
Fugaku High Speed Transfer Users Guide

Release 1.1

RIKEN R-CCS

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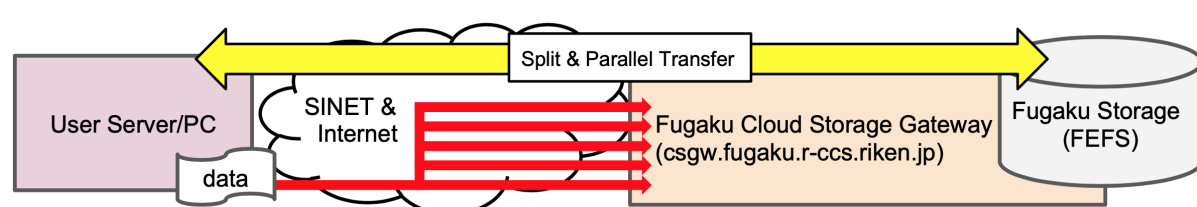
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INTRODUCTION

This document describes “how to transfer data at high speed” from the outside (e.g. Internet, SINET) to “Fugaku” environment. This document shows an example of parallel and high bandwidth data transfer between a user’s server and “Fugaku” using GridFTP protocol.

For long and massively parallel data transfer, please use the Cloud Storage Gateway (csgw.fugaku.r-ccs.riken.jp). This document shows an example of using the Cloud Storage Gateway to transfer data to the global file system of Fugaku.



1.1 What is Cloud Storage Gateway (csgw.fugaku.r-ccs.riken.jp)

Cloud Storage Gateway(csgw.fugaku.r-ccs.riken.jp) is a server for using data transfer between Fugaku and outside (e.g: Cloud, HPCI Shared Storage, your server or terminal). From the Cloud Storage Gateway, you will access to the global storage of Fugaku as well as the login node of Fugaku. The SSH public-key is set as same as the login node of Fugaku. The login method to Cloud Storage Gateway is as follows.

[SSH LOGIN]

```
$ ssh -l <FUGAKU_USER> csgw.fugaku.r-ccs.riken.jp
```

[GSISSH LOGIN]

```
$ myproxy-logon -s portal.hpci.nii.ac.jp -l <HPCI-ID> -t 168  
$ gsissh -p 2222 -l <FUGAKU_USER> csgw.fugaku.r-ccs.riken.jp
```

When you log in as described above, you will be distributed across the following two servers

- csgw1.fugaku.r-ccs.riken.jp
- csgw2.fugaku.r-ccs.riken.jp

1.2 Utilized Notations

In order to make it clear where the command execution takes place between your terminal and the Cloud Storage Gateway(csgw.fugaku.r-ccs.riken.jp), the following prompt notation is used in this document.

Command Prompt	Target System
[User]\$	Execution on the User's terminal
[CSGW]\$	Execution on the Cloud Storage Gateway

- sequential numbering (User_1, User_2, ...) will be applied when using multiple CLI terminals.

1.3 Update History

2nd Version(Jul 25, 2021)

Added Explanatory figure.
Added performance information.
Added usage for NAT use
Added parallel transfer method and option description of globus-url-copy command.

First Version (May 24, 2021)

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WHAT IS GRIDFTP ?

It is a data transfer protocol which can transfer data in parallel by TCP communication. It is expected to be faster than scp and other protocols because large files can be transferred in parallel by dividing them. The GridFTP server is running on the Cloud Storage Gateway (csgw.fugaku.r-ccs.riken.jp). Using GridFTP client software, you can transfer data between your server, terminal, etc. and Fugaku's storage in parallel.

2.1 Configuration values for GridFTP on the Cloud Storage Gateway

The Cloud Storage Gateway(csgw.fugaku.r-ccs.riken.jp) has opened the following ports for the use of GridFTP server. The default ports used by GridFTP are open. The GridFTP server allows SSH public-key authentication and GSI authentication.

Please select the authentication method that is most convenient for you.

If you have an OUTBOUND Firewall, please open the following ports in your servers.

Port	Proto- cols	Applications
22	tcp	Access Port/The port used for the SSH public-key authentication with GridFTP server.
2811	tcp	Access Port/The port used for the GSI authentication with the GridFTP server.
50000 51000	- tcp	The port for data transfer.

