

AI Cluster - Slurm

Cluster is up and running now. Anyone with a CS account who wishes to test it out should do so.

Feedback is requested:

#ai-cluster Discord channel or email Phil Kauffman (kauffman@cs dot uchicago dot edu).

Knowledge of how to use Slurm already is preferred at this stage of testing.

TODO

Since I'm still working on it, I don't guarantee any uptime yet. Mainly I need to make sure TRES tracking is working like we want. This will involve restarting slurmd and slurmctld which will kill running jobs.

- generate report of storage usage
- groups (Slurm 'Accounts') created for PI's.
 - e.g. ericj_group: ericj, user1, user1, etc
- grab QOS data from somewhere (gsheet or some kind of DB)
- Properly deploy sync script
 - Systemd unit
 - main loop
- research on slurm plugin to force GRES selection on job submit. Might be able to use:
 - SallocDefaultCommand
 - Otherwise look for 'AccountingStorageTRES' and 'JobSubmitPlugins' and /etc/slurm-llnl/job_submit.lua ← used to force user to specify '-gres'.
 - jobs that do not specify a specific gpu type (e.g. gpu:rtx8000 or gpu:rtx2080ti) could be counted against either one but not specifically the you actually used.
 - From 'AccountingStorageTRES' in slurm.conf: "Given a configuration of "AccountingStorageTRES=gres/gpu:tesla,gres/gpu:volta" Then "gres/gpu:tesla" and "gres/gpu:volta" will track jobs that explicitly request those GPU types. If a job requests GPUs, but does not explicitly specify the GPU type, then its resource allocation will be accounted for as either "gres/gpu:tesla" or "gres/gpu:volta", although the accounting may not match the actual GPU type allocated to the job and the GPUs allocated to the job could be heterogeneous. In an environment containing various GPU types, use of a job_submit plugin may be desired in order to force jobs to explicitly specify some GPU type."
- ganglia for Slurm: <http://ai-mgmt2.ai.cs.uchicago.edu>
 - figure why summary view is no longer a thing.
- update 'coolgpus'. Lose VTs when this is running.
 - coolgpus: sets fan speeds of all gpus in system.
 - Goal is to statically set fan speeds to 80%. The only way to do this is with fake Xservers... but that means you lose all the VTs. Is this a compromise I'm willing to make? It is.
- home directory
 - setup backups for home dirs
 - default quota
 - home directory usage report

Demo

kauffman3 is my test CS account.

```
$ ssh kauffman3@fe.ai.cs.uchicago.edu
```

I've created a couple scripts that run some of the Slurm commands but with more useful output. cs-sinfo and cs-squeue being the only two right now.

```
kauffman3@fe01:~$ cs-sinfo
NODELIST      NODES  PARTITION  STATE  CPUS  S:C:T  MEMORY  TMP_DISK  WEIGHT
AVAIL_FEATURES      REASON  GRES
a[001-006]    6      geforce*  idle   64    2:16:2  190000  0          1
'turing,geforce,rtx2080ti,11g' none    gpu:rtx2080ti:4
a[007-008]    2      quadro   idle   64    2:16:2  383000  0          1
'turing,quadro,rtx8000,48g'  none    gpu:rtx8000:4
```

```
kauffman3@fe01:~$ cs-squeue
JOBID  PARTITION  USER      NAME      NODELIST
TRES_PER_NSTATE  TIME
```

List the device number of the devices I've requested from Slurm. # These numbers map to /dev/nvidia?

```
kauffman3@fe01:~$ cat ./show_cuda_devices.sh
#!/bin/bash
hostname
echo $CUDA_VISIBLE_DEVICES
```

Give me all four GPUs on systems 1-6

```
kauffman3@fe01:~$ srun -p geforce --gres=gpu:4 -w a[001-006]
./show_cuda_devices.sh
a001
0,1,2,3
a002
0,1,2,3
a006
0,1,2,3
a005
0,1,2,3
a004
0,1,2,3
a003
0,1,2,3
```

give me all GPUs on systems 7-8 # these are the Quadro RTX 8000s

```
kauffman3@fe01:~$ srun -p quadro --gres=gpu:4 -w a[007-008]
./show_cuda_devices.sh
a008
0,1,2,3
a007
0,1,2,3
```

Fairshare

Check out the fairshare values

```
kauffman3@fe01:~$ sshare --long --accounts=kauffman3,kauffman4 --
users=kauffman3,kauffman4
```

	Account	User	RawShares	NormShares	RawUsage	NormUsage
EffectvUsage	FairShare	LevelFS	GrpTRESMins	TRESRunMins		

kauffman3			1	0.000094	428	1.000000
1.000000	0.000094	cpu=475,mem=2807810,energy=0,+				
kauffman3	kauffman3		1	1.000000	428	1.000000
1.000000	0.000094	1.000000	cpu=475,mem=2807810,energy=0,+			
kauffman4			1	0.000094	0	0.000000
0.000000		inf	cpu=0,mem=0,energy=0,node=0,b+			
kauffman4	kauffman4		1	1.000000	0	0.000000
0.000000	1.000000	inf	cpu=0,mem=0,energy=0,node=0,b+			

We are using the FairTree (fairshare algorithm). This is the default in Slurm these days and from what I can tell probably better suits our needs. It is no big deal to change to classic fairshare.

As the system exists now. One Account per User.

```
Account: kauffman
Member: kauffman
User: kauffman
```

We will probably assign fairshare points to accounts, not users.

Storage

```
/net/scratch:
    Create yourself a directory /net/scratch/$USER. Use it for whatever you
    want.
```

```
/net/projects:
    Lives on the home directory server.
```

Idea would be to create a dataset with a quota for people to use.
Normal LDAP groups that you are used to and available everywhere else
would control access to these directories.
e.g. jonaslab, sandlab

Currently there is no quota on home directories. This is set per user per dataset.

I was able to get homes and scratch each connected via 2x 25G. Both are SSD only so the storage should be FAST.

Each compute node (nodes with gpus) has a zfs mirror mounted at /local I set compression to lz4 by default. Usually this has a performance gain as less data is read and written to disk with a small overhead in CPU usage. As of right now there is no mechanism to clean up /local. At some point I'll probably put a find command in cron that deletes files older than 90 days or so.

Asked Questions

Do we have a max job runtime?

Yes. 4 hours. This is done per partition.

```
PartitionName=geforce Nodes=a[001-006] Default=YES DefMemPerCPU=2900  
MaxTime=04:00:00 State=UP Shared  
=YES  
PartitionName=quadro Nodes=a[007-008] Default=NO DefMemPerCPU=5900  
MaxTime=04:00:00 State=UP Shared=  
YES
```

You can take a look at all the values we set here:

```
fe0[1,2]$ cat /etc/slurm-llnl/slurm.conf
```

The man page: <https://slurm.schedmd.com/slurm.conf.html>

From:

<https://howto.cs.uchicago.edu/> - **How do I?**

Permanent link:

<https://howto.cs.uchicago.edu/techstaff:aicluster?rev=1605115898>

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