



Bundesministerium
für Bildung
und Forschung

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

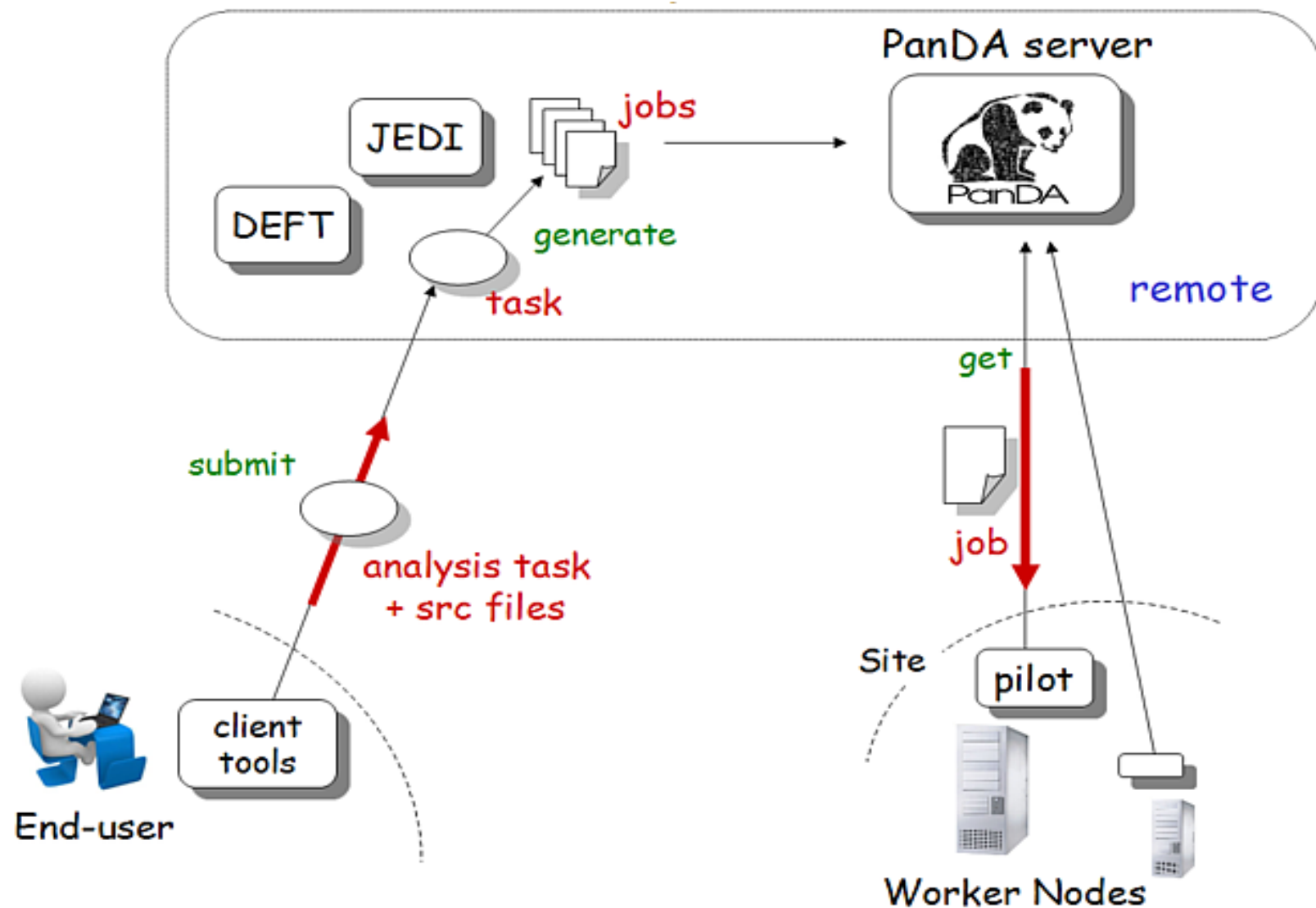
ATLAS Grid ジョブ管理



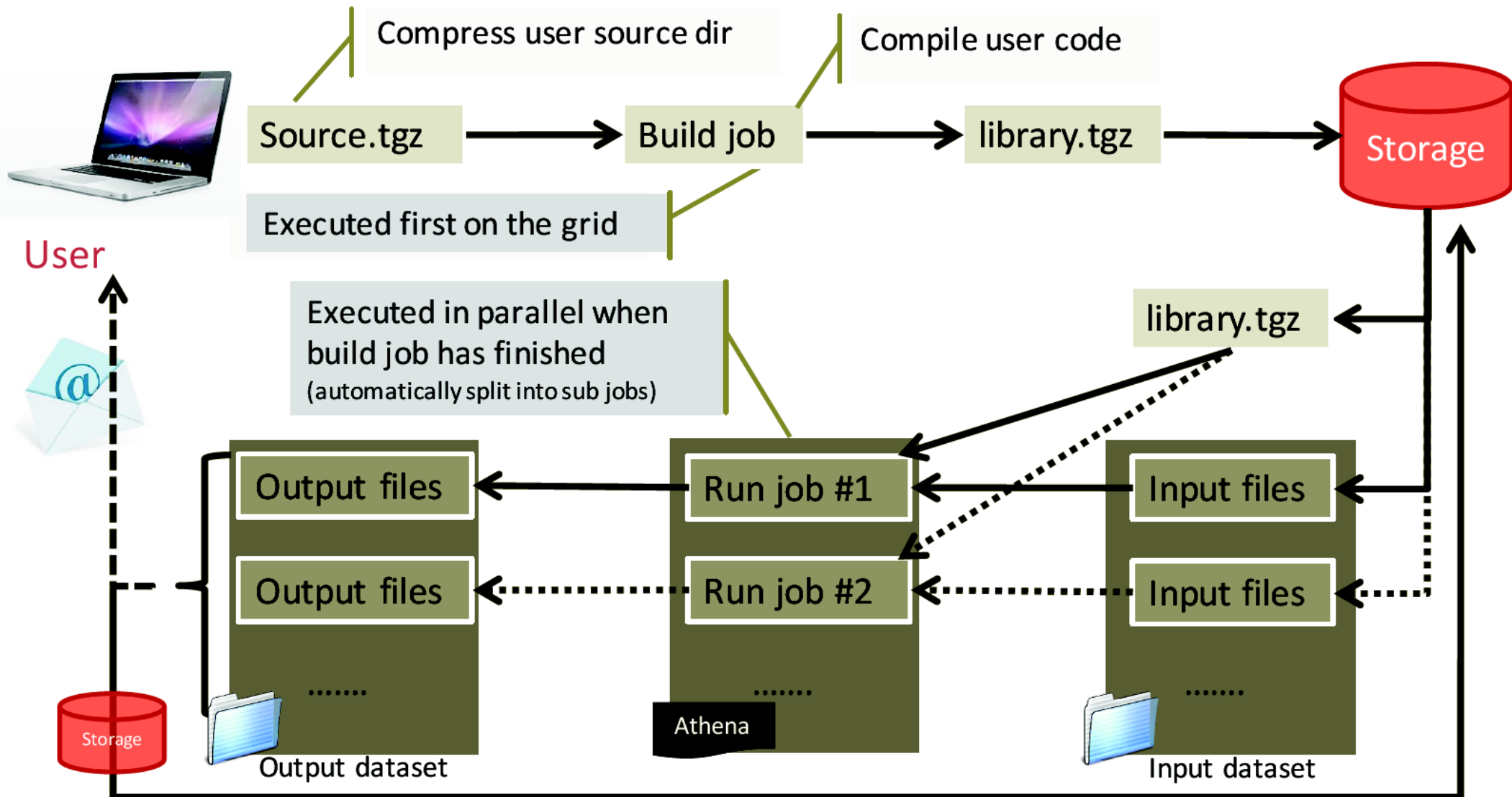
PanDA

- 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。異なったシーケ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

