



# ***Support for parameter study applications in the P-GRADE Portal***

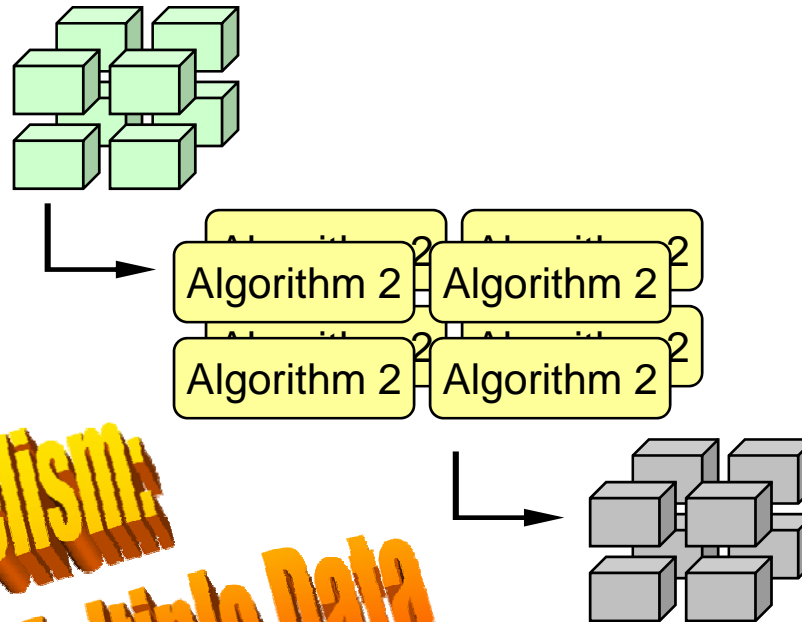
Gergely Sipos  
sipos@sztaki.hu

MTA SZTAKI (Hungarian Academy of Sciences)





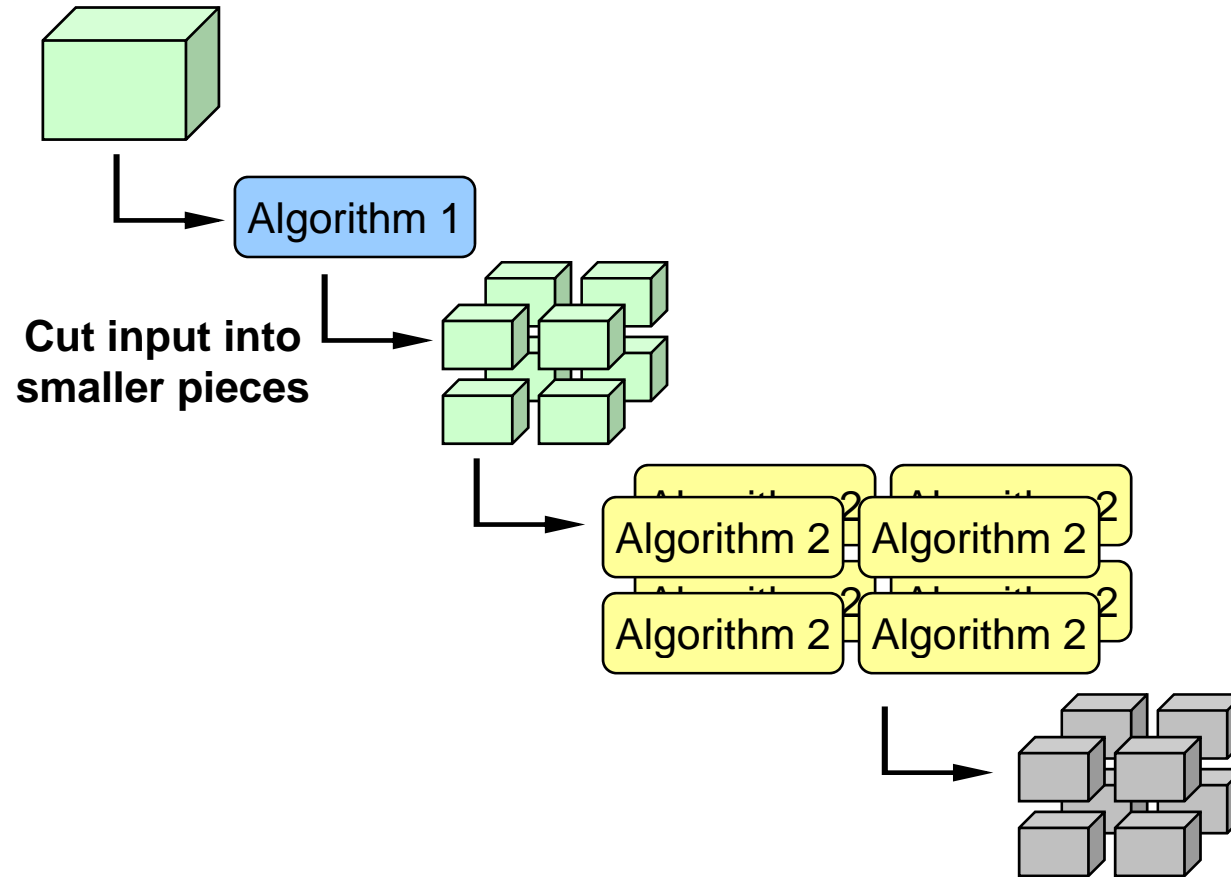
# General structure of a PS applications



