Python binding based monitoring at CMS

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SDSC
SAN DIEGO SUPERCOMPUTER CENTER

Open Science Grid

SI

CMS
Compact Muon Solenoid

Outline

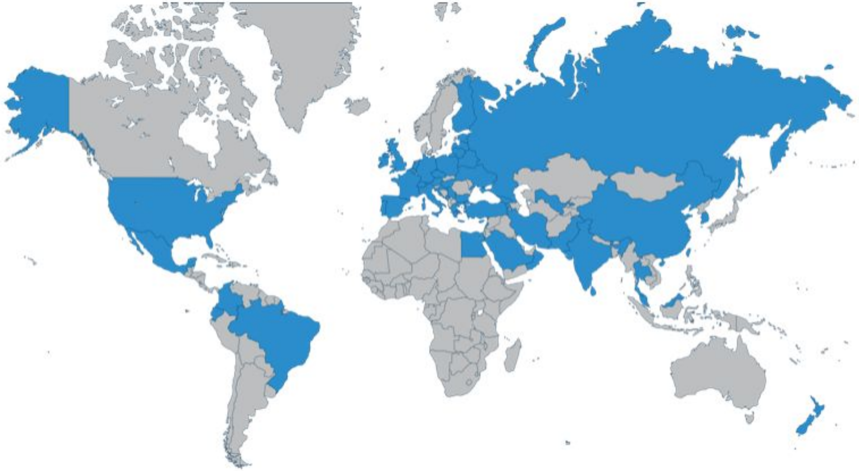
- The CMS experiment
- The CMS Global pool
- Monitoring the pools
- Pretty plots
- Conclusions

The CMS experiment

- CMS - Compact Muon Solenoid
- One of the main experiments in the LHC (Large Hadron Collider)
- Collaboration of more than 5k people

