

并行程序设计原理

北京大学信息学院



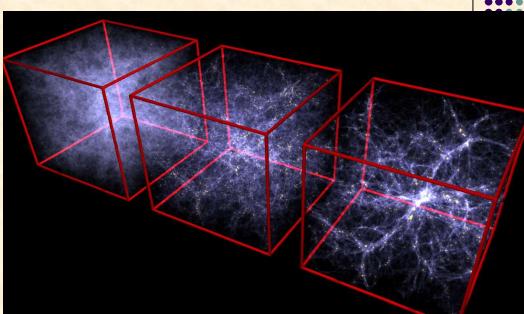
内容

- 并行体系结构
- 低层并行编程介绍 (CUDA、MPI、Pthread、SCIF、GlobalArrays、OpenMP Offload)
- 典型并行算法
- 高级并行编程 (OpenMP、Parray、MapReduce)
- 并行理论 (Petri网、线性逻辑、进程代数)

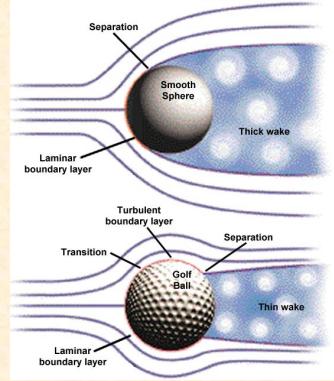
Getting Started

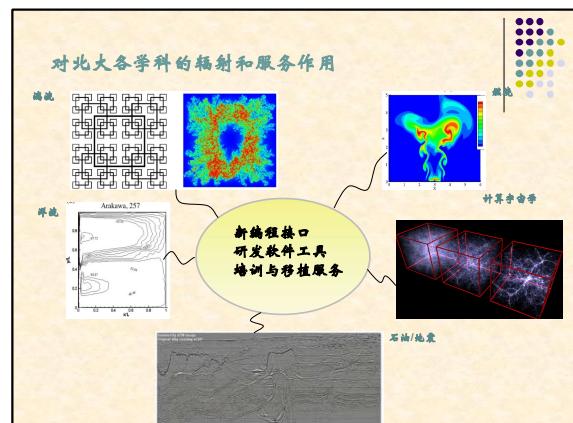
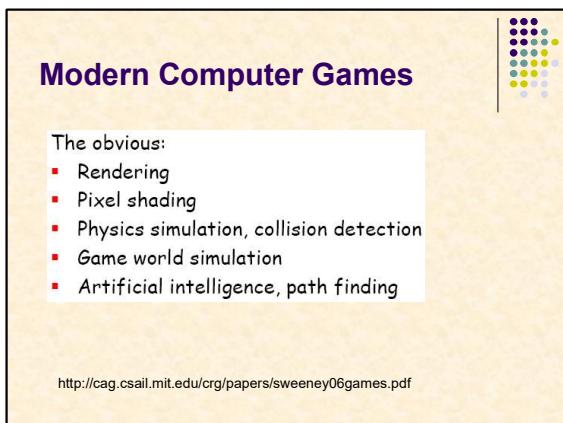
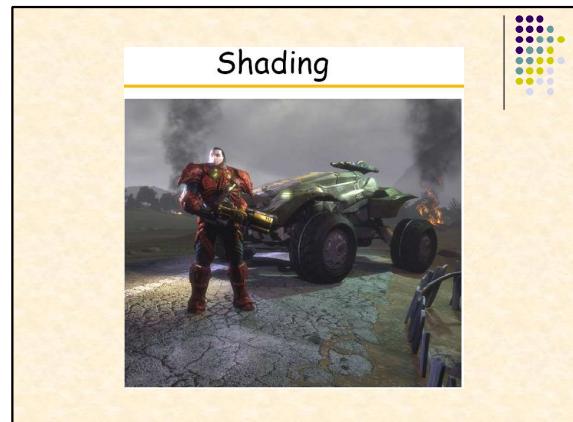
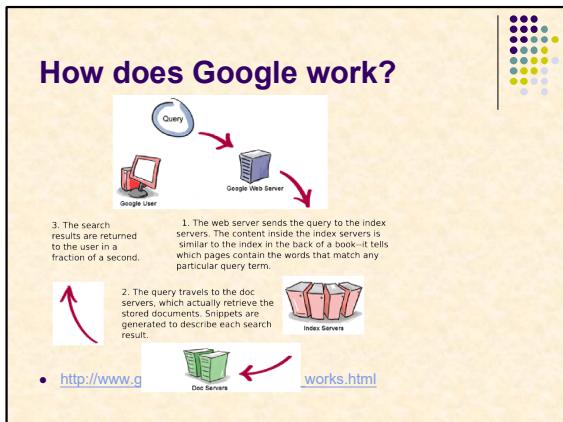
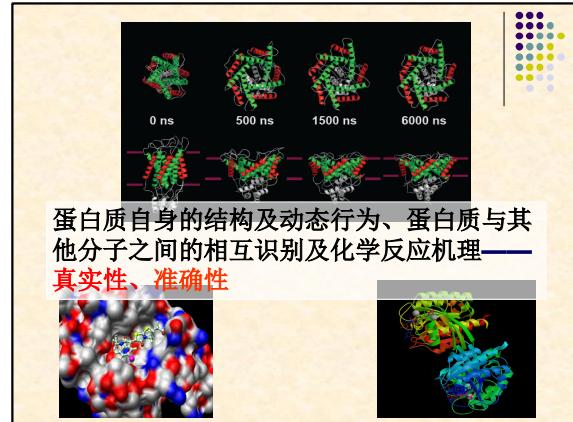
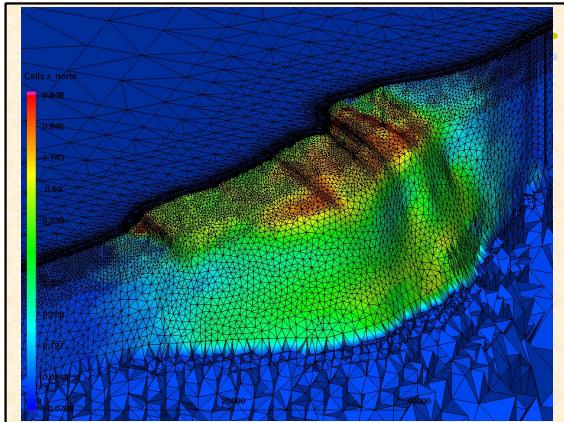
- http://www.nvidia.com/object/cuda_get.html

