

The DiRAC logo consists of a white circle containing the text "DiRAC" in a bold, red, sans-serif font. This circle is centered within a larger, semi-transparent red circle. The background of the slide is a solid red color with a subtle pattern of concentric circles and several smaller, semi-transparent circles of varying sizes scattered across the right side.

DiRAC

Introduction to Job Scheduling

Background and Introduction

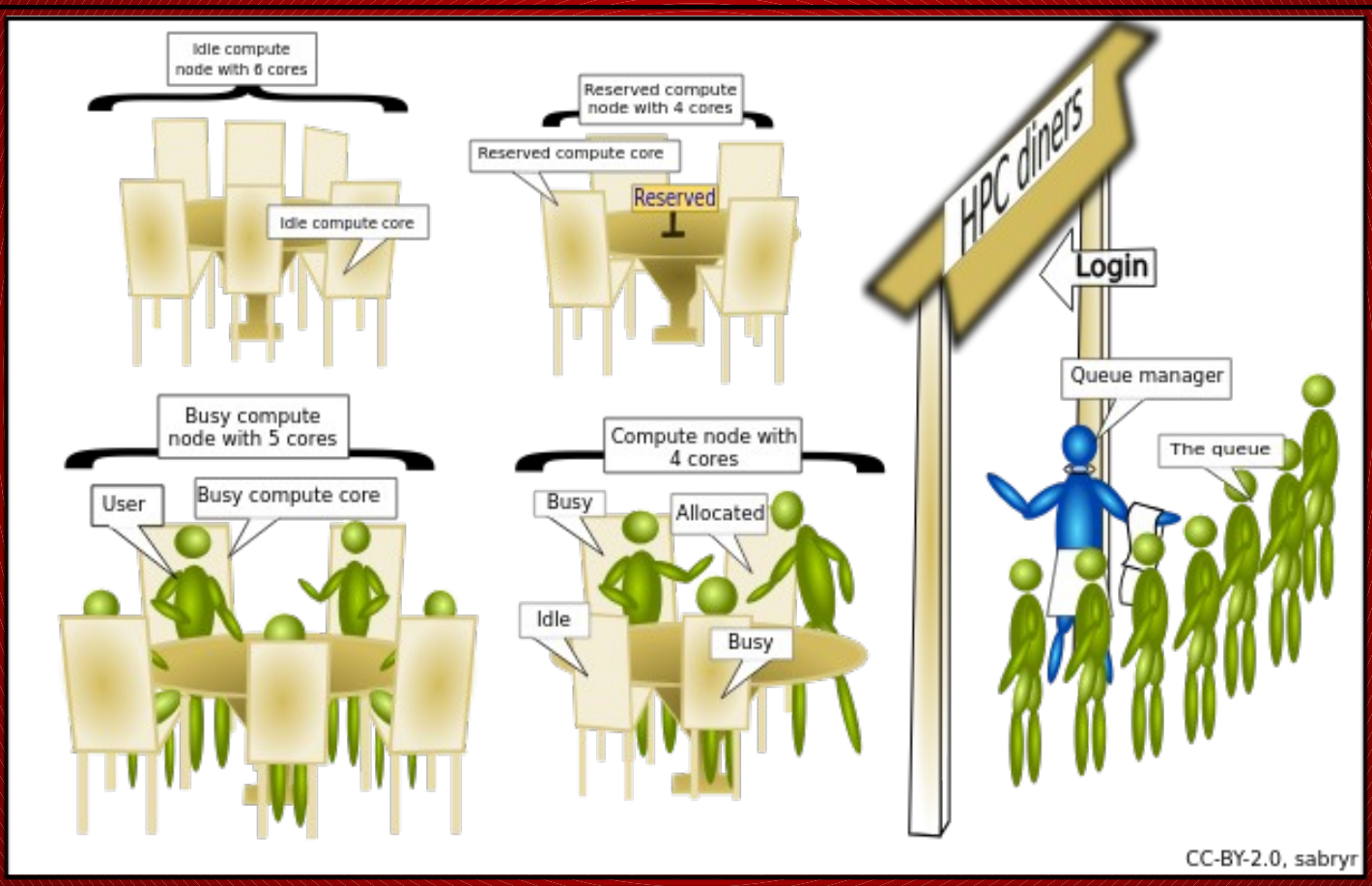
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Learning Objectives

