

# Storage Areas / Data Transfers

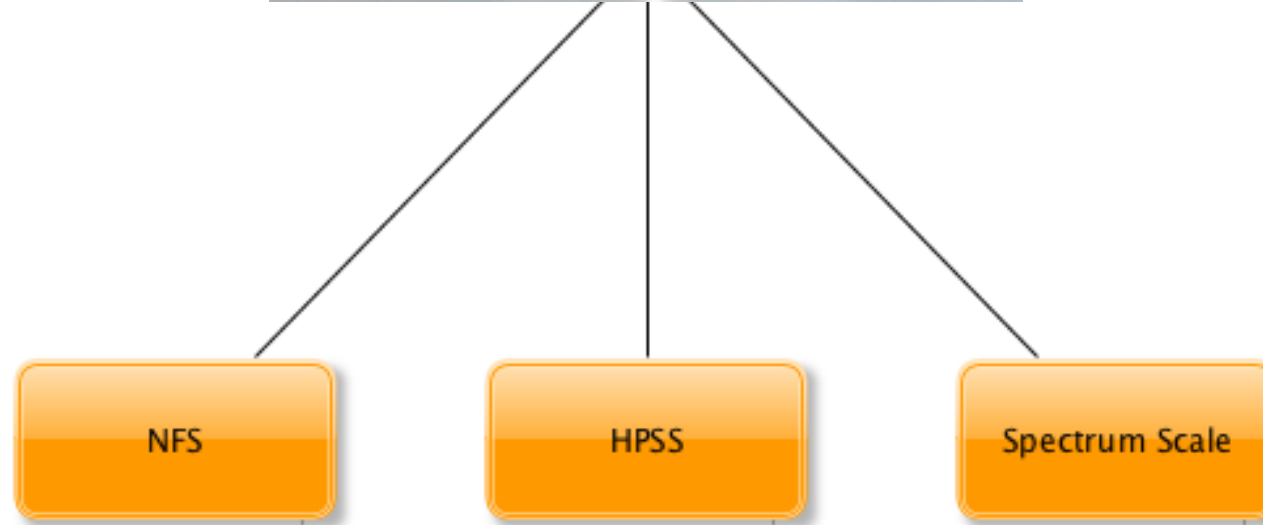
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Summit Training Workshop  
Knoxville, TN  
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# Outline

- Storage Areas
  - Available file systems and options for archiving
- Data Transfer
  - Transfer your files between Titan and Summit

# Summit and filesystems



# NFS

- User home: /ccs/home/\$USER
- Project home: /ccs/proj/[projid]
- **Long-term** storage for your general data under home or related to project under proj
- **Build** your code in /tmp/\$USER it is faster and **install** in /ccs/proj/[projid]
- There is provided a **backup**
- User home and project home are accessible read-only from the Summit compute nodes
- **Not purged**
- **Quota** of 50GB
- User home is user-centric

## NFS (cont.)

- Check quota on user home

```
> quota -Qs
```

Disk quotas for user gmarkoma (uid 14850):

Filesystem	blocks	quota	limit	grace	files	quota	limit	grace
------------	--------	-------	-------	-------	-------	-------	-------	-------

nccs-svm1.lb.ccs.ornl.gov:/nccs/home2								
---------------------------------------	--	--	--	--	--	--	--	--

3237M	51200M	51200M			49161	4295m	4295m	
-------	--------	--------	--	--	-------	-------	-------	--

# NFS (continue)

- I deleted a file from my NFS, how to recover it?
- Answer: snapshots
  - Go to the .snapshot folder (ls will not show this folder):
  - `cd .snapshot`

```
ls -l
```

```
drwx----- 27 gmarkoma gmarkoma 4096 Nov 21 16:51 daily.2018-11-23_0010
```

```
drwx----- 27 gmarkoma gmarkoma 4096 Nov 21 16:51 daily.2018-11-24_0010
```

```
...
```

# HPSS

- User archive: /home/\$USER
- Project archive: /proj/[projid]
- **Long-term** storage for large amount of general data under home or related to project under proj.
- **Quota** of 2 TB and 100 TB for user and project archive respectively. If any of the used files during htar is bigger than 68 GB size, then it will fail, similar if there are more than 1 million files per archive
- **Not purged**
- User archive is user-centric

## HPSS (cont.)

- Check HPSS quota:

```
> showusage -s hpss
```

HPSS Storage in GB:

### Project Totals

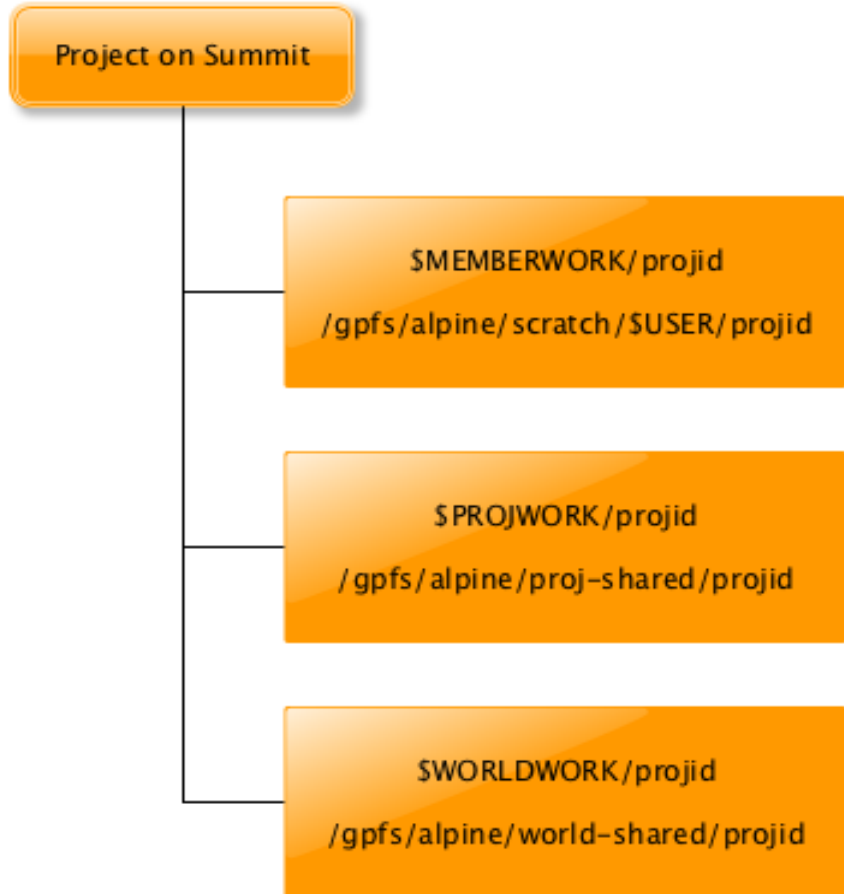
Project	Storage	Storage
stf007	46868.90	0.00



# Spider III - Alpine

- Alpine, is a Spectrum Scale (ex-GPFS) file system of 250 PB of used space, which is mounted on Summit and Data Transfer Nodes (DTN) with maximum performance of 2.5 TB/s for sequential I/O and 2.2 TB/s for random I/O
- Largest GPFS file system installation
- Up to 2.6 million accesses per second of 32 KB small files
- It is constituted by 154 Network Shared Disk (NSD) servers
- It is a shared resource among users, supporting File Per Process (FPP), Single Shared File (SSF) and any of their combination

# Alpine (cont.)

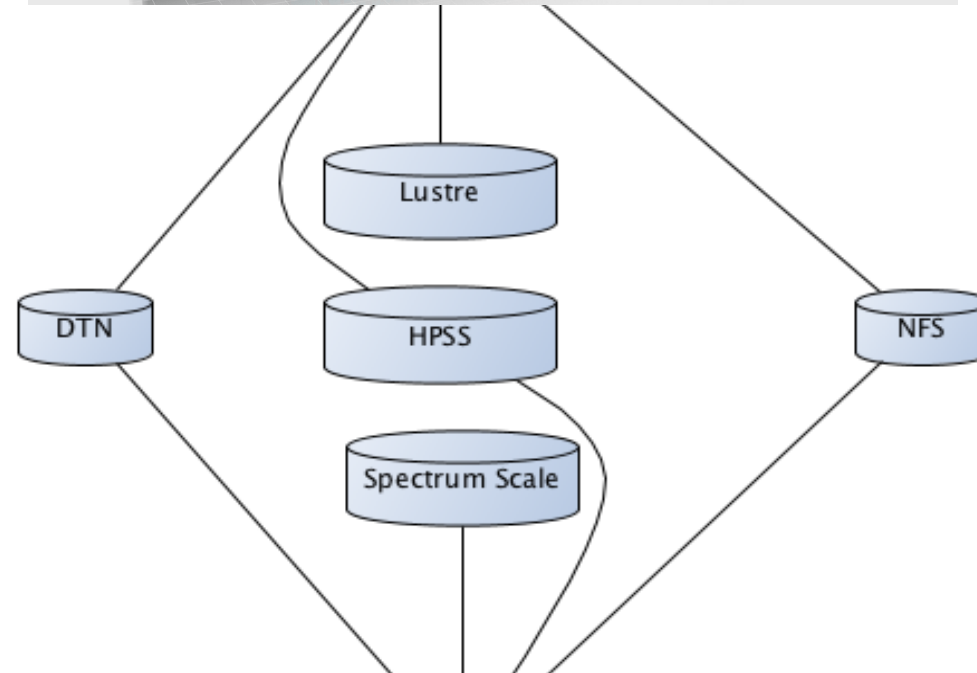
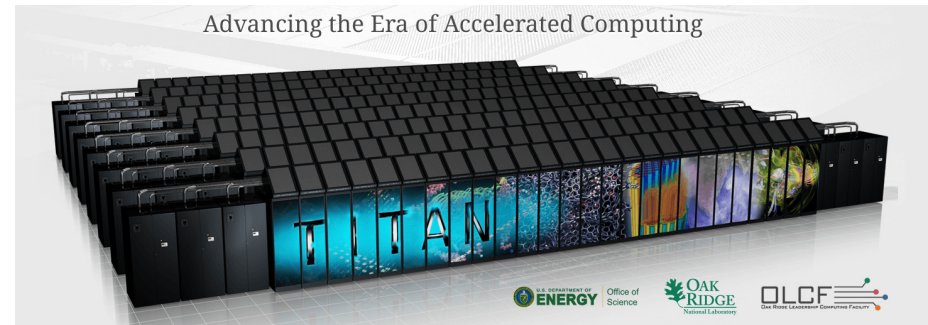