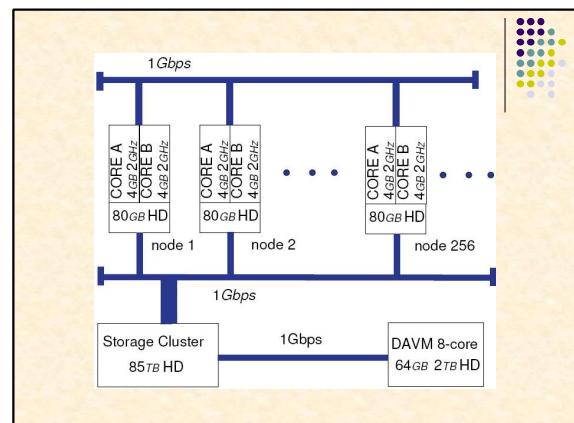
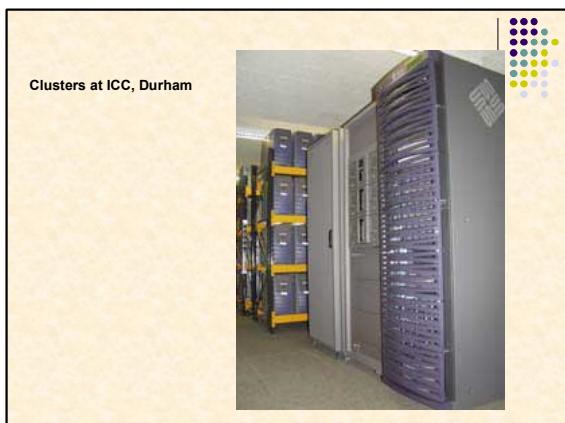
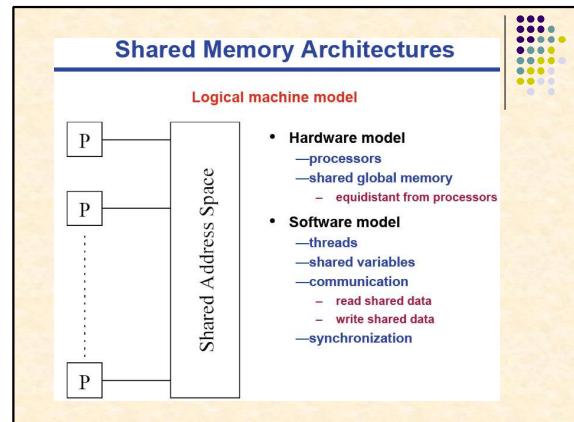
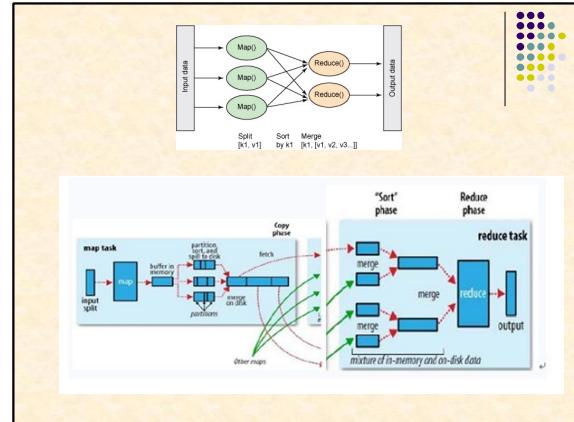
并行计算的应用