DATA TRANSFER METHOD USING GRIDFTP COMMAND

3.1 What is globus-url-copy command ?

This section describes how to Transfer using the “globus-url-copy” command, which is a data transfer tool using the GridFTP transfer protocol provided by Globus.

The globus-url-copy command cannot be operated interactively, but it provides more options than UberFTP Clinet, such as parallel transfer per file and specification of buffer size. For details of the globus-url-copy command, please refer to the following URL.

- <https://gridcf.org/gct-docs/6.2/gridftp/user/index.html#gridftp-user-command>

In a NAT environment, there is a problem with data transfer when reading with some options (confirmed in version 10.8). A workaround for this problem is described in ” *Note when transferring data in a NAT environment or under a Firewall* “, please be careful when using it in a NAT environment.

3.1.1 How to install globus-url-copy command

The globus-url-copy command can be installed and setup by the following methods. If you are using Windows or Mac, please use the Docker container provided by HPCI to build your environment.

[RHEL/CentOS]

You can use the epel repository to install globus-url-copy command. (In the example below, the myproxy package is also installed for download the GSI proxy certificate.)

RHEL/CetOS 8

```
(User)$ sudo dnf localinstall https://dl.fedoraproject.org/pub/epel/epel-release-  
↪latest-8.noarch.rpm  
(User)$ sudo dnf install --enablerepo=epel globus-gass-copy-progs myproxy
```

RHEL/CetOS 7

```
(User)$ sudo yum localinstall https://dl.fedoraproject.org/pub/epel/epel-release-  
↪latest-7.noarch.rpm  
(User)$ sudo yum install --enablerepo=epel globus-gass-copy-progs myproxy
```

[Ubuntu]

You can use the globus-toolkit-repo_latest_all repository to install globus-url-copy command.

```
(User)$ sudo wget https://downloads.globus.org/toolkit/globus-connect-server/  
↪globus-connect-server-repo_latest_all.deb  
(User)$ sudo dpkg -i globus-connect-server-repo_latest_all.deb  
(User)$ sudo apt-get install globus-gass-copy-progs myproxy
```

[Mac/Windows]

HPCI provides a Docker container image with the Globus environment as follows. By using this container image, you can easily build an environment to use the `globus-url-copy` command.

- Mac: <https://www.hpci.nii.ac.jp/gt6/docker/HPCI-Login-Docker-macOS.html>
- Windows: <https://www.hpci.nii.ac.jp/gt6/docker/HPCI-Login-Docker-win10.html>

After starting the above Docker container, install the `globus-gass-copy-progs` package using the `yum` command. (The following is an example of the `gsi-openssh-20201215` version. Please configure the options of `docker run` and other settings according to your environment)

```
(User)$ docker load -i gsi-openssh-20201215.tar.bz2
(User)$ docker run -d --rm --name gsi-openssh hpci/gsi-openssh:20201215
(User)$ docker exec -i -t gsi-openssh /bin/bash
[hpciuser@docker_container]$ sudo yum install globus-gass-copy-progs
```

3.1.2 Transfer method using the `globus-url-copy` command

This section describes how to use the `globus-url-copy` command to transfer data using SSH public key authentication and GSI authentication. The `globus-url-copy` command specifies the source url and the destination url in the following format.

```
(User)$ globus-url-copy <OPTION> <Source URL> <Destination URL>
```

The source and destination url are described in the form of “<protocol>://<user name>@<host name (IP address)>[:<port number>]/<file path>”.

For the protocol, the cloud storage gateway supports `sshftp` (transfer with SSH authentication) and `gsiftp` (transfer with GSI authentication). For example, the following is an example of transferring `~/file.txt` to the Cloud Storage Gateway via SSH authentication.

```
(User)$ globus-url-copy ~/file.txt ssh://<user>@csgw.fugaku.r-ccs.riken.jp/file.txt
```

- If you want to specify a local file or directory, you can also specify `file://` as the protocol. In the following example `> file://` is omitted.
- For `sshftp`, port 22 is used for authentication, and for `gsiftp`, port 2811 is used as the default port number. These can also be omitted.
- If you want to transfer directories recursively, you need to specify the `-r` option. See the section on transfer options below for other options.

Transfer options for `globus-url-copy` command

The number of parallelism and the transfer buffer size can be specified by `globus-url-copy`.

