Data Network

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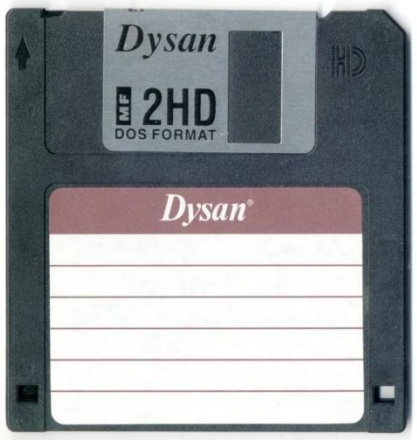
Data Network

Data networks developed as a result of business applications that were written for microcomputers. The microcomputers were not connected so there was no efficient way to share data among them. It was not efficient or cost-effective for businesses to use floppy disks to share data.



Problems Defined by Businesses

- How to avoid duplication of equipment and resources
- How to communicate efficiently
- How to set up and manage a network

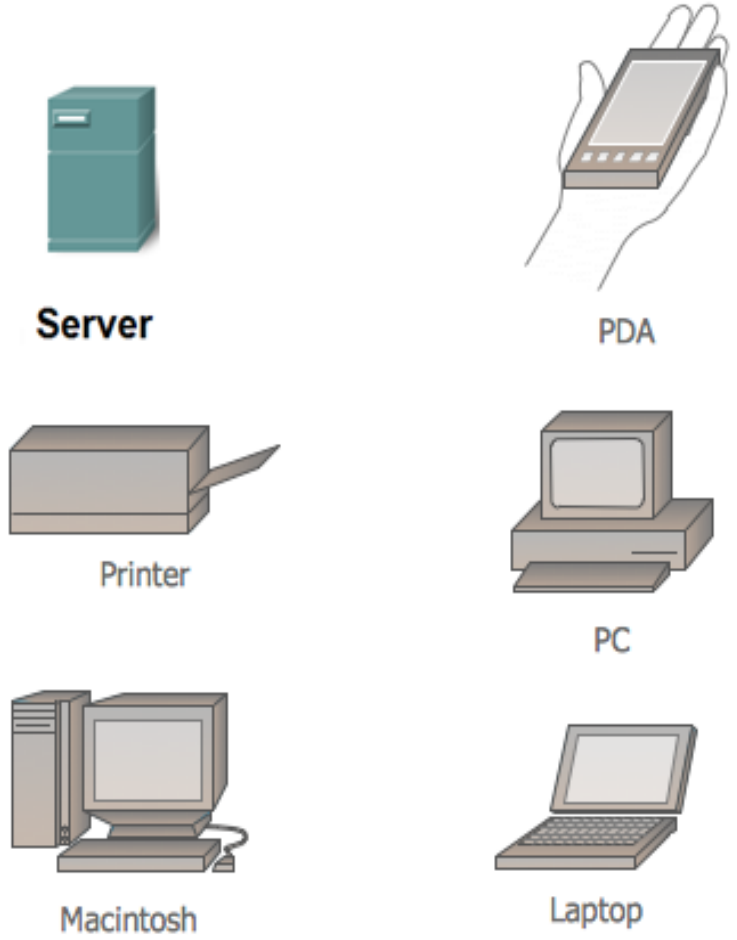
Businesses realized that computer networking would increase productivity and save money.

Network Interface Card (NIC)

- **Network Interface Card (NIC)** are used to physically connect host devices to the network media.
- NICs are sometimes called **network adapters**. Each NIC is identified by a unique code called a **Media Access Control (MAC)** address. This address is used to control data communication for the host on the network

Network Devices

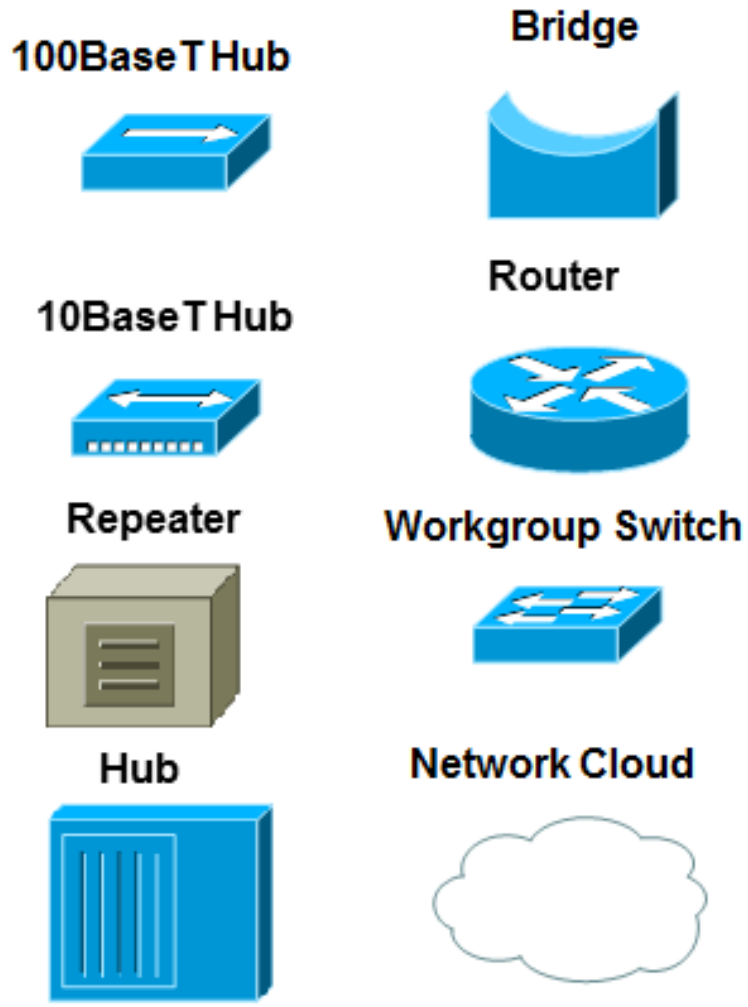
- **End-user devices (Host)** include **computers**, **printers**, **scanners**, and other devices that provide services directly to the user



