Introduction to the Minnesota Supercomputing Institute for Advanced Computational Research

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Jim Wilgenbusch
msi.umn.edu ➔ About ➔ Staff
Overview

- Why: Mission
- Who: Organization
- Where: Locations
- What: Resources and Services
- How: Eligibility, Access, and Accounts
  - Getting Started on MSI Systems (Hands On)
  - Brief Intro to Unix and Useful Commands (Hands On)
Mission

• Serve researchers at the University of Minnesota
• Provide access to HPC resources and user support to facilitate research in all disciplines
• Help attract funding
• Contribute to undergraduate and graduate educations
• Benefit the broader community
Mission

• MSI is dedicated to enabling and improving the quality of computational research at the University of Minnesota

• Basic research support through MSI is available to researchers at no or minimal cost

• MSI participates with researchers who are seeking funding for projects that require MSI consultants or developers
Organization

• MSI is an academic unit of the University of Minnesota under the Office of the Vice President of Research
• About 40 full time employees and work study students support MSI
• MSI serves more than 500 PI groups with a total of over 3,000 users
• Our current Director is Claudia Neuhauser
Locations

- **Main Offices – Walter Library, 5th Floor**
- HPC and infrastructure systems are housed in the basement of Walter Library
- MSI also has five labs:
  - Scientific Development and Visualization Laboratory (SDVL)
  - LCSE-MSI Visualization Laboratory (LMVL)
  - Basic Sciences Computing Laboratory (BSCL)
  - Biomedical Modeling, Simulation, and Design Laboratory (BMSDL)
  - Computational Genetics Laboratory (CGL)
Labs

UMN-TC East Bank, Walter Library
• Scientific Development and Visualization Laboratory (SDVL)
  – Workstations
  – Tutorials/Workshops
• LCSE-MSI Visualization Laboratory (LMVL)
  – Virtual Reality
  – Large Screen
  – Remote Visualization
  – Escorted Access
Labs

UMN-TC East Bank, Nils Hasselmo Hall
• Basic Sciences Computing Laboratory (BSCL)
  – Stereoscopic Monitors
  – Stereoscopic Projection System

UMN-TC East Bank, 717 Delaware
• Biomedical Modeling, Simulation, and Design Laboratory (BMSDL)
  – Stereoscopic Monitors

UMN-TC St. Paul, Cargill Building
• Computational Genetics Laboratory (CGL)
  – Tutorials/Workshops
Remote Access

- **NICE** – Linux web-browser interface
- **CITRIX** – Windows web-browser interface
- **NX, isub** – Client/Server interface
- **Galaxy** – Web-browser platform for biomedical research
Resources

• Computers
  – Itasca and Mesabi (HPC)
  – Interactive “Lab” computers
• Laboratories across campus
• Storage
• Software
  – Chemical and Physical Sciences, Engineering, Graphics and Visualization, Life Sciences, Development Tools
• User Services
  – Consulting, Tutorials, Code, Porting, Parallelization, Visualization
Resources

HIGH PERFORMANCE COMPUTING

High Performance Computing (HPC) systems are designed with high speed networks and large amounts of memory in order to support some of the most complex and memory intensive programs developed today. Good HPC resources are used when a research problem is too large to be isolated on a desktop or laptop computer.

INTERACTIVE HPC

We’s Interactive HPC resources are comprised of some of the same systems used to support our batch scheduled work activities. The main difference between the two services is the way in which users interact with the HPC resource.

DATA STORAGE

We also manages several data storage platforms in order to support a wide range of Big Data requirements, from high performance computing to data intensive research. We staff are available to help you determine which storage platform is best suited for your research.

CONSULTING

We strive to provide significant support for a diverse set of research and development projects spanning numerous science and engineering domains. We staff can quickly advance your sponsored research project because they are already familiar with the edge software we are coupling with data storage resources. We staff provide consulting services for project steering, data analysis, data management, generation or application development, testing and workshops, and much more.

PORTALS & DATABASES

We maintains a scalable computing and data storage environment for data and database resources in order to facilitate the creation of data analysis pipelines and a means for data sharing. Portals and Databases housed in this environment are part of projects supported by the consultants.

