

Introduction:

This workshop will cover the following topics:

- What is Globus?
- How does Globus work?
- How to create an endpoint?
- How to make a data transfer to Alpine?

Introduction:

This workshop will cover the following topics:

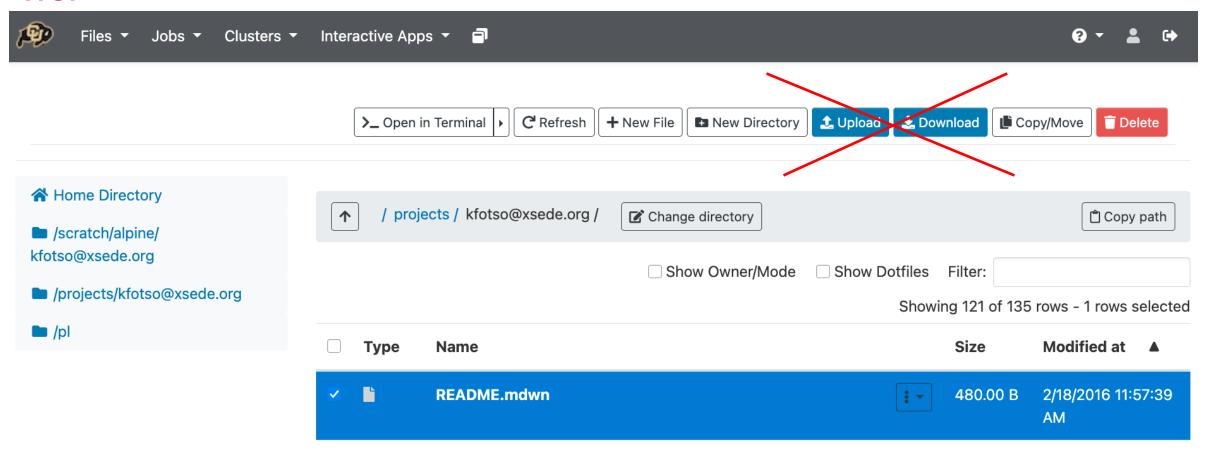
- What is rclone?
- How to create an rclone session?
- How to transfer data to Alpine using an rclone session?

Audience:

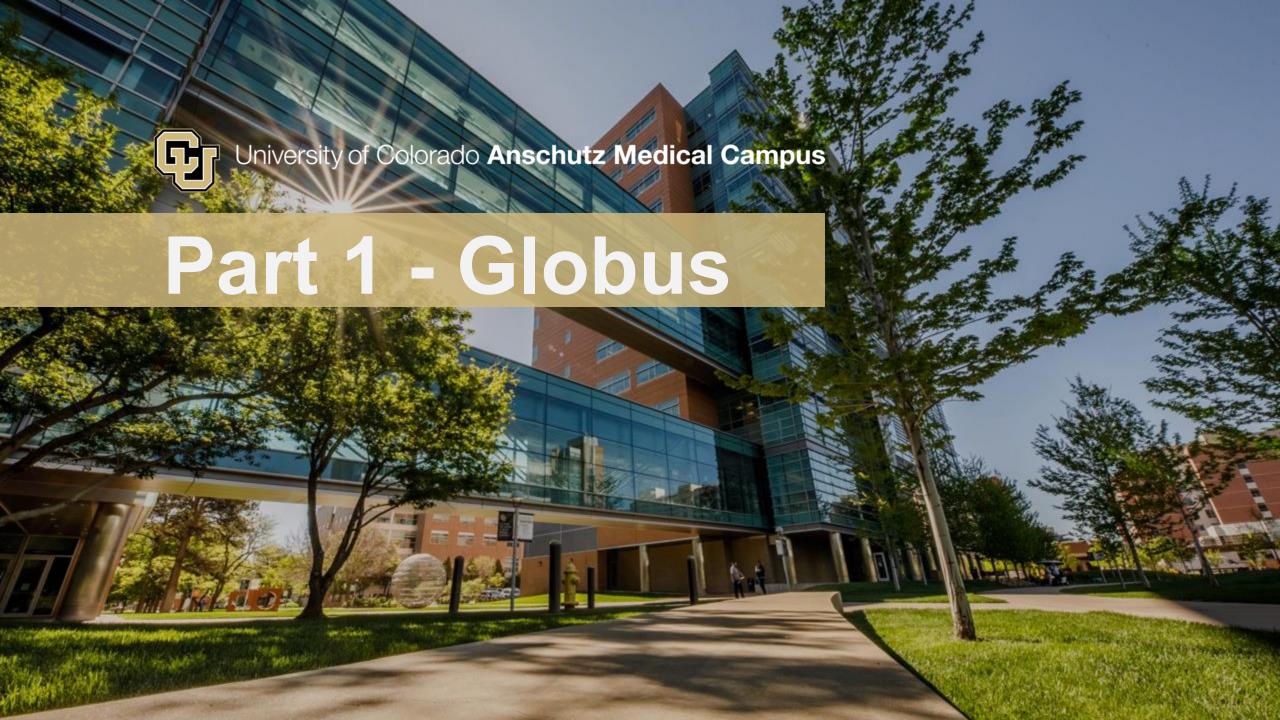
Any user who wants to transfer data to and from Alpine.

Warning:

Do not use Ondemand to download or upload any data larger than 11G!







What is Globus?

- Data management platform for fast and reliable data transfers directly from your own storage system.
- The storage system could be an HPC system, a Desktop, a laptop, a bioinformatics instrument etc ...

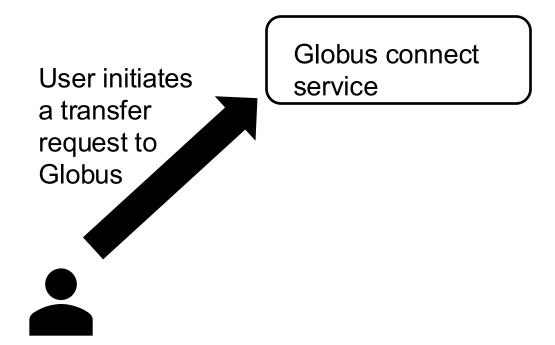


Globus protocols

- For data transfer, it uses GridFTP which is a fast and reliable data transfer protocol.
- For small size data download and pulling, the HTTPS protocol is used instead.

