ATLAS Grid ジョブ管理と AGIS

ATLAS ソフトウェア講習会 2016

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Overview

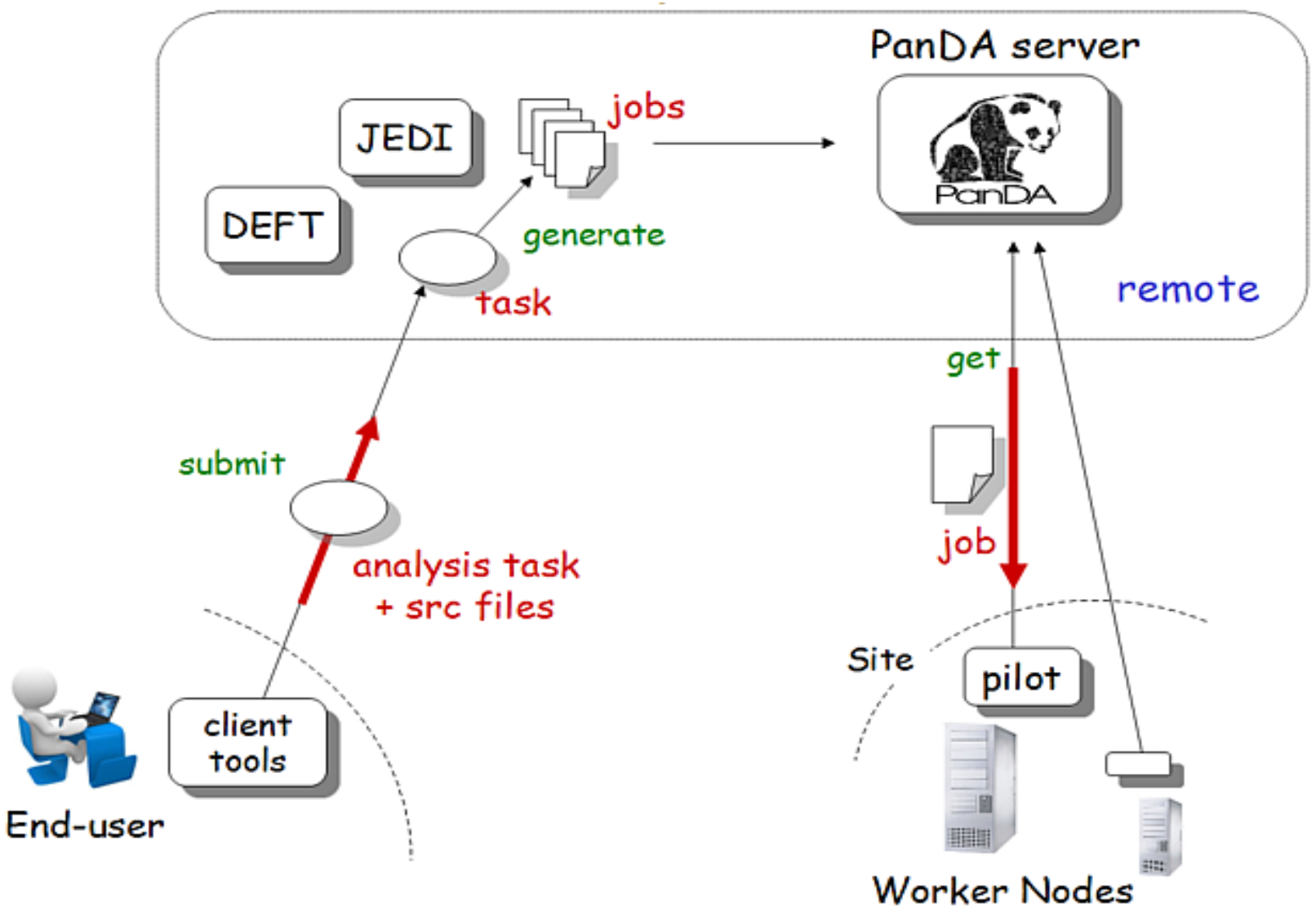
- ATLAS Grid ジョブ管理
  - PanDA
  - WLCG の基本構造
  - ATLAS ジョブとデータ
  - おまけ：ジョブ実行前のデータレプリケーション
- ATLAS の計算資源情報（ AGIS ）
  - ATLAS の資源とサイト
  - ATLAS の計算資源情報
  - PanDA ジョブ・キュー
  - Rucio ストレージ・エンド・ポイント
- リンクと参考文献

ATLAS Grid ジョブ管理

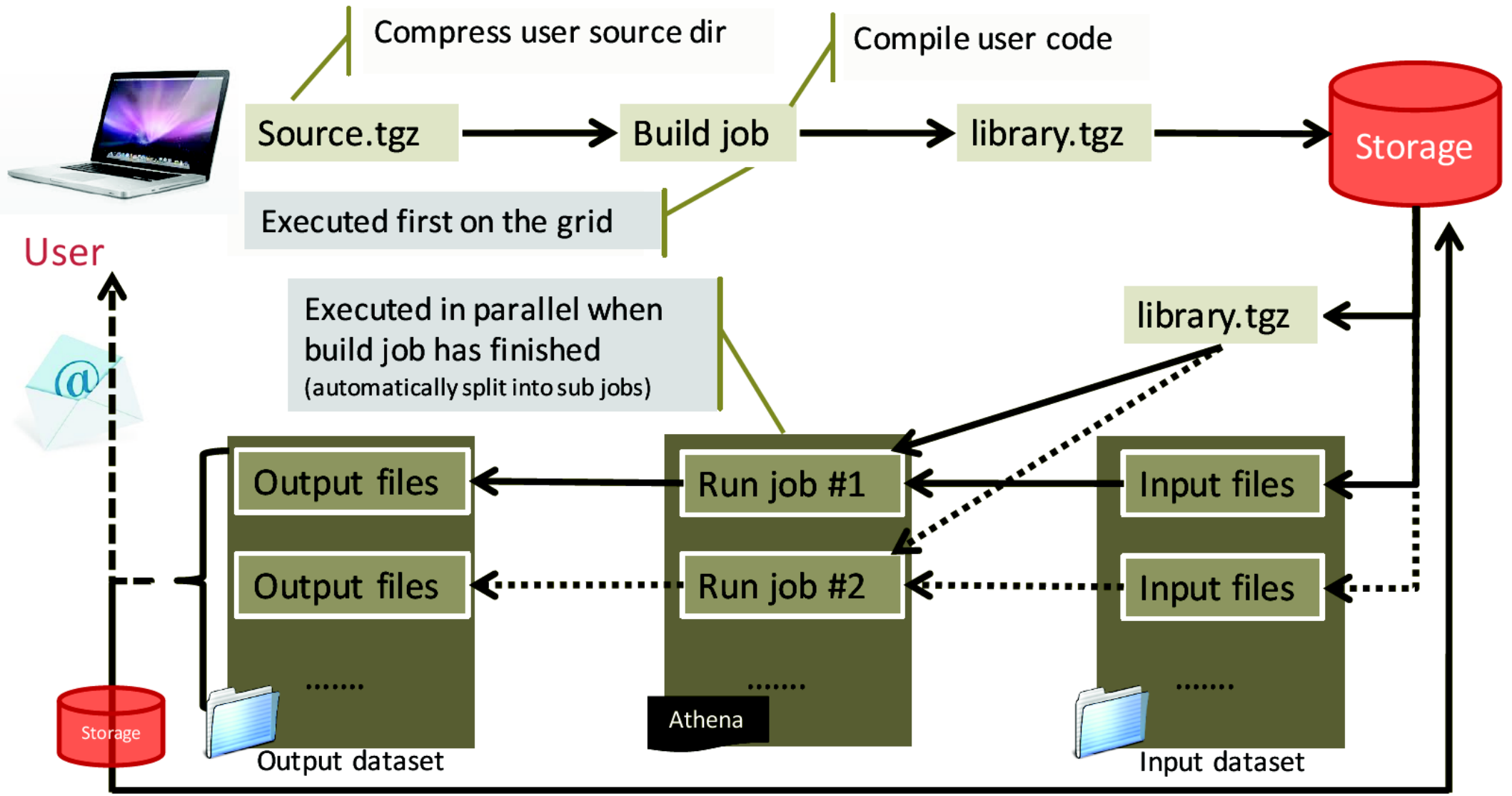
PanDA

- PanDA (Production ANd Distributed Analysis system) ATLAS 分散ジョブ管理システム
  - PanDA クライアントはジョブ管理用のクライアント・ツールセット
    - pathena - athena ジョブサブミッションツール
    - prun - python スクリプト用ジョブサブミッションツール
    - psequencer - ジョブ逐次投入用ツール。異なったシークエンスのタスク投入等のため。
    - pbook - ジョブ・ブックキーピングツール。ジョブ再投入や停止など。

