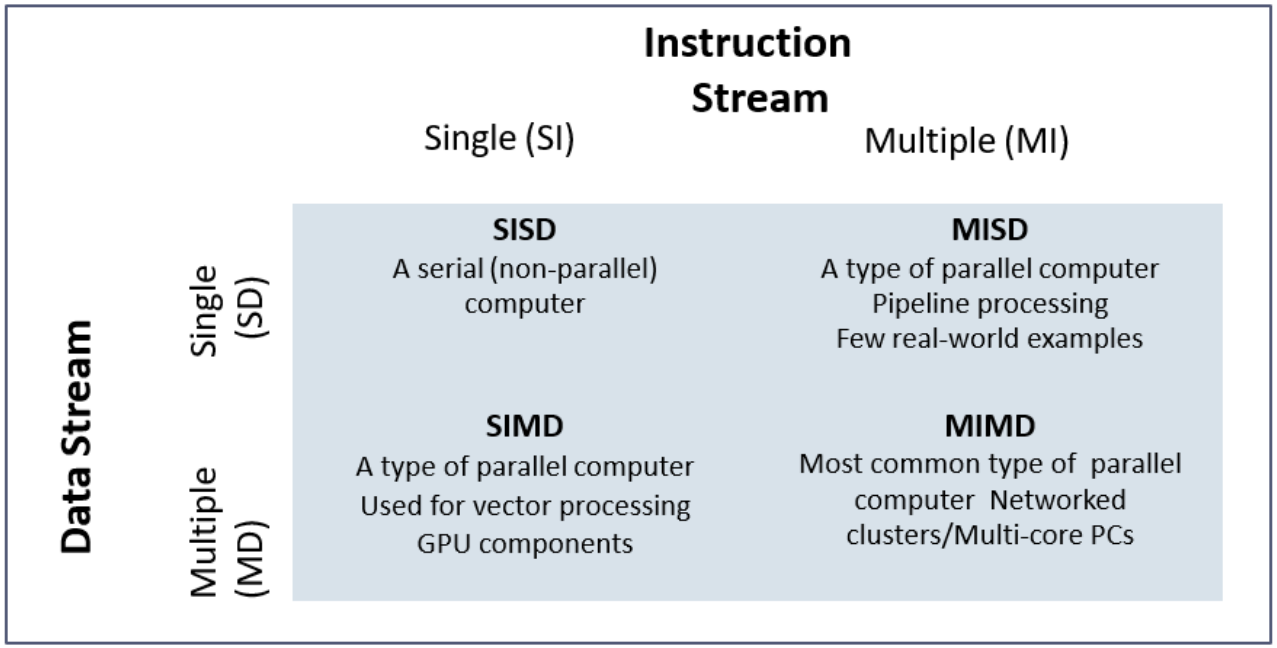
Distributed Computing Overview

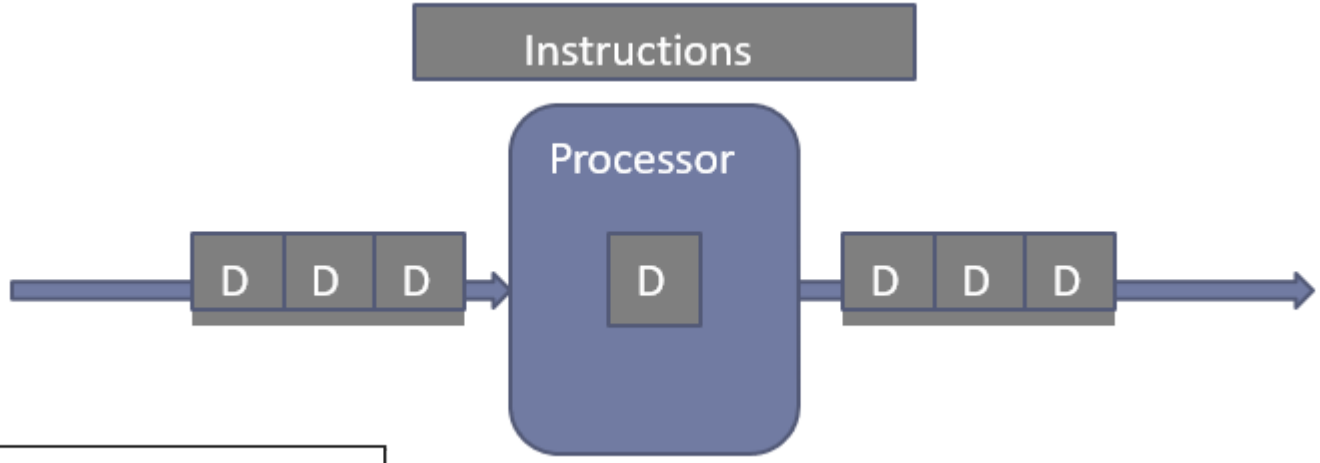
cct | College Dublin
Computing • IT • Business