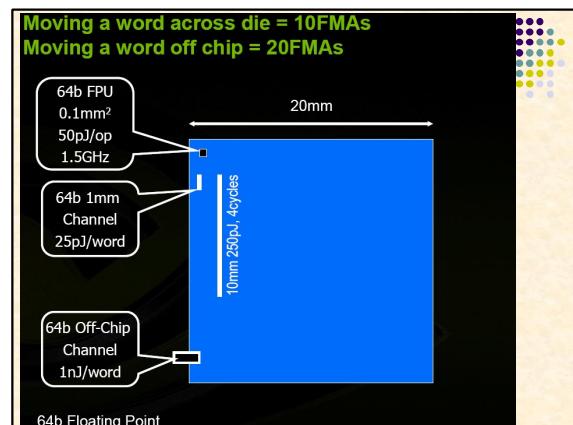
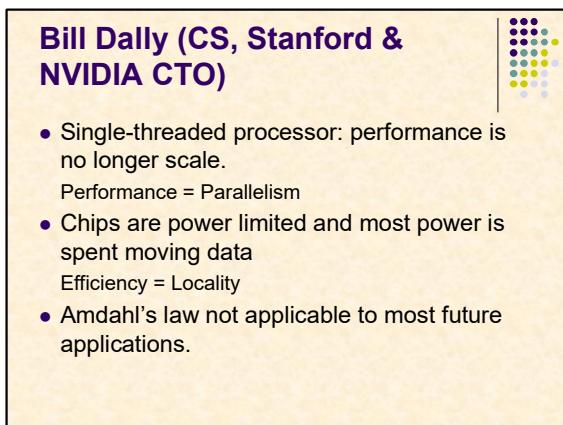
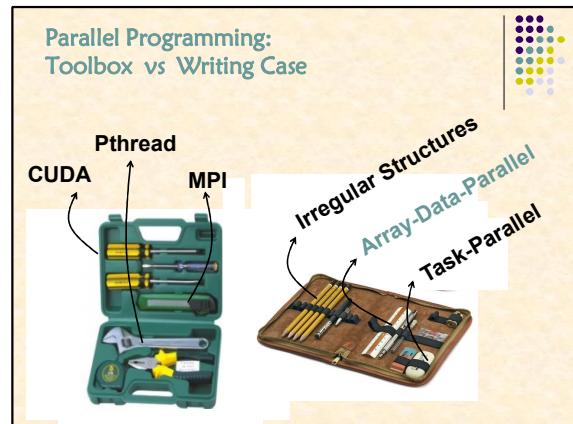
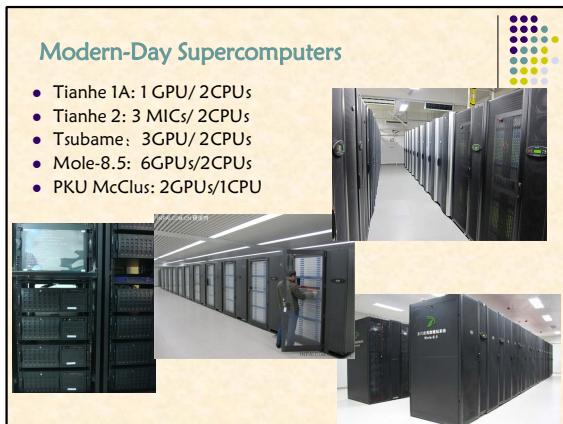
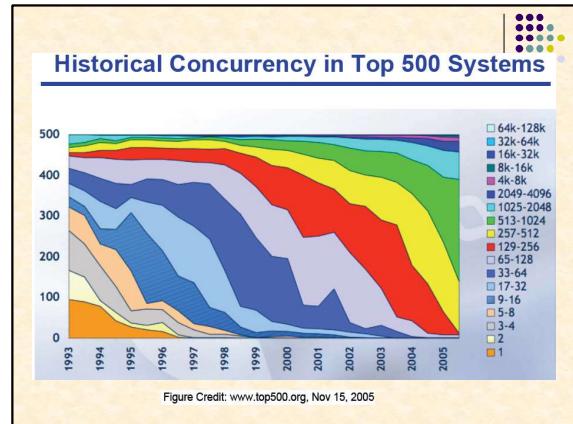
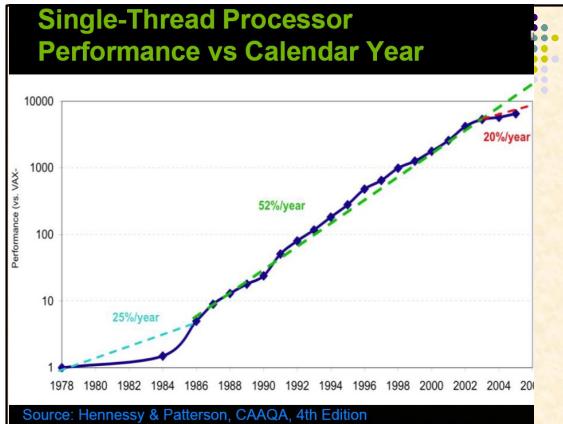



