Flynn Taxonomie

Classification of computer systems by number of instruction streams and data streams:

SISD : Single instruction stream, single data stream.
- conventional serial computers

SIMD : Single instruction stream can handle multiple data streams. All pe's are **synchronously** executing the same instruction stream but on different sets of data.
- Almost all computers implement some sort of SIMD instruction set, e.g. SSE (Streaming SIMD Extensions) → are capable of processing multiple data elements in a single clock cycle.

MISD : Machine is capable to process single data stream using multiple instruction streams.
- Uncommon architecture. Heterogenous systems operate on same data stream and must agree on result → fault tolerance.

**MIMD :** Multiple instruction streams on multiple data streams.
- General purpose parallel computers.
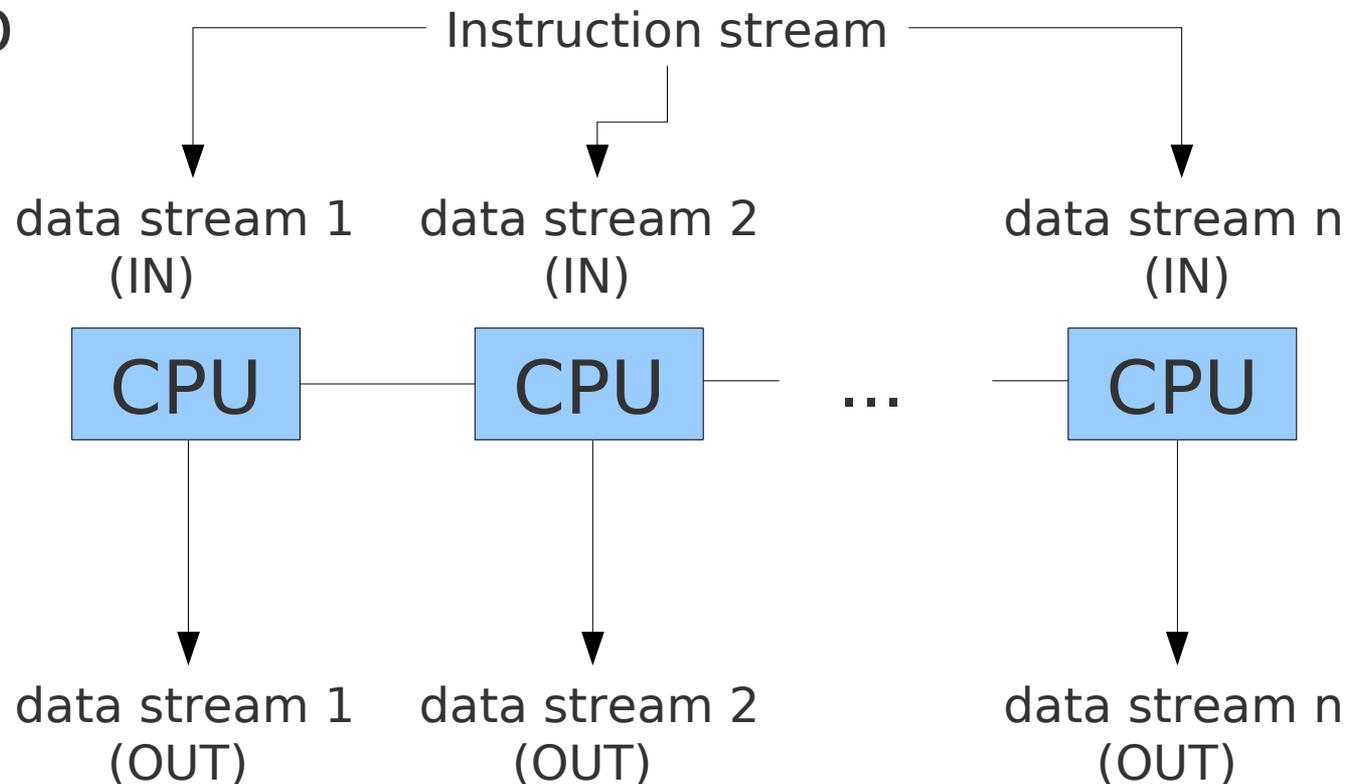
SPMD (single program, multiple data) :
All pe's execute same program, but each operates on different portion of problem data:

- Easier to program than true MIMD, but more flexible than SIMD

- Although most parallel computers today are MIMD architecturally, they are usually programmed in SPMD style.

