

LONI & LSU HPC User Environment

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- 1 Hardware Overview
- 2 User Environment
- 3 Job Management



- 1 Hardware Overview
- 2 User Environment
- 3 Job Management



Linux Clusters

- Vendor: Dell
- OS: Red Hat
- CPU: Intel Xeon

AIX Clusters

- Vendor: IBM
- OS: AIX
- CPU: Power 5/7



Linux Clusters

	Name	Peak TeraFLOPS/s	Location	Status	Login
LONI	QueenBee	50.7	ISB	Production	LONI
	Eric	4.7	LSU	Production	LONI
	Louie	4.7	Tulane	Production	LONI
	Oliver	4.7	ULL	Production	LONI
	Painter	4.7	LaTech	Production	LONI
	Poseidon	4.7	UNO	Production	LONI
LSU HPC	Tezpur	15.3	LSU	Production	HPC
	Philip	3.5	LSU	Production	HPC

AIX Clusters

	Name	Peak TF/s	Location	Status	Login
LONI	Bluedawg	0.85	LaTech	Production	LONI
	Ducky	0.85	UNO	8/31/2011	LONI
	Lacumba	0.85	Southern	12/22/2011	LONI
	Neptune	0.85	Tulane	Not accepting jobs	LONI
	Zeke	0.85	ULL	8/31/2011	LONI
LSU HPC	Pelican	2.6	LSU	Production	HPC
	Pandora	6.8	LSU	Pre-Production	HPC



- LONI account

`https://allocations.loni.org`

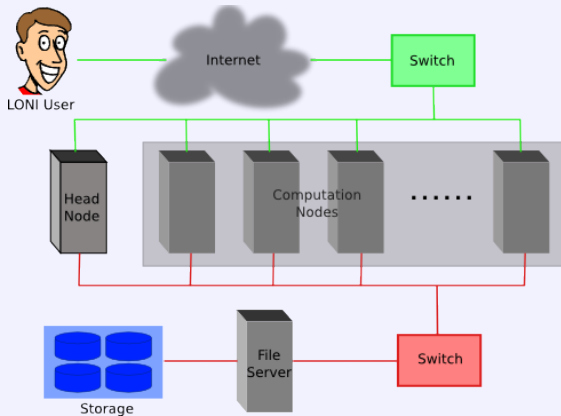
- LSU HPC account

`https://accounts.hpc.lsu.edu`

- All LONI AIX clusters are being decommissioned.
- Newest cluster at LSU HPC is Pandora, currently in User Friendly Mode



- A cluster is a group of computers (nodes) that works together closely
- Type of nodes
 - ◆ Head node
 - ◆ Compute node



- Queen Bee

- ◆ 668 nodes: 8 Intel Xeon cores @ 2.33 GHz
- ◆ 8 GB RAM
- ◆ 192 TB storage

- Other LONI Linux clusters

- ◆ 128 nodes: 4 Intel Xeon cores @ 2.33 GHz
- ◆ 4 GB RAM
- ◆ 9 TB storage

- Tezpur

- ◆ 360 nodes, 4 Intel Xeon cores @ 2.33 GHz
- ◆ 4 GB RAM
- ◆ 32 TB storage

- Philip

- ◆ 37 nodes, 8 Intel Xeon cores @ 2.93 GHz
- ◆ 24/48/96 GB RAM
- ◆ Shares storage with Tezpur



- LONI AIX clusters

- ◆ 14 Power5 nodes, 8 IBM Power5 processors @ 1.9 GHz per node
- ◆ 16 GB RAM
- ◆ 280 GB storage

- Pelican

- ◆ 16 Power5+ nodes, 16 IBM Power5+ processors @ 1.9 GHz per node
- ◆ 32 GB RAM
- ◆ 21 TB storage

- Pandora

- ◆ 8 Power7 nodes, 8 IBM Power7 processors @ 7.33 GHz per node
- ◆ 128 GB RAM
- ◆ 19 TB storage



- The amount of installed memory less the amount that is used by the operating system and other utilities
- Max amount per node
 - ◆ Linux clusters: ~ 6 GB for Queen Bee, ~ 3 GB for others
 - ◆ AIX clusters: ~ 13 GB
 - ◆ Pandora: ~ 125 GB storage