- Memberwork:
  - Short-term storage of user data related to the project but not shared
- Projwork:
  - Short-term storage of project data shared among the members of the project
- Worldwork:
  - Short-term storage of project data shared with OLCF users outside the project
- **No backup**
- **Quota 50 TB**
- **Purged after 90 days**

# Storage policy

Name	Path	Type	Permissions	Backups	Purged	Quota	Mounted on Compute nodes
<i>User Home</i>	<code>\$HOME</code>	NFS	User Set	yes	no	50GB	Read-only
<i>User Archive</i>	<code>/home/\$USER</code>	HPSS	User Set	no	no	2TB	No
<i>Project Home</i>	<code>/ccs/proj/[projid]</code>	NFS	770	yes	no	50GB	Read-only
<i>Member Work</i>	<code>/gpfs/alpine/scratch/[userid]/[projid]/</code>	Spectrum Scale	700	no	90 days	50TB	Yes
<i>Project Work</i>	<code>/gpfs/alpine/proj-shared/[projid]</code>	Spectrum Scale	770	no	90 days	50TB	Yes
<i>World Work</i>	<code>/gpfs/alpine/world-shared/[projid]</code>	Spectrum Scale	775	no	90 days	50TB	Yes
<i>Project Archive</i>	<code>/proj/[projid]</code>	HPSS	770	no	no	100TB	No

# Data Transfer



Data Transfer Nodes (DTN) improve the performance by reducing the load on the login and service nodes of the HPC facilities. Moreover, transfer data outside the HPC facility.

# Data Transfer (cont.)

- When you log-in to Summit you would like to have access to your old files (if you are already user of OLCF HPC facilities)
- There are many ways to transfer files but in general we propose Globus
- We will mention all the approaches and some performance results.

# Data Transfer (cont.)

- Using home NFS
- If the data size is less than 50 GB and there is enough free space in your home directory is through home.

```
titan> cp -r data $HOME  
summit> cp -r $HOME/data .
```

- It is simple, but is it fast?

# Data Transfer (cont.)

- Using HPSS
- Send one folder to HPSS and retrieve it from the destination. There is significant higher data size limit

```
titan> htar -cvf transfer_test.tar transfer_test/*
```

```
HTAR: a  transfer_test/data0.txt
```

```
HTAR: a  transfer_test/data10.txt
```

```
...
```

```
HTAR: a  /tmp/HTAR_CF_CHK_8183_1543522594
```

```
HTAR Create complete for transfer_test.tar. 23,068,684,800 bytes  
written for 22 member files, max threads: 3 Transfer time: 186.324  
seconds (123.809 MB/s) wallclock/user/sys: 186.521 30.654 105.275  
seconds
```

```
HTAR: HTAR SUCCESSFUL
```

```
summit> htar -xvf transfer_test.tar
```

# Transferring files through NFS and HPSS

<https://vimeo.com/304829936>



# Globus

- Globus transfers fast, parallel and reliable files between two endpoints
- Endpoints are different locations where data can be moved using the Globus transfer
- Visit [www.globus.org](http://www.globus.org) to register and/or login
- You can find the **OLCF DTN** endpoint.

# Globus(cont.)

The screenshot displays the Globus File Manager interface. At the top, the title bar reads "File Manager" and includes a "Panels" button and a "Bookmark Manager" link. Below the title bar, there are two input fields for "Collection" and "Path". The "Collection" field contains "OLCF DTN" and has a search icon. The "Path" field contains "/lustre/atlas/scratch/gmarkoma/stf007/globus/" and has a bookmark icon. To the right of these fields, there is another "Collection" field with "OLCF DTN" and a search icon, and a "Path" field with "/gpfs/alpine/scratch/gmarkoma/stf007/globus/" and a bookmark icon. Below the input fields, there is a toolbar with buttons for "select all", "up one folder", "refresh list", and "columns". The main area shows a file named "data.txt" with a timestamp of "12/1/2018 10:13am". A context menu is open over the file, listing the following actions: "Share", "Transfer or Sync to...", "New Folder", "Rename", "Delete Selected", "Preview (limited)", "Download (https)", "Open (https)", "Get Link", "Show Hidden Items", and "Deactivate". At the bottom of the interface, there are two buttons: "Start" and "Transfer & Sync Options".

