P-GRADE Portal tutorial

Part 1 – Developing basic workflows

The P-GRADE Grid Portal is an open source workflow-oriented Grid portal that enables the development, execution and monitoring of workflows composed of sequential jobs, parallel jobs and application services. The P-GRADE Portal can be used to develop and execute workflow applications on Grid systems built with Globus, EGEE (LCG or gLite) and ARC middleware technologies.

The tutorial covers the following P-GRADE Portal features:

- **Managing user certificates**
- **Importing workflows**
- **Developing, executing and monitoring workflows**
- **Using Storage Elements**

For a detailed overview of all the capabilities of the P-GRADE Portal please visit its official homepage.

Prerequisites of the tutorial:

1. **HUNGRID specific prerequisites. If you already have access to HUNGRID (e.g. you are a participant of an EGEE training course) then you can skip this part:**
   - **You must have user certificates for HUNGRID (userkey.pem and usercert.pem files) and you must be member of the HUNGRID VO. Instructions on how to obtain HUNGRID certificate and join HUNGRID VO can be found on the HUNGRID homepage.**
2. **P-GRADE Portal specific prerequisites:**
   - **You must have a graphical Web browser with a Java 2 plug-in installed on your desktop computer.**
   - **Your HUNGRID certificate files (*userkey.pem* and *usercert.pem*) must be available on your desktop computer.**
   - **You must have a user account on the Multigrid P-GRADE Portal. To request an account please follow the instructions on the login page of the Multigrid P-GRADE Portal.**

LOGIN TO THE MULTIGRID P-GRADE PORTAL

1. Open the URL: **https://pgrade-portal.sztaki.hu/gridsphere**

2. Login with your Multigrid P-GRADE Portal account (userxx,userxx)

UPLOAD YOUR CERTIFICATE FILES INTO THE HUNGRID MYPROXY SERVER

This step is required only if you are using the portal for the first time. The certificate will remain in the MyProxy server until you revoke it.

1. Open the **"Certificates"** tab

2. Click on the **"Upload"** button

3. With the **"browse"** button locate your **userkey.pem** file in the local file system and hit OK

4. Specify the **passphrase of your private key**

   (This passphrase was chosen when you requested your HUNGRID certificate.)

5. With the **"browse"** button locate your **usercert.pem** file in the local file system and hit OK

6. Submit the upload form with the following values:
   - **Hostname:** grid153.kfki.hu
   - **Port:** 7512
   - **Login:** *choose a unique user name*
   - **Password:** *choose a password (at least 6 character long)*
   - **Lifetime:** 100

DOWNLOAD A SHORT-TERM PROXY CREDENTIAL INTO THE PORTAL

1. Open on the **"Certificates"** tab

2. Click on the **"Download"** button

3. Submit the download form with the following values:
   - **Hostname:** grid153.kfki.hu
   - **Port:** 7512
   - **Login:** *The username you chose for certificate upload.*
   - **Password:** *The password you chose for certificate upload.*
   - **Lifetime:** 10 (or less than 100)
   - **Description:** *optional*

4. If download is successful then set your proxy for the **"hungrid_GLITE_BROKER"** Grid

DEFINE A NEW WORKFLOW: MATRIX MULTIPLICATION

Note: The "Matrix operations" batch program will be used as the jobs of the workflow. Please read the description of this program **here**

1. Open a new workflow (Workflow menu in the Editor) and define a new job with the following parameters:
   - **Name:** Multiplication
   - **Job type:** SEQ
   - **Job executable:** *local path of the previously downloaded matrix_operations file*
   - **Attributes:** M V
   - **Grid:** hungrid_GLITE_BROKER

2. Define a port for the job with the following parameters:
   - **Port Name:** 0
   - **Type:** In
   - **File type:** Local
   - **File:** *local path of the previously downloaded INPUT1 file*
   - **Internal File Name (case sensitive):** INPUT1

3. Define a second port to the job with the following parameters
    - **Port Name:** 1
    - **Type:** In
    - **File type:** Local
    - **File:** *local path of the previously downloaded INPUT2 file*
    - **Internal File Name (case sensitive):** INPUT2

