# JASMIN Workshop: Exercise 01: Accessing and using the jasmin “scientific analysis” servers

## Scenario

I am a new JASMIN user and I have been granted a jasmin-login role which controls access to the JASMIN shared resources, e.g. login, transfer and scientific analysis servers and LOTUS. I would like to access the JASMIN resources available for interactive computing.
**Note:** If needed refer to the cheat sheet for at the end of this document for specific commands (example of a command output is in blue text).

## Objectives

- How to login to JASMIN
- How to access the scientific analysis servers
- How to use the Modules package for the dynamic modification of the user’s environment
- How to enable X11 forwarding
- How to access the data transfer server
- To familiarize with command line interface versus graphical user interface on JASMIN

## JASMIN resources

- JASMIN login, transfer and scientific analysis servers
- Home directory: quota 100GB (SSD)
- GWS workshop (PFS): `/group_workspaces/jasmin2/workshop/users/$USER/ex01`

## Local resources

- SSH client and SSH keys
- Jasmin-login account

## Instructions

1. Launch a terminal on your local host
2. Start the ssh-agent and load your JASMIN SSH private key:
    a. Linux/MacOS:
        i. `eval $(ssh-agent -s)`
        ii. `ssh-add ~/.ssh/<your-private-key-file>`
    b. Windows
        i. Set up MobaAgent to store your private key file (https://help.jasmin.ac.uk/article/4832-mobaxterm-new#mobagent)
3. Check that your key is loaded. In a terminal window:
    a. `ssh-add -l` [lowercase L]. You should see the “fingerprint” information for your key.
4. SSH login to JASMIN login node: `ssh -A <username>@jasmin-login1.ceda.ac.uk`
5. Discover the scientific analysis servers displayed in the login message
6. Check the load ( number of users, CPU and RAM usage) and choose a scientific server
7. SSH login to a chosen scientific server, e.g. `jasmin-sci<number>.ceda.ac.uk`
8. Check your current working directory using the Linux command `pwd` and the size of this directory using the Linux command `pdu` (Use `man <command>` to check for command line options)

9. Check which Linux user group you belong to, e.g. `groups`
10. Create a directory for your output files using `mkdir`. Add the `-p` flag to create all the directories in the path. e.g. `mkdir -p /group_workspaces/jasmin2/workshop/users/$USER/ex01`
11. Then change into this directory, e.g. `cd <Above directory path>`
12. (Optional) Launch Gnuplot `gnuplot` to plot the trigonometric function `sin(x)` and save the graph into a file `my_first_plot.eps` as follows:

```
gnuplot> plot sin(x)
gnuplot> set term post eps
gnuplot> set output "my_first_plot.eps"
gnuplot> replot
gnuplot> quit
```

13. Launch another SSH login session with the option `-X` or `-Y` to enable X11 forwarding.
    **Note 1:** The X server should be running on your local desktop (also known as X11) (For Windows check the setting in MobaXterm. For macOS, start XQuartz. In Linux, the SSH terminal has X11 server running by default).
14. Launch the text editor `nedit` or view the output file (Step 13) of Gnuplot using the command `gv <path-to-filename>`. A graphic window **will display** because the X11 forwarding is enabled ( `-X` or `-Y`). The applications `gv` and `gedit` are running remotely on the JASMIN scientific analysis server but the graphic window is forwarded to your local desktop.
15. On a JASMIN scientific server, discover the modules package available on JASMIN using the command `module available` or `module av`
16. Check which modules are already added to your Shell environment using `module list`
17. Add the module 'jaspy' to your Shell environment and then remove it e.g. `module add jaspy`, `module rm jaspy`
18. Check what is running on the chosen scientific server using the Linux command `top`
19. Logout from JASMIN scientific server, then logout from `jasmin-login1.ceda.ac.uk`
20. SSH login to `jasmin-xfer1.ceda.ac.uk`
21. Check your current working directory, e.g. `pwd`
22. Modules are not available on `jasmin-xfer1.ceda.ac.uk`
23. Logout

## Review

By completing this exercise you will be able to login to the interactive computing resources to run your processing or to develop and test your code. You will be able to access the different user working areas: home and GWS. The Modules package provides for the dynamic modification of the user's environment via module files.You will be able to run X11-window applications.

