HPCC - Hrothgar
Getting Started User Guide –
Submitting and Running Jobs

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User Guide

1. Submitting and Running Jobs on HROTHGAR

Hrothgar uses Sun Grid Engine (SGE) for job scheduling. The basic batch operations (submission, monitoring and control) and their description are given below.

Note: When uploading files in preparation for launching a job it is good practice to keep each job in separate folders, labeled in an intuitive way, such as:

Job1_folder

Writing all files to the top level home directory will very quickly become difficult to follow and easy to make mistakes!

Three Operations of Batch Processing: submission, monitoring, and control

Step 1: Job submission

The following is an example of submitting a simple job: display the host name on which the job is scheduled.

First, create a job script file, e.g. test.sh, with the below content. You may also obtain it by command "cp /lustre/work/examples/test.sh ."

```
#$ -V
#$ -cwd
#$ -S /bin/bash
#$ -N test
#$ -o $JOB_NAME.o$JOB_ID
#$ -e $JOB_NAME.e$JOB_ID
#$ -q normal
#$ -pe fill 12
#$ -P hrothgar
hostname
```

In the script, the lines starting with "**#$**" are SGE options.

"**-V**" means using current environment setting in batch job.

"**-cwd**" means using the current directory where the job is submitted as the job's working directory.

"**-S /bin/bash**" means using /bin/bash as the shell for the batch session.

"**-N test**" means using "test" as this job's name, and it can be referred as variable "**$JOB_NAME**".

"**-o $JOB_NAME.o$JOB_ID**" and "**-e $JOB_NAME.e$JOB_ID**" indicate the standard output and error output files, respectively, and $JOB_ID is a unique number that distinguishes the job.

"**-q normal**" means submitting the job to the queue named "**normal**".

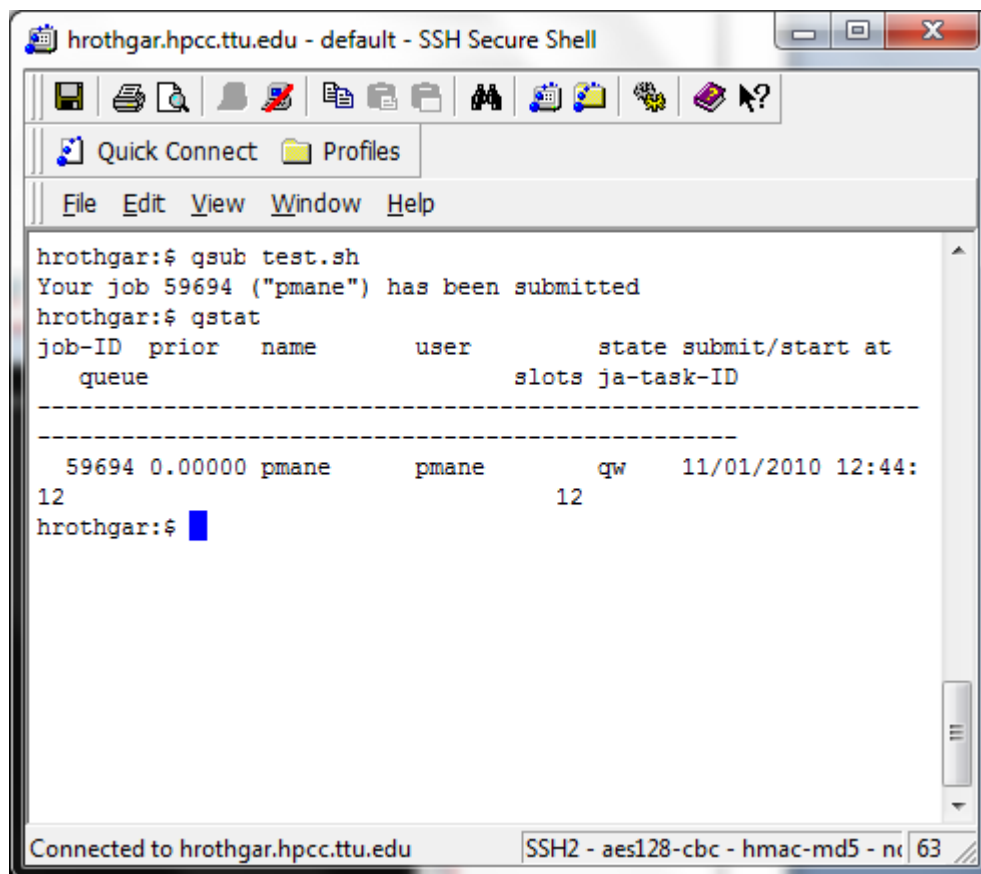"**-pe fill 12**" means using the parallel environment "fill", and requesting 12 cores.

"**-P hrothgar**" means this job belongs to "hrothgar" project, and it is for the purpose of distinguishing regular users and community cluster users.

At last, "**hostname**" is the actual command we need to run. It returns the host name where the job is scheduled.

Use the SGE qsub command to submit a batch job with the following syntax:

qsub test.sh

The following screen shot shows the procedure of submitting a job and check the job status (details in the next section). After the job is submitted by the command "qsub test.sh", it returns a message that the job identified by $JOB_ID has been submitted. In this case, the JOB ID is 59694.

