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Networks
INFO 2

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Types of Networks

Networks come in two *geographic* forms:

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Types of Networks

Networks come in two *geographic* forms:

LAN

A set of computers and other devices connected together within a local geographical area.

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Types of Networks

Networks come in two *geographic* forms:

LAN

A set of computers and other devices connected together within a local geographical area.

WAN

Computers that are connected together over a large geographical area using external communication links.

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Local Area Networks

Advantages of ~~Local Area~~ Networks:

- Sharing peripheals – printers
- Updating & installing software is easier
- Local to servers

Disadvantages of ~~Local Area~~ Networks:

- Security
- Cost (set-up)
- Reliance on central server

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Types of Networks

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Types of Networks

There are also two types of Local Area Network:

Client-Server

A network that has at least one computer performing the role of a server and clients computers that log on to the server and use the files and other facilities stored on that server.

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Types of Networks

There are also two types of Local Area Network:

Client-Server

A network that has at least one computer performing the role of a server and clients computers that log on to the server and use the files and other facilities stored on that server.

Peer-to-Peer

A network that has no server, but where each computer performs its own functions and may share some of its resources with other computers on the network.

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Client-Server

Advantages of Client-Server Networks:

- Centralised = easier distribution of software
- Share files / software
- Security, managed from server

Disadvantages of Client-Server Networks:

- Centralised = reliance on one machine
- Costs, servers expensive

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Components of a LAN

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Components of a LAN

Several components are required in a LAN:

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Components of a LAN

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- **Workstations** - PCs or terminals;

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Components of a LAN

Several components are required in a LAN:

- **Workstations** - PCs or terminals;
- **Server** (which could include a file server, a communication server, etc.);

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Components of a LAN

Several components are required in a LAN:

- **Workstations** - PCs or terminals;
- **Server** (which could include a file server, a communication server, etc.);
- **Cabling** - to link the computers together;

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Components of a LAN

Several components are required in a LAN:

- **Workstations** - PCs or terminals;
- **Server** (which could include a file server, a communication server, etc.);
- **Cabling** - to link the computers together;
- **Network cards** - fitted to each computer on the network to give it a unique identity and allow it to interact with other components of the network;

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Components of a LAN

Several components are required in a LAN:

- **Workstations** - PCs or terminals;
- **Server** (which could include a file server, a communication server, etc.);
- **Cabling** - to link the computers together;
- **Network cards** - fitted to each computer on the network to give it a unique identity and allow it to interact with other components of the network;
- **Print Server** - controls access to network printers, ensuring these resources are shared equally between users and manages print queues;

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Components of a LAN

Several components are required in a LAN:

- **Workstations** - PCs or terminals;
- **Server** (which could include a file server, a communication server, etc.);
- **Cabling** - to link the computers together;
- **Network cards** - fitted to each computer on the network to give it a unique identity and allow it to interact with other components of the network;
- **Print Server** - controls access to network printers, ensuring these resources are shared equally between users and manages print queues;
- Some form of **backup** facility.

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Wide Area Networks

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

- **Twisted Pair Copper Wire** - used in much of the telephone network;

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

- **Twisted Pair Copper Wire** - used in much of the telephone network;
- **Coaxial Cable** - high quality, well-insulated cable, transmits data at fast rate;

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

- **Twisted Pair Copper Wire** - used in much of the telephone network;
- **Coaxial Cable** - high quality, well-insulated cable, transmits data at fast rate;
- **Wireless (WiFi)** - uses radio waves, short distances;

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

- **Twisted Pair Copper Wire** - used in much of the telephone network;
- **Coaxial Cable** - high quality, well-insulated cable, transmits data at fast rate;
- **Wireless (WiFi)** - uses radio waves, short distances;
- **Fibre Optic** - uses light pulses, very fast transfer of data;

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Wide Area Networks

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- **Twisted Pair Copper Wire** - used in much of the telephone network;
- **Coaxial Cable** - high quality, well-insulated cable, transmits data at fast rate;
- **Wireless (WiFi)** - uses radio waves, short distances;
- **Fibre Optic** - uses light pulses, very fast transfer of data;
- **Microwave** - travels over long distances. Used for mobile phones;

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Wide Area Networks

Since Wide Area Networks are spread over a larger geographic area, the often need to use different communication media to communicate. This could include:

- **Twisted Pair Copper Wire** - used in much of the telephone network;
- **Coaxial Cable** - high quality, well-insulated cable, transmits data at fast rate;
- **Wireless (WiFi)** - uses radio waves, short distances;
- **Fibre Optic** - uses light pulses, very fast transfer of data;
- **Microwave** - travels over long distances. Used for mobile phones;
- **Satellites** - travels over long distances. Used for mobile phones.

