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CN-Tutorial-0

(1) List out different networking devices.

✓Hubs ✓Switches ✓Bridges ✓Routers ✓Gateways ✓CSU/DSU (Channel Service Unit/Data Service Unit) ✓NICs (Network Interface Card) ✓ISDN (Integrated Services Digital Network) adapters ✓WAPs (Wireless Access Point) ✓Modems ✓Transceivers (media converters) ✓Firewalls

(2) What is router? Describe the architecture of Router.

A Router is a networking device that forwards data packets between computer network.
Functions of a Router:
The router basically performs two major functions:

1.Forwarding –

Router receives the packets from its input ports, checks it header, performs some basic

functions like checking checksum and then looks upto the routing table to find the

appropriate output port to dump the packets onto, and forwards the packets onto that

output port.

2.Routing –

Routing is the process by which the router ascertains what is the best path for the

packet to reach the destination, It maintains a routing table which is made using

different algorithms by the router only.

Architecture of a Router:
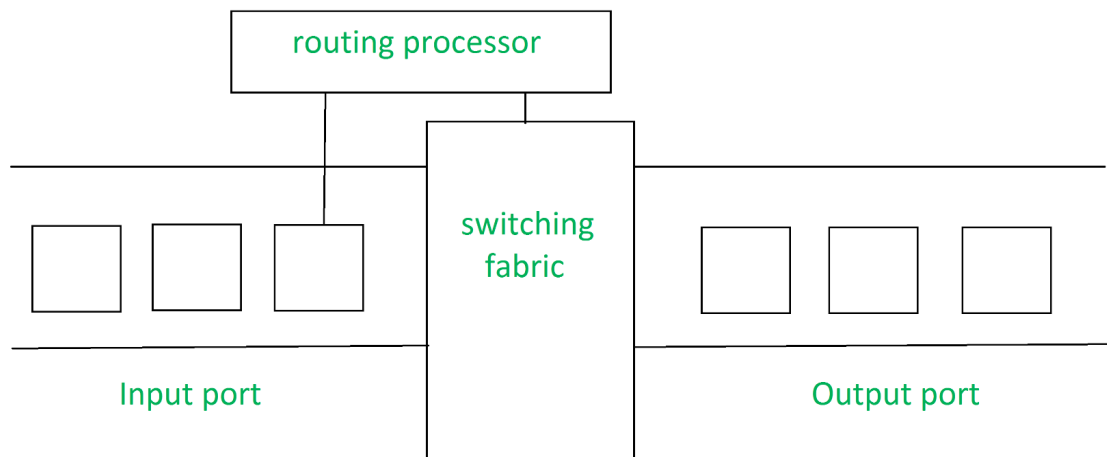
Input Port –
This is the interface by which packets are admitted into the router, it performs sevral key functions as terminating the physical link at router, this is done by the leftmost part in the below diagram, the middle part does the work of interoperating with the link layer like decapsulation, in the last part of the input port the forwarding table is looked up and is used to determine the appropriate output port based on the destination address.
Switching Fabric –
This is the heart of the Router, It connects the input ports with the output ports. It is kind of a network inside a networking device. The switching fabric can be implemented in a number of ways some of the prominent ones are:

•Switching via memory:In this we have a processor which copies the packet from input ports and sends it to the appropriate output port. It works as a traditional cpu with input and output ports acting as input and output devices

•Switching via bus:In this implementation we have a bus which connects all the input ports to all the output ports.On receiving a packet and determining which ouput port it must be delivered to, the input port puts a particular token on the packet and transfers it to the bus. All output ports are able to see the packets but it will be delivered to the output port whose token has been put in, the token is then scrapped off by that output port and the packet is forwarded

•Switching via interconnection network:This is a more sophisticated network, here instead of a single bus we use 2N bus to connect n input ports to n output ports.

Output Port –
This is the segment from which packets are transmitted out of the router. The output port looks at its queuing buffers (when more than one packets have to be transmitted through the same output port queuing buffers are formed) and takes packets, does link layer functions and finally transmits the packets to outgoing link

1.Routing Processor –

It executes the routing protocols, it works like a tradition cpu. It employs various routing algorithm like link-state algorithm, distance-vector algorithm etc. to prepare the forwarding table, which is looked up to determine the forwarding table.