The user can edit the job_script to change the parameter values .The "job script" file can contain both shell commands and special commented statements that include 'qsub' options and resource specifications. The job script file is not the actual job but the script that is runs the user jobs.

Here are some parameters of the qsub command you will see in a job_script:

Option	Argument	Function
-q	**queue_name**	Submits to queue designated by **queue_name**
-pe	**pe_name min_proc[-max_proc]**	Executes job via the Parallel Environemnt designated by **pe_name** with **min_proc-max_proc** number of processes
-N	**job_name**	Names the job **job_name**
-S	**shell** (absolute path)	Use shell as shell for the batch session
-M	**Emailaddress**	Specify user's email address
-m	**{b|e|a|s|n}**	Specify when user notifications are to be sent
-V		Use current environment setting in batch job
-cwd		Use current directory as the job's working directory
-o	**output_file**	Direct job output to **output_file**
-e	**error_file**	Direct job error to **error_file**
-A	**account_name**	Charges run to **account_name**. Used only for multi-project logins. Account names and reports are displayed at login.
-l	*resource=value*	Specify resource limits (see qsub man page)

More examples for the test script can be found under /lustre/work/app/examples

Step 2: Batch query

After job submission, users can monitor the status of their jobs with the qstat command. Table lists the qstat options:

Option	Result
-t	Show additonal information about subtasks
-r	Show resource requirements of jobs
-ext	Displays extended information about jobs
-j <jobid>	Displays information for specified job
-qs {a|c|d|o|s|u|A|C|D|E|S}	Show jobs in the specifed state(s)
-f	Shows "full" list of queue/job details

The qstat command output includes a listing of jobs and the following fields for each job:

Table: Some of the fields in qstats command output

Field	Description
JOBID	job id assigned to the job
USER	user who owns the job
STATE	current job status includes (but not limited to)
W	waiting
s	suspended
r	running
J	on hold
E	errored
D	deleted

Step 3: Job control

Control of job behavior takes many forms:

a. Job modification while in the pending/run state

Users can reset the qsub options of a pending job with the qalter command, using the

following syntax:

qalter options <job id>

where options refers only to the following qsub resource options

-l h_rt=<value>   per-job wall clock time

-o output file

-e error file

b. Job deletion

The qdel command is used to remove pending and running jobs from the queue. The following table explains the different qdel invocations:

qdel <jobid> Removes pending or running job.

qdel –f <jobid> Force immediate dequeuing of running job.

c. Job suspension/resumption

The qhold command allows users with SGE admin privileges to prevent jobs from running. A user cannot resume a job that was suspended by a sys admin nor can he a job owned by another user.

Syntax: qhold <job id>

Jobs that have been placed on hold by qhold can be resumed by using the qalter –hU command.
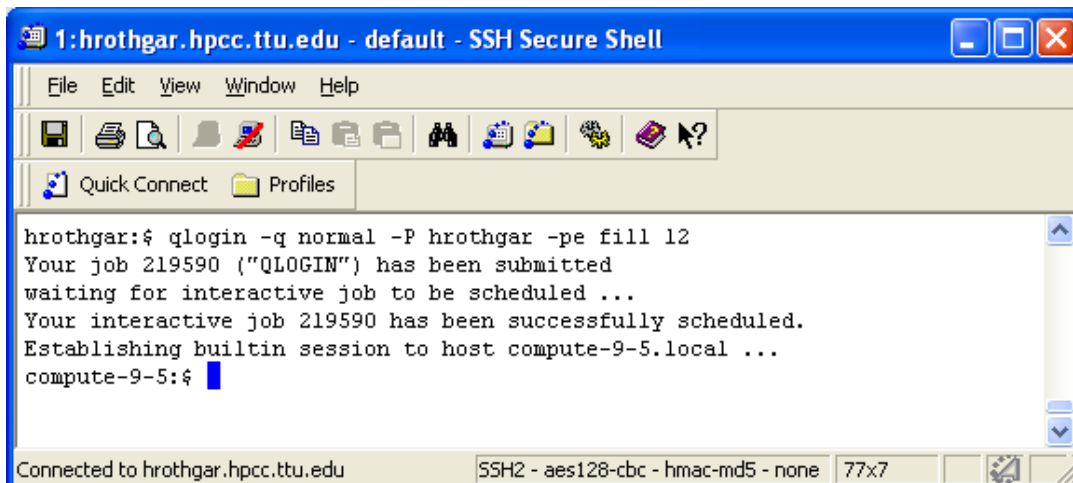
2. Interactive Jobs on HROTHGAR

Many applications require users interacting with the computer to finish certain jobs. These applications include but not limited to all the GUI (Graphical User Interface) software. Some non-GUI applications also require users to type input, make selections or do other operations during the session.

2.1 Non-GUI jobs

The command to submit an interactive job is qlogin:

qlogin –q normal –P hrothgar –pe fill 12

Sun Grid Engine will schedule a free node for this job. If there are free nodes, the system will bring the user to one free node, and the prompt becomes the node's host name. In the following screen shot, the job is scheduled to node compute-9-5, and the user may start the application from there.

2.2 GUI jobs

To start jobs for applications with GUI (graphical user interface), some extra steps are needed. Please refer to this user guide for detailed steps:
http://www.hpcc.ttu.edu/downloads/docs/HPCC-Hrothgar-X%20Server%20guide.pdf.

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