



Grid workflow and parameter study applications by P-GRADE Portal

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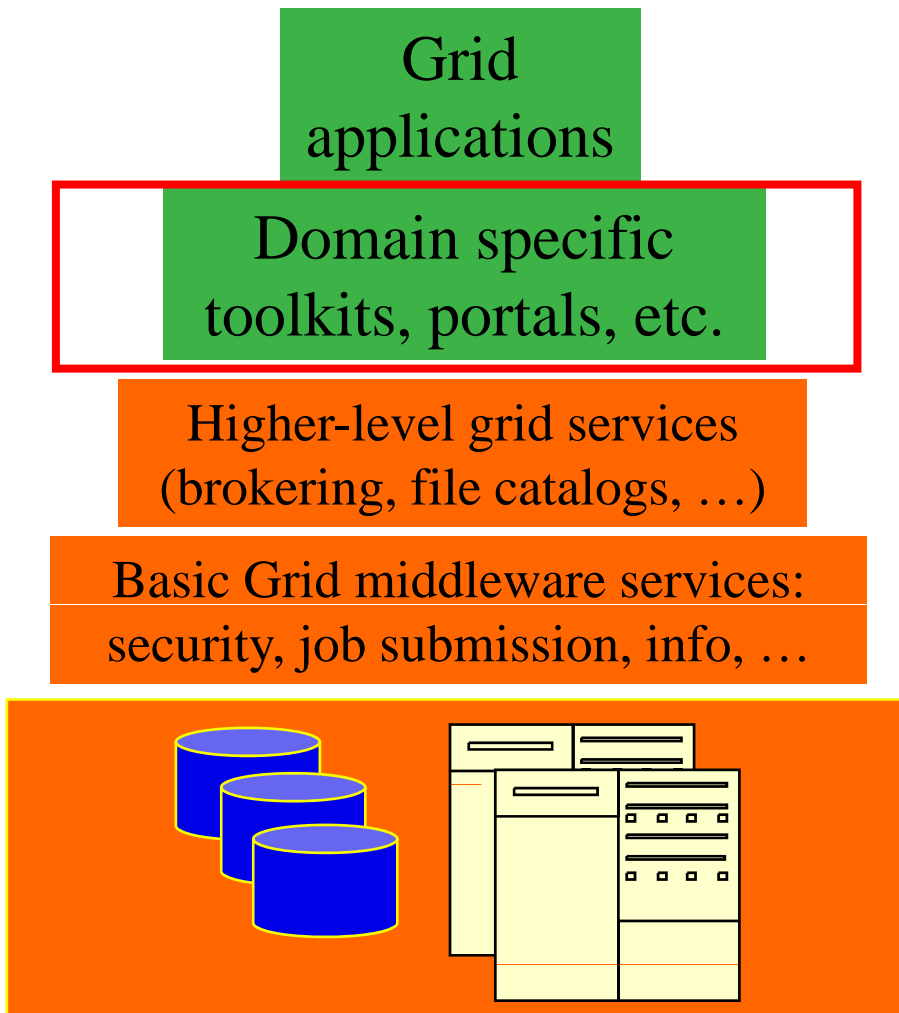


Outline

- **P-GRADE Portal and Developer Alliance**
- **Workflow capabilities of P-GRADE Portal 2.5**
Workflow practical
- **Parameter Study capabilities of P-GRADE Portal 2.5**
Parameter study practical
- **Other portal versions**
 - Specific portals based on P-GRADE
- **How to get long term access**
- **Roadmap**
 - P-GRADE grows into gUSE
- **Summary**



Reminder: High(er) level tools for EGEE users



- To hide the complexity of the grid middleware
 - To provide application specific user interfaces
 - To provide easier access mechanisms (Eg. Web portal)
 - To keep the user focused onto the “real problem”
 - Recommended External Software Packages for Egee CommuniTies
 - Current RESPECT tools:
 - GridWay
 - **P-GRADE Portal**
- <http://egeena4.lal.in2p3.fr/>
→ “Grid software” menu



Motivations to P-GRADE Portal

- Fast evolution of Grid systems and middleware:
 - **GT2, OGSA, GT3 (OGSI), GT4 (WSRF), LCG-2, gLite, ...**
- Many production Grid systems are built with them
 - EGEE (LCG-2 → gLite WMS → WMPProxy), UK NGS (GT2), Open Science Grid (GT2 → GT4), NorduGrid (~GT2)
- Although **the same set of core services** are available everywhere, they **are implemented in different ways**
 - Data services (file management)
 - Computation services (job submission)
 - Security services (proxy based single sign-on)
 - Brokers (not in every middleware, but e.g. in gLite - WMS)
- **Provide an easy to use environment for the management of grid applications and services**



P-GRADE Portal in a nutshell

- General purpose grid user environment
- Based on GridSphere web portal framework
- Development started in 2003
- Tool that helps you develop and execute workflows and workflow based parametric studies
- A Grid orchestration environment. Supported services:

Service	EGEE grids (LCG/gLite)	Globus grids
Job execution	Computing Element	GRAM
File storage	Storage Element, File catalog	GridFTP server
Certificate management	MyProxy server, VOMS server	
Information system	BDII	MDS-2, MDS-4
Brokering	Workload Management System	
Job monitoring	Mercury	
Workflow & job visualization	PROVE	

Solves Grid interoperability problem at the workflow level



P-GRADE Portal Developer Alliance

- Core development by **MTA SZTAKI, Budapest:**
P-GRADE Portal 2.5
Application specific Supplier Chain Portal
- Support for legacy codes and code repositories by **University of Westminster, London:**
GEMLC A P-GRADE Portal 2.4.1
Application specific Rendering Portal
Application specific Traffic Simulator Portal
- File manager and credential manager portlet by **Middle East Technical University, Ankara**
Portlets used in Turkish National Grid Portal
- Alternative job scheduling component by **Eötvös Loránd University, Budapest**
Under development
- Monte Carlo simulation support library portlet by **Rudjer Boskovic Institute, Zagreb**
Under development

Today





Related projects

The development and support services of P-GRADE are founded by the following projects:

- **SEE-GRID** www.see-grid.eu
portal development
grid application development
- **Coregrid** www.coregrid.net
Research & development
- **EGEE** www.eu-egee.org
grid end user training
grid application development
- **ICEAGE** www.iceage-eu.org
Grid end user training, conceptual training





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Workflow practical

- **Parameter Study capabilities of P-GRADE Portal 2.5**

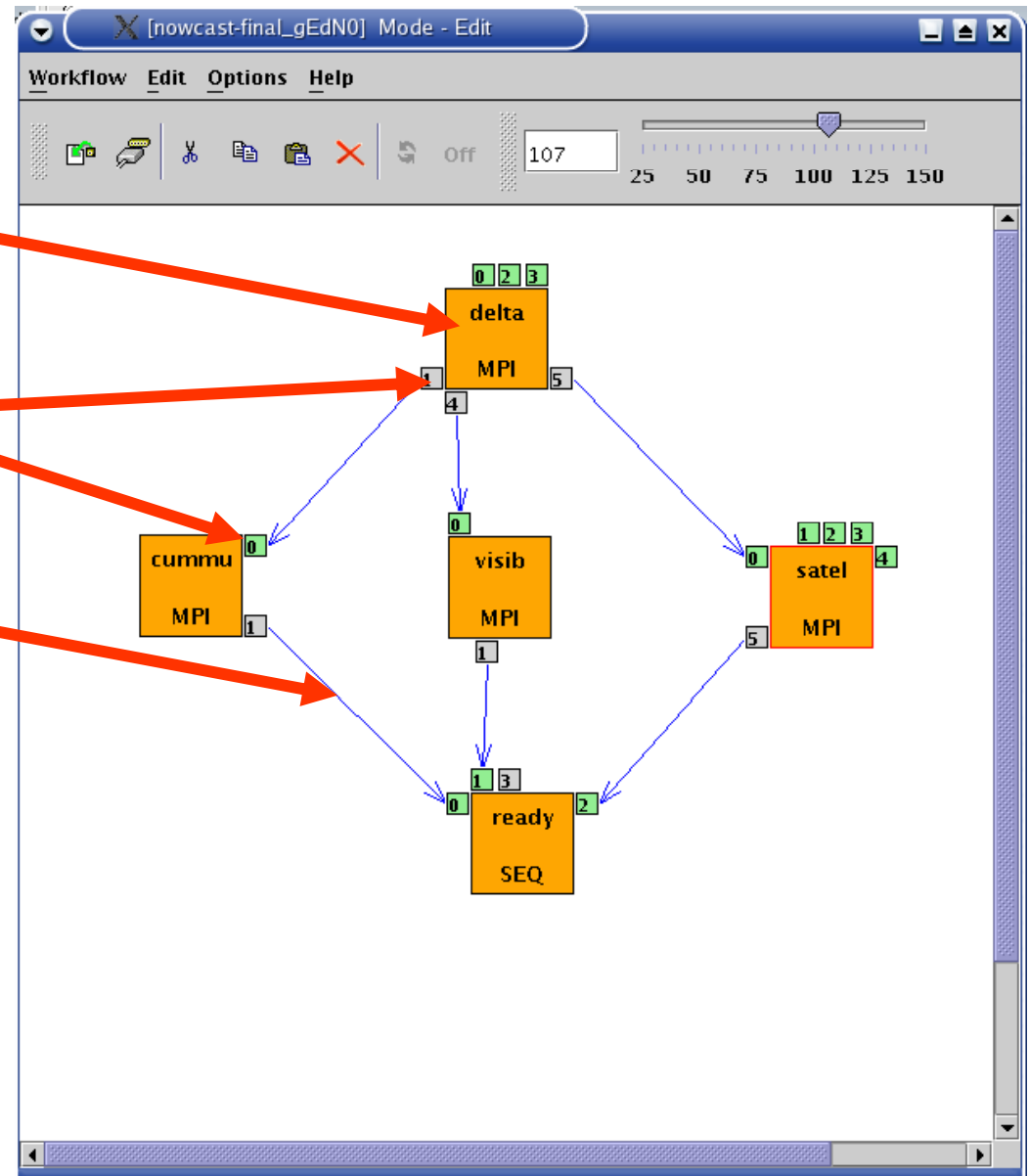
Parameter study practical

- **Other portal versions**
 - Specific portals based on P-GRADE
- **How to get long term access**
- **Roadmap**
 - P-GRADE grows into gUSE
- **Summary**



Elements of a P-Grade Portal 2.5 application

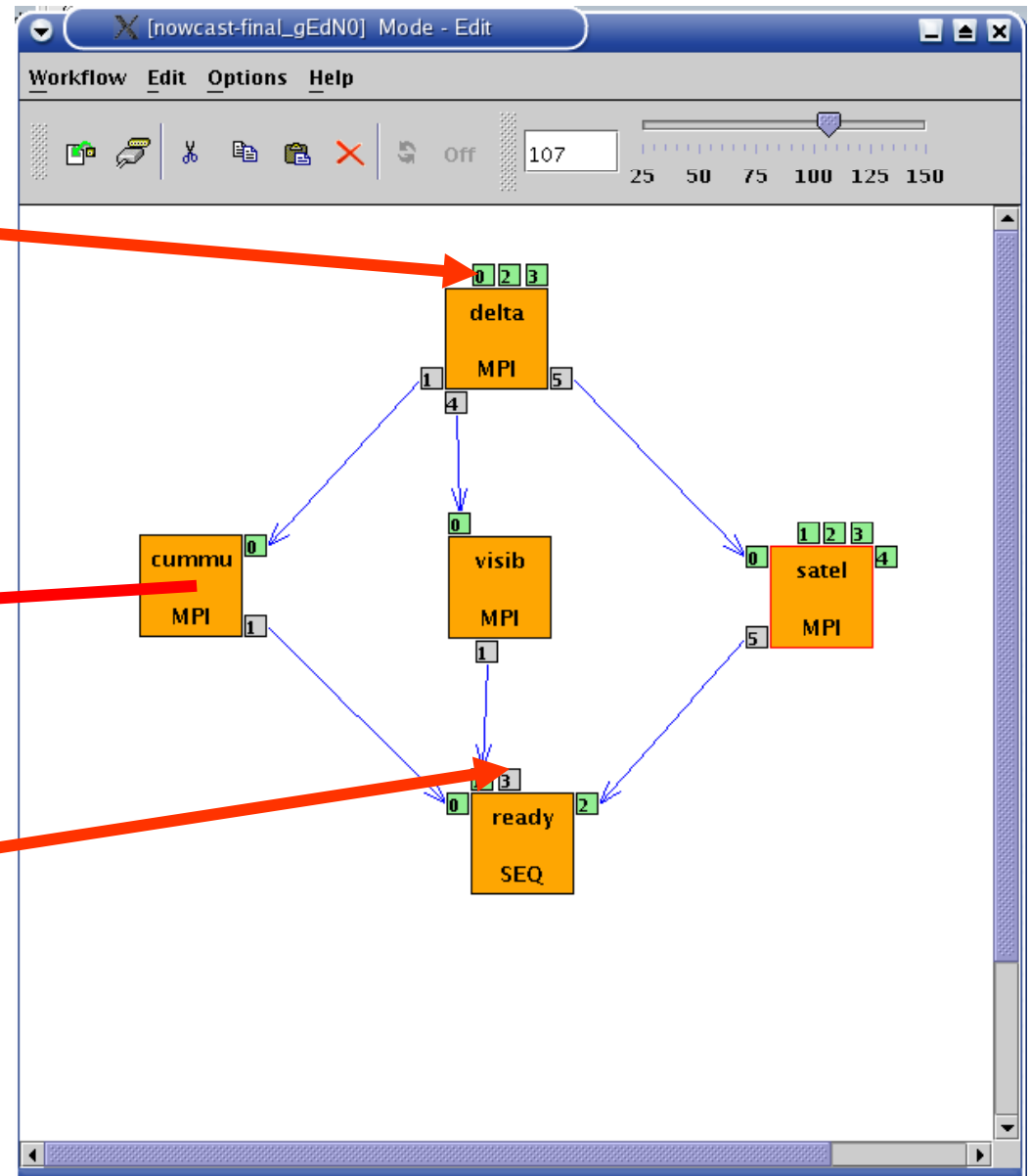
- A directed acyclic graph where
 - Nodes represent batch jobs to be submitted from the client side to a job queue
 - Ports represent input/output files the jobs require or produce
 - Arcs represent file transfer operations and dependencies among jobs
- semantics of the workflow:
 - A job can be executed if all of its input files are available
 - Responsibility of the built-in workflow manager





Elements of a P-Grade Portal 2.5 application

- **Open input files come from**
 - user client machine
 - Grid storage resources: computers running
 - gLite Storage Element
 - (Globus GSIFTP service)
- **Jobs executed on grid computing resource: clusters running:**
 - gLite Computing element
 - (Globus GRAM service)
- **Final output files go to**
 - user client machine
 - Grid storage resources: computers running
 - gLite Storage Element
 - (Globus GSIFTP service)





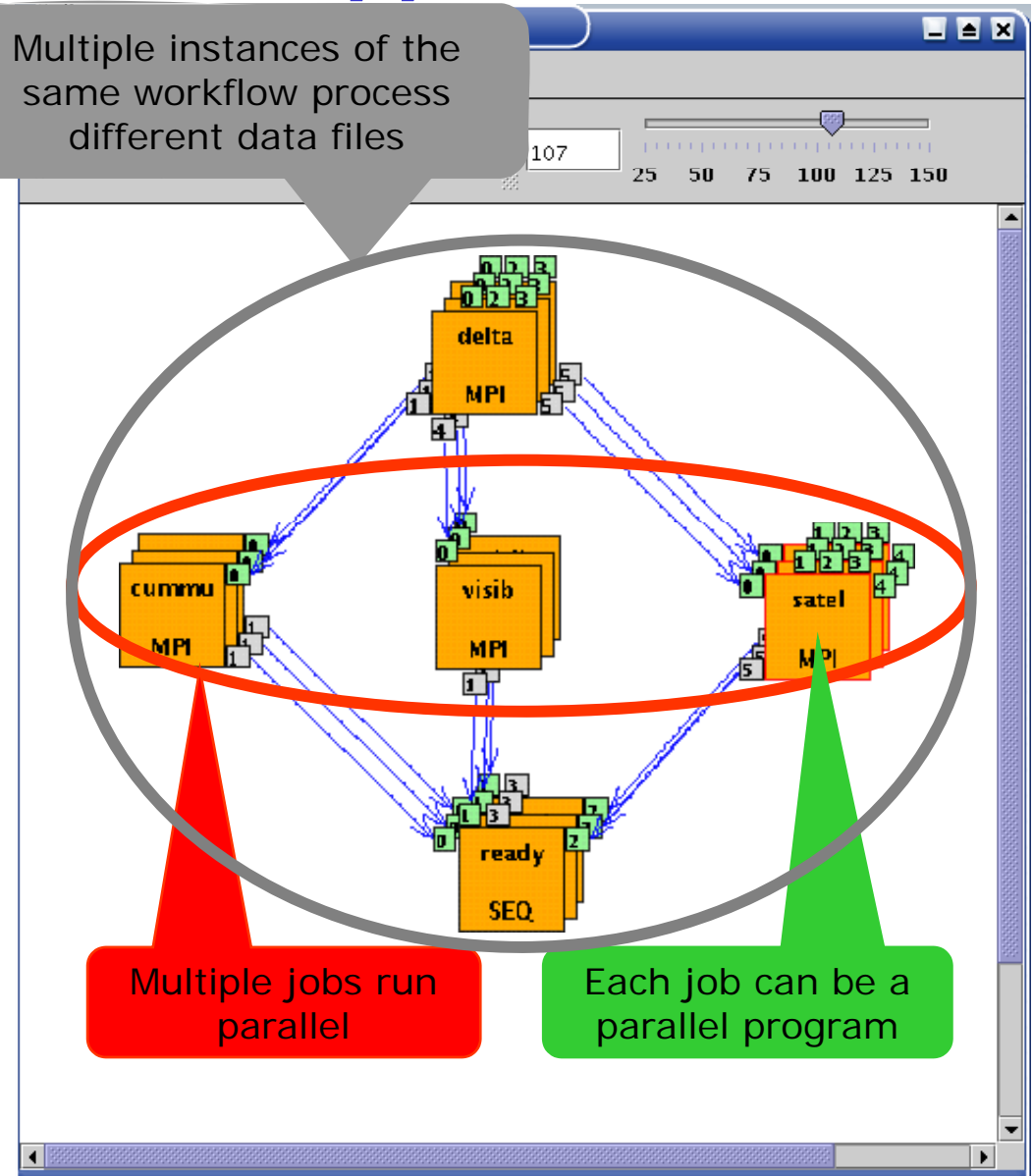
Parallel execution by a P-GRADE Portal application

– Parallel execution inside
a workflow node
(MPI job as workflow
component)

– Parallel execution among
workflow nodes
(different jobs on different
clusters)

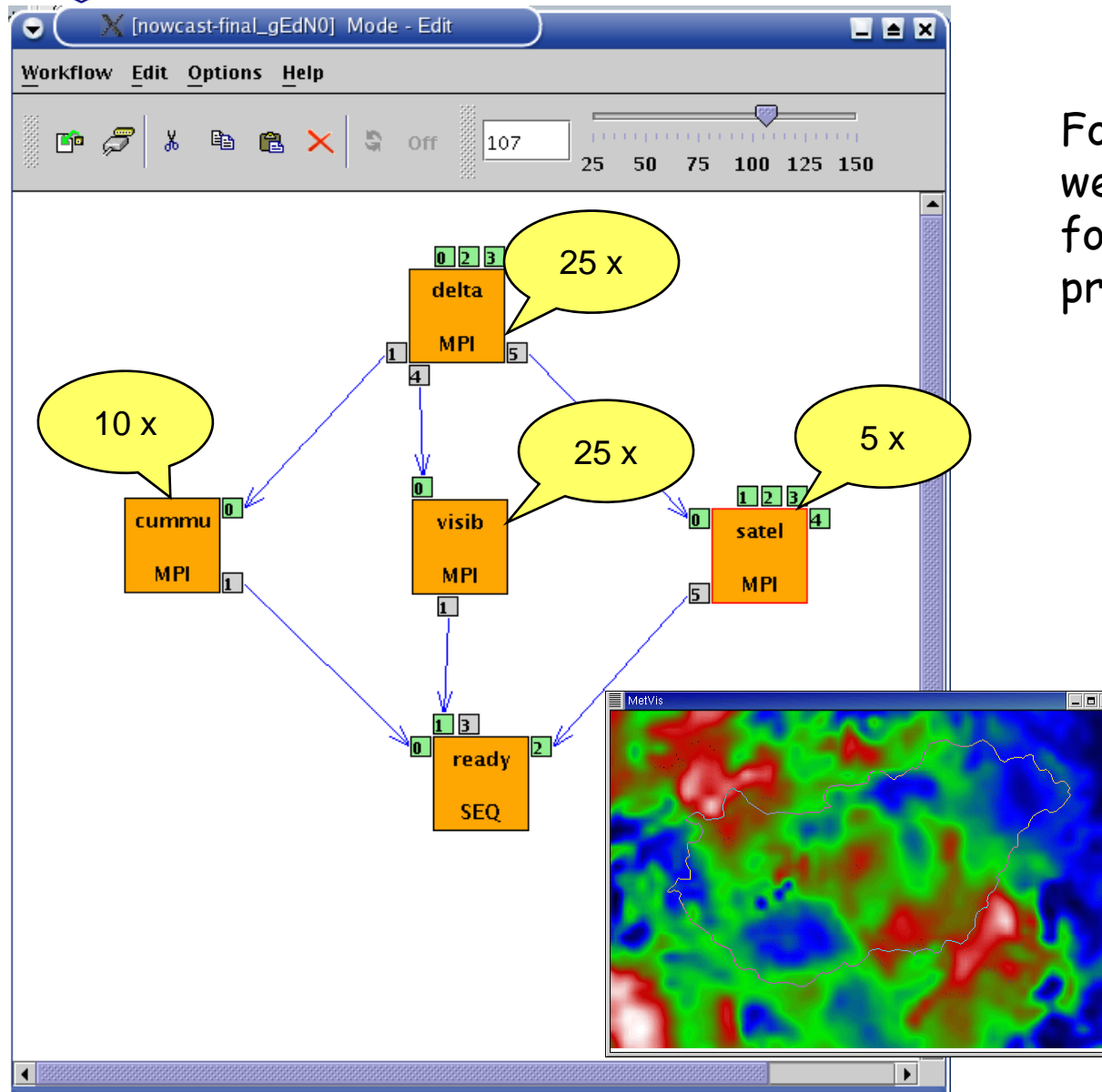
– Parameter study execution
of the workflow (Single
instruction Multiple Data)

