



NCSA Systems and Upgrade Plans

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NCSA and Cyberinfrastructure

- **Cyber-resources**
- **Cyberenvironments**
- **Innovative Computing Systems**
- **Scientific Visualization**
- **Cybereducation**
- **International and Industrial Partnerships**

NCSA Facility - ACB

- **Advanced Computation Building**

- Three rooms, totals:

- 16,400 sq ft raised floor
 - 4.5 MW power capacity
 - 250 kW UPS
 - 1,500 tons cooling capacity



- Room 200:

- 7,000 sq ft – no columns
 - 70" raised floor
 - 2.3 MW power capacity
 - 750 tons cooling capacity



Major NCSA Systems Today

- **Distributed Memory Clusters**
 - Abe (Dell, Quad core Intel Xeon): 9600 cores
 - **89 TF; Friendly User**
 - Tungsten (Dell, 3.2 GHz Xeon): 2950 processors
 - **16.4 TF; 4.4TB RAM; 145TB disk**
 - T3 (Dell, Dual core 2.66 GHz): 1024 processors
 - **22 TF; Private Sector Program**
 - Mercury (IBM, 1.3/1.5 GHz Itanium2): 1846 processors
 - **10 TF; 4.6TB RAM; 235TB disk**
- **Shared Memory Clusters**
 - Copper (IBM p690 1.3 GHz Power4): 12x32 processors
 - **2 TF; 64 or 256GB RAM each; 35TB disk**
 - Cobalt (SGI Altix 1.6 GHz Itanium2): 2x512 processors
 - **6 TF; 1 TB or 2TB RAM; 370TB disk**
- **Storage Systems**
 - Archival: SGI/Unitree **5 PB capacity**; 2 PB Oct '05
 - Infrastructure: **284TB** Fiberchannel SAN connected
- **Visualization Systems**
 - SGI Prisms (1.6 GHz Itanium2): 8 x 8 processors
 - **4 graphics pipes each; 1 GB RAM each**
 - **Infiniband connection to Altix machines**



NCSA's 4th Dell Cluster - Abe

- **Abe: Dell 1955 blade cluster**
 - 2.33 GHz Intel Cloverton Quad-Core
 - 1,200 blades/9,600 cores
 - 89.5 TF; 9.6 TB RAM; 170 TB disk
 - Perseus management; diskless boot
 - Power/Cooling
 - 500 KW / 140 tons
- **Use policy:**
 - Intended for production capability jobs of at least 1000 cores or more
 - Resource for IACAT and NSF users



Abe: IB Interconnect

- **Cisco Infiniband**
 - 2 to 1 oversubscribed
 - OFED-1.1 w/ TopSpin (Cisco) subnet manager
 - 8 96port Core switches
 - Fanning out to 75 leaf switches
 - 16 ports compute 8 uplinks to core
 - 3 leaf switches for infrastructure systems
 - Gridftp, IB->IP gateway, I/O servers
- **GigE Management Network Force10**
 - 10:1 oversubscribed

Abe: Filesystems and User Environment

- **Lustre over IB**
 - 2 9500 DDN controllers direct FC (120TB SATA disks)
 - 10 FastT900 controllers on SAN fabric (50TB FC disks)
 - 8.4GB/s sustained
 - 22 OSTs and 2 MDS w/complete auto failover
- **User Environment**
 - Torque/Moab
 - Softenv
 - Intel Compilers
 - MPI: evaluating Intel MPI, MPICH, MVAPICH, VMI-2, etc

