Module Practice and Quiz

11.5.1

Packet Tracer - Compare Layer 2 and Layer 3 Devices

In this Packet Tracer activity, you will use various commands to examine three different switching topologies and compare the similarities and differences between the 2960 and 3650 switches. You will also compare the routing table of a 4321 router with that of a 3650 switch.

Compare Layer 2 and Layer 3 Devices

Compare Layer 2 and Layer 3 Devices

11.5.2

What did I learn in this module?

Hierarchical Networks

All enterprise networks must: support critical applications, support converged network traffic, support diverse business needs, and provide centralized administrative control. The Cisco Borderless Network provides the framework to unify wired and wireless access, including policy, access control, and performance management across many different device types. The borderless network is built on a hierarchical infrastructure of hardware that is scalable and resilient. Two proven hierarchical design frameworks for campus networks are the three-tier layer and the two-tier layer models. The three critical layers within these tiered designs are the access, distribution, and core layers. The access layer represents the network edge, where traffic enters or exits the campus network. Access layer switches connect to distribution layer switches, which implement network foundation technologies such as routing, quality of service, and security. The distribution layer interfaces between the access layer and the core layer. The primary purpose of the core layer is to provide fault isolation and high-speed backbone connectivity. Networks have fundamentally changed to switched LANs in a hierarchical network, providing QoS, security, support for wireless connectivity and IP telephony and mobility services.

Scalable Networks

A basic network design strategy includes the following recommendations: use expandable, modular equipment, or clustered devices; design a hierarchical network to include modules that can be added, upgraded, and modified; create a hierarchical IPv4 and IPv6 address strategy; and choose routers or multilayer switches to limit broadcasts and filter other undesirable traffic from the network. Implement redundant links in the network between critical devices and between access layer and core layer devices. Implement multiple links between equipment, with either link aggregation (EtherChannel) or equal cost load balancing, to increase bandwidth. Use a scalable routing protocol and implementing features within that routing protocol to isolate routing updates and minimize the size of the routing table. Implement wireless connectivity to allow for mobility and expansion. One method of implementing redundancy is by installing duplicate equipment and providing failover services for critical devices. Another method of implementing redundancy is to create redundant paths. A well-designed network not only controls traffic, but also limits the size of failure domains. Switch blocks act independently of the others, so the failure of a single device does not cause the network to go down. Link aggregation, such as EtherChannel, allows an administrator to increase the amount of bandwidth between devices by creating one logical link made up of several physical links. Wireless connectivity expands the access layer. When implementing a wireless network, you must consider the types of wireless devices to use, wireless coverage requirements, interference considerations, and security. Link-state routing protocols such as OSPF, work well for larger hierarchical networks where fast convergence is important. OSPF routers establish and maintain neighbor adjacencies with other connected OSPF routers, they synchronize their link-state database. When a network change occurs, link state updates are sent, informing other OSPF routers of the change and establishing a new best path.

Switch Hardware

There are several categories of switches for enterprise networks including campus LAN, cloud-managed, data center, service provider, and virtual networking. Form factors for switches include fixed configuration, modular configuration, and stackable configuration. The thickness of a switch is expressed in number of rack units. The port density of a switch refers to the number of ports available on a single switch. Forwarding rates define the processing capabilities of a switch by rating how much data the switch can process per second. Power over Ethernet (PoE) allows the switch to deliver power to a device over the existing Ethernet cabling. Multilayer switches are typically deployed in the core and distribution layers of an organization's switched network. Multilayer switches are characterized by their ability to build a routing table, support a few routing protocols, and forward IP packets at a rate close to that of Layer 2 forwarding. Business considerations for switch selection include cost, port density, power, reliability, port speed, frame buffers, and scalability.

Router Hardware

Routers use the network portion (prefix) of the destination IP address to route packets to the proper destination. They select an alternate path if a link or path goes down. All hosts on a local network specify the IP address of the local router interface in their IP configuration. This router interface is the default gateway. Routers also serve other beneficial functions:

- They provide broadcast containment by limiting broadcasts to the local network.
- They interconnect geographically separated locations.
- They group users logically by application or department within a company, who have command needs or require access to the same resources.
- They provide enhanced security by filtering unwanted traffic through access control lists.

