AGIS / ATLAS Grid ジョブ管理

ATLAS ソフトウェア講習会 2016

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Overview

- Your Grid environments
  - Lxplus at CERN
  - VMs at Heidelberg
  - Grid UI with Docker in your Linux Box
- Introduction to Grid computing
  - Concepts
  - Certificate Authorities and VOMS
  - Setup CVMFS
  - ATLAS Grid computing & WLCG Resources
  - Grid job and data
  - ATLAS Resources
  - Grid user interface (CLI) and CVMFS
  - BigPanda Monitoring
- Rucio (ATLAS data management system)
  - Basic concept
  - SetupRucio
  - RSE expressions
- RucioUI (WebUI)
  - RucioUI
- Links ad references

ATLAS ジョブとデータ

- あくまで概略

CA

UI

ATLAS PanDA

Rucio DDM

Site A

Information Provider

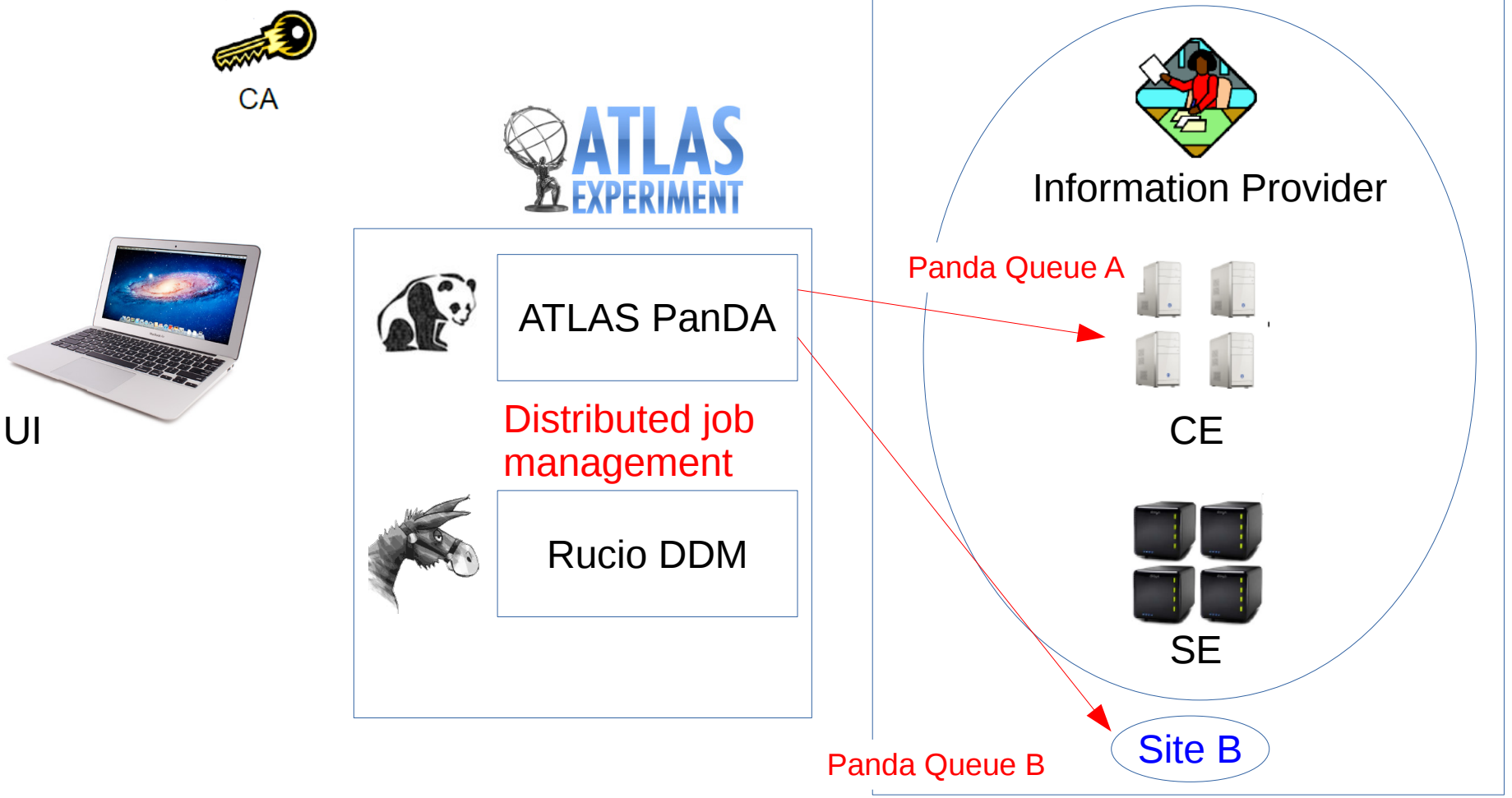
CE

SE

Site B

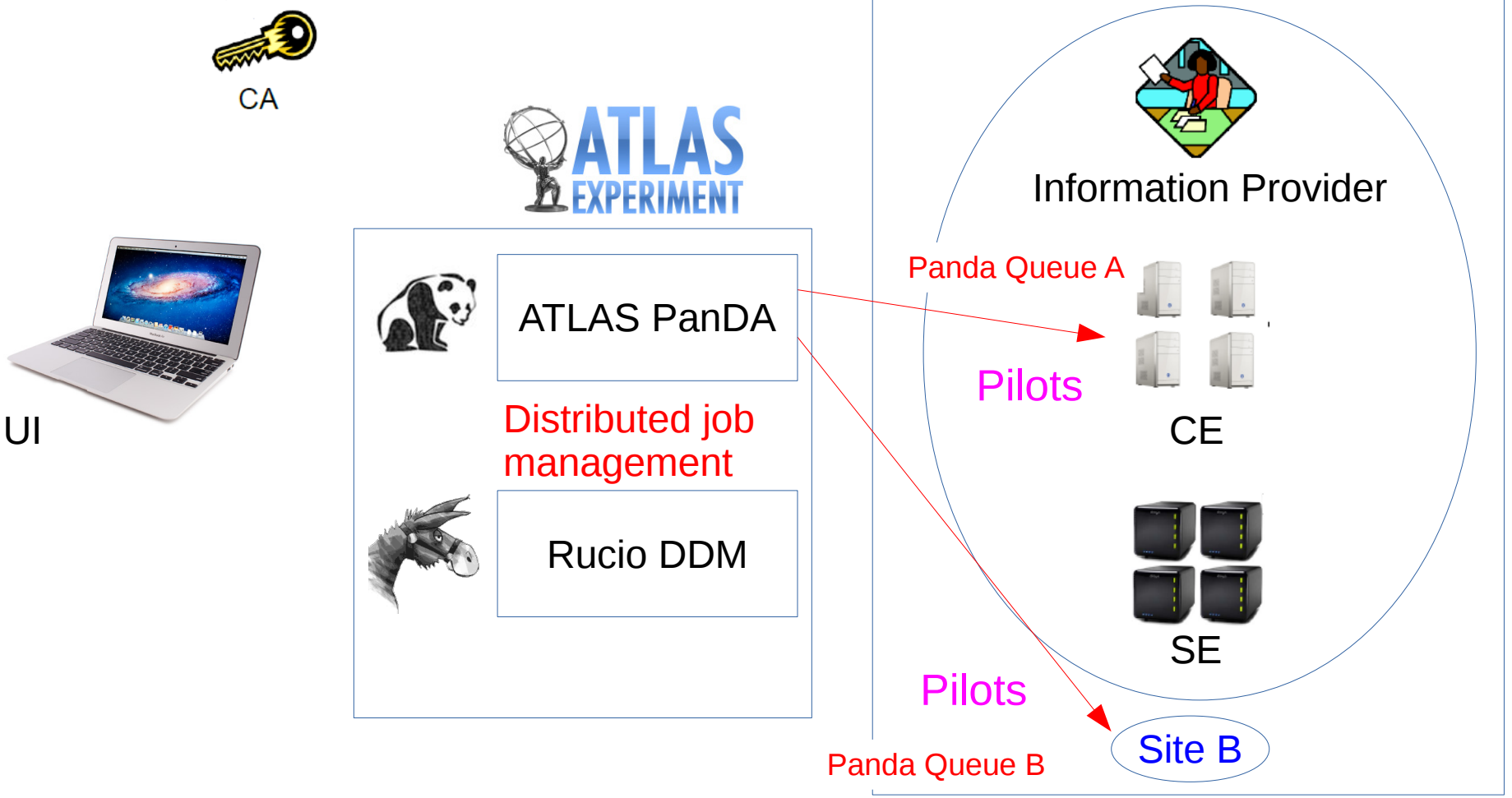
ATLAS ジョブとデータ

- あくまで概略



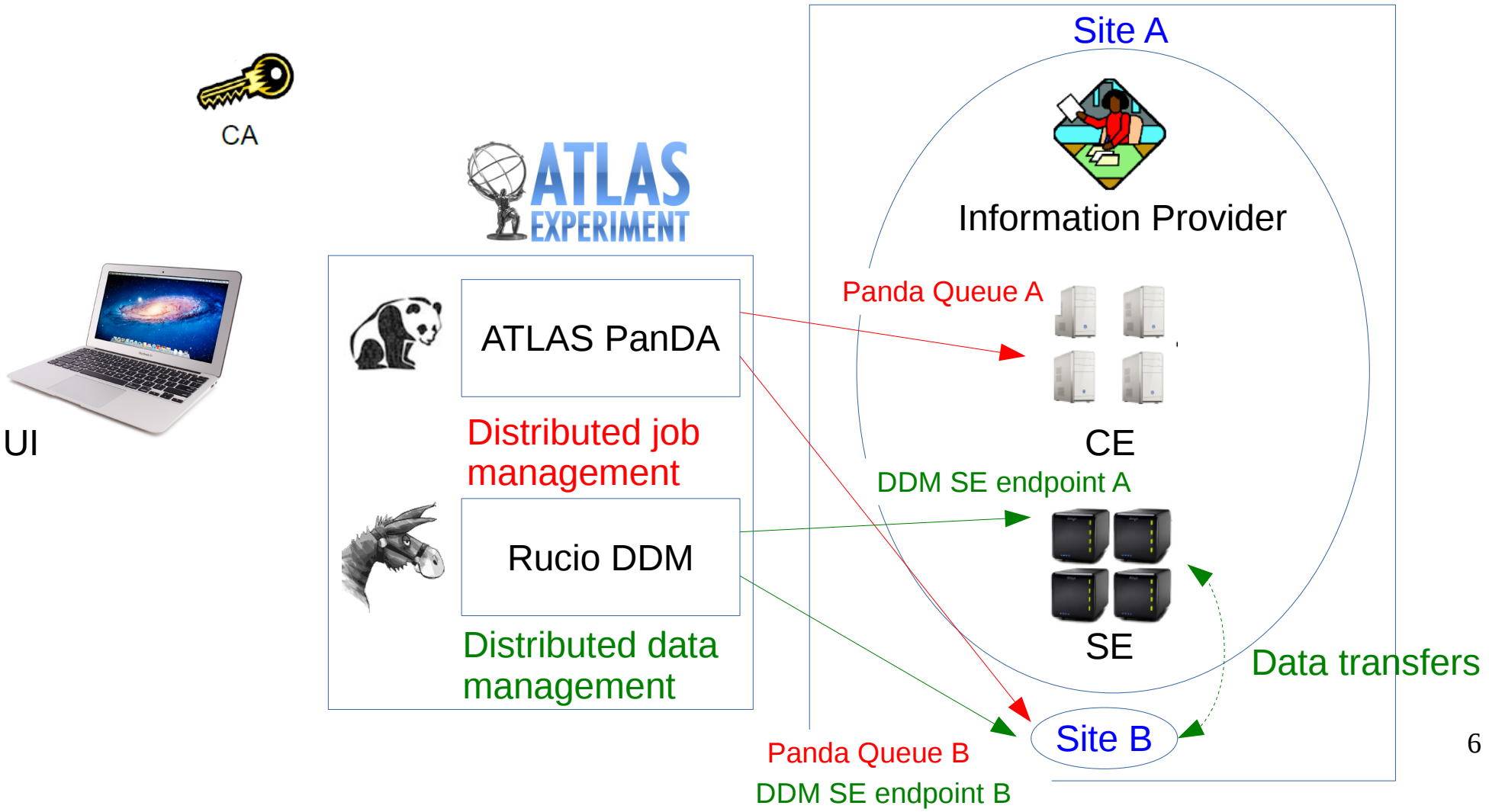
ATLAS ジョブとデータ

- あくまで概略



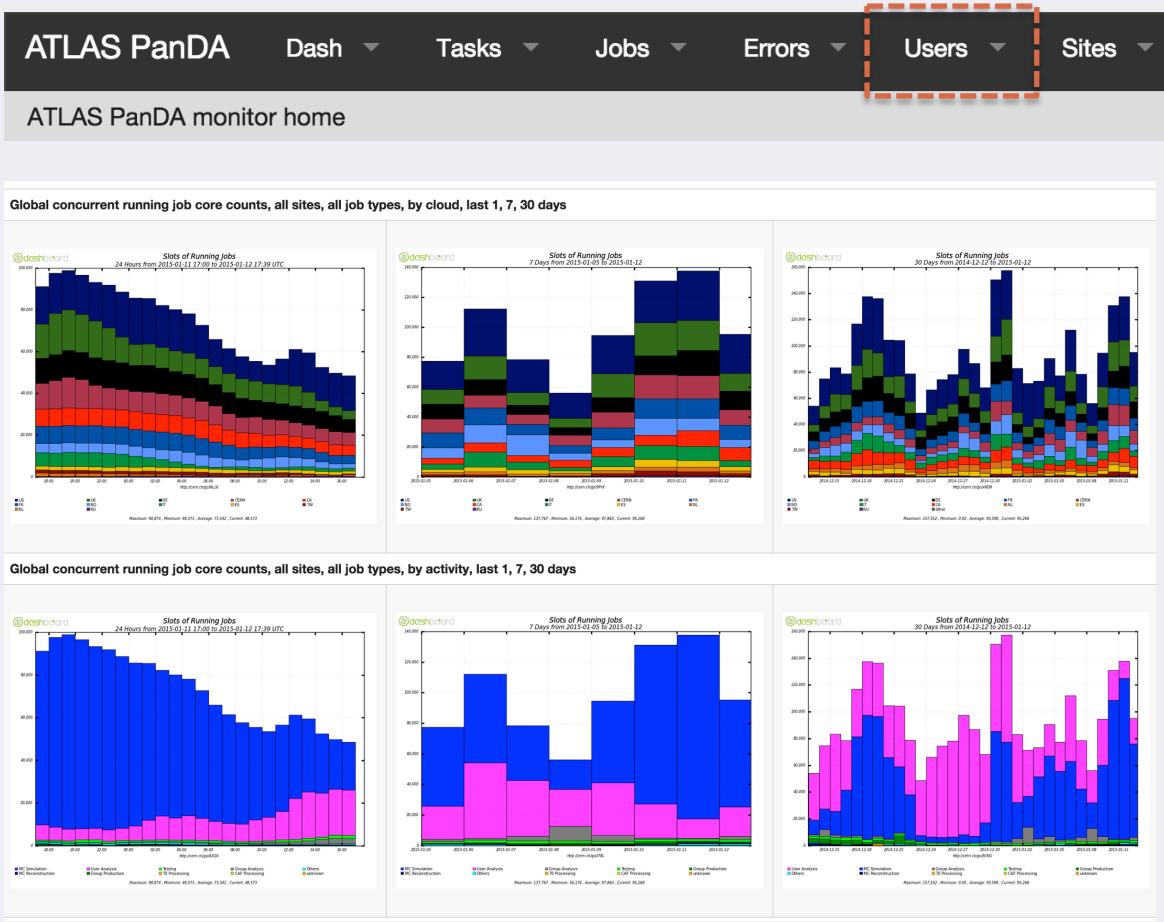
ATLAS ジョブとデータ

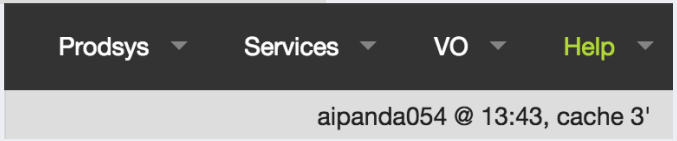
- あくまで概略



BigPanda Monitoring

- Next generation monitoring tool developed within the BigPanDA project
- Drop down menu with access to numerous views of job monitoring data
- Tool heavily used by ADC experts and shifters to track production activities
- Here we are more interested in monitoring our own jobs



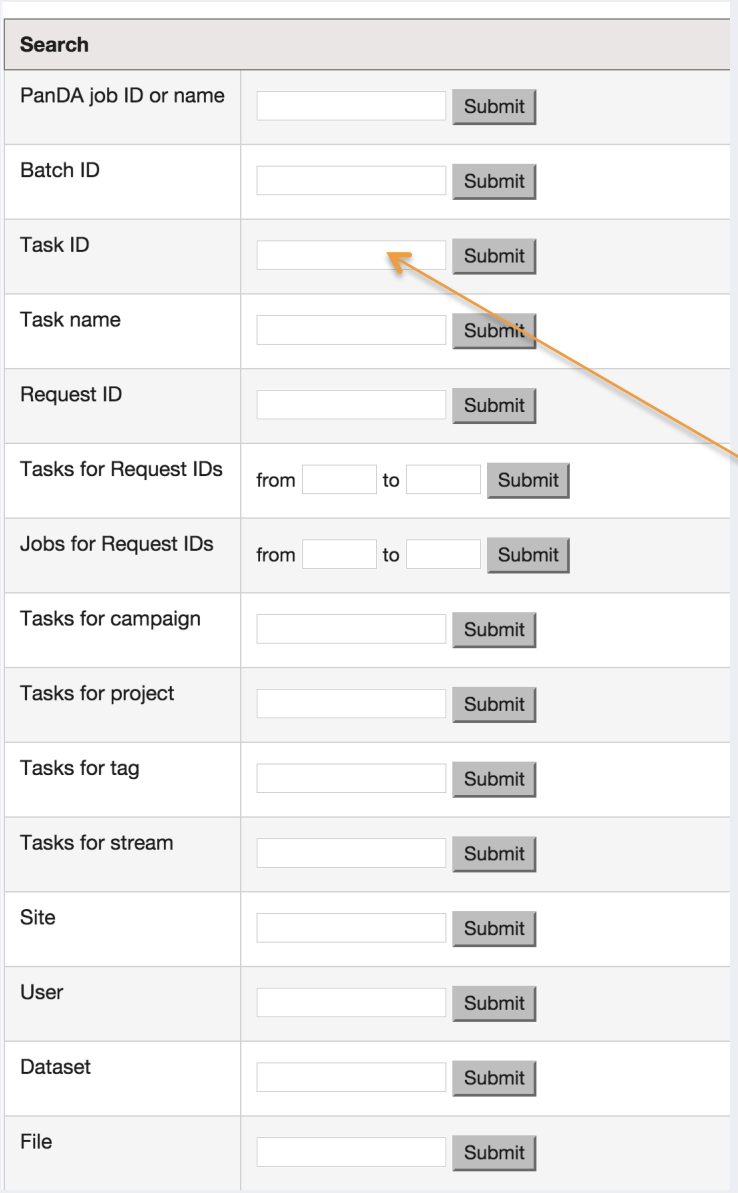


➤ http://bigpanda.cern.ch

All jobs by cloud (e.g. ES, UK, IT) running in last 1,7,30 days

All jobs by type (e.g. simulation, reconstruction, analysis) running in last 1,7,30 days

BigPanda Search Options



- Search boxes available on BigPanda front page to get specific information on tasks, jobs and user activities
- The range of displayed information can be changed by modifying or adding the URL parameters

Enter our example job Task ID here

The load on the Panda DB will increase with high N

```
&limit=N
&display_limit=N
&hours=N
&days=N
&earlierthan=Nhours
&earlierthandays=Ndays
&date_from=2014-10-01
&date_to=2014-10-03
```