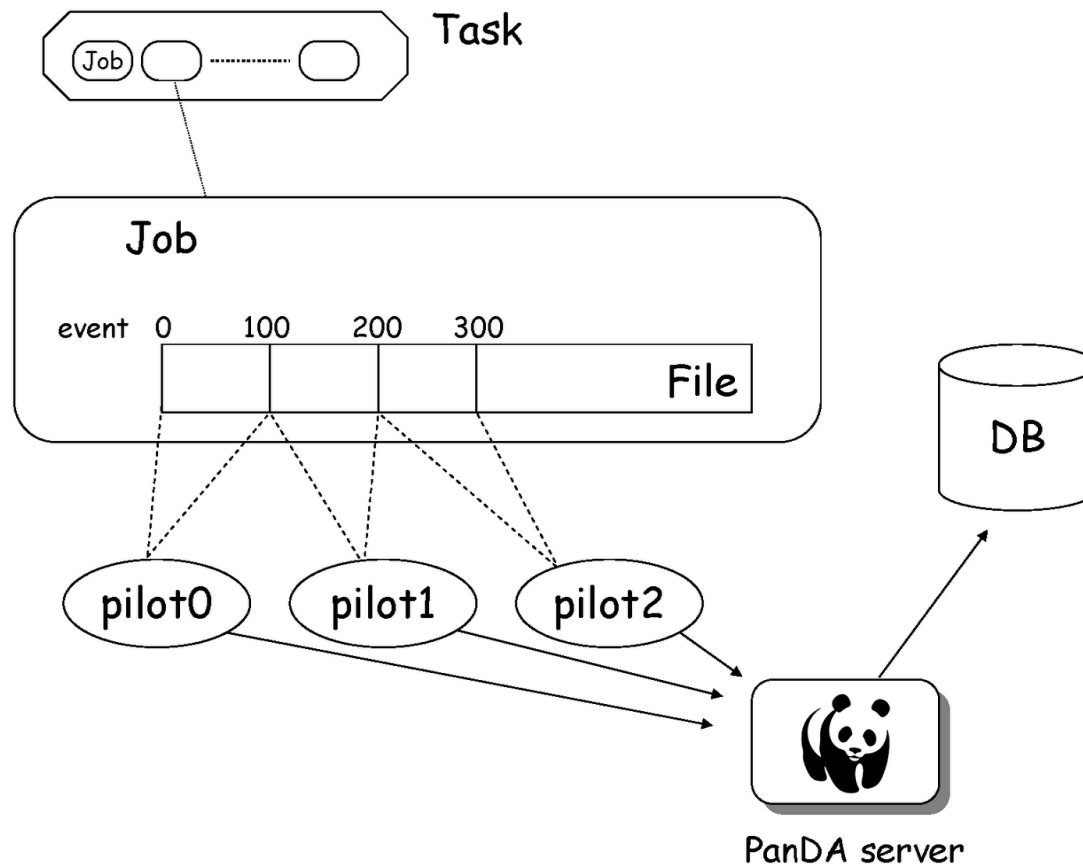


Build job と Run job



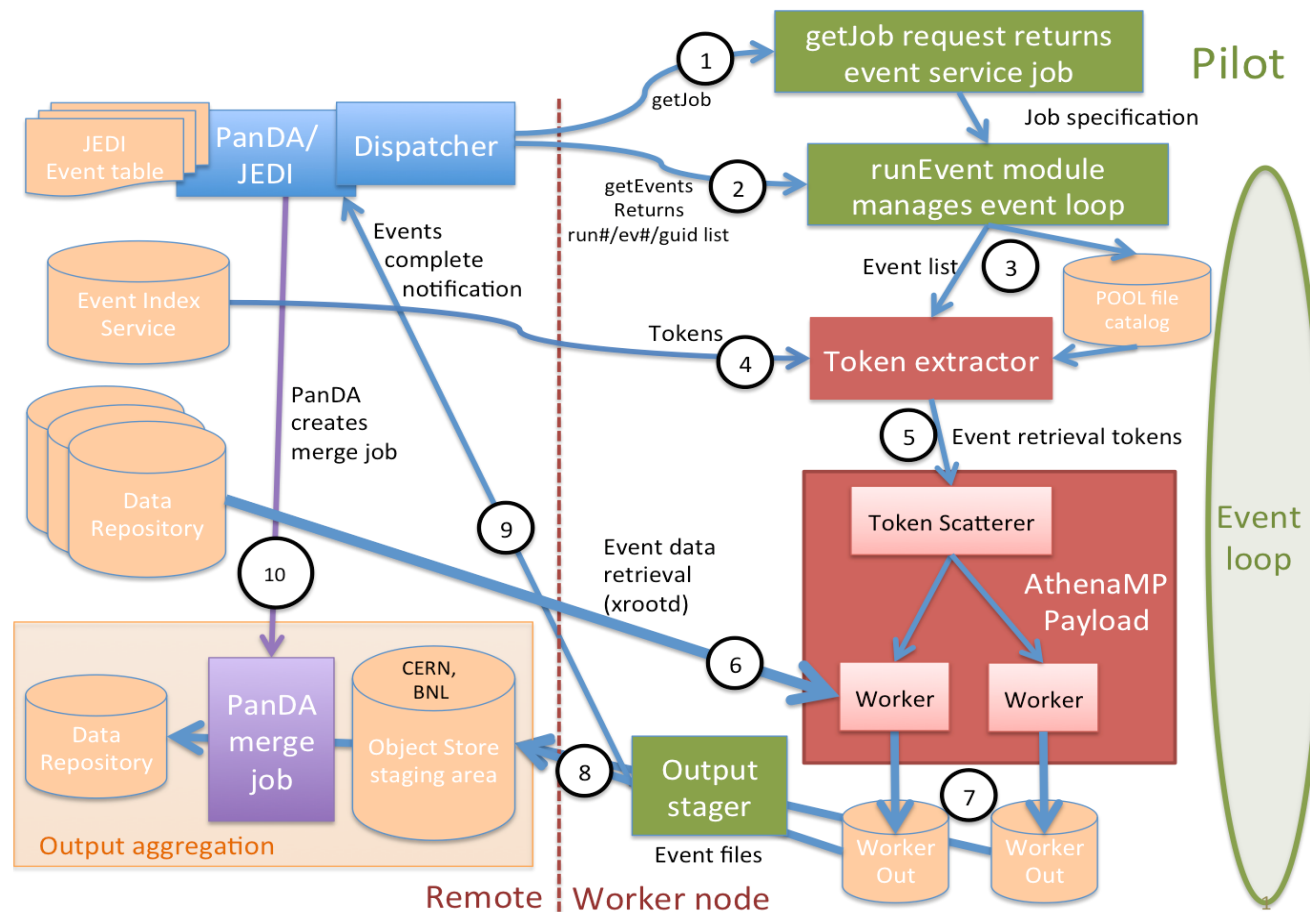
イベント・レベル処理

- 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” ショブ

```
## 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
```

