



Grid application support by the P-GRADE Portal

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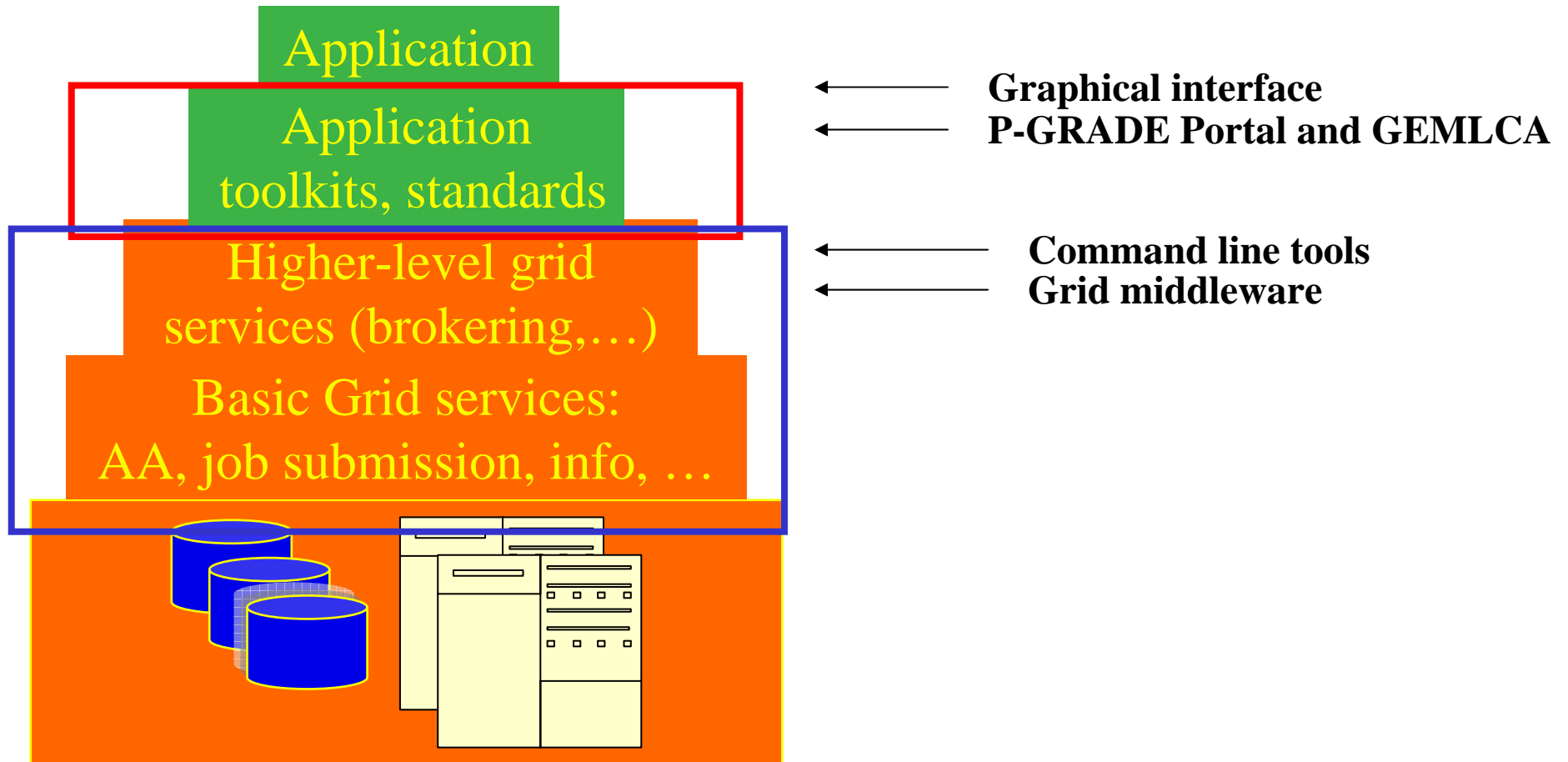


Contents

- Motivation of creating P-GRADE portal
- P-GRADE Portal in a nutshell
- Application development with the Portal
- Application execution with the Portal



Context





Current situation and trends in Grid computing

- 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**), 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
 - Computation services
 - Security services (single sign-on)
 - (Brokers)



E-scientists' concerns



- How to concentrate own **my own research** if the tool I would like to use is in continuous change?
- How can I learn and understand **the usage of the Grid**?
- How can I **develop Grid applications**?
- How can I **execute grid applications**?
- How to **tackle performance issues**?
- How to **use several Grids at the same time**?
- How to **migrate my application** from one grid to another?
- How can I **collaborate with fellow researchers**?

The P-GRADE Grid Portal gives you the answers!



P-GRADE Portal in a nutshell

- **General purpose, workflow-oriented computational Grid portal.** Supports the development and execution of workflow-based Grid applications – **a tool for Grid orchestration**
- **Based on GridSphere-2**
 - Easy to expand with new portlets (e.g. application-specific portlets)
 - Easy to tailor to end-user needs
- **Grid services** supported by the portal:

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

Solves Grid interoperability problem at the workflow level



Related projects

- The development and education of P-GRADE Portal is supported by several projects:

– **SEE-GRID** www.see-grid.eu
Development, application support



– **Coregrid** www.coregrid.net
Research, development



– **EGEE** www.eu-egee.org
LCG and gLite training, application development



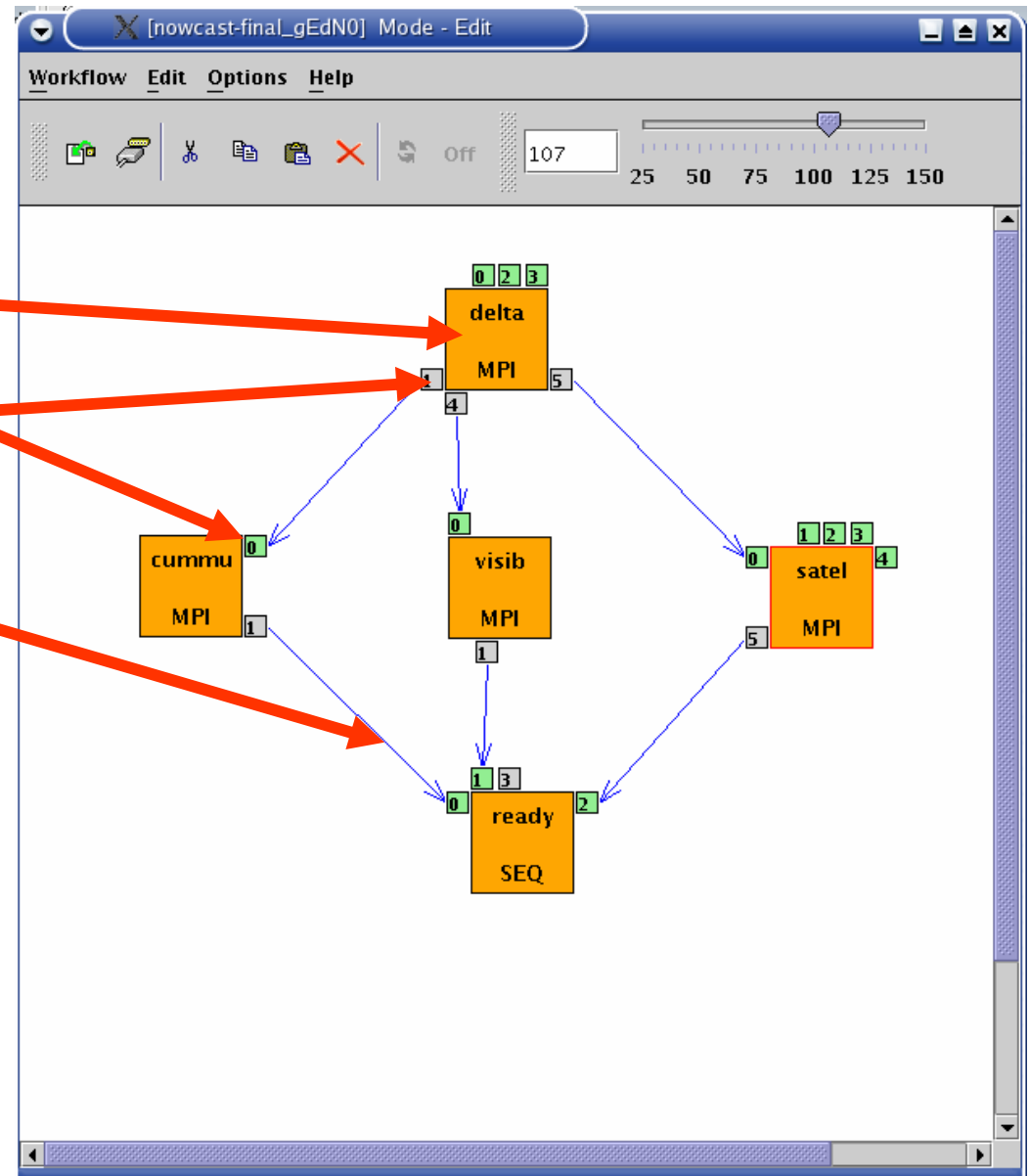
– **ICEAGE** www.iceage-eu.org
Grid training and education





What is a P-GRADE Portal workflow?

