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Computer Org I

1. What are the three main components of a computer architecture? Draw two diagrams depicting these components, one for the von Neumann architecture and the other for the Harvard architecture. Compare and contrast the two architectures.

The three main components of a computer are the processor, memory, and input/output. The von Neuman model has one memory that shares the data and information. On the other hand, the Harvard model has to separate memories for the instruction and data.

1. For your laptop or desktop, or if you don't have a computer, use one in the SCS lab:
2. What is it's processor number (product name)?

2.6 GHz Intel Core i5

b) How much is the clock speed of the processor?

3.2GHz

c) How many cores does it have?

Four cores

d) How much is the capacity of the main memory (RAM)?

8 GB

e) How much is the capacity of the hard drive?

249.52 GB

f) Which I/O (input/output) devices are available? Are they input, output, or both?

g) What types of external I/O port are available? How many of each?

Eight. 2 Both, 3 inputs, 3 outputs.

1. Search the Internet and answer the following questions for Intel CPU Xeon E5-4657L v2 (30M Cache, 2.40 GHz).
2. What is the CPU chip size?

4

1. What is the manufacturing technology (in terms of nanometers)?

c) How many cores does it have?

12

d) What is the core clock frequency?

2.4 GHz

e) What is the core clock cycle time?

f) How much power does it consume maximally per second?

115W

g) To install it on a motherboard, which type of socket is needed on the motherboard?

h) How many levels of cache does it have? How much is the total capacity at each level?

1. a) What is Moore's Law?

Moore’s Law states that density transistors doubles ever 2 years and performance doubles every 18 months.

1. As of 2015, the highest transistor count in a commercially available chip made by Intel is about 5.5 billion transistors. Estimate the number of transistors on an Intel chip in 2009 and in 2019.
2. Two important “walls” of computer architecture are the “memory wall” and the “power wall”. Describe these walls and how they affect computer organization and design.

The memory wall is the processor/memory gap. If memory bandwidth begins to lag, it cannot provide processors with enough instructions and data to continue computation, the processors will be waiting on memory. The power wall is a rechargeable lithium-ion battery. It stores electricity for domestic consumption, load shifting, and backup power. When transistors become to hot, because they are too densely packed, the chips melt. These two walls affect computer organization and design because you can add more cores to the computer or put more power walls but that might only make the problem worse and ultimately affect performance.

1. Draw a diagram showing how a C source file and an assembly source file are processed in stages by a loader, compiler, linker, and assembler in the correct sequence with intermediate inputs and outputs at each stage to execute a program. Identify where the three main components of a computer architecture are involved in each stage.