



P-GRADE Portal tutorial

Gergely Sipos
sipos@sztaki.hu

MTA SZTAKI

www.portal.p-grade.hu

pgportal@lpds.sztaki.hu



Agenda

- Basics of P-GRADE Portal (~45 minute)
- Workflow hands-on (~45 minute)
- Advanced applications with P-GRADE Portal (~15 minute)
- Hands-on cont'd – workflows, parameter studies (~20 minute)
- Next steps with P-GRADE (~10 minute)



P-GRADE overview and introduction: workflows & parameter sweeps (Basics)



Introduction of LPDS

(Lab of Parallel and Distr. Systems)

- **Research division of MTA SZTAKI from 1998**
- **Head: Peter Kacsuk, Prof.**
 - 22 research fellows
- **Foundation member**
 - Central European Grid Consortium (2003)
 - Hungarian Grid Competence Center (2003)
- **Participant or coordinator in many European and national Grid research, infrastructure, and educational projects (from 2000)**
 - FP5: GridLab, DataGrid
 - FP6: EGEE I-II, SEE-GRID I-II, CoreGrid, ICEAGE, CancerGrid
 - FP7: EGEE III, SEE-GRID-SCI, EDGeS (coordinator), ETICS, S-CUBE
- **Central European Grid Training Center in EGEE (from 2004)**

www.lpds.sztaki.hu

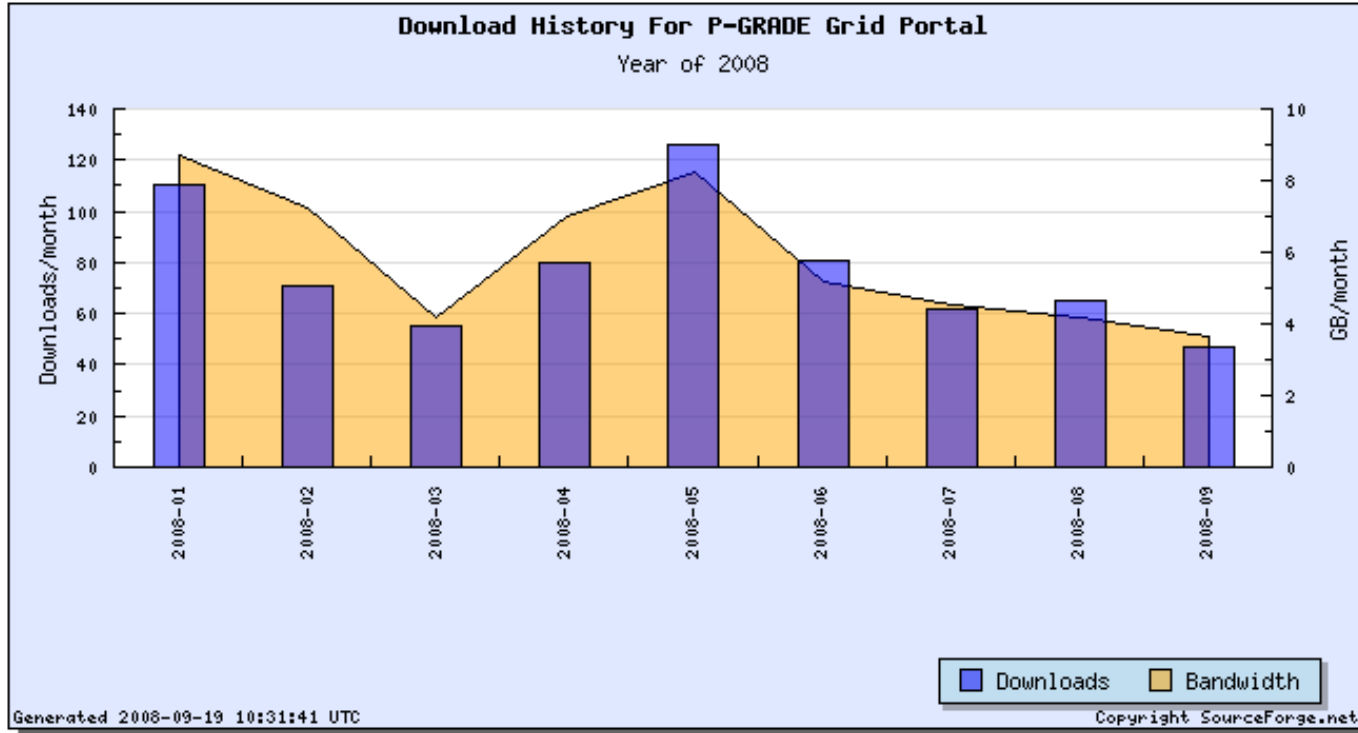


Short History of P-GRADE portal

- **P**arallel **G**rid **A**pplication and **D**evelopment **E**nvironment
- Initial development started in the Hungarian SuperComputing Grid project in 2003
- It has been continuously developed since 2003
- Detailed information:
<http://www.portal.p-grade.hu/>
- Open Source community development since January 2008:
<https://sourceforge.net/projects/pgportal/>



Download of OSS P-GRADE portal



**110 downloads
within the first
month**

**~697 total
downloads until
now**



Main P-GRADE related projects

- **EU SEE-GRID-1** (2004-2006)
 - Integration with LCG-2 and gLite
- **EU SEE-GRID-2** (2006-2008)
 - Parameter sweep extension
- **EU CoreGrid** (2005-2008)
 - To solve grid interoperation for job submission
 - To solve grid interoperation for data handling: SRB, OGSA-DAI
- **GGF GIN** (2006)
 - Providing the GIN Resource Testing portal
- **EGEE 2,3** (2006-2010)
 - Respect program tool used for training and application development
- **ICEAGE** (2006-2008)
 - P-GRADE portal is used for training as official portal of the GILDA training infrastructure
- **EU EDGeS** (2008-2009)
 - Transparent access to any EGEE and Desktop Grid systems
 - **See Demo Booth 5: EDGes – Desktop Grid Extension of the EGEE Infrastructure**

Portal installations

Portals under installation

- Documents
- Publications
- Download

For grid users

- Client requirements
- Try the Portal
- How to get access
- Trainings
- Workflow repository
- User Forum

For grid administrators

- Install the portal
- Testing the portal

For grid system developers

- Developer Alliance
- Contributing to the software

Report Problems

visitors >> 69953

Name of the portal installation	Connected to the following grid(s)	Release
Multi-Grid portal operated by SZTAKI	SEE-GRID South-Eastern European Grid VOCE Virtual Organization Central Europe of EGEE HunGrid Hungarian Grid VO of EGEE GILDA Training VO of EGEE and other projects Biomed Biomedical VO of EGEE Compchem Computational Chemistry VO of EGEE	2.7
HunGrid Portal operated by Eötvös Loránd University	HunGrid Hungarian Grid VO of EGEE	2.5
Grid-Ireland Portal operated by Grid-Ireland	Grid-Ireland	2.6.1
EGRID Portal operated by Abdus Salam ICTP	EGRID Economics VO	2.4
WPI Portal operated by Worcester Polytechnic Institute	OSG and SEE-GRID Open Science Grid and South Eastern European Grid	2.5
Turkish Grid Portal operated by ULAKBIM & METU	TR-Grid Turkish Grid	2.6
NGS P-GRADE GEMLCA Portal operated by University of Westminster	NGS and GILDA UK National Grid Service and Training VO of EGEE and other projects	GEMLCA 2.4.1
GIN resource testing Portal operated by University of Westminster	OGF GIN VO and NGS and OSG and TeraGrid and Westfocus Grid and Voce	GEMLCA 2.4
Baltic Grid Portal operated by Estonian Educational and Research Network (EENet)	Baltic Grid Baltic Grid	2.6



Multi-Grid service portal

To be used today!

