



Transferring Your Data



Research Computing
UNIVERSITY OF COLORADO **BOULDER**

Be Boulder.

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Slides available on GitHub:

[Summer_Camp_2023/Day_Two/Transferring_your_data/slides](#)

Outline

- Ways to access your data
- Data transfer using the command line
- Data transfer using Open OnDemand
- Data transfer using Globus
- Sharing Data
- Getting A Petalibrary Allocation

Accessing Data on RC Resources

- When you use RC resources the data is not on your local machine
- Ways to access the data from your local machine
 - Command line (a variety of tools)
 - Open OnDemand (straightforward GUI interface)
 - Globus (GUI interface with some set up required)

Access through the Command Line

- If you don't need a *fancy* GUI
- Provides a larger variety of tools
 - SCP
 - SFTP
 - RSYNV
 - RCLONE
 - SSHFS
 - SMB
- The tools provided can improve your data workflow (more on this later)

General Filesystem Structure

/home (2GB)

- Small important data
- Backed up frequently
- Not for sharing files or job output

/projects (250GB)

- Medium sized important data
- Software
- Can be shared with others
- Backed up, but less frequently
- Not for job output

/scratch/alpine (10TB)

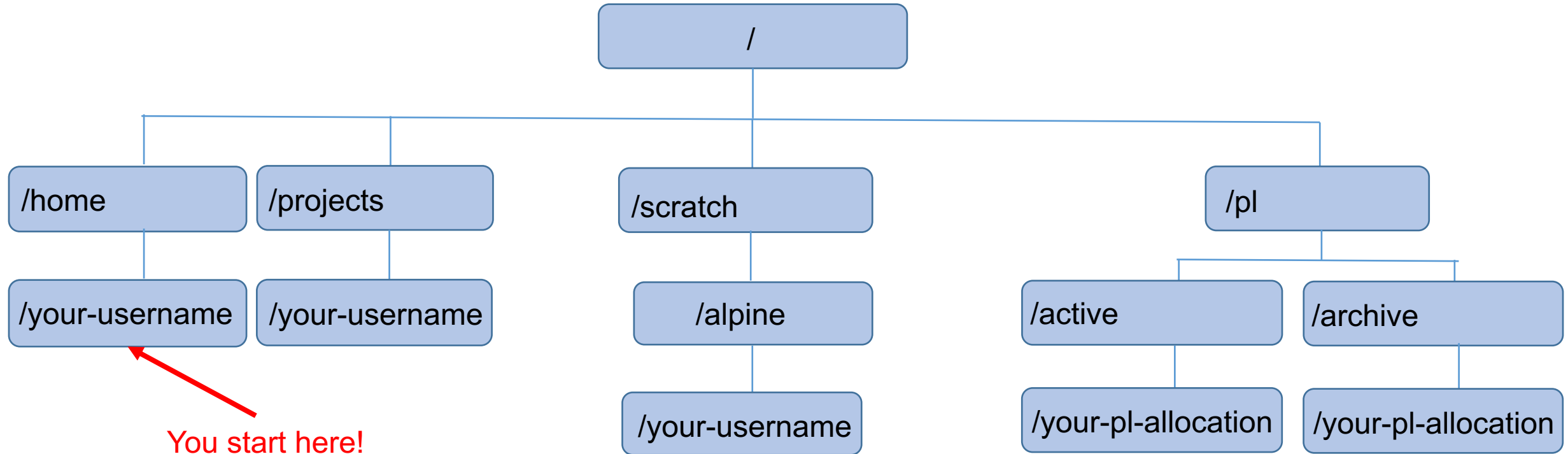
- Large data
- Can be shared with others
- Fast Data transfer to compute nodes
- Not backed up!
- Purged after 90 days!

Filesystem documentation: <https://curc.readthedocs.io/en/latest/compute/filesystems.html>

Let's get on a login node!

```
ssh <your-username>@login.rc.colorado.edu
```

RC Filesystem Map



Basic Navigation Commands

- Change directories

```
cd <relative-or-full-path>
```

- List contents of a directory

```
ls <optional-path>
```

- Print current working directory

```
pwd
```

RC endpoints

Endpoint – one of the two file transfer locations i.e., it is either the source or the destination we want to copy data from or to.

- For data on RC resources, we have two endpoints

- The **login*** nodes

- Only use for small transfers!!

`<your-username>@login.rc.colorado.edu`

- Data transfer nodes (DTNs)

`<your-username>@dtn.rc.int.colorado.edu`

- CSU

`<your-username>@dtn.rc.colorado.edu`

RC Data transfer nodes (DTNs)

- Command line use of DTNs only available if you are on CU Boulder or CSU's network or VPN
- Dedicated nodes for transferring data
 - Faster transfers
 - More stable transfers
- Suitable for
 - Large and frequent transfers
 - Automated (passwordless) transfers
 - Only for CU Boulder folks
- Cannot ssh into the DTNs!