Network Devices

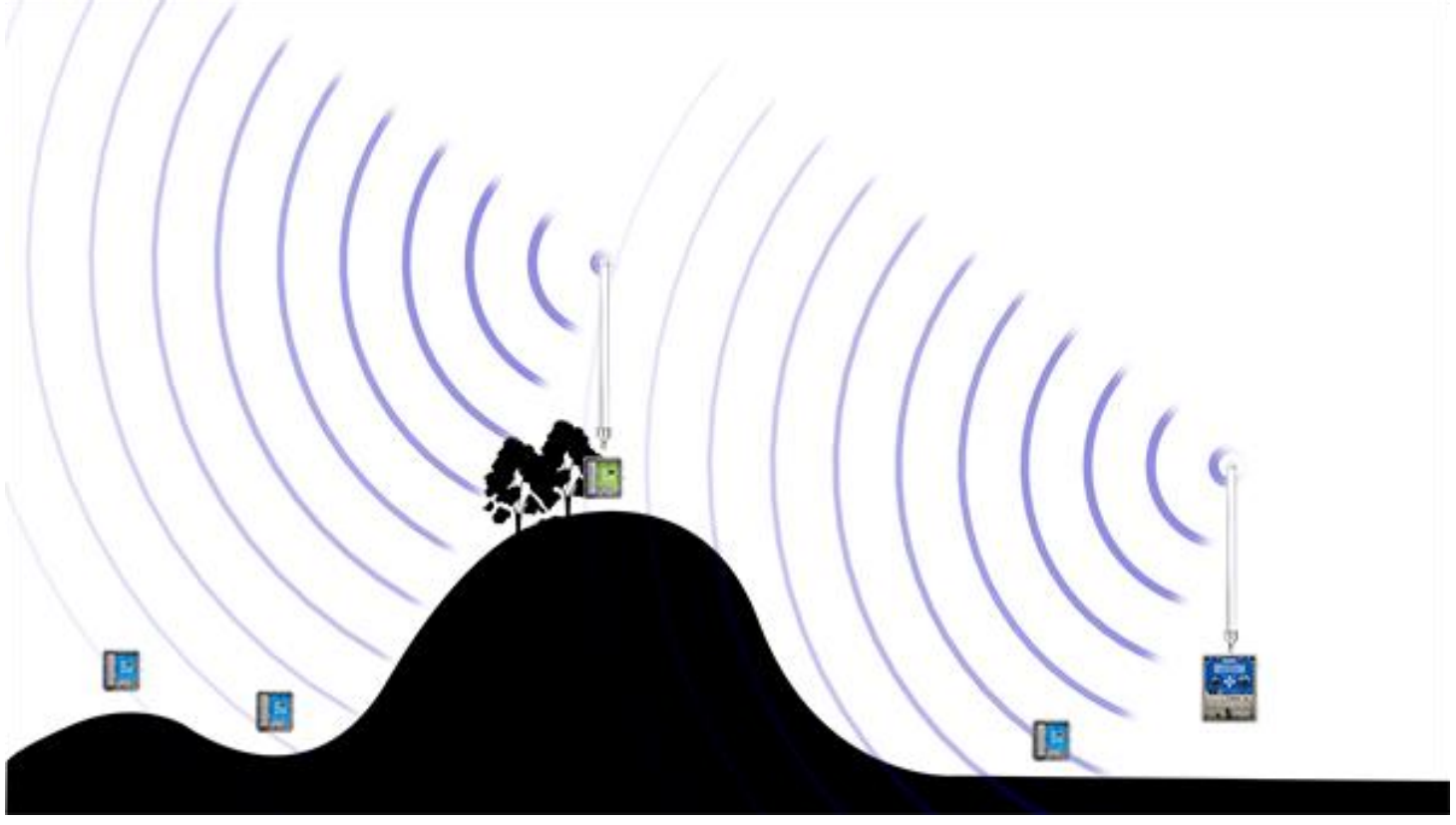
- **Network devices** include all the devices that connect the end-user devices together to allow them to communicate

1. Extend cable connections
2. Concentrate connections
3. Convert data formats
4. Manage data transfers



Repeater

- **A repeater** is a network device used to **regenerate** a signal
- A repeater does not make **intelligent** decision

