cse5441 - parallel computing

introduction

high performance computing

Wikipedia:	"High-performance computing" redirects here (supercomputer) A supercomputer is a computer with a very high-level computational capacity.
Intel:	" … time to results, handle today's unprecedented growth in data volumes, and improve the accuracy and precision of data modeling and simulation applications."
Dell:	"… drive faster processing for the most demanding applications, including computational chemistry, weather forecasting, financial analytics and engineering design."

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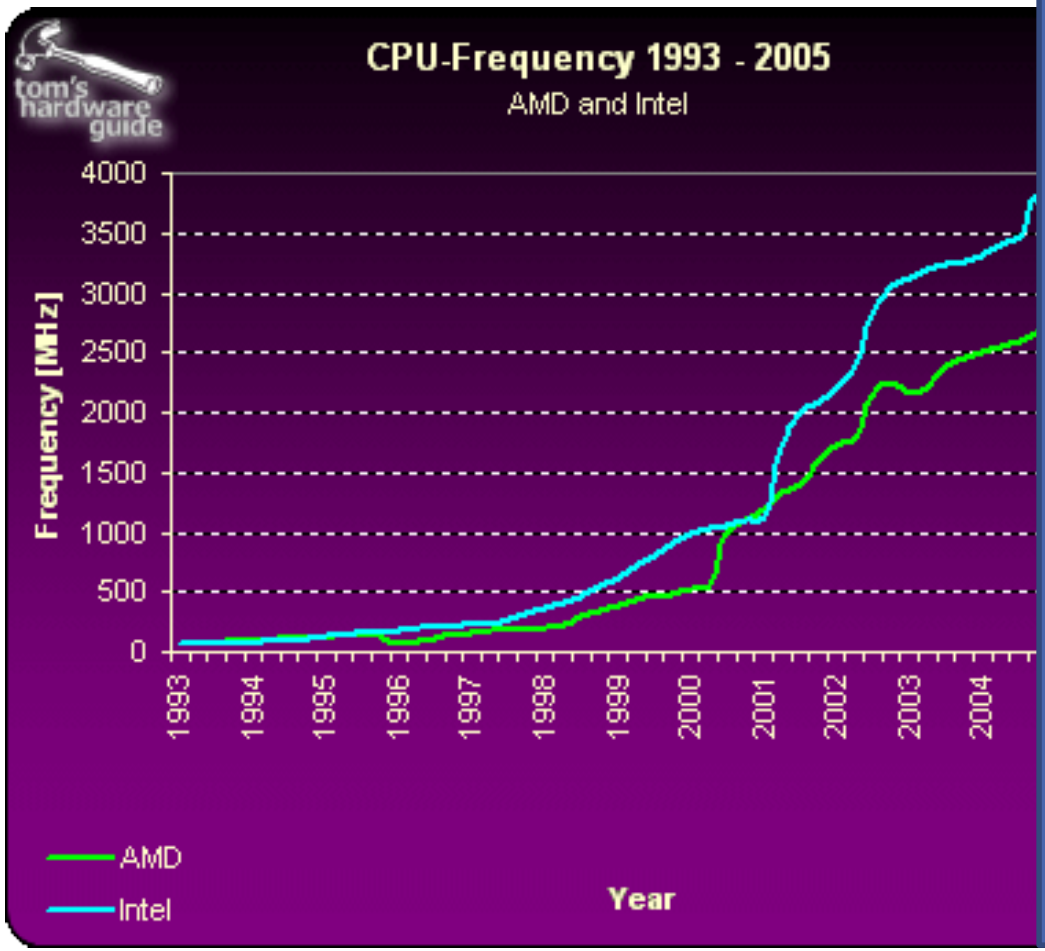
insidehpc.com:	"High Performance Computing most generally refers to the practice of aggregating computing power in a way that delivers much higher performance than one could get out of a typical desktop computer or workstation in order to solve large problems in science, engineering, or business."

https://en.wikipedia.org/wiki/Supercomputer
http://insidehpc.com/hpc-basic-training/what-is-hpc/
http://www.dell.com/learn/us/en/555/high-performance-computing
http://hpc-asia.com/wp-content/uploads/2014/12/hpc-future-trends.jpg
http://www.intel.com/content/www/us/en/high-performance-computing/server-reliability.html

why parallel computing?

http://img.tomshardware.com/us/2005/11/21/the_mother_of_all_cpu_charts_2005/cpu_frequency.gif