4. Define a third port to the job with the following parameters:
    - **Port Name:** 2
    - **Type:** Out
    - **File type:** Local
    - **Internal File Name (case sensitive):** OUTPUT
    - **File storage type:** Permanent

SAVE THE MULTIPLICATION INTO A GRID FILE

1. Save the Multiply workflow as **Multiply_remoteout** ("Save as" in the "Workflow" menu)

2. Modify **port 2** to a remote file:
    - Double click on port 2
    - Set the **"File type"** parameter to **Remote**
    - Set the "File" field to **lfn:/grid/hungrid/userXX/MatrixPS/output**
      note: output will be the name of the file.
      (E.g. lfn:/grid/hungrid/*your_family_name*)

3. Please note that after the execution **there is no result file to download**!.

DEFINE A MATRIX OPERATIONS WORKFLOW

In this exercise you should define a workflow which computes the following

expression: **AB[*, 0]^{T} * AB[*, 1]**
(A and B represent the previously downloaded INPUT1 and INPUT2 matrixes)

Hint: The "Matrix operations" program reads and produces files in the same format. Add the matrix_operation program 4 times to the Multiply workflow as it is shown in the figure below.

The jobs should compute the following operations:

- **Multip: A*B** (command line parameter: **M**)
- **Column0: A*B[*, 0]** (command line parameters: **C 0**)
- **Column1: A*B[*, 1]** (command line parameters: **C 1**)
- **Transpose: A*B[*, 0]^{T}** (command line parameter: **T**)
- **Multip.2: A*B[*, 0]^{T} * A*B[*, 1]** (command line parameter: **M**)

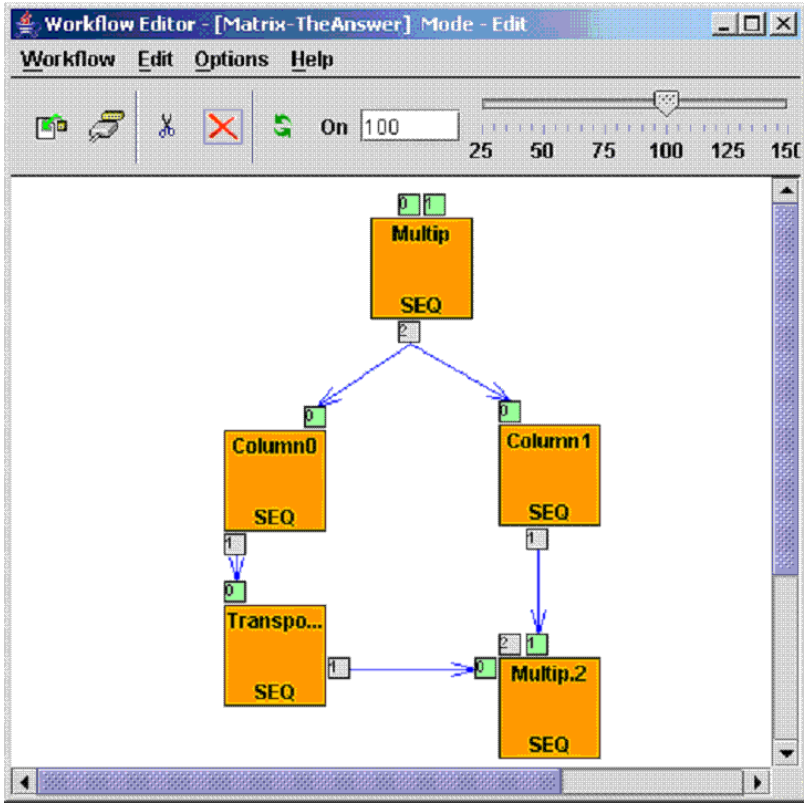

Figure 1: Matrix workflow to compute AB[*, 0]^{T} * AB[*, 1]

Do not forget to reallocate the jobs to the "hungrid_GLITE_broker" Grid after importing the workflow!