Network Infrastructure Devices and Topologies

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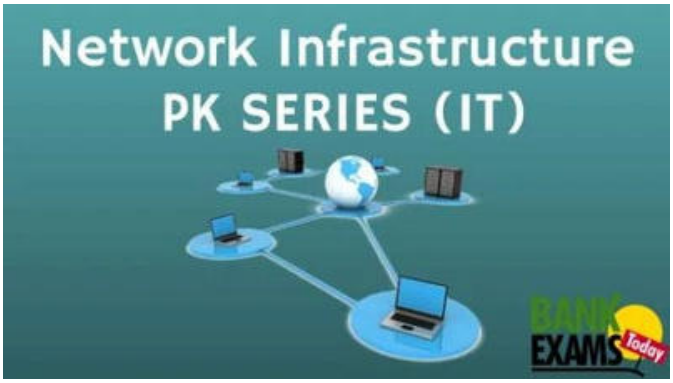
Hi Aspirants,

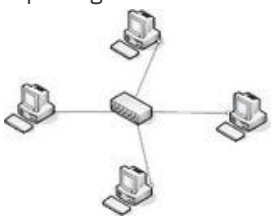
Continuing with the PK Series, today we will be discussing network infrastructure devices and topologies.



Network Infrastructure Devices

Hub

Hub is a common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. It contains multiple ports. When a packet arrives at one of its ports, it transmits that packets to all the ports. Hence you may have poor response times in a network where Hubs are used. If two network devices on the same network try to send packets at the same time, a collision is said to occur. Hubs are considered to operate at physical layer (layer 1 of OSI model). Network switches are rapidly replacing Hubs.



Switch

A device that filters and forwards packets between LAN Segments. It receives incoming data packets and **redirects them to a particular destination**. It uses hardware address (MAC) for this purpose. A switch typically operates at data link layer (Layer 2) of OSI model but it can support all types of packet protocols.

Router

It uses information from network layer (Layer 3) to direct packets through the network. Also it uses a **combination of hardware and software to route data** from source to destination.It segments large networks in to logical segments called

subnets. We'll be dealing with subnetting in a separate article.

Differences between Hub, Switch and Router

Network communications in a hub might result in collisions as many devices may attempt to communicate at the same time while in a switch a kind of electronic tunnel is created between source and destination in which on other traffic can enter. Router on the other hand, has an additional ability to forward packets between different networks while Hubs and Switches cater to one same network.

Firewall

A firewall is used to protect network's data and resources from outside threats or unauthorized access. Firewalls can be hardware of software but an ideal one is a combination of two.

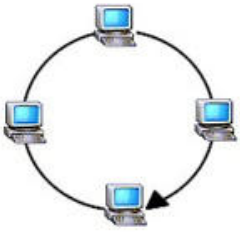
Network Topologies

Bus Topology

A network type in which every computer and network device is connected to a single cable. It transmits data in only one direction.
Advantages: cost effective, useful in small networks, easy to understand and expand joining 2 cables together.
Disadvantages: network crashes if cable fails, in heavy traffic-performance decreases.

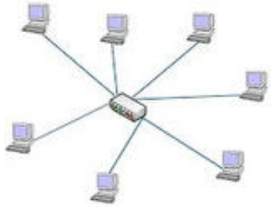
Ring Topology

A network type in which each computer is connected to another computer forming a ring. Each device will have 2 neighbors. Data transfer is sequential i.e bit by bit. Repeaters are used to avoid packet loss and signal strength. Advantages: Transmitting not affected by heavy traffic, cheap to install and expand. Disadvantages: Difficult troubleshooting, whole network disturbed if one computer fails.



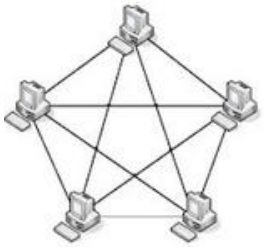
Star Topology

All computers (nodes) are connected to a single hub (central node) through a cable. Each node has a dedicated network to the hub. It can be set up with twisted pair, coaxial and optical fibre cable, all.
Advantages: Easy troubleshooting (failed computer can be detected easily), Easy to set up and modify, Fast performance.
Disadvantages: High cost of installation, problem in central node affects whole network, performance based entirely on capacity of hub.



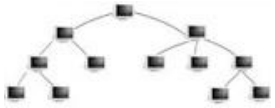
Mesh Topology

Point to point connection to other nodes and devices. Packets are transmitted only between connected nodes. While setting up, partial mesh or full mesh can be implemented depending upon if you want to connect all or some nodes.
Advantages: Each connection carries its own data load, easy to troubleshoot, provides security and privacy.
Disadvantages: difficult installation and configuration, bulk wiring required.



Tree Topology

All nodes are connected to root node forming a hierarchy. It should have at least 3 levels to hierarchy. It is mostly used in WANs.
Advantages: Easy expansion, Easy maintenance, Easy troubleshooting.
Disadvantages: Costly, Bulk cabling required.



Hybrid Topology

A network type where **two or more topologies are mixed**. Mostly used in WANs. Mostly used hybrid topology is a combination of Star-Bus or Star-Ring networks.
Advantages: Reliable, good points of both increases scalability.
Disadvantages: Design complexity, High cost of setting up.