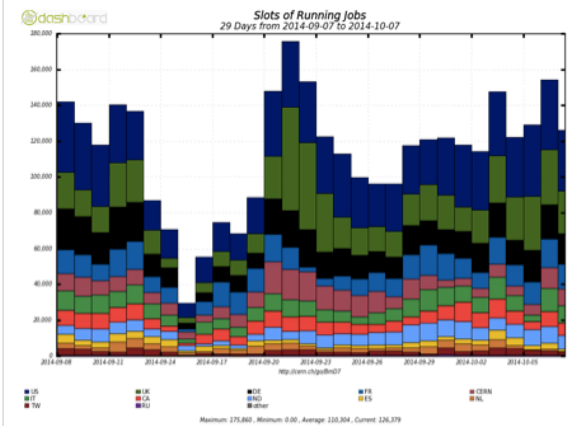
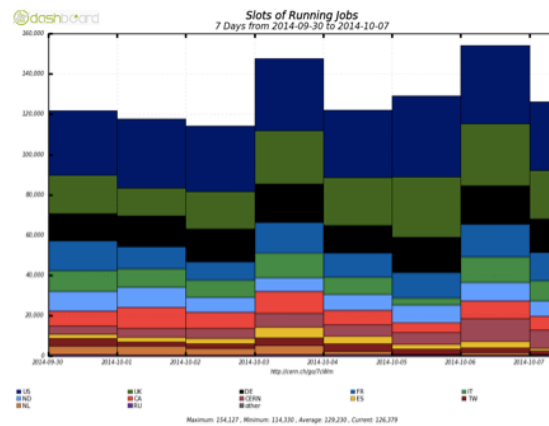
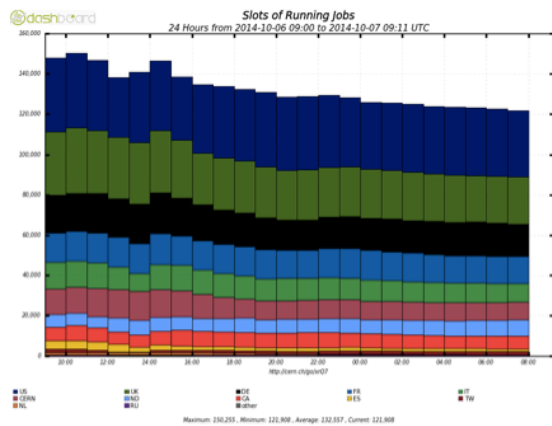
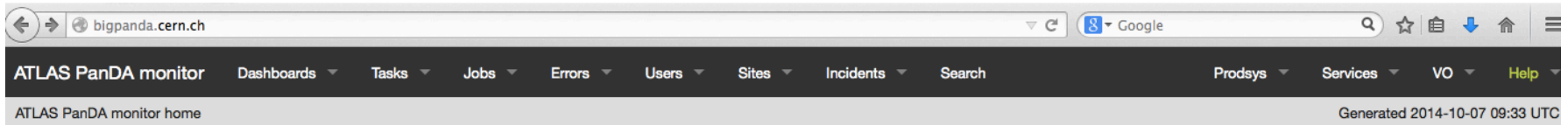
```
INFO : succeeded. new jediTaskID=5107461
```

```
## 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**



Search	
PanDA job ID or name	Submit
Batch ID	Submit
Task ID	4212437 Submit
Task name	Submit

- ### News
- 20140923: Job pages directly link to object store based log tarballs
 - 20140913: Link DEFT request page from task list and detail pages
 - 20140912: On task page highlight input containers, hide datasets by default
 - 20140911: Task name search supports wildcarding
 - 20140911: Show wait time, duration for jobs not yet running, completed
 - 20140818: Job attempt# off for user page, JEDI jobs. Not meaningful in JEDI.
 - 20140818: Task attribute summary added to user page
 - 20140817: Output container list added to task detail page
 - 20140817: Support clarified. Use DAST list, as ever, for dist analysis support

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

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

ATLAS PanDA monitor Dashboards Tasks Jobs Errors Users Sites Incidents Search Prodsys

PanDA task 4212437: user.nozturk.pruntest/

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	done	1 1 (100%) 0 (0%)	2014-10-07 09:33	10-07 09:50	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
											2			

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
-------------------------	------	--------	-------	--------	--------	---------	----------

clickable

link to jobs and their log files

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	Google
---	--------

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.prntest/ #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.prntest/ #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: atipan@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

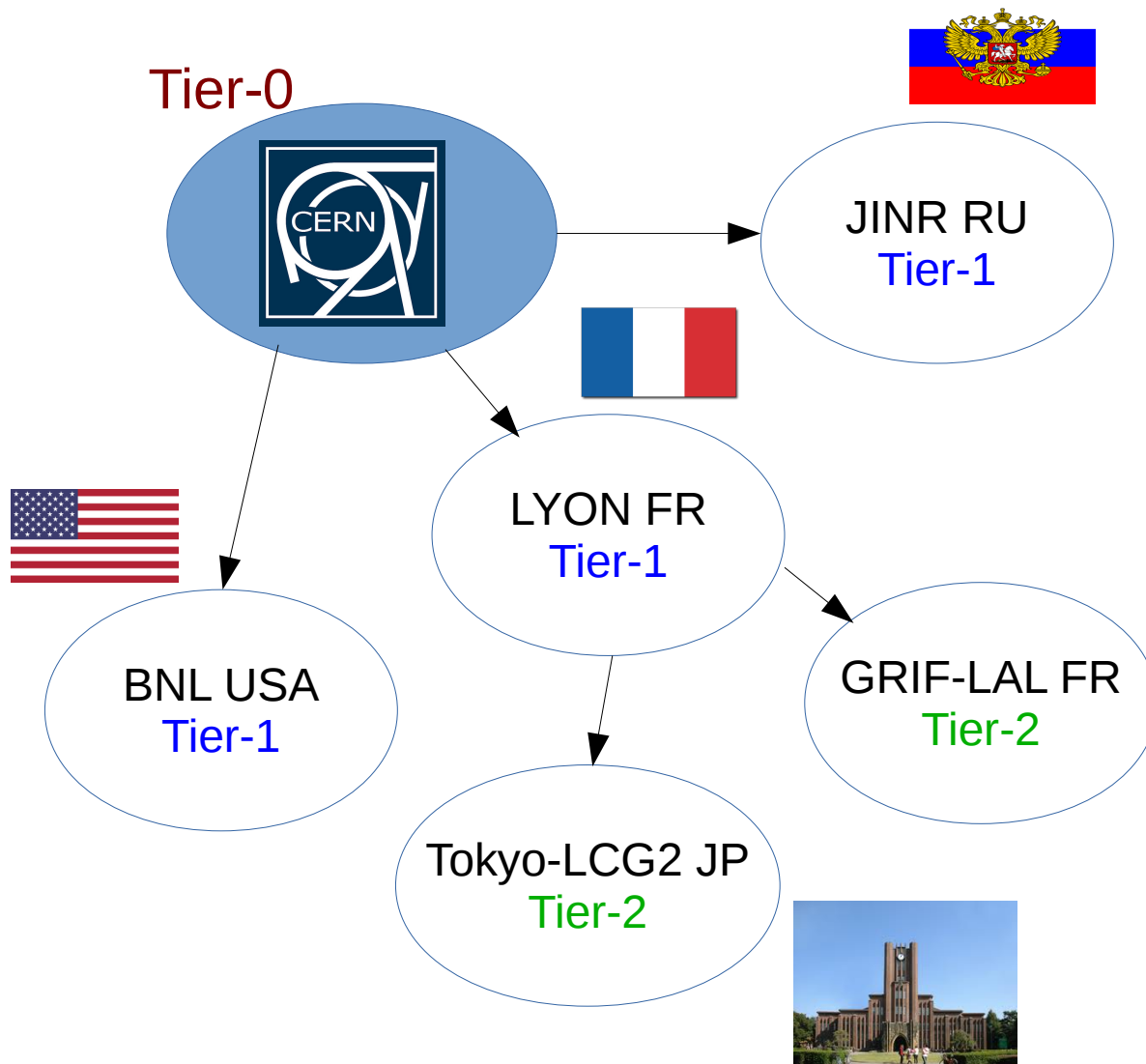
- ジョブの管理