Multiple instances of the
same workflow process
different data files





Example: Ultra-short range weather forecast (Hungarian Meteorology Service)



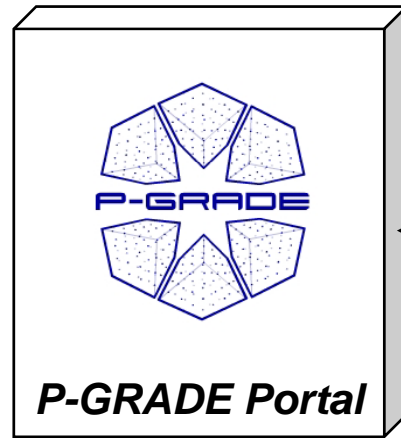
Forecasting dangerous weather situations (storms, fog, etc.), crucial task in the protection of life and property

Processed information:
surface level measurements, high-altitude measurements, radar, satellite, lightning, results of previous computed models

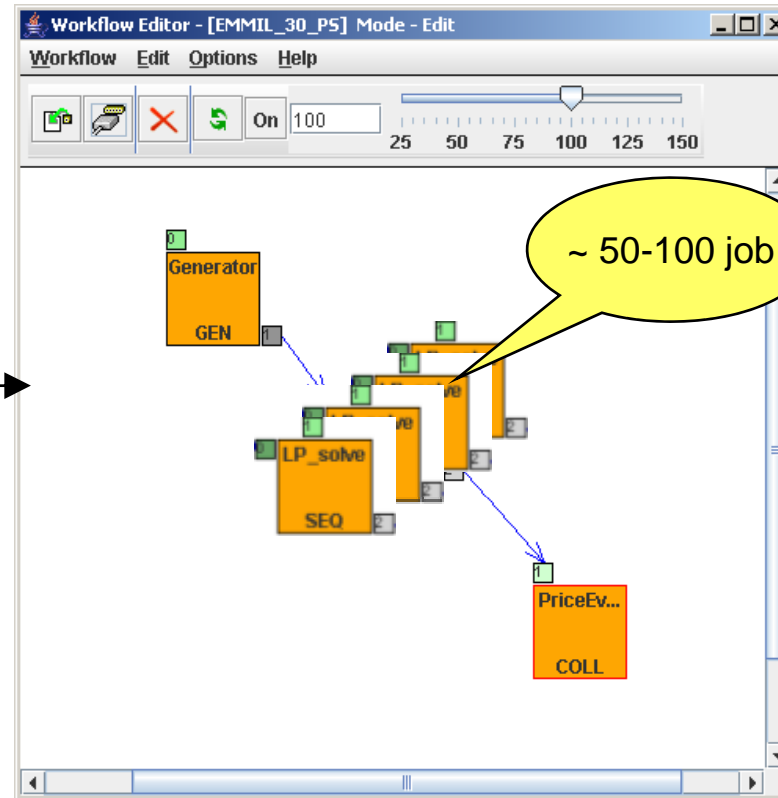
Requirements:
• Execution time < 10 min
• High resolution (1km)



Example: *E-Marketplace Model Integrated with Logistics*



Graphical User interface



Parameter study workflow



gLite based grid VO

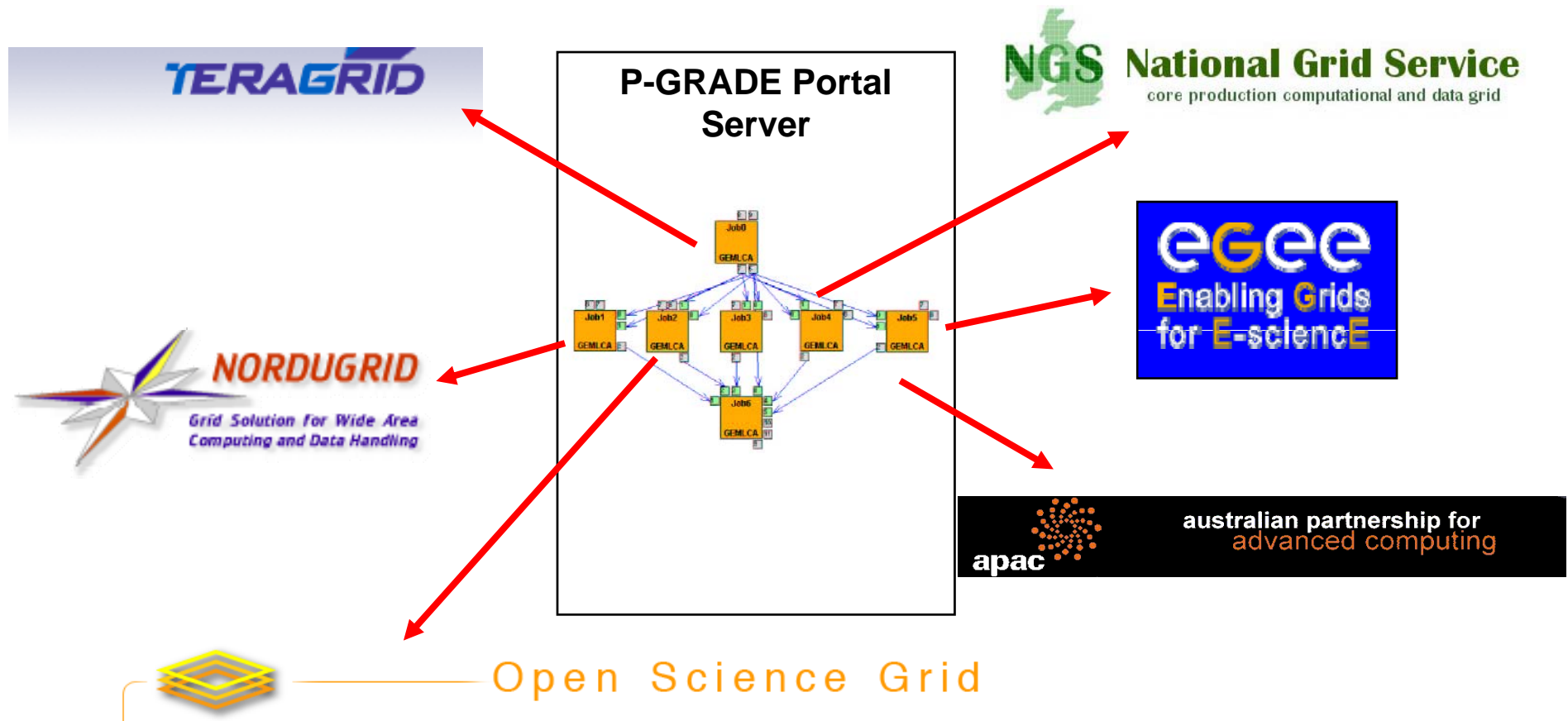
- To buy several products from suppliers
- To find logistic service providers who can deliver the goods
- To minimize overall price: price of goods + price of delivery



Workflow-level Grid interoperability: OGF GIN Resource Testing portal

Grid Interoperability Now VO Portal:

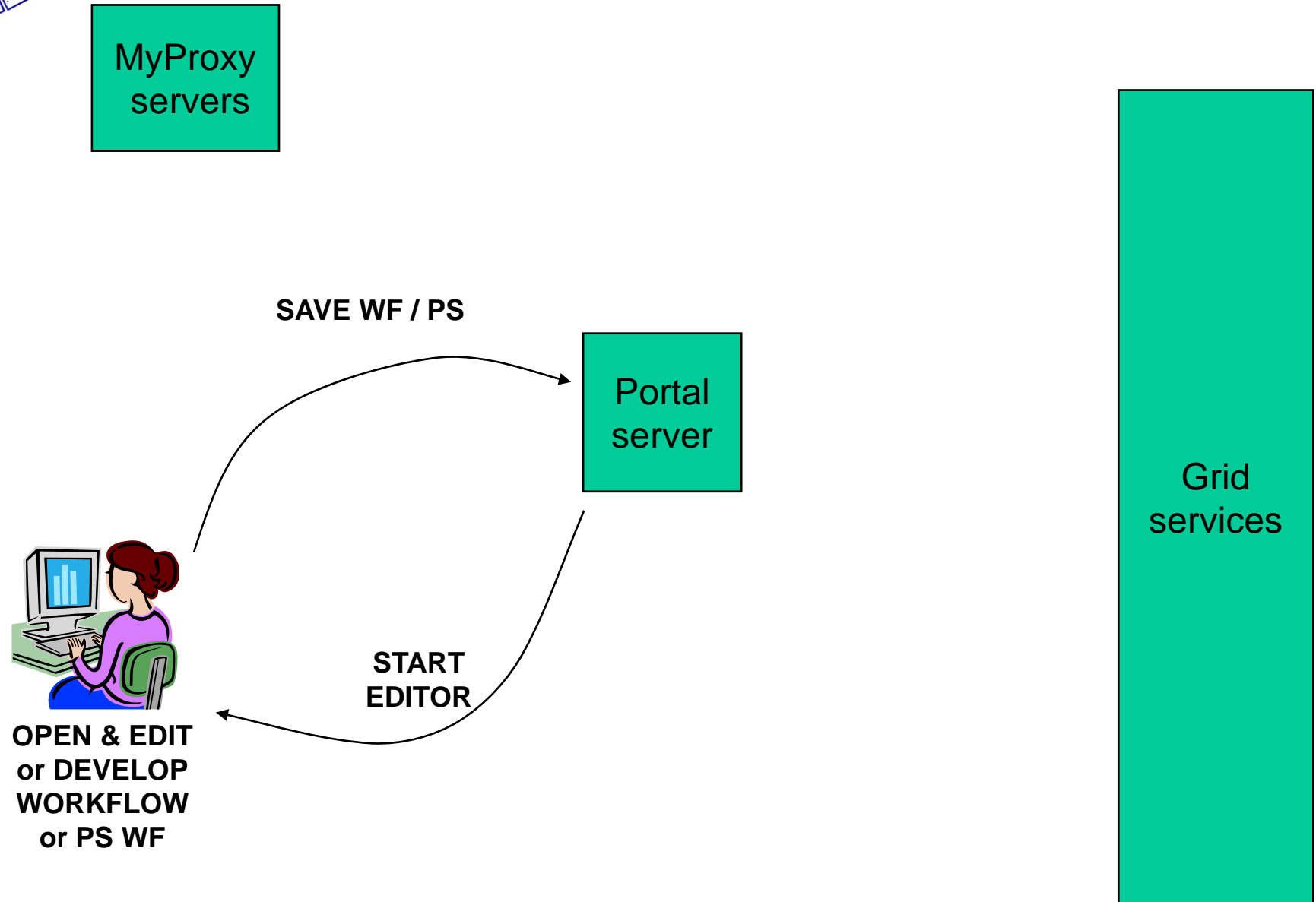
Open Grid Forum effort to demonstrate workflow level grid interoperability between major production Grids and to monitor these resources





The typical user scenario

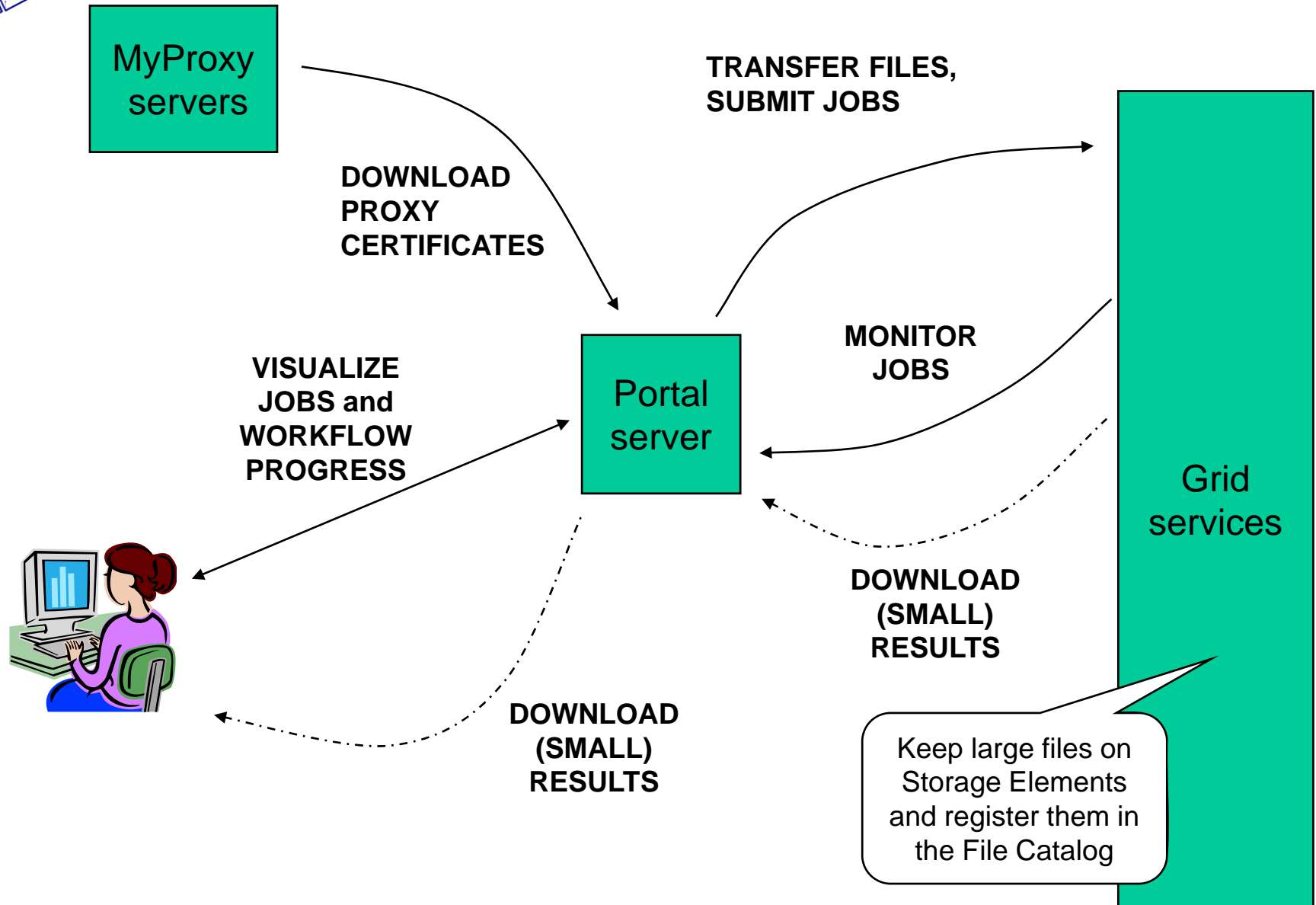
Part 1 - development phase





The typical user scenario

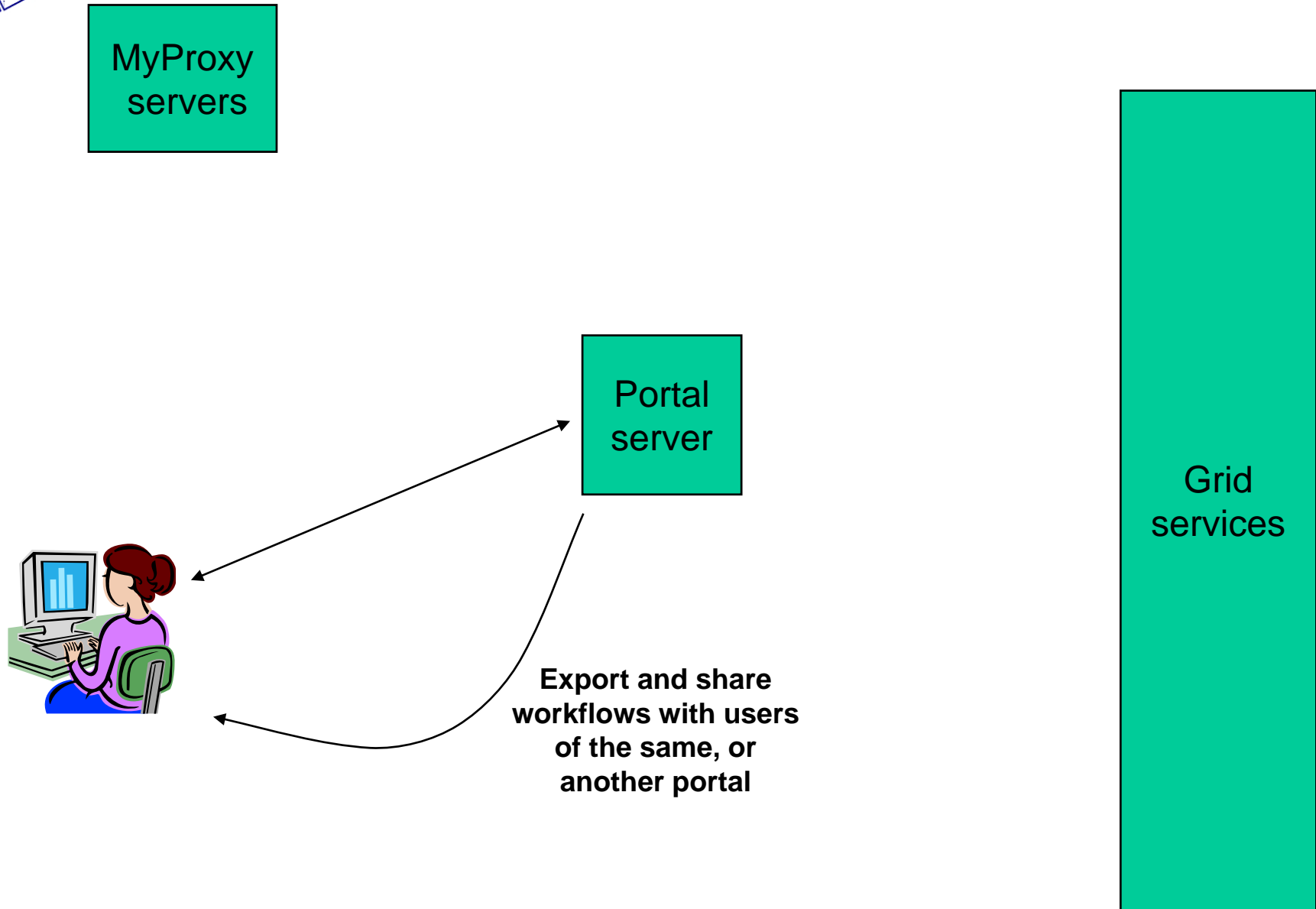
Part 2 - execution phase





The typical user scenario

Part 3 - collaborative phase





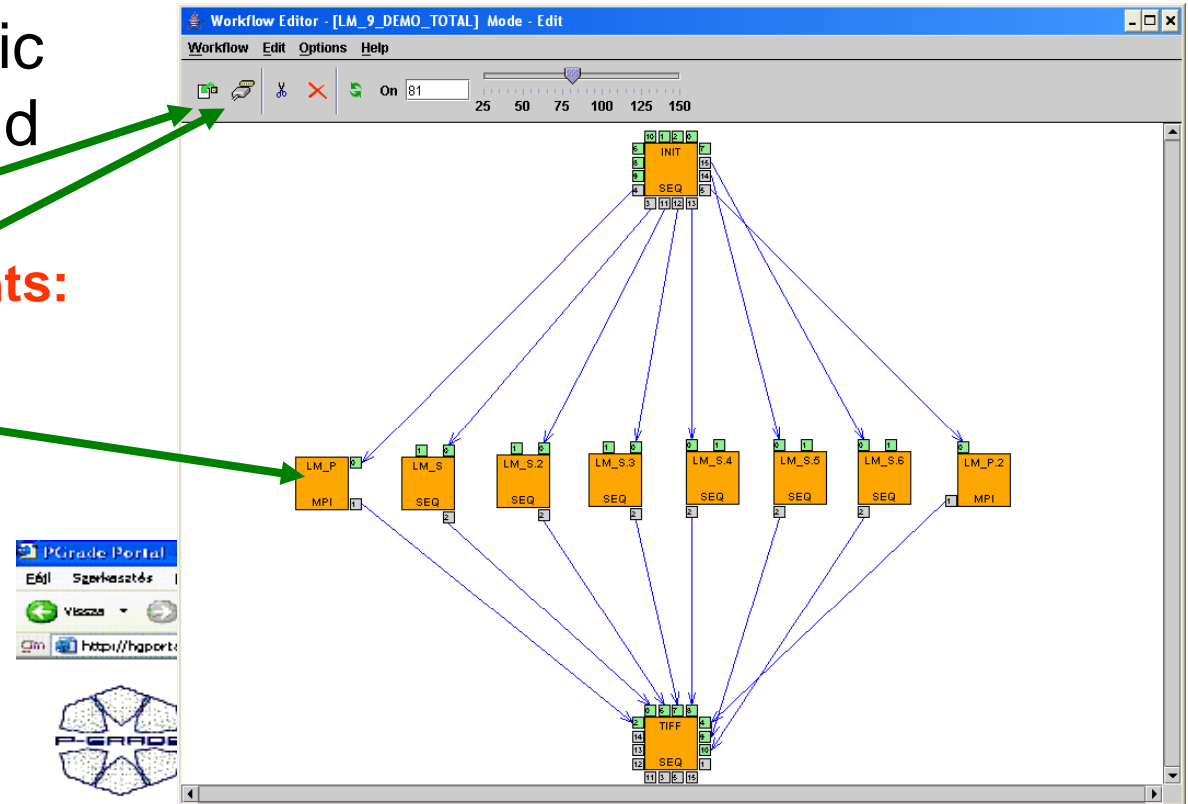
Workflow Editor

Defining the graph

Define a Directed Acyclic Graph (DAG) of jobs and legacy code services.

