



# Grid - Hands-on

ATLAS-D Physics Meeting Freiburg 2018

Dr. Gen Kawamura

II.Physikalisches Institut, Universität Göttingen

# Exercise overview (30mins)

- Your Grid environments
  - Lxplus at CERN, or NAF
  - Environments/Scripts for this tutorial
- Introduction to Grid computing
- PanDA (ATLAS job management system)
  - Hello world prun Grid job
  - Hello world pathena Grid job
  - Hello world PyRoot
  - Hello world PyRoot Grid job
- ATLAS Metadata Interface (AMI)
  - AMI Client CLI
- Rucio (ATLAS data management system)
  - Rucio Client CLI
- RucioUI (WebUI)
- Extra: Information Provider (of gLite)

# Your Grid environments



# Lxplus at CERN, or NAF

- Logging in lxplus

```
## If you have a CERN account  
ssh -Y YOUR_CERN_ACCOUNT@lxplus.cern.ch
```

- NAF
  - [https://naf-wiki.desy.de/Main\\_Page](https://naf-wiki.desy.de/Main_Page)

```
## If you have a NAF account (yourusername = username, atlasXX = node)  
ssh -XY yourusername@nafhh-atlasXX.desy.de
```



# Environments/Scripts for this tutorial

- From GitHub

```
## Cloning materials  
git clone https://github.com/GenKawamura/ATLAS-D\_2018\_Computing\_Tutorial  
cd ATLAS-D_2018_Computing_Tutorial
```

# Introduction to ATLAS Grid Computing



# Setup CVMFS

- For example. write the command aliases in `~/.bashrc`

```
## Alias to initialization of VOMS proxy
alias vinit='voms-proxy-init --voms atlas -hours 200 --valid 200:00'

## Alias to setupCVMFS
setupCVMFS(){
    export LCG_LOCATION=
    export ATLAS_LOCAL_ROOT_BASE=/cvmfs/atlas.cern.ch/repo/ATLASLocalRootBase
    source $ATLAS_LOCAL_ROOT_BASE/user/atlasLocalSetup.sh ""

    ## Using EMI LCG package
    source ${ATLAS_LOCAL_ROOT_BASE}/packageSetups/atlasLocalEmiSetup.sh --emiVersion ${emiVersionVal}
}

## Using CVMFS (with EMI LCG client tools)
setupCVMFS
```

# Hands-on exercise

## user certificate - 1

- Getting your user certificate (if you have, skip)

```
## Check important environment variables for your certificate  
env | grep X509  
  
## Generating a proxy certificate  
export X509_USER_CERT=~/.globus/usercert.pem  
export X509_USER_KEY=~/.globus/userkey.pem  
  
## Generate user certificate  
## (usercert.p12 was already exported by your browser)  
openssl pkcs12 -clcerts -nokeys -in usercert.p12 -out $X509_USER_CERT  
  
## create a private certificate with passphrase  
openssl pkcs12 -nocerts -in usercert.p12 -out $X509_USER_KEY  
  
## Set permissions  
chmod 644 $X509_USER_CERT  
chmod 400 $X509_USER_KEY  
  
## show enddate  
openssl x509 -in $X509_USER_CERT -noout -enddate  
  
## show if the certificate is valid  
openssl verify -CApath $X509_CERT_DIR -purpose sslclient $X509_USER_CERT
```

# Hands-on exercise user certificate - 2

- Checking your certificate and VO

## **## Generating a proxy**

```
vinit
```

Enter GRID pass phrase for this identity:

```
Contacting voms2.cern.ch:15001 [/DC=ch/DC=cern/OU=computers/CN=voms2.cern.ch] "atlas"...
```

```
Remote VOMS server contacted successfully.
```

```
voms2.cern.ch:15001: The validity of this VOMS AC in your proxy is shortened to 345600 seconds!
```

## **## Generating a proxy certificate without VO**

```
grid-proxy-init
```

```
voms-proxy-info -all
```

# (it displays information without VO attributes)

## **## Generating a proxy certificate with VO (a normal use)**

```
voms-proxy-init --voms atlas -hours 200
```

```
voms-proxy-info -all
```

# (it displays information with VO attributes)

## **## Using another role (if you have another)**

```
voms-proxy-init -voms atlas:/atlas/de/Role=production
```

```
voms-proxy-info -all
```

# Hands-on exercise user certificate - 2

- Checking your certificate and VO

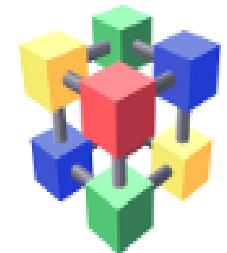
```
## Check context of your certificate
## The proxy certificate has 3 fields (Public Key, New Public Key, New Secret Key)
less /tmp/x509up_u$UID | grep '\-' 

-----BEGIN CERTIFICATE-----
-----END CERTIFICATE-----
-----BEGIN RSA PRIVATE KEY-----
-----END RSA PRIVATE KEY-----
-----BEGIN CERTIFICATE-----
-----END CERTIFICATE-----

## Check X509 attribute
openssl x509 -in /tmp/x509up_u$UID -text | less

## Using a different proxy certificate
## (switch them if you have several ones)
mv -v /tmp/x509up_u$UID /tmp/x509_different_cert
export X509_USER_PROXY=/tmp/x509_different_cert
voms-proxy-info -all
```

# PanDA (ATLAS Job Management System)



**WLCG**  
Worldwide LHC Computing Grid

# Hello World prun Grid Job

# 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!

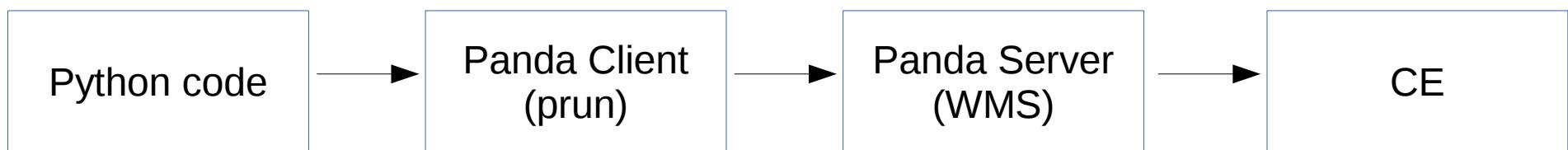
## Submitting a prun job
prun --outDS user.gkawamur.pruntest.$$ --exec hello_world.py

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.gkawamur.pruntest.$$ --exec hello_world.py -nJobs=5
```

# How it works

- A Python code is serialized and is sent to the backends



# What will happen?

- On PanDA web interface ([bigpanda.cern.ch](http://bigpanda.cern.ch)), find the jobs submitted

<b>jobstatus</b> (1)	<a href="#">finished</a> (2)
<b>minramcount</b> (1)	<a href="#">1-2GB</a> (1)
<b>outputfiletype</b> (2)	<a href="#">? (1)</a> <a href="#">log (1)</a>
<b>priorityrange</b> (2)	<a href="#">1000:1099 (1)</a> <a href="#">2000:2099 (1)</a>
<b>processingtype</b> (1)	<a href="#">panda-client-0.5.72-jed-athena (2)</a>
<b>prodsourceLabel</b> (2)	<a href="#">panda (1)</a> <a href="#">user (1)</a>
<b>prodUserName</b> (1)	<a href="#">Gen Kawamura (2)</a>
<b>reqid</b> (1)	<a href="#">94 (2)</a>
<b>specialhandling</b> (1)	<a href="#">ddm:rucio (2)</a>
<b>transformation</b> (2)	<a href="#">buildJob-00-00-03 (1)</a> <a href="#">runAthena-00-00-12 (1)</a>

Prodsys Jobs Handling

# Hello World pathena Grid Job

# Hands-on exercise simple Athena job

- The xAOD Athena example from the previous tutorial ([writing out only selected events](#))

```
## xAOD Tutorial
$ cd xAOD_example

$ mkdir source build run
$ cd build
$ asetup AthAnalysis,21.2.38,here
$ mv CMakeLists.txt ..source/
$ cmake $TestArea/..source
$ source $TestArea*/setup.sh

## Copying example files
$ cd $TestArea/..run/
$ cp -v ..myJobOptions.py .
$ cp -v ..get-sample-files.sh .
```

# Hands-on exercise simple Athena job

- The xAOD Athena example from the previous tutorial ([writing out only selected events](#))
  - The input files defined by `myJobOptions.py`

