

Introduction to GACRC Teaching Cluster

PHYS8602

Georgia Advanced Computing Resource Center (GACRC)

EITS/University of Georgia

Zhuofei Hou zhuofei@uga.edu

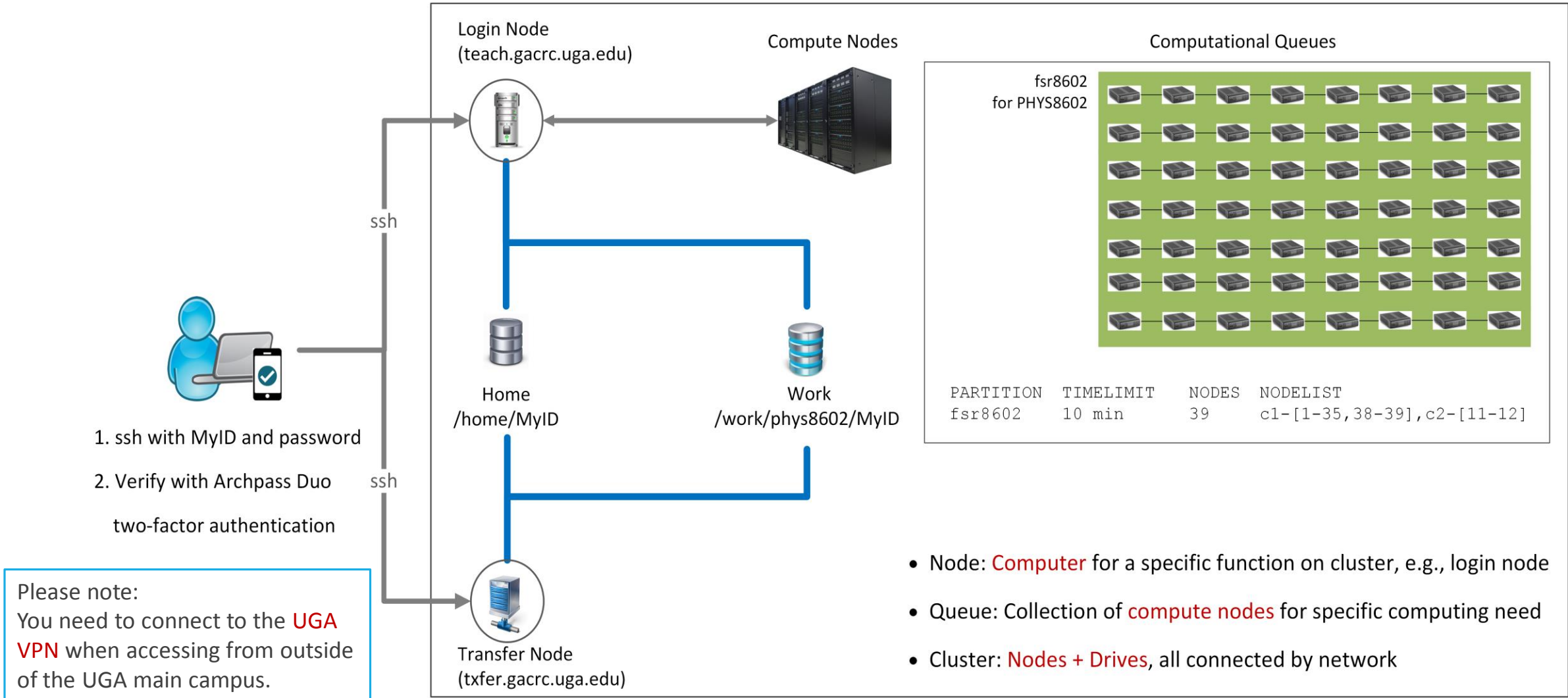
Outline

- GACRC
- Overview
- Computing Resources
 - Three Folders
 - Three Computational Queues
 - Software
- Submit Batch Job
- GACRC Wiki and Support

GACRC

- We are a high-performance-computing (HPC) center at UGA
- We provide to the UGA research and education community an advanced computing environment:
 - HPC computing and networking infrastructure located at the Boyd Data Center
 - Comprehensive collection of scientific, engineering and business applications
 - Consulting and training services
- <http://wiki.gacrc.uga.edu> (GACRC Wiki)
- https://wiki.gacrc.uga.edu/wiki/Getting_Help (GACRC Support)
- <http://gacrc.uga.edu> (GACRC Web)

Teaching Cluster



Computing Resources

➤ Two Nodes:

1. Login node (MyID@teach.gacrc.uga.edu): for submitting computational jobs
2. Transfer node (MyID@txfer.gacrc.uga.edu): for transferring data files

➤ Three Directories:

1. /home/MyID: working space for computational jobs
2. /work/phys8602/MyID: data parking for individual user in the class
3. /work/phys8602/instructor_data: data shared with class by the instructors

➤ Queue for your class: fsr8602

Computing Resources (cont.)

➤ Software

1. Software names are long and have a Easybuild toolchain name associated to it
2. Complete module name: `Name/Version-toolchain`, e.g., `Python/2.7.14-foss-2016b`
3. Software names are case-sensitive!
 - `module avail` : List all available software modules installed on cluster
 - `module load moduleName` : Load a module into your working environment
 - `module list` : List modules currently loaded
 - `module unload moduleName` : Remove a module from working environment
 - `ml spider pattern` : Search module names matching a pattern (case-insensitive)

Submit Batch Job

1. Log on to Login node using MyID and password, and two-factor authentication with Archpass Duo:
`ssh MyID@teach.gacrc.uga.edu`
2. Create a working subdirectory for a job : `mkdir ./workDir`
3. Change directory to workDir : `cd ./workDir`
4. Transfer data from local computer to workDir : use `scp` or **SSH File Transfer** to connect Transfer node
Transfer data on cluster to workDir : log on to Transfer node and then use `cp` or `mv`
5. Compile your source codes *phys8602_mult.c* into binary
6. Make a job submission script in workDir : `nano ./phys8602_sub.sh`
7. Submit a job from workDir : `sbatch ./phys8602_sub.sh`
8. Check job status : `squeue` or Cancel a job : `scancel JobID`

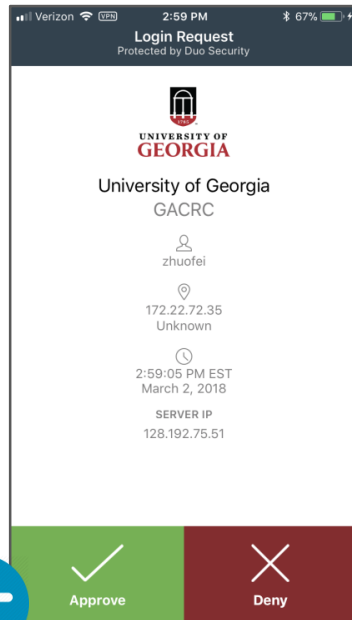
Step1: Log on to Login node - Mac/Linux using ssh

1. Open **Terminal** utility
2. Type command line: `ssh MyID@teach.gacrc.uga.edu`
3. You will be prompted for your **MyID password**
4. Teaching cluster access requires ID verification using two-factor authentication with Archpass Duo. If you are not enrolled in Archpass Duo, please refer to https://eits.uga.edu/access_and_security/infosec/tools/archpass_duo/ on how to enroll

More information: https://wiki.gacrc.uga.edu/wiki/Connecting#Connecting_to_the_teaching_cluster

Step1 (Cont.) - Mac/Linux

Using ssh in Terminal!



4. Verify login using Duo

```
ssh zhuofei@teach.gacrc.uga.edu ← 1. Log on
```

UGA DUO authentication is required for SSH/SCP access to GACRC systems. For additional help with UGA DUO authentication or to report an issue please visit: https://eits.uga.edu/access_and_security...

Password: ← 2. Enter your MyID password
When you enter password, no stars or dots will show as you are typing. Please type password carefully!

