Computer Networks

Network Devices

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Network:

- It is a collection of devices connected together to provide a certain service to the user.

- Such as computers and printers.

Network Benefits:

1) Data sharing.

2) Resource sharing (printer)

3) Modern technology (Video Conference)

Network Components:

1) End devices (PC, Printer)
2) Network Devices (intermediate devices)

    (hub, switch, router)

3) Media (wires, Wireless)

Network Devices:

1) Network Interface Card (NIC)

2) Hub

3) Switch

4) Router

1) Network Interface Card (NIC):

- The following Figure shows the most basic form of a network.
- This figure shows two hosts (end-user devices such as computers are commonly called hosts in networking terms) directly connected to each other using a networking cable.
- Every host has a Network Interface Card (NIC) that is used to connect it to a network.

HostA   HostB

- If you have more than 2 hosts to this "network", it will not work without a separate NIC card for each connection and that is not scalable or realistic.
- For more than 2 hosts to be networked, you require a network device such as a hub.

2) Hub:

- A hub is a network device that repeats information received from a host to all other connects hosts.
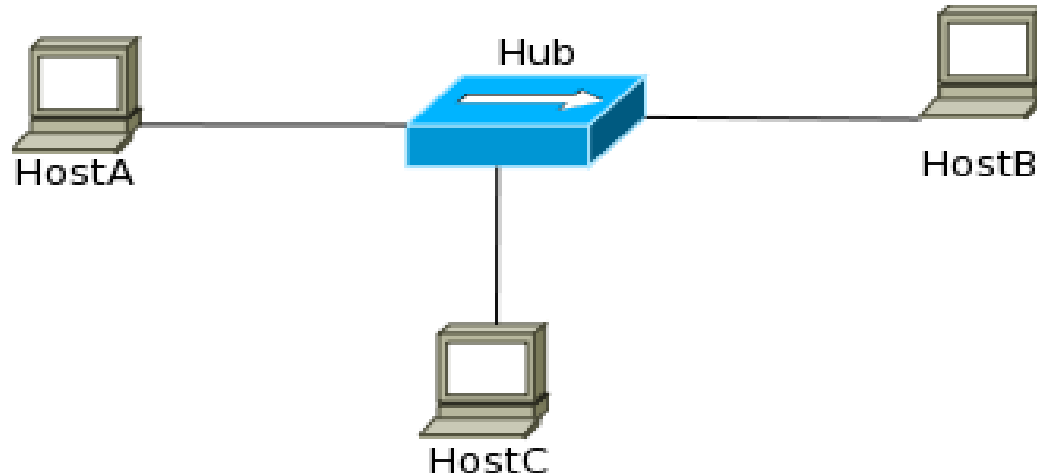
- The hub will relay any information received from Host A to Host B and Host C.

- This means that all the three hosts can communicate with each other.

Communication between hosts can be classified into three types:

1) Unicast:

- Communication from one host to another host only.

2) Broadcast:

- Communication from one host to all the hosts in the network.

3) Multicast:

- Communication from one host to few hosts only.

When a hub is used to network hosts, there are two problems that arise:

- A hub repeats information received from one host to all the other hosts.

- A hub has a single collision domain.

3) Switch:

- The problems associated with hubs can cause degradation of a network.

- To overcome these, switches are used instead of hubs.