**SIMD parallelism:**  
**Single Instruction Multiple Data**

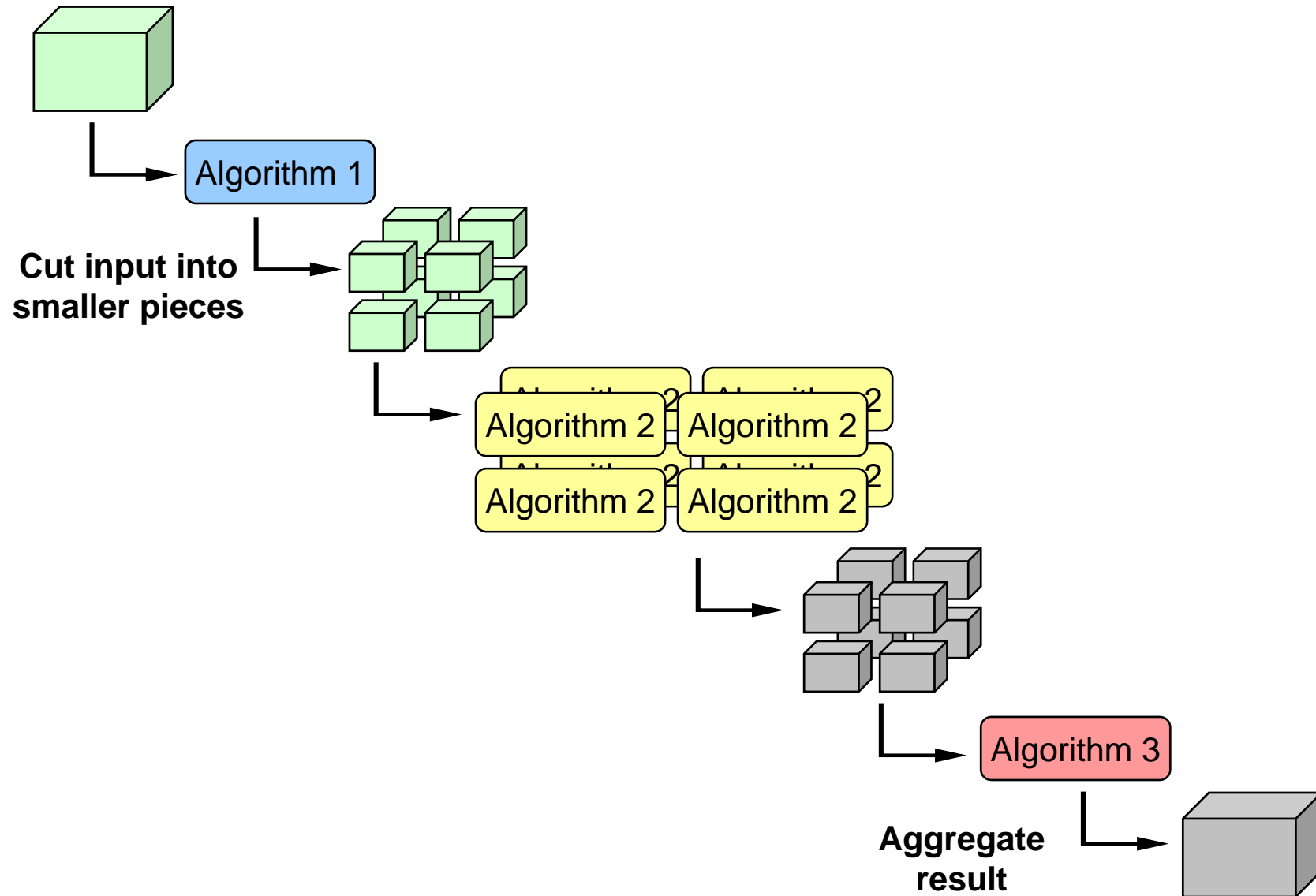


# Advanced PS applications



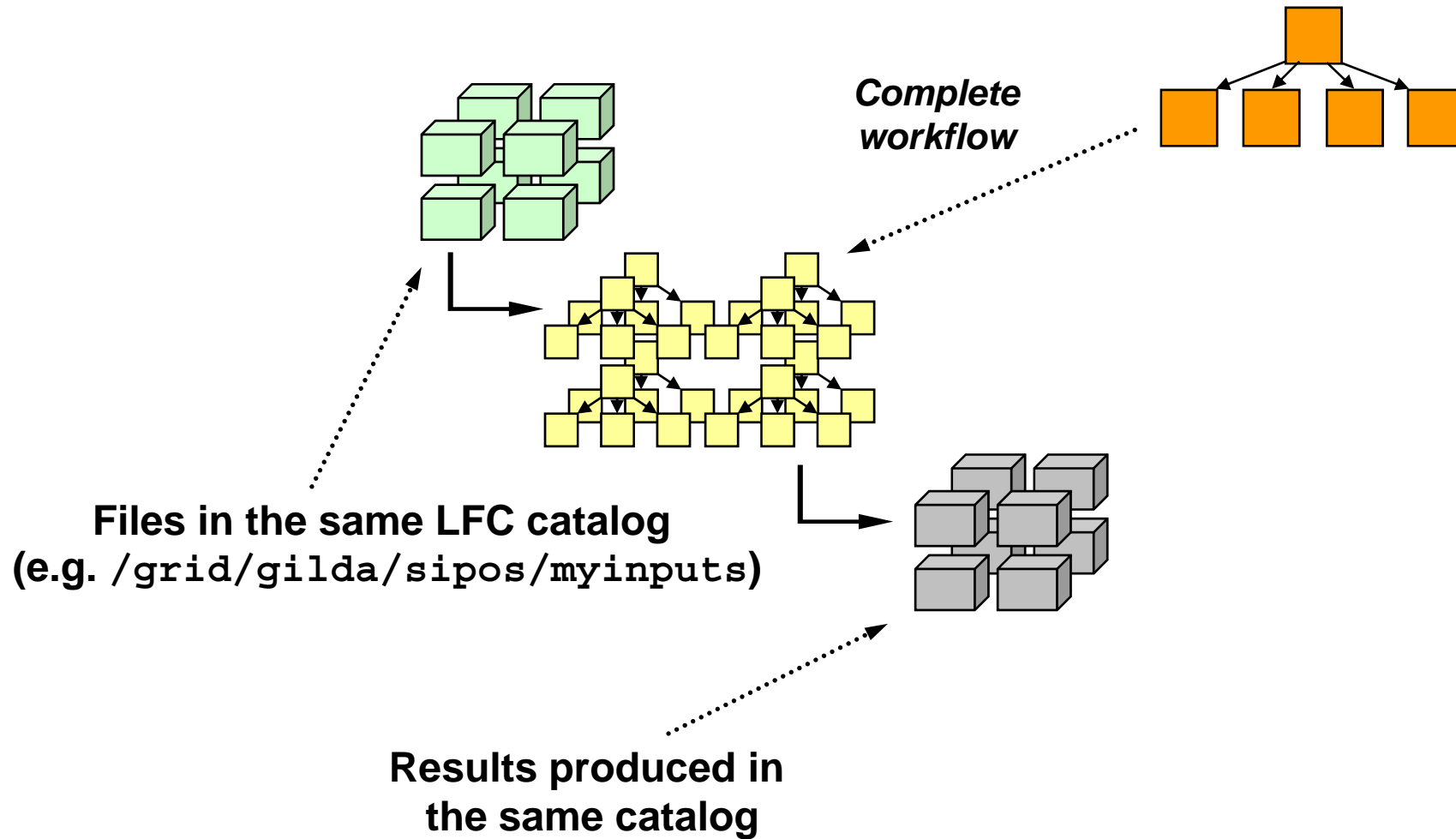


# Advanced PS applications