SISD

data stream (IN)   Instruction stream
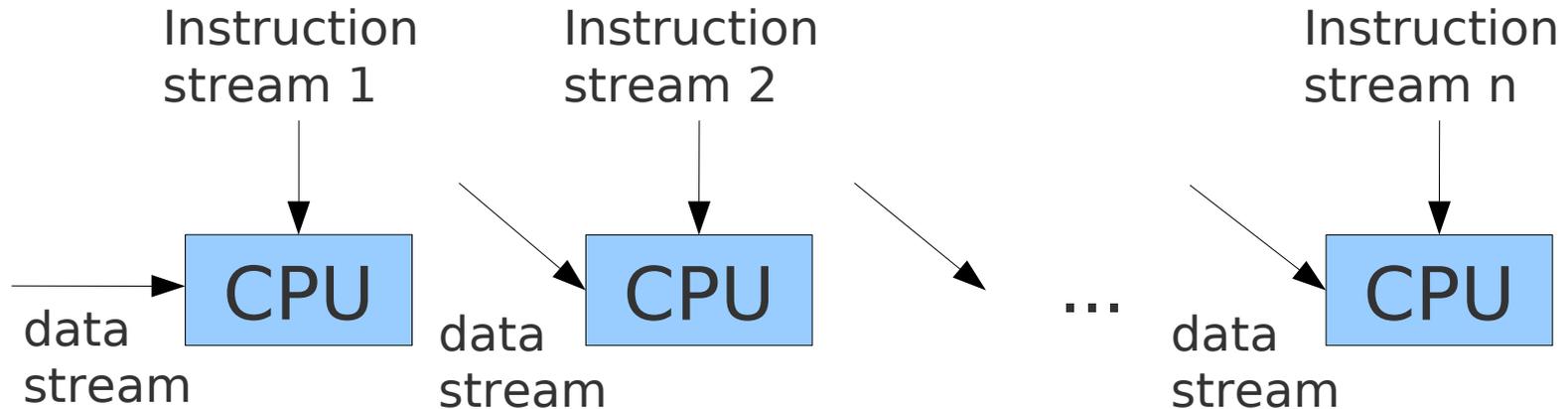
CPU
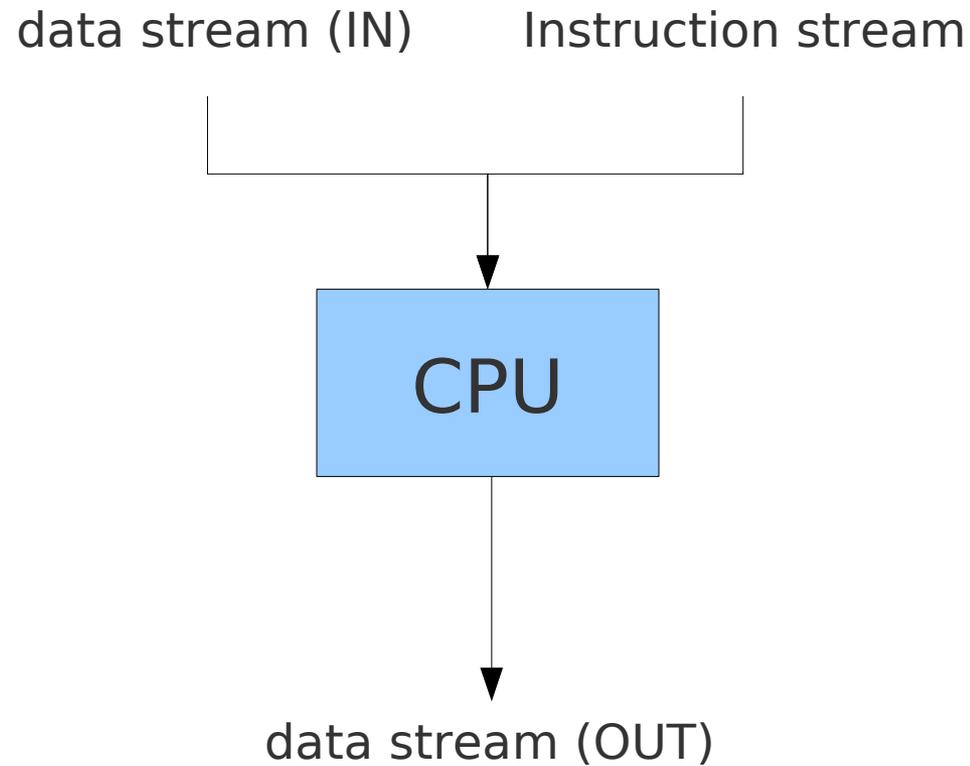
data stream (OUT)

SIMD

All pe's connected with the same instruction stream. All pe's Perform same instructions synchronously, but in parallel on different data streams.

