



ilifu Online Training

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Inter-University Institute
for Data Intensive Astronomy

**WESTERN SYDNEY
UNIVERSITY**

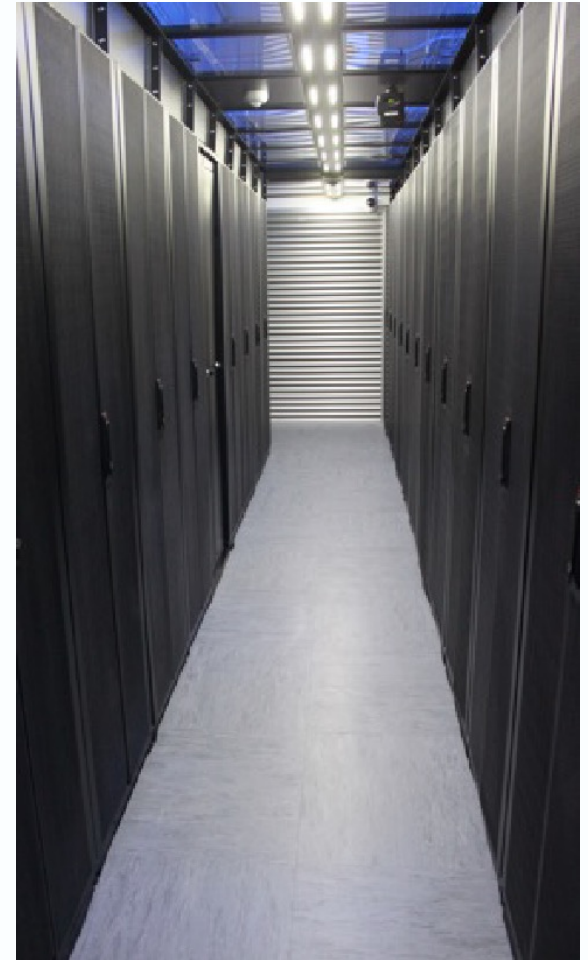


ilifu: from laptop to VM to cluster



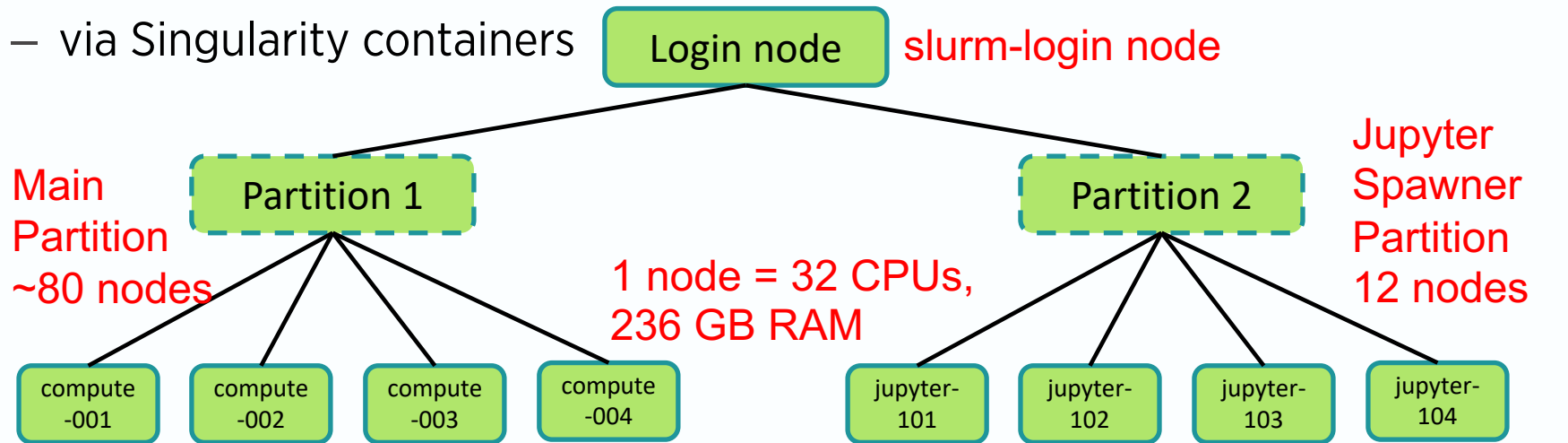
ilifu

- ilifu (<http://ilifu.ac.za>)
 - Tier 2 Data Intensive Research Facility
 - Joint Cloud Platform for Astronomy and Bioinformatics
 - Cluster w/ ~85 nodes (32 CPUs, 256/512 GB)
 - ~6 PB usable storage (BeeGFS & CephFS)
 - 10 Gb/s network to South African National Research Network (SANReN)



SLURM

- http://docs.ilifu.ac.za/#/getting_started/submit_job_slurm
- Login node (job submission & management)
 - where you land when you log in (also known as “head node”)
 - run SLURM commands/submit jobs, but not software/heavy processes
- Compute nodes
 - Where your processes run (also known as “worker nodes”)
 - via Singularity containers



SLURM

- http://docs.ilifu.ac.za/#/getting_started/submit_job_slurm
- `ssh <username>@slurm.ilifu.ac.za`
- <https://jupyter.ilifu.ac.za>
- Partitions: Main (~80 nodes), HighMem (2), GPU (4), Jupyter (12)

ssh – shell terminal

JupyterHub

```
* Support: https://ubuntu.com/advantage

System information as of Fri Aug 23 11:36:57 SAST 2019