Command line option - SCP

SCP (Secure Copy Protocol) is a command line tool to transfer files/directories to, from, or between remote locations.

- Simple, but useful!
- Copying a local file to RC resources using a login node:

```
scp file1 <username>@login.rc.colorado.edu:<remote-path>
```

- Copying a directory from RC resources to local path via a DTN:

```
scp -r <username>@dtn.rc.int.colorado.edu:<path-to-directory> <local-path>
```

Command line option - SFTP

SFTP (Secure File Transfer Protocol) a command line tool that is similar to SCP, but provides an sftp session where both the local and remote filesystems are available

- Slightly more advanced than SCP
- Useful for multiple file/directory transfers
- Starting a SFTP session on a local machine

```
sftp <username>@login.rc.colorado.edu
```

- Demo time!

Command line option - Rsync

Rsync (remote sync) a command line tool that offers remote and local file synchronization.

- Only copies the portion of the files that have changed!
- Already installed on most Linux distributions and macOS
 - Needs to be installed on Windows
- Sync RC resources to local computer

```
rsync -av <username>@login.rc.colorado.edu:<remote-path> <local-path>
```

- Flags:

- v # verbose mode
 - a # archive mode

Command line option - Rclone

Rclone is a command line tool used to manage files on cloud storage.

- It is compatible with all major cloud storage solutions
 - Supported by over 40 cloud storage products!
- Created as a cloud equivalent to the UNIX commands:
 - rsync, cp, mv, mount, ls, ncdu, tree, rm, and cat
- Needs to be downloaded on your local machine
- Requires a more involved setup process but works great!
 - <https://curc.readthedocs.io/en/latest/compute/data-transfer.html#rclone>

```
rclone copy rclonetest.csv aws_s3:testbucket/
```


Command line option - mounting

Mounting is the process of attaching a file system to a directory on another system.

- SSHFS (secure shell filesystem)
 - Needs to be installed on Mac and Windows (available on most Linux distributions)
 - You need to be on the campus network or VPN!

```
sshfs <username>@login.rc.colorado.edu:<path> <local-mountpoint>
```

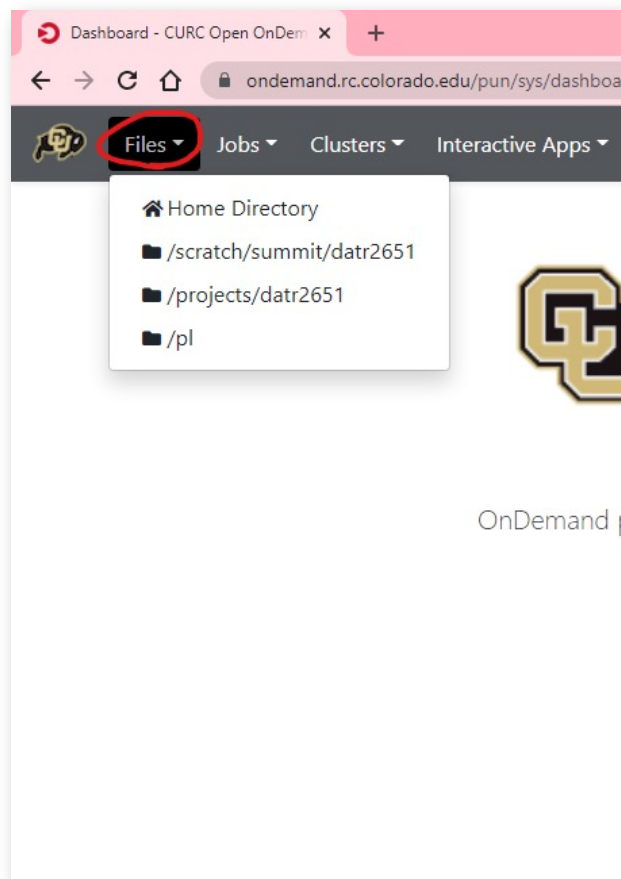
- SMB (server message block)
 - Built into all major operating systems
 - You need to be on the campus network or VPN!
 - Contact us if you want to use this

GUI based options

GUI option - Open OnDemand

- No command line required!
 - <http://ondemand.rc.colorado.edu/>
 - <http://ondemand-rmacc.rc.colorado.edu/>
- File management
 - Create, Delete, Move, and Rename
- File transfers
 - Upload and Download