Duo two-factor login for zhuofei

Enter a passcode or select one of the following options:

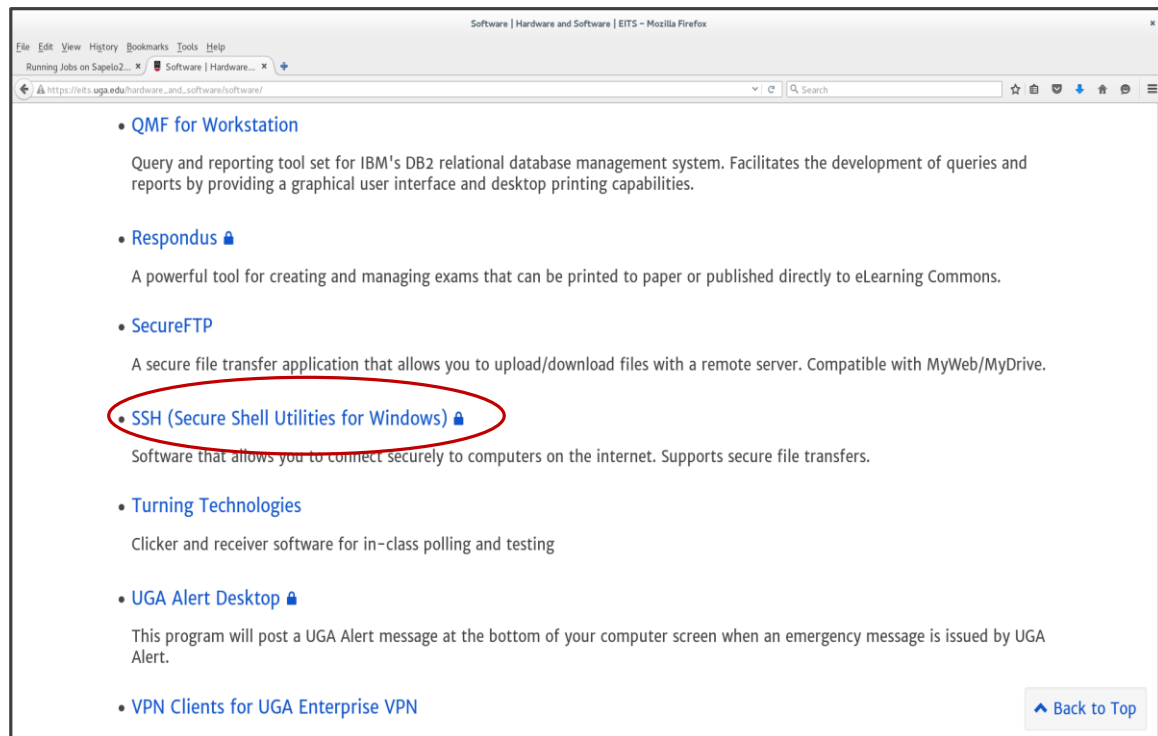
1. Duo Push to XXX-XXX-5758
2. Phone call to XXX-XXX-5758
3. Phone call to XXX-XXX-1925
- 4 5. SMS passcodes to XXX-XXX-5758 (next code starts with: 1)

Passcode or option (1-5): 1 ← 3. Select Duo login option 1
Success. Logging you in...

Last login: Fri Aug 3 11:24:43 2018 from 172.22.72.35
[zhuofei@teach ~]\$ ← 5. Logged on!

Step1 (Cont.) - Windows

1. Download and install SSH Secure Utilities: http://eits.uga.edu/hardware_and_software/software/
2. You can use PuTTY as an alternative: <https://www.putty.org/>



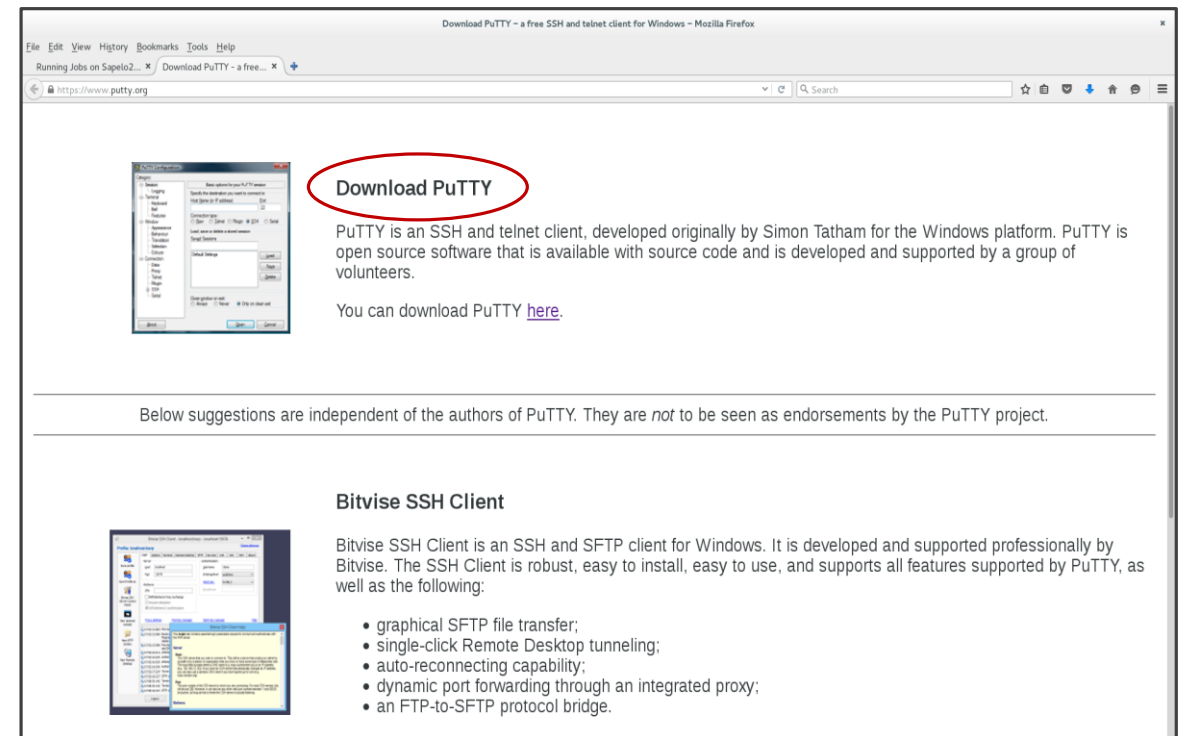
Software | Hardware and Software | EITS - Mozilla Firefox

Running Jobs on Sapelo2... x / Software | Hardware... x

https://eits.uga.edu/hardware_and_software/software/

- [QMF for Workstation](#)
Query and reporting tool set for IBM's DB2 relational database management system. Facilitates the development of queries and reports by providing a graphical user interface and desktop printing capabilities.
- [Respondus](#)
A powerful tool for creating and managing exams that can be printed to paper or published directly to eLearning Commons.
- [SecureFTP](#)
A secure file transfer application that allows you to upload/download files with a remote server. Compatible with MyWeb/MyDrive.
- [SSH \(Secure Shell Utilities for Windows\)](#)
Software that allows you to connect securely to computers on the internet. Supports secure file transfers.
- [Turning Technologies](#)
Clicker and receiver software for in-class polling and testing
- [UGA Alert Desktop](#)
This program will post a UGA Alert message at the bottom of your computer screen when an emergency message is issued by UGA Alert.
- [VPN Clients for UGA Enterprise VPN](#)

[Back to Top](#)



Download PuTTY - a free SSH and telnet client for Windows - Mozilla Firefox

Running Jobs on Sapelo2... x / Download PuTTY - a free... x

<https://www.putty.org/>

Download PuTTY

PuTTY is an SSH and telnet client, developed originally by Simon Tatham for the Windows platform. PuTTY is open source software that is available with source code and is developed and supported by a group of volunteers.

You can download PuTTY [here](#).