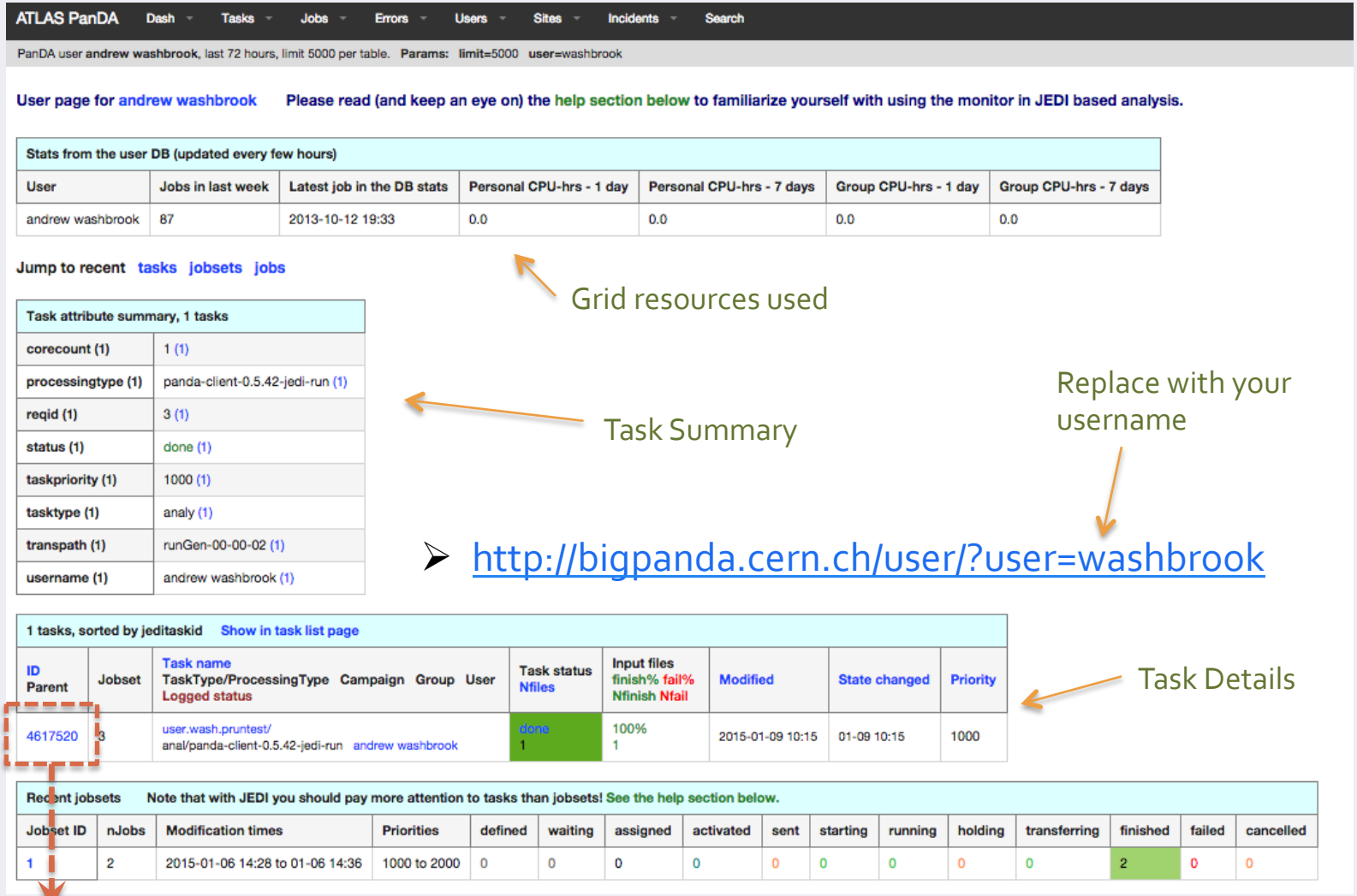
Example URL Modifiers

- Advanced usage: monitoring data can retrieved in *json* format to be enable results to be processed programmatically

➢ http://bigpanda.cern.ch/help/

User View

- The user view displays your recent activities
- Useful starting point to check your jobs
- Links on this page lead to more information on an individual tasks and associated jobs



Example Job Montioring

- http://bigpanda.cern.ch/task/4617520/

Task 4617520: user.wash.pruntest/

Task ID	Jobset	Type	WorkingGroup	User	Task status	Ninputfiles | finished | failed	Created	Modified	Cores	Priority	Parent
4617520	3	analy		andrew washbrook	done	1 | 1 (100%)	2015-01-06 14:22	01-09 10:15	1	1000	

View: job list (access to job details and logs) | child tasks | prodsys task page | brokerage logger | JEDI action logger | error summary

- http://bigpanda.cern.ch/job?pandaid=2351340829

Where the job was run

PandaID	Owner	Request Task ID	Status	Created	Time to start d:h:m:s	Duration d:h:m:s	Modified	Cloud Site	Priority
2351340829	andrew washbrook	1 4617520	finished	2015-01-06 14:23	0:0:05:05	0:0:01:13	01-06 14:36	IT ANALY_INFN-FRASCATI	1000

Job name: user.wash.pruntest/ **type:** panda-client-0.5.42-jedi-run **transformation:** runGen-00-00-02

Datasets: **Out:** user.wash.pruntest.log.14345588

Job information | logfiles | pilot job stdout, stderr, batch log | logger records | child jobs

Jobset 1

Job Log Files

Globally Unique Identifier

- http://bigpanda.cern.ch/filebrowser/?guid=b2c3305e-5581-4062-9676-92205d72018a&lfn=user.wash.pruntest.log.4617520.000001.log.tgz&site=ANALY_INFN-FRASCATI&scope=user.wash

Logical File Name

File listing

Modification time	Size [B]	File
Tue Jan 6 14:28:57 2015	0	athena_stderr.txt
Tue Jan 6 14:28:57 2015	23820	athena_stdout.txt
Tue Jan 6 14:28:57 2015	730	job_setup.sh
Tue Jan 6 14:28:52 2015	188	matched_replicas.json
Tue Jan 6 14:28:57 2015	527	metadata-2351340829.xml
Tue Jan 6 14:28:49 2015	1391	pandaJobData.out
Tue Jan 6 14:28:57 2015	0	pandatracerlog.txt
Tue Jan 6 14:28:49 2015	0	pilot.stderr
Tue Jan 6 14:28:50 2015	77	PILOT_INITDIR
Tue Jan 6 14:28:57 2015	97	Pilot_VmPeak.txt
Tue Jan 6 14:28:51 2015	280	pilotlog.out
Tue Jan 6 14:29:52 2015	83922	pilotlog.txt

- From an individual job view you can get access to log files for further diagnosis

Output and error of job payload

Pilot logs show the staging of the job at the site

Task Monitoring

- The new task is visible from my user view page in a *registered* state

2 tasks, sorted by jeditaskid Show in task list page

ID Parent	Jobset	Task name TaskType/ProcessingType Campaign Group User Logged status	Task status Nfiles	Input files finish% fail% Nfinish Nfail	Modified	State changed	Priority
4635475	6	user.wash.tutorial.dpd/ anal/panda-client-0.5.42-jedi-athena andrew washbrook	registered 29		2015-01-09 15:47	01-09 15:47	1000
4617520	5	user.wash.pruntest/ anal/panda-client-0.5.42-jedi-run andrew washbrook	done 1	100% 1	2015-01-09 14:44	01-09 14:44	1000

Task 4635475: user.wash.tutorial.dpd/

Task ID	Jobset	Type	WorkingGroup	User	Task status	Detailed JEDI status	Ninputfiles | finished | failed	Created	Modified
4635475	6	analy		andrew washbrook	submitting	scouting	29 | 0 (0%)	2015-01-09 15:47	01-09 15:48

States of jobs in this task (merge jobs excluded) Show all jobs

defined	waiting	pending	assigned	throttled	activated	sent	starting	running	holding	transferring	finished	failed	cancelled	merging
11														

Jump to job parameters, task parameters

View: job list (access to job details and logs) | child tasks | prodsys task page | brokerage logger | JEDI action logger | error summary

Input containers

data11_7TeV.00189090.physics_Egamma.merge.AOD.f403_m975

Output containers

user.wash.tutorial.dpd_MyFirstD3PD/

user.wash.tutorial.dpd.log/

➢ http://bigpanda.cern.ch/user/?user=washbrook

Task Monitoring (2)

Job attribute summary	Sort by count, alpha
atlasrelease (1)	Atlas-17.2.7 (11)
attemptnr (1)	1 (10)
cloud (1)	DE (11)
computingsite (1)	ANALY_FMPhI-UNIBA (11)
destinationse (1)	ANALY_FMPhI-UNIBA (1)
homepackage (1)	AnalysisTransforms-AtlasPhysics_17.2.7.4.1 (11)
inputfileproject (1)	data11_7TeV (10)
inputfiletype (1)	AOD (10)
jeditaskid (1)	4635475 (11)
jobsetid (1)	6 (11)
jobstatus (2)	defined (10) running (1)
outputfiletype (1)	? (11)
priorityrange (3)	900:999 (6) 1000:1099 (4) 2000:2099 (1)
processingtype (1)	panda-client-0.5.42-jedi-athena (11)
prodsourcelabel (2)	panda (1) user (10)
produsername (1)	andrew washbrook (11)
reqid (1)	6 (11)
specialhandling (1)	ddm:rucio (11)
transformation (2)	buildJob-00-00-03 (1) runAthena-00-00-12 (10)