PanDA ジョブワークフロー

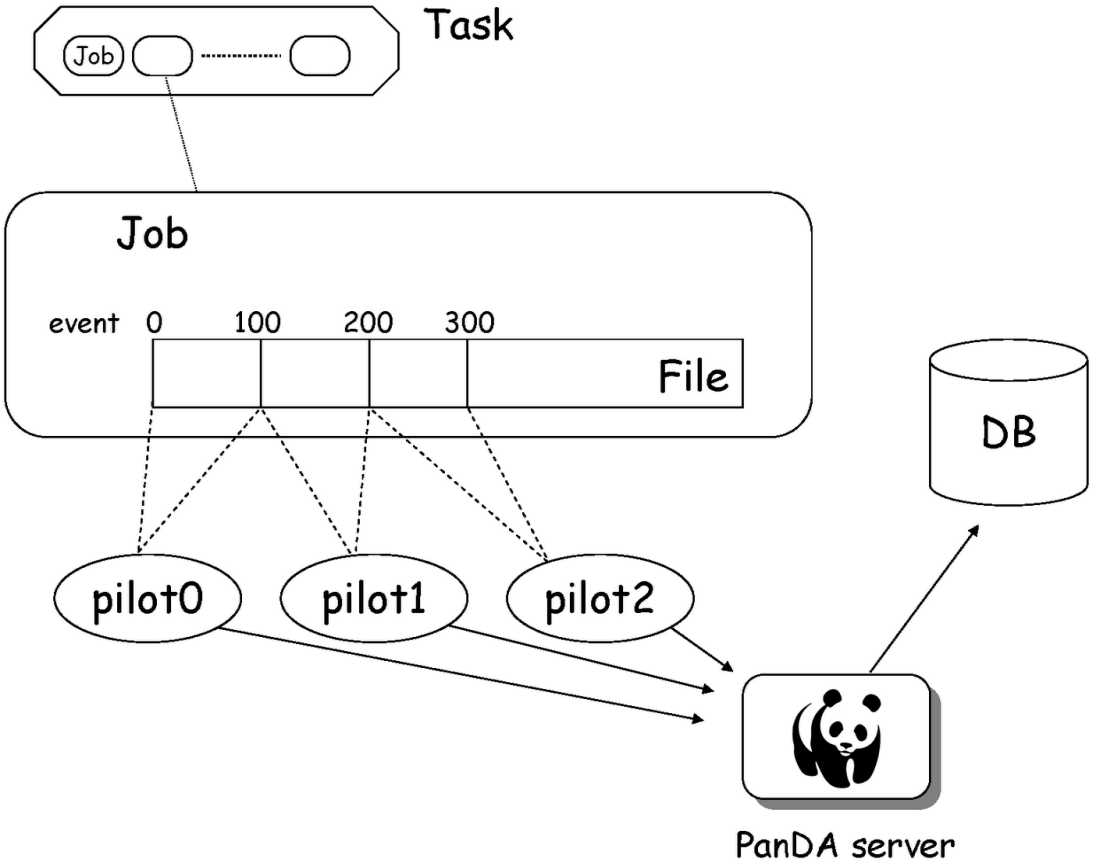


Build job と Run job



イベント・レベル処理

- PanDA は Task を物理イベント・レベルで Grid ジョブへ分割可能
  - JEDI が Task を event ベースで pilot ジョブへ



イベント・レベル処理

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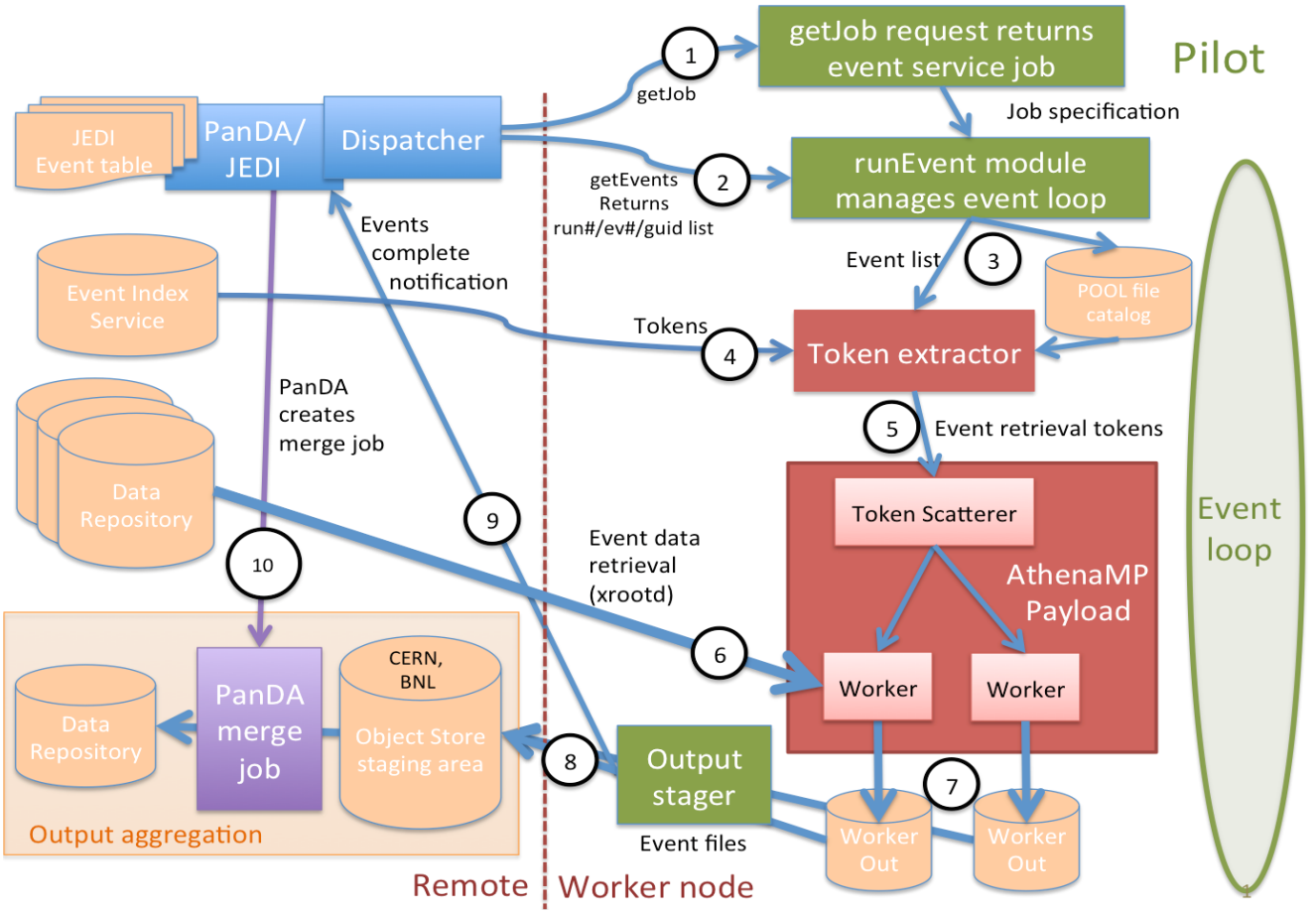


prun

- “Hello world” ジョブ

PanDA client
SetupATLAS
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!

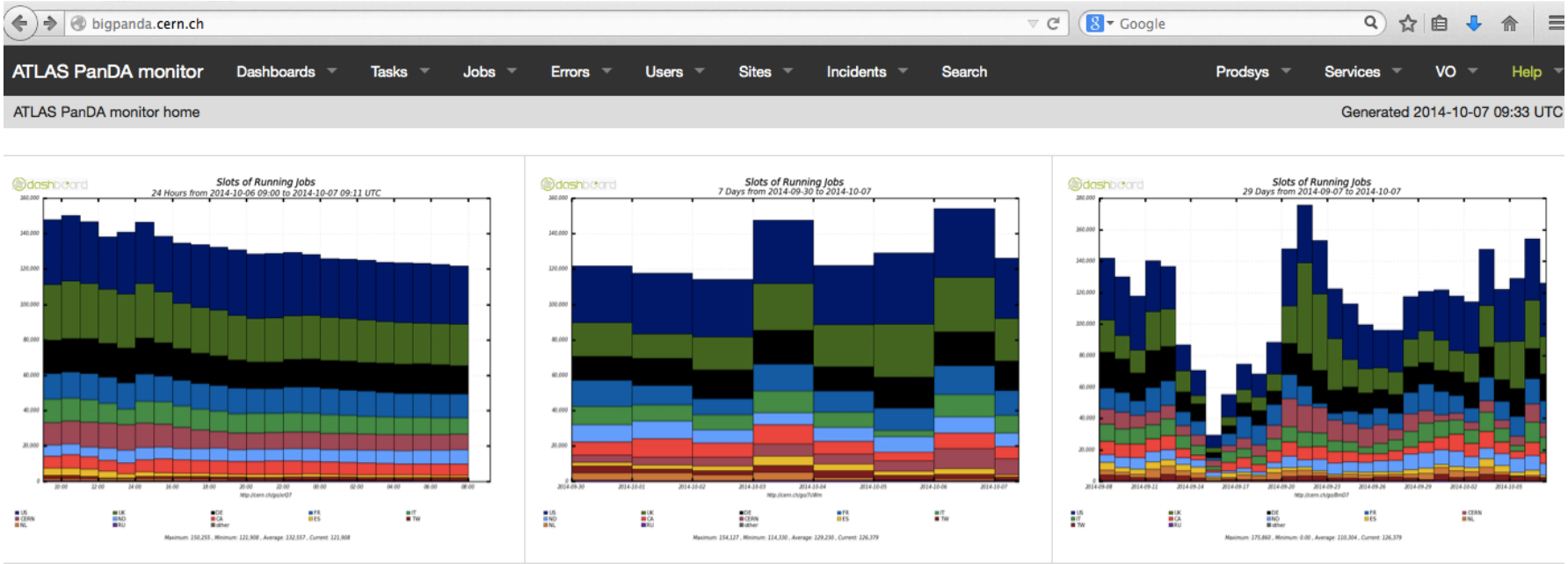
Submitting a prun job
prun --outDS user.$USER.pruntest.$$ --exec hello_world.py

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

Monitoring PanDA jobs (1/5)