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Wide Area Networks

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Wide Area Networks

Very large WANs (such as the Internet) often use telephone lines to connect machines. These can be in two forms:

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Wide Area Networks

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- Public lines;

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Wide Area Networks

Very large WANs (such as the Internet) often use telephone lines to connect machines. These can be in two forms:

- ➔ Public lines;
- ➔ Private or leased lines.

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Wide Area Networks

Very large WANs (such as the Internet) often use telephone lines to connect machines. These can be in two forms:

- ➔ Public lines;
- ➔ Private or leased lines.

Public lines are often much cheaper. Traditionally, the cost of sending data depended on the length of time taken (Dial-up).

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Wide Area Networks

Very large WANs (such as the Internet) often use telephone lines to connect machines. These can be in two forms:

- Public lines;
- Private or leased lines.

Public lines are often much cheaper. Traditionally, the cost of sending data depended on the length of time taken (Dial-up).

These days, more of a concern is *bandwidth*. Private lines cost a lot more to install but have no other traffic can be used as often as needed.

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Data Transmission

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Data Transmission

Many factors can affect the speed and accuracy of data transmission:

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- ➔ The nature of the transmission line;

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Data Transmission

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- ➔ The nature of the transmission line;
- ➔ The amount of data to be sent;

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Data Transmission

Many factors can affect the speed and accuracy of data transmission:

- ➔ The nature of the transmission line;
- ➔ The amount of data to be sent;
- ➔ Speed of network components;

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Data Transmission

Many factors can affect the speed and accuracy of data transmission:

- ➔ The nature of the transmission line;
- ➔ The amount of data to be sent;
- ➔ Speed of network components;
- ➔ Interference can cause data corruption.

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Network Topologies

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

➔ (Point-to-point network);

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

- (Point-to-point network);
- Bus network;

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

- (Point-to-point network);
- Bus network;
- Star network;

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

- (Point-to-point network);
- Bus network;
- Star network;
- Ring network;

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Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

- (Point-to-point network);
- Bus network;
- Star network;
- Ring network;
- (Line network);

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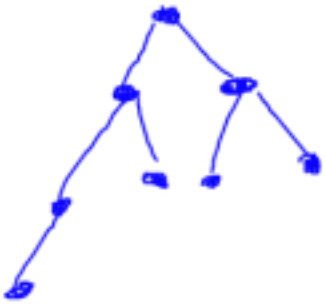
Network Topologies

Networks can be structured in various ways or **topologies**. Each has it's own advantages and disadvantages :

- ➔ (Point-to-point network);
- ➔ Bus network;
- ➔ Star network;
- ➔ Ring network;
- ➔ (Line network);
- ➔ (Tree network).



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Point-to-point network

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

✔ Very simple;

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

- ✔ Very simple;
- ✔ Easy to identify problems;

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

- ✔ Very simple;
- ✔ Easy to identify problems;
- ✔ Very fast connection.

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

- ✔ Very simple;
- ✔ Easy to identify problems;
- ✔ Very fast connection.

Problems:

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

- ✔ Very simple;
- ✔ Easy to identify problems;
- ✔ Very fast connection.

Problems:

- ✗ Rarely practical;

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Point-to-point network

This is just a a permanent link between two computers. Used in standard telephone networks.

Advantages:

- ✔ Very simple;
- ✔ Easy to identify problems;
- ✔ Very fast connection.

Problems:

- ✗ Rarely practical;
- ✗ Can only connect two machines.

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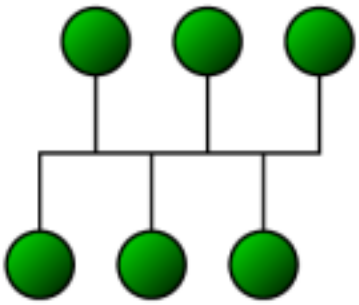
Bus network



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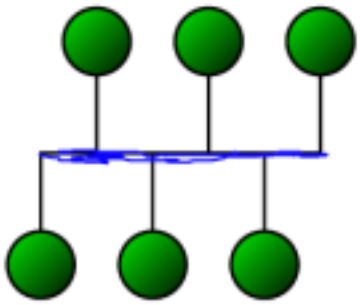
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.