- http://bigpanda.cern.ch/task/4635475/

- Switching to the Task view we can now see one job is running at the computing site ANALY_FMPhi-UNIBA
- Can follow individual progression of running jobs by clicking on Job Status

Job list Sort by PandaID, ascending mod time, descending mod time, priority, attemptnr, duration

PanDA ID Attempt#	Owner Group	Request Task ID	Transformation	Status	Created	Time to start d:h:m:s	Duration d:h:m:s	Mod	Cloud Site	Priority
2354305514 Attempt 0	andrew washbrook	6 4635475	buildJob-00-00-03	running	2015-01-09 15:48	0:0:01:16	0:0:01:19	01-09 15:49	DE ANALY_FMPhI-UNIBA	2000
	Job name: user.wash.tutorial.dpd/ #0									
	Datasets: Out: panda.0109154800.984205.lib._4635475									

Task Monitoring (3)

States of jobs in this task (merge jobs excluded) Show all jobs

defined	waiting	pending	assigned	throttled	activated	sent	starting	running	holding	transferring	finished	failed	cancelled	merging
								10			1			

Job attribute summary Sort by count, alpha

atlasrelease (1)	Atlas-17.2.7 (11)
attemptnr (1)	1 (10)
cloud (1)	DE (11)
computingsite (1)	ANALY_FMPhI-UNIBA (11)
destinationse (1)	ANALY_FMPhI-UNIBA (1)
homepackage (1)	AnalysisTransforms-AtlasPhysics_17.2.7.4.1 (11)
inputfileproject (1)	data11_7TeV (10)
inputfiletype (1)	AOD (10)
jeditaskid (1)	4635475 (11)
jobsetid (1)	6 (11)
jobstatus (2)	finished (1) running (10)
outputfiletype (1)	? (11)
priorityrange (3)	900:999 (4) 1000:1099 (6) 2000:2099 (1)
processingtype (1)	panda-client-0.5.42-jedi-athena (11)
prodsourcelabel (2)	panda (1) user (10)
produsername (1)	andrew washbrook (11)
reqid (1)	6 (11)
specialhandling (1)	ddm:rucio (11)
transformation (2)	buildJob-00-00-03 (1) runAthena-00-00-12 (10)

- http://bigpanda.cern.ch/task/4635475/

- Checking some time later there are 10 jobs in a *running* state with 1 job *finished*

Job list Sort by PandaID, ascending mod time, descending mod time, priority, attemptnr, duration

PanDA ID Attempt#	Owner Group	Request Task ID	Transformation	Status	Created	Time to start d:h:m:s	Duration d:h:m:s	Mod	Cloud Site	Priority
2354305524 Attempt 1	andrew washbrook	6 4635475	runAthena-00-00-12	running	2015-01-09 15:48	0:0:15:42	0:0:05:08	01-09 16:03	DE ANALY_FMPhI-UNIBA	999
	Job name: user.wash.tutorial.dpd/ #1									
	Datasets: In: data11_7TeV:data11_7TeV.00189090.physics_Egamma.merge.AOD.f403_m975 Out: user.wash.tutorial.dpd_MyFirstD3PD.14603408									
2354305523 Attempt 1	andrew washbrook	6 4635475	runAthena-00-00-12	running	2015-01-09 15:48	0:0:15:42	0:0:05:08	01-09 16:03	DE ANALY_FMPhI-UNIBA	1000
	Job name: user.wash.tutorial.dpd/ #1									
	Datasets: In: data11_7TeV:data11_7TeV.00189090.physics_Egamma.merge.AOD.f403_m975 Out: user.wash.tutorial.dpd_MyFirstD3PD.14603408									
2354305522 Attempt 1	andrew washbrook	6 4635475	runAthena-00-00-12	running	2015-01-09 15:48	0:0:15:42	0:0:05:08	01-09 16:03	DE ANALY_FMPhI-UNIBA	1000
	Job name: user.wash.tutorial.dpd/ #1									
	Datasets: In: data11_7TeV:data11_7TeV.00189090.physics_Egamma.merge.AOD.f403_m975 Out: user.wash.tutorial.dpd_MyFirstD3PD.14603408									

Task Monitoring (4)

Task 4635475: user.wash.tutorial.dpd/

Task ID	Jobset	Type	WorkingGroup	User	Task status	Ninputfiles | finished | failed	Created	Modified	Cores	Priority	Parent
4635475	6	analy		andrew washbrook	done	29 | 29 (100%)	2015-01-09 15:47	01-09 17:49	1	1000	

States of jobs in this task (merge jobs excluded) Show all jobs

defined	waiting	pending	assigned	throttled	activated	sent	starting	running	holding	transferring	finished	failed	cancelled	merging
											15			

