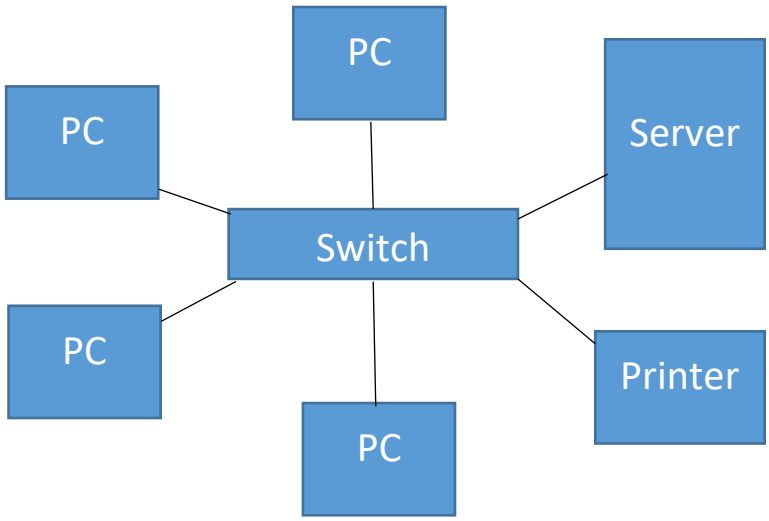
Computer Science – Non Negotiables!

Computer Networks

1) Define a **computer network**
    a. A computer network is where two or more computers are connected together so that they can communicate.
2) Define LAN, WAN and PAN
    a. **Local Area Network –** computers are connected together in a small geographical area such as a single building or site e.g. home, office, home, library etc.
    b. **Wide Area Network –** LAN's are connected together over a large geographical area so that data can be sent between networks e.g. hospitals, police stations, banks, the Internet etc.
    c. **Personal Area Network –** two devices are connected together using Bluetooth within an area of around 10 metres e.g. phone to headphones, wireless mouse to a computer etc.
3) Advantages and disadvantages of computer networks
    a. Advantages
        i. Sharing files is easier as network users can access the same files and copy them between machines
        ii. You can share the same hardware between devices e.g. printers
        iii. You can install or update software on all computers at once
        iv. You can communicate across a network easily and cheaply e.g. email
        v. User accounts can be stored centrally so a user can log in from any device on the network
    b. Disadvantages
        i. They can be expensive to set up due to hardware costs
        ii. Networks can be vulnerable to hacking, and malware can easily spread between networked computers
        iii. Some networks are reliant on one or more servers. If a server goes down, it can be very disruptive
        iv. Large networks are difficult to manage and a specialist person may need to be employed to maintain them
4) Advantages and disadvantages of **wireless networks**
    a. Advantages
        i. They are quick to connect to as you can set a device to automatically connect when in range
        ii. They can be cheaper and better for the environment as they require no wires
        iii. It is easy to add more users or devices as you do not need to install extra wires
        iv. Users can connect anywhere the signal is so they are not restricted to having to connect using a port

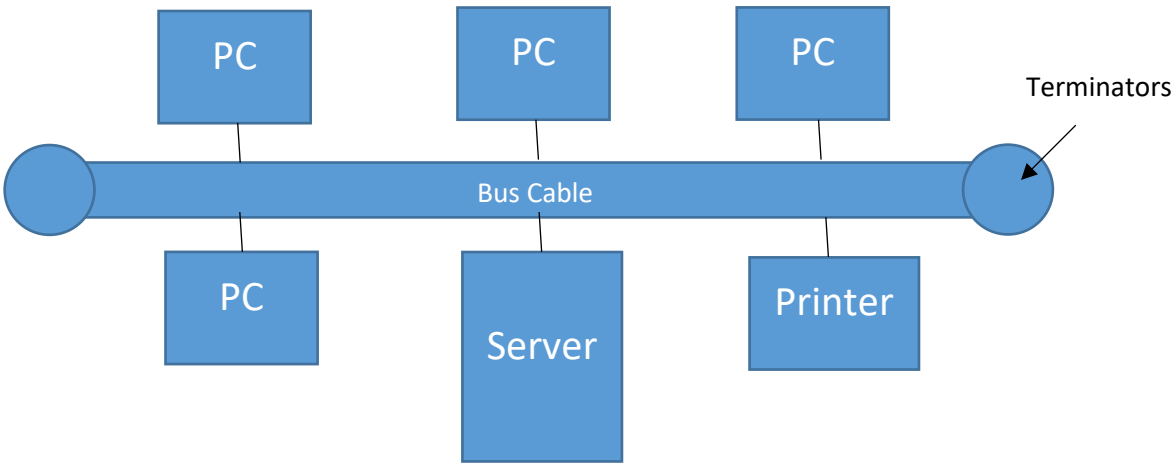
b. Disadvantages
    i. Wireless networks are generally less secure as the connection is usually visible to any device within range
    ii. The distance from the wireless access point or obstructions from walls, ceilings or furniture can weaken the signal
    iii. They generally have a lower bandwidth and are less reliable than wire networks

5) Draw and label the **Star** and **Bus** topologies and give advantages and disadvantages of both
    a. Star topology



    b. Advantages of a star topology
        i. If a device fails or a cable is disconnected, the rest of the network is unaffected
        ii. It is simple to add more devices
        iii. Star topologies have better performance than other set ups as all devices can transmit data at the same time
        iv. There are very few data collisions
    c. Disadvantages of a star topology
        i. Every device needs a cable to connect to the switch or server so this can be expensive
        ii. The switch can be expensive
        iii. If there is a problem with the switch or server, the whole network can fail
        iv. The maximum number of devices is determined by the number of ports on the switch

d. Bus topology



e. Advantages of bus topology
    i. If one device fails, the others are unaffected
    ii. Not dependant on a switch working to keep the network running
    iii. Cheaper to set up than a star topology as there are less cables and no expensive switches
f. Disadvantages of bus topology
    i. Data collisions are common so data has to be resent, slowing down the network
    ii. Unsuitable for large networks as more devices means more collisions
    iii. To avoid collisions, devices must wait for the bus cable to be available to send the data, slowing the network down
    iv. If the bus cable is broken, the rest of the network will stop working

6) Define network **protocol**
    a. A protocol is a set of rules for how devices communicate across a network
7) TCP/IP Model
    a. Layer 1 – **Application Layer** – provides a networking service to applications e.g. Google Chrome, gaming software etc.
    b. Layer 2 – **Transport Layer** – Prepares data to be sent by splitting data into packets. It also checks packets are sent and delivered correctly
    c. Layer 3 – **Internet Layer** – Adds source and destination IP addresses, directing them between devices
    d. Layer 4 – **Link** – Passes data over a physical networks, both wired and wireless
8) Network Protocols
    a. **HTTP** – Used by web browsers to access websites and send data
    b. **HTTPS** – Used to **securely** access website and send encrypted data
    c. **FTP** – Used to access, edit and move files between networked devices
    d. **IMAP** – Used to **retrieve** emails

e. **SMTP** – Used to **send** emails
f. **TCP and UDP** – Splits data into packets and checks they are sent and arrive correctly
g. **IP** - Adds source and destination IP addresses, directing them between devices
h. **WIFI and Ethernet** – Passes data over a physical networks, both wired and wireless