Answers

1. Eric works in a recruitment agency. Three days a week he works in the office and two days a week he visits clients or works from home.

The office computers are set up in a Local Area Network (LAN).

(a) Describe how a LAN can be set up. [4]

Each computer will connect to a switch (1) using ethernet cables (1) for a wired network (1). For a wireless network (1) computers will connect to the network using a (wireless) access point / Wi-Fi (1). Computers will need to be within 100 metres of the switch (1) (as this is typically the maximum cable length).

(b) Eric often has to make phone calls whilst driving. To do this, he connects his phone to his car stereo using Bluetooth.

State the type of network that Eric creates when he does this. [1]

Personal Area Network / PAN

(c) When Eric is working away from the office he will make use of a virtual private   
network (VPN).

Explain **two** advantages of Eric using VPN. [4]

Award one mark for identification and one mark for each appropriate expansion up to a maximum of two marks for each point.

VPN will give a secure connection/tunnel (1) to the company LAN. This means that he can work on confidential documents without the risk of the files being intercepted and used by an unauthorised person (hacker) (1).  
The VPN connection will require a username and password to be entered (1) which restricts access to the company’s network to authorised users (1).  
VPN can be used rather than leased lines (1) as access to the Internet is very easy to find (1), but installing a fixed line will take time / is costly (1).  
Strong encryption is used (1) which will be almost impossible for a hacker to crack (1)

The company will be installing a second office in a different city. They will connect these two offices to form one network using a leased line.

(d) State the type of network that will be created as a result. [1]

Wide Area Network (WAN)

(e) Explain **two** advantages of installing a leased line to connect the two companies. [4]

Symmetric speeds / same upload or download speeds (1) – this is important as the amount of information each office is likely to upload will be similar to the amount they will download (1).  
A dedicated line will not be shared with other users (1) so the speed/bandwidth will always be the same / no busy periods (1).  
Faults will be fixed very fast (1) resulting in fewer losses of connectivity and the effect this has on profits (1).

2. A new luxury home is being created with the following technologies being installed.

* Smart TV and surround system in the cinema room
* Smart speakers in every room
* Access to the Internet from any room in the house and in the front and back gardens
* Smart enabled devices such as light switches, light bulbs, CCTV and burglar alarm

Discuss the different ways that the house could be networked together. [6]

**PAN**

* PAN – personal area network – this could be used to connect devices such as speakers or smart speakers using a standard such as Zigbee
* Devices should be encrypted if connected to the network

**LAN**

* LAN – local area network – this would be established to connect the different rooms and outside areas together
* The LAN could be wired or wireless
* Wired LAN would use ethernet – this would be appropriate to use for the rooms in the house, especially those that may have large amounts of data such as an office or where a TV is located. It could also be taken to many more rooms, such as lounge/sitting room/bedrooms as a backup connection to Wi-Fi
* Cat 5e (or better) would allow throughputs of 1Gbps this would future proof the house well beyond todays current requirements
* Wireless LAN would enable devices to connect to the LAN easily
* Wireless Access Points / WAN could be spread throughout the house and in outside locations

**The Internet**

* This is a type of WAN/Wide Area Network
* The house would need to connect to the Internet and as a luxury house may wish to install a fibre optic line (fibre to the premises) which would be able to deliver speeds in excess of 1Gbps
* A router would be required to connect to the internet

**Security**

* Any wireless access points / Wi-Fi would need to be encrypted with WPA2 to prevent eavesdroppers
* A separate LAN could be established for non-essential services and Internet of Things devices to the network of essential items (e.g. CCTV cameras and door locks should work even if smart speakers and smart TV have a security backdoor)

| **Level** | **Mark** | **Descriptor** |
| --- | --- | --- |
| Level 0 | 0 | No rewardable material. |
| Level 1 | 1-2 | Technical vocabulary is used but it is not used appropriately to support arguments, in relation to the issues of the question.  Issues are identified but chains of reasoning are not made, leading to a superficial understanding. |
| Level 2 | 3-4 | Accurate technical vocabulary is used to support arguments but not all arguments are relevant to the issues of the question.  There is consideration of relevant issues using logical chains of reasoning.  Considers the various elements of the question. |
| Level 3 | 5-6 | Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.  There is a balanced and wide-ranging consideration of relevant issues, using coherent and logical chains of reasoning that shows a full awareness.  Carefully considers the various elements of the question. |

[Total 20 marks]