ECE 472 Homework 1

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1 Write a C program that returns the following information about your CPU, using the CPUID assembly instruction

Answer While not all of the program functions work properly, as far as I can tell they are correct and follow the documentation provided by the Intel Software Developers Manual. I have done all that I can to get the functions to work properly, and debug what was wrong but I cannot tell. As far as things such as printing the processor name and such goes, I dont know where this information would be located. I have done what I can in the lookup.h file, but for things such as the TLB and cache info, the hex values that return and the table entry that correspind have no real order, for example the hex values do not of 123...9AB they sometimes go 123..9CD or 12D so there is now way to make a nice table without taking a massive amount of time to hard code in

2 Describe the difference between architecture and organization.

Answer Architecture is the programmer's view of the computer system. it is an abstracted model of the interface between hardware and software. It is very high level and describes what the computer does without being messy or detailed. Organization is the low level description of the components and connections between the components. It deals with low level descriptions of

how a computer does a task. An example is for Archtecture, one might ask if the computer has floating point instructions, while from an organization perspective one might ask if the computer has an integrated floating point unit.

3 Describe the concept of endianness. What common platforms use what endianness?

Answer Endianess refers to the ordering of bits in digital systems. In its basic sense, endianess refers to which side of a binary string is most significant. In big-endian, binary values are ordered from the most significant bit, while in little endian they are ordered from the least significant. Architectures such as the motorolla 68000, IBM z/Architecture, and the TCP/IP internet protocol use big- endian while x86 uses little endian. ARM has the capability of using both methods, even at the same time and in the same program.

4 Give the IEEE 754 floating point format for both single and double precision.

Answer x = (-1)^s * (1 + Fraction) * 2 ^ (Exponent - Bias)
S = sign bit (0 = +, 1 = -); Single precision Bias = 127
Double precision Bias = 1203
Exponents 000..00000 & 111..11111 are reserved.

S	Exponent	Fraction	Precision
1	8 bits	23 bits	Single Precision
1	11 bits	52 bits	Double Precision

5 Describe the concept of the memory hierarchy. What levels of the hierarchy are present on flip.engr.oregonstate.edu?

Answer Memory hierarchy refers to the different layers of memory and storage that are available to the processor. It starts with registers, then the L1 cache that is specific to a single processor core, and as the level of cache goes up, it is shared by more cores, and is slower as it goes up from Ln Cache, to main memory, to general storage. Using the lscpu command, I was able to find that the flip1 server I was on had 64K of L1 cache, 256K of L2, and 12288K of L3 cache.

6 What streaming SIMD instruction levels are present on flip.engr.oregonstate.edu?

Answer The flip1 server has MMX, SSE, SSE2, SSE3 and SSE4.x and FXSR.

References

[1] http://cs.boisestate.edu/ alark/cs354/lectures/ieee754.pdf

[2] https://www.cs.umd.edu/class/sum2003/cmsc311/Notes/Data/endian.html

[3] https://en.wikipedia.org/wiki/Endianness

[4] https://en.wikipedia.org/wiki/CPUIDCalling$_C PUID$