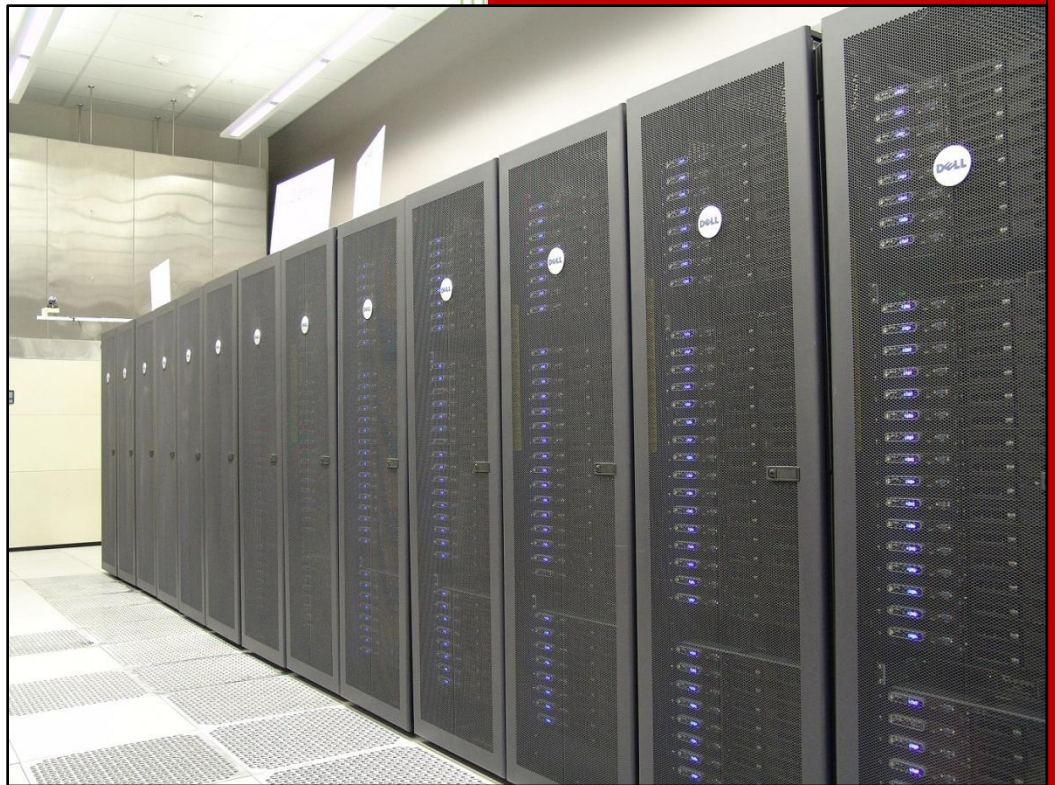


# HPCC

## How to run R jobs on Hrothgar



High Performance Computing Center  
Texas Tech University

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# User Guide

## 1. Introduction

R Job introduction R is a software package especially suitable for data analysis and graphical representation. Functions and results of analysis are all stored as objects, allowing easy function modification and model building. R provides the language, tool, and environment in one convenient package.

It is very flexible and highly customizable. Excellent graphical tools make R an ideal environment for EDA (Exploratory Data Analysis). Since most high level functions are written in R language itself, you can learn the language by studying the function code.

## 2. Setting up the environment

Hrothgar is equipped with SoftEnv to set up the environment with minimum work by users. The use of SoftEnv is not required but highly recommended by HPCC staff.