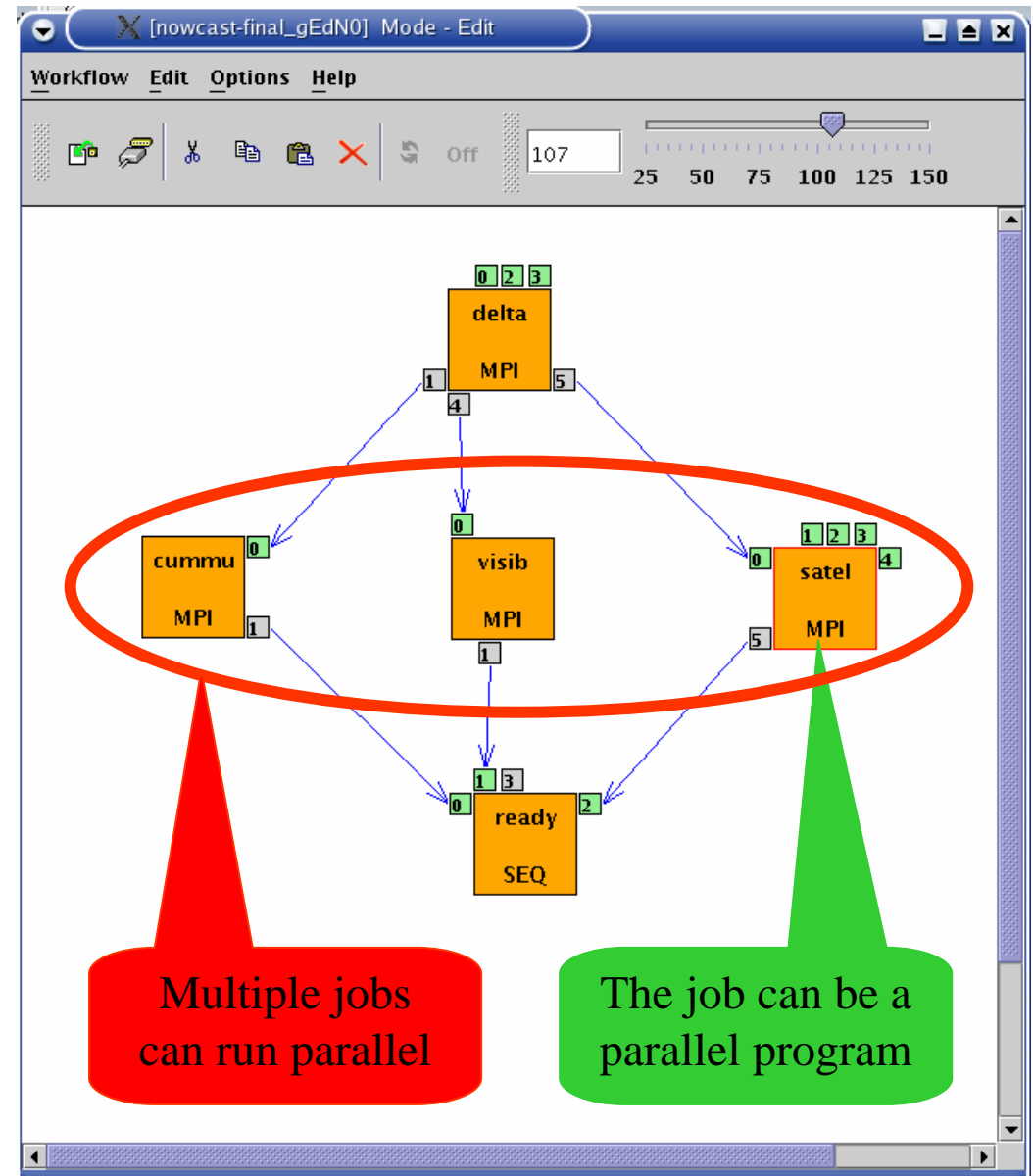
- **a directed acyclic graph where**
 - Nodes represent jobs (batch programs to be executed on a computing element)
 - Ports represent input/output files the jobs expect/produce
 - Arcs represent file transfer operations
- **semantics of the workflow:**
 - A job can be executed if all of its input files are available





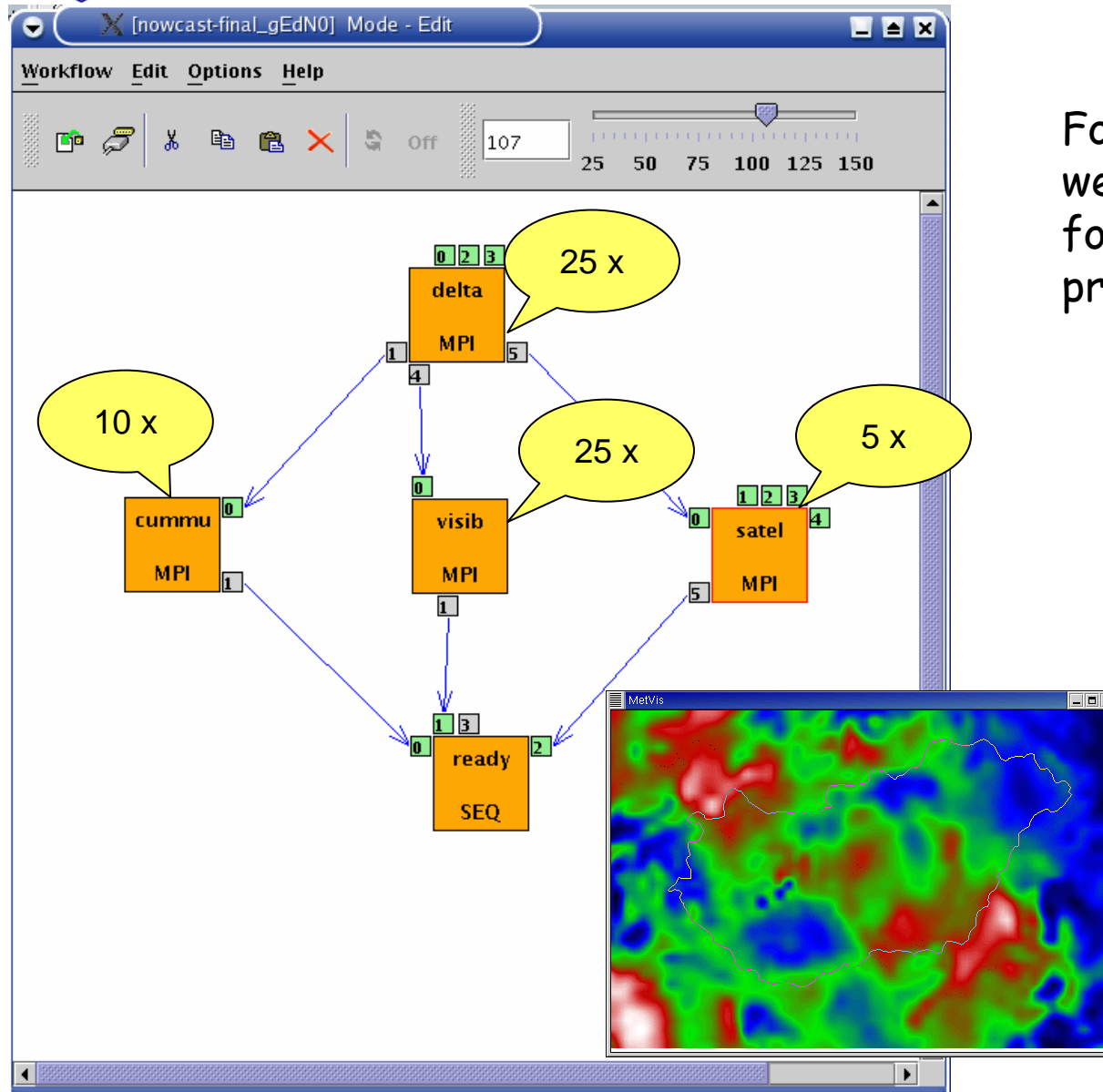
Two levels of parallelism by a workflow

- The workflow concept of the P-GRADE Portal enables the **efficient parallelization of complex problems**
- Semantics of the workflow enables two levels of parallelism:
 - **Parallel execution inside a workflow node**
 - **Parallel execution among workflow nodes**





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

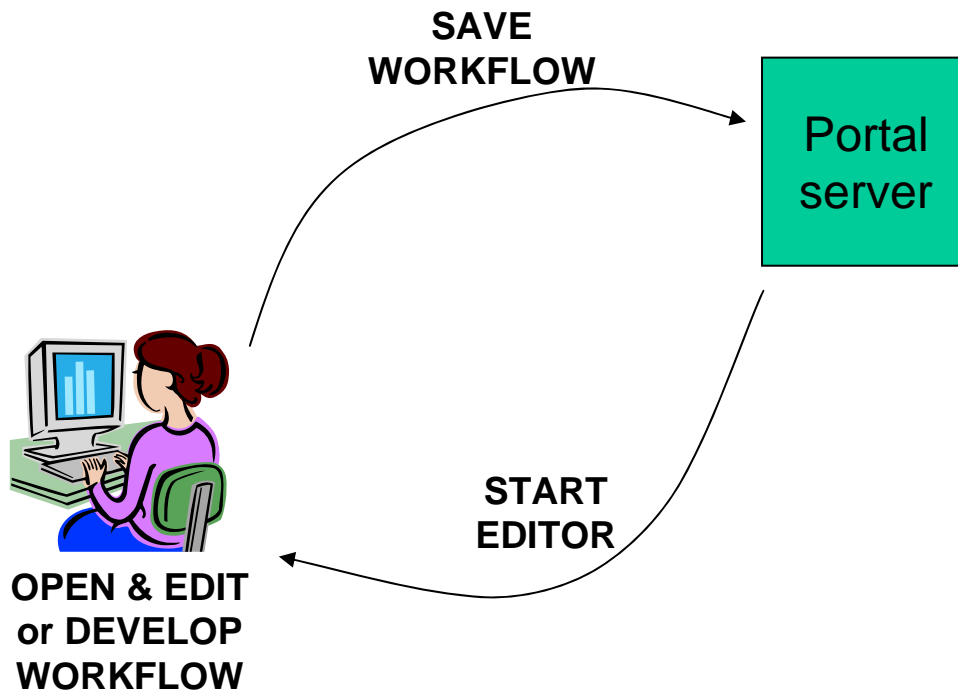
- Requirements:
- Execution time < 10 min
 - High resolution (1km)