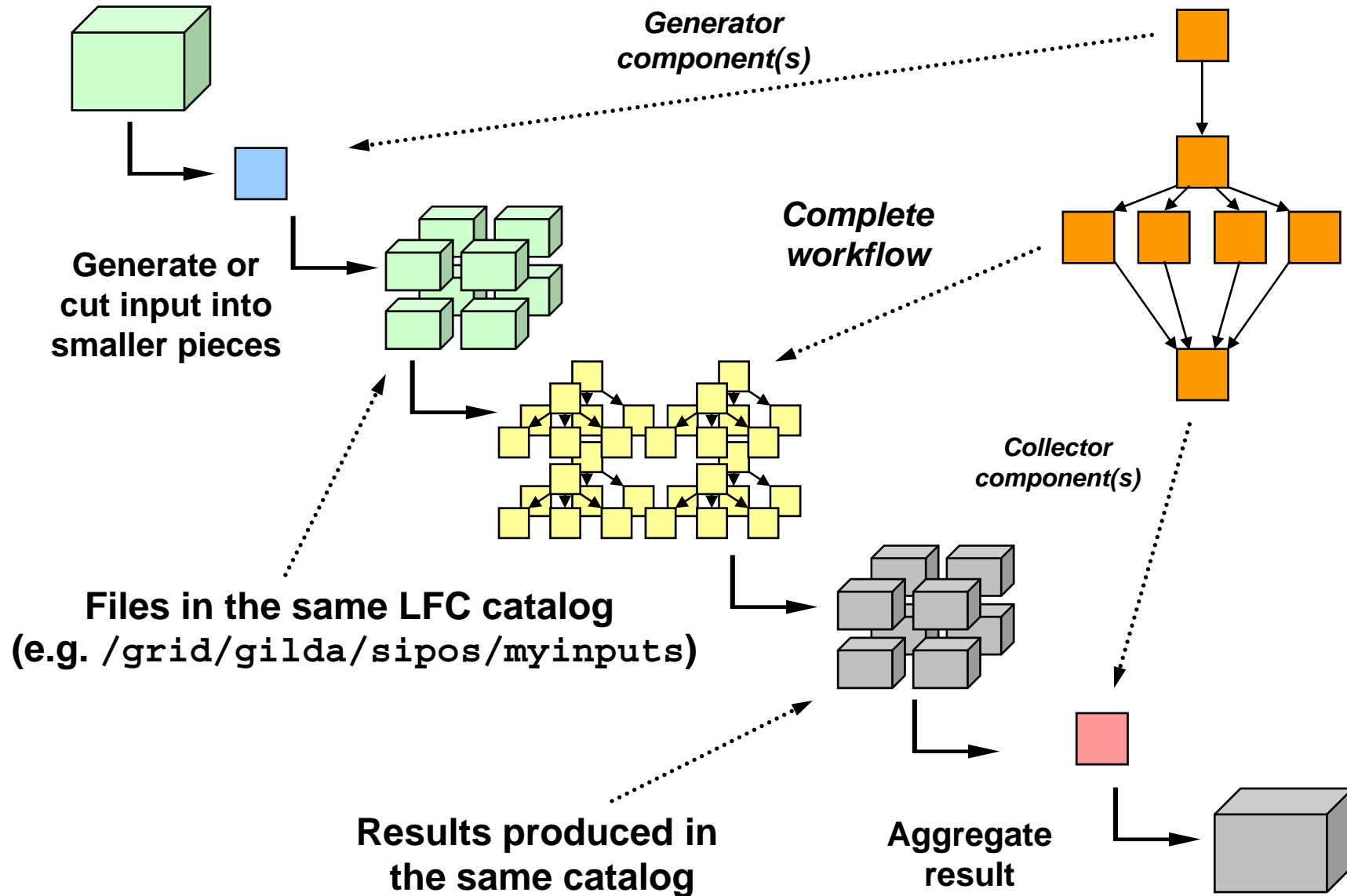


# PS applications in P-Grade Portal 2.5





# Advanced PS applications in P-GRADE Portal 2.5

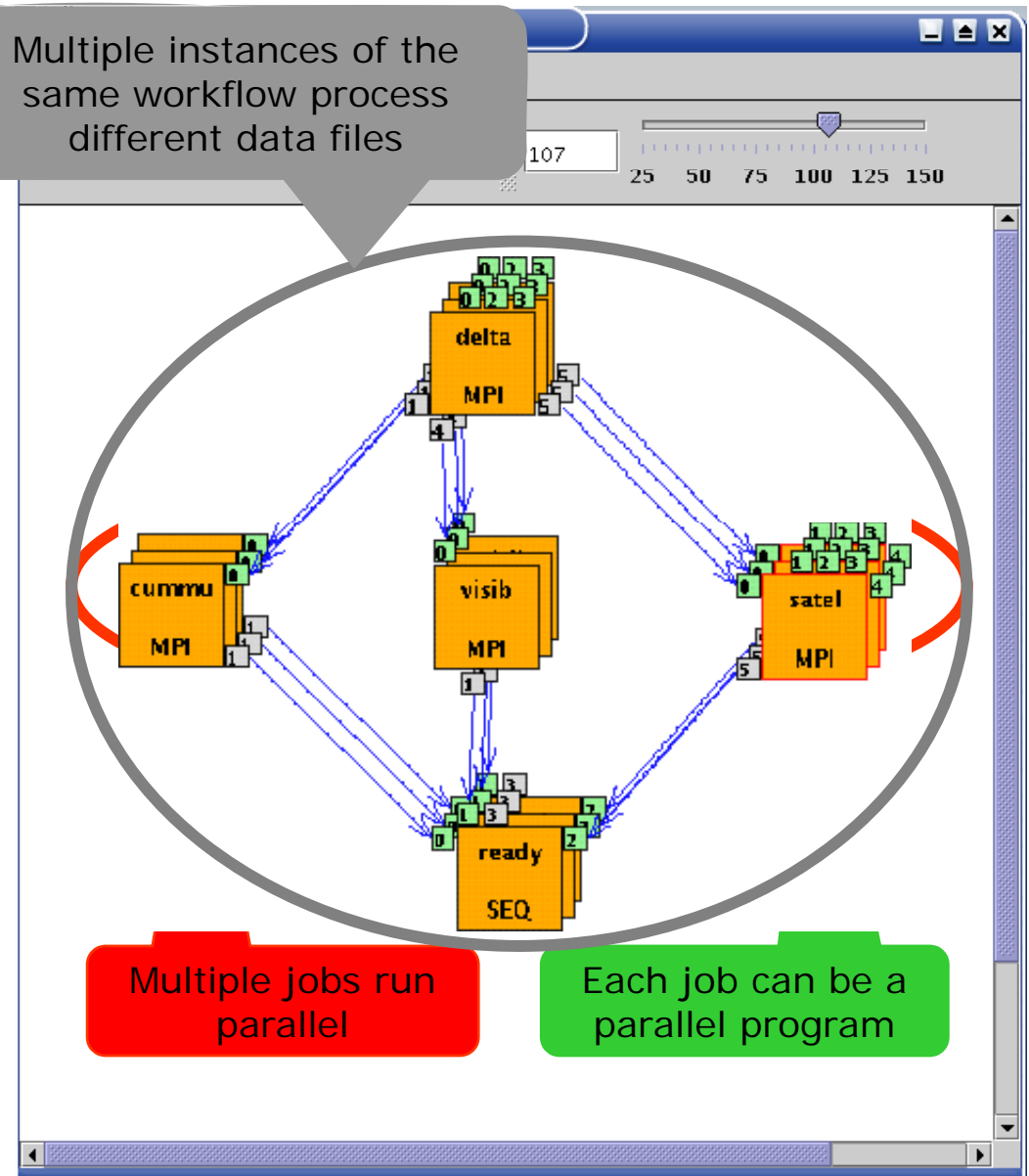




