OSCER: State of the Center

Henry Neeman, OSCER Director

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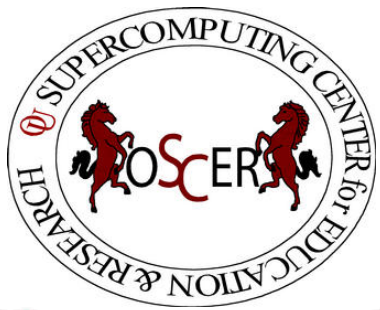
OU Supercomputing Center for Education & Research



Vice President for Research
University of Oklahoma

Oklahoma Supercomputing Symposium 2005

Wednesday October 5 2005, University of Oklahoma

People

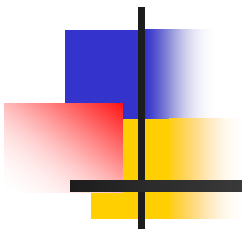

EXIT
Fall Semester 2003
Integration of HPC in
Nanotechnology
National Science Foundation

Things

Outline

- Who, What, Where, When, Why, How
- What Does OSCER Do?
  - Education
  - Research
  - Dissemination
  - Resources – an **ORDER OF MAGNITUDE YEAR**
- OSCER's Future

Who, What, Where, When, Why, How



What is OSCER?

- Multidisciplinary center
- Division of OU Information Technology
- Provides:
  - Supercomputing **education**
  - Supercomputing **expertise**
  - Supercomputing **resources**: hardware, storage, software
- For:
  - Undergrad students
  - Grad students
  - Staff
  - Faculty
  - Their collaborators (including **off campus**)

Who is OSCER? Academic Depts

- Aerospace & Mechanical Engr
- **NEW! Anthropology**
- Biochemistry & Molecular Biology
- Biological Survey
- Botany & Microbiology
- Chemical, Biological & Materials Engr
- Chemistry & Biochemistry
- Civil Engr & Environmental Science
- Computer Science
- Economics
- Electrical & Computer Engr
- Finance
- **NEW! Health & Sport Sciences**
- History of Science
- Industrial Engr
- Geography
- Geology & Geophysics
- Library & Information Studies
- Mathematics
- Meteorology
- Petroleum & Geological Engr
- Physics & Astronomy
- Radiological Sciences
- Surgery
- Zoology

More than 160 faculty & staff in **25 depts** in Colleges of Arts & Sciences, Business, Engineering, Geosciences and Medicine – with **more to come**!

Who is OSCER? Organizations

- Advanced Center for Genome Technology
- Center for Analysis & Prediction of Storms
- Center for Aircraft & Systems/Support Infrastructure
- Cooperative Institute for Mesoscale Meteorological Studies
- Center for Engineering Optimization
- Fears Structural Engineering Laboratory
- Geosciences Computing Network
- Great Plains Network
- Human Technology Interaction Center
- Institute of Exploration & Development Geosciences
- Instructional Development Program
- Laboratory for Robotic Intelligence and Machine Learning
- Langston University Mathematics Dept
- Microarray Core Facility
- National Severe Storms Laboratory
- NOAA Storm Prediction Center
- OU Information Technology
- OU Office of the VP for Research
- **NEW! Oklahoma Center for High Energy Physics**
- Oklahoma Climatological Survey
- Oklahoma EPSCoR
- **NEW! Oklahoma Medical Research Foundation**
- **NEW! Oklahoma School of Science & Math**
- St. Gregory's University Physics Dept
- Sarkeys Energy Center
- Sasaki Applied Meteorology Research Institute
- **YOU COULD BE HERE!**

Biggest Consumers

- **Center for Analysis & Prediction of Storms**: daily real time weather forecasting
- **Oklahoma Center for High Energy Physics**: simulation and data analysis of banging tiny particles together at unbelievably high speeds
- **Advanced Center for Genome Technology**: bioinformatics (e.g., Human Genome Project)

Who Are the Users?

245 users so far, including:

- 46 OU faculty
- 53 OU staff
- **104 OU students**
- 42 off campus users
- … more being added every month.

Comparison: The National Center for Supercomputing Applications (NCSA), after **20 years of history** and **hundreds of millions of dollars in expenditures**, has about **2150 users**.*

* Unique usernames on cu.ncsa.uiuc.edu and tungsten.ncsa.uiuc.edu

Where is OSCER?

OU is building a new research campus.

The first building to open, the **Peggy & Charles Stephenson Research & Technology Center** (SRTC), now houses bioinformatics, bioengineering, robotics and **OSCER**.

The **reception/poster session** was there last night.

Why OSCER?

- Computational Science & Engineering has become **sophisticated enough** to take its place alongside experimentation and theory.
- **Most students** – and most faculty and staff – **don't learn much CSE**, because it's seen as needing too much computing background, and needs HPC, which is seen as very hard to learn.
- **HPC can be hard to learn**: few materials for novices; most documents written for experts as reference guides.
- **We need a new approach**: HPC and CSE for computing novices – **OSCER's mandate!**

Why Bother Teaching Novices?