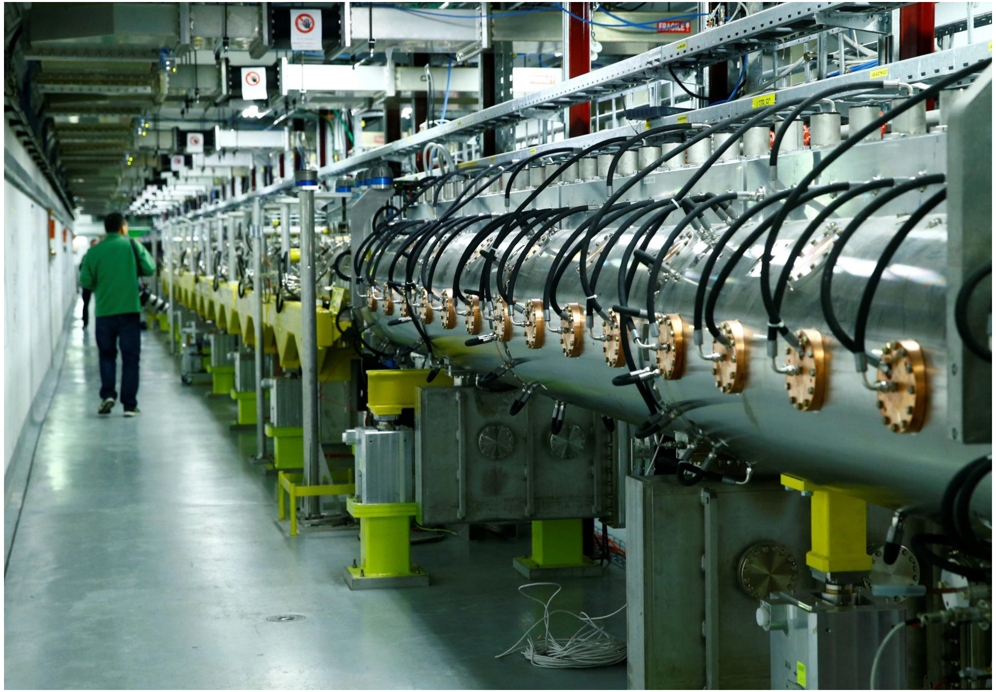
The CMS experiment

2942	1065	281	229	51
PHYSICISTS (1036 STUDENTS)	ENGINEERS	TECHNICIANS	INSTITUTES	COUNTRIES & REGIONS



The CMS experiment

Particles are injected into the LHC and accelerated using magnets

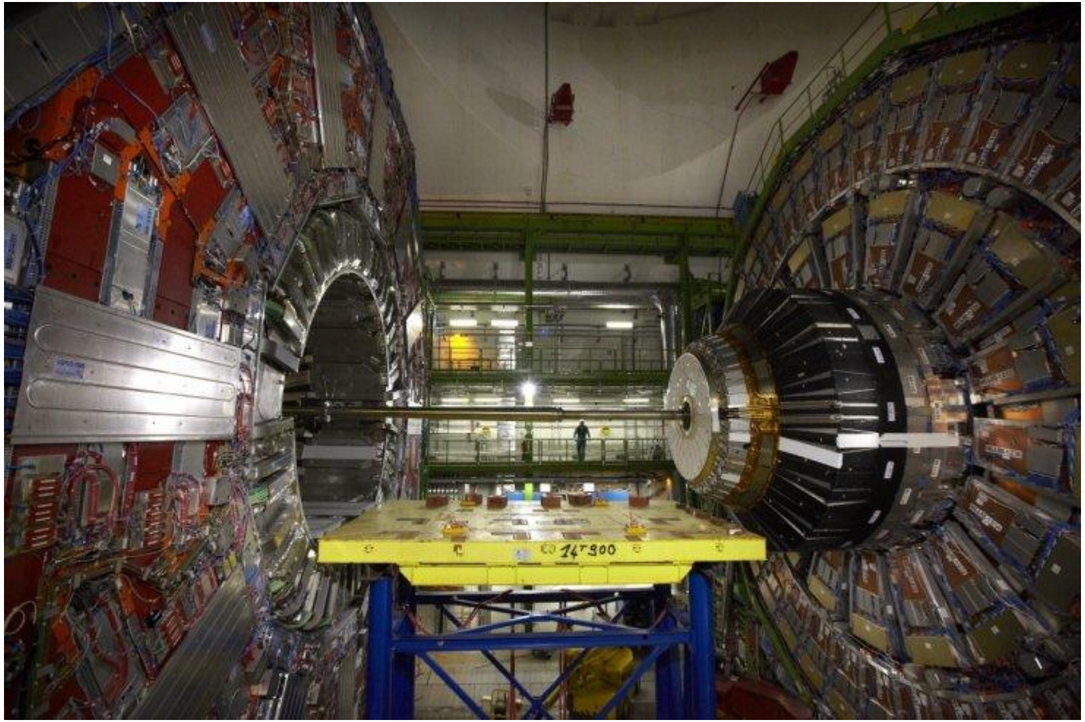


The CMS experiment

Bunches of particles circle around the LHC in opposite directions on separated tubes

The CMS experiment

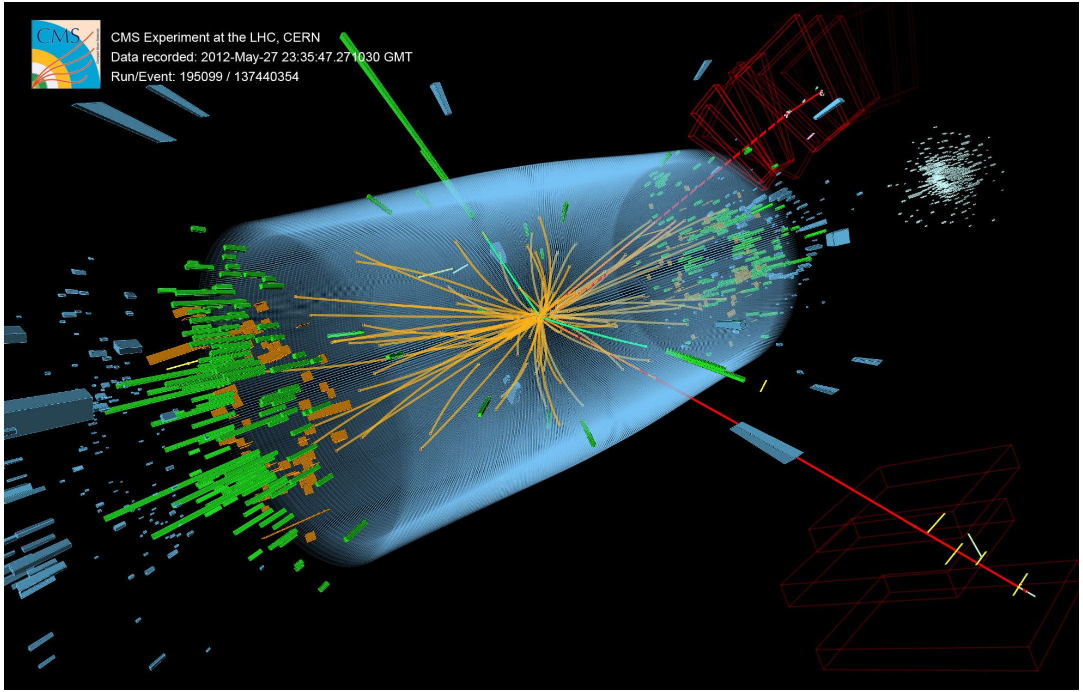
After reaching certain amount of speed (close to the speed of light), the particles are positioned so that they will crash to each other inside the different detectors



