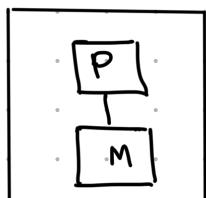


Week IV - Hardware Architect

Uniprocessor :



- 1) Single Processor
- 2) Directly memory access 

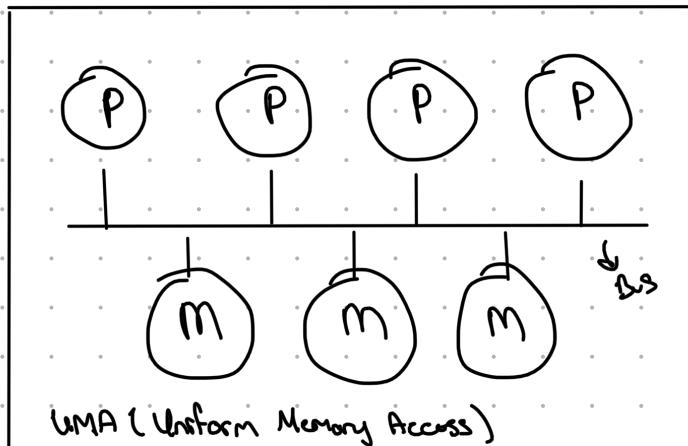
(P: Processor , M: Memory)

↳ Node

Multiprocessor :

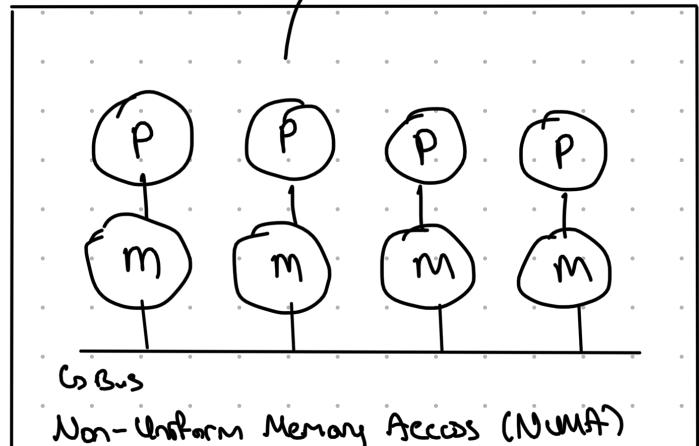
- 1) Multiple Processors
- 2) Direct memory access

SMP, multicore



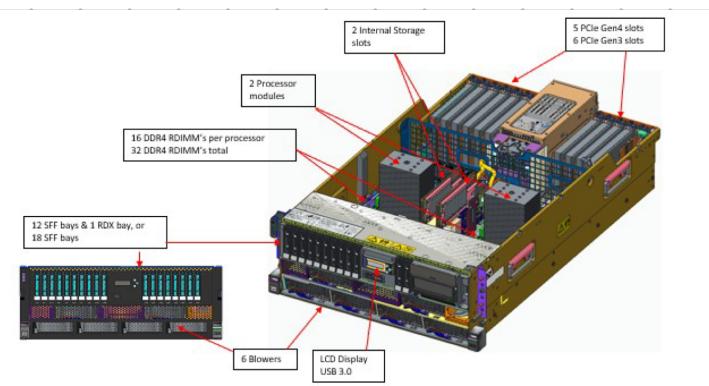
Lined up on the motherboard

NUMA



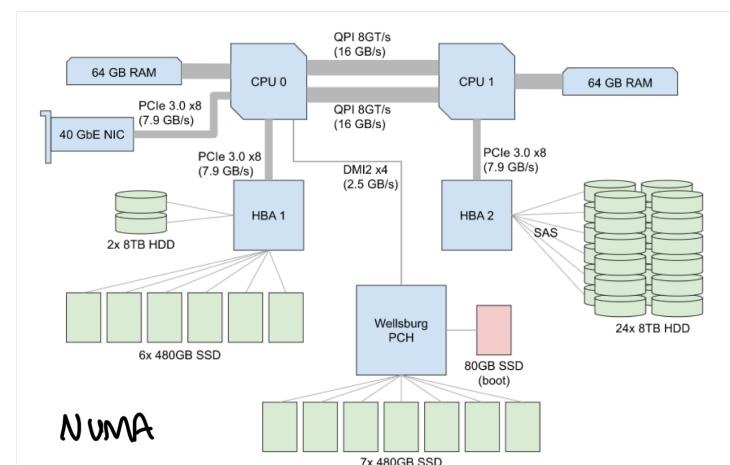
IBM PowerPC

- * Process and memory runs with pool approach.
- * Process and memory NEVER MATCH WITH EACH OTHER (Direct access available but process and memory don't match 1:1)



HP Superdome (35-40k \$)

- * Process and memory MATCH WITH EACH OTHER (Memory and process matches 1:1)



* Used for CFD (Computational Fluid Dynamics)

* Today's systems are generally using UMA (Uniform memory access) approach.