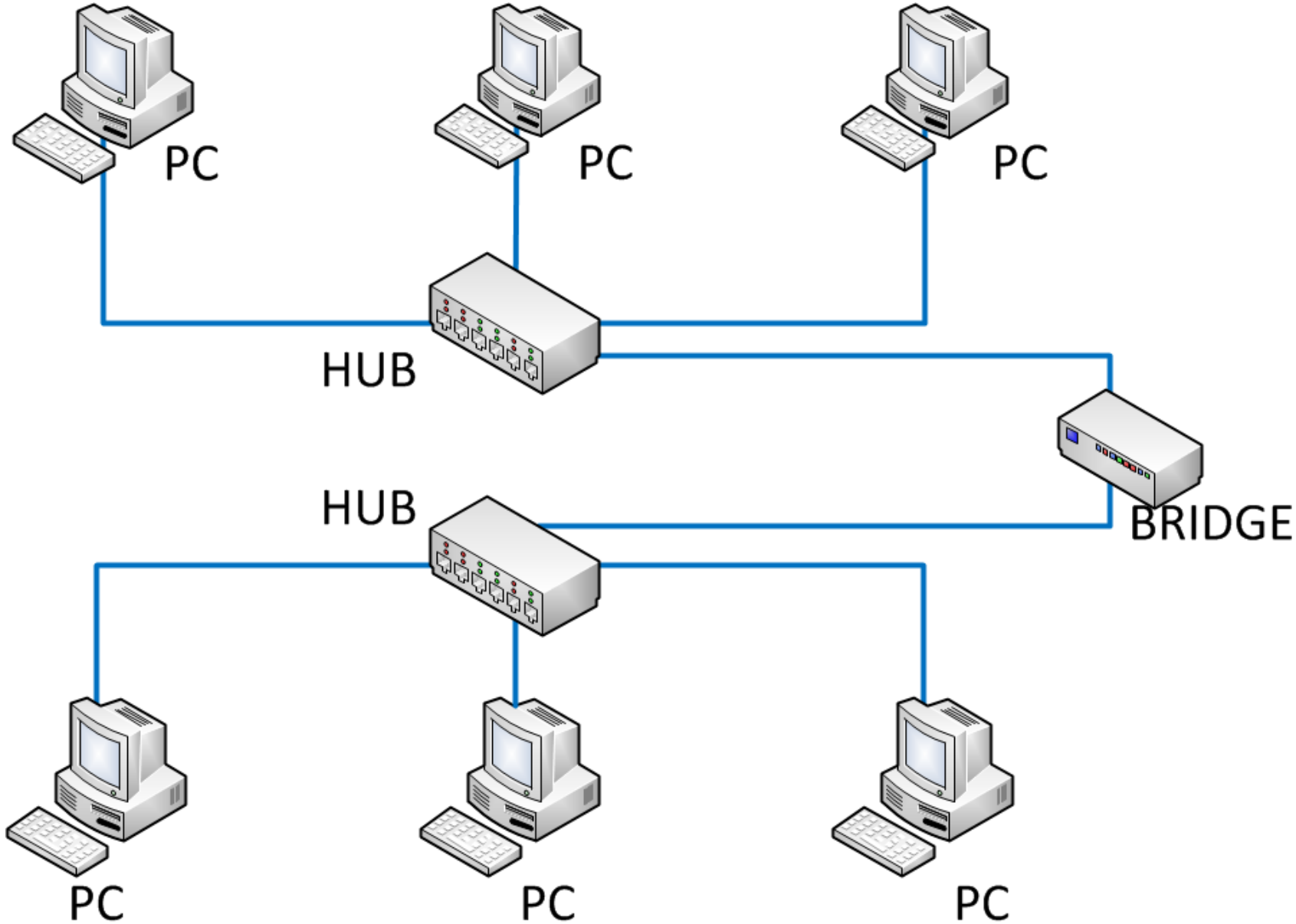


Hubs

- **Hubs** concentrate connections
- Take a group of hosts and allow the network to see them as a single unit
- Active hubs **concentrate** hosts and also **regenerate** signals

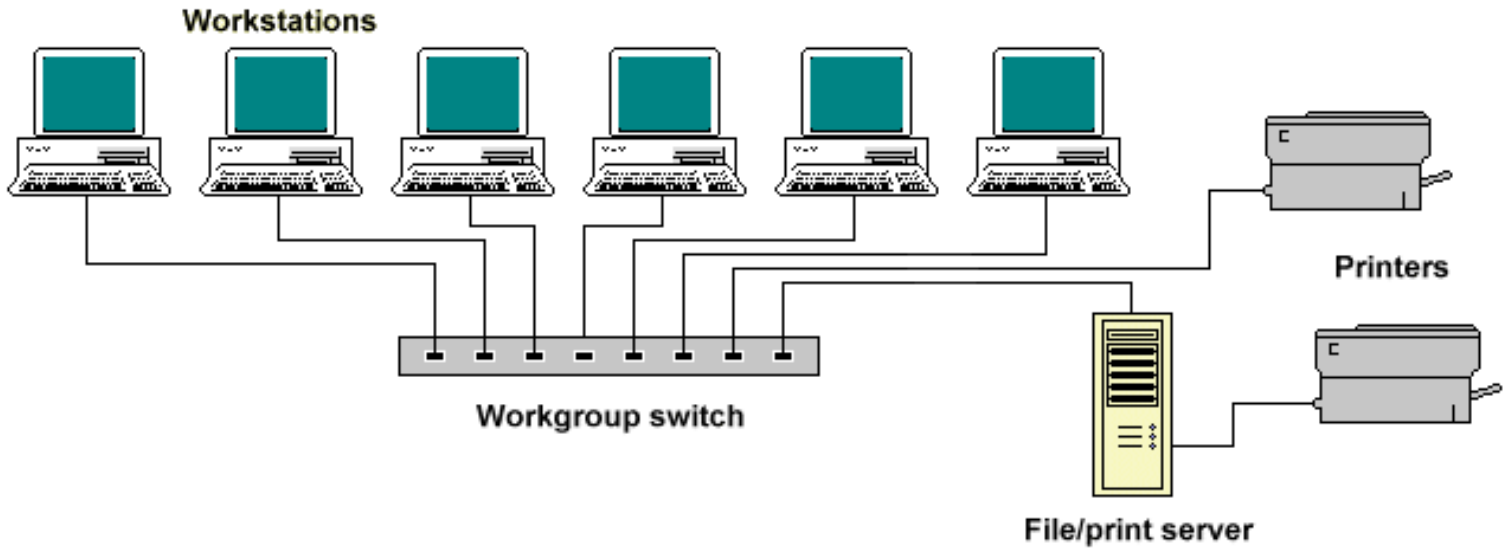
Bridges

- **Bridges** convert network data formats and perform basic data transmission management
- Bridges provide connections between LANs.
- check data to determine if it should cross the bridge to makes each part of the network more efficient


