HPCC Cluster Computing Services

**Major computing resources:**

1. Hrothgar
	1. Installed in ’05 and upgraded in ’06, ’07, ’09 and ‘10
	2. 72 teraflops in 7680 2.8 GHz cores and 12.3 teraflops in 1024 3.0 GHz cores
	3. 17.408 terabytes of memory and 1 petabytes of DDN storage
	4. DDR Infiniband for MPI communications and GigE for management
	5. Additional 46 nodes part of a community cluster
2. Antaeus
	1. Installed in ’06 upgraded in ‘11
	2. Community cluster for grid work and high energy physics
	3. 5.9 teraflops over 496 3.0 GHz cores
	4. 7936 gigabytes of memory and 106 terabytes of lustre storage
	5. GigE only
3. TechGrid
	1. 1000 desktop machines in a Condor grid
	2. Used during times that machines would otherwise be inactive
	3. Single jobs can run 100’s of iterations simultaneously.
4. Weland
	1. Installed ‘10
	2. Cluster for grid work
	3. 1.295 teraflops over 128 2.53 GHz cores
	4. 384 gigabytes of memory and mounts 106 terabyte antaeus storage system.
	5. 16 GigE nodes with 8 capable of DDR Infiniband
5. Janus
	1. Upgraded in ‘11
	2. Microsoft Windows HPC cluster
	3. One Dell PowerEdge R510 login server, with eight 2.4 GHz cores, 24 gigabytes of memory and 20 terabytes of shared storage.
	4. 18 compute nodes, each node is a Dell PowerEdge 1950 server, with eight 3 GHz cores and 16 gigabytes memory each node.
	5. GigE only
6. TACC Lonestar
	1. Became operational in ‘11
	2. 9,000,000 core hours per year have been purchased by TTU IT for TTU researchers.
	3. 302 teraflops over 22,656 3.33 GHz cores.
	4. 44 terabytes of memory and 1276 terabytes of storage
	5. Five large memory nodes, six cores each, each node has 1TB of memory.
	6. Eight GPU nodes each node has two NVIDIA M2070 GPUs.
	7. QDR infinband for MPI communications

**Community Cluster**

On the major shared resources like Hrothgar, Antaeus and Weland, scheduling software is used to allocate computing capacity in a reasonably fair manner. If you need additional computing capacity beyond this and you are considering buying a cluster, talk with us about the community cluster option. Additions to the Community Cluster are subject to space or infrastructure limitations. Please check with the HPCC staff for the current status of the Community Cluster.

In the Community Cluster you will buy nodes that are part of a larger cluster, and you will get priority access equal to the nodes you purchased. We will house, operate and maintain the resources as long as they are in warranty. This is typically three years. Contact us for more details.

**Dedicated Clusters**

A dedicated cluster is a standalone cluster that is paid for by a specific TTU faculty member or research group. HPCC is able to, subject to space and infrastructure availability house these clusters in its machine rooms providing system administration support, UPS power and cooling. Typically, for these clusters HPCC system administration support is by request with day to day cluster administration provided by the owner of the cluster.

**HPCC Software Services**

A major part of the HPCC mission is maintaining the system software on the clusters and the local grids, as well as the application software on clusters, local grids, and remote grids. Most of the standard open-source packages in the Linux distribution are installed on our clusters. We have installed a number of additional packages and can install new software as long as it is appropriately licensed. If you have a package you would like us to install contact us at hpcc@ttu.edu or fill out the form at <http://www.hpcc.ttu.edu/RequestSoftware.php>

Some application packages and a few of the libraries that we install and maintain include:

* Intel compilers, debuggers, and math libraries
* Totalview debugger
* MPI software: Open MPI, MVAPICH2
* Math libraries: Intel MKL, Gotoblas, and FFTW
* Quantum Chemistry codes: NWChem
* Molecular dynamics codes: NAMD, Gromacs, Gamess, Venus, and Amber
* Math languages/application: R, Matlab, and Comsol
* Weather modeling codes: WRF, MM5, NCARG, and Netcdf
* On Janus, the Windows Cluster: GPM (Global Proteome Machine), ArcGIS and Saga-gis, ConventorWare, LSDYNA

Currently there are some 171 application directories in the hrothgar shared application file system. In addition HPCC staff has and will assist users to compile and build applications in the user’s own directories.

**HPCC Grid Computing Services**

There is one compute grid on Texas Tech campus: TechGrid.  This grid uses mostly desktop Windows computers during periods of inactivity.  TechGrid, with 1000 nodes, uses IT and academic department desktops and runs Condor software.  Several applications such as 3-D rendering, bioinformatics, physics modeling, computational chemistry electro nuclear dynamics simulations, mathematics prime number research and statistical analysis, business financial and statistical modeling, and genomic analysis with biology department research faculty and TTU Health Sciences Center have been ported to operate within TechGrid. TechGrid’s greatest attribute is to provide greater capacity for multiple serial jobs. Some grid user’s jobs have utilized up to 600 CPU’s simultaneously, creating immense time savings.

The HPCC currently supports grid activities on the Open Science Grid (OSG) and SURAgrid.  OSG is a national grid that gathers and allocates resources to virtual organizations.  We maintain the tools and services necessary to participate in these virtual organizations.  Currently a local group with our help shares resources in a virtual organization that has collaborators from all over the world.

SURAgrid is a consortium of organizations collaborating and combining resources to help bring grid technology to the level of seamless, shared infrastructure. For more information on SURAgrid go to: http://www.suragrid.org/sura\_grid.html.

HPCC provides help getting allocations and local application support for TTU users of the NSF Teragrid.  The largest single system on Teragrid is the 400 teraflop system at UT Austin, which has a 5% Texas allocation for researchers from Texas universities.

**Other HPCC services**

HPCC provides consulting services for a variety of applications that exploit serial and parallel computing environments to address application specific scientific computing challenges. Our services include working closely with researchers and their students in migrating computer programs from PC to Linux environments, code optimization and parallelization strategies, and introducing campus researchers to national scale resources wherever requested computing time exceeds campus limitations. The NSF TeraGrid and Texas major computing resources such as Ranger at TACC are some national scale resources for example. TTU HPCC is an active partner in the TACC Lonestar IV cluster. As a result TTU researchers have access to 9,000,000 core hours per year for the lifetime of the system.

We also help campus researchers find potential interdisciplinary and intercampus collaborations where computing is the common denominator. We do this by organizing seminars and meeting with various research groups on campus. We do this both for groups that are currently involved in compute modeling and those that are thinking about it. Please feel free to contact us at hpcc@ttu.edu if you would like our help.

If you need help in bidding a system either for a proposal or to purchase on a grant, we can help you in designing and getting a bid for an appropriate system.

**Contact list:**

hpcc@ttu.edu

HPCC website: <http://www.hpcc.ttu.edu>

New account: see link on HPCC website

New software request: see link under Operations on HPCC website.