Topologies

# Star topology .

|  | A **star topology** has one **central** node with all of the other nodes connected to it. The central node would typically be a **hub** or a **switch** that could transfer data between nodes.  If a **hub** is in the central node then it will broadcast the data to all nodes connected to it. If a **switch** is in the central node then it will transfer the data to the required location. |
| --- | --- |

| **Advantages** | **Disadvantages** |
| --- | --- |
| * A damaged link only affects the attached node * You can easily add new nodes * It works well under heavy load — especially when using a switch for the central node | * The central node is a single point of failure * It requires many more cables than bus and ring, which is expensive |

# Bus topology .

|  | With a **bus topology**, each node is connected to a **single cable**. When data is sent from one node to another it is sent in both directions. **Terminators** are placed at the end of the cable to stop the signal being reflected back down the cable. The data is sent to all nodes connected to the bus. It is only accepted by the node that requires it. |
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| **Advantages** | **Disadvantages** |
| --- | --- |
| * A bus network is cheap because it uses minimal cables * A bus network is simpler to set up than other arrangements * It works well for very small networks | * If the main cable fails then the whole network fails * It isn’t very secure because data is sent to all nodes on the network * As more nodes are connected, the network performance reduces |

# Ring topology .

|  | In this arrangement, each node is connected in a **ring**. When data is transferred it moves around the ring in **one direction**.  The data will continue to move around the ring **until** it reaches its **destination**. |
| --- | --- |

| **Advantages** | **Disadvantages** |
| --- | --- |
| * It performs better than the bus topology when under heavy load * Additional nodes have a minimal impact on the network performance * There is less chance for data collision because the data moves in one direction, this makes data transmission quite fast | * There is a single point of failure — if there is a break in the loop then data cannot be transferred * It isn’t very secure because all nodes can potentially see all of the data * The whole network is as slow as the slowest link between any two nodes * To add a new node, the whole network needs to be shutdown |

# Mesh topology .

|  | In this arrangement, there are **multiple ways** for data to transfer from one node to another. Each node is connected to at least one other node. It is more common for them to be connected to more than one node.  In a **mesh network** the most efficient route is typically calculated before transferring the required data. |
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| **Advantages** | **Disadvantages** |
| --- | --- |
| * There is no central node, so there is no single point of failure * The data uses the most direct route, making data transfer faster * It works well under heavy load * If a node breaks then a new route can be found for the data * New nodes can be added without shutting down the network | * The increased cabling required for a wired network makes it expensive * A wired mesh is far more complicated to manage and maintain than the other topologies |

# Scenario 1 .

A research laboratory needs a group of three computers connected together to share resources. The network will be temporary because it is for a short experiment. The computers will be in a secure room and each user will have access to each computer, this means data transfer security isn’t a high priority. The majority of the scientists’ funding has been spent on the experiments so there are very limited funds to create this network.

| **Underline the most suitable topology for this scenario:**  Star Bus Ring Mesh |
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| **Draw a graph of your chosen topology below:** |
| **Justify your chosen topology in the space below:**  I have chosen a bus topology because this is the cheapest option for the scientists. It is also simple to set up compared to the other options and is perfect for very small networks like this one. They could have potentially used a ring network but with only three computers, it doesn’t feel necessary. |

# Scenario 2 .

A homeowner is building their dream house. There are four bedrooms and two offices in the new home. The homeowner wants a stable connection from each room to a central location. The central location will also be connected to the internet and a printer. The homeowner doesn’t require a direct connection from room to room but would like the ability to connect through the central location on occasion when the family wants to share photographs or videos with each other through the network. They have a reasonable budget but want to avoid any unnecessary costs. The homeowner anticipates that the network will be heavily used so it will need to be able to cope with high demand.

| **Underline the most suitable topology for this scenario:**  Star Bus Ring Mesh |
| --- |
| **Draw a graph of your chosen topology below:** |
| **Justify your chosen topology in the space below:**  A star network will help to provide a stable connection from each room to the central location. The rooms do not need to be directly connected to each other so a mesh wouldn’t be necessary in this scenario. A star network can also cope with the heavy network traffic that the homeowner anticipates. Although a wired mesh would be a viable solution, it would be an unnecessary expense that the homeowner doesn’t want. |

# Scenario 3 .

A new tech startup company has an office space that currently requires 20 users to be connected to a network. There will be a mixture of laptops and desktop computers. They also require shared, high-speed internet access and a shared laser printer. The network must be fast and stable. It should also be easy to add new devices to the network without having to shutdown the network or compromise on stability and speed. Users of the network will need to be in constant contact with other users in the network through an internal messaging system, this must be fast and reliable to increase productivity. The tech company has two wealthy backers and they have an excellent budget for setting up their network.

| **Underline the most suitable topology for this scenario:**  Star Bus Ring Mesh |
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| **Draw a graph of your chosen topology below:** |
| **Justify your chosen topology in the space below:**  A mesh network will provide a stable connection under a heavy load. It is also easy to add new devices to a mesh network without disrupting the network or reducing the overall speed of the network. The company needs the network to be fast and stable, a mesh will find the most direct route for data transfer, which makes the speed of the network much faster than other options. They also have an excellent budget for their network. A star network might also be suitable for this scenario but I believe that because they have such a good budget they should go for the mesh network. |

# Scenario 4 .

A small printing company has been using stand alone computers (computers not connected to a network) for several decades. They have five computers and three industrial printers. They would like to upgrade their IT infrastructure to enable all computers on the network to share a connection with the printers. They also want the ability to share an internet connection and to send data to other computers on the network. The network will be in a secured location and not accessible to the public. Data transfer must be fast because they will be sending large amounts of data to the industrial printers. They also would like the option to expand the network in the future if they need to. The company doesn’t have a large budget for this project.

| **Underline the most suitable topology for this scenario:**  Star Bus Ring Mesh |
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| **Draw a graph of your chosen topology below:** |
| **Justify your chosen topology in the space below:**  I believe that a ring network would be most suitable for this scenario. The company has a limited budget but they require the data transfer to be fast. A bus network would be a similar cost but would be much slower than a ring network. A mesh network would be too expensive for this scenario. A star network might be suitable but is also more expensive than a ring network. A ring network can also be expanded in the future without having a big impact on the network, which suits their needs. |

# Explorer task .

Decide which hardware components might be required for the network topologies that you have chosen and the scenarios given. You can draw or list them.

| **Scenario 1** |
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| **Scenario 2** |
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| **Scenario 3** |
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| **Scenario 4** |
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