Hands on Using the OSG client

Abhishek Singh Rana
and
David Meyers

OSG 0.6.0 Infrastructure

- VORS – Virtual Organization Resource Selector
- MonALISA – MONitoring Agents using a Large Integrated Service Architecture
- Gratia – Grid accounting facility
- Virtual Organization (VO) issues
- GOC – Grid Operations Center

Virtual Organization Resource Selector - VORS

- Custom web interface to a grid scanner that checks services and resources on:
  - Each Compute Element
  - Each Storage Element
- Very handy for checking:
  - Paths of installed tools on Worker Nodes.
  - Location & amount of disk space for planning a workflow.
  - Troubleshooting when an error occurs.

VORS entry for OSG_LIGO_PSU

Gatekeeper: grid3.aset.psu.edu

Scheduler Types	jobmanager is of type fork jobmanager-fork is of type fork jobmanager-mis is of type mis jobmanager-pbs is of type pbs
Path to Condor Binaries	
Path to MIS Binaries	/opt/osg-ce-0.4.1/MIS-CI/bin
MDS Port	2135
VDT Version	1.3.10b
VDT Location	/opt/osg-ce-0.4.1
$APP Location	/usr1/grid3/app
$DATA Location	/usr1/grid3/data
$TMP Location	/usr1/grid3/data
$WNTMP Location	/tmp
$OSG_GRID Location	/usr1/grid3/osg-wn-0.4.1
$APP Space Available	179.065 GB
$DATA Space Available	179.065 GB
$TMP Space Available	179.065 GB

VORS is developing a grid-scanner for Storage Elements (coming soon) for OSG 0.6.0

Testing for SE SRM control protocol : YES control type = srm_v1 end point = srm://fndca1.fnal.gov:8443/ full path = /pnfs/fnal.gov/usr/fermigrid/volatile/mis executing srmls -retry_num=0 srm://fndca1.fnal.gov:8443//pnfs/fnal.gov/usr/fermigrid/volatile/mis 2>&1

….

Testing srmls : PASS - read 12 lines 512
srm://fndca1.fnal.gov:8443//pnfs/fnal.gov/usr/fermigrid/volatile/mis 1715
srm://fndca1.fnal.gov:8443//pnfs/fnal.gov/usr/fermigrid/volatile/mis/file1 1715
srm://fndca1.fnal.gov:8443//pnfs/fnal.gov/usr/fermigrid/volatile/mis/file2 41767

