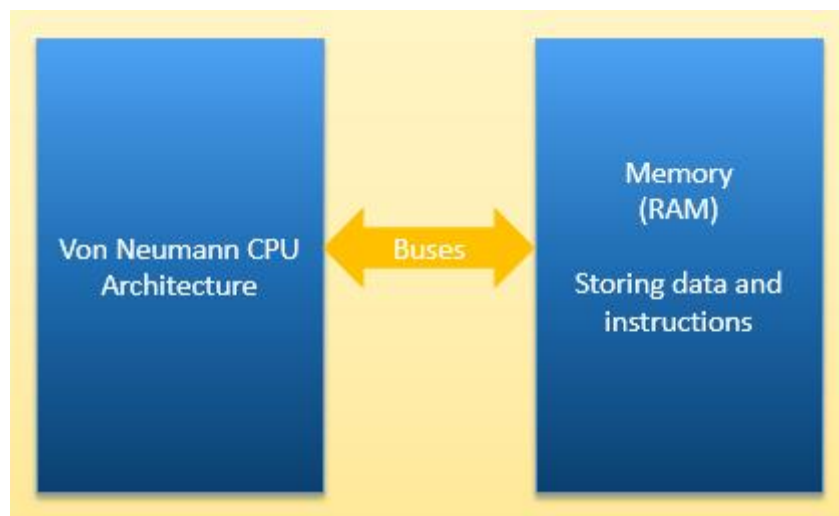




4.1.1 FDE Cycle

Von Neumann

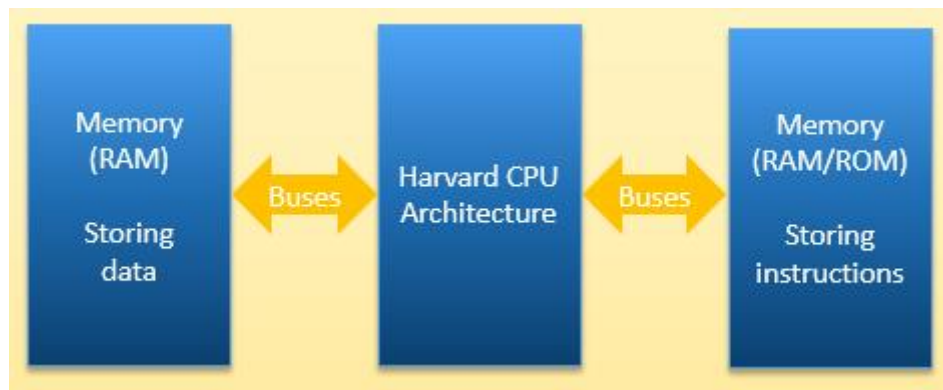
- Basic architecture
 - Single control unit
 - Single ALU
 - Special registers within the CPU
- Instructions and data stored in the same area of memory.
- Has one set of buses for instructions and memory.
- Instructions and data stored in RAM.
- Single set of bus for instructions and data.
- Instructions and data sharing the same memory and buses can create a bottleneck because they cannot be fetched simultaneously.
- Used extensively in general purpose computing systems.





Harvard

- Instructions and data stored in the different areas of memory.
- Has a different set of buses for instructions and data.
- Instructions and data can use different memory types. E.g. ROM for instructions and RAM for data.
- Used extensively in embedded systems such as digital signal processing (DSP).



Advantages:

- Instructions and data can be accessed simultaneously because they use separate memories and buses, reducing the bottleneck and potentially improving performance.
- Instruction memory can be stored in ROM preventing modification.

Disadvantages:

- More complex design and circuitry.





Contemporary Processors Architecture

Modern processors often use a modified Harvard architecture, combining features of Harvard and Von Neumann architectures.

For example, a processor may use separate instruction and data caches so that instructions and data can be accessed independently, while larger levels of cache or main memory may be shared.