- Switches are used to connect hosts in a network, but switches break up collision domain by providing a single collision domain for every port.
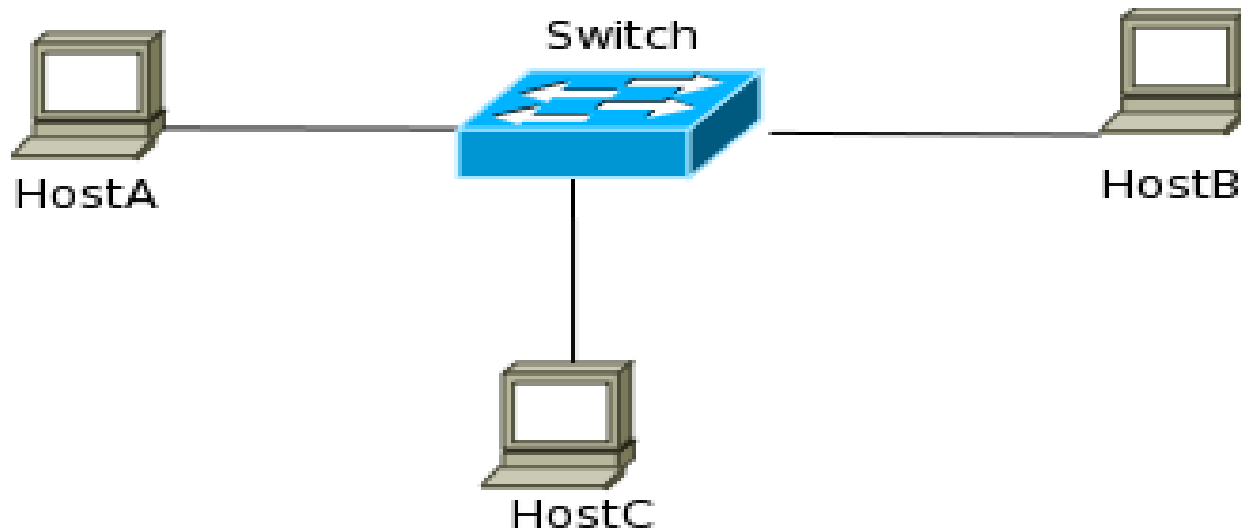
- Remember that each host in Figure is in its own collision domain and if Host A sends a packet to Host C, Host B will not receive it.
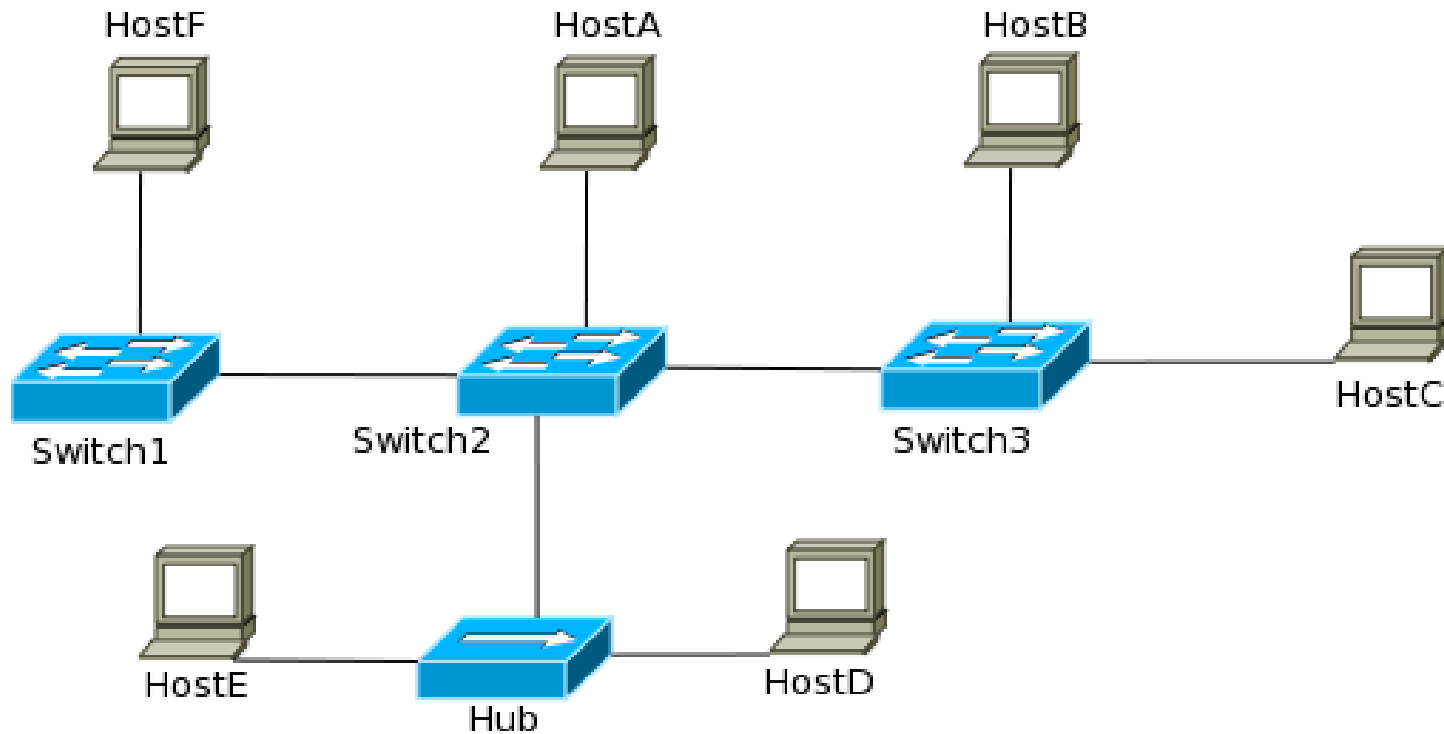
Example:

How many collision domains exist in the following network?
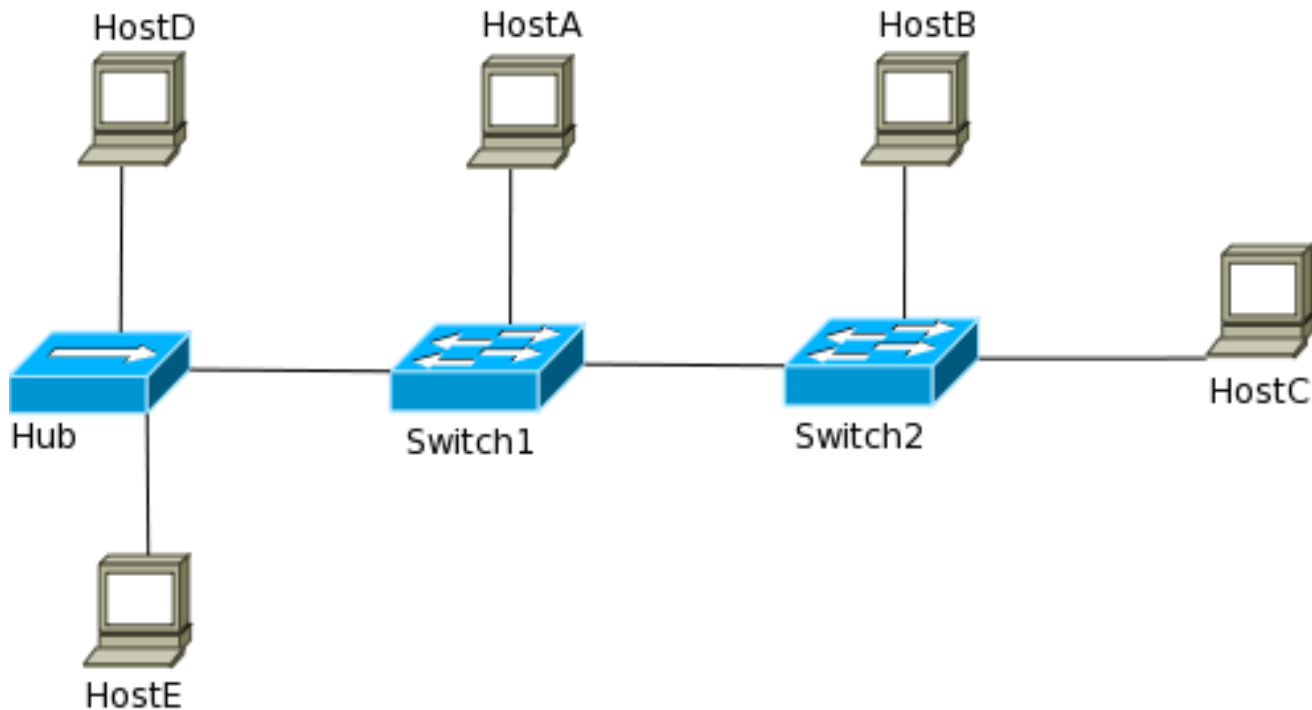
Example:

## How many collision domains exist in the following network?

Problems about the Switch:

- Hubs flood out all packets, even the unicast ones.

- A switch does not flood out unicast packets, but it does flood out a broadcast packet.

- All hosts connected to a switched network are said to be in the same broadcast domain.

- All hosts connected to it will receive any broadcast sent out in this domain.