PGrade Grid portal - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address <https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=99> Go Links >>

Welcome Workflow Certificates **Settings** Information System File Management Help

Settings

GRID configurations

Name	Information System			BaseDn	[Actions]
	Type	Host	Port		
compchem	LCG2	bdii.phy.bg.ac.yu	2170	Mds-vo-name=local,o=grid	Resources
compchem_GLITE_BROKER			N/A		Resources
compchem_LCG_2_BROKER			N/A		Resources
gilda	LCG2	glite-rb.ct.infn.it	2170	mds-vo-name=local,o=grid	Resources
gilda_GLITE_BROKER			N/A		Resources
gilda_LCG_2_BROKER			N/A		Resources
hungrid	LCG2	grid152.kfki.hu	2170	mds-vo-name=local,o=grid	Resources
hungrid_GLITE_BROKER			N/A		Resources
hungrid_LCG_2_BROKER			N/A		Resources
seegrid	LCG2	bdii.phy.bg.ac.yu	2170	mds-vo-name=local,o=grid	Resources
seegrid_GLITE_BROKER			N/A		Resources
seegrid_LCG_2_BROKER			N/A		Resources
voce	LCG2	bdii.cyf-kr.edu.pl	2170	mds-vo-name=local,o=grid	Resources
voce_GLITE_BROKER			N/A		Resources

Internet



Motivations for developing P-GRADE portal

- P-GRADE portal should
 - Hide the complexity of the underlying grid middlewares
 - Provide a high-level graphical user interface that is easy-to-use for e-scientists
 - Support many different grid programming approaches:
 - **Simple Scripts & Control** (sequential and MPI job execution)
 - **Scientific Application Plug-ins**
 - **Complex Workflows**
 - **Parameter sweep applications:** both on job and workflow level
 - **Interoperability:** transparent access to grids based on different middleware technology (both computing and data resources)
 - Support several levels of parallelism



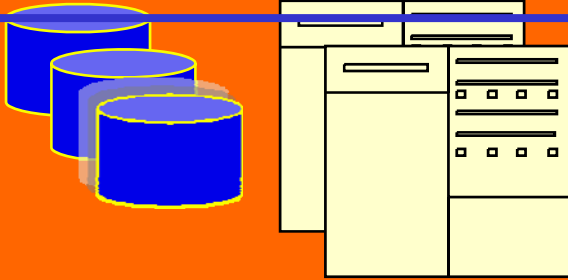
Layers in a Grid system

Application

Application
toolkits, standards

Higher-level grid
services (brokering,...)

Basic Grid services:
AA, job submission, info, ...



- ← Graphical interface
- ← P-GRADE Portal services
- ← Command line tools
- ← Grid middleware



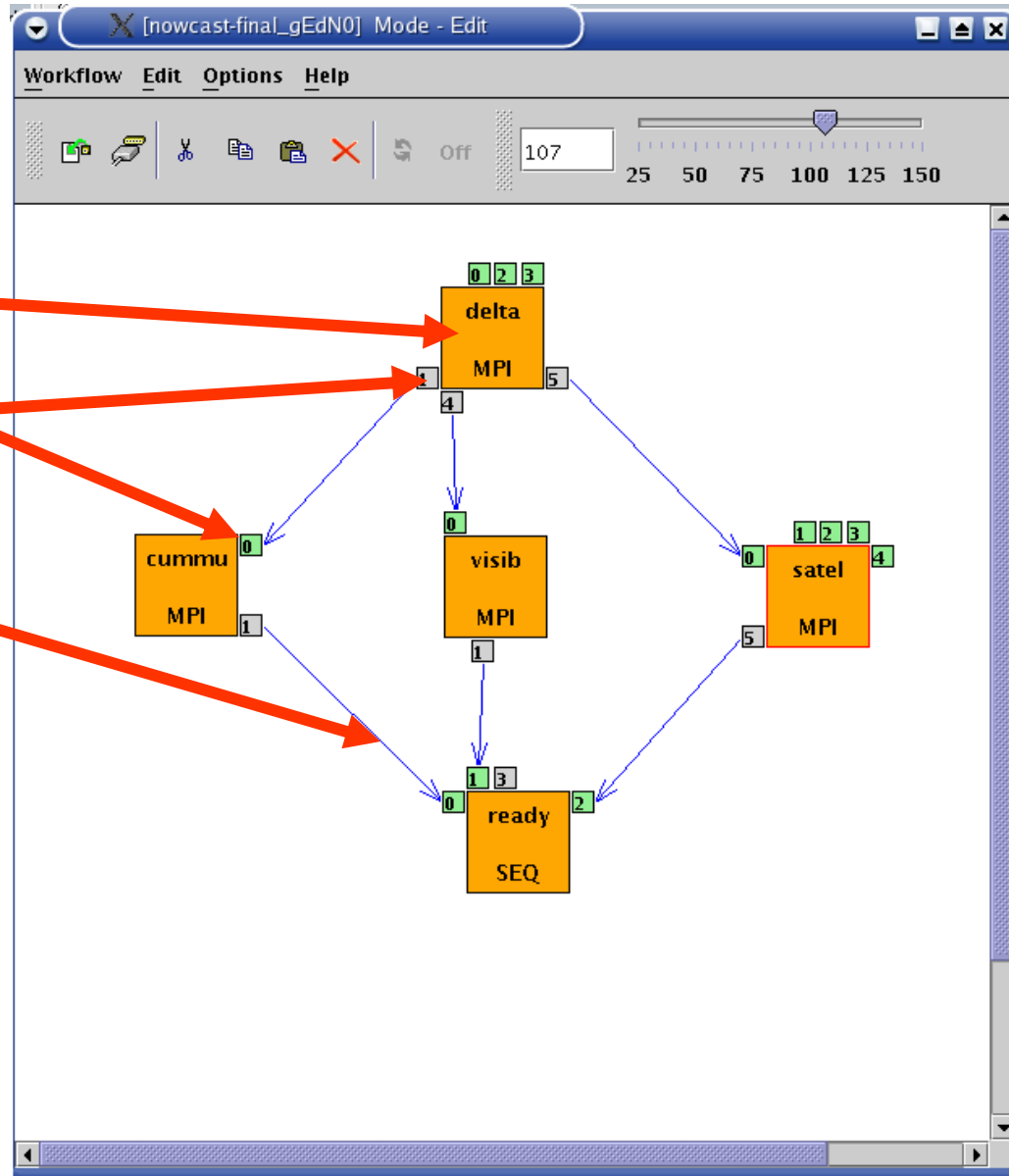
What is a P-GRADE Portal workflow?

