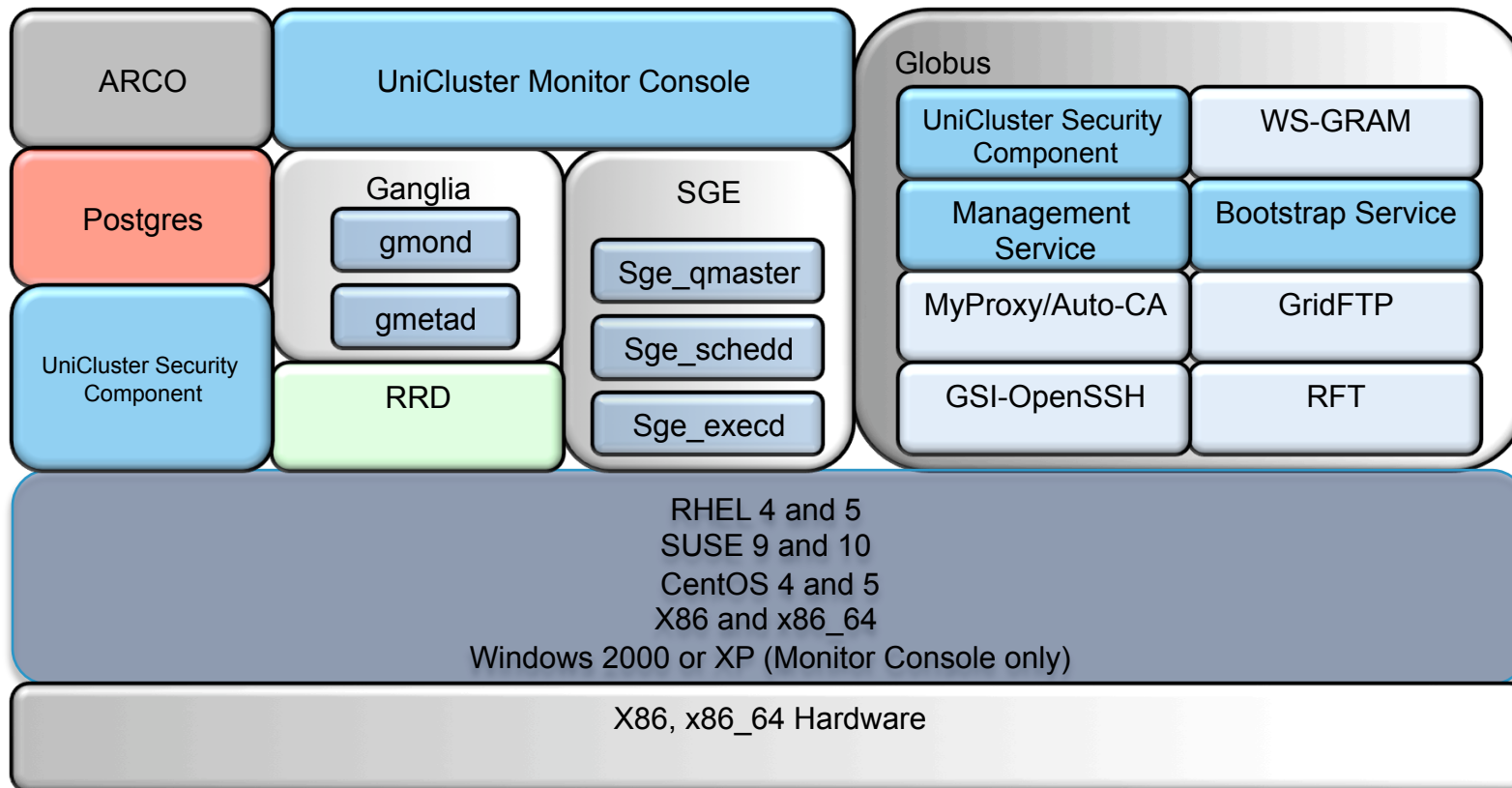# UniCluster
Simple Fully Integrated Cluster Stack

UniCluster

- ## UniCluster is a complete software stack with…

  - Integrated one step installer for head nodes, compute nodes, workstation nodes, login nodes.

  - Policy-Based Job Scheduling Sun Grid Engine (SGE). Automatically configured to run out of the box on the cluster.