System load: 0.49      Users logged in: 8
Usage of /: 35.9% of 21.15GB IP address for ens3: 192.168.100.39
Memory usage: 5%      IP address for ens4: 10.102.26.97
Swap usage: 0%        IP address for ens5: 10.102.28.133
Processes: 396

* Keen to learn Istio? It's included in the single-package MicroK8s.
https://snapcraft.io/microk8s

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

* Canonical Livepatch is available for installation.
- Reduce system reboots and improve kernel security. Activate at:
https://ubuntu.com/livepatch

170 packages can be updated.
75 updates are security updates.

Last login: Fri Aug 23 09:08:21 2019 from 196.11.235.232
jeremy@slurm-login:~$ sinfo
PARTITION AVAIL TIMELIMIT NODES STATE MODELIST
Main*      up 14-00:00:0 8 mix slwrk-[106-113]
Main*      up 14-00:00:0 14 alloc slwrk-[101,104-105,114-124]
Main*      up 14-00:00:0 38 idle slwrk-[102-103,125-160]
JupyterSpawnerONLY up infinite 4 mix slwrk-[201-202,205,209]
JupyterSpawnerONLY up infinite 4 alloc slwrk-[206-208,210]
JupyterSpawnerONLY up infinite 2 idle slwrk-[203-204]
jeremy@slurm-login:~$ sbatch compute_job.sh
```

Login node

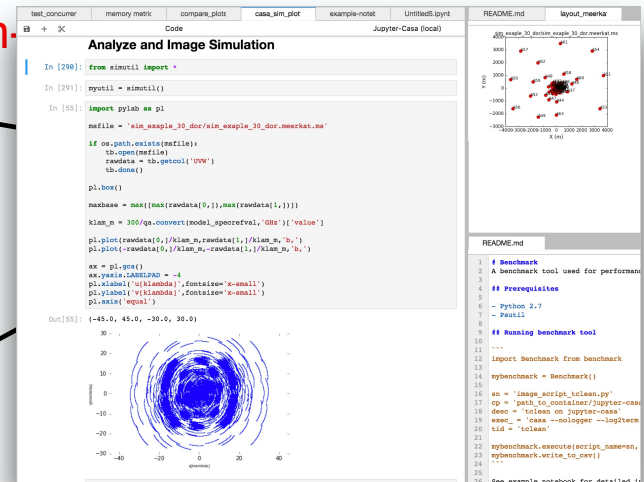
slurm

1 node = 32 CPUs,
236 GB RAM

slwrk-104

slwrk-201

...



