
COMP 322: Fundamentals of Parallel Programming

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COMP 322 Course Information: Spring 2012

- “Fundamentals of Parallel Programming”
- Lectures: MWF, 1pm - 1:50pm
- Labs: 4pm - 5:20pm on Thurs (section A01) OR 3:30pm - 4:50pm on Weds (section A02)
- Instructor: Vivek Sarkar (vsarkar@rice.edu)
- Web site:
 - <https://wiki.rice.edu/confluence/display/PARPROG/COMP322>
 - Or do a web search on “comp322 wiki”
- Prerequisites: COMP 215 or equivalent
 - Parallel programming courses at other universities require more advanced prerequisites
- Cross-listing: ELEC 323



Scope of Course

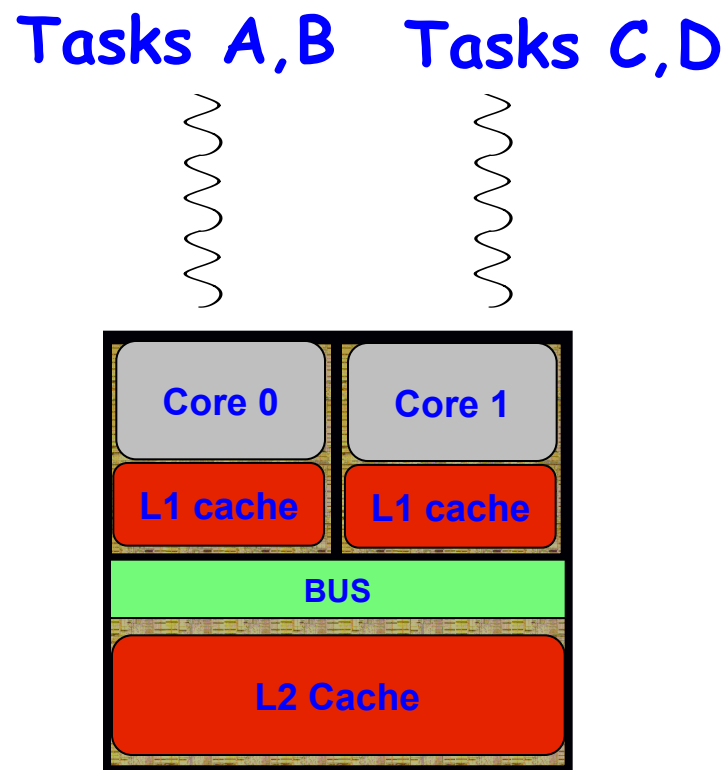
- **Approach**

- Mid-level parallel programming --- “Simple things should be simple, complex things should be possible”
- Introduce students to fundamentals of parallel programming
 - Primitive constructs for task creation & termination, collective & point-to-point synchronization, task and data distribution, and data parallelism
 - Abstract models of parallel computations and computation graphs
 - Parallel algorithms & data structures including lists, trees, graphs, matrices
 - Common parallel programming patterns
- Use Habanero-Java (HJ) as pedagogical language for two-thirds of course, and then teach standard programming models (Java concurrency, MPI, CUDA) using HJ principles



What is Parallel Programming?

- Specification of operations that can be executed in parallel
- A parallel program is decomposed into sequential subcomputations called *tasks*
- Parallel programming constructs define task creation, termination, and interaction