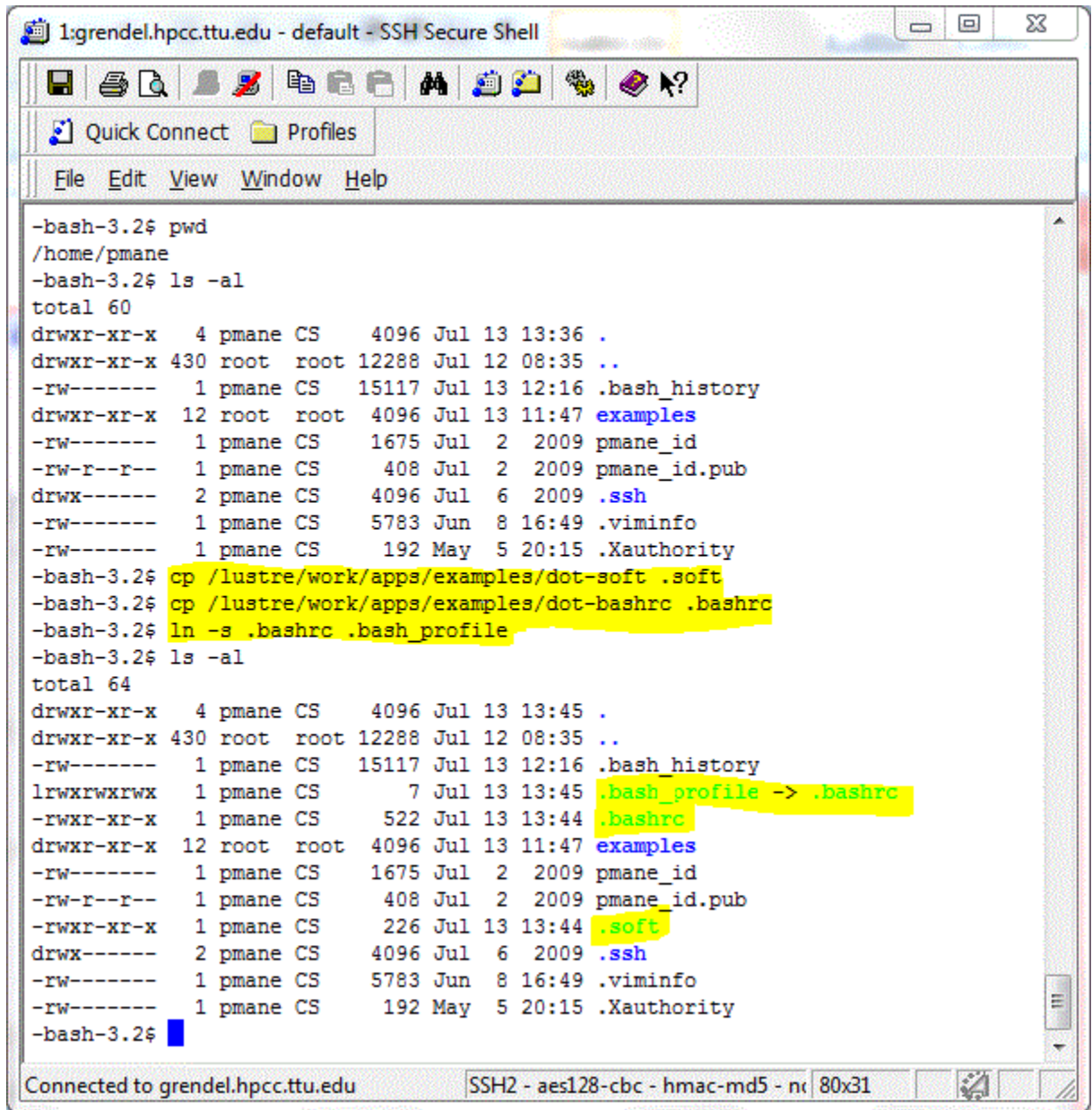
### Step 1: setting up user environment

If the user environment is already set up, please skip this step.

At the first use, the user should copy two sample dot-files: dot-bashrc is the start up script which evokes SoftEnv; dot-soft contains a list of software whose specific environment variables will be set up for the user.

```
$ cp /lustre/work/apps/examples/dot-bashrc .bashrc  
$ cp /lustre/work/apps/examples/dot-soft .soft  
$ ln -s .bashrc .bash_profile
```

Log out and log in again.