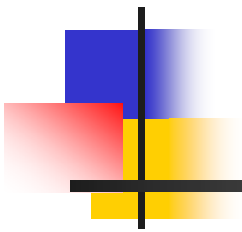
- Application scientists & engineers typically know their applications very well, much better than a collaborating computer scientist ever would.
- Commercial software lags far behind the research community.
- Many potential CSE users don't need full time CSE and HPC staff, just some help.
- One HPC expert can help dozens of research groups.
- Today's novices are tomorrow's top researchers, especially because today's top researchers will eventually retire.

What Does OSCER Do?

What Does OSCER Do?

- Teaching
- Research
- Dissemination
- Resources – **ORDER OF MAGNITUDE YEAR**

OSCER Teaching



What Does OSCER Do? Teaching

Science and engineering faculty from all over America learn supercomputing at OU by playing with a jigsaw puzzle (NCSI @ OU 2004).

What Does OSCER Do? Rounds

OU undergrads, grad students, staff and faculty learn how to use supercomputing in their specific research.

Supercomputing in Plain English

Supercomputing in Plain English workshops target not only people who are sophisticated about computing, but especially students and researchers with strong science or engineering backgrounds but modest computing experience.

Prerequisite: 1 semester of Fortran, C, C++ or Java

Taught by analogy, storytelling and play, with minimal use of jargon, and assuming very little computing background.

Materials: **http://www.oscer.ou.edu/education.php**

Registrations: almost 200 from 2001 to 2004

Workshop Topics

- Overview
- The Storage Hierarchy
- Instruction Level Parallelism
- High Performance Compilers
- Shared Memory Parallelism
- Distributed Parallelism
- Grab Bag: Scientific Libraries, I/O libraries, Visualization

Teaching: Workshops

- Supercomputing in Plain English
  - Fall 2001: 87 registered, 40 – 60 attended each time
  - Fall 2002: 66 registered, c. 30 – 60 attended each time
  - Fall 2004: 47 registered, c. 30-40 attend each time
- NCSI Parallel & Cluster Computing workshop (Aug 8-14 2004)
- **NEW! Linux Clusters Institute workshop (June 21-24 2005)**
- **NEW! NCSI Parallel & Cluster Computing workshop (July 31-Aug 6 2005)**

… and more to come.

Parallel Programming Workshop 2003

MPI programming workshop presented as part of Oklahoma Supercomputing Symposium 2003

- Working with:
  - Dr. David Joiner of the Shodor Education Foundation, National Computational Science Institute
  - Dr. Paul Gray of the University of Northern Iowa
- Demand was very high:
  - > 100 registrations for 58 seats (OU overflow bumped)
  - included over 30 visitors from 15 institutions in 7 states (AR, KS, LA, MO, OK, SD, TX)

NCSI Parallel Programming 2004

The National Computational Science Institute (www.computationalscience.org) presented a weeklong parallel programming workshop at OU Aug 8-14 2004, **and again July 31-Aug 6 2005**.

The workshop had 26 participants from 8 states (AR, IA, KS, LA, MO, OK, PA, TX), plus 5 instructors from 5 states (P. Gray, IA; D. Joiner, NY; T. Murphy, CA, H. Neeman, OK; C. Peck, IN)

Much expanded version of Sept 2003 workshop.

Excellent feedback from participants.

Hope to do it again in 2006 but not sure how to fund.

Teaching & Research: Rounds

Rounds: interacting regularly with several research groups

- Brainstorm ideas for applying supercomputing to the group's research
- Coding: design, develop, debug, test, benchmark
- Learn new computing environments
- Write papers and posters

Has now evolved into **supercomputing help sessions**, where many different groups work at the same time.