PC
PC
PC
HUB
BRIDGE
HUB
PC
PC
PC

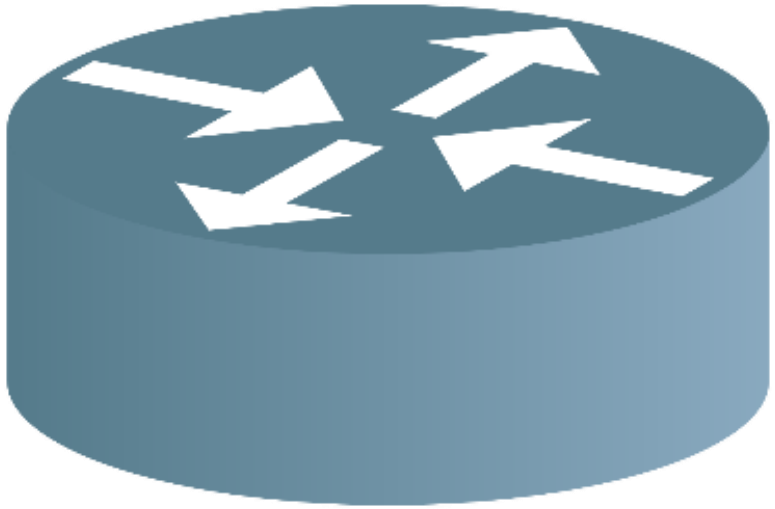
Switch

- **Workgroup switches** add more **intelligence** to data transfer management
- They can determine if data should remain on a LAN and transfer data only to the connection that needs it
- Switch does not convert data transmission formats



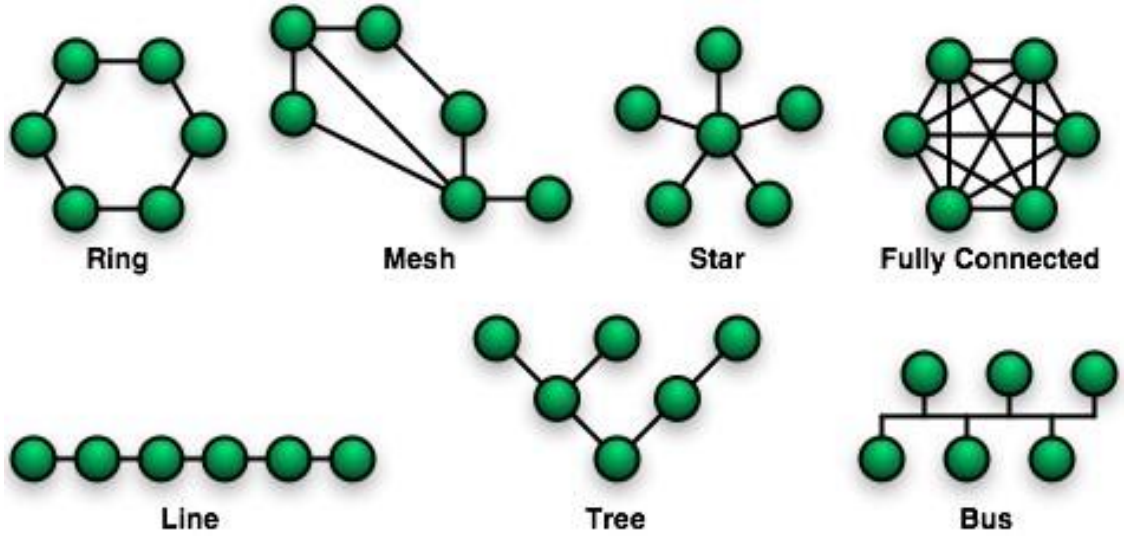
Routers

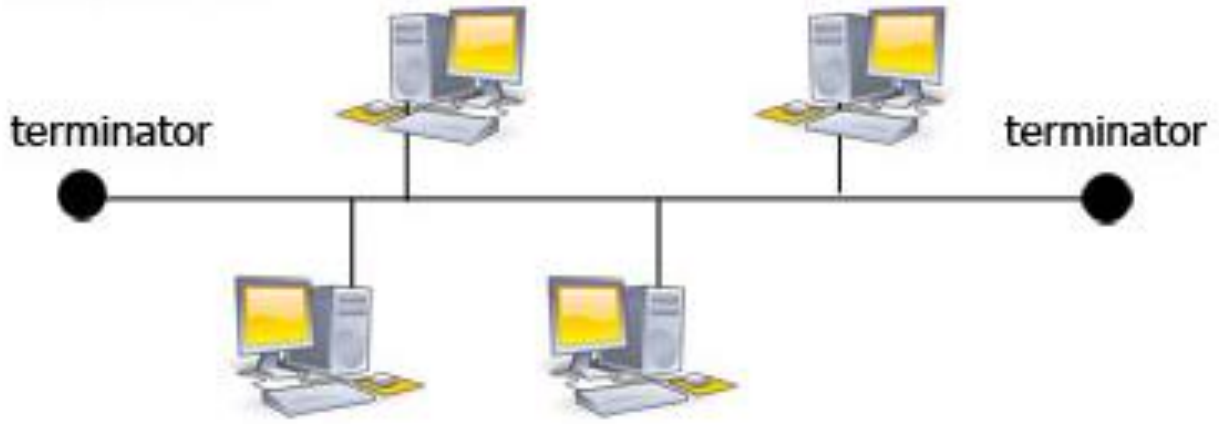
- **Routers** have all the capabilities listed above
- Routers can **regenerate** signals, **concentrate** multiple connections, **convert** data transmission formats, and **manage** data transfers
- Routers can connect to a WAN



Network Topology

- **Bus topology** uses a single backbone cable that is terminated at both ends. All the hosts connect directly to this backbone.



