Ethernet & Network Layers - Reading

Ethernet

There have been many standards created to deal with networking, but **Ethernet** and **Wi-Fi** are the two most common today. **Ethernet** is the standard used for connecting computers together with **cables** and **Wi-Fi** is used when connecting computers **wirelessly**. The **Institute of Electrical and Electronics Engineers** (**IEEE**) has given each standard a number. Ethernet is **802.3** and Wi-Fi is **802.11**. You will sometimes see these numbers appear on equipment you buy such as cables or hubs.

The particular Ethernet standard will specify items such as:

- the type of cable (**twisted pair** or **fiber-optic**)
- the speed (e.g. 100BASE-T2 is 100 Mb/s)
- how the connections are made with **hubs**, **switches** and computers (e.g. **RJ45** connectors)
- how the **media access control** (**MAC**) works.

A twisted pair Ethernet cable with an RJ45 connector at the end

Network Layers

Networks are very complicated in the way they work. There are physical parts to them, such as the cables and wires, and there is also software. To make the process simpler a standard was created which splits up the different functions of a network into **layers**.

The **Data Link Layer** is where the Network Interface Card (NIC) and OS drivers are located. Some of the ethernet and Wi-Fi protocols are in this layer.

Layer Name	What it does	Protocols
Application Layer	Applications such as email or web browsers operate in this layer	HTTP, HTTPS, FTP, SMTP
Transport Layer	Sets up communication between the two hosts. Settings such as packet size agreed. Error detection and packets requested again if error. Ports	TCP / UDP
Network Layer	Addresses and packages data for transmission. Routes packets through the network	IP
Data Link Layer	Frames containing the MAC address with data inside; network hardware such as NIC located here. OS drivers in this layer	Ethernet / PPP / Wi-Fi

The **Network Layer** contains the **IP** (**Internet Protocol**). This layer makes sure that **packets** are put back together in the correct **sequence** and that they are **routed** via the shortest route through the network.

The Transport Layer deals with the **Transmission Control Protocol** (**TCP**) or **User Datagram Protocol** (UDP). TCP checks the data has no errors and requests the sender to retransmit if it has got errors. In UDP the data is sent, but no reply is required. Errors are not detected, which is less reliable but faster.

The Application Layer provides services such as **HTTP** for applications such as web browsers to use. **SMTP** is provided at this layer for use in an email client.