IN UNITY WE SUCCEED

On each **NIC** is a **MAC address** (*assigned to the hardware*)
The **switch** reads the MAC address to send the data frames to the right device on the **LAN**.
A MAC address can be described as *a unique identifier* which is used by switches on LANs to direct data to the right device on a network.

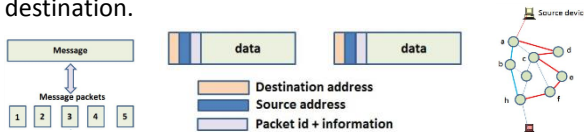Wide Area Network

Each network has an **IP Address**

Between networks (over the internet) data is sent in **packets** and directed by routers using IP addresses.
- Used by routers on WANs.
- NOT linked to hardware.
- Can be static or dynamic.

- Packet switching is where files are split into smaller packets and are then passed from router to router, using IP addresses, to get to the desired network.
- Packet switching gets data to the destination quickly due to the small file sizes of the packets which each take the fastest route.
- Packets often do not arrive in the correct order.
- If a packet is missing or corrupted then the message will instead be sent asking for that particular packet to be resent.

Each packet has a header which contains 3 important pieces of information:
- ✓ a **return IP address** to say where the packet originated from
- ✓ a **destination IP address** to tell the packet where it has to go
- ✓ a **sequence number** so that the individual data packets can be reassembled in the correct order once they have all safely arrived at their destination.

Message

Message packets
1 2 3 4 5

data   data

Destination address
Source address
Packet id + information

When the packet is received an error check is performed. The error check makes use of a calculation called a 'check sum number'. If any errors are found then the destination computer knows that the packet has been corrupted and will send a request for that packet to be resent.

PROTOCOL	LAYER:	ACRONYM STANDS FOR:	FUNCTION
TCP	3	Transmission Control Protocol	Splits the data into packets before sending, then reassembles data once arrived.
IP	2	Internet Protocol	Responsible for packet switching.
HTTP	4	Hyper Text Transfer Protocol	Used by browsers to display webpages and used to transfer websites from webservers.
HTTPS	4	Hyper Text Transfer Protocol (secure)	A more secure version of HTTP (as the data, when transferred, is encrypted).
FTP	4	File Transfer Protocol	Used to transfer, access and edit files.
SMTP	4	Simple Mail transfer Protocol	Used to send emails and transfer them between mail servers.
POP3	4	Post Office Protocol (version 3)	Used to retrieve emails from a sever. *When they are downloaded by the user, they are deleted from the server.*
IMAP	4	Internet Message Access Protocol.	Used to retrieve emails from a sever. *Only a copy of the email is downloaded, only when the user deletes the email, is it deleted from the server.*

A **layer of protocols** is a group of protocols that do a similar job/ function.

4. Application Layer	3. Transport Layer	2 Network Layer	1. Link Layer
Turns data into websites, emails OR files once it has arrived.	Splits data into packets and reassembling them.	Sends data between networks. (over the internet)	Sends data in a LAN.

We use layers because it can be difficult to conceptualise a complex system such as network communication. By dividing the system of protocols into layers we can focus on a particular area individually without worrying too much about the other layers.
The layer model is useful for manufacturers so that when they are developing new hardware they can ensure that it is compatible with existing protocols
We can map how layers relate and interact with one another.
We can recognise roughly what a protocol does by knowing which layer it resides within.
When a new protocol is developed, it can be slotted into the appropriate layer.

What I need to know:

Explain what a MAC address is needed for.
Explain what an IP address is needed for.
Explain the process of packet switching.
State what is included in a packet of data.
State what TCP stands for, which layer it is in and it's function.
State what IP stands for, which layer it is in and it's function.
State what HTTP stands for, which layer it is in and it's function.
State what HTTPS stands for, which layer it is in and it's function.
State what FTP stands for, which layer it is in and it's function.
State what POP stands for, which layer it is in and it's function.
State what IMAP stands for, which layer it is in and it's function.
State what SMTP stands for, which layer it is in and it's function.
State what is meant by a *layer* of protocols.
State the names of the 4 layers.
State the function of each layer.
List the benefits of using layers.

TCP/IP is a set of protocols (protocol stack) based on layers.
List the four layers of the protocol stack, in order.

1 ....

2 ....

3 ....

4 .... (4 marks)

State which layer of network protocols uses routers to direct data packets from the Sheffield office to the Glasgow office.

....

[1 mark]

Ben and George are good friends, however they live in separate towns. They often exchange emails, school files and play online games together. Whenever data is transmitted between them various network protocols are used.

(a) Define what is meant by the term "protocol".

....

....

....

[1]

(b) Name **two** different protocols which might be used when Ben and George communicate online. Describe what each protocol is for.

Protocol 1 ....

Description ....

....