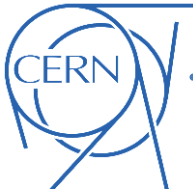


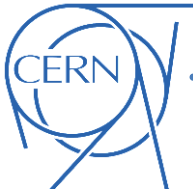
Migration of PyECLOUD simulation campaigns to HTCondor

G. Iadarola

Many thanks to: P. Dikstal, K. Li, A. Mereghetti, G. Skripka



- IT is presently changing the software used to manage the load on the **linux batch cluster** (lxbatch) moving from the **LSF** (IBM) to **HTCondor** (open).
 - This changes the way the user interacts with the system (how you submit your jobs to the cluster...)
- **Computing resources are gradually being moved** from one system to the other
- Timeline for resources dedicated to **BE-ABP** (defined by the ABP-CWG):
 - From **18 April 2017**: 50% in LSF – 50% in HTCondor
 - From **18 May 2017**: 10% in LSF – 90% in HTCondor
 - **End 2017**: end of LSF support
- **PyECLOUD buildup simulations** are heavy users of the lxbatch system
 - we need to move before being affected by resource shrinkage in LSF



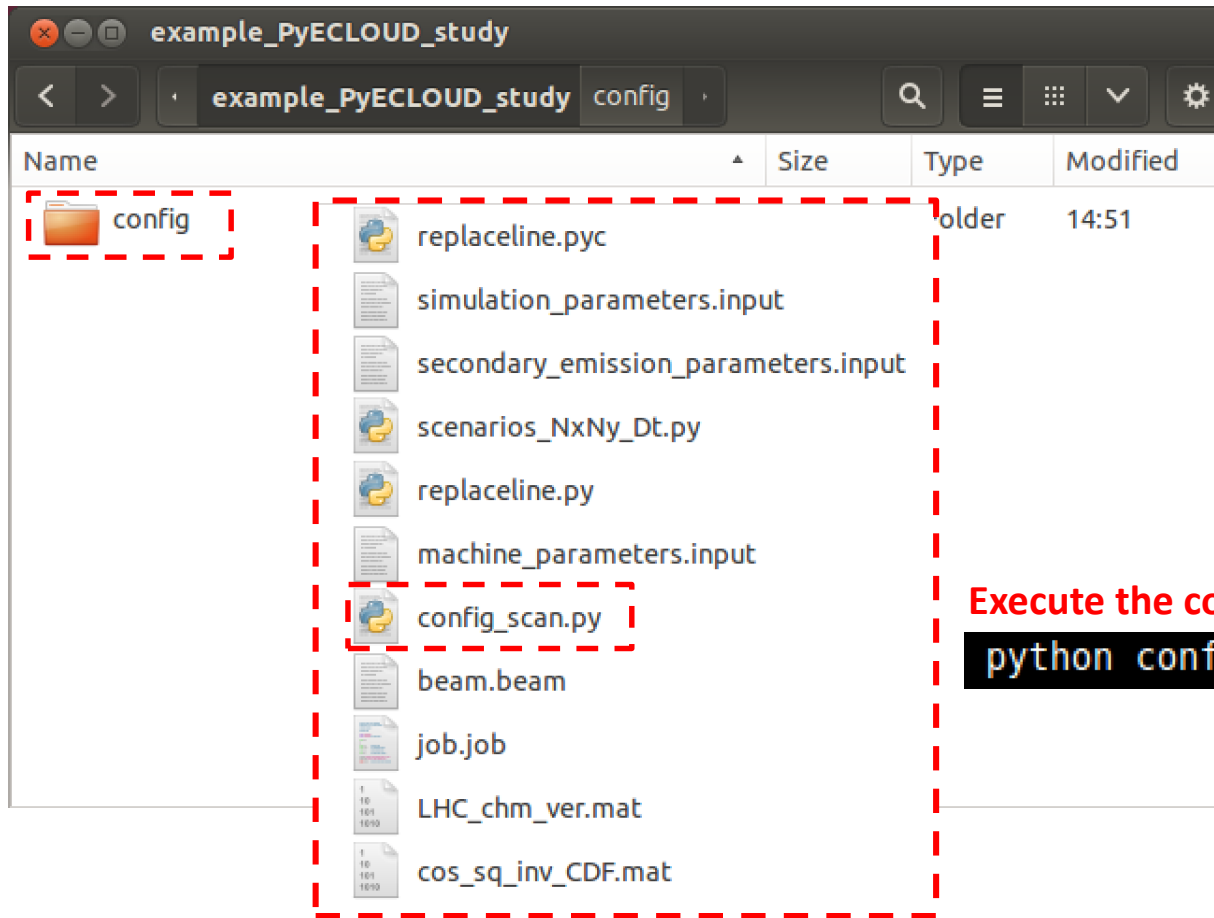
Information on the new system can be found at:

- **CERN batch service:** <http://information-technology.web.cern.ch/services/batch>
- **CERN Batch Service User Guide:** <http://batchdocs.web.cern.ch/batchdocs/>
- **HTCondor website:** <https://research.cs.wisc.edu/htcondor/>
- **Presentations at the ABP-CWG meetings:**
 - B. Jones, "LSF -> HTCondor migration", [ABP-CWG meeting 29/09/2016](#)
 - K. Li, "First experience using HTCondor for PyHEADTAIL", [ABP-CWG meeting 30/03/2017](#)



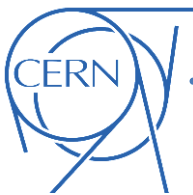
Reminder on LSF submission procedure

- We typically setup a study using a configuration script which prepares our folder structure (one folder per simulation, containing its input and output)



Execute the configuration script

```
python config_scan.py
```

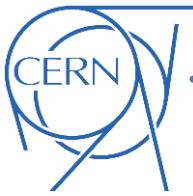


Reminder on LSF submission procedure

- We typically setup a study using a configuration script which prepares our folder structure (one folder per simulation, containing its input and output)

The screenshot shows a file manager window titled 'simulations' with the path 'example_PyECLoud_study simulations'. The left sidebar shows a tree view with folders 'config', 'simulations', and 'run'. The 'simulations' folder is highlighted with a red dashed box. The main window displays a list of folders with the following columns: Name, Size, Type, and Modified.

Name	Size	Type	Modified
LHC_ArcDriftReal_7000GeV_sey1.20_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.20_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.25_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.25_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.30_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.30_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.35_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.35_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.40_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.40_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.45_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.45_2.2e11ppb_bl_1.00ns	7 items	Folder	14:51
LHC_ArcDriftReal_7000GeV_sey1.50_1.1e11ppb_bl_1.00ns	7 items	Folder	14:51



Reminder on LSF submission procedure

- We typically prepare a study using a configuration script which prepares our folder structure (one folder per simulation, containing its input and output)

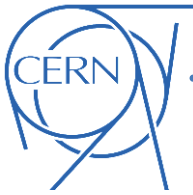
The screenshot shows a file manager window titled 'example_PyECLoud_study'. The breadcrumb path is 'example_PyECLoud_study config'. The file list is as follows:

Name	Size	Type	Modified
config	12 items	Folder	14:51
simulations	23 items	Folder	14:51
run	10,6 kB	Program	14:51

The 'run' file is highlighted with a red dashed box.

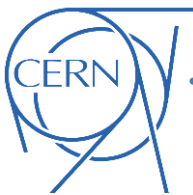
Execute `./run` on lxplus to run submit the jobs to with LSF

```
[giadarol@lxplus012 HLLHC_LSS_chambers_rot_1.3ns]$ ./run
```



