

# Networking Basics module 14

## Day 11/365

As networks grow, it is often necessary to divide one access layer network into multiple access layer networks. There are many ways to divide networks based on different criteria:

- **Broadcast containment** - Routers in the distribution layer can limit broadcasts to the local network where they need to be heard.
- **Security requirements** - Routers in the distribution layer can separate and protect certain groups of computers where confidential information resides.
- **Physical locations** - Routers in the distribution layer can be used to interconnect local networks at various locations of an organization that are geographically separated.
- **Logical grouping** - Routers in the distribution layer can be used to logically group users, such as departments within a company, who have common needs or for access to resources.

The distribution layer connects these independent local networks and controls the traffic flowing between them. It is responsible for ensuring that traffic between hosts on the local network stays local.

A router is a networking device that connects multiple Layer 3, IP networks. At the distribution layer of the network, routers direct traffic and perform other functions critical to efficient network operation. Routers, like switches, are able to decode and read the messages that are sent to them. Unlike switches, which make their forwarding decision based on the Layer 2 MAC address, routers make their forwarding decision based on the Layer 3 IP address.

Anytime the network portion of the IP addresses of the source and destination hosts do not match, a router must be used to forward the message.

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Each port, or interface, on a router connects to a different local network. Every router contains a table of all locally connected networks and the interfaces that connect to them.

When a router receives a frame, it decodes the frame to get to the packet containing the destination IP address. It matches the network portion of the destination IP address to the networks that are listed in the routing table. If the destination network address is in the table, the router encapsulates the packet in a new frame in order to send it out. It forwards the new frame out of the interface associated with the path, to the destination network. The process of forwarding the packets toward their destination network is called routing.

A router forwards a packet to one of two places: a directly connected network containing the actual destination host, or to another router on the path to reach the destination host. When a router encapsulates the frame to forward it out a routed interface, it must include a destination MAC address.

If the router must forward the packet to another router through a routed interface, it will use the MAC address of the connected router. Routers obtain these MAC addresses from ARP tables.

A host is given the IPv4 address of the router through the default gateway address configured in its TCP/IP settings. The default gateway address is the address of the router interface connected to the same local network as the source host. All hosts on the local network use the default gateway address to send messages to the router.

Routing tables contain the addresses of networks, and the best path to reach those networks. Entries can be made to the routing table in two ways: dynamically updated by information received from other routers in the network, or manually entered by a network administrator.

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LAN refers to a local network, or a group of interconnected local networks that are under the same administrative control. All the local networks within a LAN are under one administrative control. Other common characteristics of LANs are that they typically use Ethernet or wireless protocols, and they support high data rates.

Within a LAN, it is possible to place all hosts on a single local network or divide them up between multiple networks connected by a distribution layer device.

Placing all hosts on a single local network allows them to be seen by all other hosts. This is because there is one broadcast domain and hosts use ARP to find each other.

Placing additional hosts on a remote network will decrease the impact of traffic demands. However, hosts on one network will not be able to communicate with hosts on the other network without the use of routing. Routers increase the complexity of the network configuration and can introduce latency, or time delay, on packets sent from one local network to the other.

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Finished the checkpoint exam, scored 75% on first try and corrected mistakes. Only 3 modules remaining.