(3)What is hub? List out different types of hubs.

A hub is a common connection point, also known as a network hub, which is used for connection of devices in a network. It works as a central connection for all the devices that are connected through a hub. The hub has numerous ports. If a packet reaches at one port, it is able to see by all the segments of the network due to a packet is copied to the other ports. A network hub has no routing tables or intelligence (unlike a network switch or router), which is used to send information and broadcast all network data across each and every connection.

Passive Hub:The passive hubs are the connection point for wires that helps to make the physical network. It is capable of determining the bugs and faulty hardware. Simply, it accepts the packet over a port and circulates it to all

ports. It includes connectors (10base-2 port and RJ-45) that can be applied as a standard in your network. This connector is connected to all LAN devices. Additionally, the advanced passive hubs have AUI ports, which are connected as the transceiver according to the network design.

Active Hub:As compared to a passive hub, it includes some additional features. It is able to monitor the data sent to the connected devices. It plays an important role between the connected devices with the help of store technology, where it checks the data to be sent and decides which packet to send first.

It has the ability to fix the damaged packets when packets are sending, and also able to hold the direction of the rest of the packets and distribute them. If a port receives a weak signal, but still it is readable, then the active hub reconstructs the weak signal into a stronger signal before its sending to other ports. It can boost the signal if any connecting device is not working in the network. Therefore, it helps to make the continuity of services in LAN.

Intelligent Hub:It is a little smarter than passive and active hubs. These hubs have some kinds of management software that help to analyze the problem in the network and resolve them. It is beneficial to expend the business in networking; the management can assign users that help to work more quickly and share a common pool efficiently by using intelligent hubs. However, it offers better performance for the local area network. Furthermore, with any physical device, if any problem is detected, it is able to detect this problem easily.

(4) What is Switch? Describe the architecture of switch.

The switch architecture defines the internal organization and functionality of components in a switch. The switch is in charge of forwarding units of information from the input ports to the output ports.

The switch is made up of a set of identical input ports, connected to input physical channels. Each input port uses a link control module to adapt messages coming through the physical channel to the internal switch. Each message is then stored in a buffer at the input port.

(5) Distinguish between router, switch and hub.

template	Hub	Switch	Router
Layer	Physical layer	Data link layer	Network layer
Function	To connect a network of personal computers together, they can be joined	Allow connections to multiple devices, manage ports, manage VLAN	Direct data in a network

		through a central hub	security settings	
Data Transmission form	electrical signal or bits	frame & packet	packet
Port	4/12 ports	multi-port, usually between 4 and 48	2/4/5/8 ports
Transmission type	Frame flooding, unicast, multicast or broadcast	First broadcast, then unicast and/or multicast depends on the need	At Initial Level Broadcast then Uni-cast and multicast
Device type	Non-intelligent device	Intelligent device	Intelligent device
Used in(LAN, MAN, WAN)	LAN	LAN	LAN, MAN, WAN
Transmission mode	Half duplex	Half/Full duplex	Full duplex
Speed	10Mbps	10/100Mbps, 1Gbps	1-100Mbps(wireless); 100Mbps-1Gbps(wired)
Address used for data transmission	MAC address	MAC address	IP address

(6) What are Gateways? Mention the important characteristics of gateways?

Gateway is a network connecting device that can be used to connect two devices in two different networks implementing different networking protocols and overall network architecture.In other words, a gateway is a node on a network that serves as an entrance to another network.

It can connect the devices of two different networks having dissimilar structures.

Important characteristics:-

1.It is an intelligent device with filtering capabilities.

2.It has control over both collisions as well as a broadcast domain.

3.It uses a full-duplex mode of communication.

4.It has the fastest data transmission speed amongst all network connecting devices.

5.It can perform data translation and protocol conversion of the data packet as per the destination network's need.

6.It can encapsulate and decapsulate the data packets.

7.It has improved security than any other network connecting device.

(7)   Describe the features of Ethernet card. How is it different from WiFi card?

