Homework 9 - Hoffman2 Cluster

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Hoffman2 questions

Read each question carefully and answer to the best of your ability. Questions may have more than one correct answer.

1. Briefly (1 or 2 sentences) describe why somebody would want to use Hoffman2.

   The Hoffman2 Cluster is a cluster hosting program by IDRE. UCLA's shared Hoffman2 cluster currently consists of 1200+ 64-bit nodes and 13340 cores with an aggregate of over 50 TB of memory. It is the largest and most powerful cluster in the UC system.
   If anyone has a large amount of data they want to work with or they have to perform some heavy-duty computation which can't be supported by existing computing resources of the person, then it would be a good idea to make use of the Hoffman2 cluster.

2. How do you connect to Hoffman2 if you are a
   a. Unix, Linux, or Mac user?
   b. Windows user?

   a) *Unix, Linux, Mac Users*
      Login using the ssh command
      ssh login-id@hoffman2.idre.ucla.edu
   b) *Windows Users*

      Can be done using SSH clients like putty, cygwin or MobaXterm

      A NoMachine client can also be used to access Hoffman2 on Windows

3. Briefly describe the difference between a 'login node' and a 'compute node'. When should you use each of these?

   Login Nodes

   When we log onto Hoffman2, we are assigned a 'login node' for maneuvering around and file organization. To ensure load balancing, several login nodes are present which can be used interchangeably. On each login, a user is randomly assigned to one of the login nodes. The name of the login node appears on the shell prompt:

   [login_id@login4 ~]$

   A user's user id is limited to 16 sessions per login node.

   Compute Nodes

To perform computations on the Hoffman2 cluster, we require a compute node. Computations are not supposed to be performed on the login node. Hoffman2 cluster's compute nodes have different memory sizes. On submitting a job to the scheduler, it is automatically executed on the compute nodes. Compute nodes are also made available for interactive use by using the "**qrsh**" command.

4. How much storage is available in your Hoffman2 home directory? Where can you access additional storage?

   Every user of the Hoffman2 cluster has a home directory with 20GB storage for general use. Additional storage of 2TB is available in '/u/scratch' – this is kept for 7 days

5. What will happen to a job that attempts to use more memory than what had been requested?
   Any job, started in an interactive session, attempting to use more memory than requested will be automatically be terminated by the scheduler.
   Jobs or interactive sessions using more processors or significantly more memory than was reserved with UGE may be terminated without prior notice by the System Administrator.

6. You want to submit a job that requires 4 GB of memory and will complete in approximately 2 hours. Name several reasons why you should **not** request 16 GB and 24 hours of run time.
   Requesting more resources than needed will delay its starting.
   It will also defeat the job scheduler's back-filling capability and waste cluster resources.
   On requesting more resources than needed, we are effectively blocking resources of the cluster and there is a chance that some other user who requires the resources will not get them allocated. Hence, it is unfair on part of other prospective users to request for more than what is needed.

For questions 7-10, write down the appropriate commands (there can be more than one right answer!) See the IDRE website if you need help answering any of these questions.

7. Request a compute node for interactive use; you believe the job requires 12 GB of memory and will take approximately 4 hours to complete.

   *Use the command **qrsh***
   *Solution: **qrsh -l h_rt=4:00:00, h_data=12G***
   Explanation: h_rt denotes time, h_data denotes amount of memory needed

8. Request a compute node for interactive use; you want 2 CPU cores, 4 GB of memory, and believe the job will take approximately 8 hours to complete.

   *Use the command **qrsh***
   *Solution: **qrsh -l h_rt=8:00:00, h_data=4G -pe shared 2***

Explanation: h_rt denotes time, h_data denotes amount of memory needed, -pe shared denotes how many CPU cores are needed

9. Submit a job; you want to name the job 'gene_data_lasso', and you want to be emailed **only if the job is aborted**. You want 12 GB of memory, 8 hours run time, and the name of the job is 'myjob.sh'.

   *Use the option **-m** with **a** option for emailing when the job gets aborted.*

   *Solution: **qsub -N gene_data_lasso -l h_data=12G, h_rt=8:00:00 -m a myjob.sh***

10. Submit a job; this is the same as the job in question 9, with the following changes:

    a. You want to change the working directory to where you currently are in the file system.
    b. You also want to be emailed when the job starts and finishes.
    c. You only want to request 64 MB of memory.

    qsub -cwd -N gene_data_lasso -l h_data=64M, h_rt=8:00:00 -m bea myjob.sh

    -cwd*: execute the job from the current working directory*
    -N name*: specifies the name of the job*
    -l resource=value, …*: launch the job meeting the given resource request list.*
    -m b|e|a|s|n ,…*: defines or redefines under which circumstances mail is to be sent to the job owner. Options are as follows:*

    ```
    `b'    Mail is sent at the beginning of the job.
    `e'    Mail is sent at the end of the job.
    `a'    Mail is sent when the job is aborted or
    rescheduled.
    `s'    Mail is sent when the job is suspended.
    `n'    No mail is sent.
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