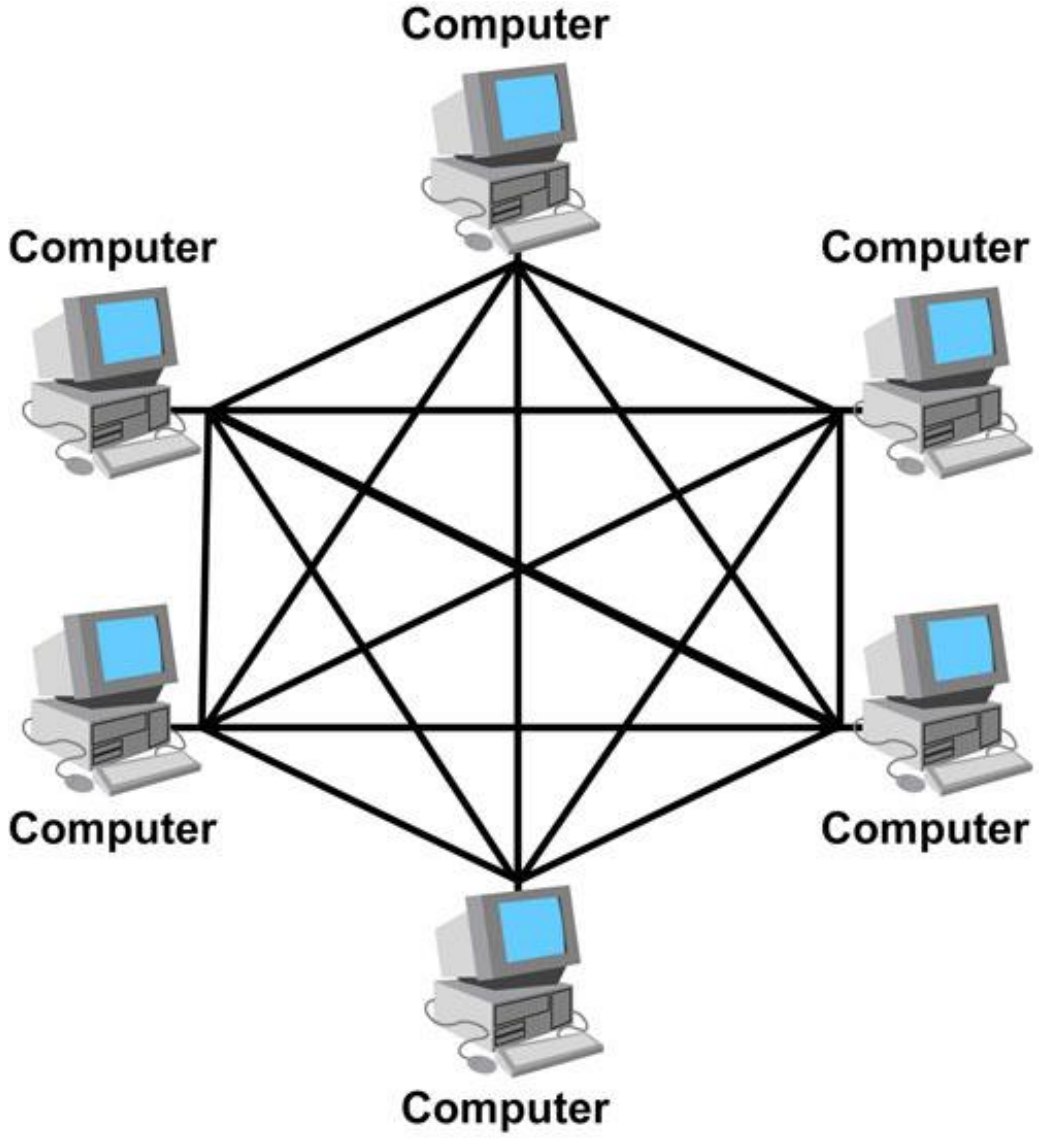


Network Topology

- **Ring topology** connects one host to the next and the last host to the first. This creates a physical ring of cable.
- **A star topology** connects all cables to a central point.
- **An extended star** topology links individual stars together by connecting the hubs or switches.
- **A hierarchical (tree)** topology is similar to an extended star. However, instead of linking the hubs or switches together, the system is linked to a computer that controls the traffic on the topology.

Network Topology

- **Mesh** topology is implemented to provide as much protection as possible from interruption of service. For example, a nuclear power plant might use a mesh topology in the networked control systems. As seen in the graphic, each host has its own connections to all other hosts. Although the Internet has multiple paths to any one location, it does not adopt the full mesh topology.