# Third level of parallelism

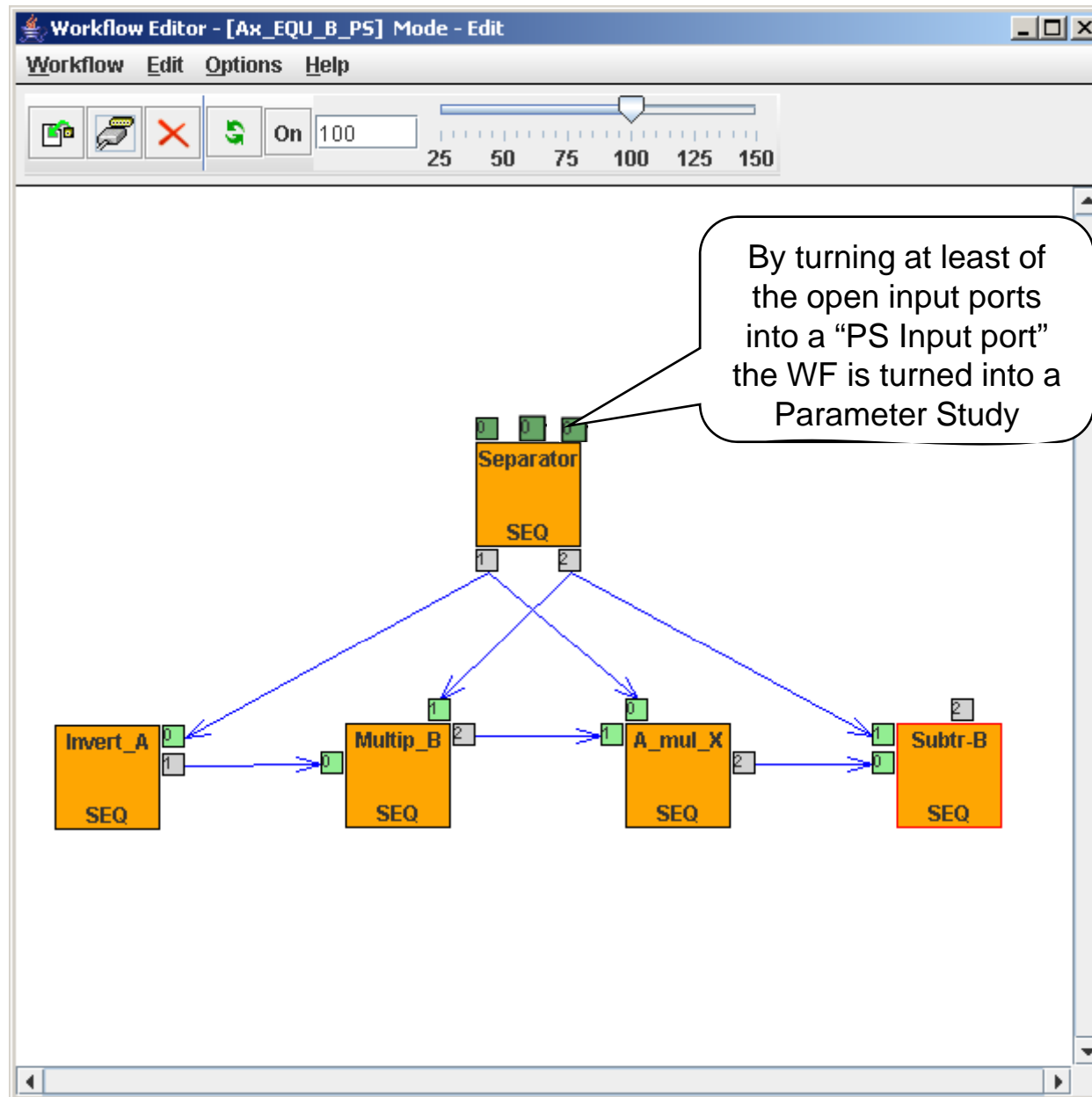
- Parallel execution inside a workflow node (SIMD/MIMD/MISD)
- Parallel execution among workflow nodes (SIMD/MIMD/MISD)
- Parameter study execution of the workflow (SIMD)

