Lesson plan

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| Topic 3 Networks |
| Learning Objectives:   * Describe the features, use and purpose of different networks:   + Personal area network (PAN)   + Local area network (LAN)   + Wide area network (WAN)   + Virtual private network (VPN) * Describe the concepts and implications for individuals and organisations of connecting devices to form a network |
| Content |
| Starter  PowerPoint Guide: Topic 3 Choice of network  Students are likely to be aware that photos can be shared using Bluetooth. Some students may suggest that apps such as What’s App could be used. These make use of the Internet so don’t answer the question. The suggested answers are to use Bluetooth to transfer directly or to use a USB cable to move the photos to a computer. It would also be possible to use a Wi-Fi connection if the printer supports it as this would be done within a LAN and not require Internet access.  Main  Personal Area Network (PAN)  Personal area networks are used to connect devices that are very close together. Possible connection methods and uses are given on the following slide. Other uses for a PAN include: a security system, a hub for home devices such as Zigbee, headphones, smart speakers and to share files between two devices.  Case study: Zigbee  Many Internet of Things (IoT) devices make use of Wi-Fi. Whilst this is compatible with existing Wi-Fi Access Points, it consumes a reasonable amount of energy.  Zigbee is a wireless standard (802.15.4) used to create personal area networks. It uses less energy than Wi-Fi or Bluetooth, so is more suitable for plug sockets, light switches and lightbulbs. Zigbee devices can communicate over longer distances by passing information over other intermediate devices. However, a dedicated hub is needed to connect all the devices to. Ask students if they use any Internet of Things devices and how they are all connected together and controlled.  Give out **Worksheet 3** and ask students to do **Task 1.**  Topic 3 Worksheet 3  Topic 3 Worksheet 3 Answers  Local Area Network (LAN)  Within networks, devices such as PCs, phones and printers are technically referred to as nodes. The photo shown is a switch which has 48 Ethernet ports that support CAT 5e cables (capable of 1Gbps each). There are two fibre optic ports on the right which can connect the switch to other switches or routers. A switch works by switching the connections between different devices. Two devices therefore can connect together at 1Gbps.  Wireless LAN and Wireless Access Points  The Wireless Access Point (WAP) shown only has one network port. This is shown on the right of the photo. Many WAPs will only have a standard ethernet cable plugged into them. The switch they connect to will have Power over Ethernet (PoE) capabilities which means they will send the power for the device through the same cable. Take students through the answers slide.  Case study: Home network  Many students will have a good idea how their own home network is connected together. Some students may understand their network in lots of detail. Encourage them to talk as much as they can about technical details and also what this means for the users of the network. Remind them that this level of detail will be useful when they annotate diagrams in the exams. The answers to the questions are given on the following slide.  Ask students to do **Task 2** on the worksheet.  WANs and reasons for installing them  Wide Area Networks (WANs) are far rarer than LANs. Most home users and business only run a LAN as they are located in one building. The largest WAN in the world is the Internet, so technically all computers connected to the Internet are connected to a WAN, however, this is not usually how people think of WANs. Take students through the slide and the answers slide that follows. Also take them through the slide that looks at the reasons why companies install WANs.  Case study: CERN  CERN is the nuclear research organisation for Europe. Their Geneva/Switzerland main campus houses the Large Hadron Collider – the most powerful particle collider in the world. This collider and other research projects generate huge amounts of data. Fibre optic connections take the data to Budapest, Hungary and other research facilities around the world. An average of 35Gbps of data is transferred across their WAN. More information about the data being transferred can be found at: <http://wlcg-public.web.cern.ch/structure>  Ask students to do **Task 3** on the worksheet.  VPN (Virtual Private Networks)  VPNs have two main uses. The first is by businesses who wish to create a secure connection from remote users (typically on laptops) to the business LAN. The use of a VPN and encryption keeps the connection secure. The second major use of VPNs is for users of the Internet in public places. If Wi-Fi is used in an airport or café, there is normally either no encryption or a shared password. This is very insecure. By using VPN, the data is encrypted between the user and the VPN provider. Users need to be careful when choosing a VPN provider as they will have access to the communications. VPN is also used to make the entry point to the Internet in another country. This allows users to circumvent country restrictions, for instance when using streaming services that only work within one country. Students should be advised to check their terms and conditions as to whether this is allowed.  Plenary  Ask students to complete the plenary task and then go through the answers.  Hand out **Homework 3**.  Topic 3 Homework 3  Topic 3 Homework 3 Answers |