Flynns Classification

Multiple Processor Organization

- Single instruction, single data stream - SISD
- Single instruction, multiple data stream - SIMD
- Multiple instruction, single data stream - MISD
- Multiple instruction, multiple data stream- MIMD

Single Instruction, Single Data Stream - SISD

- Single processor
- Single instruction stream
- Data stored in single memory
- Uni-processor

Single Instruction, Multiple Data Stream - SIMD

- Single machine instruction
- Controls simultaneous execution
- Number of processing elements
- Lockstep basis
- Each processing element has associated data memory
- Each instruction executed on different set of data by different processors
- Vector and array processors

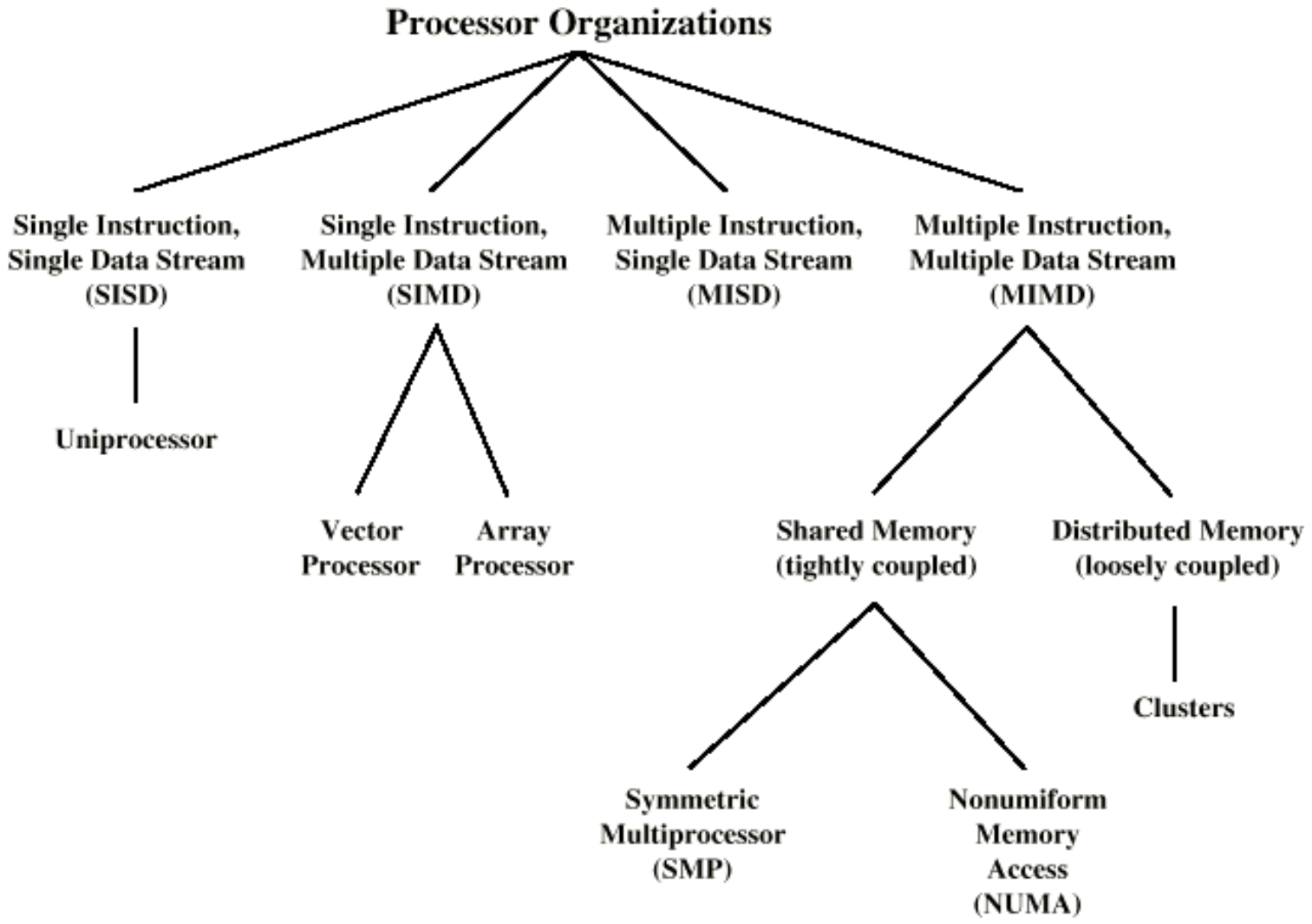
Multiple Instruction, Single Data Stream - MISD