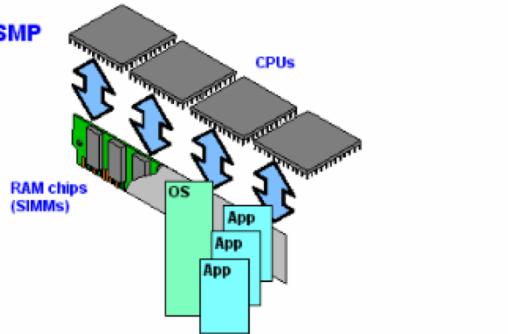
UMA

- ↳ Every processor separately
- Shared memory
- Communicate with bus

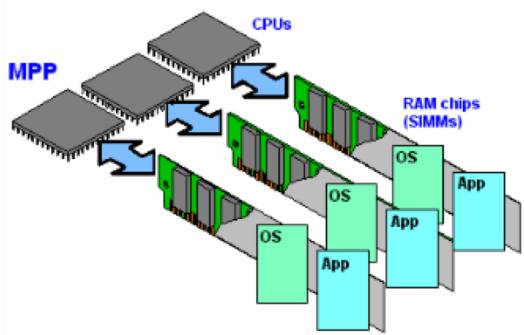
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Symmetric Multiprocessing

SMP

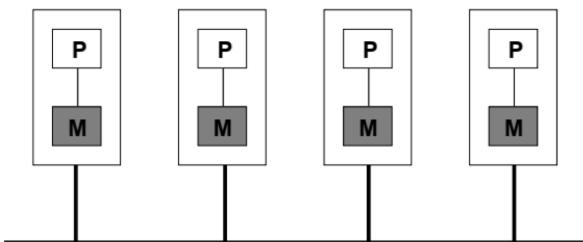


MPP



Massively Parallel Processing

Multicomputer: (Multi-node)



↳ Also may be UMA - multi

Properties:

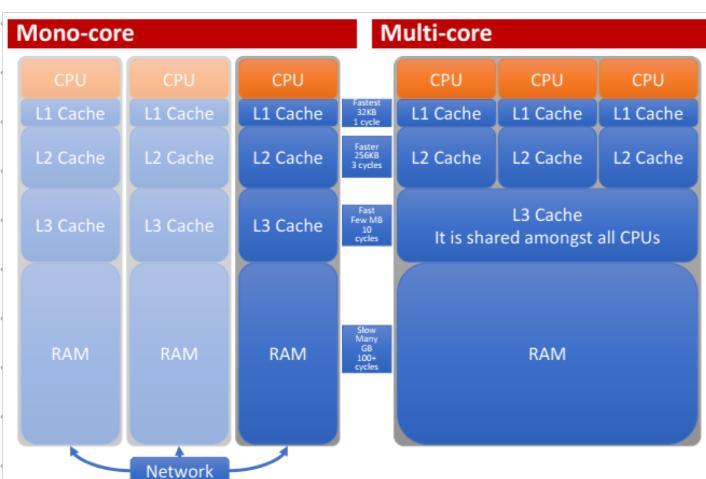
- Multiple computers
- No direct memory access !!!
- Network
- Homogeneous vs. Heterogeneous

Multi Node Computer Systems

* Communicate with network

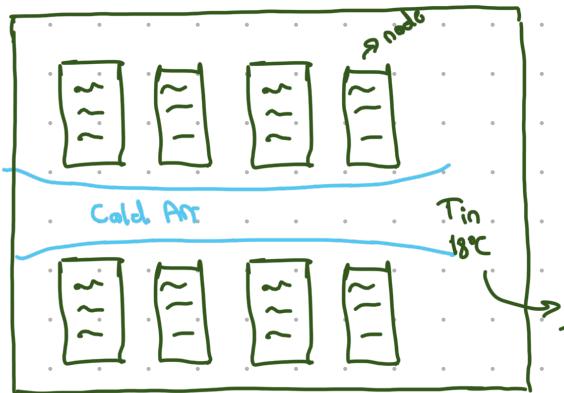
Homogeneous: All nodes are 1:1 same

Heterogeneous: Anti-homogeneous.



Data Center Cooling

1) Cold Corridor



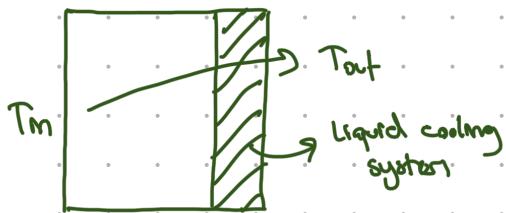
- ✓ CPU exist data center area naming as "WHITE AREA"
- Other spaces naming as "GRAY AREA"

(When designs a data center, frequently asked question)
↳ "What is your white area?,"

$T_{in} < T_{out}$

(If cabin loads greater than 30kW, this cooling model doesn't work)

2) Backdoor Liquid Cooling



(If cabin loads greater than 70-80kW, this cooling model doesn't work)

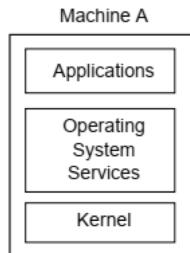
3) Direct CPU Liquid Cooling



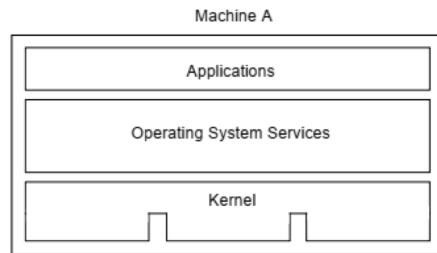
- * This cooling system is specially design for every computing module.
- * Turkey's first direct CPU liquid cooling project was designed at MUBITAK.

Software Systems

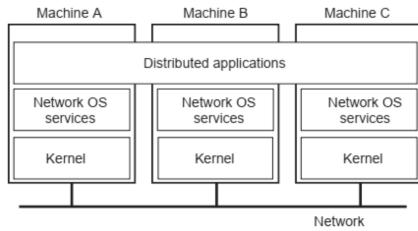
Uniprocessor OS:



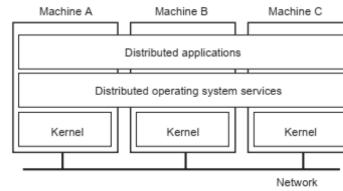
Multiprocessor OS:



Network OS:



Distributed OS: (deprecated for today)



Middleware:

