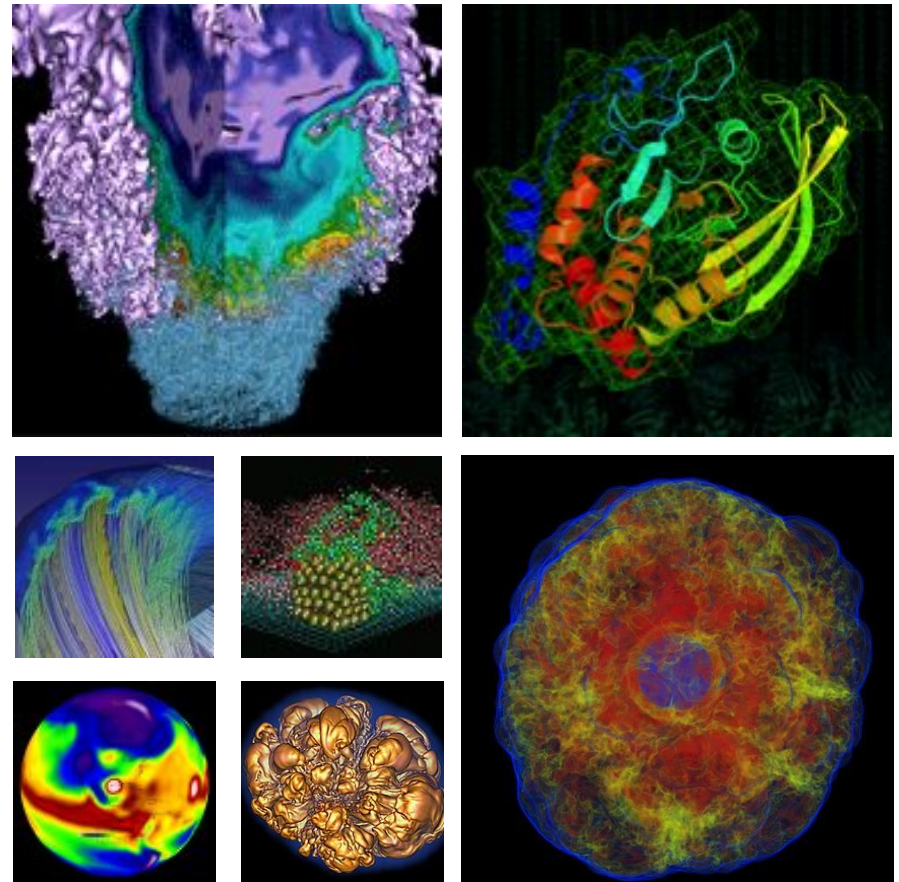


Data Transfer at NERSC



Shreyas Cholia
NERSC Data and Analytics Group

NERSC New User Training

January 25, 2019

Dedicated Data Transfer System: Data Transfer Nodes



- **Data Transfer Nodes (DTN) are dedicated servers for moving data at NERSC. (dtnXX.nersc.gov)**
 - Servers include high-bandwidth network interfaces & are tuned for efficient data transfers
 - Monitored bandwidth capacity between NERSC & other major facilities such as ORNL, ANL, BNL, SLAC...
 - Direct access to global NERSC file systems & Cori cscratch1
 - Can be used to move data internally between NERSC systems &/or NERSC HPSS
- **Use NERSC DTNs to move large volumes of data in and out of NERSC or between NERSC systems**

- **The recommended tool for moving data in & out of NERSC**
 - <http://www.globus.org/> or <http://globus.nerisc.gov/>
 - Reliable & easy-to-use web-based service:
 - Automatic retries
 - Email notification of success or failure
 - Accessible to all NERSC users
 - NERSC managed endpoints for optimized data transfers
- **Globus extensive documentation <https://docs.globus.org>**
 - Web based interaction with service
 - REST/API for scripted interactions with service
 - Globus Connect Server & Personal for setting up additional remote endpoints such your personal laptop

NERSC Managed Globus Endpoints



- Available for all NERSC users
 - Maps data servers to NERSC resources
 - See: <http://www.nersc.gov/users/storage-and-file-systems/transferring-data/globus-online/>