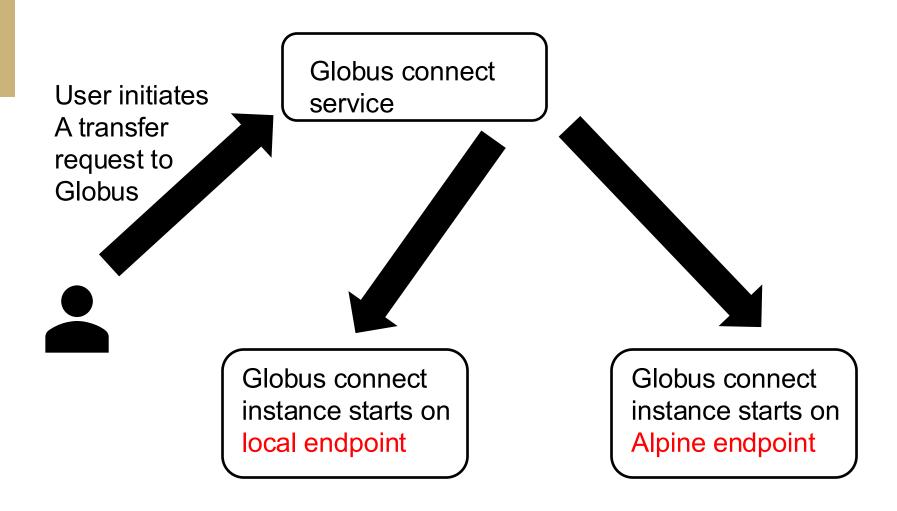


Globus in a nutshell





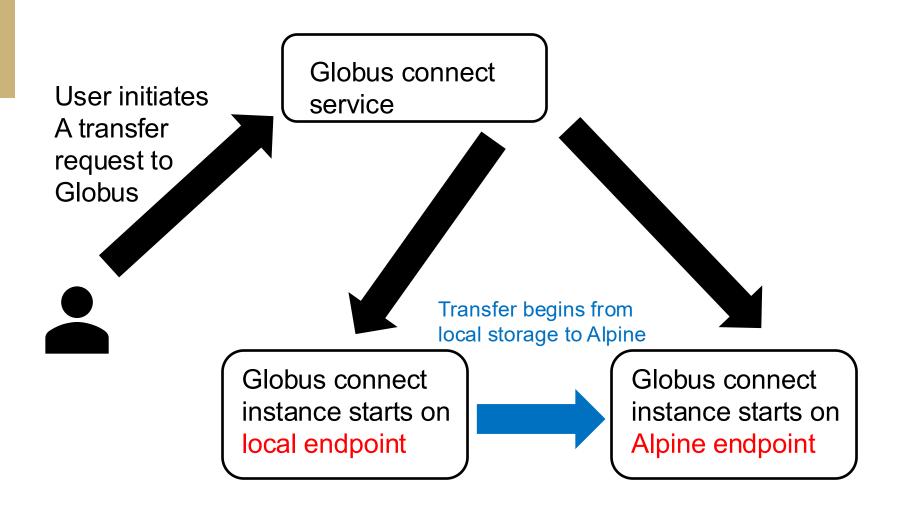
Globus in a nutshell





Source: Globus presentation by Lev Gorenstein, ATPESC 2025, slide 14, https://extremecomputingtraining.anl.gov/wp-content/uploads/sites/96/2025/08/Globus_ATPESC-2025.pdf

Globus in a nutshell





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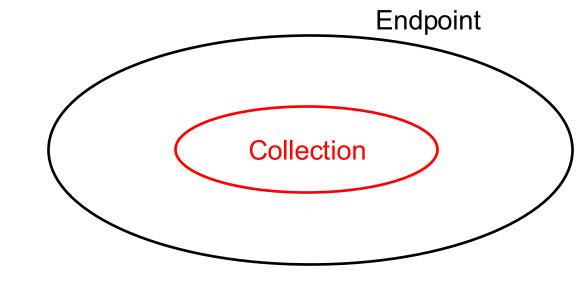
What is an Endpoint?

- It is one of the two file transfer locations.
- You use the Globus application to create an endpoint.
- Only authorized users can access an endpoint.



What is a collection?

- A collection is hosted by the endpoint.
- It represents the location containing the data plus the policies and permissions for accessing that data.
- Users interact with collections to initiate data transfers.



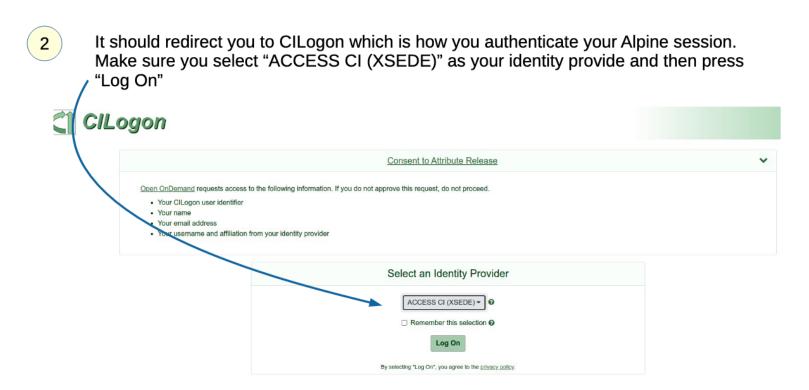
Data transfer requirements on Alpine

- Make sure that you have an Alpine account (e.g. <u>foo@xsede.org</u>).
- Verify that you can log into Globus with the right credentials.
- Create and activate a local endpoint using Globus Connect Personal.
- Verify folder permissions for Globus.

First let's login to Alpine!



1 Go to https://ondemand-rmacc.rc.colorado.edu





First let's login to Alpine!

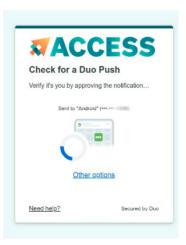


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Next it will take you to this page where you will put in your ACCESS ID and ACCESS password and press Login. This is NOT your CU Anschutz ID!!



This will prompt a DUO MFA push to your phone or whichever way you have DUO set up on your phone to authenticate. Accept the push sent to your device.

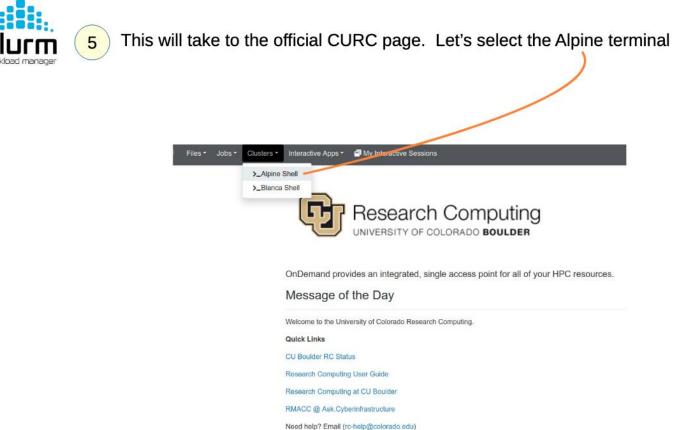




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First let's login to Alpine!





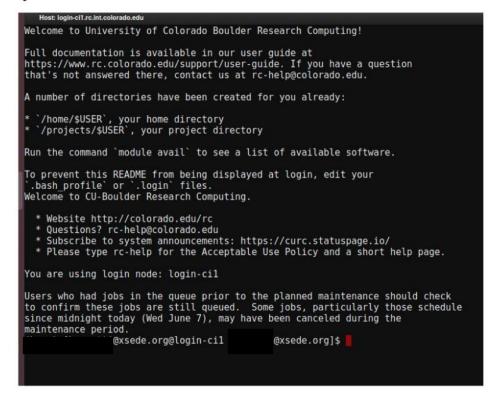


First let's login to Alpine!