```
import glob
fileInputs =
glob.glob('valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534/*')
svcMgr.EventSelector.InputCollections = fileInputs
```

- “`valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534`” is a Rucio dataset stored in Grid storages

```
## Get a sample file
$ ./get-sample-file.sh -n 1

## Test Athena with the job option file
$ athena myJobOptions.py
```

# Hands-on exercise simple pathena job

- Athena job using PanDA client
  - pathena

```
## Loading PanDA client
$ lsetup panda

## For example, you can seamlessly run Athena code on Grid
$ pathena --inDS valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534 --outDS
user.gkawamur.test.$(date +%Y%m%d%H%M%S) --nFilesPerJob=1 myJobOptions.py

.....
INFO : checking symbolic links
INFO : uploading source/jobO files
INFO : submit
INFO : succeeded. new jediTaskID=15301491
```

# Hands-on exercise simple pathena job

- Athena job using PanDA client
  - pathena

```
## Loading PanDA client
$ Isetup panda

## For example, you can seamlessly run Athena code on Grid
$ pathena --inDS valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534 --outDS
user.gkawamur.test.$(date +%Y%m%d%H%M%S) --nFilesPerJob=1 myJobOptions.py
```

....  
INFO : checking symbolic links  
INFO : uploading source/jobO files  
INFO : submit  
INFO : succeeded. new jediTaskID=15301491

1 Grid subjob processes only  
1 file in the input dataset

Input dataset  
containing  
xAOD files

Output dataset also used  
for job identifier

ATLAS-D Physics Meeting 2018

Final output dataset which  
will contain results

20

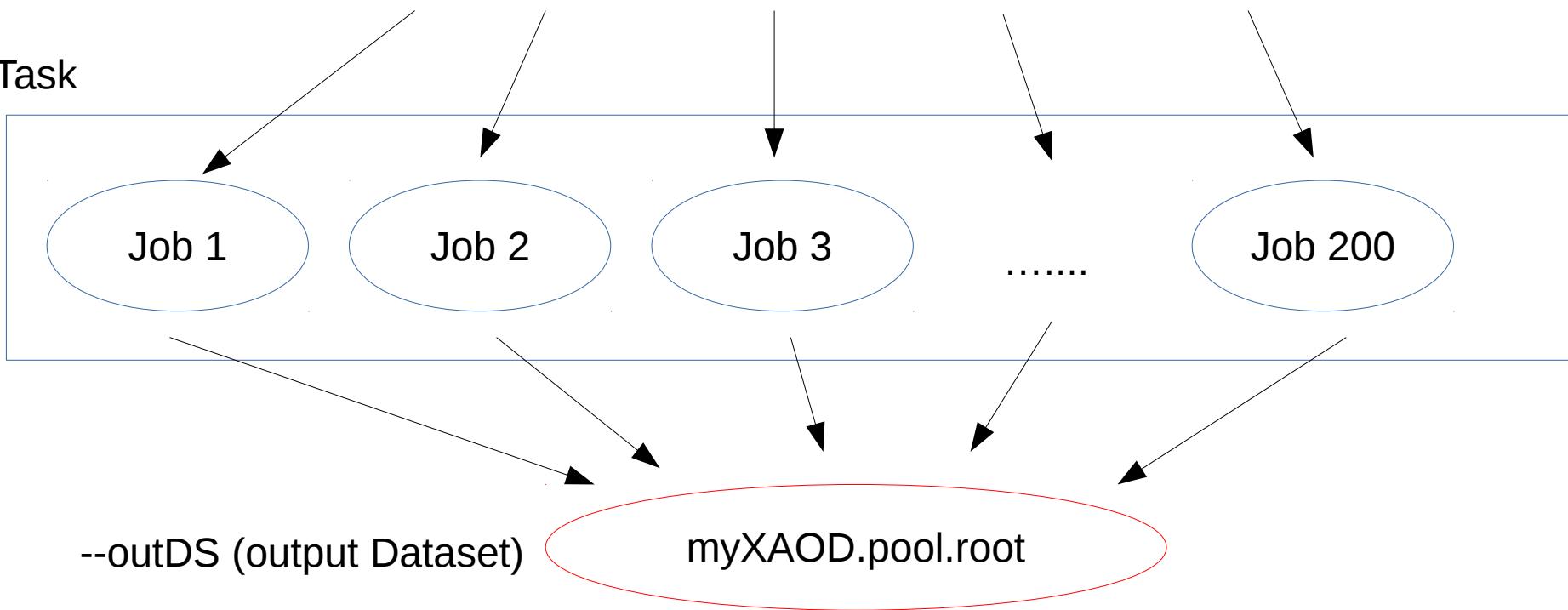
# How it works

- Executing a task processing events per job (per file)

--inDS (input Dataset)

**valid2.117050.PowhegPythia\_P2011C\_ttbar.digit.AOD.e2657\_s1933\_s1964\_r5534**

Task



# Hello World PyRoot

# Hands-on exercise

## PyRoot example

- ATLAS xAOD EDM tutorial using pyRoot
  - <https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/SoftwareTutorialxAODEDM>
  - We will run it on Grid later

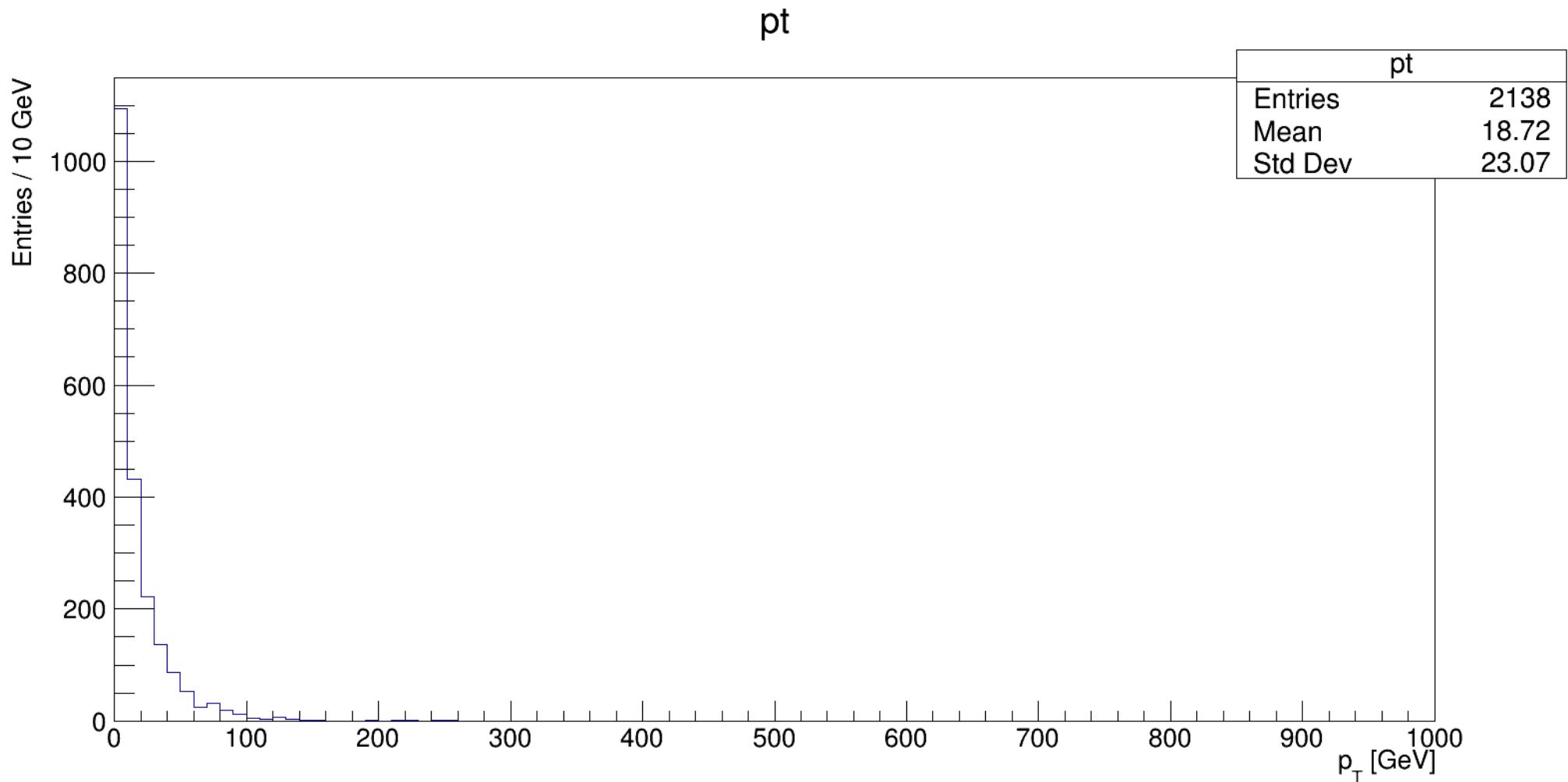
```
## Making PyRoot environments (using RootCore)
$ cd pyroot
$ source pyroot_env.sh

## Getting a sample file (set your rucio account)
$ export RUCIO_ACCOUNT=your_rucio_account_here
$ ./get-sample-files.sh -n 1
$ ls valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534/* > input.txt

## Extracting and counting electron energy
$ less xAOD_electron_hist_example.py
$ ./xAOD_electron_hist_example.py -i input.txt -o hist.root

## Plotting electron Pt distribution (on X-window TBrowser).
$ root hist.root
root [1] TBrowser t
```

# Plot of electron Pt distribution



# How it works - 1

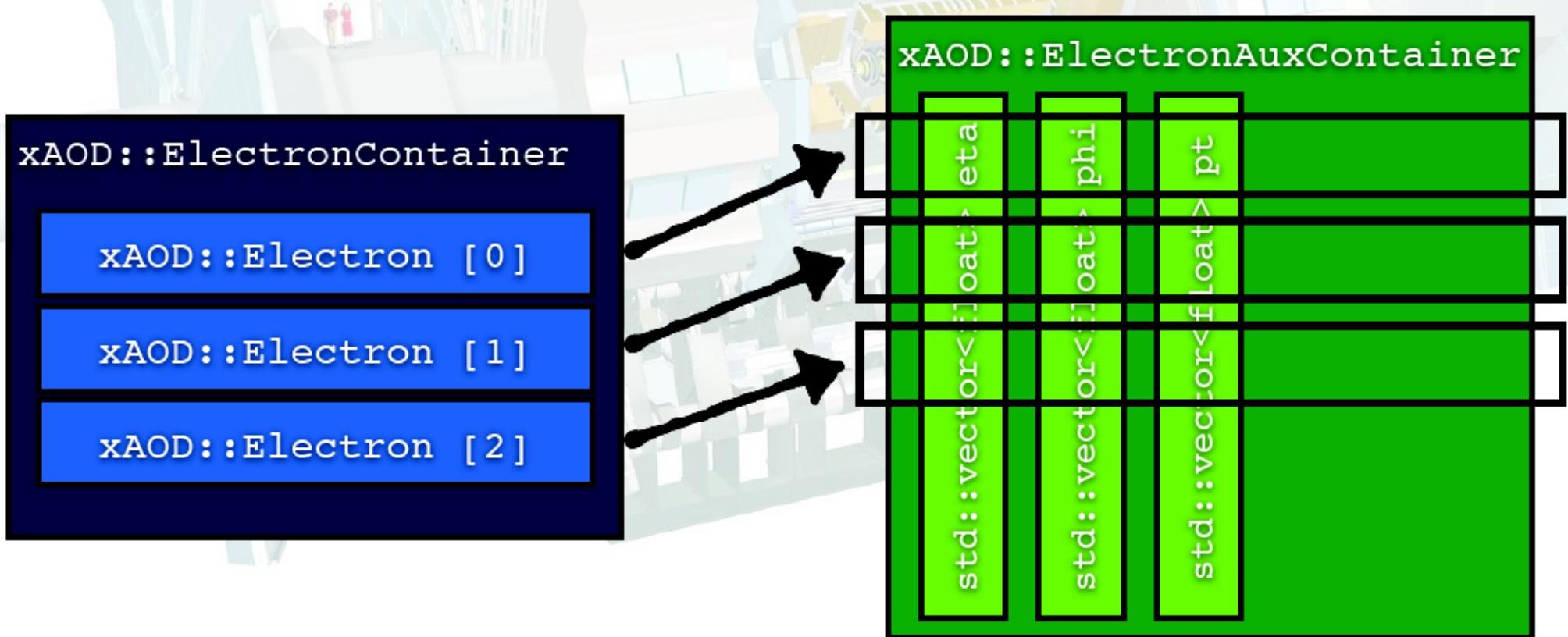
- Just looping entries (events) in a Root tree and counting electron Pt in histogram object

\* `xAOD_electron_hist_example.py`

```
# Make the "transient tree":  
t = ROOT.xAOD.MakeTransientTree( f, treeName)  
  
print( "Number of input events: %s" % t.GetEntries() )  
for entry in xrange( t.GetEntries() ):  
    t.GetEntry( entry )  
    print( "Processing run #%(runNumber)i, event #%(eventNumber)i" % ( t.EventInfo.runNumber(), t.EventInfo.eventNumber() ) )  
    print( "Number of electrons: %(n)i" % { n: len( t.ElectronCollection ) } )  
    # loop over electron collection  
    for el in t.ElectronCollection:  
        pthist.Fill(el.pt()/1000.)  
    pass # end for loop over electron collection  
    pass # end loop over entries  
f.Close()  
pass
```

# How it works - 2

- Is technically quite smart code...
  - Provides an “array of structs” interface to data held as “struct of arrays” in memory
  - This “struct of arrays” layout allows us to write files that can be browsed similar to D3PD files



# Hello World PyRoot Grid Job

# Hands-on exercise

## PyRoot with Grid

- First “Hello world” PyRoot job by PanDA client

```
## Making PyRoot environments
$ inDS="valid2.117050.PowhegPythia_P2011C_ttbar.digit.AOD.e2657_s1933_s1964_r5534"
$ outDS="user.gkawamur.DTutorial.pyroot.xAOD.v0.1_$$"
$ infile="input.txt"
$ outfile="hist.root"
$ prun --useRootCore --inDS=$inDS --forceStaged \
--outDS=$outDS --outputs=$outfile --nFiles=100 --nFilesPerJob=1 \
--exec="echo %IN > $infile; xAOD_electron_hist_example.py -i $infile -o $outfile"
```

```
## or, use a simple submitter script
$ bash submit.sh
```

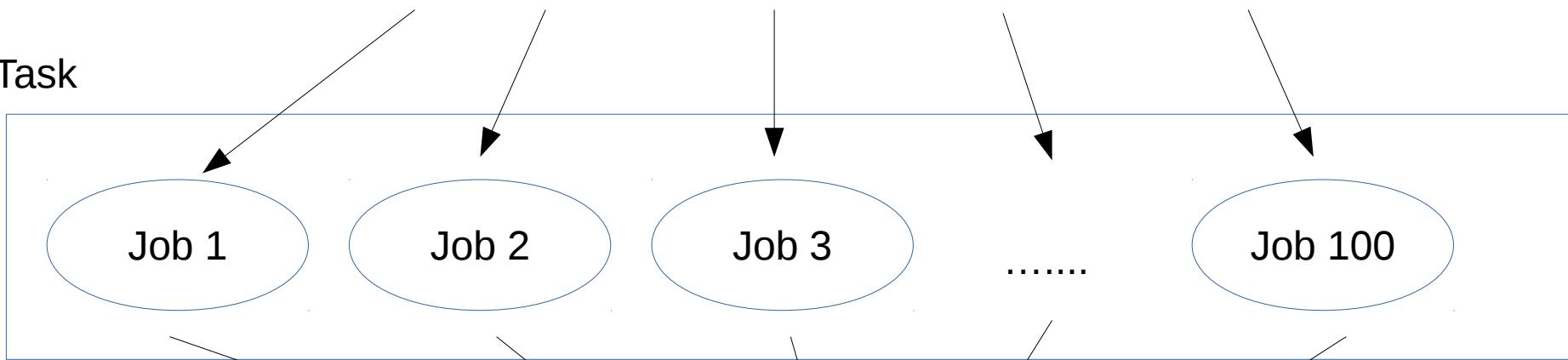
# How it works

- Executing a task processing events per job (per file)

--inDS (input Dataset)

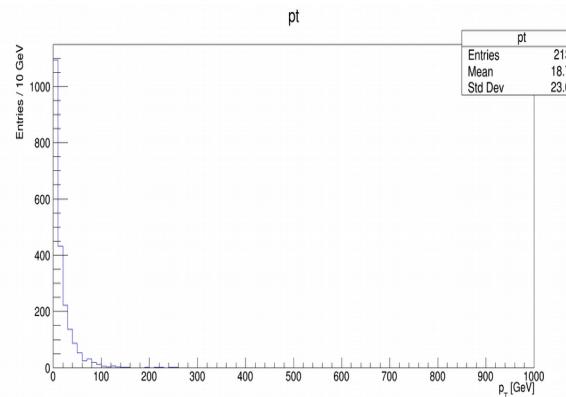
**valid2.117050.PowhegPythia\_P2011C\_ttbar.digit.AOD.e2657\_s1933\_s1964\_r5534**

Task



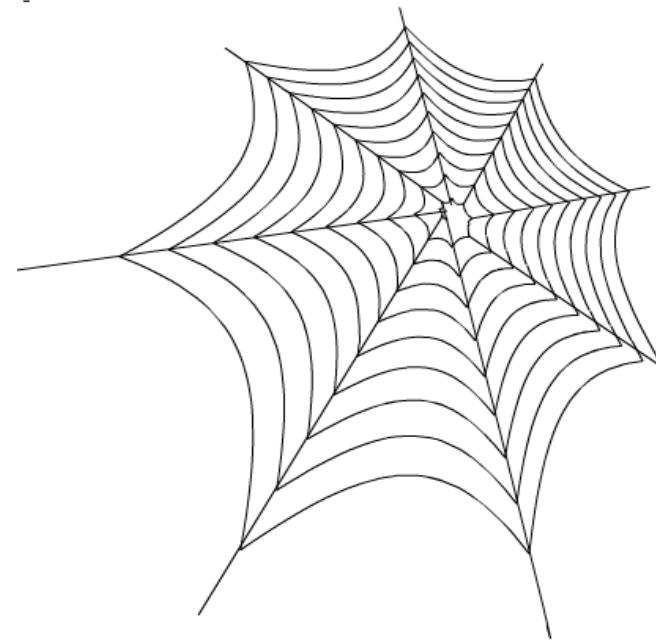
--outDS (output Dataset)

ATLAS-D Physics Meeting 2018



# ATLAS Metadata Interface (AMI)

If no time, please skip this part



# Hands-on exercise

## pyAMI Interface

- AMI CLI interface

