



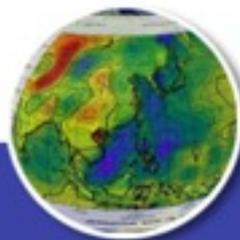
Introduction for Grid Application Platform

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Outline



- **Introduction to GAP (Grid Application Platform).**
- **GAP overview**
- **GAP core framework**
- **GAP application framework**
- **Application Porting**
- **Demo/Practice – AvianFlu Drag Discovery Services**

The objective



- **Integrate different computing resources.**
 - Single server.
 - Computing cluster.
 - Computing Grid.
- **Hope to meet**
 - Different user requirements
 - Now, we focus on Drug Discovery and Carbon Flux Data Computing.

Application Service Development



- **Application service development consists of**
 - Interfacing underlying computing resources
 - Implementing application logics
 - Designing graphic user interfaces

Many routine and tedious works

Many efforts can be reused to speedup the development

Grid Application Platform

- **Grid Application Platform (GAP)** is a grid application framework developed by ASGC. It provides a vertical integration for developers and end-users

– In our aspects, GAP should be

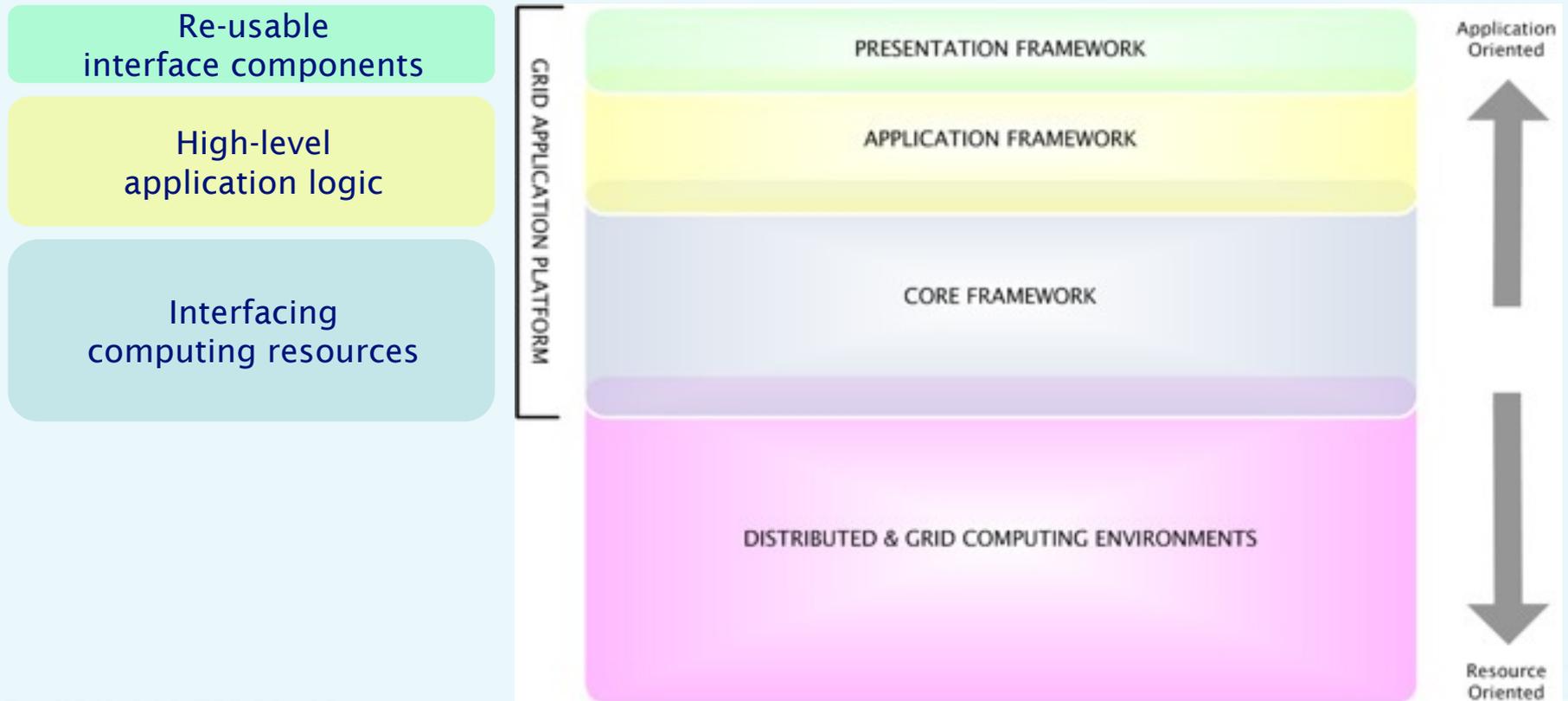
- Easy to use for both end-users and developers.
- *Easy to extend for adopting new IT technologies, the adoption should be transparent to developers and users.*
- *Light-weight in terms of the deployment effort and the system overhead.*

The layered GAP architecture

Reduce the effort of developing application services

Reduce the effort of adapting new technologies

Concentrate efforts on applications



Advantages of GAP

- Through GAP, you can be a
 - Developer
 - Reduce the effort of developing application services.
 - Reduce the effort of adopting new distributed computing technologies.
 - Concentrate efforts on implementing application in their domain.
 - Client can be developed by any Java-based technologies.
 - End-user
 - Portable and light-weight client.
 - User can run their grid-enabled application as simple as using a desktop utility.

Features



- **Application-oriented approach focuses developers effort on domain-specific implementations.**
- **Layered and modularized architecture reduces the effort of adopting new technology.**
- **Object-oriented (OO) design prevents repeating tedious but common works inbuilding application services.**
- **Service-oriented architecture (SOA) makes the whole system scalable.**
- **Portable thin client gives the possibility to access the grid from end-usersKj desktop.**

The GAP Core Framework

The GAP core framework



- **Interfacing computing environments**

- management works on **User** (login, logout, etc.), **Job** (submit, delete, etc.), and **Data** (copy, move, etc.)
- Many kinds of computing environments; GRID is just one of them

How to simplify the management works on a variety of computing environments?

- **Can's**

- simplify **User** and **Job** management as well as the access to the Utility Applications with a set of well-defined APIs
- interface different computing environments with customizable plug-ins

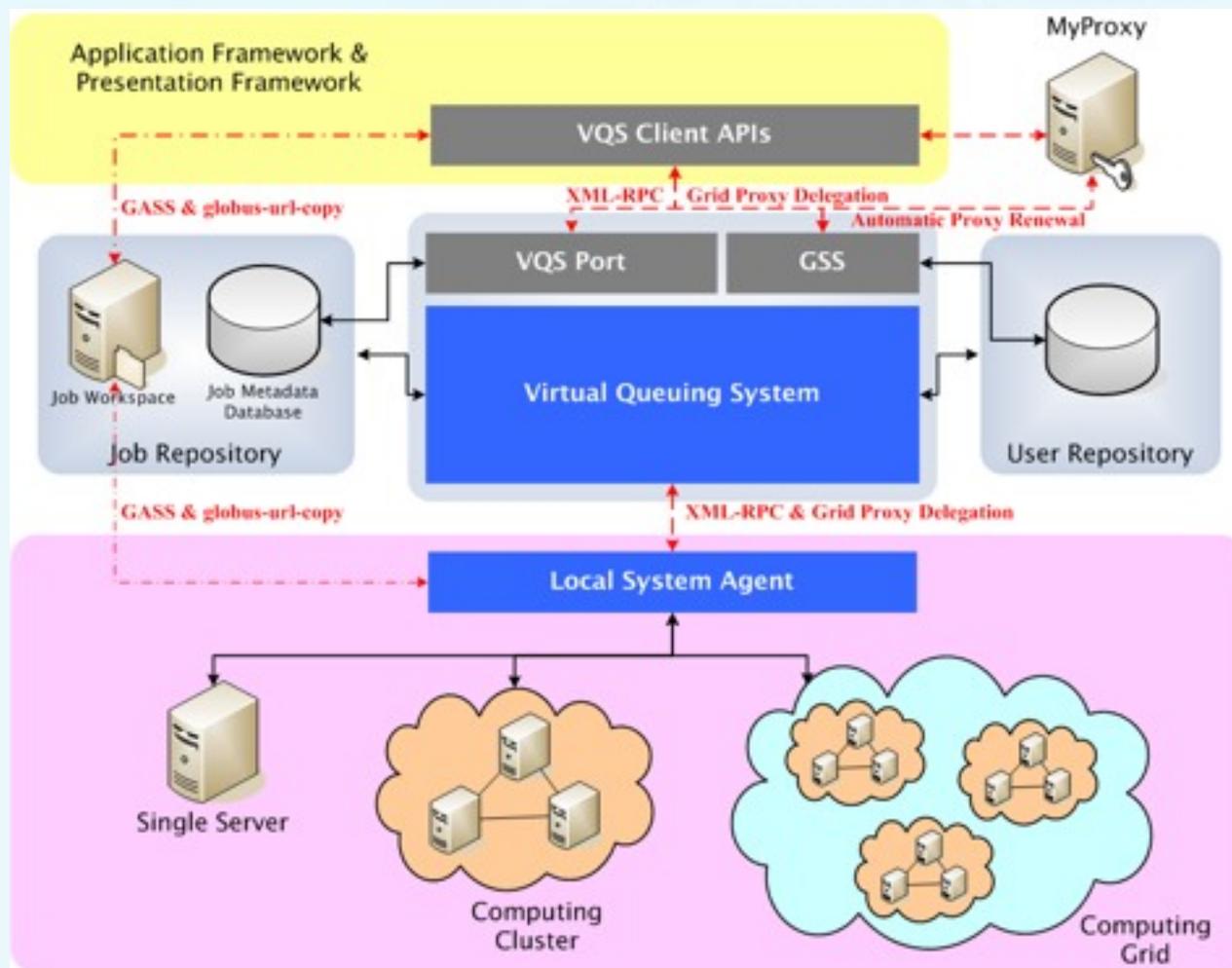
- **Cannot's**

- skip the effort of deploying Utility Applications
- simplify **Data** management (but we plan to work on it)

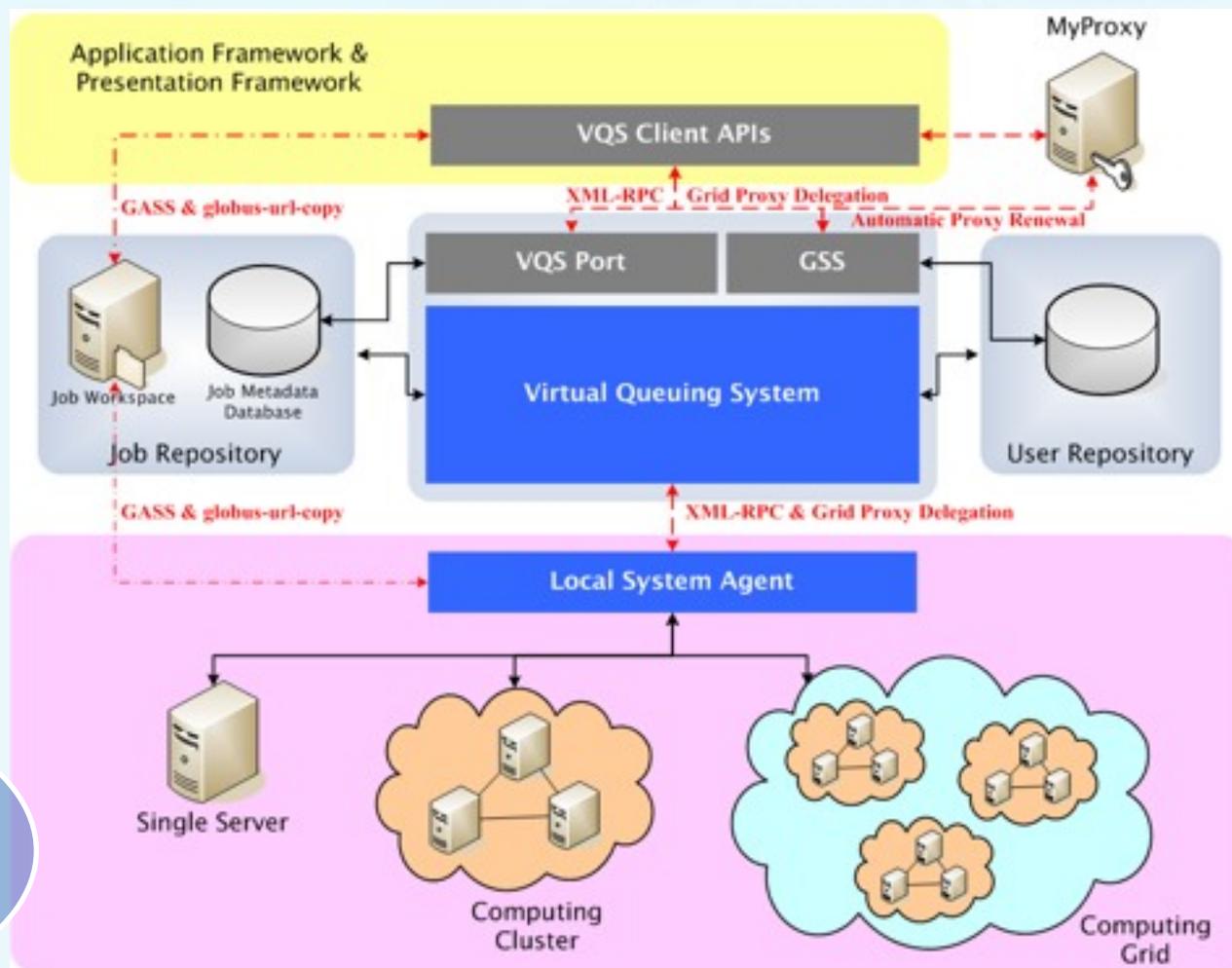
The Utility Application

- **Utility applications are building blocks of problem solving (advanced) applications**
 - can be reused for different purposes
 - advanced application = workflow(utility applications)
- **For the Core Framework, it's a black box of application execution logic**
 - where to run, how to run, what to run on the underlying computing environments
 - an execution of a utility application \Leftrightarrow a Job