Schematic of a Dual-core Processor

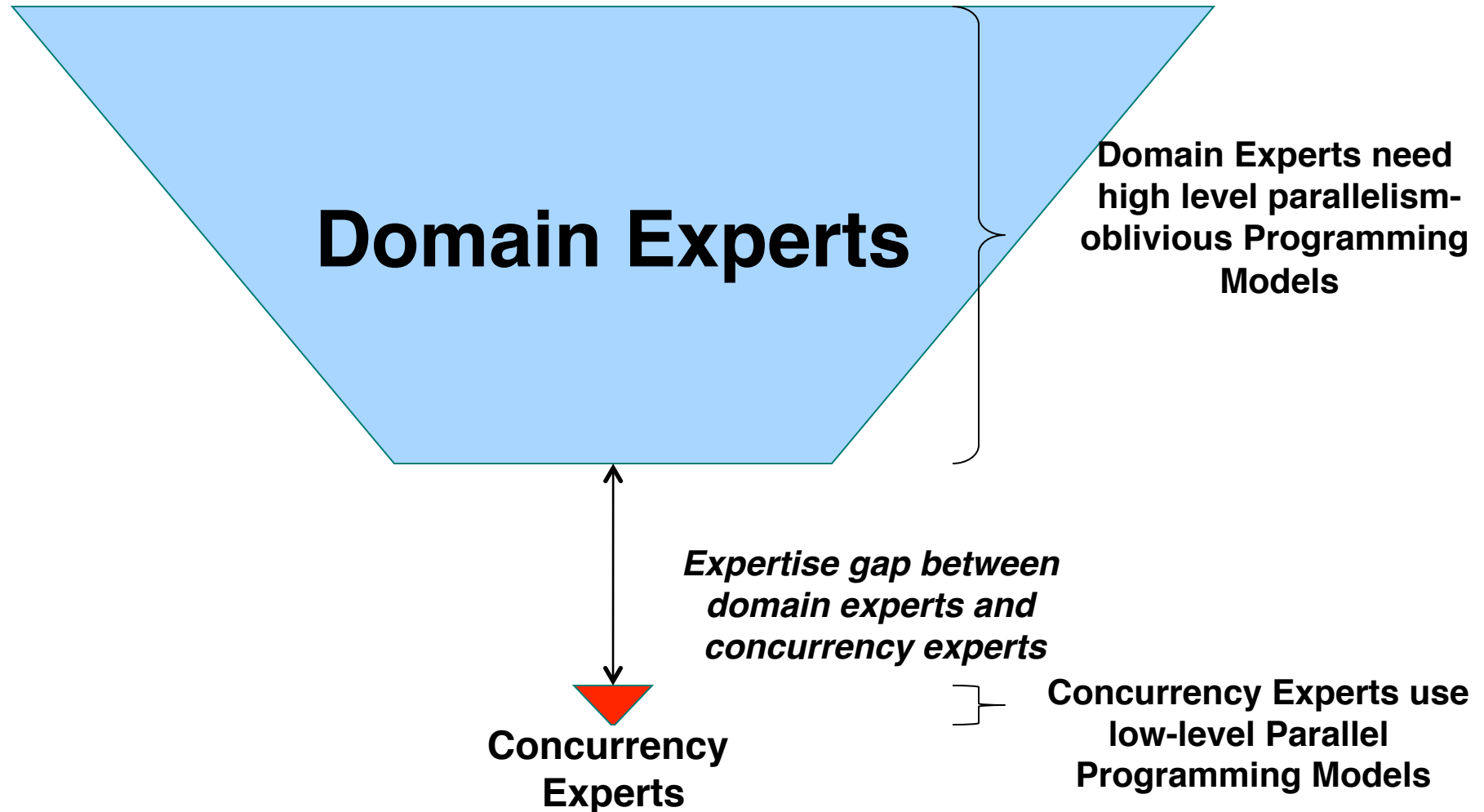


Why Parallel Computing Now?