- **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

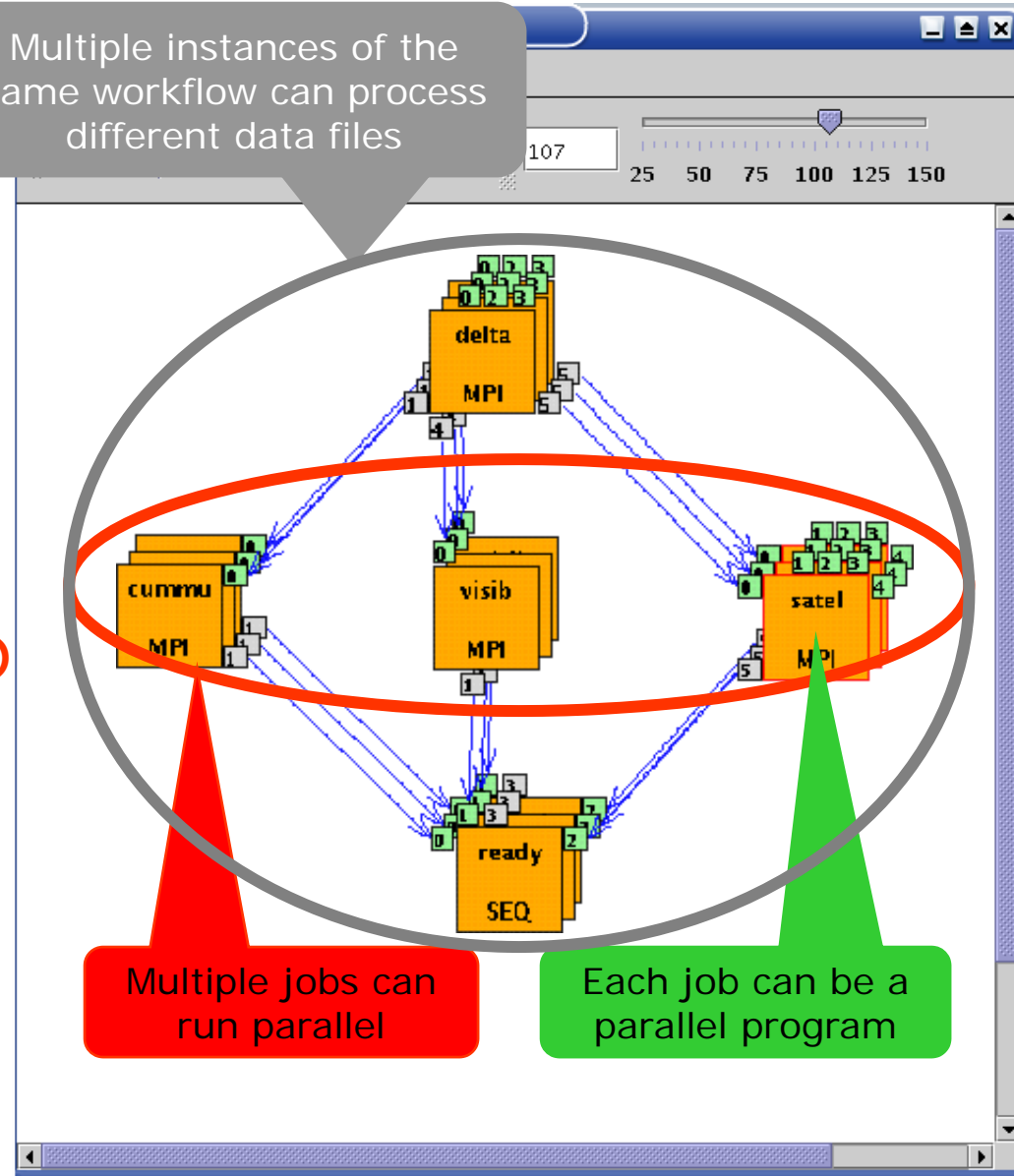




Three Levels of parallelism

- Job level: Parallel execution inside a workflow node (MPI job as workflow component)
- Workflow level: Parallel execution among workflow nodes (WF branch parallelism)
- PS workflow level: Parameter study execution of the workflow