1. **Drag & drop components:**
nodes and ports
2. **Define their properties**
3. **Connect ports by channels**

Condor DAGMan:
no cycles,
no loops,
no conditions



The screenshot shows the Workflow Manager window with a menu bar (Certificates, Settings, Information System, Help) and a "Workflow Editor" button. Below is a "Workflow list" table:

Workflow	Status	Size	Quota (100 Mb)	[Output]	[View]
LM_9_DEMO_TOTAL	submitted	26.848 MB	26%	N/A	Details
		26.848 MB	26%		

Message: Workflow successfully submitted.



Workflow Editor

Job property window

Workflow Editor - [default*] Mode - Edit

Workflow Edit Options Help

Off 100 25 50 75 100 125 150

BrokerTest properties

Bro

S

Name: BrokerTest

Job Type: SEQ MPI PVM

Job Executable: D:\A-TEST\Cell.exe
File Browser

Instrument

Process Number:

Attributes:

Grid: HUNGRID_LCG_2_B...

Monitor:

Resource: grid151.ktki.hu

JDL: JDL Editor...

Ok Cancel

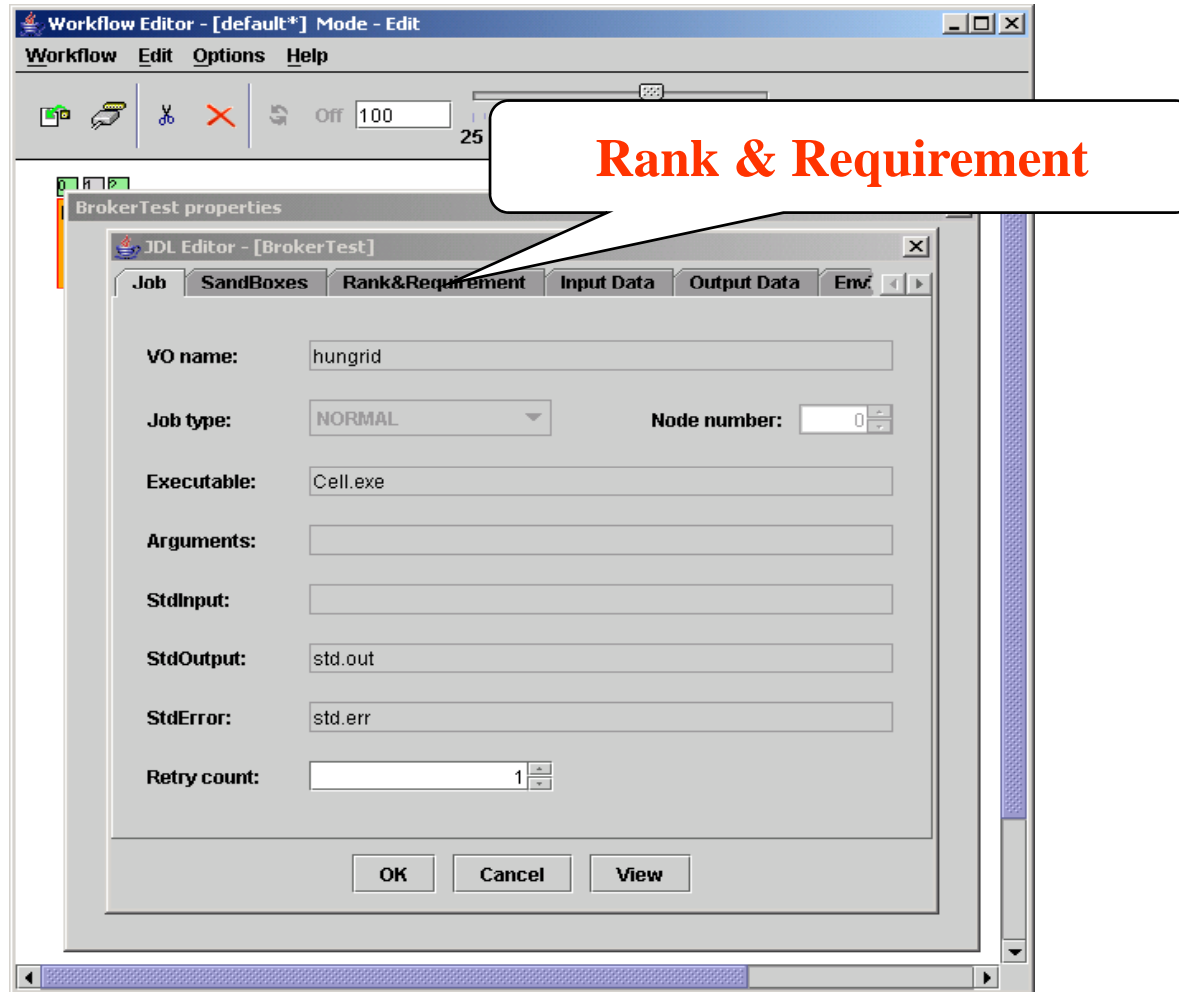
Properties of a job:

- Type of executable
- Client side location of the binary
- Number of required processors
- Command line parameters
- The resource to be used for the execution:
 - Grid (VO)
 - Resource / broker → JDL editor



Workflow Editor

Built-in JDL editor for brokered jobs

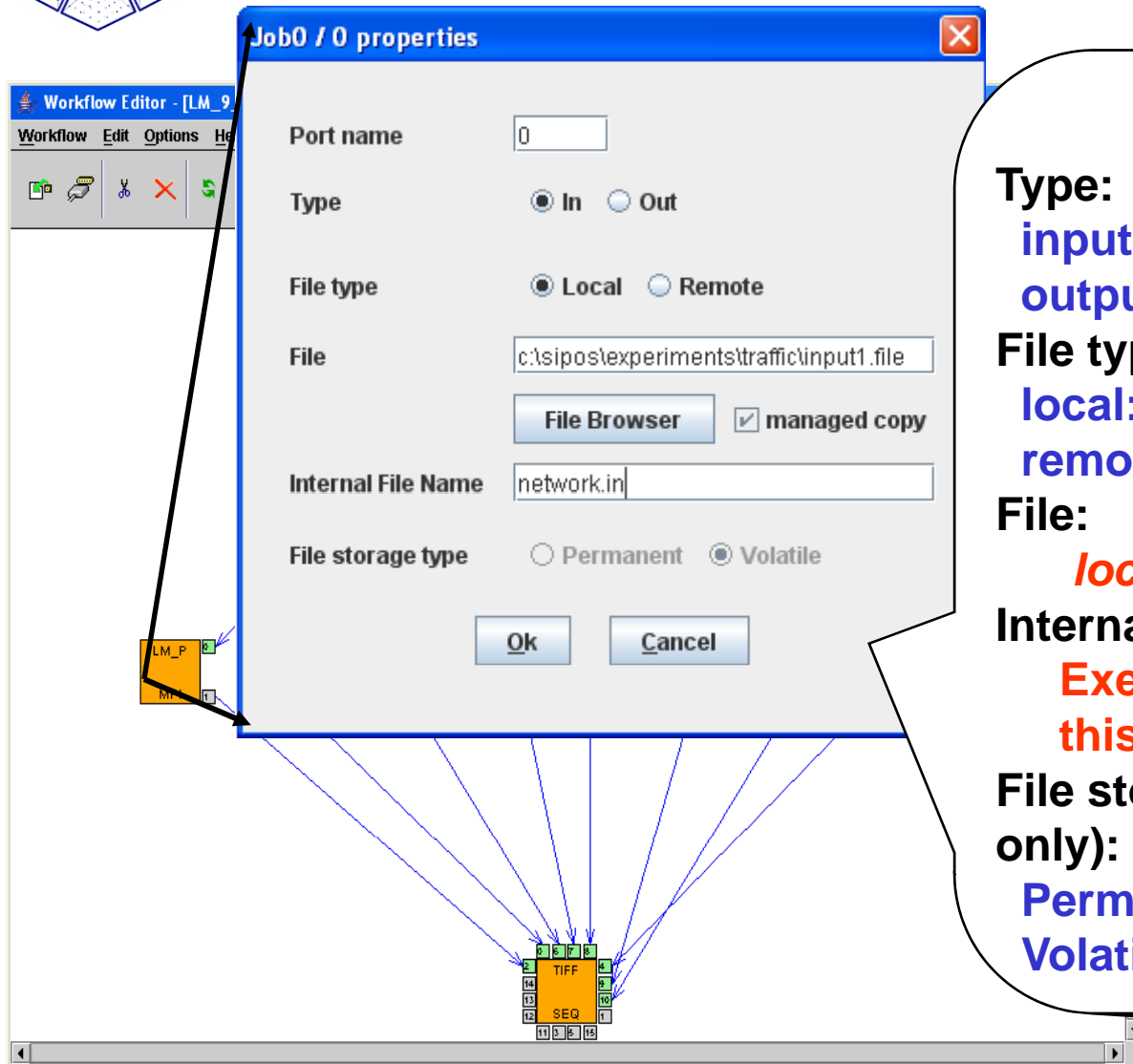


JDL → look at the gLite Users' manual!



Workflow Editor

Defining input-output files



File properties

Type:

input: *the job reads*

output: *the job generates*

File type:

local: *comes from my desktop*

remote: *comes from an SE*

File:

location of the file

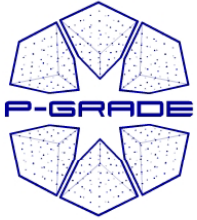
Internal file name:

Executable reads the file in this name – fopen("file.in", ...)

File storage type (output files only):

Permanent: *final result*

Volatile: *only data channel*



How to refer to an I/O file?

Input file

Output file

Local file

- Client side location:
`c:\experiments\11-04.dat`

- LFC logical file name
(LFC file catalog is required – EGEE VOs)
`lfn:/grid/gilda/sipos/11-04.dat`
- GridFTP address (in Globus Grids):
`gsiftp://somengshost.ac.uk/mydir/11-04.dat`

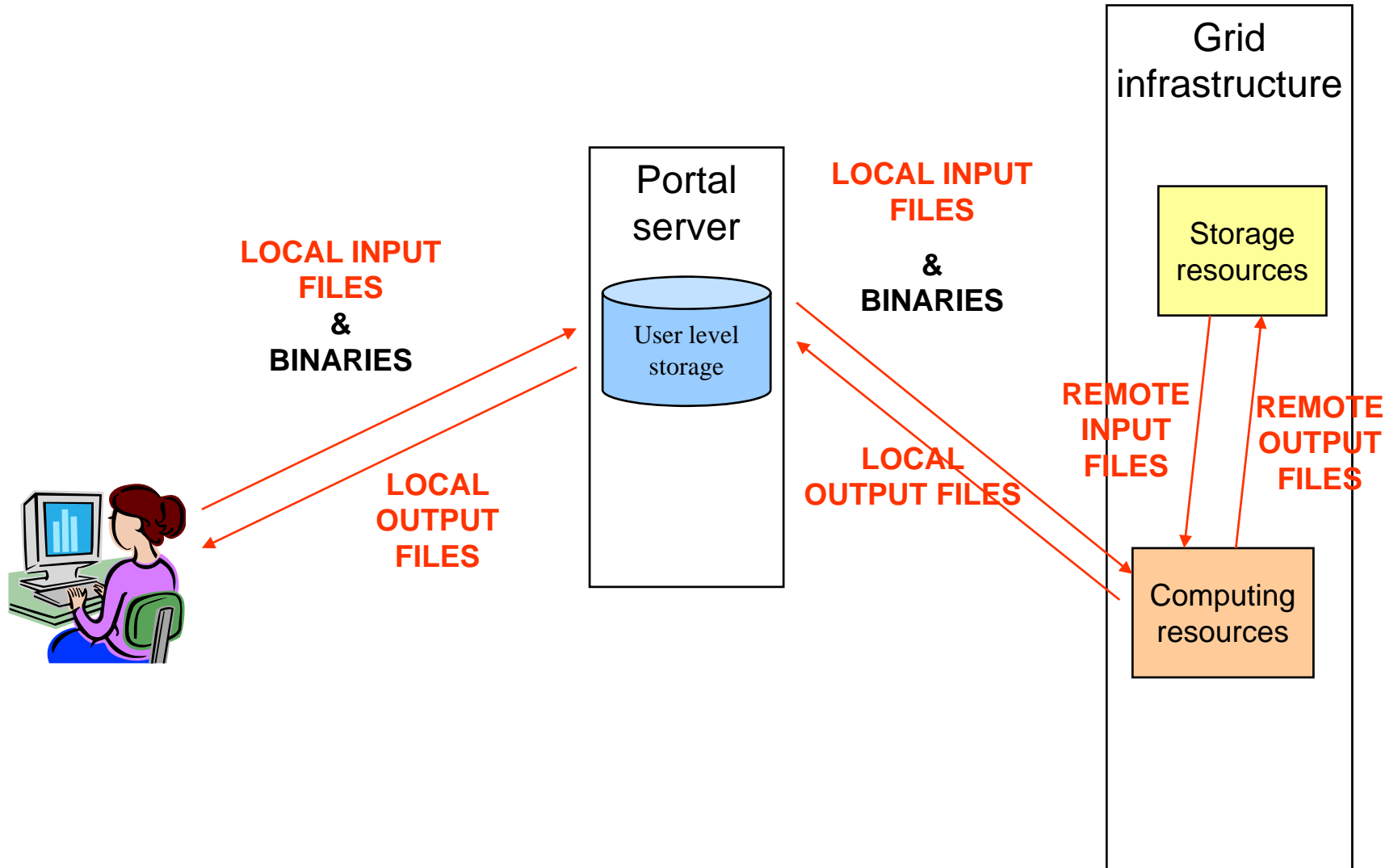
- Client side location:
`result.dat`

- LFC logical file name
(LFC file catalog is required – EGEE VOs)
`lfn:/grid/gilda/sipos/11-04_-_result.dat`
- GridFTP address (in Globus Grids):
`gsiftp://somengshost.ac.uk/mydir/result.dat`

Remote file

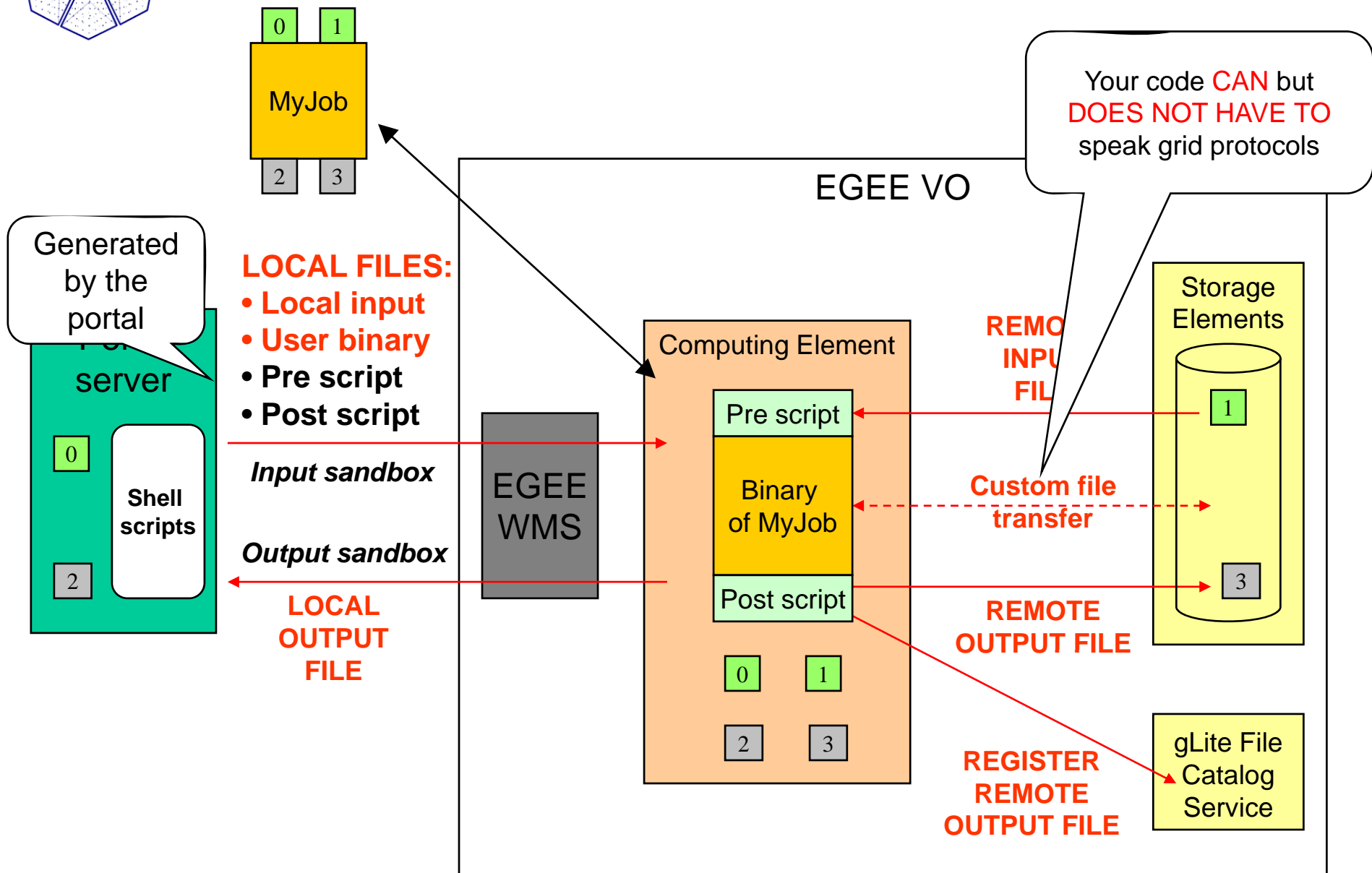


Workflow level file transfer by the workflow manager





Job level file transfer in EGEE VO





Reminder: Grid files and JDL

Example JDL file

```
Executable = "gridTest";
```

```
StdError = "stderr.log";
```

```
StdOutput
```

lfn: logical file name

```
InputSandbox = { "/home/gilda/test/";
```

```
OutputSandbox = { "stderr.log", "stdout.log";
```

```
InputData = "lfn:/grid/gilda/mydir/testbed0-00019";
```

```
OutputData = "lfn:/grid/gilda/mydir/result0-00019";
```

The file itself is NOT transferred by the gLite (or Globus) middleware!

Your binary must transfer input/output grid files!

P-GRADE Portal transfers the file for you.