Teaching: Rounds Ride-Alongs

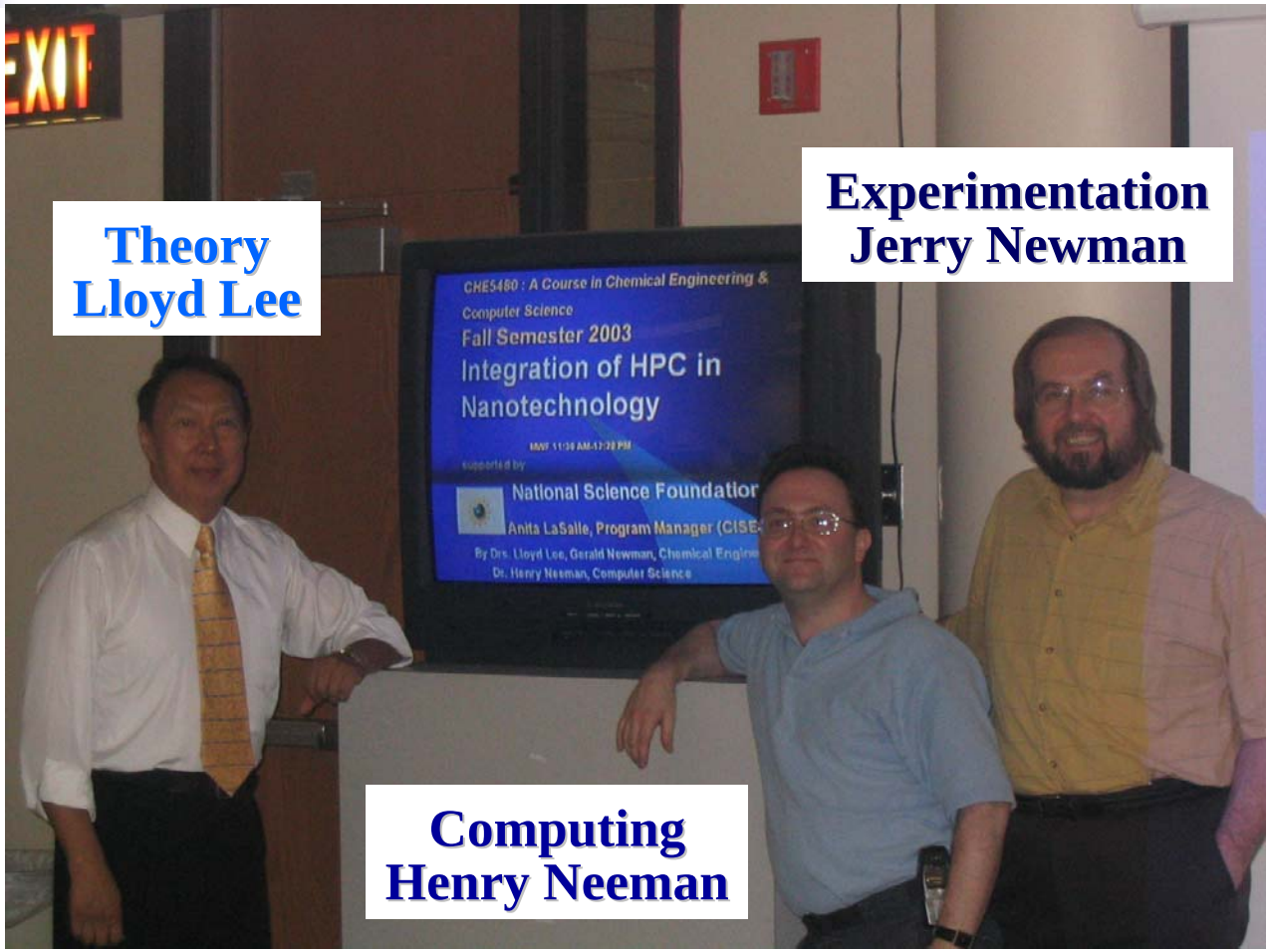
Ride-alongs: students in CS 1313 (Programming for Non-majors) get extra credit for **taking the supercomputing tour** and **"riding along"** on a round: a **"living lab"** of scientists & engineers in their native habitat.

- Library & Information Studies: on-campus internships
- History of Science: like CS students

Teaching: Academic Coursework

- CS: Scientific Computing (S. Lakshmivarahan)
- CS: Computer Networks & Distributed Processing (S. Lakshmivarahan)
- Meteorology: Computational Fluid Dynamics (M. Xue)
- Chemistry: Molecular Modeling (R. Wheeler)
- Electrical Engr: Computational Bioengineering (T. Ibrahim)
- Chem Engr: Nanotechnology & HPC (L. Lee, G. Newman, H. Neeman)

OU Nano/HPC Teaching Team



Putting together theory, computing and experimentation in a single engineering course (nanotechnology)

(taught fall 2003, summer 2005, 22 students total)

Teaching: Presentations & Tours

- Supercomputing presentations in other courses
  - Chem Engr: Industrial & Environmental Transport Processes (D. Papavassiliou)
  - Engineering Numerical Methods (U. Nollert)
  - Math: Advanced Numerical Methods (R. Landes)

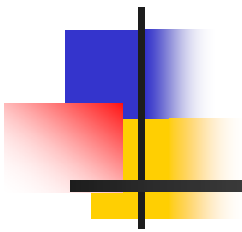
Teaching: Presentations & Tours

- Supercomputing presentations to other organizations
  - Research Experience for Undergraduates at OU
    - Ind Engr: Metrology REU (T. Reed Rhoads)
    - Ind Engr: Human Technology Interaction Center REU (R. Shehab)
    - Meteorology REU (D. Zaras)
  - Other Universities
    - **NEW! Cameron University**
    - **NEW! Northwestern Oklahoma State University**
    - **NEW! Oklahoma Baptist University**
    - **NEW! St. Gregory's University**
    - University of Central Oklahoma
  - High School
    - **NEW! Oklahoma School of Science & Mathematics**
    - Oklahoma Christian University's Opportunity Bytes Summer Academy
    - Dept of Energy National Scholarship Finalists
    - Several potential OU recruits
  - External
    - American Society of Mechanical Engineers, OKC Chapter
    - Oklahoma State Chamber of Commerce

*tour only

Interns

- OSCER has been attracting interns.
- **Library & Information Studies**: 1 student in fall 2003, 1 in fall 2004, 2 in spring 2005 (mostly working with OneNet)
- **NEW! French Colleges:** 2 from Limoges, 1 from Claremont-Ferrand
- **Independent Study**: typically 1 per semester



OSCER Research

OSCER Research

- OSCER's Approach
- Rounds
- Grants
- Upcoming Initiatives

What Does OSCER Do? Rounds

OU undergrads, grad students, staff and faculty learn how to use supercomputing in their specific research.

Research: OSCER's Approach

- **Typically**, supercomputing centers provide resources and have in-house application groups, but **most users are more or less on their own**.
- OSCER's approach is **unique**: we **partner directly** with research teams, providing supercomputing expertise to help their research move forward faster (**rounds**).
- This way, OSCER has a stake in each team's success, and each team has a stake in OSCER's success.