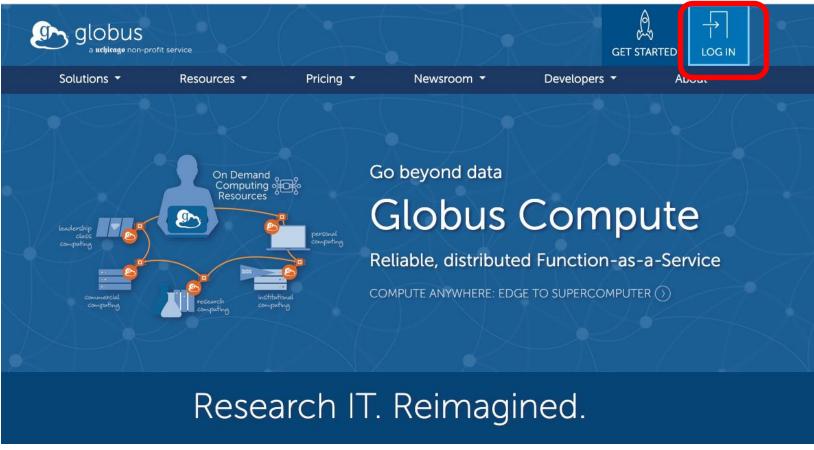
This will log you into the head node of Alpine. It will always default you to your home directory.







 Using your browser, go to https://www.globus.org/ and select "LOG IN" on the upper right area of the screen.



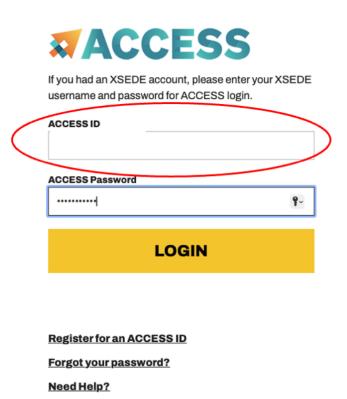


 Under "Use your existing organizational login" or "Use your organizational login" select "ACCESS CI(formely XSEDE)" and hit "Continue" as shown below.

Log in to use Globus Web App
Use your existing organizational login e.g., university, national lab, facility, project
ACCESS CI (formerly XSEDE) By selecting Continue, you agree to Globus terms of service and privacy policy.
Continue
Globus uses CILogon to enable you to Log In from this organization. By clicking Continue, you agree to the CILogon privacy policy and you agree to share your username, email address, and affiliation with CILogon and Globus. You also agree for CILogon to issue a certificate that allows Globus to act on your behalf.
OR —
Sign in with Garde
Sign in with Google Sign in with ORCID ID

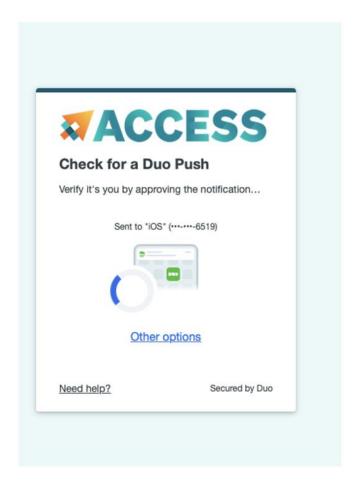


- The next page will ask you for your ACCESS-CI ID and password.
- Please make sure to enter the exact username that you use on Alpine.
- Your password should be the same as the one you use on Alpine as well. Refer to the screenshot on the next page for more illustration.

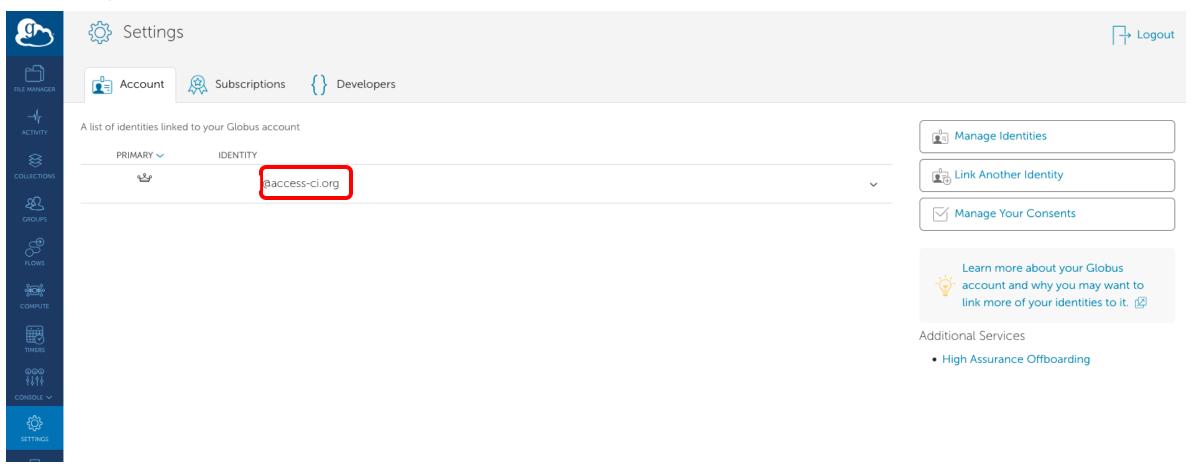




 Then, you will need to use an authentication method. We strongly recommend DUO push, as shown below.

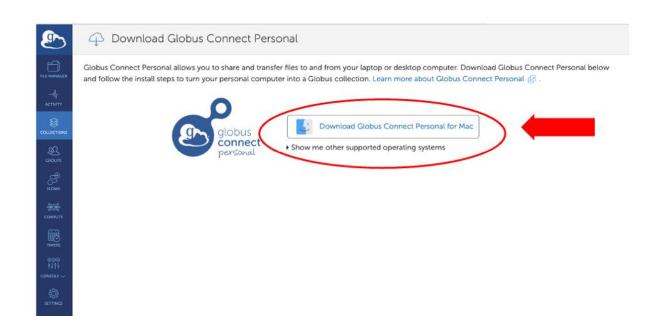


- Make sure that you have the correct institution credentials!
- Go to Settings.
- Your username should end with @accessci.org!!!



Step 2: Download Globus Connect (Mac)

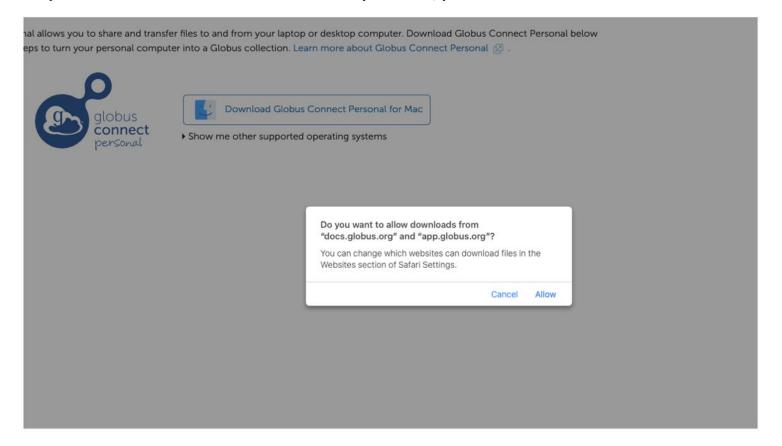
- Using the same browser go to this link: https://docs.globus.org/globus-connect-personal/install/mac/
- Select "Download Globus Connect Personal for Mac".
- It will open a new window where you will have to select again "Download Globus Connect Personal for Mac"





Step 2: Download Globus Connect (Mac)

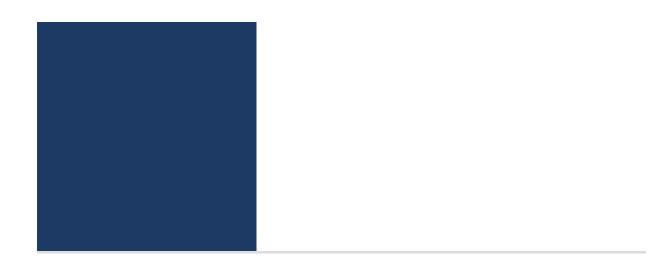
Confirm that you want to download that package.