Open in Terminal New File New Directory Upload Download Copy/Move Delete

↑ / projects / datr2651 / Change directory Copy path

☐ Show Owner/Mode ☐ Show Dotfiles Filter:

Showing 7 of 11 rows - 0 rows selected

	Type	↑ ↓ Name	↑ ↓ Size	↑ ↓ Modified at
<input type="checkbox"/>	Folder	bench	-	12/16/2021 4:46:14 PM
<input type="checkbox"/>	Folder	mana	-	12/15/2020 10:13:20 AM
<input type="checkbox"/>	Folder	private	-	8/30/2020 2:51:51 PM
<input type="checkbox"/>	Folder	public	-	12/10/2021 3:19:48 PM
<input type="checkbox"/>	Folder	scripts	-	2/9/2022 2:38:58 PM
<input type="checkbox"/>	Folder	software	-	8/10/2021 1:21:33 PM
<input type="checkbox"/>	File	NAMD_2.14_Source.tar.gz	55.1 MB	1/12/2022 3:41:54 PM

Let's take a look!

GUI option - Globus

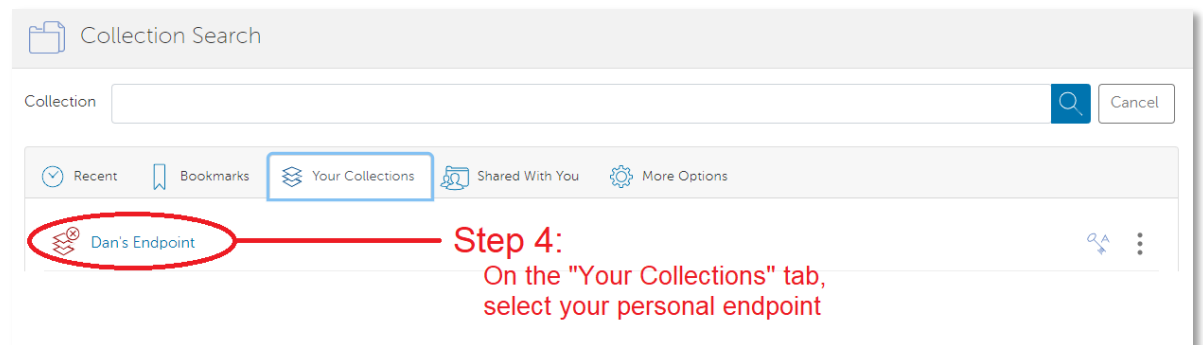
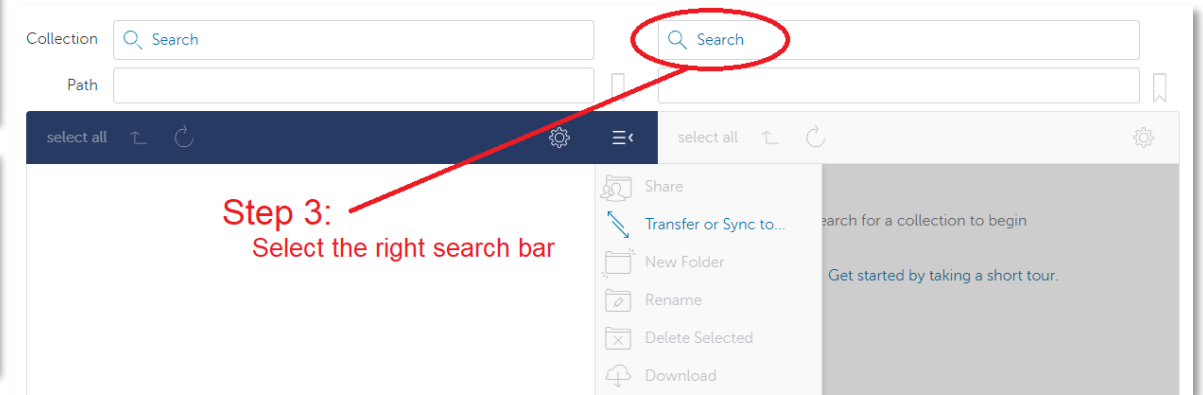
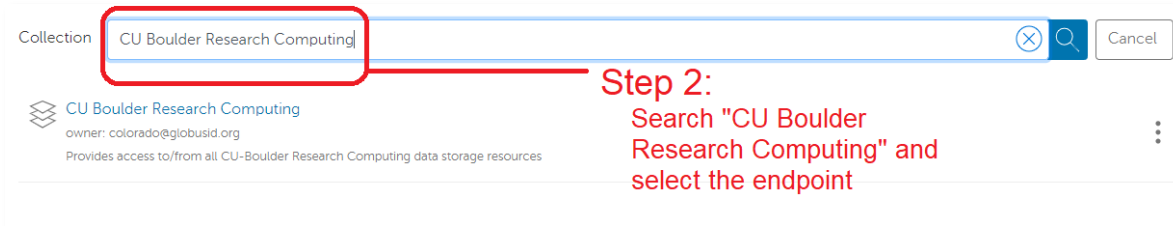
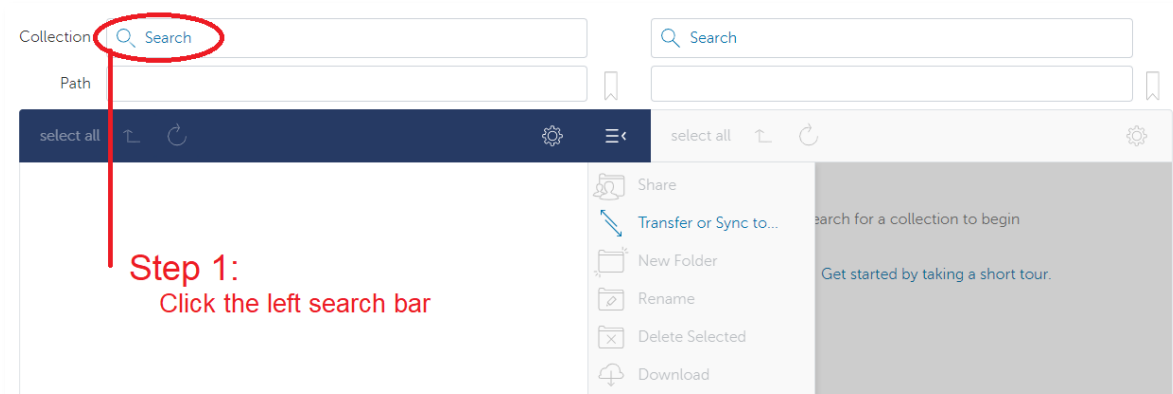
Globus is a service that allows for users to reliably move, share, and discover data

