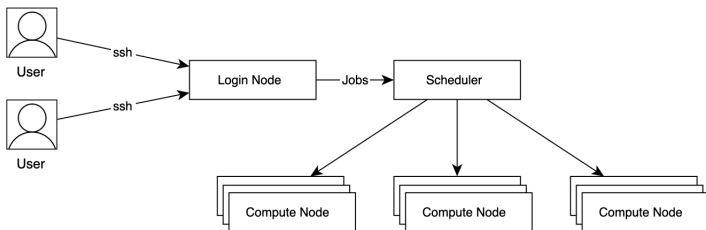


# HPC tutorial

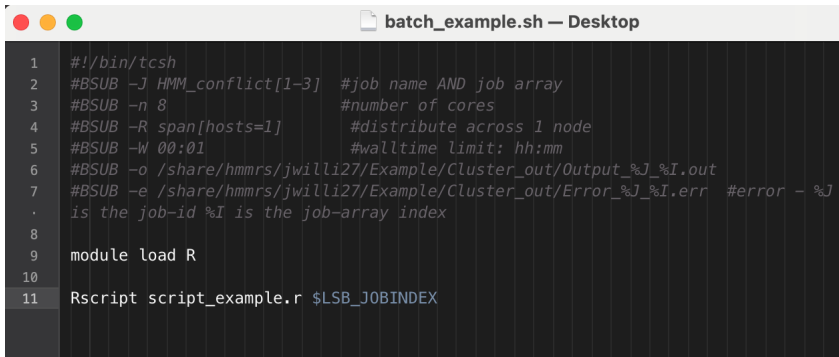


# HPC tutorial



```
1  
2  
3  args = commandArgs(TRUE)  
4  
5  cat('You passed me the integer, ', args[1])  
6  
7  # Let's generate some data!  
8  data = runif(100)  
9  
10 # Let's save the data!  
11 save( data, file=paste0('data_set_',args[1],'.rda'))
```

# HPC tutorial



```
batch_example.sh — Desktop
1  #!/bin/tcsh
2  #BSUB -J HMM_conflict[1-3] #job name AND job array
3  #BSUB -n 8                 #number of cores
4  #BSUB -R span[hosts=1]    #distribute across 1 node
5  #BSUB -W 00:01           #walltime limit: hh:mm
6  #BSUB -o /share/hmmrs/jwillli27/Example/Cluster_out/Output_%J_%I.out
7  #BSUB -e /share/hmmrs/jwillli27/Example/Cluster_out/Error_%J_%I.err #error - %J
  . is the job-id %I is the job-array index
8
9  module load R
10
11 Rscript script_example.r $LSB_JOBINDEX
```

# HPC tutorial

```
jwilli27@mac:~/Documents/Research/2021/REU $ ls -l
total 960
drwxr-xr-x  18 jwilli27  staff    576 May 18 13:51 Intro_slides/
-r-----@  1 jwilli27  staff  432461 Apr 30 19:39 Maltoudoglou2020.pdf
-rw-r--r--@  1 jwilli27  staff   19622 May  6 00:30 REUTeams2021.docx
-rw-r--r--@  1 jwilli27  staff   26875 May 12 19:55 activities_2021.pdf
-rwxr-xr-x@  1 jwilli27  staff    460 May 18 13:48 batch_example.sh*
-rw-r--r--@  1 jwilli27  staff    192 May 18 13:47 script_example.r
jwilli27@mac:~/Documents/Research/2021/REU $ █
```

# HPC tutorial

```
jwilli27@mac:~/Documents/Research/2021/REU $ scp batch_example.sh script_example.r jwilli27@login.hpc.ncsu.edu:/share/hmmrs/jwilli27/
Password:
Duo two-factor login for jwilli27

Enter a passcode or select one of the following options:

 1. Duo Push to XXX-XXX-7018
 2. SMS passcodes to XXX-XXX-7018

Passcode or option (1-2): 1
batch_example.sh
script_example.r
jwilli27@mac:~/Documents/Research/2021/REU $ █
```