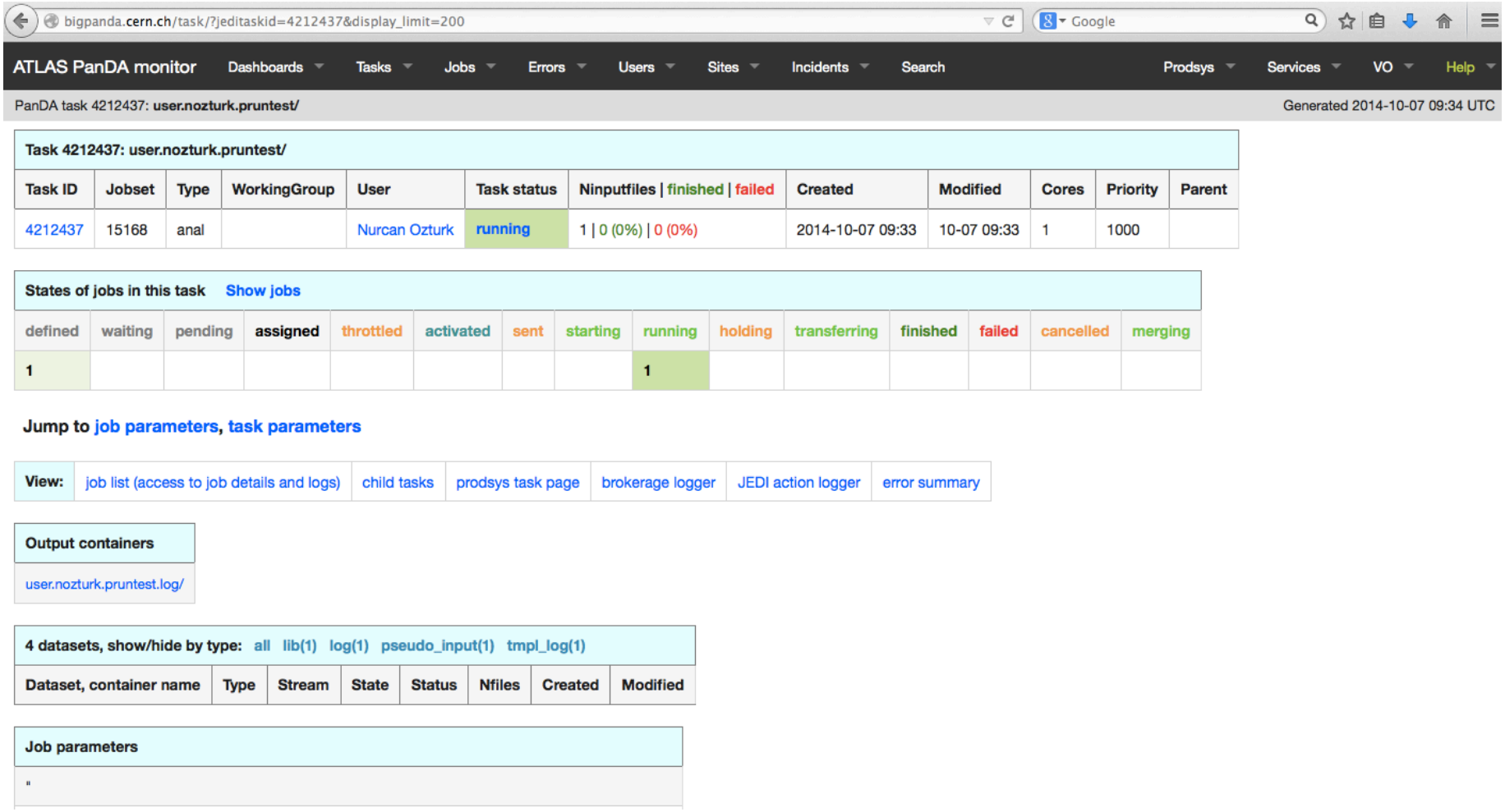
Go to: http://bigpanda.cern.ch and enter your jediTaskID



here

Monitoring PanDA jobs (2/5)

Task is running



bigpanda.cern.ch/task/?jeditaskid=4212437&display_limit=200

ATLAS PanDA monitor | Dashboards | Tasks | Jobs | Errors | Users | Sites | Incidents | Search | Prodsys | Services | VO | Help

PanDA task 4212437: **user.nozturk.pruntest/** — Generated 2014-10-07 09:34 UTC

Task 4212437: user.nozturk.pruntest/

Task ID	Jobset	Type	WorkingGroup	User	Task status	Ninputfiles | finished | failed	Created	Modified	Cores	Priority	Parent
4212437	15168	anal		Nurcan Ozturk	running	1 | 0 (0%) | 0 (0%)	2014-10-07 09:33	10-07 09:33	1	1000	

States of jobs in this task Show jobs

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

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

Output containers

user.nozturk.pruntest.log/

4 datasets, show/hide by type: all lib(1) log(1) pseudo_input(1) tmpl_log(1)

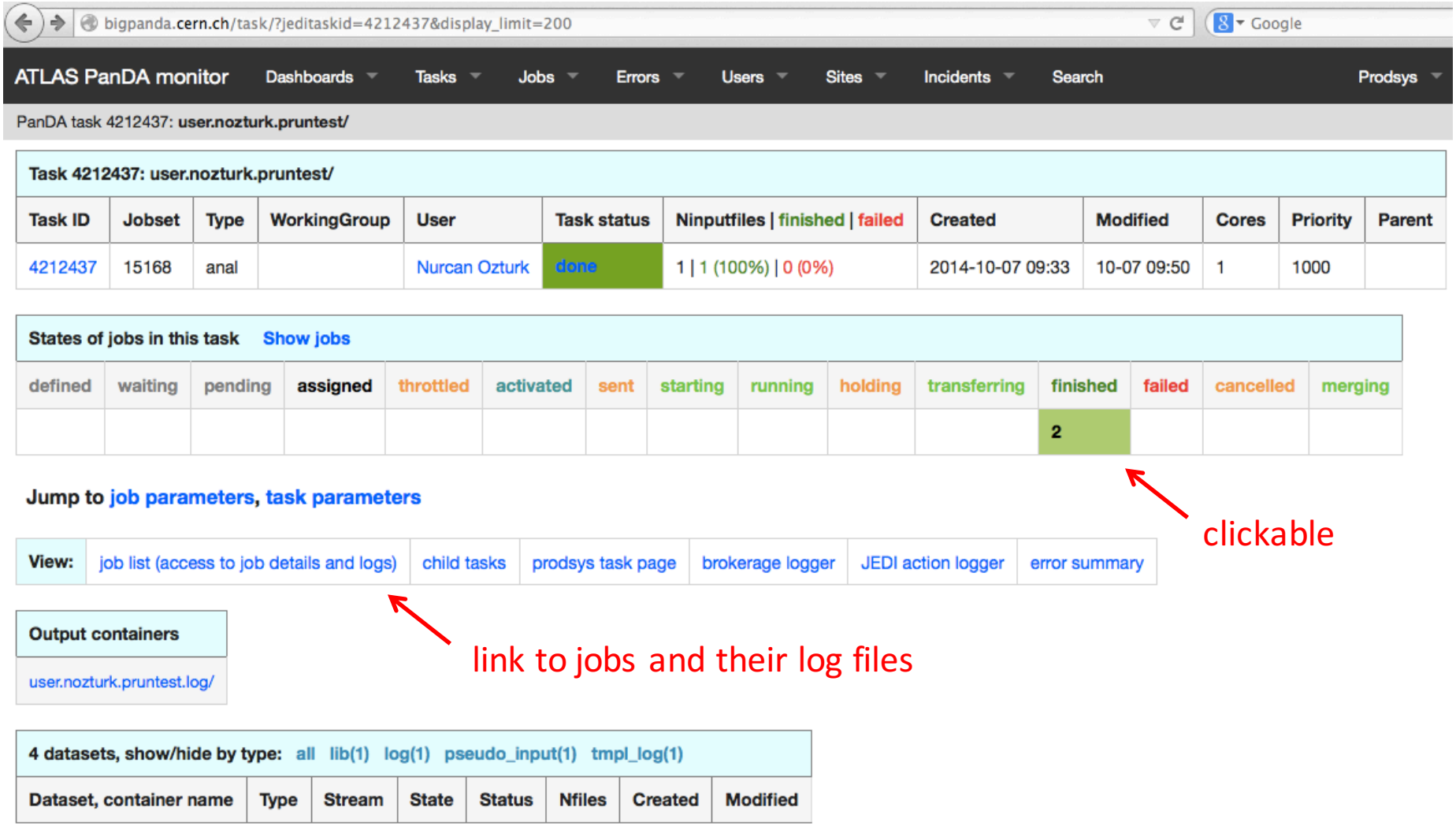
Dataset, container name	Type	Stream	State	Status	Nfiles	Created	Modified

Job parameters

"

