

Parameter study practical with the P-GRADE Portal

Part I: Develop and execute a parameter study workflow

This part of the practical demonstrates the parameter study services of P-GRADE Portal.

1. Login to P-GRADE Portal

1.1 Go to the URL:

<http://portal.p-grade.hu/multi-grid>

1.2 Login with the following account and password: (**XX** is your student number)

user**XX**

user**XX**

2. Download a short-term proxy credential into the Portal server. This proxy will be used by the workflow manager to access grid resources.

2.1 Hit the “Certificates” tab

2.2 Click on the “Download” button

2.3 Submit the download form with the following data:

Hostname: *grid001.ct.infn.it*
Port: 7512
Login: debrecen**XX**
Password: GridDEB**XX** (*case sensitive*)
Lifetime: 10
Description: *<optional>*

2.4 Set your certificate to be used with the ***gilda_LCG_2_BROKER*** Grid.

3. Create a “Matrix multiplication” workflow

This workflow will be later executed on many parameters as a parameter study. The same “MatrixDemo” binary is used in the workflow here that was used earlier today during the workflow practical. The workflow consists of only one job which multiplies two matrixes provided in two different input files.

You previously downloaded the binary executable with two sample input matrixes onto your desktop from this page:

http://portal.p-grade.hu/tutorials/induction/Matrix_operations_program_description.htm

If you did not do that, download the files now.

3.1. Create a job workflow using the “matrix_operations” executable

Click on the “Workflow” tab, then on the “Workflow manager” button. Open the workflow editor.

3.1.1 Create a new standard job in the workflow editor. Go into properties by right-clicking the job and set job type as “Standard job”. Set the following parameters:

Name: multiply
Job type: SEQ
Job executable: *<Path of the downloaded “matrix_operations” file>*
Attributes: M V
Grid: *<gilda_LCG_2_BROKER>*
Resource: *<default>*

3.1.2 Define a port for the job with the following parameters:

Port Name: 0
Type: in
File type: local
File: <Path of the downloaded "INPUT1" file>
Internal File Name: INPUT1 (case sensitive)

3.1.3 Define a second port to the job with the following parameters:

Port Name: 1
Type: in
File type: local
File: <Path of the downloaded "INPUT2" file>
Internal File Name: INPUT2 (case sensitive)

3.1.4 Define a third port to the job with the following parameters:

Port Name: 2
Type: out
File type: local
Internal File Name: OUTPUT (case sensitive)
File storage type: permanent

The workflow could be executed in its current form. However that would result one matrix: INPUT1 * INPUT2. What we need now are 3 matrixes: INPUT1_{version1} * INPUT2; INPUT1_{version2} * INPUT2; INPUT1_{version3} * INPUT2. Because of this the workflow has to be turned into a parameter study.

3.2 Extend the workflow with an auto input generator and configure it for PS execution

Switch Port 0 of the multiplier job to "PS" by right clicking on the Port.

Add a new job to the workflow and turn it first to a "generator" by right clicking on the component then into an "automatic" by another right click.

3.2.1 Set the main properties of the generator:

Job name: Matrix1Gen
Input file text:
 3 3
 1 2 3
 4 5 6
 7 8 <Y>

Click on "**Parse**", then double click on "**Y**" in the "Keys" window

Set the range values:

From: 9
 To: 15
 By: 3

Click on "**Generate**" → Parameter space is displayed in "Generated items"

Close the Parameter key definition window by clicking the OK button.

3.2.2 Open the Attributes Editor on the property window and set the following:

Click on the **Output Data** tab:

Define an **Output SE** from the following list:

egee16.cnaf.infn.it
 aliserv6.ct.infn.it
 se-nano-38.to.infn.it
 iceage-se-01.ct.infn.it

grid005.iucc.ac.il
fn2.hpcc.sztaki.hu

The list can be generated by:

- Browsing the Information system portlet for Storage Elements OR
- Executing the “`lcg-infosites --vo gilda se`” command on the User Interface

Close the property window by clicking the OK button.

3.2.3 Set the properties of the PS output port of the generator:

Double click on the output port of the generator job.

Set Directory to

`/grid/gilda/debrecenXX/MatrixPS/GeneratedInputs`

(Do not add “/” to the end of the pathname! **XX** still means your student number)

Set internal file name: `Matrix1`

Close the port property window by clicking the OK button.

3.3 Set the Parameter properties of the workflow

Open the PS property window in the “Workflow” menu of the editor. Set the following:

Output Directory: `/grid/gilda/debrecenXX/MatrixPS/Results`

(Do not put a “/” to the end of the directory name!)

Grid: `< gilda_LCG_2_BROKER >`

LCG Catalog Type: `lfc`

LFC Host: `lfc-gilda.ct.infn.it`

SE: write the same Storage Element name that you chose above.

