

Cluster Computing



Goals

- ❑ Familiarize you with cluster computing concepts
- ❑ Explain terminology
- ❑ Provide a basis for grid computing

Scaling up VS. scaling out

- ❑ **Scaling up: using a single, larger computer**

- ❑ **Scaling out: using multiple 'small' computers**

Scaling out using multiple machines

- ❑ **Scaling up an application using multiple machines to get results in a reasonable amount of time**
- ❑ **First step: just adding multiple machines**

Batch schedulers

- ❑ Spreading load across machines
- ❑ Prioritization & queuing
- ❑ Accounting & monitoring
- ❑ Tasks dependencies

Animation of cluster with scheduling software

- ❑ <http://mooc-inst.sara.cloudlet.sara.nl/mooc/cluster.html>

Batch scheduler implementations

- Torque & Maui
- Sun Grid Engine
- Condor
- ...

Hello world

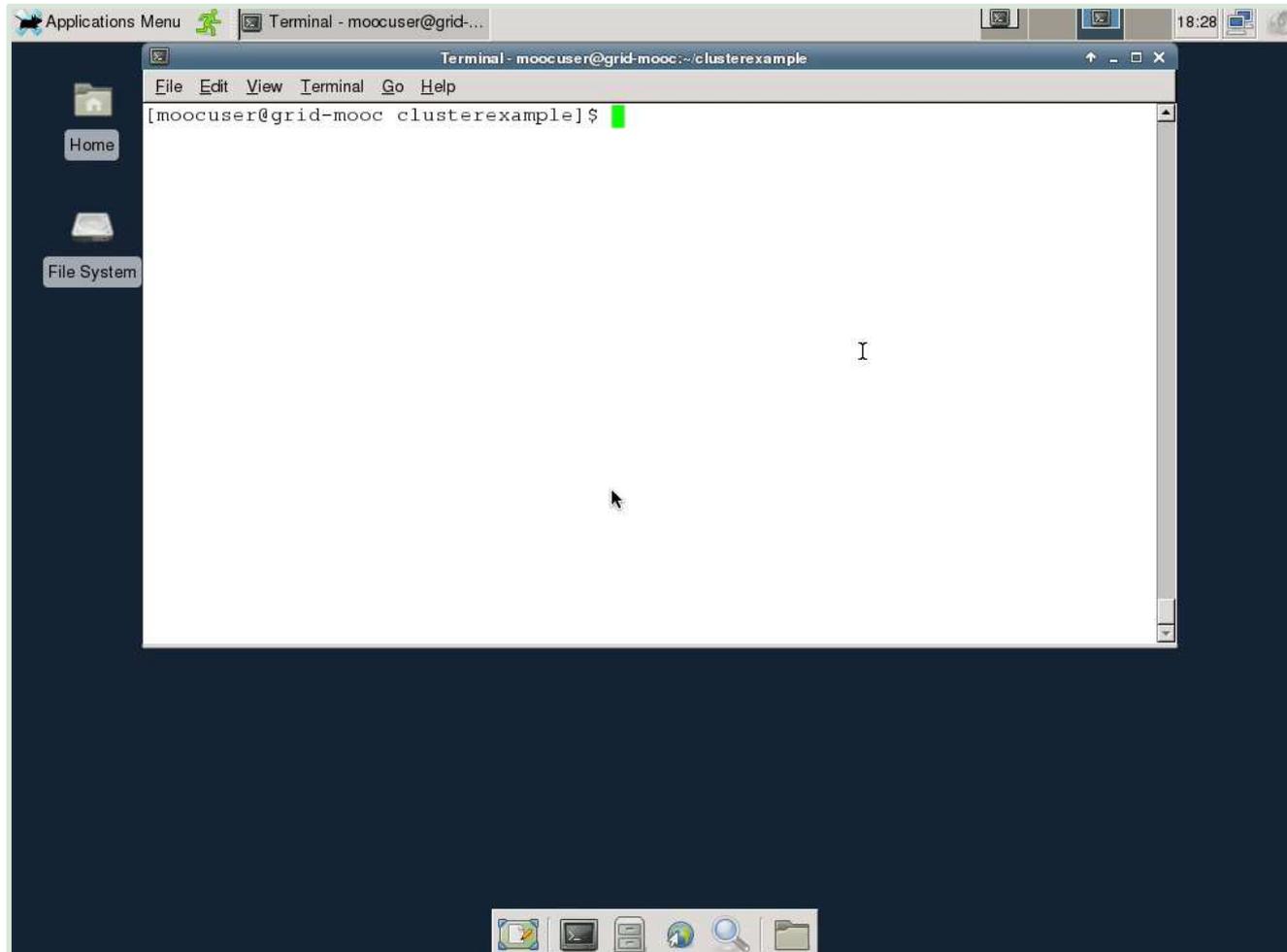
Script helloworld.sh:

```
#PBS -lwalltime=00:01:00
```

```
echo "hello world"
```

```
hostname
```

Cluster Example



Submitting multiple jobs

```
qsub -t 1-4 helloworld.sh
```

Tutorials

- ❑ [Cluster resources](#)
- ❑ [NYU](#)

Discussion

□ You should now be able to

- Write small pbs scripts
- Submit jobs
- Check job status
- Inspect job output