The screenshot shows an SSH terminal window titled "1:grendel.hpcc.ttu.edu - default - SSH Secure Shell". The terminal displays the following commands and output:

```
-bash-3.2$ pwd
/home/pmane
-bash-3.2$ ls -al
total 60
drwxr-xr-x  4 pmane CS   4096 Jul 13 13:36 .
drwxr-xr-x 430 root  root 12288 Jul 12 08:35 ..
-rw-----  1 pmane CS  15117 Jul 13 12:16 .bash_history
drwxr-xr-x 12 root  root  4096 Jul 13 11:47 examples
-rw-----  1 pmane CS   1675 Jul  2 2009 pmane_id
-rw-r--r--  1 pmane CS    408 Jul  2 2009 pmane_id.pub
drwx-----  2 pmane CS   4096 Jul  6 2009 .ssh
-rw-----  1 pmane CS   5783 Jun  8 16:49 .viminfo
-rw-----  1 pmane CS    192 May  5 20:15 .Xauthority
-bash-3.2$ cp /lustre/work/apps/examples/dot-soft .soft
-bash-3.2$ cp /lustre/work/apps/examples/dot-bashrc .bashrc
-bash-3.2$ ln -s .bashrc .bash_profile
-bash-3.2$ ls -al
total 64
drwxr-xr-x  4 pmane CS   4096 Jul 13 13:45 .
drwxr-xr-x 430 root  root 12288 Jul 12 08:35 ..
-rw-----  1 pmane CS  15117 Jul 13 12:16 .bash_history
lrwxrwxrwx  1 pmane CS     7 Jul 13 13:45 .bash_profile -> .bashrc
-rwxr-xr-x  1 pmane CS   522 Jul 13 13:44 .bashrc
drwxr-xr-x 12 root  root  4096 Jul 13 11:47 examples
-rw-----  1 pmane CS   1675 Jul  2 2009 pmane_id
-rw-r--r--  1 pmane CS    408 Jul  2 2009 pmane_id.pub
-rwxr-xr-x  1 pmane CS   226 Jul 13 13:44 .soft
drwx-----  2 pmane CS   4096 Jul  6 2009 .ssh
-rw-----  1 pmane CS   5783 Jun  8 16:49 .viminfo
-rw-----  1 pmane CS    192 May  5 20:15 .Xauthority
-bash-3.2$
```

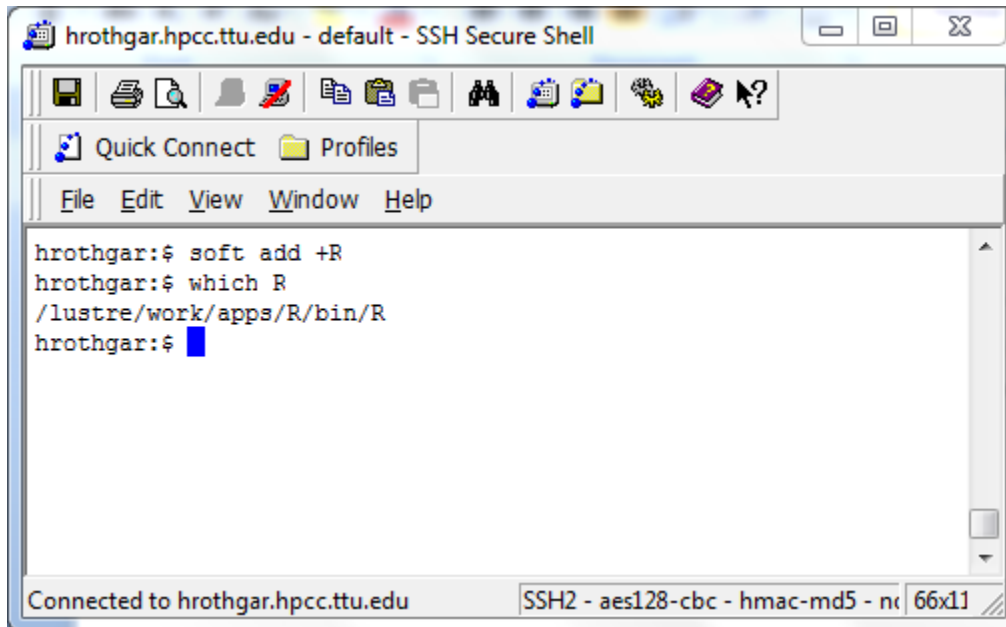
The terminal window also shows a menu bar with "File", "Edit", "View", "Window", and "Help". The status bar at the bottom indicates "Connected to grendel.hpcc.ttu.edu" and "SSH2 - aes128-cbc - hmac-md5 - n".