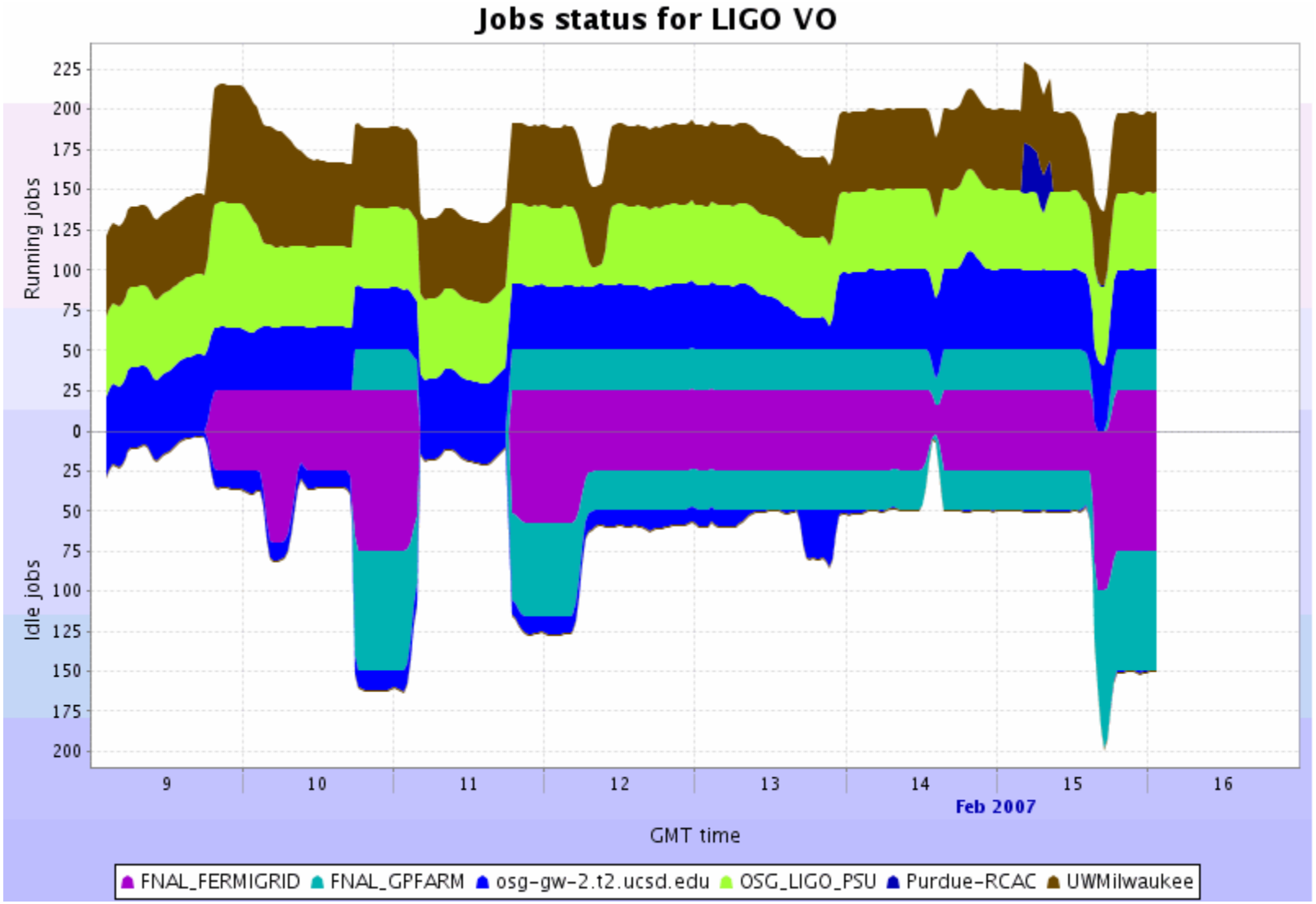
….

Testing srmcp (from SE) : FAIL - returns error code 256

MonALISA

- Mature OSG-wide real-time monitoring of jobs
- Provides templates for charting job and workflow progress on a site or per a collection of sites used by a Virtual Organization.
- Provides historical database records on past usage.

