

# **Globus Toolkit 4 hands-on**

## **Grid Computing Course**

### **Porto, 22-24 January, 2007.**

Notations:

- Commands to execute are **bold Courier**
- Important points are **blue**
- Unique IDs are **red**
- XX denotes user IDs distributed by the tutors

## **I. Certificate management**

1. Login to a user interface machine:

```
ssh userXX@n34.hpcc.sztaki.hu
```

2. Get your certificates:

```
cp ~user00/certificates/portoXX.pfx ~
```

3. Create a directory for the public and private keys:

```
mkdir .globus
```

4. Transform the certificates into .pem format:

```
openssl pkcs12 -in portoXX.pfx
```

```
Enter Import Password: ASK_TUTOR
MAC verified OK
Bag Attributes
localKeyID: F2 88 4A A0 B2 AD 2F A4 B9 56 D7 14 21 7E B0 B9 FC B7 5D 71
subject=/C=UK/O=Grid/O=Training/OU=PortoTrainingEvent/CN=User00
issuer=/C=UK/O=Grid/O=Test/OU=Authority/CN=Root
-----BEGIN CERTIFICATE-----
. . .
-----END CERTIFICATE-----
Bag Attributes
localKeyID: F2 88 4A A0 B2 AD 2F A4 B9 56 D7 14 21 7E B0 B9 FC B7 5D 71
Key Attributes: <No Attributes>
Enter PEM pass phrase: userXX
Verifying - Enter PEM pass phrase: userXX
-----BEGIN RSA PRIVATE KEY-----
. . .
-----END RSA PRIVATE KEY-----
```

5. Save the public key into a file:

Select the following part of the previous output with the mouse:

```
-----BEGIN CERTIFICATE-----  
. . .  
-----END CERTIFICATE-----
```

```
pico .globus/usercert.pem
```

```
paste: SHIFT + Insert  
save: CTRL + X
```

```
chmod 600 .globus/usercert.pem
```

6. Save the private key into a file:

Select the following part of command 4 output:

```
-----BEGIN RSA PRIVATE KEY-----  
. . .  
-----END RSA PRIVATE KEY-----
```

```
pico .globus/userkey.pem
```

```
paste: SHIFT + Insert  
save: CTRL + X
```

```
chmod 400 .globus/userkey.pem
```

7. Check your certificate:

```
ls -l .globus
```

```
-rw----- 1 user00 users 1144 2007-01-18 17:53 usercert.pem  
-r----- 1 user00 users 964 2007-01-18 17:52 userkey.pem
```

```
grid-cert-info
```

```
Certificate:  
Data:  
  Version: 3 (0x2)  
  Serial Number: 718 (0x2ce)  
  Signature Algorithm: sha1WithRSAEncryption  
  Issuer: C=UK, O=Grid, O=Test, OU=Authority, CN=Root  
  Validity  
    Not Before: Jan 3 08:30:00 2007 GMT  
    Not After : Jan 25 18:00:00 2007 GMT  
  Subject: C=UK, O=Grid, O=Training, OU=PortoTrainingEvent, CN=UserXX  
  Subject Public Key Info:  
  . . .
```

8. Create a short term proxy:

## grid-proxy-init

```
Your identity: /C=UK/O=Grid/O=Training/OU=PortoTrainingEvent/CN=UserXX
Enter GRID pass phrase for this identity: userXX
Creating proxy ..... Done
Your proxy is valid until: Fri Jan 23 21:36:05 2007
```

9. Check your proxy:

## grid-proxy-info

```
subject :
/C=UK/O=Grid/O=Training/OU=PortoTrainingEvent/CN=User00/CN=360555439
issuer  : /C=UK/O=Grid/O=Training/OU=PortoTrainingEvent/CN=User00
identity : /C=UK/O=Grid/O=Training/OU=PortoTrainingEvent/CN=User00
type    : Proxy draft (pre-RFC) compliant impersonation proxy
strength : 512 bits
path    : /tmp/x509up_u1006
timeleft : 7:58:02
```