## Step 2: setting up R environment

The latest version of R is installed on Hrothgar. Use the following commands to add R in SoftEnv:

```
$ soft add +R
```

```
$ which R
```



```
hrothgar.hpcc.ttu.edu - default - SSH Secure Shell
Quick Connect Profiles
File Edit View Window Help
hrothgar:$ soft add +R
hrothgar:$ which R
/lustre/work/apps/R/bin/R
hrothgar:$
```

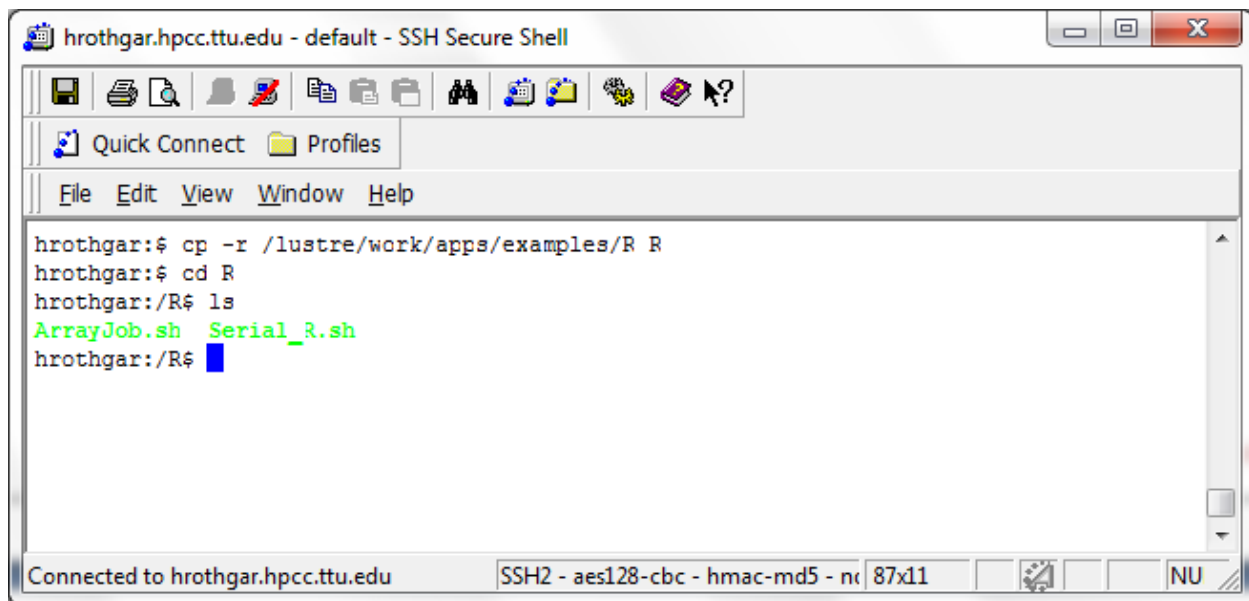
Connected to hrothgar.hpcc.ttu.edu SSH2 - aes128-cbc - hmac-md5 - n 66x11

## 3. Job Submission

### 3.1. Script for job submission

The following is a script file to submit a R job to hrothgar. The sample script and input files are available at the directory `/lustre/work/apps/examples/R`. Use the command to copy the directory:

```
$ cp -r /lustre/work/apps/examples/R R
```



```
hrothgar.hpcc.ttu.edu - default - SSH Secure Shell
Quick Connect Profiles
File Edit View Window Help
hrothgar:$ cp -r /lustre/work/apps/examples/R R
hrothgar:$ cd R
hrothgar:/R$ ls
ArrayJob.sh Serial_R.sh
hrothgar:/R$
```

Connected to hrothgar.hpcc.ttu.edu SSH2 - aes128-cbc - hmac-md5 - n 87x11 NU

Below is the example script for ArraJob.sh

```
#!/bin/bash
#$ -S /bin/bash
#$ -t 1-300:1
#$ -cwd
#$ -V
#$ -q serial
#$ -P hrothgar
/lustre/work/apps/R/bin/R --vanilla < code.$SGE_TASK_ID >
code.$SGE_TASK_ID.out
```

