PBS TUTORIAL

BASIC HOW-TO FOR USING THE PBS SCHEDULER ON CUVIER

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WHAT IS PBS AND WHAT DOES IT DO?

- PBS stands for Portable Batch Scheduler.
- Main purpose of the scheduler is to ensure that everyone gets fair usage of the computing resources and that the server does not get overloaded by too many users submitting resource intensive jobs.
- CPU or I/O resource intensive jobs that are not properly scheduled can cause the server to hang which in the end can kill everyone's runs.
- With the scheduler we can limit how much and many resources are available to individual users.

JOB SUBMISSION

- Jobs can be submitted to the scheduler queue via:
  - Pure command line:
    - /opt/pbs/bin/qsub [ALL qsub options] /path/to/command/to/run <options for your program>
  - Using qsub and a submission script.
    - The submission script is a BASH script with a few added features to allow for the needed resources/options to be easily specified in the script:
      - /opt/pbs/bin/qsub ./submission.sh

REQUESTING PBS RESOURCES

When requesting resources using the -l (ELL) option on the command line, the following can be specified. E.g,

qsub -l nodes=4:ppn=5 -l walltime=10:30:00 mem=36gb /program/to/run

Resource Name	Permissible Values	Description
nodes, ppn	Integer. 0 – Max number of nodes. Usage: nodes=X:ppn=Y	Nodes and cores per node needed to run job
walltime	hh:mm:ss	Estimated maximum wallclock time for job
cput	hh:mm:ss	Estimated maximum CPU time for job
mem	Integer follow by b, kb, mb or gb	Estimated maximum RAM for job
Ncpus	Integer. 0 – Max number of cores	CPU cores needed to run job

PBS VARIABLES

Variable	Description
$PBS_ENVIRONMENT	set to PBS_BATCH to indicate that the job is a batch job; otherwise, set to PBS_INTERACTIVE to indicate that the job is a PBS interactive job
$PBS_JOBID	the job identifier assigned to the job by the batch system
$PBS_JOBNAME	the job name supplied by the user
$PBS_NODEFILE	the name of the file that contains the list of nodes assigned
$PBS_QUEUE	the name of the queue from which the job is executed
$PBS_O_HOME	value of the HOME variable in the environment in which qsub was executed
$PBS_O_LANG	value of the LANG variable in the environment in which qsub was executed
$PBS_O_LOGNAME	value of the LOGNAME variable in the environment in which qsub was executed
$PBS_O_PATH	value of the PATH variable in the environment in which qsub was executed
$PBS_O_MAIL	value of the MAIL variable in the environment in which qsub was executed
$PBS_O_SHELL	value of the SHELL variable in the environment in which qsub was executed
$PBS_O_TZ	value of the TZ variable in the environment in which qsub was executed
$PBS_O_HOST	the name of the host upon which the qsub command is running
$PBS_O_QUEUE	the name of the original queue to which the job was submitted
$PBS_O_WORKDIR	the absolute path of the current working directory of the qsub command

SAMPLE PBS SUBMISSION SCRIPT

VIEW QUEUE AND JOB STATUS

- To view the status of the overall scheduler queue and running jobs run the following command:
  - /opt/pbs/bin/qstat -af -u <username>

```
amnh-gen-001:
                                                                  Req'd  Req'd   Elap
Job ID          Username Queue    Jobname    SessID NDS TSK Memory Time  S Time
--------------- -------- -------- ---------- ------ --- --- ------ ----- - -----
898.amnh-gen-0 tuser    batch    job1         5997   1   2    36gb  10000 R 142:3
899.amnh-gen-0 tuser    batch    job2         6083   1   2    --    10000 R 142:3
900.amnh-gen-0 tuser    batch    job3         6169   1   2    --    10000 R 142:3
901.amnh-gen-0 tuser    batch    job4         6255   1   2    --    10000 R 142:3
902.amnh-gen-0 tuser    batch    job5         7133   1   2    --    10000 R 142:3
903.amnh-gen-0 tuser    batch    job6         7219   1   2    --    10000 R 142:3
904.amnh-gen-0 tuser    batch    job7         7660   1   2    --    10000 R 142:3
905.amnh-gen-0 tuser    batch    job8         8065   1   2    --    10000 R 142:3
906.amnh-gen-0 tuser    batch    job20          --   1   2    --    10000 Q   --
907.amnh-gen-0 tuser    batch    job21          --   1   2    --    10000 Q   --
908.amnh-gen-0 tuser    batch    job22          --   1   2    --    10000 Q   --
909.amnh-gen-0 tuser    batch    job23          --   1   2    --    10000 Q   --
910.amnh-gen-0 tuser    batch    job24          --   1   2    --    10000 Q   --
911.amnh-gen-0 tuser    batch    job25          --   1   2    --    10000 Q   --
912.amnh-gen-0 tuser    batch    job26          --   1   2    --    10000 Q   --
913.amnh-gen-0 tuser    batch    job27          --   1   2    --    10000 Q   --
[ssingh@amnh-gen-001 (cuvier):~] $
```

MANIPULATING A JOB (HOLD/RELEASE/DELETE)

- Job Hold/Release
  - To put a job on hold run the following command:
    - /opt/pbs/bin/qhold <JOBID>
  - To release a job from hold run the following command:
    - /opt/pbs/bin/qrls <JOBID>
  - <JOBID> is the Job ID field returned by running /opt/pbs/bin/qstat with no options
  - If for any reason a job does not go into the HOLD/RUN state properly then you will need to send an email to callcenter@amnh.org with a request to have a look.
- Job Delete
  - To delete a job from the queue run the following command:
    - /opt/pbs/bin/qdel <JOBID>
  - <JOBID> is the Job ID field returned by running /opt/pbs/bin/qstat with no options
  - If for any reason a job does not delete properly then you will need to send an email to callcenter@amnh.org with a request to have an administrator delete the job.

AVAILABLE RESOURCES ON CUVIER

- CPUs : 124
- Memory: 1 TB
- Disk:
  - /array1 – 44 TB
  - /home – 575 GB
  - /nas1 and /nas2 – 36 TB each

- CPU and Disk resources are currently limited by quota. The defaults are follows:
- CPUs: 16
- Disk:
  - /home – 10 GB
  - /nas1 and /nas2 – 500 GB each

QUESTIONS