The typical user scenario

Part 1 - development phase

Certificate servers

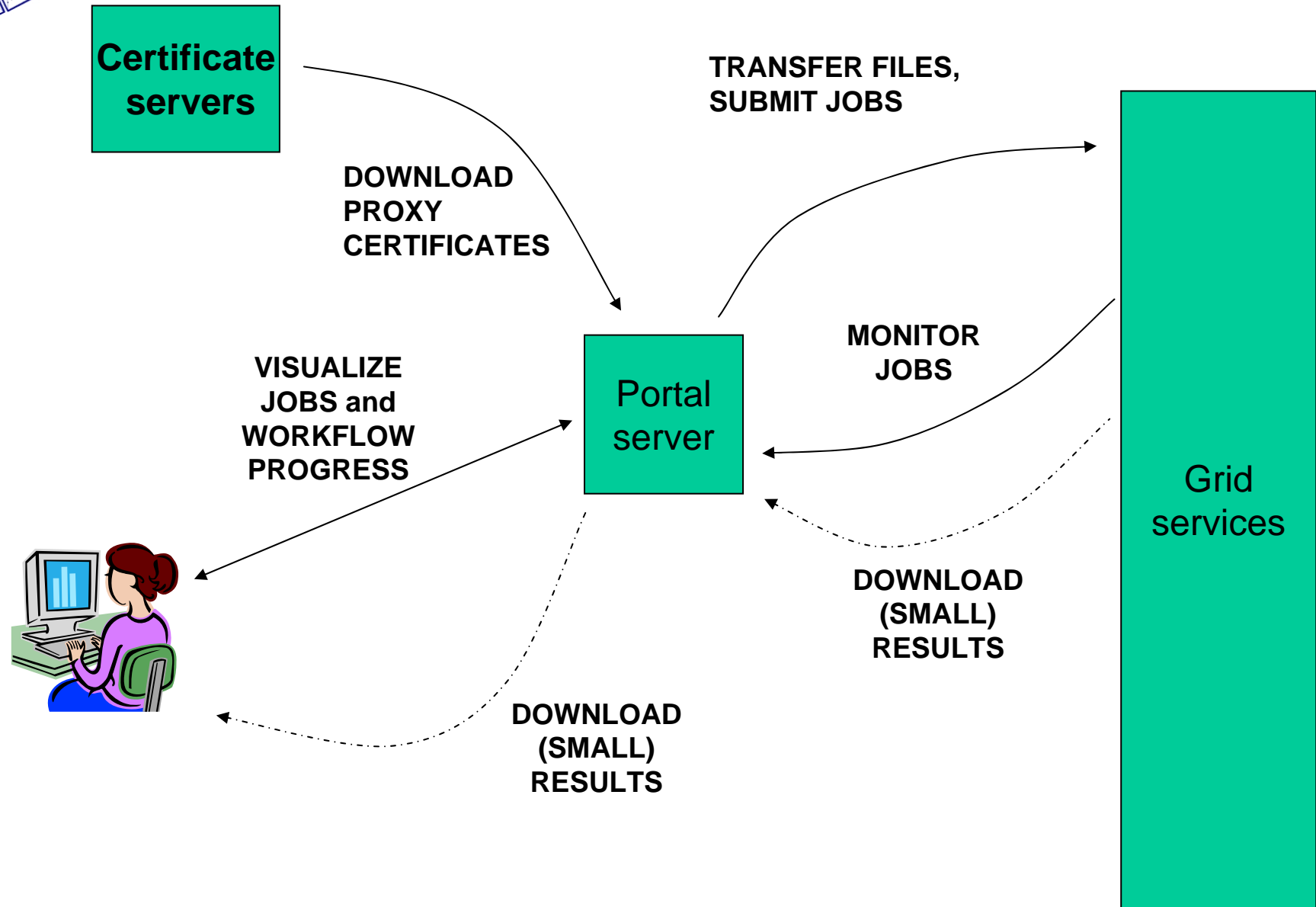


Grid services



The typical user scenario

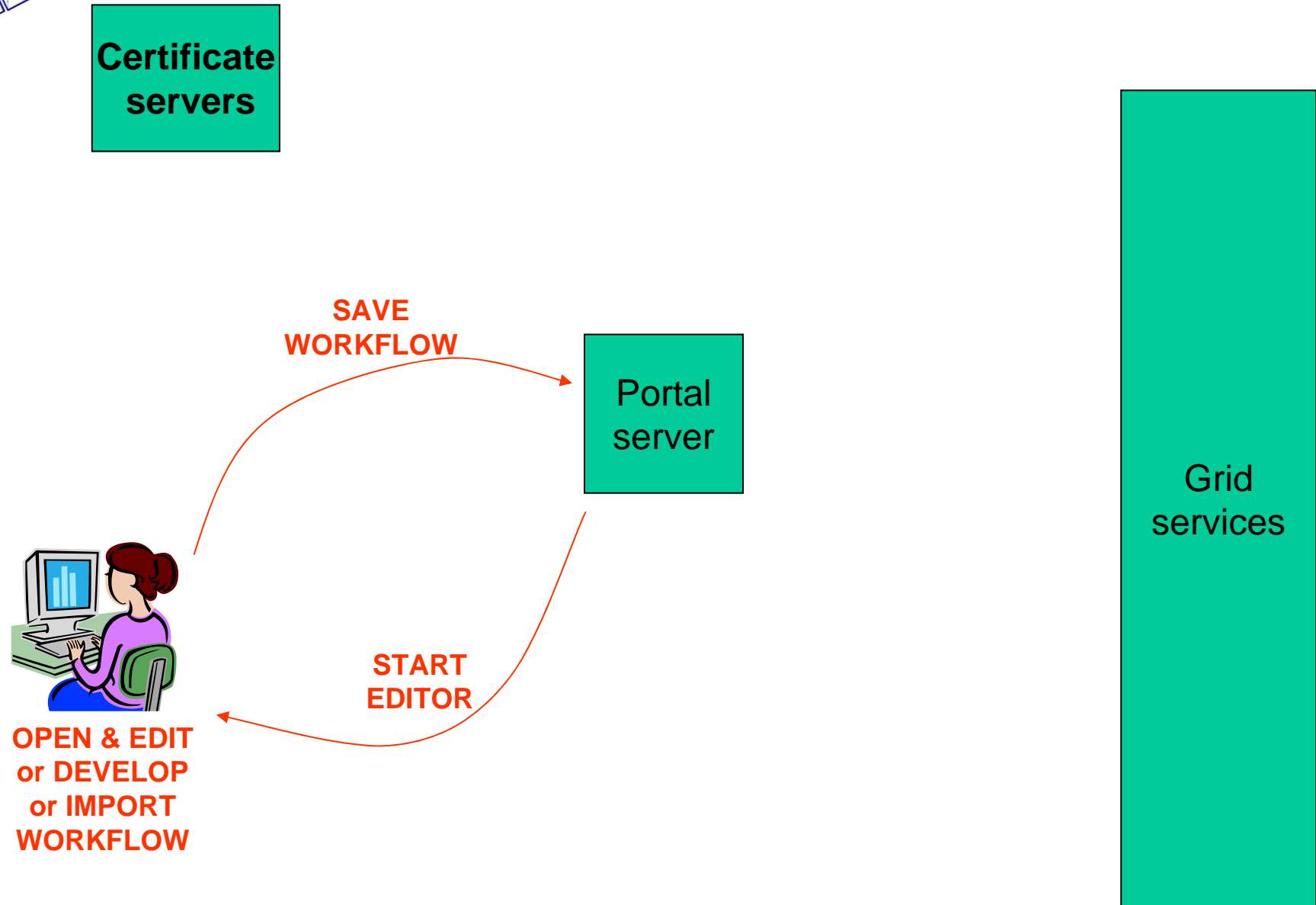
Part 2 - execution phase





The typical user scenario

Development phase:





Workflow development

Opening the workflow editor

The editor is a Java Webstart application



download and installation is only one click!

The screenshot shows a web browser window with the URL `http://hgportal.hp.../kdsphere?action=doSubmitReallyWorkflow&id=2`. The page features the P-Grade logo, a navigation menu, and several logos including the European Union flag, SEE-GRID, and VLA. Below the browser window, a Java Webstart application window titled "Workflow Manager" is displayed. It has a "Workflow Editor" tab and a "Refresh" button. The main content area shows a "Workflow list" table with the following data:

Workflow	Status	Size	Quota (100 Mb)	[Output]	[View]	[Action]
LM_9_DEMO_TOTAL	submitted	26.848 MB	269%	N/A	Details	Abort Attach Delete
		26.848 MB	269%			

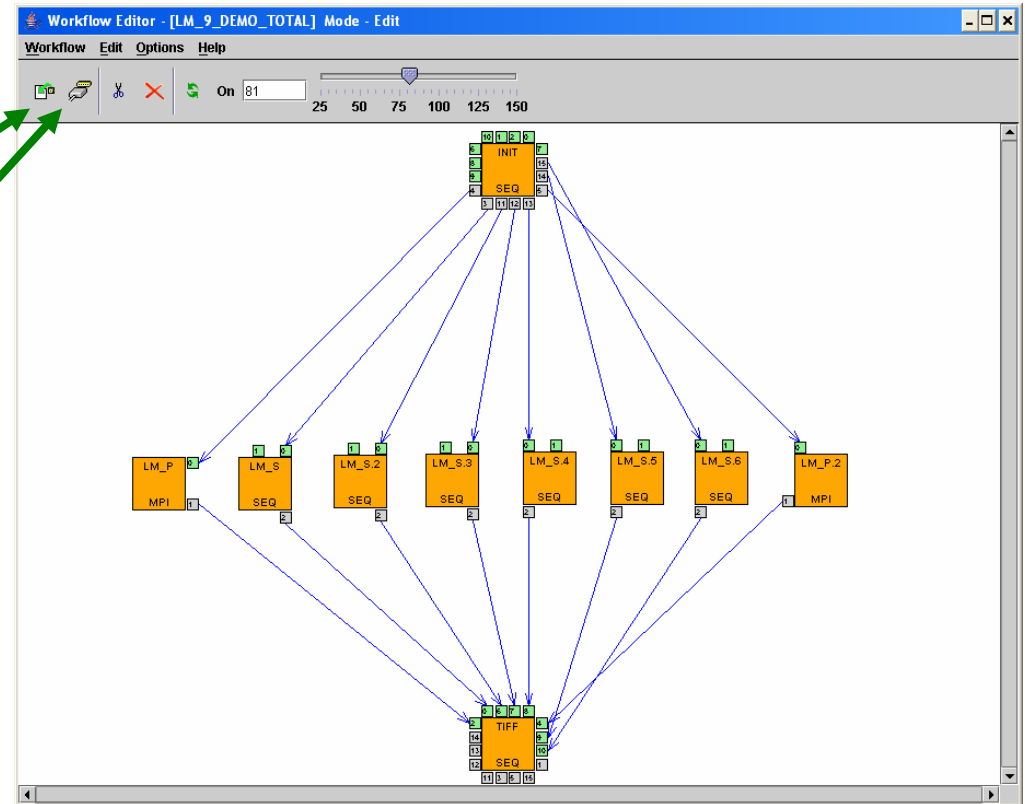
At the bottom of the application window, a message states: "Message: Workflow successfully submitted." A "Delete all" button is also visible at the bottom right of the table area.



Workflow Editor

Defining the graph

- The aim is to define a DAG of batch jobs:
 1. **Drag & drop components:**
jobs and ports
 2. **Define their properties**
 3. **Connect ports by channels**
(no cycles, no loops, no conditions)





Workflow Editor

Properties of a job

Workflow Editor - [LM_9_DEMO_TOTAL] Mode - Edit

Workflow Edit Options Help

LM_P properties

Name: LM_P

Job Type: SEQ MPI PVM

Job Executable: LM_5.bin
File Browser

Instrument

Process Number: 7

Attributes: -n -m

Grid: SEE-GRID

Monitor:

Resource: n40.hpcc.sztaki.hu:jobmanager-fork
ce01.grid.acad.bg:jobmanager-fork
grid-ce.ii.edu.mk:jobmanager-fork
grid1.irb.hr:jobmanager-fork
grid1.netmode.ece.ntua.gr:jobmanager-fork
n40.hpcc.sztaki.hu:jobmanager-fork
prof.salla6.inima.al:jobmanager-fork

Properties of a job:

- Binary executable
- Type of executable
- Number of required processors
- Command line parameters
- The resource to be used for the execution:
 - Grid/VO
 - (Computing element)



Direct resource selection: Which computing element to use?

I still don't know which resource to use!

The information system portlet queries BDII and GIIS servers

PGrade Portal - Microsoft Internet Explorer

http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doCh

Workflow Certificates Settings Information System Help

Grid: SEE-GRID VO: seegrid

Sites

	Computing Element						Storage Element		
	CPU		Job			Space			
	Free	Usage	Running	Waiting	Load	Total	Available	Usage	
	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%
BG02-IM	20	16	20%	1	0	0%	131.775 GB	79.957 GB	39%
BG03-IPP-N	3	3	0%	0	0	0%	566.608 GB	566.376 GB	0%
BG04-ACAD	48	32	33%	2	5	71%	554.647 GB	475.767 GB	14%
HR-01-RBI	60	12	80%	4	0	0%	78.317 GB	6.271 GB	92%
MK-01-UKIM_II	28	28	0%	0	0	0%	69.709 GB	69.075 GB	1%
RO-01-ICI	54	24	56%	5	36	88%	849.666 GB	828.387 GB	3%
ROGRID-NIPNE-01	24	24	0%	0	0	0%	862.807 GB	848.676 GB	2%
SZTAKI	4	4	0%	0	0	0%	4.566 GB	2.871 GB	37%
tubitaklg2	35	28	20%	1	0	0%	1.335 TB	1.335 TB	0%

Kész Internet





Automatic resource selection

1. **Select a broker Grid/VO for the job (e.g. GILDA)**
2. (Describe the ranks & requirements of the job in JDL)
3. The portal will use the broker to find the best resource for the job!



