CAO: Lecture 9
Flynn's Classification

Topics Covered

- Flynn's classification of computers
- SIMD Computer System
- MISD Computer System
- MIMD Computer System

Flynn's classification of computers

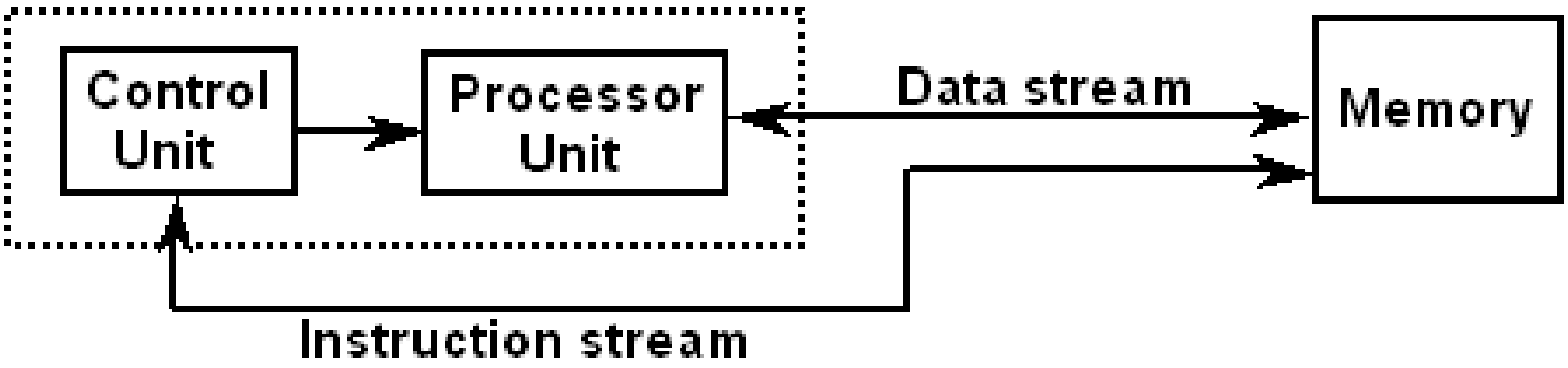
- Michael J Flynn classified computers on the basis of multiplicity of instruction stream and data streams in a computer system.
- It gives how sequence of instructions or data will be executed upon a single processor
- **Instruction stream**: is the sequence of instructions as executed by the machine
- **Data Stream** is a sequence of data including input, or partial or temporary result, called by the instruction Stream.

The four classifications defined by Flynn are based upon the number of concurrent instruction (or control) and data streams available in the architecture:

Flynn's taxonomy

	Single Instruction	**Multiple Instruction**
Single Data	**SISD**	**MISD**
Multiple Data	**SIMD**	**MIMD**

