

<p>PAN (Personal Area Network)</p> <ul style="list-style-type: none"> • Personal devices connected by Bluetooth • Spread over a very small area. • Used to connect personal devices e.g. smartphone and wireless headphones. • Uses Bluetooth to connect devices.
<p>LAN (Local Area Network)</p> <ul style="list-style-type: none"> • Confined to a single location, owned and maintained by a single organisation • Used by organisation such as schools and small businesses • Connected by cables or wireless
<p>WAN (Wide Area Network)</p> <ul style="list-style-type: none"> • Covers a wide geographical area • Used by organisations with several different sites such as banks or universities • Allows all the sites to communicate and share data • Uses national or international long distance media • The Internet is the biggest example of a WAN • Can owned collectively by several organisations, for instance a group of schools

Wireless Networking	
<ul style="list-style-type: none"> • Using radio signals or infrared light to connect devices in a network together. 	
Advantages	Disadvantages
<ul style="list-style-type: none"> • Devices can easily be added • Users can move around freely and stay connected 	<ul style="list-style-type: none"> • Signals have a limited range. • Can suffer from electromagnetic interference from other devices. • Signals can also be blocked by walls or other objects. • Each wireless access point (WAP) only has so much bandwidth. • Signals can be intercepted by unauthorised users.



Wired Networking	
<ul style="list-style-type: none"> • Using fibre or copper cable to connect devices in the network together. • Fibre cable provides a faster connection and can cover longer distances. • Copper cable is cheaper and easier to work with. 	
Advantages	Disadvantages
<ul style="list-style-type: none"> • Faster data transfer • Less likely to suffer from interference • More difficult for data to be intercepted 	<ul style="list-style-type: none"> • Expensive to install or reconfigure • Harder to move devices so less flexible

Email Protocols
<ul style="list-style-type: none"> • SMTP – Simple Mail Transfer Protocol – used to send email. • IMAP – Internet Message Access Protocol – controls the download of emails from an email server into an email client application.

Unit 5: Fundamentals of Computer Networks

The Four Layer TCP/IP Model
<ul style="list-style-type: none"> • Breaks up the process for sending of messages into separate components. • Each component handles a different part of the communication. • Helps to understand the transmission process. • Provides a basis to begin troubleshooting when something goes wrong.
<p>4) Application Layer</p> <ul style="list-style-type: none"> • Encodes and decodes messages. • Where applications such as browser and email clients operate. • HTTP, HTTPS, SMTP, IMAP and FTP protocols operate at this layer
<p>3) Transport layer</p> <ul style="list-style-type: none"> • Manages the communication between hosts. • Breaks data down into packets. • Hosts will agree settings such as the language and size of packets. • TCP and UDP protocols operate at this layer.
<p>2) Internet layer</p> <ul style="list-style-type: none"> • Adds the sender and recipient IP address and transmits the message. • Routes packets across the network. • IP Protocol operates at this layer
<p>1) Data link layer</p> <ul style="list-style-type: none"> • Provides physical transfer of packets over the network. • NIC (Network Interface Card) is at this layer • OS device drivers are at this layer.

Network Security Measures
<p>Encryption</p> <ul style="list-style-type: none"> • Turning data into an unreadable format, requiring a key to decrypt it and make it readable again. • This means that if the data is stolen it cannot be read without the key. • Data can be encrypted before being sent over a network or when stored. • Encryption is often used alongside authentication by requiring a username and password to decrypt data and access the key.
<p>Authentication</p> <ul style="list-style-type: none"> • Ways to make sure a user is who they say they are. • Examples include passwords, security dongles and biometric such as fingerprints. • The most basic security feature and widely used. • Different levels of authentication are used depending on the security level needed. • Secure systems require two-factor authentication is now needed, which requires two forms of authentication, such as a fingerprint and password. • Allows the use of access rights to grant different users access to different systems or areas of a network.
<p>Firewall</p> <ul style="list-style-type: none"> • Monitors traffic going into and out of the network, and either allows or blocks it. • A barrier between trusted and untrusted networks. • This decision is based on rules, known as the firewall policy. • Can be hardware based or software based. • Hardware firewalls are expensive, but more effective and powerful.
<p>MAC Address Filtering</p> <ul style="list-style-type: none"> • All network adapters have a unique physical address known as a MAC Address. • This address cannot be changed and allows individual devices on a network to be identified easily. • Different devices can be blocked or allowed to connect to a network.

Network Protocols
<p>Ethernet</p> <ul style="list-style-type: none"> • A family of related protocols which cover how data is sent on wired networks. It is not a single protocol. The protocols include how the hardware is managed, how data is sent and received and how data collisions are handled.
<p>Wi-Fi</p> <ul style="list-style-type: none"> • A family of protocols which cover how data is sent through wireless connections. Wi-Fi is a trademark, the generic term for these networks is WLAN. Any device with the Wi-Fi logo uses the Wi-Fi protocols.
<p>TCP - Transmission Control Protocol</p> <ul style="list-style-type: none"> • Controls the sending of data. • Data is broken down into packets which are addressed and tracked through the network to make sure that they arrive at their destination. • Any packets which don't arrive are resent. • TCP is more reliable and more widely used than UDP.
<p>UDP - User Datagram Protocol</p> <ul style="list-style-type: none"> • Controls the sending of data however but without any tracking. • Everything is sent once, data which is lost is not resent. • UDP it is a lot quicker than TCP and is often used in live streams where quality is less important than speed.
<p>IP - Internet Protocol</p> <ul style="list-style-type: none"> • Manages the addressing of packets. • Adds the sender and receiver IP addresses to each packet. • Works alongside TCP to make sure data is sent securely across The Internet.
<p>HTTP - Hypertext Transfer Protocol</p> <ul style="list-style-type: none"> • Responsible for transferring web pages. • Indicated by http:// at the start of a web address.
<p>HTTPS - Hypertext Transfer Protocol (Secure)</p> <ul style="list-style-type: none"> • An encrypted version of HTTP. • Should be used for websites which send sensitive data such as payment details or passwords. • Indicated by https:// at the start of a web address.
<p>FTP - File Transfer Protocol - transmission of files across a network and The Internet.</p>

Bus Network	Star Network
<p>All devices are connected to a single cable (called the bus)</p> <ul style="list-style-type: none"> • A terminator is at each end of the cable. <p>Advantages:</p> <ul style="list-style-type: none"> • Easy to install extra devices. • Cheap to install as it doesn't require much cable. <p>Disadvantages</p> <ul style="list-style-type: none"> • If the cable fails or is damaged the whole network will fail. • Performance becomes slower as additional devices are connected due to data collisions. • Each device receives all data, a security risk 	<ul style="list-style-type: none"> • All nodes are connected to one or more central switches. • Often used with wireless networks, where a Wireless Access Point or WAP will be the central connection <p>Advantages:</p> <ul style="list-style-type: none"> • Every device has its own connection so failure of one node will not affect others. • New devices can be added by simply connecting them to the switch. • Usually have higher performance as a message is passed only to its intended recipient. <p>Disadvantages:</p> <ul style="list-style-type: none"> • If the switch fails it takes out the whole network. • Requires a lot of cable so can be expensive.

Networks	
Disadvantages	Advantages
<ul style="list-style-type: none"> • Cost, additional equipment is needed. • Additional management by specialist staff. • Spread of malware. • Potential for hacking. 	<ul style="list-style-type: none"> • Software and files can be shared. • Hardware such as printers can be shared • Users can communicate via email, chat, etc. • Centralised maintenance and updates. • Centralised security. • User monitoring. • Different users can be given different access rights or permissions.