Transferring Data to and from NERSC

Yushu Yao

U.S. DEPARTMENT OF ENERGY | Office of Science

NERSC National Energy Research Scientific Computing Center

BERKELEY LAB Lawrence Berkeley National Laboratory

Overview

- **Structure of NERSC Systems and Disks**
- **Data Transfer Nodes**
- **Transfer Data from/to NERSC**
  - scp/sftp
  - bbcp
  - GridFTP
- **Sharing Data Within NERSC**

Systems and Disks

System	Hopper	Franklin	Carver	Euclid	Data Transfer Node	PDSF
Global Home ($HOME)	✓	✓	✓	✓	✓	
Global Scratch ($GSCRATCH)	✓		✓	✓	✓	
Project Directory	✓	✓	✓	✓	✓	✓
Local Non-shared Scratch	✓	✓				

Data transfer nodes can access most of the disks, suggested for transferring data in/out NERSC

Data Transfer Nodes

- **Two Servers Available Now:**
  - dtn01.nersc.gov and dtn02.nersc.gov
  - Accessible by all NERSC users
- **Designed to Transfer Data:**
  - High speed connection to HPSS and NGF (Global Home, Project, and Global Scratch)
  - High speed ethernet to wide area network
  - Various tools such as scp, bbcp, GridFTP, hsi
- **Suggested For Transferring Data to/from NERSC**

SCP/SFTP

- **Suggested for:**
  - Small files (<10GB)
- **Requirements:**
  - Unix-like: ssh and scp commands (Available Everywhere)
  - GUI Clients: WinSCP(Windows), Fugu(Mac), etc
    - Drag and Drop, easy to use, will not demonstrate here
- **Pros:**
  - Easy to find client, easy to use
  - Data Encrypted
- **Cons:**
  - No parallel transfer, no tuning options, slow

SCP Example

- **Get a File From Data Transfer Node:**

  scp **user_name**@dtn01.nersc.gov:**/remote/path/myfile.txt /local/path**

- **Send a File to Data Transfer Node:**

  scp **/loca/path/myfile.txt user_name**@dtn01.nersc.gov:**/remote/path**

SSH + TAR Example

If you have many small files, sometimes it is easier to use tar with ssh pipe:

- **Get a Directory From Data Transfer Node:**

  ssh user_name@dtn01.nersc.gov tar cz /remote/path/dirname | tar zxv -C /local/path

- **Send a Directory to Data Transfer Node:**

  tar cz /loca/path/dirname | ssh user_name@dtn01.nersc.gov tar zxv -C /remote/path

BaBar Copy (bbcp)

- **Requirements:**
  - Unix-like Only: Need to Download The Client
  - NIM Account and Password
- **Pros:**
  - Parallel Transfer, Tuning Options, Fast
  - Use SSH for Encrypted Authentication (Data is not encrypted)
- **Cons:**
  - Client not widely available, no windows/GUI

Getting bbcp

- **Available on all NERSC Systems**
- **On the other end, download the pre-compiled executables from its website:**
  - http://www.slac.stanford.edu/~abh/bbcp/

Initiating Transfer from A Remote Host

- **Get a File From Data Transfer Node:**

  bbcp -S "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" "user_name@dtn01.nersc.gov:/remote/path/file" /local/path

- **Send a File to Data Transfer Node:**

  bbcp -T "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" /local/path/file "user_name@dtn01.nersc.gov:/remote/path/"

  Note the "-S" option for source and "-T" option for target.

Initiating Transfer from A NERSC Host

- **Get a File From A Remote Host:**

  bbcp -S "ssh -x -a -oFallBackToRsh=no %I -l %U %H /path/to/bbcp/on/remote/host" "user_name@remote.host.com:/remote/path/file" /local/path

- **Send a File to A Remote Host:**

  bbcp -T "ssh -x -a -oFallBackToRsh=no %I -l %U %H /path/to/bbcp/on/remote/host" /local/path/file "user_name@remote.host.com:/remote/path/"

  Note the "-S" option for source and "-T" option for target.

