


CSC-110  
Computing FUNDAMENTALS  
NETWORKs

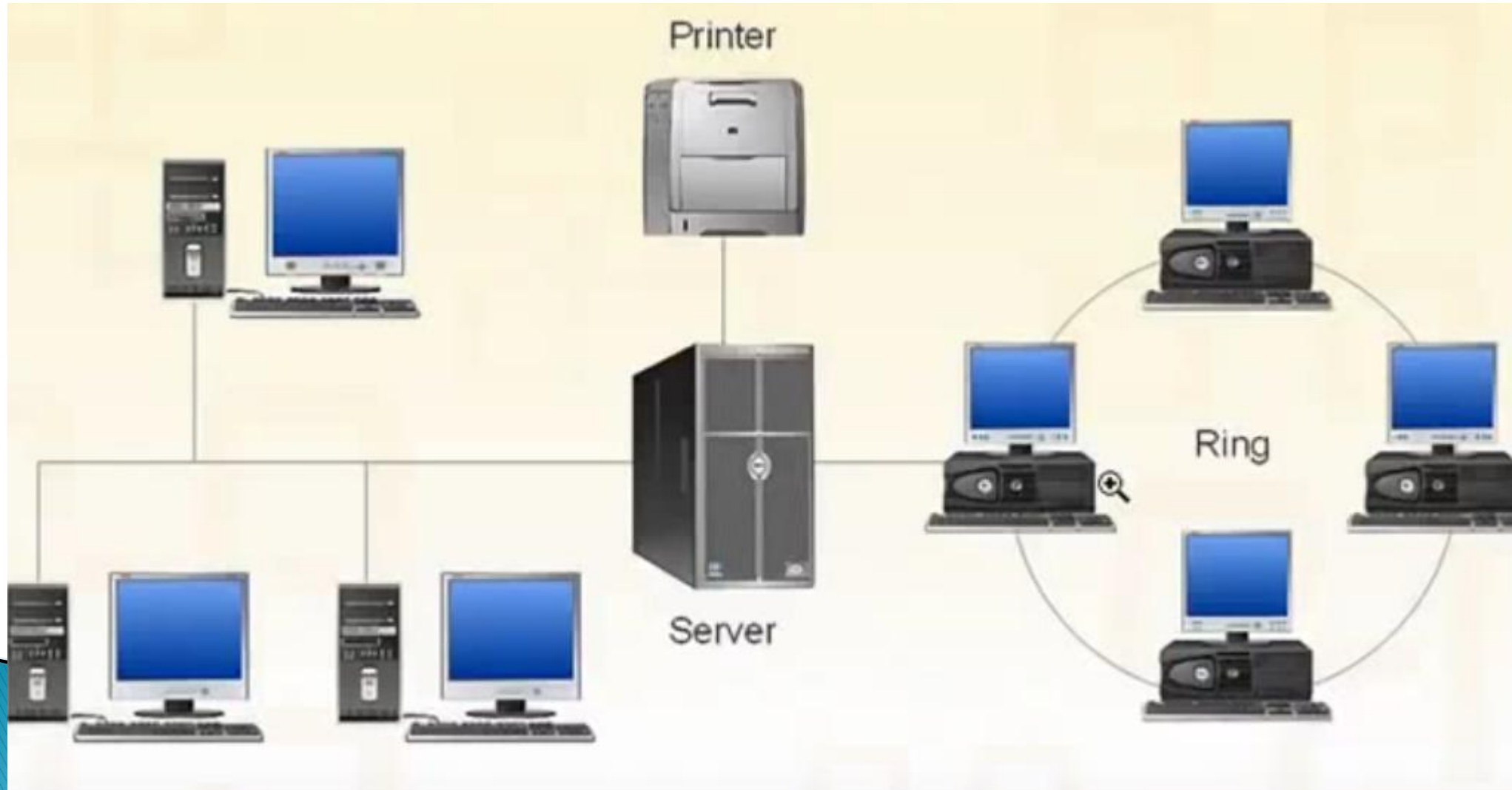
# networks

- ▶ A network is a set of technologies – including hardware, software, and media that can be used to connect computers together, enabling them to communicate, exchange information, and share resources in real time.


# Types of networks-LAN

- ▶ Local area network LAN: It generally refers to computers that are relatively close in proximity.
  - ▶ The computers in the same home, can be computers in the same office, could be computers in the same building. But when you talk about a lan you're basically talking about computers that are relatively close to each other that are connected and part of the same network they can share printers they can share servers they can share documents and so on between each other, so a local area network is a type of network wherein the computers are in relative close proximity.
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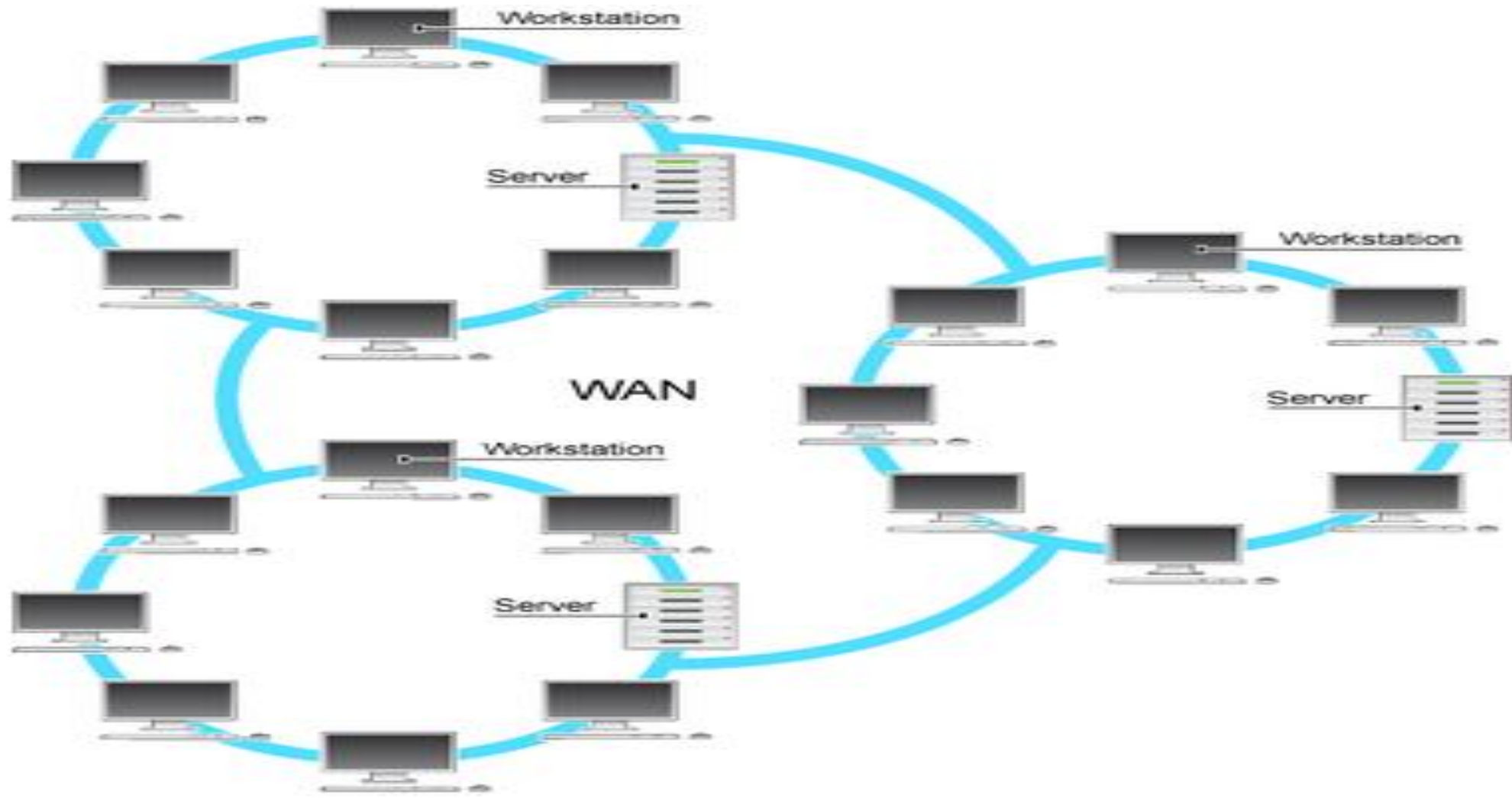
# Types of networks-LAN