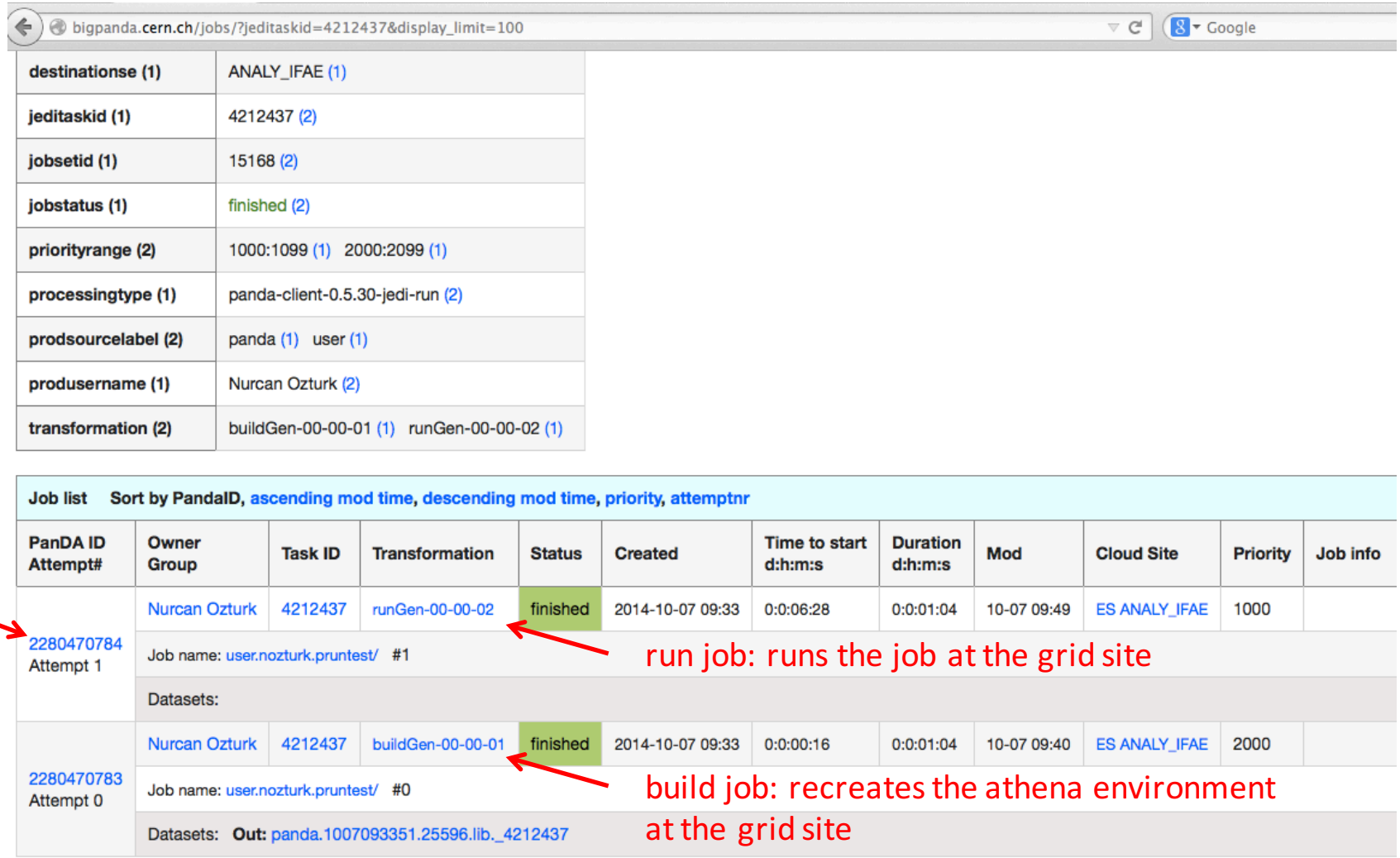
Monitoring PanDA jobs (3/5)

Task is done



Monitoring PanDA jobs (4/5)

Task details, list of jobs. Click on “PanDA ID” to go to the job details, job log files



bigpanda.cern.ch/jobs/?jeditaskid=4212437&display_limit=100

destinationse (1)	ANALY_IFAE (1)
jeditaskid (1)	4212437 (2)
jobsetid (1)	15168 (2)
jobstatus (1)	finished (2)
priorityrange (2)	1000:1099 (1) 2000:2099 (1)
processingtype (1)	panda-client-0.5.30-jedi-run (2)
prodsourcelabel (2)	panda (1) user (1)
produsername (1)	Nurcan Ozturk (2)
transformation (2)	buildGen-00-00-01 (1) runGen-00-00-02 (1)

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

PanDA ID Attempt#	Owner Group	Task ID	Transformation	Status	Created	Time to start d:h:m:s	Duration d:h:m:s	Mod	Cloud Site	Priority	Job info
2280470784 Attempt 1	Nurcan Ozturk	4212437	runGen-00-00-02	finished	2014-10-07 09:33	0:0:06:28	0:0:01:04	10-07 09:49	ES ANALY_IFAE	1000	
	Job name: user.nozturk.pruntest/ #1										
	Datasets:										
2280470783 Attempt 0	Nurcan Ozturk	4212437	buildGen-00-00-01	finished	2014-10-07 09:33	0:0:00:16	0:0:01:04	10-07 09:40	ES ANALY_IFAE	2000	
	Job name: user.nozturk.pruntest/ #0										
	Datasets: **Out:** panda.1007093351.25596.lib._4212437										

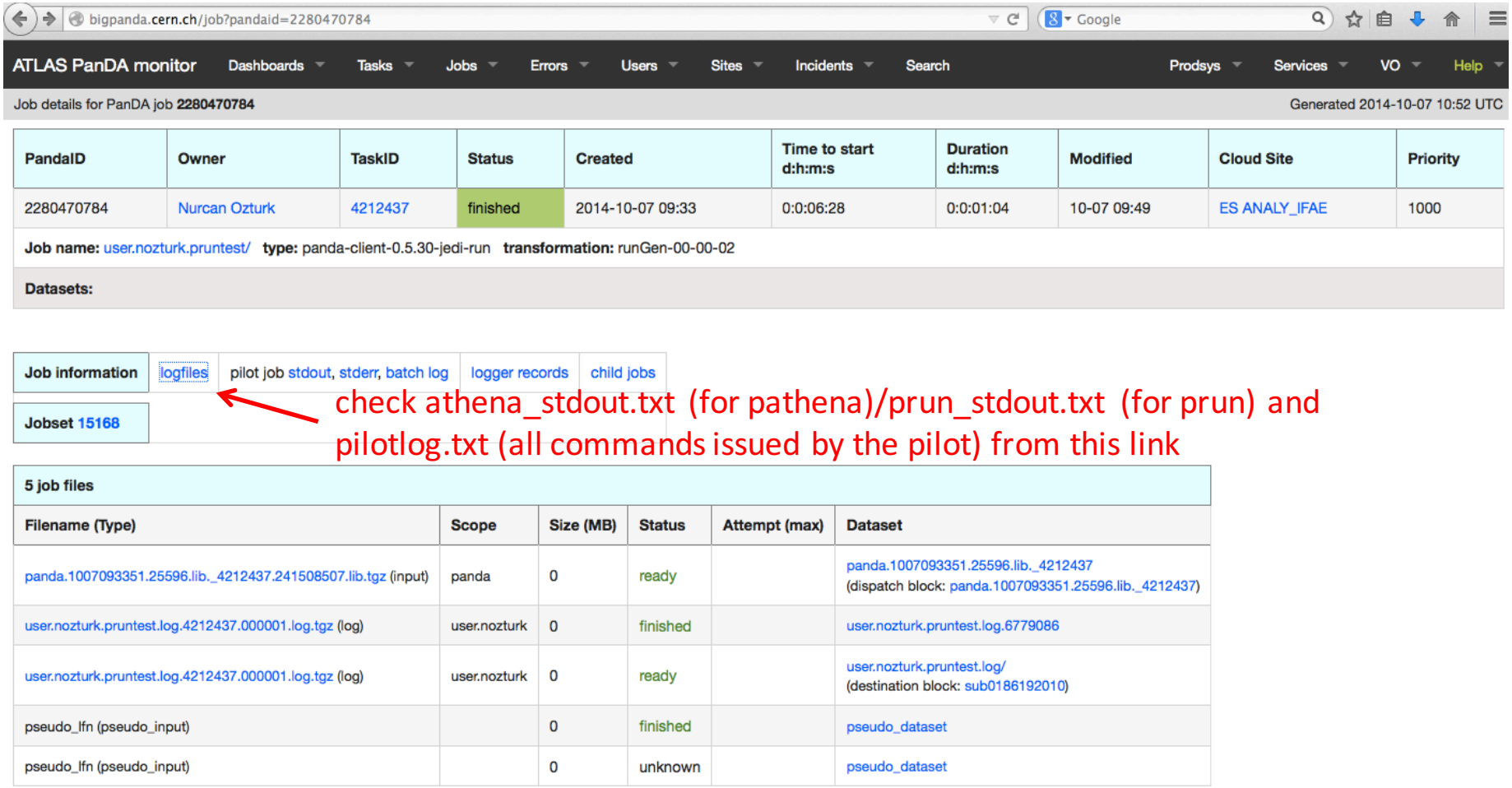
click

run job: runs the job at the grid site

build job: recreates the athena environment at the grid site

Monitoring PanDA jobs (5/5)

How to find job log files



bigpanda.cern.ch/job?pandaid=2280470784

ATLAS PanDA monitor | Dashboards | Tasks | Jobs | Errors | Users | Sites | Incidents | Search | Prodsys | Services | VO | Help

Job details for PanDA job **2280470784** — Generated 2014-10-07 10:52 UTC

PandaID	Owner	TaskID	Status	Created	Time to start d:h:m:s	Duration d:h:m:s	Modified	Cloud Site	Priority
2280470784	Nurcan Ozturk	4212437	finished	2014-10-07 09:33	0:0:06:28	0:0:01:04	10-07 09:49	ES ANALY_IFAE	1000

Job name: user.nozturk.pruntest/ **type:** panda-client-0.5.30-jedi-run **transformation:** runGen-00-00-02

Datasets:

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

Jobset 15168

check athena_stdout.txt (for pathena)/prun_stdout.txt (for prun) and pilotlog.txt (all commands issued by the pilot) from this link

5 job files

Filename (Type)	Scope	Size (MB)	Status	Attempt (max)	Dataset
panda.1007093351.25596.lib._4212437.241508507.lib.tgz (input)	panda	0	ready		panda.1007093351.25596.lib._4212437 (dispatch block: panda.1007093351.25596.lib._4212437)
user.nozturk.pruntest.log.4212437.000001.log.tgz (log)	user.nozturk	0	finished		user.nozturk.pruntest.log.6779086
user.nozturk.pruntest.log.4212437.000001.log.tgz (log)	user.nozturk	0	ready		user.nozturk.pruntest.log/ (destination block: sub0186192010)
pseudo_lfn (pseudo_input)		0	finished		pseudo_dataset
pseudo_lfn (pseudo_input)		0	unknown		pseudo_dataset

Email notifications from PanDA

From: atlpan@cern.ch
Subject: JEDI notification for TaskID:4212437 (1/1 All Succeeded)
Date: October 7, 2014 11:50:08 AM GMT+02:00
To: Nurcan Ozturk

Summary of TaskID:4212437

Created : 2014-10-07 09:33:00 (UTC)
Ended : 2014-10-07 09:50:08.720047 (UTC)