- Sequence of data
- Transmitted to set of processors
- Each processor executes different instruction sequence
- Never been implemented

Multiple Instruction, Multiple Data Stream- MIMD

- Set of processors
- Simultaneously execute different instruction sequences
- Different sets of data
- SMPs, clusters and NUMA systems

Taxonomy of Parallel Processor Architectures



MIMD - Overview

- General purpose processors
- Each can process all instructions necessary
- Further classified by method of processor communication

Tightly Coupled - SMP

- Processors share memory
- Communicate via that shared memory
- Symmetric Multiprocessor (SMP)
  - Share single memory or pool
  - Shared bus to access memory
  - Memory access time to given area of memory is approximately the same for each processor

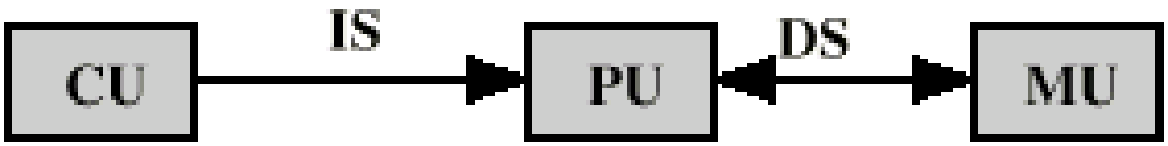
Tightly Coupled - NUMA

- Nonuniform memory access
- Access times to different regions of memory may differ

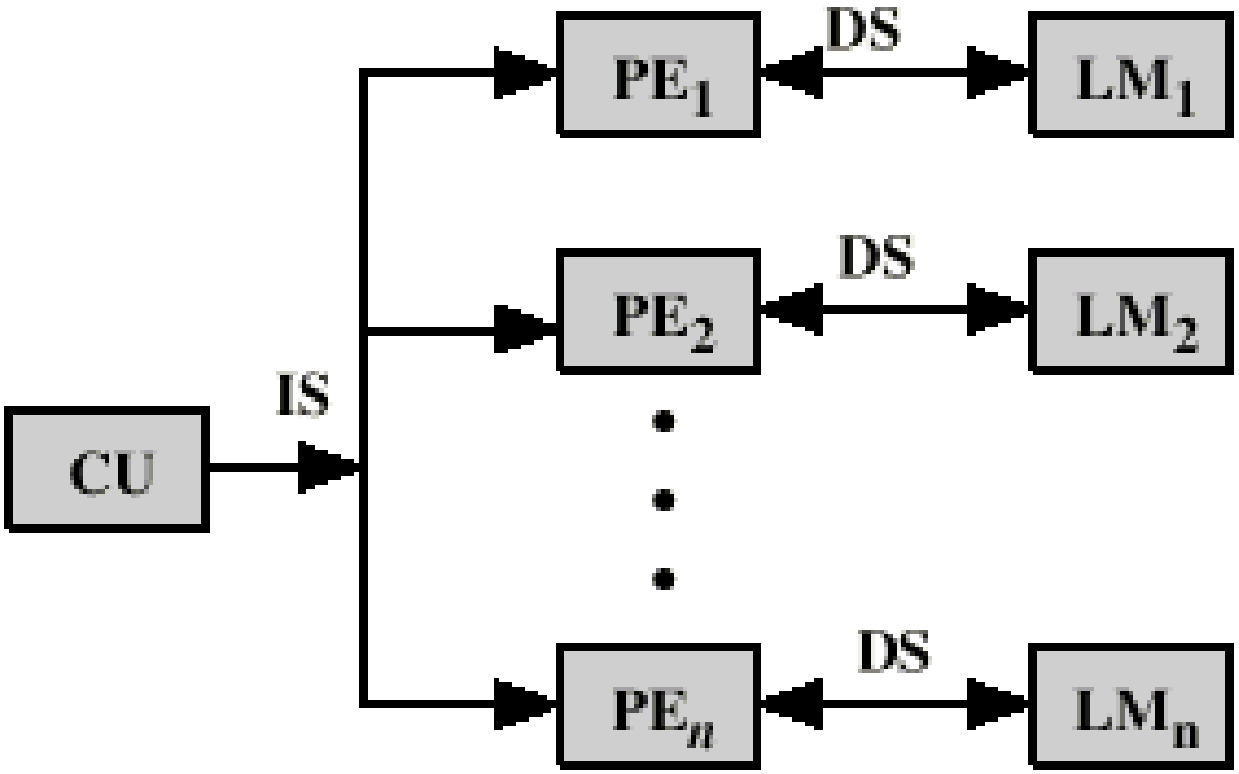
Loosely Coupled - Clusters

- Collection of independent uniprocessors or SMPs
- Interconnected to form a cluster
- Communication via fixed path or network connections