```
## Loading the pyAMI environment
$ lsetup pyami

## Search data of 2016 and period A1
$ ami list datasets data16_13TeV%periodA1.%
  data16_13TeV.periodA1.physics_Main.PhysCont.AOD.t0pro20_v01
  data16_13TeV.periodA1.physics_Main.PhysCont.DAOD_STDM2.grp16_v01_p2623
  data16_13TeV.periodA1.physics_Main.PhysCont.DAOD_STDM4.grp16_v01_p2623
  data16_13TeV.periodA1.physics_Main.PhysCont.DAOD_STDM5.grp16_v01_p2623
  data16_13TeV.periodA1.physics_Main.PhysCont.DAOD_STDM7.grp16_v01_p2623
```

# Hands-on exercise check metadata by pyAMI

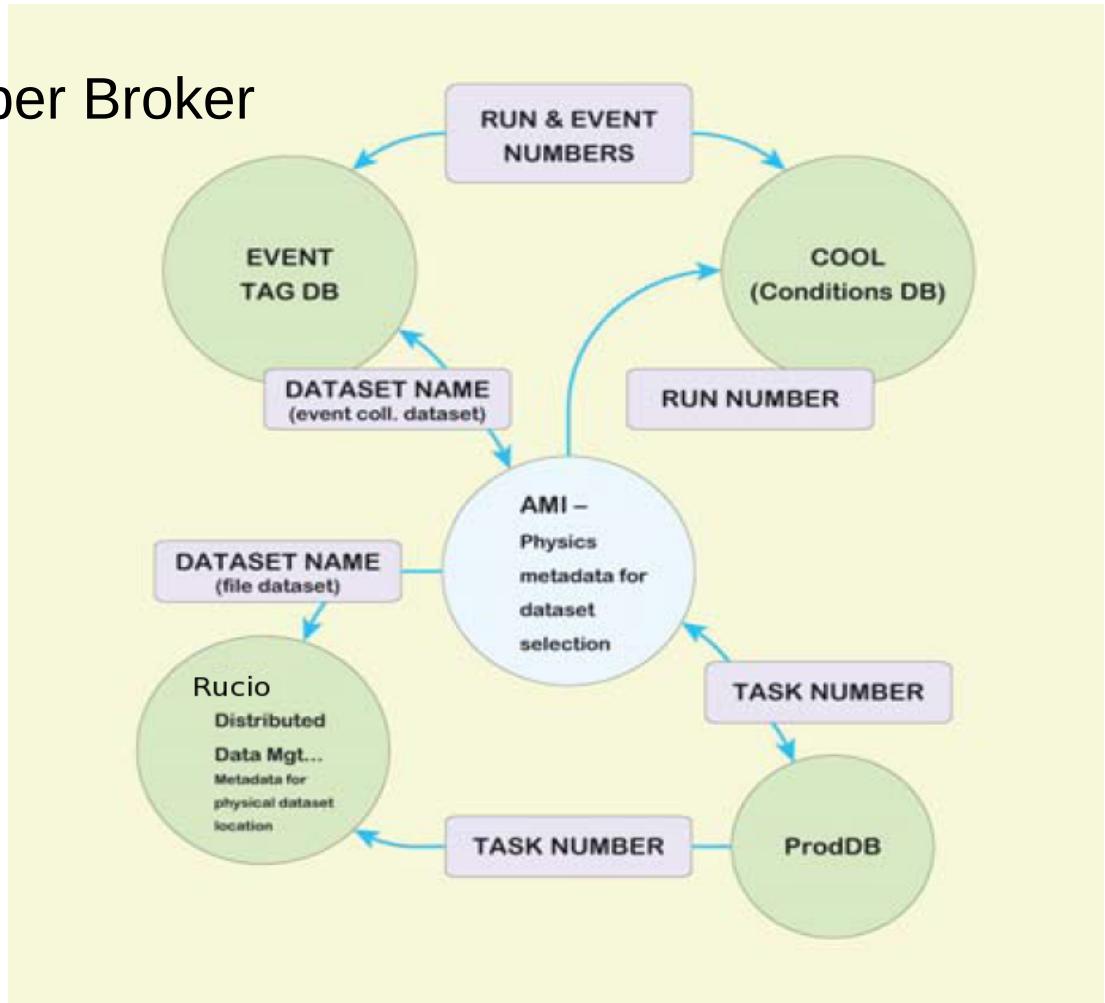
```
## Show metadata of a dataset
$ ami show dataset info data16_13TeV.00284285.physics_Main.merge.AOD.f662_m1453_r8067_p2645
logicalDatasetName : data16_13TeV.00284285.physics_Main.merge.AOD.f662_m1453_r8067_p2645
nFiles : 0
totalEvents : 0
totalSize : NULL
runNumber : 284285
period : J6
prodsysStatus : NO EVENTS YET
dataType : AOD
beamType : NULL
conditionsTag : NULL
geometryVersion : NULL
streamName : physics_Main
version : f662_m1453_r8067_p2645
lastModified : 2016-06-09 18:35:05
amiStatus : VALID
created : 2016-06-09 18:35:04
inContainer : 0
added_comment : NULL
keyword : NULL
prodsysIdentifier_0: 8650873
taskStatus_0 : UNKNOWN:METADATA ERROR
TIDState_0 : added
task_lastModified_0: 2016-06-10 09:24:25
```

# Hands-on exercise check metadata by pyAMI

```
## Show RAWs
$ ami show dataset prov data16_13TeV.00284285.physics_Main.merge.AOD.f662_m1453_r8067_p2645
...
```

# How it works

- Applications
  - The Monte-Carlo Dataset Number Broker
  - The ATLAS Metadata directory
  - Tag collector
- ProdDB
  - For Monte-Carlo simulation



S. Albrand, T. Doherty, J. Fulachier, F. Lambert. The ATLAS Metadata Interface. International Conference on Computing in High Energy and Nuclear Physics (CHEP-07), Sep 2007, Victoria, Canada. IOP Publishing, 120, pp.072003, 2008, <10.1088/1742-6596/120/7/072003>. <in2p3-00192624>

# Rucio (ATLAS data management system)



# Setup Rucio

- Initializing Rucio client

## ## Loading Rucio client