- 1 Hardware Overview
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- LONI Host name: `<cluster name>.loni.org`
 - ★ Eric: `eric.loni.org`
- LSU HPC Host name: `<cluster name>.hpc.lsu.edu`
 - ★ Tezpur: `tezpur.hpc.lsu.edu`
- Use ssh to connect
 - ★ *nix and Mac: `ssh <host name>`
 - ★ Windows: use Putty, Secure Shell Client or Bitwise Tunnelier
- The default Login shell is bash
- Supported shells: bash, tcsh, ksh, csh & sh
- Change the login shell at the profile page
 - ◆ LONI: <https://allocations.loni.org>
 - ◆ LSU HPC: <https://accounts.hpc.lsu.edu>
- Reset your password
 - ◆ LONI: https://allocations.loni.org/user_reset.php
 - ◆ LSU HPC: https://accounts.hpc.lsu.edu/user_reset.php



	Distributed File System	Throughput	File life time	Best used for
Home	Yes	Low	Unlimited	Code in development, compiled executable
Work	Yes	High	30 days	Job input/output
Local Scratch	No		Job Duration	Temporary files

- Tips

- ◆ Never write job output to your home directory
- ◆ Do not write temporary files to /tmp, use local scratch or work space
- ◆ Work space is not for long term storage. Files are purged periodically
- ◆ Use `rm purge` to delete large amount of files.



Cluster	Home		Work		Scratch
	Access Point	Quota	Access Point	Quota	Access Point
LONI Linux	/home/\$USER	5GB	/scratch/\$USER	100GB	/var/scratch
LONI AIX	/home/\$USER	500MB	/work/default/\$USER	20GB	/var/scratch
HPC Linux	/home/\$USER	5GB	/work/\$USER	NA	/var/scratch
HPC AIX	/home/\$USER	5GB	/work/\$USER	50GB	/scratch/local

- No quota is enforced on the work space of QueenBee
- Work directory is created within an hour of first login
- Check current disk usage

Linux: `showquota`

AIX: `quota`



- Environment variables
 - ◆ PATH: where to look for executables
 - ◆ LD_LIBRARY_PATH: where to look for shared libraries
 - ◆ Other custom environment variables needed by various software
- **SOFTENV** is a software that is used to set up these environment variables on all the clusters
 - ◆ More convenient than setting numerous environment variables in .bashrc or .cshrc



- Command `softenv` lists all packages that are managed by **SOFTENV**

```
[apacheco@eric2 ~]$ softenv
SoftEnv version 1.6.2
```

```
...
```

```
-----
These are the macros available:
```

```
*   @default
```

```
These are the keywords explicitly available:
```

```
+ImageMagick-6.4.6.9-intel-11.1
```

```
@types: Applications Visualization @name:
```

```
...
```

```
+NAMD-2.6-intel-11.1-mvapich-1.1
```

```
@types: Applications @name: NAMD @version:
```

```
...
```

```
+NAMD-2.7b2-intel-11.1-mvapich-1.1
```

```
@types: Applications @name: NAMD @version:
```

```
...
```



Searching for a Specific Package

- Use `-k` option with `softenv`

```
[apacheco@eric2 ~]$ softenv -k gaussian
SoftEnv version 1.6.2
```

```
...
```

```
Search Regexp: gaussian
```

```
-----
```

These are the macros available:

These are the keywords explicitly available:

```
+gaussian-03                @types: Applications Chemistry @name:
                             Gaussian @version: 03 @build: @internal:
                             ...
+gaussian-09                @types: Applications Chemistry @name:
                             Gaussian @version: 09 @build: @internal:
                             ...
+gaussview-4.1.2            @types: Applications Chemistry @name:
                             GaussView @version: 4.1.2 @build: - @about:
                             ...
```

These are the keywords that are part of the software tree,
however, it is not suggested that you use these:



Setting up Environment via Softenv: Permanent Change

- Setting up the environment variables to use a certain software package(s).
 - ◆ First add the key to `$HOME/.soft`.
 - ◆ Execute `resoft` at the command line.

```
[apacheco@eric2 ~]$ cat .soft
#
# This is the .soft file.
...
+mvapich-1.1-intel-11.1
+intel-fc-11.1
+intel-cc-11.1
+espresso-4.3.1-intel-11.1-mvapich-1.1
+gaussian-09
+lmto-intel-11.1
+nciplot-intel-11.1
+gaussview-4.1.2
+jmol-12
+vmd-1.8.6
+xcrysden-1.5.24-gcc-4.3.2
+tcl-8.5.8-intel-11.1
+gamess-12Jan2009R1-intel-11.1
+nwchem-5.1.1-intel-11.1-mvapich-1.1
+cpmd-3.11.1-intel-11.1-mvapich-1.1
@default
[apacheco@eric2 ~]$ resoft
```



Setting up Environment via Softenv: One Time Change

- Setting up environment variables to use a certain package in the current session only.
 - ◆ Remove a package: `soft add <key>`
 - ◆ Add a package: `soft add <key>`

```
[apacheco@eric2 ~]$ which g09
/usr/local/packages/gaussian09/g09/g09
[apacheco@eric2 ~]$ soft delete +gaussian-09
[apacheco@tezpurl ~]$ which g09
/usr/bin/which: no g09 in (/home/apacheco/bin:...
[apacheco@eric2 ~]$ soft add +gaussian-03
[apacheco@eric2 ~]$ which g03
/usr/local/packages/gaussian03/g03/g03
```



- `soft-dbg` shows which variables are set by a SOFTENV key

```
[apacheco@eric2 ~]$ soft-dbg +espresso-4.3.1-intel-11.1-mvapich-1.1
```

This is all the information associated with
the key or macro +espresso-4.3.1-intel-11.1-mvapich-1.1.

```
-----  
Name: +espresso-4.3.1-intel-11.1-mvapich-1.1  
Description: @types: Applications @name: Quantum Espresso @version: 4.3.1 @build: ...  
Flags: none  
Groups: none  
Exists on: Linux  
-----
```

On the Linux architecture,
the following will be done to the environment:

```
The following environment changes will be made:  
ESPRESSO_PSEUDO = /usr/local/packages/espresso/4.3.1/intel-11.1-mvapich-1.1/pseudo  
ESPRESSO_ROOT = /usr/local/packages/espresso/4.3.1/intel-11.1-mvapich-1.1  
ESPRESSO_TMPDIR = /work/${USER}  
PATH = ${PATH}:/usr/local/packages/espresso/4.3.1/intel-11.1-mvapich-1.1/bin  
-----
```



Language	Linux Cluster			AIX Clusters
	Intel	PGI	GNU	XL
Fortran	ifort	pgf77,pgf90	gfortran	xlf,xlf90
C	icc	pgcc	gcc	xlc
C++	icpc	pgCC	g++	xlc

- Usage: <compiler> <options> <your_code>
 - ◆ Example: `icc -O3 -o myexec mycode.c`
- Some compilers options are architecture specific
 - ◆ Linux: EM64T, AMD64 or X86_64
 - ◆ AIX: power5,power7 or powerpc



Language	Linux Cluster	AIX Clusters
Fortran	mpif77,mpif90	mpxlf,mpxlf90
C	mpicc	mpcc
C++	mpiCC	mpCC

- Usage: <compiler> <options> <your_code>
 - ◆ Example: mpif90 -O2 -o myexec mycode.f90
- On Linux clusters
 - ◆ Only one compiler for each language
 - ◆ There is no intel_mpicc or pg_mpicc
- There are many different versions of MPI compilers on Linux clusters
 - ◆ Each of them is built around a specific compiler
 - ◆ Intel, PGI or GNU