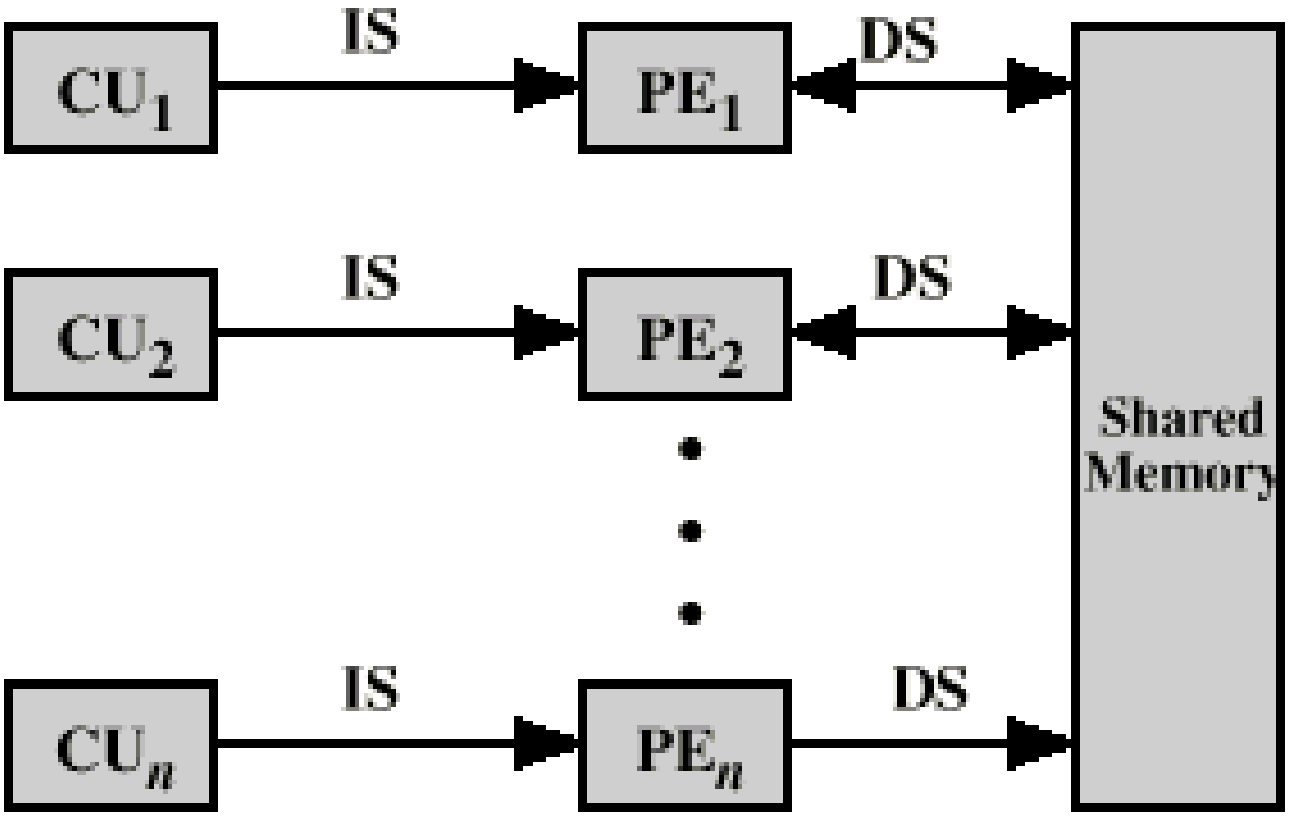
Parallel Organizations - SISD



Parallel Organizations - SIMD



Parallel Organizations - MIMD Shared Memory



Parallel Organizations - MIMD Distributed Memory