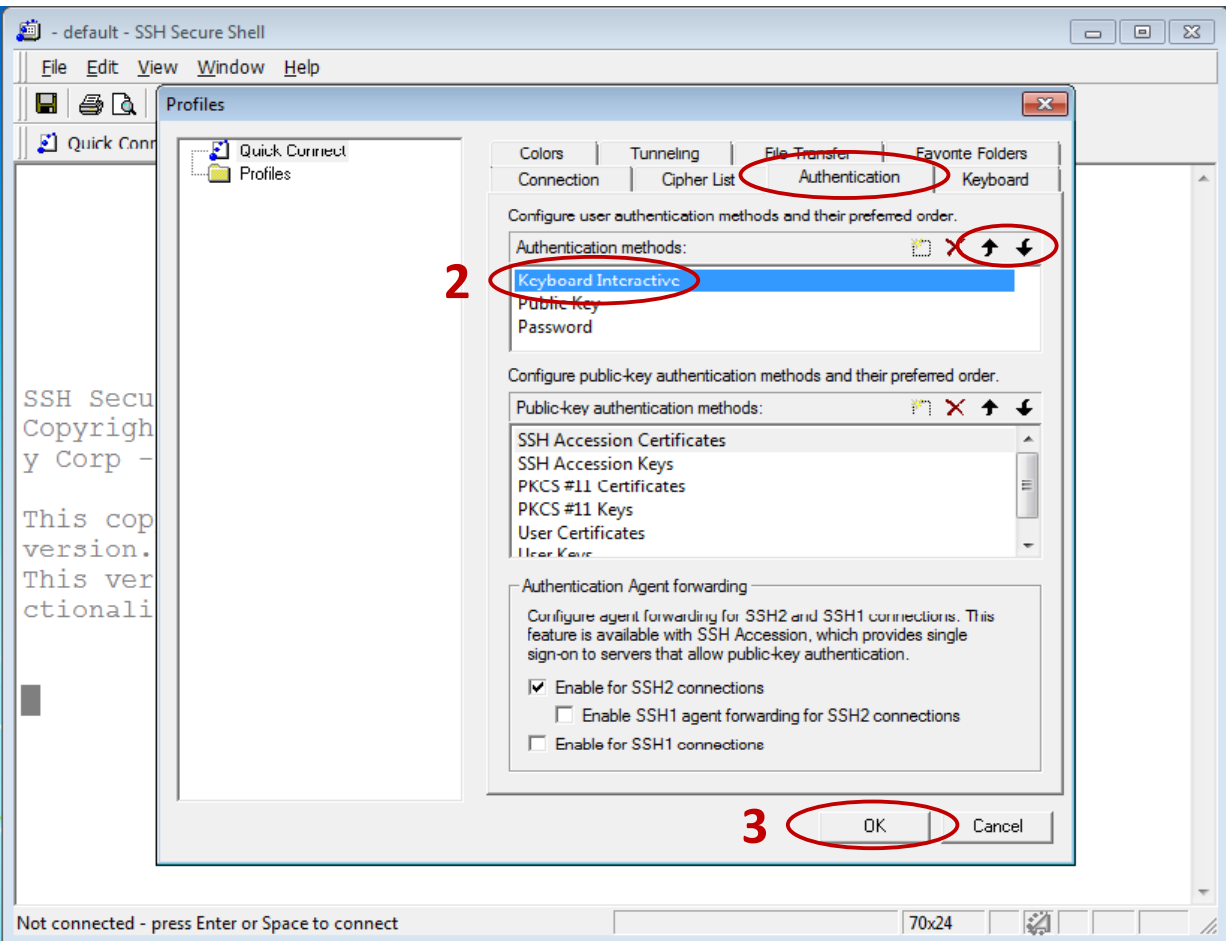
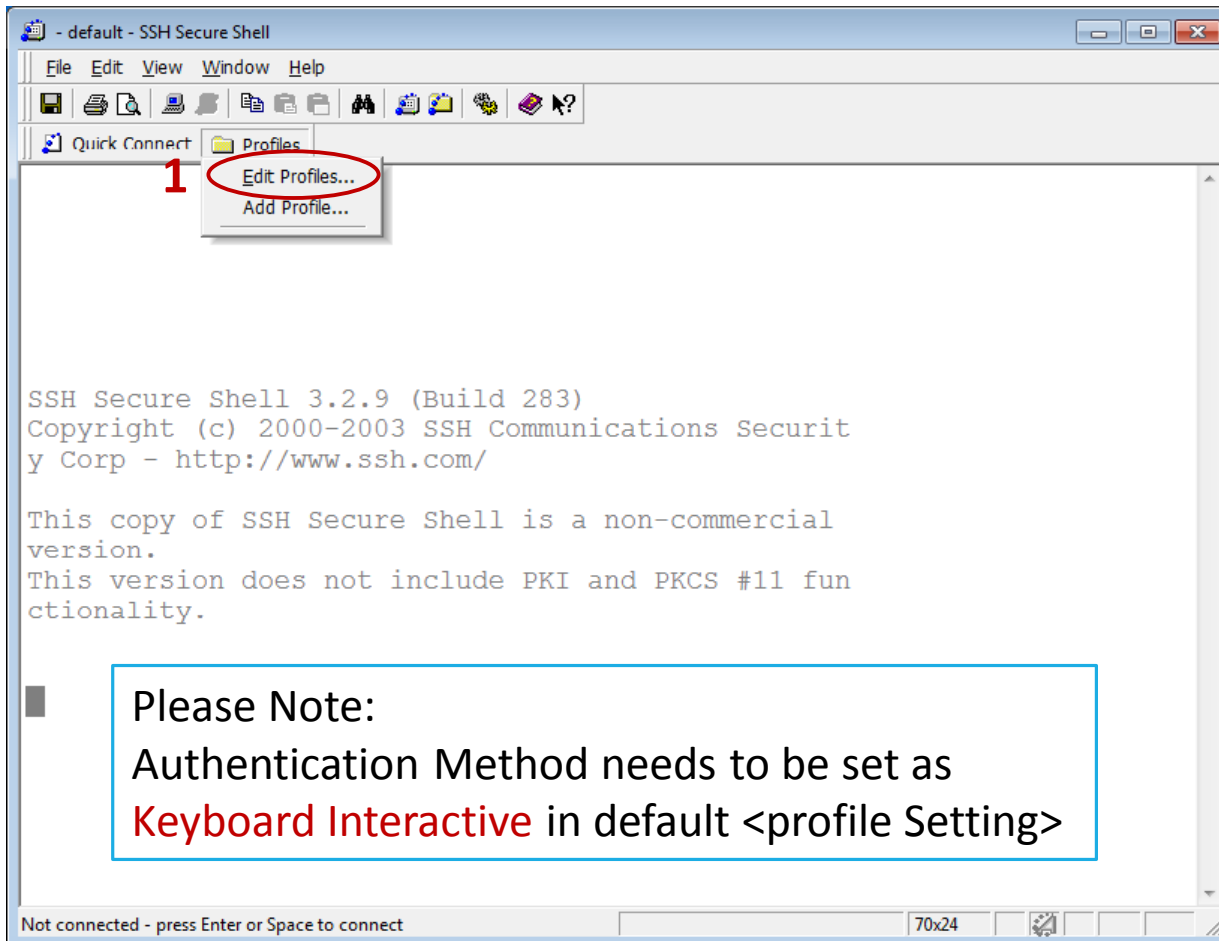
Below suggestions are independent of the authors of PuTTY. They are *not* to be seen as endorsements by the PuTTY project.

Bitvise SSH Client

Bitvise SSH Client is an SSH and SFTP client for Windows. It is developed and supported professionally by Bitvise. The SSH Client is robust, easy to install, easy to use, and supports all features supported by PuTTY, as well as the following:

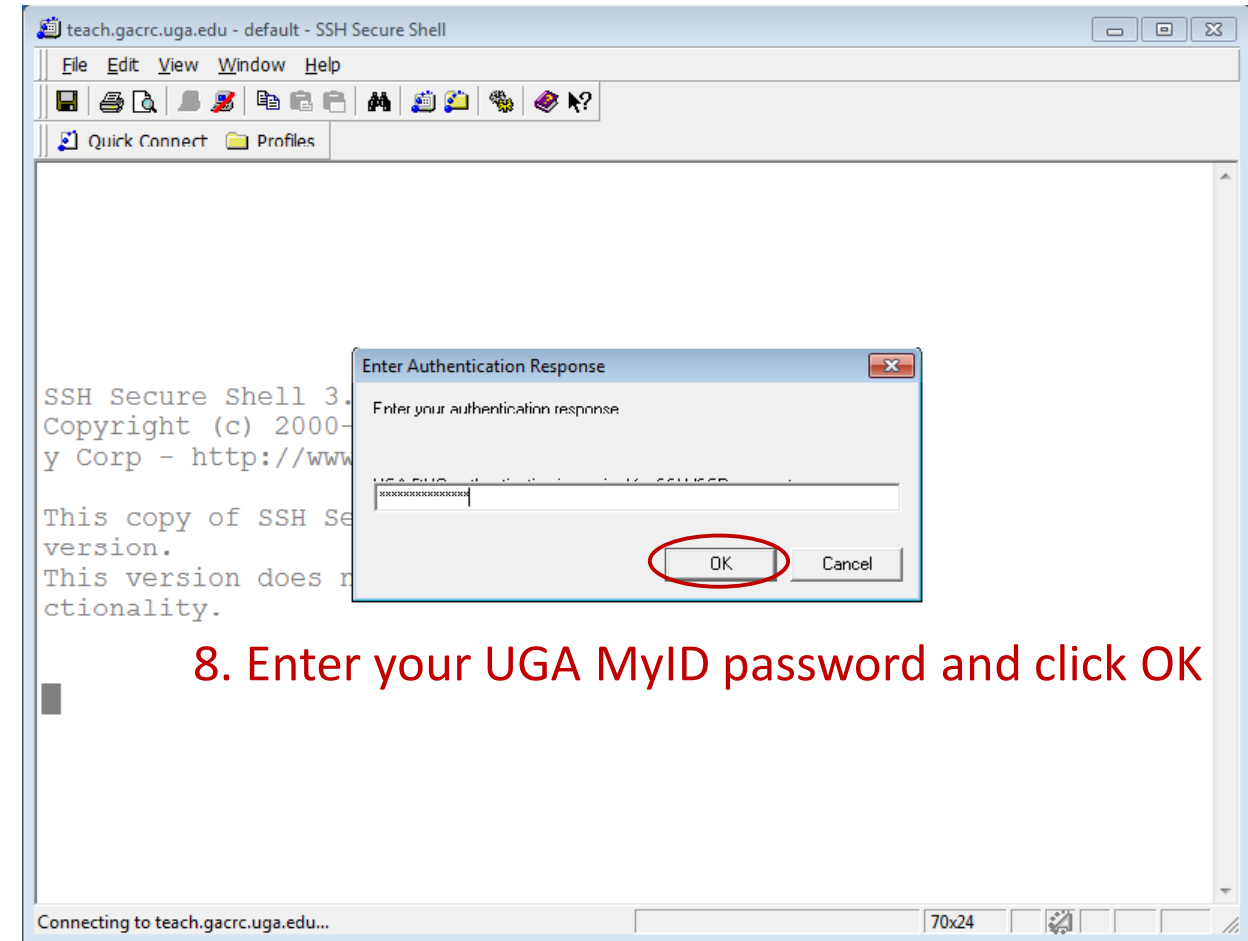
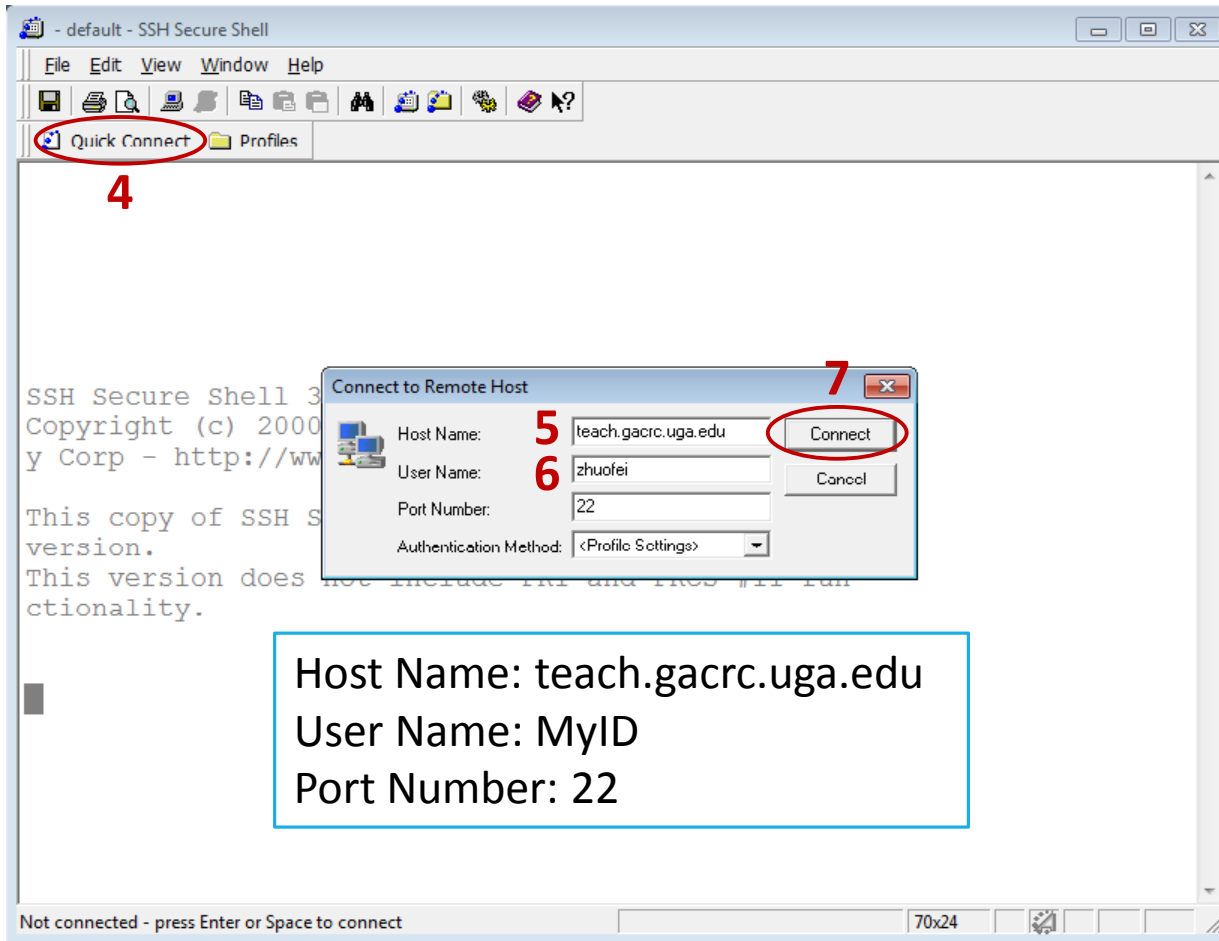
- graphical SFTP file transfer;
- single-click Remote Desktop tunneling;
- auto-reconnecting capability;
- dynamic port forwarding through an integrated proxy;
- an FTP-to-SFTP protocol bridge.

Step1 (Cont.) - Windows using SSH Secure Utilities

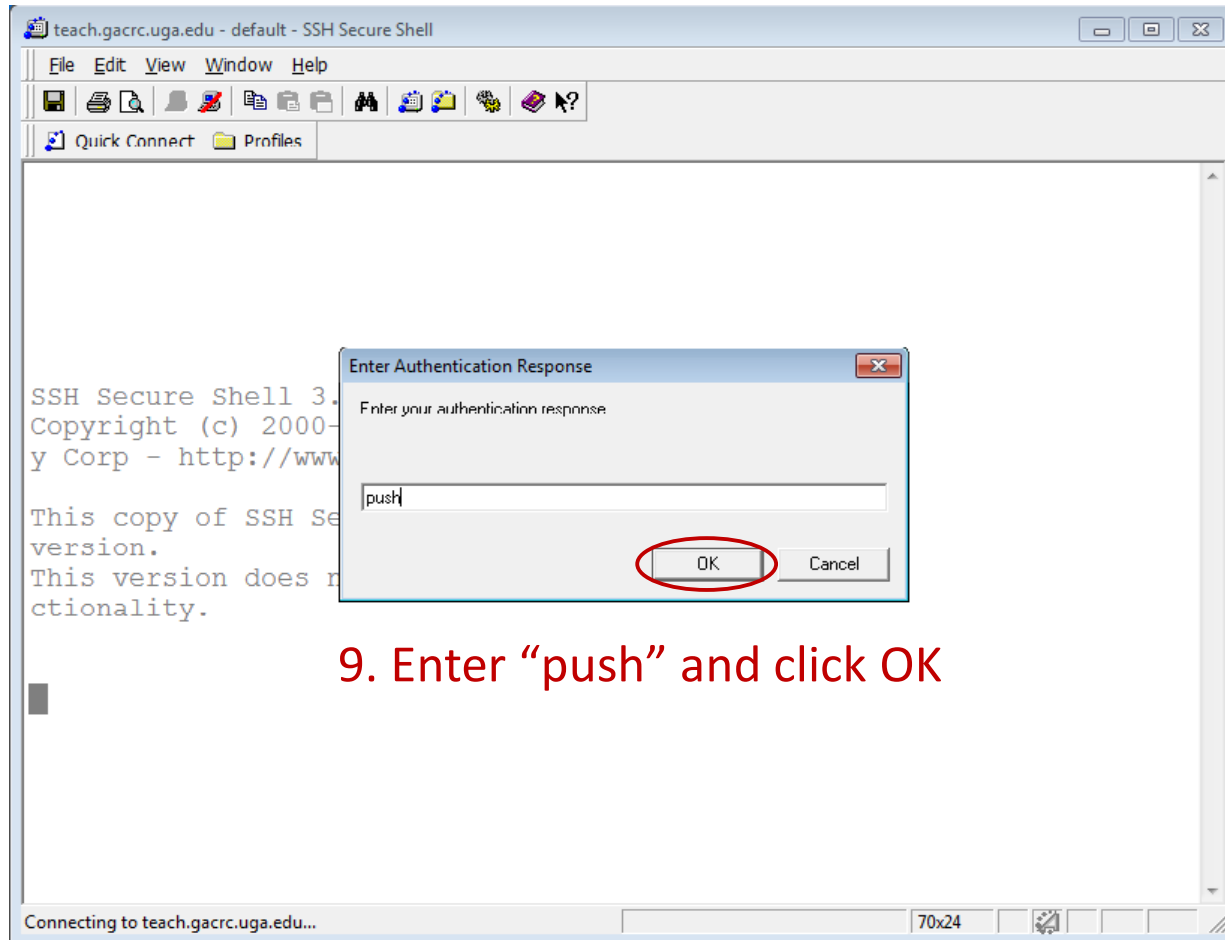


Please Note:
Authentication Method needs to be set as **Keyboard Interactive** in default <profile Setting>