The architecture overview



The architecture overview

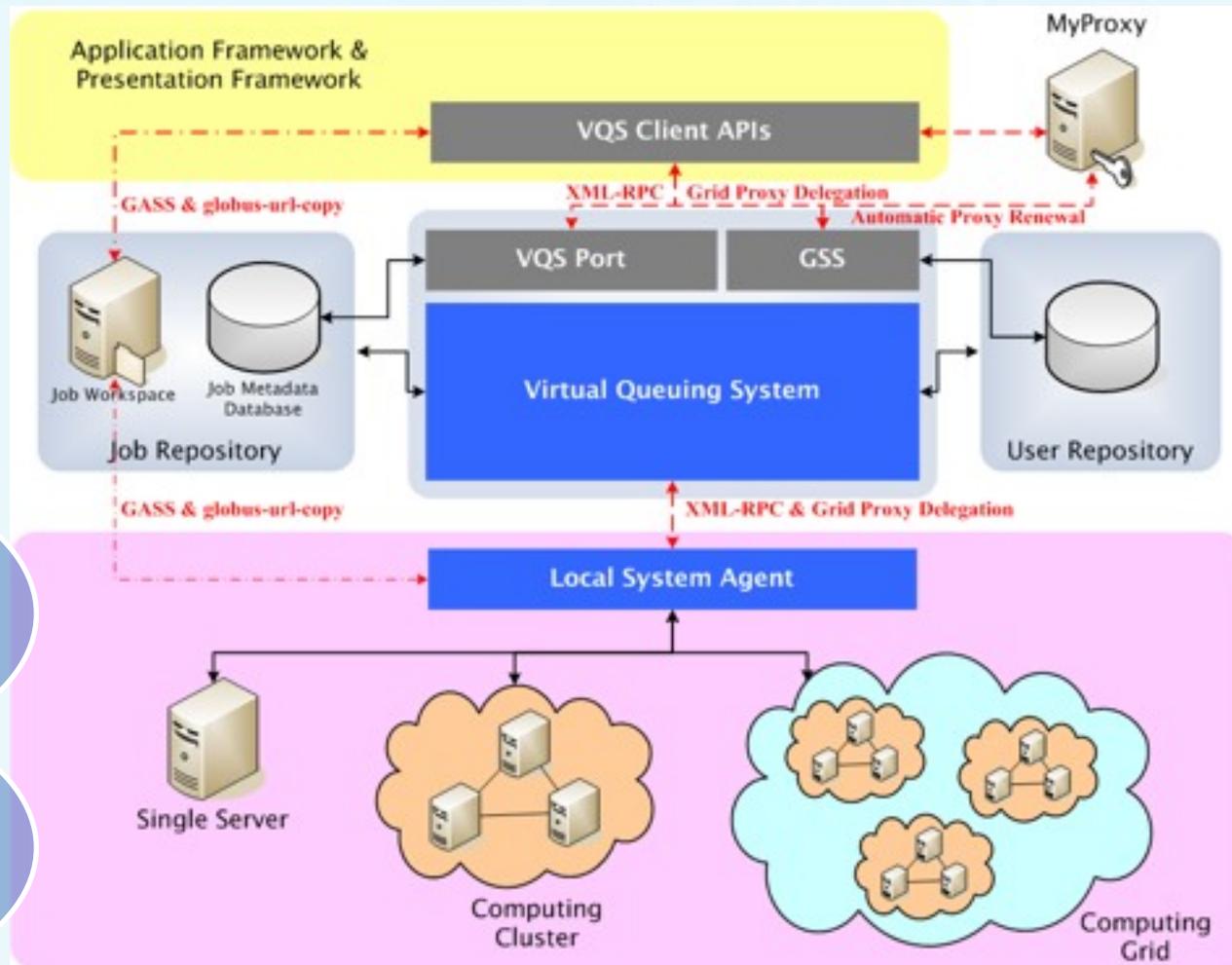


Service Oriented Architecture

The architecture overview

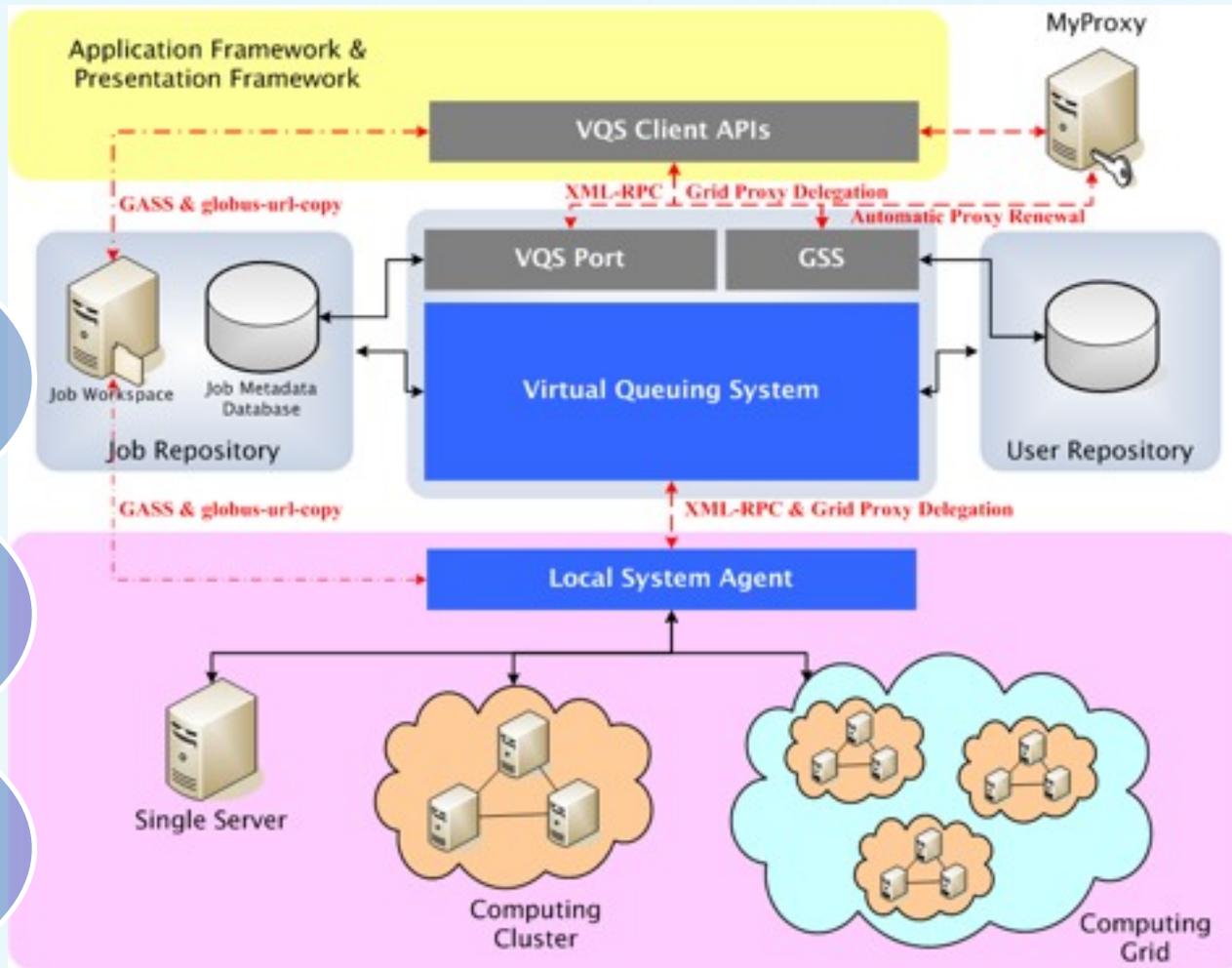
Multi-user Environment

Service Oriented Architecture



The architecture overview

- Common Interface to Heterogeneous Environment
- Multi-user Environment
- Service Oriented Architecture



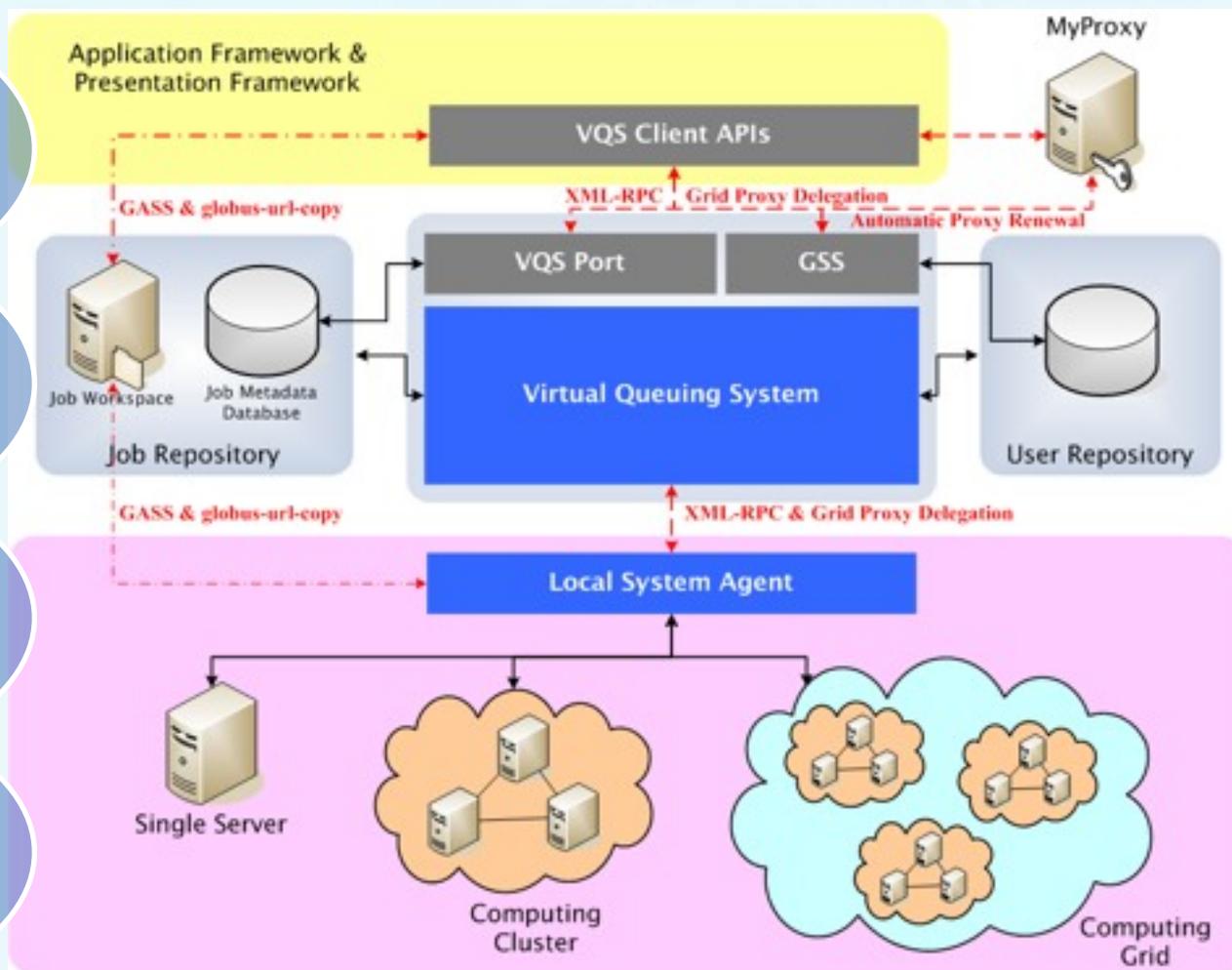
The architecture overview

Portable & light-weight Client

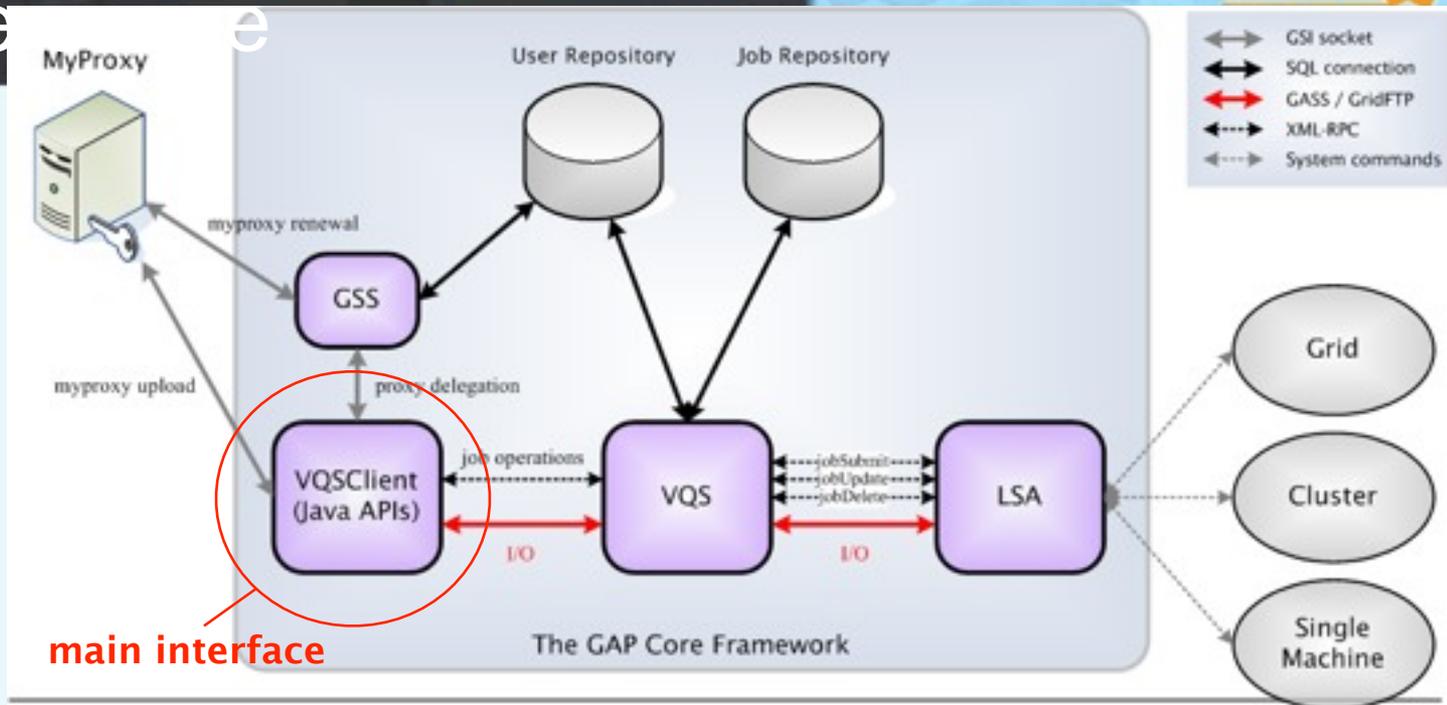
Common Interface to Heterogeneous Environment