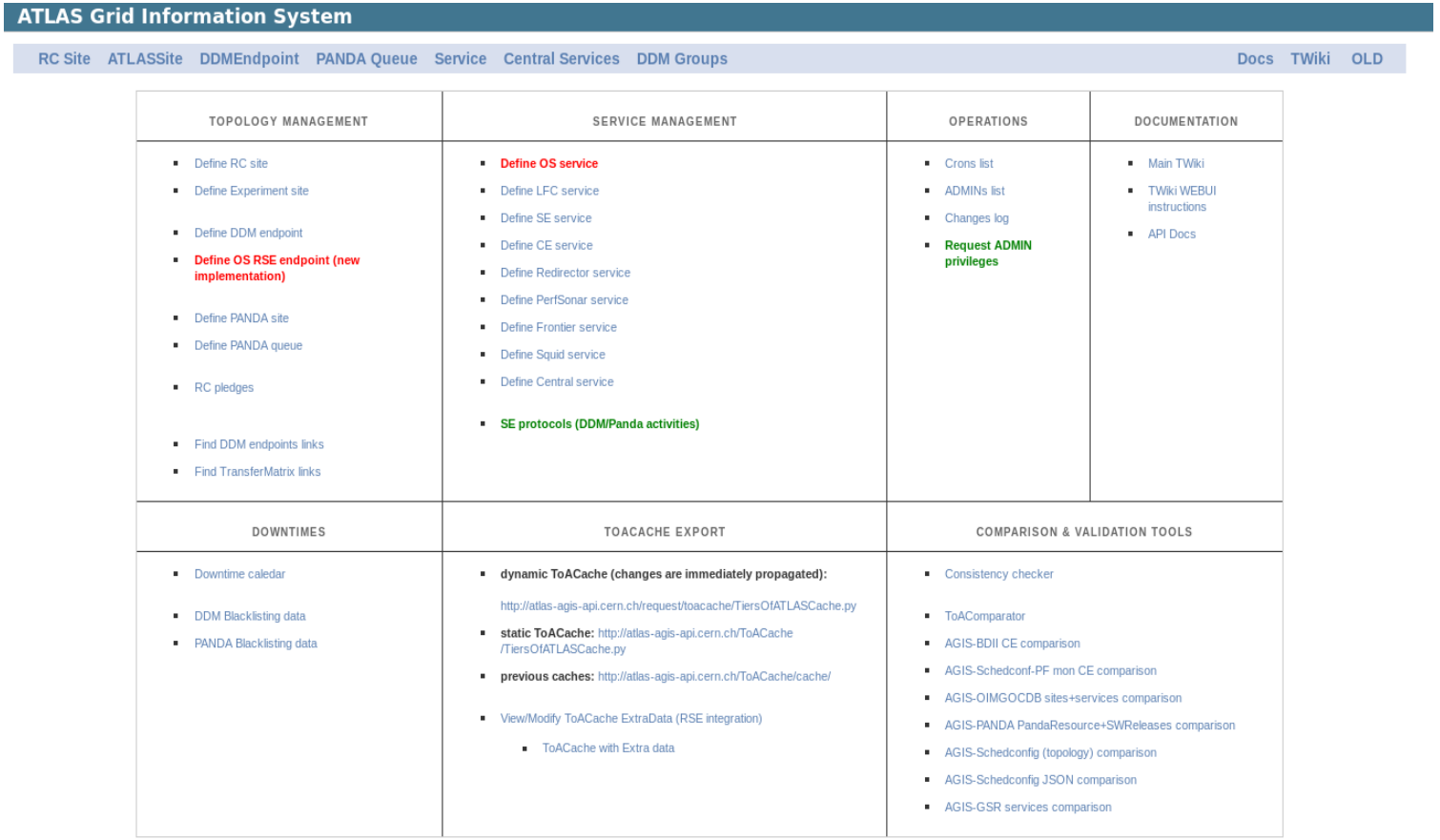
Job attribute summary Sort by count, alpha	
atlasrelease (1)	Atlas-17.2.7 (15)
attemptnr (2)	1 (10) 2 (3)
cloud (2)	DE (11) UK (4)
computingsite (2)	ANALY_FMPhI-UNIBA (11) ANALY_SHEF_SL6 (4)
destinationse (2)	ANALY_FMPhI-UNIBA (1) ANALY_SHEF_SL6 (1)
homepackage (1)	AnalysisTransforms-AtlasPhysics_17.2.7.4.1 (15)
inputfileproject (1)	data11_7TeV (13)
inputfiletype (1)	AOD (13)
jeditaskid (1)	4635475 (15)
jobsetid (1)	6 (15)
jobstatus (1)	finished (15)
outputfiletype (1)	? (15)
priorityrange (3)	900:999 (4) 1000:1099 (9) 2000:2099 (2)
processingtype (1)	panda-client-0.5.42-jedi-athena (15)
prodsourcelabel (2)	panda (2) user (13)
produsername (1)	andrew washbrook (15)
reqid (1)	6 (15)
specialhandling (1)	ddm:rucio (15)
transformation (2)	buildJob-00-00-03 (2) runAthena-00-00-12 (13)

- http://bigpanda.cern.ch/task/4635475/

- And then later all the jobs have finished and the task status is *done*
- Note that 4 of the 15 jobs were sent to a computing site in a different cloud (UK)
- Do not expect all your jobs to run at the same computing site