Depending on the transfer distance, transfer bandwidth, etc., you can change them for faster transfer. There are also options for checksum comparison. You may wish to consider specifying these options and adjusting the values as required. The following are some of the most commonly used options for transfer. For more information, please refer to the manual of `globus-url-copy`.

Option	Description
-r	Specifies that the directory should be transferred. The files and directories stored in the directory are transferred recursively.
-cd / -create-directory	Creates a directory automatically if there is no directory specified for transfer.
-v / -verbose	Verbose mode. Show detailed information during transfer.
-p / -parallel	This option allows you to specify the number of parallelism when transferring a single file in separate files. This option may cause the data transfer to fail when reading files in a NAT environment. If this happens, please use the workaround in a NAT environment or use the -cc option to transfer files in parallel.
-cc / -concurrency	Specifies that multiple files should be transferred in parallel. Unlike -p, this option has no effect on reading/writing files in a NAT environment.
-tcp-bs	Allows you to specify the size of the transfer buffer used by the ftp transfer channel.
-bs	You can specify the transfer buffer size used by each transfer method.
-verify-checksum	Get and compare checksums at source and destination (if different, transfer fails)

Transfer via SSH public-key authentication

To use SSH public-key authentication, please setup an SSH public-key on Cloud Storage Gateway(csgw.fugaku.r-ccs.riken.jp). For setting up SSH public-key, please refer to Fugaku's Startup Guide.

- Manuals: <https://www.fugaku.r-ccs.riken.jp/docs/manuals>

The following example shows how to parallel write files stored in "test.d" directory to the Fugaku global file system via SSH public-key authentication.

- <FUGAKU_USERNAME> should be your Fugaku account.
- <User> is the user name of your terminal.
- Forwarding will fail if there is no directory at the destination. * Please create a directory before the Transfer.
* In the following example, create . /test.d in the Fugaku ~/home.

```
* Writing to the Fugaku global file system(8 parallel Transfer)
(User)$ ls ~/test.d
test.01 test.02 test.03 test.04 test.05 test.06 test.07 test.08 test.09
↪test.10
(User)$ globus-url-copy -cd -r -p 8 -v ~/test.d/ sshftp://<FUGAKU_USERNAME>@csgw.
↪fugaku.r-ccs.riken.jp:22/~/test.d/
Source: file:///home/<User>/test.d/
Dest:  sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~/test.d/
test.01
Source: file:///home/<User>/test.d/
Dest:  sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~/test.d/
test.02
(snip)
Dest:  sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~/test.d/
test.10
* Confirmed
(User)$ ssh <FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp "ls test.d/"
test.01
test.02
test.03
test.04
test.05
test.06
test.07
test.08
test.09
test.10
(User)$
```


The following is an example of saving data in Fugaku global file system to the server at hand via SSH public-key authentication.

Please specify GLOBUS_TCP_PORT_RANGE to specify the transfer port.

In this example, the data will be transferred using Port 50000~51000/tcp.

And, -v option (Verbose), -r option (Recurive) and -p option (Parallel) are specified.

* For <FUGAKU_USERNAME>, please specify your Fugaku account.

* <User> is the user name of your terminal.

```
* Setup environment
(User)$ export GLOBUS_TCP_PORT_RANGE=50000,51000
* Reading from the Fugaku global file system(8 parallel Transfer)
(User)$ globus-url-copy -cd -r -p 8 -v sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-
↪ccs.riken.jp:22/~ /test.d/ ~/test.d/
Source: sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~ /test.d/
Dest:   file:///home/<User>/test.d/
test.01
Source: sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~ /test.d/
Dest:   file:///home/<User>/test.d/
test.02
(snip)
Source: sshftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp:22/~ /test.d/
Dest:   file:///home/<User>/test.d/
test.10
* Confirmed
(User)$ ls ~/test.d
test.01 test.02 test.03 test.04 test.05 test.06 test.07 test.08 test.09 ↵
↪test.10
(User)$
```

Transfer via GSI authentication

You can also use the certificates provided by HPCI to perform parallel transfers with GSI certification.

For more information on GSI certification, please refer to the HPCI Quick Start Guide.

HPCI manual page: https://www.hpci-office.jp/pages/hpci_info_manuals

The following example shows how to parallel write a file stored in the test.d directory to the Fugaku global file system with GSI authentication.

