



Enabling Grids for E-science

Computing Element & Torque Server Installation

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- **What is a Computing Element (CE) ?**
- **What is a Torque Server ?**
- **How to install a Computing Element and a Torque Server.**
- **How to configure**

- The CE is a service representing a computing resource.
- Its main functionality is job management (job submission, job control, etc.).
- For job submission, the CE can work in:
 - **push model** (where the job is pushed to a CE for its execution).
 - **pull model** (where the CE asks the WMS for jobs).

- **TORQUE** (*Tera-scale Open-source Resource and QUEue management*) is a resource management providing control over batch jobs and distributed compute resource.
- The Torque System is composed by a:
 - **pbs_server** which provides the basic batch services such as receiving/creating a batch job or protecting the job against system crashes.
 - **job_scheduler** which contains the site's policy by means of it decide which job must be executed.
 - **pbs_mom** which places the job into execution. It is also responsible for returning the job's output to the user.

Installing CE + Torque Server



- **Start from a fresh install of SLC 3.0.4**
- **Installation via**
 - **Installer script** (<http://glite.web.cern.ch/glite/packages>)
 - **APT** <http://glite.web.cern.ch/glite/packages/APT.asp>
- **Installation will install all dependencies, including**
 - other necessary gLite modules
 - external dependencies
- **JAVA is not included in distribution. Install it separately ($\geq 1.4.2_06$)**
<http://java.sun.com/j2se/1.4.2/download.html>

- Request host certificates for CE.
 - <https://gilda.ct.infn.it/CA/mgt/restricted/srvreq.php>
- Install host certificate (hostcert.pem and hostkey.pem) in **/etc/grid-certificates**.
 - *chmod 644 hostcert.pem*
 - *chmod 400 hostkey.pem*
- If planning to use certificates released by unsupported EGEE CA's, be sure that their public key and CRLs (usually distributed with an rpm) are installed.
 - The CRL of the VO GILDA are available from https://gilda.ct.infn.it/RPMS/ca_GILDA-0.28.1.i386.rpm

- The **Resource Management System** must be installed on CE node, or on a separate dedicate node, before installing and configuring the CE module.
- This release of the CE module supports PBS, Torque and LSF.

1. Verify if apt is present:

- `rpm -qa | grep apt`
- Install apt if necessary:
 - `rpm -ivh http://linuxsoft.cern.ch/cern/slc30X/i386/SL/RPMS/apt-0.5.15cnc6-8.SL.cern.i386.rpm`

2. Add gLite apt repository:

- Put one this line in a file (e.g. `glite.list`) inside the `/etc/apt/sources.list.d` directory (R 1.4)
- `rpm http://glitesoft.cern.ch/EGEE/gLite/APT/R1.4/rhel30 externals Release1.4 updates`
- `apt-get update`
- `apt-get upgrade`

3. Install Torque Server + CE:

- `apt-get install glite-torque-server-config`
- `apt-get install glite-ce-config`

See <http://glite.web.cern.ch/glite/packages/APT.asp>

- If the installation is performed successfully, the following components are installed:
 - *gLite in /opt/glite*
 - *Condor in /opt/condor-x.y.z (where x.y.z is the current condor version)*
 - *Globus in /opt/globus*
 - *Tomcat in /var/lib/tomcat5*
 - *Torque in /var/spool/pbs*

- Configuration comes through the execution of python scripts, which takes as input XML files.
- So services have to be configured by editing these XML files.
- Attributes in XML file are well commented and self-explaining.
- XML files are provided as templates, under **`/opt/glite/etc/config/templates`**
- Copy templates file to **`/opt/glite/etc/config`**
- Edit each of them separately.
- Then we could launch the configurator scripts for Torque Server and CE.