# Types of networks–WAN

- ▶ WIDE AREA NETWORK WAN: WAN is two or more LANs connected together, generally across a wide geographical area. For example, a company may have its corporate headquarters and manufacturing plant in one city and its marketing office another. It will be a matter of necessity to connect these individual locations so as to share, exchange and manage data or communication. To achieve this, the organization needs to interconnect the LANs at the different locations.
  - ▶ Internet is a WAN (City to City, Country to Country).
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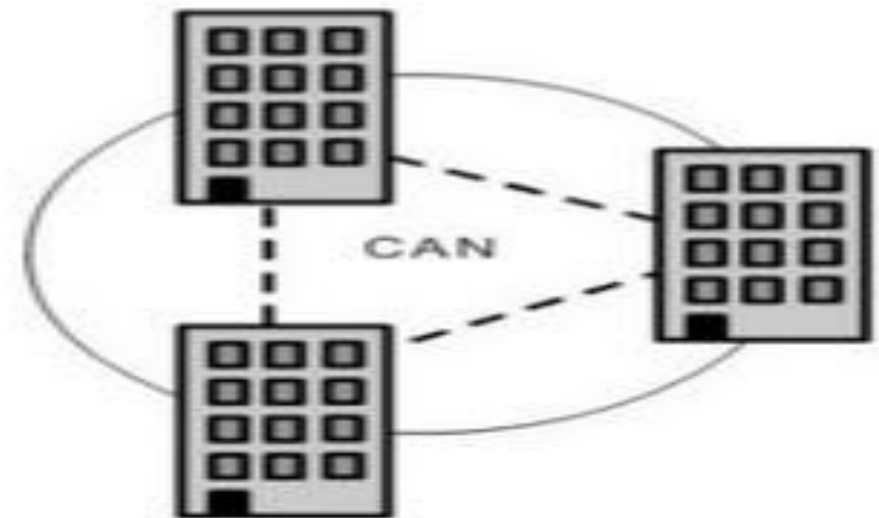
# Types of networks-WAN





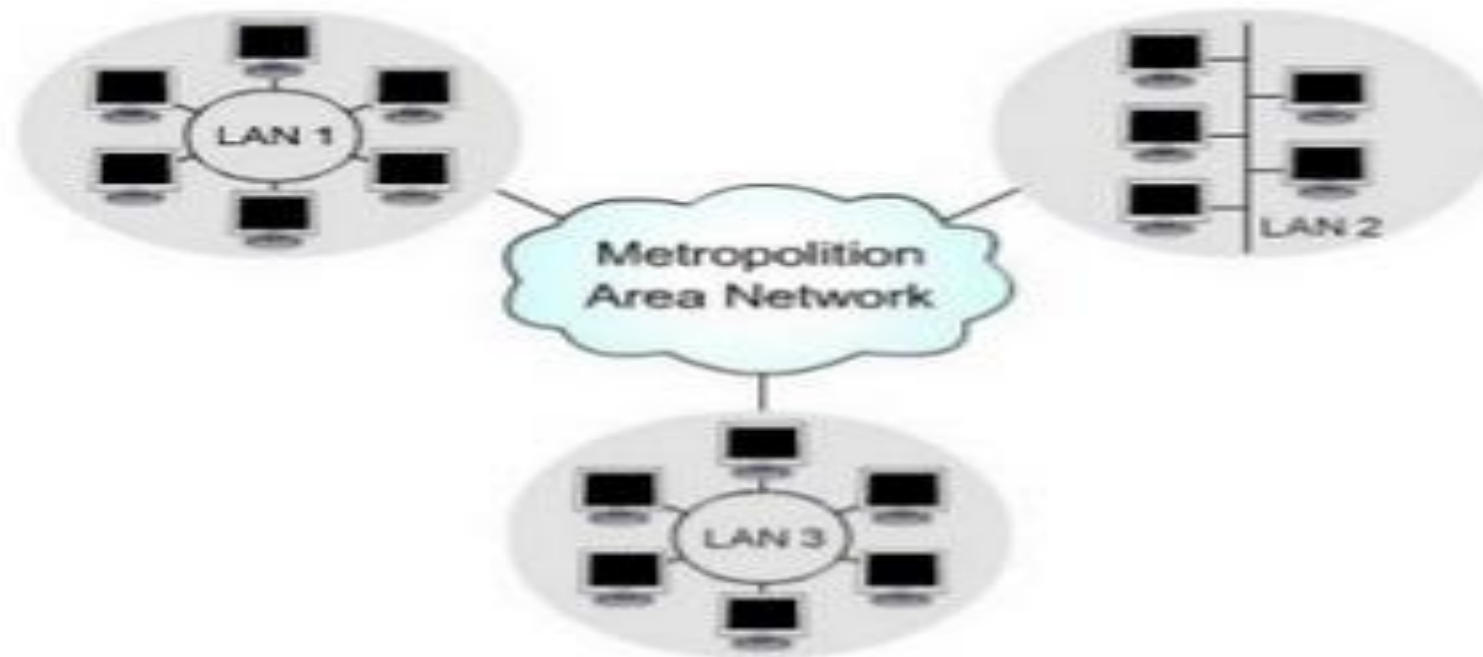
# Types of networks-can

- ▶ **CAMPUS AREA NETWORK CAN:** CAN follows the same principal as a local area network, only on a larger and more diversified scale. With CAN, different campus offices and organizations can be linked together. An interconnection of local-area networks within a limited geographical space, such as a school campus or a military base.



# Types of networks–Man

- ▶ METROPOLITAN AREA NETWORK MAN: Interconnects networks within a city. For example the different branches of banks that communicate with each other situated in the same city.





# Types of networks–han

- ▶ HOME AREA NETWORK HAN: HAN is a network contained within a user's home that connects a person's digital devices, from multiple computers and their peripheral devices, such as printers, to telephones, VCRs, DVDs, televisions, video games, home security systems, “smart” appliances, fax machines, and other digital devices that are wired into the network.
- ▶ A home network or home area network (HAN) is a type of local area network with the purpose to facilitate communication among digital devices present in the close vicinity of a Home.



# Case Study - I

MoneyMaker is a bank having its registered office at Delhi. It has branches at Mumbai, Chennai, Hyderabad and Bangalore. The operating departments in the bank are Finance, Insurance, Loan, IT, Marketing, Customer Service and HR. MoneyMaker bank uses LAN as their computer network for each department. All the branches of the bank from different cities are connected through WAN. The bank is expanding and decided to open its branches at different locations in the city.

