



Open Science Grid

PanDA Workload Management System

Jose Caballero
(Brookhaven National Laboratory)

Open Science Grid Sites Meeting
May 13, 2010



Open Science Grid

What is PanDA?

The PanDA (Production and Distributed Analysis) system was developed to meet the quite challenging requirements of the ATLAS Collaboration for a large scale workload system for production and distributed analysis.

Since September 2006 Panda has also been a principal component of the Open Science Grid program in just-in-time workload management.

Currently it is used by CHARMM, by DayaBay/LBNE, for automatic OSG ITBs validation. Other VOs are considering using it (like SBGrid).

This just-in-time model is accomplished with a pilot-based architecture →



Open Science Grid

How PanDA works?

PanDA is built on a pilot-based architecture:

🍏 Pilots are submitted to grid sites, w/o interruption, from a central managed system.

Users don't need to worry about these pilots.

Pilots check the environment, encapsulate the eventual complexity of this environment to the users, and provides for monitoring capabilities.

🍏 In parallel, users submit their jobs to a central service (PanDA server). Jobs are not submitted to the Grid sites directly.

This pilot-based approach has some advantages →



Open Science Grid

Why using pilots?

Pilots offer some advantages:

- 🍅 Users do not need to worry about brokering or scheduling.
- 🍅 Pilots checks the environment.
- 🍅 As soon as one pilot arrives to an operative WN a job is picked up. Jobs are not waiting on queue on a site while there are free resources on other sites.
- 🍅 Users do not need to concern themselves with Grid interfaces. PanDA presents them with a unified mode of access to Grid resources. →



Open Science Grid

How do users use PanDA?

Documentation can be found at www.opensciencegrid.org/panda

Users only need to copy the client tarball, “untar” it, and that’s it:

```
caballer/atlas @ pandadev01 : panda_jobs $ wget -q http://www.usatlas.bnl.gov/~caballer/panda/demo/sendjobs.tar
caballer/atlas @ pandadev01 : panda_jobs $ tar xf sendjobs.tar
caballer/atlas @ pandadev01 : panda_jobs $ ls
sendjobs  sendjobs.tar
caballer/atlas @ pandadev01 : panda_jobs $ cd sendjobs
caballer/atlas @ pandadev01 : sendjobs $ ls
argparse.py  README  sendJob.py  setup.sh  taskbuffer  userinterface
caballer/atlas @ pandadev01 : sendjobs $ source setup.sh
caballer/atlas @ pandadev01 : sendjobs $ ./sendJob.py --processingType ITB_Integration \
> --njobs 4 \
> --computingSite UCITB_EDGE7 \
> --transformation http://www.usatlas.bnl.gov/~caballer/panda/transformations/trivial_test.sh \
> --prodSourceLabel user \
> --jobParameters "a b c 1 2 3" \
> --destinationURL gsiftp://uct3-edge7.uchicago.edu:2811/tmp/output █
```

Users need a valid grid proxy to submit jobs. No special role is needed.

Users need to allocate the actual job they want to run on a valid URL and pass that URL as a parameter. This job can be any kind of executable (a bash script, perl, python, a binary...)



Open Science Grid

How do VOs use PanDA?


Two approaches for pilot submission:

 The PanDA team manage the pilot submission, and VOs relax.

 VOs decide to manage the pilot submission:

 The pilot submission host must be registered, providing for this info:

```
'name'      : 'pandadev01.usatlas.bnl.gov'  
'nickname'  : 'pandadev01'  
'host'      : 'pandadev01.usatlas.bnl.gov'  
'system'    : 'osg lcg-cg condor glidein'  
'rundir'    : '/usatlas/prodjob/share/schedlogs'  
'runurl'    : 'http://pandadev02.usatlas.bnl.gov:25880/glidein_schedlogs/'
```

 The “pilot submission agent” needs a proxy with specific VOMS attributes.

 The pilot submission host must to be configured

```
export PANDA_URL=http://panda.cern.ch:25080/server/panda  
export PANDA_URL_SSL=https://panda.cern.ch:25443/server/panda  
export PANDA_HOME=$HOME  
export SCHEDULER_LOGS=/home/username/logs/scheduler  
export CRON_LOGS=/home/username/logs/cron  
export PYTHONPATH=$HOME/panda/monitor:$HOME/panda/panda-server/current/pandaserver:$PYTHONPATH
```

 The pilot submission package is downloaded, and a cron is setup

```
0 3,9,15,21 * * * /...path.../pilotCron.sh --queue=YOURQUEUE --pandasite=YOURSITE
```



Open Science Grid

How to monitor PanDA pilots?