Step 2: Download Globus Connect (Mac)

Confirm that it was downloaded as shown below.







Step 3: Install Globus personal

Drag the Globus icon to the Application folder as shown below:

globus connect personal

Drag the Globus icon to the Applications folder.



Once installed run the app to complete set up.

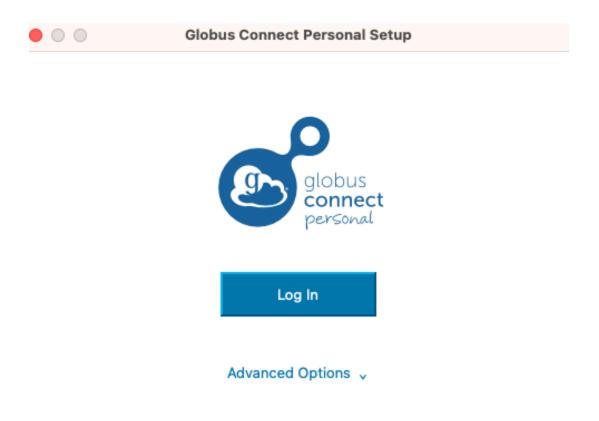
Step 3: Install Globus personal

Double click on the Globus icon to launch the Application:





Click on the button shown below to login.





A page will open on the Browser so that you create a label for future reference:

9 globus		Account ▼
	Globus Connect Personal Setup would like to:	
	View information about your linked identities (j)	
	Create Globus Connect Personal collections in the Globus Transfer service (
	View identity details (i)	
	View your identity (j)	
	Provide a label for future reference My-MacBook-Pro.local	
	You can rescind this consent at any time by visiting the Manage Consents 🗵 page.	
	By clicking "Allow", you allow Globus Connect Personal Setup , in accordance with its terrice [2] and privacy policy [2], to use the above listed information and services.	s terms of
	Allow Deny	



Once you login then your screen on the browser should look similar to this



Globus Connect Personal

Login successful.

Please continue with Globus Connect Personal Setup. You may close this window when finshed.

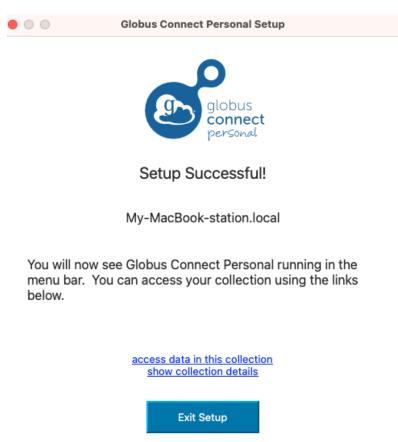


Create your collection personal endpoint as shown below.

	Globus Connect Personal Setup	
globus connect personal	Collection Details	
Owner Identity	@access-ci.org	
Collection Name	My-MacBook-station.local	
Description	Local station where I can upload files from	
High Assurance	Choose this option only if your computer stores sensitive data such as Protected Health Information or Controlled Unclassified Information.	
	Save	

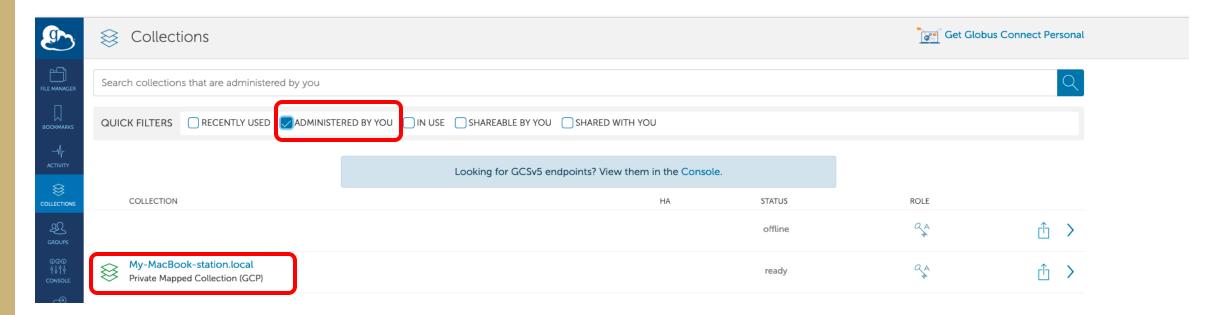


Once your endpoint collection name setup is successful your screen should look something similar to this.



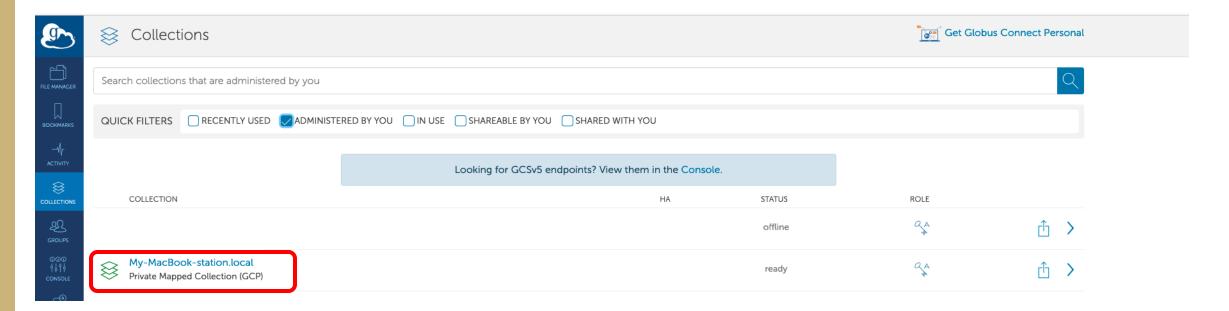


- On the Globus website, you can go to the following tab to verify the end point.
- Here, the endpoint is called "My-MacBook-station-local".
- Make sure that the filter tab "Administered by you" is selected in order to view it



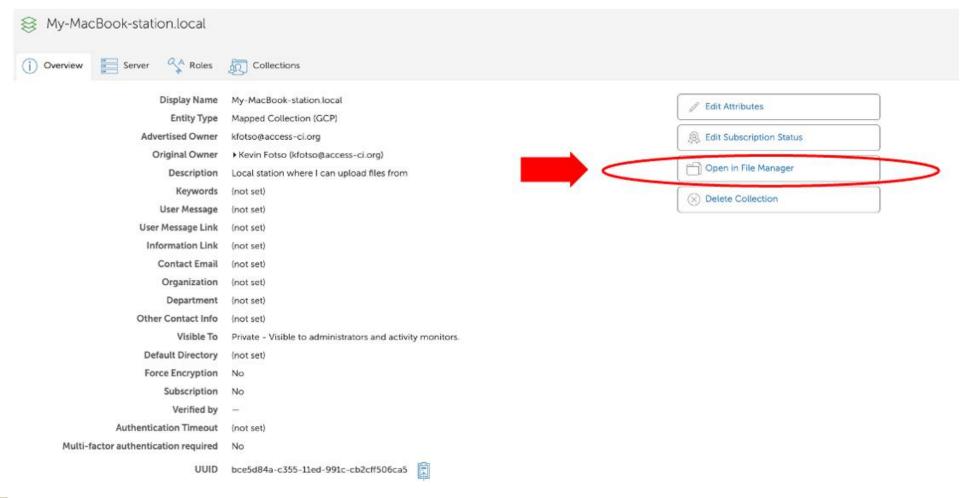


Select your personal endpoint.