## Alternative approaches and best practice

- How to troubleshoot SSH login issues?
    1. You do not have a jasmin-login account
    2. Jasmin-login was revoked because you did not respond to the email confirmation request
    3. Your SSH private key file permissions were accidentally modified.
    4. The SSH agent forwarding not enabled: `ssh -A <username>@jasmin-login1.ceda.ac.uk`
    5. You exceeded the quota limit 100GB on your home directory
    6. Your changed access permission of your home directory **`/home/users/<username>`**

7. **/tmp** is full on the JASMIN server.
8. You are not in a whitelisted network domain.

- The login node **`jasmin-login1`** is a gateway server to access the scientific analysis servers. No processing on the JASMIN login node is allowed.
  https://help.jasmin.ac.uk/article/191-login-servers
- Root privilege `sudo` is not allowed on all JASMIN servers.
- The user home directory is 100 GB quota and it is backed up, e.g. `/home/users/$USER`. Users can access snapshots to recover files/directories that have been accidentally deleted
  https://help.jasmin.ac.uk/article/176-storage
- The bash shell is supported on JASMIN. We do not support any shells other than bash
- Do not use JASMIN data transfer server **`jasmin-xfer1`** as a gateway to login to scientific analysis servers
- Running `X11` application can be slow (another alternative is to use `x2go`)

  https://help.jasmin.ac.uk/article/189-get-started-with-jasmin
  https://help.jasmin.ac.uk/article/187-login
  https://help.jasmin.ac.uk/article/4475-graphical-linux-desktop-access-using-x2go

# Cheat sheet for Exercise 01: Accessing and using the jasmin “scientific analysis” servers

1. Launch a terminal on your local host. On Mac search “Applications/Utilities/Terminal” in finder or search by keyword “terminal” by pressing the command and the space bar. On Windows, launch MobaXterm

2. Start the ssh-agent and load your SSH private key file.

```
eval $(ssh-agent -s)
ssh-add ~/.ssh/<your-private-key-file>
ssh-add -l
```

3. Check that your SSH key is loaded

```
ssh-add -l
2048 SHA256:syx3GL1DmWcb4FRRCDZToNpeI1RryftNub5MhvORvx8 /Users/freddy/.ssh/id_rsa_jasmin
```

4. SSH login to JASMIN login node

```
ssh -A <username>@jasmin-login1.ceda.ac.uk
```

5. Discover the scientific analysis servers displayed in the login message

```
        ****************************************************************
        ** JASMIN Shared VM status at 2019-06-20 13:05:01.240568     **
```

6. Check the load e.g. number or users logged in, the free memory and the CPU used, and choose a scientific analysis server

```
Average load on each VM over the last hour:
=============================================================================
Host                                    Users  Free memory  CPU
-----------------------------------------------------------------------------
jasmin-sci5.ceda.ac.uk                     11     16.1G    6.0%
```

7. SSH login to a chosen scientific analysis server e.g. sci-server number 5

```
ssh -A jasmin-sci5.ceda.ac.uk
Last login: Mon Jun 24 13:17:56 2019 from jasmin-login1.ceda.ac.uk
    RAL High Performance Computing Services Group
    Configured by PXE/Kickstart: 2014-04-02 08:58
    Admin contact:               Peter Chiu <peter.chiu@stfc.ac.uk>

Additional information about JASMIN can be found at: http://jasmin.ac.uk
For support please contact CEDA Helpdesk: support@ceda.ac.uk
[<username>@jasmin-sci5 ~]$
```

8. Which filesystem is your current working directory and what is the size of this area?

```
pwd
/home/users/<username>
pdu -sh .
9.7G   .
```

9. Check which Linux user groups you belong to

```
groups
users open gws_workshop
```

10. Create a directory for your output files (GWS workshop is a parallel file system PFS)

```
mkdir -p /group_workspaces/jasmin2/workshop/users/$USER/ex01
```

11. Change into the above directory path,

```
cd /group_workspaces/jasmin2/workshop/users/$USER/ex01
```

12. (Optional) Plot a function sin(x) using `gnuplot`

```
gnuplot
gnuplot> plot sin(x)
gnuplot> set term post eps
gnuplot> set output "my_first_plot.eps"
gnuplot> replot
gnuplot> quit
```