3.4 Connect the output port of the generator to the PS input of the Matrix job

3.5 Save and submit the workflow. Monitor and visualize the progress of execution.

Notice the difference in the Workflow portlet for normal and PS workflows: generators and real jobs are separated. (Collectors too but currently we do not have any.)

Check the existence of the generated parameter files and the final result files using the File Management portlet:

- Open the File Management portlet
- Set “Select Grid” listbox to `gilda`, then click on View in the same line
- Set “Select VO” listbox to `gilda`, then click on View in the same line
- Select `lfc-gilda.ct.infn.it` LFC host and click on List
- Be patient, then navigate into the `debrecenXX` directory with the “File Browser” and the “Change Directory” buttons.
- Navigate into the
 - `MatrixPS/GeneratedInputs` directory to see the generated input matrixes
 - `MatrixPS/Results` directory where the final output files are saved

3.6 Download and unzip the result files.

Part II: Turn a matrix operations workflow into a parameter study

In this exercise you should turn a workflow into a multi-dimensional parameter study. The workflow computes the following matrix expression, where A and B represent the input matrices:

$$AB[* , 0]T * AB[* , 1]$$

The workflow is presented in the figure below, its jobs result the following formulas:

- Multip: $A*B$
- Column0: $A*B[* , 0]$
- Column1: $A*B[* , 1]$
- Transpose: $A*B[* , 0]T$
- Multip.2: $A*B[* , 0]T * A*B[* , 1] \rightarrow$ Final result, represented by Port 2 of "Multip.2"

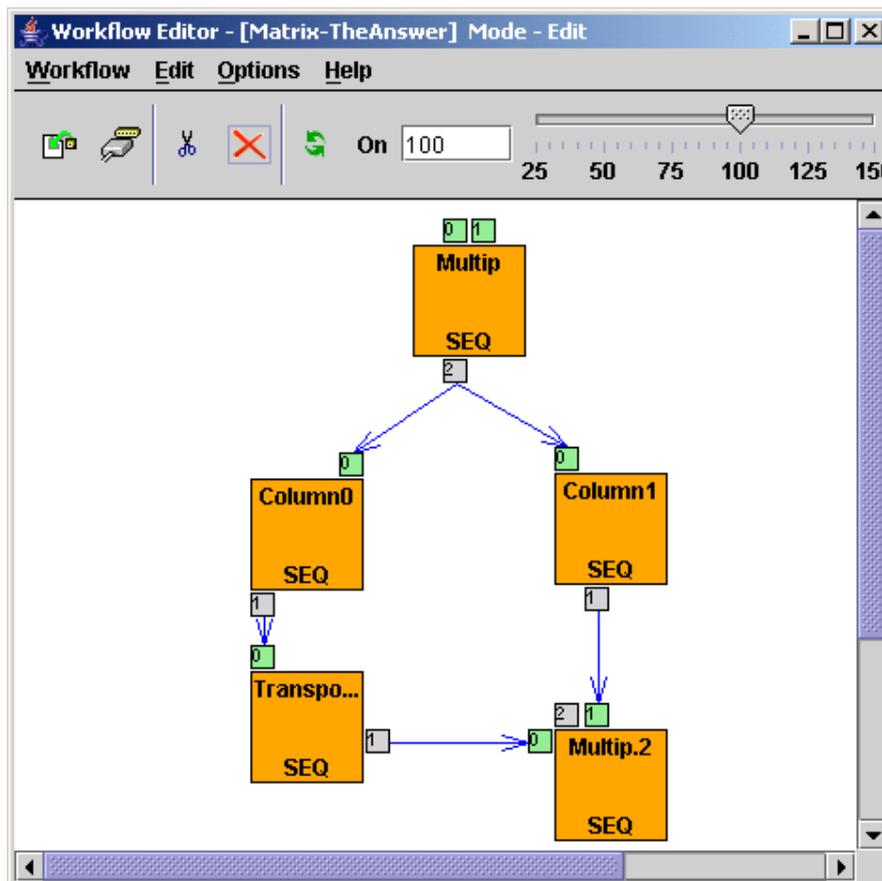
Please use your similar workflow or download the complete workflow from here

<http://portal.p-grade.hu/tutorials/induction/workflows/Matrix-operations-workflow.tar.gz>

Import it into your portal account like this:

- Click on the Workflow portlet, then onto "Upload"
- Select the previously downloaded archive from your computer and click OK.
- Open the workflow in the workflow editor. (Workflow/Open menu)

Add to two auto input generators to the graph in such a way that the workflow will be executed 4 times on the combination of 2 different INPUT1 and 2 different INPUT2 matrices.



Workflow to compute $AB[* , 0]T * AB[* , 1]$ matrix expression