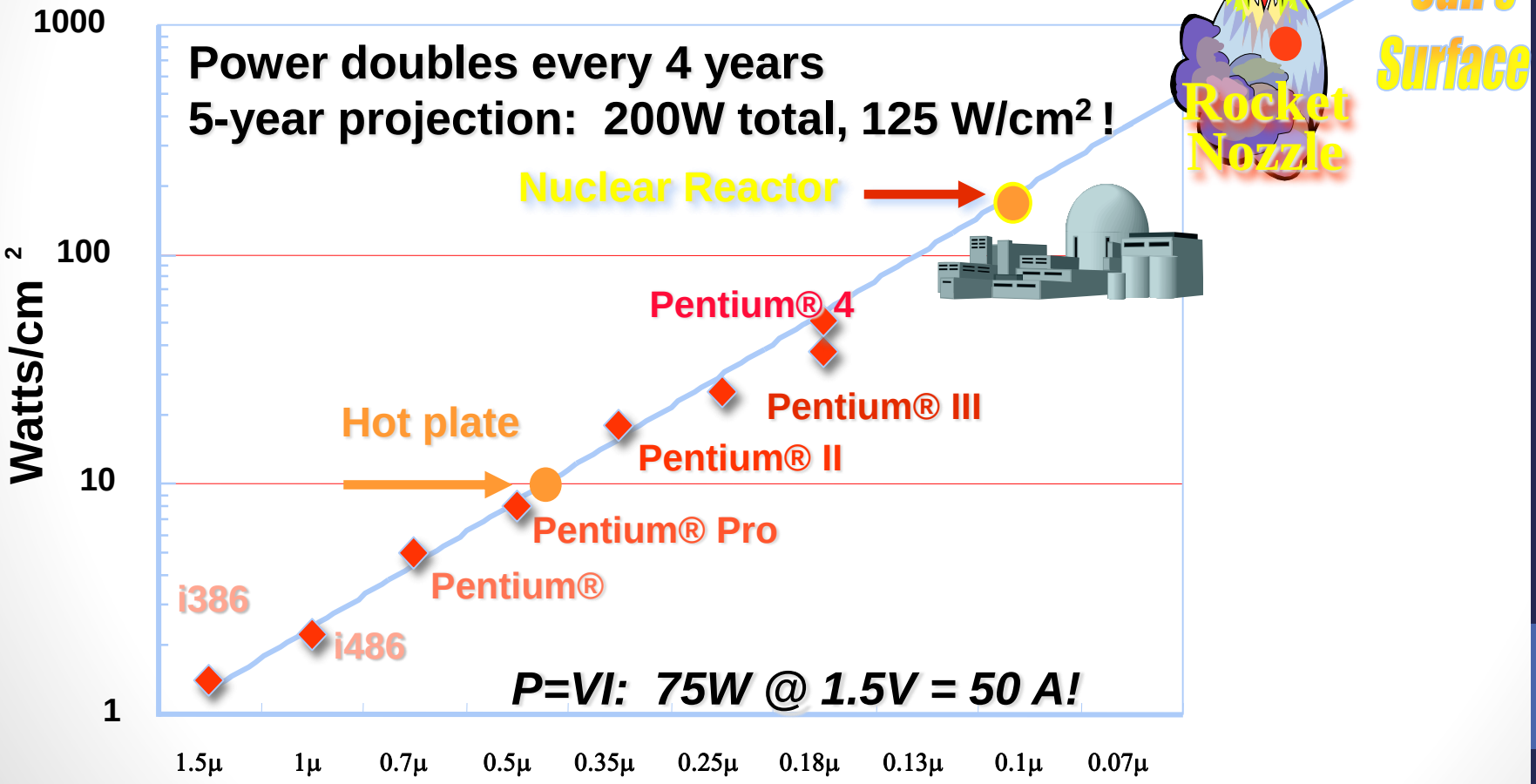
toward

a

brighter

tomorrow

why parallel computing?



* "New Microarchitecture Challenges in the Coming Generations of CMOS Process Technologies" – Fred Pollack, Intel Corp. Micro32 conference key note - 1999. Courtesy Avi Mendelson, Intel.

why parallel computing?

http://img.tomshardware.com/us/2005/11/21/the_mother_of_all_cpu_charts_2005/cpu_frequency.gif

