DOWNLOAD PDF CISCO LAN SWITCHING

Chapter 1 : Network Architecture - Cisco Community

The Cisco Catalyst, Meraki, and Nexus campus LAN switches provide a broad range of deployment options--traditional, cloud managed, or in full fabric-control mode--as well as features, scale, port speeds, and interface types.

They were Layer 2 devices bridges dedicated to solving desktop bandwidth issues. Recent LAN switches evolved to multilayer devices capable of handling protocol issues involved in high-bandwidth applications that historically have been solved by routers. Today, LAN switches are used to replace hubs in the wiring closet because user applications demand greater bandwidth. LAN Switch Operation LAN switches are similar to transparent bridges in functions such as learning the topology, forwarding, and filtering. These switches also support several new and unique features, such as dedicated communication between devices through full-duplex operations, multiple simultaneous conversations, and media-rate adaption. Full-duplex communication between network devices increases file-transfer throughput. Multiple simultaneous conversations can occur by forwarding, or switching, several packets at the same time, thereby increasing network capacity by the number of conversations supported. Full-duplex communication effectively doubles the throughput, while with media-rate adaption, the LAN switch can translate between 10 and Mbps, allowing bandwidth to be allocated as needed. Broadcast domains describe the extent that a network propagates a broadcast frame generated by a station. Some switches may be configured to support a single or multiple VLANs. Switch ports configured as a member of one VLAN belong to a different broadcast domain, as compared to switch ports configured as members of a different VLAN. Creating VLANs enables administrators to build broadcast domains with fewer users in each broadcast domain. This increases the bandwidth available to users because fewer users will contend for the bandwidth. Routers also maintain broadcast domain isolation by blocking broadcast frames. Therefore, traffic can pass from one VLAN to another only through a router. Normally, each subnet belongs to a different VLAN. Therefore, a network with many subnets will probably have many VLANs. This provides a high level of deployment flexibility for a network administrator. Advantages of VLANs include the following: Segmentation of broadcast domains to create more bandwidth Additional security by isolating users with bridge technologies Deployment flexibility based upon job function rather than physical placement Switch Port Modes Switch ports run in either access or trunk mode. In access mode, the interface belongs to one and only one VLAN. Normally a switch port in access mode attaches to an end user device or a server. The frames transmitted on an access link look like any other Ethernet frame. Trunks, on the other hand, multiplex traffic for multiple VLANs over the same physical link. Trunk links usually interconnect switches, as shown in Figure: Switches Interconnected with Trunk Links. However, they may also attach end devices such as servers that have special adapter cards that participate in the multiplexing protocol. Switches Interconnected with Trunk Links Note that some of the devices attach to their switch using access links, while the connections between the switches utilize trunk links. To multiplex VLAN traffic, special protocols exist that encapsulate or tag mark the frames so that the receiving device knows to which VLAN the frame belongs. Trunk protocols are either proprietary or based upon IEEE Or, an intervendor solution may be implemented, such as Without trunk links, multiple access links must be installed to support multiple VLANs between switches. This is not cost-effective and does not scale well, so trunks are preferable for interconnecting switches in most cases. In the store-and-forward switching method, error checking is performed and erroneous frames are discarded. With the cut-through switching method, latency is reduced by eliminating error checking. With the store-and-forward switching method, the LAN switch copies the entire frame into its onboard buffers and computes the cyclic redundancy check CRC. If the frame does not contain any errors, the LAN switch looks up the destination address in its forwarding, or switching, table and determines the outgoing interface. It then forwards the frame toward its destination. With the cut-through switching method, the LAN switch copies only the destination address the first 6 bytes following the preamble into its onboard buffers. It then looks up the destination address in its switching table, determines the outgoing interface, and forwards the frame toward its destination. A cut-through switch provides reduced latency because it begins to forward the frame as soon as it reads the