```
## 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



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。

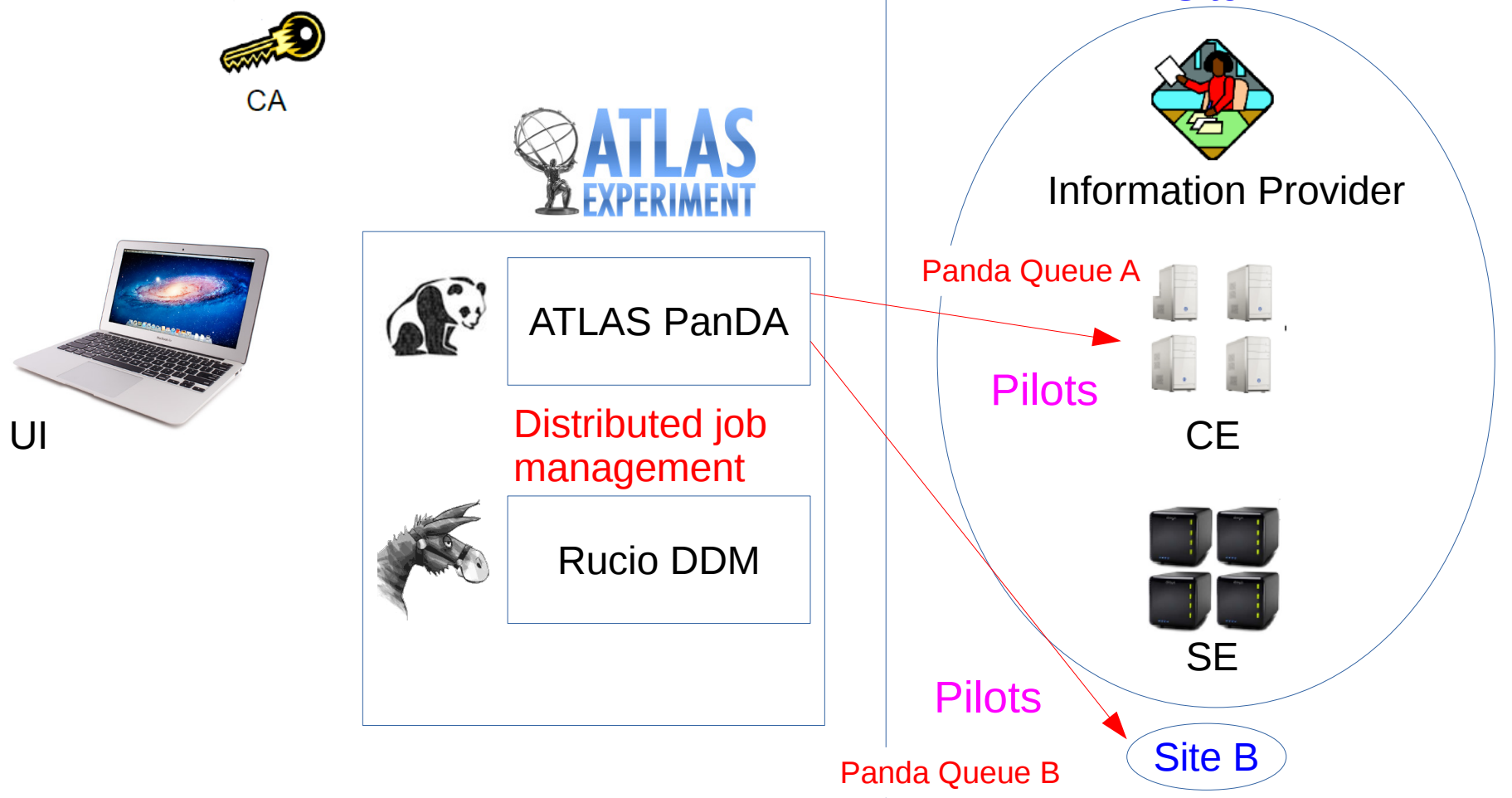
Tier-2: 大学や研究機関レベルのサイト。

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



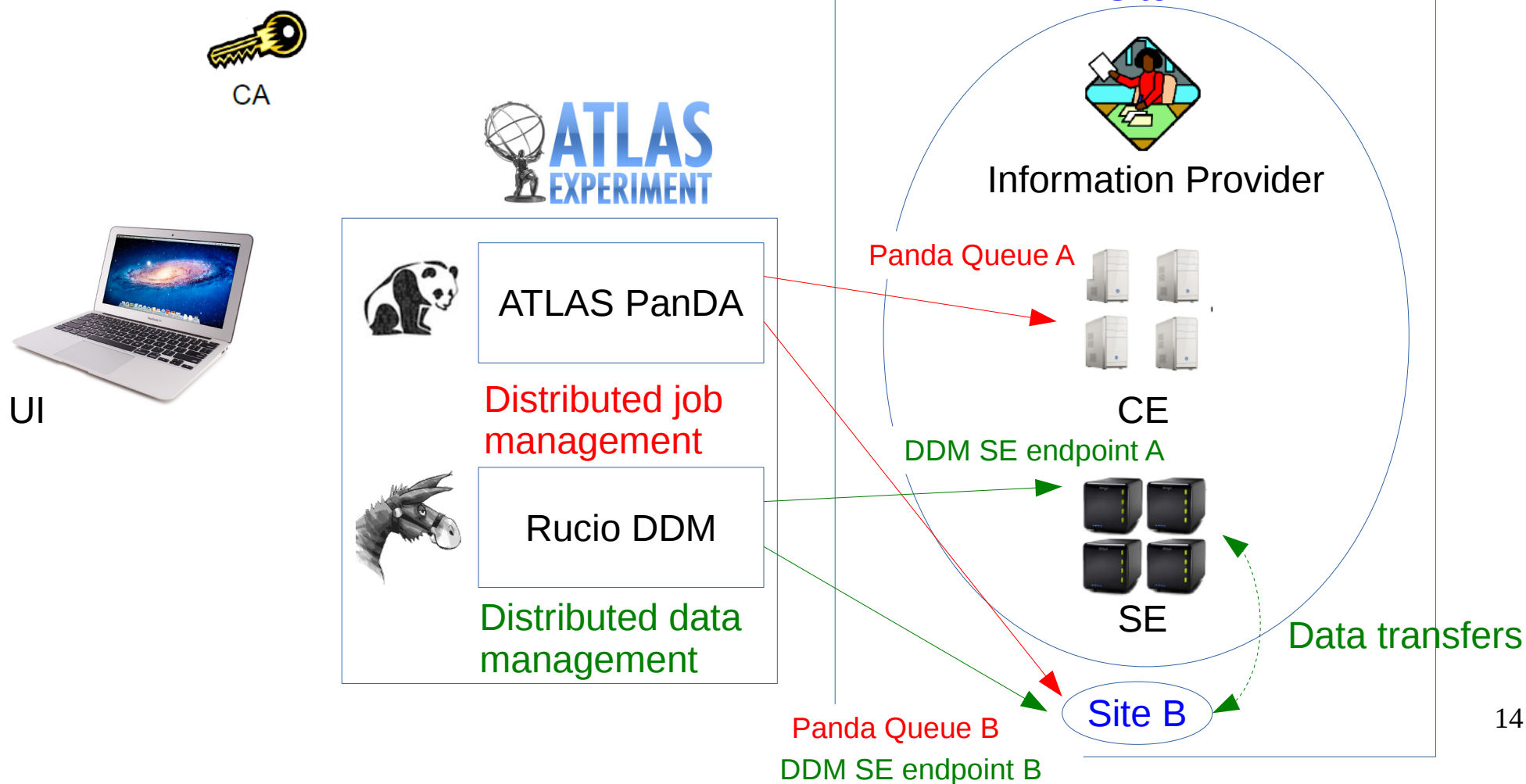