Your executable does not have to know any grid protocol if it is used in P-GRADE



Information system portlet to browse computing resources

PGrade Portal - Microsoft Internet Explorer

http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doChangeVO&cid=15

Workflow Certificates Settings Information System Help

MDS Monitor LOG Monitor

Monitor

Select Grid: SEE-GRID View

Select VO: seegrid View

Grid: SEE-GRID VO: seegrid

Sites

Site Name	Computing Element						Storage Element		
	CPU			Job			Space		
	Total	Free	Usage	Running	Waiting	Load	Total	Available	Usage
AEGIS01-PHY-SCL	112	80	29%	7	0	0%	226.793 GB	216.34 GB	5%
AEGIS02-RCUB	20	20	0%	0	0	0%	398.466 GB	396.58 GB	0%
BG01-IPP	54	18	67%	4	0	0%	609.554 GB	473.543 GB	22%
	20	16	20%	1	0	0%	131.775 GB	79.957 GB	39%
	3	3	0%	0	0	0%	566.608 GB	566.376 GB	0%
	48	32	33%	2	5	71%	554.647 GB	475.767 GB	14%
	60	12	80%	4	0	0%	78.317 GB	6.271 GB	92%
	28	28	0%	0	0	0%	69.709 GB	69.075 GB	1%
	54	24	56%	5	36	88%	849.666 GB	828.387 GB	3%
-01	24	24	0%	0	0	0%	862.807 GB	848.676 GB	2%
	4	4	0%	0	0	0%	4.566 GB	2.871 GB	37%
	35	28	20%	1	0	0%	1.335 TB	1.335 TB	0%

Graphical interface for BDII / GIIS servers



Workflow execution

Main steps

- 1. Download proxies**
- 2. Submit workflow**
- 3. Observe workflow progress**
- 4. If some error occurs correct the graph**
- 5. Download result**



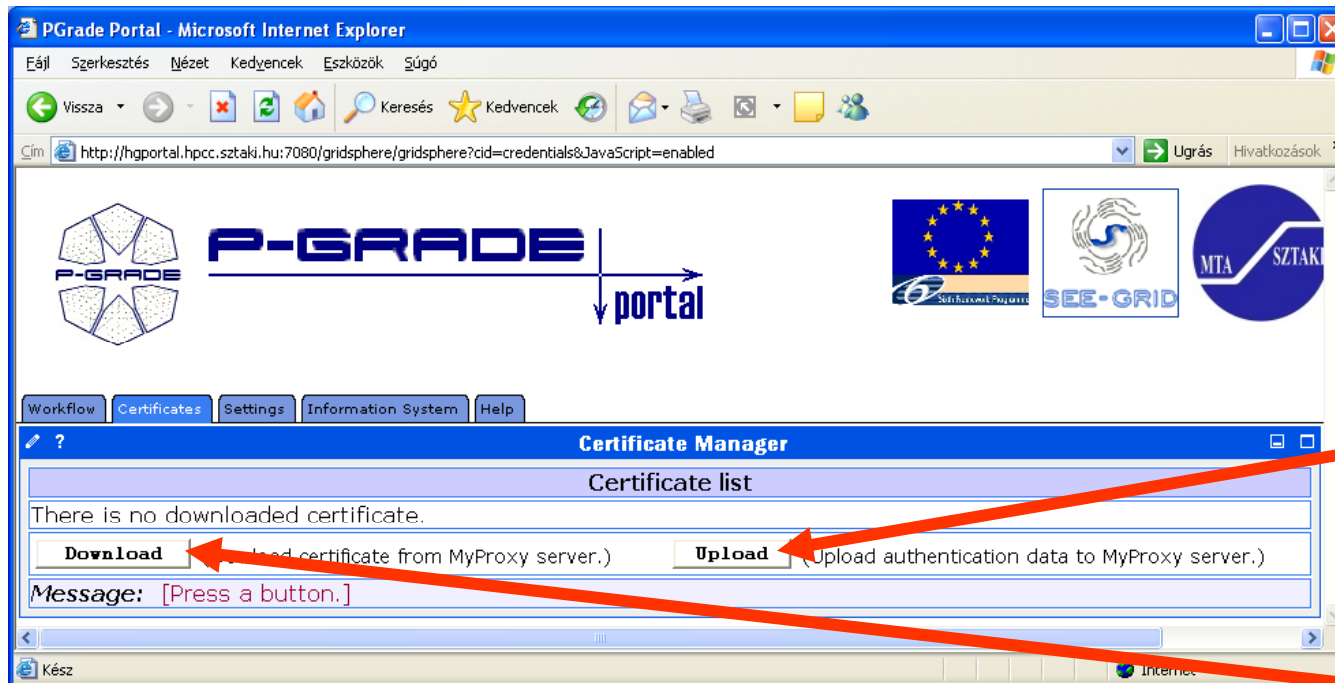
Reminder: MyProxy server

- **You may need:**
 - To interact with a grid from many machines
 - And you realise that you must NOT, EVER leave your certificate where anyone can find and use it....
 - To use a portal and delegate to the portal the right to act on your behalf (First step is for the portal to make a proxy certificate for you)
 - To run jobs that might last longer than the lifetime of a short-lived proxy
- **You can store a proxy in a “MyProxy server” and derive a second level proxy certificate when needed.**
- **Interaction with MyProxy from command line:**
 - *myproxy-init: create and store a long term proxy certificate*
 - *myproxy-info: get information about stored long living proxy*
 - *myproxy-get-delegation: get a new proxy from the MyProxy server*
 - *myproxy-destroy: Remove the proxy from MyProxy*



MyProxy interaction in P-GRADE: Certificate Manager

Certificates portlet



- To start your session on the Grid you must create a proxy certificate on the portal server
- “Certificates” portlet:
 - to upload a proxy into MyProxy servers
 - to download a proxy from MyProxy into the portal server



Certificate Manager

Downloading a proxy

PGrade Portal - Microsoft Internet Explorer

Eőjl Szerkesztés Nézet Kedvencek Eszközök Sőgő

Vissza Keresés Kedvencek

http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doGoDownload&cid=5

P-GRADE P-GRADE portal

Workflow Certificates Settings Information System Help

Certificate Manager

Download from MyProxy server

hostname	<input type="text" value="cvs.lpds.sztaki.hu"/> *	port	<input type="text" value="7512"/> *
login	<input type="text" value="seecert"/> *	password	<input type="password" value=""/>
lifetime (hours)	<input type="text" value="100"/> *	description	<input type="text"/>

*: Cannot be left empty.

Message: Fill in the fields for download!

Internet

1. MyProxy server access details:

- Hostname
- Port number
- User name (from upload)
- Password (from upload)

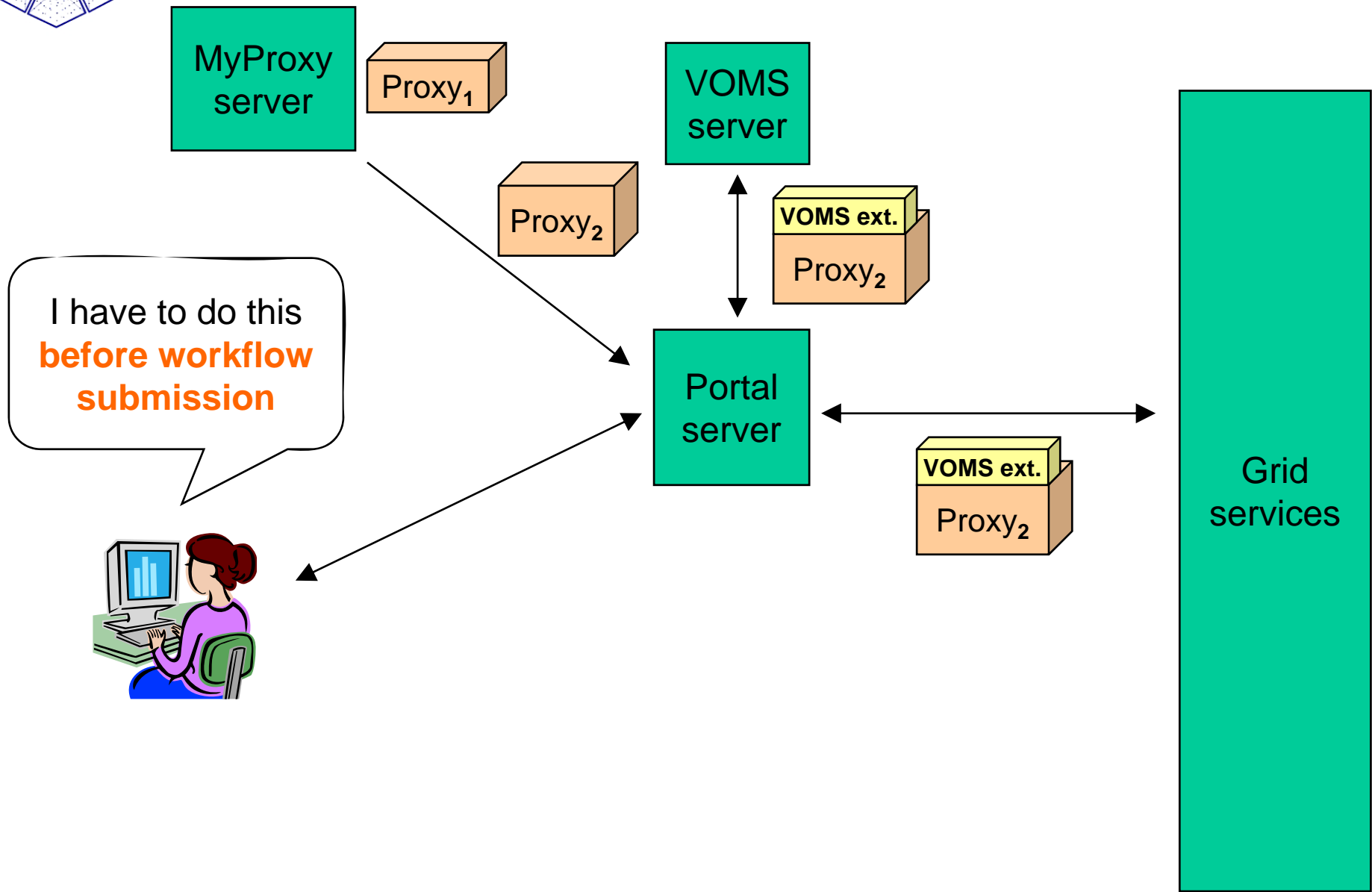
2. Proxy parameters:

- Lifetime
- Comment

3. Grid association



Certificates, proxies with gLite VOs: Download





Certificate Manager

Multi-grid portal → Multi-proxy environment

Multiple proxies can be available on the portal server at the same time!

Certificate from SEE CA:
SEE-GRID resources

Certificate from Hungarian CA:
HUNGRID resources



Workflow Management

(workflow portlet)

- The portlet presents the status, size and output of the available workflow in the “**Workflow**” list
- It has a Quota manager to control the users’ storage space on the server
- The portlet also contains the “**Abort**”, “**Attach**”, “**Details**”, “**Delete**” and “**Delete all**” buttons to handle execution of workflows
- The “**Attach**” button opens the workflow in the Workflow Editor
- The “**Details**” button gives an overview about the jobs of the workflow

Workflow Manager

Workflow Editor Refresh

Workflow	Status	Size	Quota (100 Mb)	Output	[View]	[Action]
LM_9_DEMO_TOTAL	submitted	26.848 MB	26%	N/A	Details	Abort Attach Delete
		26.848 MB	26%			

Delete all

Message: Workflow successfully submitted.



Workflow Execution

(observation by the workflow portlet)

The screenshot shows the PGrade Portal interface in Microsoft Internet Explorer. The browser title is "PGrade Portal - Microsoft Internet Explorer". The address bar shows the URL: <http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doShowWorkflowDetails&cid=2>. The page features a navigation menu with "Workflow", "Certificates", "Settings", "Information System", and "Help". The main content area is titled "Workflow Manager" and contains a "Job list" table. The table has columns for Workflow, Job, Gridname, Hostname, Status, Logs, Output, and Visualization. The first row shows a workflow named "LM_9_DEMO_TOTAL" with a status of "submitted" and "N/A" output. Below the table, a message states: "Message: Workflow details successfully displayed." The browser status bar at the bottom shows "Kész" and "Internet".

Workflow	Job	Gridname	Hostname	Status	[Logs]	[Output]	[Visualization]
LM_9_DEMO_TOTAL				submitted	-	N/A	<input type="button" value="Visualize"/> <input type="button" value="All"/> <input type="button" value="Abor"/>
	INIT	SEE-GRID	ce01.grid.acad.bg	init	-	-	-
	LM_P	SEE-GRID	n40.hpcc.sztaki.hu	init	-	-	-
	LM_P.2	SEE-GRID	n40.hpcc.sztaki.hu	init	-	-	-
	LM_S	SEE-GRID	grid-ce.ii.edu.mk	init	-	-	-
	LM_S.2	SEE-GRID	grid1.irb.hr	init	-	-	-
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	init	-	-	-
	LM_S.4	SEE-GRID	grid1.irb.hr	init	-	-	-
	LM_S.5	SEE-GRID	testbed001.grid.icl.ro	init	-	-	-
	LM_S.6	HUNGRID	grid109.kfki.hu	init	-	-	-
	TIFF	HUNGRID	grid109.kfki.hu	init	-	-	-

White/Red/Green color means the job is initial/running/finished state



Workflow Execution

(observation by the workflow portlet)

The screenshot shows the PGrade Portal interface in Microsoft Internet Explorer. The browser title is "PGrade Portal - Microsoft Internet Explorer". The address bar shows the URL: <http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doGotoPage&cid=2>. The page features a navigation menu with "Workflow", "Certificates", "Settings", "Information System", and "Help". The main content area is titled "Workflow Manager" and contains a "Job list" table. The table has columns for Workflow, Job, Gridname, Hostname, Status, Logs, Output, and Visualization. The "Status" column uses color coding: white for "init", red for "running", and green for "finished". A message at the bottom of the table area reads "Message: Job list refreshed.".

Workflow	Job	Gridname	Hostname	Status	[Logs]	[Output]	[Visualization]
LM_9_DEMO_TOTAL				running	-	N/A	<input type="button" value="Visualize"/> <input type="button" value="All"/> <input type="button" value="Abort"/>
	INIT	SEE-GRID	ce01.grid.acad.bg	running	-		-
	LM_P	SEE-GRID	n40.hpcc.sztaki.hu	init	-		-
	LM_P.2	SEE-GRID	n40.hpcc.sztaki.hu	init	-		-
	LM_S	SEE-GRID	grid-ce.ii.edu.mk	init	-		-
	LM_S.2	SEE-GRID	grid1.irb.hr	init	-		-
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	init	-		-
	LM_S.4	SEE-GRID	grid1.irb.hr	init	-		-
	LM_S.5	SEE-GRID	testbed001.grid.icl.ro	init	-		-
	LM_S.6	HUNGRID	grid109.kfki.hu	init	-		-
	TIFF	HUNGRID	grid109.kfki.hu	init	-		-

White/Red/Green color means the job is initial/running/finished state



Workflow Execution

(observation by the workflow portlet)

PGrade Portal - Microsoft Internet Explorer

Workflow Manager

Refresh Back

Workflow	Job	Gridname	Hostname	Status	[Logs]	[Output]	[Visualization]
LM_9_DEMO_TOTAL				running	-	N/A	<input type="button" value="Visualize"/> <input type="button" value="All"/> <input type="button" value="Abort"/>
	INIT	SEE-GRID	ce01.grid.acad.bg	finished	- -		-
	LM_P	SEE-GRID	n40.hpcc.sztaki.hu	init	- -		-
	LM_P.2	SEE-GRID	n40.hpcc.sztaki.hu	init	- -		-
	LM_S	SEE-GRID	grid-ce.ii.edu.mk	running	- -		-
	LM_S.2	SEE-GRID	grid1.irb.hr	finished	<input type="button" value="Out"/>	-	-
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	running	<input type="button" value="Out"/>	-	-
	LM_S.4	SEE-GRID	grid1.irb.hr	finished	<input type="button" value="Out"/>	-	-
	LM_S.5	SEE-GRID	testbed001.grid.ici.ro	running	<input type="button" value="Out"/>	-	-
	LM_S.6	HUNGRID	chemgrid3.chemres.hu	finished	<input type="button" value="Out"/>	-	-
	TIFF	HUNGRID	grid109.kfki.hu	init	- -		-

Message: Job list refreshed.

White/Red/Green color means the job is initial/running/finished state



Workflow Execution

(observation by the workflow portlet)

PGrade Portal - Microsoft Internet Explorer

http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doGotoPage&cid=2

Workflow Certificates Settings Information System Help

Workflow Manager

Refresh Back

Workflow	Job	Gridname	Hostname	Status	[Logs]	[Output]	[Visualization]	
LM_9_DEMO_TOTAL				running	-	N/A	Visualize All Abort	
	INIT	SEE-GRID	ce01.grid.acad.bg	finished	- -		-	
	LM_P	SEE-GRID	n40.hpcc.sztaki.hu	running	Out	-	Visualize	
	LM_P.2	SEE-GRID	n40.hpcc.sztaki.hu	running	Out	-	Visualize	
	LM_S	SEE-GRID	grid-ce.ii.edu.mk	finished	Out	-	-	
	LM_S.2	SEE-GRID	grid1.irb.hr	finished	Out	-	-	
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	finished	Out	-	-	
	LM_S.4	SEE-GRID	grid1.irb.hr	finished	Out	-	-	
	LM_S.5	SEE-GRID	testbed001.grid.ici.ro	finished	Out	-	-	
	LM_S.6	HUNGRID	chemgrid3.chemres.hu	finished	Out	-	-	
	TIFF	HUNGRID	grid109.kfki.hu	init	- -		-	

Message: Job list refreshed.

White/Red/Green color means the job is initial/running/finished state



Workflow Execution

(observation by the workflow portlet)

PGrade Portal - Microsoft Internet Explorer

http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doGotoPage&cid=2

Workflow Certificates Settings Information System Help

Workflow Manager

Refresh Back

Workflow	Job	Gridname	Hostname	Status	Job list		
					[Logs]	[Output]	[Visualization]
LM_9_DEMO_TOTAL				finished	Err	Being zipped..	Visualize All S
	INIT	SEE-GRID	ce01.grid.acad.bg	finished	-	-	-
	LM_P	SEE-GRID	n40.hpcc.sztaki.hu	finished	Out	-	Visualize
	LM_P.2	SEE-GRID	n40.hpcc.sztaki.hu	finished	Out	-	Visualize
	LM_S	SEE-GRID	grid-ce.ii.edu.mk	finished	Out	-	-
	LM_S.2	SEE-GRID	grid1.irb.hr	finished	Out	-	-
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	finished	Out	-	-
	LM_S.4	SEE-GRID	grid1.irb.hr	finished	Out	-	-
	LM_S.5	SEE-GRID	testbed001.grid.ici.ro	finished	Out	-	-
	LM_S.6	HUNGRID	chemgrid3.chemres.hu	finished	Out	-	-
	TIFF	HUNGRID	grid109.kfki.hu	finished	Out	-	-

Message: Job list refreshed.

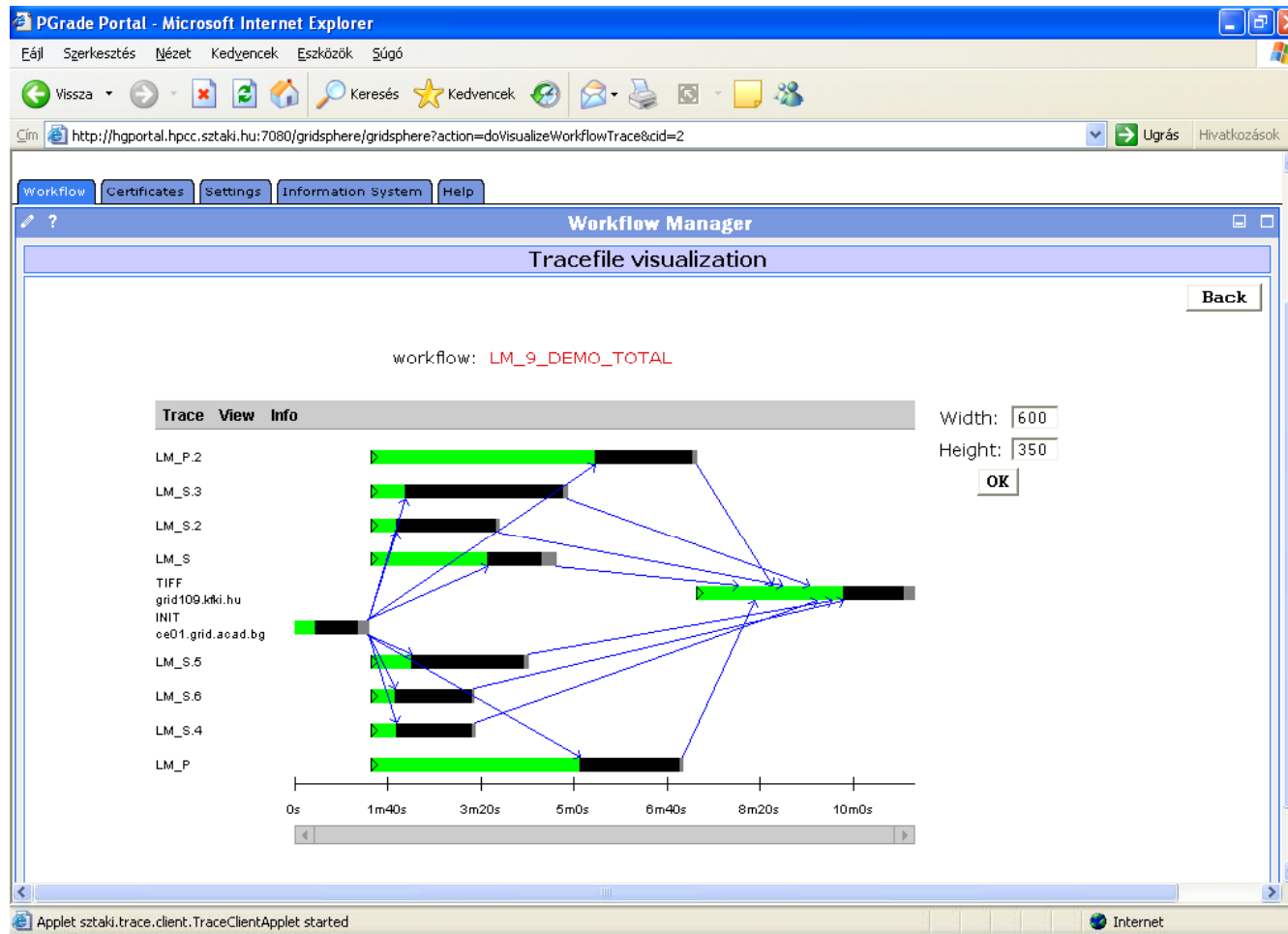
Kész Internet

White/Red/Green color means the job is initialised/running/finished



On-Line Monitoring at workflow level

(workflow portlet)



- The portal monitors and visualizes workflow progress

- Input transfer
- Computation
- Output transfer



Rescuing a failed workflow 1.