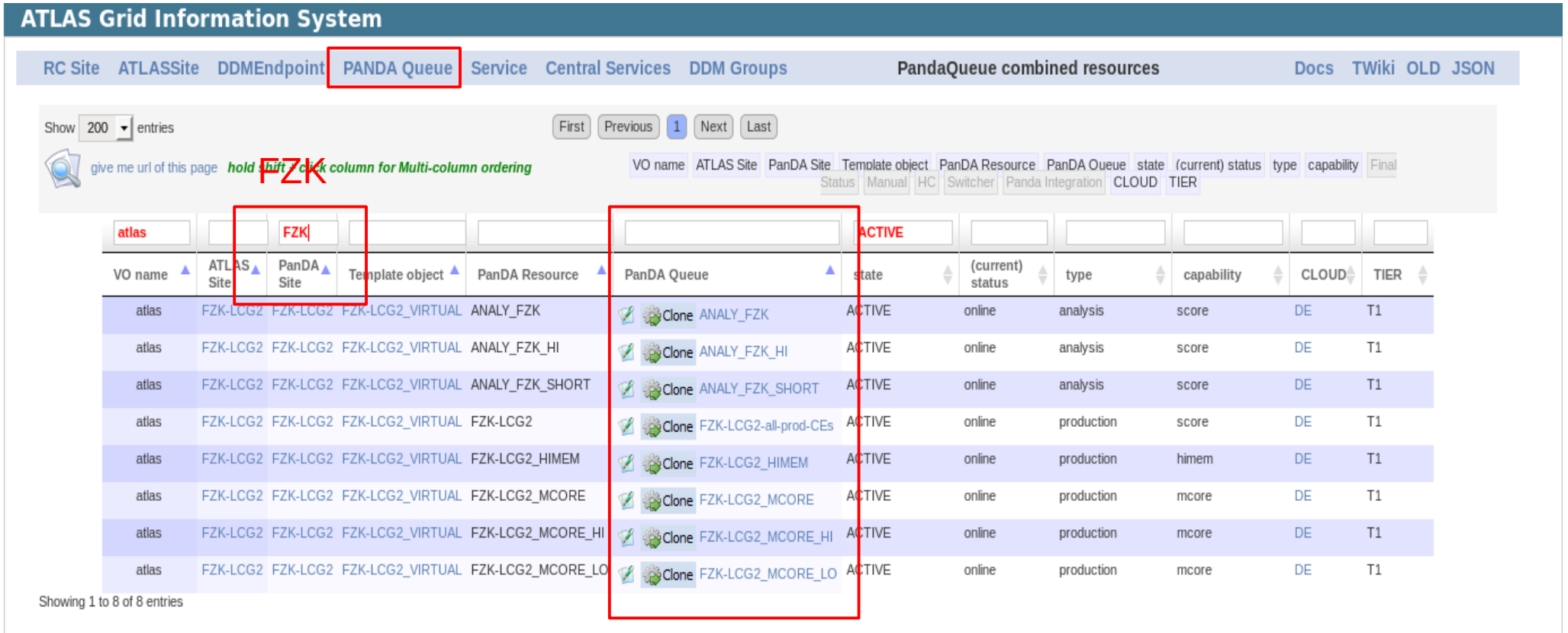
ATLAS Resources - 1

- AGIS (ATLAS Grid Information Sysgtem)
  - http://atlas-agis.cern.ch/agis/



ATLAS Resources - 2

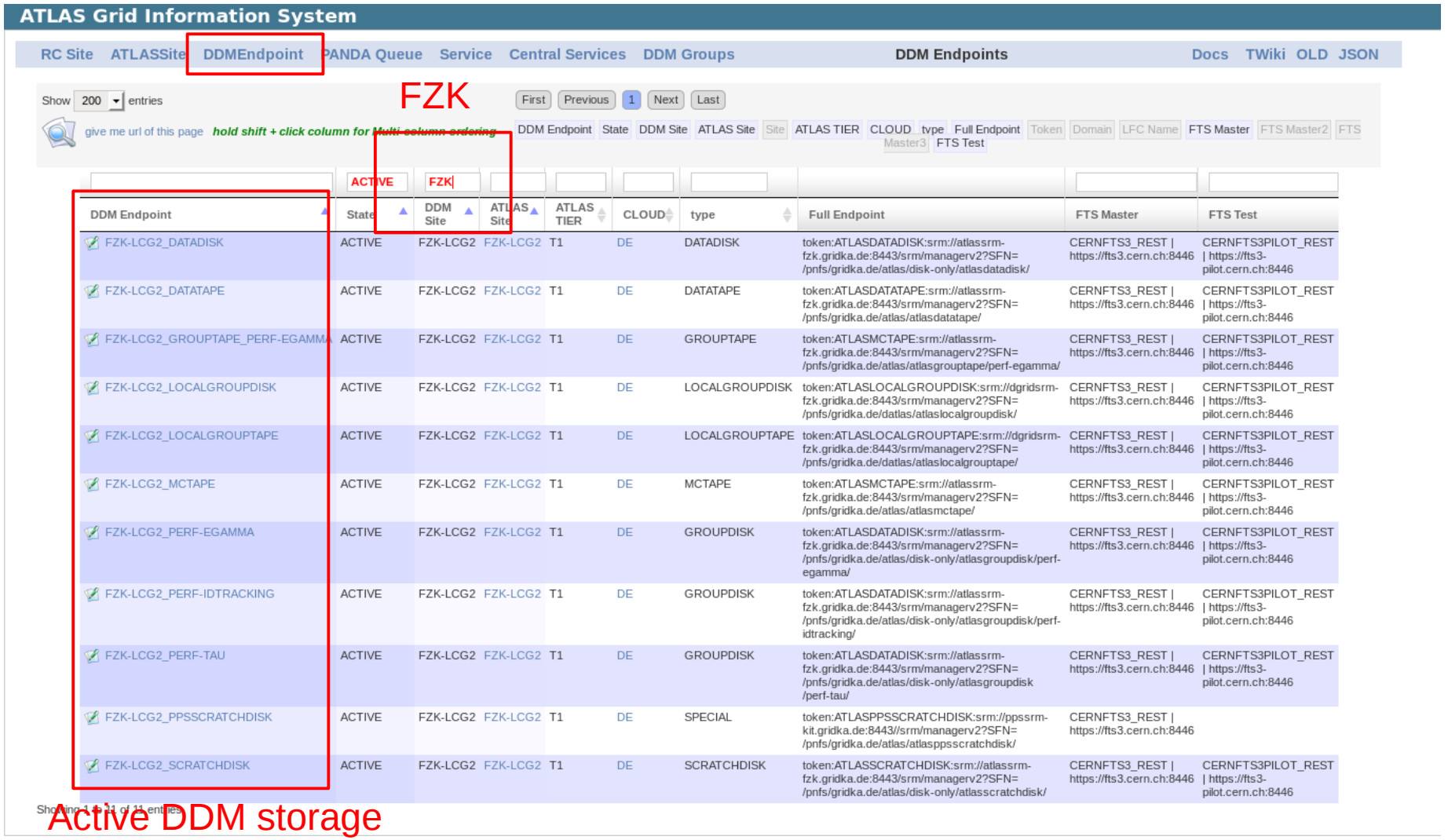
- PanDA queue end points



Active PanDA (job) queues
ANALY_ …. = Analysis queue

ATLAS Resources - 3

- DDM end points



ATLAS Resources - 4

- SCRATCHDISK (Tier1 + Tier2s in Germany)
  - FZK-LCG2_SCRATCHDISK
  - DESY-HH_SCRATCHDISK
  - DESY-ZN_SCRATCHDISK
  - LRZ-LMU_SCRATCHDISK
  - WUPPERTALPROD_SCRATCHDISK
  - UNI-FREIBURG_SCRATCHDISK
  - GOEGRID_SCRATCHDISK
- LOCALGROUPDISK (e.g. DESY-HH and UniGoettingen)
  - DESY-HH_LOCALGROUPDISK
  - GOEGRID_LOCALGROUPDISK
  - ..... _LOCALGROUPDISK

ATLAS Resources - 4

- SCRATCHDISK (Tier1 + Tier2s in Germany)
  - FZK-LCG2_SCRATCHDISK
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  - LRZ-LMU_SCRATCHDISK
  - WUPPERTALPROD_SCRATCHDISK
  - UNI-FREIBURG_SCRATCHDISK
  - GOEGRID_SCRATCHDISK

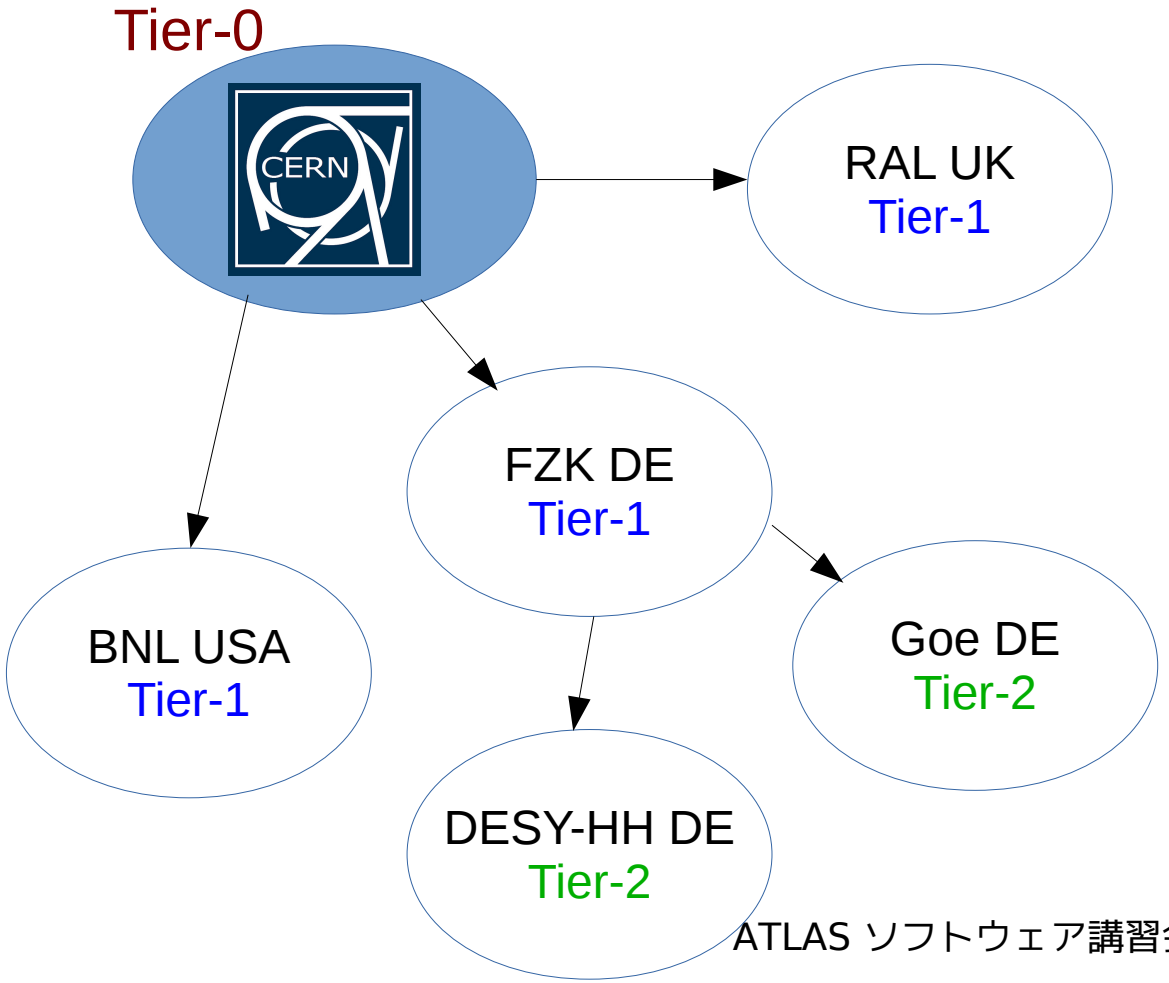
→ Storages for temporary data of PanDA jobs. Would be automatically *REMOVED*!

