Cornell Theory Center

CTC

Cornell Theory Center (CTC) is a high-performance computing and interdisciplinary research center at Cornell University. Scientific and engineering research projects supported by CTC represent a variety of disciplines, including biology, behavioral and social sciences, computer science, engineering, geosciences, mathematics, physical sciences, and business. CTC is unique among HPC centers in that it is a showcase for Windows-based high-performance computing. In 1999, we successfully moved our research community from a traditional, proprietary supercomputer running UNIX to an industry-standard cluster complex. Microsoft and Dell are major supporters of CTC, which is directed by computer scientist Thomas F. Coleman.

http://www.tc.cornell.edu/

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Case Studies

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• Plant breeders and molecular biologists generating detailed information on the genetic makeup of crops e.g. rice and wheat

• Management model for manufacturing that helps managers find best balance between capacity, inventory, and subcontracting

• New stochastic path approach for modeling protein dynamics in more meaningful time scales

• New social science research made possible by developing new statistical methods for analyzing census data

• Simulation of crack growth and strength evaluation of airplane components

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Compute Power

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644 Processors
Giganet Switch (100 MB/sec) interconnect
100 Mb switched Ethernet
1-4 GB Ram/Node, 27-56 GB Disk/Node
Serial, Dual, and Quad processors
Dell PowerEdge Servers
Pentium processors, 400 Mhz – 1Ghz
256 KB - 2 MB Cache/Processor (SMP)

Tivoli Backup System
Microsoft Distributed File System
Fileservers, 5 Terabytes Storage

*11/ 2001
256-processor
cluster in top 500
120.67 gigaflops
over 252 1Ghz
Linpack benchmark*

http://www.tc.cornell.edu/Services/Docs/resources.asp

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Visualization

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Consultation on how to visualize data
Creation of animations, videos, publication graphics
Internships for undergraduate students
Training in the use of OpenDX
Video production suite

Three-wall Windows CAVE:
Virtual reality environment (show VRML files)
Write your own with OpenGL or OpenInventor
Free by appt with kford@tc.cornell.edu

http://www.tc.cornell.edu/services/vis/index.asp
http://www.tc.cornell.edu/services/docs/cave/
http://www.tc.cornell.edu/services/edu/topics/topics.asp?section=opendx
http://www.tc.cornell.edu/services/Allocations/Account/visform.asp

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Software

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See online list for software available on the login nodes, various types
of compute nodes and the Collaboratory. This list is updated as new
packages are added. Software is added by researcher's request if feasible.

C/C++ compilers:
Microsoft Visual C++, Intel C/C++, Portland Group PGCC, Gnu gcc/g++

Fortran compilers:
Compaq Visual Fortran, Intel Fortran, Portland Group PGHPF, PGF77, PGF90

Libraries:
MPI/PRO parallel programming, Numerical Libraries

Applications software:
Computational chemistry, Data analysis, Finite element modeling, Fluid dynamics . . .

http://www.tc.cornell.edu/Services/Software/
http://www.tc.cornell.edu/services/edu/topics/software/

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Allocations

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Research allocation:
Submit proposals at any time.
Undergraduate or graduate students must have
their requests submitted by a faculty advisor.

Non-renewable six-month Exploratory:
Allocations of 100 hours. Simplified application.

• Charging is calculated using wall-clock hours; i.e. you will be charged for the time
nodes are reserved for your use, not for the time you are actually using them.
• Wall-clock hours on all of the node types are charged the same flat wall-clock rate,
regardless of number of processors. Parallelize!
• Charges for compute nodes only, not for login nodes or the collaboratory machines.

http://www.tc.cornell.edu/services/Allocations/
http://www.tc.cornell.edu/services/edu/topics/start/

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Access

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Connect to a login node (ctclogin1 or ctclogin2) to compile and submit jobs.
The login nodes are SSH servers, download an SSH client.
Login.bat is run automatically.

For full windows desktop functionality from your machine, use a terminal server,
Microsoft Terminal Server Client for Windows, Citrix ICA for non-windows.

For command line access, use telnet:
    ssh *or* telnet ctclogin1.tc.cornell.edu

http://www.tc.cornell.edu/Services/Docs/HotTips/2000/ht01.asp
http://www.tc.cornell.edu/Services/Docs/HotTips/2001/ht04.asp
http://www.tc.cornell.edu/Services/edu/topics/start/#Sec1.2

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Development Environment

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Programs can be compiled on your Windows machine, in the Collaboratory in Rhodes
Hall, or from one of the login nodes reached via Terminal Server or telnet. Work from
the command line or in a GUI environment.

Command line:
    Start | Run | cmd (bring up a command line window)
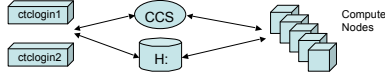   vcvars32 (run the setup script)
    cl hello.c (compile)

Visual Studio:
    Start | Programs | MS Visual Studio (bring up your choice)

http://www.tc.cornell.edu/Services/edu/topics/writing1/#Sec2
http://www.tc.cornell.edu/Services/edu/topics/mpi/basics/more.asp#Sec5.1

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Compute Environment

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1. Prepare your executable
2. Write a batch script file
3. From one of the login nodes, submit the script to the scheduler
4. Check the status of the queue, your job, etc
5. When your job has started, telnet to the node assigned, copy files to the local T: drive, run the program (or do this from within the script)
6. Copy any output files back to H:, clean up the T: drive, and end the job.

ctclogin1   CCS   Compute Nodes

ctclogin2   H:

http://www.tc.cornell.edu/Services/Docs/Batch/
http://www.tc.cornell.edu/services/edu/topics/ccs/
http://www.tc.cornell.edu/services/edu/topics/ccs2/

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More Information:

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Consulting - Send questions about use of the Velocity Cluster to consult@tc.cornell.edu or call 254-8686 and ask for a consultant.

Can answer specific questions, help with problems, discuss strategies and code planning.

Strategic users (faculty with proven application, suitable for scaling) have access to more in-depth long-term consulting help.

http://www.tc.cornell.edu/
http://www.tc.cornell.edu/Services/Docs/UserGuide/
http://www.tc.cornell.edu/services/docs/
http://www.tc.cornell.edu/services/edu/topics/
http://www.tc.cornell.edu/services/edu/events/
http://www.tc.cornell.edu/Services/Docs/Tips/cygwin.asp
http://www.tc.cornell.edu/Services/edu/topics/writing2/

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