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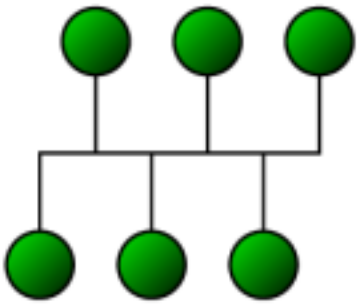
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Advantages:



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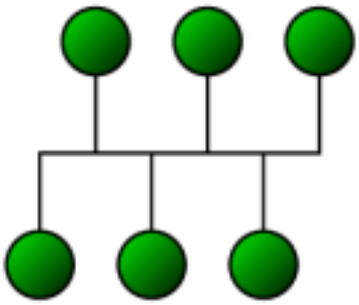
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Advantages:

- ✔ Easy and inexpensive to install as it requires the least amount of cable;



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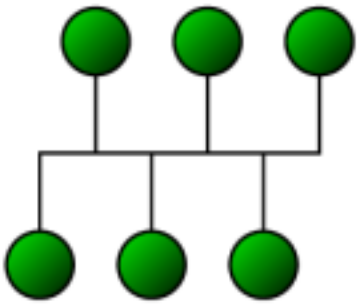
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Advantages:

- ✔ Easy and inexpensive to install as it requires the least amount of cable;
- ✔ Easy to add more stations without disrupting the network;



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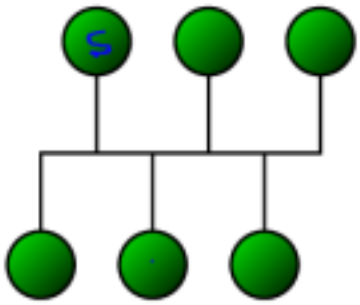
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Advantages:

- ✔ Easy and inexpensive to install as it requires the least amount of cable;
- ✔ Easy to add more stations without disrupting the network;
- ✔ If one computer fails it does not affect the other computers.



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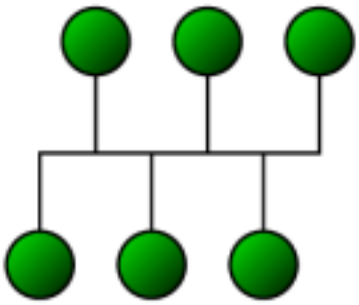
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Problems:



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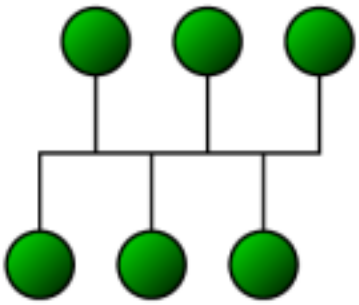
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Problems:

- ✗ The whole network goes down if the main cable fails;



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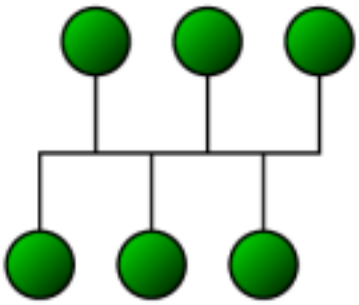
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Problems:

- ✗ The whole network goes down if the main cable fails;
- ✗ Cable failure is difficult to isolate;



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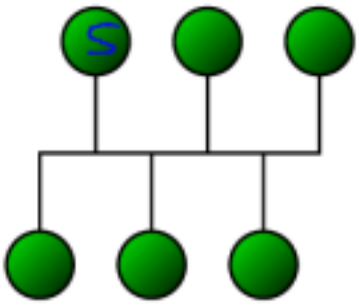
Bus network

In a bus network, all the devices share a single cable. Data can be transmitted in either direction from any node to any other.

Problems:

- ✗ The whole network goes down if the main cable fails;
- ✗ Cable failure is difficult to isolate;
- ✗ Network performance degrades under a heavy load.