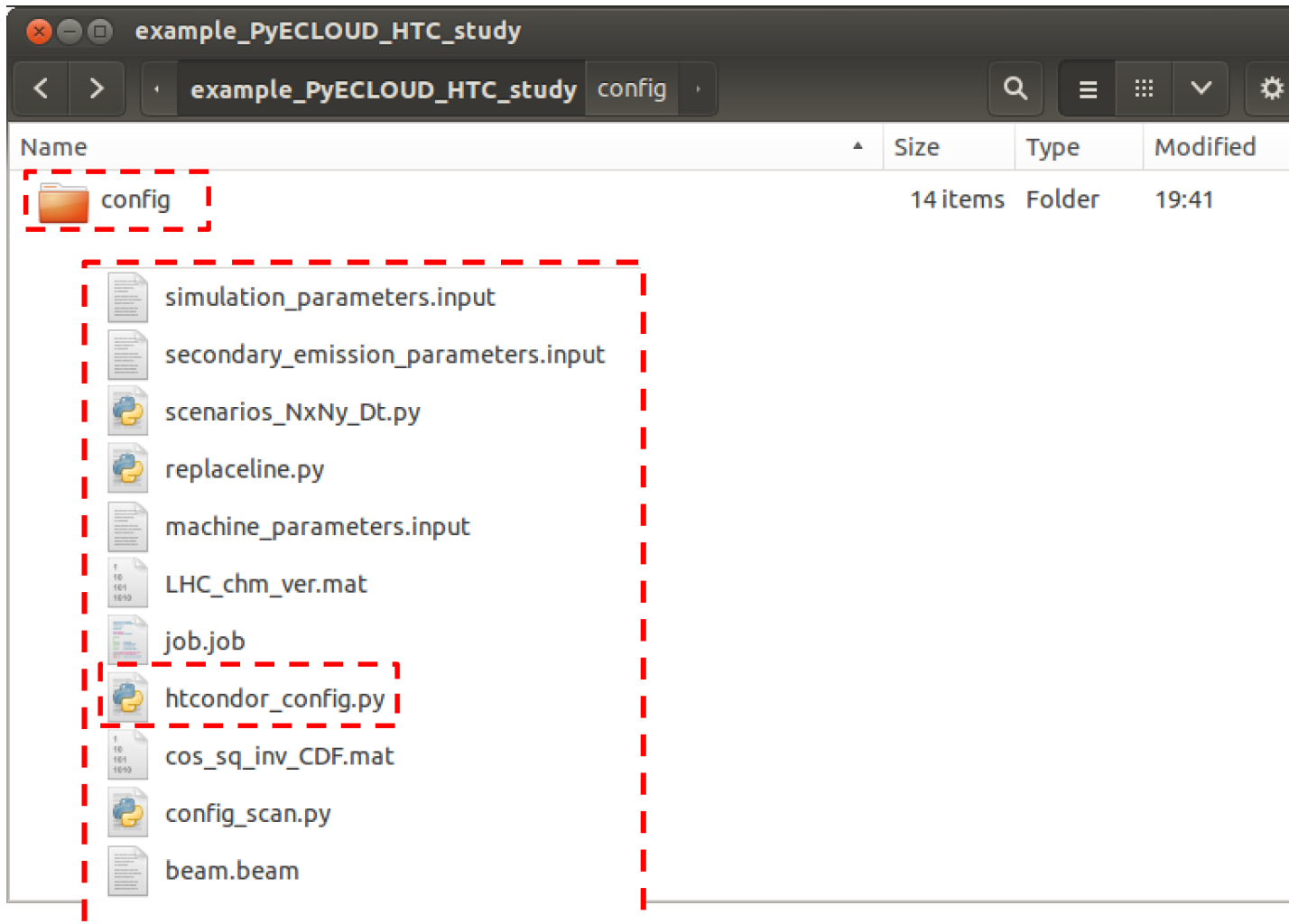
- Decided to **keep the present configuration scripts and folder structure** (your post-processing script should work without changes)
- Wrote a simple **additional module** that can be included in your configuration script in order to setup the HTCondor submission

An example study can be downloaded from the [indico page](#)



How to submit PyECLoud jobs using HTCondor

- Start with the **“config” folder** as you would have prepared it for LSF
- Add the **“htcondor_config.py”** module (from the zip attached in the [indico page](#))





How to submit PyECLoud jobs using HTCondor

- Add these two extra lines to your **“config_scan.py”** as shown below
- In HTCondor there no queue distinction, just indicate the **max time** you expect your simulations to take (with some margin)

The screenshot shows a file explorer window titled "example_PyECLoud_HTC_study" with a "config" folder selected. The folder contains 14 items, including "simulation_parameters.input", "secondary_emission", "scenarios_NxNy_D", "replaceline.py", "machine_paramet", "LHC_chm_ver.mat", "job.job", "htcondor_config.p", "cos_sq_inv_CDF.m", "config_scan.py", and "beam.beam". A code editor window titled "config_scan.py" is open, showing Python code. The code is partially obscured by a red dashed box. The visible code includes:

```
138 ..... if type(device['filename_chm']) is str:
139 .....     if '.mat' in device['filename_chm']:
140 .....         sht.copy(device['filename_chm'], current_sim_folder)
141 .....
142 .....     rl.replaceline_and_save(fname = 'job.job',
143 .....                             findln = 'CURRDIR=',
144 .....                             newline = 'CURRDIR='+current_sim_folder)
145 .....
146 .....     os.system('cp -r %s %s'%(tobecopied, current_sim_folder))
147 .....     launch_file_lines += ['bsub -L /bin/bash -J '+ sim_tag +
148 .....                           '-o '+ current_sim_folder+'/STDOUT',
149 .....                           '-e '+ current_sim_folder+'/STDERR',
150 .....                           '-q 2nd < -'+current_sim_folder+'/job.job\n', 'bjobs\n']
151 .....
152 .....
153 with open(study_folder+'/run', 'w') as fid:
154     fid.writelines(launch_file_lines)
155     os.chmod(study_folder+'/run', 0755)
156
157 import htcondor_config as htcc
158 htcc.htcondor_config(scan_folder, time_requirement_days=2.)
159
160
```

The status bar at the bottom of the code editor shows: "line: 161 / 161 col: 0 sel: 0 INS SP mode: Unix (LF) encoding: UTF-8 filetype: Python scope: unknown".