Multi-user Environment

Service Oriented Architecture



Behind the



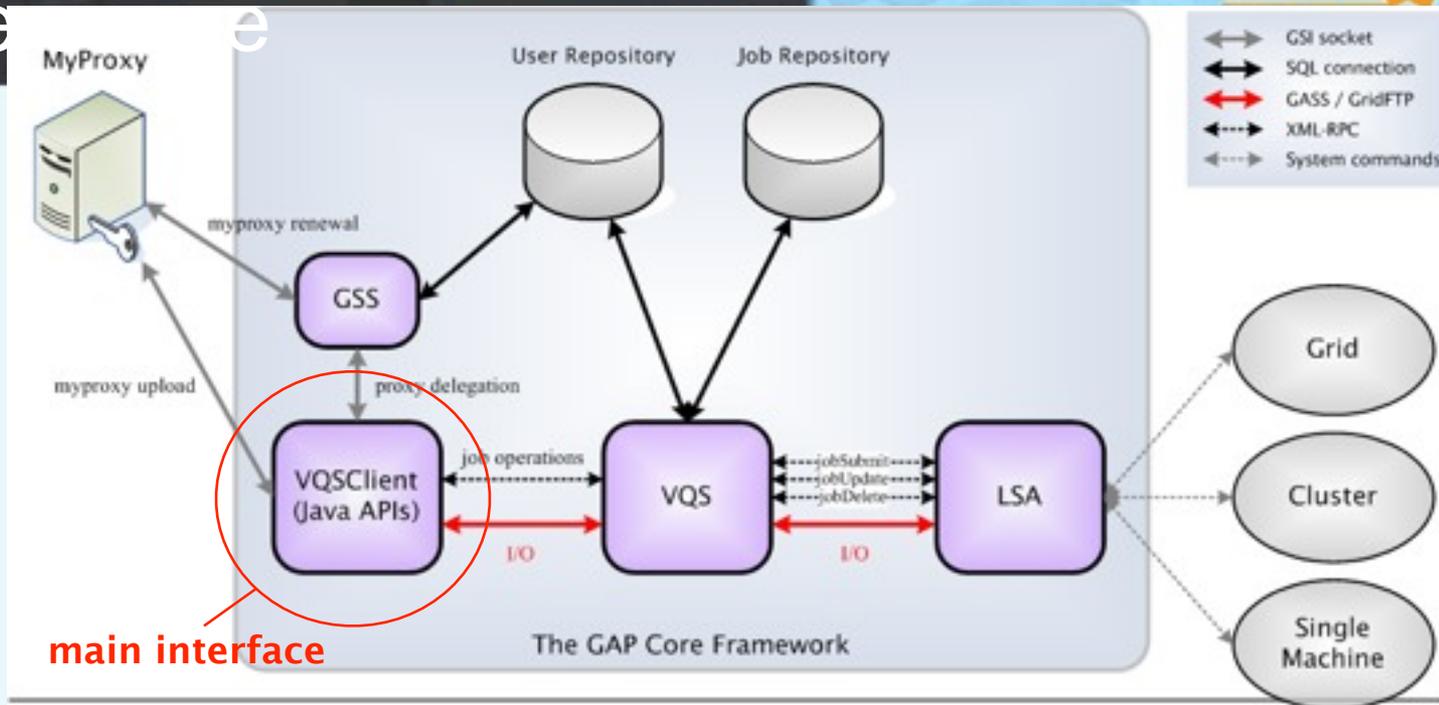
Description of Job

```
[
id : "da049d4a:10fa3a42b8a"
subId : 1
name : "RunShellScript"
appName : "SHELL"
tag : "1166681582473"
rprocs : 1
status : "DONE"
workdir : "/home/hclee/.vqs/hclee/..."
inputUrl : "file:///home/hclee/.vqs/..."
outputUrl : "file:///home/hclee/.vqs/..."
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```

Description of Utility Application (app.xml)

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<!DOCTYPE classads SYSTEM "classads.dtd" >
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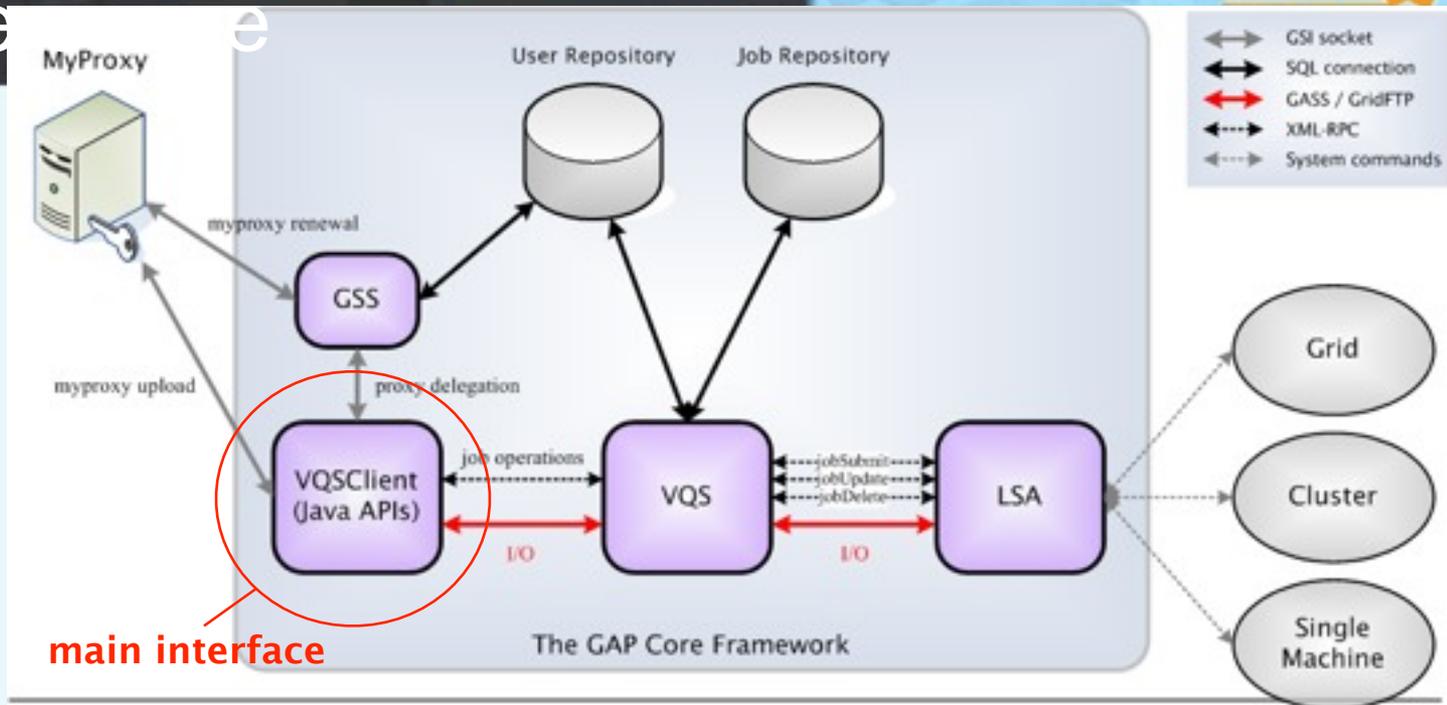
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Java 2 SE

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Behind the



Java-CoG
Java 2 SE

Description of Job

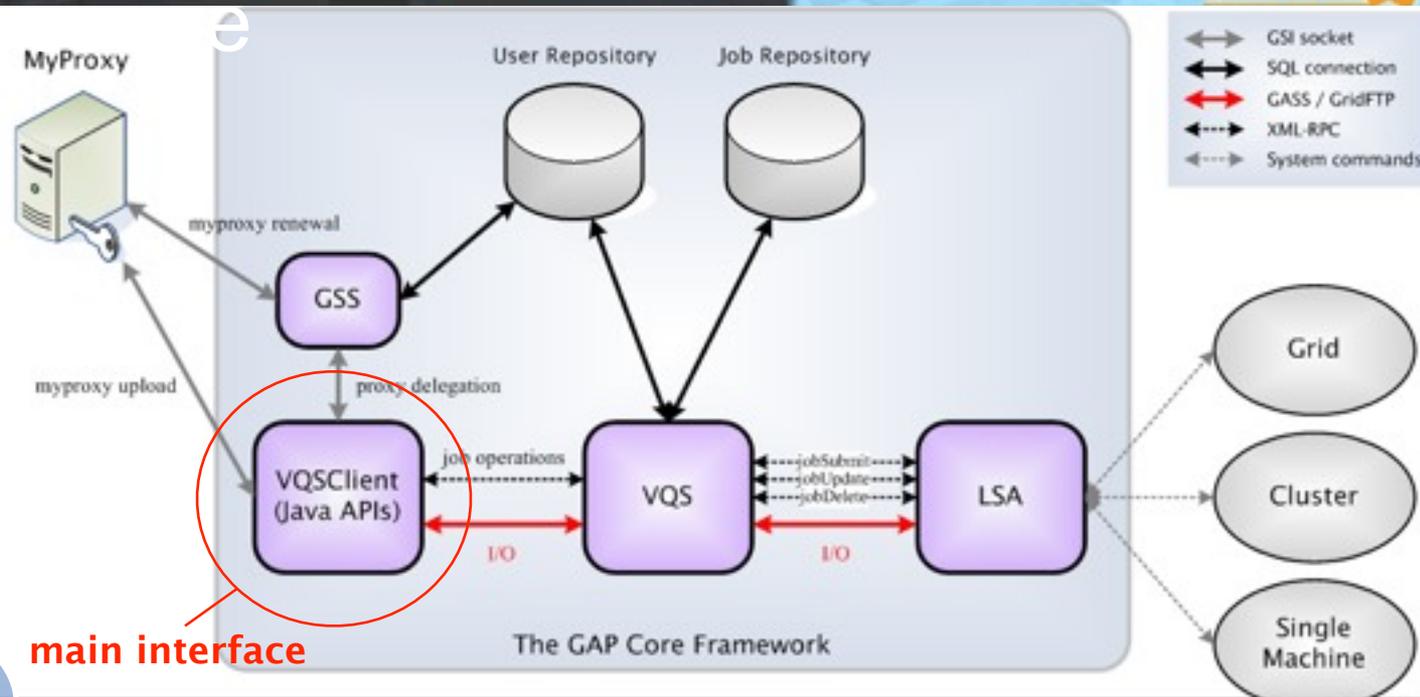
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Behind the



- Conдор ClassAds
- Java-CoG
- Java 2 SE

Description of Job

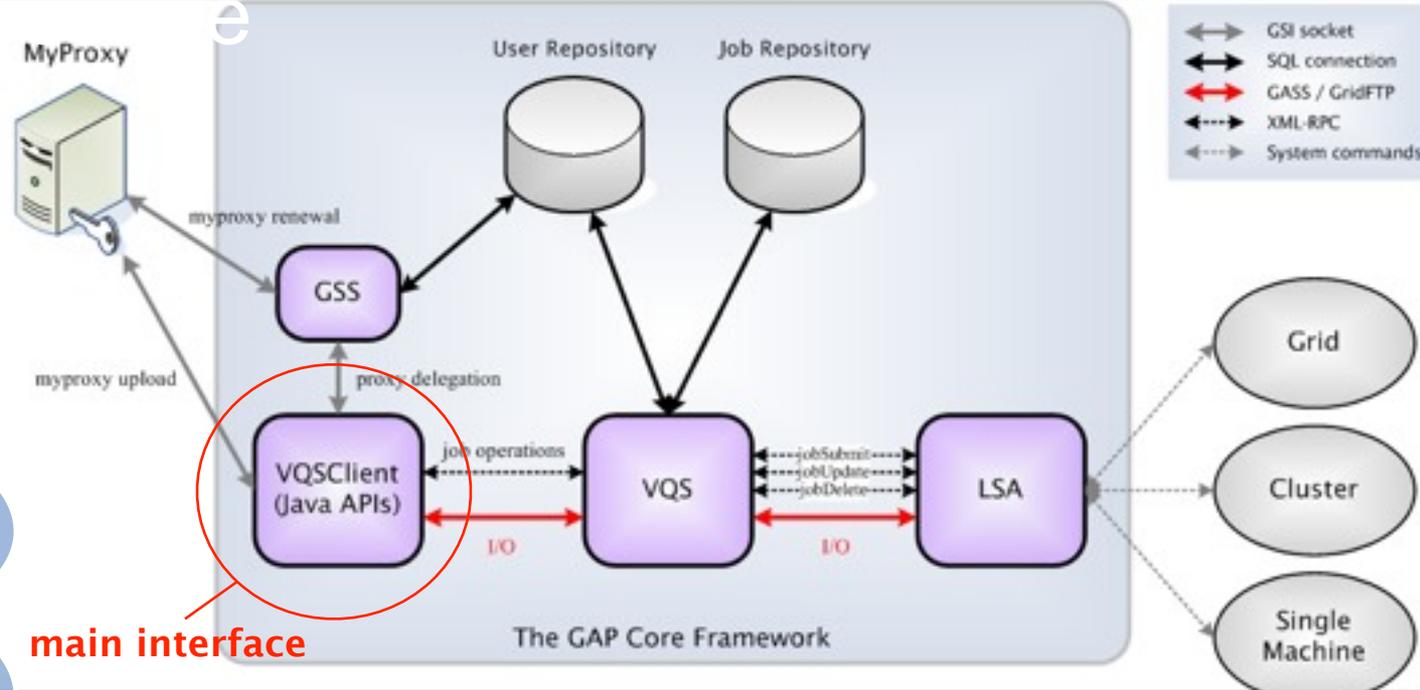
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Behind the



- Apache XML-RPC
- Condor ClassAds
- Java-CoG
- Java 2 SE

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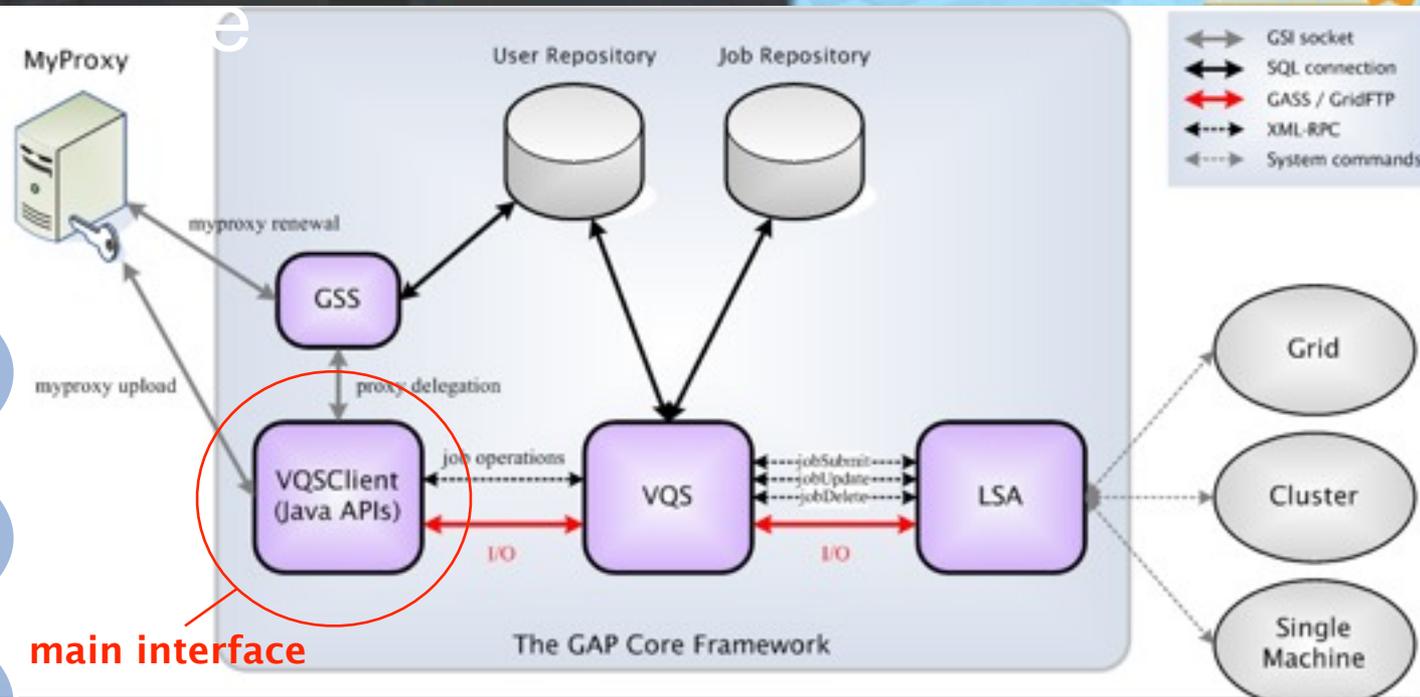
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Behind the



- PostgreSQL
- Apache XML-RPC
- Condor ClassAds
- Java-CoG
- Java 2 SE



main interface

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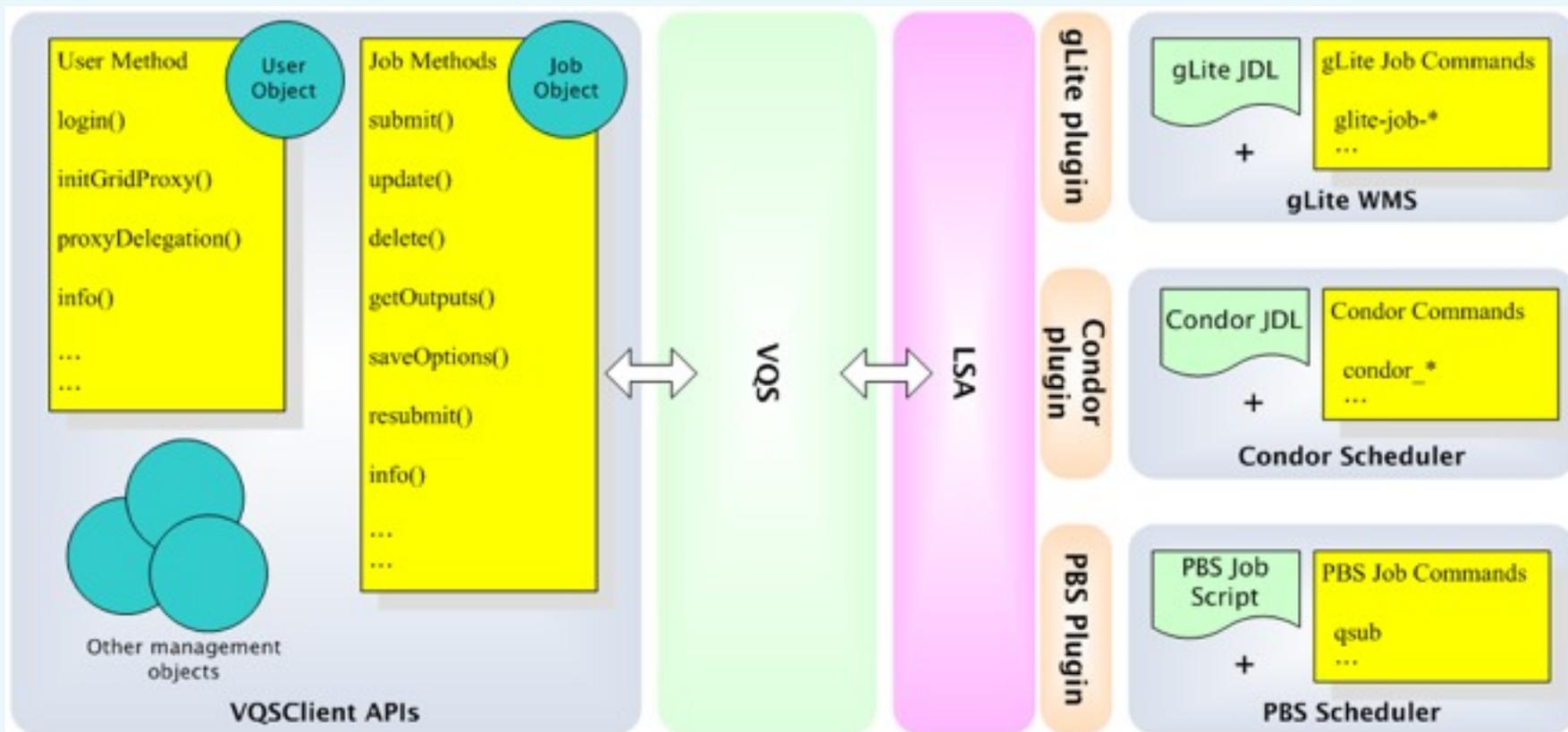
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Common interface to different resources

← common interface → different resources →



VQSCient APIs highlight



- **User** (basic User operations with Grid proxy handlers)