Workflow Editor

Defining broker jobs

A screenshot of the 'BrokerTest properties' dialog box in the Workflow Editor. The dialog has a title bar 'Workflow Editor - [default*] Mode - Edit' and a menu bar with 'Workflow', 'Edit', 'Options', and 'Help'. Below the menu bar is a toolbar with icons for file operations and a slider set to 100. The main area contains several fields: 'Name' (BrokerTest), 'Job Type' (radio buttons for SEQ, MPI, PVM), 'Job Executable' (D:\A-TEST\Cell.exe) with a 'File Browser' button, 'Process Number' (empty), 'Attributes' (empty), 'Grid' (HUNGRID_LCG_2_B...), 'Monitor' (checkbox), 'Resource' (grid151.kfki.hu), and 'JDL:' (JDL Editor... button). 'Ok' and 'Cancel' buttons are at the bottom.

Select a Grid with broker!
(*_BROKER)

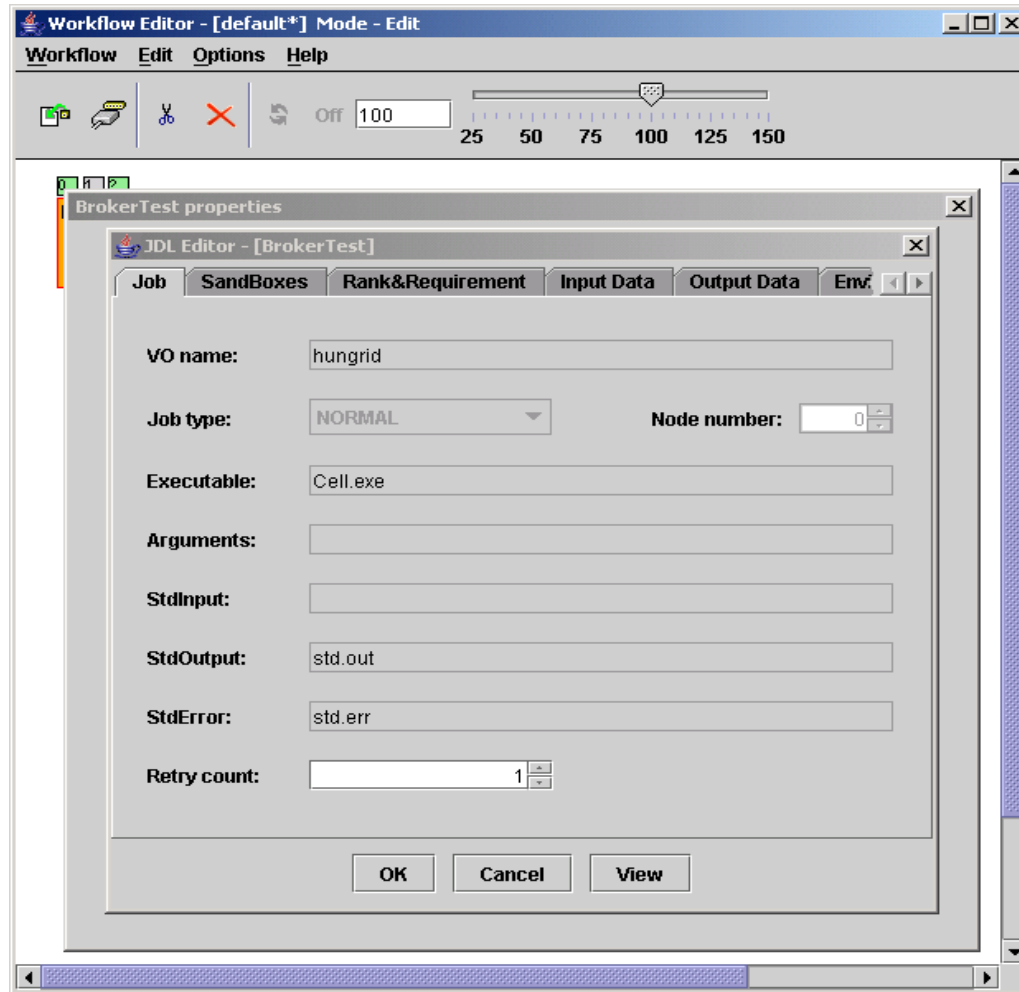
Ignore the resource field!

If default JDL is not sufficient
use the built-in JDL editor!



Workflow Editor

Built-in JDL editor

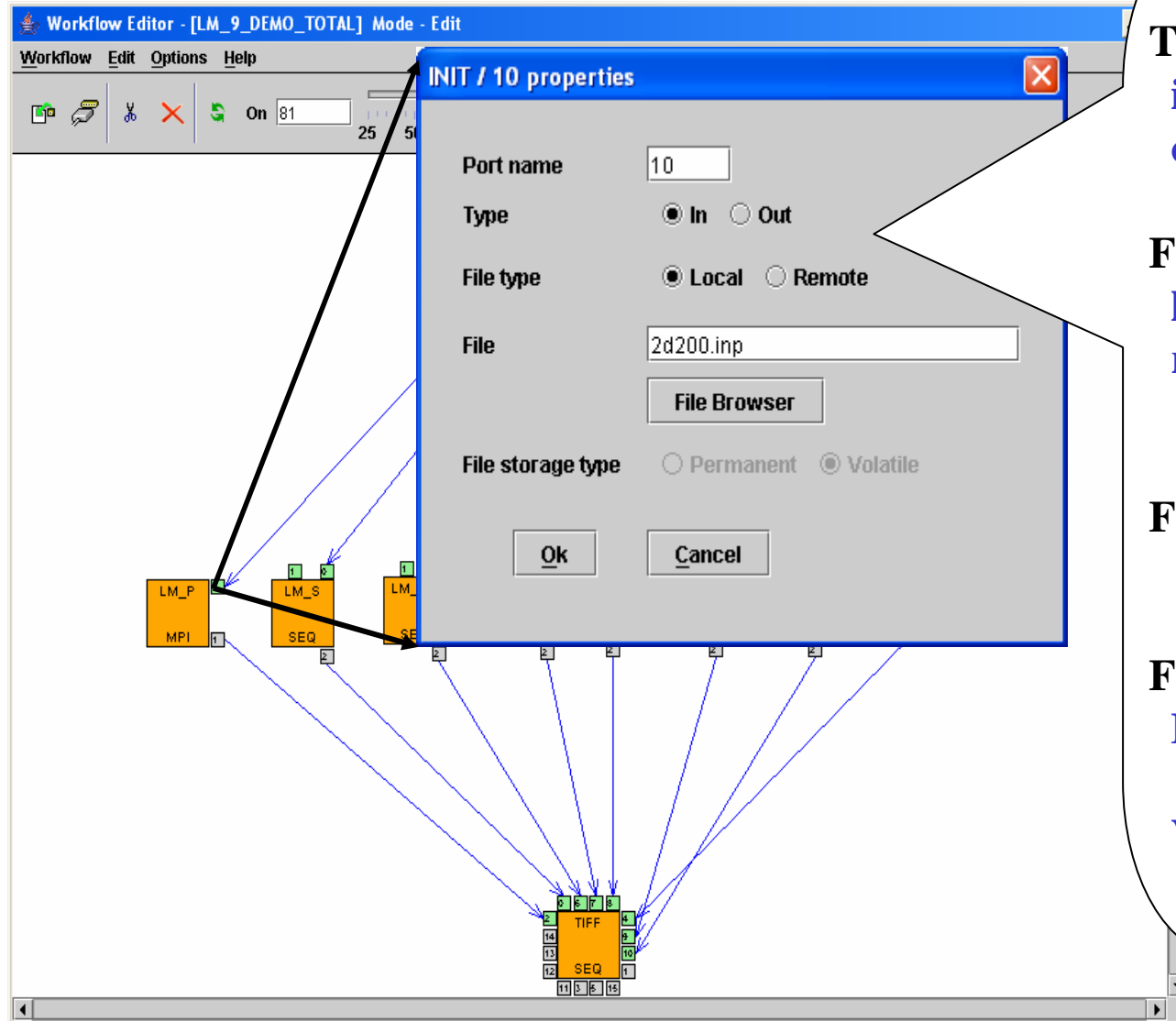


JDL → look at the LCG-2 Users' manual!



Workflow Editor

Defining ports



Type:

input: *the job requires*
output: *the job produces*

File type:

local: *from/to my desktop*
remote: *from/to a storage resource*

File:

location of the file

File storage type:

Permanent: *belongs to the final results of the WF*
Volatile: *used only for inter-job data transfer*



Possible file reference values

Input file

Output file

Local file

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

- Client side location:
`result.dat`

- LFC logical file name
(LFC file catalog is required – eGrid, Hungrid)
`lfn:/grid/egrid/sipos/11-04.dat`

- LFC logical file name
(LFC file catalog is required – eGrid, Hungrid)
`lfn:/grid/egrid/sipos/11-04_-_result.dat`