The CMS experiment

Collisions are recorded, using the many sensors inside each detector

This produces a lot of data to be analyzed


CMS Experiment at the LHC, CERN
Data recorded: 2012-May-27 23:35:47.271030 GMT
Run/Event: 195099 / 137440354

The CMS experiment

The institutes within the collaboration provide computing resources to store and analyze the data

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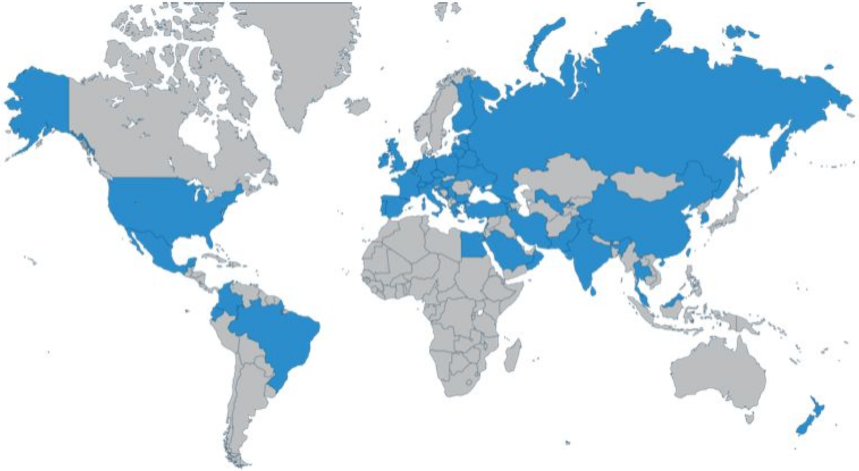
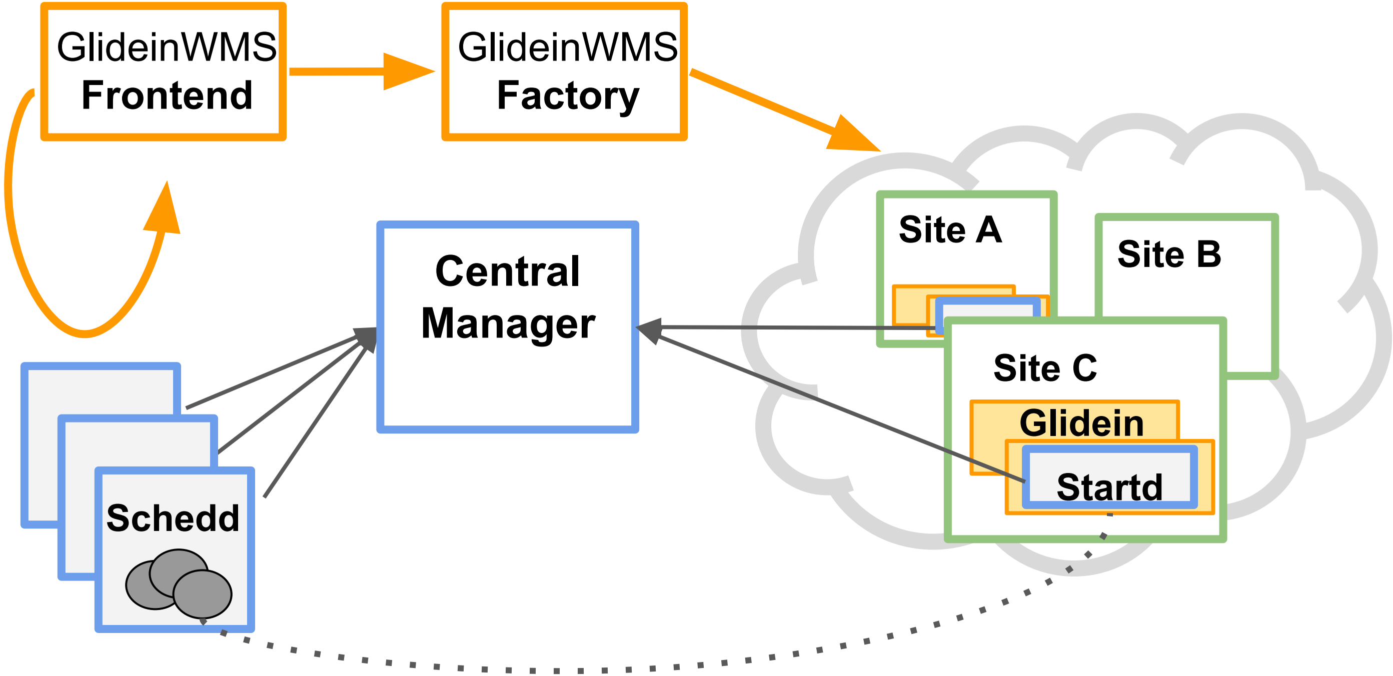
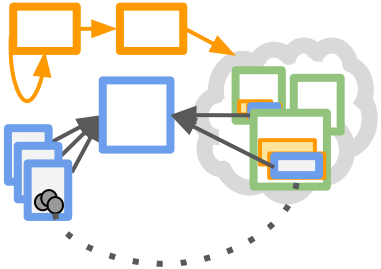