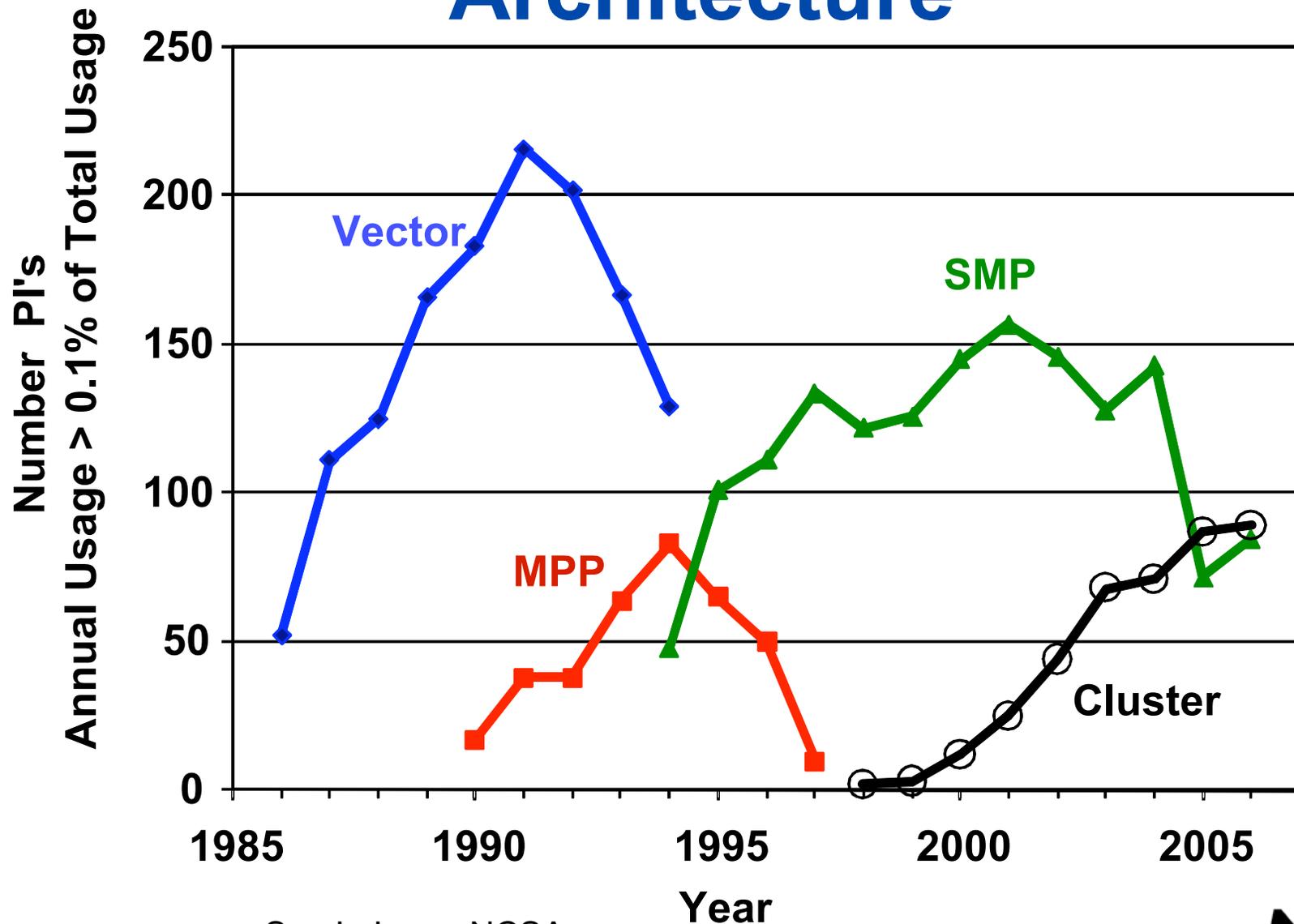
Deployment Status

- **System and NCSA software environment installation complete**
 - Also a TeraGrid resource
- **TOP500 HPL runs**
 - Rmax=62.68 TF (71%) across 1,184 nodes (9,472 cores)
- **Entered Friendly User mode in May**
 - four external applications groups provided access
 - additional groups added weekly
- **Anticipated production date: June 2007**
 - 12+ projects totaling 10M+ CPU hours already allocated

NCSA Upgrade Plans

- **Proposals submitted to NSF**
 - Track 1 Sustained Petaflop system
 - Track 2 Petascale Computing Environment
- **Private Sector Program system**
 - Annual upgrade evaluation/planning
- **University of Illinois system**
 - Illinois and IACAT resource
- **Mass storage system in progress**
 - Archive system upgrade

NCSA Users over Time by Architecture



Src: L. Lane, NCSA

Year

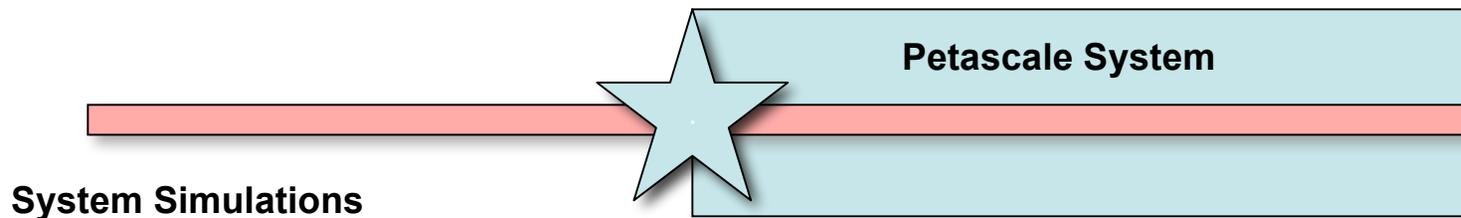
National Center for Supercomputing Applications