NERSC Endpoints

	Endpoint Name	Description	Recommended Use
Most use cases →	NERSC DTN	Multi-node, high performant transfer system with access to all NERSC Global File systems (NGF) as well as the large Cori Scratch	Almost all data transfers needs into & out of NERSC
Special use cases {	NERSC HPSS	Single node system connected directly to the NERSC HPSS tape archive	Remote transfers into & out of HPSS
	NERSC Edison	Single node system connected to NGF and uniquely to the Edison scratch file system	<i>Only recommended for access to Edison scratch</i>
	NERSC PDSF	Single node system connected to NGF and the two remaining PDSF-specific file systems, eliza3 and eliza18	<i>Only recommended for access to /eliza3 and /eliza18</i>
Now obsolete {	NERSC Cori	Originally a dual-node system needed for accessing the Cori scratch file system. The endpoint is the same as NERSC DTN	<u>Use NERSC DTN instead</u>
	NERSC DTN-JGI	Single node system that was used to access JGI-specific file systems, which are now connected to the NERSC DTN servers.	<u>Use NERSC DTN instead</u>

Globus Demo



Transferring with NERSC HPSS



- **HPSS tape archive is recommended for storing/archiving large amounts of data and/or for long periods of time**
 - See: https://docs.nersc.gov/filesystems/archive_access/
- **Use interactive DTNs with hsi/htar to move data to/from HPSS and NERSC file systems**
 - HSI for individual files and conditional access
 - HTAR for aggregation & optimization of storage/archival of large numbers of files
- **Also use Globus Online: NERSC HPSS endpoint**
 - However Globus does not directly support aggregation with 'htar' or tape-ordering
 - Preferred use is for small number of large files

Access for External Collaborators



- **NERSC supports project-level public http access**
 - Project specific area can be created:
 - /global/project/projectdirs/<yourproject>/www
 - These are available for public access under the URL:
 - <https://portal.nersc.gov/project/<yourproject>>
 - Add HTML and JS for spice
- **FTP Upload site**
 - Temporary anonymous FTP access for external partners to upload data
 - <https://www.nersc.gov/users/storage-and-file-systems/transferring-data/nersc-ftp-upload-service>

NERSC Science Gateways



- Web portals that allow you to interface with your data and computation at NERSC
- Interfaces built around your science
 - use “www” project dir to publish
 - Build sophisticated web applications in SPIN
- NEWT REST API to access NERSC resources
- Science-as-a-Service!!
- Links:
 - <http://www.nersc.gov/users/data-analytics/science-gateways/>
 - https://docs.nersc.gov/services/spin/getting_started/

The image shows two screenshots of NERSC science gateways. The top screenshot is the ESS-DIVE (Earth System Science Data) interface, displaying a list of datasets. The first dataset is titled "Blasing T J, Broniak C, Marland G H (2004): Estimates of Monthly CO2 Emissions and Associated 13C/12C Values from Fossil-Fuel Consumption in the U.S.A. (1981-2003), Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States). doi:10.3334/CDIAC/FFE.001". The second dataset is "Blake D (2005): Methane, Nonmethane Hydrocarbons, Alkyl Nitrates, and Chlorinated Carbon Compounds including 3 Chlorofluorocarbons (CFC-11, CFC-12, and CFC-113) in Whole-air Samples (April 1979 – December 2012), Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States). doi:10.3334/CDIAC/ATS.002". The third dataset is "Jones P D, Parker D E, Osborn T J, Briffa K R (2009): Global and Hemispheric Temperature Anomalies: Land and Marine Instrumental Records (1850 - 2015), Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (United States). doi:10.3334/CDIAC/CLI.002". The bottom screenshot is the Explore Materials interface, showing a periodic table of elements. The search bar contains "Na-O". The periodic table is color-coded by element groups. On the right side, there are filters for "excluded elements", "Material Tags", "Band Gap (eV)", "Energy Above Hull", and "Formation Energy".

- **Use Globus Online for large, automated or monitored transfers**
- **scp is fine for smaller, one-time transfers (<100MB)**
 - But note that Globus is also fine for small transfers
- **Don't use DTN nodes for non-data transfer purposes**
 - Use system login nodes for more general routine tasks
- **Plain "cp" is can be used for transfers within file systems**
 - Can use globus for convenience

Performance Considerations



- **Performance is often limited by the remote endpoint**
 - Not tuned for WAN transfers or have limited network link
 - These can lower performance < 100 MB/sec.
- **File system contention may be an issue**
 - Try the transfer at a different time or on a different FS.
- **Don't use your \$HOME directory**
 - Instead use /global/project, \$SCRATCH ...
- **If you think you are not getting the performance you expect, let us know: consult@nerisc.gov**

For more information



- **Data transfer info**

- <http://www.nersc.gov/users/data-and-file-systems/transferring-data>

- **Feedback / Problems?**

- consult@nersc.gov

- **Globus Support**

- <https://www.globus.org/support/>