## II. Information system query

10. Get the list of WS-GRAM sites from MDS:

```
wsrf-query -z none -s
https://n34.hpcc.sztaki.hu:8443/wsrf/services/DefaultIndexService
name()='Address']/text()[contains(., 'ManagedJobFactoryService')]
|/*[local-name()='GLUECE']"
```

```
</ns1:ComputingElement>
</ns1:GLUECE>https://193.224.187.163:8443/wsrf/services/ManagedJobFactoryService
<ns1:GLUECE xmlns:ns1="http://mds.globus.org/glue/ce/1.1"/>
https://161.74.83.49:8443/wsrf/services/ManagedJobFactoryService<ns1:GLUECE
xmlns:ns1="http://mds.globus.org/glue/ce/1.1">
  <ns1:ComputingElement ns1:Name="default" ns1:UniqueID="default">
    <ns1:Info ns1:GRAMVersion="4.0.3" ns1:LRMSType="Condor"
ns1:LRMSVersion="6.8.0 Jul 19 2006" ns1:TotalCPUs="26"/>
    <ns1:State ns1:EstimatedResponseTime="0" ns1:FreeCPUs="26"
ns1:RunningJobs="0" ns1:Status="enabled" ns1:TotalJobs="0"
ns1:WaitingJobs="0" ns1:WorstResponseTime="0"/>
    <ns1:Policy ns1:MaxCPUTime="-1" ns1:MaxRunningJobs="-1"
ns1:MaxTotalJobs="-1" ns1:MaxWallClockTime="-1" ns1:Priority="0"/>
  </ns1:ComputingElement>
  ...
```

## III. File management

11. Download a file with GridFTP:

```
globus-url-copy gsiftp://n34.hpcc.sztaki.hu/tmp/hello
file:///home/userXX/
```

12. Upload a file with GridFTP:

```
pico userXX.txt

globus-url-copy file:///home/userXX/userXX.txt
gsiftp://n34.hpcc.sztaki.hu/tmp/userXX.txt

ls -l /tmp
```

#### IV. Simple job management

13. Start a local Grid job:

```
globusrun-ws -submit -s -c /bin/hostname
```

14. Start a remote Grid job:

```
globusrun-ws -submit -s -F
https://gn6.cluster.cpc.wmin.ac.uk:8443/wsrp/services/M
anagedJobFactoryService -c /bin/hostname
```

```
globusrun-ws -submit -s -F
https://gn6.cluster.cpc.wmin.ac.uk:8443/wsrp/services/M
anagedJobFactoryService -c /bin/date
```

15. Submit a job to get current time in Veszprem

#### IV. Job management with file staging

16. Get the binary, the input and the XML based job descriptor

```
cp -r ~user00/multiply ~
cd multiply
pico multiply.xml
```

**Modify userXX to your account in the file!**

17. Submit the job to Westminster

```
globusrun-ws -submit -S -F https://grid-compute-
ws.cpc.wmin.ac.uk:8443/wsrp/services/ManagedJobFactoryS
ervice -f multiply.xml
```

```
Delegating user credentials...Done.
Submitting job...Done.
Job ID: uuid:60b7ccb2-a7cf-11db-9209-00c026a9ad39
Termination time: 01/20/2007 15:11 GMT
Current job state: StageIn
```

```
Current job state: Active
Current job state: StageOut
Current job state: CleanUp
Current job state: Done
Destroying job...Done.
Cleaning up any delegated credentials...Done.
```

18. Modify the command to execute the job in Veszprem:

```
globusrun-ws -submit -S -F
https://gt4.irt.vein.hu:8443/wsrp/services/ManagedJobFactoryService -f multiply.xml
```

19. Execute the job in Veszprem and stage the results on one of the sites in London

- Which directory to use in the RSL to London?

```
globusrun-ws -submit -S -F https://grid-compute-
ws.cpc.wmin.ac.uk:8443/wsrp/services/ManagedJobFactoryService -s -c /bin/pwd
```

Result e.g. **/home/tmp0100**

Make a copy of the multiply.xml and modify the <fileStageOut> part:

```
<destinationUrl>gsiftp://grid-compute-ws.cpc.wmin.ac.uk/home/tmp0100/stdout</destinationUrl>
```

...

- How to check that the file really exists in London?

Copy the file to SZTAKI with globus-url-copy

```
globus-url-copy gsiftp://grid-compute-
ws.cpc.wmin.ac.uk//home/tmpXXXX/OUTPUT
file:///tmp/OUTPUT_from_london_userXX
```

## V. Batch job management

20. Execute a job in batch mode:

```
globusrun-ws -submit -batch -o jobIDfile -S -F
https://anysite:8443/wsrp/services/ManagedJobFactoryService -f multiply.xml
```

```
cat jobIDfile
```

21. Query status:

```
globusrun-ws -status -j jobIDfile
```

## **VI. Collaborative work - *work in pairs***

22. The first partner should execute the multiplication job on a remote site and should generate the OUTPUT matrix in the remote storage.
23. The second partner should submit a multiplication job that reads the output of the first job as input.