

# Computer Architecture

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## Chapter 5, Textbook

- Section 5.1 Why is the stored program concept considered to be such a profound advance?  
Draw an illustration of the von Neumann architecture.  
Architecturally speaking, what are the two types of memory?  
Describe the three components of the CPU.  
Name three examples of I/O devices.  
Carefully explain memory-mapped I/O.
- Section 5.4 Our Hack computer *requires* separate instruction and data memories. Why?

## Chapter 5, Slides

- Slide 3: Describe the five stages of the instruction cycle.
- Slide 4: Separate instruction and data memories are required because of instructions such as D=M, which require two simultaneous memory reads: one to read the instruction from memory, and the second to read the data from memory. The main memories in today's computers don't have separate areas for instructions and data, even though simultaneous instruction and data reads are common. These simultaneous memory operations are handled by having separate instruction and data caches.
- Slide 8: Disassemble the machine instructions 0X000A and 0XFC10.
- Slide 9: What is the control equation for the A register's load signal?
- Slide 10: What is pipelining? What are its advantages?  
What is caching? What are its advantages?  
What is a multi-core processor? What led to their development? What are their advantages and limitations?
- Slide 11: Sketch how to add an instruction that would load an immediate value directly into the D register. What would be the pros and cons of doing so?  
What would it take to add a multiply instruction to the Hack CPU?