Multiple instances of the same workflow process different data files





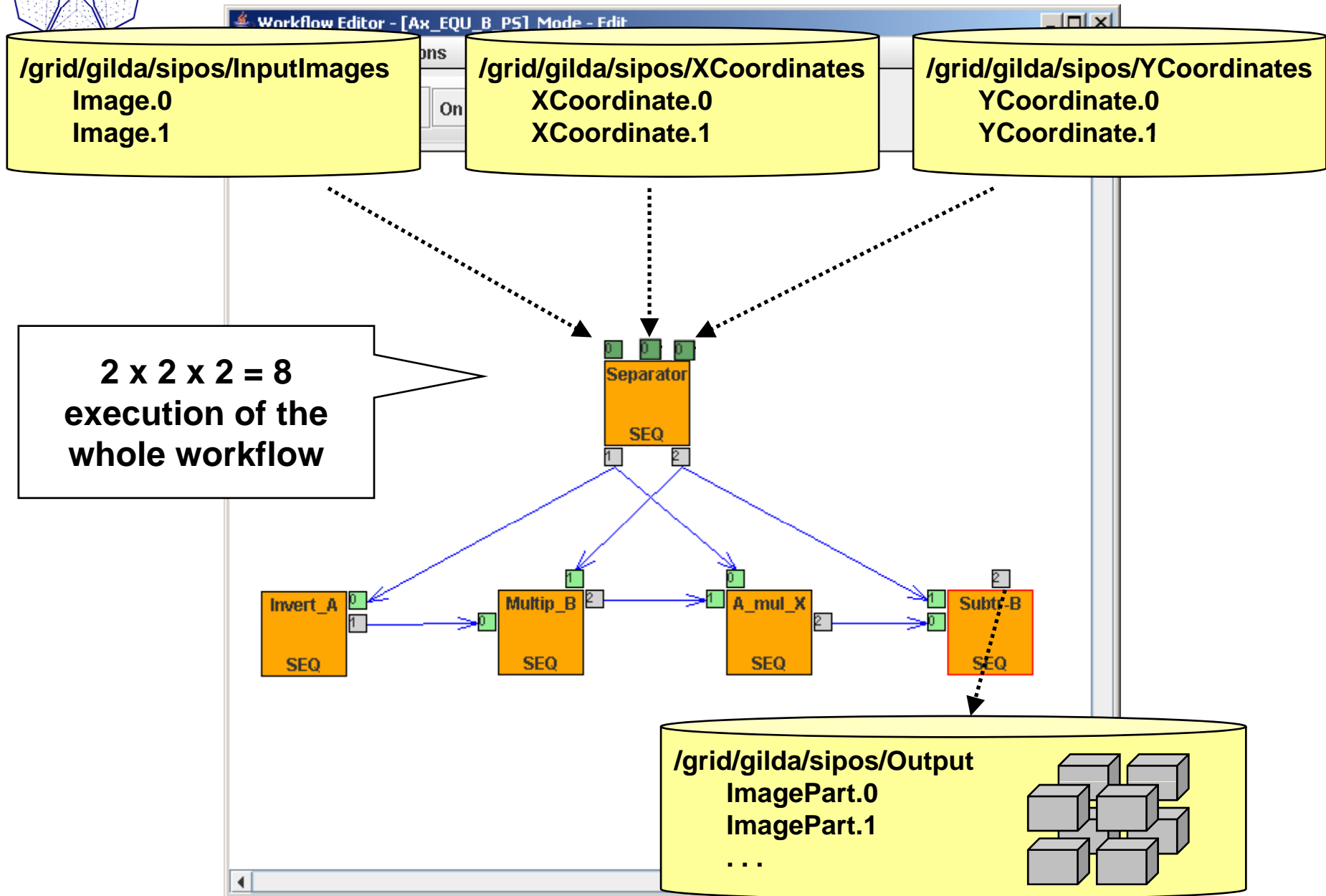
# Turning a WF into a parameter study







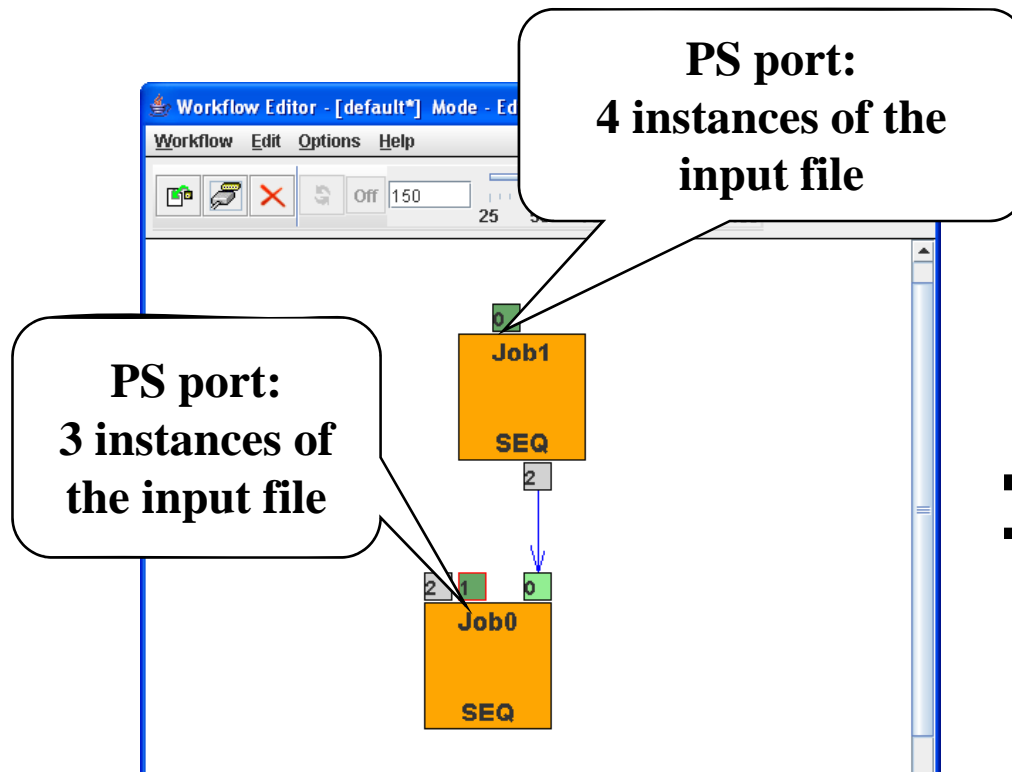
# Turning a WF into a parameter study





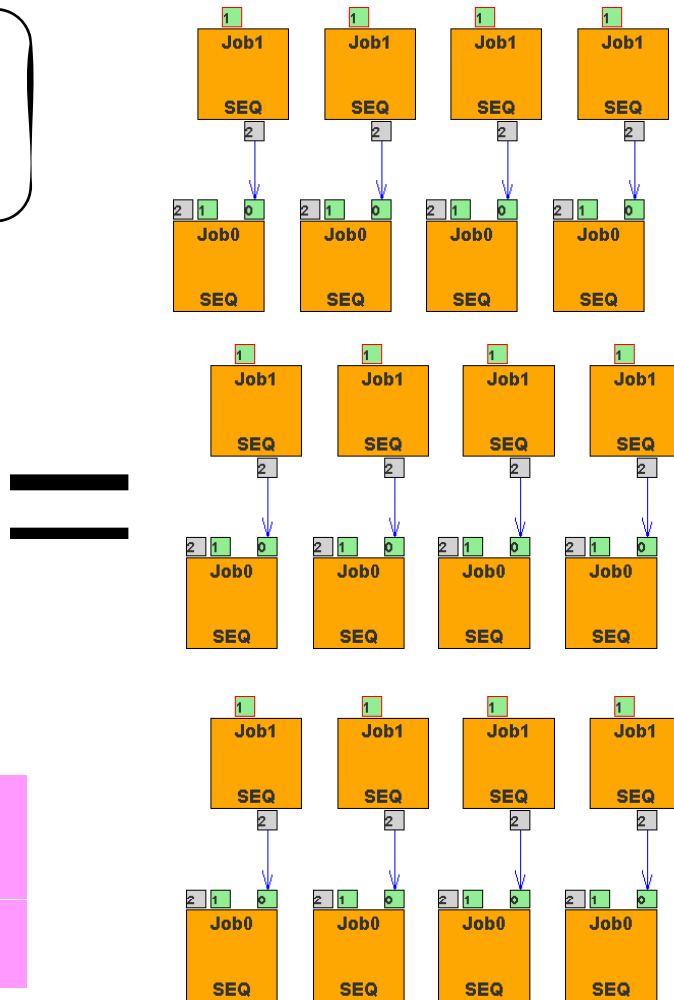
# Parameter sweep (PS) workflows

## 1 PS workflow execution



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

## 4 x 3 normal workflow execution





# PS Workflow execution

PGrade Grid portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://n43.hpcc.sztaki.hu:8080/gridsphere/gridsphere?cid=72&gs\_action=doGotoPage

Getting Started Latest Headlines

RELEASE 2.4

P-GRADE portal

Logout Welcome, hg

Welcome Workflow Certificates Settings Information System Help Infrastructure test

Workflow Manager Storage Upload

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



# PS workflow detailed view - eWorkflows

PGrade Grid portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://n43.hpcc.sztaki.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**



# Generators

- Generate input files for parameter study workflows
- Saves these files on SEs, register them with LFNs into the LFC catalog

## Auto generator

- Pre defined program logic (static binary)
- Generates text files
- User can control text file content by templates and patterns

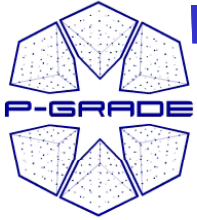
## Custom generator

- User provides generator program logic
- Useful to generate binary content (e.g. image files, audio files, ...)