destination address and determines the outgoing interface. Some switches can be configured to perform cut-through switching on a per-port basis until a user-defined error threshold is reached, when they automatically change to store-and-forward mode. When the error rate falls below the threshold, the port automatically changes back to store-and-forward mode. LAN switches must use store-and-forward techniques to support multilayer switching. The switch must receive the entire frame before it performs any protocol-layer operations. For this reason, advanced switches that perform Layer 3 switching are store-and-forward devices. Symmetric switching provides evenly distributed bandwidth to each port, while asymmetric switching provides unlike, or unequal, bandwidth between some ports. An asymmetric LAN switch provides switched connections between ports of unlike bandwidths, such as a combination of 10BaseT and BaseT. A symmetric switch provides switched connections between ports with the same bandwidth, such as all 10BaseT or all BaseT. Symmetric switching is optimized for a reasonably distributed traffic load, such as in a peer-to-peer desktop environment. A network manager must evaluate the needed amount of bandwidth for connections between devices to accommodate the data flow of network-based applications when deciding to select an asymmetric or symmetric switch. Layer 2, Layer 2 with Layer 3 features, or multilayer. A Layer 2 LAN switch is operationally similar to a multiport bridge but has a much higher capacity and supports many new features, such as full-duplex operation. As with bridges, it is completely transparent to network protocols and user applications. Such a switch might incorporate some Layer 3 traffic-control features, such as broadcast and multicast traffic management, security through access lists, and IP fragmentation. This type of switch dynamically decides whether to switch Layer 2 or route Layer 3 incoming traffic. A multilayer LAN switch switches within a workgroup and routes between different workgroups. Layer 3 switching allows data flows to bypass routers. The first frame passes through the router as normal to ensure that all security policies are observed. The switches watch the way that the router treats the frame and then replicate the process for subsequent frames. For example, if a series of FTP frames flows from a Multilayer switching observes how the router changes the Layer 2 and Layer 3 headers and imitates the router for the rest of the frames. This reduces the load on the router and the latency through the network. Review Questions Q - A multilayer switch mimics the actions of a router when an initial frame passes through a router. What things does the multilayer switch do to the Layer 2 and Layer 3 headers to thoroughly imitate the router? Furthermore, the switch must change things in the Layer 3 header such as the IP time-to-live value. Q -A LAN switch most closely resembles what type of internetworking device? A -A LAN switch behaves like a multiport bridge. Q -Two trunk protocols were described. For what situation would you use the IEEE A -Whenever you deploy a hybrid of switches from multiple vendors and need to trunk between them. All other trunk protocols work within specific vendor equipment environments. Q -Which switching method protects network segment bandwidth from errored frames? If the switch receives an errored frame, then the switch discards it. Q -How does a store-and-forward switch know if a frame is errored? A -The switch uses the CRC to determine whether any changes occurred to the frame since the source generated it. If they differ, the frame changed during transit and will be discarded in a store-and-forward switch. VLANs are broadcast domains and describe the extent that broadcast frames transit the network. Routers do not pass broadcasts. Therefore, the same VLAN cannot exist on two ports of a router. Q -How does a trunk link differ from an access link? The traffic on an access link looks like any other Ethernet frame. A trunk link transports traffic for multiple VLANs across a single physical link. Trunks encapsulate Ethernet frames with other information to support the multiplexing technology employed. What determined the user network assignment? Switched and Fast Ethernet. Clark, Kennedy, and Kevin Hamilton. Hein, Mathias, and David Griffiths. Switching Technology in the Local Network. International Thomson Publishing, Bridges, Routers, Switches, and Internetworking Protocols.

Chapter 2 : Enterprise LAN Switching for Cisco CCNA / | Pluralsight

The Cisco Catalyst and Nexus campus core and distribution LAN switches provide a broad range of deployment options in features, scale, port speeds, and interface types. Our fixed and modular, core and distribution LAN switches have been designed for an entirely new era of intent-based networking.