An Ethernet card in your computer serves one basic function: to transmit data from the network to your computer. Ethernet cards are physical expansion cards that insert into a PCI expansion slot on a computer. Some computers also have onboard Ethernet cards that sit directly on a hard drive and perform the same tasks as a PCI Ethernet card. An Ethernet card is the communications hub for your computer; it connects to a network using a network cable. Ethernet cards can also communicate one-on-one with another Ethernet card, allowing for peer-to-peer network connections -- these are useful for direct file sharing. The cable connection on the Ethernet card is called an RJ-45 connection, which connects to a variety of cable types, all capable of different transmission speeds.

Wireless networks use a central hub called a wireless router to control the flow of information to and from each device on the network, while Ethernet cards function independently and don't require a central control. This doesn't mean that computers on the Ethernet don't need a router, since routers typically function as couplers to extend the range of a network -- but it does mean that the router doesn't regulate the speed and transfer of data as with a wireless network. This allows for greater file-transfer rates across your office.

(8) What is Brouter?

A brouter is a device that functions as both a bridge and a router . It can forward data between networks (serving as a bridge), but can also route data to individual systems within a network(serving as a router).

(9) List out security devices used in Networking?

Access control.

•Antivirus and anti-malware software.

•Application security.

•Behavioral analytics.

•Data loss prevention.

•Distributed denial of service prevention.

•Email security.

•Firewalls.

(10) What is proxy server? Explain its need.

A proxy server acts as a gateway between you and the internet. It's an intermediary server separating end users from the websites they browse. Proxy servers provide varying levels of functionality, security, and privacy depending on your use case, needs, or company policy.

If you're using a proxy server, internet traffic flows through the proxy server on its way to the address you requested. The request then comes back through that same proxy server (there are exceptions to this rule), and then the proxy server forwards the data received from the website to you.

Uses:-

-To control internet usage of employees and children

-Bandwidth savings and improved speeds

-Privacy benefits

-Improved security

-Get access to blocked resources

(11) Explain the virtual private network (VPN).

A virtual private network, or VPN, is an encrypted connection over the Internet from a device to a network. The encrypted connection helps ensure that sensitive data is safely transmitted. It prevents unauthorized people from eavesdropping on the traffic and allows the user to conduct work remotely. VPN technology is widely used in corporate environments.

(12) Describe Virtual LAN.

A VLAN (virtual LAN) is a subnetwork which can group together collections of devices on separate physical local area networks (LANs). A LAN is a group of computers and devices that share a communications line or wireless link to a server within the same geographical area.Ports (interfaces) on switches can be assigned to one or more VLANs, enabling systems to be divided into logical groups -- based on which department they are associated with -- and establish rules about how systems in the separate groups are allowed to communicate with each other. These groups can range from the simple and practical (computers in one VLAN can see the printer on that VLAN, but computers outside that VLAN cannot), to the complex and legal (for example, computers in the retail banking departments cannot interact with computers in the trading departments).

(13) List out different communication Medias used for networking system.
Communicating data from one location to another requires some form of pathway or medium. These pathways, called communication channels, use two types of media: cable (twisted-pair wire, cable, and fiber-optic cable) and broadcast (microwave, satellite, radio, and infrared).

(14) What is repeater?
In telecommunications, a repeater is an electronic device that receives a signal and retransmits it.Repeaters are used to extend transmissions so that the signal can cover longer distances or be received on the other side of an obstruction.

(15) Distinguish between bridge and switch?

Switch	Bridge
It is a device which is responsible for channeling the data that is coming into the various input ports to a particular output port which will further take the data to the desired destination.	It is basically a device which is responsible for dividing a single network into various network segments.
A switch can have a lot of ports.	A bridge can have 2 or 4 ports only.
The switch performs the packet forwarding by using hardwares such as ASICS hence, it is hardware based.	The bridge performs the packet forwarding by using softwares so it is software based.

Switch	Bridge
The switching method in case of a switch can thus be store, forward, fragment free or cut through.	The switching method in case of a bridge is store and forward.
The task of error checking is performed by a switch.	A bridge cannot perform the error checking.
A switch has buffers.	A bridge may not have a buffer.

(16) Why is MAC Address required? Why MAC is called PHYSICAL ADDRESS?Write the

sample format of the MAC address.