# Globus demo, transfer from Titan to Summit

<https://vimeo.com/306412978>

# Performance Results

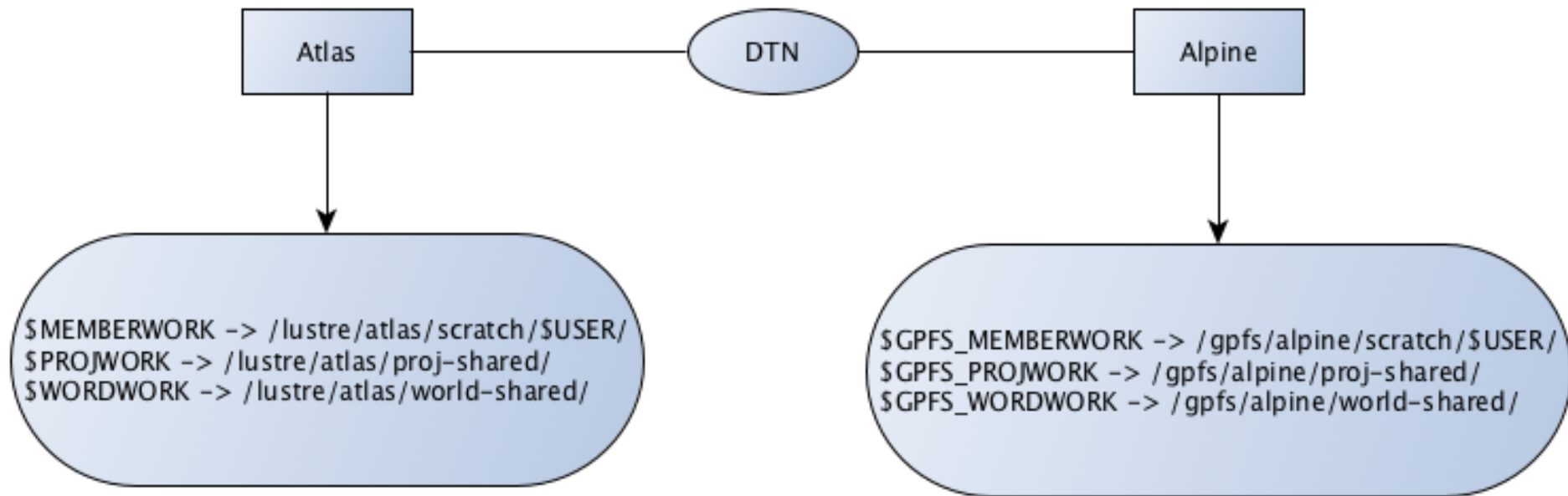
- Study case: Transfer data from Atlas to Alpine with 3 approaches. Copy the files through NFS, use HPSS, or use Globus

Type	Home NFS	HPSS	Globus
	Time in seconds to finish the transfer		
Transfer 22 files of 1GB each	323	270	10
Transfer 1 file of 22 GB	308	301	80
Transfer 4 files of 1GB each	69	53	9

- Globus is the most efficient approach to transfer files for all the evaluated cases, for small files though, transferring through NFS should be efficient.
- There are available some traditional tools such as scp, rsync
- The tests took place on 29<sup>th</sup> November

# DTN

- As long as we have both Atlas and Alpine on DTN, we use the following variables



# Conclusions – Storage areas/Data transfer

- Use NFS for installing your libraries (long-term storage)
- There are many approaches to transfer files, it seems that Globus is the fastest one but it depends on the number of files, file size etc.
- Use HPSS for large files that you don't plan to use soon and to backup soon to expire projects with important data
- Start transferring your files to Summit as soon as you have access. Atlas filesystem will be removed end of September 2019!
- Do not forget the storage policy!

# Acknowledgement


*This research used resources of the Oak Ridge Leadership Computing Facility, which is a DOE Office of Science User Facility supported under Contract DE-AC05-00OR22725.*

Thank you!  
Questions?



Backup slides

# Select your organization

 globus Globus Account Log In


## Log in to use Globus Web App

Use your existing organizational login  
e.g., university, national lab, facility, project

Oak Ridge National Laboratory


Didn't find your organization? Then use [Globus ID to sign in](#). ([What's this?](#))