- GridFTP address (in Globus Grids):
`gsiftp://myhost.com/11-04.dat`

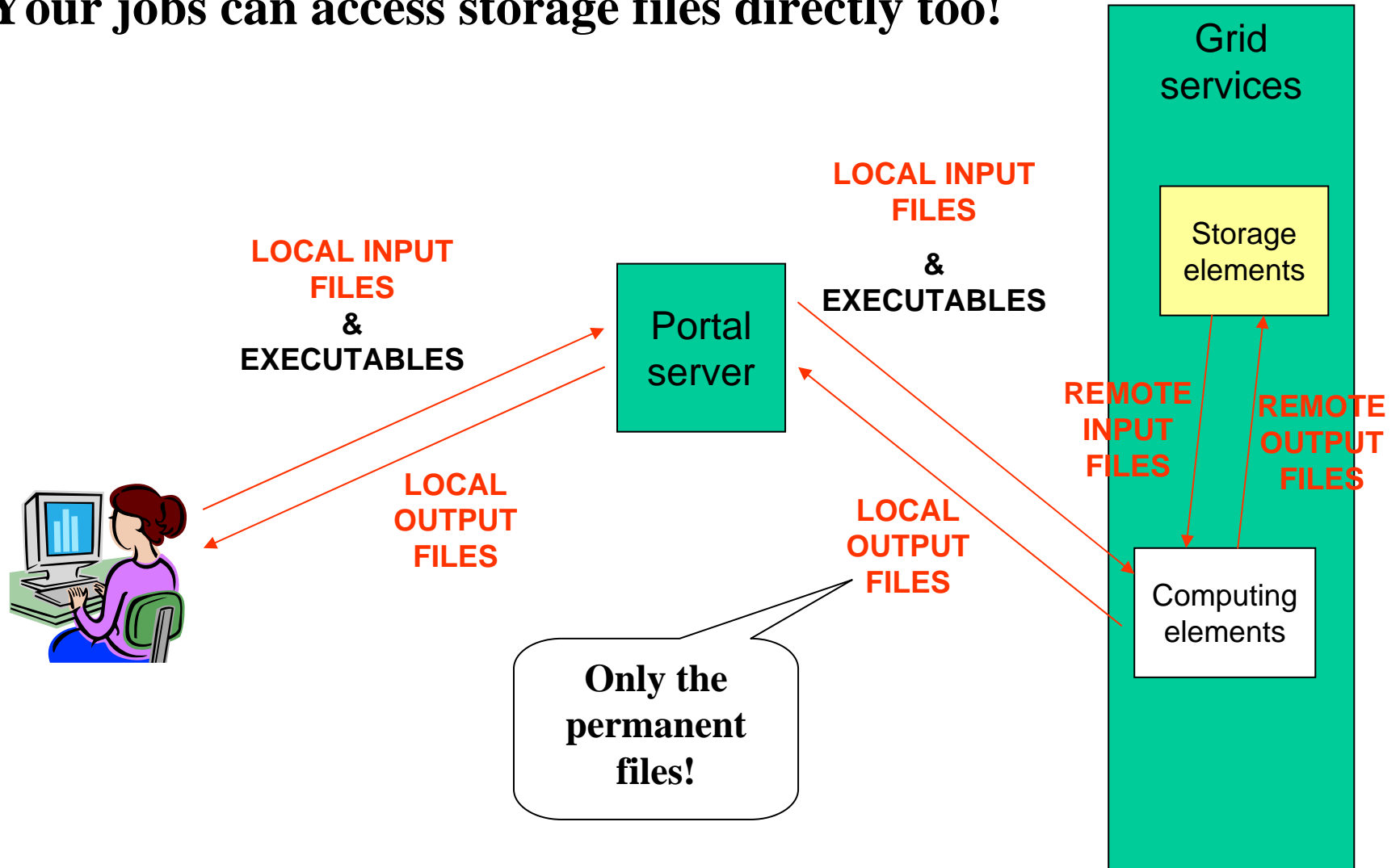
- GridFTP address (in Globus Grids):
`gsiftp://myhost.com/11-04_-_result.dat`

Remote file



Local vs. remote files

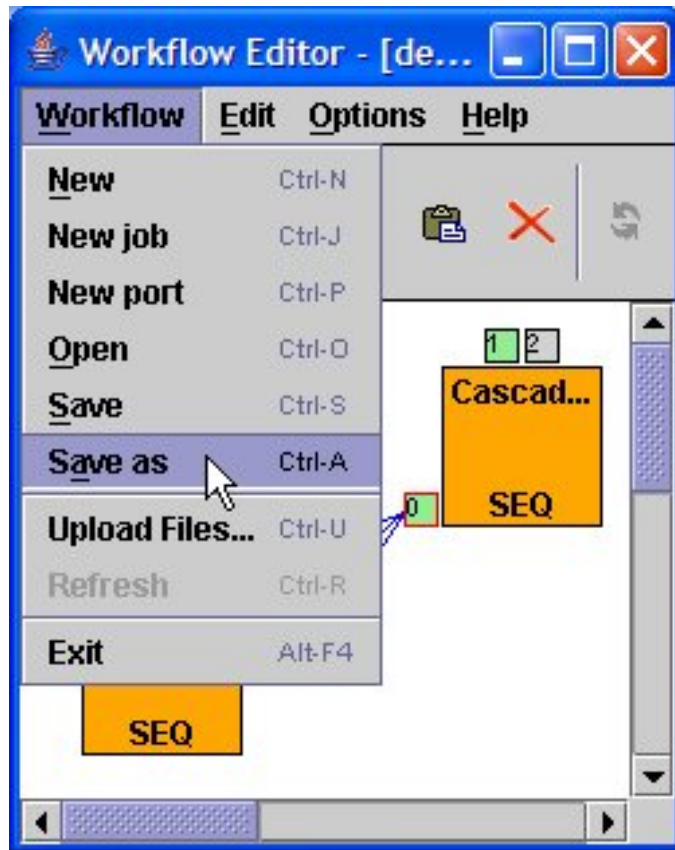
Your jobs can access storage files directly too!





Workflow Editor

Saving the workflow



Workflow is defined!

Let's execute it!



Executing workflows with the P-GRADE Portal

Main steps

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



The typical user scenario

Execution phase – step 1:

Certificate servers

DOWNLOAD
PROXY
CERTIFICATES

Portal server

Grid services





Certificate Manager

Certificates portlet

- To access GSI-based Grids the portal server application needs proxy certificates
- “Certificates” portlet:
 - to upload X.509 certificates into MyProxy servers
 - to download short-term proxy credentials into the portal server application



Certificate Manager

Downloading a proxy

1. MyProxy server access details:

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

2. Proxy parameters:

- Lifetime
- Comment

The screenshot shows a web browser window titled "PGrade Portal - Microsoft Internet Explorer". The address bar contains the URL: `http://hgportal.hpcc.sztaki.hu:7080/gridsphere/gridsphere?action=doGoDownload&cid=5`. The page header features the P-Grade logo and the text "P-GRADE portal". Below the header is a navigation menu with tabs: "Workflow", "Certificates", "Settings", "Information System", and "Help". The main content area is titled "Certificate Manager" and contains a form titled "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!



Certificate Manager

associating the proxy with a grid

Certificate details	
Downloaded from:	cvs.lpds.sztaki.hu
Issued by:	DC=ORG,DC=SEE-GRID,O=People,O=SZTAKI,CN=Jozsef Patvarczki,CN=proxy
Subject:	DC=ORG,DC=SEE-GRID,O=People,O=SZTAKI,CN=Jozsef Patvarczki,CN=proxy,CN=proxy
Timeleft:	99:56:46
Proxy type:	full legacy globus proxy
Strength [bits]:	512
Description:	

Select GRID

Select from the list:

Message: Map proxy for any of the Grids.

This operation displays the **details of the certificate** and the **list of available Grids** (defined by portal administrator)



Certificate Manager

browsing proxies

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

Issuer	Set for Grids	Time left	[Actions]
DC=ORG,DC=SEE-GRID,O=People,O=SZTAKI,CN=Jozsef Patvarczki,CN=proxy	SEE-GRID	99:50:24	Details Set for Grid Delete
C=HU,O=KFKI RMKI CA,OU=SZTAKI,CN=Patvarczki Jozsef,CN=proxy	HUNGRID	99:57:25	Details Set for Grid Delete

SEE-GRID CEs and SEs

HUNGRID CEs and SEs



The typical user scenario

Execution phase - step 2:

Certificate servers

TRANSFER FILES,
SUBMIT JOBS

Portal server

Grid services





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)

PGrade Portal - Microsoft Internet Explorer

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

Workflow Manager

Refresh Back

Workflow	Job	Gridname	Hostname	Status	[Logs]	[Output]	[Visualization]
LM_9_DEMO_TOTAL				submitted	-	N/A	Visualize All Abort
	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	-	-	-

Message: Workflow details successfully displayed.

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



Workflow Execution

(observation by the workflow portlet)

The screenshot shows the P-Grade Portal interface in Microsoft Internet Explorer. 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".

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	-	-	-

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

Job list									
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	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	Out	-	-		
	LM_S.3	SEE-GRID	grid1.netmode.ece.ntua.gr	running	Out	-	-		
	LM_S.4	SEE-GRID	grid1.irb.hr	finished	Out	-	-		
	LM_S.5	SEE-GRID	testbed001.grid.ici.ro	running	Out	-	-		
	LM_S.6	SEE-GRID	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 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.il.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.

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



Workflow Execution

What about data transfers?



The screenshot displays the Workflow Editor interface for a workflow named 'LM_9_DEMO_TOTAL'. The workflow graph shows an initial 'INIT' job followed by a sequence of 'SEQ' jobs (LM_S_1 to LM_S_6) and parallel 'MPI' jobs (LM_P_1 and LM_P_2). The PGrade Portal 'Workflow Manager' window shows the execution status of these jobs across various grid nodes.

Workflow	Job	Gridname	Hostname	Status	Logs	Output	Visualization
LM_9_DEMO_TOTAL	INIT	SEE-GRID	ce01.grid.acad.bg	finished	-	N/A	Visualize All Abort
	LM_P	SEE-GRID	n40.hpc.sztaki.hu	running	Out	-	Visualize
	LM_P_2	SEE-GRID	n40.hpc.sztaki.hu	running	Out	-	Visualize
	LM_S	SEE-GRID	grid-ce.il.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.ic.ro	finished	Out	-	-
	LM_S_6	HUNGRID	chemgrid3.chemres.hu	finished	Out	-	-
	TIFF	HUNGRID	grid109.kiki.hu	init	-	-	-

Message: Job list refreshed.



The typical user scenario

Execution phase – step 3:

Certificate servers



VISUALIZE
JOBS and
WORKFLOW
PROGRESS

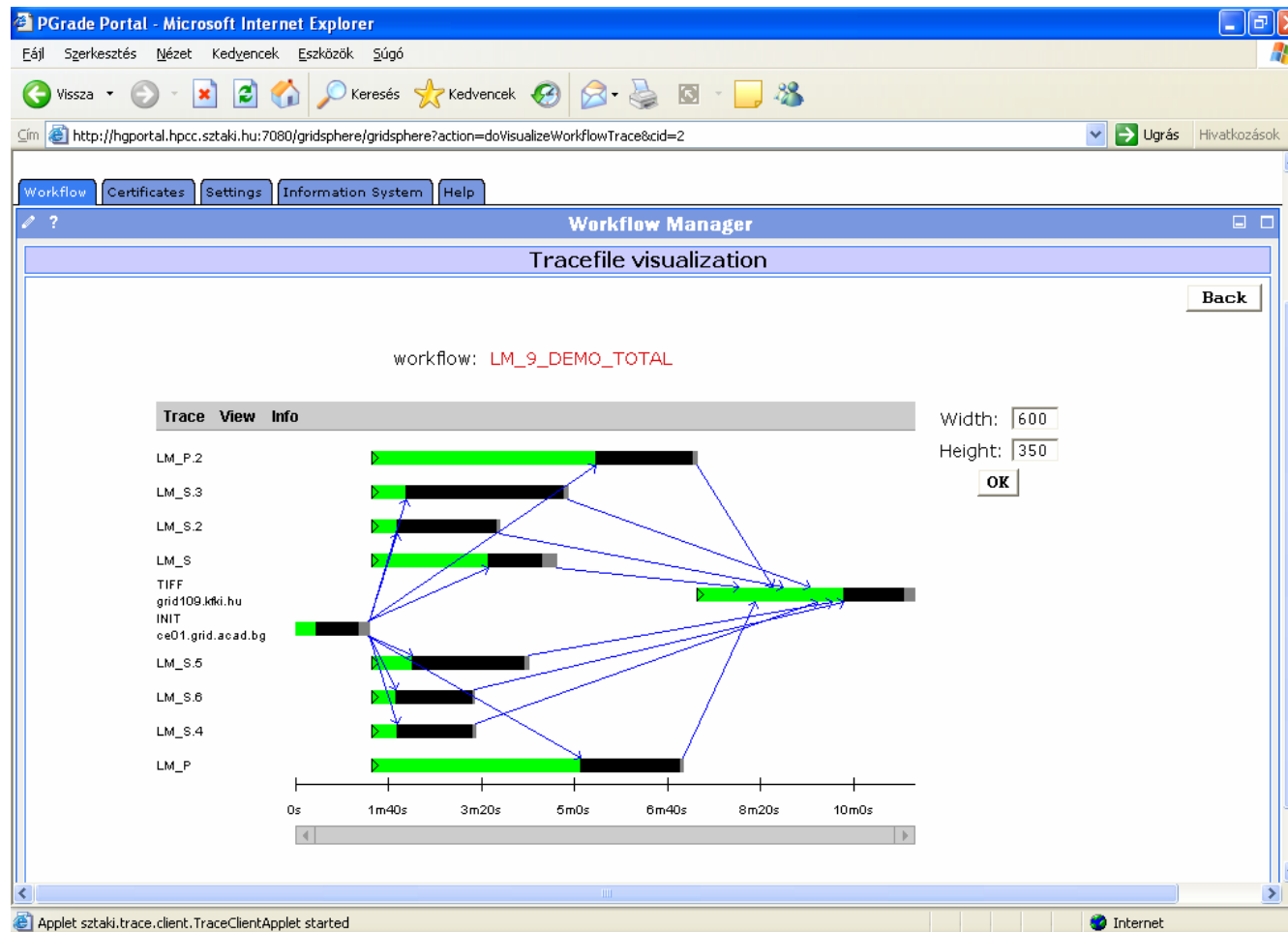
Portal
server

MONITOR
JOBS

Grid
services



On-Line Monitoring both at the workflow and job levels *(workflow portlet)*

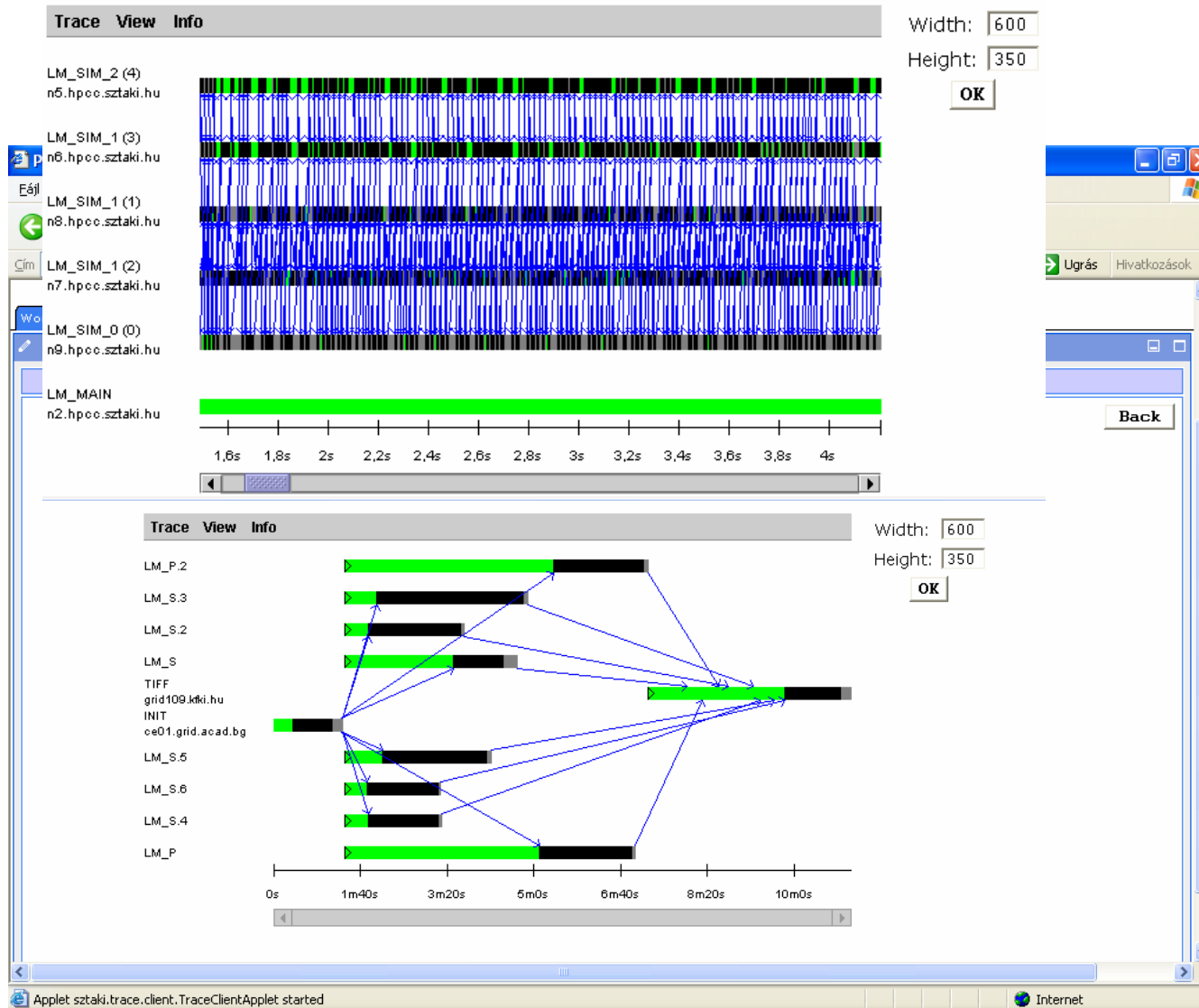


- The portal monitors and visualizes workflow progress



On-Line Monitoring both at the workflow and job levels *(workflow portlet)*

workflow / job: LM_9_DEMO_TOTAL / LM_P



- The portal monitors and visualizes parallel jobs (if they are prepared for Mercury monitor)



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	-	-	Rescue Abort Attach Delete
	Count4	SZTAKI-GRID	n0 .hpc.sztaki.hu	submitted	--	-	-	-

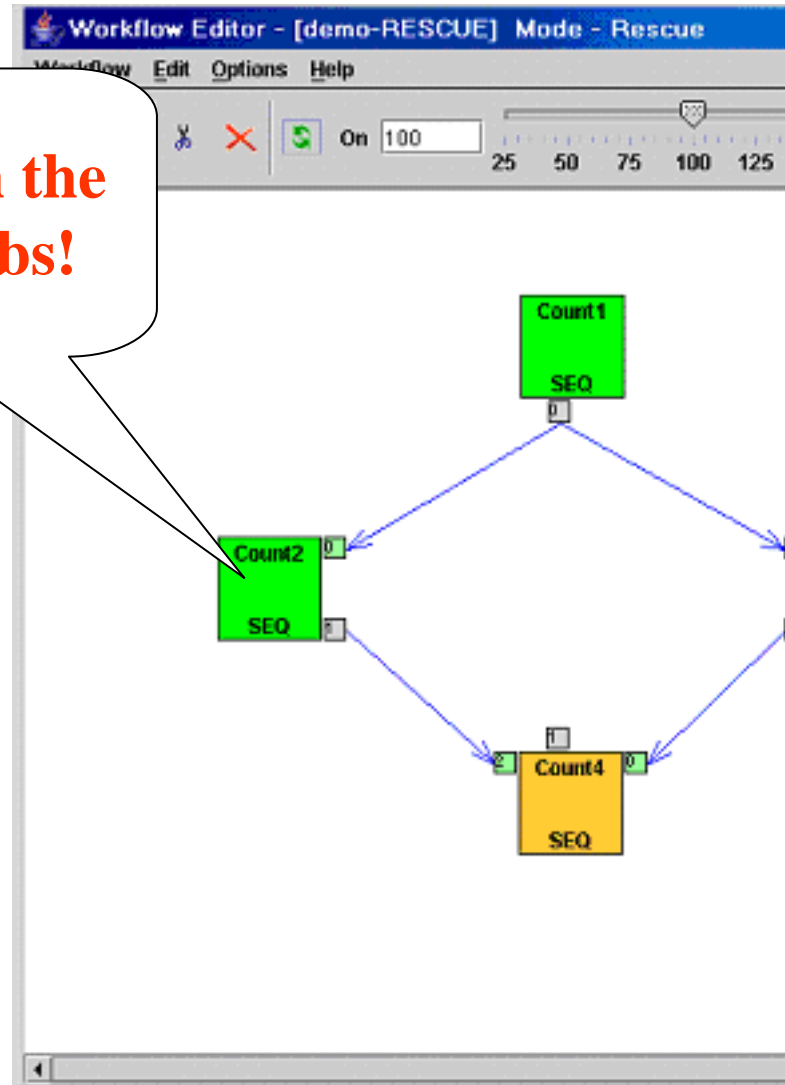
Message: Workflow details successfully displayed.

July 29, 2005



Rescuing a failed workflow 2.

Don't touch the finished jobs!



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

The execution can continue from the point of failure!



The typical user scenario

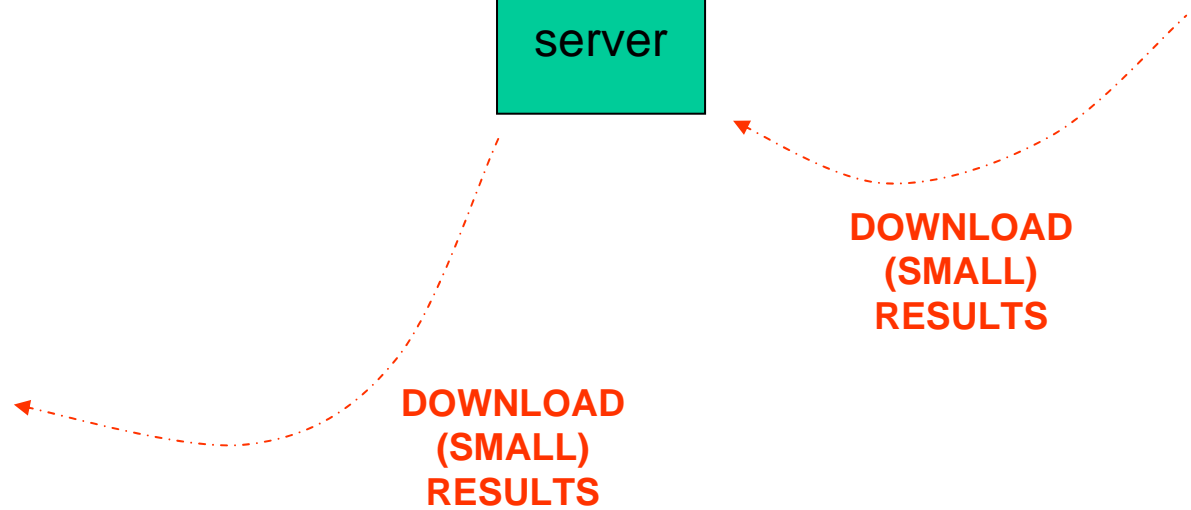
Execution phase – step 5

Certificate servers



Portal server

Grid services





Downloading the results...