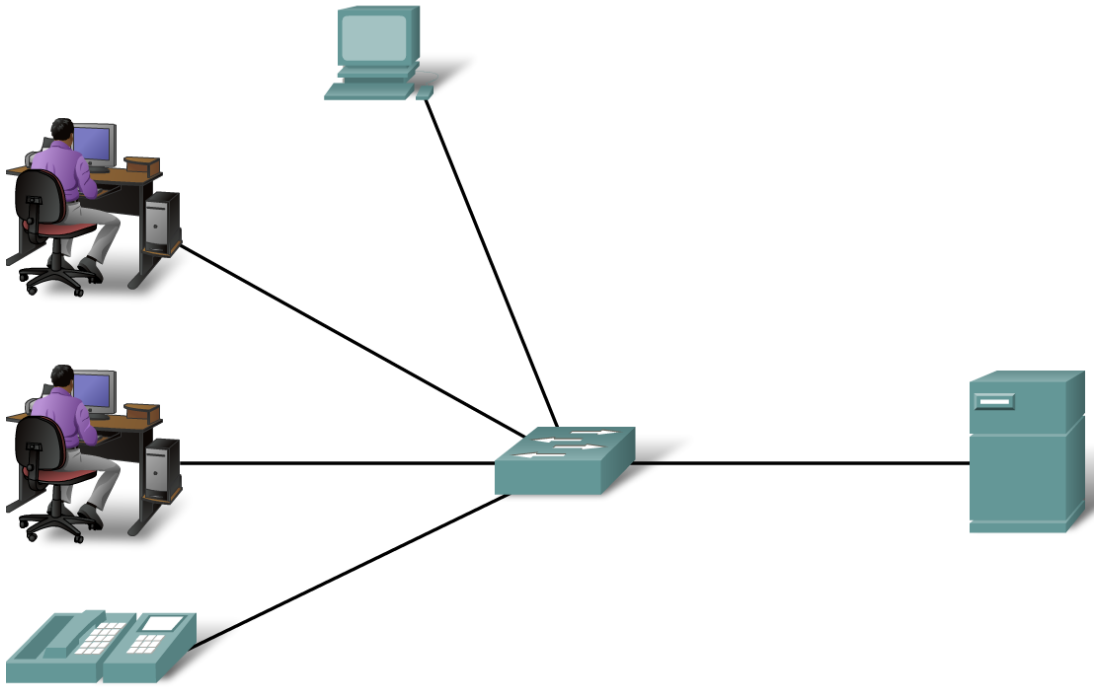


Types of Networks

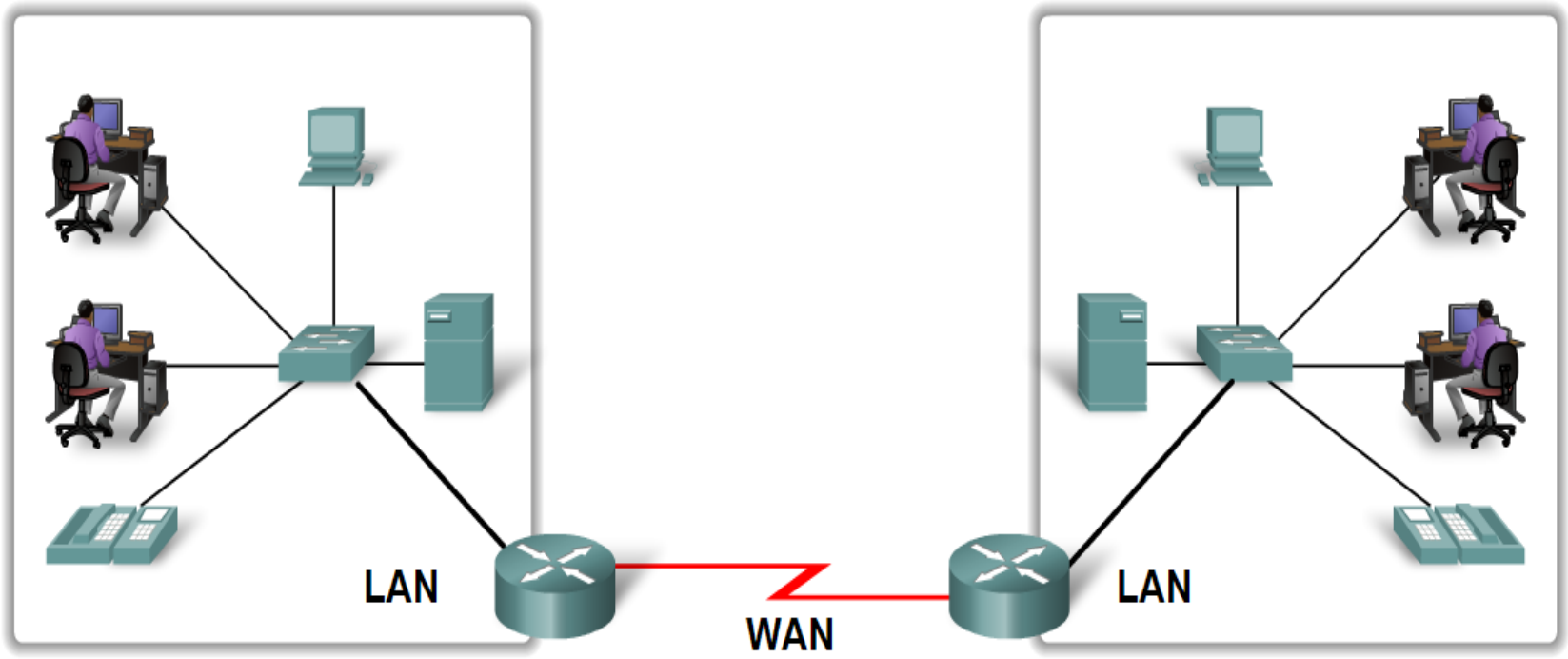
1. Size Based : LAN & WAN
2. Topology Based : Bus, Star, Ring & Mesh
3. Relationship Between PCs : Peer-To-Peer & Client/Server

What is the name of Peer-To-Peer in Microsoft?

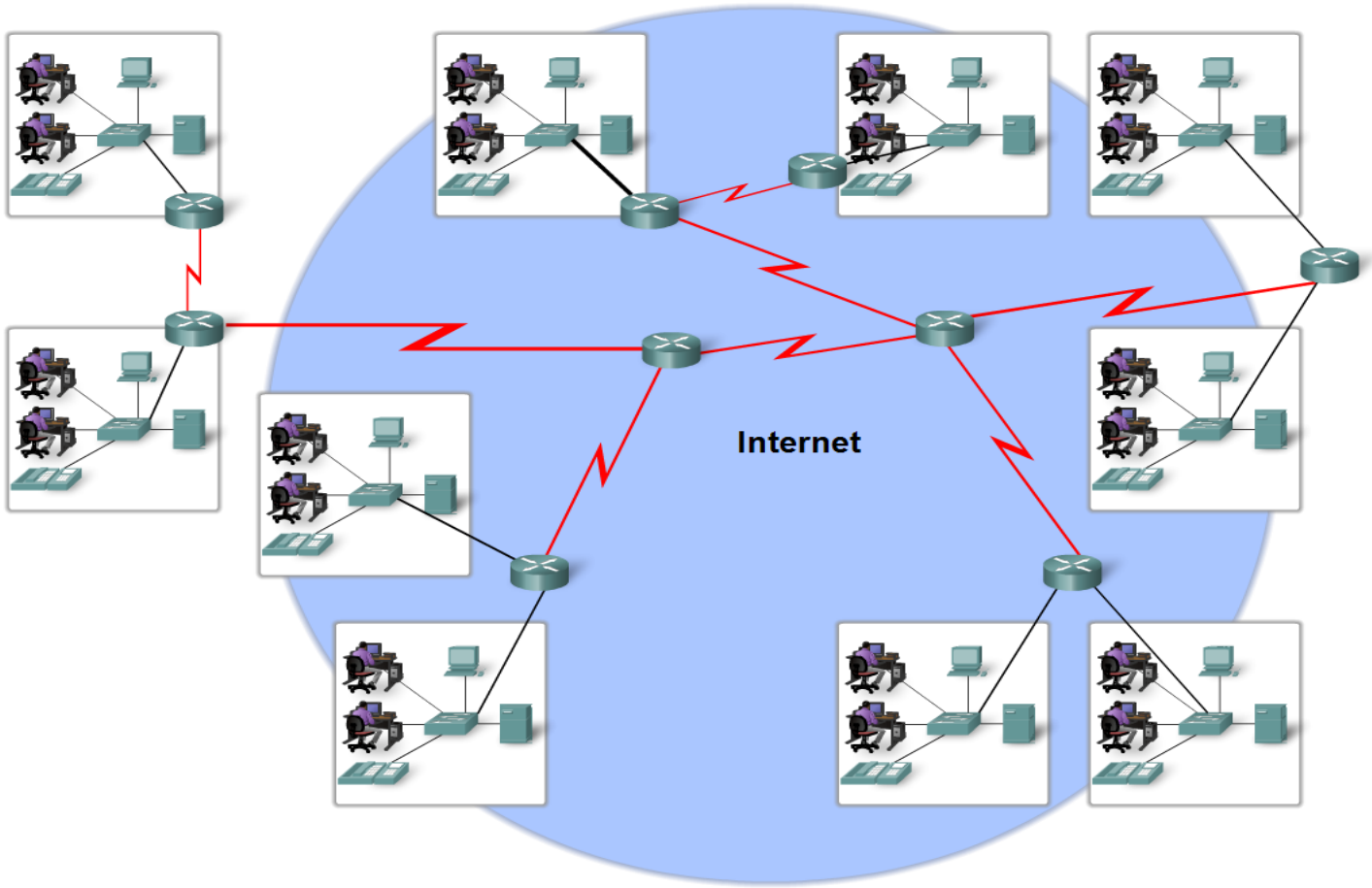
- Local Area Networks (LANs)
  - - A network serving a home, building or campus is considered a Local Area Network (LAN) : Single Organization



