



# Job Management

DIRAC Project



# Overview

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- ▶ DIRAC JDL
- ▶ DIRAC Commands
- ▶ Tutorial Exercises
- ▶ What do you have learned?



# Job Description Language (JDL)

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- ▶ JDL is the language used to specify the characteristics and resources required by the job.
- ▶ For example:
  - ▶ Executable to run and its parameters.
  - ▶ Files to be moved to and from the Worker Node
    - ▶ Input files
    - ▶ Grid files
  - ▶ and any requirements.



# Differences with gLite JDLs

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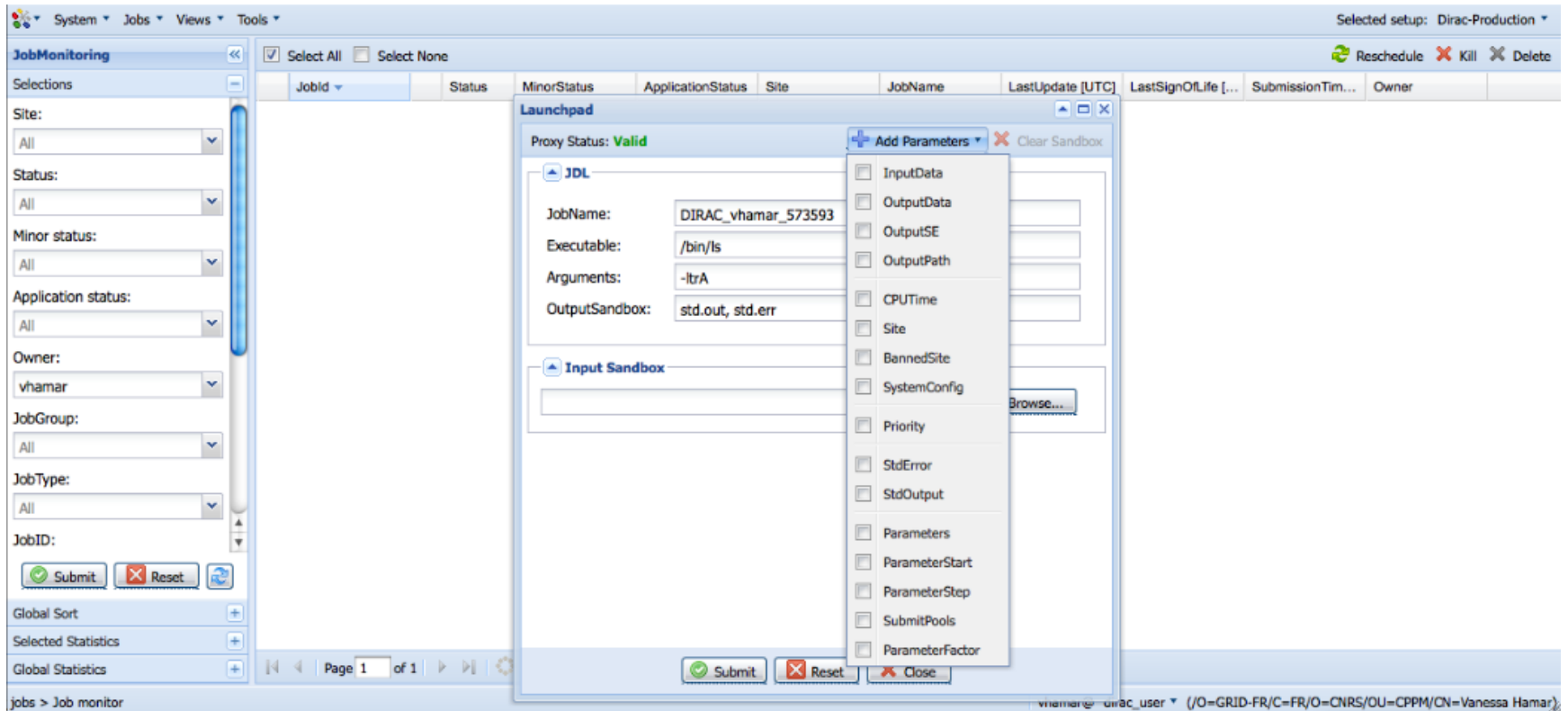
- ▶ DIRAC is not using JDLs internally, DIRAC transforms the user JDL to DIRAC internal conventions.
  - ▶ Using DIRAC specific matching mechanism for job to resources mapping
- ▶ Not all the JDLs attributes are allowed in DIRAC.
  - ▶ In particular, there is no Requirements JDL attribute.
- ▶ Some attributes are interpreted as requirements
  - ▶ E.g. Site, CPUTime