MonALISA Graph capability – Run-time performance of a LIGO App at 6 OSG sites



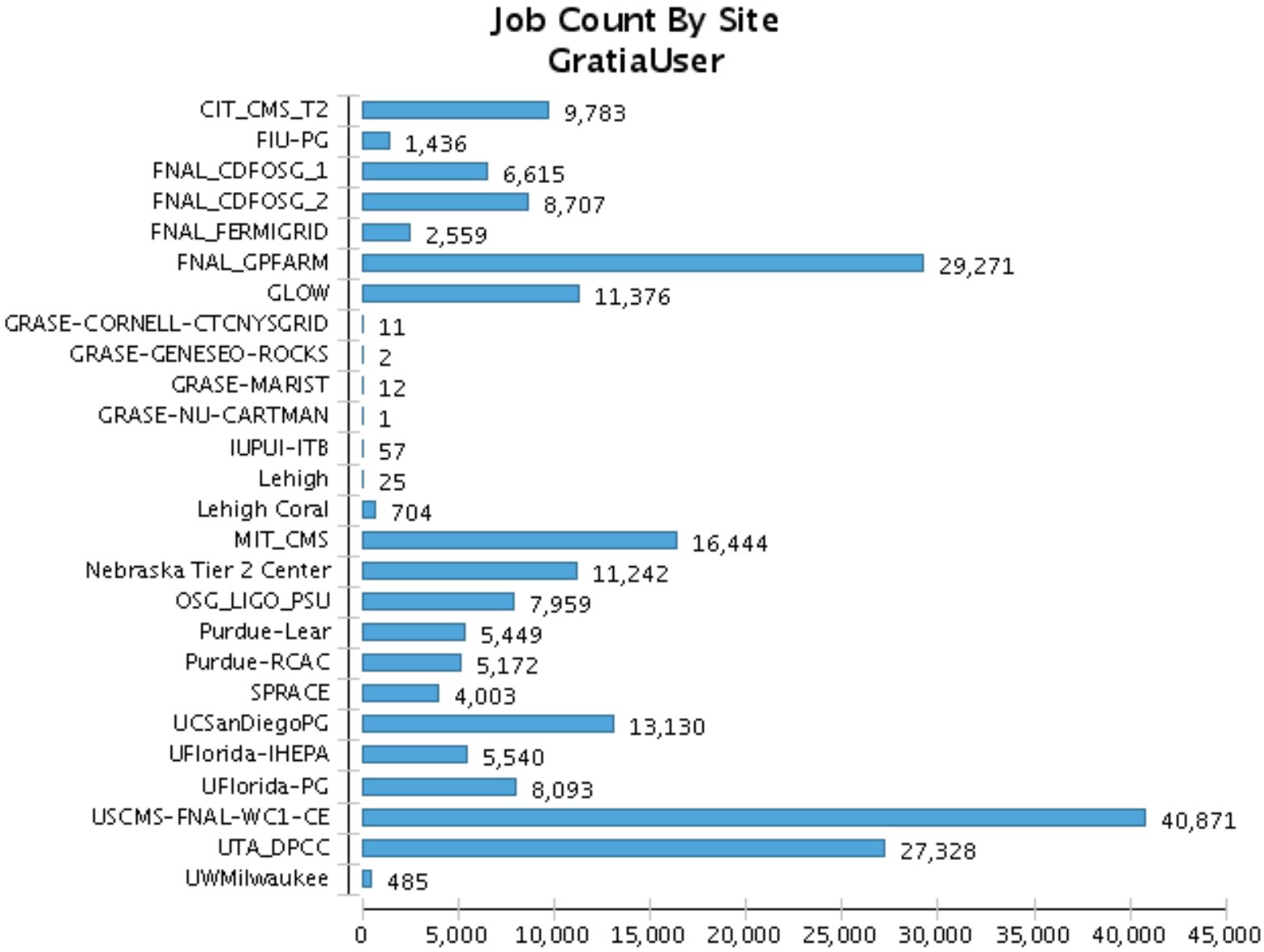
MonALISA stats – 7 day performance of a LIGO App at 6 OSG sites

Running Jobs				
Farm	Last value	Min	Avg	Max
FNAL_FERMIGRID	25	0	21.79	28
FNAL_GPFARM	25	0	24.12	28
osg-gw-2.t2.ucsd.edu	50	12	40.87	63
OSG_LIGO_PSU	48	10	49.88	77
Purdue-RCAC	0	0	14.94	34
UWMilwaukee	50	31	51.78	74
Total	**198**		**203.4**	

Idle Jobs				
Farm	Last value	Min	Avg	Max
FNAL_FERMIGRID	75	0	32.8	100
FNAL_GPFARM	75	0	36.53	100
osg-gw-2.t2.ucsd.edu	0	0	8.22	38
OSG_LIGO_PSU	0	0	0	2
Purdue-RCAC	1	0	0.188	1
UWMilwaukee	1	0	1.003	3
Total	**152**		**78.74**	

Gratia – Grid Accounting Package

- Goal: Accurate set of views of Grid resource usage.
- Uniform accounting records independent of batch scheduler and operating system.
- Gratia Probe installed as part of the OSG 0.60 Compute Element installation.
- Gratia Reporting Facility at FNAL.
- SQL retrieval of records from FNAL DB.