Every NIC has a hardware address that's known as a MAC, for Media Access Control.

Where IP addresses are associated with TCP/IP (networking software), MAC addresses

are linked to the hardware of network adapters.

A MAC address is given to a network adapter when it is manufactured. It is hardwired or hard-coded onto your computer's network interface card (NIC) and is unique to it. Something called the ARP (Address Resolution Protocol) translates an IP address into a MAC address. The ARP is like a passport that takes data from an IP address through an actual piece of computer hardware.MACs are physical addresses, because they are built into the physical hardware. The specific value of a MAC is really irrelevant in terms of the network operation, with the proviso that the MAC must be unique within a an individual network. MACs are 64 bit values, and each bit has no greater or less significance in terms of any routing or other addressing. Ex:00:1B:44:11:3A:B7


(17) What is multiport switch?

The Multiport Switch block determines which of several inputs to the block passes to the output. The block bases this decision on the value of the first input. The first input is the control input and the remaining inputs are the data inputs. The value of the control input determines which data input passes to the output.

(18) Explain the collision domain and broadcast domain of hub, switch and

router with illustrative example networks.

Example of Collision domains
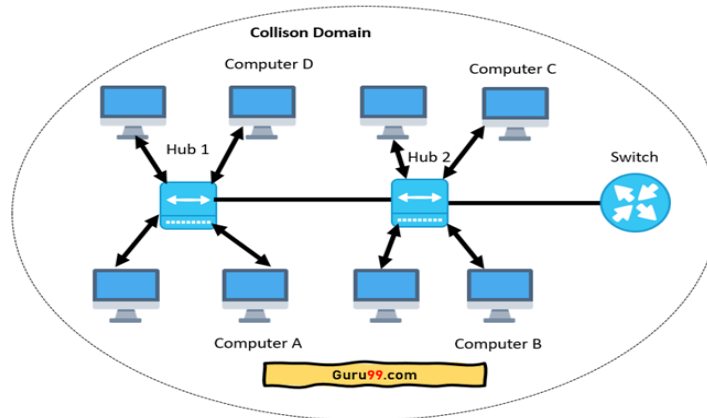
Above given image is an example of a collision domain.

In the above example, you can see "Computer A" send a data signal to "Computer C." In the same way, "Computer B" sends a data signal to "Computer D" where a Collision will happen.
When the number of devices in a collision domain rises, and the chances of Collision will be increased. If there is more traffic in a collision domain, there are high chances of crashes to occur. More collisions will happen with many network devices in a Collision domain.
An increased number of collisions will result in a low-quality network because hosts spend a large amount of time for packet processing and retransmission.
In other words, Collision never happens between two devices, which are connected to different ports of a Switch.

Example of Broadcast domains
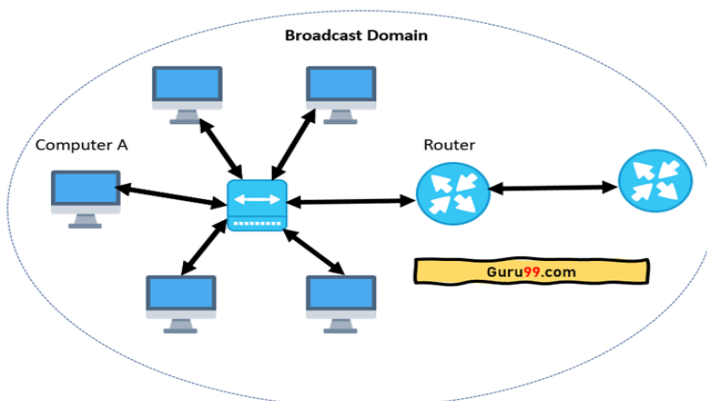
In the above-given image, you can see "Computer A" is sending a broadcast, and the switch will forward it to all the ports. Every connected switch will get a copy of the broadcast packet. Here, all the switches will flood the broadcast packet to all types of ports.In this domain type, the router also gets a copy of the broadcast packet. However, the route will not forward the packet to the next network segment. When the number of broadcasts Domain increases, the number of broadcasts also increases, and the network quality comes down.