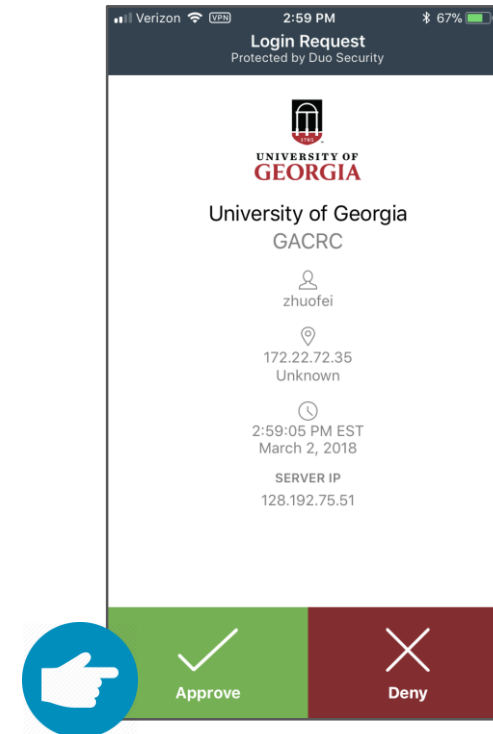
Step1 (Cont.) - Windows using SSH Secure Utilities



Step1 (Cont.) - Windows using SSH Secure Utilities

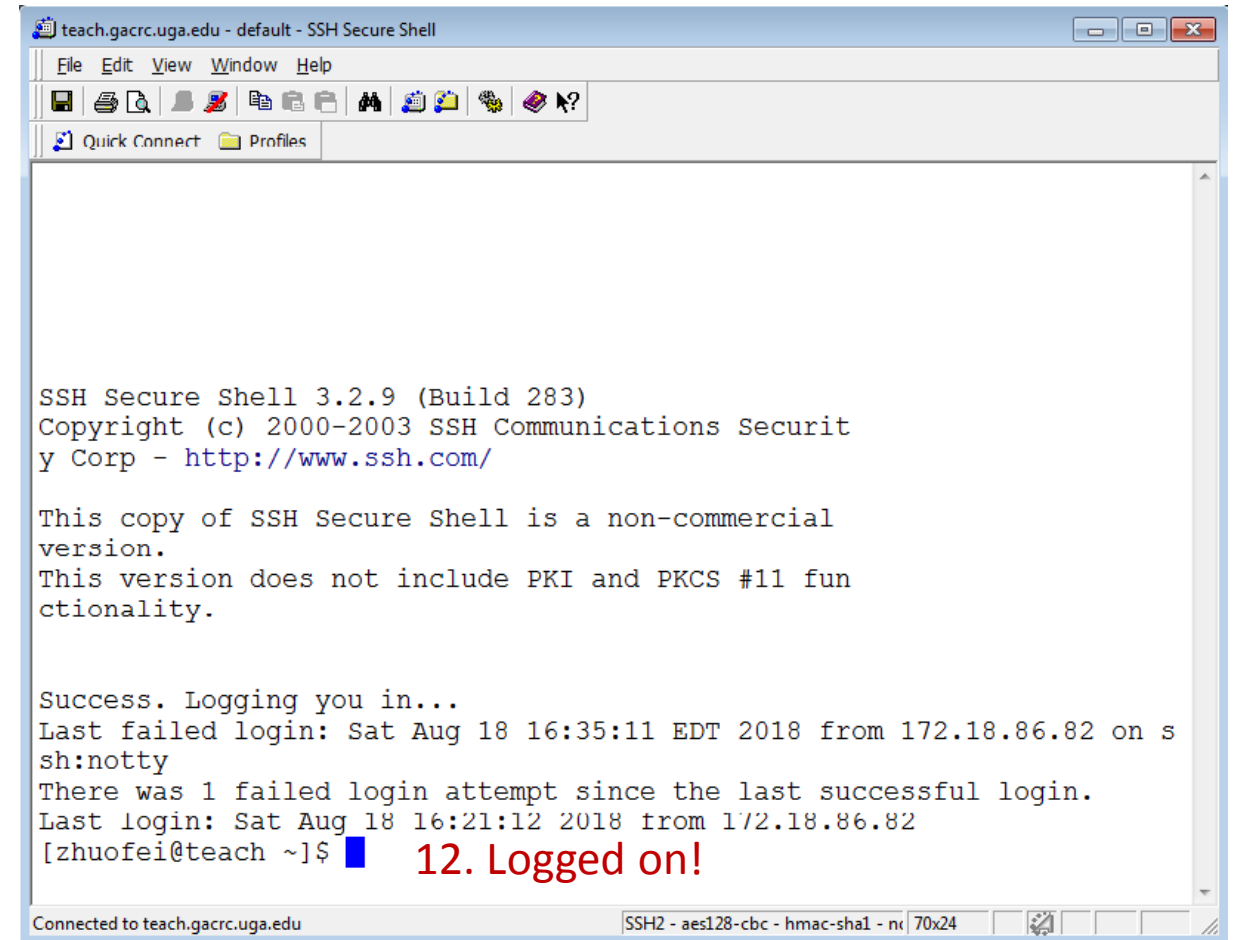
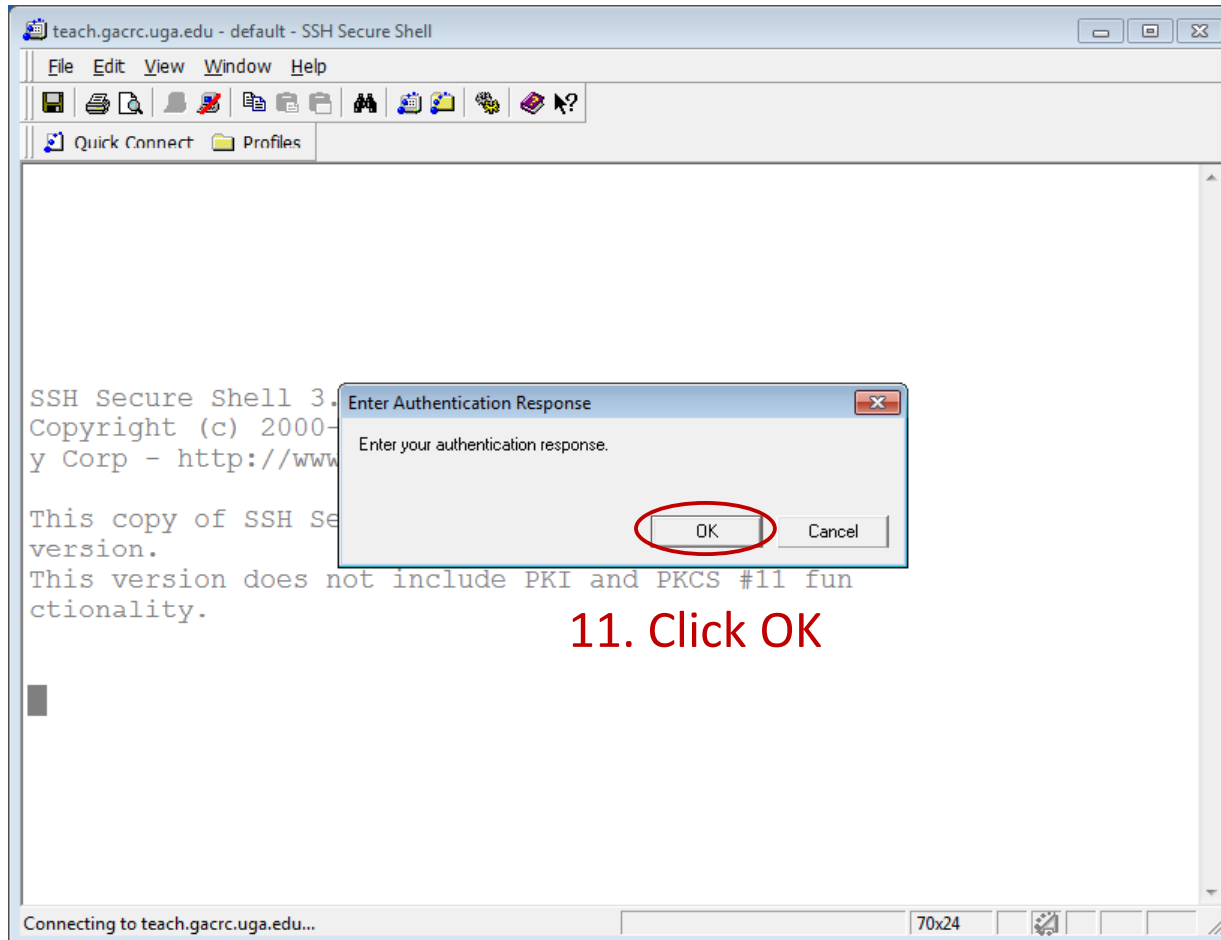


9. Enter "push" and click OK



10. Verify login using Duo

Step1 (Cont.) - Windows using SSH Secure Utilities



Step2 - 3: Create and change directory to workDir

```
[zhuofei@teach ~]$ ls
```

← ls command to list folder's contents

```
[zhuofei@teach ~]$ mkdir workDir
```

← mkdir command to create a subdirectory

```
[zhuofei@teach ~]$ ls
```

workDir

```
[zhuofei@teach ~]$ cd workDir/
```

← cd command to change directory

```
[zhuofei@teach workDir]$ ls
```

```
[zhuofei@teach workDir]$
```

← it is empty in workDir!