- **List of XML files to configure:**

glite-global.cfg.xml

glite-security-utils.cfg.xml

glite-torque-server.cfg.xml

glite-rgma-common.cfg.xml

glite-rgma.gin.cfg.xml

glite-rgma-servicetool.cfg.xml

glite-rgma-servicetool-serviceName.cfg.xml

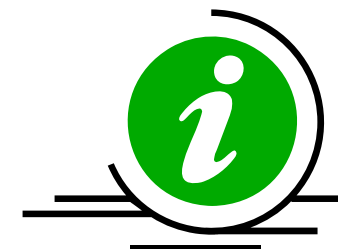
glite-dgas-client.cfg.xml

glite-ce.cfg.xml

```
<JAVA_HOME description="Environment variable  
pointing to the SUN Java JRE or J2SE package for  
example '/usr/java/j2re1.4.2_08/' or '$JAVA_HOME' (if  
it is defined as an environment variable)"  
value="/usr/java/j2sdk1.4.2_08"/>
```



Check your java package installed.



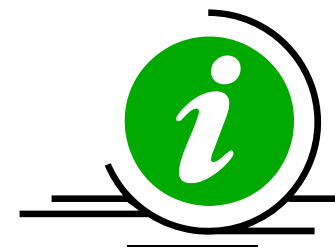
- Set the parameters to correctly build files needed by GSI.
- Enable fetch-crl cron-job

`<install.fetch-crl.cron`

`description="Install the glite-fetch-crl cron job.`

`Possible values are 'true' (install the cron job) or 'false' (do not install the cron job)"`

`value="true"/>`



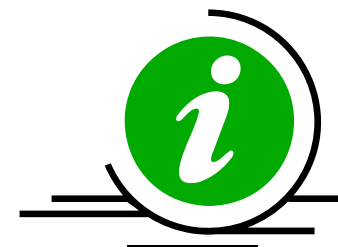
- Enable glite-mkgridmap cron-job.

```
<install.mkgridmap.cron
```

```
  description="Install the glite-mkgridmap cron job and  
  run it once.
```

```
  Possible values are 'true' (install the cron job) or 'false'  
  (do not install the cron job)"
```

```
  value="true"/>
```



Edit /opt/glite/etc/glite-mkgridmap.conf as follow:

```
#### GROUP: group URI [lcluster]
group ldap://grid-vo.cnaf.infn.it:10389/ou=Testbed-gilda,o=gilda,c=it .gilda
group vomss://cert-voms-01.cnaf.infn.it:8443/voms/gildav?/gildav .gildav
gmf_locat /opt/glite/etc/grid-mapfile-local
```

Edit /opt/glite/etc/grid-mapfile-local as follow:

```
"/gildav/*" .gildav
```




```
<instance name="grid038.ct.infn.it" service="wn-torque">
```

```
  <parameters>
```

```
    <torque-wn.name
```

```
      description="worker node name to be used  
by the torque server. It can also be  
the CE  
itself. Example:"
```

```
lxb1426.cern.ch."
```

```
      value="grid038.ct.infn.it"/>
```

```
    <torque-wn.number.processors
```

```
      description="Number of virtual processors  
on the node. Example: 1,2, .... [Typ
```

```
string]"
```

```
      value="2"/>
```

```
</parameters>
```



<rgma.server.hostname

description="Host name of the R-GMA server.

[Example: lxb1420.cern.ch] [Type: 'string']"

value="rgmasrv.ct.infn.it"/> 

<rgma.schema.hostname

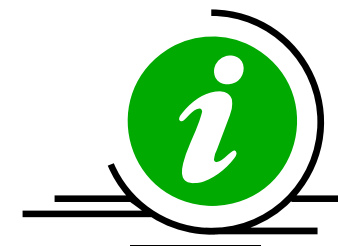
description="Host name of the R-GMA schema service.

(See also configuration parameter 'rgma.server.run_schema_service'

in the R-GMA server configuration file in case you install a server).

[Example: lxb1420.cern.ch] [Type: 'string']" 

value="rgmasrv.ct.infn.it"/>



<rgma.registry.hostname

description="Host name of the R-GMA registry service.

You must specify at least one hostname and you can specify several if you want to use several registries.

(See also configuration parameter 'rgma.server.run_registry_service' in the R-GMA server configuration file in case you install a server).