* Please make sure you have obtained a HPCI proxy certificate.

* For <HPCI-ID>, please specify your HPCI-ID.

* For <FUGAKU_USERNAME>, please specify your Fugaku account.

* <User> is the user name of the user's terminal.

* Forwarding will fail if there is no directory at the destination.

Please create a directory before the Transfer.

In the following example, create . /test.d in the Fugaku ~/home.

```
* Download proxy certificate
(User)$ myproxy-logon -s portal.hpci.nii.ac.jp -l <HPCI-ID> -t 168
Enter MyProxy pass phrase:
(User)$ grid-proxy-info | grep timeleft
timeleft : 13:50:08
* Writing to the Fugaku global file system(8 parallel Transfer)
(User)$ ls ~/test.d
test.01 test.02 test.03 test.04 test.05 test.06 test.07 test.08 test.09 ↵
↪test.10
```

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```

(User)$ globus-url-copy -cd -r -p 8 -v ~/test.d/ gsiftp://<FUGAKU_USERNAME>@csgw.
↪fugaku.r-ccs.riken.jp/~test.d/
Source: file:///home/<User>/test.d/
Dest:   gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
test.01
Source: file:///home/<User>/test.d/
Dest:   gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
test.02
(snip)
Dest:   gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
test.10
* Confirmed
(User)$ gsissh -p2222 <FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp "ls test.d/"
test.01
test.02
test.03
test.04
test.05
test.06
test.07
test.08
test.09
test.10
(User)$

```

The following is an example of parallel read from Fugaku global file system with GSI authentication. Please specify GLOBUS_TCP_PORT_RANGE is transfer port range. In this example, the data will be transferred using 50000~51000.

In this example, -v option (Verbose), -r option (Recursive) and -p option (Parallel) are specified.

- * For <FUGAKU_USERNAME>, please specify your Fugaku account.
- * <User> is the user name of your terminal.