```
user.setXXX();          user.login();          user.initGridProxy();  
user.initMyProxy();    user.delegateProxy();
```

- **Job** (basic Job operations with advanced features)

```
job.setXXX();          job.saveOptions();    job.saveLSARequirements();  
job.submit();          job.resubmit();       job.delete();          job.update();  
job.recoverInputs();  job.fetchOutputs();  job.getLoggingInfo(); job.clone();
```

- **JobManager** (more efficient multi-thread Job operations)

```
JobManager.submitJobs(user,jobList);    JobManager.resubmitJobs(user,jobList);  
JobManager.deleteJobs(user,jobList);    JobManager.updateJobs(user,jobList);  
JobManager.recoverInputs(user,jobList);  JobManager.fetchOutputs(user,jobList);
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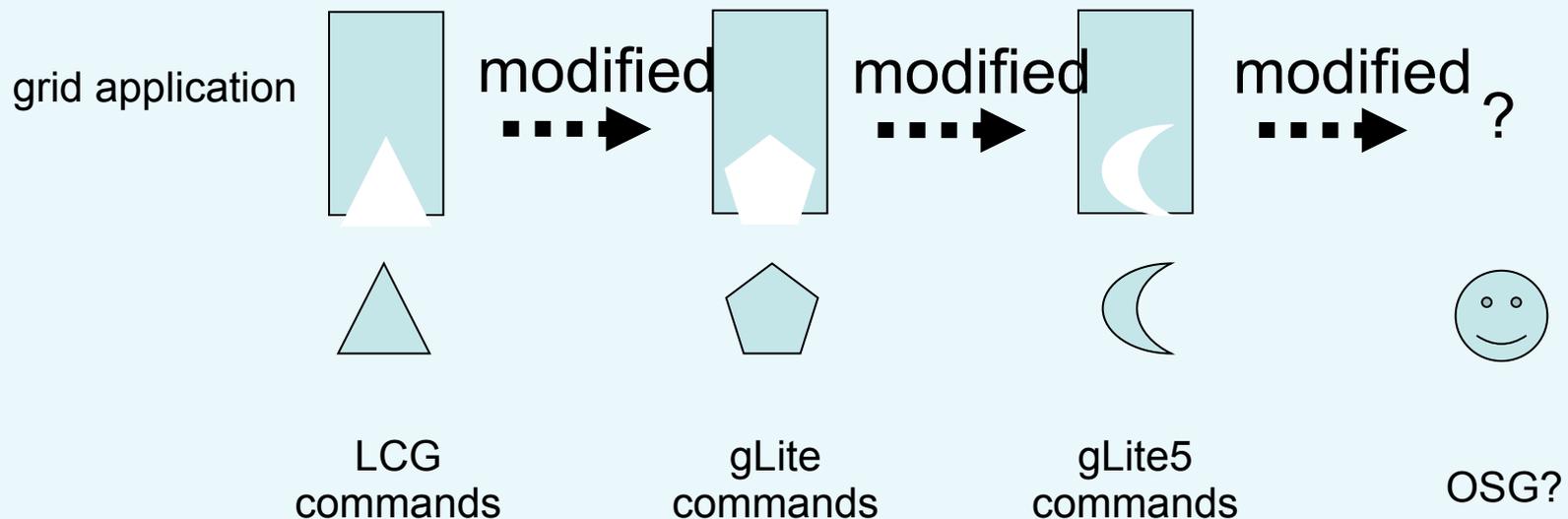
The GAP Application Framework

The GAP core framework

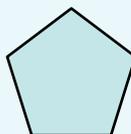
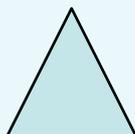


- **Interfacing computing environments**

- management works on **User** (login, logout, etc.), **Job** (submit, delete, etc.), and **Data** (copy, move, etc.)



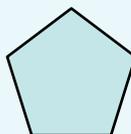
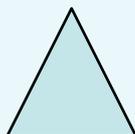
How do I benefit from Core Framework?