- ▶ The JDL syntax consists of statements ended by a semicolon, like:

```
attribute = value;
```

- ▶ Literal strings (for values) are enclosed in double quotes.

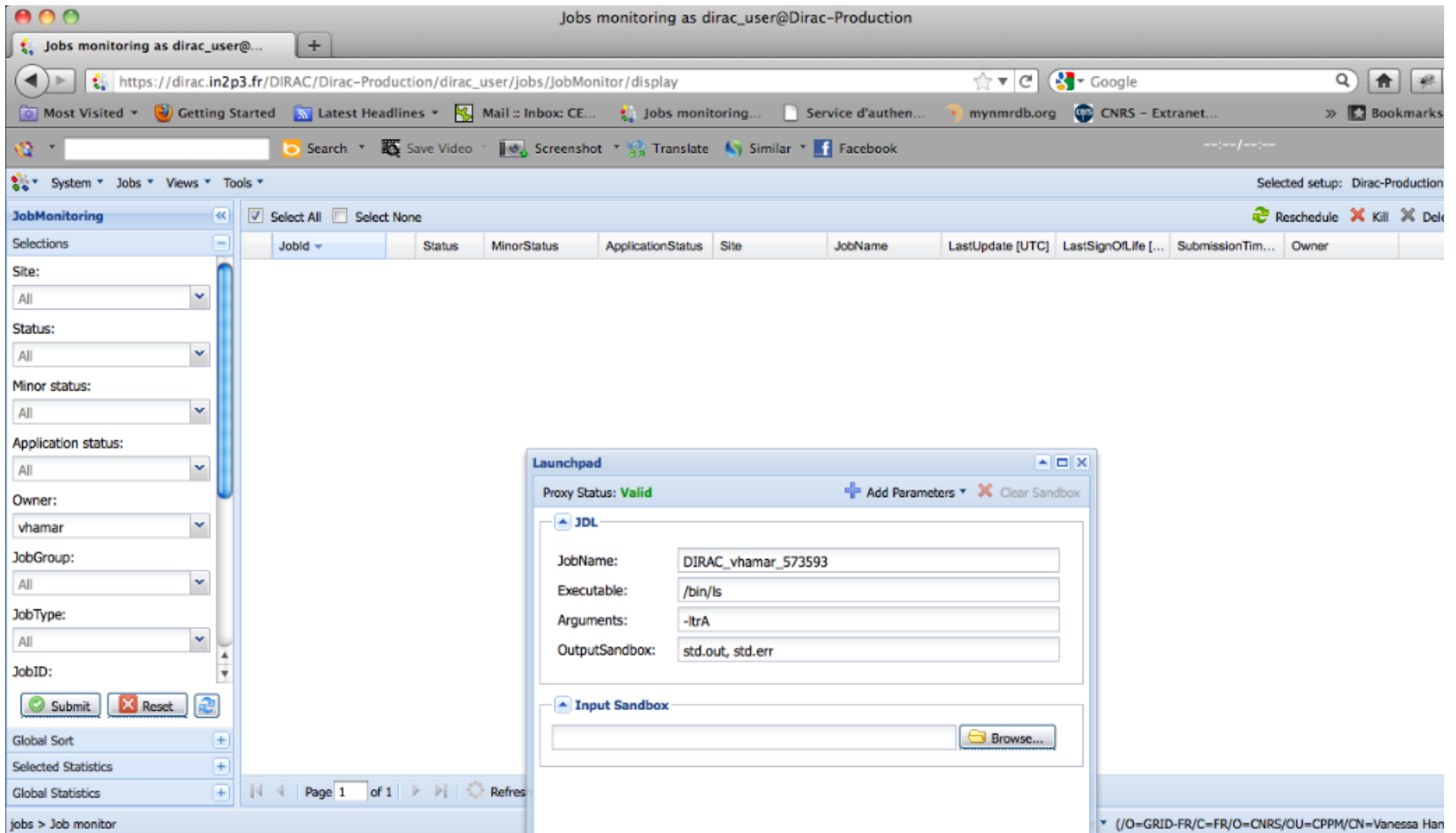
```
Site = "LCG.CPPM.fr";
```



The screenshot displays the DIRAC Job Monitoring web interface. On the left, the 'JobMonitoring' sidebar includes filters for Site, Status, Minor status, Application status, Owner, JobGroup, JobType, and JobID, along with 'Submit', 'Reset', and 'Global Sort' buttons. The main area shows a table of jobs with columns: JobId, Status, MinorStatus, ApplicationStatus, Site, JobName, LastUpdate [UTC], LastSignOfLife [...], SubmissionTim..., and Owner. A 'Launchpad' window is open, showing a 'Proxy Status: Valid' and a 'JDL' configuration for job 'DIRAC\_vhamar\_573593'. The JDL configuration includes: Executable: /bin/lis, Arguments: -ltrA, and OutputSandbox: std.out, std.err. An 'Add Parameters' dropdown menu is open, listing various parameters such as InputData, OutputData, OutputSE, OutputPath, CPUTime, Site, BannedSite, SystemConfig, Priority, StdError, StdOutput, Parameters, ParameterStart, ParameterStep, SubmitPools, and ParameterFactor. The bottom status bar shows the user 'vhamar@dirac\_user' and the path '/O=GRID-FR/C=FR/O=CNRS/OU=CPPM/CN=Vanessa Hamar'.

```
JobName = "Simple_Job";  
Executable = "/bin/ls"; *  
Arguments = "-ltr";  
StdOutput = "StdOut"; *  
StdError = "StdErr"; *  
OutputSandbox = {"StdOut", "StdErr"}; *
```

\* Mandatory attributes