# Problem

Determine which type of network to be used within a city

# Suggested Solution

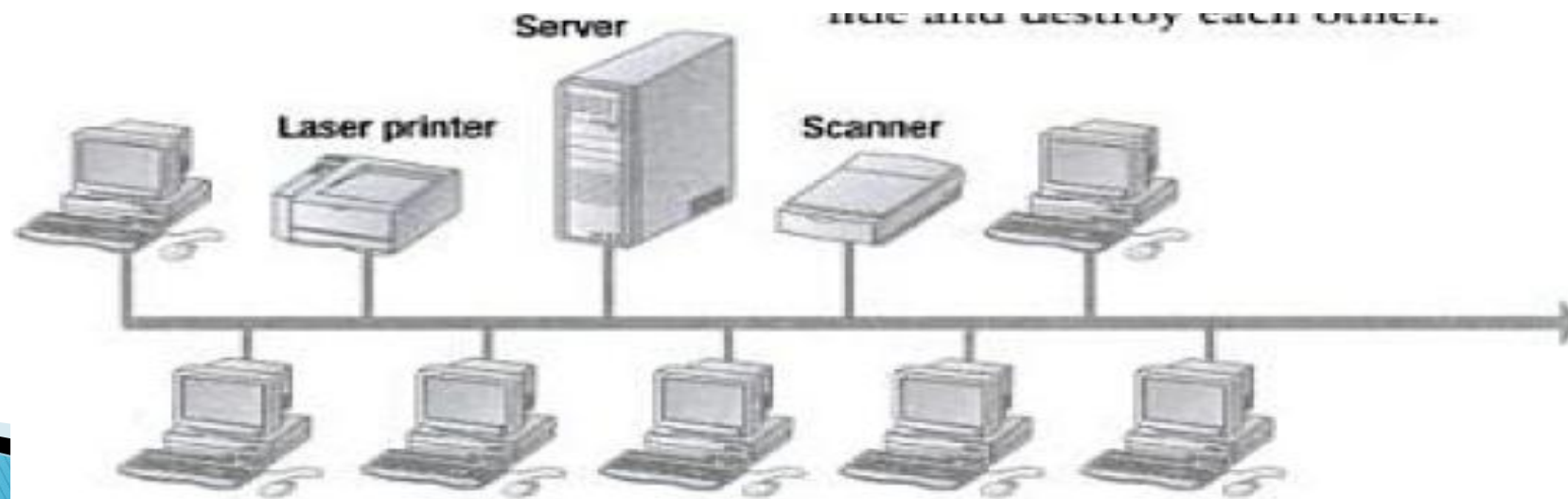
Use LAN computer network for each department in the new branch. MAN can be used for connecting the different branches of the bank within the city

# Network topology

- ▶ A network topology is the arrangement of a network, including its nodes and connecting lines.

# Network topology–bus

- ▶ Bus topology is a specific kind of network topology in which all of the various devices in the network are connected to a single cable or line.
- ▶ The advantage of this topology is that it uses the least amount of cabling.
- ▶ A disadvantage is that a broken connection can bring down all or part of the network.

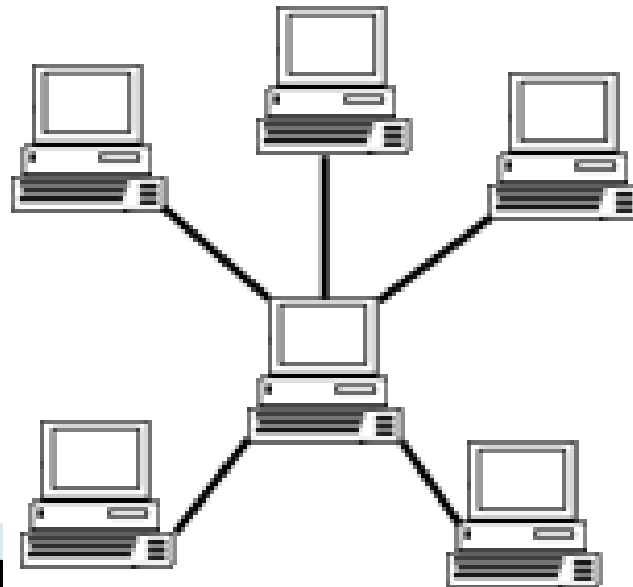




# Network topology– star

- ▶ A **star topology** is a **topology** for a Local Area Network (LAN) in which all nodes are individually connected to a central connection point, like a hub or a switch. A **star** takes more cable than e.g. a bus, but the benefit is that if a cable fails, only one node will be brought down.

Star Topology

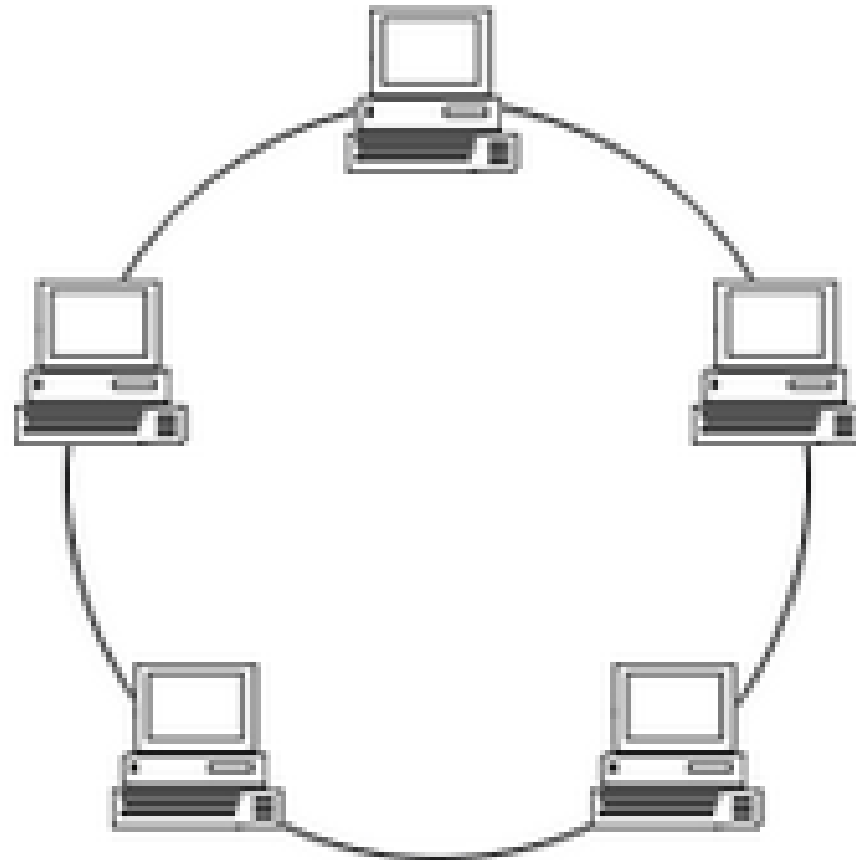


# Network topology– ring

- ▶ A ring topology is a network configuration in which device connections create a circular data path. Each networked device is connected to two others, like points on a circle. Together, devices in a ring topology are referred to as a ring network
- ▶ In a ring network, packets of data travel from one device to the next until they reach their destination. Most ring topologies allow packets to travel only in one direction, called a unidirectional ring network. Others permit data to move in either direction, called bidirectional.
- ▶ The major disadvantage of a ring topology is that if any individual connection in the ring is broken, the entire network is affected.

# Network topology- ring

## Ring Topology

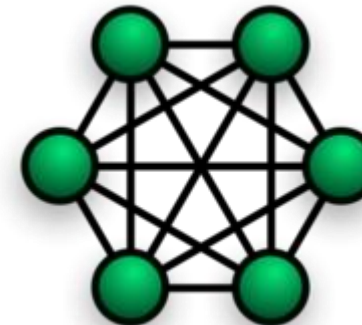
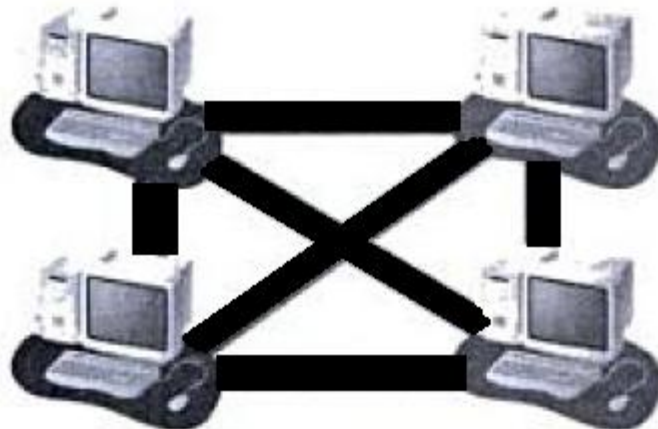


# Network topology– mesh

- ▶ Mesh is the least-used network topology and the most expensive to implement. In a mesh environment, a cable runs from every computer to every other computer. If you have four computers, you must have six cables—three coming from each computer to the other computers.