A job failed during workflow execution

Read the error log to know why

Workflow	Job	Gridname	Hostname	Status	Log	Output	View	Action
demo-RESCUE	Count1	SZTAKI-GRID	n0 .hpc.sztaki.hu	finished	Out	-	-	-
	Count2	SZTAKI-GRID	n0 .hpc.sztaki.hu	finished	Out	-	-	-
	Count3	HUNGRID	chemgrid3 .chemres.hu	error	Err	-	-	Err
	Count4	SZTAKI-GRID	n0 .hpc.sztaki.hu	submitted	--	-	-	--

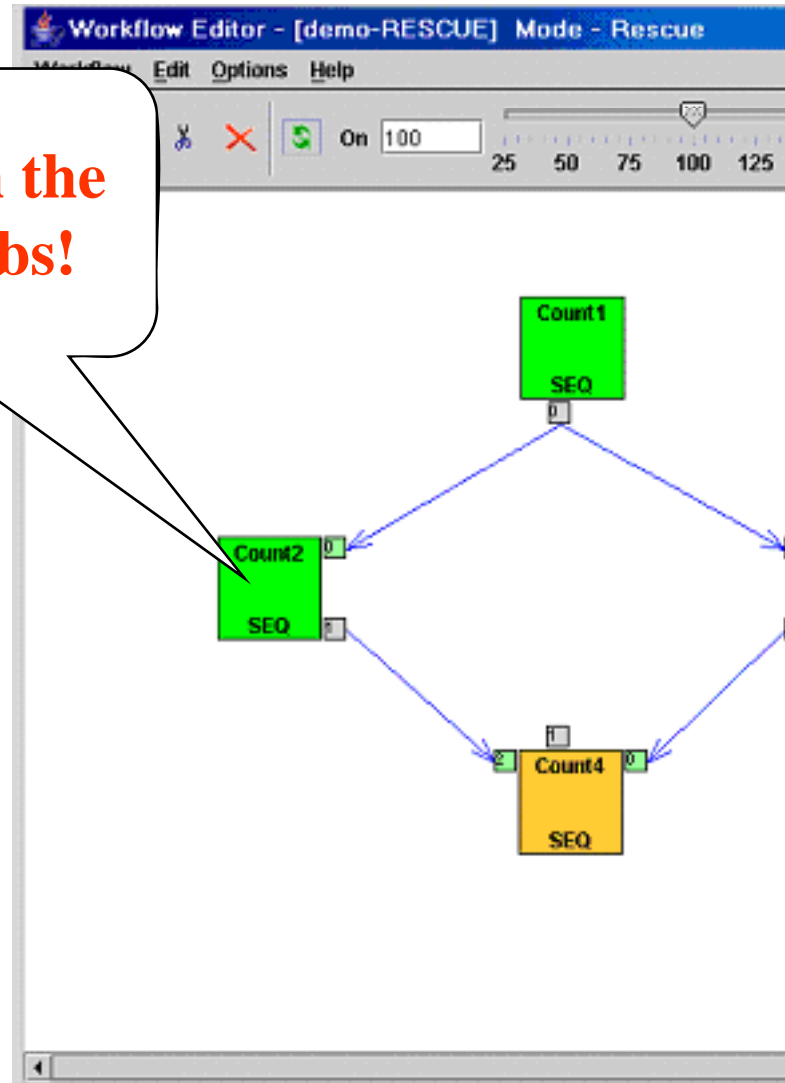
Message: Workflow details successfully displayed.

July 29, 2005



Rescuing a failed workflow 2.

Don't touch the finished jobs!



Map the failed job onto a different resource or download a new proxy for it

The execution can continue from the point of failure



Downloading the results...

The screenshot shows the P-Grade Portal web interface in a Mozilla browser window. The page title is "PGrade Portal - Mozilla" and the URL is "http://fn2.hpcc.sztaki.hu:9080/gridsphere/gridsphere?action=doGotoPage&cid=2". The page features the P-Grade logo and a "portal" label. A "Logout" link is visible in the top right corner. Below the logo, there is a navigation menu with "Workflow", "Credentials", "Settings", "Demo", and "Help" buttons. The main content area is titled "Workflow Manager" and contains a "Refresh" button and a "Back" button. A table titled "Job list" displays the following data:

Workflow	Job	Hostname	Status	[Logs]	[Output]	[Visualization]	[Action]
nowcast-final-g_SGE			finished		<input checked="" type="checkbox"/>	Visualize All	Subm Attach Delete
	cummu	n0.hpcc.sztaki.hu	finished	--		Visualize	
	delta	n0.hpcc.sztaki.hu	finished	--		Visualize	
	ready	n0.hpcc.sztaki.hu	finished	--		Visualize	
	satel	n0.hpcc.sztaki.hu	finished	--		Visualize	
	visib	n0.hpcc.sztaki.hu	finished	--		Visualize	

Below the table, a message states: "Message: Job list refreshed." A file download dialog box is open in the foreground, titled "Opening nowcast_final_g.zip". The dialog contains the following text: "The file 'nowcast_final_g.zip' is of type application/x-zip-compressed, and Mozilla does not know how to handle this file type. This file is located at: e:\pri\mc04". Below this text, the question "What should Mozilla do with this file?" is followed by four radio button options: "Open it with the default application", "Open it with" (with an empty text box and a "Choose..." button), "Save it to disk" (which is selected), and "Always perform this action when handling files of this type". At the bottom of the dialog are "OK" and "Cancel" buttons.



Outline

- **P-GRADE Portal and Developer Alliance**
- **Workflow capabilities of P-GRADE Portal 2.5**

Workflow practical

- **Parameter Study capabilities of P-GRADE Portal 2.5**

Parameter study practical

- **Other portal versions**
 - Specific portals based on P-GRADE
- **How to get long term access**
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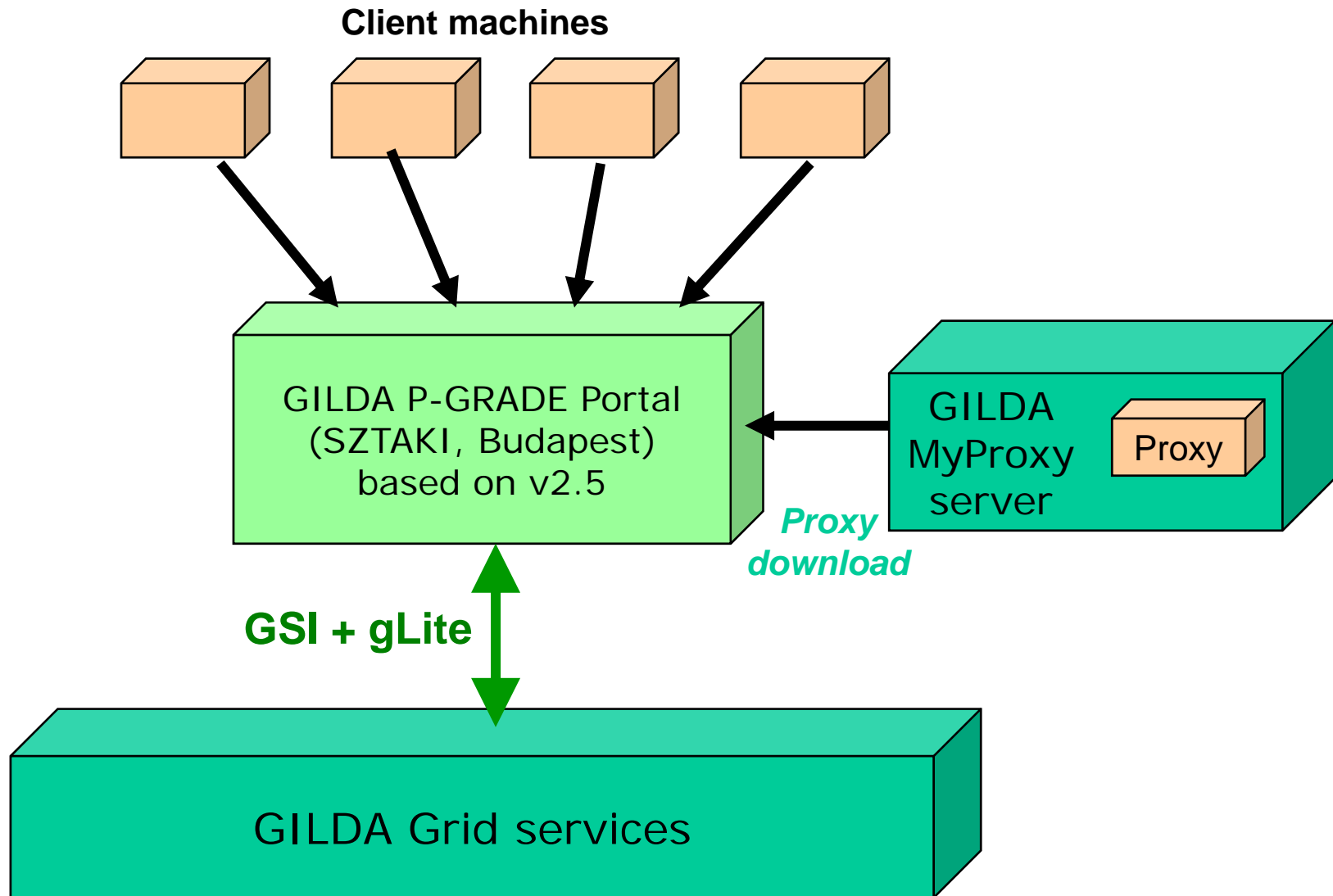


Hands-on

- Aim is to learn the basics of P-GRADE Portal workflows
 - Go through the typical application development cycles
- Portal installation to be used:
 - GILDA P-GRADE Portal
 - Based on P-GRADE Portal 2.5



Infrastructure

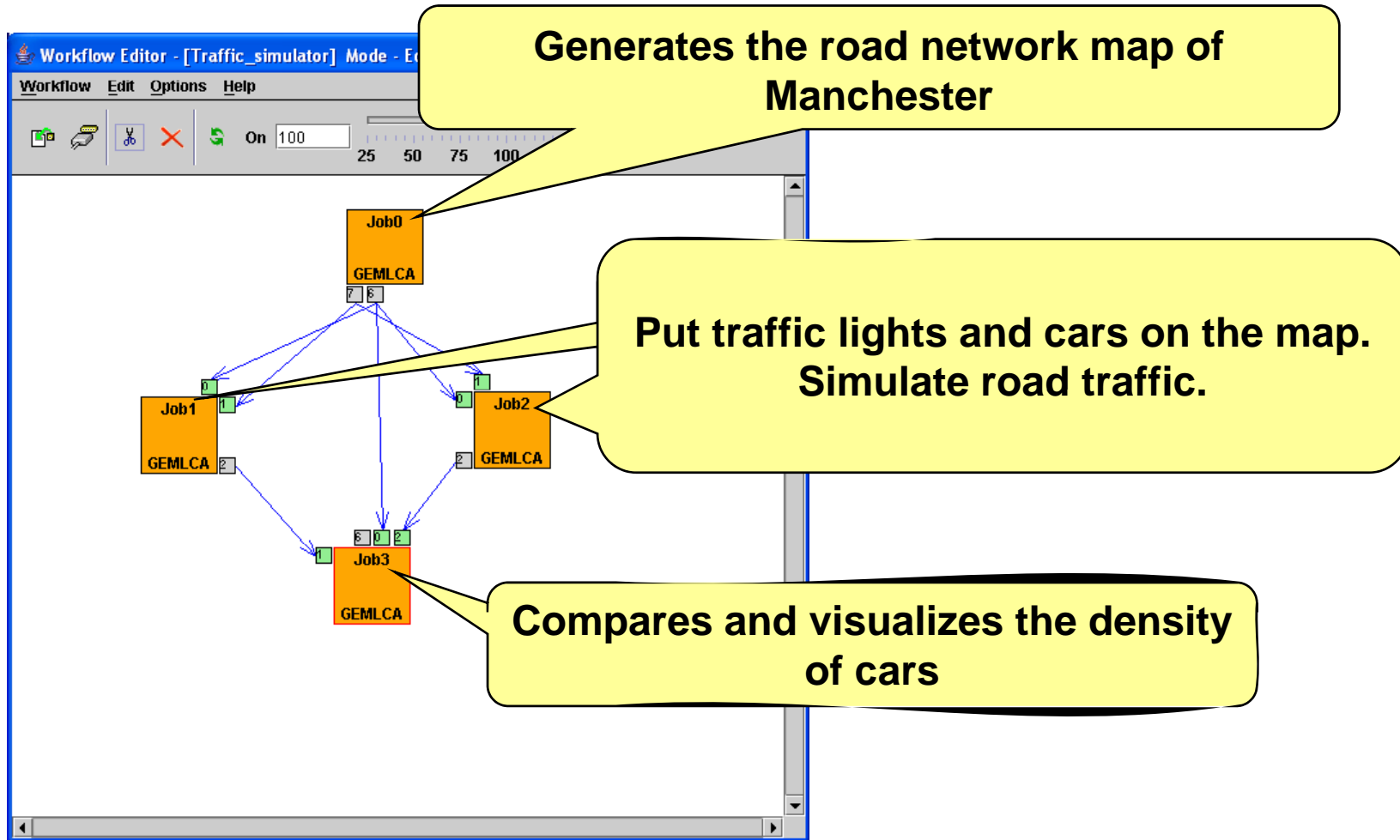




Exercise 1

Import and execute a pre-defined application

Traffic simulation

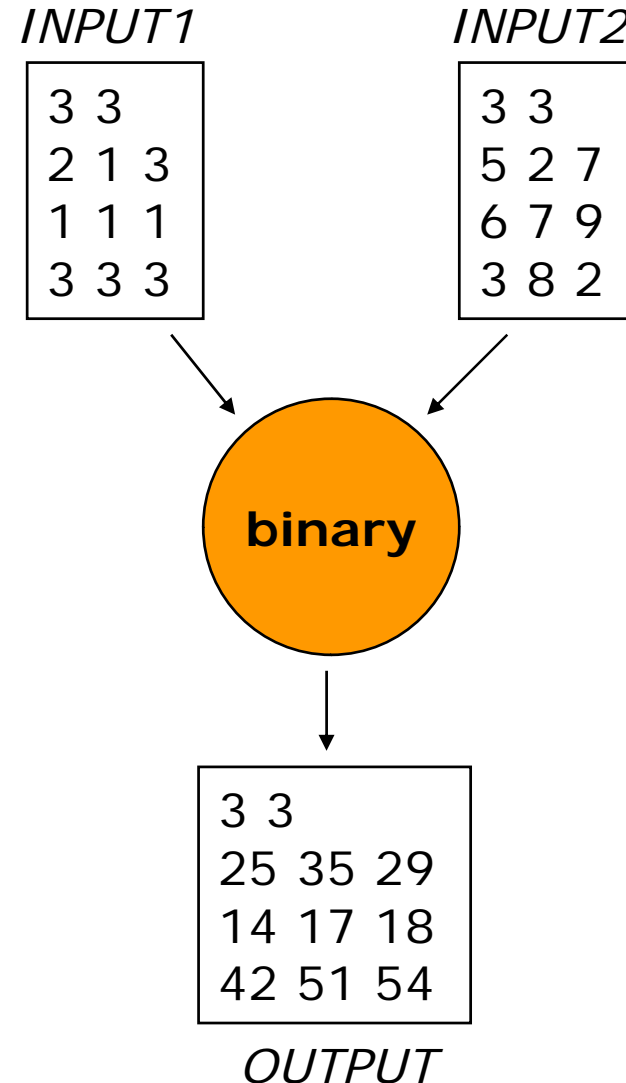




Exercise 2

Execute a matrix multiplication (one job workflow)

- C code, compiled on GILDA UI
- Reads matrixes from two files called **INPUT1** and **INPUT2**
- Writes result matrix into file called **OUTPUT**
- Controllable by command line parameters
- Local execution:
./multiply M V
- Execute as grid job, transfer input and output files in Sandboxes





Exercise 3

Save the multiplication **OUTPUT** on a SE

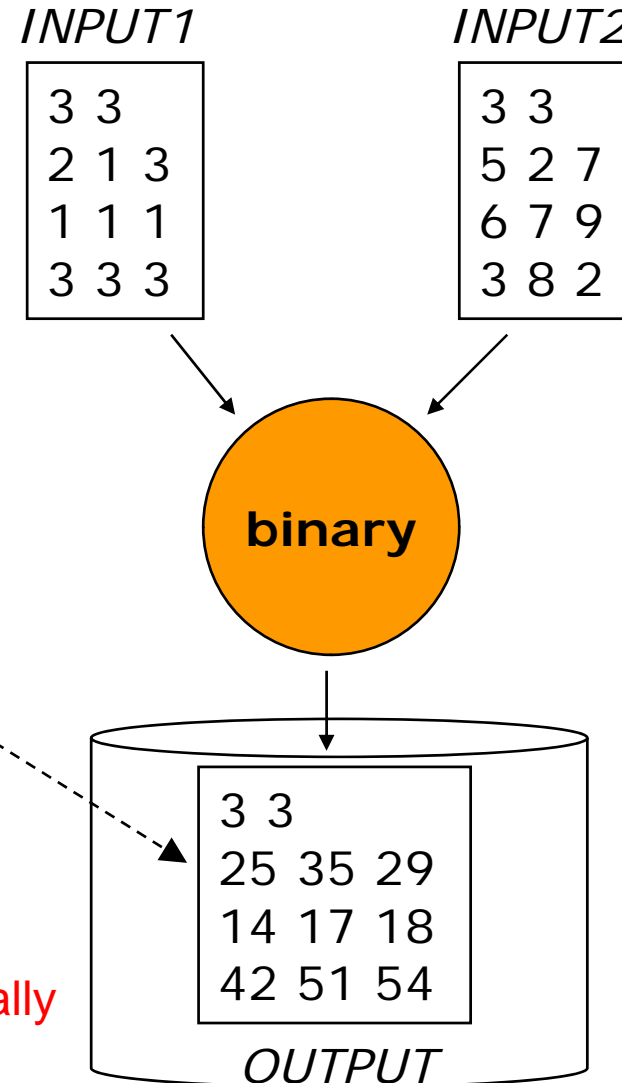
- Modify output file type from “Local” to “Remote”
- Specify a logical file name as target location:

lfn:/grid/gilda/kualalumpur11/...

lfn:/grid/gilda/kualalumpur11/...