Multiple instances of the same workflow can process different data files

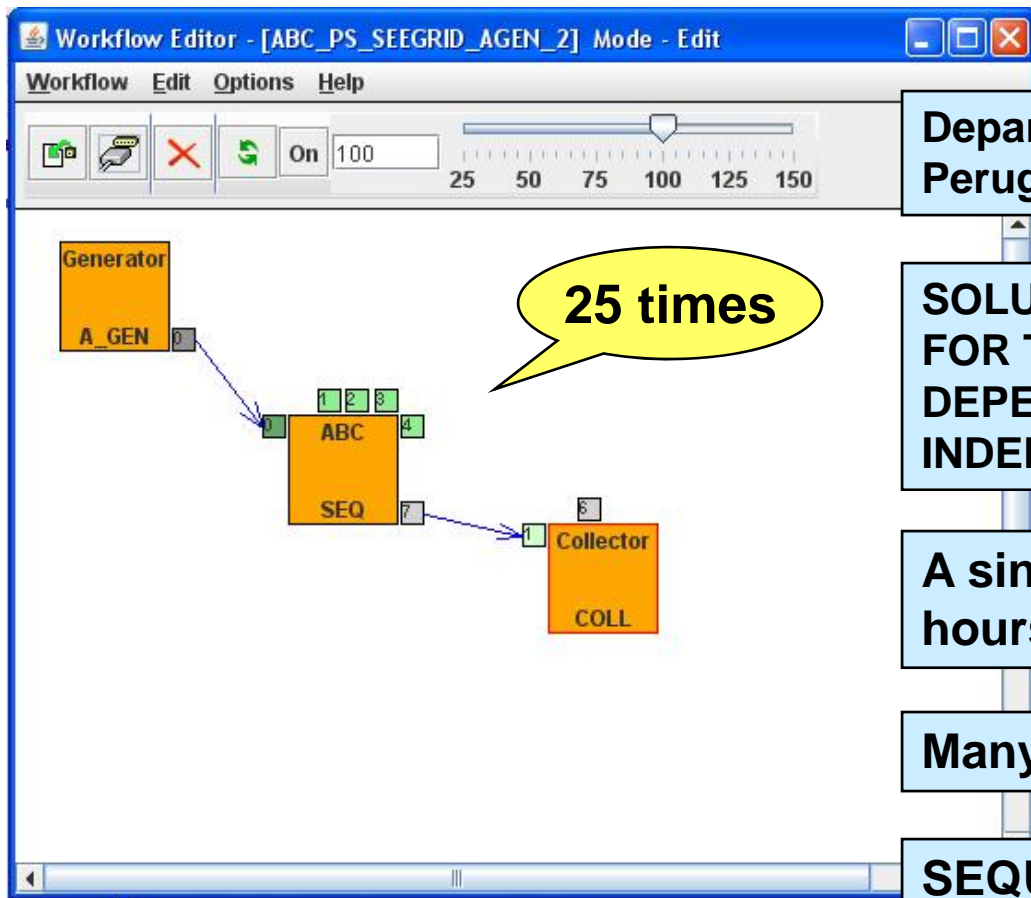


Multiple jobs can run parallel

Each job can be a parallel program



Example: Computational Chemistry



Department of Chemistry, University of Perugia

SOLUTION OF SCHRODINGER EQUATION FOR TRIATOMIC SYSTEMS USING TIME-DEPENDENT (RWAVEPR) OR TIME INDEPENDENT (ABC) METHOD

A single execution can be between 5 hours and 10 hours

Many simulations at the same time

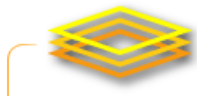
SEQUENTIAL FORTRAN 90

See at demo booth 11: EGEE Application Porting Support Group

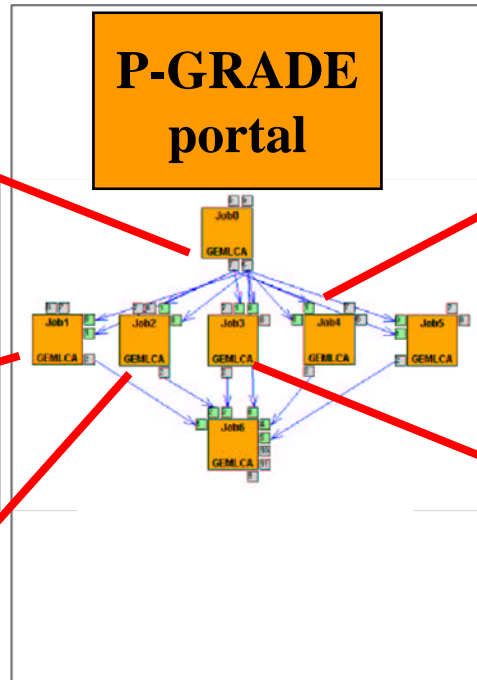


Grid interoperation by P-GRADE

Accessing Globus, gLite and ARC based grids/VOs simultaneously



Open Science Grid



NGS National Grid Service
core production computational and data grid

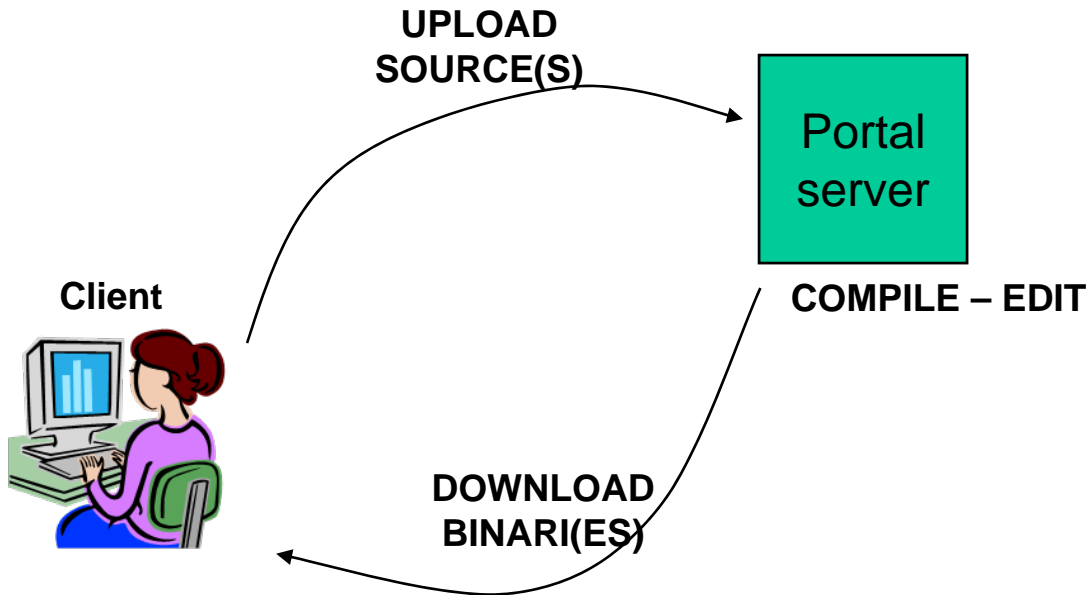




Typical user scenario

Job compilation phase

Certificate servers