- ▶ The big advantage to this arrangement is that data can never fail to be delivered; if one connection fails, there are other ways to

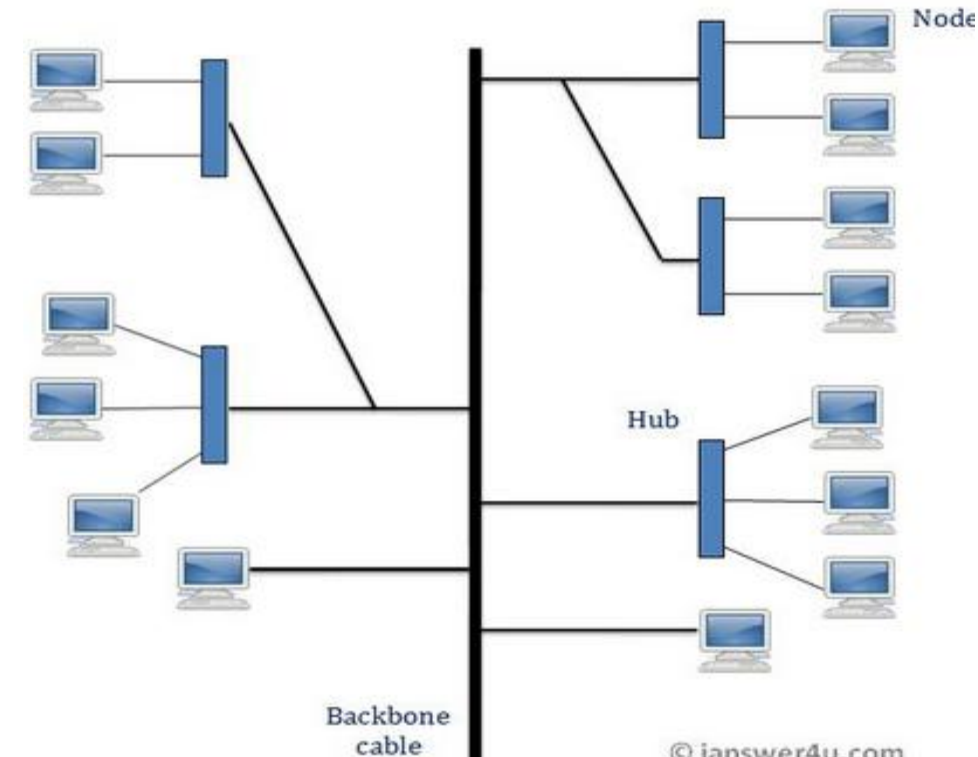
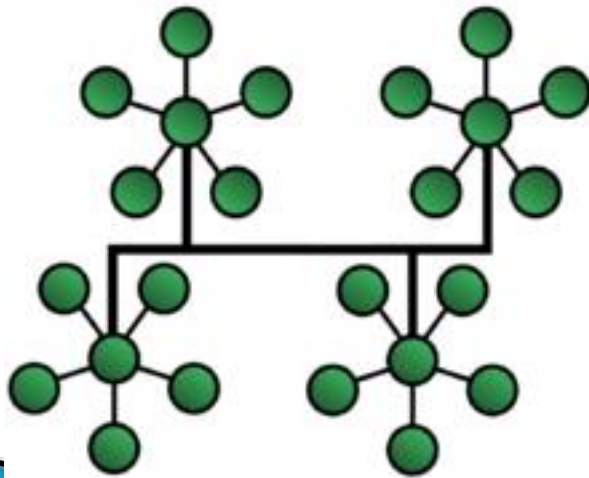
The formula for finding total links in a true mesh is  $\frac{n * (n - 1)}{2}$ , where  $n$  is total number of workstations.



$$\frac{n * (n - 1)}{2}$$

# Network topology- tree

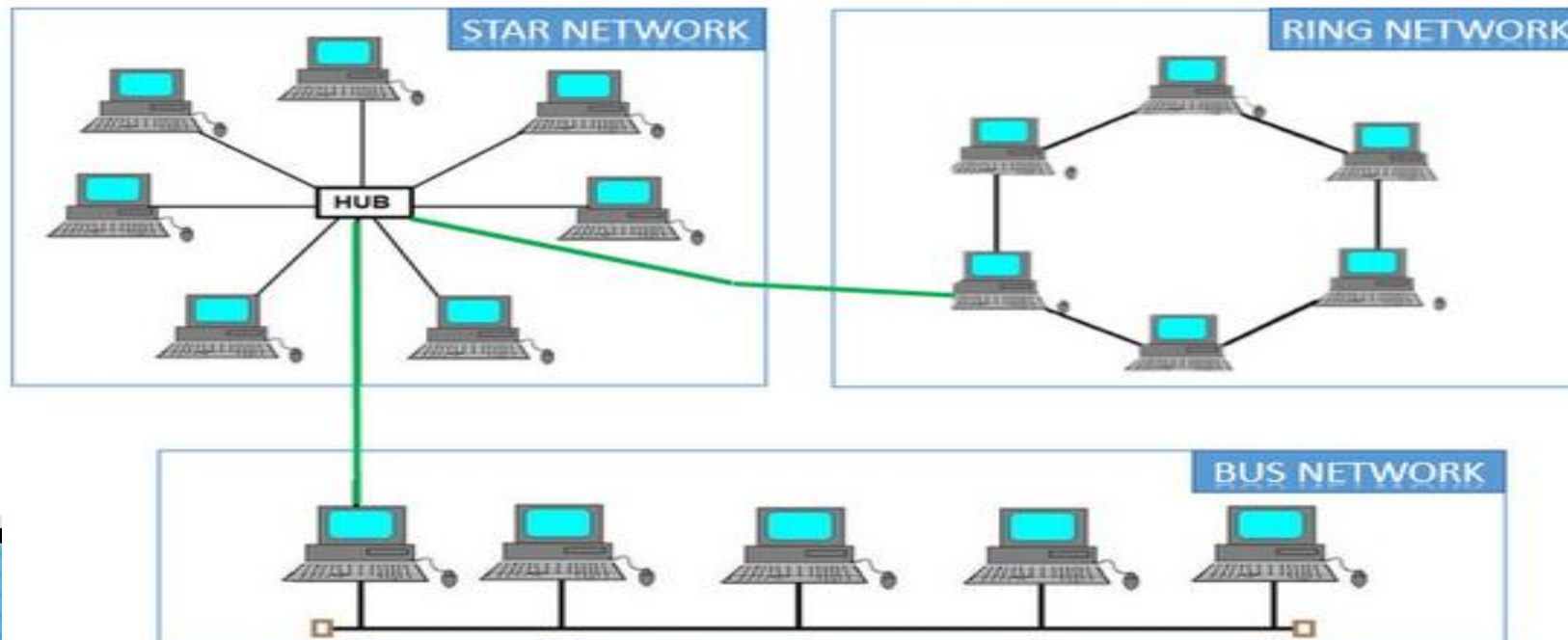
- ▶ A tree network, or star-bus network, is a hybrid network topology in which star networks are interconnected via bus networks. Tree networks are hierarchical, and each node can have an arbitrary number of child nodes.



# Network topology– hybrid

- ▶ Hybrid topology is a combination of any two or more network topologies.