Logical location defined by the user

Storage Element selected automatically

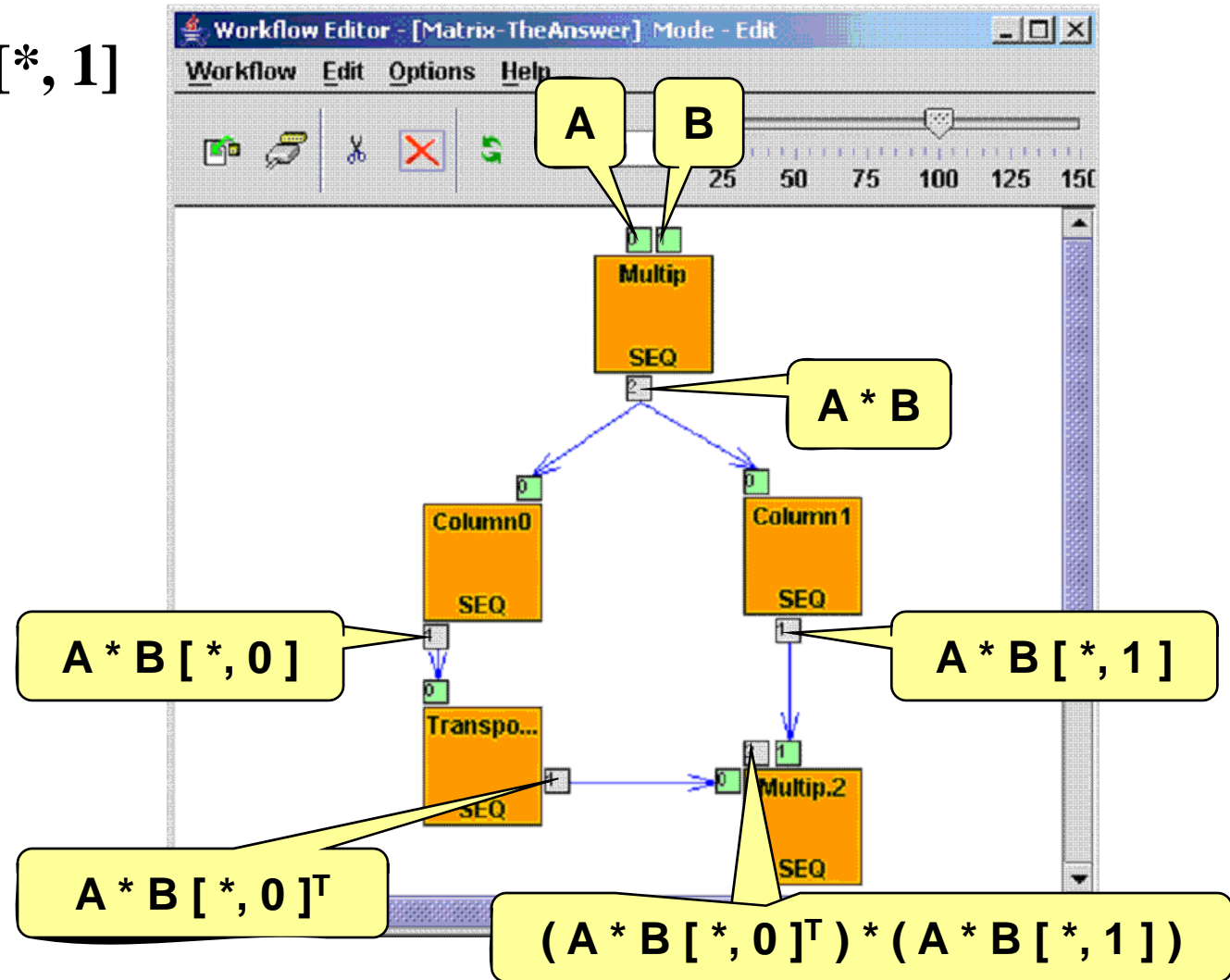


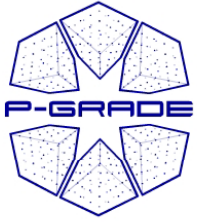


Exercise 4

Define a complex workflow using the MatrixOperations job

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





Open the tutorial

Skip the “Upload your certificate...” section

Portal and Myproxy accounts:

Portal accounts: user01 – user30

Portal passwords: user01 – user30

MyProxy download information:

Hostname: grid001.ct.infn.it

Account: kualalumpur

Password: kualalumpur



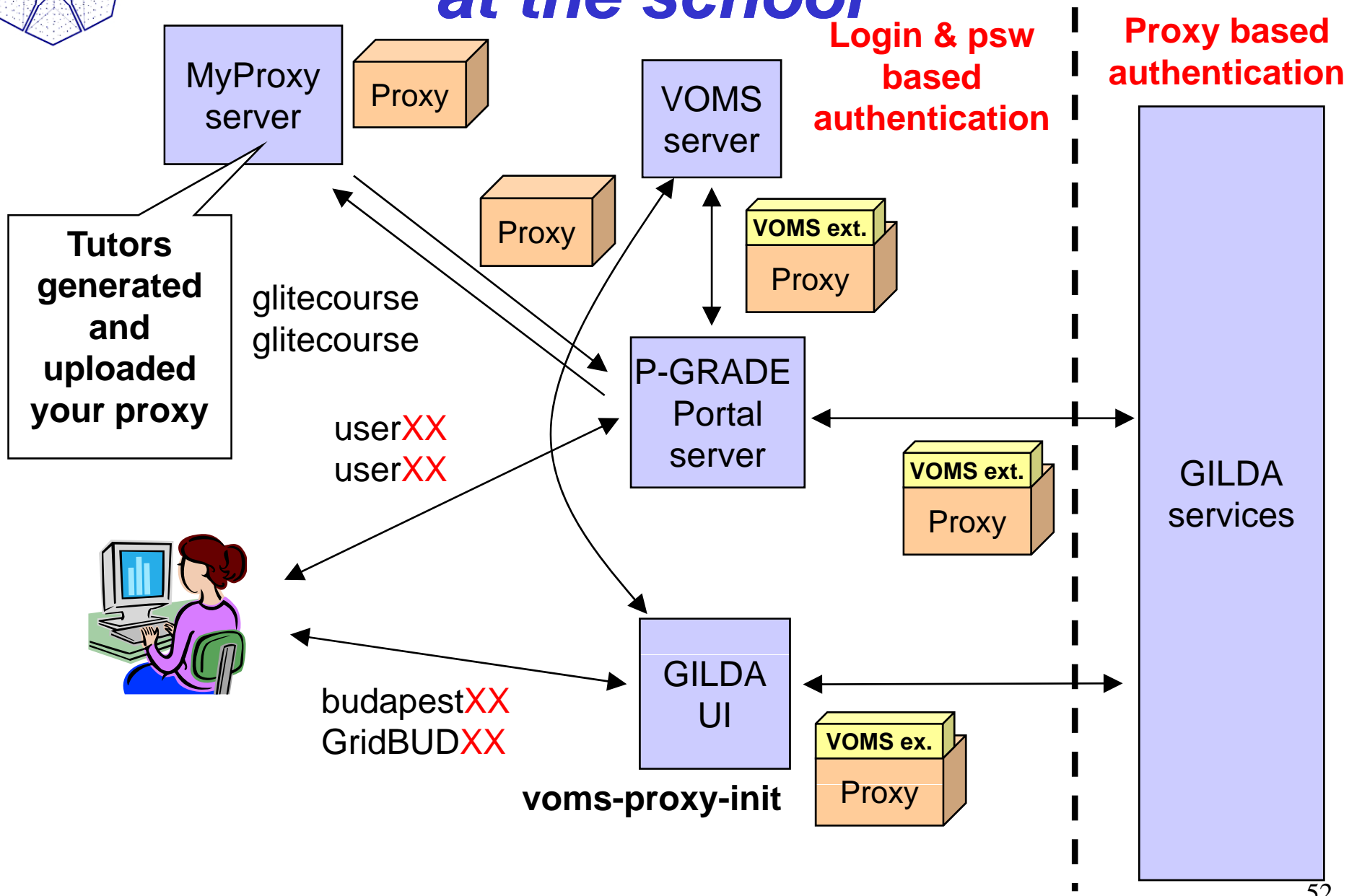
Job level fault tolerance

Tips

- **Exclude erroneous sites from the brokering process:**
 1. Open the JDL editor of the job
 2. Write **other.GlueCEInfoHostname != "hostname"** into the "Ranks & requirements" window
- **Automatic job resubmission:**
 1. Add **ShallowRetryCount = 3** into JDL



User authentication at the school





Outline

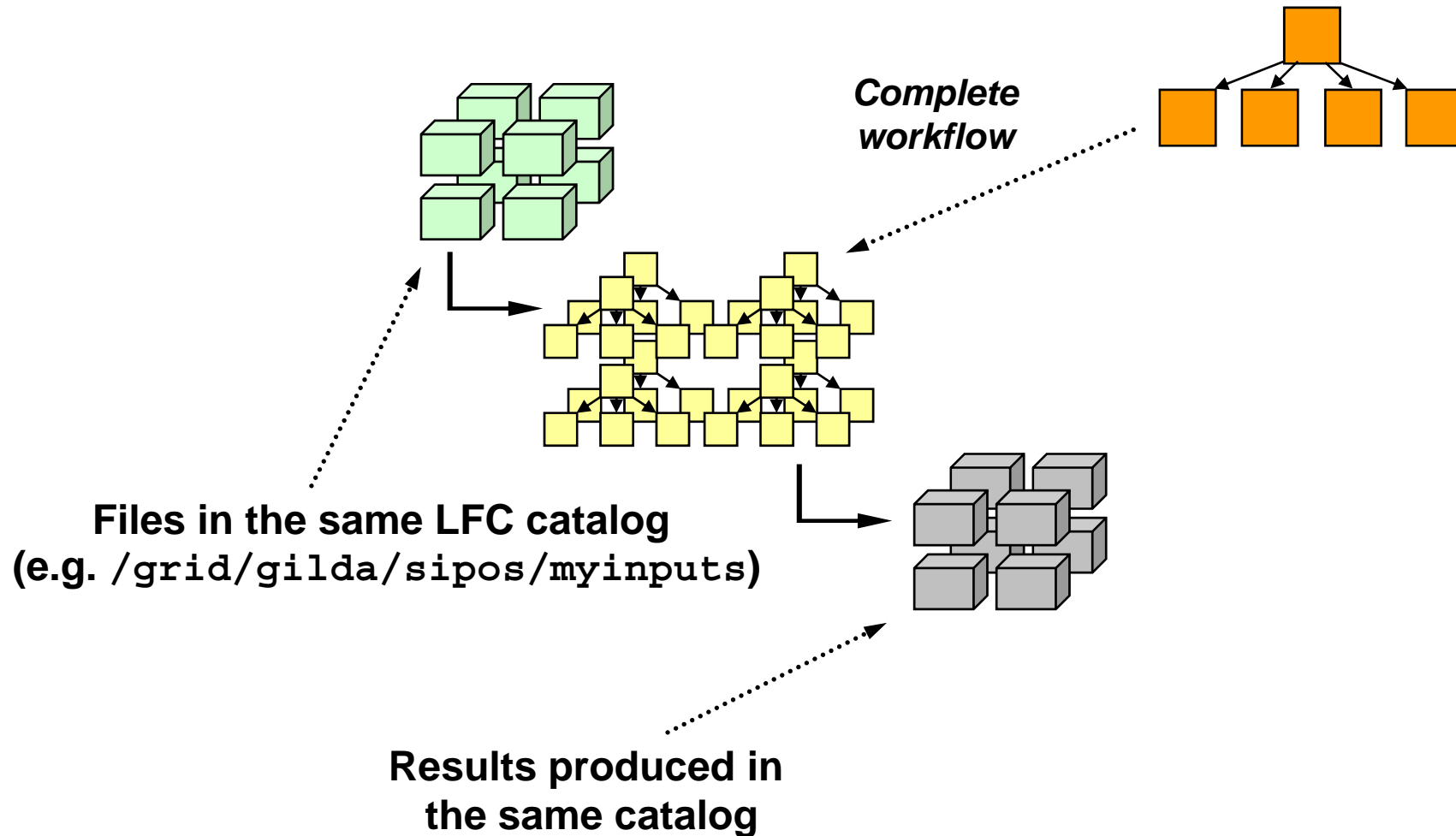
- **P-GRADE Portal and Developer Alliance**
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Parameter study features in P-GRADE Portal