Final Status : done

Total Number of Inputs : 1
Succeeded : 1
Failed : 0
Cancelled : 0

Error Dialog : None

Log : user.nozturk.pruntest.log/

Parameters : prun --outDS user.nozturk.pruntest --exec HelloWorld.py

PandaMonURL : http://bigpanda.cern.ch/task/4212437/

Report Panda problems of any sort to

the eGroup for help request
hn-atlas-dist-analysis-help@cern.ch

the JIRA portal for software bug
https://its.cern.ch/jira/browse/ATLASPANDA

pathena

- Grid 上での Athena ジョブ
  - pathena

For example, you can seamlessly run Athena code on Grid
wget http://cern.ch/tmaeno/jobOptions.pythia16.py
pathena jobOptions.pythia16.py --outDS user.<your user name>.pythiaEventGeneration

INFO : using CMTCONFIG=x86_64-slc5-gcc43-opt
INFO : extracting run configuration
INFO : ConfigExtractor > No Input
INFO : ConfigExtractor > Output=STREAM1 pythia.pool.root
INFO : ConfigExtractor > RndmStream PYTHIA
INFO : ConfigExtractor > RndmStream PYTHIA_INIT
INFO : archiving source files
INFO : archiving InstallArea
INFO : checking symbolic links
INFO : uploading source/jobO files
INFO : submit
INFO : succeeded. new jediTaskID=4212493

pbook

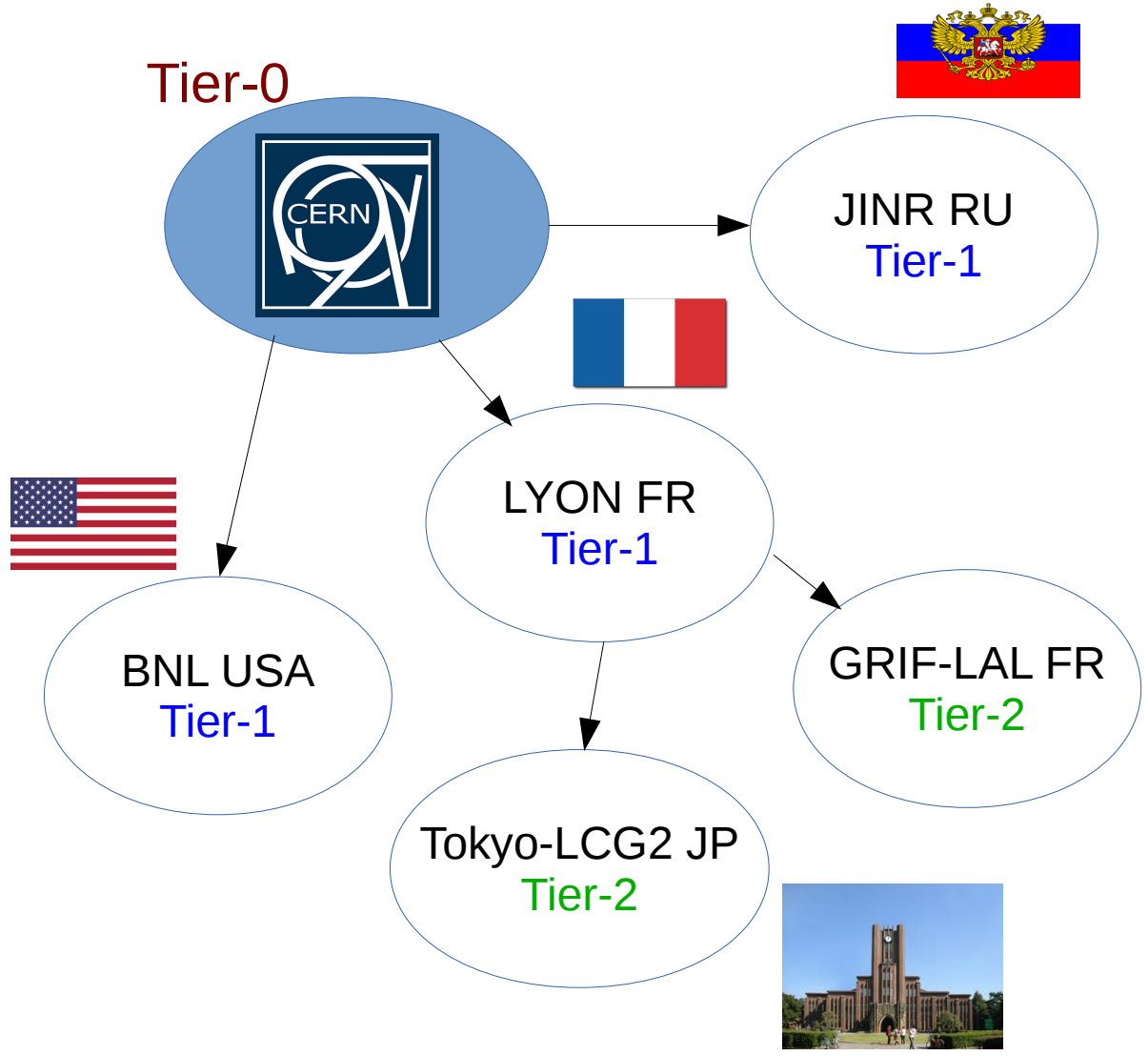
- ジョブの管理

```
## Launching PanDA book keeping interface
pbook
INFO : Synchronizing local repository ...
INFO : Got 0 jobs to be updated
INFO : Synchronization Completed
INFO : Done

Start pBook 0.5.72
>>> help()
>>> kill(4212493)
>>> retry(4212493)
>>> sync()
>>> show()
```