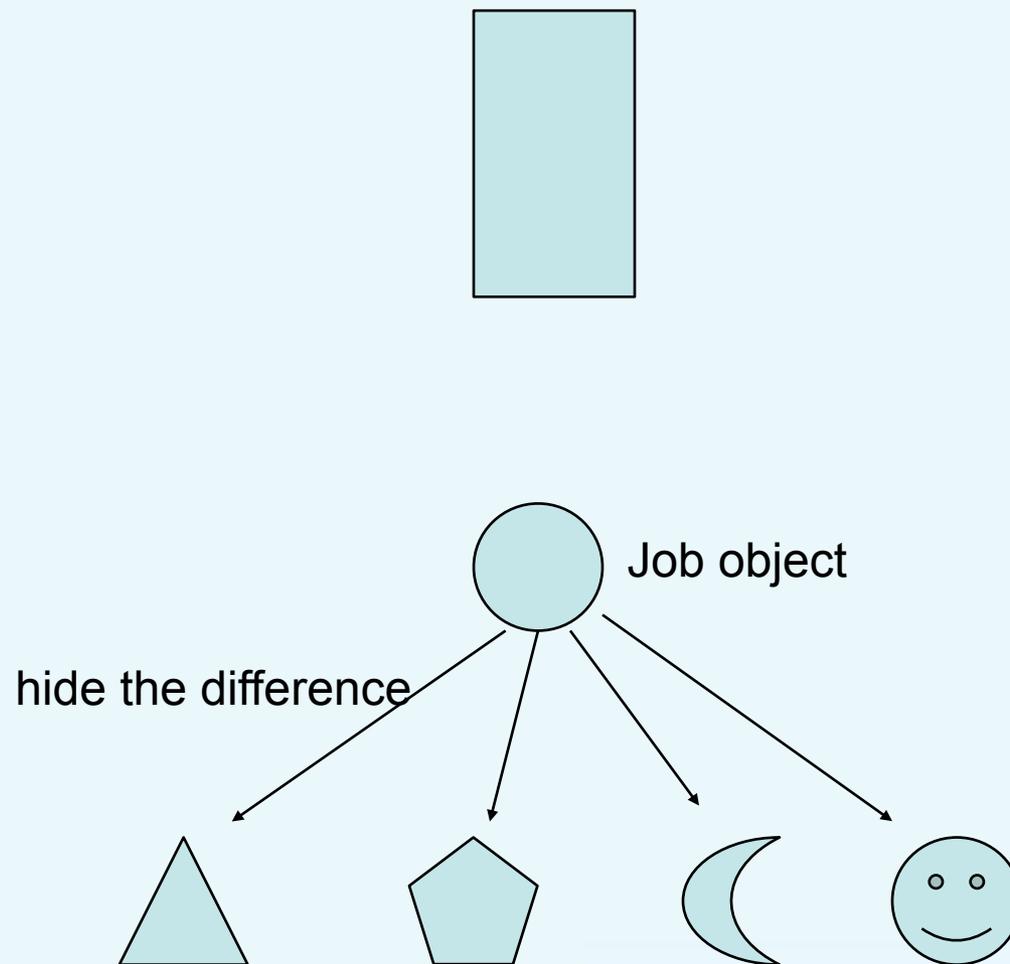
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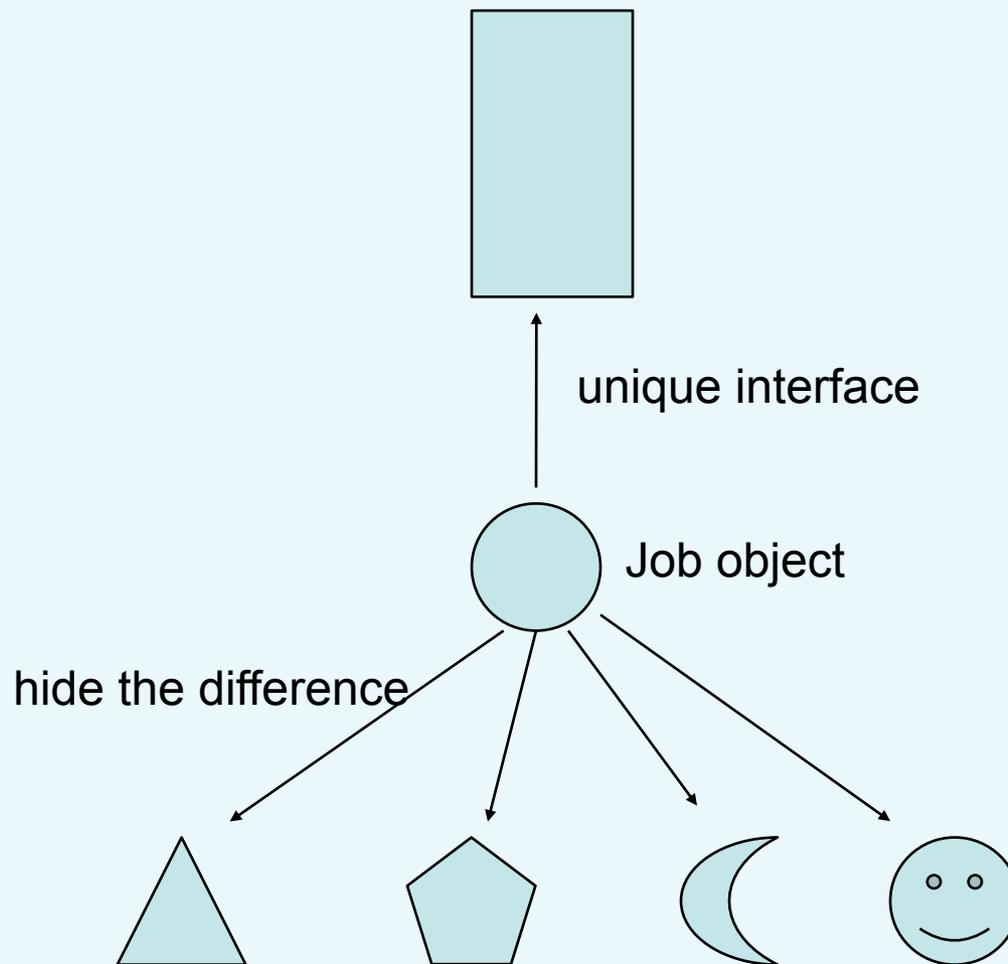
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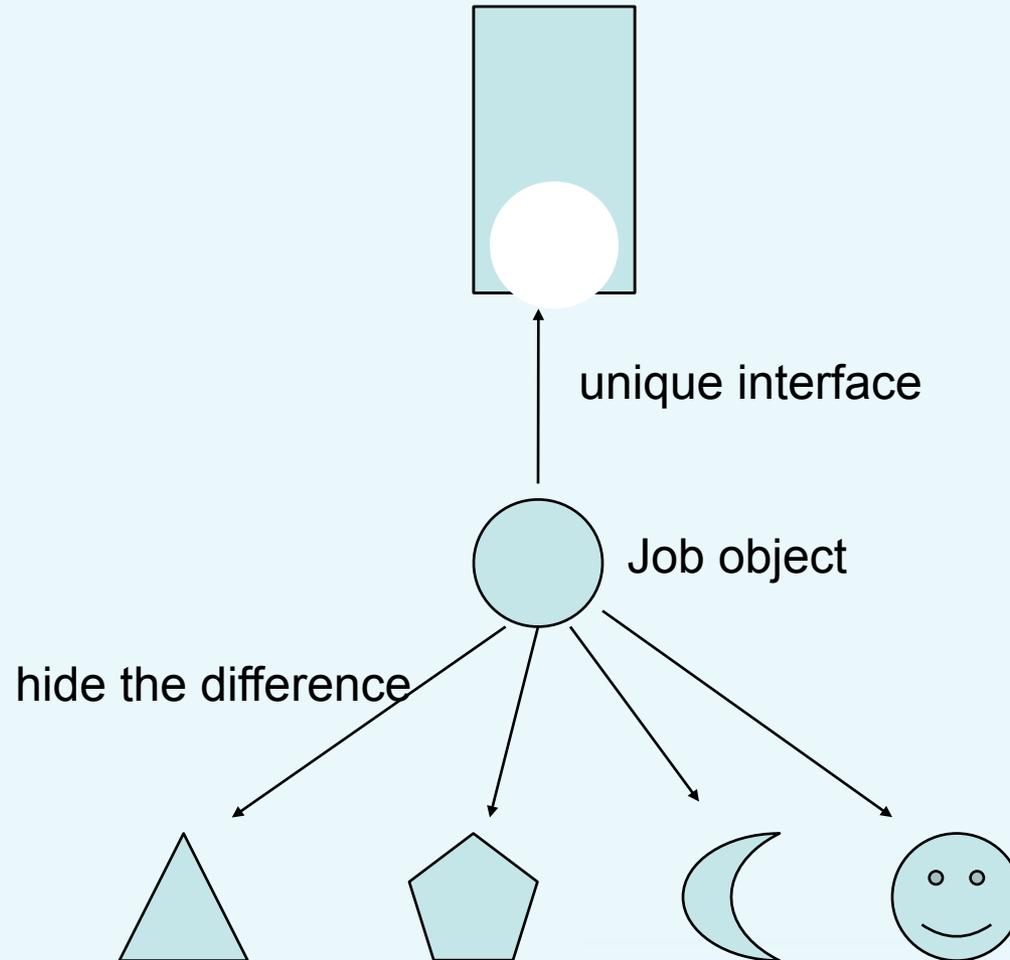
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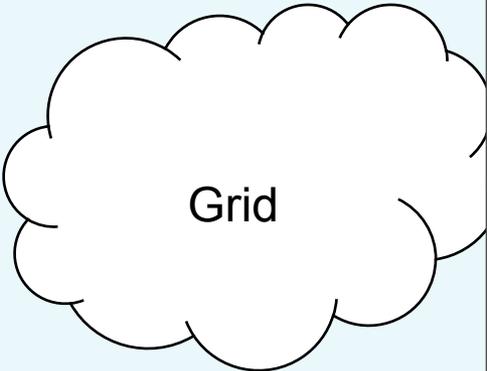
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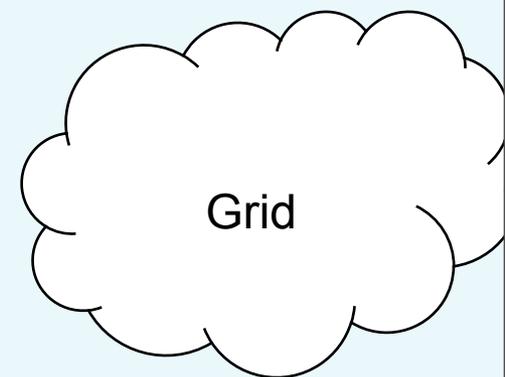


use cases from the real world

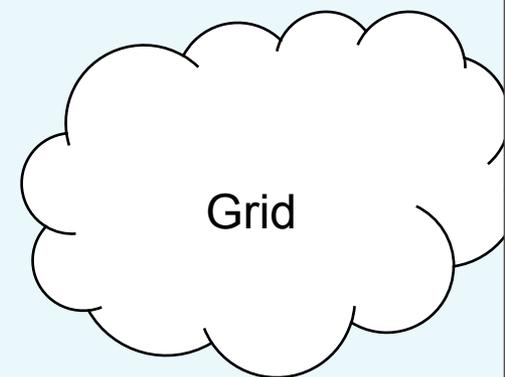


Grid

use cases from the real world



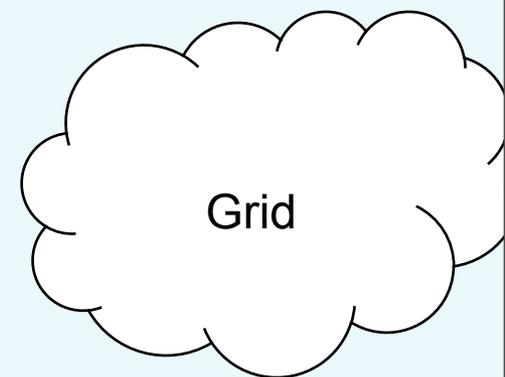
use cases from the real world



**A scientist's task use grid
as a HPC solution**

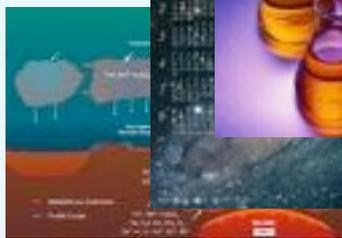
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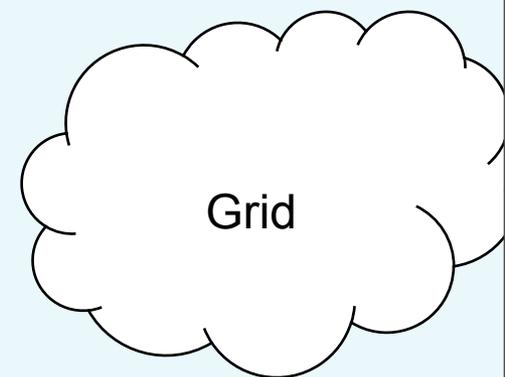


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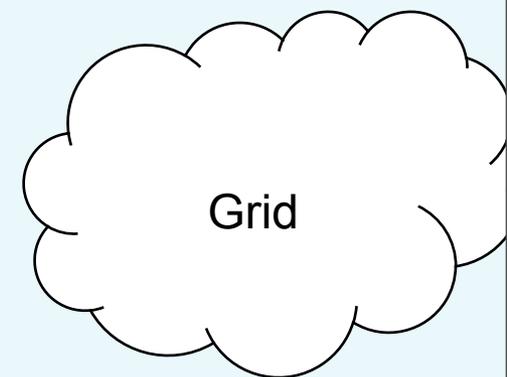
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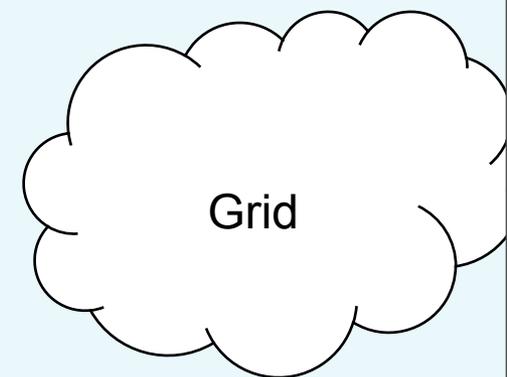
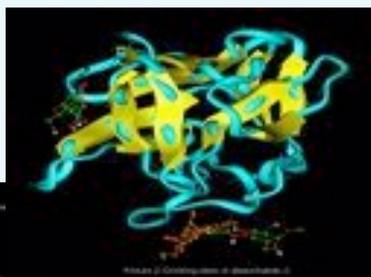


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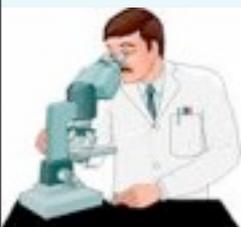
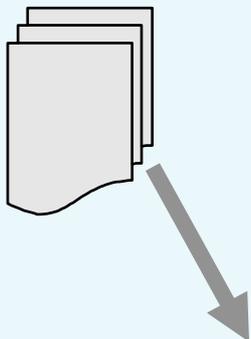
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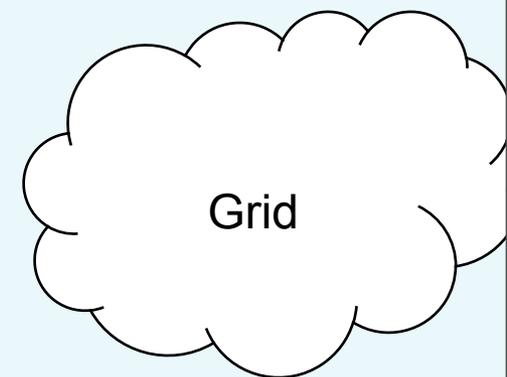
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use cases from the real world

inputs



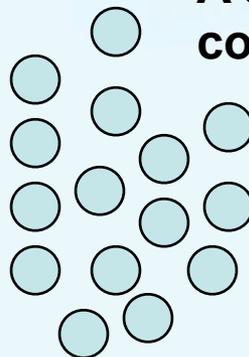
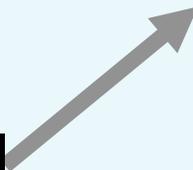
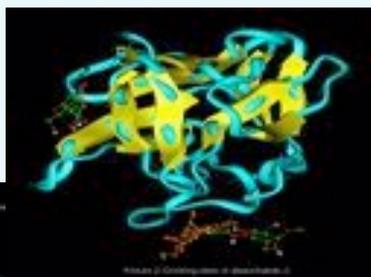
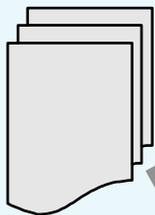
The 15-m long LHC cryodipole



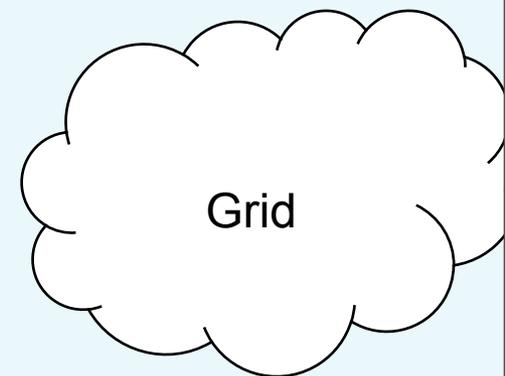
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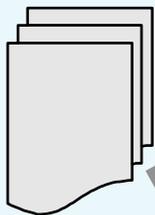
A single task might consist of lots of jobs.