Date range: 2007-02-26 00:00:00 GMT - 2007-03-05 23:59:59 GMT

Virtual Organization(VO) Issues

- Your Grid Certificate is tied to a specific VO.
- Each VO has a VO administrator. The VO admin manages a VOMS server.
- VOMS – Virtual Organization Membership Service is a DB which collects all the membership information for the organization.
- The Globus gatekeeper authentication process references your identity information from VOMS to determine if you are to be authenticated when you attempt to run a Globus job or GSIFTP a file.

Virtual Organization(VO) Issues

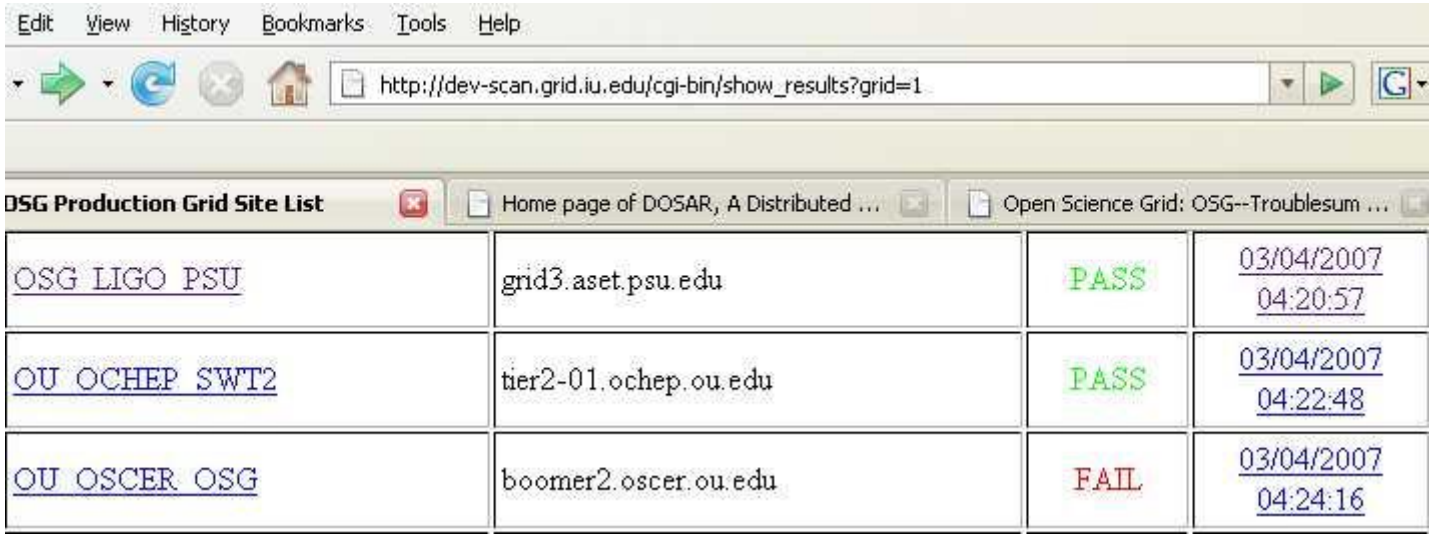
- Why can't I run a job at site X?
  - The site X may not support your VO. A Production site on the OSG is not required to support all VOs. (check with your VO admin)
  - The site X may require additional configuration to support your VO (missing VO home directory, wrong permissions, no VO grid mapping) Your VO admin may need the GOC to fix this.

Grid Operations Center

- Based at Indiana University and provides a central repository of staff and monitoring systems for:
  - Real time grid monitoring.
  - Problem tracking via a trouble ticket system.
  - Support for developers and sys admins.
  - Maintains infrastructure – VORS, MonALISA and registration DB.
  - Maintains OSG software repositories.