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 Google

 Sign in with ORCID iD

# Credentials

**ORNL UCAMS Login**


Sign in with your ORNL UserID and Password

**ORNL UserID**

**UCAMS Password**

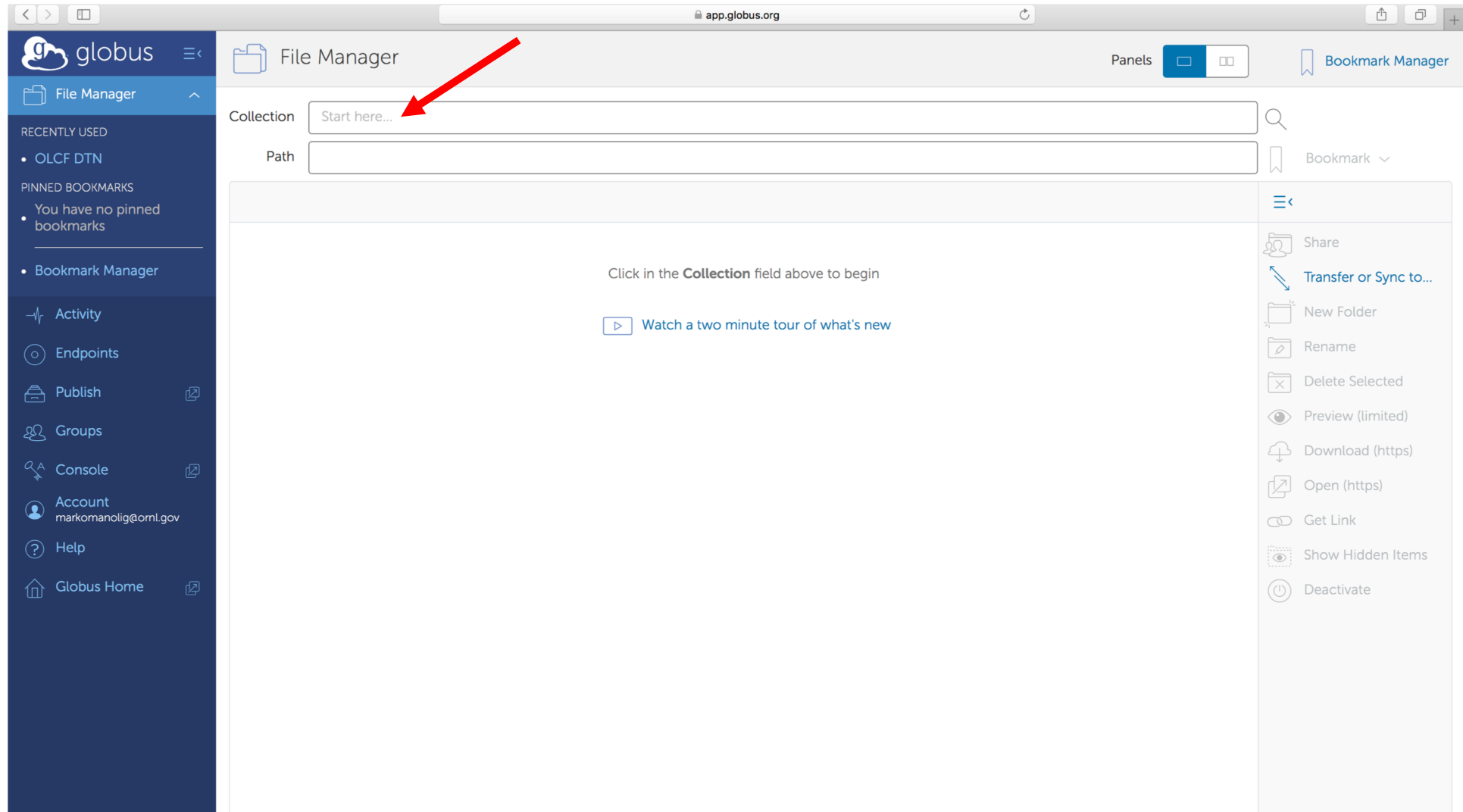
☐ Remember my UserID

**Sign In**

**OAK RIDGE**  
National Laboratory

[Security Notice](#)

# Select an endpoint



# Search for an endpoint

app.globus.org

File Manager

Panels

Collection

**OLCF DTN**  
olcf@globusid.org  
Globus endpoint for the Oak Ridge Leadership Computing Facility (OLCF) Data Transfer Nodes (DTN)

# Find the path with the required files

The screenshot shows the Globus File Manager interface. The left sidebar contains navigation options: File Manager, RECENTLY USED (OLCF DTN), PINNED BOOKMARKS (You have no pinned bookmarks), and Bookmark Manager. Below these are links to Activity, Endpoints, Publish, Groups, Console, Account (markomanolig@ornl.gov), Help, and Globus Home.