How to submit PyECLoud jobs using HTCondor

- Add these two extra lines to your **“config_scan.py”** as shown below
- In HTCondor there no queue distinction, just indicate the **max time** you expect your simulations to take (with some margin)

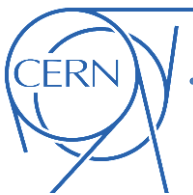
example_PyECLoud_HTC_study

example_PyECLoud_HTC_study config

Name	Size	Type	Modified
config	14 items	Folder	19:41
simulation_parameters.input			
secondary_emission_parameters.input			
scenarios_NxNy_Dt.py			
replaceline.py			
machine_parameters.input			
LHC_chm_ver.mat			
job.job			
htcondor_config.py			
cos_sq_inv_CDF.mat			
config_scan.py			
beam.beam			

Execute the configuration script

```
python config_scan.py
```



How to submit PyECLoud jobs using HTCondor

- The **usual folder structure** will be created...
- ...together with **three extra files** needed for the HTCondor submission

The screenshot shows a file manager window titled "example_PyECLoud_HTC_study" with a sub-view of "config". The window displays a table of files and folders. The following table summarizes the content shown in the screenshot:

Name	Size	Type	Modified
config	14 items	Folder	19:41
simulations	23 items	Folder	19:41
htcondor.sub	601 bytes	Text	19:41
list_sim_folders.txt	1,2 kB	Text	19:41
run	10,9 kB	Program	19:41
run_htcondor	46 bytes	Text	19:41

In the screenshot, the files `htcondor.sub`, `list_sim_folders.txt`, and `run_htcondor` are highlighted with red dashed boxes, indicating they are the "three extra files" mentioned in the text.



How to submit PyECLoud jobs using HTCondor

- The **usual folder structure** will be created...
- ...together with **three extra files** needed for the HTCondor submission

Name	Size	Type	Modified
config	14 items	Folder	19:41
simulations	23 items	Folder	19:41
htcondor.sub	601 bytes	Text	19:41
list_sim_folders.txt	1,2 kB	Text	19:41
run			
run_htcondor			

run ← You can still choose to submit the jobs to LSF executing `./run`

run_htcondor ← Submit the jobs with HTCondor executing `./run_htcondor` on lxplus



How to submit PyECLLOUD jobs using HTCondor

- All jobs submitted together form an **HTCondor cluster** to which an **ID number** is assigned

```
[giadarol@lxplus072 test_htcondor_heavy]$ ./run_htcondor
Submitting job(s).....
40 job(s) submitted to cluster 33224.1

-- Schedd: bigbird01.cern.ch : <128.142.194.108:9618?... @ 05/09/17 19:47:27
ID      OWNER      SUBMITTED  RUN_TIME ST PRI  SIZE CMD
33224.0 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.1 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.2 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.3 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.4 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.5 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.6 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.7 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.8 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
33224.9 giadarol    5/9 19:47  0+00:00:00 I 0   0.0 job.job
```



Individual jobs are identified with progressive numbers



The command “condor_q” can be used to know the state of your cluster

```
[giadarol@lxplus012 ~]$ condor_q

-- Schedd: bigbird01.cern.ch : <128.142.194.108:9618?... @ 05/09/17 20:02:20
OWNER   BATCH_NAME   SUBMITTED   DONE    RUN    IDLE  TOTAL JOB_IDS
giadarol CMD: job.job   5/9  19:47      _    40      _    40 33224.0-39

40 jobs; 0 completed, 0 removed, 0 idle, 40 running, 0 held, 0 suspended
```

Use “--nobatch” to see individual jobs

```
[giadarol@lxplus012 test_htcondor_heavy]$ condor_q --nobatch

-- Schedd: bigbird01.cern.ch : <128.142.194.108:9618?... @ 05/09/17 20:06:25
ID      OWNER      SUBMITTED   RUN TIME ST PRI  SIZE  CMD
33224.0 giadarol   5/9  19:47   0+00:16:39 R  0   293.0 job.job
33224.1 giadarol   5/9  19:47   0+00:16:39 R  0   245.0 job.job
33224.2 giadarol   5/9  19:47   0+00:16:38 R  0   269.0 job.job
33224.3 giadarol   5/9  19:47   0+00:16:38 R  0     0.0 job.job
33224.4 giadarol   5/9  19:47   0+00:16:39 R  0   293.0 job.job
33224.5 giadarol   5/9  19:47   0+00:16:38 R  0   342.0 job.job
```

