OSGMM and ReSS - Matchmaking on OSG

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Open Science Grid

Overview

• ReSS
  – The information provider

• OSG Match Maker
  – Using the information from ReSS to do match making on the grid (Condor-G jobs)
The Open Science Grid

A framework for large scale distributed resource sharing
addressing the technology, policy, and social requirements of sharing

OSG is a consortium of software, service and resource providers and researchers, from universities, national laboratories and computing centers across the U.S., who together build and operate the OSG project. The project is funded by the NSF and DOE, and provides staff for managing various aspects of the OSG.

Brings petascale computing and storage resources into a uniform grid computing environment

Integrates computing and storage resources from over 80 sites in the U.S. and beyond
ReSS

• Resource Selection Service
  – but is only really an information provider

• Developed at Fermi Lab
  – used by Dzero VO, Engagement VO, DES VO, internally at Fermi, ....

• Part of the OSG infrastructure
ReSS (continued)

• Collects data from compute elements (CE), storage elements (SE), and software entities

• Publishes the data in Condor ClassAd format

• One ClassAd per Cluster, Subcluster, CE, SE, VO
  – Cardinality of CE*Cluster*Subcluster*VO*SE*SA
  – Currently about 15,000 ads
• Condor Scheduler is maintained by the user (not part of ReSS)
Mapping the Glue Schema “tree” into a set of “flat” classads:
All possible combination of
(Cluster, Subcluster, CE, VO)
Information in ReSS

- OS name / version
- LRM information
  - Total number of job slots
  - Assigned slots
  - Open job slots
- Memory / CPU / Disk
- Network setup
- Storage configuration

Validity of ClassAds
- Each ad augmented with validity tests in the form of classad attributes
- Test attributes are put in logical 'AND' in the attribute 'isClassadValid'
ReSS ClassAd

MyType = "Machine"
GlueSubClusterLogicalCPUs = 2
GlueCEPolicyAssignedJobSlots = 0
GlueCEInfoHostName = "antaeus.hpcc.ttu.edu"
GlueHostNetworkAdapterOutboundIP = TRUE
GlueHostArchitectureSMPSize = 2
EngageSoftware_Rosetta_v3 = TRUE
EngageMemPerCPU = 1010460
GlueSubClusterWNTmpDir = "/state/partition1"
EngageOSGAPPWriteWorkNode = TRUE
GlueCEInfoContactString = "antaeus.hpcc.ttu.edu:2119/jobmanager-1sf"
GlueHostOperatingSystemName = "CentOS"
Retrieving Information from ReSS

COLLECTOR_HOST = osg-ress-1.fnal.gov
HOSTALLOW_NEGOTIATOR = osg-ress-1.fnal.gov
HOSTALLOW_NEGOTIATOR_SCHEDD = original_value,
                                osg-ress-1.fnal.gov

condor_status -any -constraint
   'StringlistIMember("VO:Engage");
    GlueCEAccessControlBaseRule')'
   -pool osg-ress-1.fnal.gov
OSGMM – OSG Match Maker

• Simple match maker for Condor-G jobs
  – Based on “Matchmaking in the Grid Universe” in the Condor manual

• Open Source
  – http://osgmm.sourceforge.net/

• Installs on top of the OSG Client software stack
OSGMM – How does it work?

- Retrieve base ClassAds from ReSS
- Validate/maintain the sites with probe jobs
- Determine the current state of the system by looking at current job states and success rates (continuous system feedback)
- Merge the information, and insert into local Condor system
- Let Condor manage the jobs
State of all jobs in the system
*(condor_q and job log files)*

**Condor**
Job Management
Match Making

**OSGMM**
Information Management

Update site information
*(condor_advertise)*

**ReSS Central Collector**

Retrieve base site information
*(condor_status)*
Match Making against CEs - How?

- CE as a black box
  - Drop some jobs in and see how it goes
  - Keep some history of success / performance
  - Adjust Rank / Requirements
Site Rank

• Integer between 0 and 1000
• Calculated every minute from current state and some history
• Factors:
  – Jobs submitting/staging/pending/running provides the baseline
  – Job success rate for the site over the last 6 hours
  – Ratio between matched jobs, and the max number we want on that site
Periodic Hold/Release

- Job fails...
- Job is in the queue for too long...
- Job is running for too long...
- When submitting to another site, do not submit to a site which we have already failed on

resubmit to another site
globusscheduler = $$\$(\text{GlueCEInfoContactString})$

requirements = (  
  (TARGET.GlueCEInfoContactString =!= \text{UNDEFINED}) &&  
  (TARGET.Rank > 300) &&  
  (TARGET.OSGMM_CENetworkOutbound == \text{True}) &&  
  (TARGET.OSGMM_SoftwareGlobusUrlCopy == \text{True}) &&  
  (TARGET.OSGMM_MemPerCPU >= 500000) )

# when retrying, remember the last 4 resources tried  
match_list_length = 4  
Rank = (TARGET.Rank) -  
  ((TARGET.Name =?= \text{LastMatchName0}) * 1000) -  
  ((TARGET.Name =?= \text{LastMatchName1}) * 1000) -  
  ((TARGET.Name =?= \text{LastMatchName2}) * 1000) -  
  ((TARGET.Name =?= \text{LastMatchName3}) * 1000)
# make sure the job is being retried and rematched
periodic_release = (NumGlobusSubmits < 10)
globusresubmit = (NumSystemHolds >= NumJobMatches)
rematch = True
globus_rematch = True

# only allow for the job to be queued or running for a while
# then try to move it
# JobStatus==1 is pending
# JobStatus==2 is running
periodic_hold = (  
  ((JobStatus==1) && ((CurrentTime - EnteredCurrentStatus) > (5*60*60))) ||  
  ((JobStatus==2) && ((CurrentTime - EnteredCurrentStatus) > (24*60*60))) )
### CLI: condor_grid_overview

<table>
<thead>
<tr>
<th>ID</th>
<th>Owner</th>
<th>Resource</th>
<th>Status</th>
<th>Time</th>
<th>Sta</th>
<th>Sub</th>
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<tbody>
<tr>
<td>46381</td>
<td>rynge</td>
<td>(DAGMan)</td>
<td></td>
<td>1:58:54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46382</td>
<td>rynge</td>
<td>GLOW</td>
<td>Running</td>
<td>1:55:43</td>
<td>1</td>
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</tr>
<tr>
<td>46384</td>
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<tr>
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<td>rynge</td>
<td>Nebraska</td>
<td>Running</td>
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<td>1</td>
<td></td>
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<table>
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<th>Subm</th>
<th>Pend</th>
<th>Run</th>
<th>Stage</th>
<th>Fail</th>
<th>Rank</th>
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<tbody>
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<td>4</td>
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<td>10</td>
<td>0</td>
<td>0</td>
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<td>6</td>
<td>5</td>
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<tr>
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<td>0</td>
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<tr>
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Questions?