Step4: Transfer data from local computer to workDir - Mac/Linux

1. Connect to Transfer node (MyID@txfer.gacrc.uga.edu) in Terminal on local computer
2. Type scp command: scp (-r) [Source] [Target]
3. Once you input MyID password, scp command will send “push” to your Duo Enrolled mobile device for verification

E.g. 1: use scp on local computer, from Local → workDir on cluster

```
scp ./file zhuofei@txfer.gacrc.uga.edu:/home/zhuofei/workDir
```

```
scp -r ./folder/ zhuofei@txfer.gacrc.uga.edu:/home/zhuofei/workDir
```

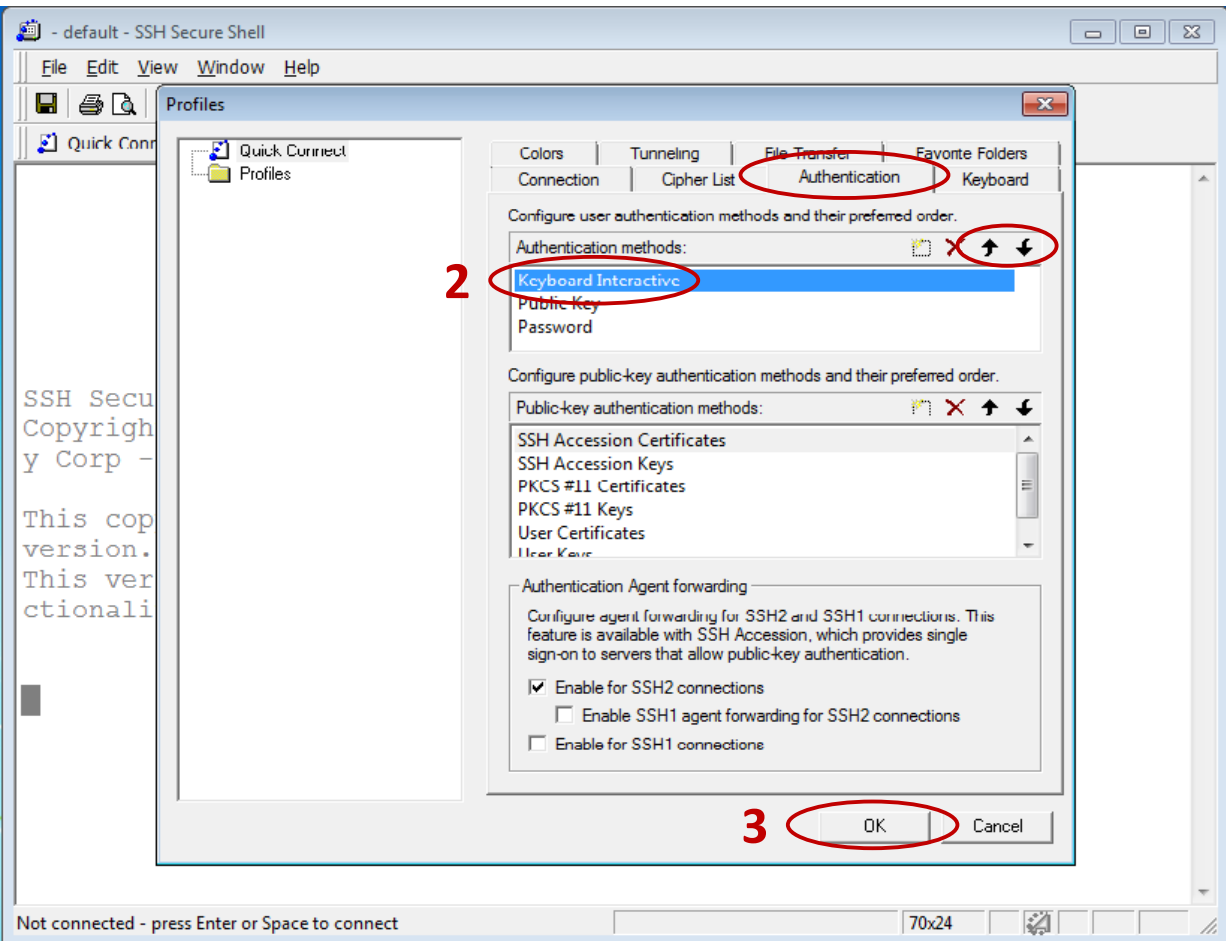
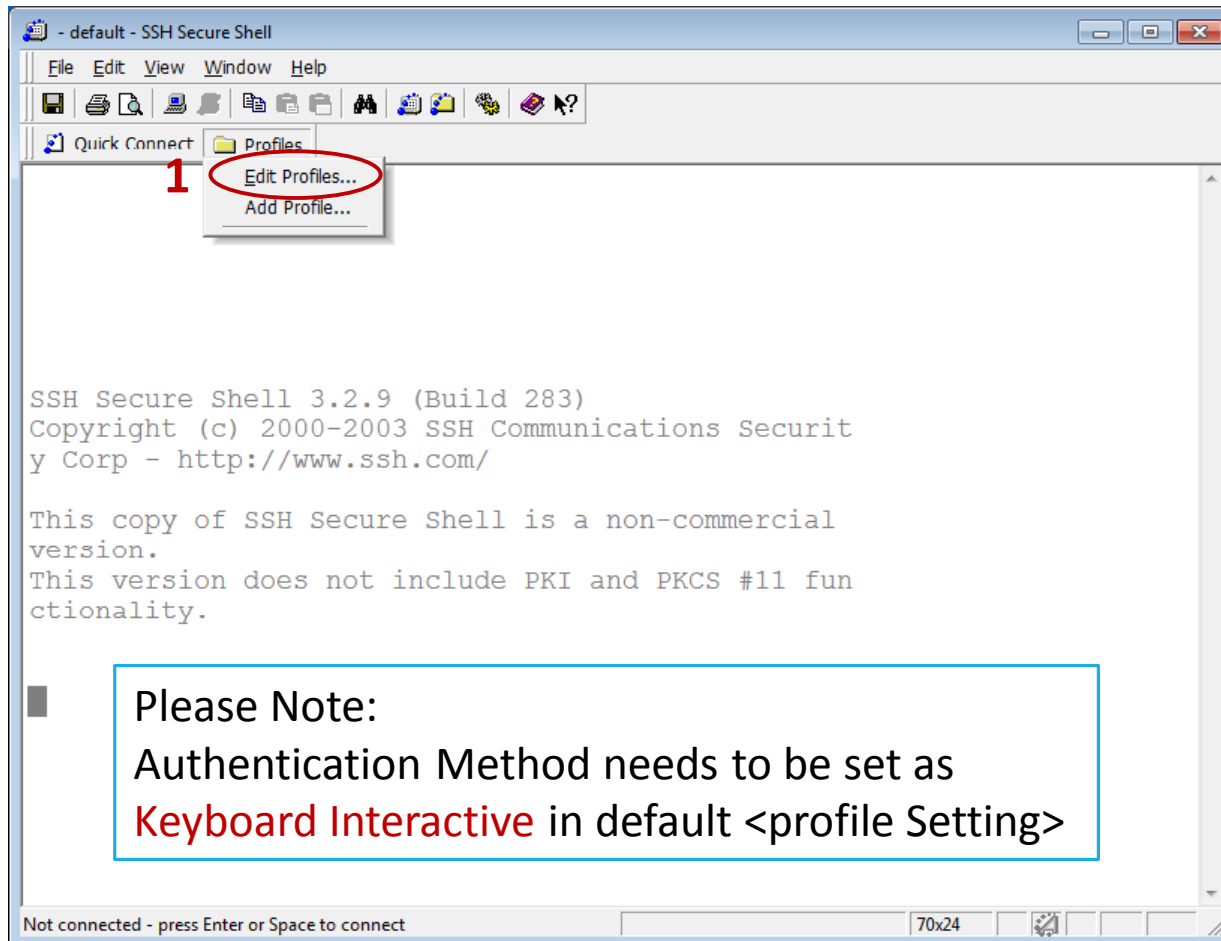
E.g. 2: use scp on local computer, from workDir on cluster → Local

```
scp zhuofei@txfer.gacrc.uga.edu:/home/zhuofei/workDir/file .
```

```
scp -r zhuofei@txfer.gacrc.uga.edu:/home/zhuofei/workDir/folder/ .
```

https://wiki.gacrc.uga.edu/wiki/Transferring_Files#The_File_Transfer_node_for_the_teaching_cluster_.28txfer.gacrc.uga.edu.29

Step 4 (Cont.) - Windows using SSH Secure Utilities



Please Note:
Authentication Method needs to be set as **Keyboard Interactive** in default <profile Setting>

Step4 (Cont.) - Windows using SSH Secure Utilities

SSH Secure Shell 3.0
Copyright (c) 2000
y Corp - http://www.ssh.com

This copy of SSH Secure Shell is a free version.
This version does not have all the functionality.