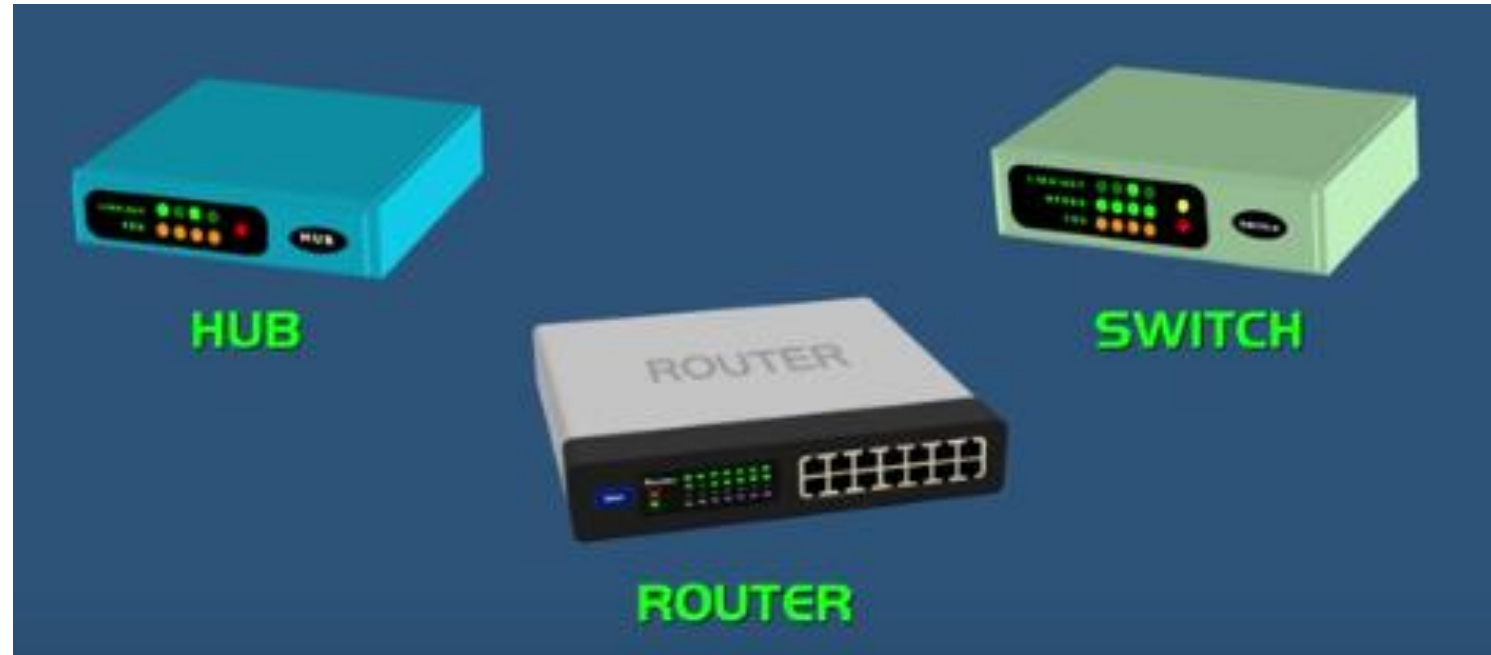
## HYBRID TOPOLOGY






# Network hardware

- ▶ Three types of network hardware:
  1. HUB
  2. SWITCH
  3. ROUTER



# Network-hub

- ▶ The purpose of the HUB is to connect all of your network devices together on an internal network.
  - ▶ It's a device that has multiple ports that accepts Ethernet connections from network devices.
  - ▶ Hub is considered not to be intelligent because it does not filter any data or has any intelligence as to where the data is supposed to be sent.
  - ▶ The Hub knows when a device is connected to one of its ports and a data packet arrives at one of its ports, it is copied to all the other ports, so all the devices on the Hub see the data packets.
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# Network devices– HUB

