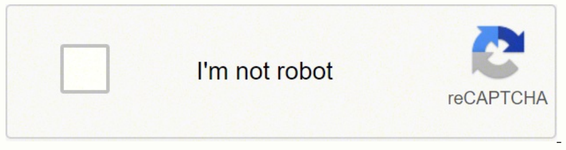

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Whats the difference between layer 2 and layer 3 switches

The term Layer 2 is adopted from the Open System Interconnect (OSI) model, which is a reference model for explaining and describing network communications. It is the process of using devices and MAC addresses on a LAN to segment a network. Switches and bridges are mostly used for Layer 2 switching. They help to break up large size collision domain into separate smaller ones. Layer 2 CISCO switches are similar to bridges. They interconnect networks at layer 2, mostly at the MAC sub-layer, and operate as bridges. It builds tables for the transfer of frames among systems. Layer 2 ethernet switches are faster compared to routers, as they do not take much time for evaluation at the network layer header information. Instead, they should look at the frame’s hardware addresses, which helps you decide what action needs to take like forward, flood, or drop it. In this networking tutorial, you will learn: What is Layer 3 Switching? A Layer 3 switch is a switch that performs routing functions in addition to switching. A client computer needs a default gateway for layer 3 connectivity to any remote subnets. This type of layer helps you to combine the functionality of a switch and a router. It acts as a switch to connect devices that are on the same subnet or virtual LAN. This type of CISCO network switches support routing protocols. It helps to inspect incoming packets and makes routing decisions based on the source and destination addresses. That is how layer 3 switch acts as both for switch and a router. How Layer 2 Switching works? Layer2 switching Here is an example of a network where a switch is connected to four host devices known as D1, D2, D3, and D4. D1 wants to send a data packet to D2 for the first time. D1 knows the IP address of D2 as they are communicating for the first time. However, it does not know the MAC (hardware) address of the recipient host. Thus D1 uses an ARP to discover the MAC address of D2. The Layer switch sends the ARP request to all the ports that exclude the port on which D1 is connected. D2, when receives the ARP request, replies to the ARP response message with its MAC address. D2 also gathers the MAC address of D1. Here, with the help of the above-given messages, switch learns which MAC addresses are assigned to which ports. Similarly, D2 also sends its MAC address in the ARP message,the switch now takes the MAC address of D2 and banks it into the MAC address table. It also stores the MAC address of D1 in the address table as it was sent by D1 to switch with the ARP request message. So, whenever D1 wants to send any data to D2, the switch will check the table and forward it to the other destination port of D2. Similarly, the Layer Switch will keep on maintaining the hardware address of each connecting host. Functions of layer 2 switching Here are important functions of Layer 2 switching: MAC addresses are known from all the incoming frames source addresses. Bridges and switches communicate with each other using the STP to remove bridging loops. Frames designed for unknown locations are overflowed out to all ports except the one that received the frame. It performs the same function as a transparent bridge. Frames are forwarded using specialized hardware, which is known as Application-Specific Integrated Circuits (ASIC). Layer-2 switches also perform the switching function to re-arrange the data frames from the source to its destination network. Layer-2 Switch splits a complicated LAN (local area network) into small VLAN networks. Functions of layer 3 switching Here are important functions of Layer 3 switching: Define paths based on logical addressing Provide Security Run layer three checksums Process and respond to any option information Allows you to update simple Network Management Information Base (MIB) information Applications of Layer-2 Switches Here are some important applications of Layer 2 switches. You can send a data frame from the source to the destination that is situated in the same VLAN without being physically connected. Servers of IT companies can be put centrally at one place. The clients located at some other locations can access the data link layer without latency, which saves the server cost and time. Companies also used it for internal communications by configuring the hosts on the same VLAN by using Layer 2 switches without any internet connection. Software professionals also use these switches for sharing their tools by keeping them centrally at one server location. Difference between Layer 2 and Layer 3 Switches Here are some important difference between Layer 2 and Layer 3 switching: Layer 2 Layer 3 Layer 2 switching is used to reduce traffic on the local network. It is mostly used to Implement VLAN. In Layer 2, switching packets are rerouted from the source to the destination port. In Layer 3 switching, switches use a little time to check data packets before finding the best available route to direct data packets to the destination