MISD

Instruction stream 1   Instruction stream 2   Instruction stream n

CPU   CPU   ...   CPU

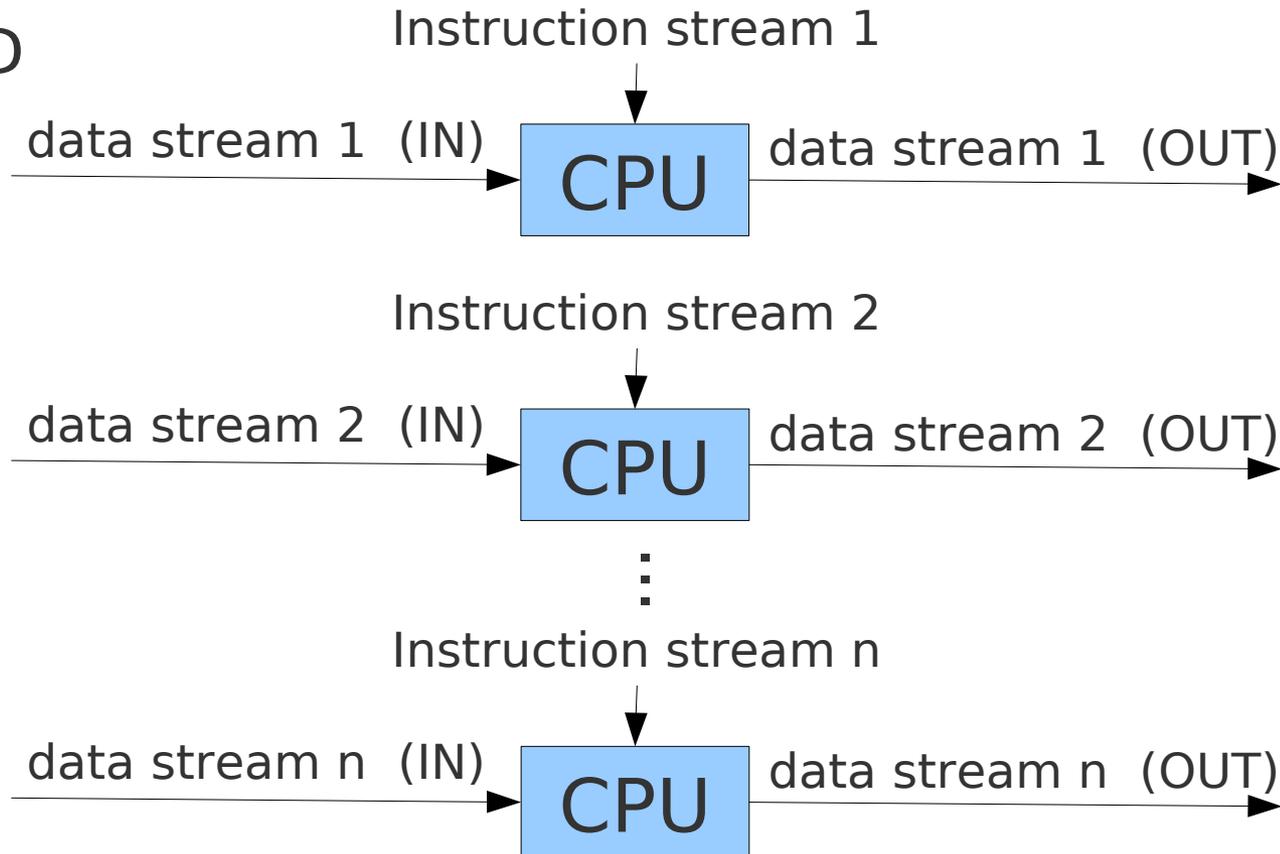data stream   data stream   data stream

All pe's connected with the same data stream. All pe's perform differents instructions on same data stream.
Examples:
- Fault tolerance (e.g. Space shuttle).
- Multiple cryptography algorithms attempting to crack a single coded message.
- Multiple frequency filters operating on a single signal stream.

MIMD

Instruction stream 1

data stream 1 (IN) → **CPU** → data stream 1 (OUT)

Instruction stream 2

data stream 2 (IN) → **CPU** → data stream 2 (OUT)

⋮

Instruction stream n

data stream n (IN) → **CPU** → data stream n (OUT)

Exploits asynchronous parallelism. When all pe's of a MIMD architecture run same program → SPMD