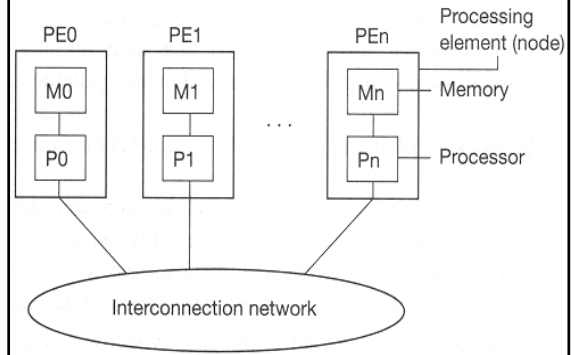## Introduction to MIMD architectures

- {Multi-processor}
- {Multi-computer}
- 15.1 Architectural concepts
- 15.2 Problems of scalable computers
- 15.3 Main design issues of scalable MIMD computers

TECH
Computer Science

Multi-computer:
Structure of Distributed Memory MIMD Architectures

Multi-computer (distributed memory system):
Advantages and Disadvantages

- +Highly Scalable
- +Message passing solves memory access synchronization problem

- -Load balancing problem
- -Deadlock in message passing
- -Need to physically copying data between processes

Multi-processor:
**Structure of Shared Memory MIMD Architectures**
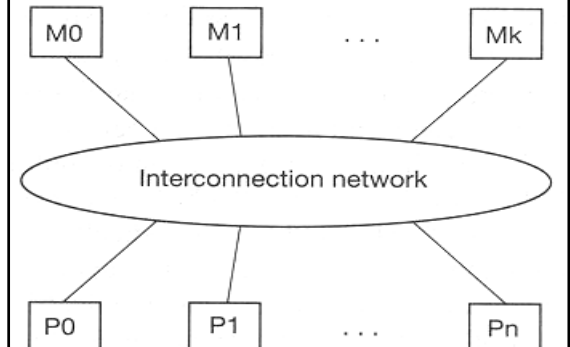
Multi-processor (shared memory system):
Advantages and Disadvantages

- +May use uniprocessor programming techniques
- +Communication between processor is efficient

- -Synchronized access to share data in memory needed
- -Lack of scalability due to (memory) contention problem

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Best of Both Worlds
(Multicomputer using virtual shared memory)

- Also called distributed shared memory architecture
- The local memories of multi-computer are components of global address space:
  - → **any processor can access the local memory of any other processor**
- Three approaches:
  - → **Non-uniform memory access (NUMA) machines**
  - → **Cache-only memory access (COMA) machines**
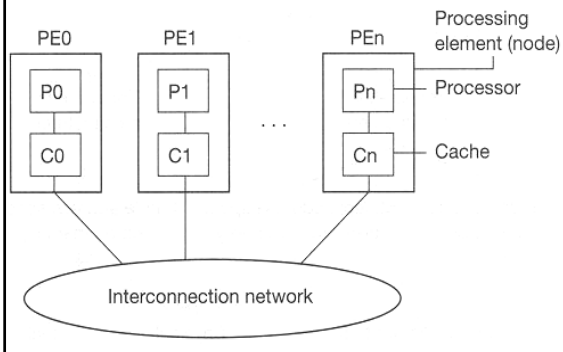 - → **Cache-coherent non-uniform memory access (CC-NUMA) machines**
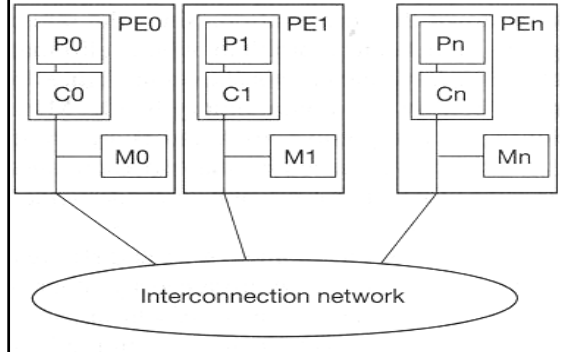
Structure of NUMA Architectures

NUMA: remote load

Result := A + B
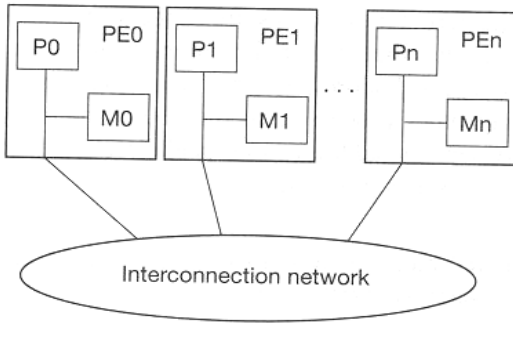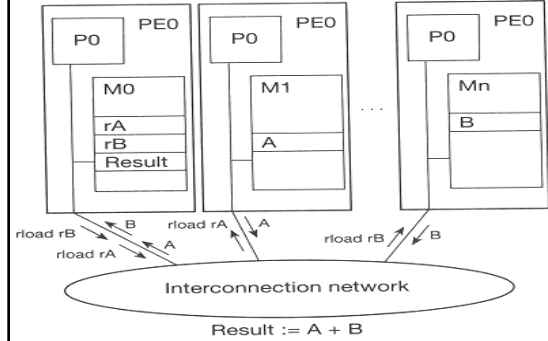
Structure of COMA Architectures

Structure of CC-NUMA Architectures

Classification of MIMD computers