

Concurrent Programming

Session 2: Introduction

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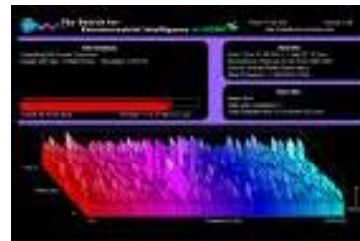
Why Parallelism?

- More complex computing problems
 - Toy Story animation
 - Disney and Pixar used 117 SPARC Workstations to render it.
 - 43 years for a single processor



Why Parallelism?

- More Complex Computing Problems:
- SETI@home
 - Analyses data from the world's largest radio telescope, in the hope of detecting signals generated by alien civilizations
- More than 2 million years for a single computer



Why Parallelism?

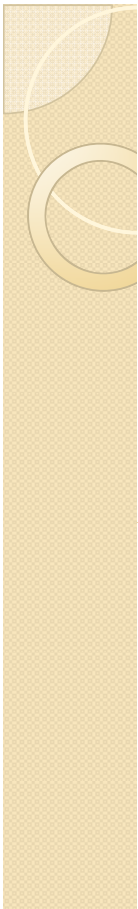
- Constructing Faster Computers is expensive, hard and impossible:
 - Silicon technology limitations
 - Cooling problems
 - Performance degradation

So?



Architectures

- Multi-Processor
 - A set of processors which communicate through a bus
- Multi-Computers
 - A set of workstations which communicate through a network.



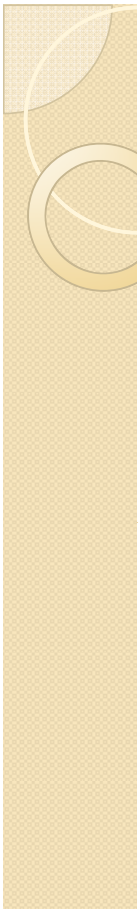
Spectrum of HW Systems

- MPP (Massively Parallel Processors)
 - Expensive, need HP networking, simultaneous access to shared memory, single address space, hardwired, tightly couples
- COW (Cluster of Workstations)
 - Cheaper, easy to make, message passing, not hardwired, flexible, loosely coupled



Architecture

- Discuss about:
 - The differences of MPs and MCs
 - Programming model?
 - Scalability?
 - Ease of programming?
 - Building cost?
 - Hardware availability?
 - Software availability?

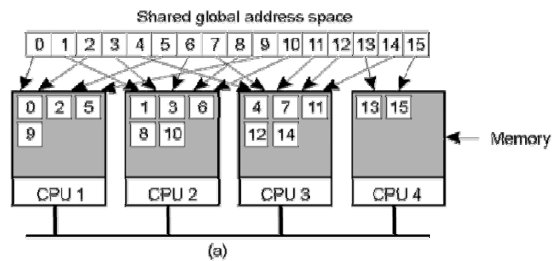


Parallelism vs. Distribution

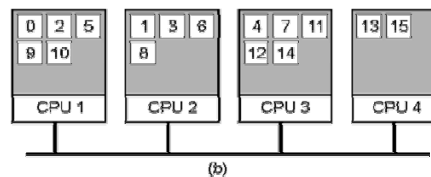
- Sometimes a user's program which is inherently parallel, can be run on a multiprocessor.
- This will happen by a parallelizing compiler, proper operating system and specific hardware.
- In a distributed system, this will happen among more than a computer.

Distributed Shared Memory (DSM)

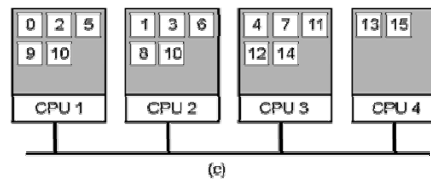
Pages of address space distributed among four machines



Situation after CPU 1 references page 10



Situation if page 10 is read only and replication is used



Questions

- A complex algorithm is going to be executed. Which one is cheaper? Using a multicomputer or a multiprocessor?
- What's the idea behind the DSM?
- Discuss about COW and MPP from the following point of view:
 - Cost,
 - Ease of programming
 - Scalability
 - Speed
 - Programming model