```

* Download proxy certificate
(User)$ myproxy-logon -s portal.hpci.nii.ac.jp -l <HPCI-ID> -t 168
Enter MyProxy pass phrase:
(User)$ grid-proxy-info | grep timeleft
timeleft : 13:50:08
* Setup environment
(User)$ export GLOBUS_TCP_PORT_RANGE=50000,51000
* Reading from the Fugaku global file system(8 parallel Transfer)
(User)$ globus-url-copy -cd -r -p 8 -v gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-
↪ccs.riken.jp/~test.d/ ~/test.d/
Source: gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
Dest:   file:///home/<User>/test.d/
test.01
Source: gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
Dest:   file:///home/<User>/test.d/
test.02
(snip)
Source: gsiftp://<FUGAKU_USERNAME>@csgw.fugaku.r-ccs.riken.jp/~test.d/
Dest:   file:///home/<User>/test.d/
test.10
* Confirmed
(User)$ ls ~/test.d
test.01 test.02 test.03 test.04 test.05 test.06 test.07 test.08 test.09 ↪
↪test.10
(User)$

```

3.1.3 Options for globus-url-copy command

The number of parallelism and transfer buffer size can be specified by globus-url-copy.

There are also options for checksum comparison.

Please consider specifying the options and adjusting the specified values as necessary.

The following are the most commonly used options for transfer. Please refer to the manual of globus-url-copy for details.

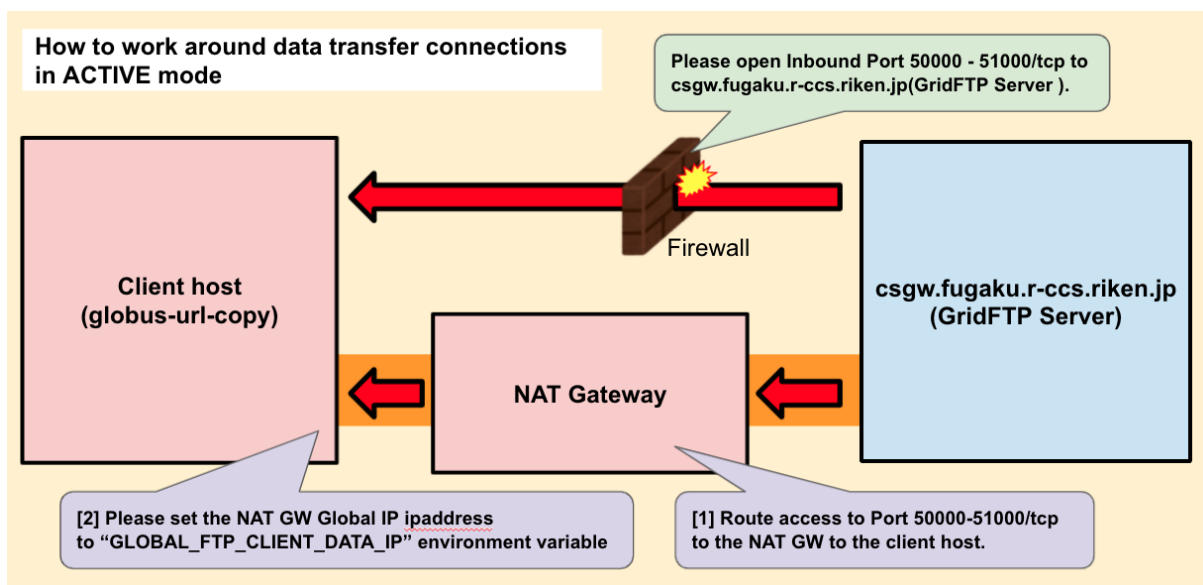
Option	description
-r	Specifies that the directory should be transferred. Files and directories stored in the directory will be transferred recursively.
-v / -verbose	Verbose mode. Show detailed information during transfer.
-p / -parallel	You can specify the number of parallel transfers
-tcp-bs	Specifies the size of the transfer buffer used by the FTP transfer channel.
-bs	You can specify the transfer buffer size used by each transfer method.
-verify-checksum	Get and compare checksums at source and destination (if different, transfer fails)

3.1.4 Note when transferring data in a NAT environment or under a Firewall

In globus-url-copy, data is usually transferred in PASSIVE mode (the client connects to the GridFTP server and transfers the data). However, if the -p option etc. are specified, the data is transferred in ACTIVE mode (the data is transferred by connecting the GridFTP server to the client environment), and the data cannot be transferred from the GridFTP server to the client (globus-url-copy) in the NAT environment or the Firewall setting environment. In a NAT or Firewall environment, the data transfer connection from the GridFTP server to the client (globus-url-copy execution environment) cannot be established and the transfer fails when reading the data.

The workaround is to open the receiving port if it is caused by the Firewall, or to configure the NAT server or router to forward the data by routing or IP masquerading in a NAT environment.

Depending on your environment, this workaround may not be possible. If this is not possible, please use the “-cc” option to transfer multiple files in parallel, rather than using the “-p” option to transfer the same file separately, to increase the transfer speed. To increase the transfer speed, please transfer multiple files in parallel using the -cc option.



How to read files in the firewall

Please open the Inbound Port 50000 - 51000/tcp from csgw.fugaku.r-ccs.riken.jp to the client host as shown in the figure.

How to read files in the NAT

For forwarding under NAT, you need to configure the routing settings and environment variables from the NAT server or router to the client environment before running the globus-url-copy command.

1. In order to forward Port 50000 - 51000/tcp accesses from csgw.fugaku.r-ccs.riken.jp to the client host, please configure routing and IP masquerade settings on your NAT server or router (according to your NAT server or router).
2. Set the environment variable GLOBUS_FTP_CLIENT_DATA_IP to the host where the globus-url-copy command was executed, and execute the globus-url-copy command.

```
(User)$ export GLOBUS_FTP_CLIENT_DATA_IP=<NAT_GW_IPADDRESS>
(User)$ globus-url-copy -r -p 8 -v ~/test.d/ sshftp://<FUGAKU_USERNAME>@csgw.
↪fugaku.r-ccs.riken.jp:22/~/test.d/
```

3.1.5 Performance

This is the performance of data transfer from R-CCS login node das04.r-ccs.riken.jp to gsgw1.fugaku.r-ccs.riken.jp on HPCI shared storage.

- Measured with 1GB x 128File(total 128GB).
- das04(client) and csgw(server) are connected at 100Gbps.
- das04(client) uses /dev/shm (on memory) as a destination for source and destination data.
- As described below, the read and write FEFS area is under /data and the Strip setting is the default (Strip Count: 1 / BlockSize 1MB).

Transfer speeds will vary depending on user usage, but both the -p (file split transfer) and -cc (file parallel transfer) options allow efficient transfers. Also, if the -p option is not available in a NAT environment, the -cc option can be increased to improve transfer bandwidth. Please refer to these results and adjust the number of parallelism, buffer size, block size, etc.

Write Performance

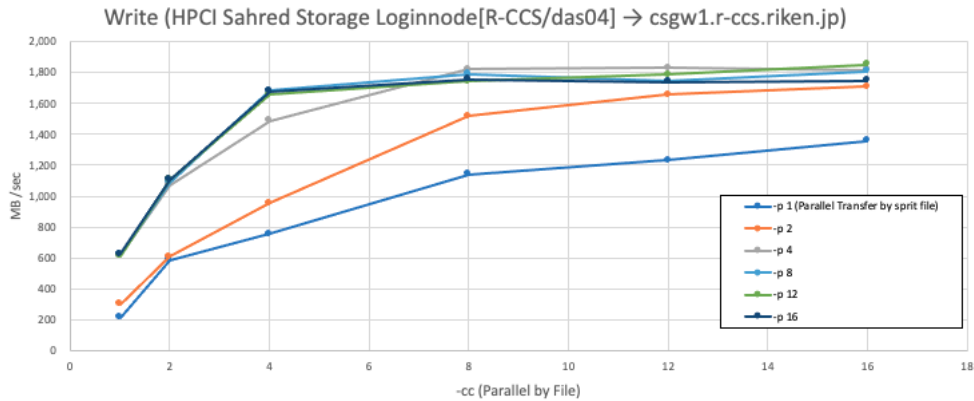
Command

```
(das04)$ time -p globus-url-copy -bs 1048576 -rst -cd -v \
    -p <Split Transfer Count> -cc <Parallel Count> -r \
    /dev/shm/test.d/
    sshftp://${USER}@csgw1.fugaku.r-ccs.riken.jp/data/.../test.d/
```

Result

- -p : Split Transfer Count(Split a single file and transfer it in parallel)
- -cc: Parallel Transfer Count(Parallel file-by-file transfer)

MB/sec	cc=1	cc=2	cc=4	cc=8	cc=12	cc=16
p=1	212.635	584.555	756.054	1141.804	1231.796	1356.747
p=2	300.066	609.572	957.033	1516.767	1657.745	1709.173
p=4	616.461	1072.805	1486.126	1822.583	1828.920	1816.118
p=8	619.445	1087.819	1681.040	1791.713	1743.078	1808.335
p=12	611.991	1106.979	1656.386	1743.632	1785.133	1853.819
p=16	626.898	1105.322	1679.496	1756.231	1738.264	1749.032



Read Performance

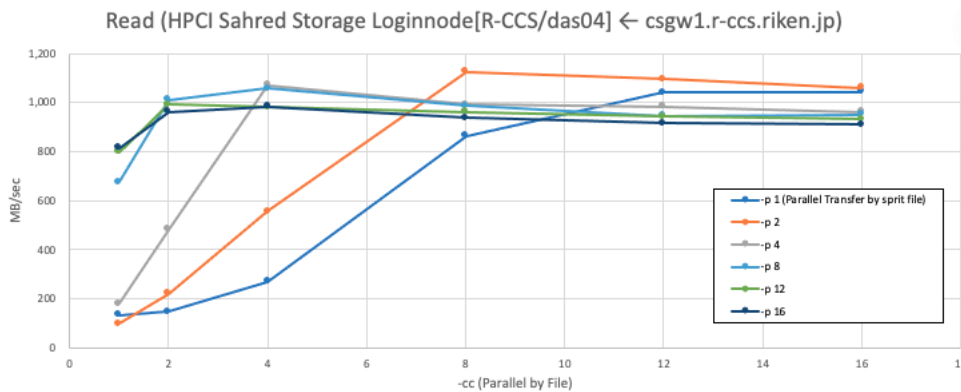
Command