- It is extremely important to compile and run you code with the same version!!!
- Use the default version if possible
- These MPI compilers are actually wrappers
 - ◆ They still use the compilers we've seen on the previous slide
 - ★ Intel, PGI or GNU
 - ◆ They take care of everything we need to build MPI codes
 - ★ Head files, libraries etc.
 - ◆ What they actually do can be reveal by the `-show` option

```
[apacheco@eric2 ~]$ mpif90 -show
ln -s /usr/local/packages/mvapich/1.1/intel-11.1/include/mpif.h mpif.h
ifort -fPIC -L/usr/local/ofed/lib64 -Wl,-rpath-link -Wl, \
  /usr/local/packages/mvapich/1.1/intel-11.1/lib/shared \
  -L/usr/local/packages/mvapich/1.1/intel-11.1/lib/shared \
  -L/usr/local/packages/mvapich/1.1/intel-11.1/lib \
  -lmpichf90nc -lmpichfarg -lmpich -L/usr/local/ofed/lib64 \
  -Wl,-rpath=/usr/local/ofed/lib64 -libverbs -libumad -lpthread -lpthread -lrt -limf
rm -f mpif.h
```



- Installed under `/usr/local/packages`
- Most of them managed by SOFTENV
 - ◆ Numerical and utility libraries
 - FFTW, HDF5, NetCDF, PetSc, Intel MKL
 - ◆ Computational Chemistry
 - Amber, CPMD, Gaussian, GAMESS, Gromacs, LAMMPS, NAMD, NWCHEM
 - For DFT Workshop additional packages on Eric: LMTO, NCIPLOT, Quantum Espresso
 - ◆ Visualization
 - GaussView, Jmol, VisIt, VMD, XCrySDen,
 - ◆ Profiling/debugging tools
 - DDT, Tau, TotalView
 - ◆ ...



Exercise: Build SOFTENV Environment for workshop

- Find softenv key for various packages that you will use for the current workshop
 - ◆ Gaussian 09
 - ◆ LMTO
 - ◆ NCIPLOT
 - ◆ Quantum Espresso
 - ◆ MPI implementation (Quantum Espresso is compiled with mvapich 1.1 and intel 11.1 compiler)
 - ◆ Visualization Packages: GaussView, Jmol, VMD, XCrysden
 - ◆ Other packages of interest: CPMD, GAMESS, NWChem
- Check if variables are in your path

```
echo $PATH
```

```
which g09
```

```
which mpirun
```

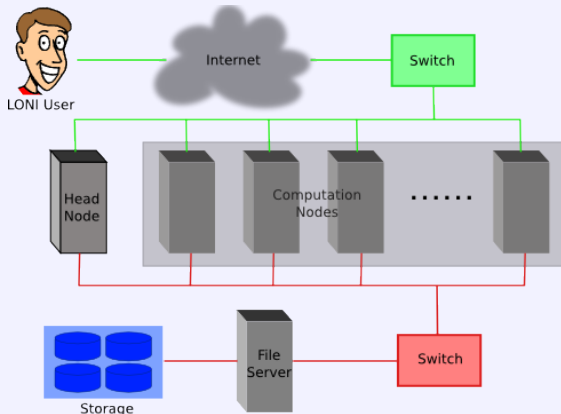
```
which nciplot.x
```



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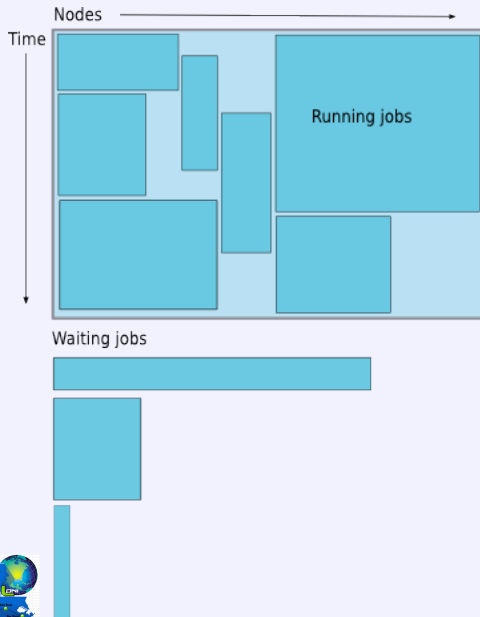
- A cluster is a group of computers (nodes) that works together closely
- Type of nodes
 - ◆ Head node
 - ◆ Multiple Compute nodes
- Multi User Environment
- Each user may have multiple jobs running simultaneously.