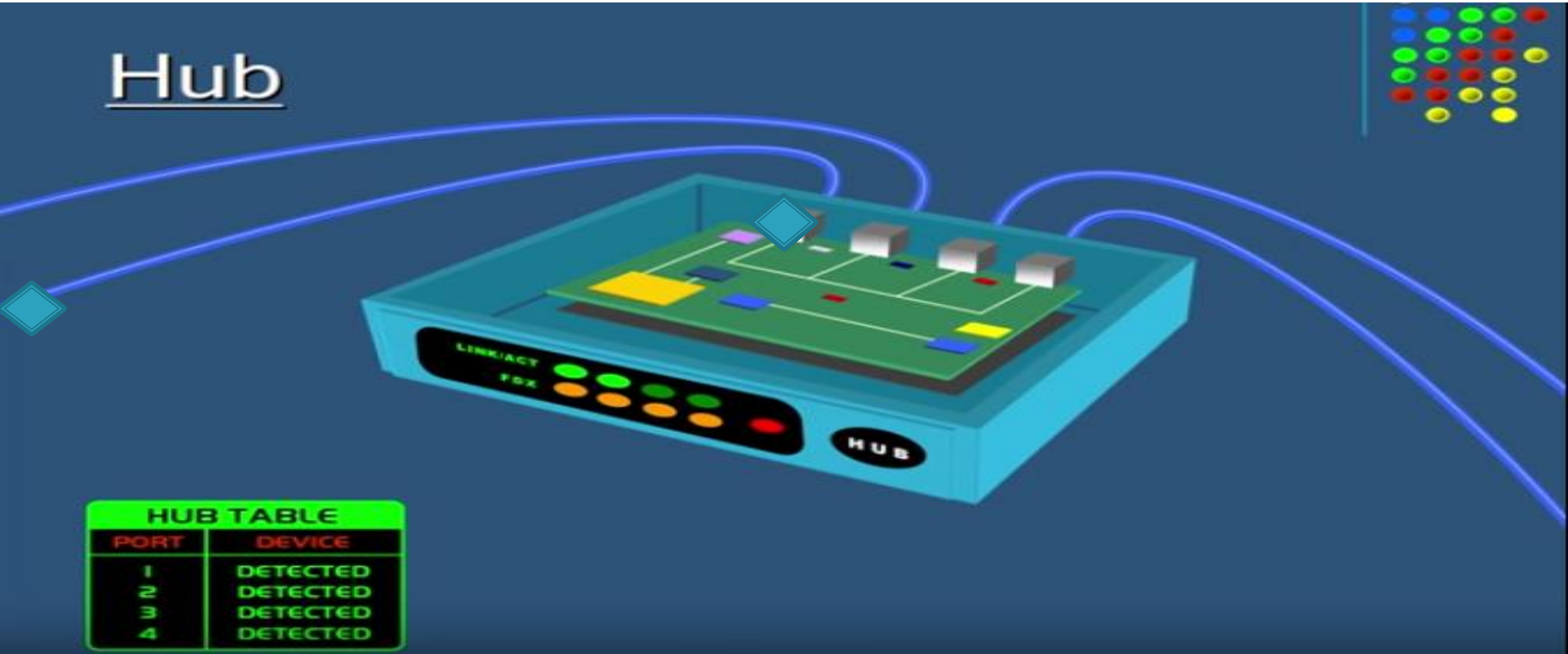
Hub



HUB TABLE	
PORT	DEVICE
1	DETECTED
2	DETECTED
3	DETECTED
4	DETECTED

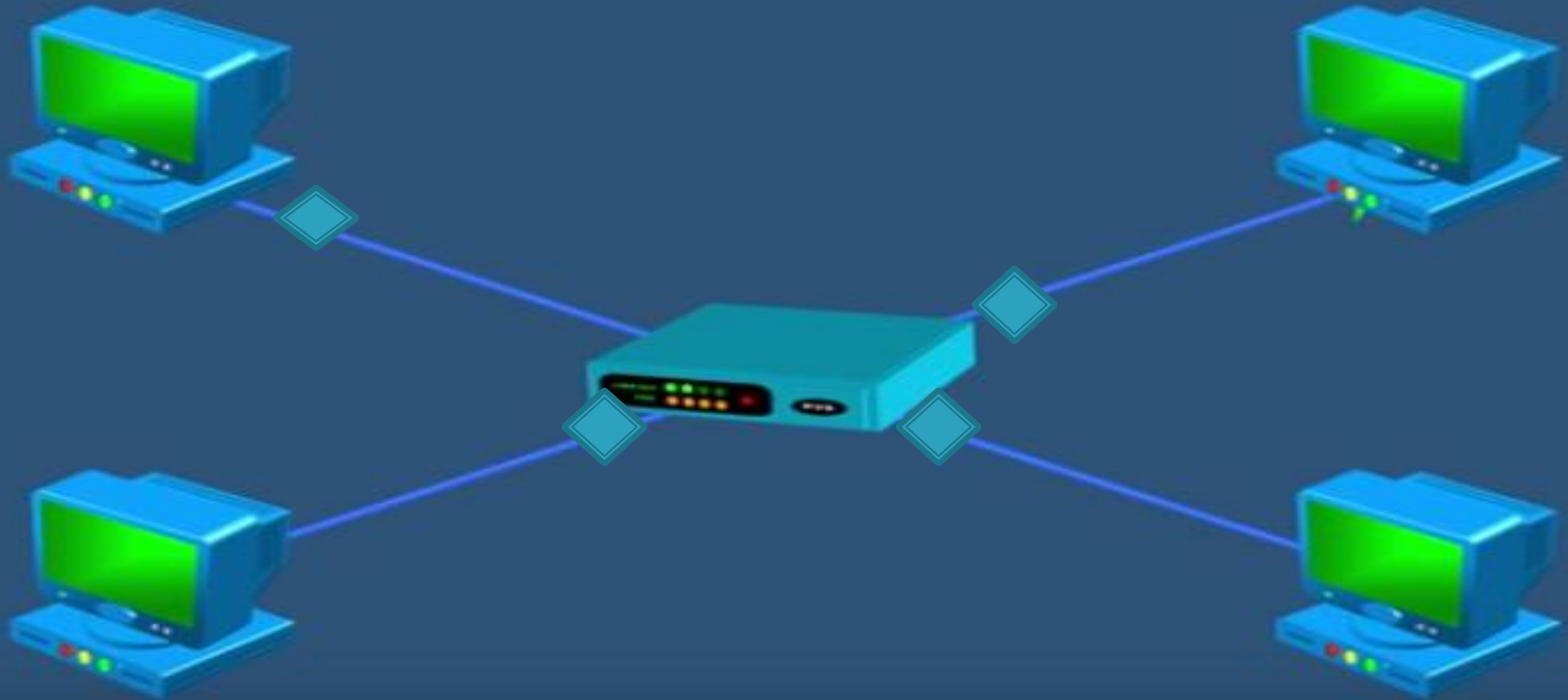
# Network devices– HUB

Hub



# Network devices–hub

Hub




# Network devices–hub

- ▶ HUB creates security concerns.
- ▶ HUB also creates unnecessary traffic which wastes bandwidth.



# Network devices-switch

- ▶ Switch is very similar to a Hub.
  - ▶ Switch is intelligent.
  - ▶ Switch can actually learn the physical addresses of the devices that are connected to it. It stores these physical addresses called MAC addresses in its table. So when a data packet is sent to a switch it's only directed to the intended destination.
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# Network devices-switch

## Switch



SWITCH TABLE		
PORT	DEVICE	MAC ADDRESS
1	DETECTED	
2	DETECTED	
3	DETECTED	
4	DETECTED	

# Network device-switch

## Switch

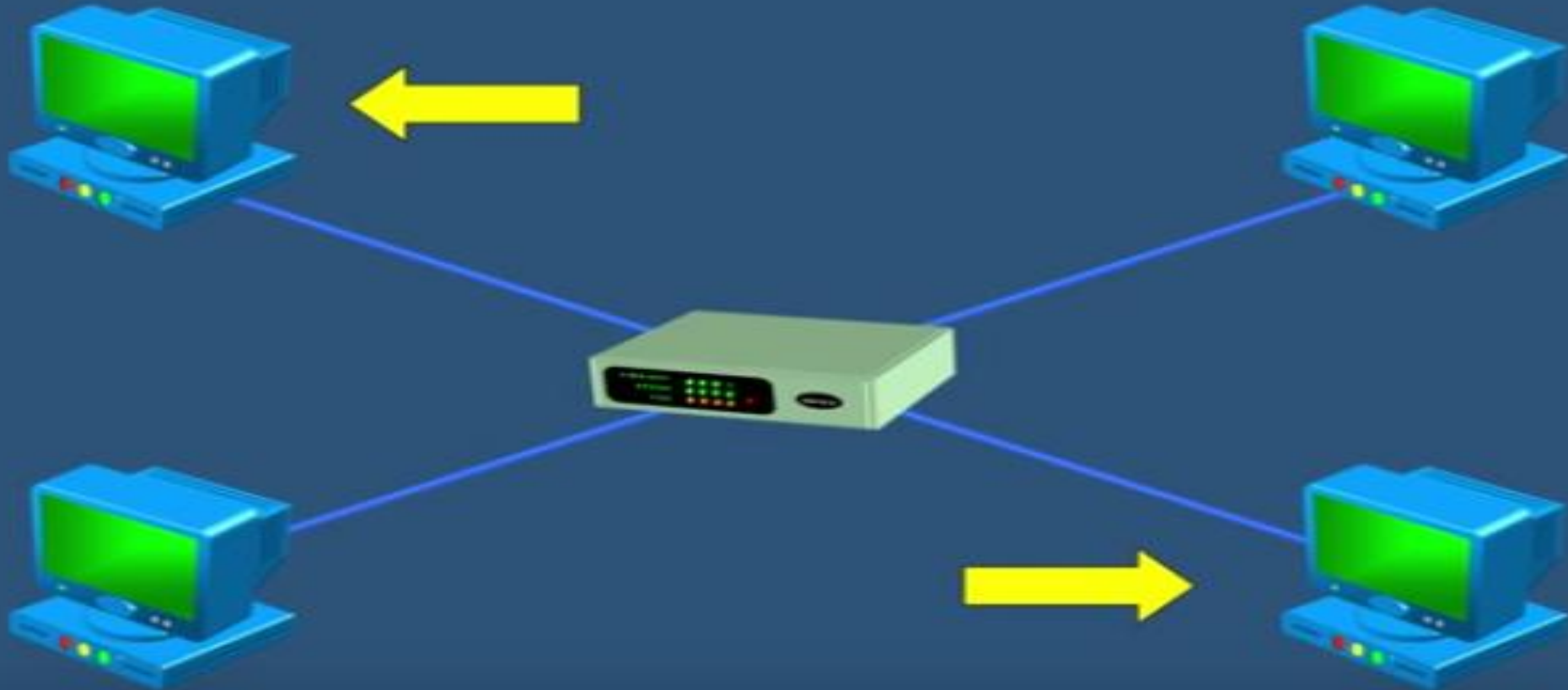
DATA DIRECTED ONLY TO  
INTENDED PORT



SWITCH TABLE		
PORT	DEVICE	MAC ADDRESS
1	DETECTED	00-04-5A-63-A1-66
2	DETECTED	90-02-7B-C2-C0-67
3	DETECTED	32-07-9A-92-A2-00
4	DETECTED	72-00-FA-63-A9-66

# Network devices-switch

Switch



# Network devices-switch

**SWITCH**





# NETWORK DEVICES-SWITCH

- ▶ Switches are more preferred than Hub because they reduce any unnecessary traffic on the network.