# HPC tutorial

```
jwilli27@mac:~/Documents/Research/2021/REU $
jwilli27@mac:~/Documents/Research/2021/REU $ ssh jwilli27@login.hpc.ncsu.edu
Password:
Duo two-factor login for jwilli27

Enter a passcode or select one of the following options:

 1. Duo Push to XXX-XXX-7018
 2. SMS passcodes to XXX-XXX-7018

Passcode or option (1-2): 1
Success. Logging you in...
Last login: Sat May 15 15:51:50 2021 from 107.15.139.144
*****
*                               *
*      North Carolina State University, Raleigh, NC 27695      *
*      Office of Information Technology                          *
*      http://hpc.ncsu.edu/                                     *
*                               *
*****
*                               *
*      Welcome to henry2 Linux cluster                          *
*                               *
*****
*                               *
*      WARNING - USER BEWARE                                  *
*                               *
*      This is a NC State HPC Production System. Use of this system is subject *
*      to NC State Computer Use Policy - policies.ncsu.edu/policy/pol-08-00-01 *
*      and the OIT HPC Acceptable Use Policy - hpc.ncsu.edu/About/AUP.php      *
*                               *
*      Share/scratch/tmp-space is NOT being backed-up and files are subject to *
*      deletion at any time. You use share/scratch/tmp disk space at your own  *
*      risk.                                                    *
*                               *
*      Security violations, and unauthorized or unlawfull use of this system  *
*      will be prosecuted.                                       *
*                               *
*****
[jwilli27@login02 ~]$
[jwilli27@login02 ~]$
[jwilli27@login02 ~]$
[jwilli27@login02 ~]$
[jwilli27@login02 ~]$
[jwilli27@login02 ~]$
```

# HPC tutorial

```
[jwilli27@login02 ~]$ cd /share/hmms/jwilli27/
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$ ll
total 193
-rwxr-xr-x.  1 jwilli27 hmms    460 May 18 13:54 batch_example.sh
drwxr-sr-x.  3 jwilli27 hmms  32768 May 17 12:51 HMM_conflict
drwxr-sr-x.  3 jwilli27 hmms  32768 Sep  5 2020 NFI_data
-rw-r--r--.  1 jwilli27 hmms    192 May 18 13:54 script_example.r
drwxr-sr-x. 1830 jwilli27 hmms 131072 May 16 18:14 tmp
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$
```

# HPC tutorial

```
[jwilli27@login02 jwilli27]$
[jwilli27@login02 jwilli27]$ mkdir Example/
[jwilli27@login02 jwilli27]$ mv script_example.r batch_example.sh Example/
[jwilli27@login02 jwilli27]$ cd Example/
[jwilli27@login02 Example]$ ll
total 1
-rwxr-xr-x. 1 jwilli27 hmms 460 May 18 13:54 batch_example.sh
-rw-r--r--. 1 jwilli27 hmms 192 May 18 13:54 script_example.r
[jwilli27@login02 Example]$ mkdir Cluster_out/
[jwilli27@login02 Example]$ ll
total 2
-rwxr-xr-x. 1 jwilli27 hmms 460 May 18 13:54 batch_example.sh
drwxr-sr-x. 2 jwilli27 hmms 4096 May 18 13:56 Cluster_out
-rw-r--r--. 1 jwilli27 hmms 192 May 18 13:54 script_example.r
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$ more batch_example.sh
#!/bin/tcsh
#BSUB -J HMM_conflict[1-3] #job name AND job array
#BSUB -n 8 #number of cores
#BSUB -R span[hosts=1] #distribute across 1 node
#BSUB -W 00:01 #walltime limit: hh:mm
#BSUB -o /share/hmms/jwilli27/Example/Cluster_out/Output_%J_%I.out
#BSUB -e /share/hmms/jwilli27/Example/Cluster_out/Error_%J_%I.err #error - %J is the job-id %I is the job-arr
module load R

Rscript script_example.r $LSB_JOBINDEX
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
```