Research & Teaching: Rounds

Rounds: interacting regularly with several research groups

- **Brainstorm** ideas for applying supercomputing to the group's research
- **Code**: design, develop, debug, test, benchmark
- **Learn** new computing environments
- **Write** papers and posters

Has now evolved into **supercomputing help sessions**, where many different groups work at the same time.

Research: Grant Proposals

- OSCER provides text not only about resources but especially about education and research efforts (workshops, rounds, etc).
- Faculty write in small amount of money for:
  - funding of small pieces of OSCER personnel;
  - storage (disk, tape);
  - special purpose software.
- In many cases, OSCER works with faculty on developing and preparing proposals.
- OSCER has a **line item** in the OU proposal web form that all new proposals have to fill out.

External Research Grants

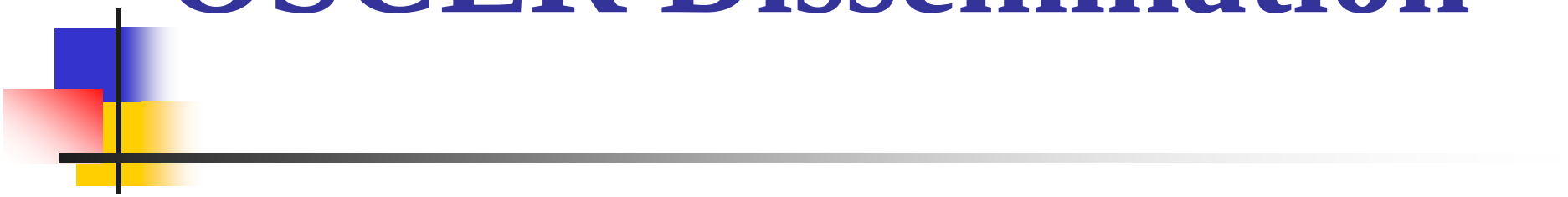
- K. Droegemeier et al., "Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere," NSF, $17M (total), $5.6M (OU)
- K. Droegemeier et al., "Linked Environments for Atmospheric Discovery (LEAD)," NSF, $11.25M (total), $2.5M (OU)
- M. Strauss, P. Skubic et al., "Oklahoma Center for High Energy Physics", DOE EPSCoR, $3.4M (total), $1.6M (OU)
- M. Richman, A. White, V. Lakshmanan, V. DeBrunner, P. Skubic, "Real Time Mining of Integrated Weather Data," NSF, $950K
- D. Weber, K. Droegemeier, H. Neeman, "Modeling Environment for Atmospheric Discovery," NCSA, $435K
- H. Neeman, K. Droegemeier, K. Mish, D. Papavassiliou, P. Skubic, "Acquisition of an Itanium Cluster for Grid Computing," NSF, $340K
- J. Levit, D. Ebert (Purdue), C. Hansen (U Utah), "Advanced Weather Data Visualization," NSF, $300K
- L. Lee, J. Mullen (Worcester Polytechnic), H. Neeman, G.K. Newman, "Integration of High Performance Computing in Nanotechnology," NSF, $400K
- R. Wheeler, "Principal mode analysis and its application to polypeptide vibrations," NSF, $385K
- R. Kolar, J. Antonio, S. Dhall, S. Lakshmivarahan, "A Parallel, Baroclinic 3D Shallow Water Model," DoD - DEPSCoR (via ONR), $312K
- D. Papavassiliou, "Turbulent Transport in Wall Turbulence," NSF, $165K
- D. Papavassiliou, M. Zaman, H. Neeman, "Integrated, Scalable MBS for Flow Through Porous Media," NSF, $150K
- Y. Wang, P. Mukherjee, "Wavelet based analysis of WMAP data," NASA, $150K

OSCER-RELATED FUNDING TO DATE:
$43.7M total, $21.8M to OU

External Research Grants (cont'd)

- E. Mansell, C. L. Ziegler, J. M. Straka, D. R. MacGorman, "Numerical modeling studies of storm electrification and lightning," $605K
- K. Brewster, J. Gao, F. Carr, W. Lapenta, G. Jedlovec, "Impact of the Assimilation of AIRS Soundings and AMSR-E Rainfall on Short Term Forecasts of Mesoscale Weather," NASA, $458K
- R. Wheeler, T. Click, "National Institutes of Health/Predoctoral Fellowships for Students with Disabilties," NIH/NIGMS, $80K
- K. Pathasarathy, D. Papavassiliou, L. Lee, G. Newman, "Drag reduction using surface-attached polymer chains and nanotubes," ONR, $730K
- D. Papavassiliou, "Turbulent transport in non-homogeneous turbulence, " NSF, $320K
- C. Doswell, D. Weber, H. Neeman, "A Study of Moist Deep Convection: Generation of Multiple Updrafts in Association with Mesoscale Forcing," NSF, $430K
- D. Papavassiliou, "Melt-Blowing: Advance modeling and experimental verification," NSF, $321K
- R. Kol,ar et al., "A Coupled Hydrodynamic/Hydrologic Model with Adaptive Gridding," ONR, $595K
- M. Xue, F. Carr, A. Shapiro, K. Brewster, J. Gao, "Research on Optimal Utilization and Impact of Water Vapor and Other High Resolution Observations in Storm-Scale QPF," NSF, $880K.
- J. Gao, K. Droegemeier, M. Xue, "On the Optimal Use of WSR-88D Doppler Radar Data for Variational Storm-Scale Data Assimilation," NSF, $600K.
- K. Mish, K. Muraleetharan, "Computational Modeling of Blast Loading on Bridges," OTC, $125K
- V. DeBrunner, L. DeBrunner, D. Baldwin, K. Mish, "Intelligent Bridge System," FHWA, $3M
- D. Papavassiliou, "Scalar Transport in Porous Media," ACS-PRF, $80K
- Y. Wang, P. Mukherjee, "Wavelet based analysis of WMAP data," NASA, $150K
- R. Wheeler et al., "Testing new methods for structure prediction and free energy calculations (Predoctoral Fellowship for Students with Disabilities)," NIH/NIGMS, $24K
- L. White et al., "Modeling Studies in the Duke Forest Free-Air CO2 Enrichment (FACE) Program," DOE, $730K