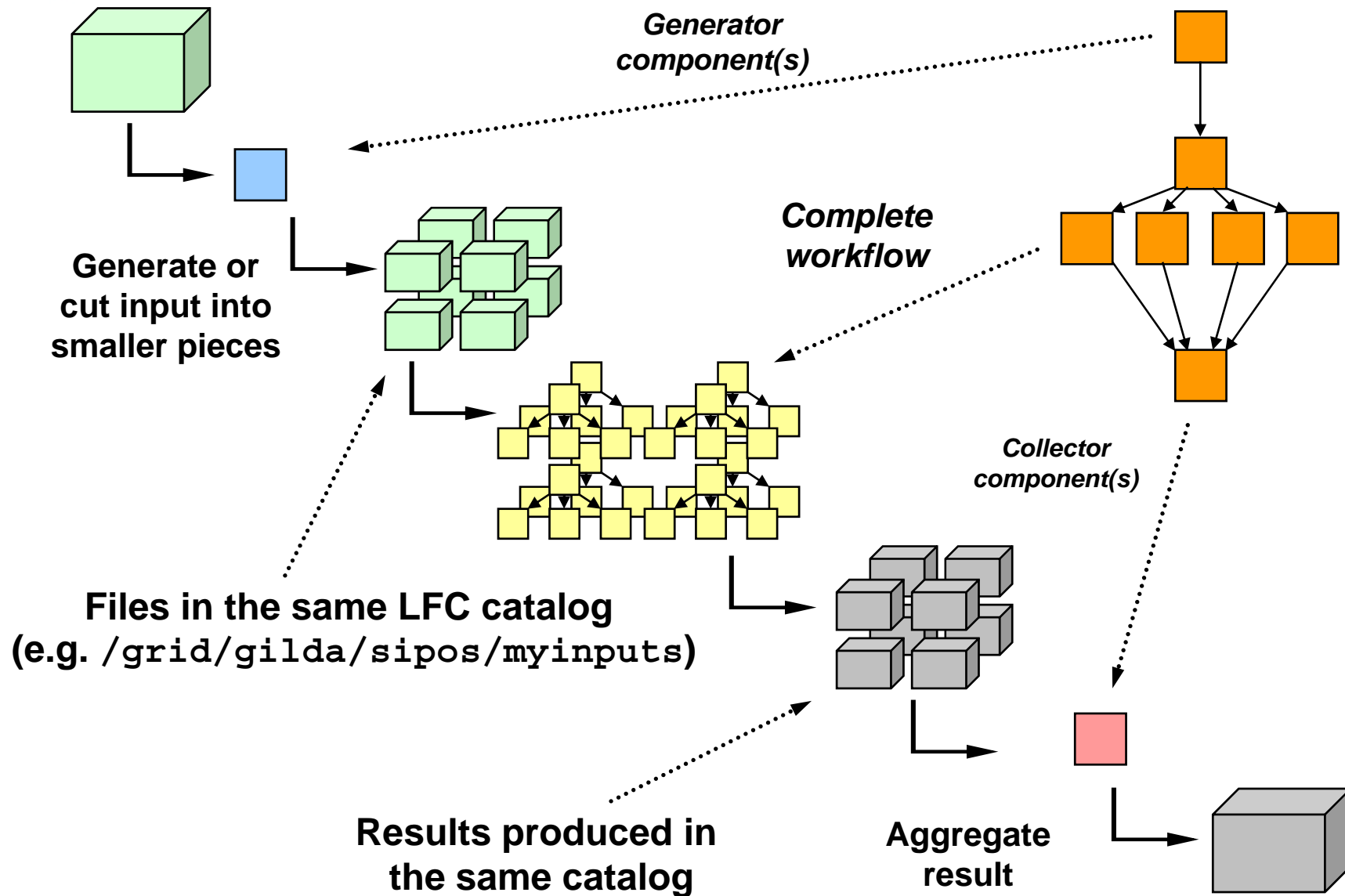


Scaling up a workflow to a parameter study



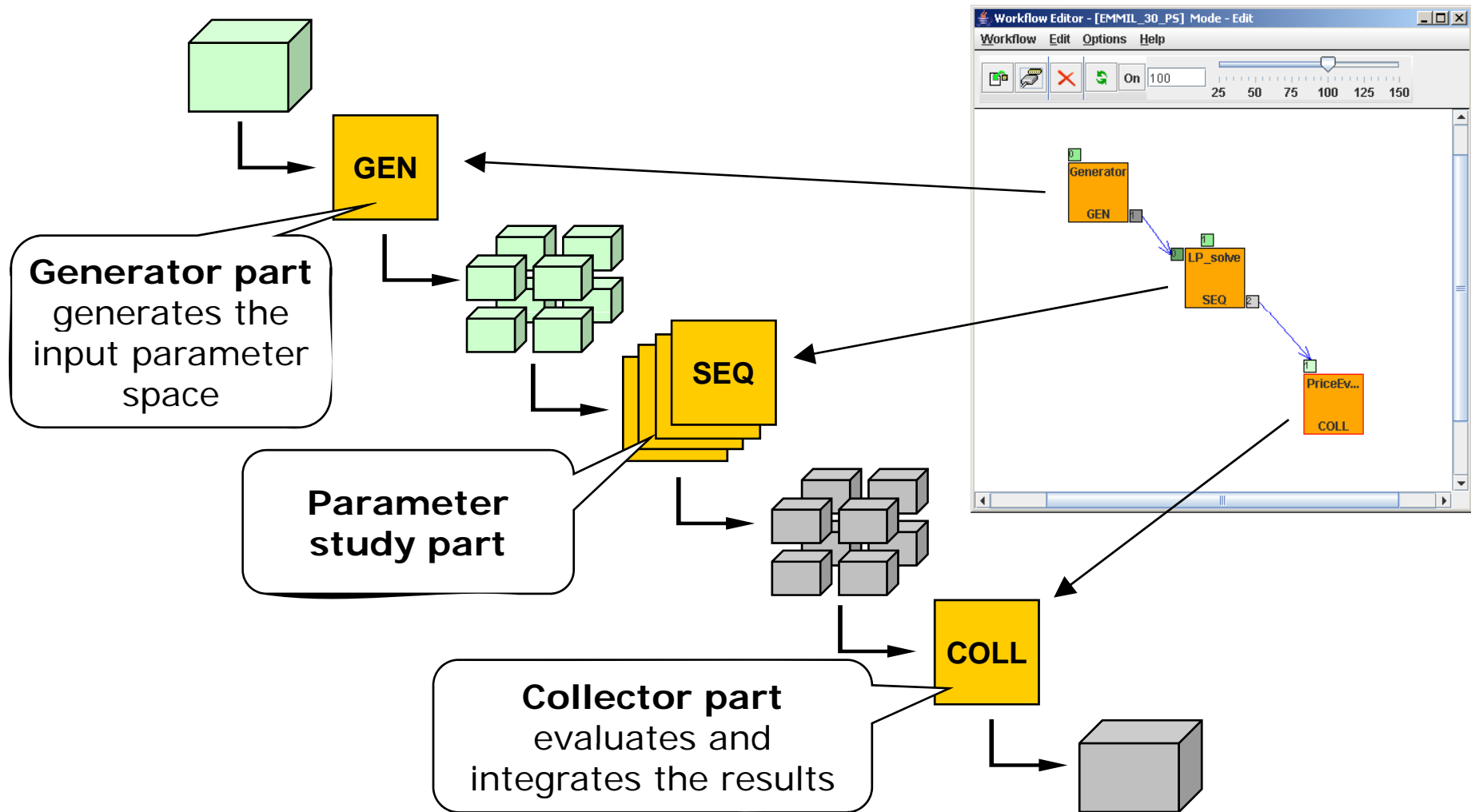


Advanced parameter studies



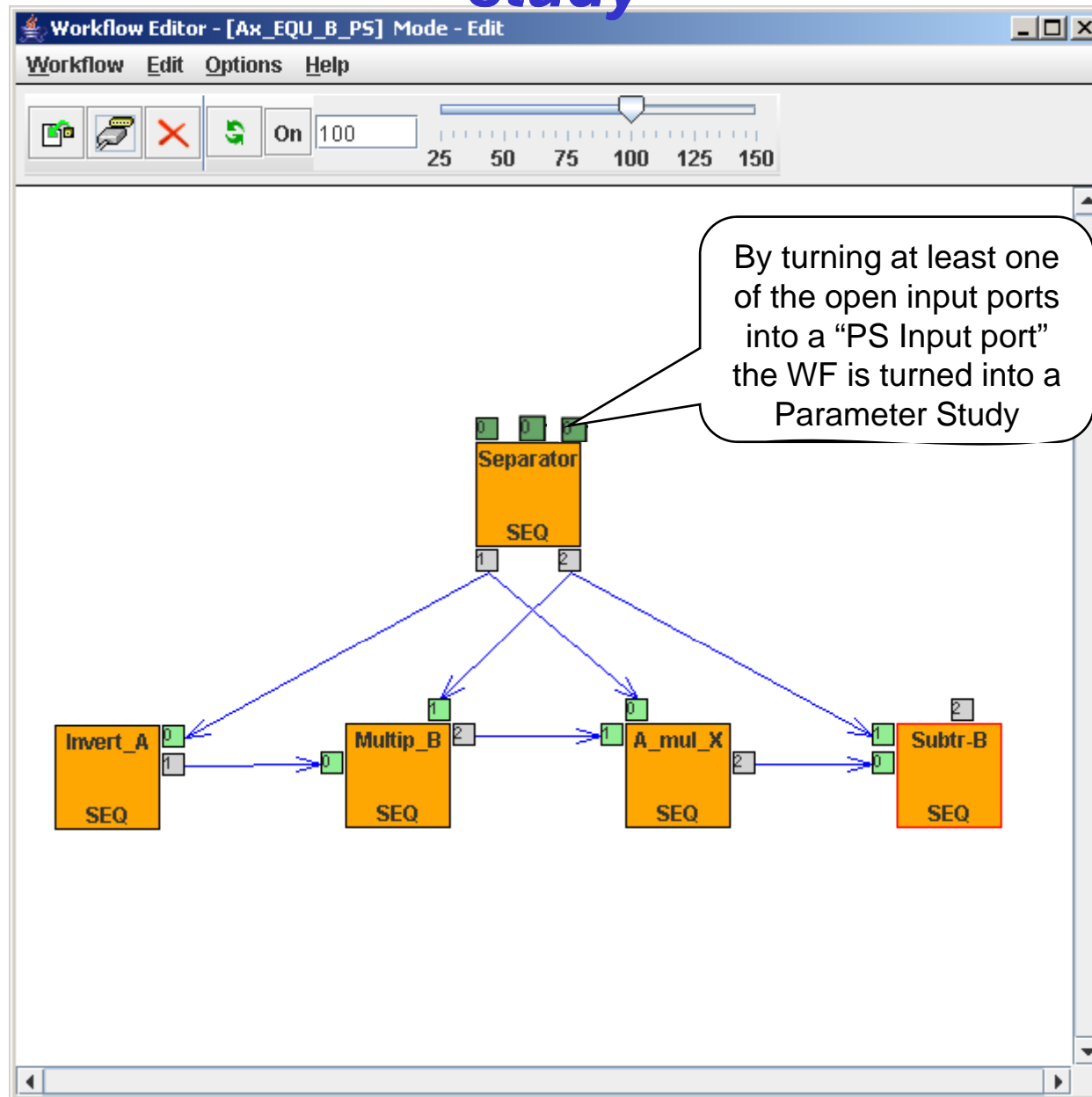


Concept of parameter study workflows



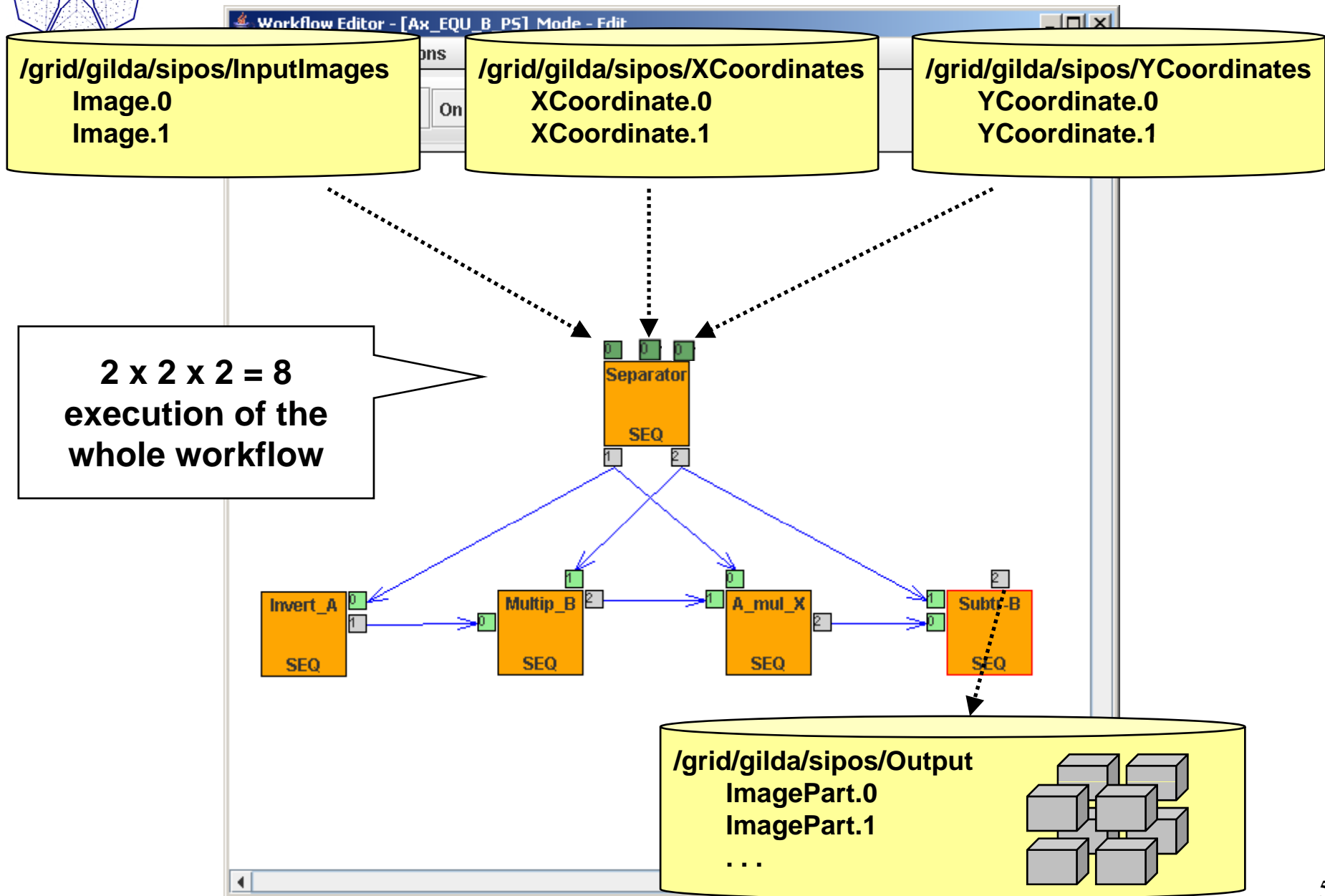


Turning a WF into a parameter study



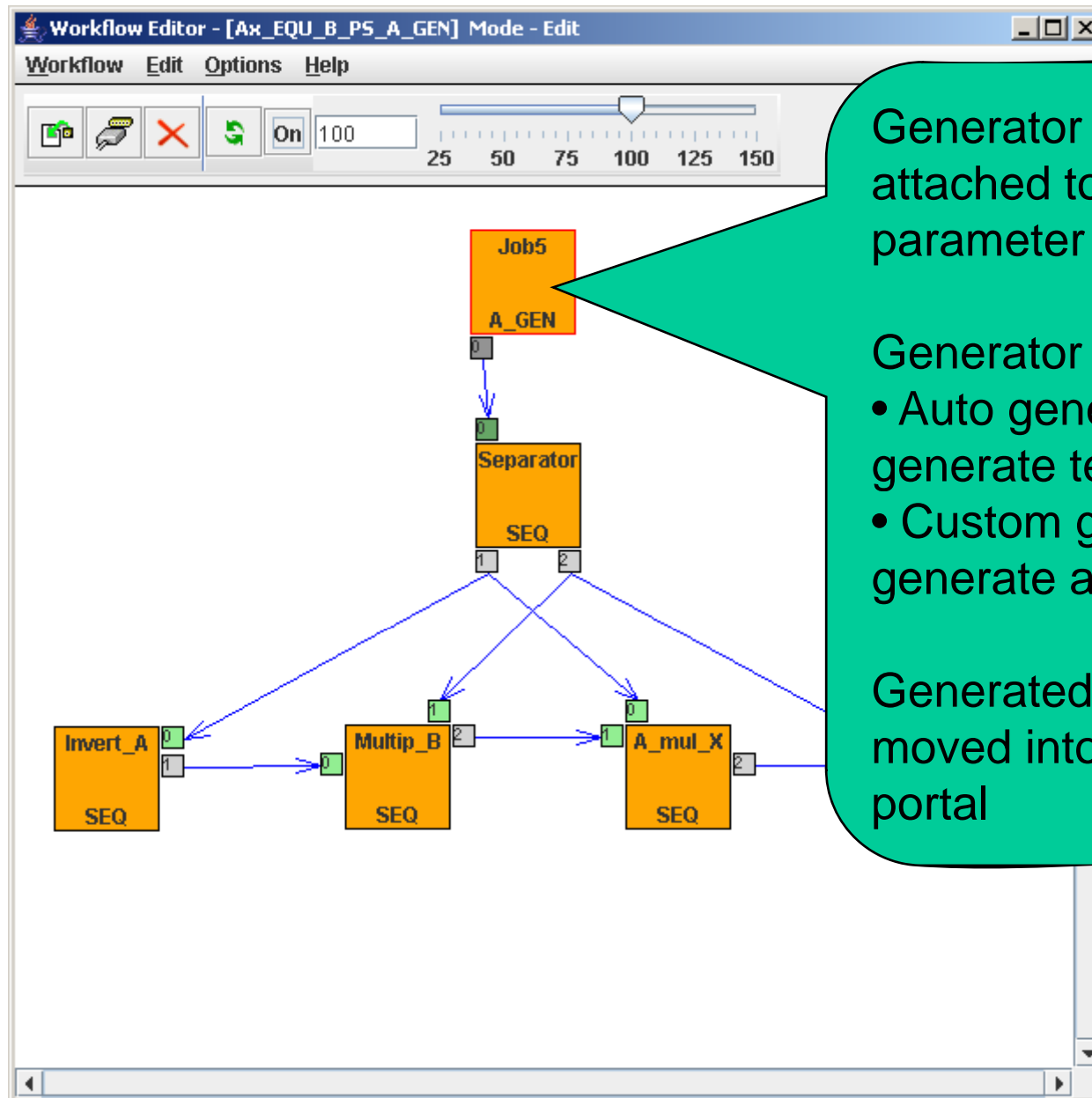


Input-output files are stored in SEs





Parameter generator



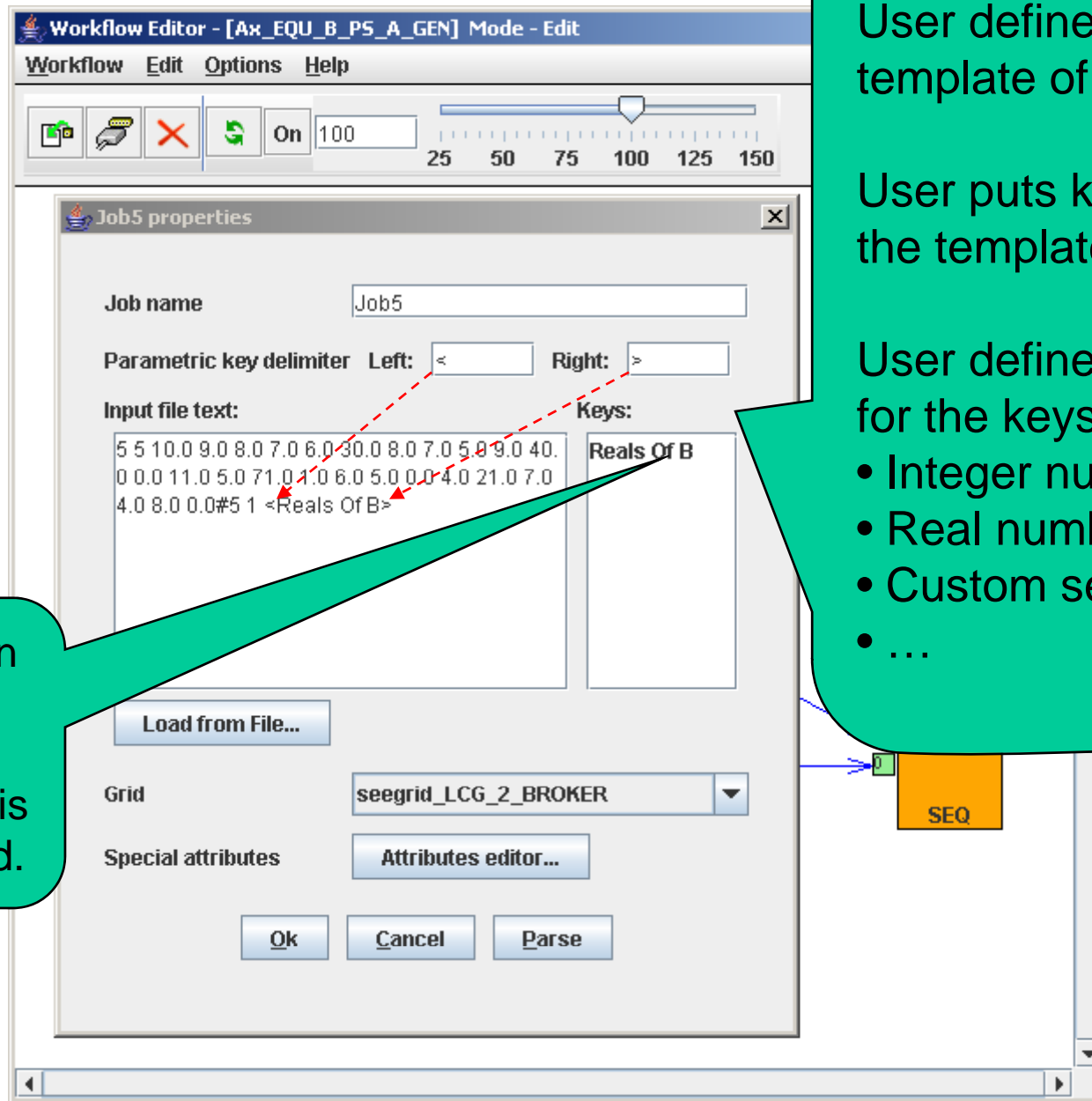
Generator can be attached to any parameter input port

- Generator can be
- Auto generator: to generate text files
 - Custom generator: to generate any content

Generated files are moved into SE by the portal



Definition Window of Auto Generator .Job



User defines the template of the text file

User puts keys into the template

User defines values for the keys

- Integer number
- Real number
- Custom set
- ...

By clicking on a key the definition window for this key is opened.



Executing PS workflows

The screenshot shows the PGrade Grid portal interface. The browser window title is "PGrade Grid portal - Windows Internet Explorer". The address bar shows the URL: http://n43.hpcc.sztaki.hu:8080/gridsphere/gridsphere?cid=77&gs_action=doRefreshList. The page displays a table of workflow jobs with the following data:

Job Name	Status	Size	Progress	Completion	Actions
Ax_EQUAL_B_PS_G_C_sztaki_fork	finished	253 KB	0.25%	✓	PS Details, Submit, Attach, Delete
Ax_EQU_B	init	112 KB	0.11%	N/A	Details, Submit, Attach, Delete
Ax_EQU_B_voice_PS	init	151 KB	0.15%	N/A	PS Details, Submit, Attach, Delete

PS Details for parameter sweep workflows applications



Detailed view of a PS workflow

PGrade Grid portal - Windows Internet Explorer

http://n44.hpcc.sztaki.hu:8080/gridsphere/gridsphere?cid=72&gs_action=doShowWorkflowDetails

File Edit View Favorites Tools Help

PGrade Grid portal

Welcome, Peter Kacsuk

Welcome Workflow Certificates Settings Information System Help

Workflow Manager Storage Upload

Workflow Manager

Refresh Back

PS workflow details

PS Workflow	Status	[Output]	[Logs]	[Action]
Ax_EQU_B_PS_A_GEN_Collector	submitted	N/A	-	Abort Attach Delete

Jobs in generator phase

Job	Status	Type	Gridname	Hostname	[Logs]
Job5	finished	auto-generator	seegrid_LCG_2_BROKER	Portal Server	Out

eWorkflow list Statistics

Total	Init	Submitted	Rescue	Error	Finished
2	0	2	0	0	0

Workflow

Workflow	Status	[Output]	[View]	[Action]
Ax_EQU_B_PS_A_GEN_Collector.1	submitted	N/A	Details	Suspend Abort
Ax_EQU_B_PS_A_GEN_Collector.2	submitted	N/A	Details	Suspend Abort

Jobs in collector phase

Job	Status	Type	Gridname	Hostname	[Logs]
Collector	init	collector	seegrid_LCG_2_BROKER	unknown	--

Message: eWorkflow list successfully shown.

November 13, 2006

Internet 100%

Generator job(s)

Overall statistics of workflow instances

Workflow instances

Collector job(s)



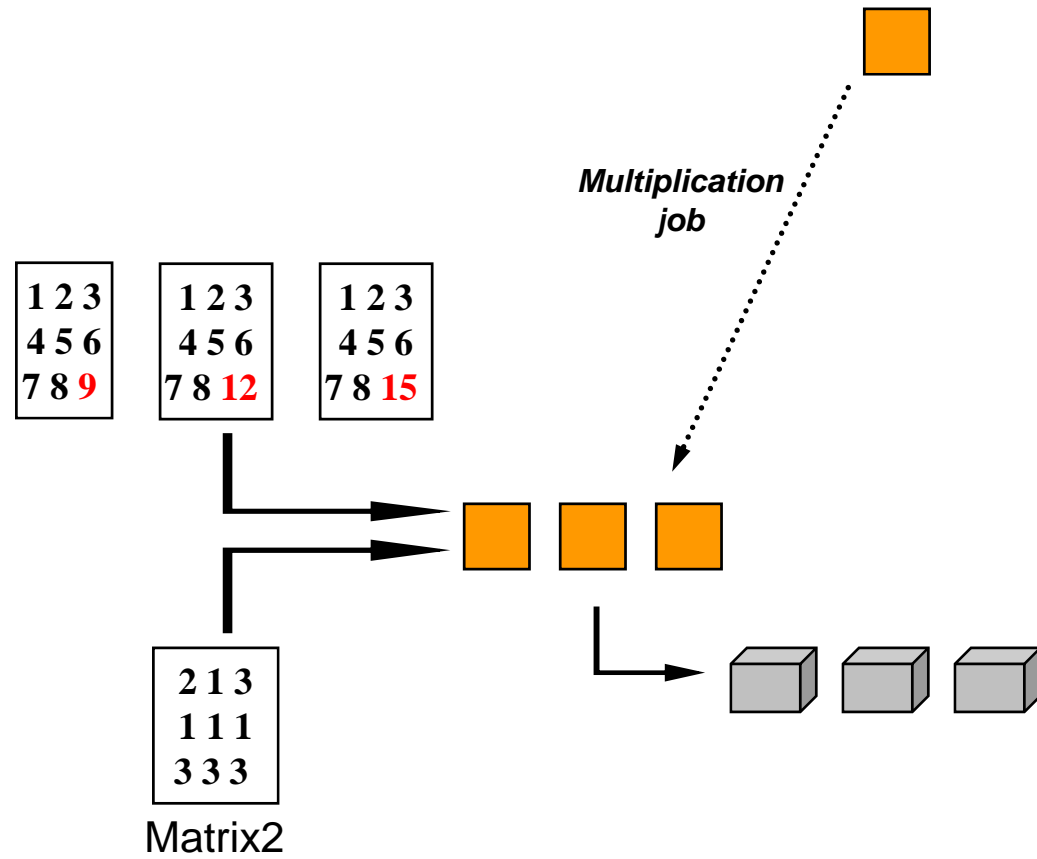
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Exercise