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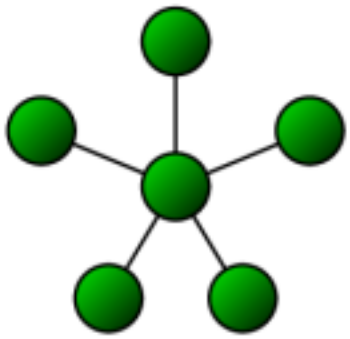
Star network



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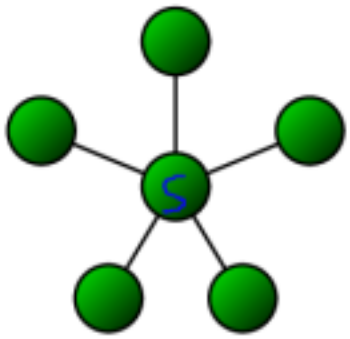
Star network

Each node in a star network is connected to a central computer that controls the network.



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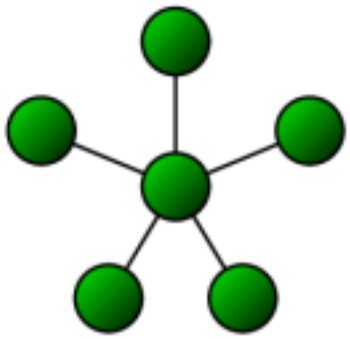
Star network

Each node in a star network is connected to a central computer that controls the network.

Advantages:



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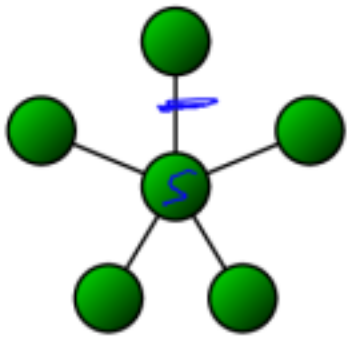
Star network

Each node in a star network is connected to a central computer that controls the network.

Advantages:

- ✔ If one cable fails, the other stations are not affected;



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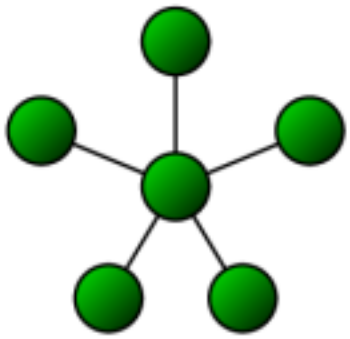
Star network

Each node in a star network is connected to a central computer that controls the network.

Advantages:

- ✔ If one cable fails, the other stations are not affected;
- ✔ Consistent performance even when the network is being heavily used;



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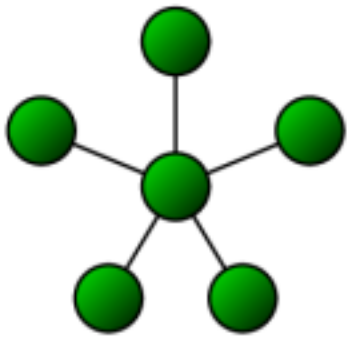
Star network

Each node in a star network is connected to a central computer that controls the network.

Advantages:

- ✔ If one cable fails, the other stations are not affected;
- ✔ Consistent performance even when the network is being heavily used;
- ✔ No problems with 'collisions' of data since each station have its own cable to the server;



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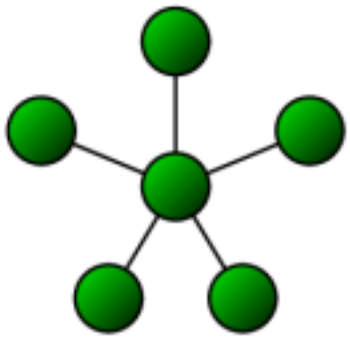
Star network

Each node in a star network is connected to a central computer that controls the network.

Advantages:

- ✔ If one cable fails, the other stations are not affected;
- ✔ Consistent performance even when the network is being heavily used;
- ✔ No problems with 'collisions' of data since each station have its own cable to the server;
- ✔ Easy to add new stations without disrupting the network.



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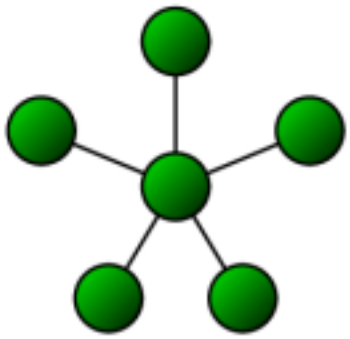
Star network

Each node in a star network is connected to a central computer that controls the network.