- あくまで概略



ATLAS ジョブとデータ

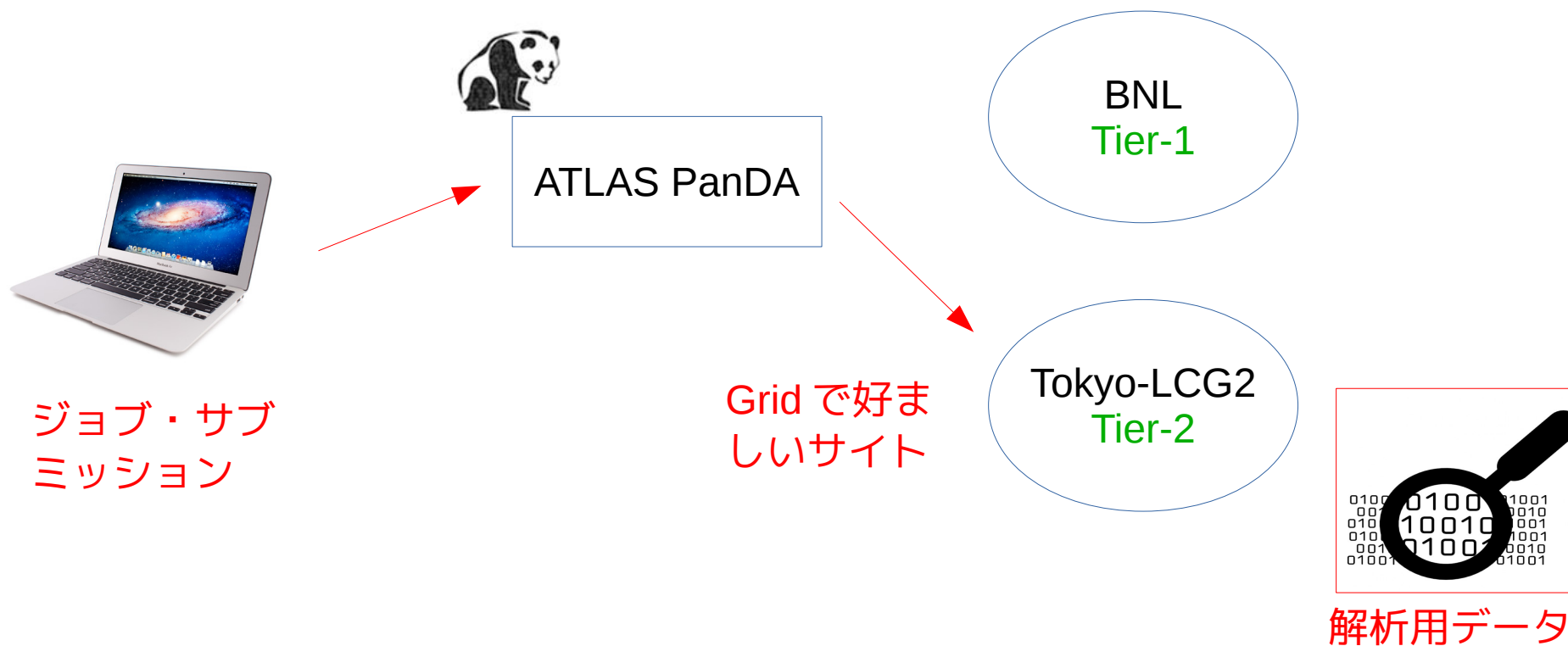


- あくまで概略



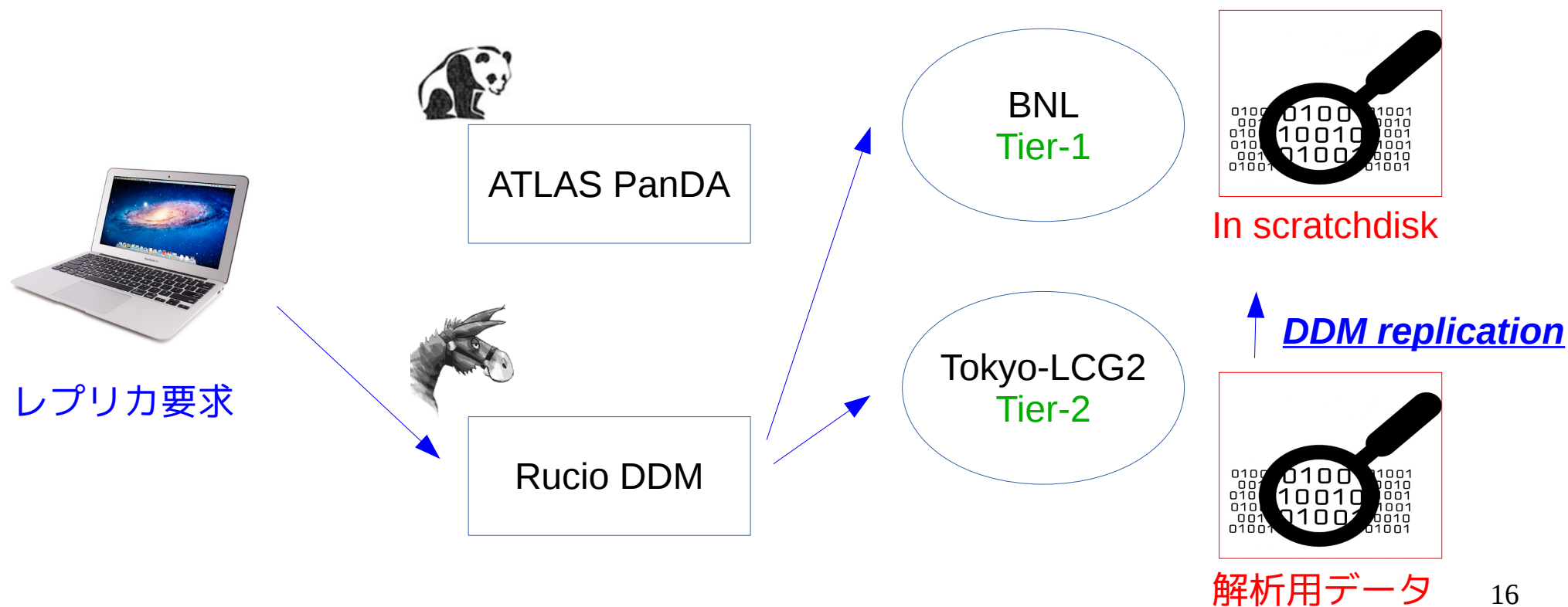
おまけ：ジョブ実行前のデータレプリケーション

- 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



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)