The CMS Global pool

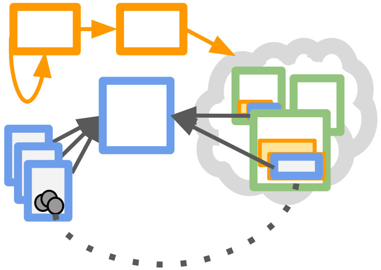


Not only 1 but 5 pools

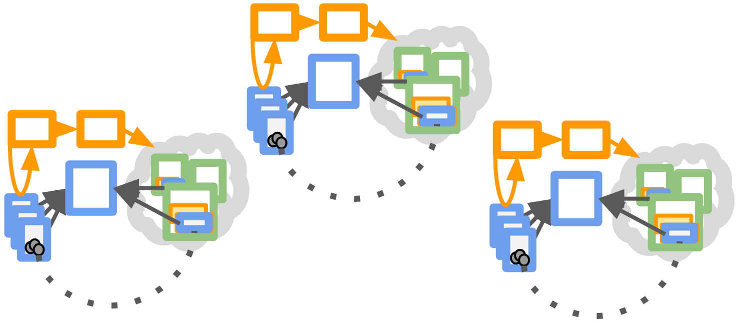
Global pool



CERN pool



Volunteer, ITB and ITBDev



5 Central Managers
7 Negotiators
76 Schedds
134k Slots
300k Cores

What we wanted

- A monitor to watch them all
- Be able to reuse the monitoring infrastructure provided by CERN
    - short and long term storage
    - auth
    - pretty plots software (grafana & kibana)
- Written in a friendly language (python)
- and most importantly….