  - Cluster & Job Monitoring with SGE and Ganglia for node and cluster system metrics.

  - Cluster Accounting. SGE ARCO installed and configured to collect job accounting information for the cluster.

  - File Transfer. Grid FTP installed and configured for transferring files securely and reliably across the cluster or Grid.

  - Globus Grid Services. Globus, MyProxy, GSI-OpenSSH, WS-GRAM – installed and configured for the cluster

  - Univa UD Cluster console provides secure job and cluster monitoring.

UniCluster

- **UniCluster is an ideal solution when…**
  - You are already using SGE – UniCluster installs into an existing SGE environment
  - A Secure Grid environment based on Globus is needed to run jobs
  - Transferring files securely in the cluster is required
  - Nodes in the cluster have different roles/usage such as workstation, head node, compute node and login node.
  - You tried to setup myProxy and configure Globus Security – then gave up!
  - You are looking for a simple and configurable cluster solution that quickly allows you start running work in about an hour.
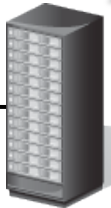
The UniCluster 3.2 Stack

UNIVA UD

ARCO	UniCluster Monitor Console	Globus	
Postgres	Ganglia / SGE	UniCluster Security Component	WS-GRAM
UniCluster Security Component	gmond / gmetad / Sge_qmaster	Management Service	Bootstrap Service
	Sge_schedd	MyProxy/Auto-CA	GridFTP
	RRD / Sge_execd	GSI-OpenSSH	RFT

RHEL 4 and 5
SUSE 9 and 10
CentOS 4 and 5
X86 and x86_64
Windows 2000 or XP (Monitor Console only)

X86, x86_64 Hardware

Installing UniCluster

Before Installing:

- Start with a clean install of RHEL 4 or 5, CentOS 4,5 or SuSE 9,10
- Configure the networking on the machine
- Configure ntp on the machine
- Setup DNS – Forward and Reverse name resolution.
- Setup a common user namespace, shared home directories and consistent user UID across all nodes.
- Configure the firewall to avoid blocking ports, or turn off the firewall (if the cluster is protected)
- Don't use or turn off SELinux.
- Xinetd is required for some services

Download the software from http://www.grid.org
As root unpack the software.
Run the ./install_unicluster script
Select 'main' when prompted for install type.
Choose the default options (unless you wish to change them)
The script will install and configure
All of the required services and software

Retrieve the bootstrap user password from the bootstrap ACL file. The bootstrap password is used later to install other nodes.

Copy the software to each compute node (or share using NFS)
As root run the ./install_software script once again
When prompted for install type choose 'compute' or 'login' or 'workstation'
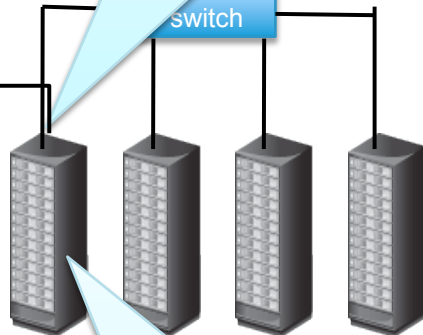The installer will prompt for the 'main' node name and the bootstrap password.
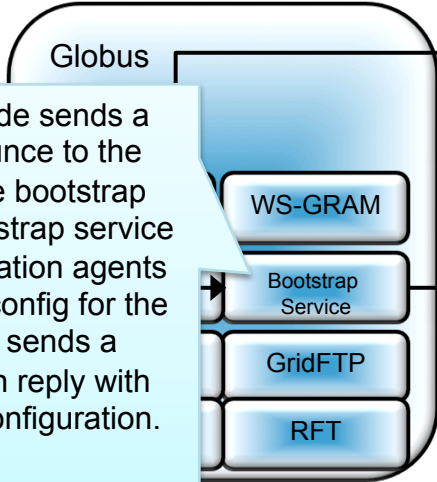
The compute node sends a bootstrap announce to the main node to the bootstrap service. The bootstrap service calls autoconfiguration agents to determine the config for the new node and sends a autoconfiguration reply with the new node configuration.

The new compute node uses the autoconfiguration information and calls the appropriate configuration agents to configure the services on the node.