OSCER Dissemination



Our Dissemination Philosophy

SHAMELESS SELF-PROMOTION

Disseminating OSCER

- "Oklahoma Innovations" radio show
- Talk: OU Information Technology Symposium 2003, 2004
- Paper, Talk: 3rd LCI International Conference on Linux Clusters, October 2002 ("Supercomputing in Plain English: Teaching High Performance Computing to Inexperienced Programmers")
- Talk: EDUCAUSE Southwest Regional Conf 2003
- Papers (various) acknowledging OSCER

Supercomputing Symposium 2002

- 5 Participating Universities: OU, Oklahoma State, Cameron, Langston, U Arkansas Little Rock
- 2 Participating companies: Aspen Systems, IBM
- Academic Partners: OK EPSCoR, COEITT
- 69 participants, including 22 students
- Roughly 20 posters

Supercomputing Symposium 2003

- Participating Universities: **35 schools** in **13 states & Puerto Rico**
- Participating organizations: NSF, 9 companies, 11 other groups
- Academic Partners: OK EPSCoR, OU VPR, Great Plains Network, OU IT, OSCER
- Industry sponsors: Aspen Systems, Atipa Technologies, Dell Computer Corp, Infinicon Systems, Perfect Order
- Approximately 200 participants, including almost 100 students
- Roughly 50 posters, many by students
- Keynote speaker: Peter Freeman, head of NSF CISE

Supercomputing Symposium 2004

- **Over 400 registrations**
- Academic: **37 schools** including **over 150 students** from **13 states** plus **Canada** and **India**
- Government: 16 agencies – 4 federal, 10 state, 2 local
- Industry: **40 companies** – **NEW! Vendor expo**
- Academic Partners: OK EPSCoR, OU VPR, OU IT, OSCER, **NEW! Oklahoma Chamber of Commerce**
- Industry sponsors
  - Platinum: Intel
  - Gold: Perfect Order, Platform Computing, James River Technical, Dell, Oracle
  - Silver: Aspen Systems, Annapolis Micro Devices, Advanced Clustering Technologies
  - Bronze: Internet Security Systems, United Devices, Integrated Technology Solutions
- Roughly 60 posters, many by students

Supercomputing Symposium 2005

- **Over 400 registrations**
- Academic: **31 schools** from **11 states**
- Government: **16 agencies**: 7 federal, 6 state, 3 local
- Industry: **44 companies**
- Academic Partners: OK EPSCoR, OU VPR, OU IT, OSCER, State Chamber of Commerce
- Industry sponsors
  - Platinum: Intel, **Uptime**
  - Gold: **ADIC**, Dell, **Foundry Networks**, Perfect Order, **Precision I/O**, Sun
  - Silver: Aspen Systems, Atipa Technologies, **CDW-G**, **Myricom**, **PathScale**
  - Bronze: Advanced Clustering Technologies
- Roughly 40 posters, many by students

Supercomputing Symposium 2006

- Wednesday October 4 2006
- **Keynote**: Dr. Kathie Olsen

  Deputy Director & Chief Operating Officer

  National Science Foundation

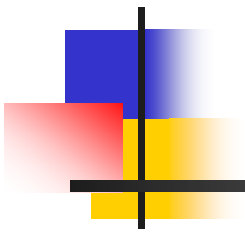
LCI Conference 2006

OSCER has been chosen to host the Linux Clusters Institute conference May 1-4 2006.

This is a more traditional academic conference, with refereed papers and so on.

Conference Chair: Henry Neeman

http://www.linuxclustersinstitute.org/



OSCER Resources

An ORDER OF MAGNITUDE year!

