

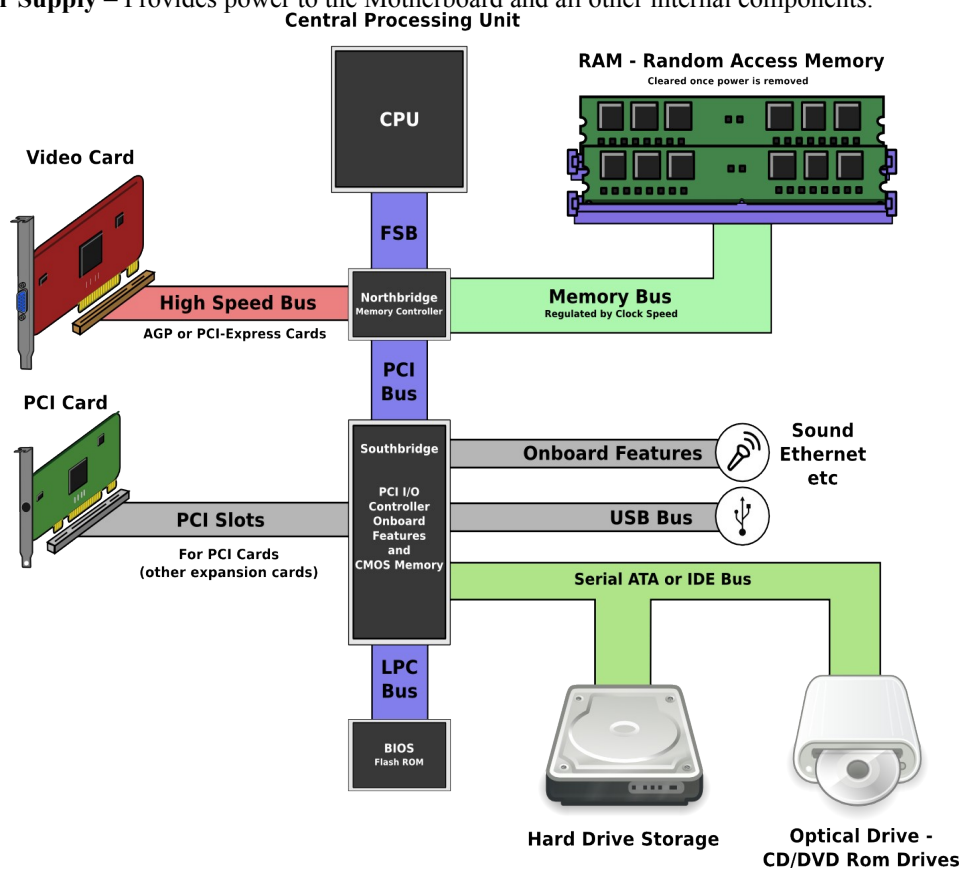
# Local Computer Basics – Overview Sheet

This should provide you with background knowledge around the hardware and software of a personal computer. It's hoped that you should become familiar enough to have confidence in experimentation and to take from this section a guide into growing a robust understanding of a computer's physical and basic software maintenance.

## Introduction to PC Hardware - Functional Parts

A computer is made up of many parts which it is important to be able to maintain should anything go wrong. This includes being able to correctly plug in outside peripherals, being able to make clear buying decisions based on supported characteristics and being able to replace parts or build a computer from scratch.

- **Motherboard** – Central component on which everything else plugs into.
- **CPU** – Used for processing all software running on the computer, mathematical calculator.
- **RAM** – Memory used to remember all the results from all the calculations and store data before transport.
- **Hard Drive** – Computer Storage, stores the operating system and local user files.
- **Optical Drive** – Allows CDs and DVDs to be read by the computer.
- **Power Supply** – Provides power to the Motherboard and all other internal components.



## Recognising Ports and Parts

It's important that as you explore the physical construction of personal computers that you have a way to identify each of the parts and ports. Each sheet gives you a visual reference as well as a name that you can look up should you need more information about it.

## Buses

Buses are connections between each component part of the computer, the PCI bus is currently the primary 32bit bus on which most other buses are translated to. For instance, the USB bus goes into a the usb chipset (OHCI controller) and is translated to the PCI bus which communicates more directly with the Memory controller. The width and speed of the bus determines how much data can be transported over it per second. 32Bits wide is currently the standard for most internal buses, but newer computers can use 64bit buses too.

## BIOS, Basic Input Output System

The BIOS is the software that is initially executed in order to bring the computer to life. Its job is to search for all hardware and check it for errors during the POST (self test). Then boot the machine providing hardware access to the operating system if required. The BIOS can have many settings which can be accessed just as the computer is being switched on by pressing certain keys such as F2, F12 or Delete. There is also a lot of information about the computer's hardware available for finding problems.

The BIOS is stored on a Flashable chip on the motherboard and can be upgraded using flashing software and the correct and appropriate BIOS image, using the wrong image can cause a computer to cease working and admins should take great care in upgrading the BIOS.