OPENSTACK ENVIRONMENT

SYSTEM SPECIFICATIONS

EXAM PLES USES

SUPERCOMPUTING INSTITUTE

University of Minnesota

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HPC Systems

**Mesabi: (recent)**
- Cores: 16,848 Intel Haswell
- Memory: 67 TB
- Accelerators: 80 K40 Nvidia gpGPUs
- Peak: 675 TFlops

**Itasca: Hewlett-Packard 3000BL**
- Cores: 8728 Intel Nehalem Cores
- Memory: 31 TB of memory
- Peak: 100 TFlops

HPC systems require Service Units
Top 12 University Funded Academic Systems in the US

Mesabi

![Graph showing the Top 12 University Funded Academic Systems in the US with Mesabi highlighted.](image-url)
Storage

• **High Performance Storage**
  – 2.4 PB
  – 25 GBs read/write
  – Available on HPC resources

• **Hadoop Cluster**
  – 39 compute nodes
  – 14 TB Hadoop HDFS

• **Tier-2 Storage**
  – 2.1 PB
  – Available via Amazon’s S3 interface
  – Available anywhere in the world

• **Archive Storage**
  – 3.5 PB tape-based storage
  – Offline storage
Software

• Approximately 400 software applications
  – msi.umn.edu > Resources > Software
• Classified into three service levels
  – Primary, Ancillary, Minimal
• msi.umn.edu > Resources > Software > Software Service Levels
• Users may install software locally
• We can purchase software with justification
Software Restrictions

• Access Restrictions
  – User list > Contact Help Desk
• Time Restrictions
  – Limited Licenses
  – Calendaring System
• Check documentation for individual software requirements to see if this applies.
• Software on limited systems
User Services

• Help Desk
• Consulting
• Tutorials and Workshops
• Classes
• Code Development
• Porting
• Parallelization
• Visualization
Consulting Services

- MSI has 24 consulting staff
- 17 consultants have an advanced degree
- We provide 10-20 workshops and tutorials annually
- 1-2 hour meetings on computational or informatics methodologies
- Informational sessions for proposal development
Collaborations

• Extended involvement with an analyst funded by a grant mechanism
• 46 projects are supported by MSI annually
• Collaborations involve staff who have knowledge of:
  – Specific research domains
  – Current analytical methods
  – Statistics
  – Computing
  – Application Development
Internal and External Services

• Internal Services
  – Assist with long-term development projects
  – Wide range of project activities
  – Tailored to specific research initiatives or development programs
  – Provided at cost
• External Services
  – msi.umn.edu > Services
• MSI requests acknowledgement in publications and grant proposals
Service Costs

- **Free** for UMN faculty and their associates
- **Free** for other MN academic institutions
- Fee for hosting UMN faculty systems
- Fee for software development
- Fee for service for external organizations
Research Outcomes

- 1,831 MSI PI publications
- 165 MSI PI publications in high-impact journals
- 935 unique journal titles
- $427 million C&G funding by MSI PIs
- $66 millions by top 25 MSI users
Account Structure

• **Principle Investigator (PI):** Controls everything in the group

• **Users:** Added by the PI

• **Group Administrators:** Users within a group that can do everything the PI can do except add other Group Administrators
PI Eligibility

- **Faculty members** at the University of Minnesota
- University of Minnesota **academic professionals** with department approval
- Faculty **researchers** at other accredited institutions of post-secondary education in the state of Minnesota
Account Duration

- **MSI accounts are renewed annually**
  - Renewal period opens the first week of October
  - Resource allocations must be renewed each year
- Accounts and allocations are good through the calendar year
- Additional resources may be requested during the year
  - HPC Allocations Committee meets four times a year
  - Below threshold resource allocations are handled through the MSI Help Desk
Disk Resources

- Labs and HPC systems have shared home directories
- Disk space is allocated by group
- 150 GB initial quota on HPC systems
- PI may request a quota increase if necessary
- msi.umn.edu > Resources > Storage
Access

- System access information is available at msi.umn.edu > Access > Sign Up
- For current users, access through msi.umn.edu > MyMSI
- For building access, visit the MSI reception desk
- Information can be found in the General Information page for each lab via msi.umn.edu > Resources > Labs
- For help, email help@msi.umn.edu or call x6-0802
MSI Web Pages

- **MSI Home Page**
  msi.umn.edu

- **Software**
  msi.umn.edu/sw

- **Password Reset**
  msi.umn.edu/password

- **Tutorials**
  msi.umn.edu/tutorial

- **FAQ**
  msi.umn.edu > Resources > FAQ
Questions?

- MSI Help Desk is staff Monday-Friday from 8:30 AM – 5:00 PM
- Walk-in help is available in Walter 587
- Call x6-0802 (1-612-626-0802)
- Email help@msi.umn.edu