Running jobs on the OSG

- Command line tools –common idioms
  - Check the VORS page



We need to specify the gatekeeper (second column above) for a site:

globus-job-run grid3.aset.psu.edu /bin/date
Sun Mar 4 00:30:02 EST 2007

Can we authenticate on OU_OCHEP_SW2 ?
globusrun -a -r tier2-01.ochep.ou.edu
GRAM Authentication test successful

Running jobs on the OSG

- globusrun and globus-job-run can be used for complex job specifications:
  - Batch schedulers supported include:
    - Condor, LSF, PBS and SGE
  - To access many nodes on a remote resource specify the proper batch scheduler used at that site:

globus-job-run grid3.aset.psu.edu/jobmanager-pbs /bin/date

Command is queued on the batch scheduler and will run when the job reaches the front of the queue. The job may wait in the queue for minutes to hours depending on your priority and how busy the resource is.

Running jobs on the Grid

- Globus is built on a Resource Specification Language (RSL) which can control batch schedulers that manage clusters.
- An RSL example:
  - &(executable="/bin/ls") (directory="/tmp") (arguments="-l")
  - Place the RSL string in a file: myjob.rsl
  - Try: globusrun -s -r osg-itb.ligo.caltech.edu -f myjob.rsl
  - Try globusrun –s –r osg-itb.ligo.caltech.edu/jobmanager-condor –f myjob.rsl
- But for more robust job management use Condor-G!

GridFTP: File transfer and staging

- GridFTP is the globus protocol for transferring files between:
  - Grid clients (submit hosts) and grid Compute Elements.
- Support multiple simultaneously streams for high performance.
- Supports third-party copy: Host A requests Host B transfer files to Host C.
- globus-url-copy is a wrapper on GridFTP with a convenient syntax.

globus-url-copy

- Syntax: globus-url-copy source-url destination-url

- Example:

globus-url-copy gsiftp://osg-itb.ligo.caltech.edu/archive/frames/H-H1_RDS-1024.gwf
gsiftp://testwulf.hpcc.ttu.edu/mnt/hep/osg/workdir/H-H1_RDS-1024.gwf

Many options exist. Please see the globus-url-copy of the GridIFTP User's Guide:
http://www.globus.org/toolkit/docs/3.2/gridftp/user/globusurlcopy.html#commandlineoptions
for details.

Condor-G/DAGman

- Globus virtualized the interface to high performance computing resources and file transfers.
- However, run-time event management in distributed systems is needed:
  - Gatekeeper may be down.
  - GridFTP server may be down.
  - Operating system may become unresponsive.
  - Batch scheduler may become unresponsive.
  - Submit host may not be able to stage-out results of a job due to a full disk.
- Condor-G/DAGman provides a means to monitor and manage end-to-end events during a Grid application execution.

Condor-G/DAGman

- Condor folks created the globus universe. Condor scripts submitted to the globus universe are submitted to a Globus gatekeeper or GridFTP server and use all of the resources of Globus jobs.
- Condor scripts are submitted by the user running a Condor client and having a local condor queue. So Grid job management is simplified for the user due to Condor toolset:
  - condor_submit: submit a condor script.
  - condor_q: check the status of a condor job.
  - condor_rm: remove a condor job from the queue.

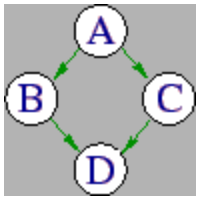
A simple Condor-G script

```
universe = globus
executable = /bin/ls
notification = NEVER
globusrsl = (jobtype=single)
globusscheduler = osg-itb.ligo.caltech.edu/jobmanager-condor
copy_to_spool = false
error = /home/dmeyers/osg-itb.err
log = /home/dmeyers/osg-itb.log
output = /home/dmeyers/osg-itb.out
transfer_executable = false
transfer_error = true
transfer_output = true
periodic_release = (NumSystemHolds <= 3)
periodic_remove = (NumSystemHolds > 3)
remote_initialdir = /home/dmeyers
queue
```

DAGman

- DAG manager (DAGman) is an extension to the Condor system that adds a Directed Acyclic Graph(DAG) abstraction.
- Many scientific and engineering workflows can be modeled as a collection of DAG nodes.
- Each DAG node is tracked and its status determined by the DAG manager. Errors are handled by auto-restarting a failed node to increase reliability. Condor has the notion of a rescue DAG which represents the place in the Graph where a workflow can be restarted from, to resume a workflow.