- A software that manages resources (CPU time, memory, etc) and schedules job execution
 - ◆ Linux Clusters: Portable Batch System (PBS)
 - ◆ AIX Clusters: Loadleveler
- A job can be considered as a user's request to use a certain amount of resources for a certain amount of time
- The batch queuing system determines
 - 1 The order jobs are executed
 - 2 On which node(s) jobs are executed



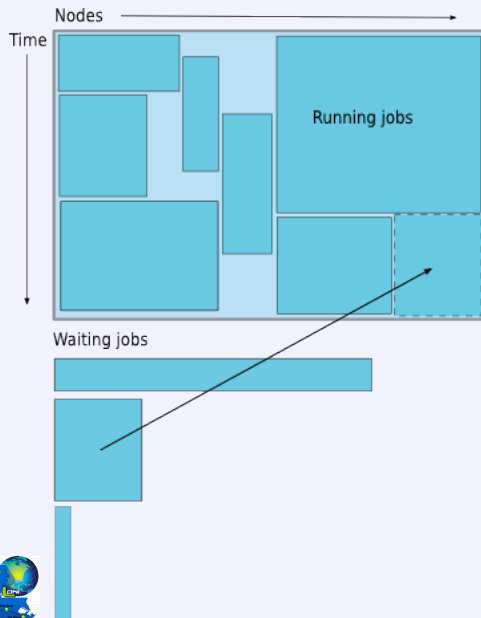
A Simplified View of Job Scheduling



- Map jobs onto the node-time space
 - Assuming CPU time is the only resource
- Need to find a balance between
 - Honoring the order in which jobs are received
 - Maximizing resource utilization



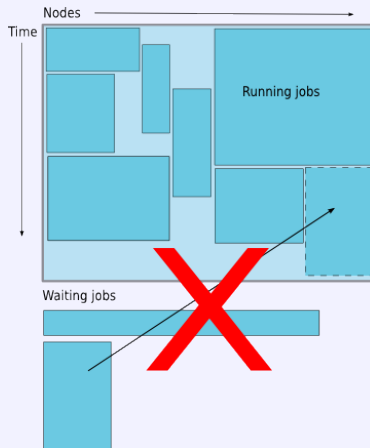
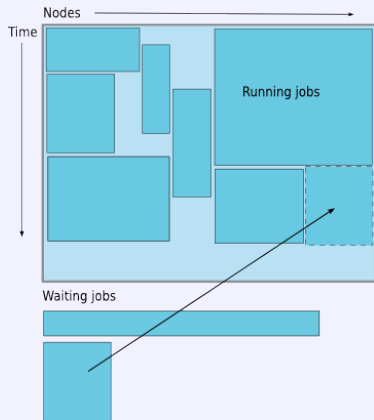
Backfilling



- A strategy to improve utilization
 - Allow a job to jump ahead of others when there are enough idle nodes
 - Must not affect the estimated start time of the job with the highest priority
- Enabled on all LONI and LSU HPC clusters



How much time Should I request?



- Ask for an amount of time that is
 - Long enough for your job to complete
 - As short as possible to increase the chance of backfilling



- There are more than one job queue
- Each job queue differs in
 - Number of available nodes
 - Maximum run time
 - Maximum running jobs per user
- The main purpose is to maximize utilization



QueenBee

Queue	Max Run-time	Total number of nodes	Max running jobs per user	Max nodes per job	Use
workq	2 days	530	8	128	Unpreemptable
checkpt		668		256	preemptable
preempt		668	NA		Requires permission
priority		668	NA		Requires permission

Other Clusters

Queue	Max Run-time	Total number of nodes	Max running jobs per user	Max nodes per job	Use
single	14 days	16	64	1	Single processor jobs
workq	3 days	96	8	40	Unpreemptable
checkpt		128		64	preemptable
preempt		64	NA		Requires permission
priority		64	NA		Requires permission



Tezpur

Queue	Max Run-time	Total number of nodes	Max running jobs per user	Max nodes per job	Use
single	3 days	16	64	1	Single processor jobs
workq		180	8	90	Unpreemptable
checkpt		344		180	preemptable
preempt		NA			Requires permission
priority		NA			Requires permission