The screenshot shows the P-Grade Portal web interface. At the top, there is a navigation menu with 'File', 'Edit', 'View', 'Go', 'Bookmarks', 'Tools', 'Window', and 'Help'. The address bar shows the URL: `http://fn2.hpcc.sztaki.hu:9080/gridsphere/gridsphere?action=doGotoPage&cid=2`. The main content area features the P-Grade logo and the word 'portal' with a downward arrow. A 'Logout' link is visible in the top right. Below the logo, there is a navigation bar with buttons for 'Workflow', 'Credentials', 'Settings', 'Demo', and 'Help'. The 'Workflow Manager' section is active, displaying a 'Job list' table. The table has columns for 'Workflow', 'Job', 'Hostname', 'Status', '[Logs]', '[Output]', '[Visualization]', and '[Action]'. The 'nowcast-final-g_SGE' workflow is expanded, showing a list of jobs: 'cummu', 'delta', 'ready', 'satel', and 'visib', all with a status of 'finished'. A 'Message:' box at the bottom of the workflow manager indicates 'Job list refreshed.'.

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

The screenshot shows a Mozilla dialog box titled "Opening nowcast_final_g.zip". The text inside the dialog reads: "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, there is a question: "What should Mozilla do with this file?". There are four radio button options: "Open it with the default application", "Open it with" (followed by an empty text field 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, there are "OK" and "Cancel" buttons.



Additional features

- **Workflows and traces** can be exported from the portal server onto your client machine
- **Workflows and traces** can be imported into the Portal



- **Share your workflows or results with other researchers!**
- **Migrate your application from one portal into another!**



Workflow/trace export/import

To export a workflow from the portal onto your machine

To delete every unnecessary files of the workflow

To delete trace/output of the workflow (if any)

The screenshot displays the P-Grade Workflow Manager interface. The main content area shows a table of workflows with columns for Name, Size, Trace, and Output. Each row includes 'Download' and 'set init' buttons. The 'Delete' button is visible for the 'WF12Sz' workflow. The interface also features a navigation menu with 'Workflow Manager', 'Storage', and 'Upload' options. The top right corner shows a user login for 'Gabor Hermann' with a 'Logout' link.

Workflow	Size	Trace	Output	Action
WF1	27 276 Byte			Download set init
WF12	77 964 Byte	--		Download set init
WF12Sz	95 528 Byte	--	337 Byte	Download set init Delete



References

- **P-Grade Portal service is available for**
 - **SEE-GRID infrastructure**
 - **Central European VO of EGEE**
 - **GILDA: Training VO of EGEE**
 - **Many national Grids (UK National Grid Service, HunGrid, etc.)**
 - **US Open Science Grid, TeraGrid**
 - **Economy-Grid, Swiss BioGrid, Bio and Biomed EGEE VOs, BioInfoGrid, BalticGrid**
 - **GIN VO**





Parameter study extension of the portal

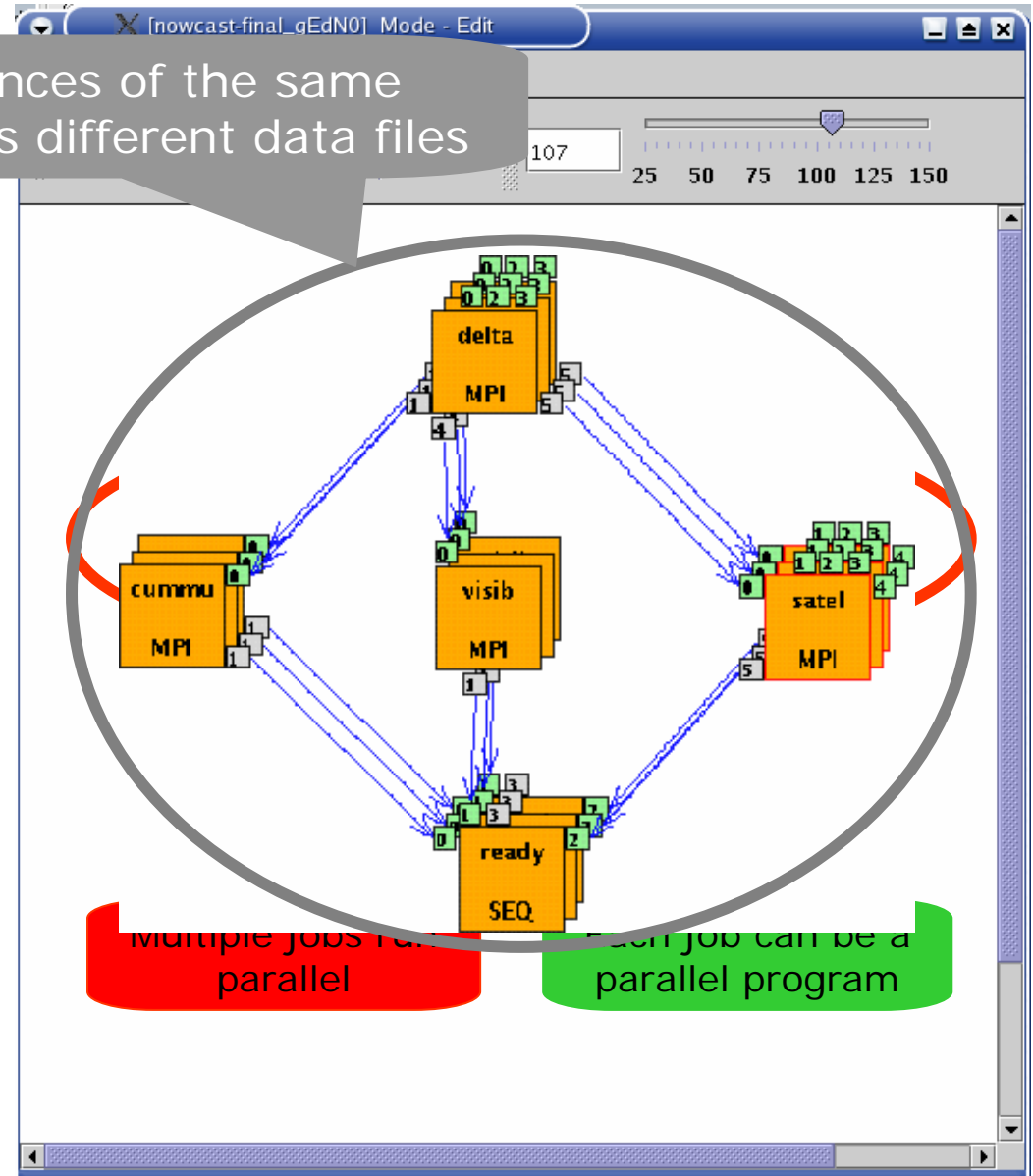
- Users want parameter study (PS) support at workflow level
- It means:
 - If the user has an existing workflow in a repository, he would like to run
 - **the same workflow** (without any change)
 - **with many different parameters**



Introducing three levels of parallelism

Multiple instances of the same workflow process different data files

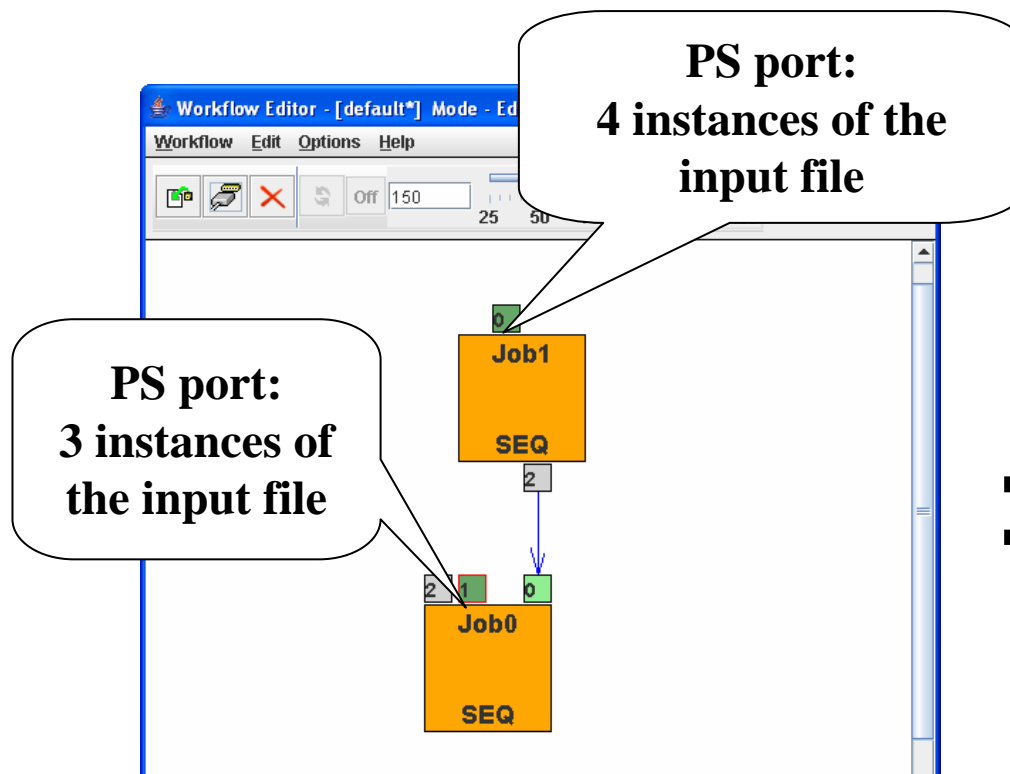
- Parallel execution inside a workflow node (SIMD/MIMD/MISD)
- Parallel execution among workflow nodes (SIMD/MIMD/MISD)
- Parameter study execution of the workflow (SIMD)