The screenshot displays the DIRAC Job Monitoring web interface. The browser window title is "Jobs monitoring as dirac\_user@Dirac-Production". The URL is `https://dirac.in2p3.fr/DIRAC/Dirac-Production/dirac_user/jobs/JobMonitor/display`. The interface includes a navigation menu with "System", "Jobs", "Views", and "Tools". The "Jobs" section is active, showing a table of jobs with columns: JobID, Status, MinorStatus, ApplicationStatus, Site, JobName, LastUpdate [UTC], LastSignOffLife [...], SubmissionTim..., and Owner. On the left, there are filters for Site, Status, Minor status, Application status, Owner, JobGroup, JobType, and JobID. A "Launchpad" window is open, showing the configuration for a job named "DIRAC\_vhamar\_573593". The configuration includes the Executable `/bin/lis`, Arguments `-ltrA`, and OutputSandbox `std.out, std.err`. The "Input Sandbox" section is also visible with a "Browse..." button. The bottom status bar shows "Page 1 of 1" and a "Refresh" button.



- ▶ Sandbox files are stored in the DIRAC Workload Management Service and are only available for the time of life of the corresponding job.
  - ▶ Volatile storage.
  - ▶ Some grace period, typically 1 week for keeping sandboxes to allow their retrieval.
- ▶ Data are stored in the Grid Storage
  - ▶ Permanent storage
- ▶ The size of the Sandboxes is limited to ~10MG per job
  - ▶ Submitting a job with a large sandbox will result as an error
  - ▶ Large output sandboxes are stored in the Grid Storage
    - ▶ This is the user responsibility to clean up this storage



# Example

## Input and Output Sandbox

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### ► Simple.jdl

```
Executable = "testJob.sh";  
StdOutput = "StdOut";  
StdError = "StdErr";  
InputSandbox = {"testJob.sh"};  
OutputSandbox = {"StdOut", "StdErr"};
```