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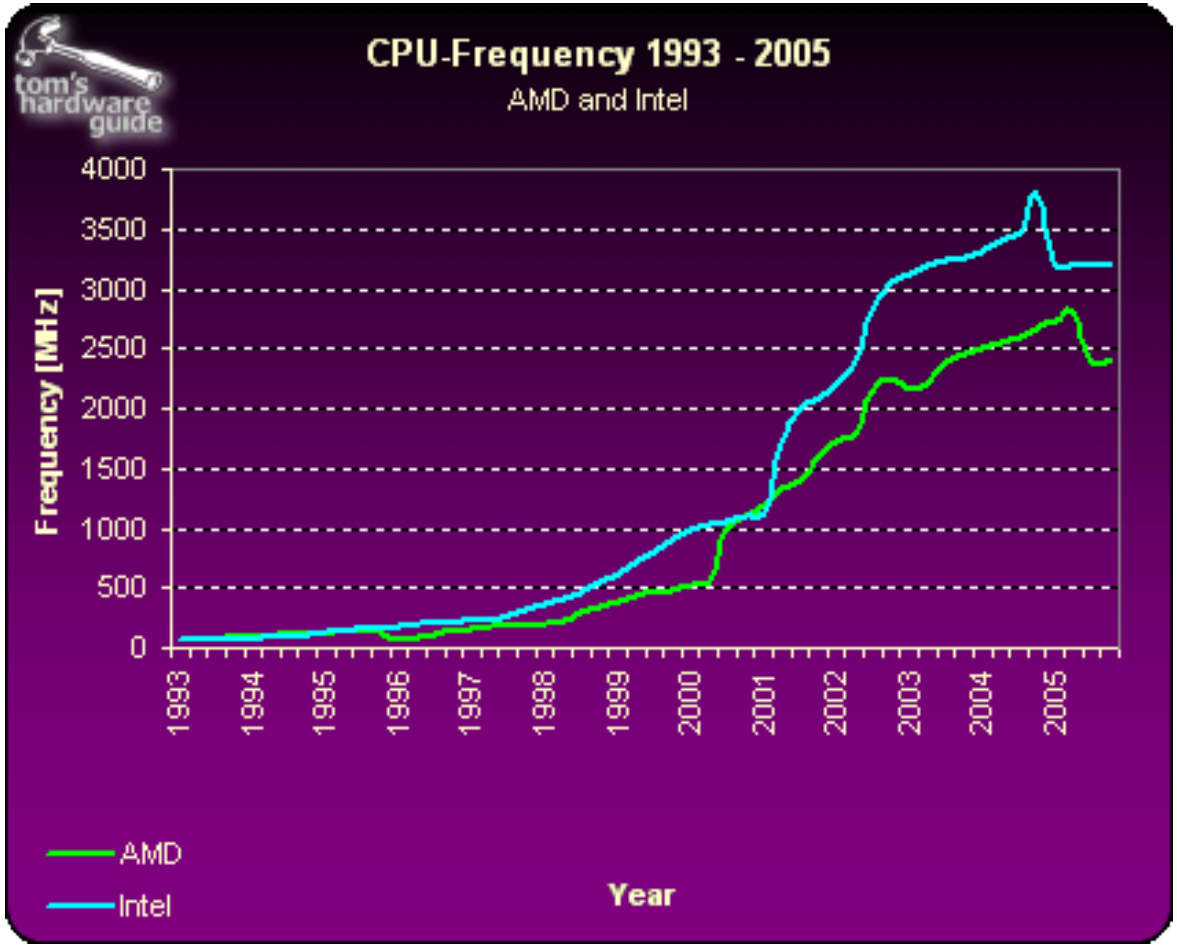
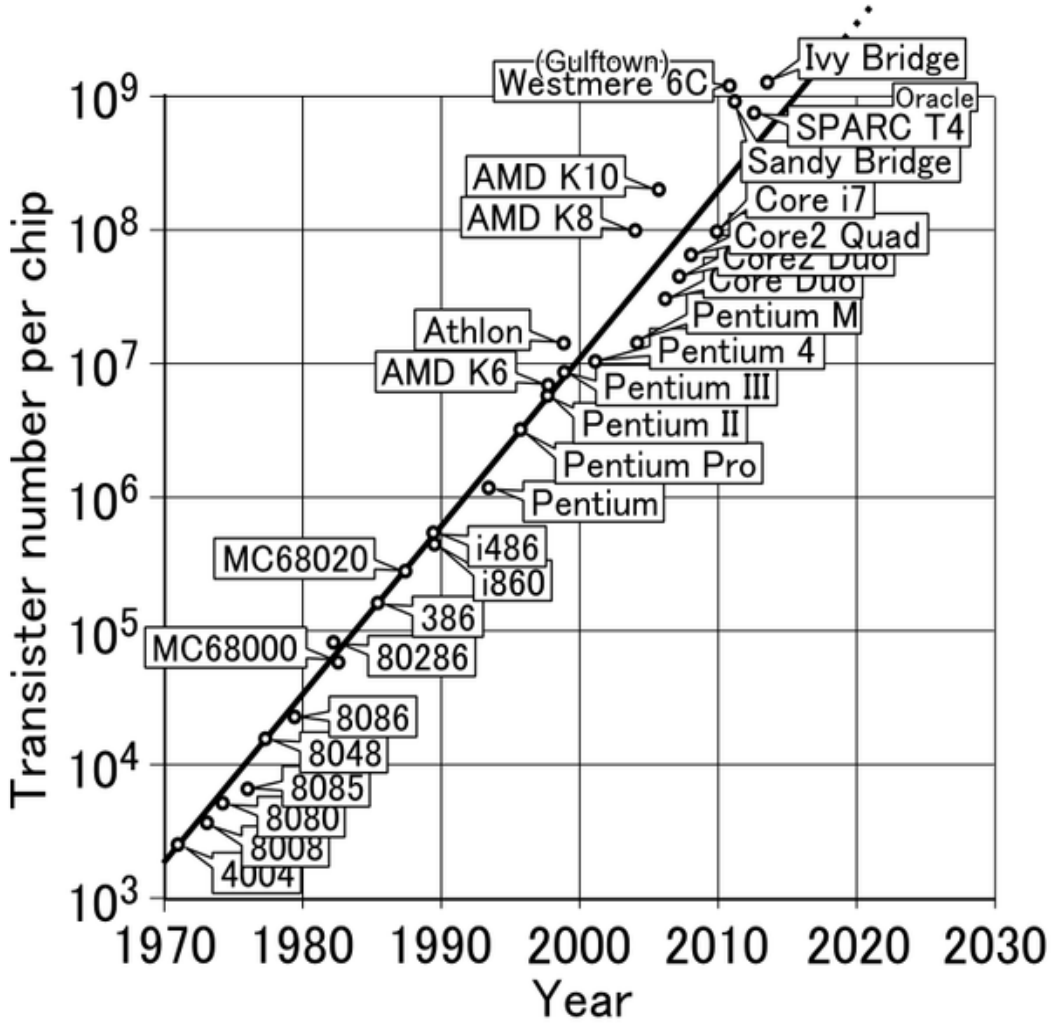