13. Launch another SSH login session with the option `-X` or `-Y` to enable `X11` forwarding and then SSH into your previously chosen scientific analysis serverg

```
ssh -AX <username>@jasmin-login1.ceda.ac.uk
[<username>jasmin-login1 ~]$ ssh -AX <username>@jasmin-sci<number>.ceda.ac.uk
```

14. Launch the text editor `nedit` (or lightweight IDE `geany`). Use the postscript viewer `gv` to view the output file `"my_first_plot.eps"` which was generated at Step 13 (Optional)

```
[<username>@jasmin-sci1 ~]$ nedit
Or (Optional)
[<username>@jasmin-sci1 ~]$ gv my_first_plot.eps
```

15. Discover the modules package available on JASMIN

```
[<username>@jasmin-sci5 ~]$ module av
----------------------------/utils/Modules/default/modulefiles-------------------------------
dot      gm/2.0.26       lotus-mpi/8.2   lsfmodules/6.2  lsfmodules/9.1  module-info     null
globus/4.0 lotus-mpi/10.1  lsfmodules/10.1 lsfmodules/8.0  module-cvs      modules   use.own

-----------------------------------/apps/modulefiles-----------------------------------------
contrib/arsf/apl/3.5.03                  intel/fce/15.0.090_v2
contrib/arsf/apl/3.5.06                  intel/fce/16.1
...
```

16. Check which modules are already added to your Shell environment

```
[<username>@jasmin-sci5 ~]$ module list
Currently Loaded Modulefiles:
  1) lsfmodules/10.1    2) lotus-mpi/8.2
```

17. Add the module ‘jaspy’ to your Shell environment and then remove it

```
[<username>@jasmin-sci5 ~]$ module add jaspy
Currently Loaded Modulefiles:
  1) lsfmodules/10.1   2) lotus-mpi/8.2
[<username>@jasmin-sci5 ~]$ module li
Currently Loaded Modulefiles:
  1) lsfmodules/10.1       2) lotus-mpi/8.2         3) jaspy/3.7/r20181219
[<username>@jasmin-sci1 ~]$ module rm jaspy
```

18. Check what is running on the chosen scientific analysis server use `top` or `ps`

```
[<username>@jasmin-sci1 ~]$ top -u <username>
top - 13:27:21 up  2:12,  4 users,  load average: 0.10, 0.10, 0.15
Tasks: 310 total,   1 running, 309 sleeping,   0 stopped,   0 zombie
Cpu(s):  1.0%us,  0.3%sy,  0.0%ni, 98.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:  32863020k total, 26084472k used,  6778548k free,    14672k buffers
Swap:  4194300k total,        0k used,  4194300k free, 24243732k cached

   PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
 41056 freddy    20   0 13444 1360  900 R  0.7  0.0   0:00.28 top
 39697 freddy    20   0  112m 2000  904 S  0.0  0.0   0:00.00 sshd
 39710 freddy    20   0  104m 1824 1380 S  0.0  0.0   0:00.06 bash
 40922 freddy    20   0  112m 2504  948 S  0.0  0.0   0:00.13 sshd
 40939 freddy    20   0  104m 1828 1384 S  0.0  0.0   0:00.06 bash
 41005 freddy    20   0  136m 3108 2208 S  0.0  0.0   0:00.10 gv
 50356 freddy    20   0  160m 7160 4612 S  0.0  0.0   0:00.11 nedit
q (to exit top)
```

19. Exit the text editor `nedit` or Ghostscript viewer `gv`. Logout from the scientific analysis server and from the login server

```
logout
Connection to jasmin-sci5.ceda.ac.uk closed.
logout
Connection to jasmin-login1.ceda.ac.uk closed.
```

20. SSH login to the JASMIN data transfer server

```
[<yourusername>@yourlocalhost ~]ssh -A <username>@jasmin-xfer1.ceda.ac.uk
```

21. Which filesystem is your current working directory?

```
pwd
/home/users/<username>
```

22. The Modules package is not available on JASMIN data transfer server

```
[<username>@jasmin-xfer1 ~]$  module avail
-bash: gnuplot: command not found
```

23. Logout from JASMIN transfer server

```
[<username>@jasmin-xfer1 ~]$ logout
Connection to jasmin-xfer1.ceda.ac.uk closed.
```