DAGman



Diamond DAG

An example input file for DAGMan is

```
# Filename: diamond.dag
Job A A.condor
Job B B.condor
Job C C.condor
Job D D.condor
Script PRE A top_pre.csh
Script PRE B mid_pre.perl $JOB
Script POST B mid_post.perl $JOB $RETURN
Script PRE C mid_pre.perl $JOB
Script POST C mid_post.perl $JOB $RETURN
Script PRE D bot_pre.csh
PARENT A CHILD B C
PARENT B C CHILD D
Retry C 3
```

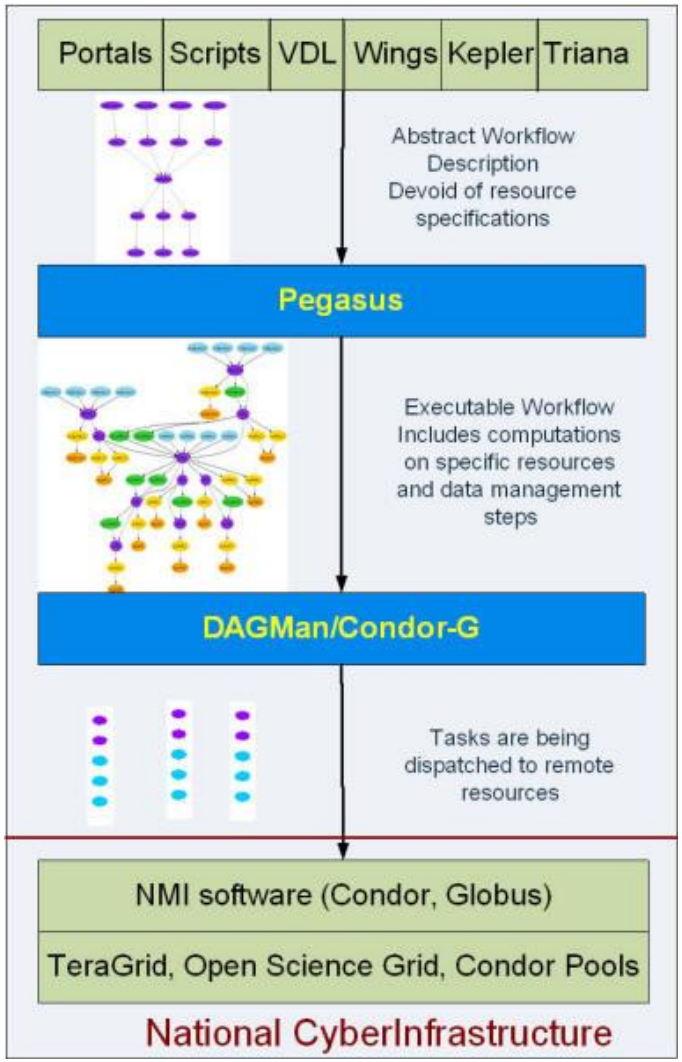
DAGMan

For more information on DAGMan see the DAGMan section of the Condor manual: http://www.cs.wisc.edu/condor/manual/v6.4/2_11DAGMan_Applications.html#fig:dagman-diamond

Automatic Tools exist to convert DAGs into Condor-G submit scripts that can be run with the Condor command: condor-submit-dag.

One of these tools is the Pegasus Workflow Planner described at: http://pegasus.isi.edu/

For More information on these topics see the references and URLs on the next page.



Trouble Shooting Info

- OSG Troubleshooting guide:

http://grow.uiowa.edu/dokuwiki/doku.php/projects/troubleshooting/troubleshooting_guide

Includes Condor-G and Globus Error Codes and

Email addresses for:

The OSG Grid Operations Center

The OSG Troubleshooting Working Group

If you have a problem that you can not resolve, contact your VO support center first.

Your VO support center contact can be found at:

http://www.grid.iu.edu/osg-includes/sc.php