```
Isetup rucio
```

```
*****
Requested: rucio ...
Setting up emi 3.17.1-1_v2.sl6 ...
Skipping: grid middleware already setup (from UI)
Setting up rucio 1.7.3 ...
Info: Setting compatibility to slc6
Info: Set RUCIO_AUTH_TYPE to x509_proxy
Info: Set RUCIO_ACCOUNT to gkawamur
>>>>>>>>>>>>>>>> Information for user <<<<<<<<<<<<<<
emi:
Your proxy has 95h:54m:0s remaining
*****
```

## ## Rucio command

```
rucio
```

```
usage: rucio [-h] [--version] [--verbose] [-H ADDRESS] [--auth-host ADDRESS]
              [-a ACCOUNT] [-S AUTH_STRATEGY] [-T TIMEOUT] [--robot]
              [--user-agent USER_AGENT] [-u USERNAME] [-pwd PASSWORD]
              [--certificate CERTIFICATE] [--ca-certificate CA_CERTIFICATE]
```

## ## In Rucio, check which account you use

```
rucio whoami
```

# Hands-on exercise

## list scopes

- Each user account has one default scope, e.g., `user.rucio_user` for account `rucio_user`

```
## Listing scopes
rucio list-scopes

user.gkawamur
...
group.phys-sm
group.phys-susy
...
data15_13TeV
data15_1beam
data15_900GeV
...
mc15_5TeV
mc15_8TeV
mc15_900GeV

## Your user scope
rucio list-scopes | grep user.$USER

user.gkawamur
```

# Hands-on exercise

## list DIDs

- A data Identifier is found by name and scope

```
## To list all DIDs within a scope
```

```
rucio list-dids user.gkawamur:*
```

SCOPE:NAME	[DID TYPE]
user.gkawamur:user.gkawamur.pruntest_7168.log	CONTAINER
user.gkawamur:user.gkawamur.tut.helloworldathena.test.log	CONTAINER
user.gkawamur:user.gkawamur.20160323144306.1.log	CONTAINER
user.gkawamur:user.gkawamur.tutorial.grid.deriv.test1.log	CONTAINER
user.gkawamur:user.gkawamur.pruntest_14222.log	CONTAINER

```
## Using filters (search)
```

```
rucio list-dids data16_13TeV:* --filter type=DATASET,datatype=AOD
```

SCOPE:NAME	[DID TYPE]	
data16_13TeV:data16_13TeV.00293572.physics_CosmicCalo.merge.AOD.x387_m1554		DATASET
data16_13TeV:data16_13TeV.00297447.physics_Standby.merge.AOD.x416_m1583		DATASET
data16_13TeV:data16_13TeV.00297041.physics_Main.merge.AOD.f686_m1583		DATASET
data16_13TeV:data16_13TeV.00297041.physics_CosmicCalo.merge.AOD.f686_m1583		DATASET
data16_13TeV:data16_13TeV.00297041.physics_ZeroBias.merge.AOD.f686_m1583		DATASET

# Hands-on exercise

## list contents

### ## List file contents of dataset or container

```
rucio list-files data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

SCOPE:NAME	GUID	ADLER32	FILESIZE	EVENTS
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004._0001.1	98325FCF-9E4E-B442-A4B2-2A64E271C697   ad:130a9a7c   182.9 MB   887			
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0005._0001.1	85303413-544F-EC4A-B494-494091163A92   ad:d78501da   220.4 MB   836			
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0006._0001.1	970BCEFD-CF3D-C541-8507-471F54E3167A   ad:abc20882   2.7 GB   9097			

### ## List file contents of dataset or container

```
rucio list-content data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

SCOPE:NAME	[DID TYPE]
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004._0001.1	FILE
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0005._0001.1	FILE
data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0006._0001.1	FILE

### ## List all contents recursively

```
rucio list-dids --recursive data16_13TeV:data16_13TeV.periodA3.physics_Main.PhysCont.AOD.t0pro20_v01
```

SCOPE:NAME	[DID TYPE]
data16_13TeV:data16_13TeV.00297730.physics_Main.merge.AOD.f694_m1583	DATASET
data16_13TeV:data16_13TeV.00297730.physics_Main.merge.AOD.f694_m1583._lb0108._0001.1	FILE
data16_13TeV:data16_13TeV.00297730.physics_Main.merge.AOD.f694_m1583._lb0108._0002.1	FILE
data16_13TeV:data16_13TeV.00297730.physics_Main.merge.AOD.f694_m1583._lb0108._0003.1	FILE
data16_13TeV:data16_13TeV.00297730.physics_Main.merge.AOD.f694_m1583._lb0109._0001.1	FILE
data16_13TeV:data16_13TeV.periodA3.physics_Main.PhysCont.AOD.t0pro20_v01	CONTAINER

# Hands-on exercise

## show metadata

```
## Showing metadata of a dataset
```

```
rucio get-metadata data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

```
purge_replicas: None
campaign: None
is_new: None
is_open: False
closed_at: 2016-07-18 07:39:44
deleted_at: None
availability: AVAILABLE
eol_at: None
guid: None
panda_id: None
provenance: None
accessed_at: 2016-09-19 22:00:22
version: f716_m1620
scope: data16_13TeV
hidden: False
md5: None
events: 25475721
adler32: None
complete: None
lumiblocknr: None
monotonic: False
updated_at: 2016-09-19 22:00:42
obsolete: False
transient: None
did_type: DATASET
suppressed: True
expired_at: None
stream_name: physics_Main
account: tzero
run_number: 303819
name: data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
task_id: None
datatype: AOD
created_at: 2016-07-17 04:17:53
bytes: 6462688464808
project: data16_13TeV
length: 2595
prod_step: merge
phys_group: None
```

# Hands-on exercise

## list replicas

### ## Listing dataset replicas

```
rucio list-dataset-relicas data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

```
DATASET: data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

RSE	FOUND	TOTAL
CERN-PROD_TZDISK	2567	2595
GRIF-LPNHE_DATADISK	2595	2595
IN2P3-CC_DATADISK	2595	2595
CERN-PROD_DERIVED	2595	2595

### ## Listing file replicas

```
rucio list-file-relicas data16_13TeV:data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620
```

SCOPE	NAME	FILESIZE	ADLER32	RSE: REPLICA
data16_13TeV   data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004_.0001.1   182.9 MB   130a9a7c   GRIF-LPNHE_DATADISK: srm://lpnse1.in2p3.fr:8446/srm/managerv2?SFN=/dpm/in2p3.fr/home/atlas/atlasdatadisk/rucio/data16_13TeV/39/bc/data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004_.0001.1				
data16_13TeV   data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004_.0001.1   182.9 MB   130a9a7c   TAIWAN-LCG2_DATADISK: https://dpm000.grid.sinica.edu.tw:443/dpm/grid.sinica.edu.tw/Physical_MaterialsDisk/rucio/data16_13TeV/39/bc/data16_13TeV.00303819.physics_Main.merge.AOD.f716_m1620._lb0004_.0001.1				

# Hands-on exercise download data

- Make a local copy from Rucio RSEs

```
## Downloading a dataset to local disk (select an output dataset of your test job)
```

```
rucio download user.gkawamur:user.gkawamura.test1
```

```
2016-10-01 20:26:57,534 INFO [Starting download for user.gkawamur:user.gkawamura.test1 with 0 files]
```

```
-----  
Download summary
```

```
-----  
DID user.gkawamur:user.gkawamura.test1
```

```
Total files : 0
```

```
Downloaded files : 0
```

```
Files already found locally : 0
```

```
Files that cannot be downloaded : 0
```

# Hands-on exercise request a replica

- Request a replica to a RSE space
  - The same action can be performed by **R2D2**

```
## Request a replication
rucio add-rule user.gkawamur:user.gkawamura.test1 --grouping DATASET 1 "DESY-HH_SCRATCHDISK"
...
<Transfer ID>

## Check the transfer status (or by RucioUI https://rucio-ui.cern.ch/list\_rules)
rucio rule-info <Transfer ID>
```

# RucioUI (WebUI)

## - Request replicas -



# RucioUI

- Move data between RSEs, use Rucio replication rules
- Such request can be generated by CLI and UI
- The UI tool is *the Rucio Rule Definition Droid (R2D2)*  
<https://rucio-ui.cern.ch/r2d2>
- Basic need: X509 certificate in your browser



ATLAS Rucio UI    Monitoring ▾    Data Transfers (R2D2) ▾    Reports ▾    pattern OR name OR rule id    Search    Using account: gkawamur ▾    Other Monitoring ▾    Help ▾

You are here: Rucio Rule Definition Droid - List Rules    Rucio Version ( WebUI / Server ): 1.8.0 / 1.8.0

### Rules

New request

Account	RSE	State	Activity	Interval
gkawamur	RSE		User Subscriptions	14 days

Apply

Show 10 entries

Search:

Name	Account	RSE Expression	Creation Date	State	Locks OK	Locks Replicating	Locks Stuck
No data available in table							

Name	Account	RSE Expression	Creation Date	State	Locks OK	Locks Replicating	Locks Stuck

Showing 0 to 0 of 0 entries

Previous    Next

[delete rule](#)

[download as JSON](#)

# RucioUI: Select DIDs - 1

- Data transfers (R2D2) → Request new rule

ATLAS Rucio UI   Monitoring ▾   Data Transfers (R2D2) ▾   Reports ▾   pattern OR name OR rule id   Search   Using account: gkawamur ▾   Other Monitoring ▾   Help ▾

You are here: Rucio Rule Definition Droid -

If you are new to this interface, click [here](#) to take the [tour](#).

