Networking Basics

(Work in progress)

This article discusses networking on a very basic level. It is written with a goal of being concise and giving an overview. Networking is its own complex field of study, and many of the statements here have exceptions and footnotes.

Packet Switching

Modern telecommunication is based on packet switching. A packet is a grouping of data, and can be thought of as a letter sent with the snail mail. They consist of a a header (the information on the envelope) and a payload (the content of the letter). Information in the header is used by networking systems to direct the packet to its destination, where the payload is extracted and used by application software.

The conceptual power of packet switching is that the network path can be segmented into steps, and many different optimizations can be made in for instance traffic shaping and shortest-path finding.

Device concepts

There are several important device concepts in networking. The reason this article describes "device concepts" is that several of them may be implemented in a single physical device. For example, many home routers may serve as both router, switch, wireless access point (and sometimes modem). To make things even more confusing, the terms each have synonyms and are often used interchangeably.

Switches create networks

Switches connect devices in a network based on MAC addresses. Such local networks are what is usually referred to as Local Area Networks (LAN).

Routers connect networks

Routers are like the postmen of the internet. They read the address on a packet and send it on its way along the right network path, usually to the next router on the shortest path towards the destination. Connecting networks, they create *internetworks*. For instance, an IP address is usually an address in the internetwork known as "The Internet"

Wireless Access Points connect wireless devices to ethernet

Typically they are a device connected to a LAN via ethernet. Wireless devices may use the access point to connect to the LAN.

OSI Model

The **Open Systems Interconnection model** is a conceptual model that characterises and standardises the communication functions of a telecommunication system without regard to its underlying internal structure and technology. It is quite abstract, and each layer may not have a clear equivalent (or *instance*) in every context, especially in embedded systems. A layer serves the layer above it and is served by the layer below it (above = higher layer number).

	Layer	Unit	Description
Host Layers	7: Application Layer		High-level APIs, including resource sharing, remote file access
	6: Presentation Layer	Data	This layer translates data between the form that the application accepts and the form that the network uses
	5: Session Layer		Manages sessions, which are continuous back-and-forth connections that last for a while
	4: Transport Layer	Segment or Datagram	This is where the transmission is made reliable, using segmentation and acknowledgement
Media Layers	3: Network Layer	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2: Data Link Layer	Frame	Reliable transmission of data frames between two nodes connected by a physical layer
	1: Physical Layer	Bit or Symbol	Transmission and reception of raw bit streams over a physical medium

(this handy table was lifted from the wikipedia article on the OSI model)

Internet Protocol Suite

The Internet Protocol Suite is the set of protocols used in The Internet. Its most important components are the Transmission Control Protocol (**TCP**) and the Internet Protocol (**IP**).