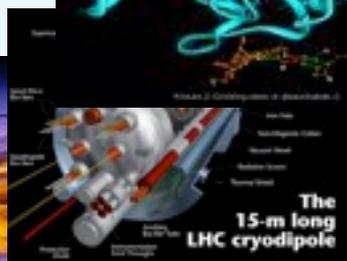
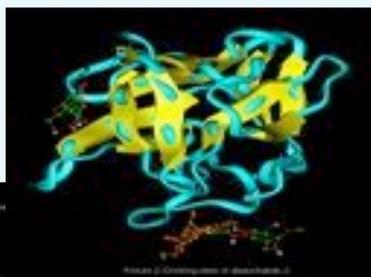
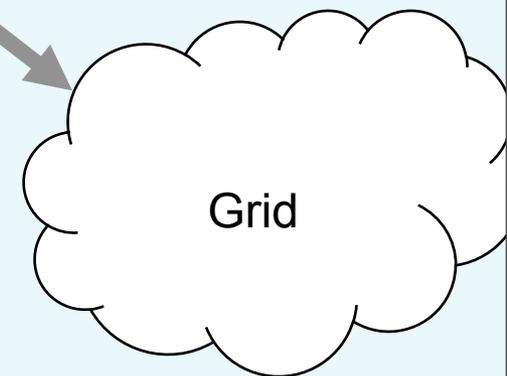
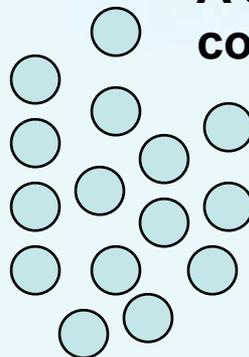
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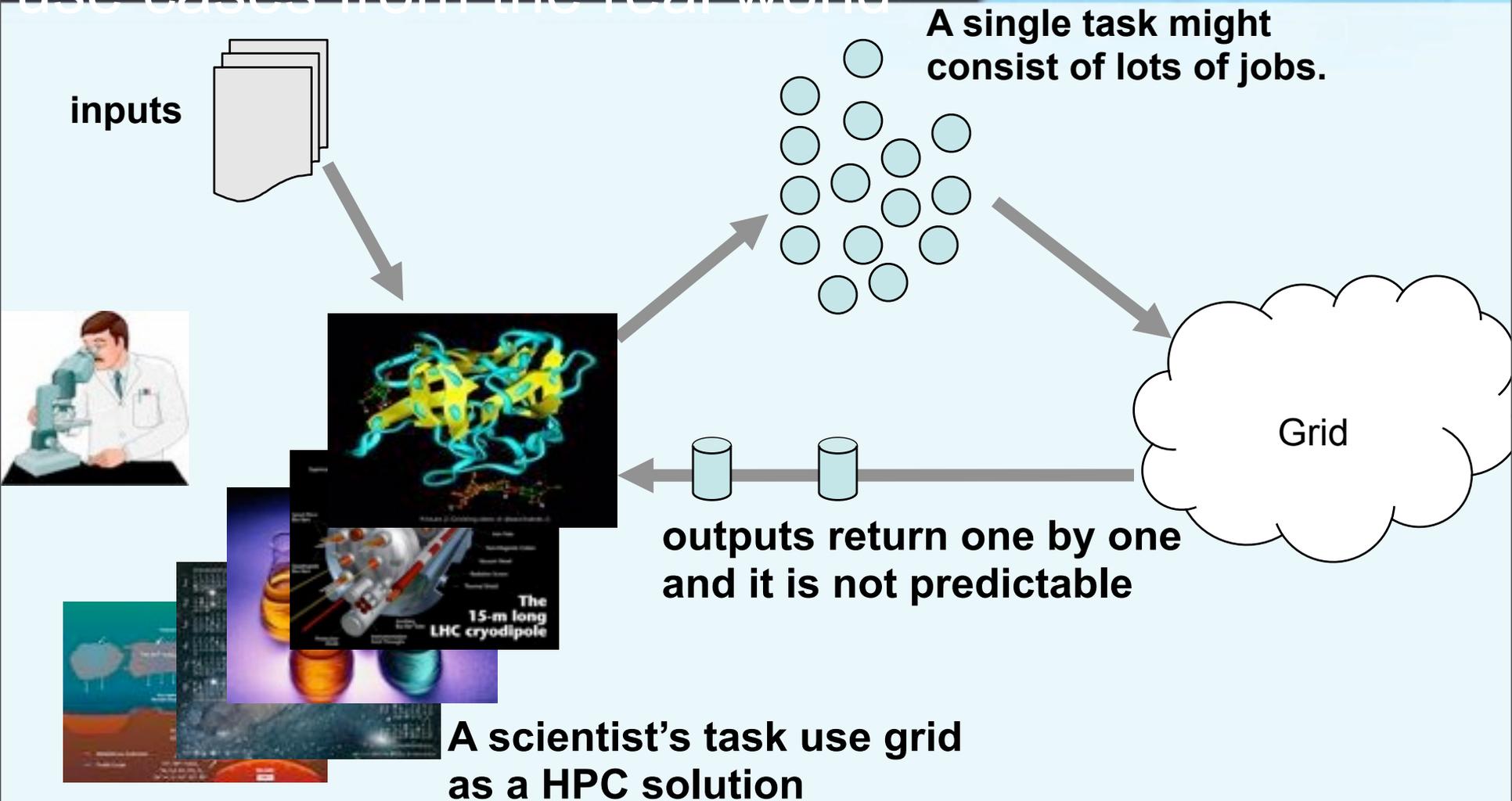


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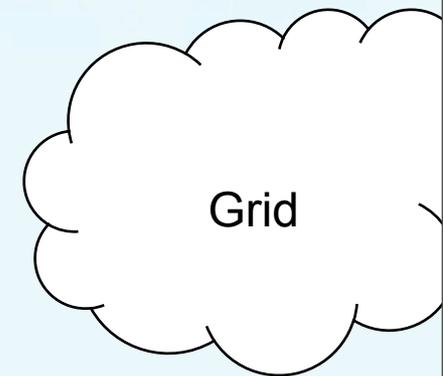


A scientist's task use grid as a HPC solution

use cases from the real world



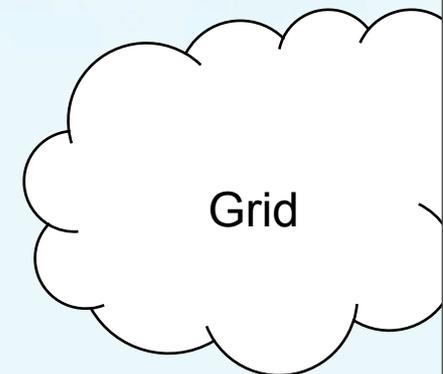
We define
Modal Objects representing the use cases



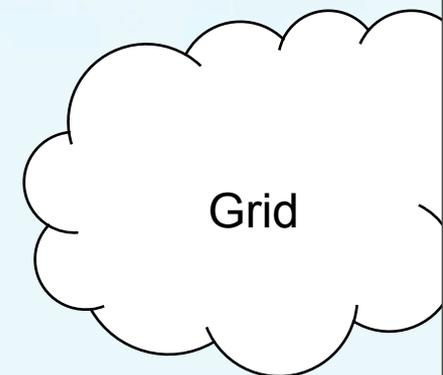
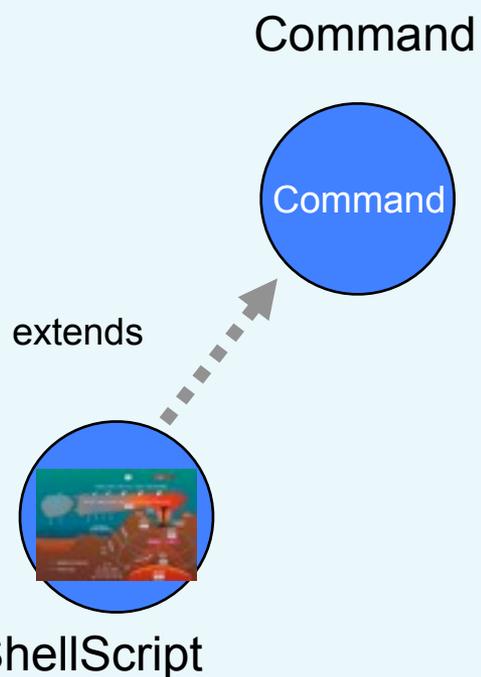
We define
Modal Objects representing the use cases



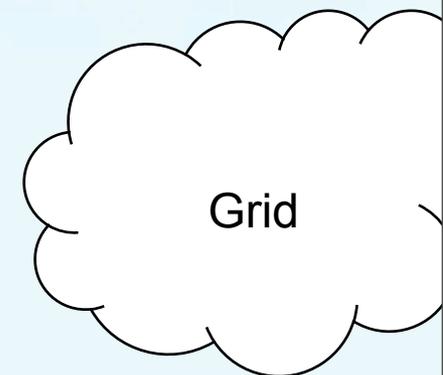
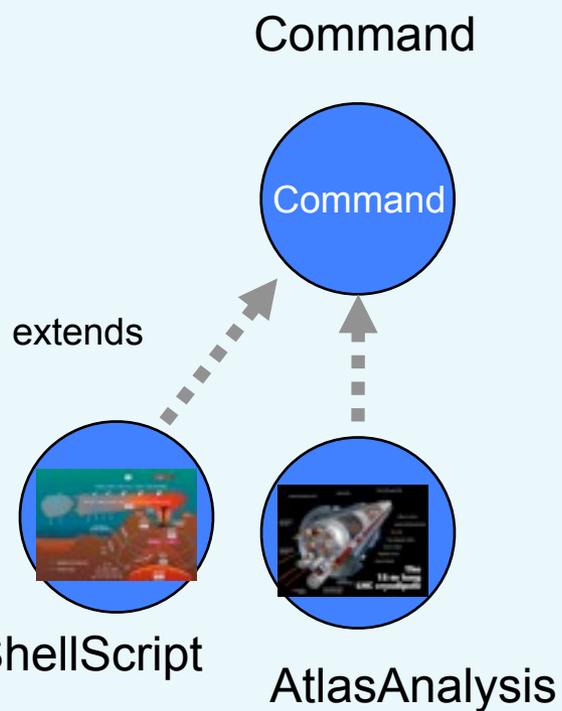
Command



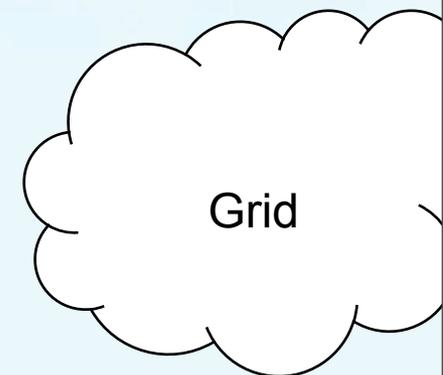
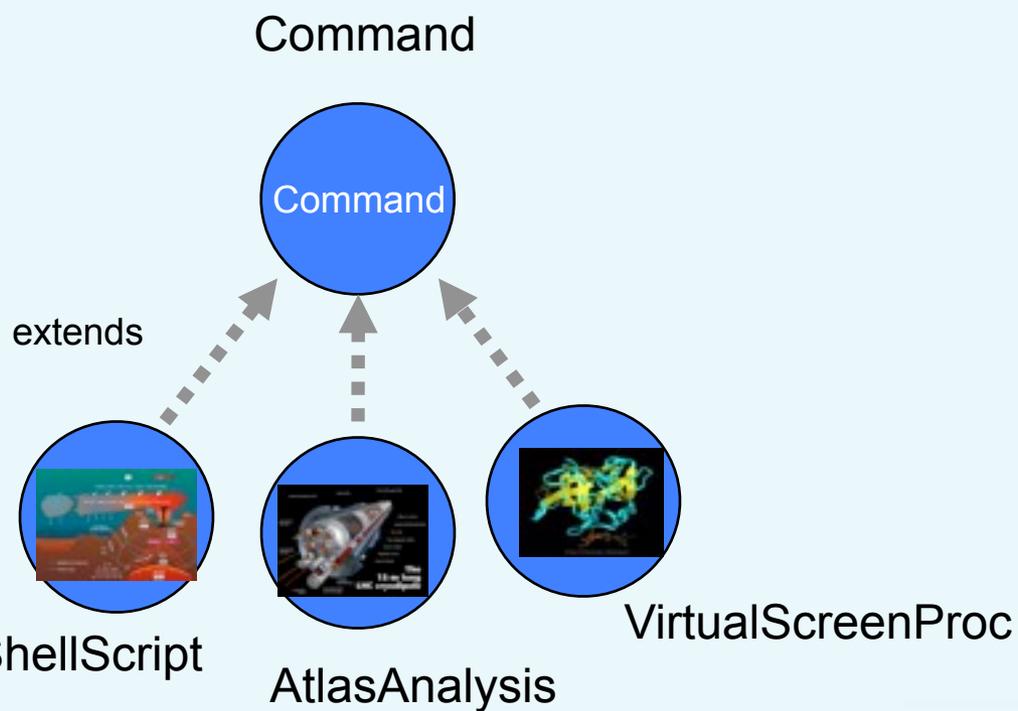
We define
Modal Objects representing the use cases



We define
Modal Objects representing the use cases

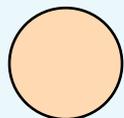


We define
Modal Objects representing the use cases



We define
Modal Objects representing the use cases

CommandParam



Command



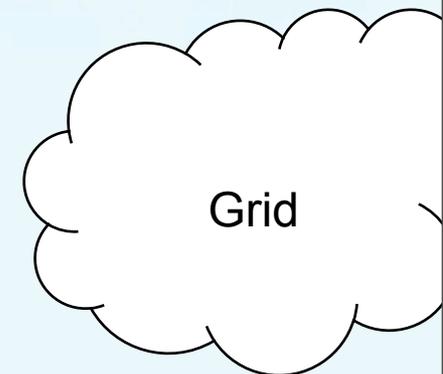
extends



RunShellScript

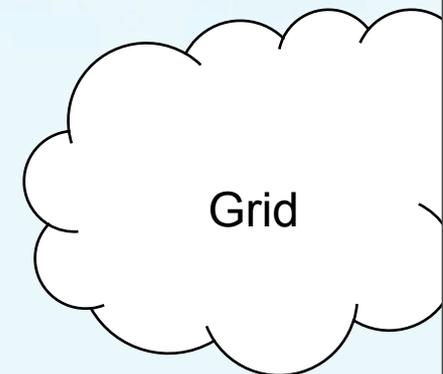
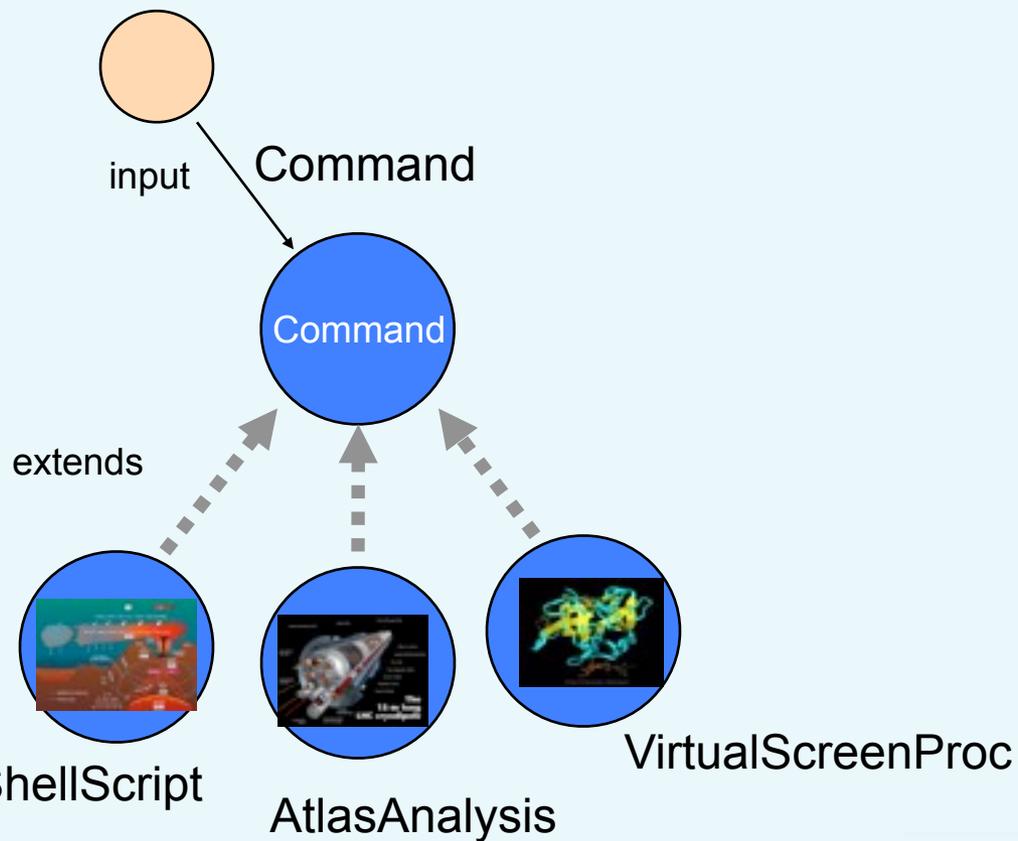
AtlasAnalysis