Approve rules

If you find any errors or have suggestions for improvements for this interface please report it to [Jira](#).

Your input will be saved until you submit it. If you want to clear the form please click [here](#).

1. Select Data Identifiers (DIDs)

DID Pattern Search   List of DIDs

Please start by entering a DID or DID wildcard and search for either containers or datasets. Then select the requested DIDs. Please do not use a trailing '/' for containers.

Data pattern: panda.0323093918.103961.lib\_7993599   Search    Container    Dataset

Show: 10   Filter:

entries

Name
panda.0323093918.103961.lib_7993599

Official dataset:  
data15\_13TeV.00266904.physics\_Main.merge.DAOD\_SUSY1.  
f594\_m1435\_p2361\_tid05608871\_00

User dataset:  
user.jdoe:my.dataset.1

Enter if you have a dataset list

Wild card query by Rucio expression

# RucioUI: Select DIDs - 2

- E.g. a wild card pattern
  - “data15\_13TeV.\*.physics\_Main.merge.DAOD\_SUSY1.\*”

Your input will be saved until you submit it. If you want to clear the form please click [here](#).

**1. Select Data Identifiers (DIDs)**

DID Pattern Search List of DIDs

Please start by entering a DID or DID wildcard and search for either containers or datasets. Then select the requested DIDs. Please do not use a trailing '/' for containers.

Data pattern    Container  Dataset

Show  Filter:

entries

Name	
data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.f594_m1435_p2361_tid05608871_00	
data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2425_tid06685122_00	
data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2540_tid07869001_00	
data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r7600_p2521_p2614_tid08133087_00	
data15_13TeV.00266919.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2425_tid06685125_00	
data15_13TeV.00266919.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2540_tid07869009_00	
data15_13TeV.00266919.physics_Main.merge.DAOD_SUSY1.r7600_p2521_p2614_tid08133105_00	
data15_13TeV.00267073.physics_Main.merge.DAOD_SUSY1.f594_m1435_p2361_tid05629722_00	
data15_13TeV.00267073.physics_Main.merge.DAOD_SUSY1.r6943_p2410_p2425_tid06685128_00	
data15_13TeV.00267073.physics_Main.merge.DAOD_SUSY1.r6943_p2410_p2540_tid07869016_00	

Name

Showing 1 to 10 of 524 entries

Previous  2 3 4 5 ... 53 Next

**Select the DIDs you want to replicate**

**Data Identifiers and Scope**

Files, datasets and containers share the same naming convention, which is composed of two strings: the scope and the name, separated by a colon. The combination of scope and name is called a data identifier (DID).

The scope is used to divide the name space into several, separate sub spaces for production and individual users. User scope always start with 'user.' followed by the account name.

By default users can read from all scopes but only write into their own one. Only privileged accounts have the right to write into multiple scopes including production scopes like mc15\_13TeV.

Examples:

Official dataset:  
data15\_13TeV.00266904.physics\_Main.merge.DAOD\_SUSY1.  
f594\_m1435\_p2361\_tid05608871\_00

**metadata**

User dataset:  
user.jdoe:my.dataset.1

# RucioUI: Select DIDs - 3

- Metadata

data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.f594_m1435_p2361_tid05608871_00	
accessed_at	Mon, 14 Sep 2015 04:34:53 UTC
account	panda
availability	AVAILABLE
closed_at	Mon, 24 Aug 2015 14:33:30 UTC
created_at	Sun, 07 Jun 2015 10:09:59 UTC
datatype	DAOD_SUSY1
did_type	DATASET
events	10593
filesize	237.94 MB
hidden	false
is_open	false
length	7
monotonic	false
name	data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.f594_m1435_p2361_tid05608871_00
obsolete	false
prod_step	merge
project	data15_13TeV
run_number	266904
scope	data15_13TeV
stream_name	physics_Main
suppressed	true
task_id	5608871
updated_at	Mon, 14 Sep 2015 06:35:06 UTC
version	f594_m1435_p2361

# RucioUI: select a RSE - 1

- Find your destination space

**2. Select Rucio Storage Elements (RSEs)**

Please enter an RSE or an RSE expression.

RSE (expression)	BNL-OSG2_SCRATCHDISK	Check Quota
------------------	----------------------	-------------

RSE	Remaining Quota	Total Quota
BNL-OSG2_SCRATCHDISK	45.47 TB	45.47 TB

Name	Remaining Quota	Total Quota
------	-----------------	-------------

If you have quota the table will show your total and remaining quota

**Continue**

**2. Select Rucio Storage Elements (RSEs)**

Please enter an RSE or an RSE expression.

RSE (expression)	BNL-OSG2_DATADISK	Check Quota
------------------	-------------------	-------------

You have no quota for this RSE. If you really want to create a rule for this RSE you can continue and create a manual request, which you will have to send to DDM support.

**Continue**

If you have no quota use either have to switch to an account which has quota or you can ask for approval

# RucioUI: select a RSE - 2

- SCRATCHDISKs in Germany
  - cloud=DE&type=SCRATCHDISK

2. Select Rucio Storage Elements (RSEs)

Please enter an RSE or an RSE expression.

RSE (expression) **cloud=DE&type=SCRATCHDISK** RSE expression Check Quota

List of RSEs

RSE	Remaining Quota	Total Quota
CSCS-LCG2_SCRATCHDISK	20 TB	20 TB
CYFRONET-LCG2_SCRATCHDISK	11 TB	11 TB
DESY_IH_SCRATCHDISK	30.68 TB	30.68 TB
DESY-ZN_SCRATCHDISK	25 TB	25 TB
FMPHI-UNIBA_SCRATCHDISK	11 TB	11 TB
FZK-LCG2_SCRATCHDISK	50 TB	50 TB
GOEGRID_SCRATCHDISK	25 TB	25 TB
HEPHY-UIBK_SCRATCHDISK	1.65 TB	1.65 TB
IEPAS-KOSICE_SCRATCHDISK	14.29 TB	14.29 TB
LRZ-LMU_SCRATCHDISK	26.91 TB	26.91 TB
MPPMU_SCRATCHDISK	20 TB	20 TB
PRAGUELCG2_SCRATCHDISK	20.4 TB	20.4 TB
PSNC_SCRATCHDISK	2.2 TB	2.2 TB
TUDRESDEN-ZIH_SCRATCHDISK	4.26 TB	4.26 TB
UNI-FREIBURG_SCRATCHDISK	32.5 TB	32.5 TB
UNI-SIEGEN-HEP_SCRATCHDISK	50 GB	50 GB
WUPPERTALPROD_SCRATCHDISK	22.55 TB	22.55 TB

Name	Remaining Quota	Total Quota
------	-----------------	-------------

Continue

# RucioUI: select options

**3. Options**

Please select/enter your wanted options and then submit your rule request.

Grouping  
 All  Dataset  None

Lifetime (in days). Leave empty for infinite lifetime.  
15

Copies  
1

Comment  
For ATLAS-D

Create sample

Asynchronous Mode

Number of files

Continue

A grouping definition of how the replica will be distributed

Use if you select files randomly

# Rucio UI: summary

- Before submission check rules

4. Summary					
DID	Copies	Files	Size	Requested Size	
data15_13TeV:data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.f594_m1435_p2361_tid05608871_00	1	7	237.94 MB	237.94 MB	
data15_13TeV:data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2425_tid06685122_00	1	14	2.96 GB	2.96 GB	
data15_13TeV:data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r6944_p2410_p2540_tid07869001_00	1	5	3.4 GB	3.4 GB	
data15_13TeV:data15_13TeV.00266904.physics_Main.merge.DAOD_SUSY1.r7600_p2521_p2614_tid08133087_00	1	10	2.62 GB	2.62 GB	
<b>Total</b>	<b>4</b>	<b>36</b>	<b>8.59 GB</b>	<b>8.59 GB</b>	

This request will create rules for the following DIDs:

The rules will replicate to one of the following RSEs:

Check quota limit carefully!

