RECAP/

The need for routing

As network grows, 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 info 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**

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.

Roters, like switches, are able to decode and read the msg 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.***

The routing table

- **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 connected to them.**

When router receives a frame,

It decodes the frame to get to the packet containing the destination IP address.

It matches the network portion of IP to the network that are listed in the routing table

If the destination 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 (this is called routing)

**A router forwards a packet to one of two places:**

- Directly connected network containing the actual destination host

- Another router on the path to reach the destination host

When a router encapsulates the frame to forward it out a router interface

- it must include MAC address

**If it forwards the packet to another router it will use MAC address of the connected router**

A host is given 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 msges to the router**

**Routing tables contain the addresses of networks, and the best path to reach those networks.**

Entries are made in 2 ways:

Dynamically updated by information received from other routers in the network

Manually entered by a network administrator

Create a LAN

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, also typically use Ethernet or wireless protocols, and they support high data speed.

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