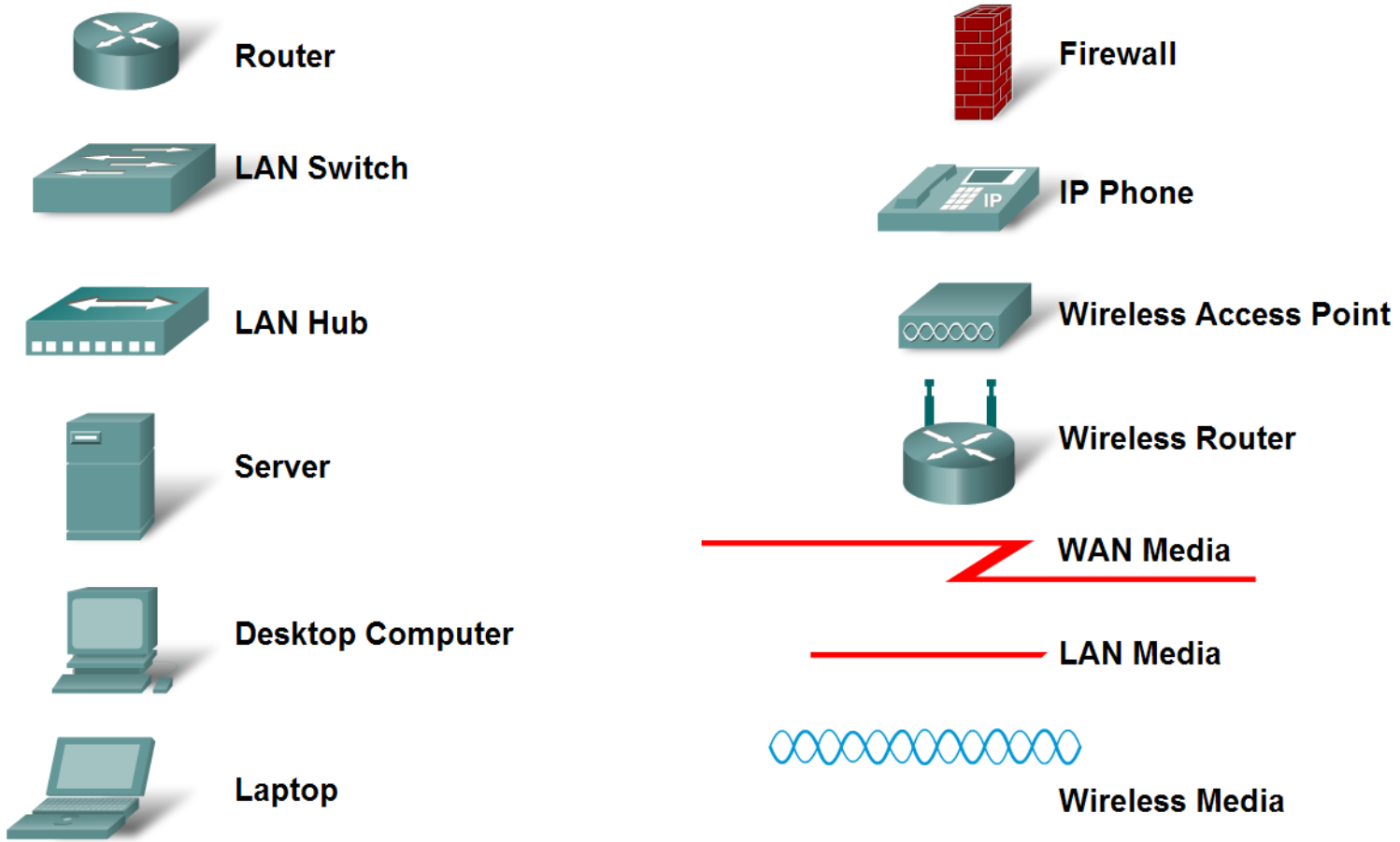
- Wide Area Networks (WANs)
  - - LANs separated by geographic distance are connected by a network known as a Wide Area Network (WAN)



