Lesson plan

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| Topic 2 Connection types |
| Learning Objectives:   * Examine the implications of selecting and using different connection types * Evaluate the impact of connection types on the performance of an IT system |
| Content |
| Starter  PowerPoint Guide: Topic 2 Connection types  The starter allows for students to recap what they learnt in the previous topic about wireless and wired technologies. This lesson goes into more details about these technologies by looking at the implications and impact of different connections on IT systems. Ask students the question and go through the answers slide.  Main  Copper cabling  Telephone networks were originally set up using copper cable. This is predominantly used to connect homes and businesses in the UK to the cabinet in the street. Connections beyond this are then often made with fibre.  Fibre optics  Fibre optic cable is capable of carrying far more information through it than copper cable. Hence it is often used in businesses and the major backbone cables of the Internet. The major backbone cables can be viewed here: <https://www.submarinecablemap.com/>  Wi-Fi and Wireless Access Point location  Students are likely to be aware of Wi-Fi and its uses. In the past there has been some controversy over the use of microwaves for both Wi-Fi and modern mobile phone signals. However, it is currently thought that low powered consumer devices are safe. Whilst Wi-Fi standards allow for fast transfer rates, these are often not achieved due to interference and the location of the device. It is important to note that not only can objects reduce the signal strength, but also the distance from the Wireless Access Point (WAP). In the example given, the Wi-Fi router would be best placed in the centre of the building.  Surf Air Travel Club  Show students the video of this business <https://www.youtube.com/watch?v=GgzTjmAcsZw>. The video gives an insight into some of the user needs of the business and how Wi-Fi was able to help. It also shows how Wi-Fi can be implemented to improve the reliability. In this case they used multiple WAPs which are configured to have the same identifier (SSID). The particular company makes it easy to implement this solution so that it all works seamlessly.  Give out **Worksheet 2** and ask students to do **Task 2.**  Topic 2 Worksheet 2  Topic 2 Worksheet 2 Answers  Mobile performance  Students should have experience of many of the reasons that mobile phones have poor reception. You may wish to also remind them of situations such as New Year’s Eve or large events such as festivals or during a natural disaster when mobile networks do not work well. Ask them to check through the reasons given on the slide to see if they were the cause of their problems.  Mobile signal and city signals  It is possible for a mobile phone to be 22 miles from a base station. However, base stations are often much closer as signal strength will be reduced due to absorption in various materials. In cities, base stations may be very close together as there are a high number of users wishing to use them and there are also many buildings that will cause a reduction in signal strength.  Weather effects  The weather will degrade signal strength to some degree. Students may have not only experienced this with a mobile phone but also with home Wi-Fi if they are trying to use it outside. Moisture naturally absorbs many signals from microwaves as this is how microwave ovens work. The best conditions for mobile phone signals are cool and dry as when there is the least moisture in the air.  Ask students to do **Task 2** on the worksheet.  Bandwidth and congestion  Bandwidth shows how much data can be transferred. It isn’t accurate to call this speed. Ask students to find similarities in the analogy with a road network. For instance, a road network has cars, whilst a computer network has packets. The speed of the cars is fixed (at 70mph). The equivalent in a network is the latency of the network connection. If the computer network has a high bandwidth it is the equivalent of having many lanes on a motorway. Congestion on either a road or computer network will mean that fewer cars or packets are transferred per second.  Case study: Wembley stadium  The new 5G network launched by EE has much more bandwidth than 4G with speeds up to 1Gbps. This allows for 4K streaming and enhanced content for matches such as different viewing angles.  Ask students to do **Task 3** on the worksheet.  Network choice factors  A number of factors will determine the choice of network. The remaining factors are covered in the following slides and include security and reliability, cost and bottlenecks.  Security and reliability  Both fibre optic and Ethernet cables are very reliable when used within the correct distances. Many home broadband connections, by contrast, are less reliable due to the distance from the house to the cabinet. Wi-Fi and mobile signals are the least reliable due to objects, distance and weather. Wi-Fi and mobile are also transmitted through public places. For this reason, it is essential that they use encryption to keep the data secure.  Cost  Different types of connection have different costs associated with them. Initial costs are for laying cables in the ground. If a business wishes to install a new fibre connection it may cost many thousands. Connections with more bandwidth are also more expensive as the ISP will need to route more information to the Internet. Now would be a good opportunity for students to search a major ISP such as BT to find how much their business and home packages cost. Typical monthly mobile broadband costs vary depending on how much data transferred. FTTC for residential customers is around £20-£50 per month in 2019.  Bottlenecks  Again, the analogy with a road network is a good one. Ask students where traffic jams most occur near your school or college. It may be on the school site (a slower moving road) or when a dual carriageway reaches a single carriageway. Bottlenecks occur on computer networks when a high bandwidth connection joins a slow bandwidth connection. The example on the slide shows a mobile phone connecting to a router which connects to the Internet and finally a server. The slowest connection is 30Mbps, so the connection between smartphone and server will never exceed 300Mbps. The bottleneck in this case is the connection between the router and the Internet. A second analogy that you may wish to use for bottlenecks is a sand timer.  Implications for businesses  Many businesses now rely heavily on the Internet. A slow connection will likely mean a loss of productivity. Some businesses, such as hotels, also provide free Wi-Fi to their customers. <https://www.youtube.com/watch?v=84spE6JlG8U> (from 0m00s-5m20s) shows why this is often the case. Further implications to businesses of slow and unreliable connections are given on the next slide.  Ask students to do **Task 4** on the worksheet.  Plenary  Ask students to complete the plenary task and then go through the answers on the following slide.  Hand out **Homework 2**.  Topic 2 Homework 2  Topic 2 Homework 2 Answers |