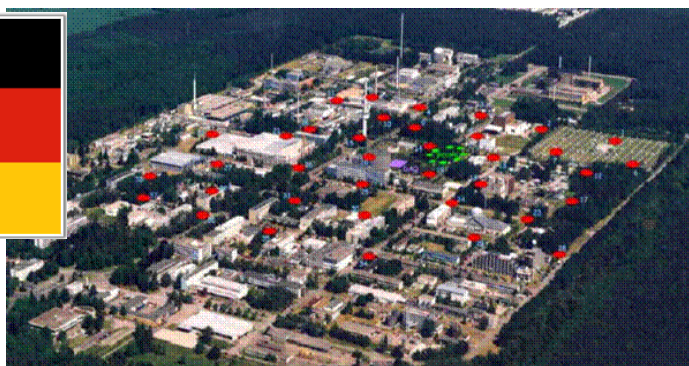


ATLAS の資源とサイト

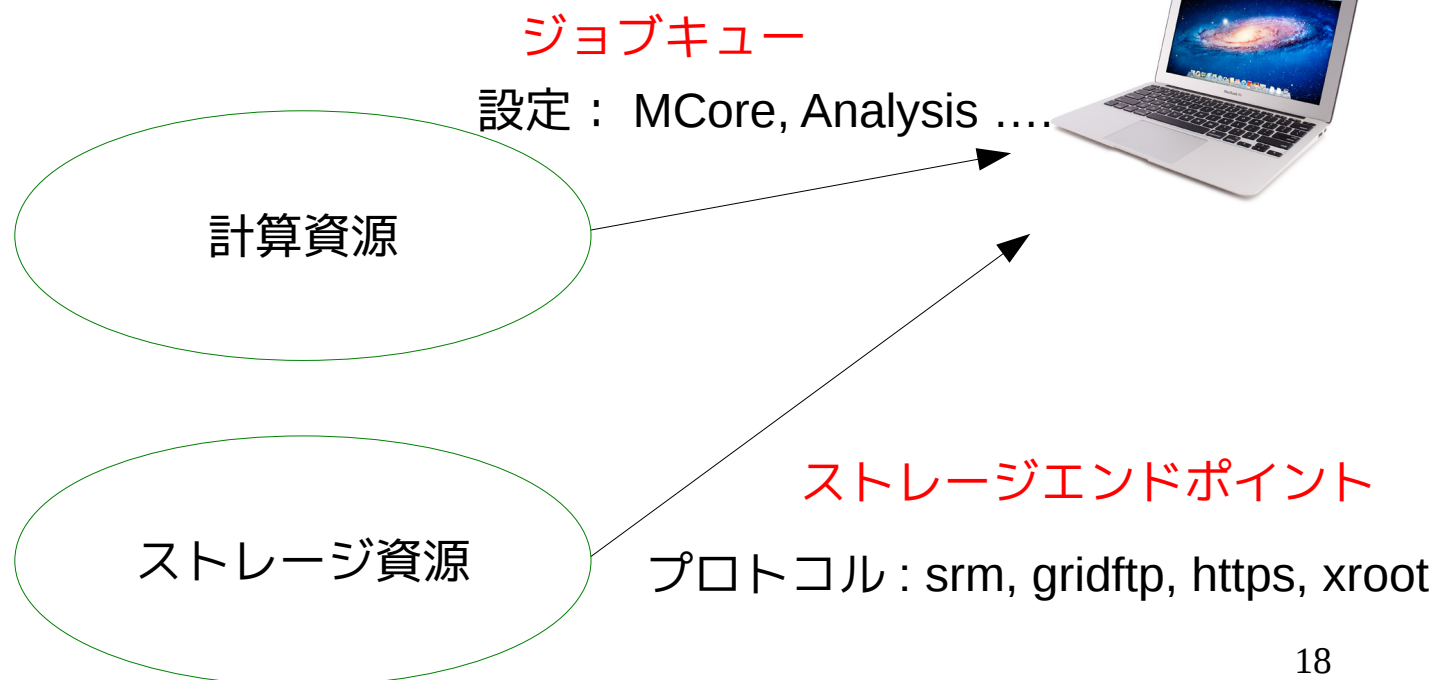
- FZK Tier-1



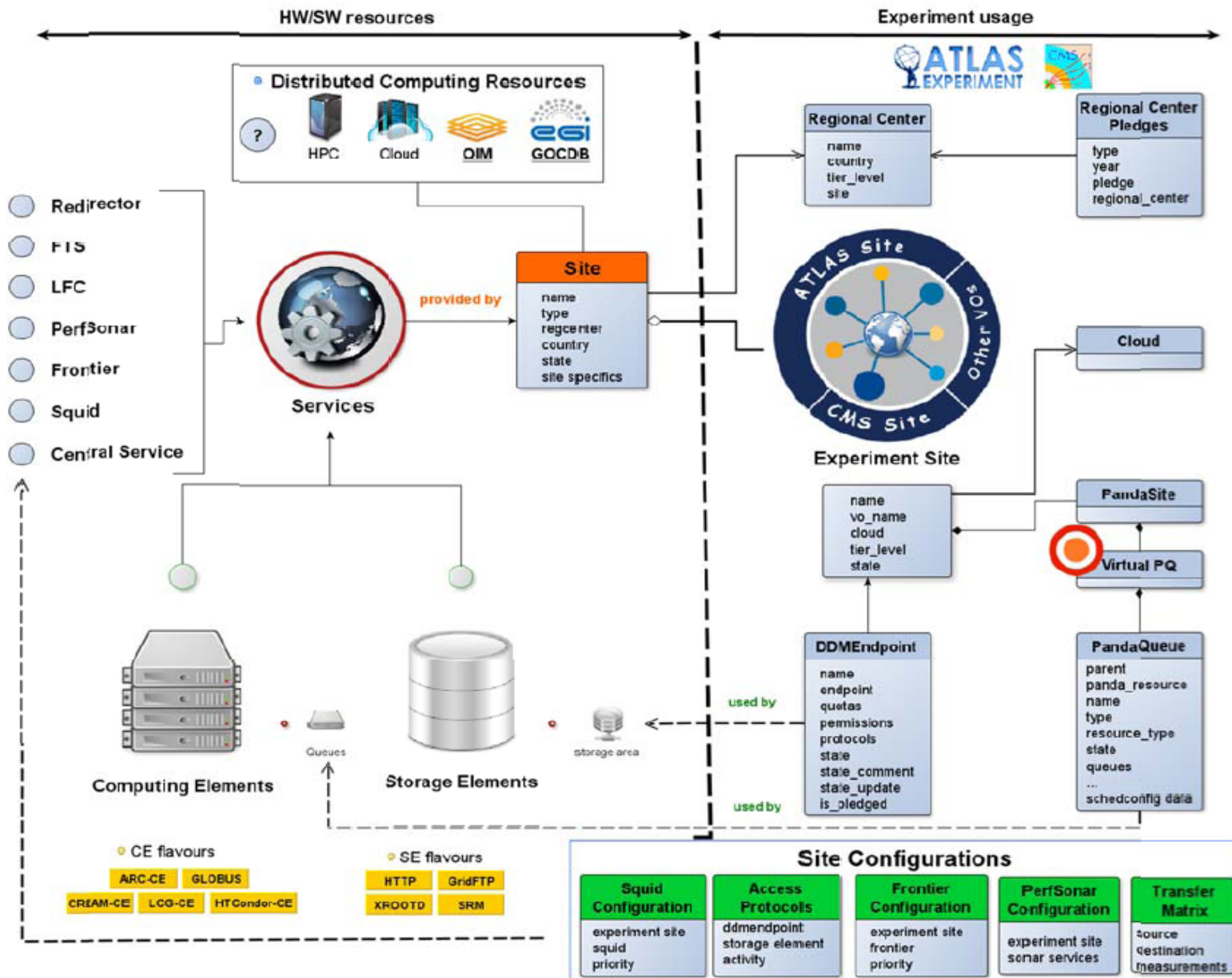
Forschungszentrum Karlsruhe
in der Helmholtz-Gemeinschaft