To kill a single job:

```
[giadarol@lxplus012 test_htcondor_heavy]$ condor_rm 33224.33
Job 33224.33 marked for removal
```

To kill the entire cluster

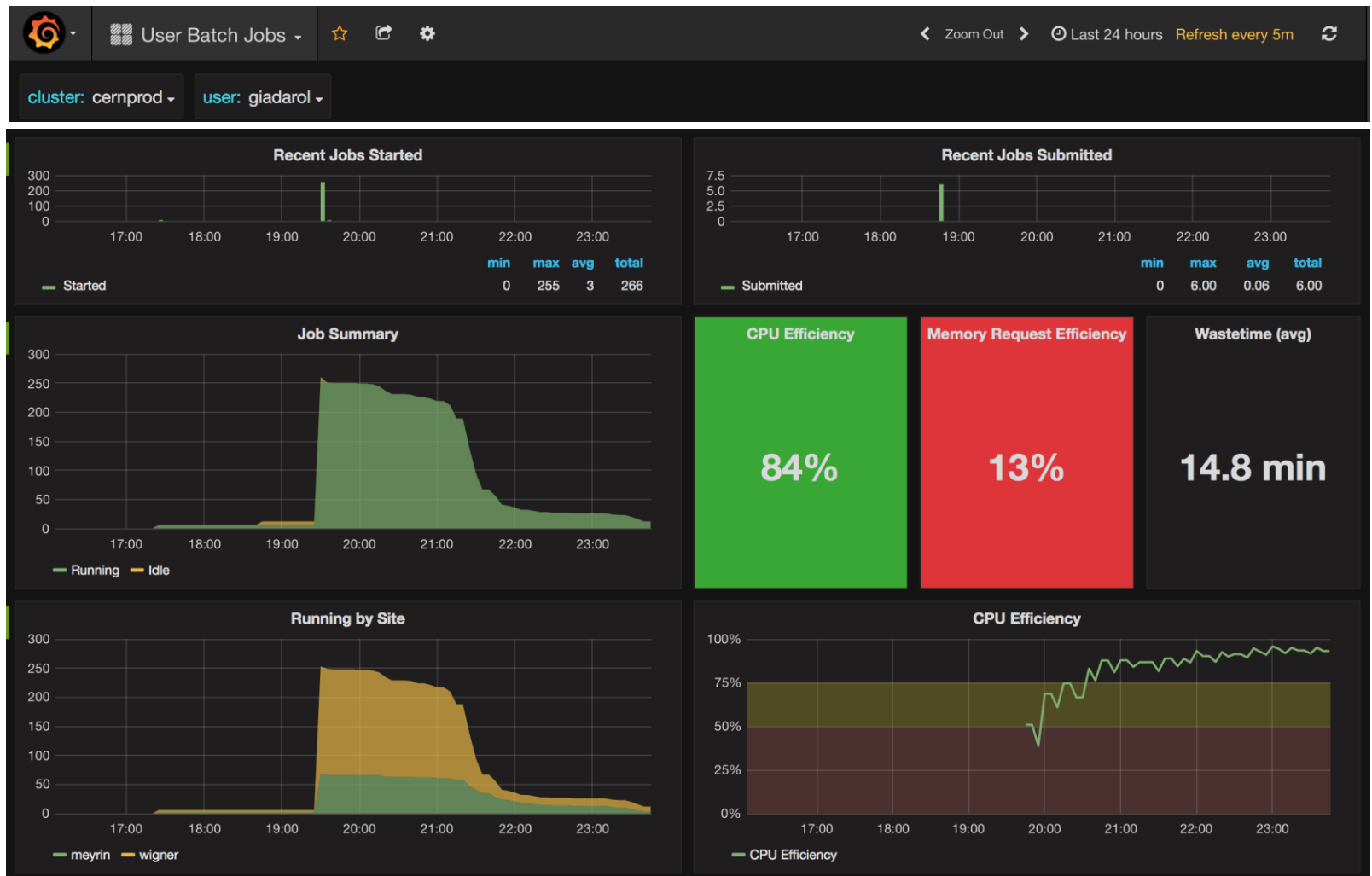
```
[giadarol@lxplus012 test_htcondor_heavy]$ condor_rm 33224
All jobs in cluster 33224 have been marked for removal
```

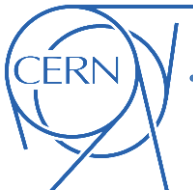


How to submit PyECLoud jobs using HTCondor

HTCondor dashboard can be also used to monitor the jobs of a single user

<http://information-technology.web.cern.ch/services/batch>





Thanks for your attention!