# Collector

- Collects output files and perform collective operation on them. E.g.
  - Standard deviation
  - Average
  - Statistics
  - Evaluation and find the “best” result
  - ...
- User provides the program logic
- Portal provides data transfer
  - Refer in your code to input files as local files
  - **No need to use any Grid API in your code**



# Workflow Management Window showing Generator and Collector

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

**eWorkflow list**

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

Collector phase is inactive until each eWorkflow has terminated

# Workflow Management Window showing terminated Generator and Collector



PGrade Grid portal - Windows Internet Explorer

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

RELEASE 2.4

**P-GRADE** portal

MTA SZTAKI

Welcome, Peter Kacsuk

Logout

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	finished	✓	-	Submit 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	0	0	0	2

There is no submitted eWorkflow.

**Jobs in collector phase**

Job	Status	Type	Gridname	Hostname	[ Logs ]
Collector	finished	collector	seegrid_LCG_2_BROKER	ce01.info.uvt.ro	Out -

**Message:** eWorkflow list successfully shown.

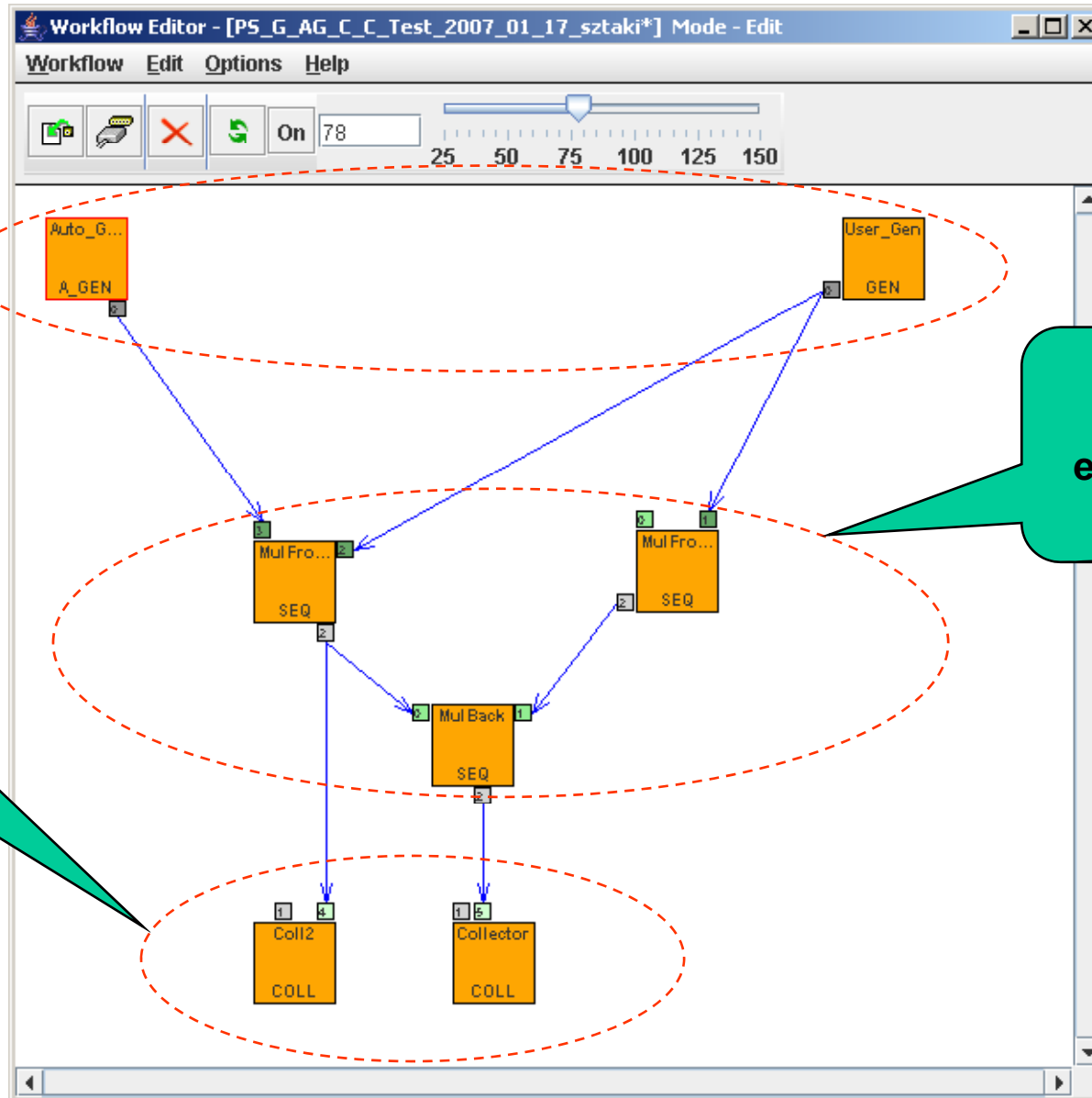
The **Output(s)** of the collector(s) can be downloaded.