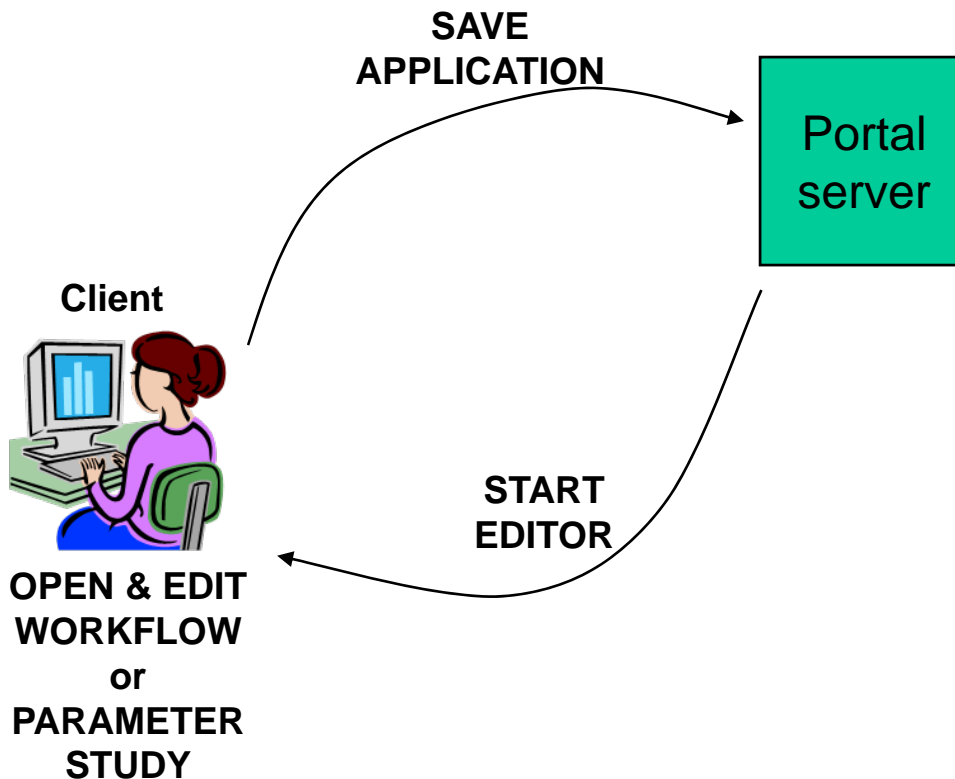
Grid services



Typical user scenario

Application development phase

Certificate servers

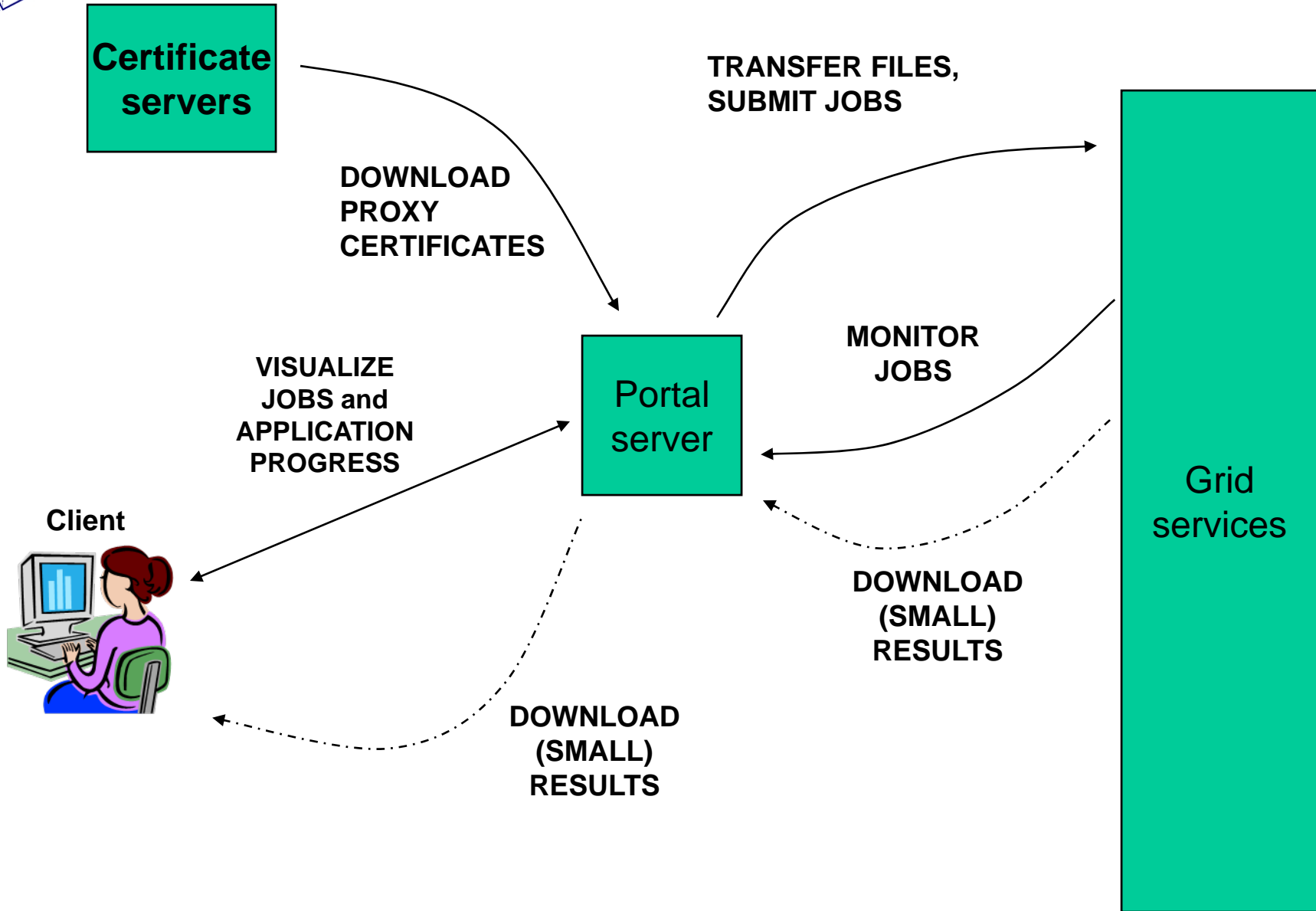


Grid services



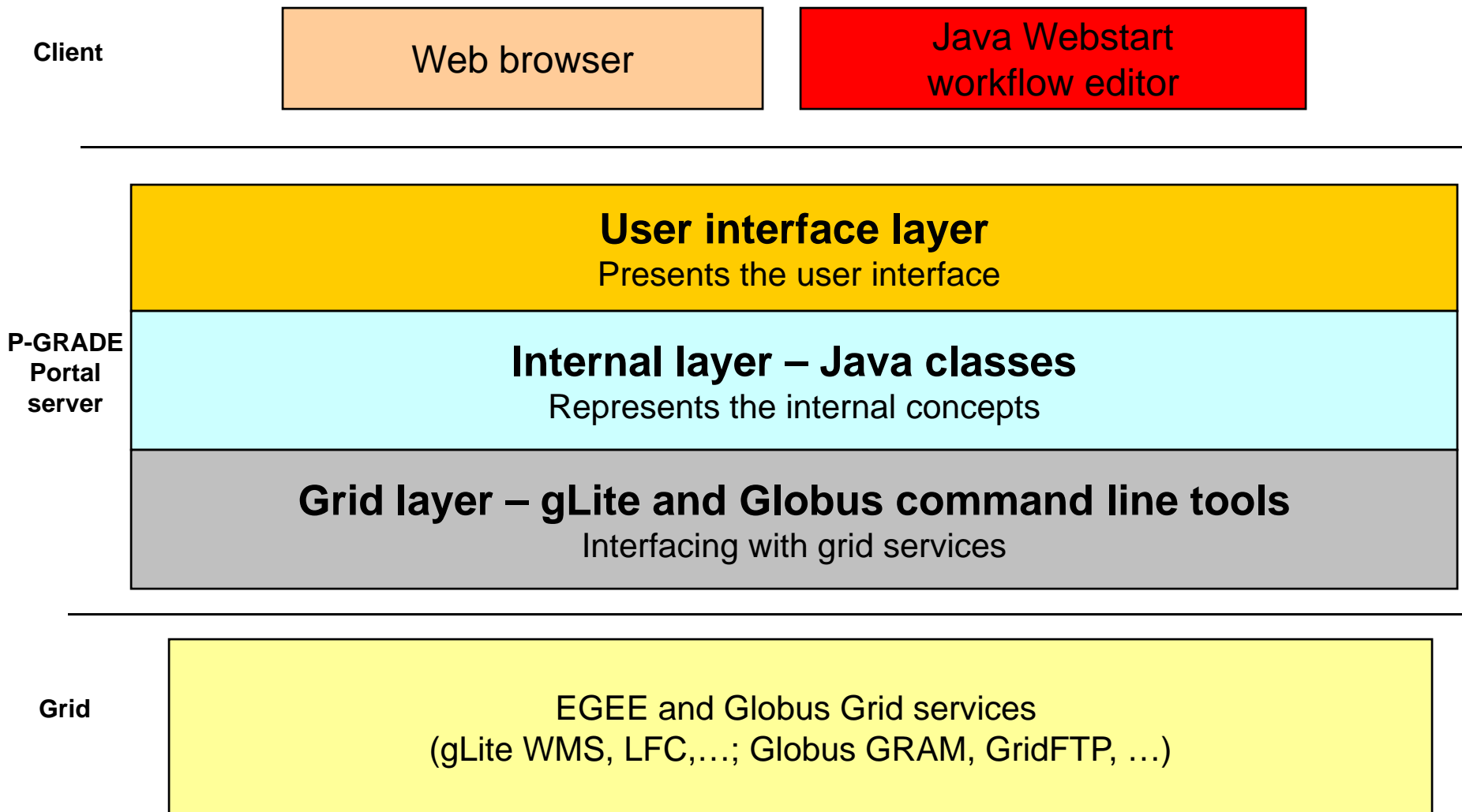
Typical user scenarios

Workflow execution phase





P-GRADE Portal structural overview





Interface layer

Client

Web browser

Java Webstart
workflow editor

User interface layer

Web server

Gridsphere Web portal framework

Gridsphere
portlets

P-GRADE
portlets

Workflow
monitor:
Java applet
generator

Workflow
editor:
Java webstart
application

P-GRADE
Portal
server



Interface layer functionalities

- **Workflow portlet**
 - Workflow manager, Storage, Upload
- **Certificate portlet**
 - Upload, download and other operations
- **Settings portlet**
 - Grid settings, Quota settings
- **File management**
 - Manage files in the grid
- **Compiler portlet**
 - Compile jobs on portal server

- Login
- Welcome
- ...