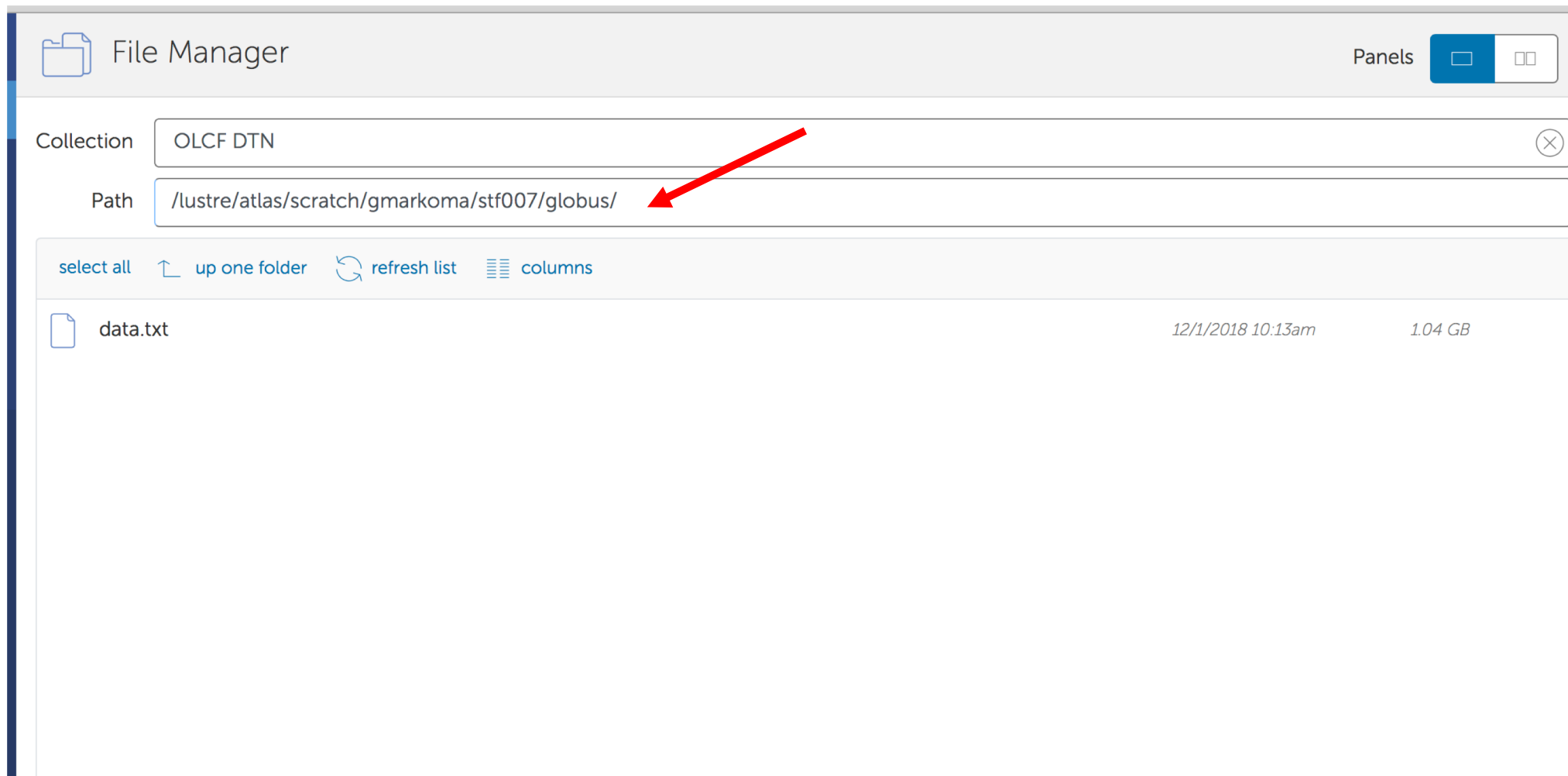
The main area displays the 'File Manager' for the 'OLCF DTN' collection. The 'Path' field is set to '/~/', indicated by a red arrow. Below the path field are buttons for 'select all', 'up one folder', 'refresh list', and 'columns'.

The file list shows the following items:

Item	Size	Modified
a.out	116 KB	10/9/2018 12:44pm
anaconda3	4.09 KB	12/5/2018 2:15pm
btio-pnetcdf-1.1.1_backup.tgz	26.14 MB	9/30/2018 11:01pm
btio-pnetcdf-1.1.1.tar.gz	10.32 KB	9/30/2018 10:58pm
data.txt	1.04 GB	12/1/2018 10:03am
del	4.09 KB	12/7/2018 2:50pm
Desktop	4.09 KB	9/13/2018 12:22pm
direct.cpp	1.48 KB	11/9/2018 10:27am
help	4.09 KB	11/12/2018 12:09pm
hostfile	126 B	12/10/2018 11:38pm
hostfile2	16 B	12/10/2018 11:40pm
hostfileaa	84 B	12/10/2018 11:37pm
hostfileab	28 B	12/10/2018 11:37pm

On the right side of the file list, there are several actions available: Share, Transfer or Sync to..., New Folder, Rename, Delete Selected, Preview (limited), Download (https), Open (https), Get Link, Show Hidden Items, and Deactivate.

# Find the path with the required files (cont.)



The screenshot shows a web-based File Manager interface. At the top, there's a header bar with a folder icon and the text "File Manager". On the right side of the header, there's a "Panels" section with two icons: a single square and a double square. Below the header, there are two input fields. The first is labeled "Collection" and contains the text "OLCF DTN". The second is labeled "Path" and contains the text "/lustre/atlas/scratch/gmarkoma/stf007/globus/". A red arrow points to the end of the path field. Below these fields, there's a toolbar with four items: "select all", "up one folder" (with an upward arrow icon), "refresh list" (with a circular arrow icon), and "columns" (with a list icon). Below the toolbar, there's a table listing files. The table has three columns: the first column shows a file icon and the filename "data.txt"; the second column shows the date and time "12/1/2018 10:13am"; the third column shows the file size "1.04 GB".

