Introducing Network Design Concepts

Designing and Supporting Computer Networks – Chapter 1
Objectives

- Explain how a hierarchical network design creates a stable, reliable, scalable network
- Explain what factors need to be considered when the Core Layer of a network is designed and implemented
- Explain which factors need to be considered when the Distribution Layer of a network is designed and implemented
- Explain which factors need to be considered when the Access Layer of a network is designed and implemented
- Describe the benefits and security implications of creating server farms
- Describe the considerations of an implementation of a wireless network design
- Describe the factors that affect the implementation of VPNs, including how remote workers can be supported
Explain How a Hierarchical Network Design Creates a Stable, Reliable, Scalable Network

Network requirements:

- Ease of management
- Fast recovery
- Application response time
- Fast troubleshooting
Explain How a Hierarchical Network Design Creates a Stable, Reliable, Scalable Network

Four fundamental network design goals:

- Scalability
- Availability
- Security
- Manageability
Explain How a Hierarchical Network Design Creates a Stable, Reliable, Scalable Network

- Core Layer: connects Distribution Layer devices
- Distribution Layer: interconnects smaller LANs
- Access Layer: provides connections for hosts and end devices
Explain How a Hierarchical Network Design Creates a Stable, Reliable, Scalable Network

Subdividing the three-layer model into modular areas:

- **Enterprise campus**
- **Server farm**
- **Enterprise edge**
Explain How a Hierarchical Network Design Creates a Stable, Reliable, Scalable Network

Steps in network design projects:

- Identify the network requirements
- Characterize the existing network
- Design the network topology and solutions
 Explain what Factors Need to be Considered when Designing the Network Core Layer

- Network backbone
- Goals of the Core Layer
  Provide 100% uptime
  Maximize throughput
  Facilitate network growth
Explain what Factors Need to be Considered when Designing the Network Core Layer

- Combining routing and switching in the same device
- Redundancy and load balancing
- High-speed and aggregate links
- Quick convergence
Explain what Factors Need to be Considered when Designing the Network Core Layer

- Full mesh topology
- Partial mesh topology
- Failure prevention
- Reducing human error

[Diagram showing causes of network outages: 40% Human Errors, 40% Application Failures, 20% Environmental Factors, HW, OS, Power, Disasters. Source: Gartner; Copyright @2001]
Explain which Factors Need to be Considered when Designing the Distribution Layer of a Network

- Filtering and managing traffic flow
- Access control policies
- Route summarization
- Isolating Core Layer from Access Layer failures
- Routing between VLANs
Explain which Factors Need to be Considered when Designing the Distribution Layer of a Network

- Explain how redundant links improve network reliability and stability
Explain which Factors Need to be Considered when Designing the Distribution Layer of a Network

- Explain how ACLs filter traffic for security and traffic management
Explain which Factors Need to be Considered when Designing the Distribution Layer of a Network

- Explain the concept of route summarization and describe how it is implemented at the Distribution Layer of the network.
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

- Physical location of equipment
- Wiring closets
- Converged networking
- Availability
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

- Naming structures
- VLAN architecture
- Traffic patterns
- Prioritization strategies
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

- Star topologies
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

Functions of VLANs:

- Separate and classify traffic
- Control broadcasts
- Contain VLANs within a single wiring closet
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

QoS at the network edge:
- Classification
- Assigned priority
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

Security risks at the network edge:

- Authentication
- Wireless security
Explain which Factors Need to be Considered when Designing the Access Layer of a Network

Security measures at the Access Layer:

- Physical security
- Strong passwords
- SSH
- Disabling unused ports
- Security policy
Describe the Benefits and Security Implications of Creating Server Farms

- Defined entry and exit points for network traffic
- Redundant, high-capacity links
- Load balancing and failover
- Lower cost of providing services
Describe the Benefits and Security Implications of Creating Server Farms

- Firewalls
- LAN switch security features
- Intrusion and prevention systems
- Load balancers
- Network analysis and management devices
- DMZs
Describe the Benefits and Security Implications of Creating Server Farms

- Building in redundancy for high availability
- Virtualization
Describe the Considerations of an Implementation of a Wireless Network Design

Customer requirements:

- Roaming
- Authentication
- Services and applications
- Encryption
- Coverage and number of users
Describe the Considerations of an Implementation of a Wireless Network Design

- Physical WLAN design
- Site survey
- Logical WLAN design
- Open guest access vs. secured employee access
Describe the Factors that Affect the Implementation of VPNs

- Cost of bandwidth
- QoS
- Security
- Remote access
Describe the Factors that Affect the Implementation of VPNs

Interconnection options:

- Traditional WAN technologies
- Newer WAN technologies
Describe the Factors that Affect the Implementation of VPNs

- Explain ways to provide redundant connectivity to remote sites
Summary

- The four fundamental technical requirements of network design are scalability, availability, security and manageability.

- Network projects involve identifying the requirements, characterizing the existing network, and designing the network topology and solutions.

- Redundancy at the Core Layer keeps the network functioning even when a device or link fails.

- Routing efficiency at the Distribution Layer isolates the Core from Access Layer failures.

- Using VLANs and IP subnets is the most common way to segregate user groups and traffic within the Access Layer.