<http://panda.cern.ch:25980/server/pandamon/query>

PilotID	Type	Accepts	Queue	Tstart	Tstate	State	Status	Err	ErrorInfo	Trun	Tjob	Tchk
tp_gridui07_10352_20100512-143317_67 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	5'	5'	submitted	active					5'
tp_gridui07_10352_20100512-143310_66 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	5'	5'	submitted	active					5'
tp_gridui07_10352_20100512-142131_65 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	17'	17'	submitted	active					17'
tp_gridui07_10352_20100512-141548_64 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	22'	22'	submitted	active					22'
tp_gridui07_10352_20100512-140737_63 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	31'	5'	done	finished		Dispatcher has no jobs		25'	
tp_gridui07_10352_20100512-140658_62 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	31'	5'	done	finished		Dispatcher has no jobs		25'	
tp_gridui07_10352_20100512-133009_61 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	68'	31'	done	finished		Dispatcher has no jobs		37'	
tp_gridui07_10352_20100512-132945_60 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	68'	17'	done	finished		Dispatcher has no jobs		51'	
tp_gridui07_10352_20100512-132801_59 idl script submit log out err	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	70'	23'	done	finished		Dispatcher has no jobs		47'	
tp_gridui07_23371_20100511-043015_22 idl script submit log out err LIVE PandaID=1068853625	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	05-11 04:30	33hr	done	finished		PandaID 1068853625 done		35'	
tp_gridui07_23371_20100511-042400_21 idl script submit log out err LIVE PandaID=1068853624	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	05-11 04:24	33hr	done	finished		PandaID 1068853624 done		39'	
tp_gridui07_23371_20100511-041325_20 idl script submit log out err LIVE PandaID=1068853623	trivial	BNL_ITB_Test1	BNL_ITB_Test1-condor	05-11 04:13	34hr	done	finished		PandaID 1068853623 done		19'	



Open Science Grid

How to monitor PanDA jobs?

<http://panda.cern.ch:25980/server/pandamon/query>

Jobs:

PandaID, Owner, Working group	Job	Status	Created	Time to start	Duration	Ended/ Modified	Cloud/Site, Type	Priority
1068853625 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:31:50	0:00:03	05-11 04:32	OSG/BNL ITB_Test1 , analysis-run	1367
1068853624 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:24:53	0:00:03	05-11 04:25	OSG/BNL ITB_Test1 , analysis-run	1367
1068853623 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:14:26	0:00:04	05-11 04:14	OSG/BNL ITB_Test1 , analysis-run	1367
1068853622 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:12:55	0:00:03	05-11 04:13	OSG/BNL ITB_Test1 , analysis-run	1367
1068853621 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:10:42	0:00:07	05-11 04:11	OSG/BNL ITB_Test1 , analysis-run	1367
1068853620 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 22:10:39	0:00:08	05-11 04:11	OSG/BNL ITB_Test1 , analysis-run	1368
1068853619 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 21:51:31	0:00:03	05-11 03:51	OSG/BNL ITB_Test1 , analysis-run	1368
1068853618 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 21:47:24	0:00:04	05-11 03:47	OSG/BNL ITB_Test1 , analysis-run	1368
1068853617 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 21:42:07	0:00:03	05-11 03:42	OSG/BNL ITB_Test1 , analysis-run	1368
1068853616 Suchandra Thapa	jobID=2049 check_wn_tmp	finished	2010-05-06 06:00	4 days, 21:42:00	0:00:03	05-11 03:42	OSG/BNL ITB_Test1 , analysis-run	1368
1068853585 Suchandra Thapa	jobID=2045 check_osg_data	finished	2010-05-06 06:00	4 days, 21:28:29	0:00:04	05-11 03:28	OSG/BNL ITB_Test1 , analysis-run	1381
1068853584 Suchandra Thapa	jobID=2045 check_osg_data	finished	2010-05-06 06:00	4 days, 21:28:27	0:00:04	05-11 03:28	OSG/BNL ITB_Test1 , analysis-run	1381
1068853583 Suchandra Thapa	jobID=2045 check_osg_data	finished	2010-05-06 06:00	4 days, 21:26:17	0:00:04	05-11 03:26	OSG/BNL ITB_Test1 , analysis-run	1381
1068853582 Suchandra Thapa	jobID=2045 check_osg_data	finished	2010-05-06 06:00	4 days, 21:20:55	0:00:04	05-11 03:21	OSG/BNL ITB_Test1 , analysis-run	1381



Open Science Grid

What should the sites do?

🍏 Sites have to be registered in the PanDA system. Almost all the needed information can be found in MyOSG. Usually sites only need to provide for the complete CE name (including the jobmanager!).

🍏 Sites MUST to support the OSG Virtual Organization (or the VO using PanDA). Many sites (15-20) are publishing on MyOSG they give support for OSG VO, but a simple globus-job-run against them fails. Sometimes the site really supports OSG VO, but is not able to provide for an UNIX account when the pilot has VOMS attributes.

🍏 If a specific group or user worries about identity, and they prefer jobs not being executed with a generic pilot identity, PanDA addresses it via MyProxy

- 🍊 the user needs the client on the jobs submission host
- 🍊 the site needs to install the client also on the VNs

🍏 Connectivity: PanDA server, the URL with the job, and maybe the MyProxy server.

🍏 curl: pilots use curl for secure communication with the server. Program curl must be properly installed. Unless... ➡



Open Science Grid

... and a personal question

To develop code for both the client and the pilot I am still stuck with python 2.3

There are already more secure and functional versions, but not supported by SL4

Are really there sites still using SL4?