Problems:



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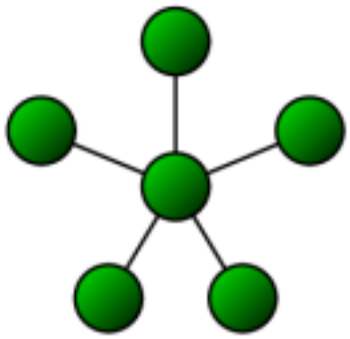
Star network

Each node in a star network is connected to a central computer that controls the network.

Problems:

✗ May be costly to install because of the length of cable required;



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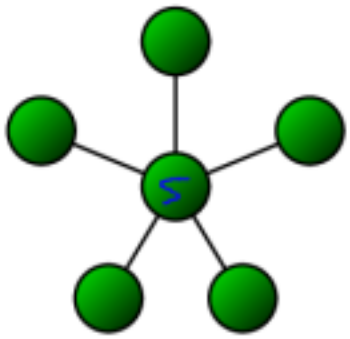
Star network

Each node in a star network is connected to a central computer that controls the network.

Problems:

- ✗ May be costly to install because of the length of cable required;
- ✗ Reliance on central host - failure of the central hub renders the network inoperable.



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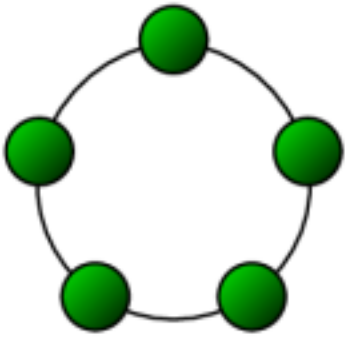
Ring network



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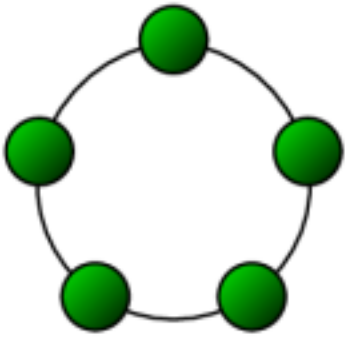
Ring network

In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.



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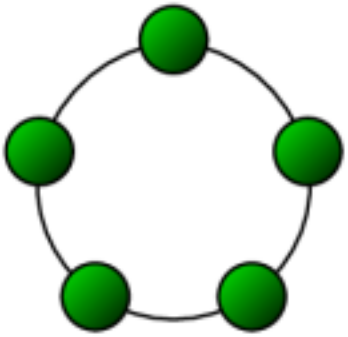
Ring network

In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Advantages:



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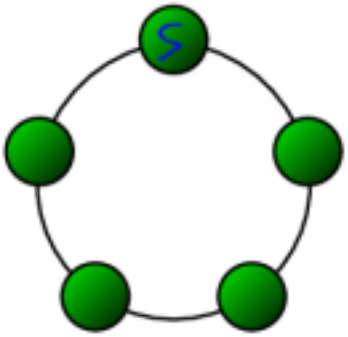
Ring network

In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Advantages:

- ✔ There is no dependence on a central computer or file server, and each node controls transmission to and from itself;



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Advantages:

- ✔ There is no dependence on a central computer or file server, and each node controls transmission to and from itself;
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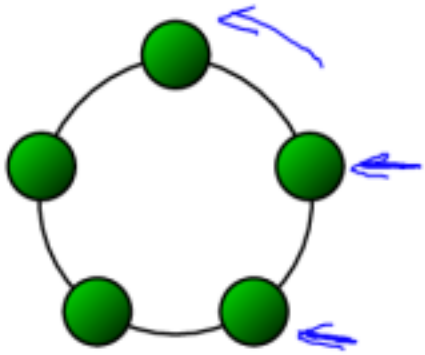

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In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Advantages:

- ✔ There is no dependence on a central computer or file server, and each node controls transmission to and from itself;
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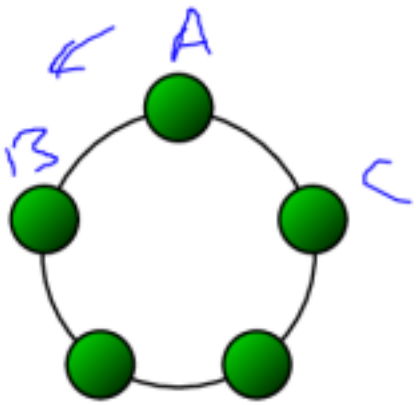

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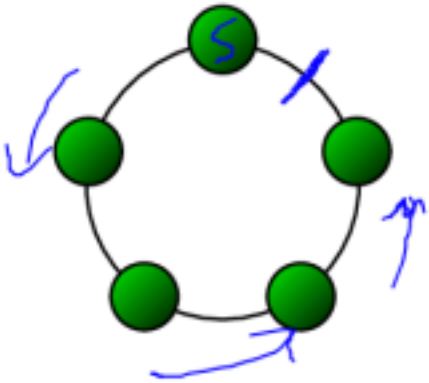
- ✔ Easy to identify and isolate faults.



