High-Performance Computing at The University of Michigan College of Engineering

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MichiganEngineering

Who We Are

- College of Engineering "centralized" HPC support
- Been trying this for 10+ years
- Involved in NPACI - left us with some infrastructure
- Have a degree modification academic program (*. . . and Scientific Computing*)

What We Provide

- public compute nodes for use by anyone on campus
  - rental of dedicated nodes for people who don't want to wait in the queue
- software (compilers, libraries, applications)
  - limited support
- services to faculty
  - hardware purchasing (cluster expansion) support
- "HPC environment"
  - software that works in batch, batch software, scheduling, stability, predictability

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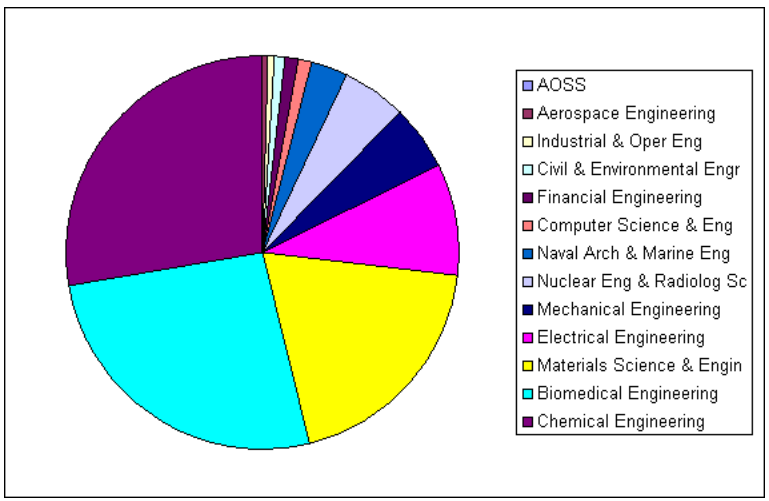
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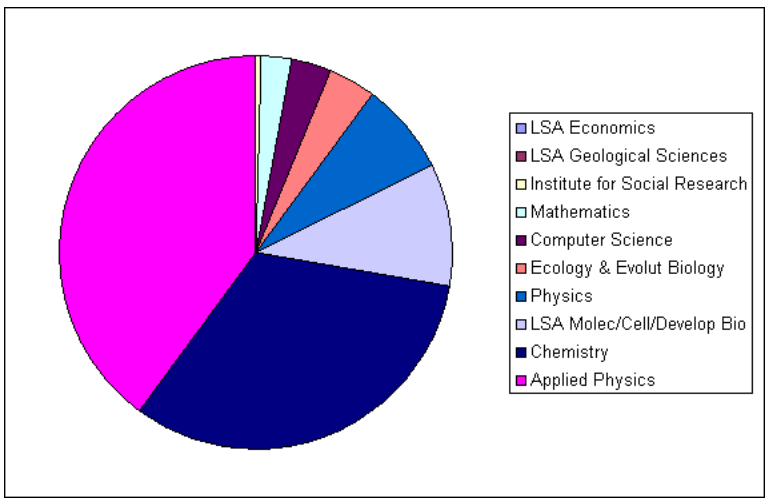
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To Whom We Provide It

- for the past 2 years: 80% engineering, 10% medicine, 7% lit/sci/arts, 3% other
- we're seeing a lot of growth in users (but not usage, yet) from outside of Engineering: Ecology, Chemisty, Geology, Statistics/Public Policy, Physics