# Network devices

## Hub, Switch, & Router



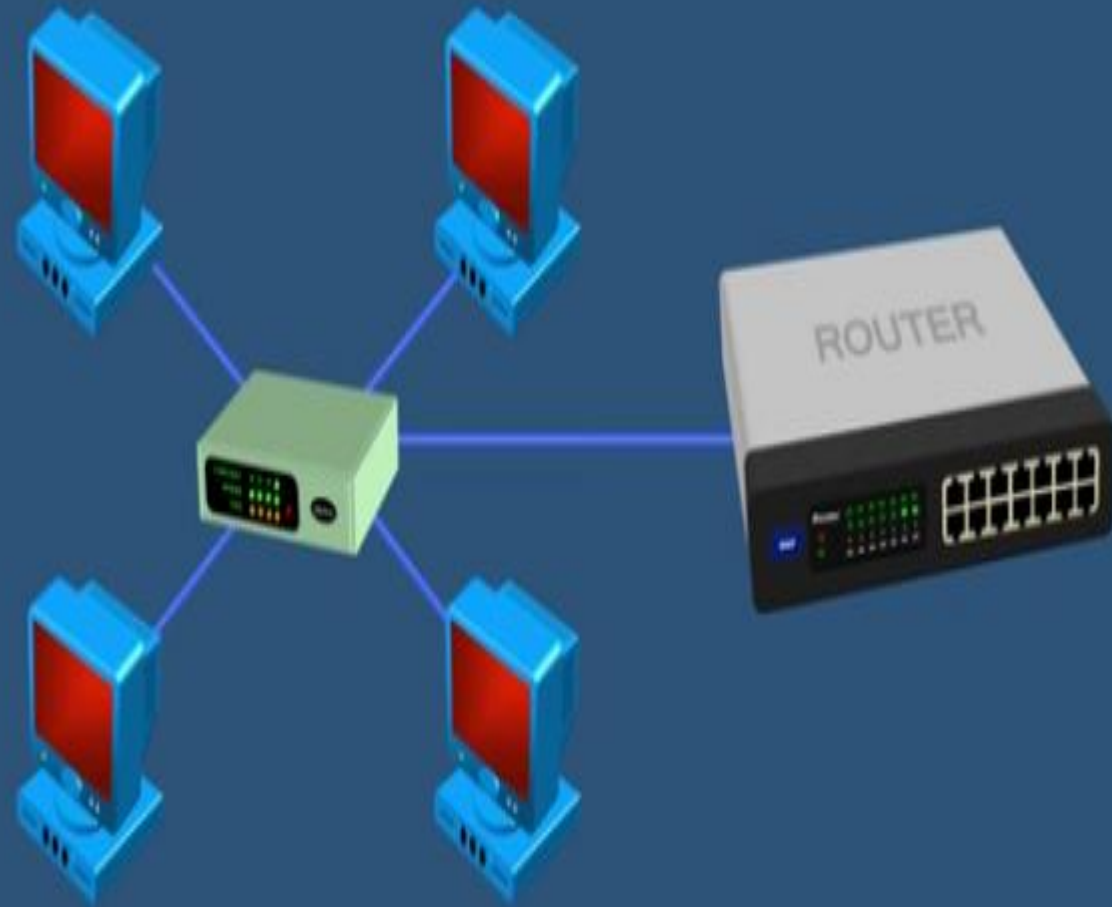
**Hubs** and **Switches** are used to exchange data within a local area network.

Not used to exchange data outside their own network.

# Network devices–routers

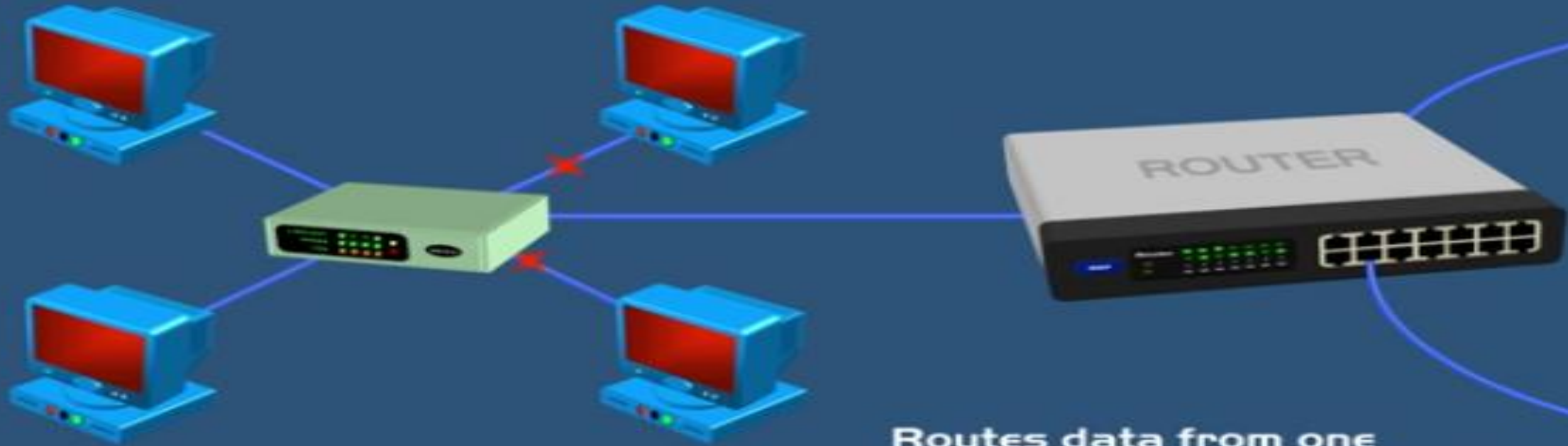
To exchange data outside their own network, a device needs to be able to read I.P. addresses.

- HUBS AND SWITCHES DO NOT READ IP ADDRESSES.




# NETWORK DEVICES-ROUTER

## Router



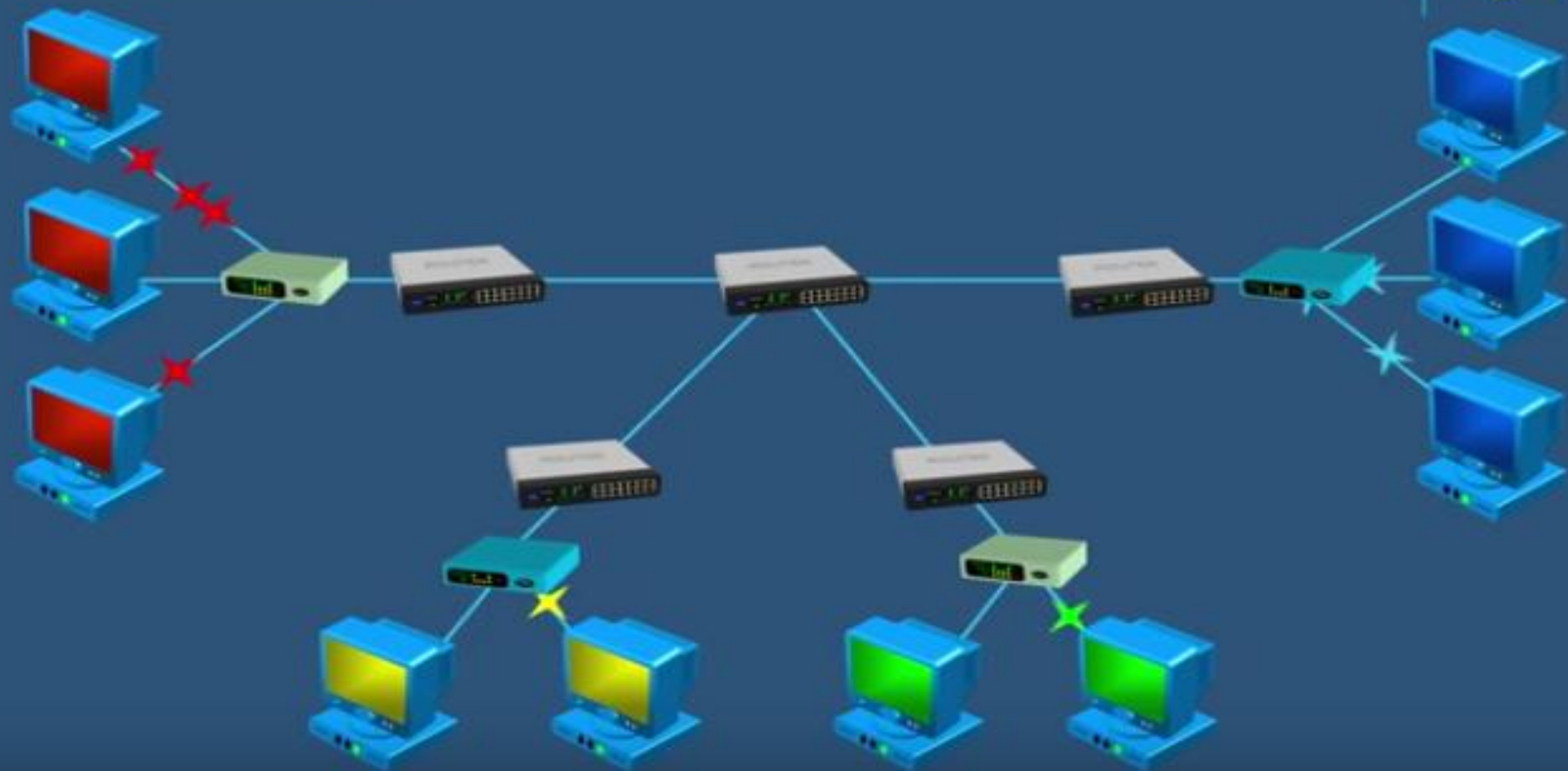
Routes data from one network to another based on their **IP address**.

