On-Demand Research Computing
- Infrastructure as a Service -
- Software as a Service -
Software as a Service (SaaS)

with MATLAB provides:

- **Seamless access to MDCS workers from your personal workstation**

- **Access to NVIDIA GPUs for added performance***

- **“Quick Queue” for quick turnaround and scientific gateways**

 Requires MATLAB Client with Parallel Compute Toolbox (Available under CU site license)

*GPUs use can decrease your code run time providing optimal use of your subscription

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**Configuration**

- **Total**
  - 64 cores, 192GB of RAM in 8 servers:

- **8 Servers**
  - 2, 2.4 GHz Xeon E5620 CPUs (2 x 4 cores)
  - 24GB of RAM (3GB/core)
  - 1 NVIDIA Tesla M2070 GPU per node

- **Gigabit Ethernet interconnect**

- **Storage**
  - 8TB mounted via CIFS

- **Software**
  - MATLAB MDCS 2011B
  - CAC parallel MATLAB client code

*GPUs use can decrease your code run time providing optimal use of your subscription*
Infrastructure as a Service (IaaS)

red cloud provides on-demand:

- **Virtual Servers**
- **Storage**: Virtual disks for the virtual servers

Plus the necessary fast networking, power, space, and cooling to make everything work.

<table>
<thead>
<tr>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>– 96 cores, 384GB of RAM in 8 servers:</td>
</tr>
<tr>
<td><strong>8 Servers</strong></td>
</tr>
<tr>
<td>– 2, 2.7 GHz Xeon E5650 CPUs (2 x 6 cores)</td>
</tr>
<tr>
<td>– 48GB of RAM (4GB/core)</td>
</tr>
<tr>
<td>– Maximum virtual server size:</td>
</tr>
<tr>
<td>– 12 cores, 48GB RAM</td>
</tr>
<tr>
<td><strong>10 Gigabit Ethernet interconnect</strong></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
</tr>
<tr>
<td>– 7.5TB</td>
</tr>
<tr>
<td>– Accessible by virtual servers via 10Gb iSCSI</td>
</tr>
<tr>
<td><strong>Software</strong></td>
</tr>
<tr>
<td>– Eucalyptus 2.0.3 (Open Source)</td>
</tr>
</tbody>
</table>
Subscription-based Recovery Model

Cornell Users $500/core year*
Other Academic Institutions $750/core year

Cornell Users $750/core year
Other Academic Institutions $1200/core year

*A core year is equal to 8585 hours

Each subscription account includes 50GB of storage

NOTE: Rates are awaiting approval from Department of Financial Affairs

10/6/2011

www.cac.cornell.edu
## What if ???

<table>
<thead>
<tr>
<th></th>
<th>Consulting</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornell Users</td>
<td>$59.90/hour</td>
<td>$0.91/GB/year</td>
</tr>
<tr>
<td>Other Academic</td>
<td>$85.47/hour</td>
<td>$1.45/GB/year</td>
</tr>
<tr>
<td>Institutions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*NOTE: Rates are awaiting approval from Department of Financial Affairs*
Looking for a Server or Workstation?

But….

- Want it up and running yesterday?
- Need a big fast machine for only a few months or weeks?
- Need a small server to run continuously?
- Don’t want to invest in a dedicated server or cluster?
Why Red Cloud?

• **Predictable, Reproducible, Reliable Performance**
  We publish hardware specifications (CPU, RAM, network) and do not oversubscribe.

• **No Hidden Costs**
  No cost for network traffic in or out of the cloud.

• **Fast Access to Your Data**
  Fast data transfers via 10Gb Ethernet in or out of the cloud at no additional charge.

• **Expert Help**
  System, application, and programming consulting are available.

• **Easy Budgeting with Subscriptions**
  No billing surprises!

• **Amazon API Compatible**
  Migrate when your requirements outgrow Red Cloud.
## Red Cloud vs. HPC Clusters

Cloud and HPC cluster computing complement each other. Which is best for your needs?

<table>
<thead>
<tr>
<th></th>
<th>Red Cloud</th>
<th>HPC Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HW Configuration</strong></td>
<td>Flexible</td>
<td>Fixed</td>
</tr>
<tr>
<td><strong>SW Configuration</strong></td>
<td>Configurable by user</td>
<td>Managed by a system administrator</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Root privileges</td>
<td>User privileges</td>
</tr>
<tr>
<td><strong>Maintenance Overhead</strong></td>
<td>User does system configuration/maintenance</td>
<td>Done by a system administrator</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>Resources shared with other cloud instances on the same server.</td>
<td>Bare metal performance</td>
</tr>
<tr>
<td><strong>Nominal Cost Per Core</strong></td>
<td>Lower</td>
<td>Higher</td>
</tr>
</tbody>
</table>
Virtual Server Configurations

- **CPU**: 1, 2, 4, 8, or 12 cores
- **RAM**: 4GB/core
- **Network**: 10Gb Ethernet *shared with all virtual servers on the same server*
- **Disk**: Local scratch disk *deleted when cloud instance is terminated*
- **OS**: CentOS 5.6 & CentOS 6 *user-customizable*
- **Privileges**: Root access

<table>
<thead>
<tr>
<th>Type</th>
<th>Cores</th>
<th>RAM</th>
<th>Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1.small</td>
<td>1</td>
<td>4GB</td>
<td>20GB</td>
</tr>
<tr>
<td>C1.medium</td>
<td>2</td>
<td>8GB</td>
<td>40GB</td>
</tr>
<tr>
<td>M1.large</td>
<td>4</td>
<td>16GB</td>
<td>200GB</td>
</tr>
<tr>
<td>M1.xlarge</td>
<td>8</td>
<td>32GB</td>
<td>400GB</td>
</tr>
<tr>
<td>C1.xlarge</td>
<td>12</td>
<td>48GB</td>
<td>1000GB</td>
</tr>
</tbody>
</table>
Elastic Block Storage (EBS)

- Each EBS volume is a virtual disk that can be attached to or detached from a cloud virtual server on demand. Inside a virtual server, each attached EBS volume is a block device (e.g. /dev/vdb)

- User can create EBS volumes up to 1TB in increments of 1GB.

- 50GB is included with each subscription. Additional storage is available at CAC storage rates.

- EBS volumes connect to virtual servers in Red Cloud via iSCSI for best performance (300+ MB/sec observed in testing).

- Cloud virtual servers can serve storage to other cloud virtual servers or clients external to the Red Cloud (e.g. NFS or CIFS shares, WebDAV, databases)

- Cloud virtual servers can access network storage external to Red Cloud
Demo: Cloud Virtual Server

• Create instances
• Login
• Install software
• Add user
• Customized GUI environment in VNC
More Info


• Questions? E-mail: help@cac.cornell.edu