What we did

- For each classAd, create a list of attributes we were interested in
  - How many attributes you can find in the Negotiator classAd?

```
[ddavila@vocms0804 ~]$ condor_status -negotiator -l | wc
391     1220    17030
```

- Wrote < 300 lines of python using the **HTCondor python bindings**
- Used a cronjob to execute the script for each of our pools

A <u>very</u> simple example

```
import htcondor

collector = htcondor.Collector("collector-hostname.domain")

projection=["Name", "Disk", "Memory"]
condor_ad_type = htcondor.AdTypes.Startd
constraint="Cpus > 0"

#SELECT Name, Disk Memory FROM Startd WHERE Cpus > 0

ads = collector.query(condor_ad_type, constraint, projection)

for ad in ads:
    print ad
```

What you get

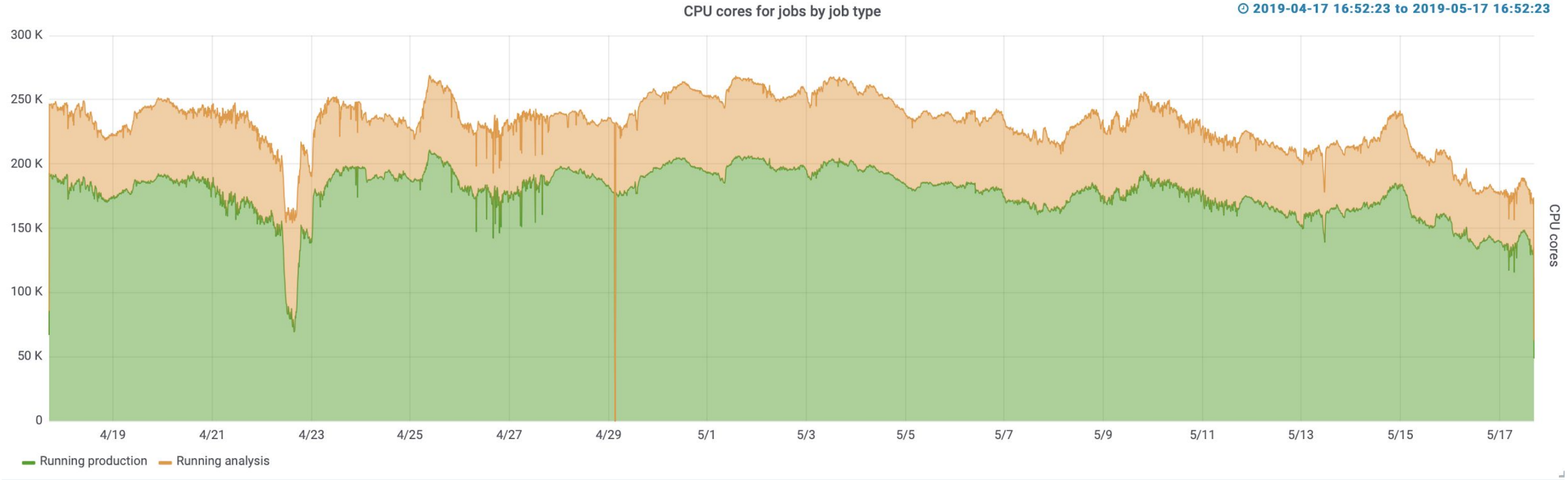
A list of these:

```
[
    Disk = 214761;
    Memory = 2048;
    Name = "slot1_10@glidein_64_218192637@b6515245b4.cern.ch"
 ]
```

- We use a home made function to transform into JSON
- Since 8.8.2 the ClassAd module has a new printJson()