VirtualScreenProc

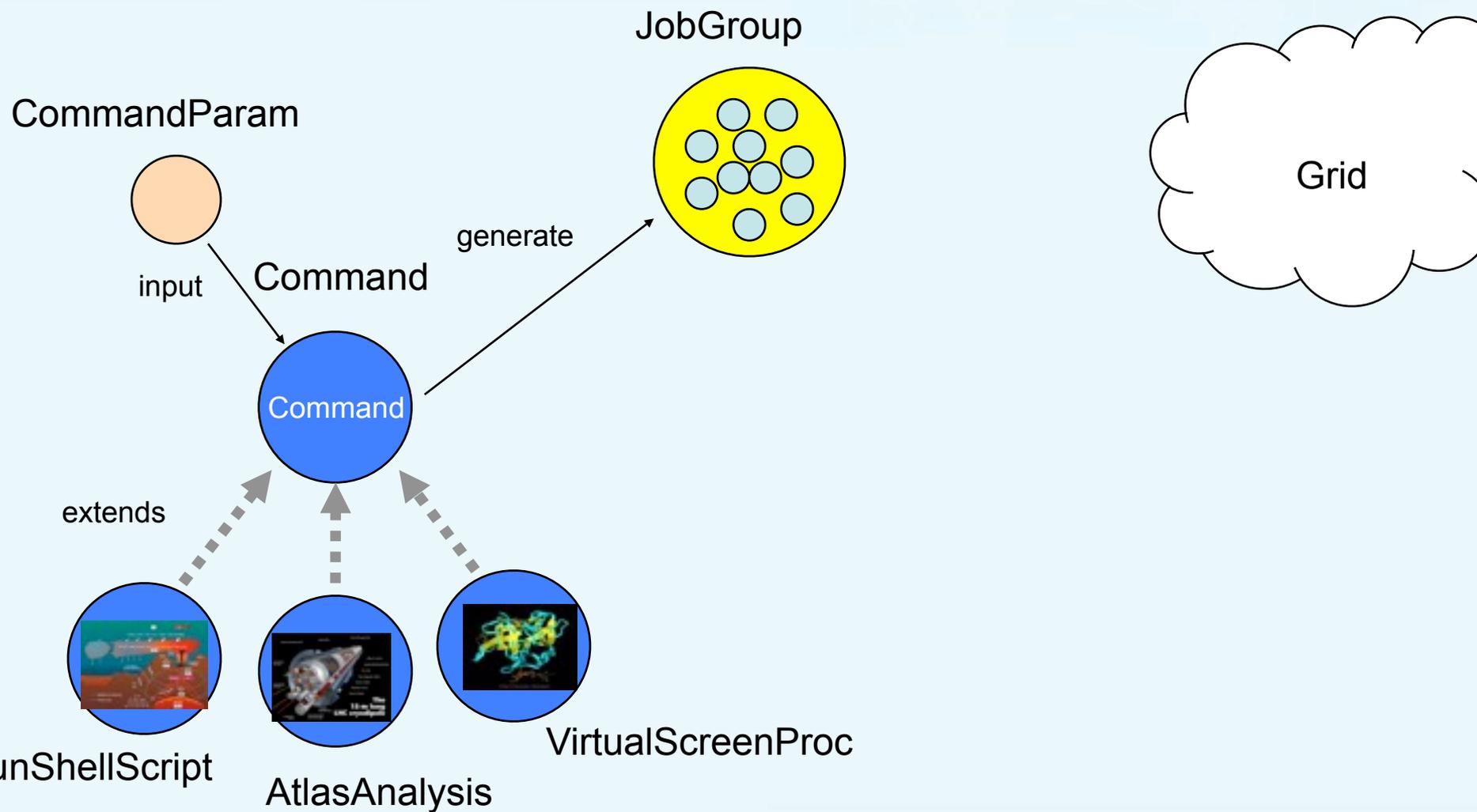


We define
Modal Objects representing the use cases

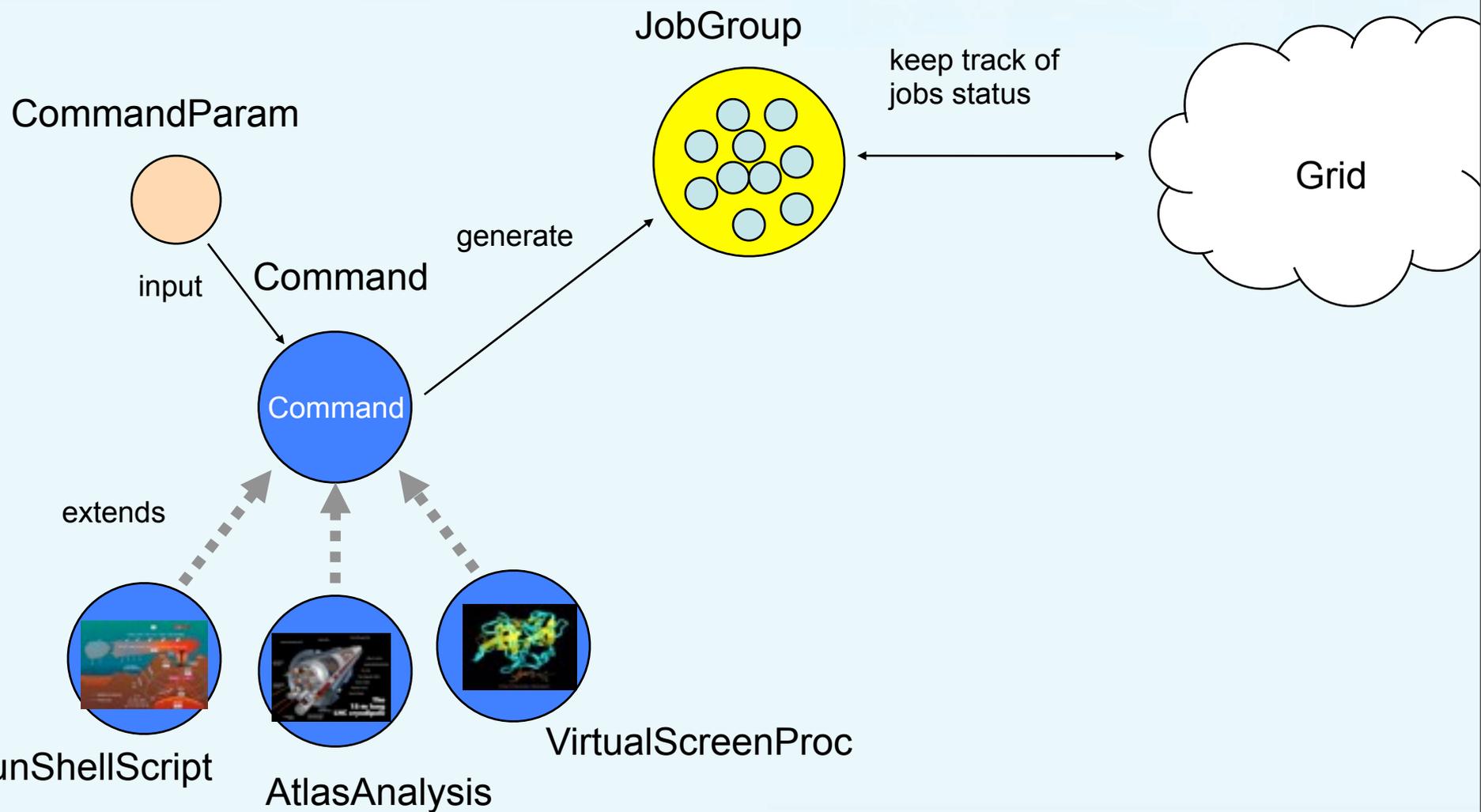
CommandParam



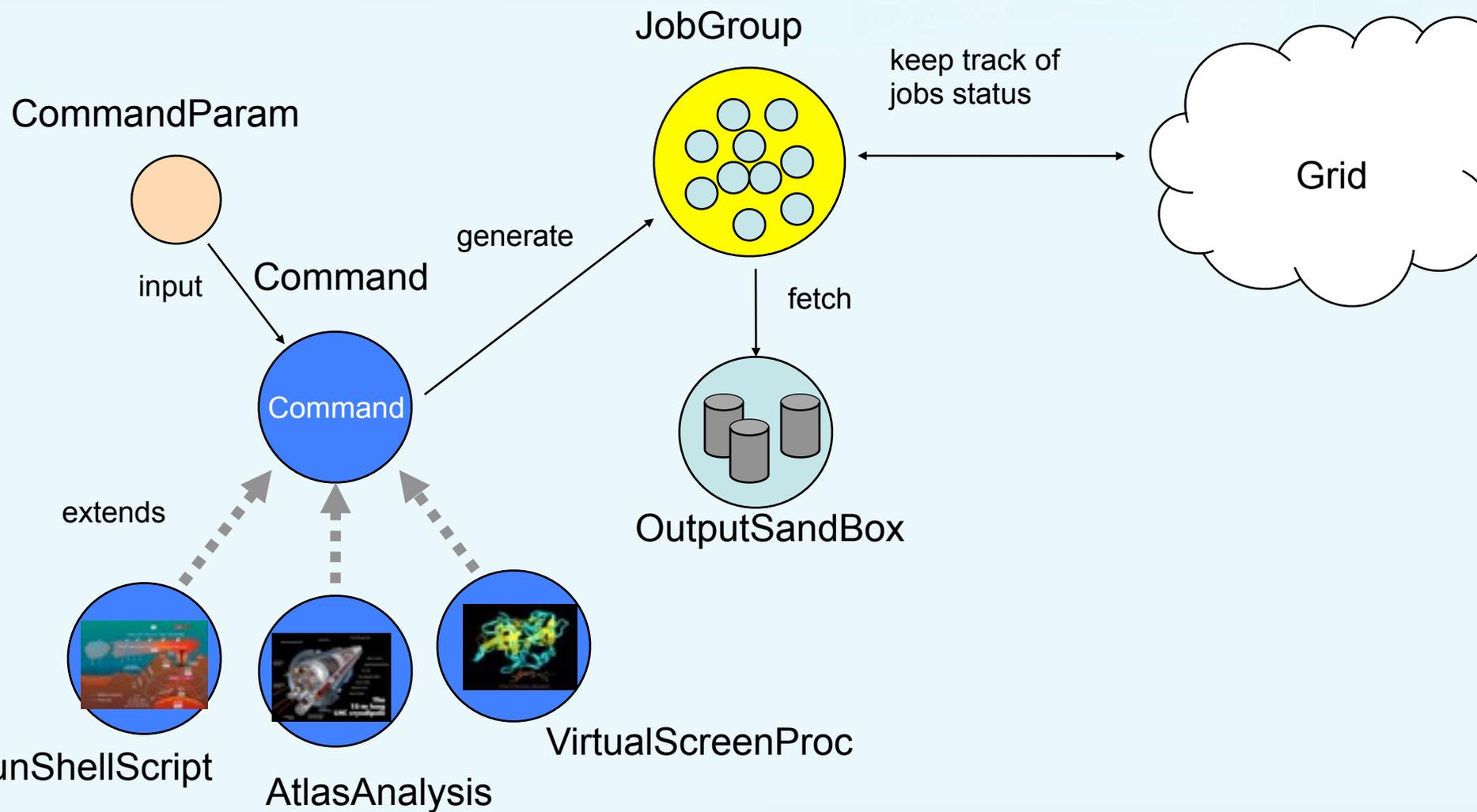
We define
Modal Objects representing the use cases