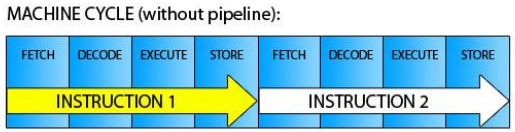
2004 – Intel cancels Tejas and Jayhawk due to "heat problems due to the extreme power consumption of the core ..."

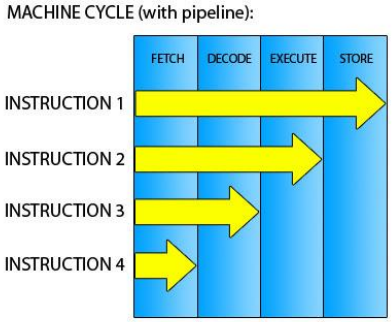
Moore's law



http://www.cringely.com/wp-content/uploads/2013/10/642px-Moores_law_1970-2011.png

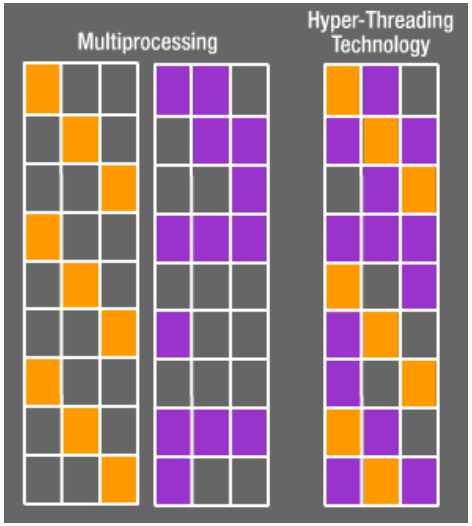
parallel everywhere





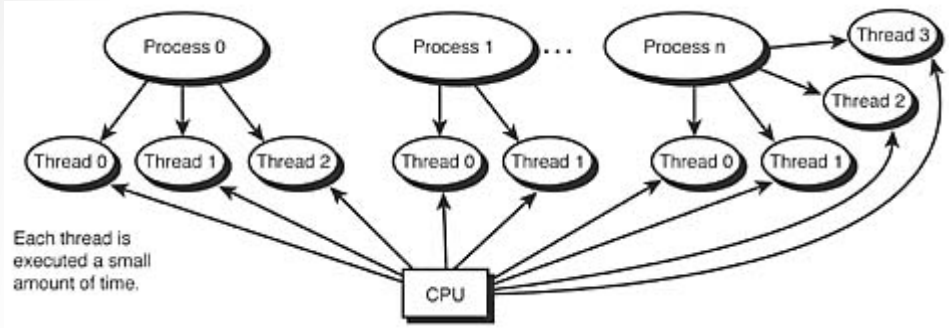
pipelining

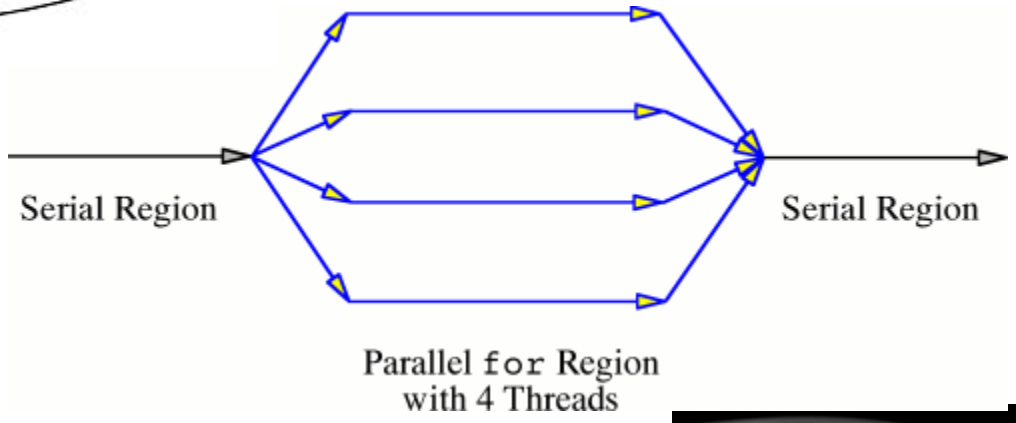
hyper-
threading

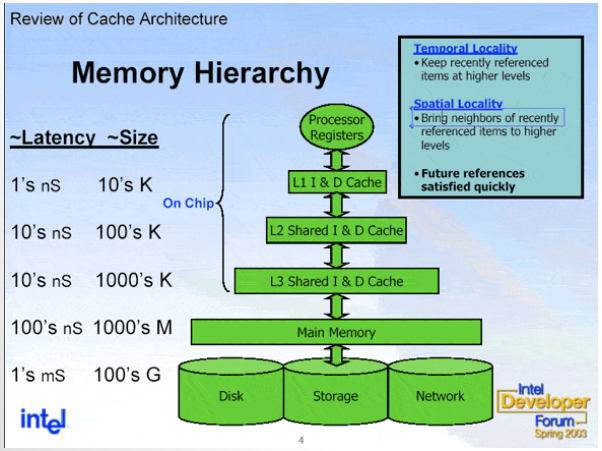


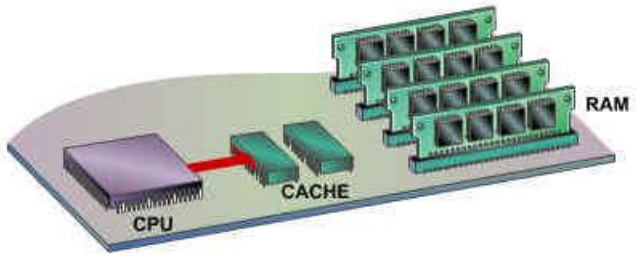
https://software.intel.com/sites/default/files/m/d/4/1/d/8/205971_205971.gif
http://blog.teachbook.com.au/wp-content/uploads/2011/02/Machine-Cycle.jpg

cse5441 - software focused









http://www.alf.sd83.bc.ca/courses/it11/images/proces9.jpg
http://www.yaldex.com/games-programming/FILES/02fig02.gif
http://www.senukex.co/wp-content/uploads/Multi-Threading.jpg
http://www.nordichardware.com/skrivelser_img/372/intelgrafik.gif
http://www.windowsnetworking.com/img/upl/image0021225707175745.gif

cse5441 - course outline

- introduction
- single-core methods
  - cache management
  - loop analysis and transformation
  - data dependence analysis
- parallel programming methods
  - Posix threads
  - OpenMP
  - CUDA
  - Message Passing Interface (MPI)
- vectorizing compilers

cse5441 - syllabus

- organizational information
- course materials
  - text / additional readings
  - lecture presentations
  - electronic media
  - programming sessions
- course objectives
  - high-performance architectures
  - programming for high performance
  - multi-processing architectures
  - multi-processing APIs
- grading policies
- important dates
- course expectations and policies

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