Old OSCER Hardware

- **TOTAL:** 1484 GFLOPs*, 368 CPUs, 434 GB RAM
- Aspen Systems Pentium4 Xeon 32-bit Linux Cluster
  - 270 Pentium4 Xeon CPUs, 270 GB RAM, 1.08 TFLOPs
- Aspen Systems Itanium2 cluster
  - 66 Itanium2 CPUs, 132 GB RAM, 264 GFLOPs
- IBM Regatta p690 Symmetric Multiprocessor
  - 32 POWER4 CPUs, 32 GB RAM, 140.8 GFLOPs
- IBM FAStT500 FiberChannel-1 Disk Server
- Qualstar TLS-412300 Tape Library

* GFLOPs: billions of calculations per second

Hardware: IBM p690 Regatta

32 POWER4 CPUs (1.1 GHz)

32 GB RAM

218 GB internal disk

OS: AIX 5.1

Peak speed: 140.8 GFLOPs*

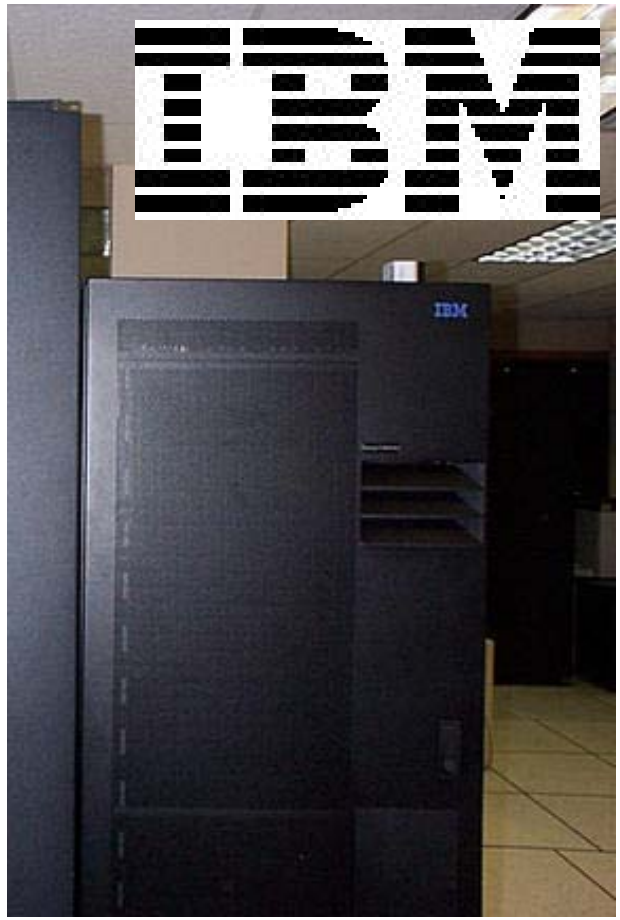
Programming model:
shared memory
multithreading (OpenMP)
(also supports MPI)

*GFLOPs: billions of calculations per second

sooner.oscer.ou.edu

IBM FAStT500 FC-1 Disk Server

- 2200 GB hard disk: 30×73 GB FiberChannel-1
- IBM 2109 16 Port FiberChannel-1 Switch
- 2 Controller Drawers (1 for AIX, 1 for Linux)
- Room for 60 more drives: researchers buy drives, OSCER maintains them
- Expandable to 13,000 GB at current drive sizes



Hardware: Pentium4 Xeon Cluster

270 Pentium4 XeonDP CPUs

270 GB RAM

~10,000 GB disk

OS: Red Hat Linux Enterprise 3

Peak speed: 1,080 GFLOPs*

Programming model: distributed multiprocessing (MPI)

* GFLOPs: billions of calculations per second

boomer.oscer.ou.edu

Hardware: Itanium2 Cluster

66 Itanium2 1.0 GHz CPUs
132 GB RAM
5,774 GB disk
OS: Red Hat Linux Enterprise 3
Peak speed: 264 GFLOPs*
Programming model:
distributed multiprocessing (MPI)
*GFLOPs: billions of calculations per second

Aspen Systems Inc.

schooner.oscer.ou.edu

Tape Library

- Qualstar TLS-412300
- Reseller: Western Scientific
- Initial configuration
  - 100 tape cartridges (10,000 GB)
  - 2 drives
  - 300 slots (can fit 600)
- Room for 500 more tapes, 10 more drives: researchers buy tapes, OSCER maintains – **expandable to 120 TB**
- Software: Veritas NetBackup DataCenter, Storage Migrator

Coming OSCER Hardware (2005)

- **TOTAL:** 11,445 GFLOPs*, 1856 CPUs, 2508 GB RAM
- **NEW! Dell Pentium4 Xeon 64-bit Linux Cluster**
  - 1024 Pentium4 Xeon CPUs, 2240 GB RAM, 6.55 TFLOPs
- Aspen Systems Itanium2 cluster
  - 66 Itanium2 CPUs, 132 GB RAM, 264 GFLOPs
- **NEW! Condor Pool:** 750 student lab PCs (100 so far)
- **COMING! National Lambda Rail**
- Qualstar TLS-412300 Tape Library

* GFLOPs: billions of calculations per second

New! Pentium4 Xeon Cluster

1,024 Pentium4 Xeon CPUs
2,180 GB RAM
14,000 GB disk
Infiniband & Gigabit Ethernet
OS: Red Hat Linux Enterp 3
Peak speed: 6,553 GFLOPs*
Programming model:
distributed multiprocessing (MPI)

*GFLOPs: billions of calculations per second

topdawg.oscer.ou.edu

**DEBUTED AT #54 WORLDWIDE,
#9 AMONG US UNIVERSITIES,
#4 EXCLUDING BIG 3 NSF CENTERS**

www.top500.org

Coming! Condor Pool

Condor is a software package that allows number crunching jobs to run on idle desktop PCs.

OU IT is deploying a large Condor pool (750 desktop PCs) over the course of the 2005.