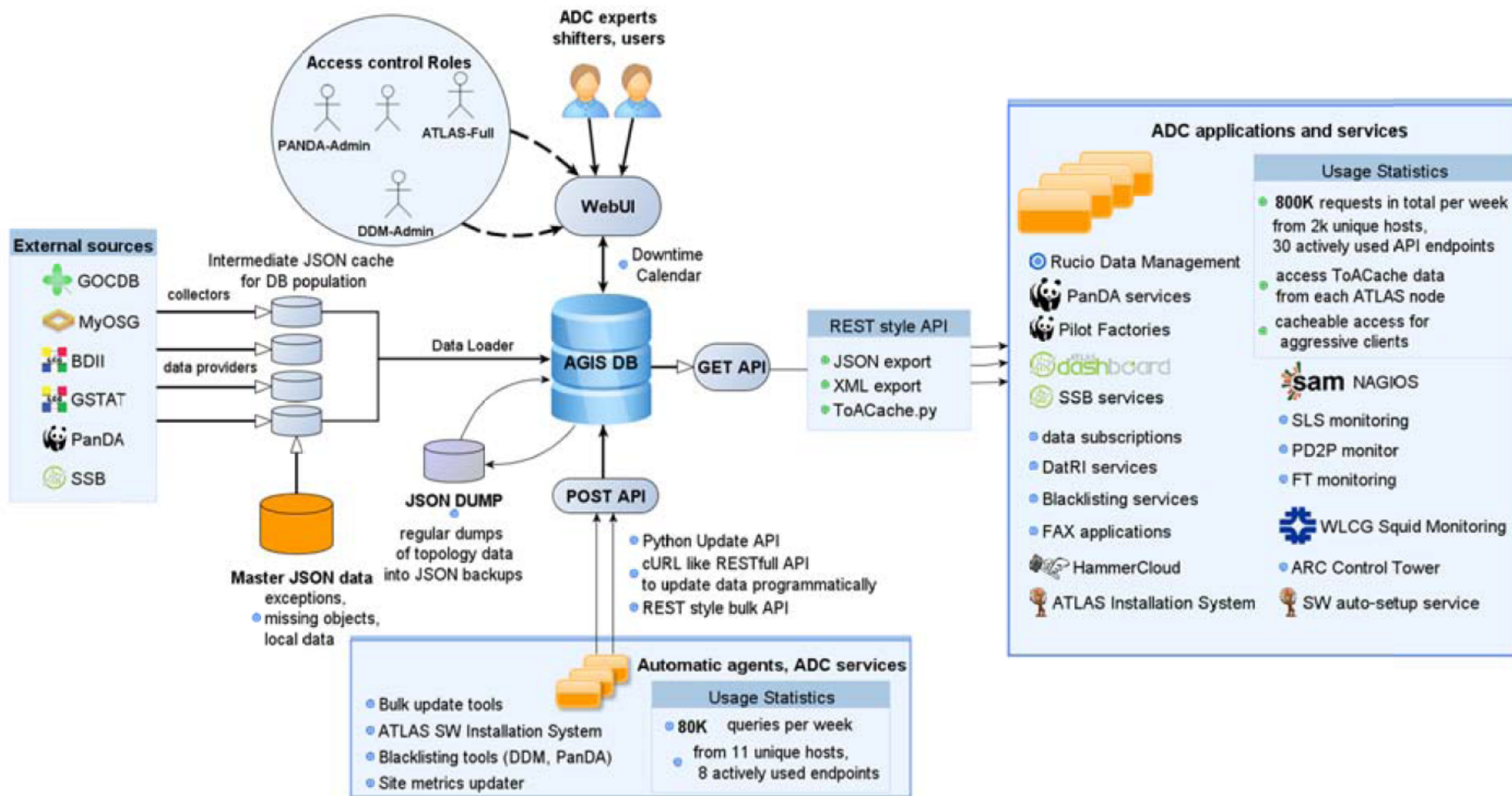
FZK Computing centre



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/>

ATLAS Grid Information System			
RC Site ATLASsite DDMEndpoint PANDA Queue Service Central Services DDM Groups			Docs TWiki OLD
TOPOLOGY MANAGEMENT - Define RC site - Define Experiment site - Define DDM endpoint - Define OS RSE endpoint (new implementation) - Define PANDA site - Define PANDA queue - RC pledges - Find DDM endpoints links - Find TransferMatrix links	SERVICE MANAGEMENT - Define OS service - Define LFC service - Define SE service - Define CE service - Define Redirector service - Define PerfSonar service - Define Frontier service - Define Squid service - Define Central service - SE protocols (DDM/Panda activities)	OPERATIONS - Crons list - ADMINS list - Changes log - Request ADMIN privileges	DOCUMENTATION - Main TWiki - TWiki WEBUI instructions - API Docs
DOWNTIMES - Downtime caledar - DDM Blacklisting data - PANDA Blacklisting data	TOACACHE EXPORT - dynamic ToACache (changes are immediately propagated): http://atlas-agis-api.cern.ch/request/toacache/TiersOfATLASCache.py - static ToACache: http://atlas-agis-api.cern.ch/ToACache/TiersOfATLASCache.py - previous caches: http://atlas-agis-api.cern.ch/ToACache/cache/ - View/Modify ToACache ExtraData (RSE integration) - ToACache with Extra data	COMPARISON & VALIDATION TOOLS - Consistency checker - ToAComparator - AGIS-BDII CE comparison - AGIS-Schedconf-PF mon CE comparison - AGIS-OIMGOCDB sites+services comparison - AGIS-PANDA PandaResource+SWReleases comparison - AGIS-Schedconfig (topology) comparison - AGIS-Schedconfig JSON comparison - AGIS-GSR services comparison	

PanDA ジョブ・キュー

- PanDA ジョブ・キュー・エンドポイント

ATLAS Grid Information System

RC Site ATLASite DDMEndpoint **PANDA Queue** Service Central Services DDM Groups PandaQueue combined resources Docs TWiki OLD JSON

Show 200 entries First Previous 1 Next Last

give me url of this page hold shift + click column for Multi-column ordering

VO name	ATLAS Site	PanDA Site	Template object	PanDA Resource	PanDA Queue	state	(current) status	type	capability	CLOUD	TIER
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	ANALY_FZK	Clone ANALY_FZK	ACTIVE	online	analysis	score	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	ANALY_FZK_HI	Clone ANALY_FZK_HI	ACTIVE	online	analysis	score	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	ANALY_FZK_SHORT	Clone ANALY_FZK_SHORT	ACTIVE	online	analysis	score	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	FZK-LCG2	Clone FZK-LCG2-all-prod-CEs	ACTIVE	online	production	score	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	FZK-LCG2_HIMEM	Clone FZK-LCG2_HIMEM	ACTIVE	online	production	himem	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	FZK-LCG2_MCORE	Clone FZK-LCG2_MCORE	ACTIVE	online	production	mcore	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	FZK-LCG2_MCORE_HI	Clone FZK-LCG2_MCORE_HI	ACTIVE	online	production	mcore	DE	T1
atlas	FZK-LCG2	FZK-LCG2	FZK-LCG2_VIRTUAL	FZK-LCG2_MCORE_LO	Clone FZK-LCG2_MCORE_LO	ACTIVE	online	production	mcore	DE	T1

Showing 1 to 8 of 8 entries

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

ATLAS Grid Information System

RC Site

ATLASSite