[Example: lxb2029.cern.ch] [Type: string]

<value>rgmasrv.ct.infn.it</value>

</rgma.registry.hostname>



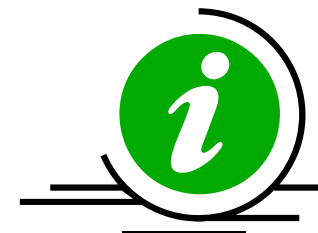
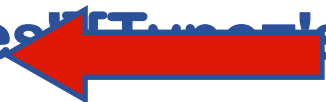
`<rgma.gin.run_generic_info_provider`

`description="Run generic information provider (gip) backend (yes|no). GIP cannot be used together with the R-GMA CE provider and this parameter must be set`


`to no if gin is used on a gLite CE node (where rgma.gin.run_ce_provider is set to yes by default)`

`[Example='yes'["Type='string']"`

`value="no"/>`



```
<rgma.gin.run_fmon_provider
  description="Run fmon backend (yes|no). This is used
  by LCG for gridice. If desired, this provider can be
  used together with either GIP or the CE Provider
  [Example='yes'][Type='string']"
  value="yes"/>
```



In this case you have to install an extra package:

gridice-sensor-1.5.1-p12_sl3.i386.rpm



http://infnforge.cnaf.infn.it/project/showfiles.php?group_id=8



- Define the parameters for the gLite RGMA servicetool Service

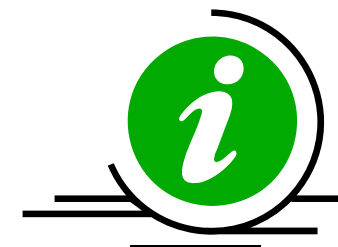
<rgma.servicetool.sitename

description="DNS name of the site publisher node.

This parameter must have the same value as the rgma.site-publisher.sitename parameter in the R-GMA Server configuration.

Example: lxb2029.cern.ch] [Type: 'string']"

value="{HOSTNAME}"/> 



`<rgma.servicetool.vo`

`description="List of VOs that this service is considered part of.`

Optional parameter - you can specify one or several or it can be left empty or be removed.

`[Example: EGEE] [Type: 'string']">`

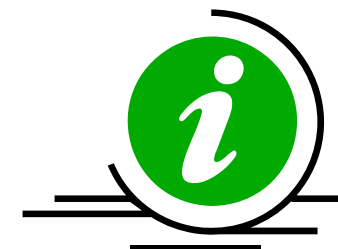
`<value>gildav</value>`



`<value>gilda</value>`



`</rgma.servicetool.vo>`

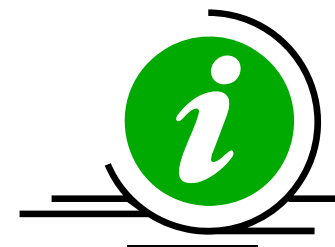


<dgas-client.atmClient.resource.PA.id

description="Specifies the contact string of the PA where the Computing Element is registered

(i.e. the PA that is responsible for setting the CE's price).The PA contact string is formed as: PA host name:port:subject of host cert"

value="grid-demo1.ct.infn.it:56567:/C=IT/O=GILDA/OU=Host/L=INFN Catania/CN=grid-demo1.ct.infn.it/emailAddress=gilda-ca@ct.infn.it"/>

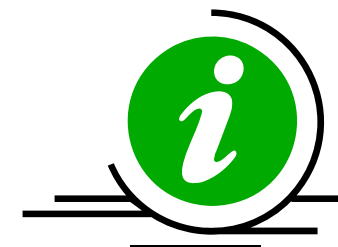


<dgas-client.atmClient.resource.Bank.id

description="Specifies the contact string of the site HLR where the Computing Element is registered (i.e. the HLR that manages the CE's account).

The HLR contact string is formed as: HLR host name:port:subject of host cert"

value="grid-demo1.ct.infn.it:56568:/C=IT/O=GILDA/OU=Host/L=INFN Catania/CN=grid-demo1.ct.infn.it/emailAddress=gilda-ca@ct.infn.it"/>



<voms.voname

<value>**gildav**</value>



<value>**gilda**</value>



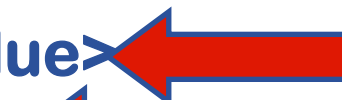
</voms.voname>

<voms.vomsnode

description="The full hostname of the VOMS server responsible for each VO.