When deployed, it'll provide a huge amount of additional computing power – more than is cu available in all of OSCER today.

And, the cost is very very low.

What is Condor?

Condor is **grid computing** technology:

- it **steals compute cycles** from existing desktop PCs;
- it **runs in background** when no one is logged in.

Condor is like SETI@home, but **better**:

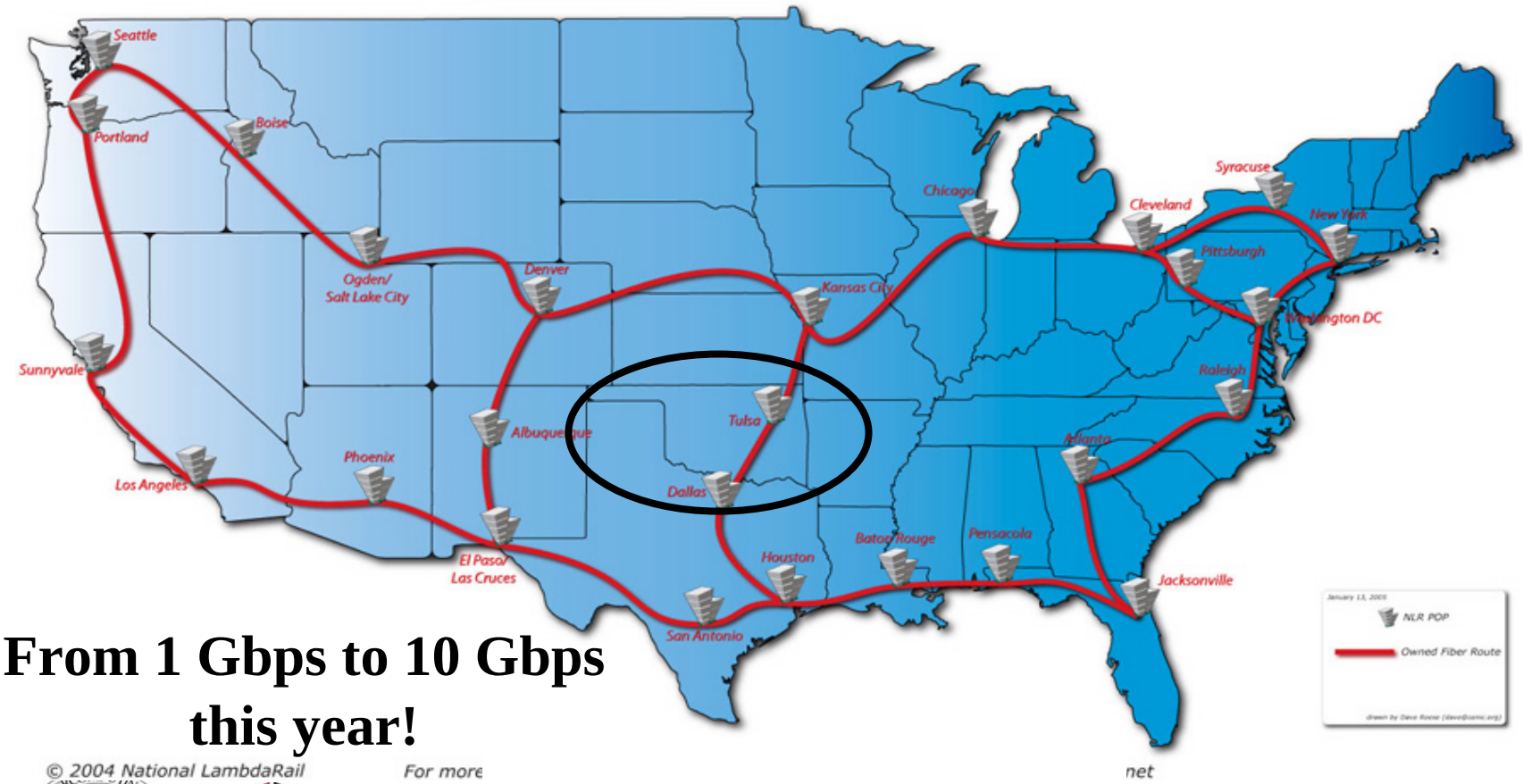
- it's **general purpose** and can work for any **"loosely coupled"** application;
- it can do all of its **I/O over the network**, not using the desktop PC's disk.

Current Status at OU

- Pool of approx 100 test machines in PC labs
- Submit/management from Neeman's desktop PC
- Already being used/tested
- Rollout to multiple labs during fall
- Total rollout to 750 PCs by end of 2005
- **COMING:** 2 submit nodes with large RAID, 2 management nodes

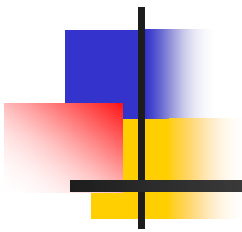
Coming! National Lambda Rail

The ***National Lambda Rail*** *(NLR)* is the next generation of high performance networking.



From 1 Gbps to 10 Gbps this year!

For more net



OSCER's Future

Grid Oklahoma

In spring 2004, OSCER led a statewide proposal to create an Oklahoma-wide computational grid for academic research.

Although the proposal did not get funded, we had 125 faculty and staff from 11 institutions across the state.