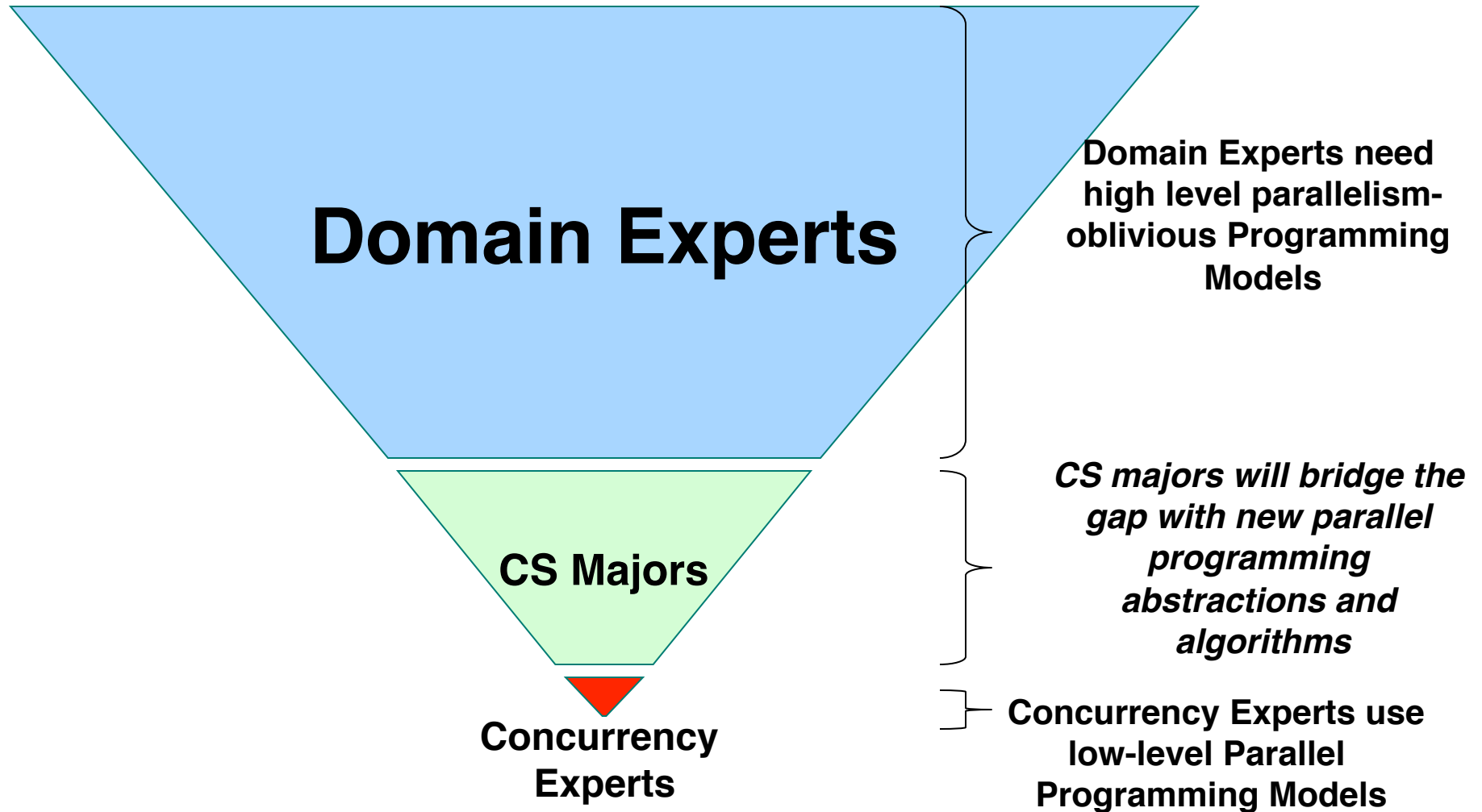
- Researchers have been using parallel computing for decades as a specialized capability:
 - Problems too large to solve on one computer; use 100s or 1000s
- There have been higher level courses in parallel computing (COMP 422, COMP 522) at Rice for several years
- Why has Rice added a 300-level undergraduate course on parallel programming now?
 - Because the entire computing industry has bet on multicore parallelism
 - Number of cores in a single computer chip is projected to increase to ~ 100 by 2020
 - There is a desperate need for all computer scientists and practitioners to be aware of parallelism
 - Nationwide discussion on how to add parallel programming foundations to the undergraduate CS curriculum --- Rice is ahead of the curve



Parallel Software Challenge & Expertise Gap



CS Majors to the Rescue

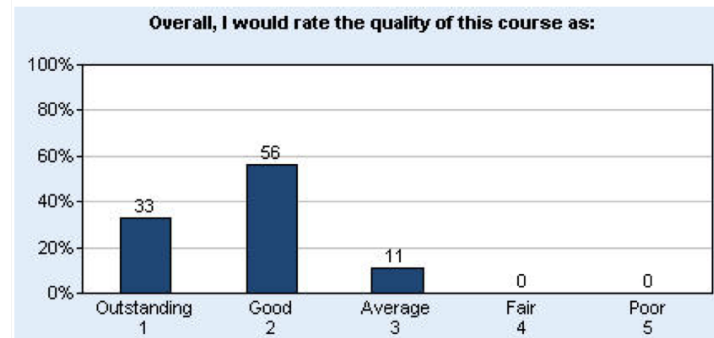


COMP 322 course evaluations: Spring 2011

- First time course was offered in current form (prior offering in Fall 2009 was targeted to juniors/seniors)

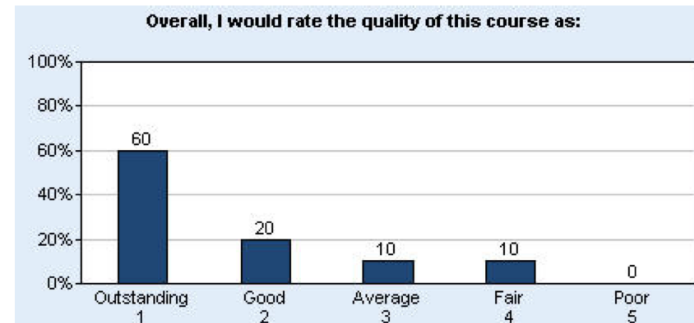
- **Section A01**
(9 responses from 12 enrolled)

Class Mean: 1.78 Rice Mean: 1.87
Responses: 9



- **Section A02**
(10 responses from 12 enrolled)

Class Mean: 1.70 Rice Mean: 1.87
Responses: 10



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