Today, switching refers to a technology that is similar to a bridge in many ways. The term bridging refers to a technology in which a device known as a bridge connects two or more LAN segments. A bridge transmits datagrams from one segment to their destinations on other segments. When a bridge is powered and begins to operate, it examines the Media Access Control MAC address of the datagrams that flow through it to build a table of known destinations. If the bridge knows that the destination of a datagram is on the same segment as the source of the datagram, it drops the datagram because there is no need to transmit it. If the bridge knows that the destination is on another segment, it transmits the datagram on that segment only. If the bridge does not know the destination segment, the bridge transmits the datagram on all segments except the source segment a technique known as flooding. The primary benefit of bridging is that it limits traffic to certain network segments. Like bridges, switches connect LAN segments, use a table of MAC addresses to determine the segment on which a datagram needs to be transmitted, and reduce traffic. Switches operate at much higher speeds than bridges, and can support new functionality, such as virtual LANs. Traditional Ethernet is a half-duplex technology. Each Ethernet host checks the network to determine whether data is being transmitted before it transmits and defers transmission if the network is in use. In spite of transmission deferral, two or more Ethernet hosts can transmit at the same time, which results in a collision. When a collision occurs, the hosts enter a back-off phase and retransmit later. As more hosts are added to the network, hosts must wait more often before they can begin transmitting, and collisions are more likely to occur because more hosts are trying to transmit. Today, throughput on traditional Ethernet LANs suffers even more because users are running network-intensive software, such as client-server applications, which cause hosts to transmit more often and for longer periods of time. An Ethernet LAN switch improves bandwidth by separating collision domains and selectively forwarding traffic to the appropriate segments. Ethernet switching shows the topology of a typical Ethernet network in which a LAN switch has been installed. Ethernet switching In Figure: Ethernet switching , each Ethernet segment is connected to a port on the LAN switch. If Server A on port 1 needs to transmit to Client B on port 2, the LAN switch forwards Ethernet frames from port 1 to port 2, thus sparing port 3 and port 4 from frames destined for Client B. If Server C needs to send data to Client D at the same time that Server A sends data to Client B, it can do so because the LAN switch can forward frames from port 3 to port 4 at the same time it is forwarding frames from port 1 to port 2. By spreading users over several collision domains, collisions are avoided and performance improves. Many LAN switch installations assign just one user per port, which gives that user an effective bandwidth of 10 Mbps. Layer 2 bridging protocols, such as IEEE VLANs are formed to group related users regardless of the physical connections of their hosts to the network. The users can be spread across a campus network or even across geographically dispersed locations. A variety of strategies can be used to group users. For example, the users might be grouped according to their department or functional team. When you configure VLANs, the network can take advantage of the following benefits: Broadcast control-Just as switches physically isolate collision domains for attached hosts and only forward traffic out a particular port, VLANs provide logical collision domains that confine broadcast and multicast traffic to the bridging domain. This extreme level of security can be highly desirable for certain projects and applications. You might, for example, assign an engineer who is testing a multicast application and the servers the engineer uses to a single VLAN. The engineer experiences improved network performance by being on a "dedicated LAN," and the rest of the engineering group experiences improved network performance because the traffic generated by the network-intensive application is isolated to another VLAN. Recabling to change connectivity is no longer necessary in the switched LAN environment because network management tools allow you to reconfigure the LAN logically in seconds. The Catalyst has five slots in which modules can be installed. The supervisor engine module is always installed in slot 1. The

