

Network by Design (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Objective

Explain the need to design a hierarchical network that is scalable.

Instructor Note: This activity can be completed by individuals or groups of two students. It can then be shared with another individual, group, class, or the instructor.

Scenario

Your employer is opening a new, branch office.

You have been reassigned to the site as the network administrator where your job will be to design and maintain the new branch network.

The network administrators at the other branches used the Cisco three-layer hierarchical model when designing their networks. You decide to use the same approach.

To get an idea of what using the hierarchical model can do to enhance the design process, you research the topic.

Resources

- World Wide Web access
- Word processing software

Directions

Step 1: Use the Internet to find information and take notes about the Cisco three-layer hierarchical model. The site should include information about the:

- a. Access layer
- b. Distribution layer
- c. Core layer

Step 2: In your research, make sure to include:

- a. A simple definition of each hierarchical layer
- b. Three concise facts about each layer
- c. Network device capabilities needed at each layer
- d. A detailed graphic that shows a full, three-layer hierarchical model design

Step 3: Create a simple table to organize and share your research with another student, group, the class, or instructor.

Suggested Activity Example Solution: (information based on [The Cisco Three-Layered Hierarchical Model](#) and [LAN Design](#))

Access Layer	
Definition	This hierarchical layer connects local clients to the network. It is sometimes called the desktop layer.
Facts	<p>At this level:</p> <ul style="list-style-type: none"> • Network equipment works with the distribution and core layers to send and receive transmissions from clients and users. • Collision domains are created using switches. • Switches can be configured to filter MAC addresses and share bandwidth.
Network Device Features	<ul style="list-style-type: none"> • Port security • VLANs functionality • Fast Ethernet/Gigabit Ethernet transmissions • Power over Ethernet (PoE) • Link aggregation • Quality of service (QoS)
Distribution Layer	
Definition	This hierarchical layer provides policy-based, decision-making network connectivity to the access layer below it and the core layer above it.
Facts	<p>At this level:</p> <ul style="list-style-type: none"> • Firewalls and access lists can be placed. • Link aggregation can occur. • Broadcast and multicast domain boundaries are created.
Network Device Features	<ul style="list-style-type: none"> • Layer 3 support • High forwarding rate • Gigabit Ethernet/10 Gigabit Ethernet • Redundant components • Security policies/access control lists • Link aggregation • Quality of service (QoS)
Core Layer	
Definition	This hierarchical layer is the backbone of the network. It includes high-powered routers and switches that use high-speed cabling, such as fiber optics. The main function of this layer is reliable delivery of network packets.
Facts	<p>At this level:</p> <ul style="list-style-type: none"> • All other layers of the hierarchical design model are supported.

	<ul style="list-style-type: none"> • Load balancing is desired as an integral service. • Efficient, fast, reliable data paths ensure fast network transmissions.
Network Device Features	<ul style="list-style-type: none"> • Layer 3 support • Very high forwarding rate • Gigabit Ethernet/10 Gigabit Ethernet • Redundant components • Link aggregation • Quality of service (QoS)
Three-Layer Hierarchical Design Graphic	<p>The diagram illustrates a three-layer hierarchical network design. At the top is the Core layer with two switches. Below it is the Distribution layer with two switches. At the bottom is the Access layer with three switches. The Core and Distribution layers are connected via red lines, indicating Layer 3 connectivity. The Distribution and Access layers are connected via black lines, indicating Layer 2 connectivity. A dashed line separates the Distribution and Access layers. Below the Access layer switches, specific VLANs are listed: 'VLAN 2 - Voice', 'VLAN 102 - Data', 'VLAN 3 - Voice', 'VLAN 103 - Data', 'VLAN n - Voice', and 'VLAN 100 + N - Data'. To the right, a red double-headed arrow labeled 'Layer 3' spans the Core and Distribution layers, while a blue double-headed arrow labeled 'Layer 2' spans the Distribution and Access layers.</p>

Identify elements of the model that map to IT-related content:

- Network design
- Cisco three-layer hierarchical model
- Access layer
- Distribution layer
- Core layer