Answers

Task 1

A consultancy firm has 500 employees. Each one of them has a desktop personal computer. Most employees will also use a company laptop, which they may wish to plug in at work or use at home.

Employees also have a company or personal smartphone.

The company makes heavy use of cloud applications and at times employees will need to upload and download large files.

All employees will need access to the corporate LAN via their laptops when away from the office.

(a) In the table below, identify all the user needs for the company. The first row has been completed for you as have two further user needs.

(b) For each user need, specify what type of network, hardware or software should   
be specified.

|  |  |
| --- | --- |
| **User needs** | **Network specifications** |
| 500 desktop personal computers connection to the LAN | 500 ethernet cables – Cat 5e  11 switches (with 48 ports each) |
| 500 laptops wired connection to the LAN | 500 ethernet cables – Cat 5e  11 x 48 port switches |
| 500 laptops wireless connection to the LAN | 10 Wireless access points (up to 50 users per AP)  1 switch for the WAPs |
| 500 smartphones wireless connection to the LAN | 10 Wireless access points (up to 50 users per AP)  1 switch for the WAPs |
| 500 laptops – connection when away from the office | VPN / Virtual Private Network  500 Mobile broadband contracts  Tethering (personal area network / PAN) from laptop to smartphone. |

Note: Switches may have a different number of ports and wireless access points may be able to cope with a different number of users. Students may wish to research the capabilities of some switches and wireless access points.

Task 2

Wi-Fi is a set of standards for wireless connections. It is also referred to as 802.11.

Research the different standards used for Wi-Fi. In particular, focus on the following features:

* The year the standard was first used
* The different speeds
* The frequencies used
* Any other relevant features

List each of the standards and their features below.

1999 – 802.11a: 54Mbps, 5GHz, 45 metres

1999 – 802.11b: 11Mbps, 2.4GHz, 45 metres

2003 – 802.11g: 54Mbps, 2.4GHz, 45 metres

2009 – 802.11n: 72-600Mbps, 2.4GHz or 5GHz, 50 metres

2014 – 802.11ac: 433Mbps up to 6.9Gbps (8 antennae)

**More information:**   
<https://www.actiontec.com/wifihelp/evolution-wi-fi-standards-look-802-11abgnac/>

802.11n is also called Wi-Fi 4, 802.11ac is Wi-Fi 5 and 802.11ax is Wi-Fi 6 (capable of speeds between 600-9608Mbps)

The above figures are maximum speeds with each particular access point and standard. Actual speeds will be slower due to interference and distance.

Task 3

There are many different companies that supply broadband including:

* BT
* PlusNet
* Sky Broadband
* Virgin Media
* TalkTalk
* Zen Internet

(a) Choose **two** packages from those offered by the suppliers above. What do these packages include?  
Answers will depend on the packages chosen. Typically, speed/bandwidth and data offered will dictate the price.

(b) Find a package aimed at businesses. What different features or services are offered?   
Typically, businesses are offered superior fault fixing. They may also have a dedicated synchronous line (same upload/download speed). Some packages may also offer backup options such as a second line or 4G.

Task 4

A small manufacturing company currently has a connection to the Internet using a copper cable. The bandwidth is 5Mbps down and 1Mbps up.

The connection is too slow for their current needs and they are looking to upgrade.

They are considering upgrading the copper cable to Fibre to The Cabinet (FTTC) or installing a new Fibre Optic line direct to the premises (FTTP).

What considerations should they make regarding the implementation of these connection types. Specifically, the timescales involved, testing and downtime.

Fibre optic will require a new cable to be laid (and likely a large expense of thousands). It will be future proof as the cable will be capable of taking speeds over 1Gbps. The timescale to install the line will be weeks, and even longer if a new cable needs to be laid a long distance.

Upgrading the copper cable can be done with little expense by changing the connection at the cabinet. Typically, the connection will be changed within days of ordering and the downtime will be minimal, perhaps a few hours.

The fibre optic could be put in as a second line. Once it has been fully tested the network could switch to using it, giving minimal downtime of only a few minutes. If the first connection were turned off when the new fibre optic line was ordered, there would be significant downtime.

Task 5

**Two** scenarios are given at the end of the question. For each scenario, select the most appropriate network.

The following network types are available to choose from:

* LAN
* VPN
* WAN (Leased or Public line)
* PAN

In addition, you will need to explain the factors which affect the choice of the network.

Consider the following factors in your explanations:

* Cost
* Efficiency
* Compatibility
* Implementation
* Productivity
* Connectivity
* Security
* Specifications
* User needs
* User experience

**Case Study 1:**

Andrew and Sarah both work for the same company. The often work from home, especially when they are working on the same project. They would like to create a home office which will allow them to easily access documents on either of their computers, as well as sharing both a printer and a scanner. The company are not providing any financial support for this system, and they will not need to access any files from the office.

Explain which network they should use and provide reasons linked to at least **three** factors for your choice.

They should use a **LAN** (Local Area Network).

* **Cost** wise a LAN is one of the cheaper options and if they implement a wireless system, additional hardware is not required.
* The LAN is an **efficient** system for Andrew and Sarah’s requirements as it allows sharing of documents and programs, as well as peripheral devices.
* A LAN is relatively easy to **implement**; a server is not necessarily required, and the network could be wireless, meaning there isn’t necessarily the hassle of wiring all the systems together.

*Other factors may be used*

**Case Study 2:**

A government agency needs to connect multiple offices together to create one large, secure network. They have five large office buildings throughout the United Kingdom. Their staff are responsible for uploading a huge amount of information to the internet and sending it to other departments for analysis. The agency is involved in national security, so it is vital that all information is sent securely. The agency needs the upload speeds to match the download speeds and the performance to be consistent throughout the day.

Explain which network they should use and provide reasons linked to at least **three** factors for your choice.

They should use a **WAN** (Wide Area Network), using a Leased Line, using a **VPN** (Virtual Private Network) or encryption.

* The WAN can be used to connect all the agency LANs, thus connecting all offices together
* By using a VPN, data is encrypted when sent to and from the network, so employees can send data between the five office buildings knowing it is **secured** and safe from hackers
* The company can also use a leased line, which will create a synchronous upload and download speed and a consistent performance throughout the day. This will give the desired **efficiency**.
* At **implementation**, the leased line will take some time to install.

*Other factors may be used*