supervisor engine module is the main system processor switch; it provides a console port and two Mbps Fast Ethernet ports. A variety of other modules providing Mbps Ethernet and Fast Ethernet interfaces can be installed in slots 2 through 5. Ports are identified by their slot number and their position, from left to right, on the module. The switches in Figure: Configuring the Switches When a Catalyst switch first starts up, the following defaults are set: The console port is set to baud, 8 data bits, no parity, and 1 stop bit. If you want to change the baud rate, use the set system baud command. If you want to disable CDP on ports that do not have a Cisco device, use the set cdp disable command. All modules and all ports are enabled. To disable a module, use the set module disable command, and to disable a port, use the set port disable command. All Mbps Ethernet ports are set to half duplex. Use the set port duplex command to set a port to full duplex. When you first start up a switch, you should set some values that apply to the switch as a whole. For example, you might enter the following commands at the console port of Switch A: The set system name establishes "SwitchA" as the name of this switch. The set time command sets the current time, using a hour clock format. The default prompt is "Console". The set password command sets password protection for the administrative interface in normal mode. When you enter the set password command, the switch prompts you to enter a password and then prompts you to reenter the password. The set enablepass command sets password protection for the administrative interface in privileged mode. When you enter the set enablepass command, the switch prompts you to enter a password and then prompts you to reenter the password. The set interface command assigns an IP address and netmask to interface sc0. After you make this assignment, you can Telnet to the switch to perform administrative tasks. The switch supports up to eight simultaneous Telnet connections. The second set vlan command creates VLAN 20 and assigns port 4 in slot 2 to it. The set trunk command configures port 1 in slot 1 as a trunk and adds VLANs 10 and 20 to it. Trunks are used for Fast Ethernet connections between switches. When a port is configured as a trunk, it runs in ISL mode. To detect and break loops, trunks use the spanning-tree protocol on all VLANs that are carried across the trunk. The second set vlan command creates VLAN 20 and assigns ports 1 and 3 in slot 2 to it. This trunk is used to communicate with Switch B. The second set trunk command configures port 2 in slot 2 as a trunk and adds VLANs 10 and 20 to it. This trunk is used to communicate with Switch A. Summary LAN switching technology improves the performance of traditional Ethernet, FDDI, and Token Ring technologies without requiring costly wiring upgrades or time-consuming host reconfiguration. The low price per port allows the deployment of LAN switches so that they decrease segment size and increase available bandwidth.

Chapter 3 : Cisco Catalyst PS Switch - POE n - Cisco Community

Cisco LAN Switchingprovides the most comprehensive coverage of the best methods for designing, utilizing, and deploying LAN switching devices and technologies in a modern campus network. Divided into six parts, this book takes you beyond basic switching concepts by providing an array of proven design models, practical implementation solutions.

Chapter 4 : LAN Switching and VLANs - DocWiki

1 Front Matter Table of Contents Index About the Author Cisco LAN Switching Kennedy Clark Kevin Hamilton Publisher: Cisco Press First Edition August 26,

Chapter 5 : Cisco LAN Switching Fundamentals

Cisco LAN Switching Fundamentals provides administrators of campus networks with the most up-to-date introduction to LAN switching within a traditional Ethernet environment. It provides an easy-to-understand introduction to LAN switching best practices using Cisco Catalyst switches.

Chapter 6 : Internetwork Design Guide -- LAN Switching - DocWiki

This is the mode used by the Cisco Catalyst series switches and cannot be modified on the switch. Cut-Through (Real Time) Cut-through switching technology is the another important type of LAN switching technology to be employed.

Chapter 7 : LAN/WLAN Switching in Windows 10 - HP Support Community -

Cisco LAN Switching should appeal to a wide variety of people working in the network field. It is designed for any network administrator, engineer, designer, or.

Chapter 8 : Cisco LAN Switching Fundamentals [Book]

Cisco LAN Switching Fundamentals provides administrators of campus networks with the most up-to-date introduction to LAN switching within a traditional Ethernet environment. Cisco LAN Switching Fundamentals presents an in-depth look at modern campus network requirements.

Chapter 9 : Cisco Meraki - Cloud Managed Networks that Simply Work

A LAN switch is a device that provides much higher port density at a lower cost than traditional bridges. For this reason, LAN switches can accommodate network designs featuring fewer users per segment, thereby increasing the average available bandwidth per user.