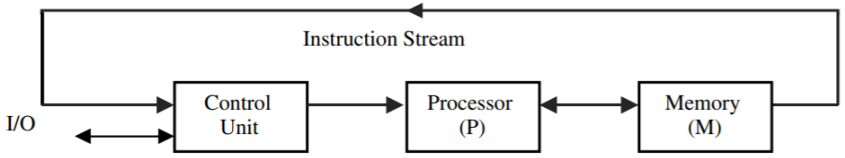
- **Flynn's Taxonomy**
- This is a classical approach (1966) used to classify parallel computers
- Flynn uses the stream concept for describing a machine's structure and It classifies systems using two dimensions
  - **Data Stream**
  - **Instruction Stream**
- In classifying a system, each of these dimensions can have one of two values
  - **Single**
  - **Multiple**



Distributed Computing Overview

- **Single instruction stream single data stream (SISD)**
- A sequential computer which exploits no parallelism in either the instruction or data streams. **Single control unit (CU)** fetches single instruction stream (IS) from memory. The CU then generates appropriate control signals to direct single processing element (PE) to operate on single data stream (DS).



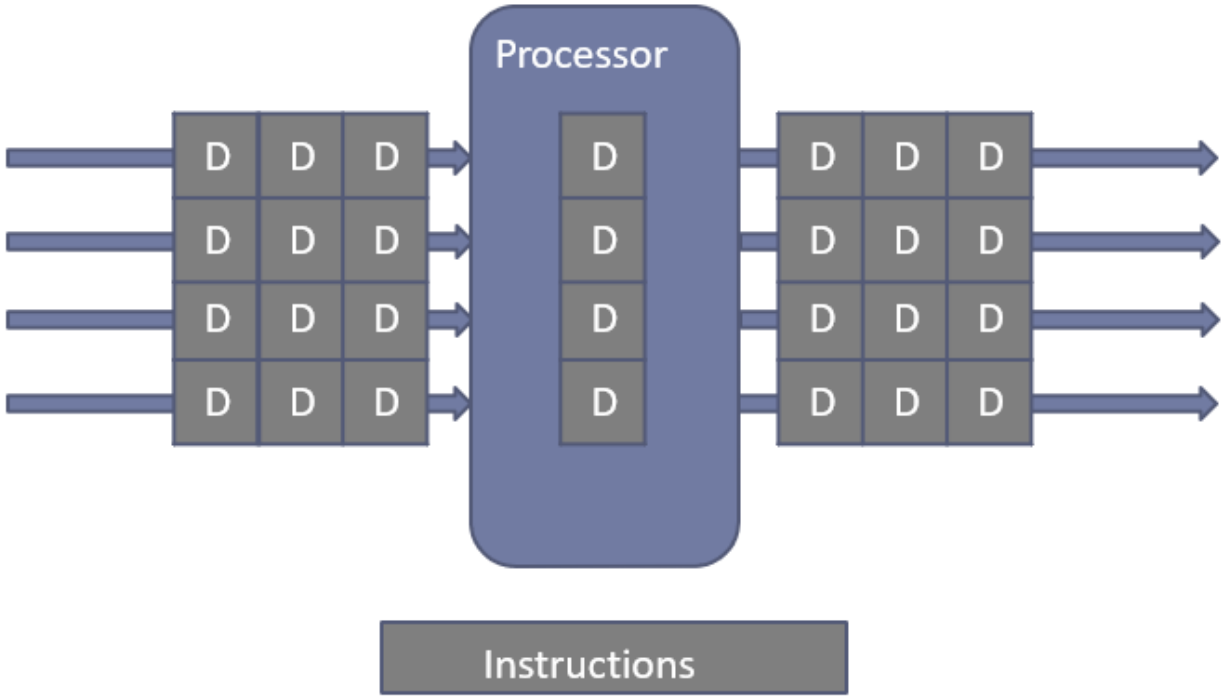


SISD architecture.

- Examples of SISD architecture are the traditional uniprocessor machines like older personal computers.