We're using this as a jumping off point for building statewide collaborations involving High End Computing.

Grid Oklahoma will happen; the question is how and when, not whether.

Grid Oklahoma

Originally, Grid Oklahoma was a proposed as an Oklahoma NSF EPSCoR Research Infrastructure Improvement project (but not selected by Oklahoma EPSCoR):

- **Universities**: **11** public and private (OSU, OU, TU, Cameron, ECU, Langston, OK Baptist, OK Christian, Rogers State, St. Gregory's, UCO)
- **Government** Agencies: **4** (OneNet, OK Climate Survey, National Severe Storms Lab, Storm Prediction Center)
- **People**: **122** faculty & staff from **26 disciplines**

Condor as 1st Step to Grid Oklahoma

- **Quick & dirty**
- **Low cost**: equipment = $0, software is cheap or free, labor is modest
- **Flocking** gets institutions accustomed to creating and maintaining **virtual organizations** and **sharing** resources.
- Can be a jumping off point for a **much larger Grid** computing environment.
- **Funding agencies** are demanding Grid computing for compute-intensive research projects.

NSF CI-TEAM Program

- The NSF Cyberinfrastructure TEAM program is a brand new program.
- It is providing grants of up to $250,000 for up to 2 years.
- One of CI-TEAM's goals is to expand ***Cyberinfrastructure*** – for example, supercomputing – to institutions and people that traditionally haven't had much access.

Our NSF CI-TEAM Project

OU is leading an NSF CI-TEAM proposal, submitted May 27 2005.

The focus: setting up Condor pools across the country.

These Condor pools would be **available for any appropriate application**.

Most of the **money** in OU's CI-TEAM proposal **would go to institutions other than OU**, for VMware.

If fully funded, the CI-TEAM grant would pay for **3,000 CPUs at other institutions** – which can flock with OU's 750 CPUs.

CI-TEAM Participants So Far

- **At OU**
  - OSCER/IT
  - Arts & Sciences: Botany & Microbiology; Chemistry & Biochemistry; Mathematics; Physics & Astronomy; Zoology
  - Engineering: Aerospace & Mechanical Engineering; Civil Engineering & Environmental Science; Chemical, Biological & Materials Engineering; Computer Science; Electrical & Computer Engineering, Industrial Engineering
  - Medicine: Surgery, Radiological Sciences
- **Other Academic Institutions in Oklahoma:** Langston U. (minority serving), Oklahoma Baptist U. (4 year), Oklahoma School of Science & Mathematics (high school), St. Gregory's U. (4 year), U. Central Oklahoma (Masters-granting)
- **Academic Institutions outside Oklahoma**: Contra Costa College of CA (2 year), Emporia State U. (Masters), Kansas State U. (PhD), U. Arkansas Fayetteville (PhD), U. Arkansas Little Rock (PhD), U. Kansas (PhD), U. Nebraska (PhD), U. Northern Iowa (Masters)

Expanded High School Program

OSCER is looking for partners at high schools for:

- supercomputing **talk & tour;**
- high school student **projects** in major computational science & engineering research efforts.

Your local high school can get involved!

Commercial Partners

OSCER already had our first commercial partners:

WeatherNews Inc.

They ran daily real time weather forecasts for about a year.

We have also been pursuing proposal submissions with local companies (can't say names yet).

We would like to see many more commercial participants.

NSF IGERT

NSF Integrative Graduate Education Research & Training.

$2.7M, mostly to pay for PhD students.

Teach them how to do my job, so that they either:

- become me (somewhere else!), or
- be professors who can hit the ground running, by taking on large, multidisciplinary computational science & engineering research projects.

Invited full proposal was submitted August 2005; still pending.

International Collaboration

OSCER is now pursuing our first direct international collaboration in supercomputing education.

The first presentation will be the "Supercomputing in Plain English Overview" talk to Computer Science students at El Bosque University in Colombia (Monday October 24 2005).

Challenge: Many of the students speak little English, and I speak no Spanish.

We need to turn "Supercomputing in Plain English" into "Supercomputing en Español!"

What Next?

More, MORE, **MORE!**

- More users
- More rounds
- More workshops
- More collaborations (intra- and inter-university; high school; commercial; government; **INTERNATIONAL**)
- **MORE PROPOSALS!**

How Can You Get Involved?

To get involved with OSCER:

- Send e-mail to **hneeman@ou.edu**.
- By OSCER Board policy, to be eligible to use OSCER resources, you must be either:
  - an OU faculty or staff member, or
  - a student working on a research or education project directed/co-directed by an OU faculty or staff member, or
  - a non-OU researcher working on a project that has, as one of its PI/Co-PIs, an OU faculty or staff member.

So talk to us about starting a **collaboration**!

A Bright Future

- OSCER's approach is unique, but it's the right way to go.
- People are taking notice nationally – e.g., you!
- We'd like there to be more and more OSCERs around the country:
  - local centers can react quickly to local needs;
  - inexperienced users need one-on-one interaction to learn how to use supercomputing in their research.

Panel

Join us for the panel

“How to Get Money to Buy a Supercomputer”

today at 4:15pm in this room.

Featuring:

Guy Almes, NSF

John Matrow, Wichita State University

Henry Neeman, OSCER

Dan Stanzione, Arizona State University

Thank you for your attention.

hneeman@ou.edu