
- Faults and error
  - Faults are to be distinguished from error.
  - A fault is an abnormal condition that requires management attention or action to repair.
  - Error is a single event.
  - A fault is usually indicated by failure to operate correctly or by excessive errors.
  - Example
    - if physically cut he network cable, no signals can get throught.

- Or damaged cable or switch can cause degrade in performance of network transmission.
- Various error control mechanisms of the various protocols can be used to compensate for errors.
- User Requirement
  - End user expect fast and reliable resolution
  - End user expect immediate notification on outage of services
  - The notification can be scheduled or nonscheduled.
  - For example the n/w manager defined a corned (schedule) job to check status of components.
  - In case, if the network breaks in between to schedule period the network manager should do the repair job immediately, that is unscheduled job.
  - To provide high level of fault resolution requires very rapid and reliable fault detection and diagnostic management functions
  - The impact of and duration of fault can be minimized by the use of redundant components and alternative communication routers to give nte network degree of "fault tolerance".
  - The fault management capability itself should be redundant to increase network reliability
  - Users expect reassurance of correct network operation through mechanism that use confidence tests or analyze dumps, logs, alerts or statistics.

Security Management
- Concerned with protecting network resources and sensitive information data.
- Mainly involve controlling/limiting access to:
  - hosts and network devices,
  - particular applications on a given device,
  - particular protocols traversing the network.
- Also includes:
  - identify security risks & their consequences
  - implement secure network design and equipment
  - administrate user groups and passwords
  - usage log, report of violations and alarms
- Network security facilities should be available for authorized users only.
- End users want to know that the proper security policies are in force and effective and that the management of security facilities is itself secure.

Performance management
  - The process of collecting and analyzing performance indicators
  - e.g. throughput, delay.
  - It is comprises of two broad categories
    - Monitoring
      - It is the function that tracks activities on the network
    - Controlling
      - It is the function that enables performance management to make adjustments to improve network performance.
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  - Identifying bottlenecks, evaluating trends and making predictions of future performance.
  - While measuring the performance following issues are considered:
    - What is the level of capacity utilization?
    - Is there excessive traffic?
    - Has throughput been reduced to unacceptable level?

- Are there bottlenecks?
- Is response time increasing?
- User Requirements
  - The end user may want to know average and worst case response times and the reliability of network services.
  - End user wants best case and good response time.
  - Network manager need performance statistics to help them plan, manage, and maintain large networks.
  - Performance statistics can be used to recognize potential bottlenecks before they cause problems to the end users.
  - Appropriate corrective action can then be takes.
    - Changing routing table to change route to next path.
    - Distribute traffic load during times of peak use
  - Future plan can be make on the basis of performance status and action take.

Accounting Management
- The process of measuring resource utilization on the network. Quite similar to performance management.
- Data can be used to determine costs, bill the users and checking quotas.
- Allows management people to properly allocate resources, and optionally, bill users for their consumption of those resources.
- Network resources such as bandwidth, processes, memory and QoS should be managed.
- The network manager should be able to plan for growth of network.
- The network manager needs to be able to track the use of network resources by the end user or end use class for a number of reasons including following
  - An end user or group of end users may be a busing their access privileges and burdening other.
- User Requirements
  - The network manager needs should specify the kinds of accounting information to be recognized at various modes.
  - Certain algorithms should be used to calculate the changing
  - Determine the interval in which recorded information is send to higher level management.
  - To limit access to accounting information

The accounting facility must provide the capability to verify end user's authorization to access and manipulate the information.