Philip

Queue	Max Run-time	Total number of nodes	Max running jobs per user	Max nodes per job	Use
single	3 days	24	12	1	Single processor jobs
workq		28		5	Unpreemptable
checkpt		28			preemptable
bigmem		5			
preempt		NA			Requires permission
priority		NA			Requires permission

Queue Characteristics: LSU HPC AIX Clusters

Pelican

Queue	Max Run-time	Total number of pro-cessors	Max run-ning jobs per user	Max pro-cessors per job	Use
SP5L	4 hours	256	8	256	Short Jobs
MP5L	5 days			128	Medium Jobs
LP5L	7 days		4	64	Long Jobs

Pandora

Queue	Max Run-time	Total number of pro-cessors	Max run-ning jobs per user	Max pro-cessors per job	Use
interactive	30mins	8	6	8	Interactive Jobs
workq	3 days	224		128	Standard Queue
single	7 days	64		32	Single Node Jobs



- Queue querying
 - Check how busy the cluster is
- Job submission
- Job monitoring
 - Check job status (estimated start time, remaining run time, etc)
- Job manipulation
 - Cancel/Hold jobs



- `qfree`: show number of free,busy and queued nodes
- `qfreeloni`: run `qfree` on all LONI Linux clusters

```
[apacheco@eric2 ~]$ qfree
PBS total nodes: 128, free: 49, busy: 79, down: 0, use: 61\%
PBS workq nodes: 96, free: 40, busy: 28, queued: 0
PBS checkpoint nodes: 104, free: 40, busy: 35, queued: 0
PBS single nodes: 32, free: 9 *36, busy: 16, queued: 366
[apacheco@eric2 ~]$ qfreeloni
----- qb -----
PBS total nodes: 668, free: 3, busy: 647, down: 18, use: 96\%
PBS workq nodes: 530, free: 0, busy: 278, queued: 367
PBS checkpoint nodes: 668, free: 1, busy: 369, queued: 770
----- eric -----
PBS total nodes: 128, free: 49, busy: 79, down: 0, use: 61\%
PBS workq nodes: 96, free: 40, busy: 28, queued: 0
PBS checkpoint nodes: 104, free: 40, busy: 35, queued: 0
PBS single nodes: 32, free: 9 *36, busy: 16, queued: 366
----- louie -----
PBS total nodes: 128, free: 44, busy: 83 *2, down: 1, use: 64\%
PBS workq nodes: 104, free: 40, busy: 0, queued: 0
PBS checkpoint nodes: 128, free: 44, busy: 82, queued: 50
PBS single nodes: 32, free: 7 *26, busy: 2, queued: 0
----- oliver -----
PBS total nodes: 128, free: 74, busy: 52, down: 2, use: 40\%
PBS workq nodes: 62, free: 8, busy: 11, queued: 0
...
```



- Command: `llclass`

```
apacheco@peg304$ llclass
```

Name	MaxJobCPU d+hh:mm:ss	MaxProcCPU d+hh:mm:ss	Free Slots	Max Slots	Description
interactive	undefined	undefined	4	4	Interactive Parallel jobs running on in
SP5L	unlimited	unlimited	154	256	Short (4 hours) Parallel queue on Power
MP5L	unlimited	unlimited	154	256	Middle (5 days) Parallel queue on Power
LP5L	unlimited	unlimited	154	256	Long (7 days) Parallel queue on Power5+

"Free Slots" values of the classes "SP5L", "MP5L", "LP5L" are constrained by the MAX_STARTERS limit

```
pandoral:~ apacheco$ llclass
```

Name	MaxJobCPU d+hh:mm:ss	MaxProcCPU d+hh:mm:ss	Free Slots	Max Slots	Description
interactive	unlimited	unlimited	8	8	Queue for interactive jobs; maximum runt
workq	unlimited	unlimited	80	224	Standard queue for job submissions; maxi
single	unlimited	unlimited	32	64	Queue for single-node job submissions; m

"Free Slots" values of the classes "workq", "single" are constrained by the MAX_STARTERS limit(s).