File Manager

Panels

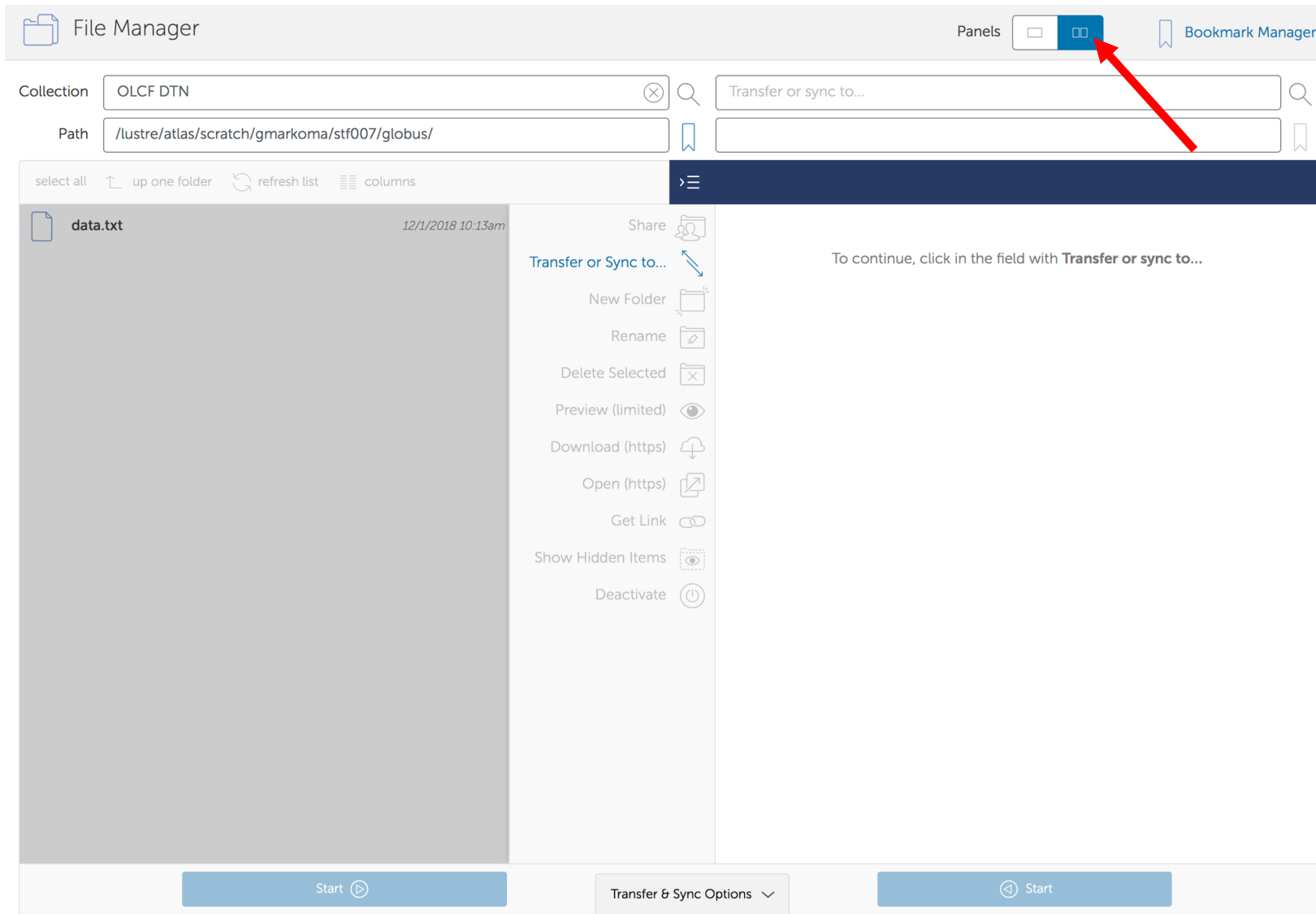
Collection OLCF DTN

Path /lustre/atlas/scratch/gmarkoma/stf007/globus/

select all up one folder refresh list columns

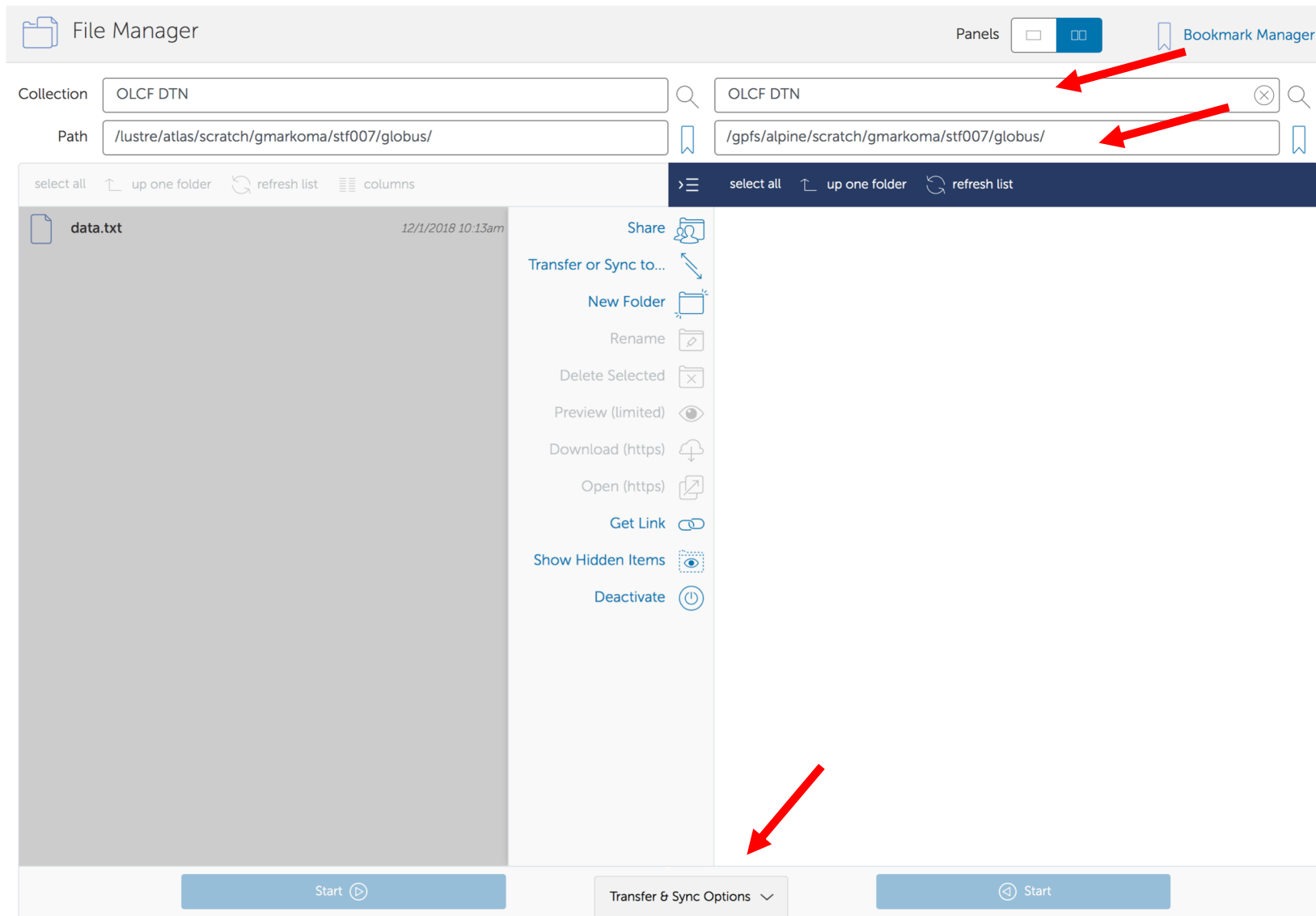
data.txt	12/1/2018 10:13am	1.04 GB
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# Choose appropriate panels option





# Use appropriate settings





# Transfer encryption

The screenshot displays the File Manager interface. At the top, the 'Collection' is set to 'OLCF DTN' and the 'Path' is '/lustre/atlas/scratch/gmarkoma/stf007/globus/'. A search bar on the right also shows 'OLCF DTN'. Below this, a file named 'data.txt' is selected, with a date of '12/1/2018 10:13am' and a size of '1.04 GB'. A context menu is open for this file, showing options like 'Share', 'Transfer or Sync to...', 'New Folder', 'Rename', 'Delete Selected', 'Preview (limited)', 'Download (https)', 'Open (https)', 'Get Link', 'Show Hidden Items', and 'Deactivate'. A red arrow points from the left towards the 'data.txt' file. Another red arrow points from the bottom left towards the 'Start' button in the 'Transfer & Sync Options' panel. This panel includes a 'Label This Transfer' input field and 'Transfer Settings' with the following options: 'sync - only transfer new or changed files' (unchecked), 'delete files on destination that do not exist on source' (unchecked), 'preserve source file modification times' (unchecked), 'verify file integrity after transfer' (checked), and 'encrypt transfer' (unchecked). A red arrow points from the bottom left towards the 'encrypt transfer' checkbox.