Web browser

Client

Gridsphere Portal framework

P-Grade Portal server

Gridsphere portlets

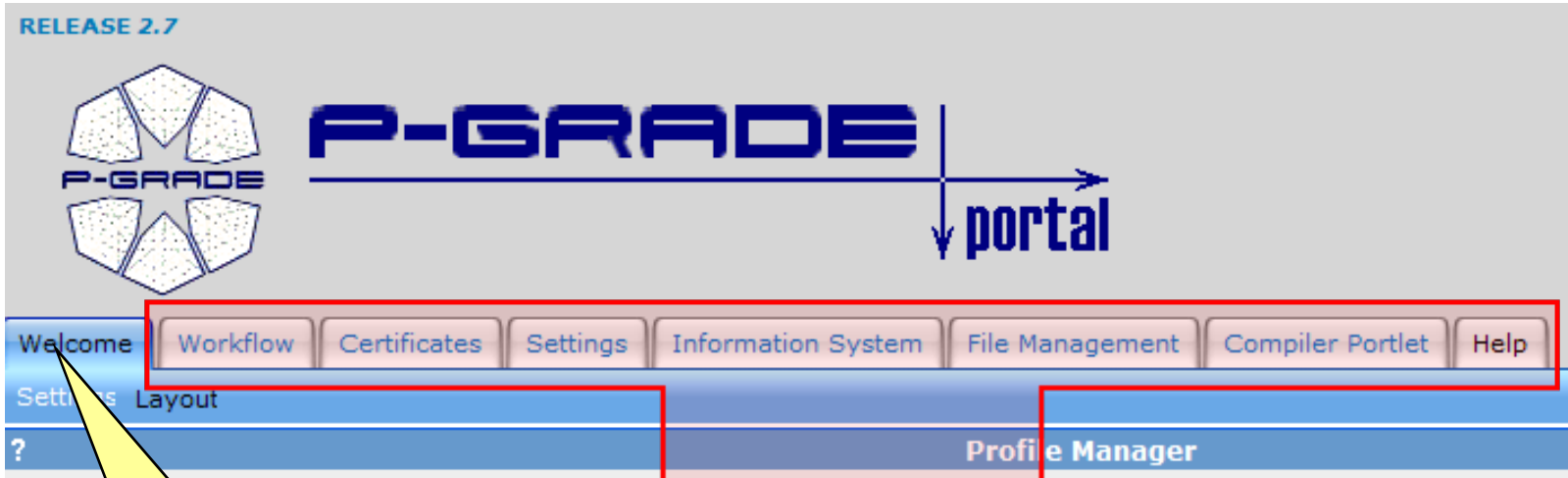
P-Grade portlets

Workflow monitor:
Java applet generator

Workflow editor:
Java webstart application



P-GRADE vs. Non-P-GRADE portlets



**GridSphere
2.x
Grid Portal
framework**

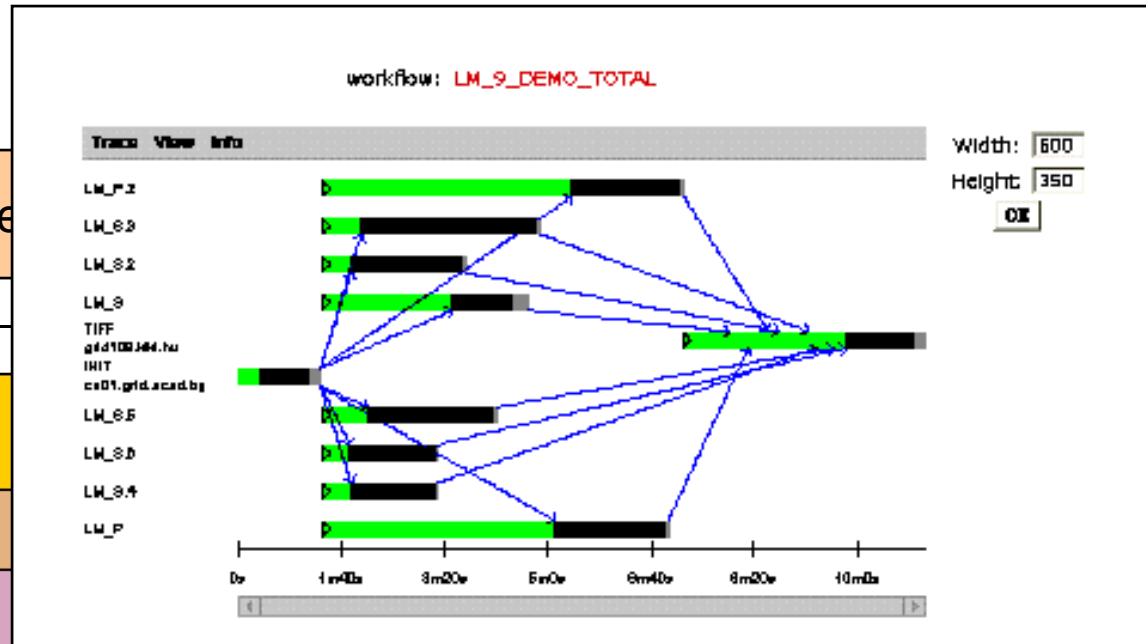
P-GRADE Portal portlets



Interface layer

Client

We



P-GRADE Portal server

Gridsphere portlets

P-GRADE portlets

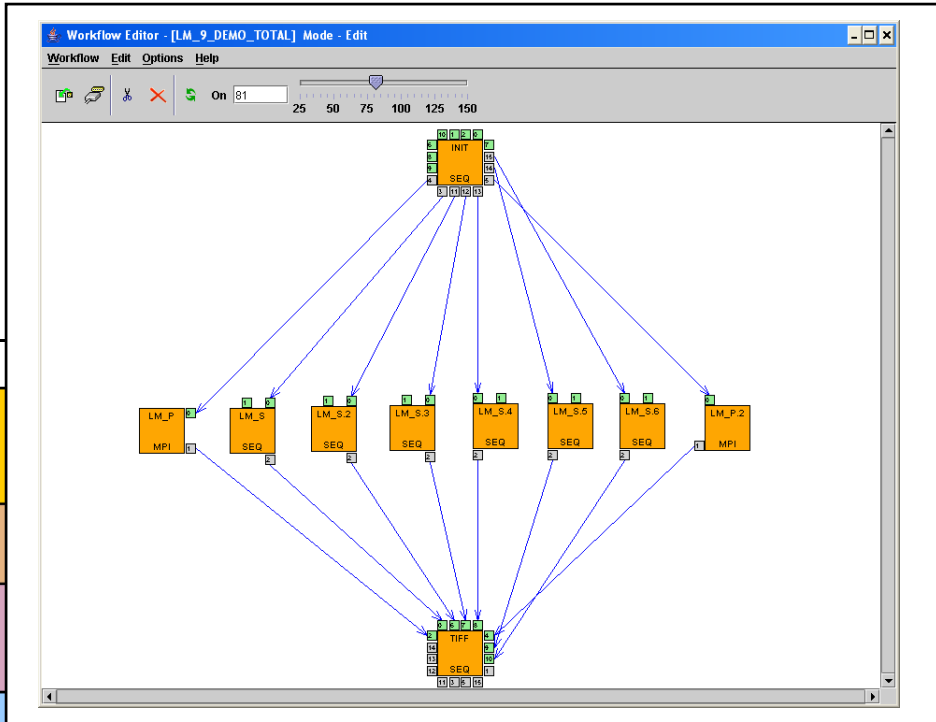
Workflow monitor:
Java applet generator

Workflow editor:
Java webstart application



Interface layer

Client



Java Webstart workflow editor

P-GRADE Portal server

Gridsphere portlets

P-GRADE portlets

Workflow monitor:
Java applet generator

Workflow editor:
Java webstart application



Portlets/functionalities of P-GRADE portal

- Settings (portlet)
- Certificate and proxy management (portlet)
- Information system visualization (portlet)
- Graphical workflow editing
- Workflow manager (portlet)
- LFC (EGEE) file management (portlet)
- Compilation support (portlet)
- Fault-tolerance support



Settings Portlet

PGrade Grid portal - Microsoft Internet Explorer

Address: https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=105

Settings

GRID configurations

Name	Information System				[Actions]
	Type	Host	Port	BaseDn	
biomed	LCG2	cclcgtopbdii02.in2p3.fr	2170	Mds-vo-name=local,o=grid	Resources
biomed_GLITE_BROKER			N/A		Resources
biomed_LCG_2_BROKER			N/A		
compchem	LCG2	egee-bdii.cnaf.infn.it	2170	Mds-vo-name=local,o=	
compchem_GLITE_BROKER			N/A		
compchem_LCG_2_BROKER			N/A		
gilda	LCG2	glite-rb.ct.infn.it	2170	mds-vo-name=local,o=	
gilda_GLITE_BROKER			N/A		
gilda_LCG_2_BROKER			N/A		
hungrid	LCG2	grid152.kfki.hu	2170	mds-vo-name=local,o=	
hungrid_GLITE_BROKER			N/A		
hungrid_LCG_2_BROKER			N/A		
seegrid	LCG2	bdii.phy.bg.ac.yu	2170	mds-vo-name=local,o=grid	Resources
seegrid_GLITE_BROKER			N/A		Resources
voce	LCG2	bdii.cyf-kr.edu.pl	2170	mds-vo-name=local,o=grid	Resources
voce_GLITE_BROKER			N/A		Resources

- **Portal administrator can**
 - connect the portal to several grids
 - register the basic resources of the connected grids



Settings Portlet

PGrade Grid portal - Microsoft Internet Explorer

Address: https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=111&gs_action=doEditGridResources

Settings

Back

Resources for 'seegrid' GRID

URL	Job manager	[Actions]
c01.grid.etfbl.net	jobmanager-pbs-seegrid	Delete
ce.grid.tuiasi.ro	jobmanager-lcgpbs-seegrid	Delete
ce.phy.bg.ac.yu	jobmanager-pbs-seegrid	
ce.ulakbim.gov.tr	jobmanager-lcgpbs-seegrid	
ce001.fmi.uni-sofia.bg	jobmanager-lcgpbs-seegrid	
ce001.grid.uni-sofia.bg	jobmanager-lcgpbs-seegrid	
ce001.imbm.bas.bg	jobmanager-lcgpbs-seegrid	
ce002.ipp.acad.bg	jobmanager-lcgpbs-seegrid	
ce01.afroditi.hellasgrid.gr	jobmanager-pbs-seegrid	
ce01.grid.renam.md	jobmanager-lcgpbs-seegrid	
ce01.isabella.grnet.gr	jobmanager-pbs-seegrid	Delete
ce01.mosigrid.utduj.ro	jobmanager-pbs-seegrid	Delete
ce01.rogrid.unibuc.ro	jobmanager-lcgpbs-seegrid	Delete
ce02.grid.acad.bg	jobmanager-pbs-seegrid	Delete
ce64.phy.bg.ac.yu	jobmanager-pbs-seegrid	Delete
cluster1.csk.kg.ac.yu	jobmanager-pbs-seegrid	Delete
g01.etf.unssa.rs.ba	jobmanager-pbs-seegrid	Delete
grid01.cg.ac.yu	jobmanager-pbs-seegrid	Delete

User can customize the connected grids by adding and removing resources



Certificate and proxy management Portlet

The screenshot shows the P-Grade Portal interface in Microsoft Internet Explorer. The main content area is titled "Certificate Manager" and displays a "Certificate list" table. The table has columns for "Issuer", "Set for Grids", "Time left", and "[Actions]".