Select "Open in File Manager".





This will open a File Manager window.

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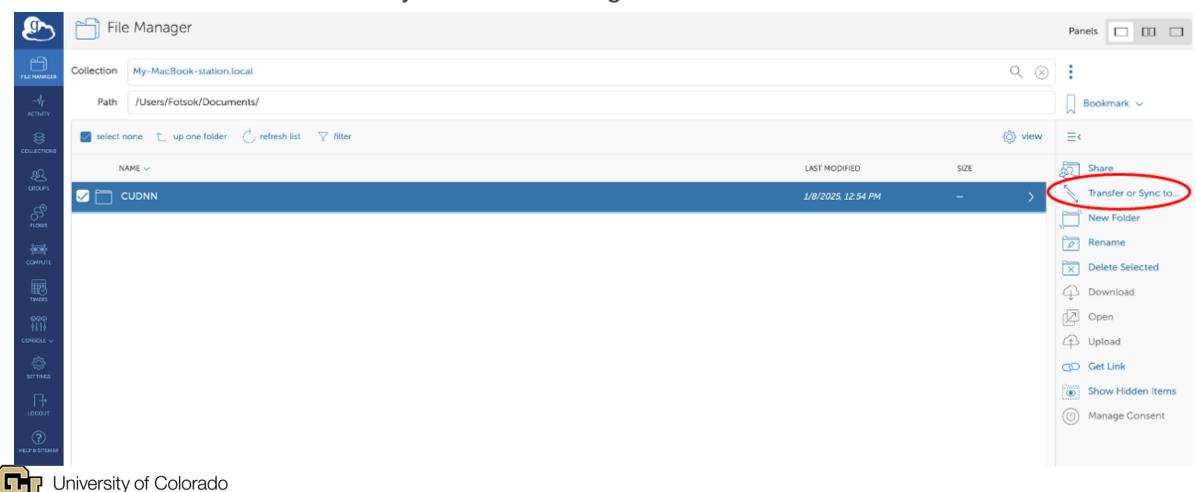
• From there, confirm that you are using your personal endpoint/Collection and select the folder that you wish to transfer to Alpine.

The screenshot below shows that we are trying to transfer a local folder called

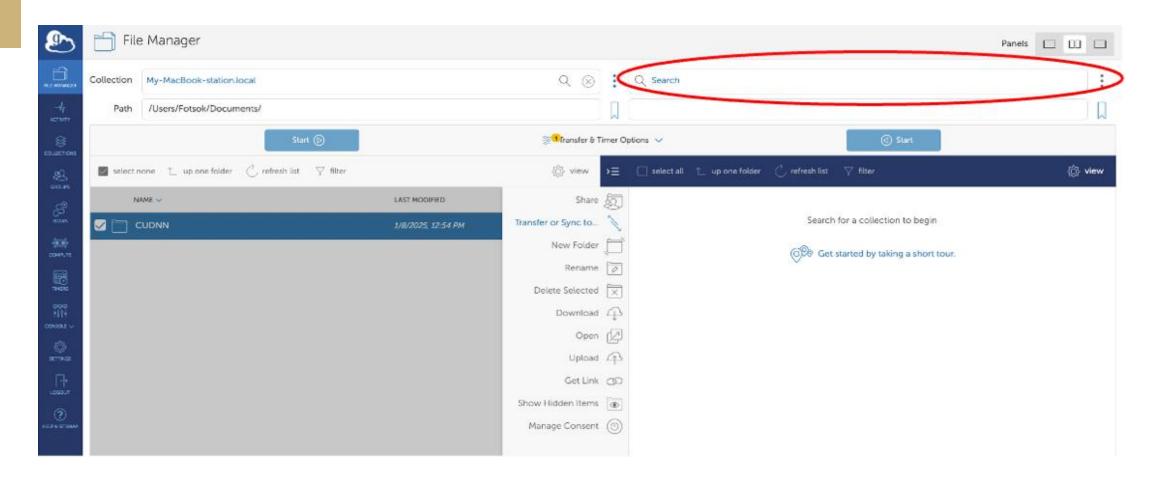
"CUDNN". File Manager Panels Q (X) Collection My-MacBook-station.local Path /Users/ /Documents/ Bookmark ~ 🛮 select none 🗠 up one folder 💍 refresh list 🔻 filter view Ξ< LAST MODIFIED CUDNN Transfer or Sync to. 1/8/2025, 12:54 PM New Folder X Delete Selected Download ☑ Open ← Upload Get Link Show Hidden Items (1) Manage Consent University of Colorado

Anschutz Medical Campus

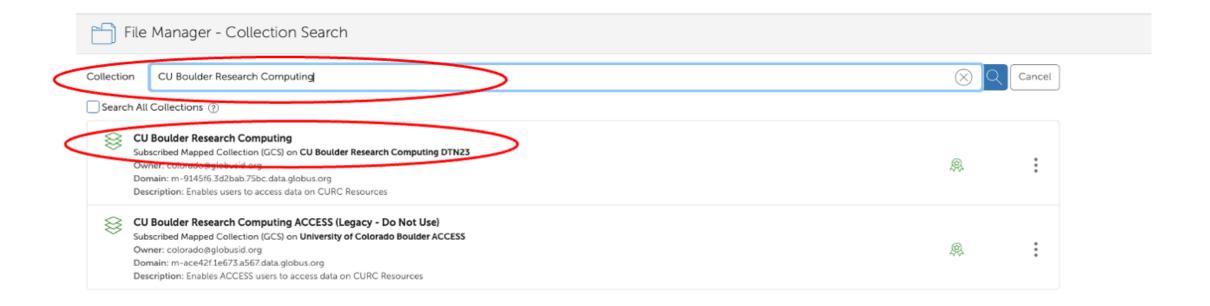
- Open the Alpine Collection to make the transfer.
- To do that select "Transfer or Sync to.." on the right-hand side of the screen.



Then click on the search bar on the right to look for the Alpine Collection.