- Describe briefly what a job scheduler does
- Recap the fundamentals of Slurm job submission and monitoring
- Use Slurm and SAFE to determine the submission parameters to use to submit a job
- Summarise the main ways researchers may request time on a DiRAC facility

Job Scheduling: A Recap

The General Idea



Submission Fundamentals

- Essential commands
 - **sbatch** - submit a job
 - **squeue** - query job status
- Job scripts
 - Written using Bash shell
 - Runs *something*
 - **#SBATCH** lines - job parameters to Slurm

```
$ sbatch basic-script.sh
Submitted batch job 6485195
$ squeue -j 6485195
...
```

```
#!/bin/bash
#SBATCH --account=yourAccount
#SBATCH --partition=aPartition
#SBATCH --nodes=1
#SBATCH --time=00:00:30

date
```

Account and Partition

- **--account** - where resources used by this job will be charged
 - Not your machine login or SAFE username - it's a project account
 - Project accounts assigned allocation of resources (e.g. CPU, disk space)
 - See project accounts in your DiRAC SAFE account (under **Projects**)
- **--partition** - resources split across partitions (or queues)
 - Represents a (somewhat) ordered list of jobs
 - e.g. for a specific resource, or a class of priority

Exploring Partitions

```
$ sinfo -s
```

PARTITION	AVAIL	TIMELIMIT	NODES(A/I/O/T)	NODELIST
cosma7	up	3-00:00:00	80/137/7/224	m[7229-7452]
cosma7-pauper	up	1-00:00:00	80/137/7/224	m[7229-7452]
cosma7-shm	up	3-00:00:00	0/1/0/1	mad02
cosma7-shm-pauper	up	1-00:00:00	0/1/0/1	mad02
cosma7-bench	up	1-00:00:00	0/0/1/1	m7452
cosma7-rp	up	3-00:00:00	82/140/2/224	m[7001-7224]
cosma7-rp-pauper*	up	1-00:00:00	82/140/2/224	m[7001-7224]

- In particular
 - **TIMELIMIT** - maximum time limit for jobs on a queue
 - **NODELIST** - nodes assigned to each partition
 - * - indicates default queue

Queues on Other Sites

- Edinburgh's Tursa
 - **cpu** and **gpu** queues
 - Plus other gpu-specific queues
- Cambridge's CSD
 - Number of queues for different CPU and GPU architectures
 - e.g. **cclake**, **icelake**, **sapphire**, and **ampere**
- Leicester's DiAL3
 - Two queues named slurm and devel
 - **slurm** - main HPC resource
 - **devel** - development or testing use (i.e. short running jobs)

Which Accounts have Access?

```
$ scontrol show partition=cosma7
PartitionName=cosma7
AllowGroups=cosma7 AllowAccounts=do009, dp004, dp012, dp050, dp058, ... AllowQos=ALL
AllocNodes=ALL Default=NO QoS=N/A
DefaultTime=NONE DisableRootJobs=NO ExclusiveUser=NO GraceTime=0 Hidden=NO
MaxNodes=UNLIMITED MaxTime=3-00:00:00 MinNodes=0 LLN=NO MaxCPUsPerNode=UNLIMITED
Nodes=m[7229-7449]
```

- **AllowAccounts** - those that have access to this queue

Submitting our Job

- e.g. on Tursa...
- Submit using **sbatch**
- Query status using **squeue**

```
#!/bin/bash
#SBATCH --account=abc1234
#SBATCH --partition=cpu
#SBATCH --qos=standard
#SBATCH --nodes=1
#SBATCH --time=00:00:30

date
```

```
$ sbatch basic-script.sh
Submitted batch job 21501
$ squeue -j 21501
```

	JOBID	PARTITION	NAME	USER	ST	TIME	NODES	
NODELIST(REASON)								
	21502	cpu	basic-sc	username	R	0:01	1	tu-c0r0n66

DiRAC Project Allocations

Obtaining an Allocation

- Managed through STFC's independent Resource Allocation Committee (RAC)
- Number of request mechanisms:
 - **Call for Proposals** - annual invitation to UK theory and modelling communities
 - Scientific, technical, or Research Software Engineer (RSE) support time
 - **Director's Discretionary Award**
 - Invitation to apply for discretionary allocations
 - If you find you are using code at larger scale than previously

<https://dirac.ac.uk/getting-access/>

Acknowledgements

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www.software.ac.uk