Below is the example script for Serial\_R.sh

```
#!/bin/sh
#$ -V
#$ -cwd
#$ -S /bin/bash
#$ -N RJOB
#$ -o $JOB_NAME.o$JOB_ID
#$ -e $JOB_NAME.e$JOB_ID
#$ -q serial
#$ -P hrothgar

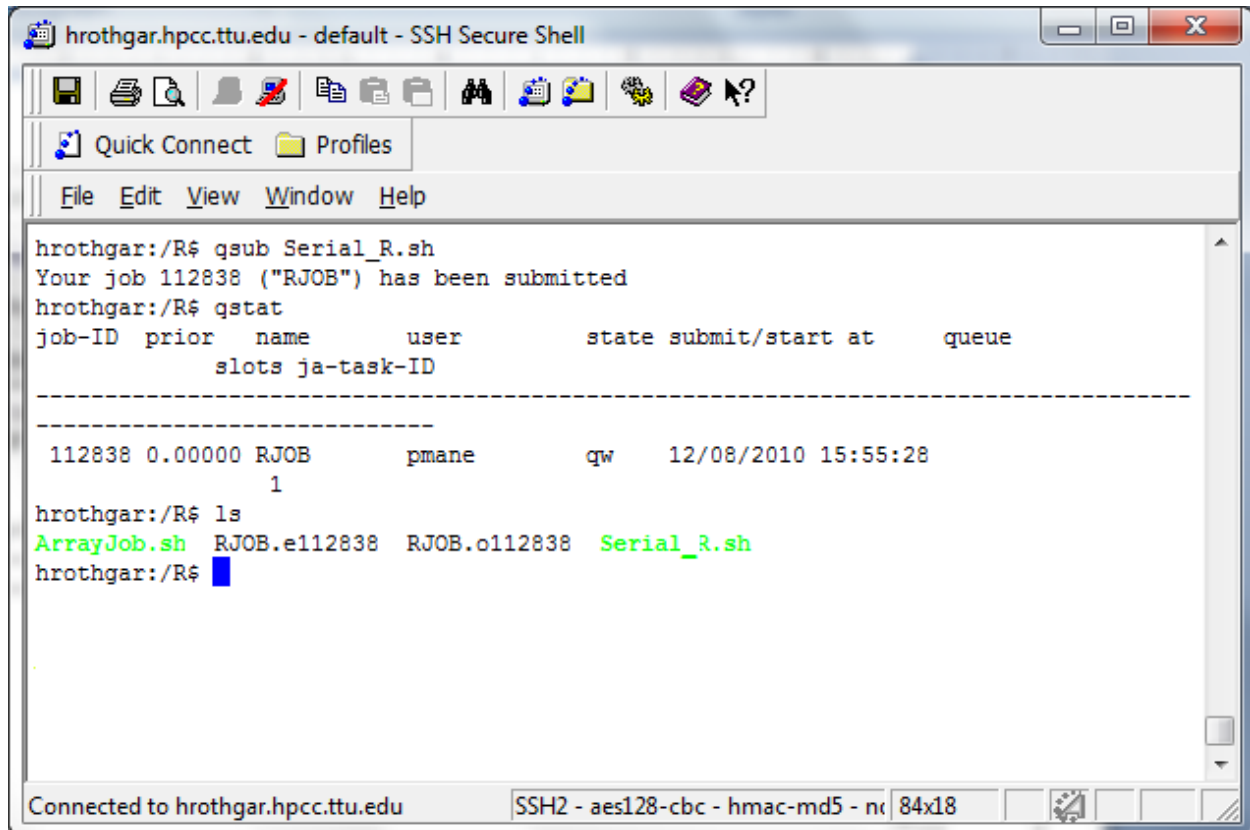
/lustre/work/apps/R/bin/R --vanilla < ds_gfdl_tmax.r > out.118
```

### 3.2. Job submission

`$ qsub ArrayJob.sh` - To submit your R job to Hrothgar

`$ qsub Serial_R.sh`

`$ qstat` – To check the status of the job



The screenshot shows an SSH terminal window titled "hrothgar.hpcc.ttu.edu - default - SSH Secure Shell". The terminal displays the following commands and output:

```
hrothgar:/R$ qsub Serial_R.sh
Your job 112838 ("RJOB") has been submitted
hrothgar:/R$ qstat
job-ID prior name user state submit/start at queue
-----
112838 0.00000 RJOB pmane qw 12/08/2010 15:55:28
1
hrothgar:/R$ ls
ArrayJob.sh RJOB.e112838 RJOB.o112838 Serial_R.sh
hrothgar:/R$
```

The status output is formatted as follows:

job-ID	prior	name	user	state	submit/start at	queue
112838	0.00000	RJOB	pmane	qw	12/08/2010 15:55:28	

The terminal also shows a file listing for the job directory, including `ArrayJob.sh`, `RJOB.e112838`, `RJOB.o112838`, and `Serial_R.sh`.