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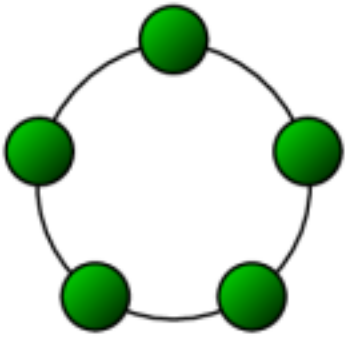
In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Problems:



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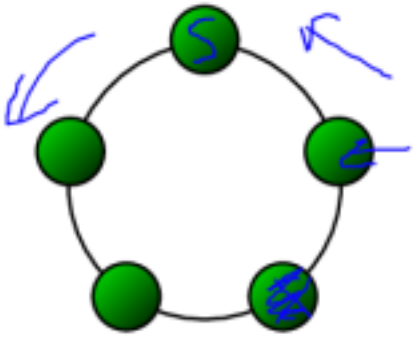
Ring network

In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Problems:

- ✗ One malfunctioning workstation can create problems for the entire network;



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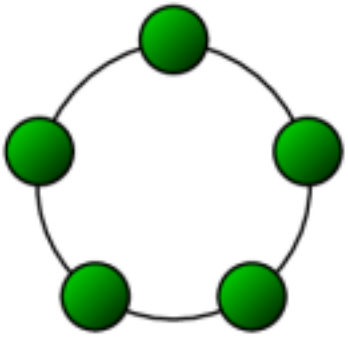
Ring network

In a ring network, a series of computers are connected together and there is no central controlling computer. Each node may communicate with any other node in the ring.

Problems:

- ✗ One malfunctioning workstation can create problems for the entire network;
- ✗ Moving, adding and changing the devices can affect the network;



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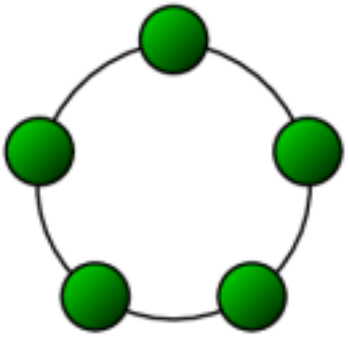

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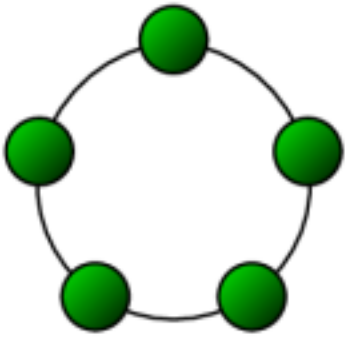
Problems:

- ✗ One malfunctioning workstation can create problems for the entire network;
- ✗ Moving, adding and changing the devices can affect the network;
- ✗ ~~Very high transmission rates are possible;~~
- ✗ Bandwidth is shared on all links between devices.



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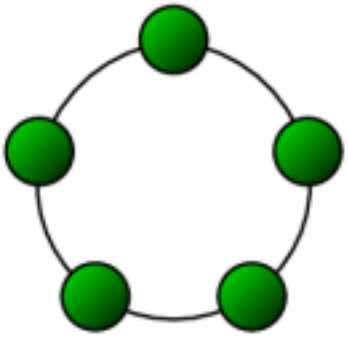
Line network



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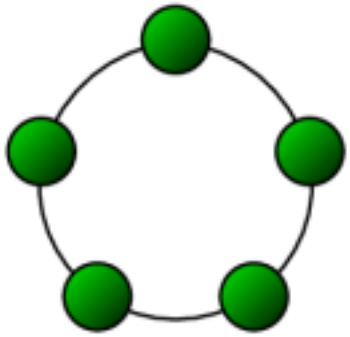