Cluster Frontend

Database

Globus

WS-GRAM

Bootstrap Service

GridFTP

RFT

Bootstrap Announce

Node Autoconfiguration

switch

Compute Nodes

Customer Cluster

- **Node installation status can be checked by calling the servicescheck.pl script**

```
./servicesCheck.pl
**********************************************************************
Searching for running services ....
**********************************************************************
Checking the Grid Engine qmaster daemon... This service is running.
Checking the Grid Engine schedd daemon... This service is running.
Checking the Ganglia gmetad daemon... This service is running.
Checking the Grid Engine dbwriter... This service is running.
Checking MyProxy/Auto CA... This service is running.
Checking the Authorization Agent... This service is running.
Checking the container process... This service is running.
Checking GridFTP... This service is running.
Checking the Grid Engine execd daemon... This service is running.
Checking the Ganglia gmond daemon... This service is running.
Checking PostgreSQL... This service is running.
Checking GSI-OpenSSH... This service is running.
**********************************************************************
Done querying services ....
**********************************************************************
```

Installing UniCluster

- **UniCluster Express can be installed 'offline' to avoid 'man in the middle' attacks.**

- **In an offline install the bootstrap-announce-file must be manually transferred to the main node after the compute, login or workstation node is installed.**

- **UniCluster install provides many default settings which can be overridden to meet your needs**

  - ./install_unicluster.sh –help

- **Unicluster can be uninstalled by calling the unistallation script.**

  - ./uninstall_unicluster.sh

Using UniCluster

- ## **Next Steps…**

  - Login to UniCluster to monitor the cluster.

  - Source the UniCluster environment settings.
    ```
    [user@host ~]$  . /usr/local/unicluster/unicluster/unicluster-user-env.sh
    ```

  - Login as a regular user not root
    ```
    [user@host ~]$  unicluster-grid-logon
    ```
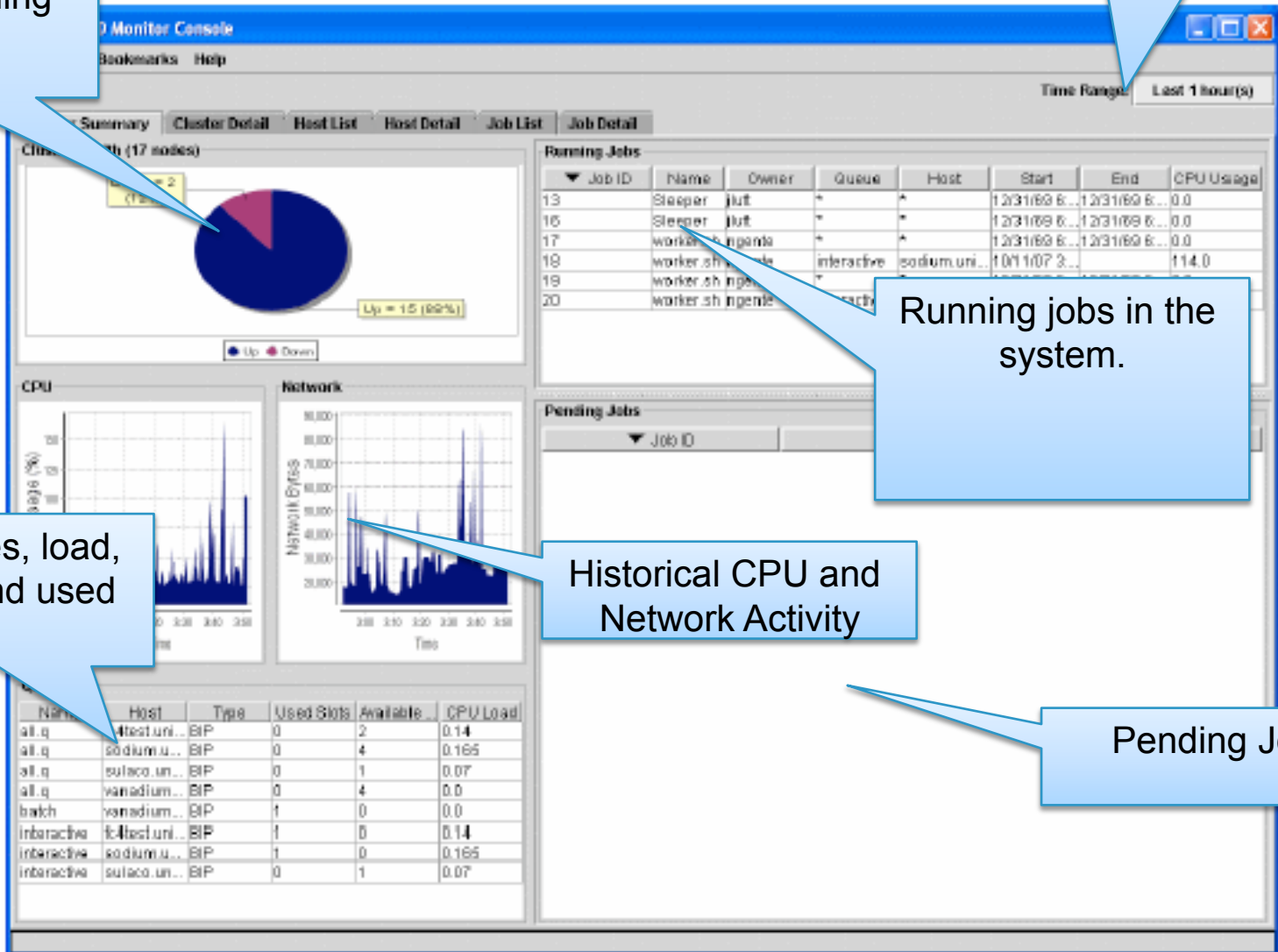
  - Run the UniCluster Monitor
    ```
    [user@host ~]$  unicluster-mgmt-console
    ```