RSE	Remaining Quota	Total Quota
CSCS-LCG2_SCRATCHDISK	20 TB	20 TB
CYFRONET-LCG2_SCRATCHDISK	11 TB	11 TB
DESY-HH_SCRATCHDISK	30.68 TB	30.68 TB
DESY-ZN_SCRATCHDISK	25 TB	25 TB
FMPHI-UNIBA_SCRATCHDISK	11 TB	11 TB
FZK-LCG2_SCRATCHDISK	50 TB	50 TB
GOEGRID_SCRATCHDISK	25 TB	25 TB
HEPHY-UIBK_SCRATCHDISK	1.65 TB	1.65 TB
IEPSAS-KOSICE_SCRATCHDISK	14.29 TB	14.29 TB
LRZ-LMU_SCRATCHDISK	26.91 TB	26.91 TB
MPPMU_SCRATCHDISK	20 TB	20 TB
PRAGUELCG2_SCRATCHDISK	20.4 TB	20.4 TB
PSNC_SCRATCHDISK	2.2 TB	2.2 TB
TUDRESDEN-ZIH_SCRATCHDISK	4.26 TB	4.26 TB

# Rucio UI: Transfer status

- Go to top page and see your transfer activity
  - <https://rucio-ui.cern.ch/r2d2>

ATLAS Rucio UI   Monitoring   Data Transfers (R2D2)   Reports   pattern OR name OR rule id   Search   Using account: gkawamur   Other Monitoring   Help

You are here: Rules Backlog Monitoring   Rucio Version ( WebUI / Server ): 1.8.0 / 1.8.0

Account	Activity	Endpoint	State	Age	Load
gkawamur	Activity	RSE	Done	younger than 12 hours	Load

Rules

Data Type Project Stream   Get Link   Search:

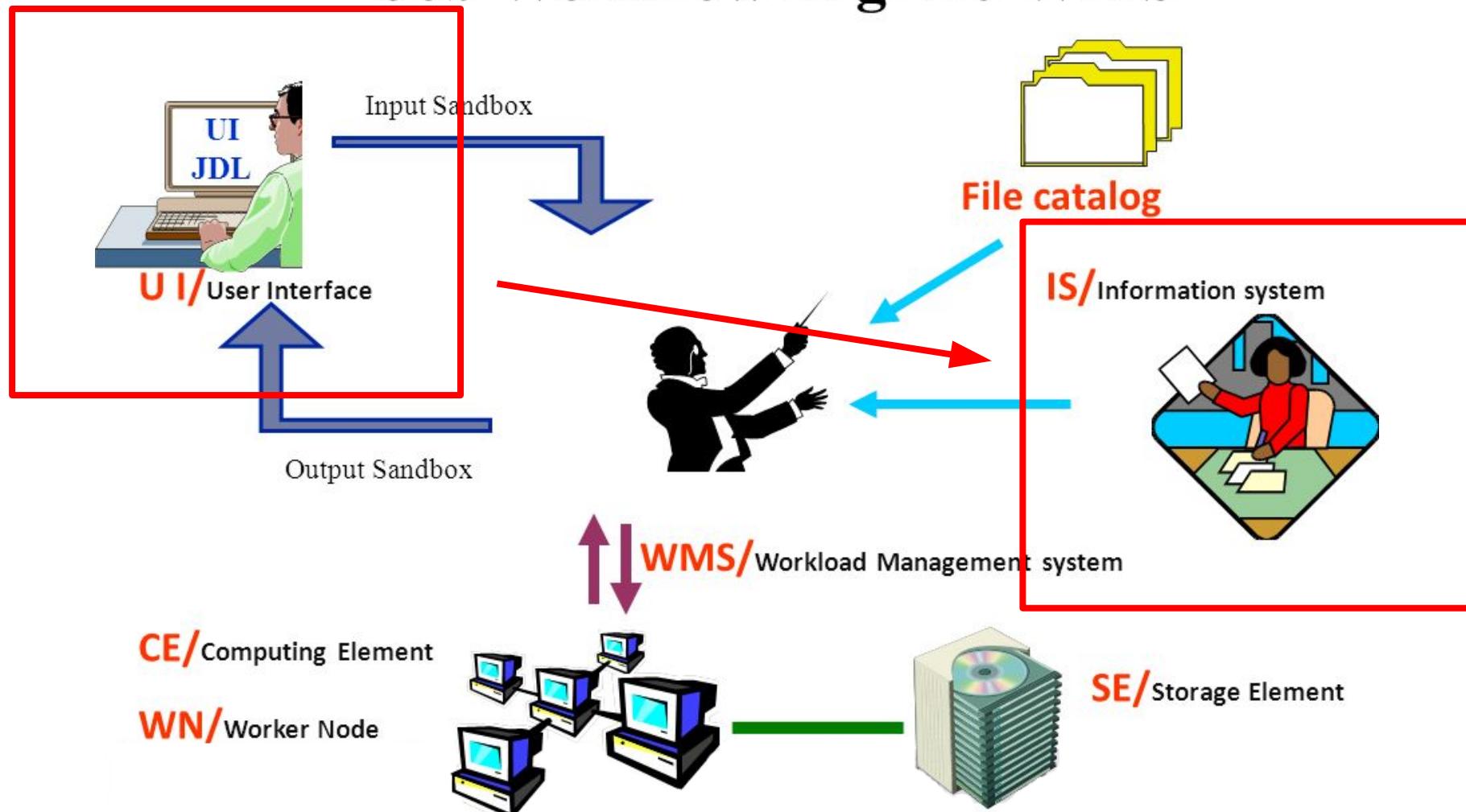
Name	Endpoint	State	Creation Date	Data Type	Project	Stream	Version	OK	Replicating	Stuck
data16_13TeV.00309640.express_express.recon.E SD.f750	CERN-PROD_DATADISK	Done	Sun, 02 Oct 2016 20:23:55 UTC	ESD	data16_13TeV	express_express	0	956	0	0
data16_13TeV.00309640.physics_Late.recon.ESD.f750	SLACRDXD_DATADISK	Done	Sun, 02 Oct 2016 20:59:14 UTC	ESD	data16_13TeV	physics_Late	0	955	0	0
data16_13TeV.00309640.physics_Late.recon.ESD.f750	BNL-OSG2_DATADISK	Done	Sun, 02 Oct 2016 20:59:14 UTC	ESD	data16_13TeV	physics_Late	0	955	0	0
data16_13TeV.00309640.debugrec_hlt.merge.AOD.g53_f750_m1689	CERN-PROD_DATADISK	Done	Sun, 02 Oct 2016 21:01:47 UTC	AOD	data16_13TeV	debugrec_hlt	0	1	0	0
data16_13TeV.00309640.debugrec_hlt.merge.AOD.g53_f750_m1689	INFN-T1_DATADISK	Done	Sun, 02 Oct 2016 21:01:47 UTC	AOD	data16_13TeV	debugrec_hlt	0	1	0	0
data16_13TeV.00309640.debugrec_hlt.merge.AOD.g53_f750_m1689	UNI-FREIBURG_DATADISK	Done	Sun, 02 Oct 2016 21:01:48 UTC	AOD	data16_13TeV	debugrec_hlt	0	1	0	0
data16_13TeV.00309640.physics_Late.merge.AOD.f750_m1689	RAL-LCG2_DATADISK	Done	Sun, 02 Oct 2016 23:08:55 UTC	AOD	data16_13TeV	physics_Late	0	96	0	0
data16_13TeV.00309640.physics_Late.merge.AOD.f750_m1689	UKI-NORTHGRID-LANCS-HEP_DATADISK	Done	Sun, 02 Oct 2016 23:08:55 UTC	AOD	data16_13TeV	physics_Late	0	96	0	0

## Extra: Information Provider (of gLite)



# Information Provider

## Job Workflow in gLite-WMS



# Hands-on exercise

## Information Provider - 1

- Searching resources

```
## EMI (European Middleware Initiative) LCG (LHC Computing Grid) tools
$ setupCVMFS
```

```
## See usage
$ lcg-infosites
```

Usage: lcg-infosites [options] selection(s)

Selections:

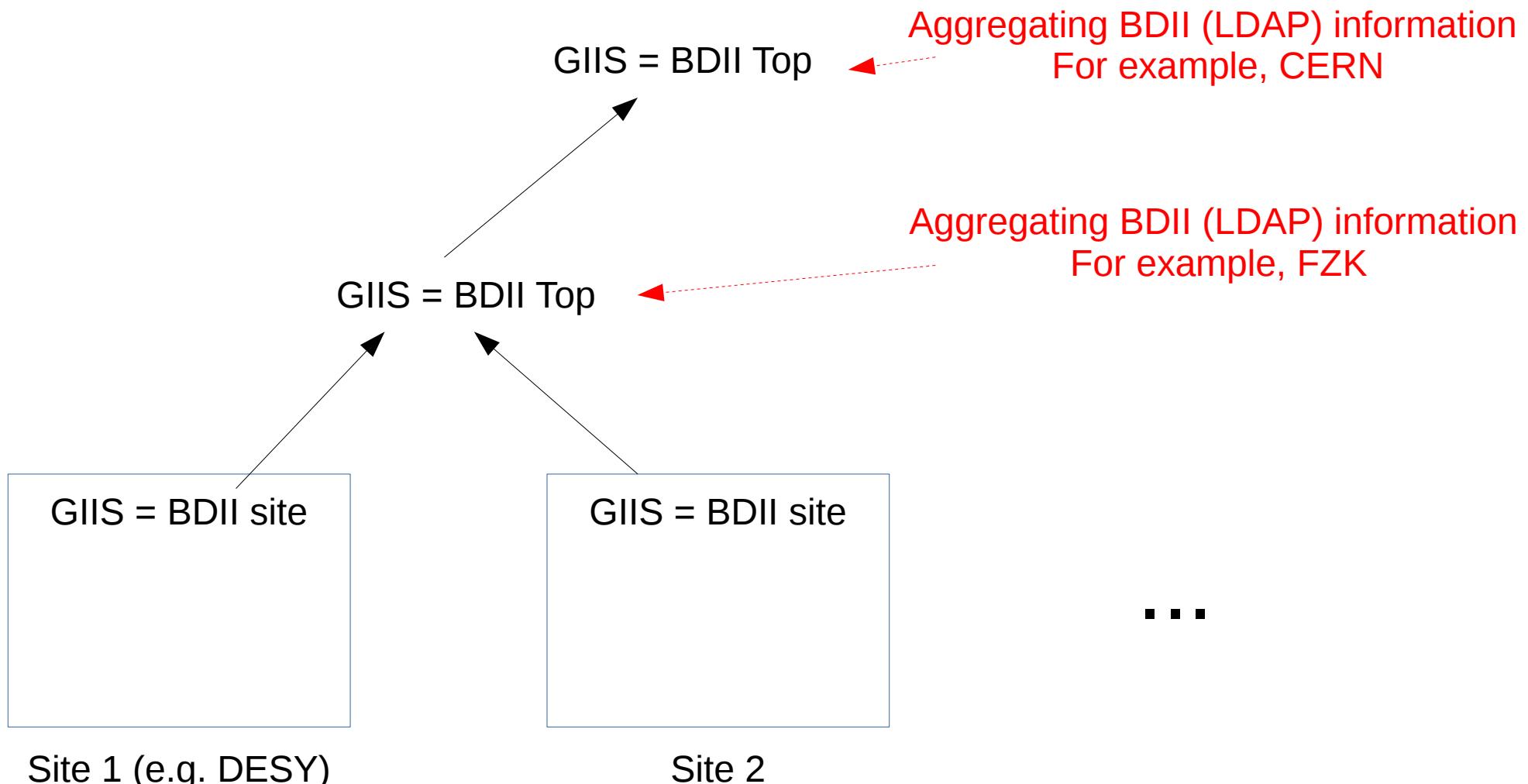
```
all      dli      lfc      tag
bdii_site  dliLocal  lfcLocal  vobox
bdii_top   fts      myproxy   voms
ce        gridice  se        voms-admin
closeSE   lb       sitenames  voview
cream     lcg-ce   space     wms
```

```
## Searching for storage element at DESY-HH
```

```
$ lcg-infosites --vo atlas se -f DESY-HH
```

	Avail Space(kB)	Used Space(kB)	Type	SE
n.a	n.a	SRM	dcache-se-atlas.desy.de	
144686862585	1155357848246	SRM	dcache-se-atlas.desy.de	
989417595283	2662137428541	SRM	dcache-se-atlas.desy.de	
1991791084	n.a	SRM	dcache-se-atlas.desy.de	
33956785021	30907581359	SRM	dcache-se-atlas.desy.de	
3972844749	n.a	SRM	dcache-se-atlas.desy.de	
n.a	n.a	SRM	prometheus.desy.de	
963849833	2517808	SRM	prometheus.desy.de	

# Structure of Information Providers among sites



# GlueSchema & LDAP

- [https://www.slac.stanford.edu/grp/eg/minos/dist/dist\\_aux2/packages/GridTools/HEAD/docs/glue\\_schema.html](https://www.slac.stanford.edu/grp/eg/minos/dist/dist_aux2/packages/GridTools/HEAD/docs/glue_schema.html)
- [https://www.centos.org/docs/5/html/CDS/ag/8.0/Finding\\_Directory\\_Entries-LDAP\\_Search\\_Filters.html](https://www.centos.org/docs/5/html/CDS/ag/8.0/Finding_Directory_Entries-LDAP_Search_Filters.html)

# Hands-on exercise

## Information Provider - 2

- Using 'ldapsearch' command

```
## Checking site-level information provider (GIIS)
$ lcg-infosites --vo atlas bdii_site -f DESY-HH
ldap://grid-giis0.desy.de:2170/mds-vo-name=DESY-HH,o=grid
ldap://grid-giis1.desy.de:2170/mds-vo-name=DESY-HH,o=grid

## Getting GridFTP endpoints from GIIS at DESY-HH
$ SE=dcache-se-atlas.desy.de
$ ldapsearch -xLLL -b 'o=grid' "(&(GlueChunkKey=GlueSEUniqueID=$SE)" -p 2170 -h grid-giis0.desy.de | grep gsiftp
GlueSEAccessProtocolType: gsiftp

## Getting SRM endpoints from GIIS at DESY-HH
$ ldapsearch -xLLL -b 'o=grid' "(&(GlueChunkKey=GlueSEUniqueID=$SE)" -p 2170 -h grid-giis0.desy.de | grep httpg

## ATLASDATADISK (using AND), the unit of size is "GigaByte"
$ ldapsearch -xLLL -b 'o=grid' "(&(GlueChunkKey=GlueSEUniqueID=$SE)(GlueSALocalID=atlas:ATLASDATADISK))" \
-p 2170 -h grid-giis0.desy.de

## Only OnlineSize (=GlueSATotalOnlineSize)
$ ldapsearch -xLLL -b 'o=grid' "(&(GlueChunkKey=GlueSEUniqueID=$SE)(GlueSALocalID=atlas:ATLASDATADISK))" \
GlueSATotalOnlineSize -p 2170 -h grid-giis0.desy.de
```

# Hands-on exercise

## Information Provider - 3

- Getting SE information given by a site BDII

```
## Connecting to DESY-HH SE via SRM protocol
```

```
srm_ls srm://dcache-se-atlas.desy.de
```

```
512 /  
512 /upload/  
512 /admin/  
512 /usr/  
512 /pnfs/
```

```
## SRM space token (which is used by Rucio Storage Endpoint)
```

```
srm-get-space-tokens -space_desc=ATLASLOCALGROUPDISK srm://dcache-se-atlas.desy.de
```

```
Space Reservation Tokens:
```

```
540002
```

```
## Checking site-level information provider
```

```
lcg-infosites --vo atlas bdii_site -f DESY-HH
```

```
ldap://grid-giis0.desy.de:2170/mds-vo-name=DESY-HH,o=grid
```

```
ldap://grid-giis1.desy.de:2170/mds-vo-name=DESY-HH,o=grid
```

```
## Getting GridFTP endpoints
```

```
SE=dcache-se-atlas.desy.de
```

```
ldapsearch -xLLL -b 'o=grid' '(GlueChunkKey=GlueSEUniqueID=$SE)' -p 2170 -h grid-giis0.desy.de | grep gsiftp
```

```
GlueSEAccessProtocolType: gsiftp
```

```
## Connecting to DESY-HH SE via GridFTP protocol
```

```
uberftp -ls gsiftp://dcache-door-atlas12.desy.de/
```