

BLUE WATERS

SUSTAINED PETASCALE COMPUTING

Teaching a Virtual School /XSEDE Graduate Course

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GREAT LAKES CONSORTIUM
FOR PETASCALE COMPUTATION

CRAY

UIUC ECE 598HK (now ECE508) Background

- Started as a full-semester experimental graduate course on algorithm scalability techniques for manycores in 2010
- Offered as a one-week VSCSE Summer School
 - in 2011 and 2012, video linked to 10 sites
- Also as a one-week EU PUMPS Summer School
 - Offered in 2012, 2013, 2014, 2015 in Barcelona
- Offered as multi-university Virtual School course ECE 598HK in 2012 and 2014

Seven Techniques in Many-core Programming

- Scatter to gather transformation
- Granularity coarsening and register tiling
- Data access tiling
- Data layout and traversal ordering
- Binning (spatial sorting) and cutoff
- Bin sorting and partitioning for non-uniform data
- Hierarchical queues and kernels for dynamic data

Model of Operation

- The lead university provides
 - Video lectures
 - Programming labs
 - Exams
 - Lead TAs
 - Wiki page
 - Grade report to local faculty
- Each participating university locally offers a experimental course
 - Classroom discussions
 - Local responsible faculty
 - Final grading policy/decisions

Fall 2014 Offering

- U. of Illinois/NCSA - Lead
 - Prof. Wen-mei Hwu
- U. of Tennessee, Knoxville
 - Prof. Greg. Peterson
- U. of Oklahoma
 - Prof. Ron Barnes
- NC State U.
 - Prof. Huiyang Zhou

Some Important Parts

- Bi-Weekly conference calls with all instructors
 - Overview of the next two weeks, tips, known issues, resources
 - Status on the ground, feedback, requests,
- Course Wiki that gives each participating university
 - Customized calendars and deadlines
- Final project proposal workshops and presentations attended by lead professor and TAs

Some Thoughts

- Pooling specialized graduate courses will become a necessity for public institutions
 - More frequent offering, fewer students required per institution, access to less common faculty expertise
- Key to sustainability is building a community
 - More than one potential lead university
 - Contribution to lectures, labs, exams, and course staffing by participating universities
 - Some type of credit system may be needed for sustainability



Contact Steve Gordon or Scott Lathrop if you interested in becoming a participant or lead for a an existing or new course!