Interactive Jobs

- Set up an interactive environment on compute nodes for users
 - Advantage: can run programs interactively
 - Disadvantage: must be present when job starts
- Purpose: testing and debugging code. **Do not run jobs on head node!!!**

```
qsub -I -V -l walltime=<hh:mm:ss>,nodes=<#  
of nodes>:ppn=cpu -A <your allocation> -q  
<queue name>
```

- On QueenBee, cpu=8
- Other LONI Clusters: cpu=4 (parallel jobs) or cpu=1 (single queue)
- To enable X-forwarding: add -x



Batch Jobs

- Executed using a batch script without user intervention
 - Advantage: system takes care of running the job
 - Disadvantage: can change sequence of commands after submission
- Useful for Production runs

```
qsub <job script>
```

```
llsubmit <job script>
```



PBS Job Script: Parallel Jobs

```
#!/bin/bash
#PBS -l nodes=4:ppn=4
#PBS -l walltime=24:00:00
#PBS -N myjob
#PBS -o <file name>
#PBS -e <file name>
#PBS -q checkpoint
#PBS -A <loni_allocation
#PBS -m e
#PBS -M <email address>

<shell commands>
mpirun -machinefile $PBS_NODEFILE \
  -np 16 <path_to_executable> <options>
<shell commands>
```

Shell being used
of nodes & processors
Maximum walltime
Job name
standard output
standard error
Queue name
Allocation name
Send mail when job ends
to this address

shell commands
run parallel job

shell commands



PBS Job Script: Serial Jobs

```
#!/bin/bash
#PBS -l nodes=1:ppn=1
#PBS -l walltime=24:00:00
#PBS -N myjob
#PBS -o <file name>
#PBS -e <file name>
#PBS -q single
#PBS -A <loni_allocation
#PBS -m e
#PBS -M <email address>

<shell commands>
<path_to_executable> <options>
<shell commands>
```

Shell being used
of nodes & processors
Maximum walltime
Job name
standard output
standard error
Use single queue
Allocation name
Send mail when job ends
to this address

shell commands
run parallel job
shell commands



Loadleveler Job Script I

```
#!/bin/sh
#@ job_type = parallel
#@ output = $(jobid).out
#@ error = $(jobid).err
#@ notification = error
#@ notify_user = youremail@domain
#@ class = checkpoint
#@ wall_clock_limit = 24:00:00
#@ node_usage = shared
#@ node = 2,2
#@ total_tasks = 16
#@ requirements = (Arch == "POWER5")
#@ environment = COPY_ALL
#@ queue
```

```
<shell commands>
poe <path_to_executable> <options>
<shell commands>
```

Shell being used
Job Type
standard output
standard error
notify on error
to mail address
job queue
max walltime
node usage
of nodes
total processors
job requirements
environment

shell commands
run parallel job
shell commands



Loadleveler Job Script II

```
#!/bin/sh
#@ job_type = serial
#@ output = $(jobid).out
#@ error = $(jobid).err
#@ notification = error
#@ notify_user = youremail@domain
#@ class = checkpoint
#@ wall_clock_limit = 24:00:00
#@ node_usage = shared
#@ node = 1
#@ total_tasks = 1
#@ requirements = (Arch == "POWER5")
#@ environment = COPY_ALL
#@ queue
```

```
<shell commands>
<path_to_executable> <options>
<shell commands>
```

Shell being used
Job Type
standard output
standard error
notify on error
to mail address
job queue
max walltime
node usage
of nodes
total processors
job requirements
environment

shell commands
run parallel job
shell commands



- On Pandora:

- `#@ resources = ConsumableMem(512 mb)`
`ConsumableCPUS(1)` **is required**
- `#@ requirements = (Arch == "POWER7")`
- `#@ network.MPI_LAPI = sn_all,shared,US,HIGH`



Linux Clusters

- `showstart <job id>`
 - ◆ Check estimated time when job can start
- When can the estimated time change
 - ◆ Higher priority job gets submitted
 - ◆ Running jobs terminate earlier than time requested
 - ◆ System has trouble starting your job
- `qstat <options> <job id>`
 - ◆ Show information on job status
 - ◆ All jobs displayed if `<job id>` is omitted
 - ◆ `qstat -u <username>`: Show jobs belonging to `<username>`
 - ◆ `qstat -a <job id>`: Display in an alternative format
- `qshow <job id>`
 - ◆ Show information of running job `<job id>`: node running on and CPU load