## Booting – Selection

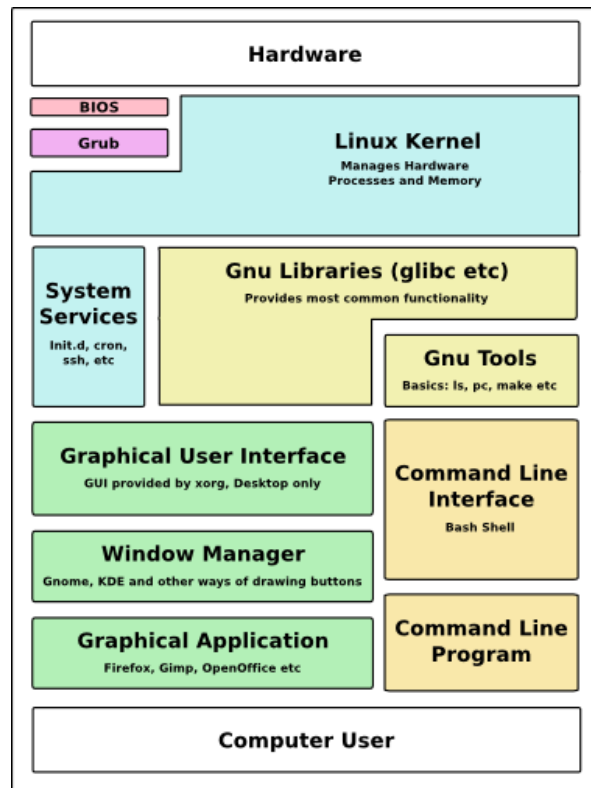
When the computer starts the BIOS will select a device to boot from using an ordered list and pass off execution to that. If a certain key is pressed such as F12 or F10 the computer can generate a list of possible boot devices and allow the user to select one. This is useful for forcing the booting from

## Operating Systems Stack

The operating system is the software that is used to support user programs, connecting the software with the hardware and provide infrastructure to share standard functionality. Often there is multiple parts of an operating system, this example shows a basic system such as Ubuntu:

## File Systems

A file system is a location where the computer is able to store files. It is logical and may not correspond to a physical device directly. For instance a single physical drive can be split up into multiple partitions, each of which is a file system. The file system may also span multiple drives or use mirroring such as RAID (explained below). Each file system can have a different structure (the way files are stored) and these types depend on the function of the system:



Ext3	Default Ubuntu file system, secure, fast and reliable.
Ext4	New file system for Ubuntu currently being tested, faster.
Swap	Used by the Linux kernel to cache memory to disk.
NTFS	Windows XP and Vista file system
HFS+	MacOSX file system
FAT32	Old Windows 95/98 file system now used for USB mass storage devices
ISO9660	File system for CD and DVD-ROM disks.
NFS	Networked file system for storing files on other computers as if they were local.

*There are many more types of file systems.*

## Drive Partitions

Each physical hard drive will contain a section at the very beginning of the disk called a *Partition Table* which describes all of the file systems on the drive. You can only have 4 *primary* partitions on each physical drive, but one of the primary partitions is able to define further *logical* partitions allowing more than 4.

Each physical drive gets a device node in `/dev/` starting with `sd` for instance the first physical drive is `/dev/sda` and the second is `/dev/sdb` and so on. Each drive's partitions also get a device node each, for example the first partition on the first drive is `/dev/sda1` and the third partition on the second drive would be `/dev/sdb3` and so on.

Each drive can be re-partitioned, this is how the disk is split up into sections. **This will loose all existing information if you attempt it!** You can either choose to use command line tools such as ``parted`` or graphical tools such as ``gparted``

## RAID Partitioning

RAID is an advanced method of using more than one physical drive that appears to be a single logical partition to the operating system. It is a way to span a drive over multiple drives for redundancy in case one physical drive should fail. These systems are not often found on desktop machines, but are quite common on servers.

There are multiple RAID levels which describe different ways drives can be formatted and managed, for instance RAID-1 has two hard drives which mirror each other, each disk should contain a copy of all the data, if one disk should fail then the data would not be lost. RAID-1 can also increase the performance of reading data for servers that service networks.

## Mounting File Systems

Each partition needs to be mounted in order to be accessed by the operating system. Each file system to be mounted needs to have a *mount point* which is an empty directory location in which the computer can assign access to the files on the drive. You can see all currently mounted file systems by using the ``mount`` program on the command line.

By default when the computer boots up it will mount the *root file system* which contains all the files required to start and run the system. On desktop machines this file system is usually the same drive which all other files are stored but this is not always the case.

You can use the ``mount`` program on the command line to mount a file system manually, this is useful for debugging problems or doing something temporally. But the system will not still be mounted if the machine is reset. Conversely if you want to unmount a file system you can use the program ``umount``.

It is possible to configure the computer to mount the drive by on each boot by adding the drive and it's options to the `/etc/fstab` configuration file. You will find in this file existing file systems which allow the operating system to function and where they are mounted. For example:

```
mount -t ntfs /dev/sdc1 /media/windows
```

Mount a windows XP drive which is the first partition (1) on the third physical disk (sdc) and make it accessible at `'/media/windows/'` This means that the folder `'C:\Program Files'` will now be accessible in the folder `'/media/windows/Program Files'` as well as all other files and folders on the drive.

## Auto Mounting

Modern desktop operating systems such as Ubuntu will automatically mount file systems from externally inserted drives such as CD-ROMs, USB Mass Storage Drives (flash drives) and etcetera, this is to allow the user to use files and folders without having to type in complex commands or edit configurations. The mount points are chosen by the computer just before it mounts and will normally create a new directory in `/media` if the drive has no name then the folder will be called `'disk'` `'disk-1'` `'disk-2'` and so on.

Even though these drives have been mounted automatically they can still be unmounted using the same command line tools and can still be seen using the mount command.