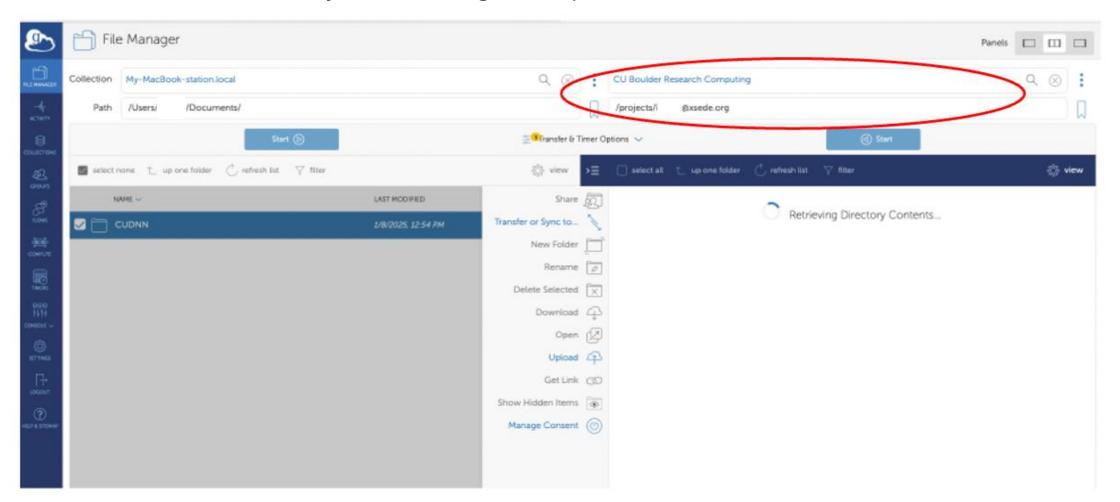


Under Collection, enter "CU Boulder Research Computing".

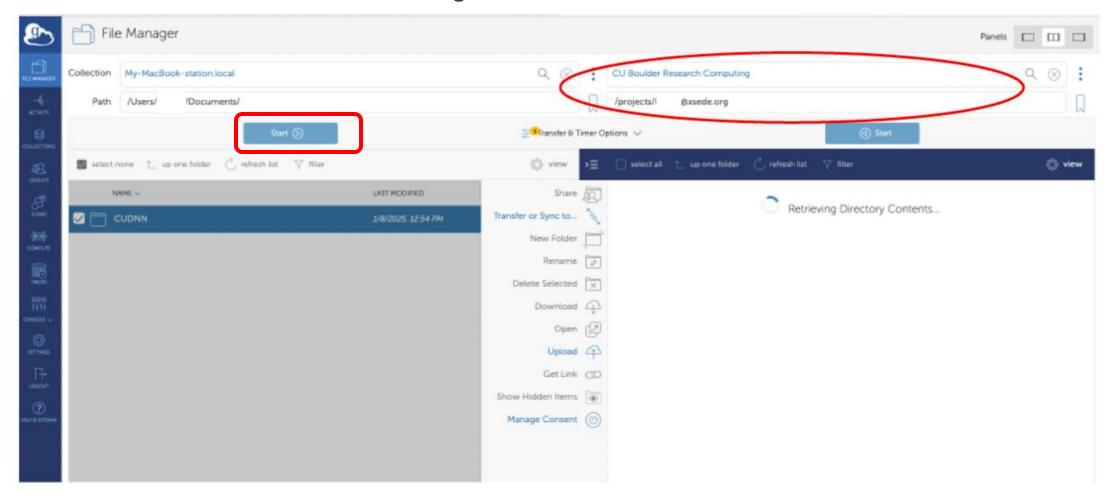




- Finally, enter the Alpine path where you wish to transfer your dataset.
- Here, we are transferring the dataset from our local system to /projects/myalpineusername@xsede.org.org. With "myalpineusername" being the actual username that you use to log into Alpine.



- To begin the transfer, select the blue "Start" button on the left, as here we are transferring data from our local system to Alpine.
- If we wished to do the opposite, we would have selected the blue "Start" button and a folder of interest on the right instead.



Use Alpine guest collection

- If you wish to transfer some data to a collaborator that does not own an account on Alpine.
- They will need to have globus installed on their local system.
- Refer to this guide for that: https://github.com/kf-cuanschutz/CU-Anschutz-HPC-documentation/blob/main/Globus-guest-collection-files/Presentation_Globus_guest_collection_v2.pdf



What is rclone?

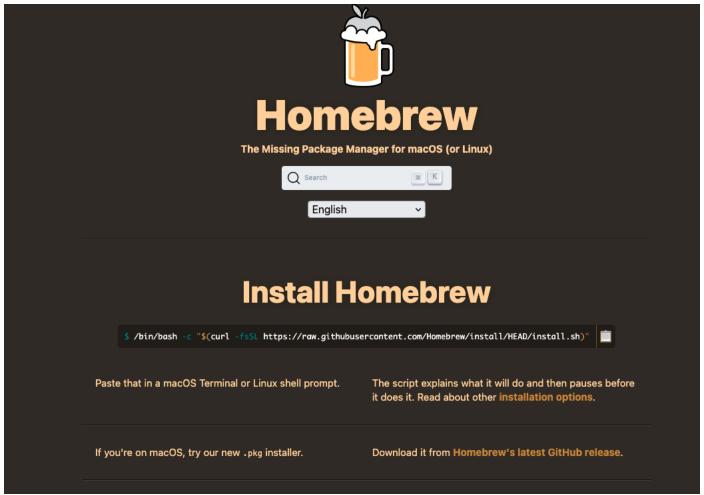
- Command line program to manage files on cloud storage.
- Used by many cloud vendors.
- Helpful to transfer data, backup or restore data.

Steps to transfer data

- Install rclone on your local system.
- Access an Alpine compute node and configure an rclone session
- Use your local rclone to authorize access to your onedrive folder.
- Initiate the transfer.



If you have a MacBook install homebrew.



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Source: https://brew.sh/

If you have a MacBook install homebrew.

```
.edu@P37QM944DD accelerators % /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Ho
==> Checking for `sudo` access (which may request your password)...
Password:
==> This script will install:
```



Source: https://brew.sh/

Add homebrew to your path



Source: https://brew.sh/

· Install rclone locally.

```
accelerators % brew install rclone
==> Downloading https://formulae.brew.sh/api/formula.jws.json
==> Downloading https://formulae.brew.sh/api/cask.jws.json
==> Fetching downloads for: rclone
==> Downloading https://ghcr.io/v2/homebrew/core/rclone/manifests/1.71.
==> Fetching rclone
==> Downloading https://ghcr.io/v2/homebrew/core/rclone/blobs/sha256:a7
==> Pouring rclone--1.71.0.arm64_sequoia.bottle.tar.gz
==> Caveats
```



 Make sure that rclone is installed and is in your path.

/opt/homebrew/bin/rclone



Log into Alpine and access a compute node.

```
@login-ci1 ~]$ acompile --ntasks=4 --time=12:00:00
ing job... salloc --nodes=1 --partition=acompile --ntasks=4
--oversubscribe srun --pty /bin/bash
ob allocation 17370782
pu-a2-u32-3 are ready for job
```

Load rclone

```
@c3cpu-a2-u32-3 ~]$ module load rclone
@c3cpu-a2-u32-3 ~]$ rclone config

Zv25/v9/v8 v9:33:46 NOTICE: Config file "/home/ /.config/rclone/rclone.conf" not found

No remotes found, make a new one?

n) New remote
s) Set configuration password
q) Quit config
n/s/q> n
name> onedrive
Option Storage.
Type of storage to configure.
Choose a number from below, or type in your own value.
```



Run "rclone config" to make your first remote session.

```
@c3cpu-a2-u32-3 ~]$ module load rclone
@c3cpu-a2-u32-3 ~]$ rclone config

2025/09/08 09:33:46 NOTICE: Config file "/home/

No remotes found, make a new one?

n) New remote
s) Set configuration password
q) Quit config
n/s/q> n
name> onedrive
Option Storage.
Type of storage to configure.
Choose a number from below, or type in your own value.
```

/.config/rclone/rclone.conf" not found

Select "n" for a new remote session.

```
@c3cpu-a2-u32-3 ~]$ module load rclone
@c3cpu-a2-u32-3 ~]$ rclone config

2025/09/08 09:33:46 NOTICE: Config file "/home/

No remotes found, make a new one?

n) New remote
s) Set configuration password
q) Ouit config

n/s/q> n

name> onedrive
Option Storage.
Type of storage to configure.
Choose a number from below, or type in your own value.
```

/.config/rclone/rclone.conf" not found

Name the storage session.