Adoption Example: Petascale Timeline

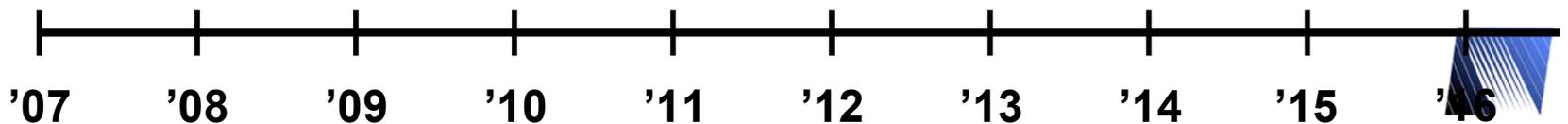
S&E
Applications

Petascale Science Applications
Petascale Engineering Applications
Other Petascale Applications



Computing
Technology

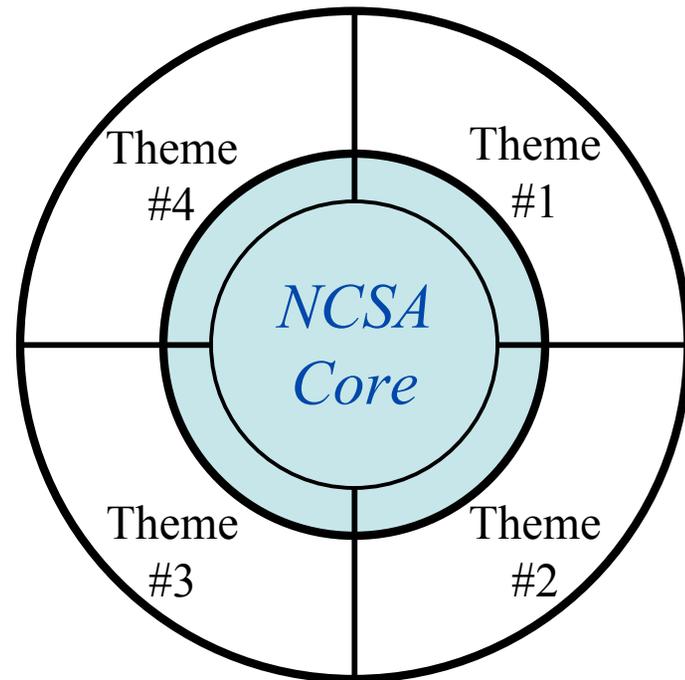
Exploitation of Hardware Acceleration Capabilities
Enhancement of Computing System Software
Enhancement of Applications Development Environment



Institute for Advanced Computing Applications and Technology

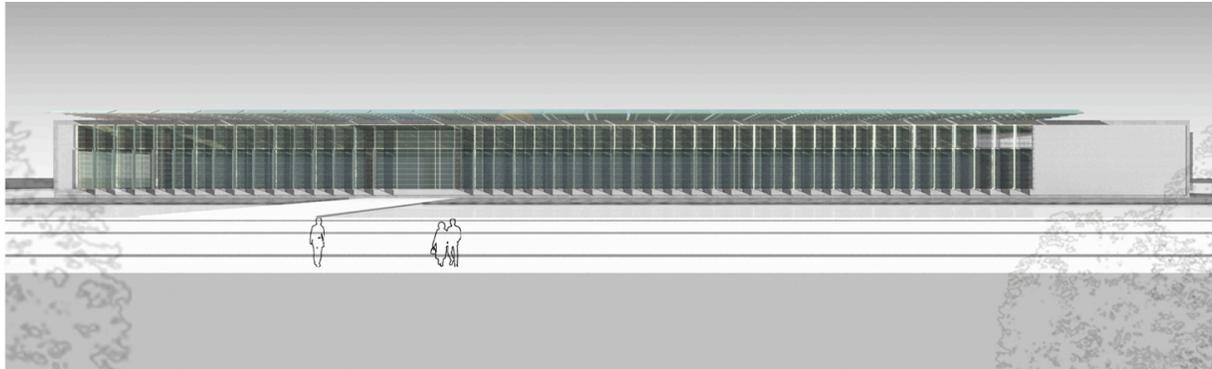
- Combine research in UIUC's academic units with advanced technology development at NCSA to:
 - Create and apply innovative computing **applications**
 - Create and apply innovative computing **technologies**
- Transfer new applications and technologies to the broader research community through NCSA

IACAT Research Themes



Simulation of Natural & Engineered Systems
Data-intensive Applications and Technologies
Advanced Information Systems
Computing and Creativity

Petascale Computing Facility Outline



- **Data Center**

- >50,000 sq.ft. building

- >20 MW

- **Green Innovations**

- Power Distribution System

- Free-cooling chilled water system (winter)