Distributed Computing Overview

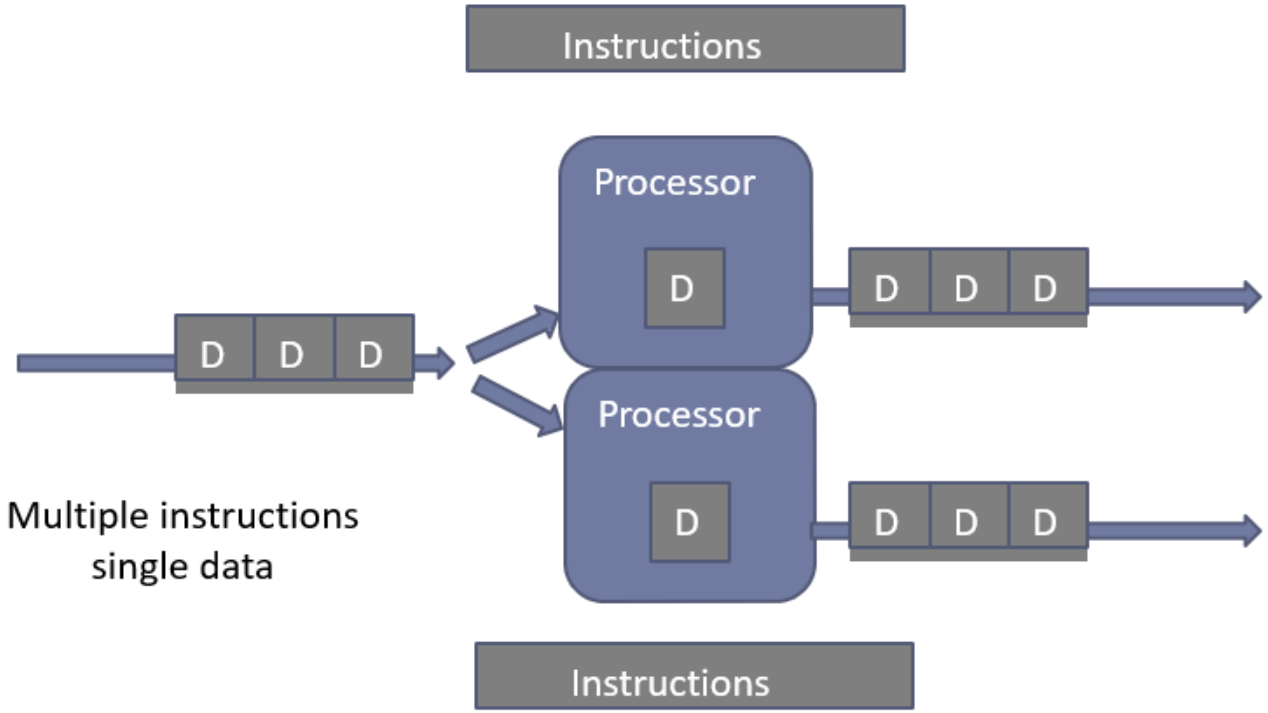
- **SIMD (Single Instructions and Multiple Data)**
- **Single instruction, multiple data (SIMD)** is a type of parallel computer used for vector (arrays of data) processing GPU components



Distributed Computing Overview

College Dublin
Computing • IT • Business

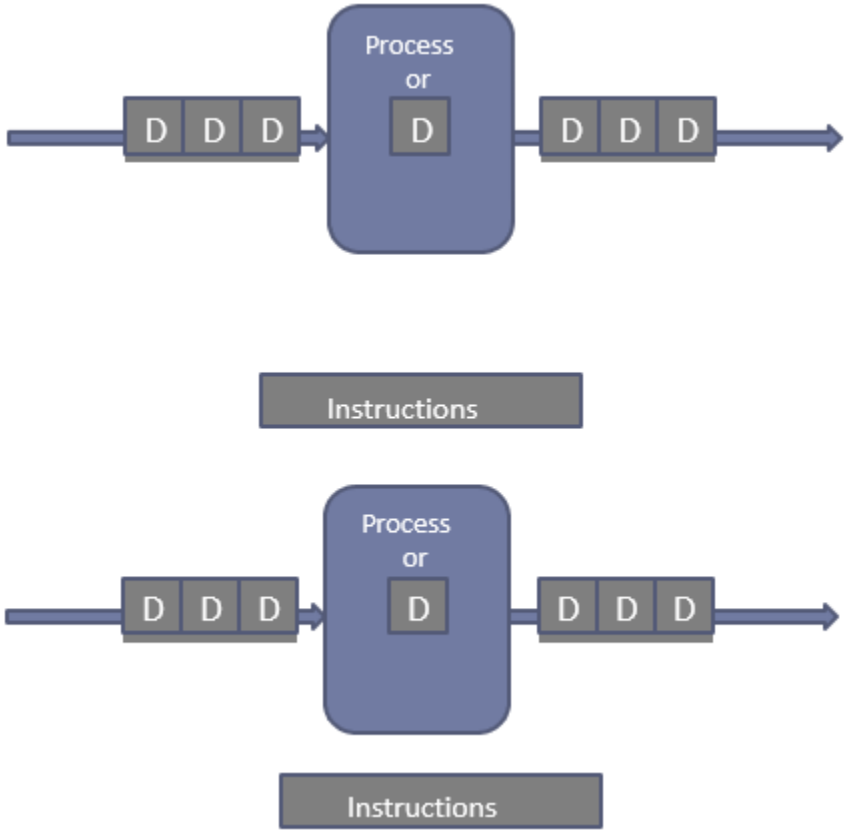
- **MISD:** Multiple instructions operate on one data stream. This is an uncommon architecture which is generally used for fault tolerance. **Heterogeneous systems** operate on the same data stream and must agree on the result. Examples include the Space Shuttle flight control computer.