```
(das04)$ time -p globus-url-copy -bs 1048576 -rst -cd -v \
-p <Split Transfer Count> -cc <Parallel Count> -r \
sshftp://${USER}@csgw1.fugaku.r-ccs.riken.jp/data/.../test.d/
/dev/shm/test.d/
```

Result

- -p : Split Transfer Count(Split a single file and transfer it in parallel)
- -cc: Parallel Transfer Count(Parallel file-by-file transfer)

MB/sec	cc=1	cc=2	cc=4	cc=8	cc=12	cc=16
p=1	132.999	146.944	269.853	865.235	1041.158	1043.748
p=2	97.617	220.283	555.353	1124.899	1095.365	1060.744
p=4	179.808	483.512	1072.161	992.748	985.108	962.816
p=8	676.819	1012.378	1058.026	986.360	945.766	952.168
p=12	797.677	991.971	981.670	962.927	943.619	933.135
p=16	813.773	961.779	984.691	939.013	916.993	911.356



3.2 What is uberftp command ?

This section describes how to transfer data using the “uberftp” command, a data transfer tool using the GridFTP transfer protocol that can be used interactively with GSI authentication. Unlike the globus-url-copy command, uberftp can also be used interactively. This section focuses on the interactive use of uberftp.

Also, “uberftp” command does not support ssh authentication, so please use GSI authentication. And, “uberftp” command can split and transfer files, but cannot transfer files in parallel (version 2.8). Please note that, as with globus-url-copy, the split transfer may fail when reading files in a NAT environment. If you want to read files in parallel in a NAT environment, please take the same workaround as globus-url-copy or use the file parallel option (cc option) of the globus-url-copy command.

This section describes how to transfer data using the “uberftp” command, a data transfer tool that uses the GridFTP transfer protocol for interactive use with GSI authentication.

3.2.1 How to install uberftp command

The uberftp command can be installed and setup by the following methods. If you are using Windows or Mac, please use the Docker container provided by HPCI to build your environment.

[RHEL/CentOS]

The uberftp command can be installed and setup by the following methods. If you are using Windows or Mac, please use the Docker container provided by HPCI to build your environment.

RHEL/CetOS 8

```
(User)$ sudo dnf localinstall https://dl.fedoraproject.org/pub/epel/epel-release-
↳latest-8.noarch.rpm
(User)$ sudo dnf install --enablerepo=epel uberftp myproxy
```

RHEL/CetOS 7

```
(User)$ sudo yum localinstall https://dl.fedoraproject.org/pub/epel/epel-release-
↳latest-7.noarch.rpm -y
(User)$ sudo yum install --enablerepo=epel uberftp myproxy
```

[Ubuntu]

You can use the globus-toolkit-repo_latest_all repository to install uberftp command.

```
(User)$ sudo wget https://downloads.globus.org/toolkit/globus-connect-server/
↳globus-connect-server-repo_latest_all.deb
(User)$ sudo dpkg -i globus-connect-server-repo_latest_all.deb
(User)$ sudo apt-get install uberftp myproxy
```

[Mac/Windows]

HPCI provides a Docker container image with the Globus environment as follows. By using this container image, you can easily build an environment to use the uberftp command.

- Mac: <https://www.hpci.nii.ac.jp/gt6/docker/HPCI-Login-Docker-macOS.html>
- Windows: <https://www.hpci.nii.ac.jp/gt6/docker/HPCI-Login-Docker-win10.html>

After starting the above Docker container, install the uberftp package using the yum command. (The following is an example of the gsi-openssh-20201215 version. Please configure the options of docker run and other settings according to your environment)

```
(User)$ docker load -i gsi-openssh-20201215.tar.bz2
(User)$ docker run -d --rm --name gsi-openssh hpci/gsi-openssh:20201215
(User)$ docker exec -i -t gsi-openssh /bin/bash
[hpciuser@docker_container]$ sudo yum install uberftp
```

3.2.2 Transfer method using the uberftp command

This section describes how to use the uberftp command to transfer data interactively. The uberftp command uses GSI authentication. This example shows how to write data from local to the global filesystem on Fugaku, and then read data from the global filesystem on Fugaku to local.

- <FUGAKU_USERNAME> should be the account of Fugaku.
- As with other FTP clients, prefixing the command with “I” makes it a local command.