AIX Clusters

- `llq <options> <job id>`
 - ◆ All jobs are displayed if `<job id>` is omitted
 - ◆ Display detailed information: `llq -l <job id>`
 - ◆ Check estimated start time: `llq -s <job id>`
 - ◆ Show jobs from a specific user: `llq -u <username>`

```
apacheco@l3f1n03$ llq
```

Id	Owner	Submitted	ST	PRI	Class	Running on
l3f1n03.14904.0	huiwu	7/16 15:45	R	50	checkpt	l3f1n09
l3f1n03.14908.0	srick	7/18 10:15	R	50	checkpt	l3f1n13
l3f1n03.14909.0	srick	7/18 10:18	R	50	checkpt	l3f1n04
l3f1n03.14911.0	huiwu	7/19 13:48	R	50	checkpt	l3f1n11
l3f1n03.14910.0	srick	7/18 10:18	R	50	checkpt	l3f1n06

```
5 job step(s) in queue, 0 waiting, 0 pending, 5 running, 0 held, 0 preempted
```



AIX Clusters

- `showllstatus.py`: Show job status and node running on

```
apacheco@peg304$ showllstatus.py
```

Node	Status	Load	Arch	Node	Status	Load	Arch
ian1	Idle	1.02	Power4	pen09	Busy	16.28	Power5
pen01	Run	4.08	Power5	pen10	Busy	16.33	Power5
pen02	Run	2.01	Power5	pen11	Idle	0.00	Power5
pen03	Run	4.50	Power5	pen12	Idle	0.00	Power5
pen04	Run	7.04	Power5	pen13	Busy	16.21	Power5
pen05	Run	3.99	Power5	pen14	Run	2.50	Power5
pen06	Busy	16.30	Power5	pen15	Idle	0.00	Power5
pen07	Run	2.00	Power5	pen16	Idle	0.00	Power5
pen08	Run	4.07	Power5				

Step	ID	Owner	Status	Class	Hosts	Queue	Date	Disp.	Date
ian1.97678.0		nserno	R	MP5L	1	07/19 11:19	07/19 11:19		
ian1.97677.0		nserno	R	MP5L	1	07/19 11:16	07/19 11:16		
ian1.97672.0		cmcfer1	R	MP5L	1	07/19 08:38	07/19 08:38		
ian1.97650.0		nserno	R	MP5L	1	07/18 13:30	07/18 13:30		
ian1.97647.0		yuzhiyi	R	MP5L	4	07/18 10:27	07/18 10:27		
ian1.97646.0		jgibs22	R	MP5L	1	07/18 10:09	07/18 10:09		
ian1.97645.0		nserno	R	MP5L	1	07/17 13:20	07/17 21:40		
ian1.97644.0		nserno	R	MP5L	1	07/17 13:20	07/17 17:20		
ian1.97643.0		nserno	R	MP5L	1	07/17 13:20	07/17 16:51		



Linux Clusters

- `qdel <job id>`
 - ◆ Cancel a running or queued job
- `qhold <job id>`
 - ◆ Put a queued job on hold
- `qrls <job id>`
 - ◆ Resume a held job

AIX Clusters

- `llcancel <job id>`
 - ◆ Cancel a running or queued job
- `llhold <job id>`
 - ◆ Put a queued job on hold
- `llhold -r <job id>`
 - ◆ Resume a held job



- User's Guide

- ◆ HPC: <http://www.hpc.lsu.edu/help>
- ◆ LONI: https://docs.loni.org/wiki/Main_Page

- Contact us

- ◆ Email ticket system: sys-help@loni.org
- ◆ Telephone Help Desk: 225-578-0900
- ◆ Walk-in consulting session at Middleton Library
 - ★ Tuesdays and Thursdays only
- ◆ Instant Messenger (AIM, Yahoo Messenger, Google Talk)
 - ★ Add "lsuhpchelp"



Using qsub with advanced reservation

```
qsub -W x=FLAGS:ADVRES:{reservation name}
```