port. Layer 2 uses the Address Resolution Protocol (ARP) to discover other devices’ MAC addresses. Layer 3 devices utilize IP addresses for routing within Virtual LANs (VLANs). Layer 2 switch comes with a little tendency of switching packets from one port to another. Layer 3 switching helps devices to communicate outside the networks as well. Layer 2 switch does simple switching by finding and maintain a table of MAC addresses. Layer 3 switch is a specialized device that is designed for routing of data packets through IP addresses. Layer 2 vs. Layer 3 Switch Item Layer 2 Switch Layer 3 Switch Routing Function Mac address only Supports higher routing such as static routing and dynamic routing, VLAN Tagging Based on IP Address No Yes Inter-VLAN No Yes Application Pure Layer 2 domain Aggregate multiple access switches Advantage of Layer2 Switching Here are the pros/benefits of Layer2 Switching switches: Helps to forward packets based on unique MAC addresses Does not offer any setup or management It can be quickly deployed at a lower cost L2 switches flow accounting capabilities Low latency and improved security Advantage of Layer3 Switching Here are the pros/benefits of Layer3 Switching: L3 support routing between virtual LANs. Improve fault isolation. Provide ease of security management. Reduce broadcast traffic volumes. Ease the configuration process for VLANs, as a separate router is not needed between each VLAN. Separate routing tables, and as a result, segregate traffic better. Offers flow accounting and high-speed scalability. Lower network latency as a packet that does not make extra hops to go through a router. Limitation of Layer2 Switching Here are the cons/drawback of Layer2 switching: The layer 2 switches must break up the collision domains correctly. It does not break up broadcast domains by default. L2 switches does not allow you to implement any intelligence while forwarding packets. Does not helps you to perform switching or IP address-based routing. Never given guarantee required bandwidth to VoIP users Limitation of Layer3 Switching Here are the cons/drawbacks of Layer2 switching: The cost of the L3 switch is quite high compared to the Layer 2 switch. Layer 3 switch does not offer WAN functionality. Multiple tenants and virtualization. Does not offer any functionality. Summary: Layer2 is the process of using devices and MAC addresses on a LAN to segment a network. A Layer 3 switch is a switch that performs routing functions in addition to switching. Layer 2 switches perform the switching function to re-arrange the data frames from the source to its destination network. Layer 3 switches define paths based on logical addressing. Layer 2 switches are used to reduce traffic on the local network, whereas Layer 3 switches mostly used to Implement VLAN. The advantage of Layer 2 switches is that it helps to forward packets based on unique MAC addresses The advantage of Layer 3 switches offers flow accounting and high-speed scalability. The main drawback of Layer 2 switches is that it does not allow you to implement any intelligence while forwarding packets. The main drawback of the Layer 3 switch does not offer WAN functionality. In graphics software, a layer is the term used to describe the different levels at which you can place an object or image file. In the program you can stack, merge or define layers when creating a digital image. Layers can be partially obscured allowing portions of images within a layer to be hidden or shown in a translucent manner within another image, or you can use layers to combine two or more images into a single digital image. For the purpose of editing, working with layers allows you to go back and make changes within a layer as you work. See also “Graphics Software Terminology” in the Quick Reference section of Webopedia. A network switch is an essential part of any network. With the diversity of network applications and the increasing diversity of converged network implementations, Layer 3 switches thrive in data centers, complex enterprise networks, and commercial applications. Layer 2 vs. Layer 3 switch, which is the preferred network switch? Layer 2 Switches and Layer 3 Switches What are they？ The Open Systems Interconnection (OSI) model uses Layer 2 switches and Layer 3 switches and is a reference model for describing and explaining network communications. The OSI model has seven layers: application layer, presentation layer, session layer, transport layer, network layer, data link layer and physical layer. Layers 2 and 3 refer to the data link layer and network layer, respectively. The ones that work in these layers are called layer 2 switches and layer 3 switches. Layer 2 switch Layer 2 switches are basically just switching, which means they redirect packets from a source port to a destination port using the MAC address of the device. It keeps track of which ports are assigned which MAC addresses by maintaining a MAC address table. MAC addresses operate within layer 2 of the OSI reference model. A MAC address simply distinguishes one device from another, and each device is assigned a unique