IT – Enabled Research
Institute for Digital Research and Education (IDRE)

Warren Mori
What is IDRE?

- **Vision:** Support, advance and guide a campus wide program to make UCLA a world leader in both research and education on high performance computation, data visualization, and analyses of large data sets and databases.

- **IDRE is working to:**
  - Build Bridges and act as a Catalyst for cross-disciplinary teams focused on problems of national significance
  - Prepare researchers for the petascale
  - Create a strong intellectual environment through workshops, seminars, and conferences
  - Provide a facility for code development and maintenance
  - Build up computational resources
  - Develop policies for use of data center space and IDRE resources
  - Develop and coordinate curriculum in the areas of computation, visualization, and simulation
What are IDRE’s challenges?

- Building bridges across disciplines
- Increasing UCLA’s visibility to funding agencies and to UC
- Funding for a core infrastructure that can match the competition (e.g., USC)
- Preparing for the petascale
- Allocating available resources
- Technology investigation
  - New HW and SW solutions need to be explored, this needs to happen independent of grant cycles.
Why Invest in Data Centers for Research?

- **Visibility**
  - Leading Universities need a minimum amount of data center space

- **Recruitment and Retention**
  - Increase in number of faculty where computation is fundamental to their research
  - Computing facilities and expertise are increasing factor in recruitment and retention

- **Growth**
  - Most faculty who own clusters are planning to increase cluster size in 1-5 years (not just replacing existing nodes)
  - Some clusters are not currently fully utilized

- **Savings**
  - Utilities
  - Downtime
  - Sys. Admin.
  - Shared compute time

- **Competition**
  - USC- Two 10,000 sq.ft data centers. Full AC and power redundancy. $40M for the entire building, estimated $10-15M for the data center space alone.
Data Center: Growth, Capacity and Investment

Committed/Waiting    Projected

2500 MAX. CAPACITY

Increase Capacity to 1300

IDRE CAPACITY

Investigate other options for business and research
Total Investment: $4.724M +1200 nodes
IDRE Investment: $175K +400 nodes
Campus invested: $3.2M +500 nodes w/ Redundancy
Original Capacity: 400 nodes

Projected Investment:
- 1-2 Yrs: 1321 nodes
- 3-5 Yrs: 1729 nodes
- 5+: 2229 nodes

Current: 393 nodes
Future: Increase to 1300 nodes

2003: 351 nodes
2005: 355 nodes
Current 4/07: 808 nodes
1-2 Yrs: 900 nodes
3-5 Yrs: 900 nodes
5+: 900 nodes
Data Center: More Efficient Models

- Models:

<table>
<thead>
<tr>
<th>Condominium</th>
<th>Shared</th>
<th>General Purpose</th>
<th>Special Purpose</th>
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| • Larger Clusters (>96 nodes)  
  • Close to 100% Utilization  
  • Optimized for a single purpose | • Smaller Clusters  
  • Low Average Utilization  
  • Can be accommodated in a Homogeneous Environment | • For those with no access to HPC Resources  
  • Longer wait times  
  • Shorter Runs  
  • Small Number of CPUs Per Run  
  • Can be linked to Shared Cluster Resources | • Smaller Clusters (<96 nodes)  
  • Close to 100% Utiliz.  
  • Optimized for a single purpose |
Building Bridges: IDRE can impact much of the campus

- IDRE teams pursuing large computational grants
- Supporting campus dialog: Over 20 lectures available online
- Beyond the Sciences:
  - Highly successful “Digital Innovations Day: Countries, Cultures, Communication”
  - Coordinating with Humanities, Arts and Architecture and Social Sciences to develop collaborations
Technology Investigation

• A robust technical infrastructure must include ongoing investigation and testing
  – GPUs
  – Grid computing
  – Exploring solutions for maintaining and converting legacy code to work on new platforms
  – Benchmarking hardware
  – Testing new software
Single Campus Architecture

- Grid Portal
- MyProxy Server
- Storage Server
- ION Visualization Server
- OSG Submit Node
- Grid Appliance

Credential mapped to local ID

Head node
Cluster I

Head node
Cluster II

https
Uniform browser based interface
Single CA is shared among all campuses

All appliances talk to both their campus portal and the UC portal
UC-Wide Cyberinfrastructure Vision

10GB Ethernet Network

Campus Grid

SDSC

Campus Grid

UC Grid Portal

TeraGrid

Campus Grid

Replicated Data

Campus 1

“Commercial Applications” Cluster

Campus 2

Backup Services

Replicated Data

Campus 3

Visualization “Pixel” Cluster

Campus 4