Cisco has several categories of routers including branch, network edge, service provider and industrial. Branch routers optimize branch services on a single platform while delivering an optimal application experience across branch and WAN infrastructures. Network edge routers deliver high-performance, highly secure, and reliable services that unite campus, data center, and branch networks. Service provider routers differentiate the service portfolio and increase revenues by delivering end-to-end scalable solutions and subscriber-aware services. Industrial routers are designed to provide enterprise-class features in rugged and harsh environments. Cisco router form factors include the Cisco 900 Series, the ASR 9000 and 1000 Series, the 5500 Series, and the Cisco 800. Routers can also be categorized as fixed configuration or modular. With the fixed configuration, the desired router interfaces are built-in. Modular routers come with multiple slots that allow a network administrator to change the interfaces on the router. Routers come with a variety of different interfaces, such as Fast Ethernet, Gigabit Ethernet, Serial, and Fiber-Optic.

11.5.3

Module Quiz - Network Design

1. Which cost-effective physical network topology design is recommended when building a three-tier campus network that connects three buildings?
   - ○ bus
   - ○ mesh
   - ◉ extended star
   - ○ dual ring

2. How much traffic is a 48-port gigabit switch capable of switching when operating at full wire speed?
   - ○ 24 Gb/s, because this is the maximum forwarding rate on Cisco switches
   - ○ 1 Gb/s, because data can only be forwarded from one port at a time
   - ◉ 48 Gb/s, by providing full bandwidth to each port
   - ○ 44 Gb/s, due to overhead requirements

3. What is the term that is used for the area of a network that is affected when a device or network service experiences problems?
   - ◉ failure domain
   - ○ user domain
   - ○ collision domain
   - ○ broadcast domain

4. Which type of router would an enterprise use to allow customers to access content anytime and anyplace, regardless of whether they are at home or work?
   - ○ service provider routers
   - ◉ network edge routers
   - ○ branch routers
   - ○ modular routers

5. Which design feature will limit the size of a failure domain in an enterprise network?
   - ○ the use of a collapsed core design
   - ○ the purchase of enterprise equipment that is designed for large traffic volume
   - ○ the installation of redundant power supplies
   - ◉ the use of the building switch block approach

6. What is a function of the distribution layer?
   - ○ network access to the user
   - ◉ interconnection of large-scale networks in wiring closets
   - ○ high-speed backbone connectivity
   - ○ fault isolation

7. What is the function of PoE pass-through?
   - ○ allows a switch to disable redundant Layer 2 paths in the topology to prevent Layer 2 loops
   - ○ allows multiple physical switch ports to be aggregated together and act as a single logical link to increase bandwidth on trunk links
   - ◉ allows switches, phones, and wireless access points to receive power over existing Ethernet cables from an upstream switch
   - ○ allows a multilayer switch to forward IP packets at a rate close to that of Layer 2 switching by bypassing the CPU

8. Which function is supplied by the access layer in a three-layer network design?
   - ○ backbone connectivity
   - ○ high-speed connectivity
   - ○ routing
   - ○ application of policies
   - ◉ network access

9. Which action should be taken when planning for redundancy on a hierarchical network design?
   - ◉ Add alternate physical paths for data to traverse the network.
   - ○ Immediately replace a nonfunctioning module, service ,or device on a network.
   - ○ Implement STP PortFast between the switches on the network.
   - ○ Purchase backup equipment for every network device at the distribution layer.

10. What is a collapsed core in a network design?
    - ○ a combination of the functionality of the access and core layers
    - ○ a combination of the functionality of the access and distribution layers
    - ○ a combination of the functionality of the access, distribution, and core layers
    - ◉ a combination of the functionality of the distribution and core layers

11. What is the name of the layer in the Cisco borderless switched network design that is considered to be the backbone used for high-speed connectivity and fault isolation?
    - ○ network access
    - ○ network
    - ◉ core
    - ○ data link
    - ○ access

12. Which technology is required when switched networks are designed to include redundant links?
    - ○ link aggregation
    - ◉ Spanning Tree Protocol
    - ○ virtual private networks
    - ○ virtual LANs

13. Which feature could be used in a network design to increase the bandwidth by combining multiple physical links into a single logical link?
    - ○ subinterfaces
    - ○ trunk ports
    - ○ VLANs
    - ◉ EtherChannel

14. Which statement describes a characteristic of Cisco Catalyst 2960 switches?
    - ○ They do not support an active switched virtual interface (SVI) with IOS versions prior to 15.x.
    - ○ They are modular switches.
    - ○ They are best used as distribution layer switches.
    - ◉ New Cisco Catalyst 2960-C switches support PoE pass-through.

15. Which network design solution will best extend access layer connectivity to host devices?
    - ○ implementing routing protocols
    - ○ implementing redundancy
    - ◉ implementing wireless connectivity
    - ○ implementing EtherChannel

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