WLCG の基本構造

- LHC Tier 構造



WLCG
Worldwide LHC Computing Grid

Tier-0: RAW データ、テープドライブ、プレプロセッシング、リコンストラクション

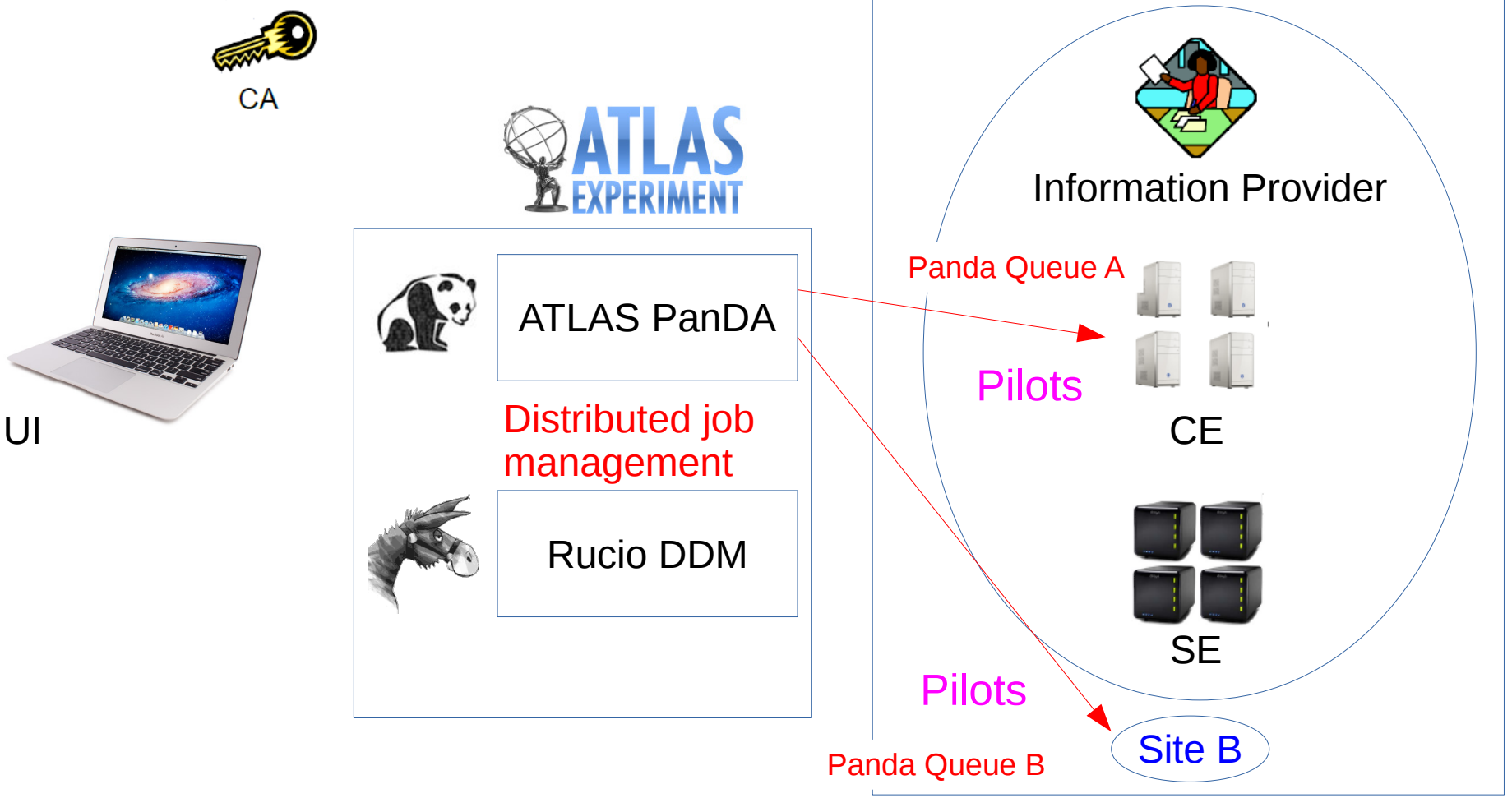
Tier-1: 国レベル。テープドライブ有。巨大計算資源とディスク。

Tier-2: 大学や研究機関レベルのサイト。

注）階層構造自体は現在フレキシブルになりつつあり。データ転送等は各サイト間のエンドポイント同士で要求可能。

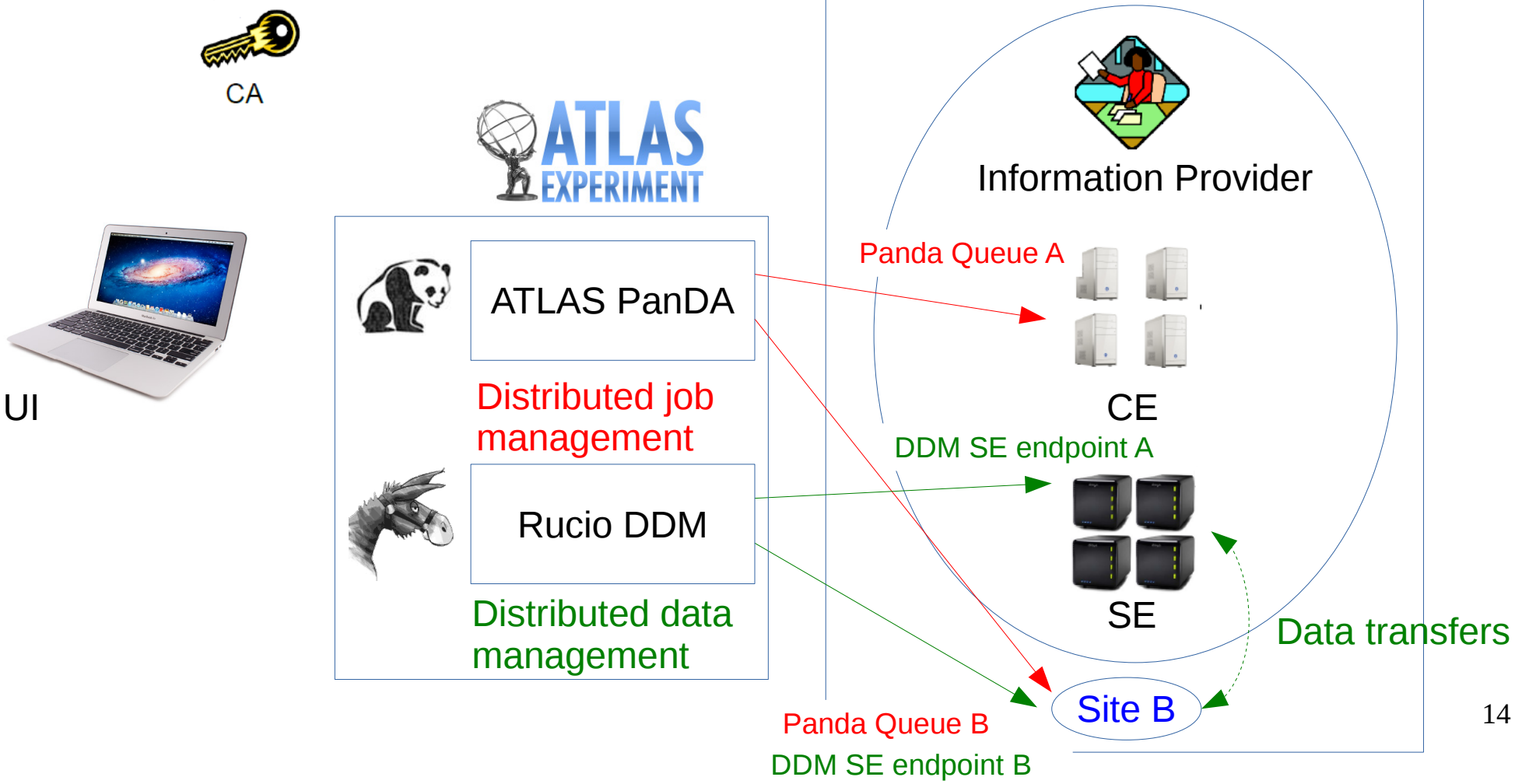
ATLAS ジョブとデータ

- あくまで概略



ATLAS ジョブとデータ

- あくまで概略



おまけ：ジョブ実行前のデータレプリケーション

- データエラーやクラッシュ等理解不能な状況にはまって抜け出せない場合に試す価値あり
  - 大量のデータ処理を行うジョブにありがち

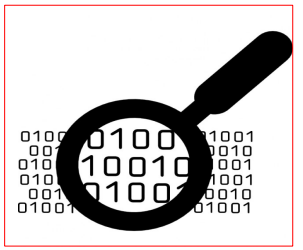
ジョブ・サブミッション

ATLAS PanDA

BNL
Tier-1

Grid で好ましいサイト

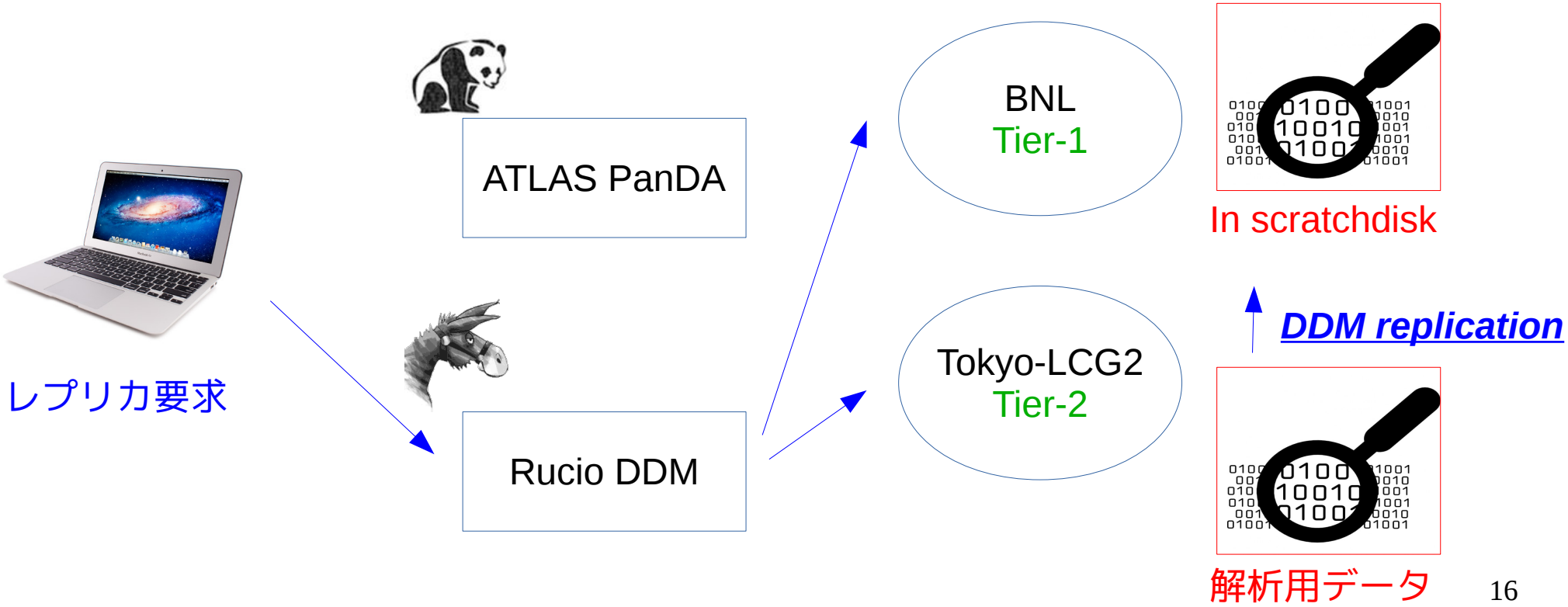
Tokyo-LCG2
Tier-2



解析用データ

おまけ：ジョブ実行前のデータレプリケーション

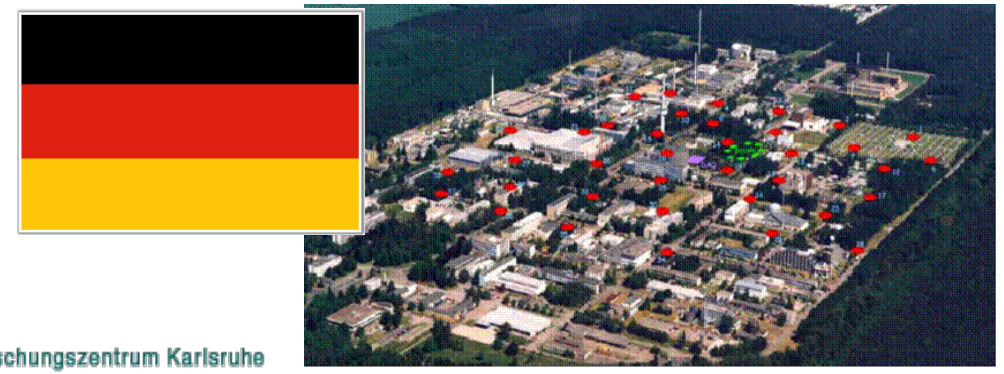
- レプリケーションを作ったあとにジョブ実行
  - 理由 : Grid ジョブはデータロケーションを好む。ローカルなデータアクセスは圧倒的に速い



ATLAS の計算資源情報（ AGIS ）

ATLAS の資源とサイト

- FZK Tier-1



Forschungszentrum Karlsruhe
in der Helmholtz-Gemeinschaft

FZK Computing centre

ジョブキュー

設定： MCore, Analysis ….