  - The Java console should display all of the cluster and job statistics.

The UniCluster Console

Number and percentage of machines running and down.

Time Range can be changed to hour, day, week.

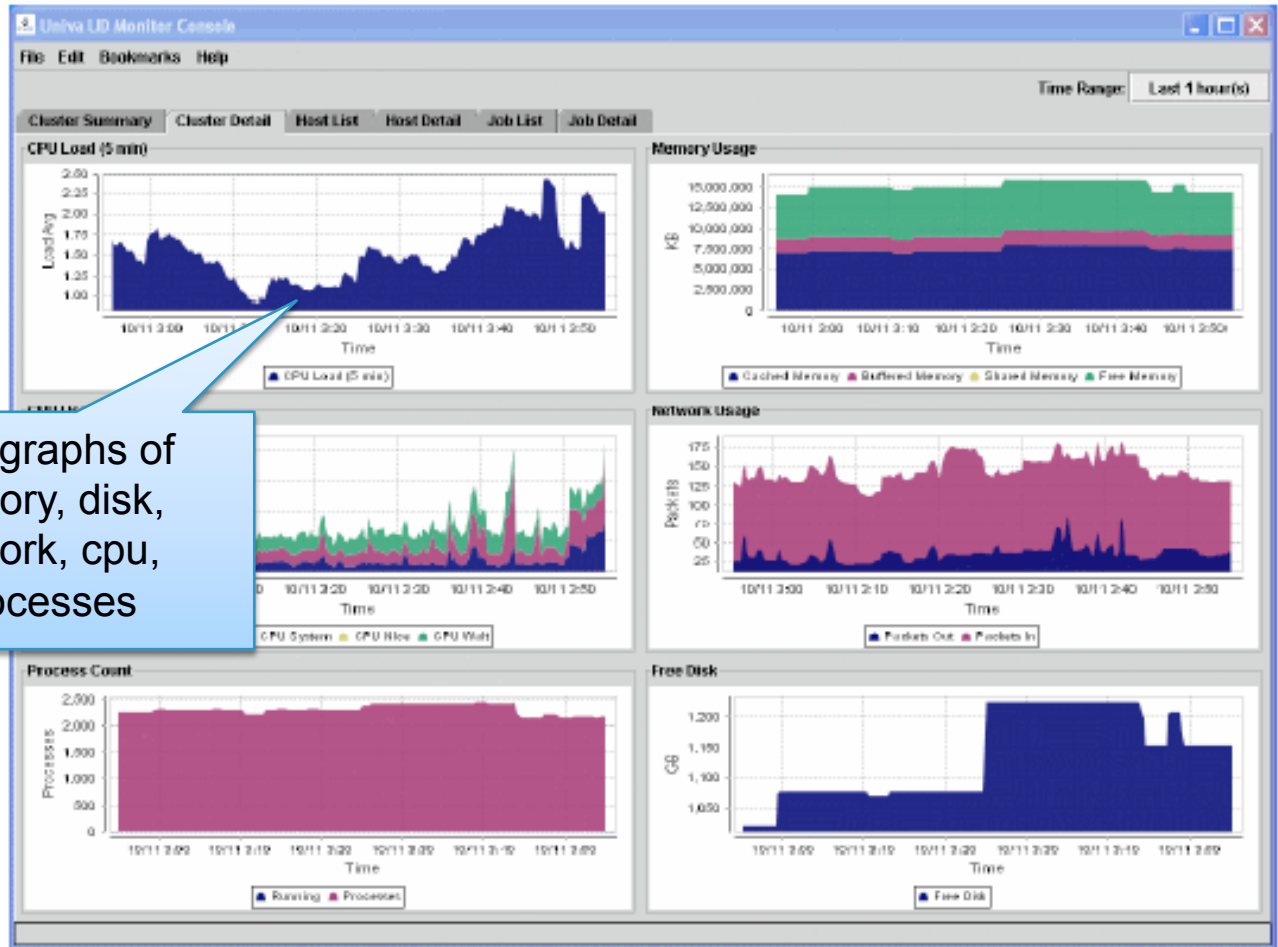**Running jobs in the system.**

SGE Queues, load, available and used slots

Historical CPU and Network Activity
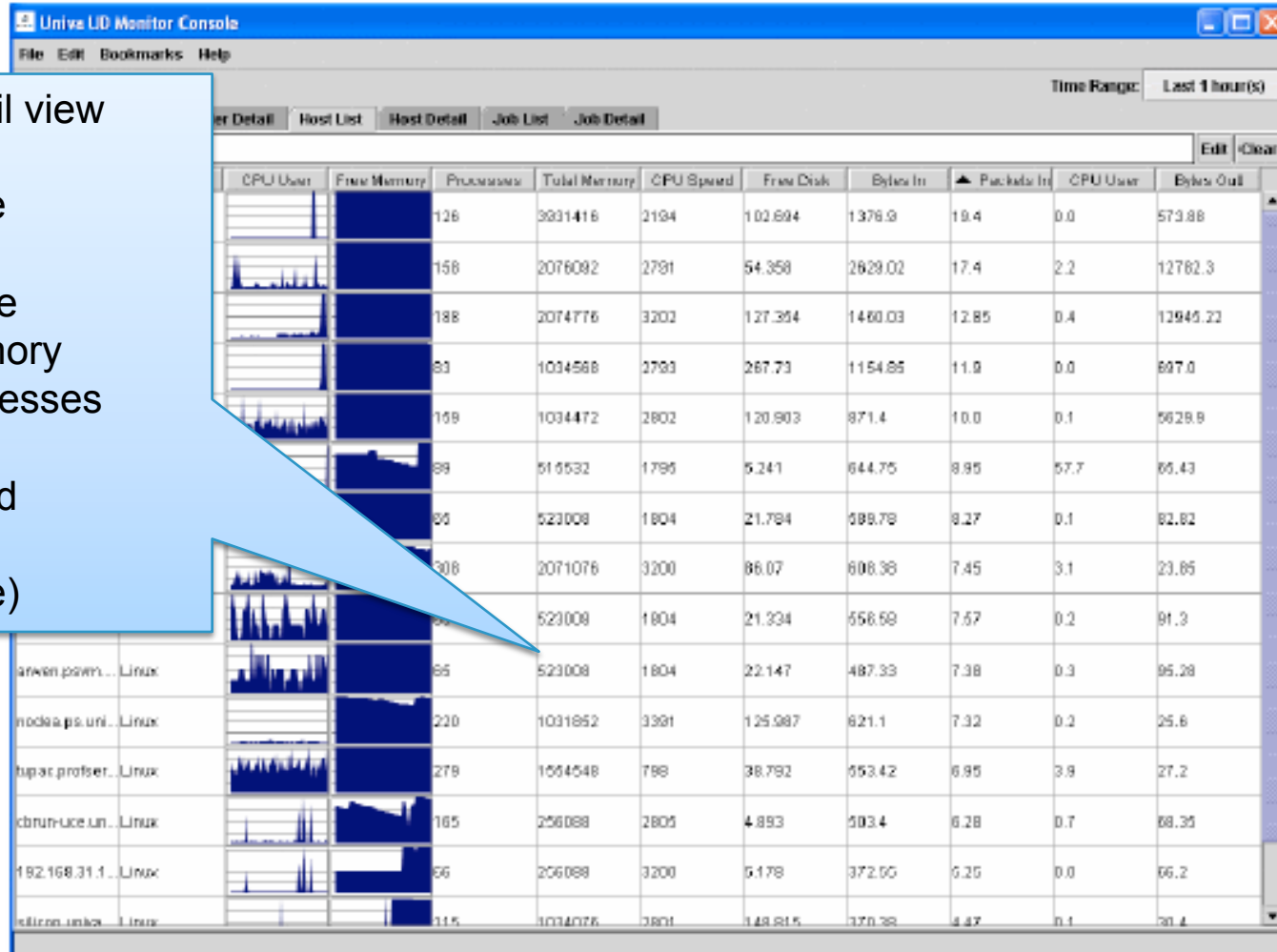
Pending Jobs