Host Name: txfer.gacrc.uga.edu
User Name: MyID
Port Number: 22

Not connected - press Enter or Space to connect

SSH Secure Shell 3.0
Copyright (c) 2000
y Corp - http://www.ssh.com

This copy of SSH Secure Shell is a free version.
This version does not have all the functionality.

Enter Authentication Response
Enter your authentication response

Connecting to teach.gacrc.uga.edu...

8. Enter your UGA MyID password and click OK

Steps 9 - 11 are the same as listed on page 13 - 14!

Step4 (Cont.) - Windows using SSH Secure Utilities

13. Click yellow button

```

SSH Secure Shell 3.2.9 (Build 283)
Copyright (c) 2000-2003 SSH Communications Security Corp - http://www.ssh.com/

This copy of SSH Secure Shell is a non-commercial version.
This version does not include PKI and PKCS #11 functionality.

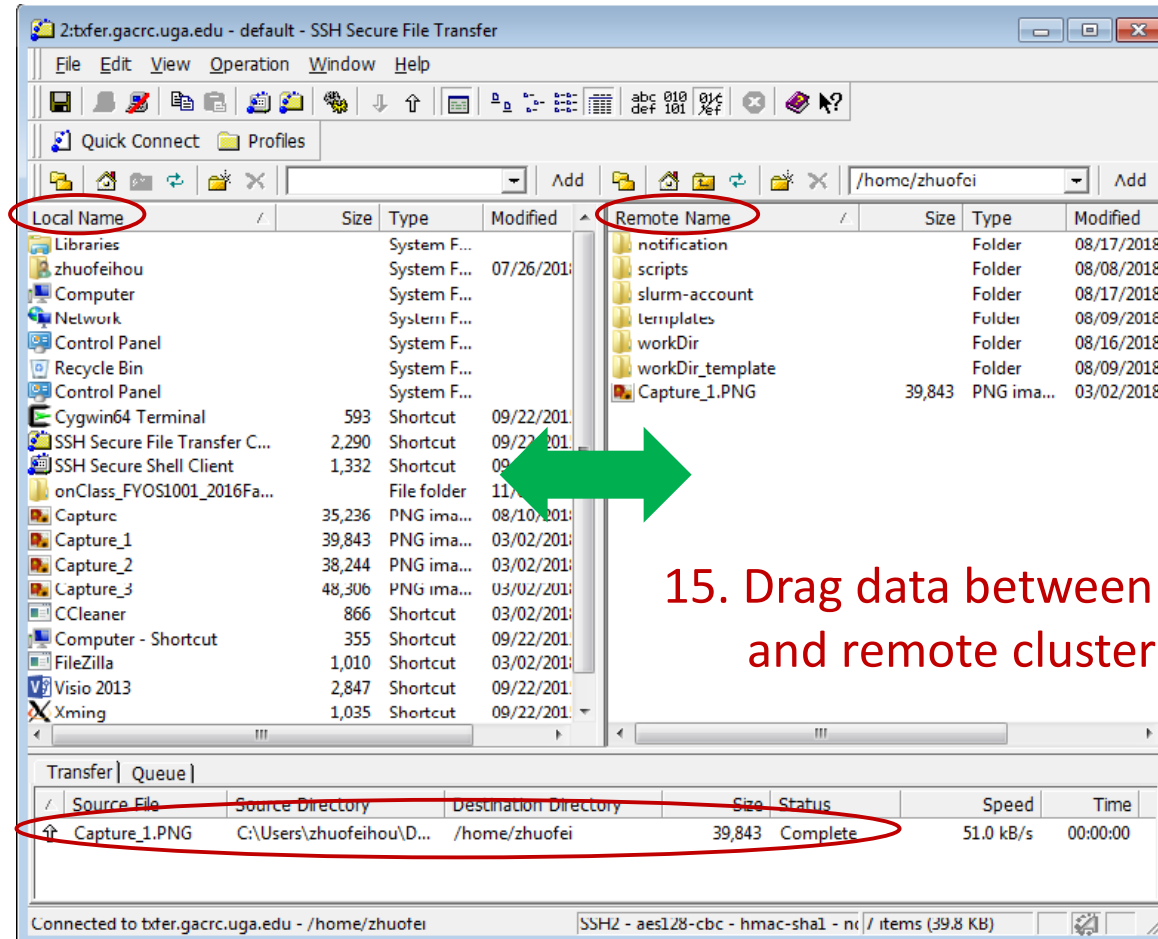
Success. Logging you in...
Last failed login: Sun Aug 19 16:19:49 EDT 2018 from 172.18.86.77 on ssh:notty
There were 3 failed login attempts since the last successful login.
Last login: Thu Jul 26 11:24:24 2018 from 172.17.128.47
[zhuofei@txfer ~]$
  
```

12. Logged on!

14. Change local and remote paths

Local Name	Size	Type	Modified	Remote Name	Size	Type	Modified
Libraries		System F...		notification		Folder	08/17/2018
zhuofei\hou		System F...	07/26/2018	scripts		Folder	08/08/2018
Computer		System F...		slurm-account		Folder	08/17/2018
Network		System F...		templates		Folder	08/09/2018
Control Panel		System F...		workDir		Folder	08/16/2018
Recycle Bin		System F...		workDir_template		Folder	08/09/2018
Control Panel		System F...					
Cygwin64 Terminal	593	Shortcut	09/22/2018				
SSH Secure File Transfer C...	2,290	Shortcut	09/22/2018				
SSH Secure Shell Client	1,332	Shortcut	09/22/2018				
onClass_FYOS1001_2016Fa...		File folder	11/02/2018				
Capture	35,236	PNG ima...	08/10/2018				
Capture_1	39,843	PNG ima...	03/02/2018				
Capture_2	38,244	PNG ima...	03/02/2018				
Capture_3	48,306	PNG ima...	03/02/2018				
CCleaner	866	Shortcut	03/02/2018				
Computer - Shortcut	355	Shortcut	09/22/2018				
FileZilla	1,010	Shortcut	03/02/2018				
Visio 2013	2,847	Shortcut	09/22/2018				
Xming	1,035	Shortcut	09/22/2018				

Step4 (Cont.) - Windows using SSH Secure Utilities



15. Drag data between local computer and remote cluster

Step4 (Cont.): Transfer data on cluster to workDir

- Log on to Transfer node (MyID@txfer.gacrc.uga.edu)
 - ✓ Mac/Linux: ssh MyID@txfer.gacrc.uga.edu (page 8-9)
 - ✓ Windows: use SSH Secure Client app (page 14-16)
- Directories you can access on txfer:
 1. /home/MyID (Landing home)
 2. /work/phys8602/MyID
 3. /work/phys8602/instructor_data
- Transfer data between two folders on cluster using **cp** or **mv**, e.g.:

```
mv /work/phys8602/MyID/datafile /home/MyID/workDir
```

Step5: Compile your Fortran program *phys8602_mult.c* into binary

```
[zhuofei@teach ~]$ cat phys8602_mult.c
/* Multiple two integer numbers */
#include <stdio.h>
int main(void)
{
int i=3, j=4, iprod;
FILE *fp;
fp = fopen("output.txt", "w");
iprod=i*j;
fprintf(fp, "The product of %d and %d is %d\n", i,j,iprod);
fclose(fp);
return 0;
}
[zhuofei@teach ~]$ module load PGI/17.9
[zhuofei@teach ~]$ pgcc phys8602_mult.c -o phys8602_mult.x
[zhuofei@teach ~]$ ./phys8602_mult.x
```

Note:

phys8602_mult.c is put in `/usr/local/training/phys`
You can copy it into your working directory for use

- ➔ load PGI compilers
- ➔ compile into binary
- ➔ run binary

Step6: Make a job submission script *phys8602_sub.sh*

```
$nano phys8602_sub.sh
```

Note:

phys8602_sub.sh is put in
/usr/local/training/phys
You can copy it into your working
directory for use

```
#!/bin/bash
#SBATCH --job-name=testJob           # Job name
#SBATCH --partition=fsr8602         # Partition (queue) for PHYS8602
#SBATCH --ntasks=1                 # Single task job
#SBATCH --cpus-per-task=1           # Number of cores per task
#SBATCH --mem=2gb                   # Total memory for job
#SBATCH --time=00:10:00             # Time limit hrs:min:sec; TIMELIMIT 10 min
#SBATCH --output=log.%j             # Standard output and error log
#SBATCH --mail-user=MyID@uga.edu    # Where to send mail
#SBATCH --mail-type=END,FAIL        # Mail events (BEGIN, END, FAIL, ALL)

cd $SLURM_SUBMIT_DIR
time ./phys8602_mult.x              # run binary compiled in step 5
```

More Information: https://wiki.gacrc.uga.edu/wiki/Running_Jobs_on_the_teaching_cluster

Step7: Submit a job from workDir using sbatch

```
$ sbatch phys8602_sub.sh  
Submitted batch job 139
```

Tips: sub.sh is a job submission script for

1. specifying computing resources
2. loading software using **module load**
3. running any Linux commands you want to run
4. running your compiled binary

Step8: Check job status using squeue

```
$ squeue -l
Wed Aug  8 13:40:02 2018
JOBID PARTITION   NAME       USER      STATE    TIME    TIME_LIMI  NODES  NODELIST
162     fsr8602   testJob    zhuofei   PENDING  0:00     00:10:00    1    (None)
160     fsr8602   testJob    zhuofei   RUNNING  0:02     00:10:00    1    c2-11
161     fsr8602   testJob    zhuofei   RUNNING  0:02     00:10:00    1    c2-11

$ squeue
JOBID PARTITION   NAME       USER      ST     TIME    NODES  NODELIST
162     fsr8602   testJob    zhuofei   PD     0:15     1    (None)
160     fsr8602   testJob    zhuofei   R      0:17     1    c2-11
161     fsr8602   testJob    zhuofei   R      0:17     1    c2-11
```

Common STATE: R for Running; PD for PenDing; TO for TimedOut; S for Suspended; F for FAILED
TIME: the elapsed time used by the job, not remaining time, not CPU time.