# Activity

File Manager

Panels   Bookmark Manager

Collection OLCF DTN

Path /lustre/atlas/scratch/gmarkoma/stf007/globus/

Transfer request submitted successfully. Task id: cf7a7560-fd70-11e8-9345-0e3d676669f4

select none up one folder refresh list columns

data.txt 12/1/2018 10:13am 1.04 GB


- Share
- Transfer or Sync to...
- New Folder
- Rename
- Delete Selected
- Preview (limited)
- Download (https)
- Open (https)
- Get Link
- Show Hidden Items
- Deactivate


Start


Transfer & Sync Options



Start

# Activity report

[File Manager](#)  **OLCF DTN to OLCF DTN**  
transfer completed

 Overview

 Event Log

Task Label	OLCF DTN to OLCF DTN
Source	OLCF DTN  owner: olcf@globusid.org
Destination	OLCF DTN  owner: olcf@globusid.org
Task ID	cf7a7560-fd70-11e8-9345-0e3d676669f4
Owner	Georgios Markomanolis (markomanolig@ornl.gov)
Condition	SUCCEEDED
Requested	2018-12-11 01:16 pm
Completed	2018-12-11 01:16 pm
Transfer Settings	<ul style="list-style-type: none"><li>• verify file integrity after transfer</li><li>• transfer is not encrypted</li><li>• overwriting all files on destination</li></ul>

1

Files

0

Directories

1.04 GB

Bytes Transferred

140.19

Effective Speed

MB/s

0

Pending

2

Succeeded

0

Cancelled

0

Expired

0

Failed

0

Retrying

0

Skipped

[View debug data](#)