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

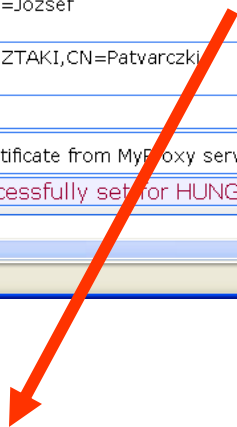
Below the table are buttons for "Download" (Download certificate from MyProxy server.) and "Upload" (Upload authentication data to MyProxy server.). A message at the bottom states: "Message: Certificate successfully set for HUNGRID." A "Refresh" button is also present.

as grids to

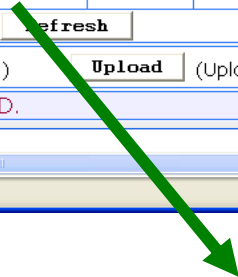
o grids

oxys as

ow can be



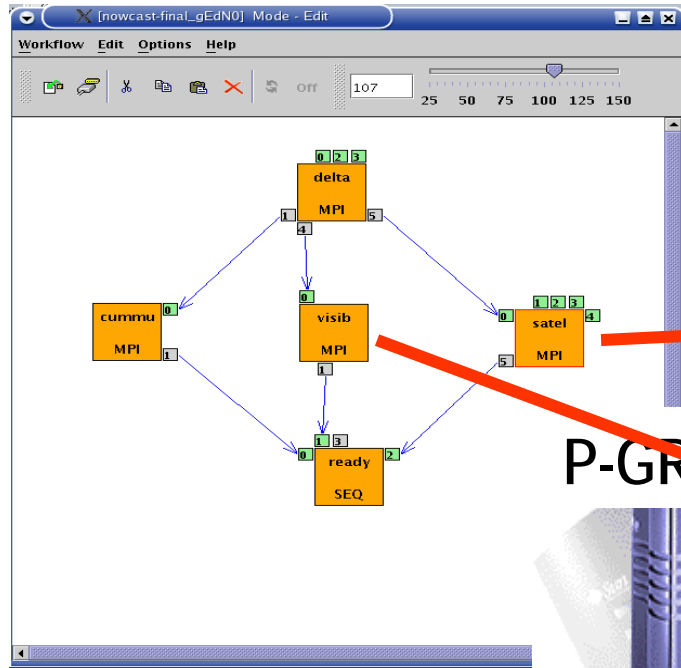
SEE-GRID access



HUNGRID access



Solving Grid interoperation by P-GRADE Portal



EGEE Grid



P-GRADE-Portal



Different jobs can be parallel executed in different grids

UK NGS



London



Rome



Athens





Interoperation vs. Interoperability

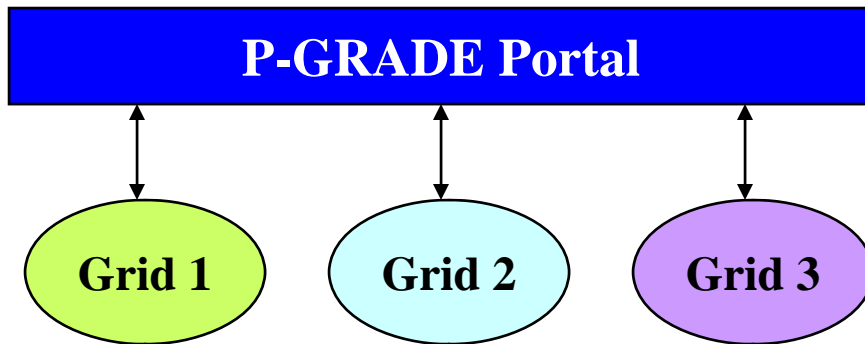
As defined by the **GIN** (Grid Interoperation Now)
CG (Community Group) of the **OGF** (Open Grid Forum)

Interoperation:

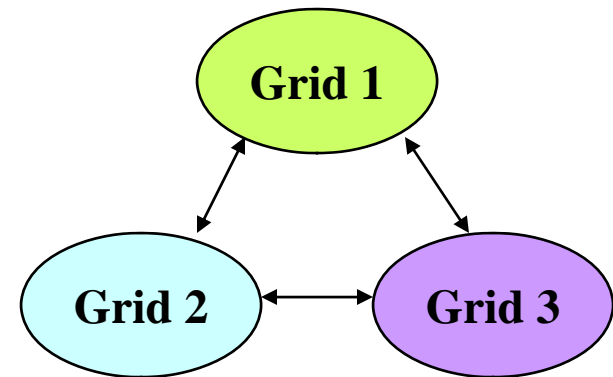
- short term solution that defines what needs to be done to achieve interoperation between current production grids using **existing technologies**

Interoperability:

- native ability of Grids and Grid middleware to interact directly via common **open standards**



Interoperation



Interoperability



Information system Portlet

PGrade Grid portal - Microsoft Internet Explorer

Address: https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=119&gs_action=doChangeVO

Select BDII: voce-BDII View

Select VO: voce View

Grid: voce-BDII VO: voce

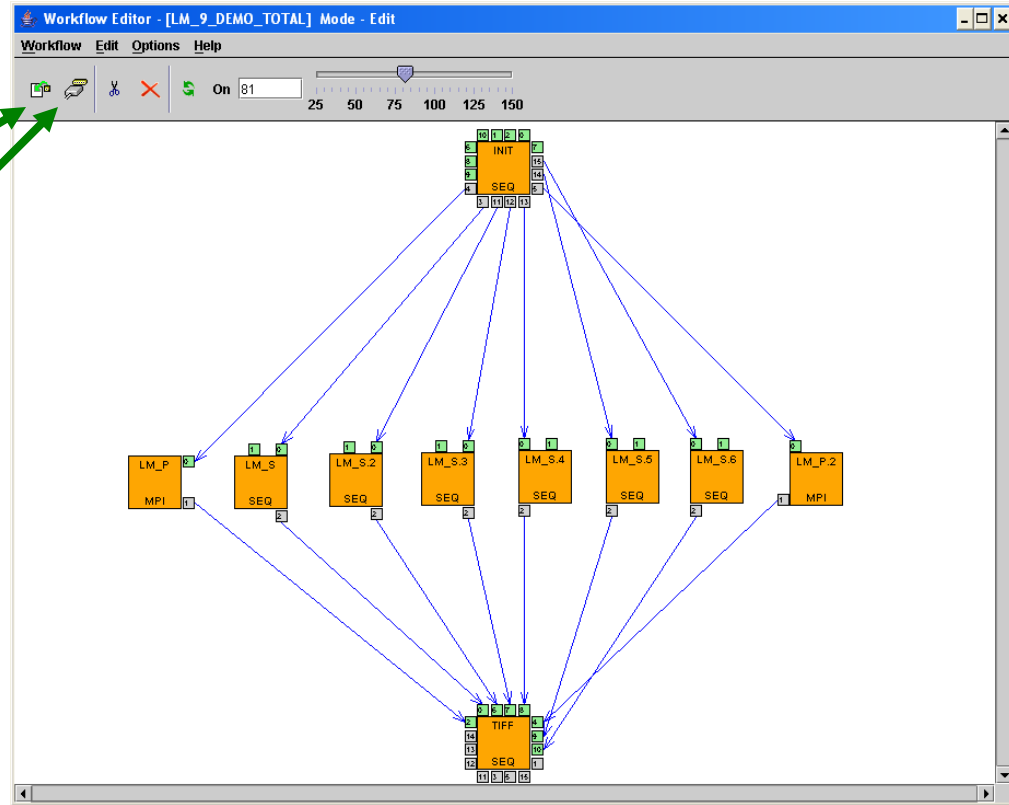
Sites

Site Name	Computing Element						Storage Element				
	CPU			Job			Space				
	Total	Free	Usage	Running	Waiting	Load	Total	Available	Usage		
bmegrid	32	2	94%	30	2	6%	142.498 [GB]	142.498 [GB]	0%		
budapest	321	213	34%	108	53	33%	5.402 [TB]	5.402 [TB]	0%		
cyfronet-lcg2	562	221	61%	327	109	25%	82.497 [TB]	30.091 [TB]	64%		
egee.fesb.hr	24	1	96%	23	6	21%	446.796 [GB]	446.796 [GB]	0%		
egee.grid.niif.hu	8	7	12%	1	0	0%	2.375 [TB]	2.375 [TB]	0%		
egee.irb.hr	24	13	46%	11	0	0%	141.844 [GB]	141.611 [GB]	0%		
egee.srce.hr	27	3	89%	24	16	40%	1.378 [TB]	1.378 [TB]	0%		
elte	6	6	0%	0	0	0%	6.659 [TB]	6.659 [TB]	0%		
gup-jku	8	3	62%	5	4	44%	183.569 [GB]	183.496 [GB]	0%		
hephy-vienna	168	122	27%	46	0	0%	27.39 [TB]	27.39 [TB]	0%		
iisas-bratislava	73	15	79%	58	1	2%	1.762 [TB]	1.76 [TB]	0%		
pearl-amu	18	0	100%	12	26	68%	55.395 [GB]	55.323 [GB]	0%		
prague_cesnet_lcg2	64	46	28%	0	0	0%	4.473 [TB]	4.473 [TB]	0%		
psnc	680	62	91%	336	59	15%	4.47 [TB]	4.47 [TB]	0%		
tu-kosice	15	15	0%	0	0	0%	114.692 [GB]	114.584 [GB]	0%		
warsaw-egee	208	195	6%	12	444444	100%	1.35 [TB]	1.35 [TB]	0%		



Graphical workflow editing

- 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)
 4. Automatically generates JDL file





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)~~



Workflow Editor

Defining broker jobs

Workflow Editor - [default*] Mode - Edit

Workflow Edit Options Help

Off 100 25 50 75 100 125 150

BrokerTest properties

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.kfki.hu

JDL: JDL Editor...