Even if the same server is responsible for more than one VO, there must be exactly one entry for each VO listed in the 'voms.voname' parameter.">

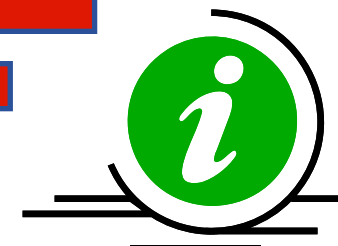
<value>**cert-voms-01.cnaf.infn.it**</value>



<value></value>



</voms.vomsnode>

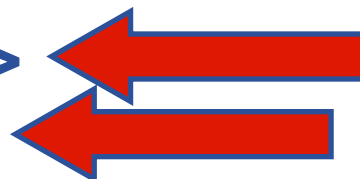


<voms.vomsport>

<value>**15008**</value>

<value></value>

</voms.vomsport>

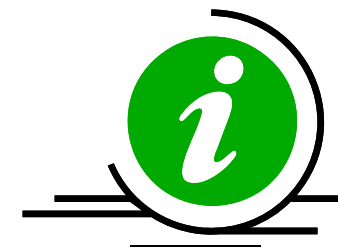
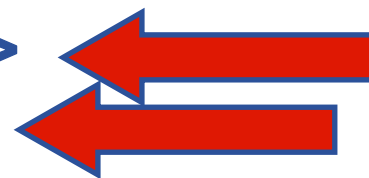


<voms.vomscertsbj>

<value>**/C=IT/O=INFN/OU=Host/L=CNAF/CN=cert-
voms-01.cnaf.infn.it**</value>

<value></value>

</voms.vomscertsbj>



<vo.sgm.user

description="User name of the account allowed to update software management tags on this CE node. This is a parameter array that must match the list in voms.voname">

<value>gildavsgm</value> 

<value>gildasgm</value> 

</vo.sgm.user>

<vo.sgm.group

description="Group name of the account allowed to update software management tags on this CE node. This is a parameter array that must match the list in vo.sgm.user">

<value>gildavsgm</value> 

<value>gildasgm</value> 

</vo.sgm.group>



`<vo.sgm.vo.role`

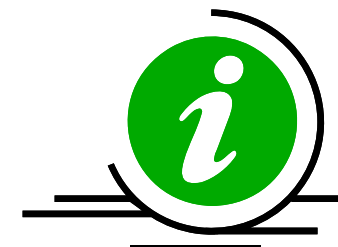
`description="The VO Role mapped to the SGM account in the grid-mapfile. This is a parameter array that must match the list in vo.sgm.user`

`[Example: LCGAdmin][Type: string]">`

`<value>VO-Admin</value>` ←

`<value></value>` ←

`</vo.sgm.vo.role>`



<cemon.wms.host

description="Array of the hostnames of the WMS server(s) that should receive notifications from this CE. This list is used to create the predefined subscriptions

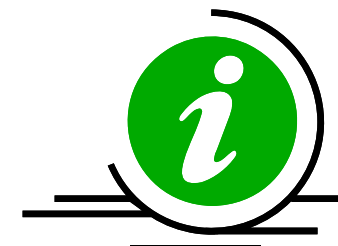
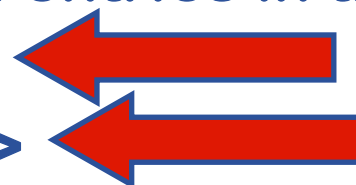
to be used in pull mode (asynchronous mode with predefined subscriptions).

Entries in this array must match entries in the cemon.wms.port array">

<value>glite-rb.ct.infn.it</value>

<value>glite-rb2.ct.infn.it</value>

</cemon.wms.host>



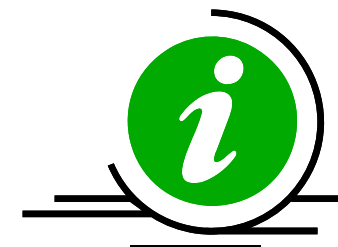
```
<cemon.wms.port
```

```
  description="Array of the port number on which the  
  WMS server(s) receiving notifications from this CE  
  is listening. Entries in this array must match entries in  
  the cemon.wms.host array">
```

```
  <value>5120</value>
```

```
  <value>5120</value>
```

```
</cemon.wms.port>
```



<cemon.lrms

description="The type of Local Resource Management System. It can be pbs, lsf or condor. The value pbs is also used for torque. If this parameter is absent or empty, the default type is pbs"

