**Research Computing Resources**

The central campus Information Technology Services (ITS) Research Computing provides a number of computing resources to support and promote computational research at UNC-Chapel Hill. Some School departments supplement these services with in-house offerings such as storage or research programming.

High performance and high throughput computing resources include a 704 node (8064 core) Dell Linux cluster, Kill Devil, with QDR Infiniband interconnect and a minimum of 4 GB memory per core; a smaller 1000-core HP Linux cluster with QDR Infiniband interconnect and at least 6 GB of memory per core; and two 32-core servers with one terabyte of memory each to accommodate codes that require extremely large amounts of RAM. The Kill Devil cluster also includes 64 NVidia Tesla GPUs (M2070).

Storage for research data accessed on the above systems includes more than 2 petabytes of disk, comprising locally attached disks; network-attached shared scratch space; and network-attached shared file systems. Supported file systems include Lustre, Isilon OneFS, GPFS and NFS. An archival mass storage system, with a current capacity of more than 700 TB, is also available.

Infrastructure components are housed in an 11,000 square foot data center with more than 2 megawatts of power 800 tons of cooling available. The data center is staffed and monitored 7x24x365.

Centrally provided and managed software applications include a variety of Fortran and C compilers; Gaussian, Amber, Insight II, and dozens of other open-source packages commonly used in the biosciences and physical sciences. In addition, standard mathematical and statistical software such as Mathematica, Matlab, Stata, R, and SAS are available, as are GIS applications, including ArcGIS, and visualization/image processing packages such as ENVI and IDL. Research Computing also offers a virtualization service called the Virtual Computing Lab (VCL). Originally developed by NC State University in collaboration with IBM, the VCL provides faculty, students and staff with anytime, anywhere access to custom application environments created specifically for their use and deployed on demand via an internet connection. They also provide TarHeel Linux, an easy-to-install Linux computing environment designed particularly for use on CCI machines and compatible with both Mac and PC operating systems. Computational scientists on staff in Research Computing are available for consultation on use of systems, applications, modeling, analysis and code optimization.

An Oracle database server and campus-wide Oracle site license can be used to provide backend database capabilities for applications and projects. In addition to hosting research databases, Research Computing’s database administrator can be leveraged by projects to ensure professional management of databases, freeing up researchers to focus on their actual research. Expert assistance is also available for performance analysis, code porting and code parallelization.

Condor-based grid capabilities have been deployed centrally and in various campus units, and Research Computing staff can also facilitate access to Open Science Grid and XSEDE national resources. In addition, Research Computing provides and supports a CentOS-based Linux image (Tar Heel Linux), customized for use with the UNC technology infrastructure, and a software application repository to enable rapid deployment of distributed Linux workstations on campus. Codes developed and tested in these environments can easily scale up to the central compute clusters.

Computing services in Research Computing are largely based on an underlying common campus architecture that includes Kerberos authentication, role-based authorization and shared, centrally installed and managed software applications when practical. More than two hundred software packages and utilities are offered for use on the central systems. By relying on ITS to maintain the hardware, security environment and software builds of computing systems, researchers are free to devote their time to science and research rather than to system administration.