MAC address. It utilizes hardware-based switching technology to manage traffic in the LAN (Local Area Network). Since the switching happens at layer 2, the process is fairly fast since all it does is order the MAC addresses at the physical layer. Simply put, a Layer 2 switch acts as a bridge between multiple devices. Layer 3 switch A Layer 3 switch is the exact opposite of a Layer 2 switch. Layer 2 switches cannot route packets at Layer 3. Layer 3 uses IP addresses for routing which is different from Layer 2 switches. It is a specialized hardware device used to route packets. Layer 3 switches have fast switching capabilities and higher port density. They are a major upgrade over traditional routers and offer better performance. The main advantage of Layer 3 switches is that they can route packets without making additional network hops and are therefore faster than routers. However, they lack some additional features of routers. Layer 3 switches are typically used in large enterprises. In short, a Layer 3 switch is nothing more than a high-speed router, but without WAN connectivity. Difference between Layer 2 and Layer 3 Switch Switching and routing Switching operates at layer 2 of the OSI reference model, where packets are redirected to destination ports based on MAC addresses. So the layer 2 switch just does the switching. However, Layer 3 switches are specialized hardware devices used to route packets using IP addresses. So it just does routing. Features A layer 2 switch can only switch packets from one port to another, whereas a layer 3 switch can both switch and route. Routing is not possible in Layer 2 switching, which means that devices can communicate within the same network. In Layer 3 switching, devices can communicate inside and outside the network. MAC and IP address The Layer 2 switch uses the MAC address of the device to redirect packets from the source port to the destination port. They redirect packets by maintaining a table of MAC addresses. Instead, Layer 3 switches use IP addresses to link the individual subnets together through a special routing protocol Application Layer 2 switching is hardware based, the switch uses an ASIC (Application Specific Integrated Circuit) to maintain the MAC address table. Switches and bridges use Layer 2 switching like a typical LAN, which divides a large domain into multiple smaller domains. Switches use a process called Address Resolution Protocol (ARP) to determine the MAC addresses of other devices. Layer 3 switches are modern combinations of switches and routers, typically used for routing within virtual LANs (VLANs). Speed Switches operating at layer 2 typically take less time than switches operating at layer 3. All they do is assign MAC addresses to reroute packets from source ports to destination ports in Layer 2 switching. Conversely, a Layer 2 switch takes some time to inspect the packet before it can find the best route to send the packet to its destination port. Layer 2 Switch Layer 3 Switch Switching operates at the Layer 2 of the OSI Reference Model. Layer 3 switches do both switching as well as routing. It uses MAC addresses to facilitate communication within devices from the same network. It uses IP addresses to link different subnets together using dynamic routing protocols. It is a single broadcast domain. It is a multiple broadcast domain. Devices can only communicate within the same network. Devices can communicate within or outside the networks. Switching at Layer 2 is quite fast as they do not look at the Layer 3 portion of the data packets. It takes time to examine data packets before sending them to their destination. How to choose When torn between Layer 2 and Layer 3 switches, you should consider where to use it. If you have a pure Layer 2 domain, you can simply choose a Layer 2 switch. A pure Layer 2 domain is where hosts connect, so Layer 2 switches can function properly there. This is often referred to as the access layer in the network topology. Layer 3 switches are required if you need switches to aggregate multiple access switches and do inter-VLAN routing. This is called the distribution layer in network topology. Summary The speed and efficiency of a network switch depends on its processor, switching fabric, and its algorithms. Its complexity depends on the layers at which the switch operates in the Open Systems Interconnection (OSI) model. Generally speaking, ordinary computer networks have always been dominated by Layer 2 switches. But as complexity increases, applications require more robust and reliable network configurations. This is where Layer 3 switches come into play. More advanced equipment is not always better, but it is right to choose the most suitable equipment for your specific application. Want to know more, please click here: Cisco Switches, Ruckus Switches, SMB Switches, Industrial Ethernet Switches Read More: Layer 3 Switch vs. Router: Can Layer 3 Switch Replace Router? Hot-selling Switches Revealed! Cisco, Aruba, Juniper and More Brands Buyer Guide: Cisco Switches vs. Aruba Switches

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