Number of concurrent streams

Use the "-s" option to change the number of streams, default is 4 (recommended for most cases)

- **Get a File From Data Transfer Node:**

bbcp -s 8 -S "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" "user_name@dtn01.nersc.gov:/remote/path/file" /local/path

- **Send a File to Data Transfer Node:**

bbcp -s 8 -T "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" /local/path/file "user_name@dtn01.nersc.gov:/remote/path/"

Firewall Problem and -z

Sometimes your local firewall causes problem in transferring, e.g. error message like below:

bbcp: Accept timed out on port 5031
bbcp: Unable to allocate more than 0 of 8 data streams.
Killed by signal 15.

- **You can add the -z option and try again.**
- **Get a File From Data Transfer Node:**

bbcp -z -S "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" "user_name@dtn01.nersc.gov:/remote/path/file" /local/path

- **Send a File to Data Transfer Node:**

bbcp -z -T "ssh -x -a -oFallBackToRsh=no %I -l %U %H /usr/common/usg/bin/bbcp" /local/path/file "user_name@dtn01.nersc.gov:/remote/path/"

GridFTP

- **Requirements**
  - Need Client Tool
  - Need Grid Certificate
- **Pros**
  - Parallel Transfer, Many Tuning
  - Fast and Reliable
- **Cons**
  - Complicated Grid Infrastructure
  - Steep learning curve
  - Additional administrative hoops

GridFTP (cont.)

- **Basic Procedure:**
  - Obtain Grid Certificate
  - Setup Grid Certificate
  - Call globus-url-copy
  - Details in the NERSC Website
- **Globus Online (Next Talk) is an alternative to the above which is much simpler**

"Grid" Nodes

- **Round-robin based DNS load balancing on login nodes may cause problems for bbcp and GridFTP**
- **We have "Grid" nodes to solve that:**
  - franklingrid and hoppergrid
  - Access local scratch with bbcp/GridFTP
  - i.e use franklingrid.nersc.gov instead of franklin.nersc.gov

Comparing Your Options

Method	Requirements	Simple To Use	Parallel Transfer	Speed
scp/sftp	Any SSH/SFTP Client	Simple	NO	Slow
bbcp	bbcp client (no windows support)	Simple With Instructions	YES	Moderate-Fast
GridFTP	GridFTP Client Grid Certificate	Less Simple, multiple steps needed	YES	Fast

Sharing Data inside NERSC (Minimizing Data Transfer)

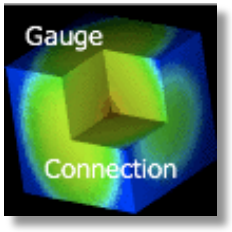
- **With Yourself NERSC Systems**
  - Global Home ($HOME)
    - **Everywhere except PDSF**
  - Global Scratch ($GSCRATCH)
    - **Everywhere except Franklin and PDSF**
    - **Note: inactive data will be purged**
- **With Other NERSC Users**
  - Project Directories
    - **By request, email consult@nersc.gov**

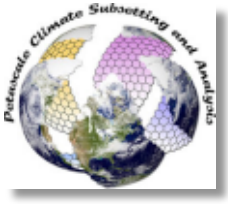
Performance Tuning

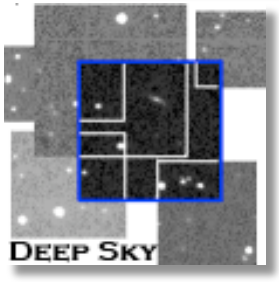
- **Performance of the default settings are hard to beat, but not unbeatable**
- **More Information about Performance Tuning:**
  - http://www.psc.edu/networking/projects/tcptune/
  - http://fasterdata.es.net/

Science Gateway Services

- **Create scientific communities around data sets**
  - NERSC HPSS, NGF accessible by broad community for exploration, scientific discovery, and validation of results
  - Increase value of existing data
- ***Science gateway: custom (*hardware/software) to provide remote data/computing services**
  - Deep Sky – "Google-Maps" for astronomical image data
    - Discovered 36 supernovae in 6 nights during the PTF Survey
    - 15 collaborators worldwide worked for 24 hours non-stop
  - GCRM – Interactive subselection of climate data (pilot)
  - Gauge Connection – Access QCD Lattice data sets
  - Planck Portal – Access to Planck Data
- **New models of computational access**
  - Projects with mission-critical time constraints require guaranteed turn-around time.
  - Reservations for anticipated needs: Computational Beamlines
  - Friendly interfaces for applications and workflows







Questions?

National Energy Research Scientific Computing Center