External Hardware Connectors

External hardware: Hardware devices outside the box of your workstation or laptop.

USB

USB is an abbreviation for Universal Serial Bus.

USB2

- Uses a 4-pin connector.
- High Speed or High Bandwidth (compared to older USB1 (was very slow))
- 480Mbit/sec [mega-bits per second == 60 megabytes/second]
- Older USB1 and USB1.1 devices will work perfectly well with a USB2 port.

Many common USB devices use a USB2 port. Most mice, keyboards, USB flash drives [sometimes called "pen drives", "memory sticks", and wrongly just called a "USB" by many people], a great many sound interfaces, printers, cameras, scanners, external CD drives, external hard drives, and many other devices use USB2.

USB3

- Uses a 7-pin connector [but a USB3 port will work with most USB2 devices]
- SuperSpeed USB [or SS]
- First generation [3.0]: 5Gbit/s [gigabits per second == 625 megabytes/sec]
- Latest generation [3.2]: 20Gbit/s [gigabits per second == 2.5 gigabytes/sec]
- USB2 devices should work OK into a USB3 port.

Very useful for large-volume data transfers, like faster external hard drives for backups.

In general, a USB3 device should work into a USB2 port, but will be much, much slower than into a USB3 port. USB2 devices should work OK into a USB3 port.

USB4

Brand new [August 2019], probably a bit too "cutting-edge" for this year's course, but you might like to check the USB page in Wikipedia if you're feeling geeky.

Mostly used for very fast data transfer between computers.

Video devices

The VDU [Visual Display Unit] is generally connected using either a VGA, DVI, HDMI or DisplayPort port. DVI ports come in three categories: DVI-I, DVI-D and DVI-A. Adaptor cables can be used to connect VGA displays to DVI-I and DVI-A ports, and to connect DVI-I and DVI-A monitors to VGA ports.

Check-out the details on these various standards for yourself.

One nice thing about the newer HDMI and DisplayPort ports is that the connectors are a lot smaller than the older ports. This is a big factor when designing a laptop.

Networking

Cabled networking

Cabled networks generally use what's known as CAT5 cabling. Category 5 cable has four twisted pairs of fine cables, normally ending with RJ45 plugs. [RJ=registered jack, a standard introduced by Bell Systems in the USA, and now pretty-much universal across the globe]

For us, there are three basic standards or speeds of networking along these cables, known as 10BASE-T, 100BASE-TX and 1000BASE-T.

You may see network ports labelled or described as 10/100 or 10/100/1000 – that shows which of these a device is able to handle.

For example, my home network hub offers 1000BASE-T connectivity. If a workstation connected to it only has a 10/100 network port, it will only communicate at 100BASE-TX. If I connect a very old machine with only a 10BASE-T network port, it will still work, but communication with that machine will be limited to 10BASE-T.

Standard	Data Speed	Data Speed [equivalent]
10BASE-T	10Mbit/second	1.25 Megabytes/second
100BASE-TX	100Mbit/second	12.5 Megabytes/second
1000BASE-T	1000Mbit/second (sometimes called gigabit)	125 Megabytes/second

To put this into perspective, good home broadband can offer 250Mbit/second, or around 30 Megabytes per second.

Most cabled school workstations have network ports rated at 100BASE-TX, which is more than adequate.

Wireless networking

Modern wireless networks have a maximum theoretical data rate of 54Mbit/second or a little less than 7 Megabytes/second.

This is the same whether you're using 2.4GHz or 5GHz options on your home wireless router. [The difference is that 2.4GHz signals will travel further, whilst, if you're close to the router, you might get slightly better performance at 5MHz.]

Either way, if you want to really hammer your fast broadband line, you need a cable connection to your modem/router, working at 1000BASE-T.

Other outboard devices

eSATA

An eSATA port is usually a socket somewhere on the front or rear panel of the PC, enabling an outboard SATA device (such as a portable HDD or SSD) to be connected. Useful for backups or moving work between a laptop and a workstation.

Firewire

Firewire is another method of data transfer. It's generally used for audio and video equipment. It can handle data rates up to 800Mbit/second [100 megabytes/sec] – so roughly twice the speed of USB2.

Thunderbolt

Fairly new, very fast, generally only works well on short cable distances.
Similar maximum speeds to USB3.2

Differences between home and work (school, college, business …) networks

Printers

On a home network, it is common to have a printer connected to a single PC (usually a workstation) via USB, and then to let other users access it by "sharing".

On a work network, it is usual for the printer to be connected directly to the network (using a CAT5 cable), and for a large central computer, the network **server** to make that printer available to users who are authorised to use it. So, for example, your network manager might be able to see every printer in the school; your IT teacher might be able to see the printers in every IT classroom and a few staff rooms, but not the one in the Head's study; you might only be able to see the printers in the IT classrooms.

Storage

(You probably know this already!)

At home (or on your own laptop) your work is stored on the **local** hard drive (or SSD) – that is to say the drive inside that workstation or laptop.

In a school or other work environment, your work is stored centrally, on a HDD in a central computer – a server. This means, whatever computer in the school you log in to, since it verifies who you are, and validates your log-in from its list of users and password, it can then identify your work area on the server's HDD, and let you see your work.