Ok Cancel

Select a Grid with broker!
(*_BROKER)

Ignore the resource field!

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



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`

- Client side location:
`result.dat`

- LFC logical file name
(LFC file catalog is required – EGEE VOs)
`lfn:/grid/gilda/sipos/11-04.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/11-04.dat`

- GridFTP address (in Globus Grids):
`gsiftp://somengshost.ac.uk/mydir/result.dat`

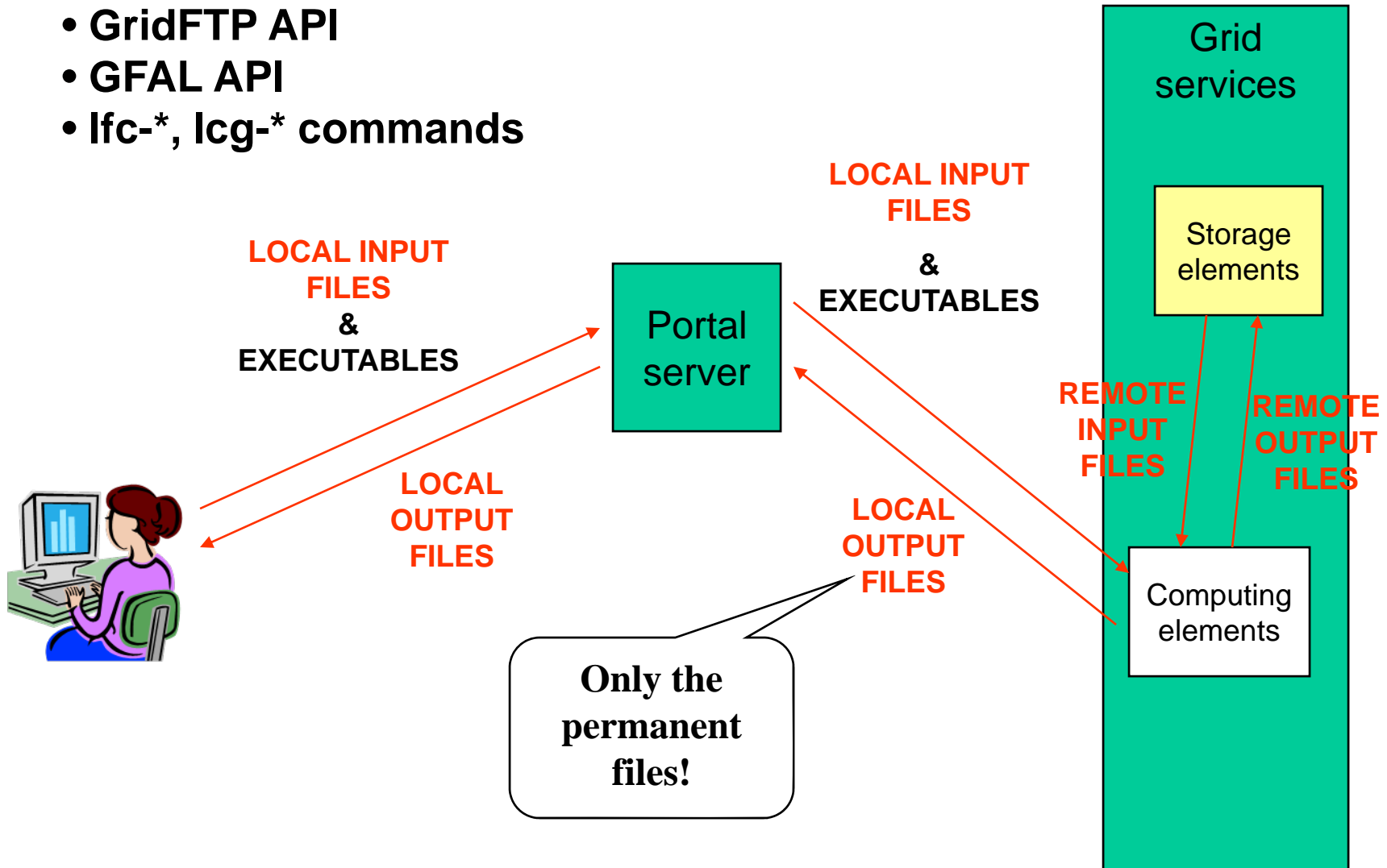
Remote file



Local vs. remote files

Your binary can access data services directly too

- GridFTP API
- GFAL API
- lfc-*, lcg-* commands





Workflow manager

PGrade Portal - Microsoft Internet Explorer

Ejl Szerkesztés Nézet Kedvencek Eszközök Súgó

Vissza Keresés Kedvencek Multimédia

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

mywebsearch Search Smiley Central Screensavers Cursor Mania

RELEASE 2.1

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	<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.



LFC (EGEE) file management

PGrade Grid portal - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Mail Print Share Add-ons User

Address <https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=133> Go Links >>

Welcome Workflow Certificates Settings Information System **File Management** Compiler Portlet Help

file

? File Management

Select Grid: View

Select VO: View

Select LFC Host: List

or Enter

File Browser

- + Balasko
- + ErdelyiZoltan
 - POSIX-TEST-10485-24626
 - POSIX-TEST-11134-23067
 - POSIX-TEST-12464-3948
 - POSIX-TEST-16138-5559
 - POSIX-TEST-17957-20543
 - POSIX-TEST-20716-13234
 - POSIX-TEST-24498-25005
 - POSIX-TEST-24776-20792
 - POSIX-TEST-27728-19524
 - POSIX-TEST-29926-26667
 - POSIX-TEST-3182-23422
 - POSIX-TEST-6451-13508
 - POSIX-TEST-7730-27146
- + SAM

Go Up

Change Directory

Remove

Details

Replicas

Make Directory

Rename

Current Path: /grid/seegrid

Download Upload

Message: Upper directory listed



Compilation support



PGrade Grid portal - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Print Mail Stop

Address <https://n42.hpcc.sztaki.hu:8443/gridsphere/gridsphere?cid=Compiler+Portlet> Go Links

RELEASE 2.7

 **P-GRADE** portal 

Logout
Welcome, Gabor Hermann

Welcome Workflow Certificates Settings Information System File Management **Compiler Portlet** Help

Compiler

Compiler Portlet

File: Browse... Upload

Name: New directory New file

Name	Size	Last modified / Type
Copy	Move	Delete Download

File: Browse... Upload

Name: New directory New file

Name	Size	Last modified / Type
Copy	Move	Delete Download

July 14, 2008



Fault-tolerant Grid applications



- Utilizing
 - Condor DAGMan's rescue mechanism
 - EGEE job resubmission mechanism of WMS
- If the EGEE broker leaves a job stuck in a CEs' queue, the portal automatically
 - kills the job on this site and
 - resubmits the job to the broker by prohibiting this site.
- As a result
 - the portal guarantees the correct submission of a job as long as there exists at least one matching resource
 - job submission is reliable even in an unreliable grid



Lessons learnt

- **P-GRADE portal provides**
 - Easy-to-use but powerful workflow system (graphical editor, wf manager, etc.)
 - Three levels of parallelism
 - MPI job level
 - Workflow branch level
 - Parameter sweep at workflow level
 - Multi-grid/multi-VO access mechanism for various grids (LCG-2, gLite and GT2)
 - Simultaneous access
 - Transparent access
 - Migrating a workflow from one grid to another requires no modification in the workflow



Learn once, use everywhere
Develop once, execute anywhere

Thank you!

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