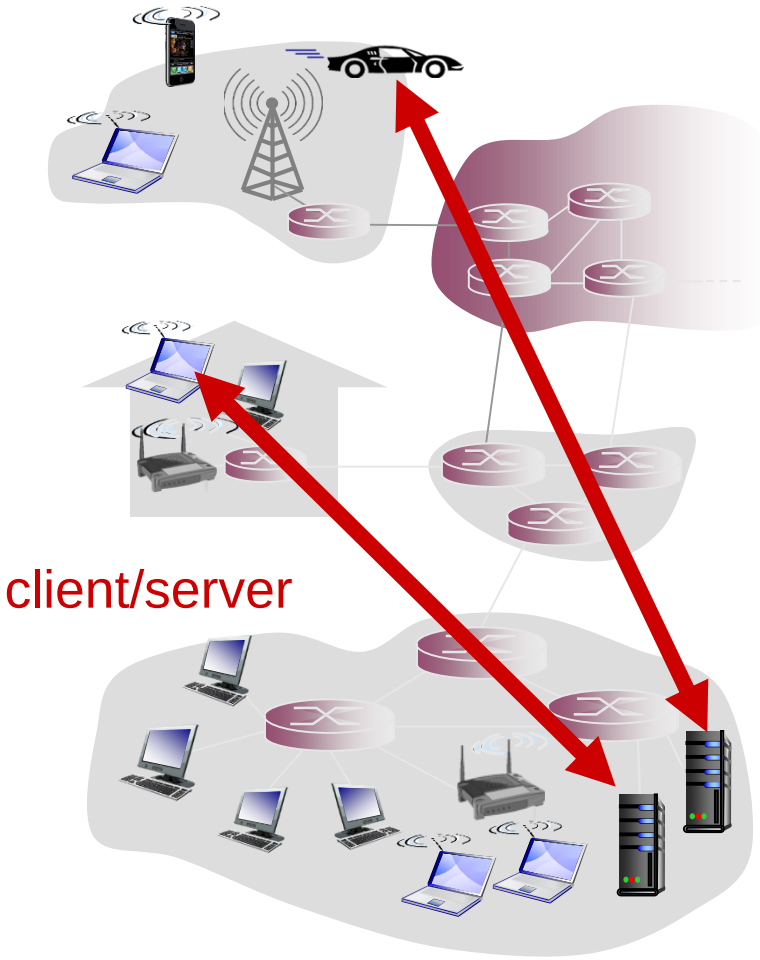
- The internet is defined as a global mesh of interconnected networks



Common Data Network Symbols



Client-server architecture



server:

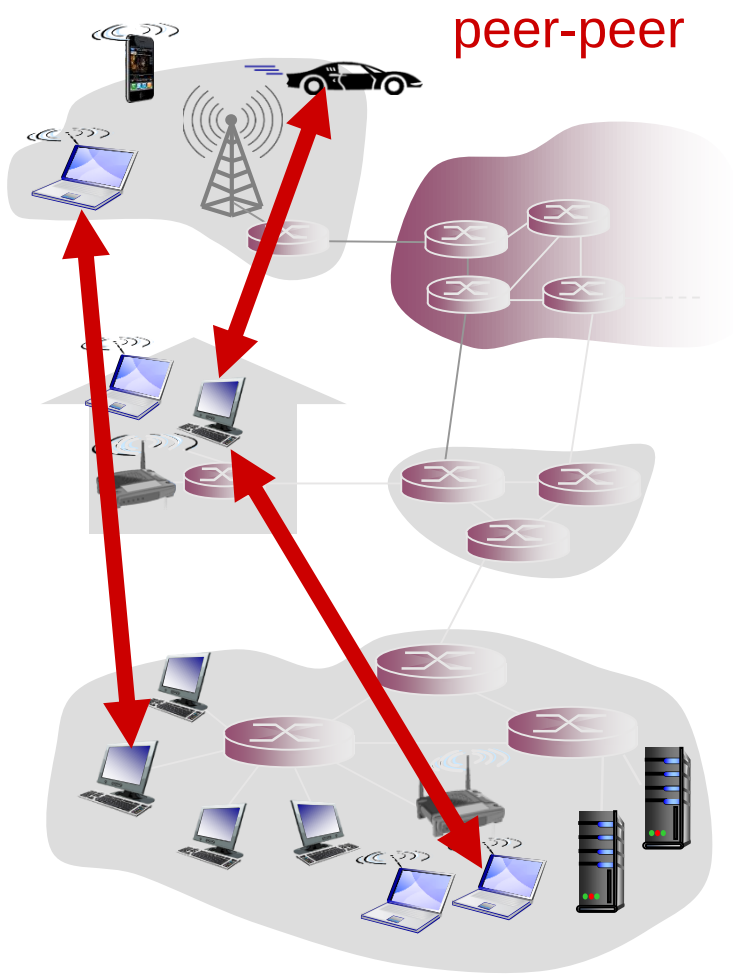
- always-on host
- permanent IP address
- data centers for scaling

clients:

- communicate with server
- may be intermittently connected
- may have dynamic IP addresses
- do not communicate directly with each other

P2P architecture

- *no* always-on server
- arbitrary end systems directly communicate
- peers request service from other peers, provide service in return to other peers
  - *self scalability* – new peers bring new service capacity, as well as new service demands
- peers are intermittently connected and change IP addresses
  - complex management



Processes communicating

process: program running within a host

- within same host, two processes communicate using inter-process communication (defined by OS)
- processes in different hosts communicate by exchanging messages

clients, servers

client process: process that initiates communication

server process: process that waits to be contacted

- aside: applications with P2P architectures have client processes & server processes

Comparison between Client/Server & Peer To Peer Networks

Peer To Peer	Client/Server
Does not required special SW	Required
Lower cost Implementation	Higher cost
Easy Installation	Difficult Installation
Does not require administration	Required
Does not provide a single point of Failure	Provide a single point of failure
Low security	High security
Un centralized	High control of administration & management
Suitable for small nets	Suitable for large nets