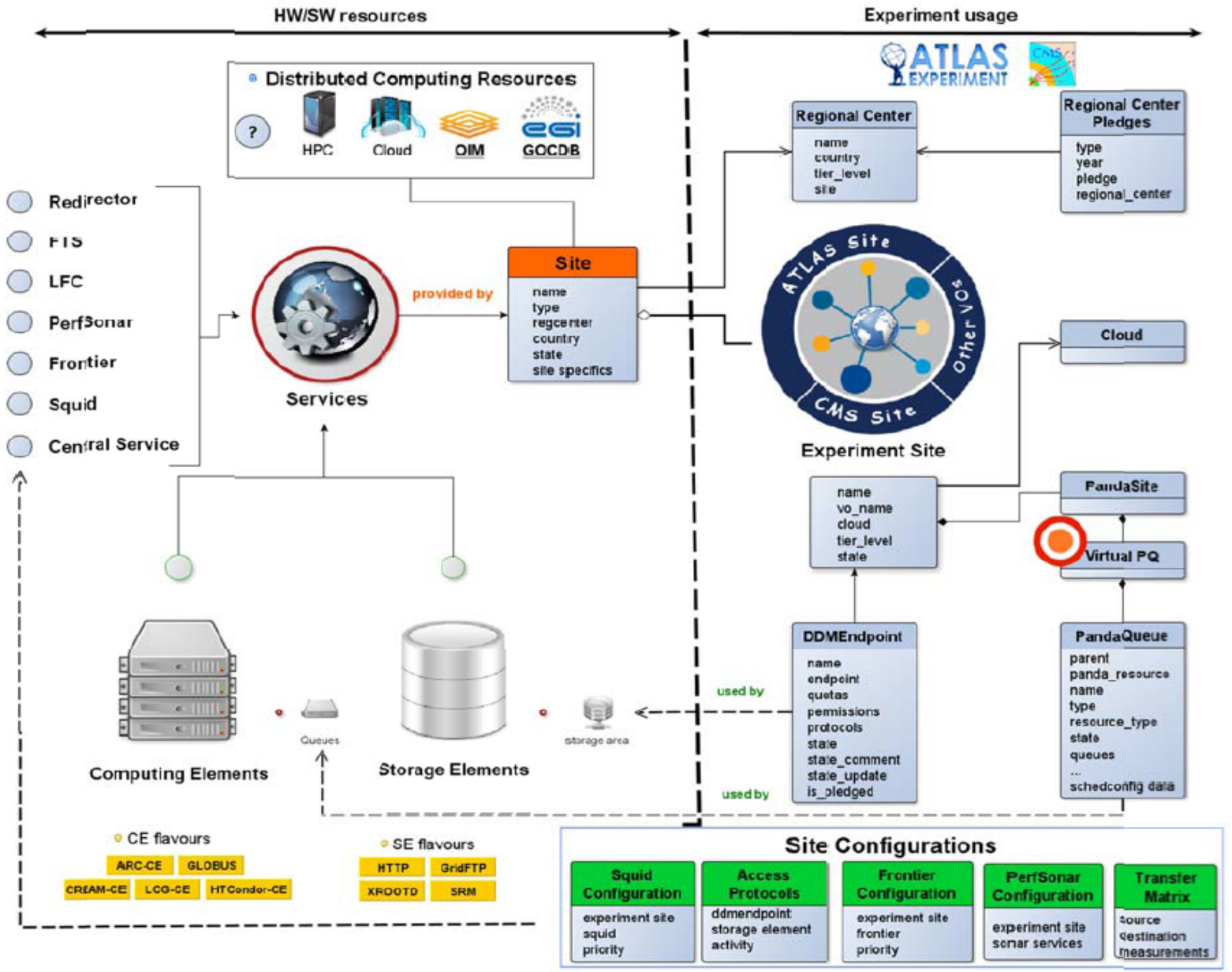
計算資源

ストレージ資源

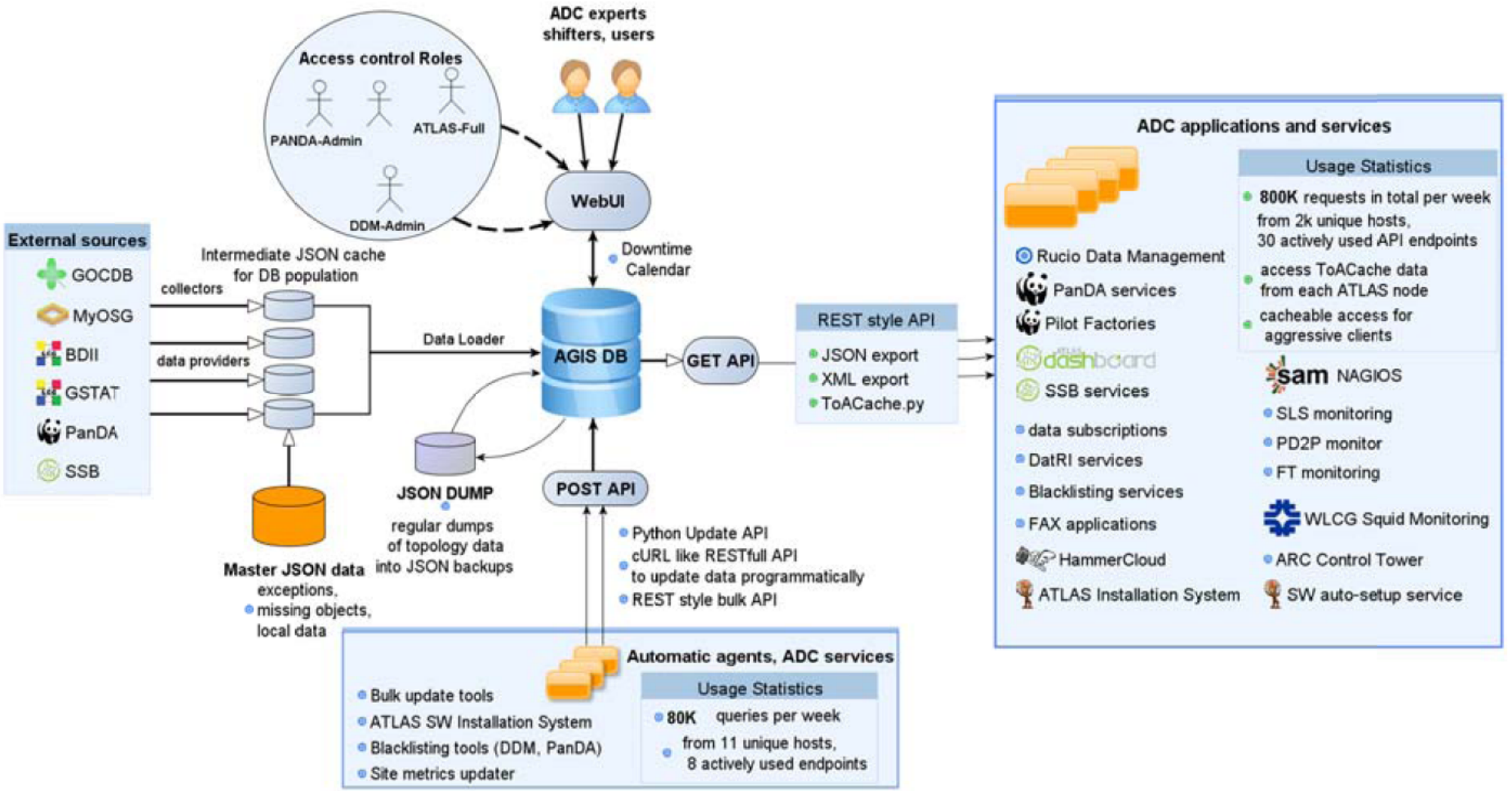
ストレージエンドポイント

プロトコル : srm, gridftp, https, xroot

ATLAS の資源とサイト - 抽象化（計算資源と実験）

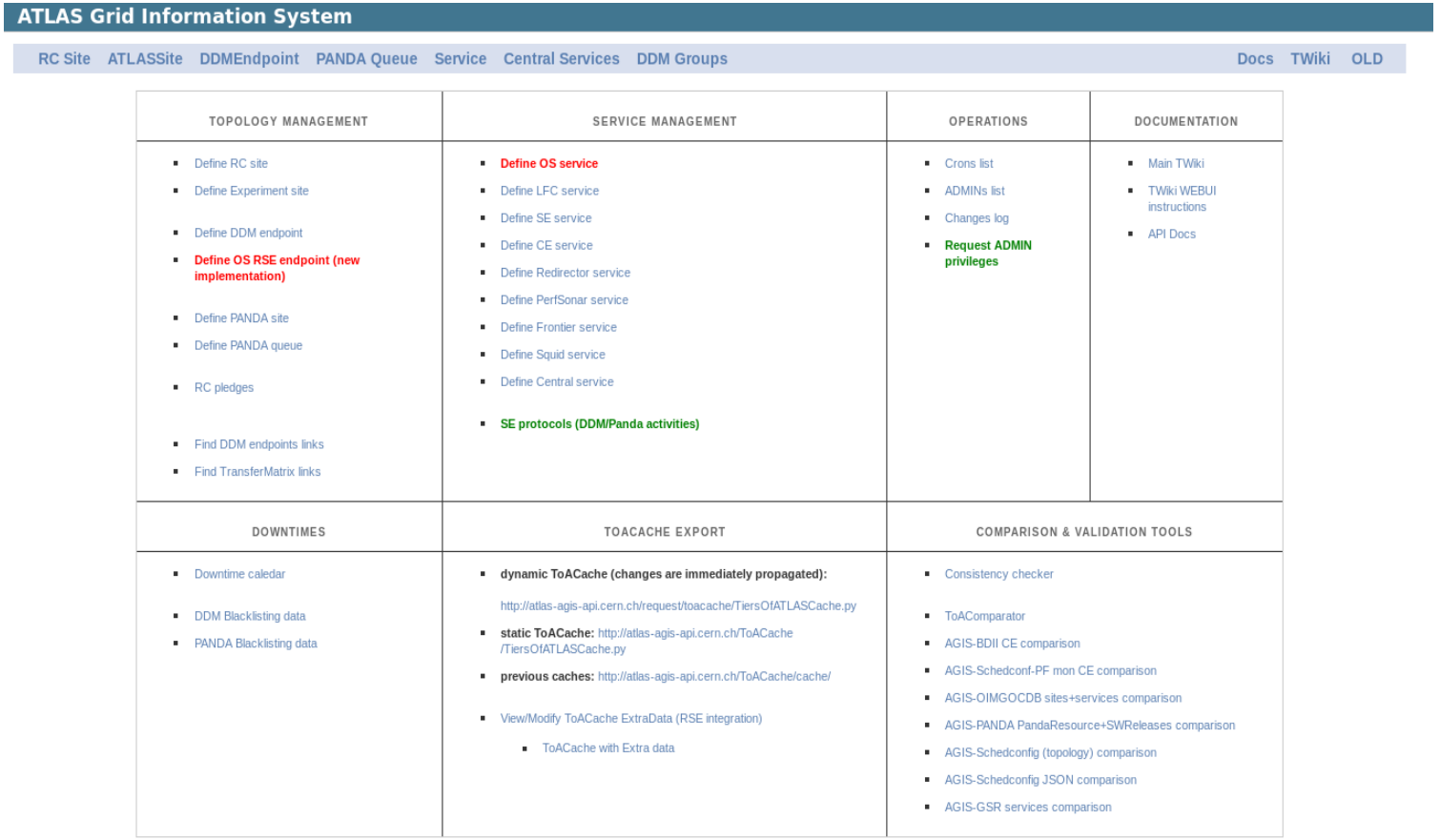


ATLAS の資源とサイト - 実装



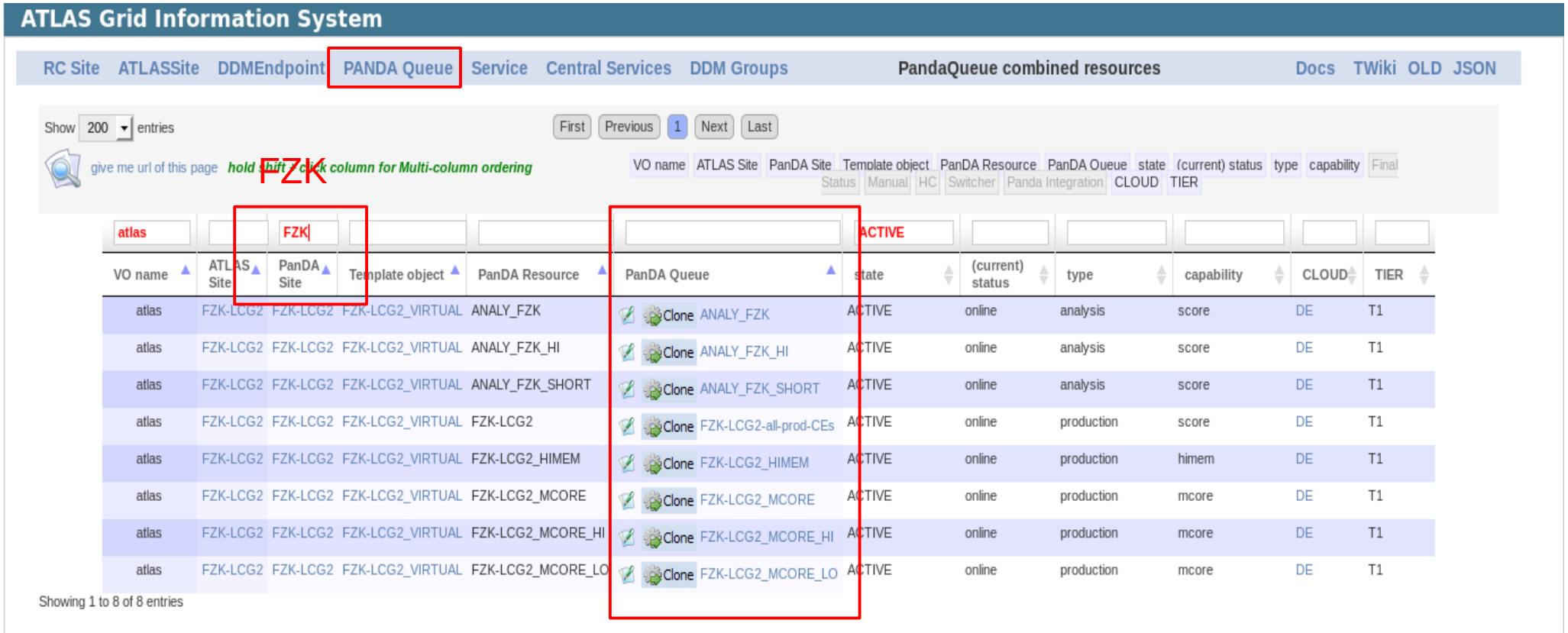
ATLAS の計算資源情報

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



PanDA ジョブ・キュー

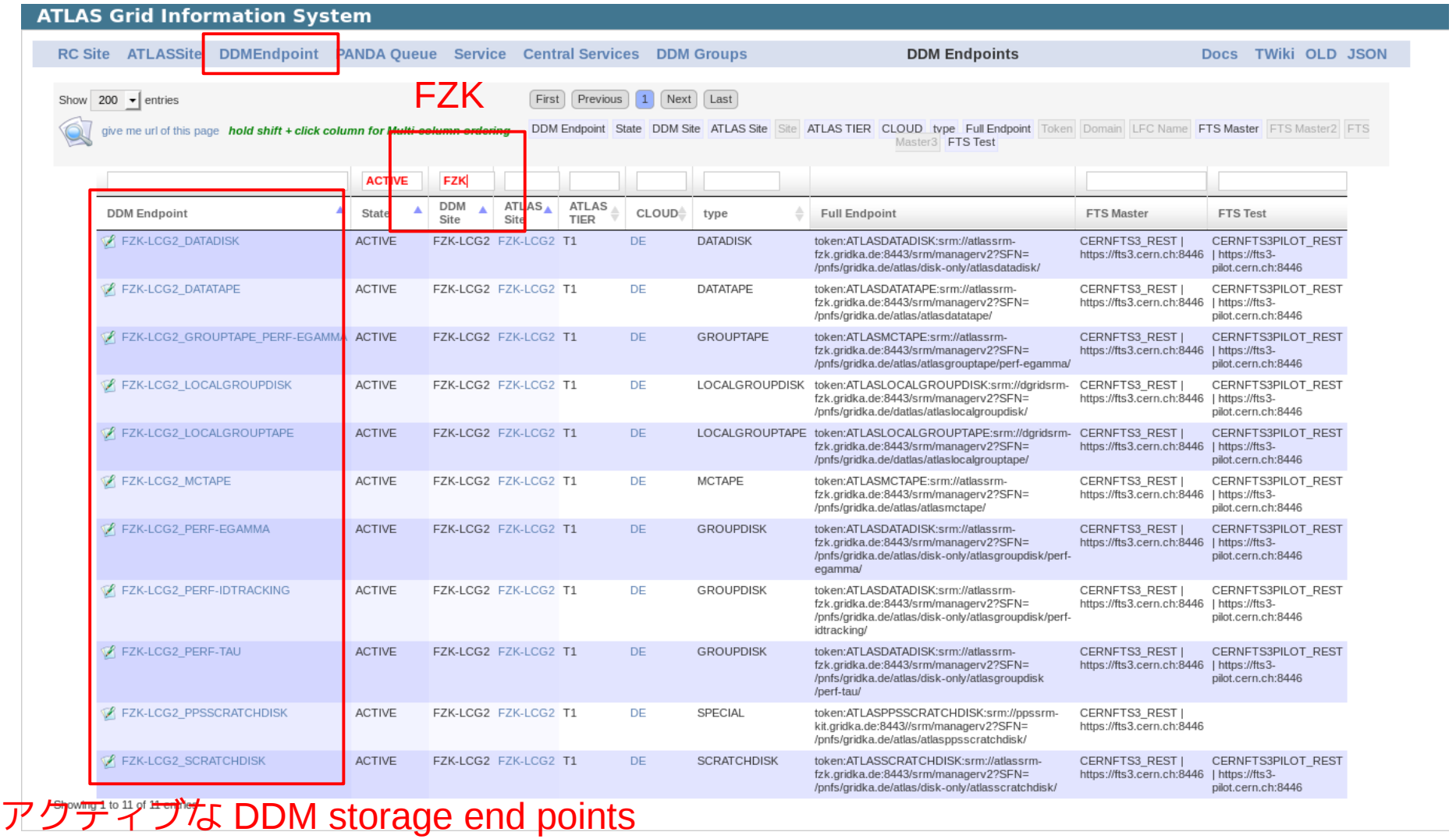
- PanDA ジョブ・キュー・エンドポイント



アクティブな PanDA (job) キュー
ANALY_ …. = Analysis キュー

Rucio ストレージ・エンド・ポイント

- DDM Rucio Storage End points



アクティブな DDM storage end points

ATLAS Distributed Analysis Help

hn-atlas-dist-analysis-help@cern.ch

リンクと参考文献

- Software twiki tutorial
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/SoftwareTutorialGettingDatasets
- ATLAS-D meeting 2016 Grid/Rucio Tutorial, Gen Kawamura
- Monitoring Your Grid Jobs, Andrew Washbrook University of Edinburgh, ATLAS Software & Computing Tutorials 14th January 2015 PUC, Chile
- Software tutorial using Grid
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/SoftwareTutorialUsingTheGrid
- ATLAS Software Tutorial, Feb 2016
  - https://indico.cern.ch/event/465378/
- Calafiura, Paolo, et al. "The ATLAS Event Service: A new approach to event processing." Journal of Physics: Conference Series. Vol. 664. No. 6. IOP Publishing, 2015.
- Anisenkov, Alexey, et al. "AGIS: Evolution of Distributed Computing information system for ATLAS." Journal of Physics: Conference Series. Vol. 664. No. 6. IOP Publishing, 2015.