DIMENSIONS of MANAGEMENT
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Network Management Dimensions

- Management interoperability
  - Ensure management interoperability between different systems
- Management Subject
  - What subject to manage
- Management Life Cycle
  - Manage a network from beginning to the end
- Management Layer
  - Ensure each layer of the network is being managed/providing proper info to each other
- Management Function
  - Ensure network is being functional, FCAPS
- Management Process & Organization
  - How to organize a management
NETWORK MANAGEMENT

- Management Interoperability

  Aspects
  - Communication viewpoint, dealing with what kinds of messages are exchanged between parties engaging in management communications
    - Protocol: SNMP
  - Function viewpoint, dealing with the management functions that either party can provide
  - Information viewpoint, dealing with how management information that needs to be exchanged is being represented

Communication Viewpoint: Can You Hear Me Now?
- How is a management session established?
- How does a manager need to authenticate itself to the agent
- How does a management message that carries a request identify the type of request that is being made?
- How does the manager recognize a message as a response to the request
- Is a timestamp required? (e.g., yyyy:mm:dd:hh:mm:ss)
- How is management information carried inside a management message encoded?
- How is the agent supposed to react if two messages that seemingly contain the same request are received?
- Who can initiate the tearing down of a management session?
  - Effectively, this means What should happen when a response to a management request is not received after a certain amount of time?

Function Viewpoint: What Can I Do for You Today?
- What functions are provided to enable a manager to retrieve information from the agent?
- How can a managed system's configuration be modified?
- Are "transactions" supported?
- Is there a function that allows a manager to sign up to receive only specific types of events?
- Does the agent provide functionality that allows events to be replayed in case a management application missed an event, perhaps because it was offline?
- Does the agent provide introspection capabilities that enable a manager
- Can the agent be programmed to perform certain test functions at predefined intervals, or do those functions need to be invoked explicitly every time?
Information Viewpoint: What Are You Talking About?

- Do you provide abstractions that allow the managed system to be modeled as a collection of objects, following rules of object-oriented design?
- Do you provide abstractions that allow the managed system to be modeled as a set of tables, reminiscent of tables used in databases?
- Do you simply define rules by which to define a set of command parameters that need to be sent in conjunction with commands to achieve the desired effect?

Management Life Cycle

- Planning
  - Network planning does not occur only upon initial deployment. It should occur on an ongoing basis to ensure that the network is kept up-to-date. Planning should accordingly be supported not only by offline planning tools, but by management systems that feed back information about actual utilization and performance data in the current network.
- Deployment
  - Equipment must be installed and turned up. Deployment can involve its own unique set of management procedures.
**NETWORK MANAGEMENT**

- **Operation**
  - Monitoring the network, troubleshooting, conducting performance tuning, collecting performance statistics and accounting data, and so forth.

- **Decommissioning**
  - Eventually, network equipment might have to be decommissioned in an orderly manner. There can be many reasons for decommissioning.

**NETWORK MANAGEMENT**

- **Management Layer**
  - The management layer involves managing relationships and dependencies between network elements, generally required to maintain end-to-end connectivity of the network. It is concerned with keeping the network running as a whole.

- **Element Management**
  - The element management layer involves managing the individual devices in the network and keeping them running. This includes functions to view and change a network element’s configuration, to monitor alarm messages emitted from elements in the network, and to instruct network elements to run self-tests.

- **Network Management**
  - The network management layer involves managing relationships and dependencies between network elements, generally required to maintain end-to-end connectivity of the network.
Service management
- Concerned with managing the services that the network provides and ensuring that those services are running smoothly and functioning as intended.

Business management
- Business management deals with managing the business associated with providing services and all the required support functions.

Network element
- The network element, in effect. The network element is involved with the management functionality that the network element itself supports, independent of any management system.

Management Function
- Each layer of management, different management functions need to be performed.
- It is possible to categorize those functions, with the same categories applying across management layers.

Management Process and Organization
- How to organize the management
- Processes that are required to ensure that the networks are run smoothly and reliably, as well as the structure of the support organization.
- Topic of the management process and organization is nontechnical aspects viewpoint.
Management Process and Organization

aspects to consider:

- Coverage: Are all the tasks accounted for, or are there areas in which tasks can fall through the cracks?
- Clear roles, responsibilities, and interfaces:
  - Is it clear who has to deliver what to whom?
  - Are there any overlaps in responsibilities?
- Efficiency and effectiveness: How effective are the tasks being performed?
- Resilience: The processes and procedures must cover the unexpected, whether from human error or other unexpected events.
- Flexibility: Adaptive and simply changes to new networking tech supported