# The generic PS workflow application

**First phase:**  
Generators  
executed



**Second phase:**  
eWorkflows  
executed

**Third phase:**  
collectors  
executed

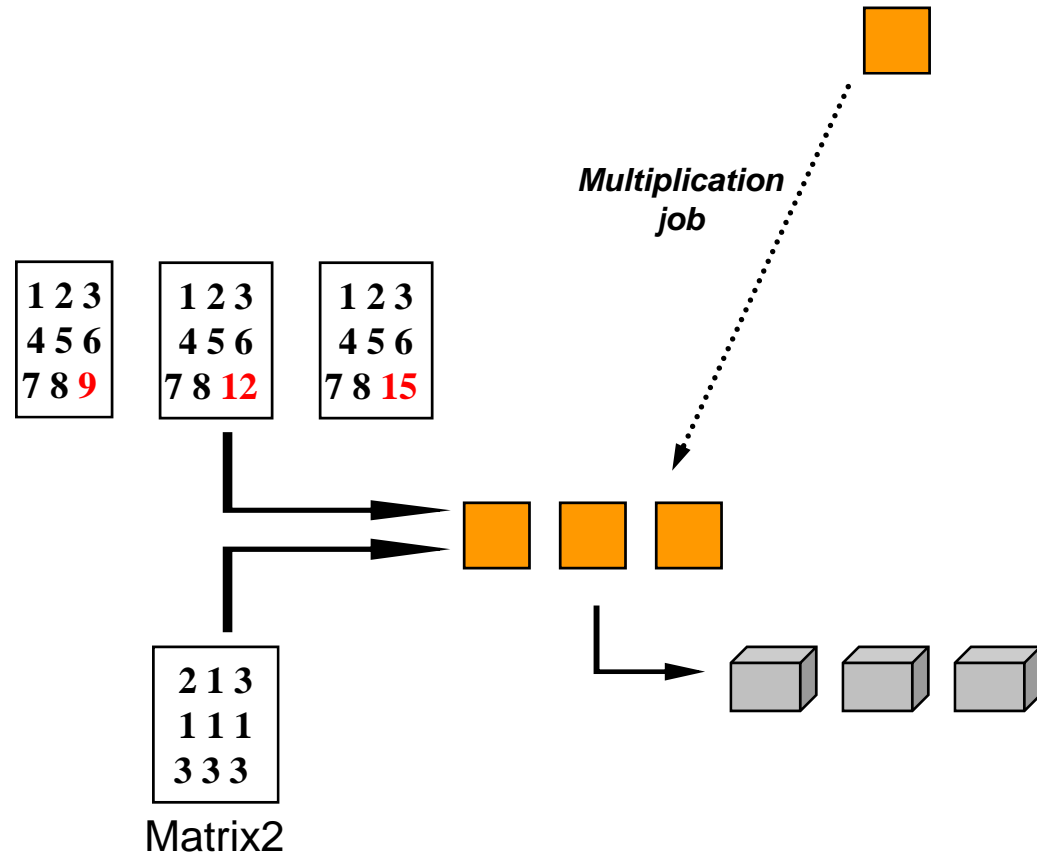


# ***Introduction to the practicals***



# Hands-on exercise

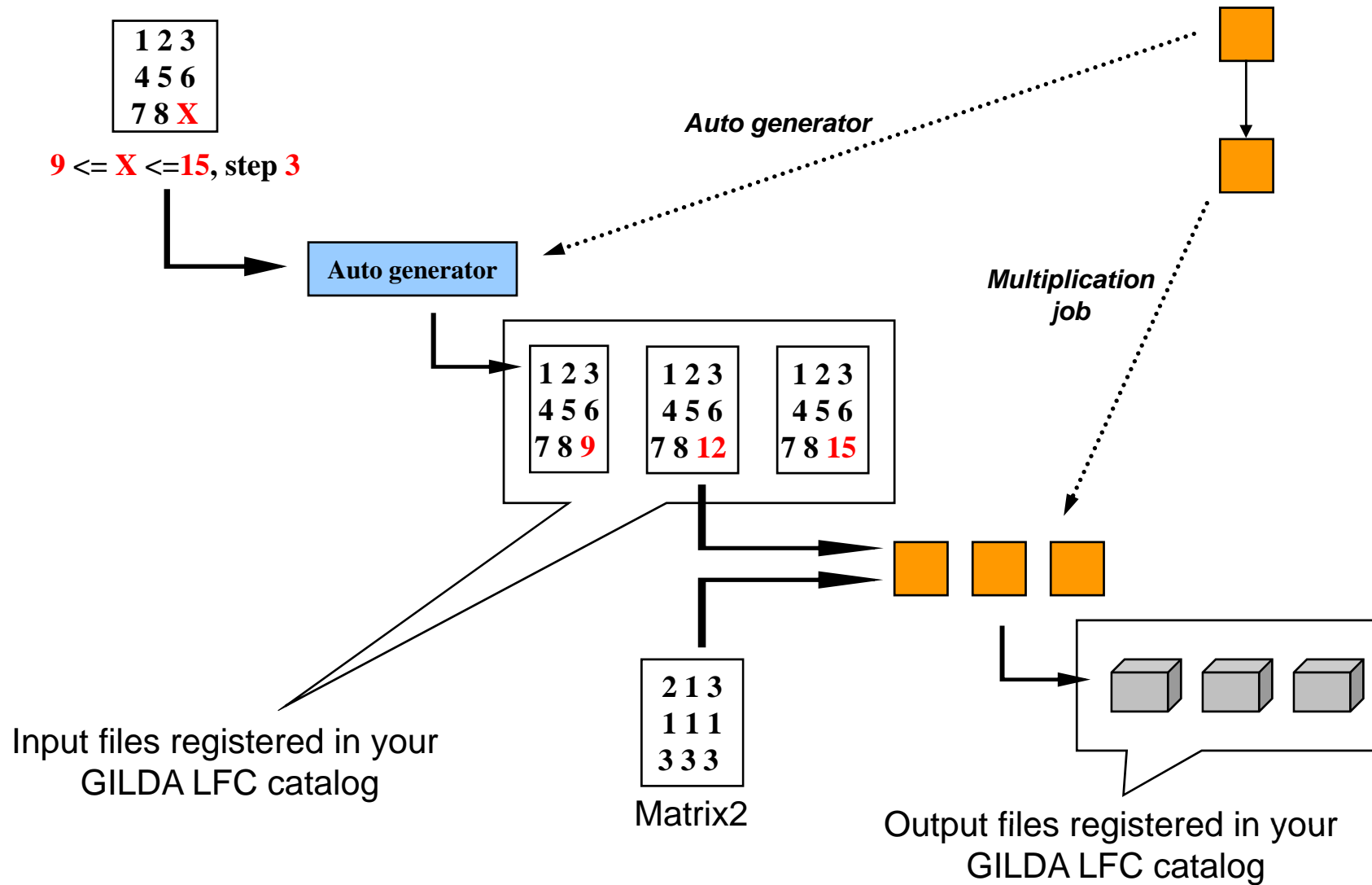
## Matrix multiplication PS





# Hands-on exercise

## Matrix multiplication PS

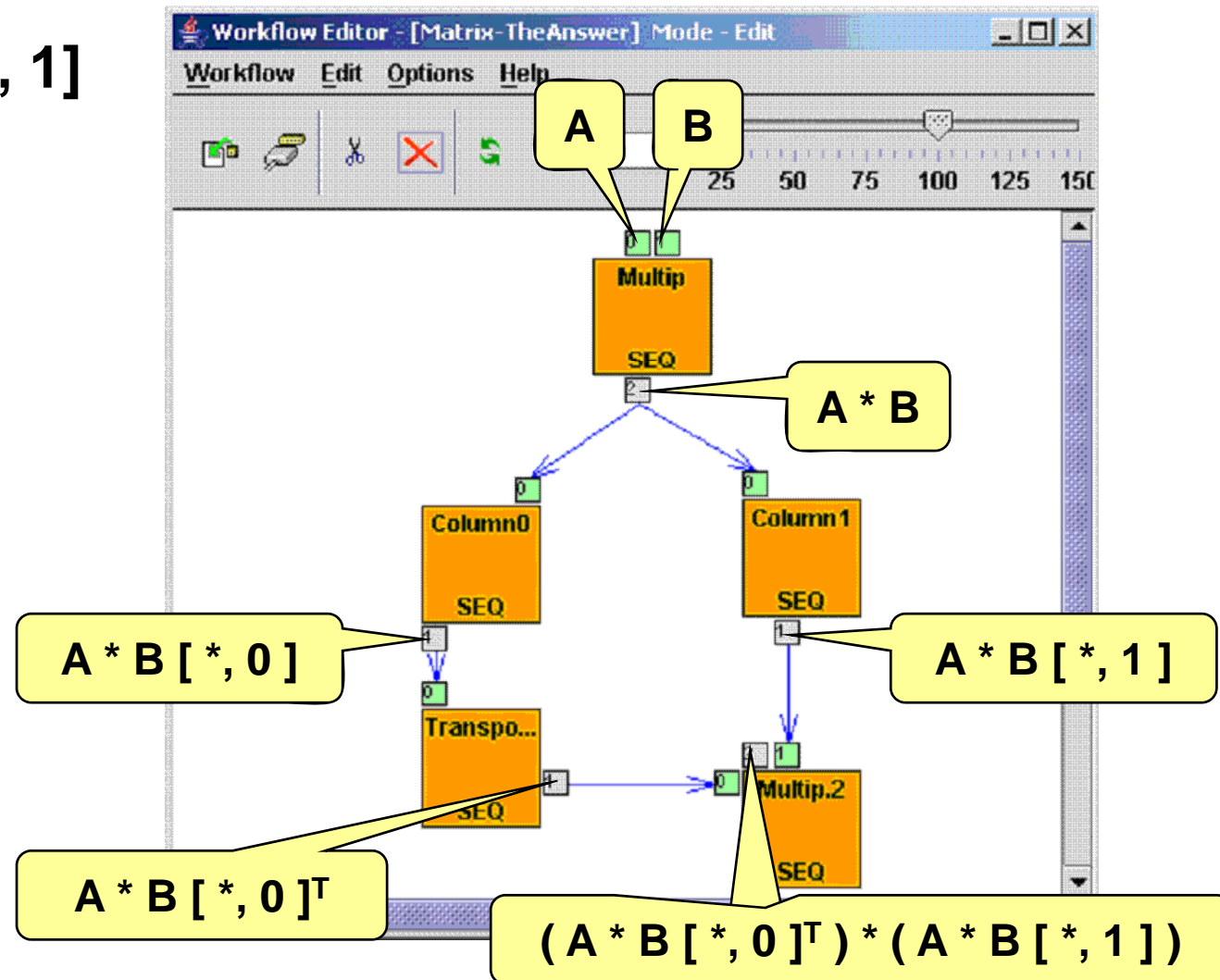