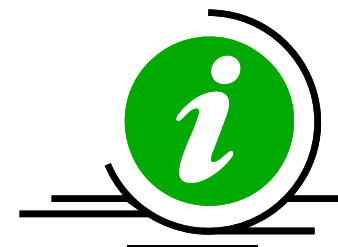
value="pbs"/> 

<cemon.cetype


description="The type of Computing Element. It can be blah, condorc or gram. If this parameter is absent or empty, the default type is blah.

blah and condorc are equivalent, they are both valid values for historical reasons"

value="condorc"/> 




```
<cemon.cluster-batch-system-bin-path
  description="The path of the lrms commands.
  Example: /usr/pbs/bin or /usr/local/lfs/bin"
  value="/usr/bin"/>
```

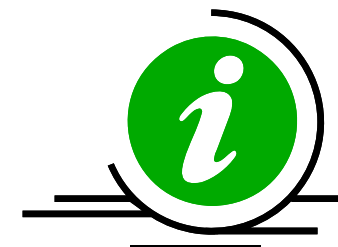


```
<cemon.cesebinds
  description="The CE-SE bindings for this CE node.
  The format is: 'queue[|queue]' se se_entry point
  A . character for the queue list means all queues.
  Leave the entry empty or comment out the parameter
  if no CE-SE Bindings have to be configured">
```

```
<value>'.' gildav::aliserv6.ct.infn.it::dpm
/data01</value>
```



```
</cemon.cesebinds>
```



<custom.runtime.environment

description="The entries specified in this array parameter are added to the CE info provider file as additional

GlueHostApplicationSoftwareRunTimeEnvironment entries.

[Example: MY_APP_1_0_0] [Type: 'string']">

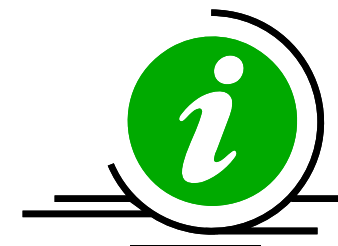
<value>CSOUND-4.13</value> ←

<value>DEMTTOOLS-1.0</value> ←

<value>POVRAY-3.5</value> ←

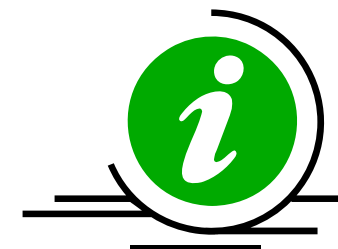
<value>RASTER-3D</value> ←

</custom.runtime.environment>



- Install the GILDA's VOMS server host certificates *gildav-cert-voms-01.cnaf.infn.it.pem* in the directory **/etc/grid-security/vomsdir**
- Edit the **/opt/glite/etc/vomses** file as follow:

```
"gildav" "cert-voms-01.cnaf.infn.it" "15008"  
"/C=IT/O=INFN/OU=Host/L=CNAF/CN=cert-voms-01.cnaf.infn.it" "gildav"
```



- In order to commit configuration, execute

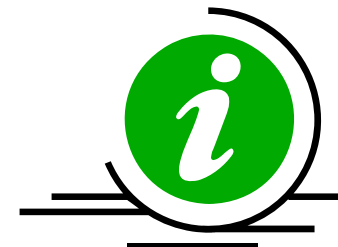
```
python /opt/glite/etc/config/script/glite-torque-server-config.py --configure
```

```
python /opt/glite/etc/config/script/glite-torque-server-config.py --start
```

```
python /opt/glite/etc/config/script/glite-ce-config.py --configure
```

```
python /opt/glite/etc/config/script/glite-ce-config.py --start
```

Now your CE should be capable to receive jobs coming for the WMS.



- Edit **/etc/ssh/sshd_config** and add the following lines at the end:

```
HostbasedAuthentication yes  
IgnoreUserKnownHosts yes  
IgnoreRhosts yes
```

- Restart the server with:

```
/sbin/service sshd restart
```

- On the CE generate an updated version of **/etc/ssh/ssh_known_hosts** by running:

```
/opt/edg/sbin/edg-pbs-knownhosts
```

- Copy that file into all the WorkerNodes.