Step8 (Cont.): Cancel job using scancel

```
$ queue -l
Wed Aug 8 14:03:47 2018
JOBID PARTITION NAME USER STATE TIME TIME_LIMI NODES NODELIST
169 fsr8602 testJob zhuofei RUNNING 0:07 00:10:00 1 c1-38
168 fsr8602 testJob zhuofei RUNNING 0:10 00:10:00 1 c1-39

$ scancel 169

[zhuofei@teach workDir]$ queue -l
Wed Aug 8 14:03:47 2018
JOBID PARTITION NAME USER STATE TIME TIME_LIMI NODES NODELIST
169 fsr8602 testJob zhuofei COMPLETI 0:15 00:10:00 1 c1-39
168 fsr8602 testJob zhuofei RUNNING 0:18 00:10:00 1 c1-38

$ queue -l
Wed Aug 8 14:04:08 2018
JOBID PARTITION NAME USER STATE TIME TIME_LIMI NODES NODELIST
168 fsr8602 testJob zhuofei RUNNING 0:35 00:10:00 1 c1-38
```

Step8 (Cont.): Check job details using scontrol show job

```
$ scontrol show job 174

JobId=174 JobName=testJob
  UserId=zhuofei(1772) GroupId=gacrc-instruction(21004) MCS_label=N/A
  JobState=RUNNING Reason=None Dependency=(null)
  Requeue=1 Restarts=0 BatchFlag=1 Reboot=0 ExitCode=0:0
  RunTime=00:00:28 TimeLimit=00:10:00 TimeMin=N/A
  SubmitTime=2018-08-08T14:28:44 EligibleTime=2018-08-08T14:28:44
  StartTime=2018-08-08T14:28:44 EndTime=2018-08-08T16:28:44 Deadline=N/A
  ...
  Partition=fsr8602 AllocNode:Sid=teach:30986
  NodeList=c1-38
  NumNodes=1 NumCPUs=1 NumTasks=1 CPUs/Task=1 ReqB:S:C:T=0:0:*:*
  ...
  Command=/home/zhuofei/workDir/phys8602_sub.sh
  WorkDir=/home/zhuofei/workDir
  StdErr=/home/zhuofei/workDir/log.174
  StdOut=/home/zhuofei/workDir/log.174
```

Step8 (Cont.): Check node info using sinfo

```
$ sinfo
PARTITION AVAIL  TIMELIMIT  NODES  STATE NODELIST
highmem   up    7-00:00:00    5  idle c1-[36-37,40],c2-[9-10]
gpu       up    1-00:00:00    1  down* c2-2
interq    up    1-00:00:00    3  idle c2-[4-6]
batch     up    7-00:00:00   39  idle c1-[1-35,38-39],c2-[11-12]
fsr8602   up           10:00   39  idle c1-[1-35,38-39],c2-[11-12]
fsr4601   up           1:00   39  idle c1-[1-35,38-39],c2-[11-12]
```

idle = no cores in use; mix = some cores are still free; alloc = all cores are allocated

GACRC Wiki <http://wiki.gacrc.uga.edu>

Running Jobs: https://wiki.gacrc.uga.edu/wiki/Running_Jobs_on_the_teaching_cluster

Software: <https://wiki.gacrc.uga.edu/wiki/Software>

Transfer File:

https://wiki.gacrc.uga.edu/wiki/Transferring_Files#The_File_Transfer_node_for_the_teaching_cluster_28txfer.gacrc.uga.edu.29

Linux Command: https://wiki.gacrc.uga.edu/wiki/Command_List

Training: <https://wiki.gacrc.uga.edu/wiki/Training>

GACRC Support

<https://uga.teamdynamix.com/TDClient/Requests/ServiceCatalog?CategoryID=11593>

➤ Job Troubleshooting:

Please tell us details of your question or problem, including but not limited to:

- ✓ Your user name
- ✓ Your job ID
- ✓ Your working directory
- ✓ The queue name and command you used to submit the job

➤ Software Installation:

- ✓ Specific name and version of the software
- ✓ Download website
- ✓ Supporting package information if have

Please note to make sure the correctness of datasets being used by your jobs!

GACRC Service Catalog

Georgia Advanced Computing Resource Center (GACRC) service catalog

Services (11)

[Account Creation](#)

For a research group's PI to request user accounts for group members on the GACRC computing systems.

[Class Account Creation](#)

For an instructor to request user accounts for students attending a course that will need to use GACRC computing systems.

[Class Account Modification](#)

For instructors to request changes to be made in previously requested class account.

[Computing Lab Modification/Deletion](#)

[General Internal](#)

[General Support](#)

Report issues and request help with GACRC systems, except for software installation requests and account/lab creation requests.

[Lab Creation](#)

For a research group's PI to register a computing lab on the GACRC computing systems

[Modify/Delete Account](#)

For PIs to request changes in or deletion of user accounts on GACRC computing systems.

[Software Installation/Update](#)

Request software and common application database (e.g. NCBI blast databases) installation and upgrade.

My Recent Requests

[home directory is not fully provisioned: ss57215](#)

[GACRC Sapelo2 New Lab/Use Account Request 2018-11-14_preTraining](#)

[GACRC Sapelo2 Cluster New Lab/Use Account Request 2018-11-05_preTraining](#)

[provision 5 user accounts for ugahelpdesk group](#)

[GACRC Sapelo2 New Lab/Use Account Request 2018-10-22_preTraining](#)

[View All Recent Requests >](#)

Popular Services

[EITS Help Desk Support Request](#)

[MyID Account Request](#)

[Change Request](#)

[02 Restricted VPN Access](#)

[Terry Classroom & Meeting Room Support](#)

[View All Popular Services >](#)

My Recently Visited Services

[Modify/Delete Account](#)

[Class Account Creation](#)

Service - General Support - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Mail - zhuofei@uga.edu x Service - General Support x

https://uga.teamdynamix.com/TDClient/Requests/ServiceDet?ID=25844

90%

UNIVERSITY OF GEORGIA

Search the client portal

Zhuofei Hou

Home IT Help Desks Projects/Workspaces **Services** Knowledge Base News

Project Requests Ticket Requests My Favorite My Recent My Approvals Services A-Z Search

[Service Catalog](#) / [Academics, Learning & Research](#) / [GACRC Service Catalog](#) / General Support

General Support


If you do not have a myid, please mail gacrc-help@uga.edu, and we will respond promptly.


The purpose of this form is to provide a method to report issues and to request help with GACRC systems.


Please use this form for all questions and support needs (e.g. to report issues, to troubleshoot jobs, to request resources or grant writing help, etc). Please do not use this form for software installation requests or lab/user account management, which all have separate forms.

Please refer to the GACRC documentation for information on GACRC resources, how to connect and transfer files, how to run jobs, installed software list, training schedule, and a FAQ.

The link to this documentation is <https://wiki.gacrc.uga.edu>

 Request Service

 Share

 Add to Favorites

 Click to request

This site is operated by [Enterprise Information Technology Services \(EITS\)](#) at the University of Georgia.

[Privacy](#) | [Accessibility](#) | [Website Feedback](#)

<https://uga.teamdynamix.com/TDClient/Requests/ServiceCatalogSearch>



General Support

+ Show Help - Hide Help

Report issues and request help with GACRC systems, except for software installation requests and account/lab creation requests.

Short Description *

Email *

MyID *

Phone Number *

Support Needed For

- Galaxy
- Sapelo2
- Teaching Cluster
- Work Filesystem
- Home Filesystem
- Scratch Filesystem
- Project Filesystem
- Xfer Nodes
- Other

Lab *



Thank You!