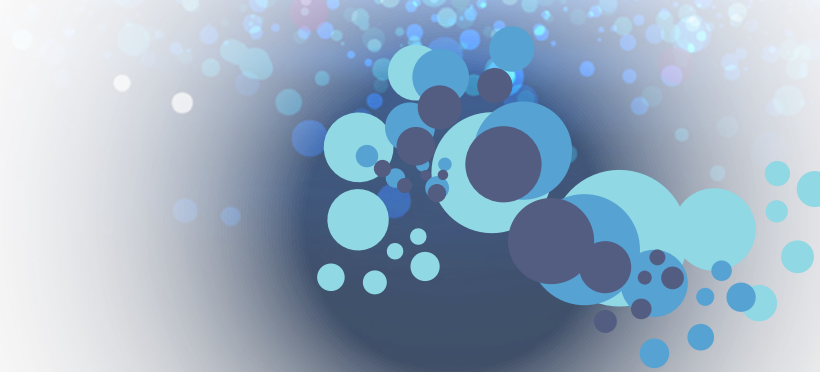


IP, MAC and Packets

Teacher's Notes

Lesson Plan

Length	60 mins	Specification Link	216/f	Units	
Learning objective		Candidates should be able to: (a) explain the terms IP addressing, MAC addressing, packet and protocols			
Time (min)	Activity			Further Notes	
5	<p>Using the following website (http://www.cambridgegcseccomputing.org/weblink22) show the students the dismantling of London Bridge in 1968 so that it could be sent to Arizona in America.</p> <p>Point out that as it was so large; it was split into segments each of which was numbered so that it could be reconstructed in America.</p> <p>Tell the students that large files are split into segments (packets) before they are transmitted to recipients over a network and they are also labelled for reconstruction.</p>				
15	Watch the set of videos, pausing to discuss the content.				
5	<p>Discuss the videos to assess learning. Ask questions such as:</p> <ul style="list-style-type: none"> • What is an IP address? • What is a MAC address? • What is a packet? 			<p>A unique identifier which originally consists of 4 8 bit numbers.</p> <p>Every computer today has some sort of network interface card (NIC) either built-in or installed on the computer.</p> <p>Every NIC is created with a hardware number permanently "burned" into it. This permanent hardware number is known as the MAC (Media Access Control).</p> <p>MAC addresses are 48 bits in length and are usually displayed as a 12 digit hexadecimal number.</p> <p>A packet is one unit of binary data capable of being routed through a computer network.</p> <p>To improve communication performance and reliability, each message sent between two network devices is often subdivided into packets.</p>	



Time (min)	Activity	Further Notes
20	Worksheet 1 Pupils to complete Worksheet 1 either on paper or on computer. They may need access to the Internet to research some of the questions. Ask individual students for their answers and discuss with the class so that all students have the correct answers.	Answers provided. Ask students with the correct responses to explain to the class how they arrived at their answers.
10	The students use the Interactive Activity 1 .	
	Extension Challenge/Homework Students to complete and submit Worksheet 2 for homework.	
5	Plenary – Quick revision In order to assess learning, revisit the questions asked after the video.	



WORKSHEET 1 ANSWERS

1

Every computer on a network has an IP address and a MAC address. Describe what is meant by:

(a) An IP address (including the differences between dynamic and static IP addresses and private and public ones.)

IP stands for Internet Protocol which is the set of procedures used by computers accessing the Internet.

Every computer accessing the Internet must have a unique identifier and this is their IP address which originally consisted of 4, 8 bit numbers.

If a computer has a dynamic IP address it is not permanent and a new, different one may be allotted to it.

A static IP address is permanent and does not change.

A private or internal IP address is valid on a local area network e.g. in a home or school. It is used to communicate between the other computers and equipment on the network.

A public IP address is used by any server or computer connected to the Internet for communicating with Internet services.

(b) A MAC address

MAC stands for Media Access Control.

Every computer today has some sort of network interface card (NIC) either built-in or installed on the computer.

Every NIC is created with a hardware number permanently “burned” into it. This permanent hardware number is known as the MAC (Media Access Control).

MAC addresses are 48 bits in length and are usually displayed as a 12 digit hexadecimal number.

2

(a) Explain what is meant by a ‘packet’.

A packet is one unit of binary data capable of being routed through a computer network.

To improve communication performance and reliability, each message sent between two network devices is often subdivided into packets.

(b) What does a packet consist of?

A packet consists of:

a header containing the source and destination addresses and the position of this packet in the complete message or file.

the body containing the message data (also known as the payload)

a footer (also known as the trailer).



WORKSHEET 1 ANSWERS

3

How are the packets transmitted from the source to the destination?

- The source computer splits the file into packets and addresses them with the recipients IP address.
- The file is split as the transmission of a large file would consume all the bandwidth and slow the network.
- These packets are then sent onto the network – using cables or microwaves as in a WIFI network.
- Routers on the network inspect each packet and decide the most efficient path for the packet to take on the next stage of its journey.
- In order to do this each router has a configuration table containing information on which connections lead to particular groups of addresses.
- The routers can balance the load across the network on a millisecond-by-millisecond basis.
- If there is a problem with one part of the network while a message is being transferred, packets can be routed around the problem, ensuring the delivery of the entire message.
- The final router can direct the packet to the correct recipient.

4

What are meant by ‘protocols’ and why are they important?

A protocol is the special set of rules that the computers use when they communicate. And send data to each other.

Protocols specify how they interact with each other on a network.

Protocols exist at several levels in a telecommunication connection.

Several network protocols are available, but the most common is TCP/IP, which is the “language” of the Internet. It is these protocols that send computer communication from the computer, transmit over the cables and find the right computer to deliver the data packets.

The packets are prepared and transmitted in accordance with these rules. They allow the recipient to check if the packet has arrived intact and send a request for a resend if it is not.



WORKSHEET 2 ANSWERS

- 1 A graphic designer is sending a copy of his latest work to a colleague who is also connected to the firm's network.

Explain how the computers and the network handle the transfer of this data. (6)

Points to include:

The source computer splits the file into packets...

...and addresses them with the recipients IP address and the position of the packet in the whole file.

The file is split as the transmission of a large file would consume all the bandwidth and slow the network.

Routers on the network inspect each packet and decide the most efficient path for the packet to take on the next stage of its journey.

The routers can balance the load across the network on a millisecond-by-millisecond basis.

If there is a problem with one part of the network while a message is being transferred, packets can be routed around the problem, ensuring the delivery of the entire message.

The final router can direct the packet to the correct recipient.

The computers use the TCP/IP protocol.

The recipient computer inspects the package and can ask for it to be resent if not intact.