The UniCluster Console

RRD graphs of memory, disk, network, cpu, processes

The UniCluster Console

Host detail view provides:
Hostname
Osname
Cpu usage
Free memory
Total processes
Memory
Cpu speed
Free disk
(and more)

Job Submission to UniCluster

- **Standard SGE command line tools**
  - `qsub` for submitting jobs
  - `qstat` for viewing job status
  - `qdel` for removing jobs
  - `qconf` for modifying and displaying the SGE configuration.

  - Example:

    `[user@host ~]$ qsub usr/local/unicluster/sge/examples/jobs/simple.sh`

Additional Grid Tools

- ## GridFTP –

  - securely transfer files across sites and hosts

  `globus-url-copy` command line tool

  Example:

  ```
  [user@host ~]$ globus-url-copy
  gsiftp://host01.univaud.com:2811/home/user/file01
  gsiftp://host02.univaud.com:2811/tmp/foo
  ```

- ## WS-GRAM

  - Submit WS jobs to globus

  `globusrun-ws`

  ```
  Example:
  [user@host ~]$ globusrun-ws -submit —factory https://
     mainnode.univaud.com:8443/wsrf/services/ManagedJobFactoryService -c /
     bin/true
  ```

Additional Grid Tools

- **Example:**

  ```
  globusrun-ws -submit -factory-type SGE -factory
  https://mainnode.domain.com -c /bin/false
  ```

  (admittedly the examples are pretty trivial!)

- **GSI-OpenSSH**

  - gsissh, gsiscp, gsiftp
  - Replacements for ssh, scp and ftp that use the Globus security framework.

- **Example:**

  ```
  [user@hostA ~]$ gsissh -l user hostB.univaud.com -p 2222
  Last login: Wed Oct 24 12:43:55 2007 from hostA.univaud.com
  Message as of: 01/22/2008
  ```

UniCluster & Grid.org

- **Grid.org is a community site for cluster users administrators and developers**
- **UniCluster can be downloaded from grid.org**
- **Grid.org contains**
  - Forums to discuss issues on Grid and UniCluster
  - A wiki for UniCluster
  - Bug reporting for UniCluster and other projects
  - Mailing lists
  - Links to other cluster and Grid articles.

UniCluster and Intel Cluster Ready

- **Intel Cluster Ready simplifies the delivery and certification of HPC clusters.**

- **UniCluster will be Intel Cluster Ready (ICR) when UniCluster 4.0 Ships**

- **UniCluster 4.0 is scheduled for Fall 2008**
  - A partial release will be available in July/August 2008 containing ICR tools.
  - Additional Intel Software tools available Fall 2008

- **UniCluster 4.0 will ship with the Intel Cluster Checker**

- **The software can be downloaded from:**
  - http://www.grid.org
- **Documentation is available from:**
  - http://www.grid.org/download
- **User Forums and Troubleshooting**
  - http://www.grid.org/forum

Thank You!