Distributed Computing Overview

cct College Dublin
Computing • IT • Business

- **MIMD (Multiple instructions Multiple data)**
- Multiple autonomous processors simultaneously executing different instructions on different data.
- **MIMD** architectures include multi-core **superscalar processors**, and distributed systems, using either one shared memory space or a distributed memory space.



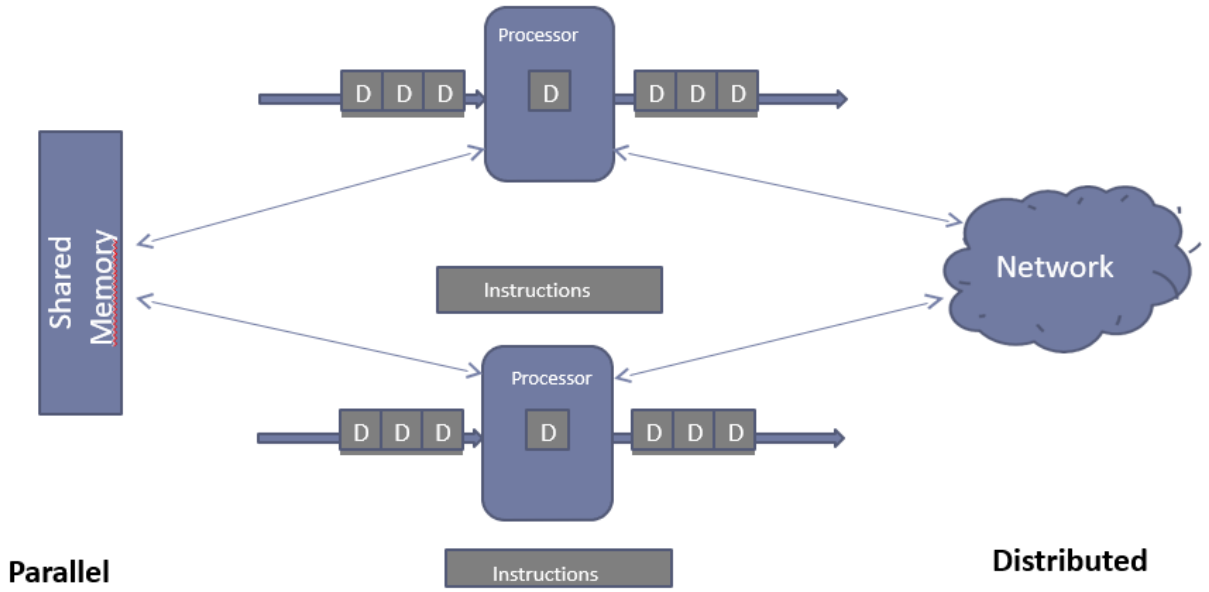
https://cs.stanford.edu/people/eroberts/courses/soco/projects/risc/pipelining/

		Data Streams	
		Single	**Multiple**
Instruction Streams	Single	SISD: Intel Pentium 4	SIMD: SSE instructions of x86
	Multiple	MISD: No examples today	MIMD: Intel Core i7

Hardware categorization and examples based on number of instruction streams and data streams: SISD, SIMD, MISD, and MIMD.

Distributed Computing Overview

- **Parallel vs. Distributed Processor**



- Parallel computing is a type of computation in which many calculations or execution of processes are carried out simultaneously. Whereas, a distributed system is a system whose components are located on different networked computers which communicate and coordinate their actions by passing messages to one another.