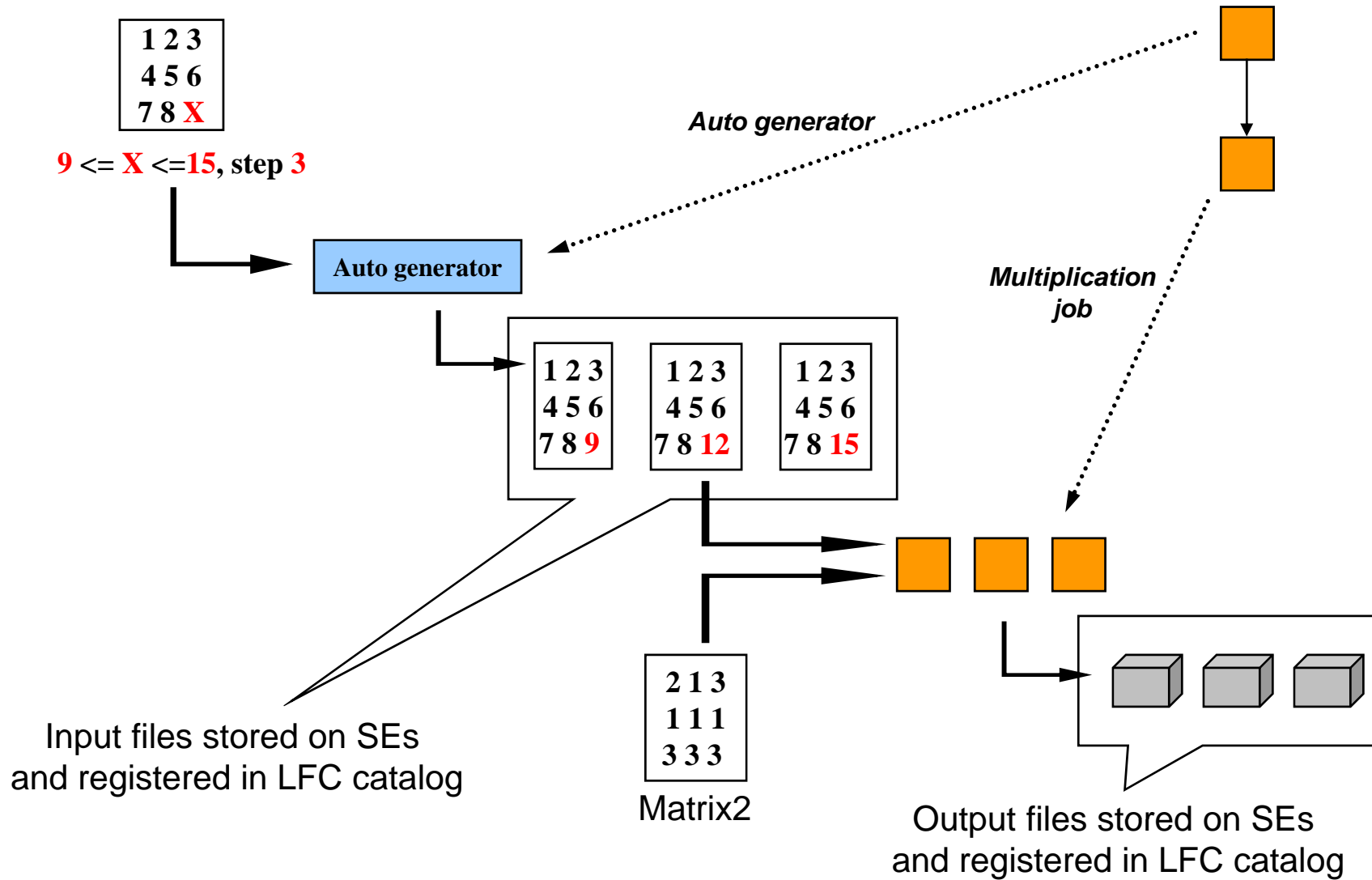
Matrix multiplication PS





Exercise

Matrix multiplication PS

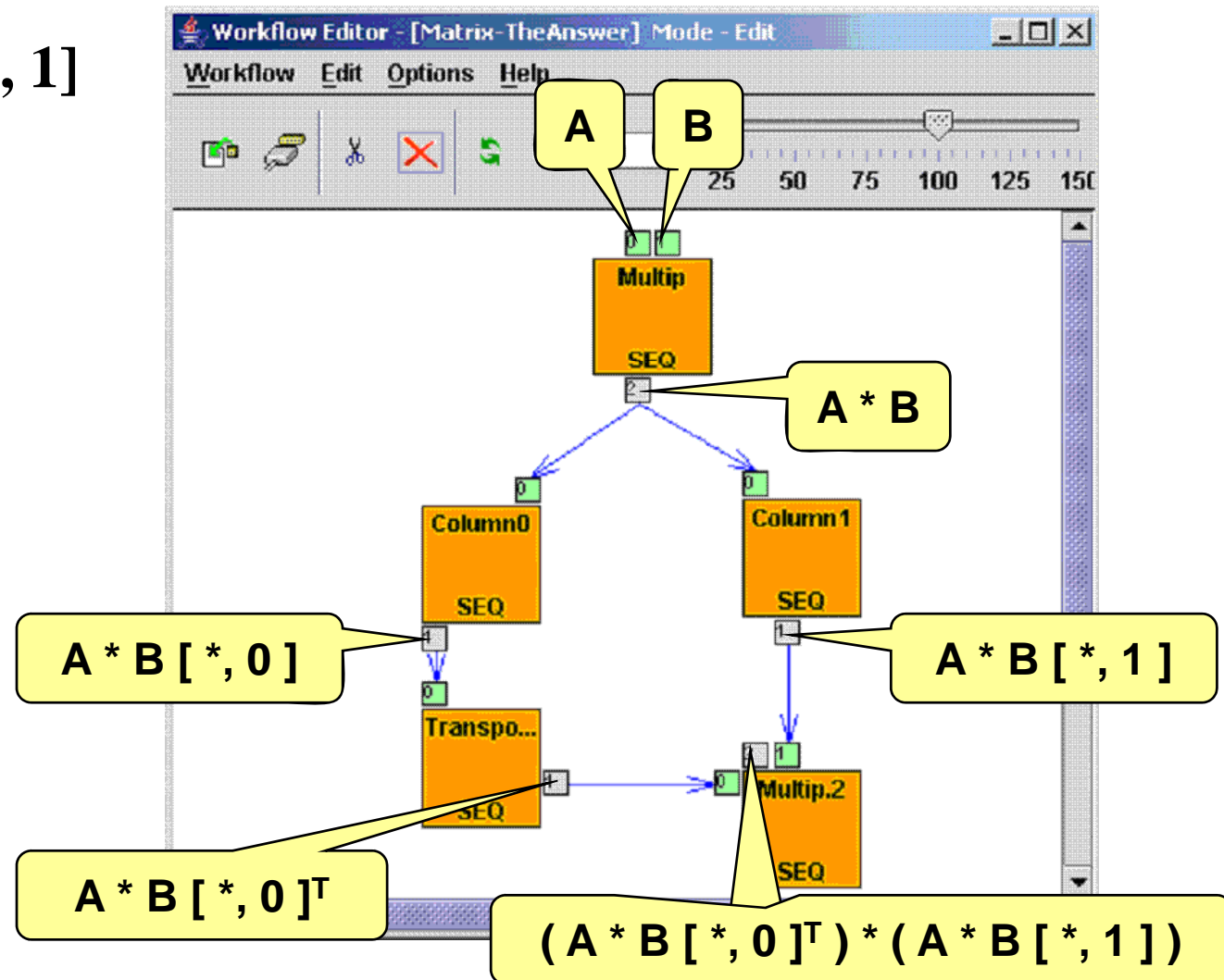




Exercise 2

Turn the matrix operations WF into a parameter study

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





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Some applications gridified with P-GRADE 2.5

- Ultra short range weather forecast (MEANDER): **workflow** that integrates 4 meteorological algorithms and one visualizer component
- Road traffic simulation: predict the density of cars on the roads of Manchester. **Workflow** that integrates 4 simulator components
- Minimizing operational cost of factories and logistic service providers (EMMIL): **Parametric workflow** resulting thousands of short running jobs
- Molecular Dynamics Study of Water Penetration (CHARMM): **Parametric workflow** resulting hundreds of long running jobs
- Studying oscillons and magnetic monopole configurations: **Parametric workflow** resulting hundreds of short running jobs



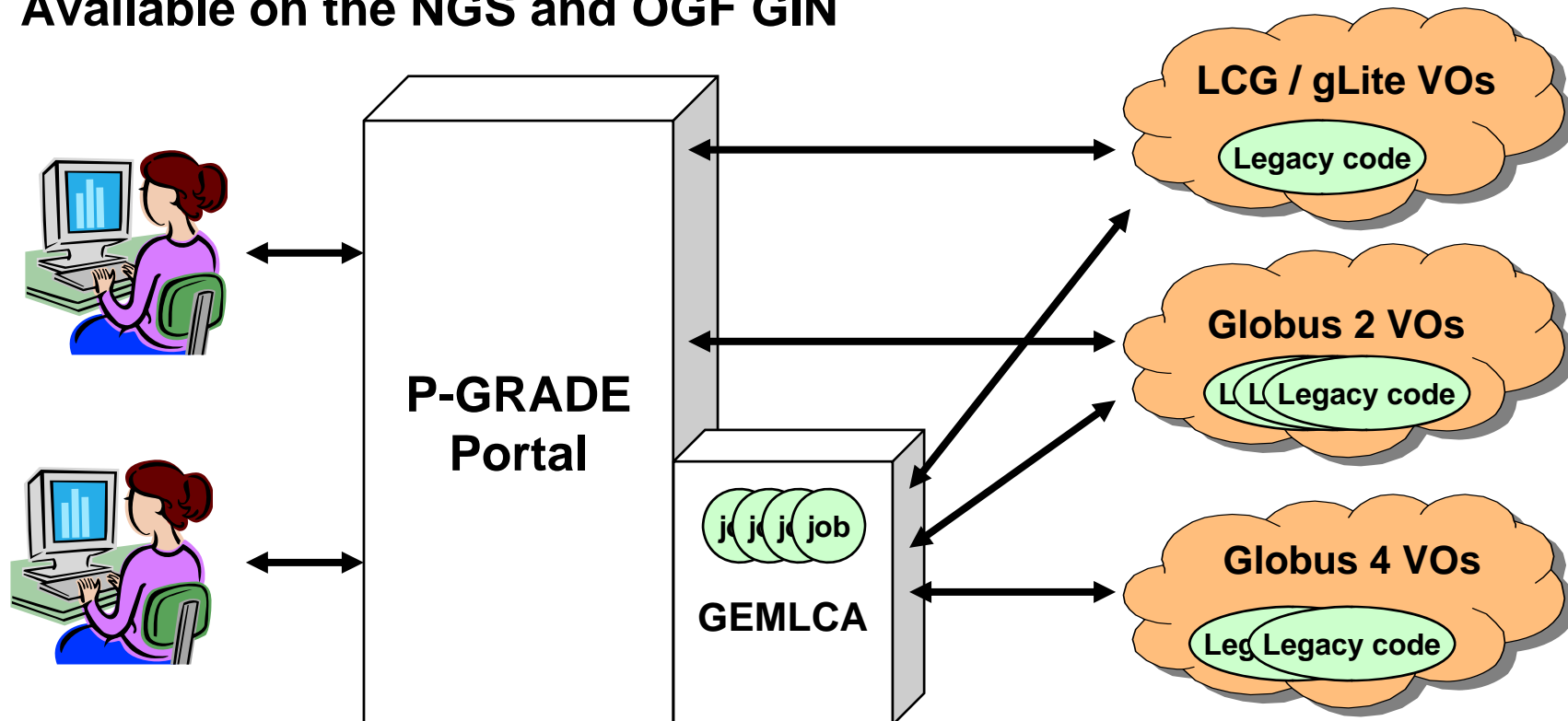
Complete P-GRADE development cycle

- **Develop and test the workflow**
 - Workflow editor, certificate manager, workflow manager, Information system portlets
- **Scale up to a parameter study**
 - Input file generator
 - Output file collector
- **Develop an application specific portlet:**
 - to hide workflow and application logic from real end users: *Separate grid experts from end users*
 - *Developer Alliance Membership is required*
 - *Java and shell script programming experience is required*



GEMMLCA P-GRADE Portal 2.4.1

- P-GRADE Portal extended with GEMMLCA Grid service back-end
 - To share jobs and legacy codes as application components with others
 - A step towards collaborative e-Science
- Developed by the University of Westminster (London)
- Support for Globus 4 grids (besides GT2 and EGEE)
- Available on the NGS and OGF GIN





Application Specific Portals

“Make the grid disappear”

The Rendering Portal

RELEASE 2.5



Rendering

Create a new rendering job by uploading file to be rendered

New rendering job | Manage rendering jobs | Help

Name:

Type:

Start frame:

End frame:

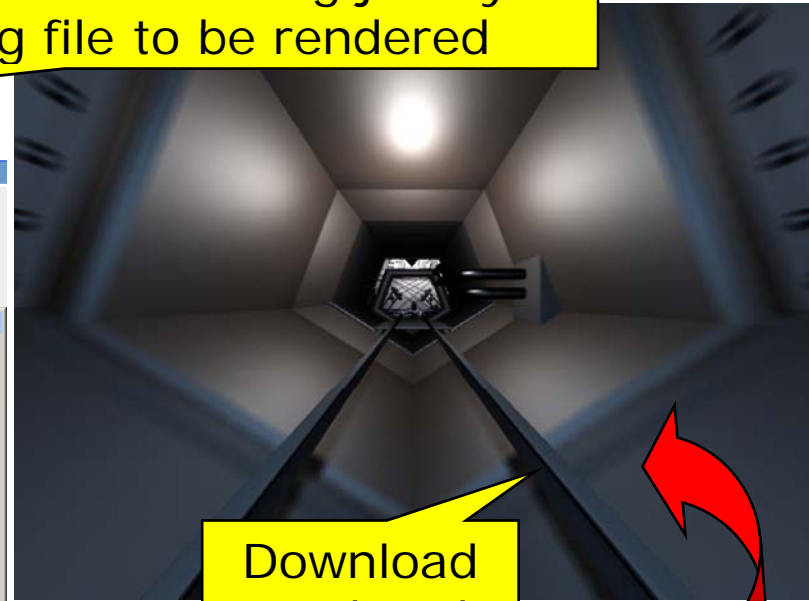
Step size:

Upload file from local pc:

File Upload

Look in: EGEE 07 demo

- ~\$E07 UoW demos
- Document Scrap 'http__mut_cpc_w...'
- EGEE07 UoW demos
- GEMLCA_EGEE2007Conf
- knight.blend
- knight-fast.blend
- longer.blend
- lostride.blend



Download rendered images

Workflow Manager

Workflow list					
Workflow	Status	Size	Quota (100 Mb)	[Output]	[View]
Ball	finished	220 KB	0.22%	<input checked="" type="checkbox"/>	<input type="button" value="Details"/>
Knight	finished	1.17 MB	1.17%	<input checked="" type="checkbox"/>	<input type="button" value="Details"/>
Lostride	finished	11.175 MB	11.18%	<input checked="" type="checkbox"/>	<input type="button" value="Details"/>
Overall used quota:		12.561 MB	12.56%		

Submit workflow



Application Specific Portals

“Make the grid disappear”

Supplier chain portal

Welcome Emmil

Emmil 3.0

Download finished Auction's results

Welcome Emmil

Emmil 3.0

ID

Available Auctions for Suppliers

ID	Auction Adviser	Date/Time	Remaining Time	Number of Bids	Set Sup
0	Buyer_01	Fri Sep 28 13:49:51 CEST 2007	0 weeks, 6 days, 5 hours, 58minutes, 12 seconds	1	

Available Auctions for 2D1

ID	Auction Adviser	Date/Time	Remaining Time

Closed

ID	Auction Adviser	Date/Time

Microsoft Excel -

Product #	Quantity	Unit Price	Value of order	Delivery Variable Cost	Price				
0	25	140.65	3516.26	209.34	3725.59523				
3	70	19.14	1339.54	586.15	1925.689562				
5	50	18.65	932.28	418.68	1350.952805				
7	5	939.68	4698.39	41.87	4740.255005				
8	50	39.15	1957.69	418.68	2376.370132				
1	31	32.49	1007.12	259.58	1266.702419				
3	130	19.14	2487.65	1088.55	3576.20147				
4	100	25.95	2594.84	837.35	3432.187057				
Summ Quantity	461	Container Number	5	Delivery Fix Cost per container	74.63	Delivery Fix Cost	373.14	Price for Supplier 4	22767.09
								TOTAL PRICE	153088.56

Flow Editor - [EMMIL_30_P5] Mode - Edit

Generator GEN

LP_solve SEO

PriceEv... COLL

Parameter study optimization workflow is automatically generated and executed



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Portal installations

- **P-GRADE Portal services:**
 - **SEE-GRID infrastructure**
 - **Central European VO of EGEE**
 - **GILDA: Training VO of EGEE**
 - **Many national Grids (UK National Grid Service, HunGrid, Turkish Grid, etc.)**
 - **US Open Science Grid, TeraGrid**
 - **Economy-Grid, Swiss BioGrid, Bio and Biomed EGEE VOs, BalticGrid**
 - **OGF Grid Interoperability Now (GIN) VO**
- Portal services and account request:
 - portal.p-grade.hu/index.php?m=5&s=0





Support services

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

- Training:
 - Training events, trainer community:
email list: pgrade-training@lpds.sztaki.hu
 - Test portal using GILDA resources
 - Online tutorials
- User forum
- Installation and operational support team

www.lpds.sztaki.hu/gasuc

- Application Development and Porting Support:

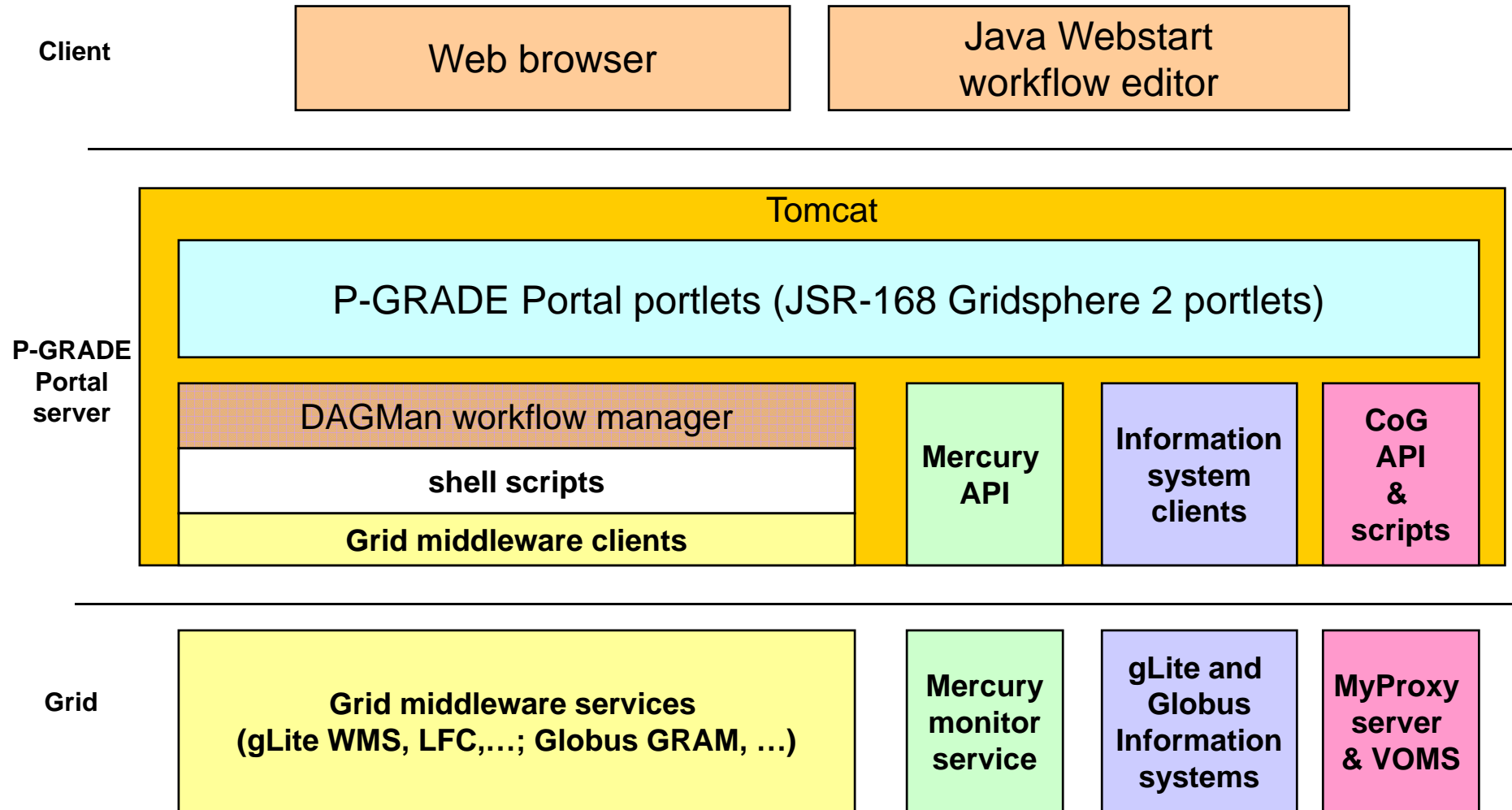


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Implementation overview





Roadmap

From P-GRADE to gUSE

- P-GRADE:
portal interface + high level middleware services
- **gUSE: Grid User Support Environment**
 - ~ **P-GRADE services exposed as Web Services**
 - Scalable
 - Flexible
 - Extendable
 - Autonomous
 - Replaceable
 - **New features**
 - Loops at workflow level
 - If-then-else structures at workflow level
 - Nested workflows, recursive workflows
- Release: 2008 Q1



Summary & conclusions

- **Benefits of being member of the user community**
 - Short learning curve → Swift uptake of grid technology
 - Graphical access → Protection against cmd line and API changes
 - High level, abstract tools → easy to perform complex operations (e.g. file transfer + LFC update)
 - Support services
- **Benefits of being member of the developer community**
 - Customizable to certain user communities
 - Customizable to certain applications
 - Customizable to certain middleware releases
- **Benefits of keeping your eyes on P-GRADE activities**
 - Regular releases with remarkable new features
 - Broadening user community → new applications
 - Broadening developer community



Learn once, use everywhere
Develop once, execute anywhere

Questions?

portal.p-grade.hu
pgportal@lpds.sztaki.hu