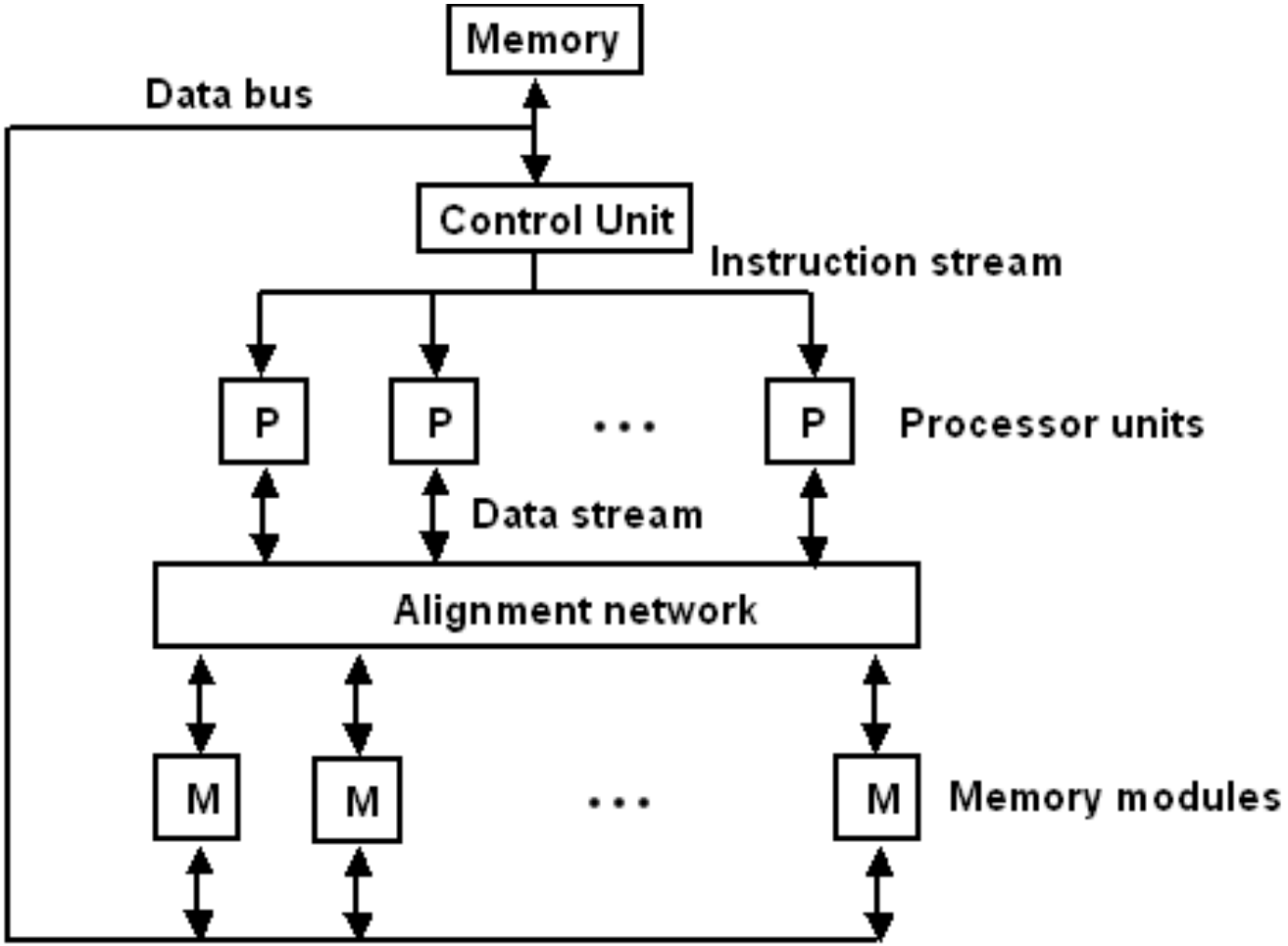
- Instructions are decoded by the control unit and then ctrl unit send the instructions to the processing units for execution.
- Data Stream flows between the processors and memory bi directionally.


Control Unit
Processor Unit
Data stream
Memory
Instruction stream

- The **control unit** directs the various components of a computer. It **reads and interprets (decodes) instructions in the program one by one.**
- A key component of a computer that the control units **interacts with is the program counter**, a special memory (a register) that **keeps track of which location in memory the next instruction is to be read from.**
- Another key component that the control unit **interacts with is the ALU** (arithmetic and logic unit). The ALU is the only part in the main computer that can do any maths. **The control units calls the ALU when it wants to e.g. add two numbers**.
- Finally, the control unit **routinely interacts with the memory**. Program instructions are stored in memory, at the location indicated by the program counter. When the **control unit decodes an instruction, it will often have to fetch some data that also lies in memory.**

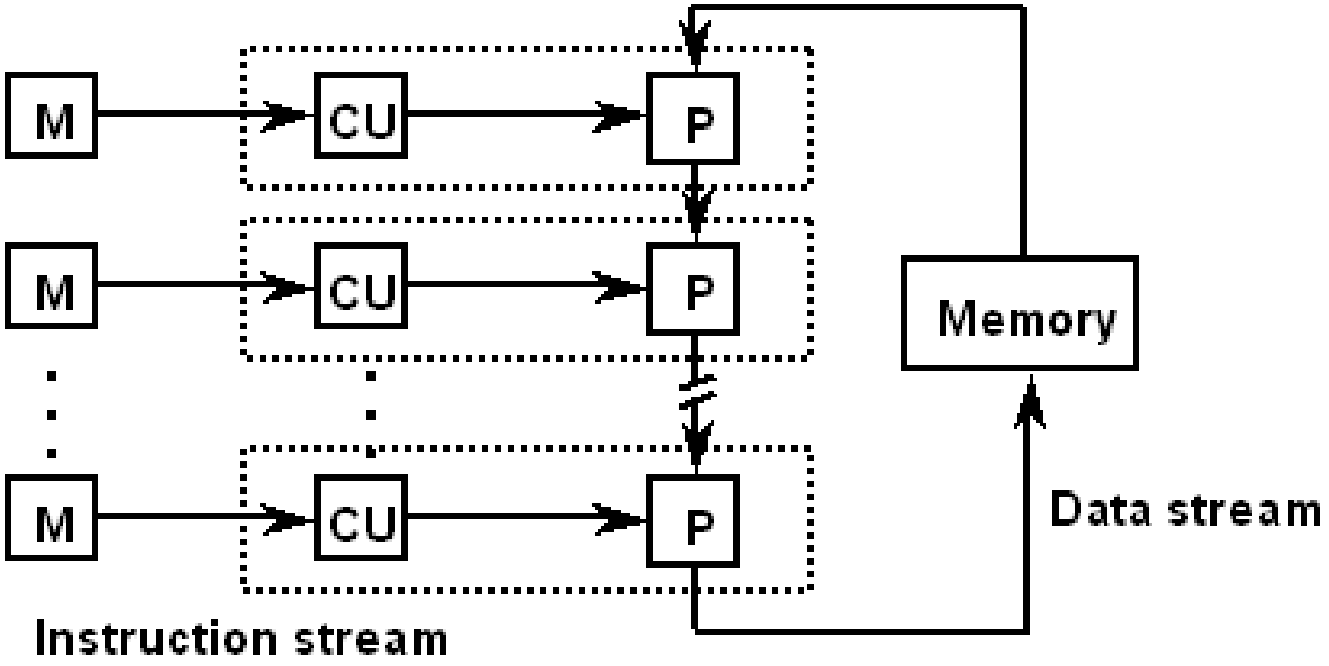
- A sequential computer which exploits no parallelism in either the instruction or data streams.
- Examples of SISD architecture are the traditional uniprocessor machines like a PC or old mainframes.