- There does exist a command line version (not covered here)
- Our recommended way to transfer data
 - Stable and fast data transfers
 - Transfers continue if a user disconnects
 - Web GUI or Globus Connect Personal GUI
- Supported on all major operating systems
 - Works well with cloud storage providers



Globus Demo

- Globus login is simple and quick: <https://app.globus.org>
 1. CU Boulder users - select “University of Colorado at Boulder” in the dropdown menu
 - Other institutions should select “ACCESS”
 2. Login with your credentials
 3. Continue with onscreen prompts until you are brought to the Globus WebGUI
- Installing a Globus Endpoint on your local machine
 - Required if you want to transfer data to your machine
 - Navigate to <https://www.globus.org/globus-connect-personal>
 - Click on operating system specific version and follow install instructions



Let's check it out!

The PetaLibrary

The PetaLibrary is a CU Boulder Research Computing service

- Expands the amount of storage space available to you
 - Confidential data should not be stored on PetaLibrary!!
- Aims to work seamlessly with all RC resources
- Supports the storage, archival, and sharing of data
- Available at a subsidized cost for researchers affiliated with University of Colorado
- New customer's initial upper limit:
 - 200 TB for Active storage (available to compute resources)
 - 100 TB for Archive storage (**not** available to compute resources)

Sharing Data

- RC Users on RC resources
 - Send a request and a list of the users to rc-help@colorado.edu
 - RC will place the chosen users in your Linux group
 - Allows them to see your scratch and project directories
 - You can set permissions in the space, so items are hidden
 - On-premise collaborators can also access Petalibrary files with Globus Shared Endpoints
- Off-premise collaborators
 - Data sharing is only available if you have a PetaLibrary allocation
 - Data transfer is done through Globus Shared Endpoints

Unix Groups

- Unix Groups
 - 3 Levels of permissions:
 - User
 - Group
 - Other
 - All users have a group associated with their username
 - Permissions can be set for an individual file with the `chmod` command

```
chmod g+rx file.exe
```

Globus Shared Endpoints

- Globus offers ‘shared endpoints’ which don’t require a user to have an account with RC.
- RC provides this capability for easy access of Data.
- PetaLibrary exclusive!
- Generates a shared collection that can be accessed with a link.
 - See <https://scholar.colorado.edu/concern/datasets/9593tw13k>
 - Can assign various permissions to specific users or all users withing Globus
 - More information on here: <https://docs.globus.org/how-to/share-files/>

Thank you!!

For more help contact rc-help@colorado.edu