cosmological numerical simulations Springel et al. (2001)



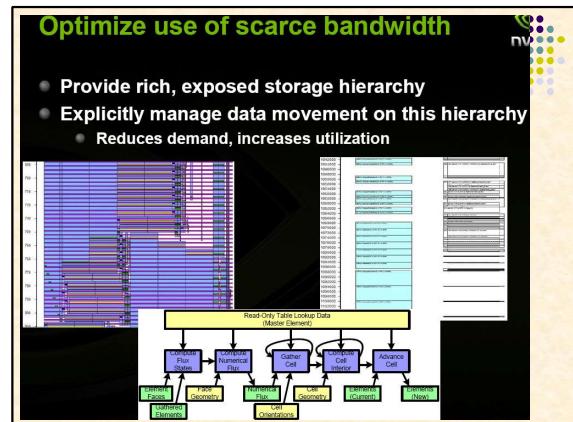
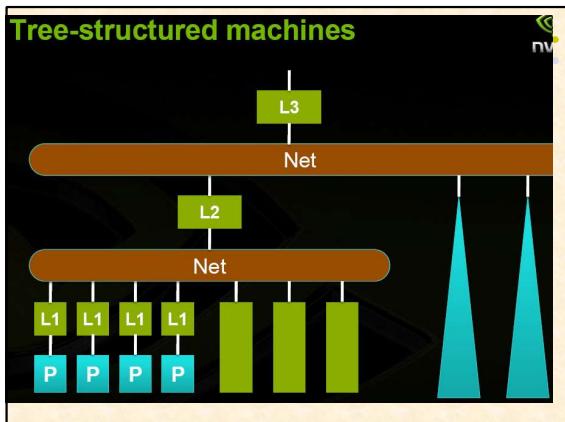
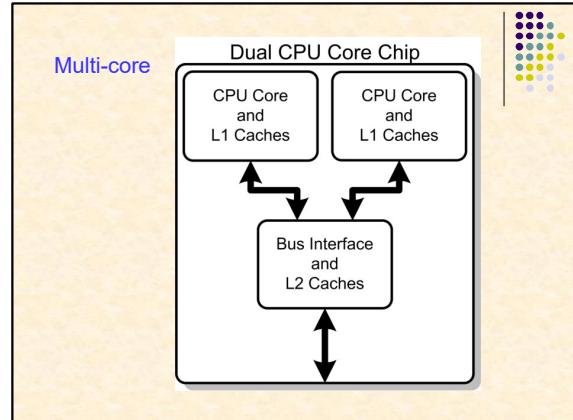







Exploiting parallelism and locality requires:

- Many efficient processors**
(To exploit parallelism)
- An exposed storage hierarchy**
(To exploit locality)
- A programming system that abstracts this**



Avoid Denial Architecture

- Single thread processors are in denial about parallelism and locality
- They provide two illusions:
 - Serial execution - Denies parallelism
 - Tries to exploit parallelism with ILP - inefficient & limited scalability
 - Flat memory - Denies locality
 - Tries to provide illusion with caches – very inefficient when working set doesn't fit in the cache
- These illusions inhibit performance and efficiency