- LOCALGROUPDISK (e.g. DESY-HH and UniGoettingen)
  - DESY-HH_LOCALGROUPDISK
  - GOEGRID_LOCALGROUPDISK
  - …... _LOCALGROUPDISK

→ Permanently *KEPT*. Generally speaking, in total a few hundred TB in each site

ATLAS Grid computing and WLCG resources - 1

- LHC multi-tier structure
  - WLCG = Worldwide LHC Computing Grid



Tier-0: Raw data, Data store (in tape), Pre-processing, Reconstruction

Tier-1: National LCG-Centre, faster network connections and lager storage spaces (e.g. Tape), MC production, user analysis, etc.

Tier-2: University or Facility level computing sites. MC production, user analysis, etc.

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- LHC multi-tier structure
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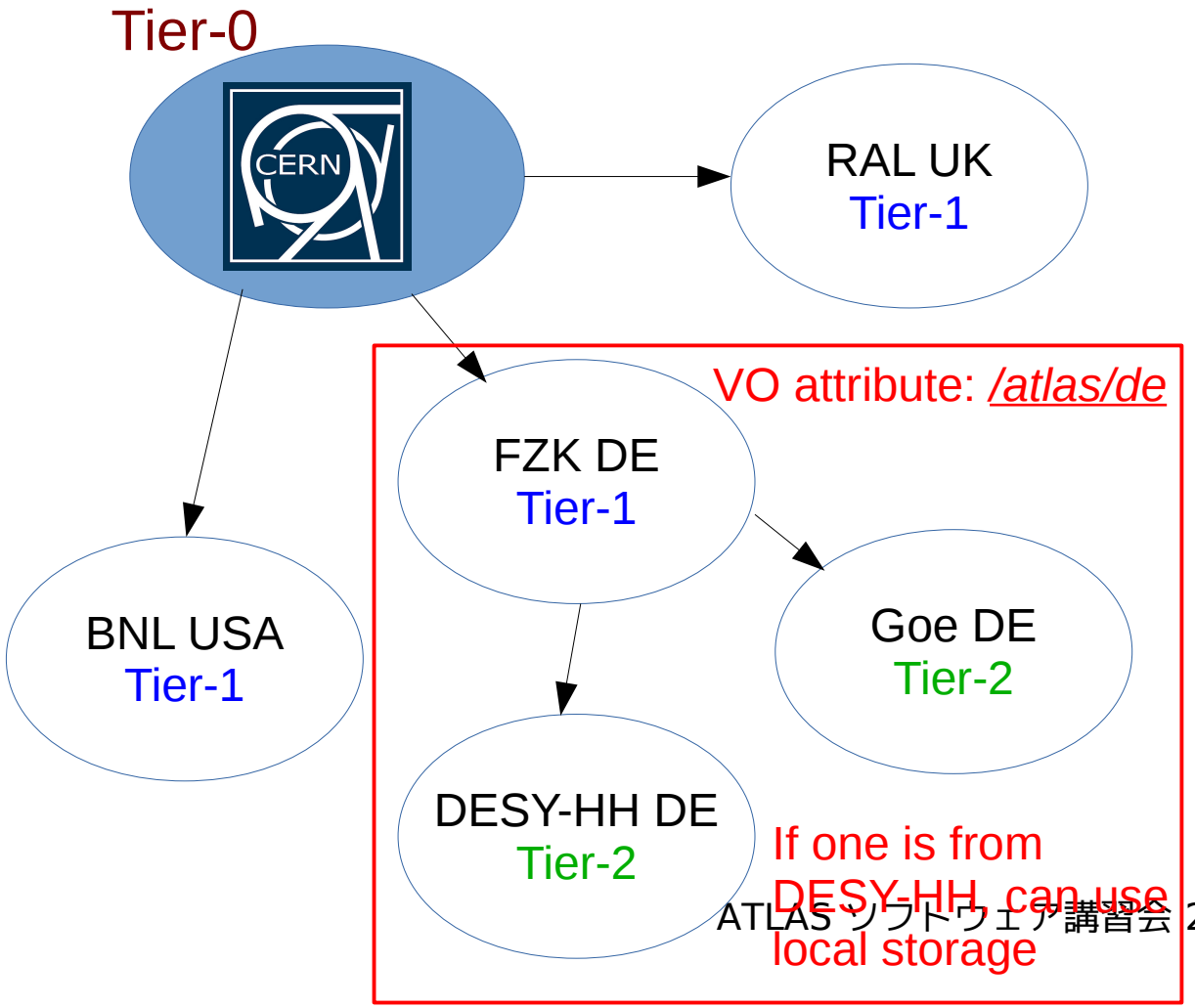

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Tier-2: University or Facility level computing sites. MC production, user analysis, etc.

Hands-on exercise
Using ATLAS client tools

- First “Hello world” job by PanDA client

PanDA client
lsetup panda

Make a Python script
cat hello_world.py

```
#!/usr/bin/python
print "Hello world!"
```

chmod 755 hello_world.py
./hello_world.py

```
Hello world!
```

Submitting a prun job
prun --outDS user.$USER.pruntest.$$ --exec hello_world.py

```
INFO : gathering files under /home/gen/tmp/for_new_comer
INFO : upload source files
INFO : submit
INFO : succeeded. new jediTaskID=5107461
```

Submitting 5 prun jobs
prun --outDS user.$USER.pruntest.$$ --exec hello_world.py –nJobs=5

Hands-on exercise using ATLAS client tools

- Athena job by PanDA client
  - pathena
    - This topic would be explained in Athena session

```
## For example, you can seamlessly run Athena code on Grid
pathena DPD_topOptions.py
–inDS=data11_7TeV.00189090.physics_Egamma.merge.AOD.f403_m975
--outDS=user.wash.tutorial.dpd
```

Links and references

- RucioUI
  - https://rucio-ui.cern.ch/
- Rucio Documentation
  - http://rucio.cern.ch/index.html
- Software twiki tutorial
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/SoftwareTutorialGettingDatasets
- Athena Docker setup
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/AthenaMacDockerSetup
- Docker container for CVMFS
  - https://github.com/sbinet/docker-containers/tree/master/cvmfs-atlas
- Binet, Sébastien, and Ben Couturier. "*docker & HEP: Containerization of applications for development, distribution and preservation.*" Journal of Physics: Conference Series. Vol. 664. No. 2. IOP Publishing, 2015.
  - http://iopscience.iop.org/article/10.1088/1742-6596/664/2/022007/meta
- ATLAS-D meeting 2015 Rucio Tutorial, Thomas Beermann
- Monitoring Your Grid Jobs, Andrew Washbrook University of Edinburgh, ATLAS Software & Computing Tutorials 14th January 2015 PUC, Chile
- Athena Mac Docker
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/AthenaMacDockerSetup
- Software tutorial using Grid
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/SoftwareTutorialUsingTheGrid