DDMEndpoint

PANDA Queue

Service

Central Services

DDM Groups

DDM Endpoints

Docs

TWiki

OLD

JSON

Show 200 entries

give me url of this page

hold shift + click column for Multi-column ordering

FZK

First

Previous

1

Next

Last

DDM Endpoint

State

DDM Site

ATLAS Site

ATLAS TIER

CLOUD

type

Full Endpoint

Token

Domain

LFC Name

FTS Master

FTS Master2

FTS

DDM Endpoint	State	DDM Site	ATLAS Site	ATLAS TIER	CLOUD	type	Full Endpoint	FTS Master	FTS Test
 FZK-LCG2_DATADISK	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	DATADISK	token:ATLASDATADISK:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/disk-only/atlasdatadisk/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_DATATAPE	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	DATATAPE	token:ATLASDATATAPE:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlasdatatape/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_GROUPTAPE_PERF-EGAMMA	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	GROUPTAPE	token:ATLASMCCTAPE:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlasgrouptape/perf-egamma/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_LOCALGROUPDISK	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	LOCALGROUPDISK	token:ATLASLOCALGROUPDISK:srm://dgridsrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlaslocalgroupdisk/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_LOCALGROUPTAPE	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	LOCALGROUPTAPE	token:ATLASLOCALGROUPTAPE:srm://dgridsrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlaslocalgrouptape/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_MCTAPE	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	MCTAPE	token:ATLASMCCTAPE:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlasmcctape/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_PERF-EGAMMA	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	GROUPDISK	token:ATLASDATADISK:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/disk-only/atlasgroupdisk/perf-egamma/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_PERF-IDTRACKING	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	GROUPDISK	token:ATLASDATADISK:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/disk-only/atlasgroupdisk/perf-idtracking/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_PERF-TAU	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	GROUPDISK	token:ATLASDATADISK:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/disk-only/atlasgroupdisk/perf-tau/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446
 FZK-LCG2_PPSSCRATCHDISK	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	SPECIAL	token:ATLASPPSSCRATCHDISK:srm://ppssrm-kit.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/atlasppsscratchdisk/	CERNFTS3_REST https://fts3.cern.ch:8446	
 FZK-LCG2_SCRATCHDISK	ACTIVE	FZK-LCG2	FZK-LCG2	T1	DE	SCRATCHDISK	token:ATLASSCRATCHDISK:srm://atlasrm-fzk.gridka.de:8443/srm/managerv2?SFN=/pnfs/gridka.de/atlas/disk-only/atlascratchdisk/	CERNFTS3_REST https://fts3.cern.ch:8446	CERNFTS3PILOT_REST https://fts3-pilot.cern.ch:8446

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
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