- While broadcasts are useful and essential for network operations, in a large switched network too many broadcasts will slow down the network.

4) Router:

- Routers do not allow broadcasts to be transmitted across different networks it interconnects and hence effectively breaks up a broadcast domain.
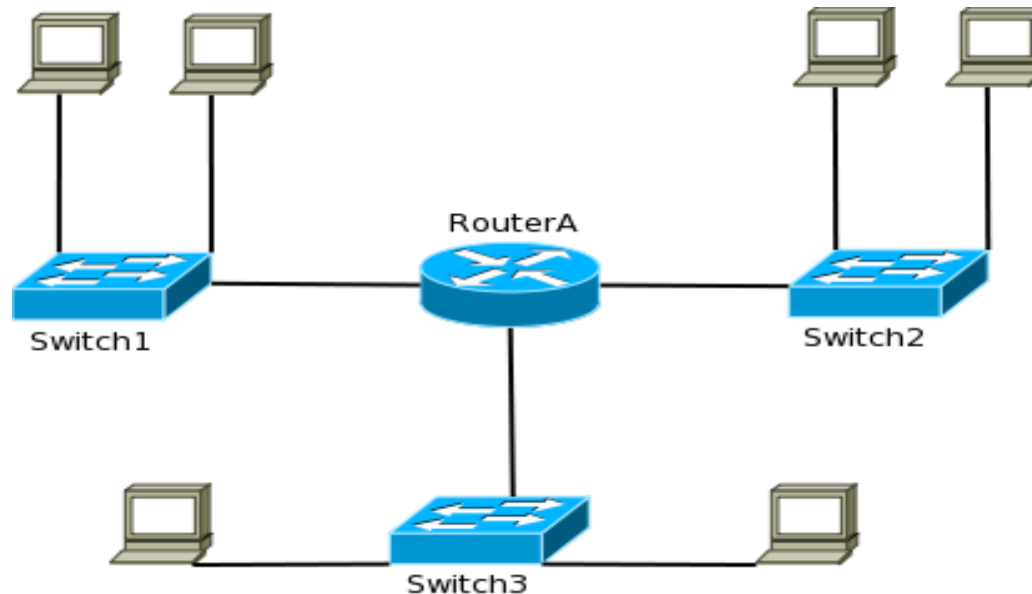
- In the network shown in Figure, broadcasts from hosts connected to Switch1 will not reach hosts connected to Switch2 or Switch3. This is because the router will drop the broadcast on its receiving interface.

Functions of Routers:

1) Breaking up broadcast.

2) Packet Switching:

  ➢ Routers switch the packets among networks.

3) Path Selection:

  ➢ Select the best path for the destination network.

4) Path Filtering:

  ➢ Routers can drop or forward packets based on certain criteria like their source and destination.
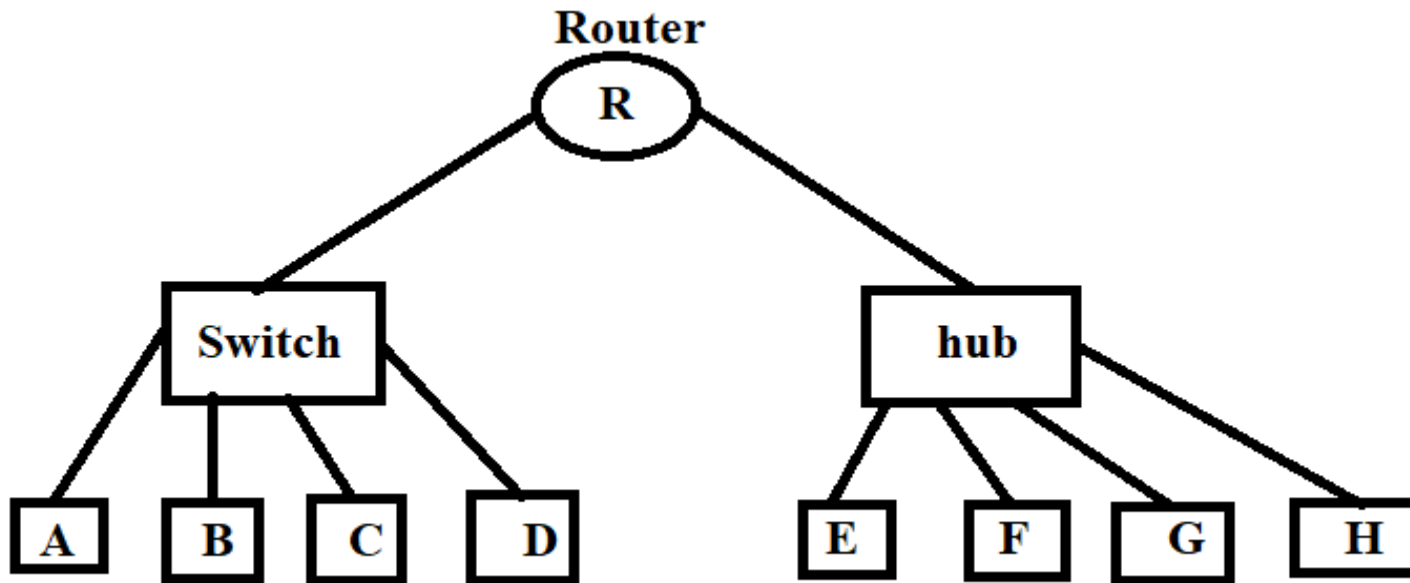
Collision domain and broadcast domain:

Device	Collision Domain	Broadcast Domain
Hub	1	1
Switch	n	1
Router	n	n

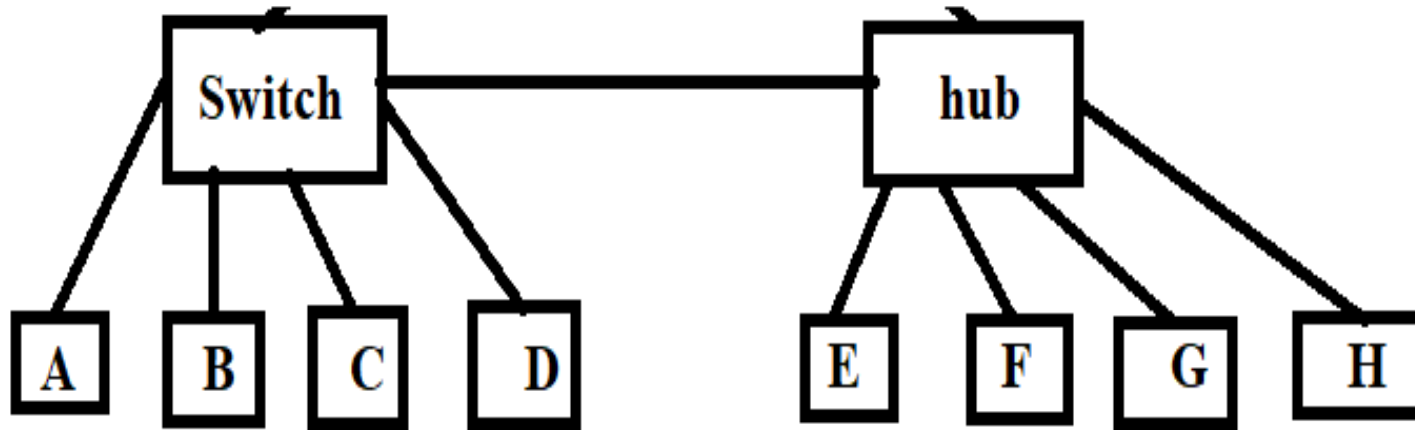- **n: number of ports (or number of interfaces)**

Examples:

How many broadcast domains and collision domains?

- **Broadcast domain:**
- **Collision domain:**

Examples:

How many broadcast domains and collision domains?

- **Broadcast domain:**
- **Collision domain:**

<u>Networking Types:</u>

<u>1) Local Area Network (LAN):</u>

- This is a term used to describe a network covering a limited geographical area such as a floor, building or a campus.

- LAN usually has a high data-transfer rate.

- The Ethernet standard is the most commonly used technology in LANs.

<u>2) Wide Area Network (WAN):</u>

- This is a term used to describe a network covering a large geographical area such as a multiple cities, a country or even across the world.

- They are used to connect LANs across the area they cover.

- A typical example would be the LANs at various offices of a company connected by WAN.