Type "onedrive" for the type of storage.

```
Storage> onedrive
Option client id.
OAuth Client Id.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_id>
Option client_secret.
OAuth Client Secret.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_secret>
Option region.
Choose national cloud region for OneDrive.
Choose a number from below, or type in your own string value.
Press Enter for the default (global).
 1 / Microsoft Cloud Global
   \ (global)
 2 / Microsoft Cloud for US Government
   \ (us)
 3 / Microsoft Cloud Germany
 4 / Azure and Office 365 operated by 21Vianet in China
   \ (cn)
region> global
   University of Colorado
   Anschutz Medical Campus
```

Hit enter for the ClientID to leave blank.

```
Storage> onedrive
Option client_id.
OAuth Client Id.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client id>
Option client_secret.
OAuth Client Secret.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_secret>
Option region.
Choose national cloud region for OneDrive.
Choose a number from below, or type in your own string value.
Press Enter for the default (global).
 1 / Microsoft Cloud Global
  \ (global)
 2 / Microsoft Cloud for US Government
  \ (us)
 3 / Microsoft Cloud Germany
 4 / Azure and Office 365 operated by 21Vianet in China
   \ (cn)
region> global
   University of Colorado
   Anschutz Medical Campus
```

Hit enter for the client_secret to leave blank.

```
Storage> onedrive
Option client_id.
OAuth Client Id.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_id>
Option client_secret.
OAuth Client Secret.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client secret>
Option region.
Choose national cloud region for OneDrive.
Choose a number from below, or type in your own string value.
Press Enter for the default (global).
 1 / Microsoft Cloud Global
  \ (global)
 2 / Microsoft Cloud for US Government
  \ (us)
 3 / Microsoft Cloud Germany
 4 / Azure and Office 365 operated by 21Vianet in China
   \ (cn)
region> global
   University of Colorado
   Anschutz Medical Campus
```

Enter "global" to select Microsoft Cloud Global for the cloud region.

```
Storage> onedrive
Option client_id.
OAuth Client Id.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_id>
Option client_secret.
OAuth Client Secret.
Leave blank normally.
Enter a value. Press Enter to leave empty.
client_secret>
Option region.
Choose national cloud region for OneDrive.
Choose a number from below, or type in your own string value.
Press Enter for the default (global).
 1 / Microsoft Cloud Global
   \ (global)
 2 / Microsoft Cloud for US Government
   \ (us)
 3 / Microsoft Cloud Germany
 4 / Azure and Office 365 operated by 21Vianet in China
   \ (cn)
region> global
  University of Colorado
```



Select "No" for auto config as Alpine is considered here as a headless machine.

```
v/n > n
Use auto config?
 * Say Y if not sure
 * Say N if you are working on a remote or headless machine
y) Yes (default)
n) No
v/n> n
Option config token.
For this to work, you will need rclone available on a machine that has
a web browser available.
For more help and alternate methods see: https://rclone.org/remote setup/
Execute the following on the machine with the web browser (same rclone
version recommended):
        rclone authorize "onedrive"
Then paste the result.
Enter a value.
config_token>
```



Here we are told by rclone that we need to go back to our local computer and authorize this rclone session.

```
v/n > n
Use auto config?
* Say Y if not sure
 * Say N if you are working on a remote or headless machine
v) Yes (default)
n) No
v/n > n
Ontion confid token
For this to work, you will need rclone available on a machine that has
a web browser available.
For more help and alternate methods see: https://rclone.org/remote setup/
Execute the following on the machine with the web browser (same rclone
version recommended):
        rclone authorize "onedrive"
Then paste the result.
Enter a value.
config_token>
```



Authorize the session on your local computer by running the rclone command below:



It will generate an access token on your local computer shell!

```
% rclone authorize onedrive

2025/09/08 09:40:00 NOTICE: Config file "/Users/......./.config/rclone/rclone.conf

2025/09/08 09:40:00 NOTICE: Make sure your Redirect URL is set to "http://localhost:53682/" in your

2025/09/08 09:40:00 NOTICE: If your browser doesn't open automatically go to the following link: htt

N18KUbYJY4hbvkAngw

2025/09/08 09:40:00 NOTICE: Log in and authorize rclone for access

2025/09/08 09:40:00 NOTICE: Waiting for code...

2025/09/08 09:40:02 NOTICE: Got code

Paste the following into your remote machine --->

{"access_token":"eyJ0eXAiOiJKV1QiLCJub25jZSI6IIJfOXhRUW5BTVNjSnYyQkpFSXVibkFqU09GU1Z6N0pUMDhZOVljYjF
```



Your default browser should display a "Success" message as shown below, assuming that you are already logged into your CU Anschutz onedrive.



Success!

All done. Please go back to rclone.



Copy the entire access token and paste it back to the Alpine shell.

{"access_token":"eyJ0eXAiOiJKV1QiLCJub25jZSI6IkNpU29XZVZDQS1EeFJLRVpOU3JGbFR3aS0yVEgtQ1JyRXF0Z1dkNi1aeFUiLCJhbGci0iJSUzI1NiIsIng1dCI6Ik pZaEFjVFBNWl9MWDZEQmxPV1E3SG4wTmVYRSIsImtpZCI6IkpZaEFjVFBNWl9MWDZEQmxPV1E3SG4wTmVYRSJ9.eyJhdWQi0iIwMDAwMy0wMDAwLTAwMDAtYzAwMC0wMDAw MDAwMDAwMDAiLCJpc3MiOiJodHRwczovL3N0cy53aW5kb3dzLm5ldC81NjMzMzdjYS1hNTE3LTQyMWEtYWF1MC0xYWE1YjQxNGZkN2YvIiwiaWF0IjoxNzU3MzQ10DM1LCJuYmY n":4717}

On Alpine, select "onedrive as the connection type when asked.

```
Option config type.
Type of connection
Choose a number from below, or type in an existing string value.
Press Enter for the default (onedrive).
 1 / OneDrive Personal or Business
  \ (onedrive)
 2 / Root Sharepoint site
  \ (sharepoint)
   / Sharepoint site name or URL
3 | E.g. mysite or https://contoso.sharepoint.com/sites/mysite
   \ (url)
 4 / Search for a Sharepoint site
   \ (search)
 5 / Type in driveID (advanced)
   \ (driveid)
 6 / Type in SiteID (advanced)
  \ (siteid)
   / Sharepoint server-relative path (advanced)
 7 | E.g. /teams/hr
   ( (pacii)
config_type> onedrive
Option config driveid.
Select drive you want to use
Choose a number from below, or type in an existing string value.
Press Enter for the default (b!9XXsPNqdm0KyEDYi7vpyGAizD93 LuNKpsvKo69UrIz70zmP9x3UTZqzBsEE-stx).
1 / OneDrive (business)
   \ (b!9XXsPNgdm0KyEDYi7vpyGAizD93_LuNKpsvKo69UrIz70zmP9x3UTZqzBsEE-stx)
2 / PersonalCacheLibrary (business)
   \ (b!9XXsPNqdm0KyEDYi7vpyGAizD93_LuNKpsvKo69UrIxbtcD_WclWSZRmdhXFWzDZ)
config driveid> 1
```