(a) Engineering



(b) LS&A

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Usage by School

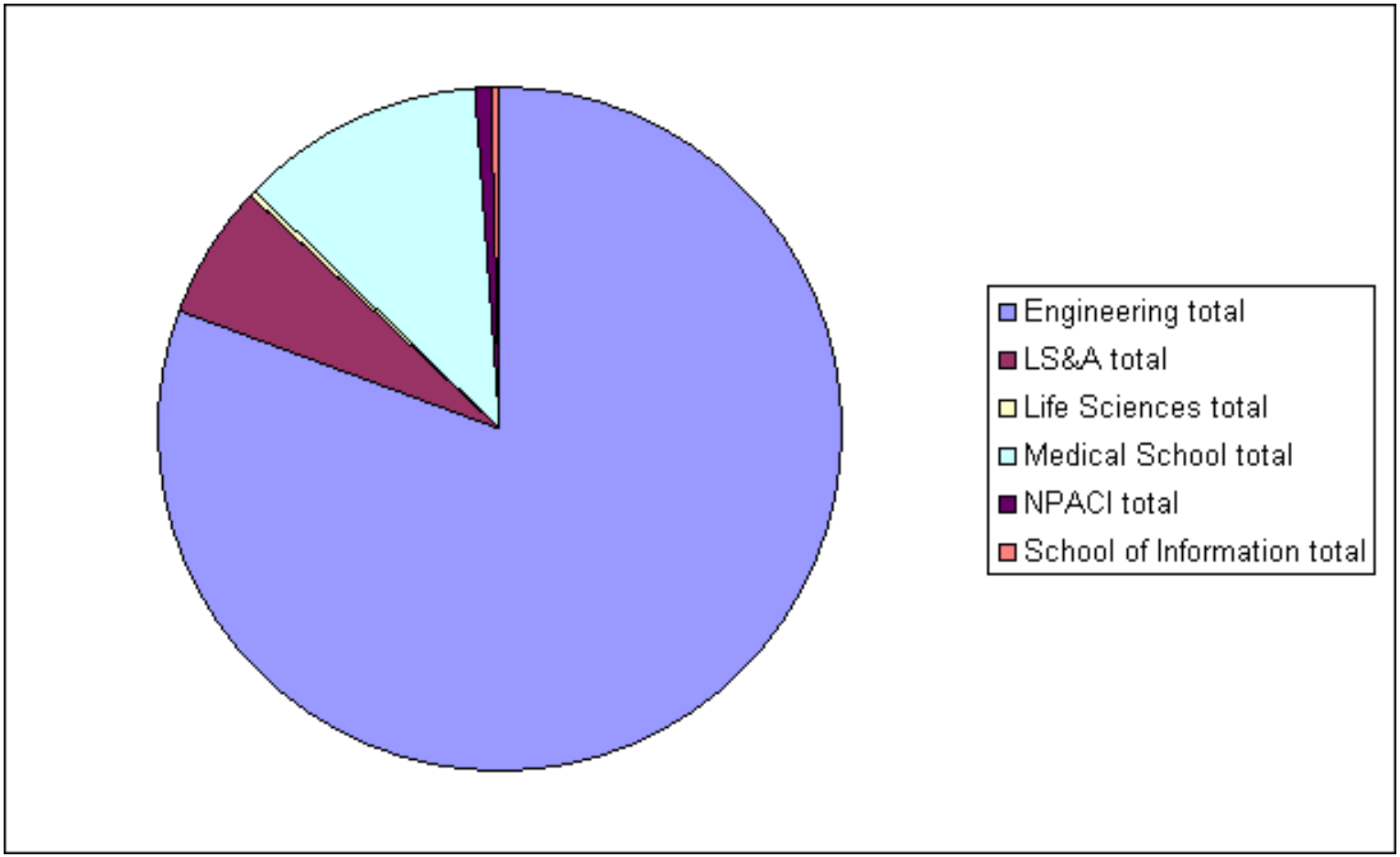


Figure: Usage by School

What We Rely On

- broader College of Engineering IT (CAEN) support
  - for software, operations, networking, and storage support
- support from the College
  - for staff salaries and some one-time expenses
- efficiencies in control over the hardware
  - people can't buy whatever they feel like
- centrally provided machine room space
  - no one sees any costs for this (currently)

How We Justify Ourselves

- Support of faculty
  - base funding for 4 FTE, 2 student employees
- expansion via faculty hardware purchases
  - direct cost pass-through, santized for their protection
- dedicated access rental model
  - recharge of salary to people outside of Engineering
- largest centralized cluster on campus
  - other units doing 8,16,32,48-node clusters inefficiently