User Guide

## 4. RMPI

### 4.1. Introduction

RMPI is an interface to MPI that allows R users to take advantage of MPI functionality, without having to learn C, C++ or Fortran.

### 4.2. Setting up RMPI environment

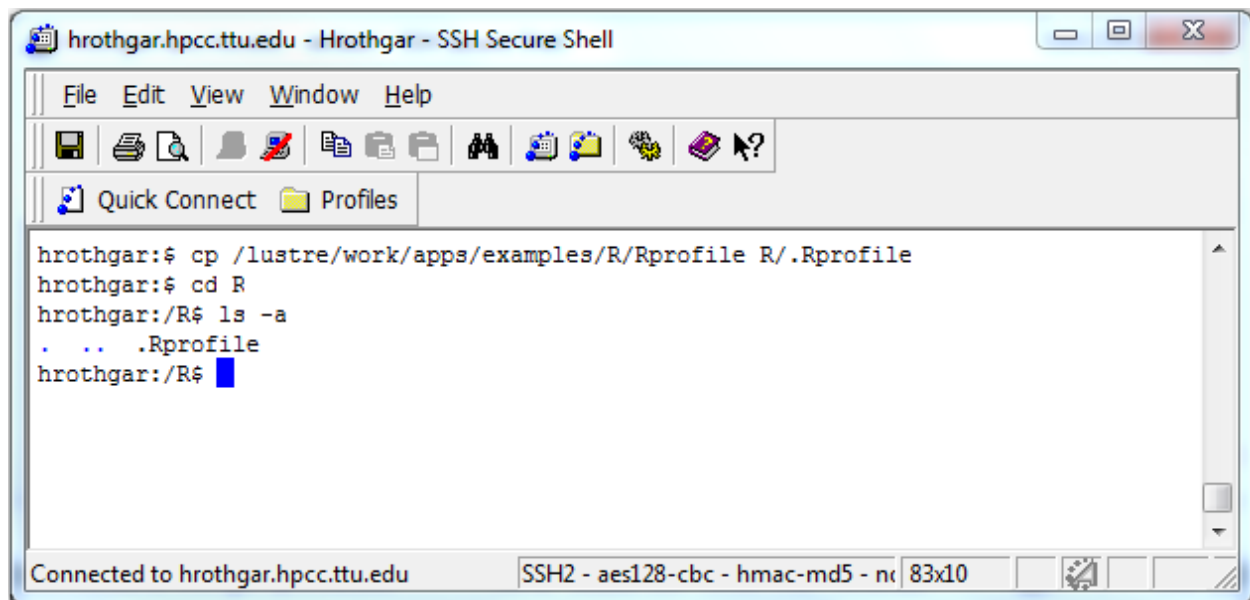
To run Rmpi jobs you will need a certain R profile. To use the correct R profile, use the following commands to copy the R profile to your working directory:

```
$ mkdir $HOME/R
```

```
$ cp /lustre/work/apps/examples/R/Rprofile $HOME/R/.Rprofile
```

Once you have copied the profile you can check if it is in the right directory by using:

```
$ ls -a
```



```
hrothgar.hpcc.ttu.edu - Hrothgar - SSH Secure Shell
File Edit View Window Help
Quick Connect Profiles
hrothgar:~$ cp /lustre/work/apps/examples/R/Rprofile R/.Rprofile
hrothgar:~$ cd R
hrothgar:~/R$ ls -a
.  ..  .Rprofile
hrothgar:~/R$
```