SLURM – user commands

- <https://slurm.schedmd.com/>

\$ sinfo #shows partitions and resources

\$ squeue #shows all jobs in SLURM queue

\$ squeue -u <username> #shows your jobs

\$ sbatch slurm_job_script.sh #submit job to SLURM queue

\$ sbatch --help #describes input parameters

\$ scancel <jobid> #cancels job

\$ sacct #shows status of recent jobs that have run, or are running

SLURM – running a job

```
$ cat slurm_job_script.sh

#!/bin/bash

#SBATCH --job-name=demo_job

#SBATCH --time=00:01:00

#SBATCH --mem=4GB

#SBATCH --output=demo-job-%j.out

#SBATCH --error=demo-job-%j.err

#SBATCH --account=b03-idia-ag


module load python/3.7.7

python myscript.py


$ sbatch slurm_job_script.sh #submit job to SLURM queue
```

SLURM – running a job

```
$ cat slurm_job_script.sh
```

```
#!/bin/bash
```

```
#SBATCH --job-name=demo_casa
```

```
#SBATCH --time=01:00:00
```

```
#SBATCH --mem=4GB
```

```
#SBATCH --output=demo-job-%j.out
```

```
#SBATCH --error=demo-job-%j.err
```

```
#SBATCH --account=b03-ida-ag
```

Describe job
parameters/resources

```
echo "Submitting demo SLURM job"
```

```
singularity exec /ida/software/containers/casa-stable-5.7.0.simg casa -c myscript.py
```

container software script



```
$ sbatch slurm_job_script.sh #submit job to SLURM queue
```

what's being executed with
above parameters

SLURM – running a job

```
$ cat slurm_job_script.sh

#!/bin/bash

#SBATCH --job-name=demo_casa

#SBATCH --time=01:00:00

#SBATCH --mem=4GB

#SBATCH --output=demo-job-%j.out

#SBATCH --error=demo-job-%j.err

#SBATCH --account=b03-idia-ag


module load casa/5.7.0

casapy -c myscript.py


$ sbatch slurm_job_script.sh #submit job to SLURM queue
```

SLURM – running an interactive job

- http://docs.ilifu.ac.za/#/getting_started/submit_job_slurm?id=interactive-slurm-session

```
$ srun --pty bash #opens bash shell session on compute  
#node with default 3 hours and ~7GB RAM
```

```
$ srun --pty --time=01:00:00 --mem=64GB singularity exec  
/idia/software/containers/casa-stable.img casa
```

```
#opens interactive CASA session on compute node,  
#with 1 hour walltime, 64GB RAM,  
#using Singularity CASA container
```

```
$ srun --help
```

```
#view srun help docs for input parameters
```

SLURM – running an interactive job

- With X11 support for viewing GUI

```
$ ssh -Y <username>@slurm.ilifu.ac.za
```

#important to include the -Y parameters when logging into the SLURM login node, for X-forwarding

```
$ srun --x11 --pty bash
```

#opens bash shell session on compute node
#with X11 support; default 3 hours, ~7GB RAM

```
$ srun --x11 --pty --time=00:10:00 --mem=1GB --qos qos-interactive bash
```

Demo Time!

Best practices

- Don't run software / heavy processes / scp on the login node
 - Only submit jobs and run SLURM commands (sbatch, srun, squeue, etc)
 - Use transfer.ilifu.ac.za to transfer data (external/internal), not login node
- Before running a large job, identify the available resources
 - Use sinfo. Don't hog the cluster. Reduce your allocation if possible
 - Increase likelihood of jobs running with less memory and less walltime
- Use sbatch (srun / screen / tmux are volatile)
- Cleanup files that aren't needed
 - Old raw data, temporary products, scratch data, etc
- Don't place large files in your home directory (/users)
- Use Singularity (you cannot install software on the nodes)

THANK YOU

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