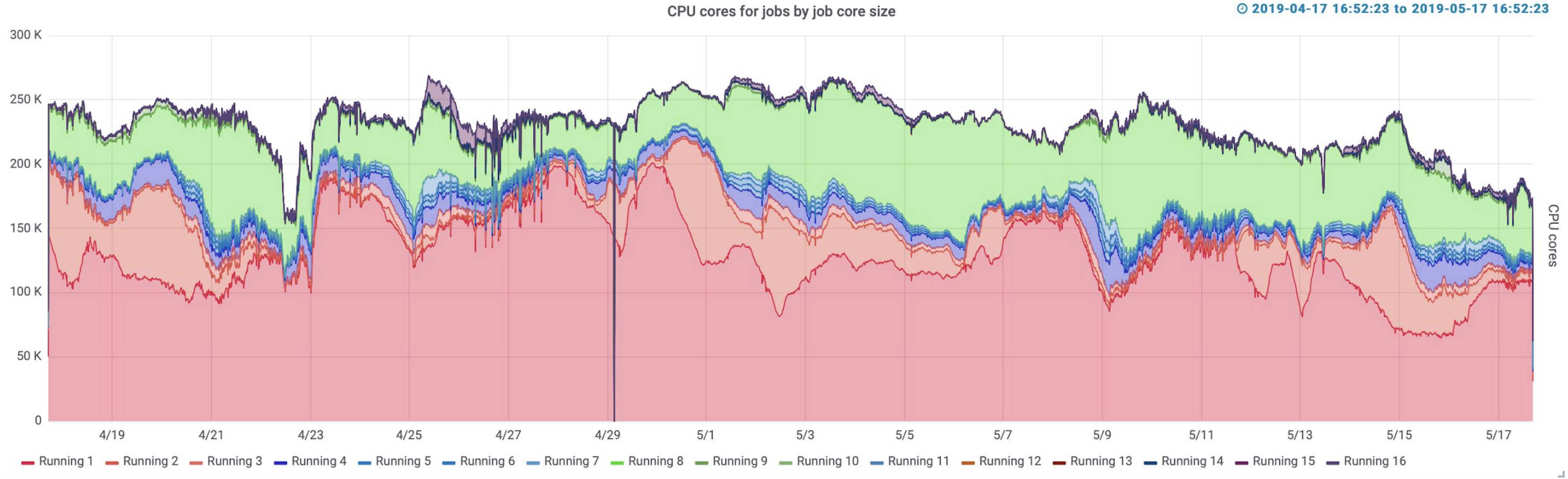
Some pretty plots

Number of cores in use by job type



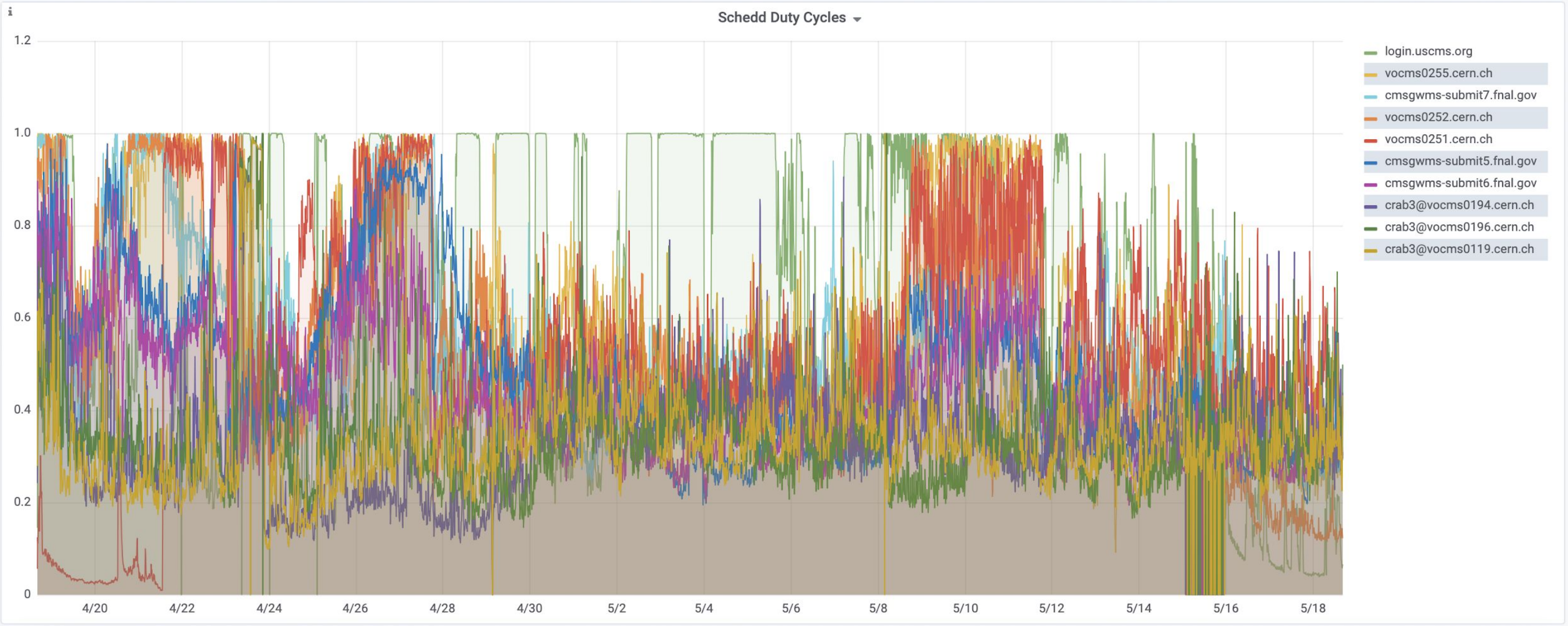
Some pretty plots

Number of cores grouped by slot size



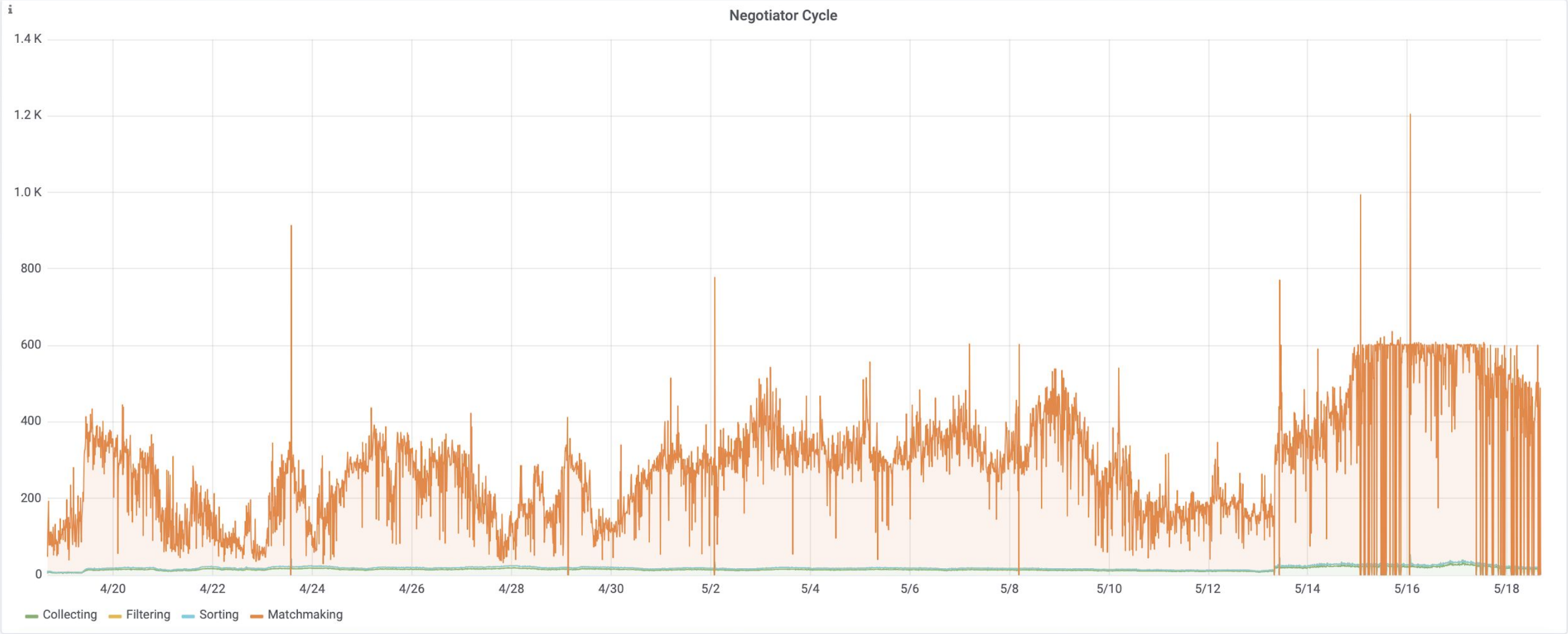
Some pretty plots

The 10 schedds with the highest duty cycle



Some pretty plots

Length of each negotiation phase



Conclusions

- There is a lot of data you can get from condor
- Using the HTCondor python bindings you can collect these data, in a easy and friendly way.
- The most difficult part is to decide what to monitor
- Most of the attributes in the classAds are well documented

Thank you for listening!