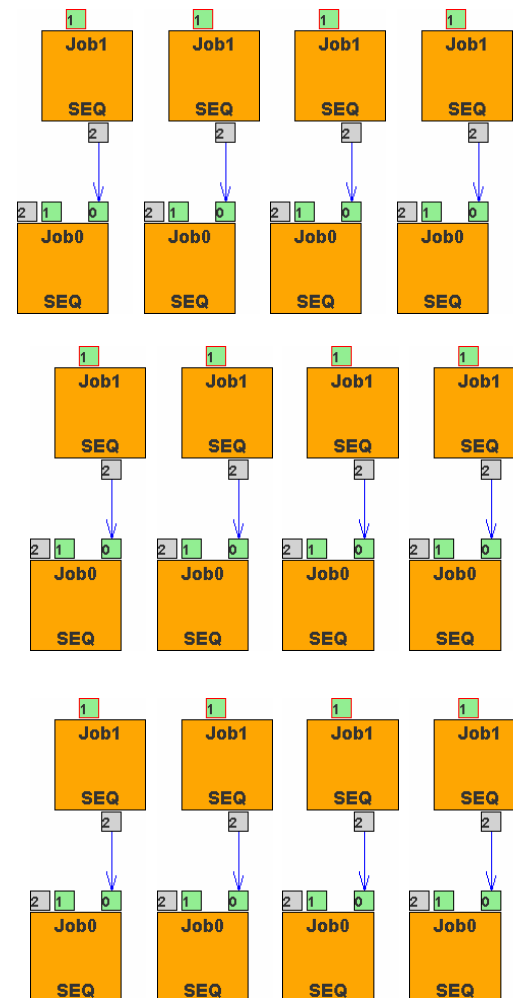
Parameter sweep (PS) workflow execution in P-GRADE portal

1 PS workflow execution



This provides the 3rd level of parallelism resulting a very large demand for Grid resources

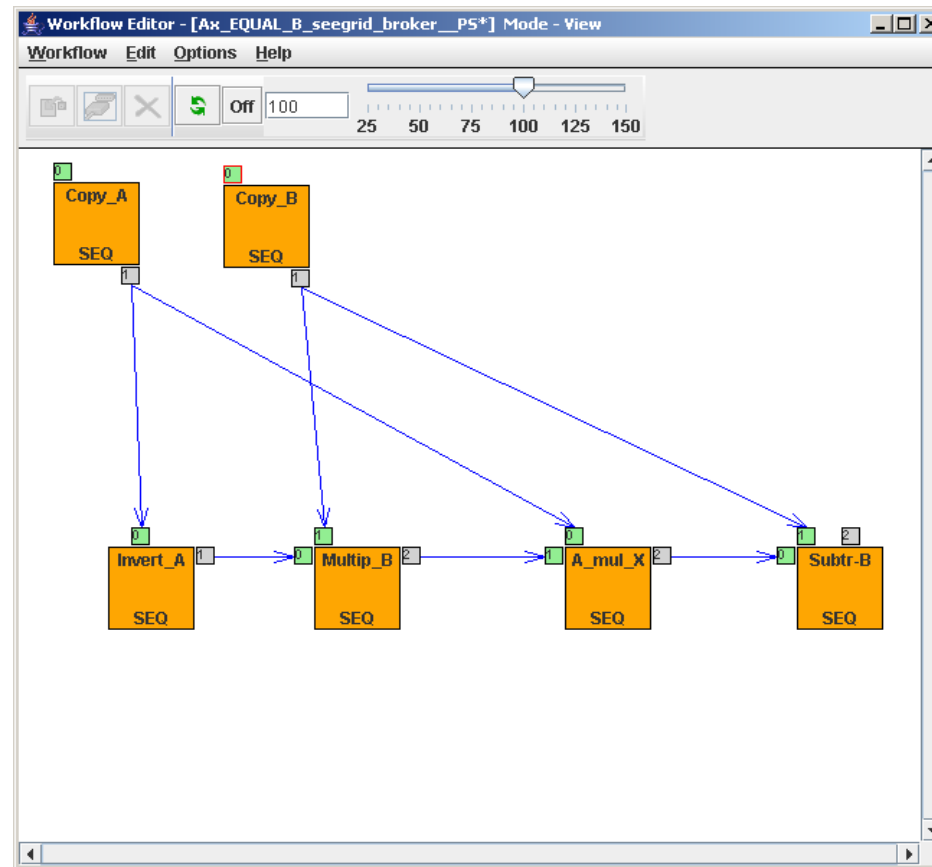
4 x 3 normal workflow execution





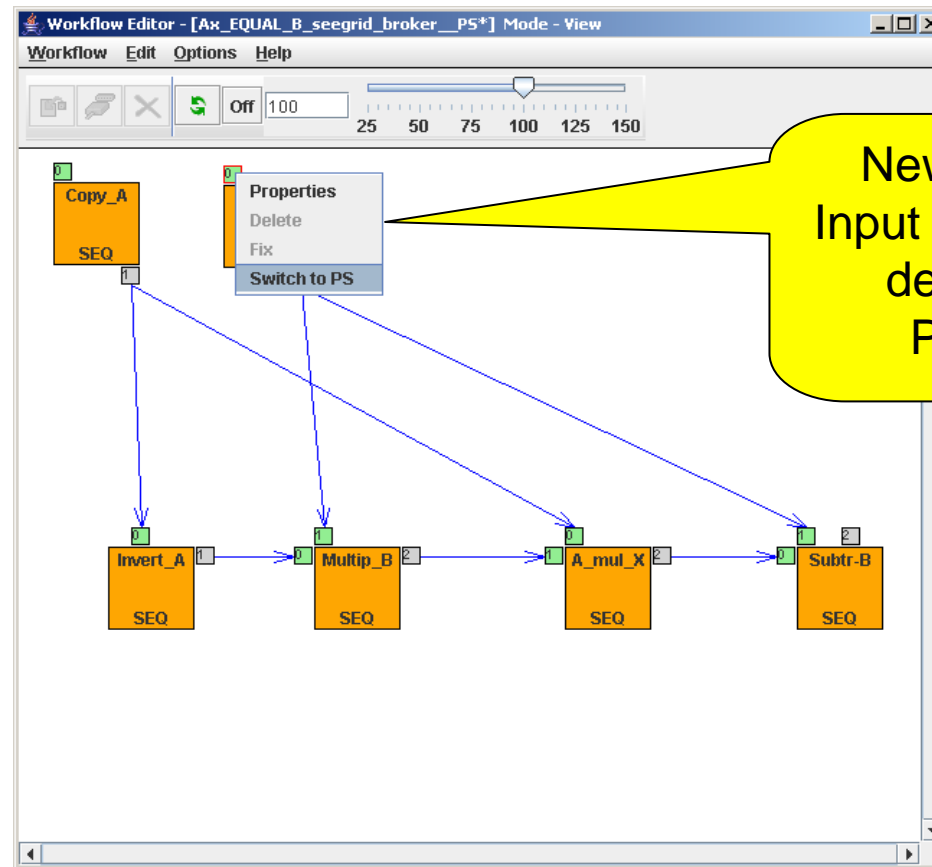
Steps of creating a PS-workflow

1. Start from a tested Workflow





2. Define the PS Port(s)



New feature:
Input Port can be
defined as
PS_port



3. Define Subdirectory of Inputs

The screenshot shows the Workflow Editor interface. The main window title is "Workflow Editor - [Ax_EQUAL_B_seeGRID_broker_PS] Mode - Edit". The menu bar includes "Workflow", "Edit", "Options", and "Help". Below the menu bar is a toolbar with icons for file operations and a slider set to 100. The workflow diagram shows three orange boxes labeled "Copy_A SEQ", "Invert_A SEQ", and "Subtr-B SEQ". A blue arrow points from "Copy_A SEQ" to "Invert_A SEQ". A dialog box titled "Copy_B / 0 PS properties" is open, showing the following fields:

- PS Port name: 0
- Type: In Out
- Directory type: Local Remote
- Directory: /grid/seeGRID/hermann/PS_EQUATION_
- File Browser: managed copy
- Internal File Name: INPUT
- File storage type: Permanent Volatile

Buttons for "Ok" and "Cancel" are at the bottom of the dialog box. A yellow callout bubble points to the "Directory" field with the text: "Subdirectory of a Grid File Catalogue must be defined".



4. Define Subdirectory for the results

The screenshot shows the Workflow Editor interface for a workflow named "Ax_EQUAL_B_seegrid_broker_PS". The main window displays a sequence of steps: Copy_A, Copy_B, Invert_A, Multip_B, A_mul_X, and Subtr-B, all labeled as "SEQ". A "PS Properties" dialog box is open, showing the "Output Directory" set to "/grid/seegrid/hermann/PS_EQUATION_OUTP" and the "Grid" set to "seegrid_LCG_2_BROKER". The dialog box has "OK" and "Cancel" buttons. The workflow steps are connected by arrows, and a blue arrow points from the "Copy_A" step to the "PS Properties" dialog box.



5. PS Workflow ready to Submit

Workflow Manager

Workflow Editor Refresh

Workflow	Status	Size	Quota (100 Mb)	[Output]	[View]	[Action]
Ax_EQUAL_B_seegrid_broker_PS	init	135 KB	0.13%	N/A	PS Details	Submit Attach Delete

Done



Progress of submissions in PS detailed view

PGrade Grid portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://n43.hpcc.szaki.hu:8080/gridsphere/gridsphere?cid=7: Go

Getting Started Latest Headlines

Refresh Back

PS workflow details of 'Ax_EQUAL_B_seeGRID_broker__PS'

Statistics						Logs
Total	Init	Submitted	Rescue	Error	Finished	-
6	2	4	0	0	0	

eWorkflow list

Workflow	Status	[Output]	[View]	[Action]
Ax_EQUAL_B_seeGRID_broker__PS.1	submitted	N/A	Details	Abort
Ax_EQUAL_B_seeGRID_broker__PS.2	submitted	N/A	Details	Abort
Ax_EQUAL_B_seeGRID_broker__PS.3	submitted	N/A	Details	Abort
Ax_EQUAL_B_seeGRID_broker__PS.4	submitted	N/A	Details	Abort
Ax_EQUAL_B_seeGRID_broker__PS.5	init	N/A	Details	Abort

Message: The list refreshed.

Done

Total = Init + Submitted + Rescue + Error + Finished



Conclusions: E-scientists' concerns are resolved!

- The P-GRADE Portal hides the complexity and differences of Grids
 - **Globus X – LCG2 – gLite Grid interoperability at the workflow level**
 - **Switching between Grid technologies will be transparent to the end-user**
 - Various components can be integrated into large Grid applications
 - Sequential codes
 - MPI codes
 - Legacy codes (with the GEMMLCA-specific P-GRADE Portal)
- **You code does not have to include grid specific commands**
- Graphical tools for application development, execution and monitoring
- **Support for collaborative team work**
 - **Sharing workflows**
 - **Sharing jobs (components)**
- Built by standard portlet API → customizable to specific application areas, user groups



How to learn the P-GRADE portal?

- Take a look at www.lpds.sztaki.hu/pgportal
(*manuals, slide shows, installation procedure, etc.*)
- **Visit or request a training event!** (event list also on homepage)
 - Lectures, demos, hands-on tutorials, application development support
- **Get an account for one of its production installations:**
 - VOCE portal - SZTAKI
 - SEEGRID portal – SZTAKI
 - GILDA portal – SZTAKI
 - NGS portal – University of Westminster
- **If you are the administrator of a Grid/VO then contact SZTAKI to get your own P-GRADE Portal!**
- **If you know the administrator of a P-GRADE Portal you can ask him/her to give access to your Grid through his/her portal installation! (Multi-Grid portal)**



Learn once, use everywhere
Develop once, execute anywhere

Thank you!

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