



PBS Pro – Documentation

PBS Pro Arrays - Basic

Introduction

Using PBS Arrays allows users to submit a large number of jobs based on the same PBS command file. Additionally, array job naming convention allows users to reference the entire set of jobs as a unit, or to reference one particular job from the set.

Job arrays are submitted through the use of the **-J** option to qsub, or by using *#PBS -J* in your command file.

Submitting an Array Job via PBS

There are various methods to use arrays to submit jobs to PBS.

The first method using the PBS command file below runs four individual Matlab scripts called matlabdemo0, matlabdemo1, matlabdemo2 and matlabdemo3, and places the output from each script into out.dat[0-3]. The use of arrays significantly reduces the load on the queue manager when compared to the same number of individual jobs.

```
#!/bin/bash -l
#
# set jobname
#PBS -N Matlab_Array_Test

# set job resources
# [change these resource settings as required]
#PBS -l select=1:ncpus=1
#PBS -l walltime=0:10:00
#PBS -l mem=4g

# set job array size
# [change this setting as required]
#PBS -J 0-3

# set project code
# [change this to the correct project code]
#PBS -P [projectid]

# request that regular output (stdout) and
# terminal output (stderr) go to the same file
#PBS -j oe
#

# set default for email notifications
# [change this to the correct email address]
```



PBS Pro – Documentation

```
#PBS -m bea
#PBS -M username@usq.edu.au

# set queue
#PBS -q default

# load required matlab module
module load matlab/2016b

# change to working directory
echo "Changing directory to work area"
cd $PBS_O_WORKDIR
pwd
/bin/cat $PBS_NODEFILE

# execute program
matlab -nodisplay -nosplash < matlabdemo$PBS_ARRAYID.m > out.dat$PBS_ARRAYID
```

Four individual jobs will then appear in the output from *qstat*, e.g. 7834-0.hpc-admin-prd-t1.usq.edu.au for job one and 7834-1.hpc-admin-prd-t1.usq.edu.au for job two. Each individual job can then be referenced using commands such as *qdel* and *qalter*, and are allocated separate resources for each job.

PBS Multiple Jobs

Another method of submitting multiply jobs via one PBS command file is to list each individual job on separate lines within the one command file. Below is an example of submitting four individual Matlab jobs called *matlabdemo0*, *matlabdemo1*, *matlabdemo2* and *matlabdemo3*, and placing the output from each job into *out.dat[0-3]*.

```
#!/bin/bash -l
#
# set jobname
#PBS -N Matlab_Multi_Test

# set job resources
# [change these resource settings as required]
#PBS -l select=1:ncpus=1
#PBS -l walltime=0:10:00
#PBS -l mem=4g

# set checkpoint level
#PBS -c s

# set project code
# [change this to the correct project code]
#PBS -P [projectid]
```

PBS Pro – Documentation

```
# request that regular output (stdout) and
# terminal output (stderr) go to the same file
#PBS -j oe

# set default for email notifications
# [change this to the correct email address]
#PBS -m bea
#PBS -M username@usq.edu.au

# set queue
#PBS -q default

# load required matlab module
module load matlab/2016b

# change to working directory
echo "Changing directory to work area"
cd $PBS_O_WORKDIR
pwd
/bin/cat $PBS_NODEFILE

# execute program
matlab -nodisplay -nosplash < matlabdemo0.m > out.dat0 &
matlab -nodisplay -nosplash < matlabdemo1.m > out.dat1 &
matlab -nodisplay -nosplash < matlabdemo2.m > out.dat2 &
matlab -nodisplay -nosplash < matlabdemo3.m > out.dat3 &

# wait for background jobs to finish
wait
```

The four individual jobs will only appear as one job in the output from *qstat*, e.g. 7834.hpc-admin-prd-t1.usq.edu.au for all individual jobs. Each individual job cannot be referenced using commands such as *qdel* and *qalter*. There are some legitimate reasons for using this method. For example, as each individual job is run on the same node only one Matlab license will be used, whereas using PBS arrays could use four Matlab licenses to run the same individual jobs, as they will be run on different nodes.

Please Note: This type of job submission runs all individual jobs on the one node, no matter how many nodes are specified in the PBS command file.

References:

1. [PBS Professional 14 User Guide](#)
2. [PBS Professional 14 Administrator's Guide](#)
3. [PBS Professional - HPC Cluster Workload Manager](#)