# Network devices-router

- ▶ The router inspects the data's IP address and determines if the packet was meant for its own network or if it's meant for another network. If the router determines that the data packet is meant for its own network it receives it but if it's not meant for its own network it sends it off to another network, so a router is essentially the gateway of a network.
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# Router



# Network architectures

- ▶ There are two types of Network architectures:
  - ▶ Client/Server Architecture
  - ▶ Peer to peer Architecture
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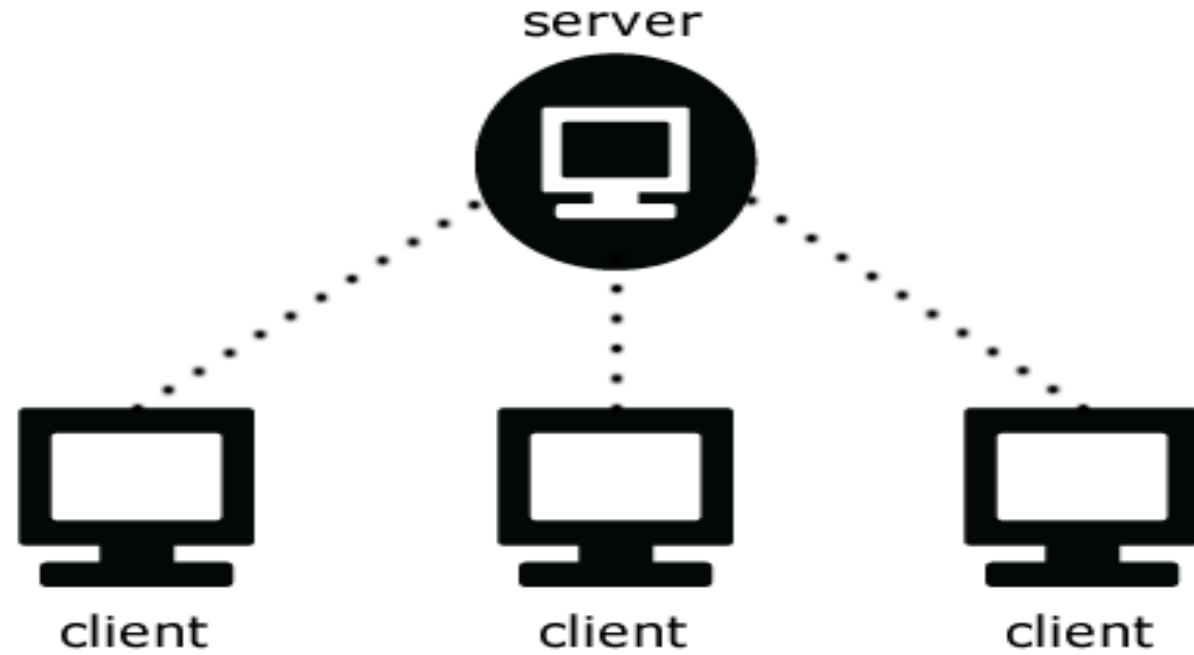


Fig: Client-Server Model

Client-server architecture (client/server) is a network architecture in which each computer or process on the network is either a client or a server. If we look at the client-server model in detail, two processes are involved, one each on the client machine and on the server machine. Communication is done by first client process sending a message over the network to the server process. The client process then waits for a reply message. When the server process gets the request, it performs required processes and sends back a reply message. For example, when a person at home accesses a page on the World Wide Web, the same model is employed, with the remote Web server being the server and the user's personal computer being the client.

# Network architectures–client/server architecture

## A Few Examples

- Web (HTTP) servers
- FTP Servers
- Print servers
- File servers
- Database servers

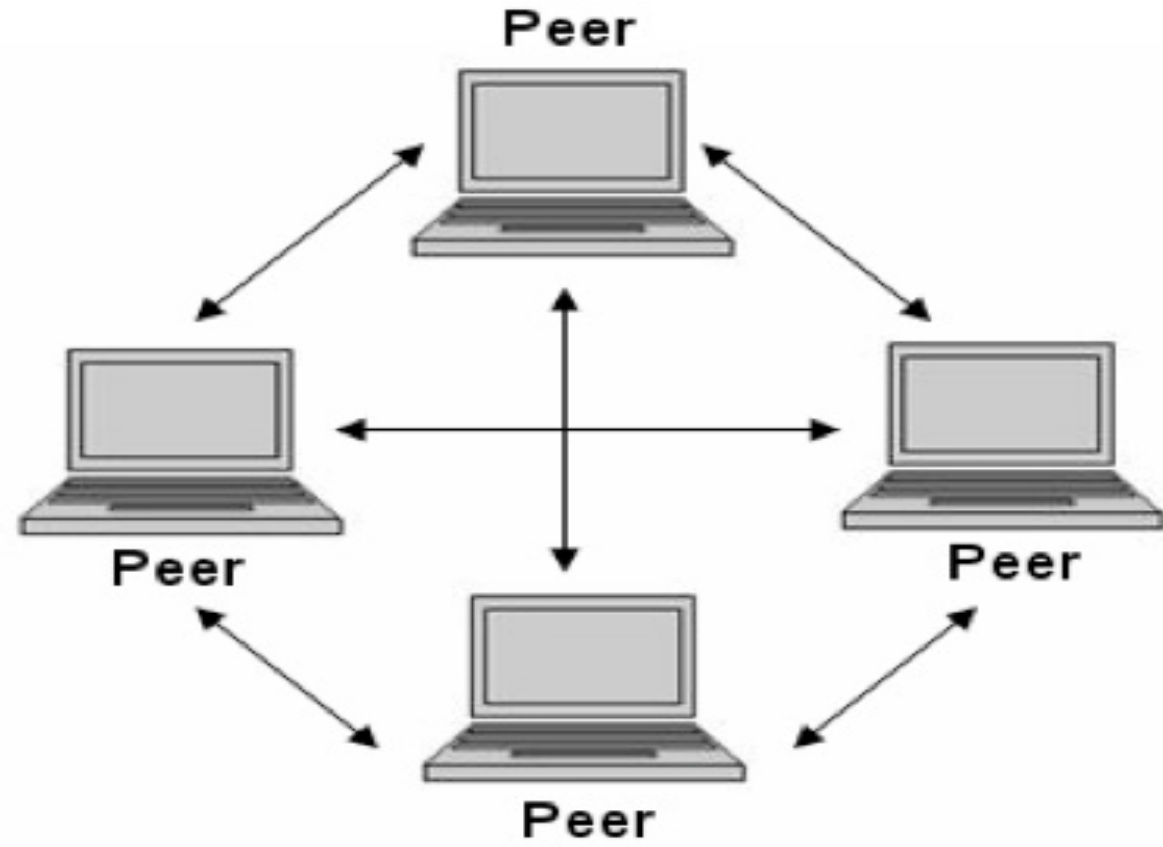


Fig: Peer to peer Model

A peer-to-peer (P2P) network is created when two or more PCs or devices are connected and share their resources without communicating with a separate server computer. In peer to peer networking architecture, each computer (workstation) has equivalent capabilities and responsibilities. Each PC acts as an independent workstation that stores data on its own hard drive but which can share it with all other PCs on the network. Computers connecting with each other in a workgroup can share files, printers, and internet access.

# Network architecture– peer to peer architecture (p2p)

## Common P2P Examples

- Napster
  - Morpheus
  - Gnutella
  - Freenet
  - BitTorrent
  - Skype
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