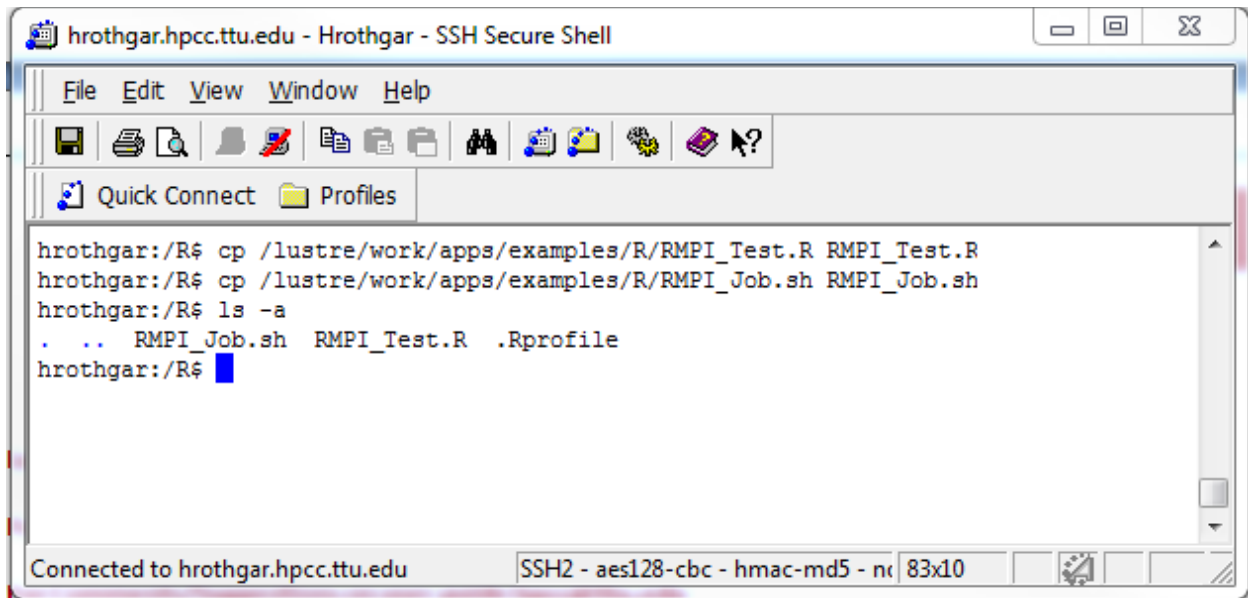
### 4.3. Submitting RMPI Jobs

Now that the environment is set up, you can submit a test script. Copy the example files with the following commands:

```
$ cp /lustre/work/apps/examples/R/RMPI_Test.R $HOME/R/RMPI_Test.R
```

```
$ cp /lustre/work/apps/examples/R/RMPI_Job.sh $HOME/R/RMPI_Job.sh
```





The screenshot shows a terminal window titled "hrothgar.hpcc.ttu.edu - Hrothgar - SSH Secure Shell". The terminal displays the following commands and output:

```
hrothgar:/R$ cp /lustre/work/apps/examples/R/RMPI_Test.R RMPI_Test.R
hrothgar:/R$ cp /lustre/work/apps/examples/R/RMPI_Job.sh RMPI_Job.sh
hrothgar:/R$ ls -a
.  ..  RMPI_Job.sh  RMPI_Test.R  .Rprofile
hrothgar:/R$
```

The status bar at the bottom of the terminal indicates the connection details: "Connected to hrothgar.hpcc.ttu.edu" and "SSH2 - aes128-cbc - hmac-md5 - nc 83x10".

Below is the example for RMPI\_Job.sh

```
#!/bin/sh
#$ -V
#$ -cwd
#$ -S /bin/bash
#$ -N R_par
#$ -o $JOB_NAME.o$JOB_ID
#$ -e $JOB_NAME.e$JOB_ID
#$ -q normal
#$ -pe fill 24
#$ -P hrothgar

mpirun -np 24 /lustre/work/apps/R/bin/R --no-save -q < RMPI_Test.R > RMPI_Test.out
```

Below is the example for RMPI\_Test.R

```
mpi.remote.exec(paste(Sys.info()[c("nodename")], "checking in as", mpi.comm.rank(), "of", mpi.comm.size()))
mpi.close.Rslaves()
mpi.quit()
```

*\$ qsub RMPI\_Job.sh* - To submit RMPI job

*\$qstat* - To check job status

# User Guide

**Last updated: 08/16/2013**

**For Additional Assistance Contact: [hpccsupport@ttu.edu](mailto:hpccsupport@ttu.edu)**

**For Comments/Suggestions on user guide [hpcc@ttu.edu](mailto:hpcc@ttu.edu)**