## Hands-on exercise 2

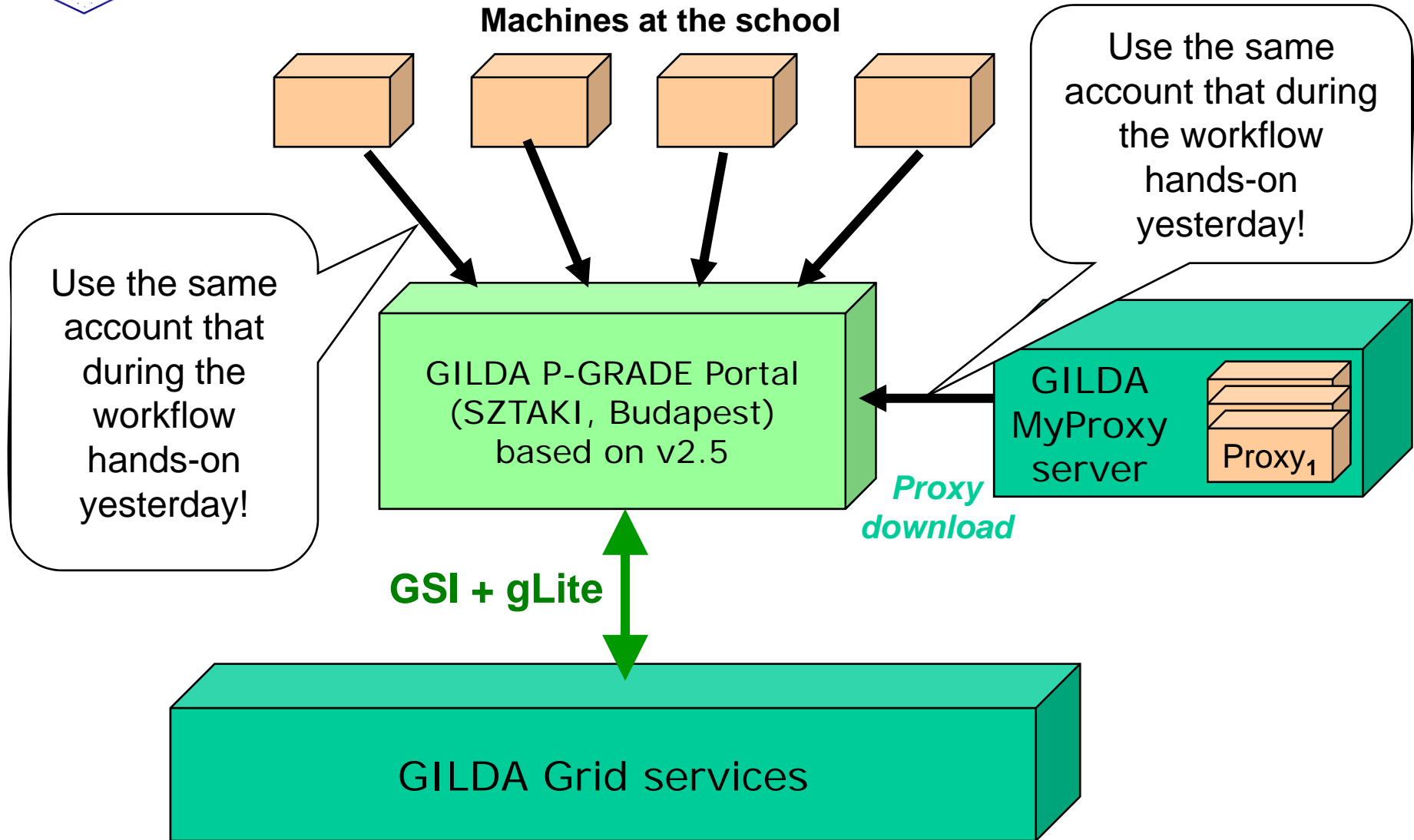
**Turn the matrix operations WF into a parameter study**

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





# Infrastructure for the hands-on





***Open the parameter study  
practicals from the agenda page***

Use the same portal and MyProxy  
accounts than yesterday!