# HPC tutorial

```
[jwilli27@login02 Example]$ bsub < batch_example.sh
Job <167546> is submitted to default queue <debug>.
[jwilli27@login02 Example]$ bjobs
JOBID  USER  STAT  QUEUE  FROM_HOST  EXEC_HOST  JOB_NAME  SUBMIT_TIME
167546 jwilli2 PEND  debug  login02    login02    *nflict[1] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[2] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[3] May 18 15:04
[jwilli27@login02 Example]$ bjobs
JOBID  USER  STAT  QUEUE  FROM_HOST  EXEC_HOST  JOB_NAME  SUBMIT_TIME
167546 jwilli2 PEND  debug  login02    login02    *nflict[1] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[2] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[3] May 18 15:04
[jwilli27@login02 Example]$ bjobs
JOBID  USER  STAT  QUEUE  FROM_HOST  EXEC_HOST  JOB_NAME  SUBMIT_TIME
167546 jwilli2 PEND  debug  login02    login02    *nflict[1] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[2] May 18 15:04
167546 jwilli2 PEND  debug  login02    login02    *nflict[3] May 18 15:04
[jwilli27@login02 Example]$ bjobs
JOBID  USER  STAT  QUEUE  FROM_HOST  EXEC_HOST  JOB_NAME  SUBMIT_TIME
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[1] May 18 15:04
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[2] May 18 15:04
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[3] May 18 15:04
[jwilli27@login02 Example]$ bjobs
JOBID  USER  STAT  QUEUE  FROM_HOST  EXEC_HOST  JOB_NAME  SUBMIT_TIME
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[1] May 18 15:04
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[2] May 18 15:04
167546 jwilli2 RUN   debug  login02    login02    8*bc3g1   *nflict[3] May 18 15:04
[jwilli27@login02 Example]$ bjobs
No unfinished job found
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$
[jwilli27@login02 Example]$ ll
total 35
-rwxr-xr-x. 1 jwilli27 hmmrs  460 May 18 13:54 batch_example.sh
drwxr-sr-x. 2 jwilli27 hmmrs 32768 May 18 15:04 Cluster_out
-rw-r--r--. 1 jwilli27 hmmrs  677 May 18 15:04 data_set_1.rda
-rw-r--r--. 1 jwilli27 hmmrs  667 May 18 15:04 data_set_2.rda
-rw-r--r--. 1 jwilli27 hmmrs  669 May 18 15:04 data_set_3.rda
-rw-r--r--. 1 jwilli27 hmmrs  195 May 18 14:54 script_example.r
```

# HPC tutorial

```
[jwilli27@login02 Example]$ more Cluster_out/Output_167546_1.out
You passed me the integer, 1
-----
Sender: LSF System <lsfadmin@n3g1-11>
Subject: Job 167546[1]: <HMM_conflict[1-3]> in cluster <henry2> Done

Job <HMM_conflict[1-3]> was submitted from host <login02> by user <jwilli27> in cluster <henry2> at Tue May 18 15:04:31 2021
Job was executed on host(s) <8*n3g1-11>, in queue <debug>, as user <jwilli27> in cluster <henry2> at Tue May 18 15:04:36 2021
</home/jwilli27> was used as the home directory.
</share/hmms/jwilli27/Example> was used as the working directory.
Started at Tue May 18 15:04:36 2021
Terminated at Tue May 18 15:04:38 2021
Results reported at Tue May 18 15:04:38 2021

Your job looked like:
-----
# LSBATCH: User input
#!/bin/tcsh
#BSUB -J HMM_conflict[1-3] #job name AND job array
#BSUB -n 8 #number of cores
#BSUB -R span[hosts=1] #distribute across 1 node
#BSUB -W 00:01 #walltime limit: hh:mm
#BSUB -o /share/hmms/jwilli27/Example/Cluster_out/Output_%J_%I.out
#BSUB -e /share/hmms/jwilli27/Example/Cluster_out/Error_%J_%I.err #error - %J is the job-id %I is the job-array index

module load R

Rscript script_example.r $LSB_JOBINDEX
-----
Successfully completed.

Resource usage summary:

CPU time : 0.52 sec.
Max Memory : -
Average Memory : -
Total Requested Memory : -
Delta Memory : -
Max Swap : -
Max Processes : -
Max Threads : -
Run time : 17 sec.
Turnaround time : 7 sec.

The output (if any) is above this job summary.

PS:
Read file </share/hmms/jwilli27/Example/Cluster_out/Error_167546_1.err> for stderr output of this job.
```