SIMD Computer System



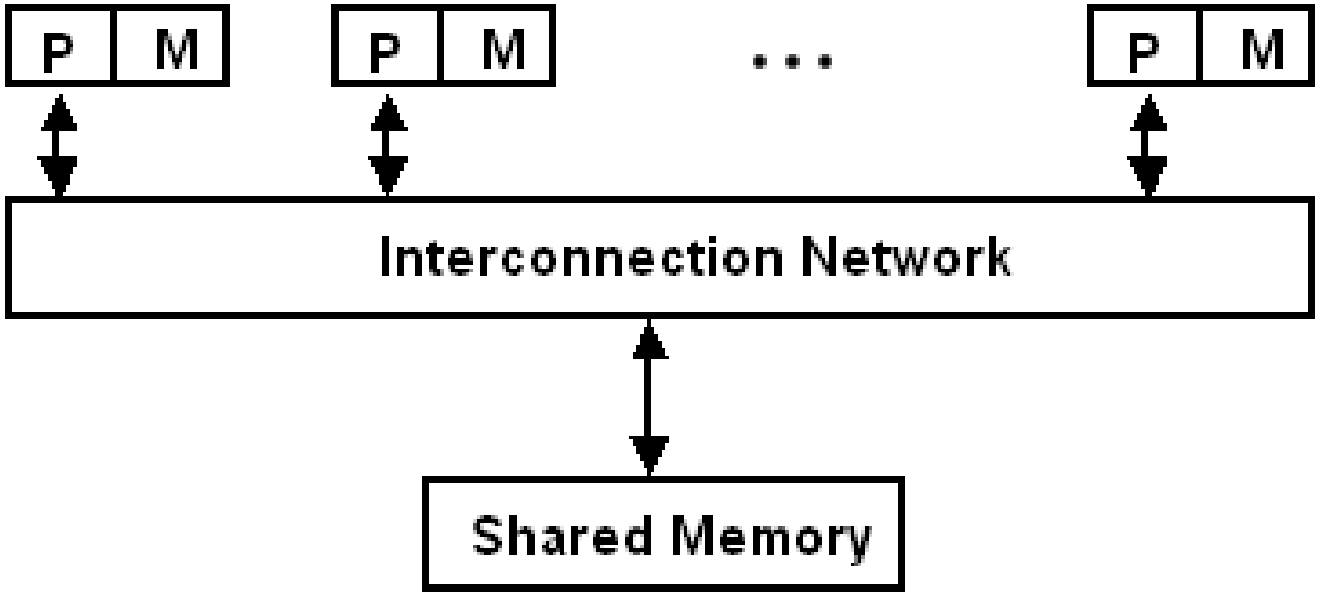
- A computer which exploits multiple data streams against a single instruction stream to perform operations which may be naturally parallelized.
- For example, an array processor.

MISD COMPUTER SYSTEMS



- Multiple instructions operate on a single data stream.
- Uncommon architecture which is generally used for fault tolerance.
- Heterogeneous systems operate on the same data stream and must agree on the result.
- Examples include the Space Shuttle flight control computer.

MIMD COMPUTER SYSTEMS



- Multiple autonomous processors simultaneously executing different instructions on different data. Distributed systems are generally recognized to be MIMD architectures; either exploiting a single shared memory space or a distributed memory space.