---

### ► testJob.sh

```
#!/bin/bash  
/bin/hostname  
/bin/date
```



# Example

## Input and Output Data

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### ▶ testJob.jdl

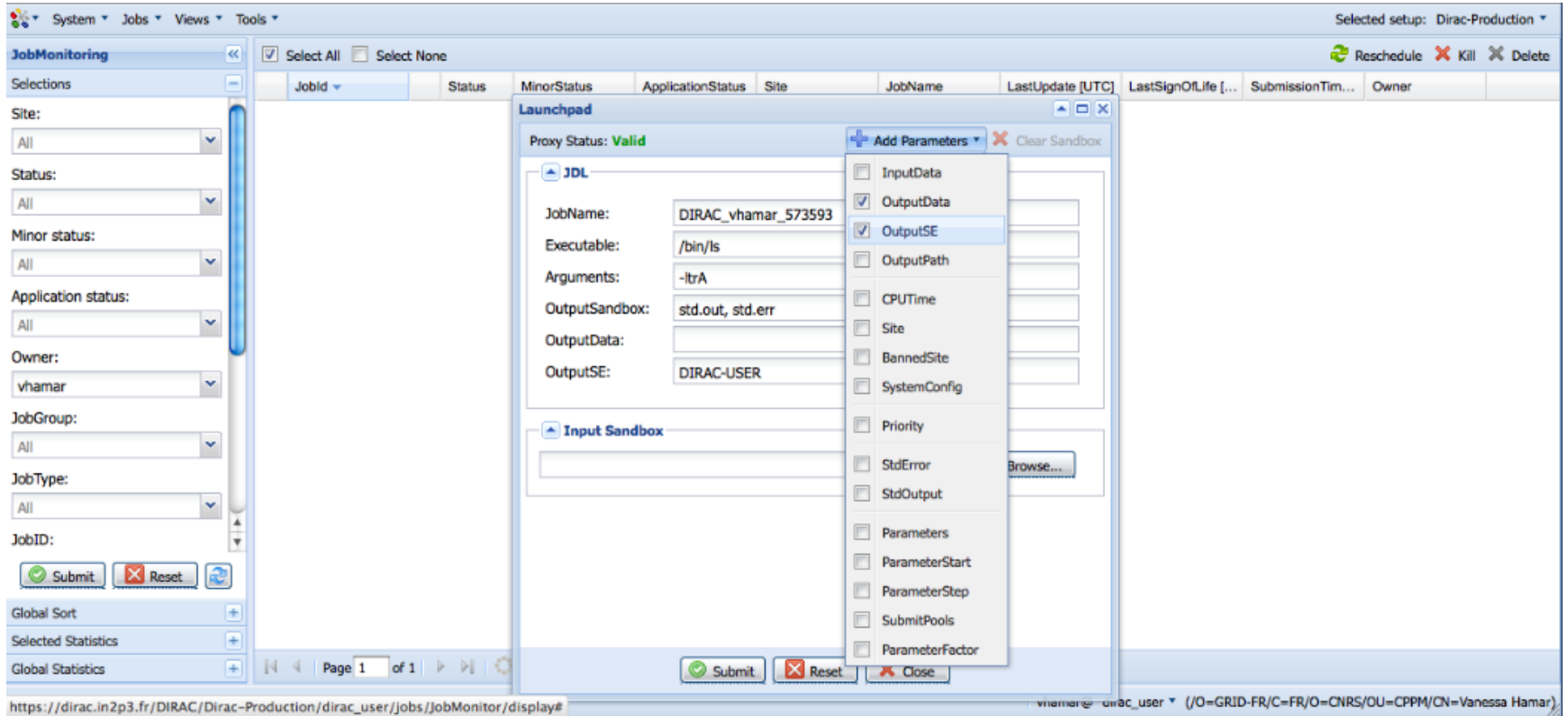
```
Executable = "testJob.sh";  
StdOutput = "StdOut";  
StdError = "StdErr";  
InputSandbox = {"testJob.sh", "LFN:/  
    vo.formation.idgrilles.fr/user/v/vhamar/  
    test.txt"};  
OutputSandbox = {"StdOut", "StdErr"};  
OutputSE = "M3PEC-disk";
```