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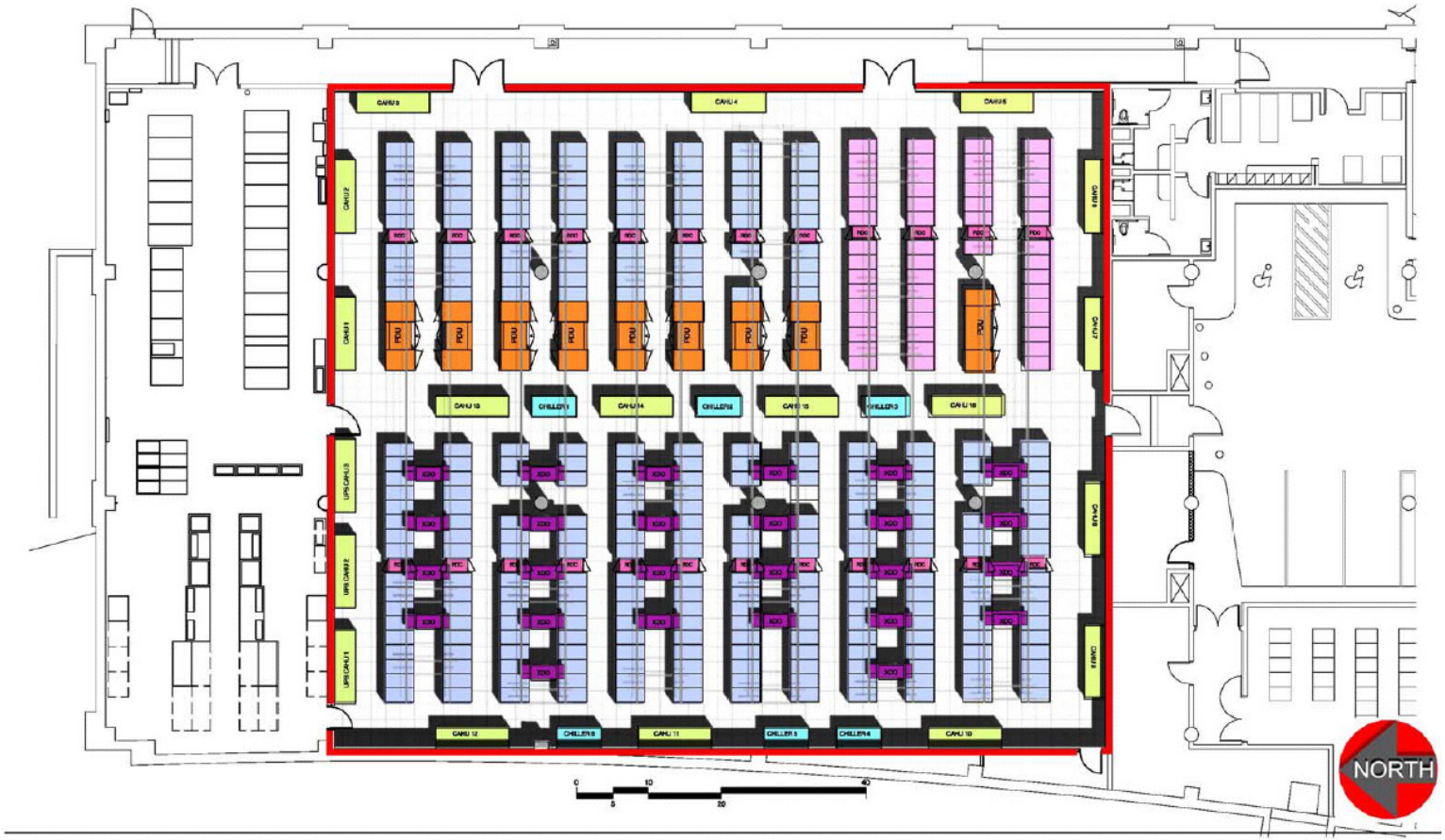
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The Future

- new data center under construction
  - 10,000sf, 4MW power, 294 6kW racks for University use
  - shared with Merit (state-wide public education network provider) and Internet2
  - for use by anyone on campus for "research" or "academic" computing
  - Provost's Office paying for construction + some other subsidies
  - Engineering had a large role in the approval and construction process, we'll see about operations
- perhaps some large shared compute resources to go in this room for use by all of campus

Michigan Academic Computing Center



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The Equipment and Software

- 771 Opteron cores in 347 nodes (outstanding orders for 356 more cores)
- 11 Infiniband connected nodes (AMD Opteron 254, 275, and 175) (oustanding order for 64 more ports/cards/cables)
- 448 G5 cores in 224 nodes
- 96 Myrinet connected nodes (Apple G5)
- non-blocking gigabit Ethernet in 2 switches (Force10 E1200 and Cisco 6509E)
- 6TB home directory storage (80GB/user + snapshots)
- 35+ supported Engineering applications and libraries: `http://cac.engin.umich.edu/resources/systems/nyxV2/software.html`

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The System Software

- Torque / Maui / Moab / Gold for resource management and scheduling
- Linux RHEL4
- OS X 10.3
- Kickstart or Netboot
- radmind — http://rsug.itd.umich.edu/software/radmind/
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Questions?

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