```
* Download proxy certificate
(User)$ myproxy-logon -s portal.hpci.nii.ac.jp -l <HPCI-ID> -t 168
Enter MyProxy pass phrase:
(User)$ grid-proxy-info | grep timeleft
timeleft : 13:50:08
* Access to Cloud Storage Gateway
(User)$ uberftp -u <FUGAKU_USERNAME> csgw.fugaku.r-ccs.riken.jp
220 sm02sv11 GridFTP Server 13.21 (gcc64, 1607703417-0) [Grid Community Toolkit 6.
↪2] ready.
230 User <FUGAKU_USERNAME> logged in.
UberFTP (2.8)>
* Confirm the local forwarding directory
UberFTP (2.8)> lcd ./test.d
UberFTP (2.8)> ll
drwxrwxr-x  2 <user> <group>      200 May 23 19:15 .
drwx----- 72 <user> <group>    16384 May 23 19:15 ..
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.01
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.02
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.03
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.04
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.05
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.06
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.07
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.08
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.09
-rw-rw-r--  1 <user> <group> 104857600 May 23 19:43 test.10
UberFTP (2.8)> lpwd
/home/<user>/test.d
* Write to the src.dir data on the Fugaku
UberFTP (2.8)> mkdir src.dir
UberFTP (2.8)> cd src.dir
UberFTP (2.8)> pwd
/home/<FUGAKU_GROUP>/<FUGAKU_USER>/src.dir
UberFTP (2.8)> mput * ./
test.01: 104857600 bytes in 0.078164 Seconds (1.249 GB/s)
```

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```

test.02: 104857600 bytes in 0.062107 Seconds (1.572 GB/s)
test.03: 104857600 bytes in 0.057231 Seconds (1.706 GB/s)
test.04: 104857600 bytes in 0.057512 Seconds (1.698 GB/s)
test.05: 104857600 bytes in 0.059141 Seconds (1.651 GB/s)
test.06: 104857600 bytes in 0.064720 Seconds (1.509 GB/s)
test.07: 104857600 bytes in 0.066412 Seconds (1.470 GB/s)
test.08: 104857600 bytes in 0.069008 Seconds (1.415 GB/s)
test.09: 104857600 bytes in 0.069565 Seconds (1.404 GB/s)
test.10: 104857600 bytes in 0.068166 Seconds (1.433 GB/s)
UberFTP (2.8)> ls
drwxr-xr-x 12 <FUGAKU_USER> <FUGAKU_GROUP> 4096 May 23 20:42 .
drwx----- 14 <FUGAKU_USER> <FUGAKU_GROUP> 4096 May 23 20:42 ..
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.01
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.02
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.03
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.04
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.05
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.06
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.07
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.08
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.09
-rw-r--r-- 1 <FUGAKU_USER> <FUGAKU_GROUP> 104857600 May 23 19:43 test.10
* Read from the src.dir data on the Fugaku to local dest.dir
UberFTP (2.8)> lmkdir ~/dest.dir
UberFTP (2.8)> lcd ~/dest.dir
UberFTP (2.8)> lpwd
/home/<user>/dest.dir
UberFTP (2.8)> pwd
/home/<FUGAKU_GROUP>/<FUGAKU_USER>/src.dir
UberFTP (2.8)> mget * ./
test.01: 104857600 bytes in 0.300731 Seconds (332.523 MB/s)
test.02: 104857600 bytes in 0.395436 Seconds (252.885 MB/s)
test.03: 104857600 bytes in 0.292810 Seconds (341.518 MB/s)
test.04: 104857600 bytes in 0.295335 Seconds (338.599 MB/s)
test.05: 104857600 bytes in 0.296257 Seconds (337.545 MB/s)
test.06: 104857600 bytes in 0.299359 Seconds (334.047 MB/s)
test.07: 104857600 bytes in 0.331494 Seconds (301.665 MB/s)
test.08: 104857600 bytes in 0.300032 Seconds (333.298 MB/s)
test.09: 104857600 bytes in 0.294818 Seconds (339.192 MB/s)
test.10: 104857600 bytes in 0.314017 Seconds (318.454 MB/s)
UberFTP (2.8)> lls
total 1024020
drwx----- 2 <user> <group> 200 May 23 20:50 .
drwx----- 73 <user> <group> 16384 May 23 20:45 ..
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.01
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.02
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.03
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.04
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.05
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.06
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.07
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.08
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.09
-rw----- 1 <user> <group> 104857600 May 23 19:43 test.10
UberFTP (2.8)>

```