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### ▶ testJob.sh

```
#!/bin/bash  
/bin/hostname  
cat test.txt
```

# Example Input and Output Data



The screenshot displays the DIRAC JobMonitoring web interface. On the left, there is a sidebar with filters for Site, Status, Minor status, Application status, Owner, JobGroup, JobType, and JobID. The main area shows a table of jobs with columns for JobID, Status, MinorStatus, ApplicationStatus, Site, JobName, LastUpdate [UTC], LastSignOfLife [...], SubmissionTim..., and Owner. A 'Launchpad' window is open, showing details for a job named 'DIRAC\_vhamar\_573593'. The job's Executable is '/bin/lis', Arguments are '-ltrA', and OutputSandbox is 'std.out, std.err'. The OutputData field is empty, and the OutputSE is 'DIRAC-USER'. A dropdown menu is open, showing a list of parameters that can be added to the job's output, including InputData, OutputData, OutputSE, OutputPath, CPUTime, Site, BannedSite, SystemConfig, Priority, StdError, StdOutput, Parameters, ParameterStart, ParameterStep, SubmitPools, and ParameterFactor. The 'OutputSE' option is currently selected.

System ▾ Jobs ▾ Views ▾ Tools ▾ Selected setup: Dirac-Production ▾

**JobMonitoring** << ☒ Select All ☐ Select None Reschedule ✕ Kill ✕ Delete

Site: All ▾

Status: Done ▾

☐ All  
☐ Completed  
☒ Done  
☐ Failed  
☐ Killed  
☐ Matched

JobGroup: All ▾

JobType: All ▾

JobID:

Global Sort +  
 Selected Statistics +  
 Global Statistics +

| JobID                         | Status | MinorStatus      | ApplicationStatus | Site         | JobName         | LastUpdate [UTC] | LastSignOffLife [...] | SubmissionTim... | Owner  |
|-------------------------------|--------|------------------|-------------------|--------------|-----------------|------------------|-----------------------|------------------|--------|
| <input type="checkbox"/> 8834 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:40 | 2011-10-24 07:40      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8833 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:40 | 2011-10-24 07:40      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8832 | Done   | Execution Com... | Unknown           | LCG.M3PEC.fr | DIRAC_vhamar... | 2011-10-24 07:40 | 2011-10-24 07:40      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8831 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8830 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8829 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8828 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:40 | 2011-10-24 07:40      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8827 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:40 | 2011-10-24 07:40      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8826 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8825 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:38 | 2011-10-24 07:38      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8824 | Done   | Execution Com... | Unknown           | LCG.MSFG.fr  | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8823 | Done   | Execution Com... | Unknown           | LCG.M3PEC.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8822 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8821 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:38 | 2011-10-24 07:38      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8820 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8819 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:38 | 2011-10-24 07:38      | 2011-10-24 07:28 | vhamar |
| <input type="checkbox"/> 8818 | Done   | Execution Com... | Unknown           | LCG.IN2P3.fr | DIRAC_vhamar... | 2011-10-24 07:37 | 2011-10-24 07:37      | 2011-10-24 07:28 | vhamar |

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jobs > Job monitor vhamar@ dirac\_user ▾ (/O=GRID-FR/C=FR/O=CNRS/OU=CPPM/CN=Vanessa Hamar)

- ▶ In the directory *scripts* of your DIRAC installation there are a lot of commands that can be used for different purposes:
  - ▶ Job Management
  - ▶ Data Management
  - ▶ Proxy Management
  - ▶ Administration of the system



