


WEEK- 5

1.7 The Von Neumann Model.

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- On the ENIAC, all programming was done at the digital logic level.
- Programming the computer involved moving plugs and wires.



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- Inventors of the ENIAC, John Mauchley and J. Presper Eckert, conceived of a computer that could store instructions in memory.
- The invention of this idea has since been ascribed to a mathematician, John von Neumann, who was a contemporary of Mauchley and Eckert.
- Stored-program computers have become known as von Neumann Architecture systems.
- Today's stored-program computers have the following characteristics:
 - Three hardware systems:
 - **A central processing unit (CPU).**
 - **A main memory system.**
 - **An I/O system.**

- A single data path between the CPU and main memory.
- This single path is known as the *von Neumann bottleneck*.

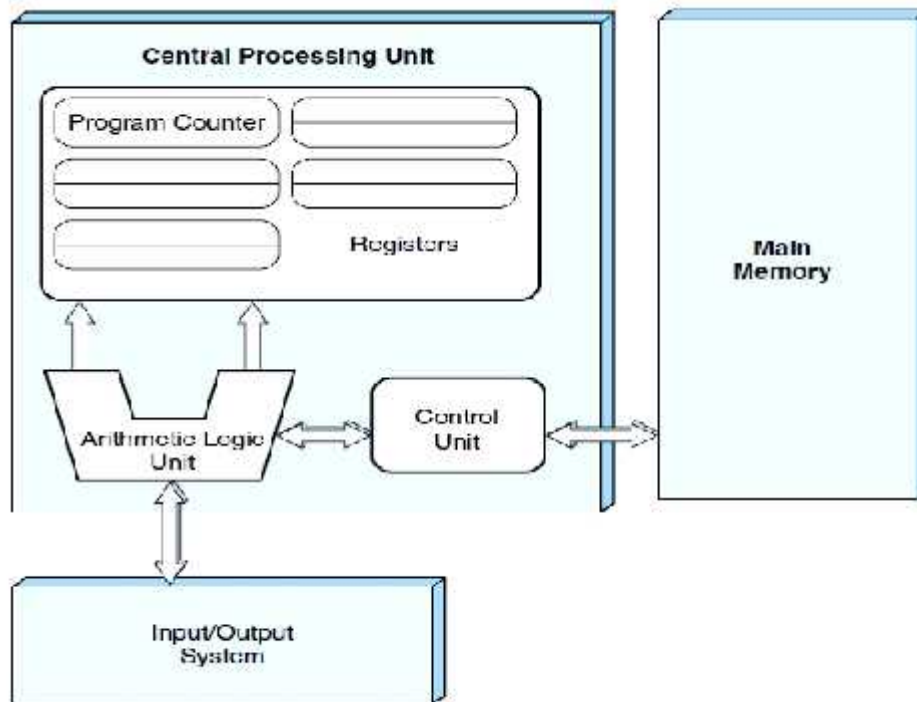


FIGURE 1.2 The von Neumann Architecture

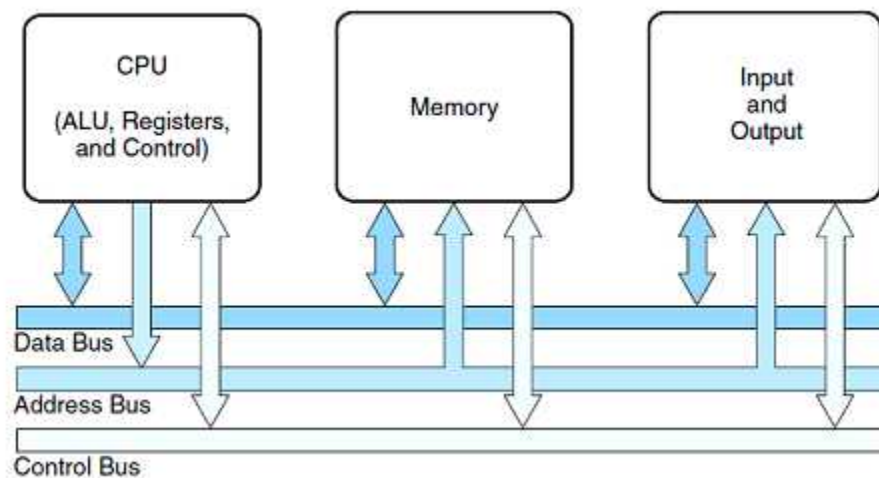


FIGURE 1.3 The Modified von Neumann Architecture, Adding a System Bus

- Conventional stored-program computers have undergone many incremental improvements over the years.
- These improvements include adding specialized buses, floating-point units, and cache memories, to name only a few.
- But enormous improvements in computational power require departure from the classic Von Neumann architecture.
- Adding processors are one approach.
- In the late 1960s, high-performance computer systems were equipped with dual processors to increase computational throughput.
- In the 1970s supercomputer systems were introduced with 32 processors.
- Supercomputers with 1,000 processors were built in the 1980s.
- In 1999, IBM announced its Blue Gene system containing over 1 million processors.
- Parallel processing is only one method of providing increased computational power.
- More radical systems have reinvented the fundamental concepts of computation.
- These advanced systems include genetic computers, quantum computers, and data flow systems.
- At this point, it is unclear whether any of these systems will provide the basis for the next generation of computers.