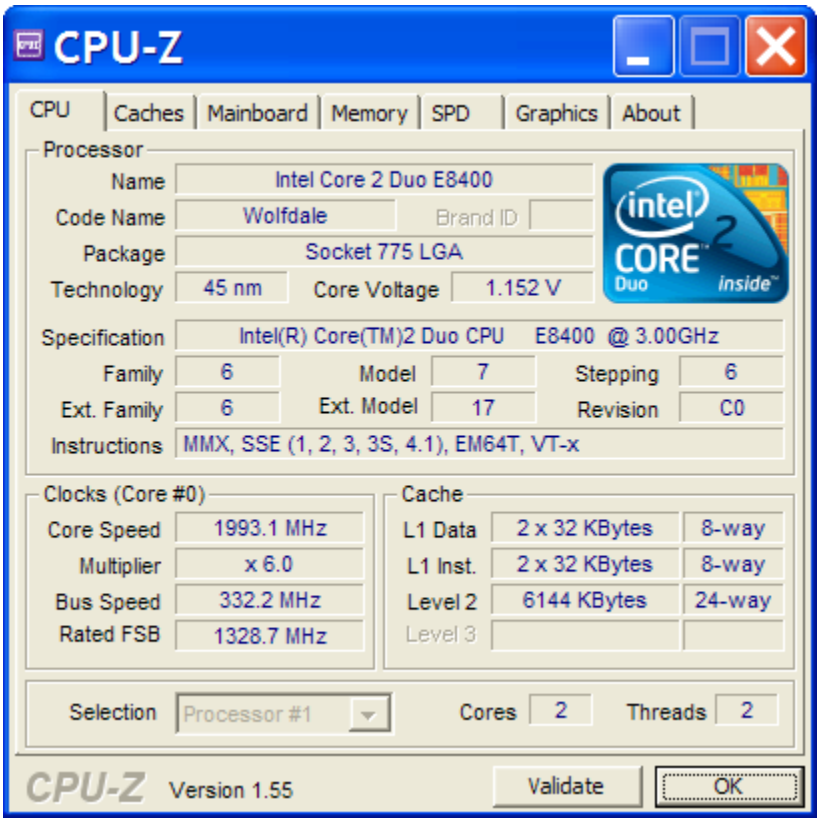
PRACTICAL 2: INVESTIGATING THE MAIN FEATURES OF THE PC SYSTEM

INTRODUCTION

The properties of the computer you are sitting at are set by a number of features. In the hardware, it depends on the type of processor the PC has, but also the chipset that controls most of the communication with the rest of the PC's facilities. The operating system too (Windows, Linux) will also determine a lot of the properties. The purpose of this lab is to investigate the hardware: the second half of this module will be concerned with the operating system. We will start with the processor, and then work out to the peripherals.

THE PROCESSOR

In order to qualify as a PC (and be able to run Windows) the processor must belong to the Intel family of processors that started with the 8086, then developed into the 80186, 80286 and eventually the Pentium processors we have now. There are many versions of this architecture, sometimes referred to as the x86 architecture, though Intel prefers to use IA32 or IA64 (for Intel Architecture 32 or 64 bit). To find out about the specific chip, we are going to use a free utility: CPU-Z This uses a specific assembly language instruction: CPUID to query the processor. Launch CPU-Z (the lecturer will explain how) and you should get a display similar to the following:



PROCESSOR NAMES

There are so many versions of the Pentium chips that naming becomes quite complicated. In my desktop, the processor is called an 'Intel Core 2 Duo E8400' The term 'Core' refers to the broad division of architecture (the previous class was the Netburst). It's a terrible name, because it used to refer to the number of cores: Duo being two obviously. However, it has just become a name for the family: current newer members being Core i3, Core i5 & Corei7.
What is the Name of the processor on your PC?:

_____

The 'technology' is the typical line size on the chip. What is this for your PC, and what voltage does the core run at?

_____

You can use Wikipedia to see more details of the specific chip on your PC. Use it, or Intel's web pages, to find out what the Intel 'Tick-Tock' process is:

_____

_____

The precise version of the processor is also given by values in fields such as the family, model and so on.

INSTRUCTIONS SETS

Early processors had very small instruction sets. As they have expanded, new categories of instructions have been added. Obviously, software can only use the facilities of the processor that it is running on. The following categories of instructions are probably available on your processor; use the web to find out what they are for:

MMX_____

SSE_____

EM64T_____

VT-x_____

CLOCK

In the specification, what is the clock rate of your core?_____

Is the Core speed the same, and if not why not? _____

CACHE

There is a summary of the cache information on the first tab, but if you go to the cache tab you will get more information on the cache memory. There will be more on the cache later in the course, but for the mean time, find out: How many levels are there on your processor, and how much is at each level?

_____

Why is the top level typically listed as X2 (or perhaps X4)?

_____

What is the difference between I- Cache and D-Cache?

_____

MAINBOARD

The details of what memory and peripherals can be used with the PC depend largely on the chipset. If you go to the Mainboard tab and find the chipset, you should be able to use the web to get a block diagram of your chipset. What is the chipset and Southbridge (if any) on your PC?_____

MEMORY

Again, this will be covered in more detail later. For the moment, find out:

How much DRAM is on your PC: _____

How many channels there are connecting to the DRAM: _____

What the DRAM frequency is: _____

How many times slower or faster the DRAM is than the processor: _____

If the delay before accessing data is given approximately by the cycle time, t_{RAS} how many processor cycles happen in the time it takes to access data

_____

SERIAL PRESENCE DETECT (SPD)

DRAM comes in broad families (DDR, DDR2, DDR3), but even within a family there can be variations in things like the voltage that the memory runs from, and the delay before data is ready to read (latency). Information about these features is held in a small ROM chip on the memory module so that the hardware settings can be configured to match the requirements of the memory module. During startup of the PC hardware, the BIOS performs a Power On Self Test (POST) sequence which includes reading this information from the Memory Module. It is read out via a serial link with two wires (clock and data) using a variation of the I^2C protocol known as the System Management Bus (SMB). This is a low data rate bus defined originally by Intel and used typically for communication between sections of the motherboard such as for power management.

What is the clock frequency for the memory (in MHz)? _____

What is the maximum bandwidth (the PC2- figure)? _____

What is the ratio between these two? _____

Why is there this ratio? _____