# DIRAC Commands

## DIRAC WMS

dirac-wms-job-attributes  
dirac-wms-job-delete  
dirac-wms-job-get-input  
dirac-wms-job-get-jdl  
dirac-wms-job-get-output  
dirac-wms-job-get-output-data  
dirac-wms-job-kill  
dirac-wms-job-logging-info  
dirac-wms-job-parameters  
dirac-wms-job-peek  
dirac-wms-job-reschedule  
dirac-wms-job-status  
dirac-wms-job-submit  
dirac-wms-jobs-select-output-search  
dirac-wms-select-jobs

## DIRAC ADMIN

dirac-admin-add-group  
dirac-admin-add-host  
dirac-admin-add-site  
dirac-admin-add-user  
dirac-admin-allow-catalog  
dirac-admin-allow-se  
dirac-admin-allow-site  
dirac-admin-ban-catalog  
dirac-admin-ban-se  
dirac-admin-ban-site  
dirac-admin-bdii-ce  
dirac-admin-bdii-site  
dirac-admin-ce-info  
dirac-admin-delete-user  
dirac-admin-externals-versions



# DIRAC Commands

## DIRAC DMS

dirac-dms-catalog-metadata  
dirac-dms-change-replica-status  
dirac-dms-check-file-integrity  
dirac-dms-clean-directory  
dirac-dms-data-size  
dirac-dms-filecatalog-cli  
dirac-dms-fts-monitor  
dirac-dms-fts-submit  
dirac-dms-get-file  
dirac-dms-get-storage-directories  
dirac-dms-lfn-accessURL  
dirac-dms-lfn-logging-info  
dirac-dms-lfn-metadata  
dirac-dms-lfn-replicas  
dirac-dms-pfn-accessURL  
dirac-dms-pfn-metadata  
dirac-dms-remove-catalog-files

## DIRAC PROXY

dirac-proxy-get-uploaded-info  
dirac-proxy-info  
dirac-proxy-init  
dirac-proxy-upload

## DIRAC UTILITIES

dirac-platform  
dirac-rss-reassign-token  
dirac-rss-renew-token  
dirac-service





# DIRAC Commands: Sending Jobs

- The command used to submit jobs using DIRAC is:

```
dirac-wms-job-submit <JDL>
```

```
$ dirac-wms-job-submit Simple.jdl
```

```
JobID = 11
```





# DIRAC Commands: Common options

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- ▶ All the DIRAC commands are following the UNIX notation for passing arguments to the command
- ▶ Some options are common to all the commands:
  - o to pass any configuration option, e.g.
    - o /DIRAC/Setup=DIRAC-Production
  - d, -dd, -ddd to choose various levels of the output verbosity
  - h to show help message for the command
- ▶ In the following there are some examples of commonly used commands

- ▶ The command used to get the job status is:

```
dirac-wms-job-status <Job_ID>
```

```
$ dirac-wms-job-status 11  
JobID=11 Status=Waiting;  
MinorStatus=Pilot Agent Submission;  
Site=ANY;
```



# Dirac Commands: Job Retrieval

- ▶ To retrieve job outputs use the command:

```
dirac-wms-job-get-output [ --dir output_dir] <Job_ID> [<Job_ID>]
```

```
$ dirac-wms-job-get-output --dir this_dir 470  
469 468
```

```
$ ls -la this_dir/
```

```
total 20
```

```
drwxr-xr-x 5 hamar dirac 4096 Oct 26 19:02 .
```

```
drwxr-xr-x 3 hamar dirac 4096 Oct 26 19:02 ..
```

```
drwxr-xr-x 2 hamar dirac 4096 Oct 26 19:02 468
```

```
drwxr-xr-x 2 hamar dirac 4096 Oct 26 19:02 469
```

```
drwxr-xr-x 2 hamar dirac 4096 Oct 26 19:02 470
```



# Dirac Commands: Job Retrieval

System ▾ Jobs ▾ Views ▾ Tools ▾ Selected setup: Dirac-Production ▾

JobMonitoring << [x] Select All [ ] Select None [Reschedule] [Kill] [Delete]

