Institute for Cyber-Enabled Research

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http://contact.icer.msu.edu

Research Resource

iCER is a research unit at MSU. We provide:

- Advanced computing hardware
- Software-as-a-service
- Training
- Consulting
- Proposal writing support

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Funding From …

- The Vice President office for Research and Graduate Studies (VPRGS)

- Engineering College, College of Natural Science and College of Social Science

- This allows us to provide services and resources for **FREE!**

Advanced Architectures

- Anything more advanced than your desktop
- Local resources
  - Lab, Department, Institution (HPCC)
- National resources
  - NSF (XSEDE), DOE (Titan) , Others
- Commercial Resources (cloud computing)
  - Amazon, Azure, Liquid Web, Others

Advanced Architectures (II)

- Science takes too long
- Computation runs out of memory
- Needs licensed software
- Needs advanced interface (visualization/ database)
- Lots of file i/o

Bigger & Better ?

- The goal of iCER is <u>NOT</u>:
  - Kflops / second
- Instead, the goal of iCER <u>IS</u>:
  - KSciences / second
- Doing More Science, Faster
  - Reducing the "Mean time to Science"
- iCER is designed to help researchers do their science and when appropriate scale them up to national resources

Accounts (Access)

- Pis can request accounts (for each group member) at

  http://contact.icer.msu.edu/account
- Each account has access to:
  - 50 GB of replicated file spaces
  - 520 processing cores
  - 360 TB of high-speed scratch space
- Also available: shared group folders

Hardware Highlights

- > 600 nodes, 7600 computing cores, 50 TB RAM
  - Large Memory Nodes (up to 6TB!)
  - GPU clusters (K20, M1060)
  - Xeon PHI cluster (5110p)
  - + 8000-core condor cluster
- High-speed file servers
  - 360TB parallel scratch file space
  - 1PB replicated home/research file servers
- High-speed network (FDR,QDR,SDR,10g)
- Evaluation nodes

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Shared System

- Queueing system
  - Submit jobs to the queue
  - Jobs will run as resources become available
  - Up to one-week walltime
  - Up to 520 processing cores per user at any time
  - The larger the job, the longer/harder it is to schedule
- Priority access available!
  - You purchase the nodes, we manage them + provide cyber-infrastructure
  - When you are not using your nodes, we will run short jobs on them.

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Buy-In Bonanza (2014)

- 20 cores, 64 Gb, $3,806*
- 20 cores, 256 Gb, $5339*
- 20 cores, 128 Gb, 2 Nvidia K20, $7899*
- 20 cores, 128 Gb, 2 Intel 5115P, $9043*
- 48 cores, 1 Tb, $29,979
- 48 cores, 1.5 Tb, $34,989
- 48 cores, 3 Tb, $60,995
- 96 cores, 6 Tb, $142,772
- Replicated storage: $175/TB per year

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* Some grant/funding agencies require a chassis for an additional $1216 (8 slots).

Software Stack

- All nodes run Red Hat Linux 6.3
- Almost 2000 software titles installed!
  - Includes several commercial software titles such as MATLAB, ANSYS, Comsol, Stata
  - Many open-source titles
  - Full list: http://wiki.hpcc.msu.edu
  - Users can install software in their own directories
- If you have windows software / complicated workflows, we may have solutions …

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Training Timeline

Date	Event
9/30 - 10/1	Software Carpentry
10/7	OpenMP Parallelism
10/23	• Intro to HPCC • Intro to Python • Intro to Matlab
11/5 – 11/6	MPI Parallelism
11/?	Intro to Bioinformatics
12/4	OpenACC Parallelism

Training Timeline (II)

- MSU Seminars in Research and Instructional Technology
- In December (date TBD)
- Two days, free seminars
  - Morning sessions, 8:30 – 11:30
  - Afternoon sessions, 1:30 – 4:30
  - Lunch provided, guest speakers
- Sessions will include:
  - Introduction to HPC
  - Advanced HPC
  - http://train.msu.edu/faculty/seminars

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Training Timeline (III)

Anticipated Spring Workshops

- Software Carpentry / Unix Basics

- Data Carpentry

- Intro to R

- Intro to Python

- Bioinformatics Workshop

- Molecular Modeling Workshop

- + many more …

- See http://wiki.hpcc.msu.edu

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Specialist Support

Dr. Yongjun Choi
Computational Physics

Specialist Support

Dr. Dirk Colbry
Computer Science

HPCC
High Performance Computing Center

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Specialist Support

Dr. Benjamin Ong
Applied Mathematics

Specialist Support

Dr. Matthew Scholz
Bioinformatics

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BICEP

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Computing Consultations

- Open office hours, Mondays 1 – 2pm
  Biomedical and Physical Science (BPS 1440)
- 1-on-1 consultation sessions
  http://contact.icer.msu.edu
- Guest lectures @ group or department meeting
- iCER cream Thursdays (monthly)
- Support (via email):
  http://contact.icer.msu.edu
  http://rt.hpcc.msu.edu

Proposal Preparation

- Personalized letters of support
- HPC facilities statement
- Data Management suggestions
- Computing equipment consultations
      http://icer.msu.edu/proposal-writing

Miscellaneous Musings

iCER provides many other services:

- Data sharing (Globus Online Subscriptions)
- Visualization Servers
- Virtual Computing Lab
- Specialized bioinformatics support (BICEP)
- Support for scaling to XSEDE resources
- + … ?

CYBERINFRASTRUCTURE DAYS 2014
OCTOBER 23 & 24

- Learn how cyberinfrastructure can benefit scholarly pursuits
- Networking opportunities
- Resource fair
- Poster session showcasing CI-enabled research

http://vprgs.msu.edu/CI-Days/

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We are here to help

http://contact.icer.msu.edu
- Questions
- Schedule consultations
- Code reviews
- Programming help
- Hardware purchasing
- Grant writing support