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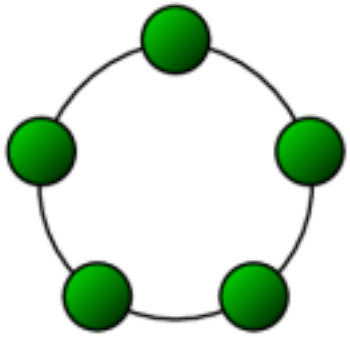
Advantages:



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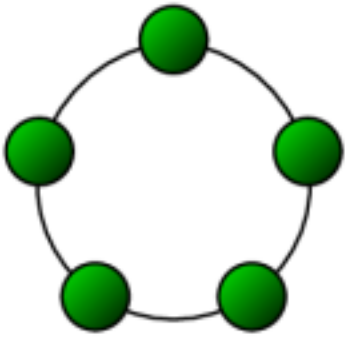

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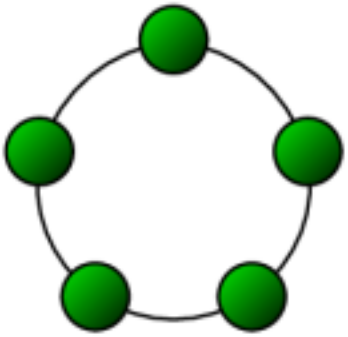

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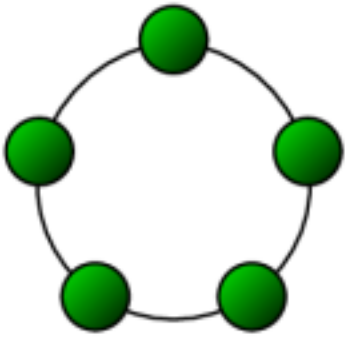

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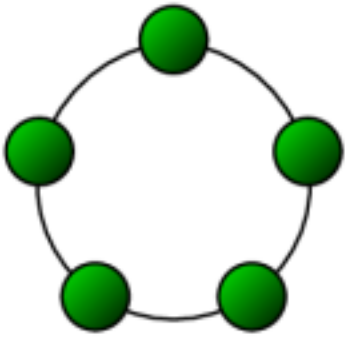

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Network Administrator

Most institutions have a network administrator to look after their computer network day-to-day.

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The Role of a Network Administrator:

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The Role of a Network Administrator:

- ➔ Installing and upgrading hardware and software when necessary;

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- ➔ Installing and upgrading hardware and software when necessary;
- ➔ Adding new user profiles;

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The Role of a Network Administrator:

- ➔ Installing and upgrading hardware and software when necessary;
- ➔ Adding new user profiles;
- ➔ Maintaining access rights;

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- ➔ Installing and upgrading hardware and software when necessary;
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- ➔ Keeping users informed of changes;

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- ➔ Keeping users informed of changes;
- ➔ Preforming backups;

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- ➔ Preforming backups;
- ➔ Troubleshooting network problems;

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- ➔ Keeping users informed of changes;
- ➔ Preforming backups;
- ➔ Troubleshooting network problems;
- ➔ Ensuring network security is maintained;

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- ➔ Installing and upgrading hardware and software when necessary;
- ➔ Adding new user profiles;
- ➔ Maintaining access rights;
- ➔ Keeping users informed of changes;
- ➔ Preforming backups;
- ➔ Troubleshooting network problems;
- ➔ Ensuring network security is maintained;
- ➔ Disaster recovery!

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The Internet

The Internet is a worldwide network made up of Local Area Networks (LANs) and Wide Area Networks (WANs). It has no central governing body and there is no control of content.

It continues to grow at a phenomenal rate. There are approximately 17 billion websites on the Internet. Millions of users are accessing the Internet at any one time.

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Accessing the Internet

What hardware or software is required to access the Internet?

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➔ An ICT device (a computer, a mobile phone, etc.).

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Accessing the Internet

What hardware or software is required to access the Internet?

- An ICT device (a computer, a mobile phone, etc.).
- A Telephone Line (standard, ISDN, ADSL) or a wireless connection.

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Accessing the Internet

Asymmetric Digital Subscriber Line

What hardware or software is required to access the Internet?

- An ICT device (a computer, a mobile phone, etc.).
- A Telephone Line (standard, ISDN, ADSL) or a wireless connection.
- A Modem (**Mo**dulator **Dem**odulator) for analogue lines to convert computer signals.

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- Connection via an ISP (Internet Service Provider).

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- ➔ Connection via an ISP (Internet Service Provider).
- ➔ An Internet browser, to display web pages in readable form from HTML.

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