Site: All ▾  
Status: All ▾  
Minor status: All ▾  
Application status: All ▾  
Owner: vhamar ▾  
JobGroup: All ▾  
JobType: All ▾  
JobID: [Submit] [Reset] [Refresh]

| JobId    | Status | MinorStatus         | ApplicationStatus | Site            | JobName          | LastUpdate [UTC] | LastSignOfLife [...] | SubmissionTim... | Owner  |
|----------|--------|---------------------|-------------------|-----------------|------------------|------------------|----------------------|------------------|--------|
| [ ] 8834 | Done   | JDL                 | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:40 | 2011-10-24 07:40     | 2011-10-24 07:28 | vhamar |
| [ ] 8833 | Done   | Attributes          | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:40 | 2011-10-24 07:40     | 2011-10-24 07:28 | vhamar |
| [ ] 8832 | Done   | Parameters          | vn                | LCG.M3PEC.fr    | DIRAC_vhamar...  | 2011-10-24 07:40 | 2011-10-24 07:40     | 2011-10-24 07:28 | vhamar |
| [ ] 8831 | Done   | Logging info        | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:39 | 2011-10-24 07:39     | 2011-10-24 07:28 | vhamar |
| [ ] 8830 | Done   | Peek StandardOutput | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:39 | 2011-10-24 07:39     | 2011-10-24 07:28 | vhamar |
| [ ] 8829 | Done   | Get LogFile         | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:39 | 2011-10-24 07:39     | 2011-10-24 07:28 | vhamar |
| [ ] 8828 | Done   | Get PendingRequest  | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:40 | 2011-10-24 07:40     | 2011-10-24 07:28 | vhamar |
| [ ] 8827 | Done   | Get StagerReport    | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:40 | 2011-10-24 07:40     | 2011-10-24 07:28 | vhamar |
| [ ] 8826 | Done   | Actions             | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:39 | 2011-10-24 07:39     | 2011-10-24 07:28 | vhamar |
| [ ] 8825 | Done   | Pilot               | vn                | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:38 | 2011-10-24 07:38     | 2011-10-24 07:28 | vhamar |
| [ ] 8824 | Done   | Sandbox             | LCG.M3PEC.fr      | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39 | 2011-10-24 07:28     | vhamar           |        |
| [ ] 8823 | Done   | Show value          | LCG.M3PEC.fr      | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39 | 2011-10-24 07:28     | vhamar           |        |
| [ ] 8822 | Done   | Get input file(s)   | LCG.M3PEC.fr      | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39 | 2011-10-24 07:28     | vhamar           |        |
| [ ] 8821 | Done   | Get output file(s)  | LCG.M3PEC.fr      | DIRAC_vhamar... | 2011-10-24 07:39 | 2011-10-24 07:39 | 2011-10-24 07:28     | vhamar           |        |
| [ ] 8820 | Done   | Execution Com...    | Unknown           | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:38 | 2011-10-24 07:38     | 2011-10-24 07:28 | vhamar |
| [ ] 8819 | Done   | Execution Com...    | Unknown           | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:39 | 2011-10-24 07:39     | 2011-10-24 07:28 | vhamar |
| [ ] 8818 | Done   | Execution Com...    | Unknown           | LCG.IN2P3.fr    | DIRAC_vhamar...  | 2011-10-24 07:38 | 2011-10-24 07:38     | 2011-10-24 07:28 | vhamar |
| [ ] 8817 | Done   | Execution Com...    | Unknown           | LCG.M3PEC.fr    | DIRAC_vhamar...  | 2011-10-24 07:37 | 2011-10-24 07:37     | 2011-10-24 07:28 | vhamar |

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https://dirac.in2p3.fr/DIRAC/Dirac-Production/dirac\_user/jobs/JobMonitor/display# vhamar@ dirac\_user (/O=GRID-FR/C=FR/O=CNRS/OU=CPPM/CN=Vanessa Hamar)

- ▶ Submit “mandelbrot” job with Web Launchpad
  - ▶ Monitor it
  - ▶ Get results in the Web browser
  
- ▶ **Goals**
  - ▶ Understand job description
  - ▶ Understanding job Web monitoring and manipulation tools