Then choose Onedrive business.

```
Option config type.
Type of connection
Choose a number from below, or type in an existing string value.
Press Enter for the default (onedrive).
  1 / OneDrive Personal or Business
        \ (onedrive)
  2 / Root Sharepoint site
        \ (sharepoint)
         / Sharepoint site name or URL
  3 | E.g. mysite or https://contoso.sharepoint.com/sites/mysite
        \ (url)
  4 / Search for a Sharepoint site
         \ (search)
  5 / Type in driveID (advanced)
         \ (driveid)
   6 / Type in SiteID (advanced)
        \ (siteid)
         / Sharepoint server-relative path (advanced)
  7 | E.g. /teams/hr
        \ (path)
config type> onedrive
Option config driveid.
Select drive you want to use
Choose a number from below, or type in an existing string value.
Press Enter for the default (htgxxsPNqdm0KyEDYi7vpyGAizD93 LuNKpsvKo69UrIz70zmP9x3UTZqzBsEE-stx).
  1 / OneDrive (business)

\(\frac{1}{2}\) \(\frac{1}\) \(\frac{1}{2}\) \(\frac{1}{2
  2 / PersonalCacheLibrary (business)
        \ (b!9XXsPNqdm0KvEDYi7vpvGAizD93_LuNKpsvKo69UrIxbtcD_WclWSZRmdhXFWzDZ)
config driveid> 1
```

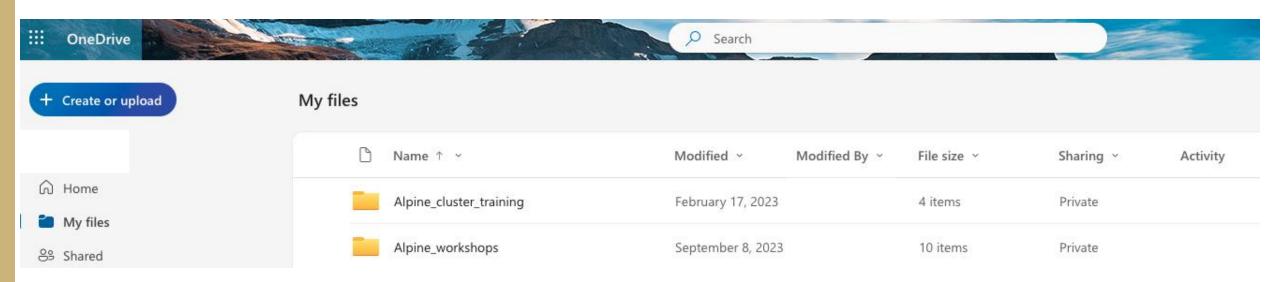
Then rclone should show you the URL where it can access your onedrive folders.

```
config_driveid> 1
Drive OK?
Found_drive "root" of type "business"
URL: (https://olucdenver-my.sharepoint.com/personal/
y) Yes (default)
n) No
y/n>y
[onedrive]
type = onedrive
token = {"access_token":"eyJ0eXAi(
```

/Documen



You can confirm that by pasting that URL into a browser.





Step3: Use your local rclone to authorize access

Your new rclone session now shows.

onedrive

```
drive_type = business
------
y) Yes this is OK (default)
e) Edit this remote
d) Delete this remote
y/e/d> y
Current remotes:
Name

Type
```

- e) Edit existing remote
- n) New remote

onedrive

- d) Delete remote
- r) Rename remote
- c) Copy remote
- s) Set configuration password
- q) Quit config
 e/n/d/r/c/s/q>



Step3: Use your local rclone to authorize access

Enter "q" to quit the config mode and verify your existing rclone sessions with:

rclone listremotes

[kfotso@xsede.org@c3cpu-a2-u32-3 rclone]\$ rclone listremotes onedrive:



Step3: Use your local rclone to authorize access

List the folders contained into your drive to verify the location with: rclone Is onedrive:

```
sede.org@c3cpu-a2-u32-3 rclone]$ rclone ls onedrive:
Concise_guide_to_use_Globus_on_the_hub.docx
Document.docx
```



Here we transfer a folder named "LMOD" from onedrive to Alpine with the command:

rclone sync –progress onedrive:LMOD LMOD_folder

```
| @xsede.org@c3cpu-a2-u32-3 rclone]$ rclone sync --progress onedrive:LMOD LMOD_folder
Transferred: 9.537 KiB / 9.537 KiB, 100%, 0 B/s, ETA -
Transferred: 1 / 1, 100%
Elapsed time: 1.2s
```



rclone sync – progress onedrive: LMOD LMOD_folder



Similar with the rsync command on Linux.



rclone sync progress onedrive: LMOD LMOD_folder



- Shows the details regarding the data transfer.
- Keeps track of the already existing folders.



rclone sync –progress onedrive:LMOD LMOD_folder



Name of the rclone session



rclone sync –progress onedrive: LMOD LMOD_folder

The folder of interest to transfer



rclone sync –progress onedrive:LMOD LMOD_folder



Name of the receiving folder that Will be created on Alpine.



For more information regarding rclone commands, please refer to this page:

https://curc.readthedocs.io/en/latest/compute/data-transfer.html#step-3-basic-usage-commands-for-rclone

As long as your session token remains valid, you can even make a slurm script out of your rclone command.

```
#!/bin/bash
#SBATCH -- job-name=rclone
#SBATCH --time=00:30:00
#SBATCH --output=rclone.out
#SBATCH --error=rclone.err
#SBATCH --qos=normal
#SBATCH --partition=amilan
#SBATCH --nodes=1
#SBATCH --ntasks=4
#SBATCH --mail-type=BEGIN, FAIL, END
# Whom to send the email to
#SBATCH --mail-user=
                                @cuanschutz.edu
# Loading rclone module
module load rclone
# Rclone data transfer:
rclone sync --progress onedrive:LMOD LMOD_folder
       University of Colorado
       Anschutz Medical Campus
```

Verify that your data transfer completed successfully.

```
@xsede.org@c3cpu-a2-u32-3 rclone]$ ls
LMOD_folder rclone_script.sh
```



Make sure to delete your rclone session as soon as you are done with your transfer!

```
xsede.org@c3cpu-a2-u32-3 rclone]$ rclone config
Current remotes:
Name
                      Type
onedrive
                     onedrive
e) Edit existing remote
n) New remote
  Delete remote
r) Rename remote
c) Copy remote
s) Set configuration password
q) Quit config
e/n/d/r/c/s/q > d
Choose a number from below, or type in an existing value.
 1 > onedrive
remote> 1
No remotes found, make a new one?
      University of Colorado
      Anschutz Medical Campus
```