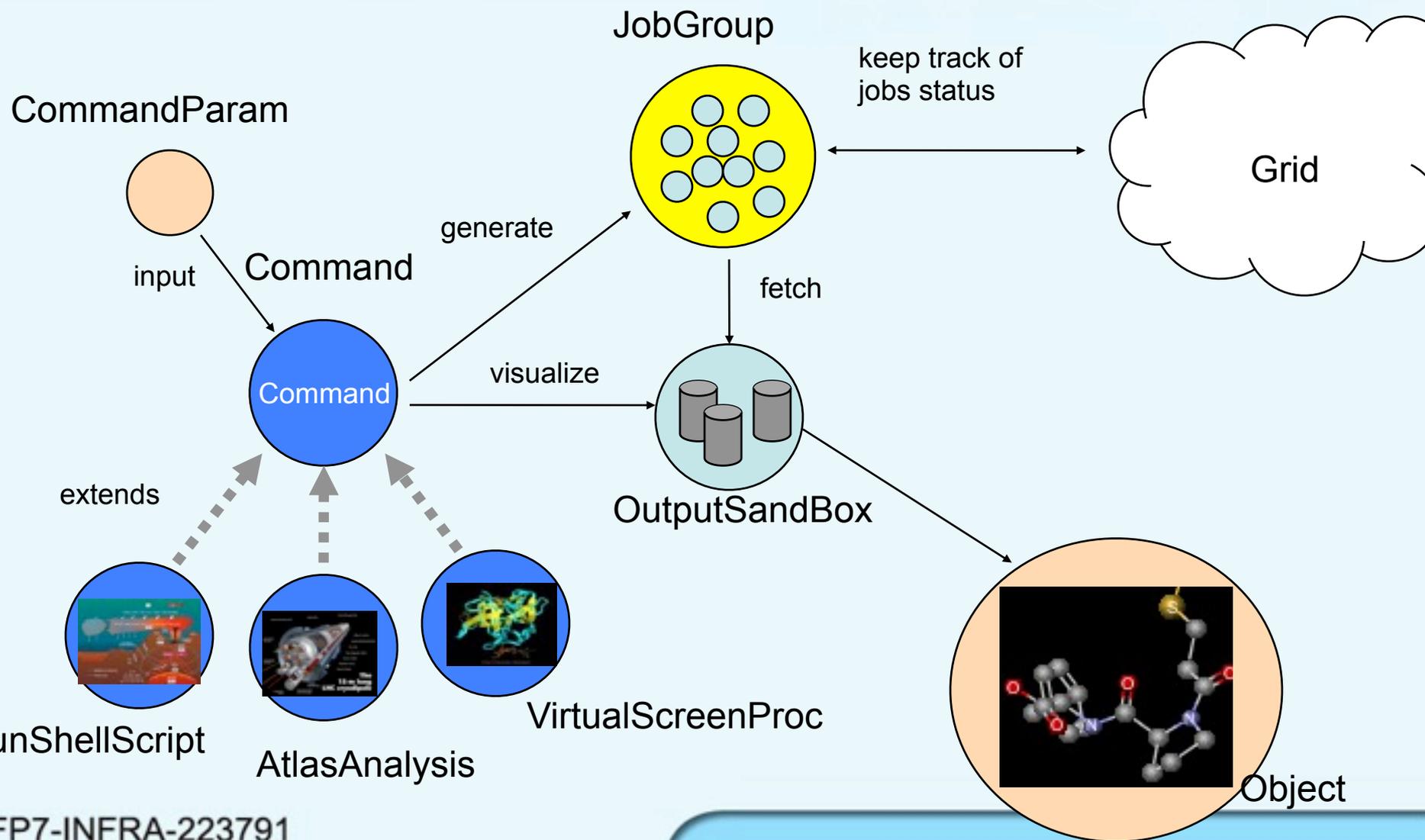
We define
Modal Objects representing the use cases



We define
Modal Objects representing the use cases

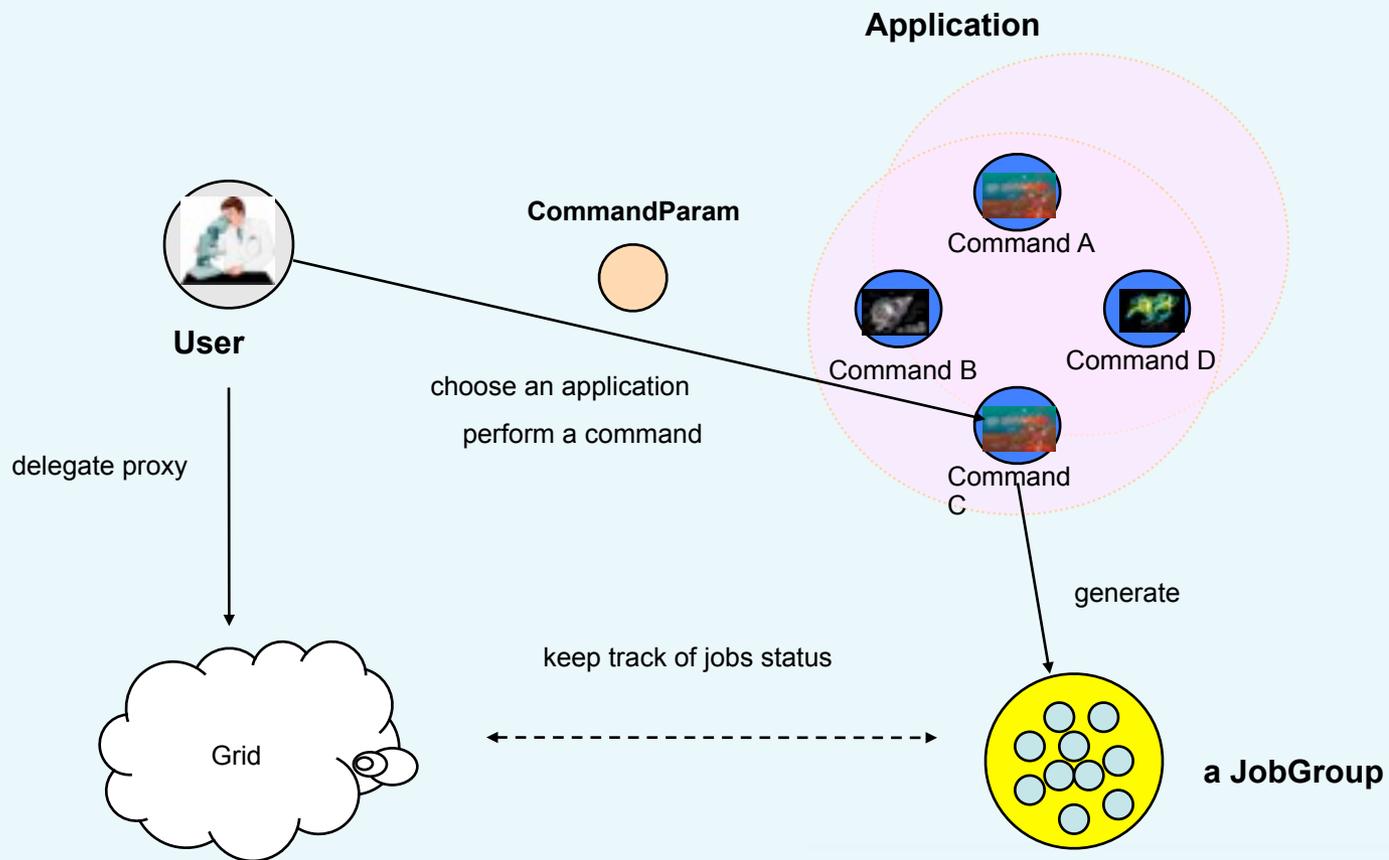


We define
Modal Objects representing the use cases

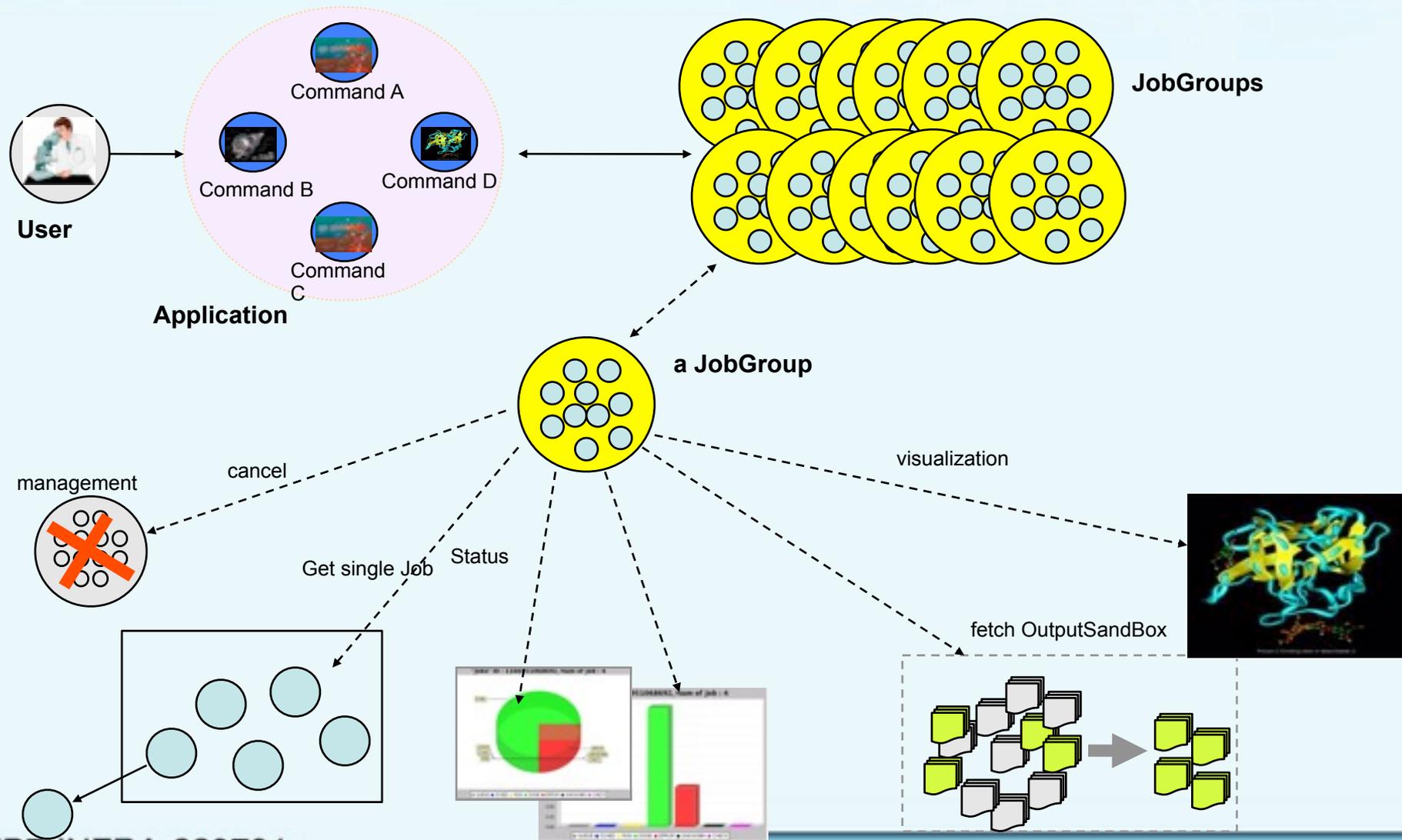


FP7-INFRA-223791

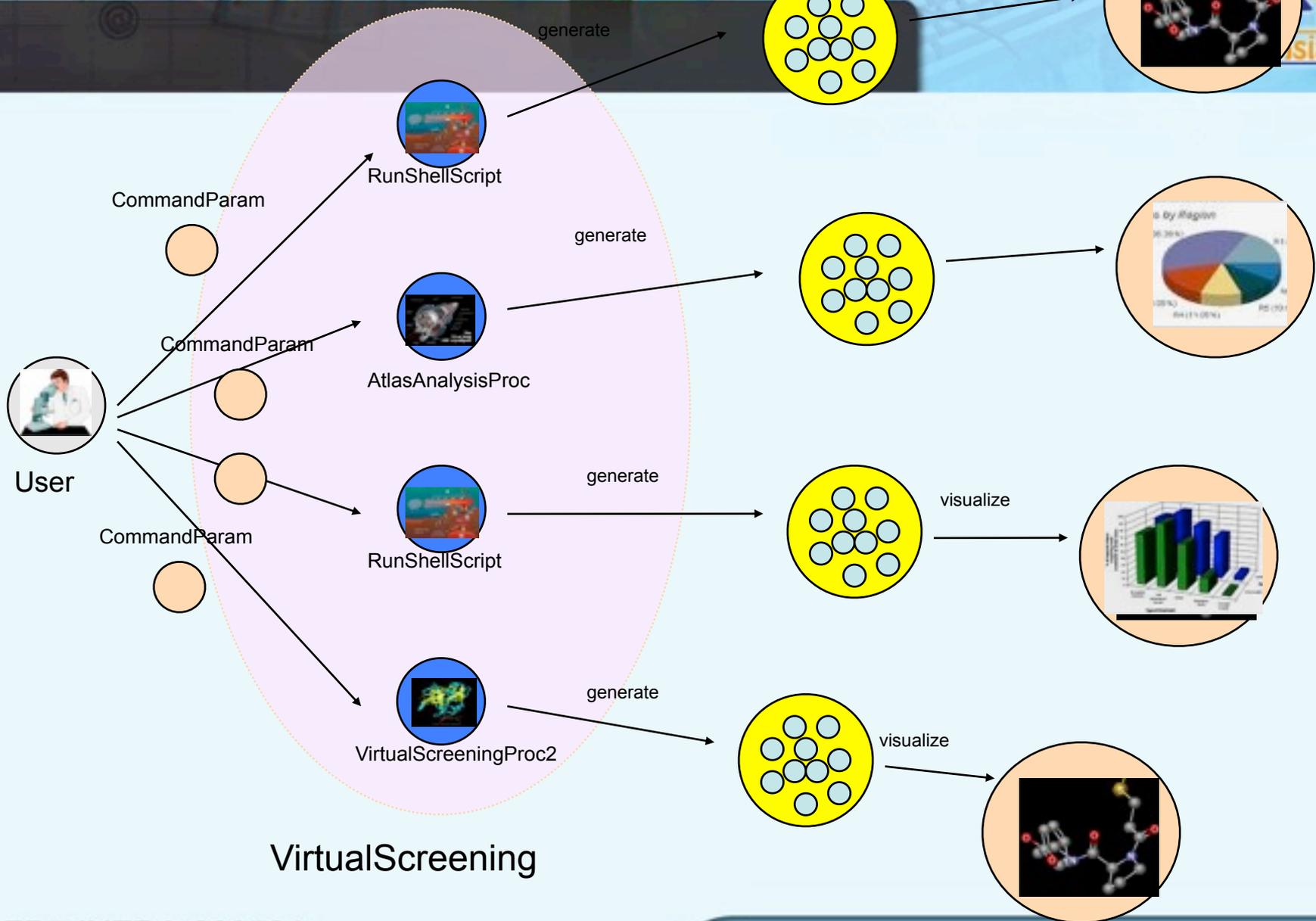
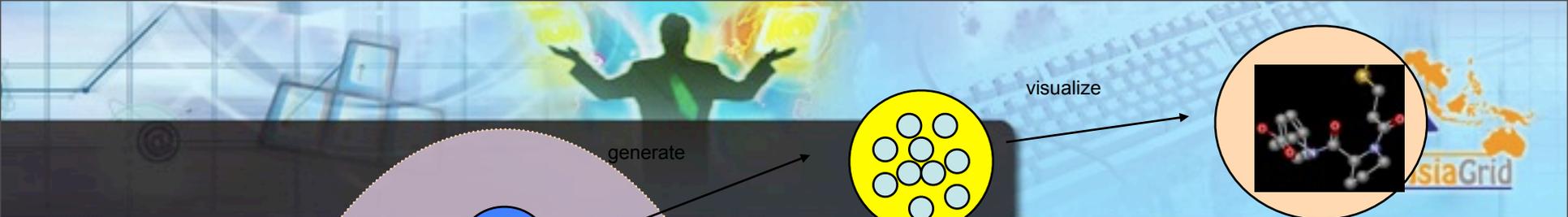
Use Case 1



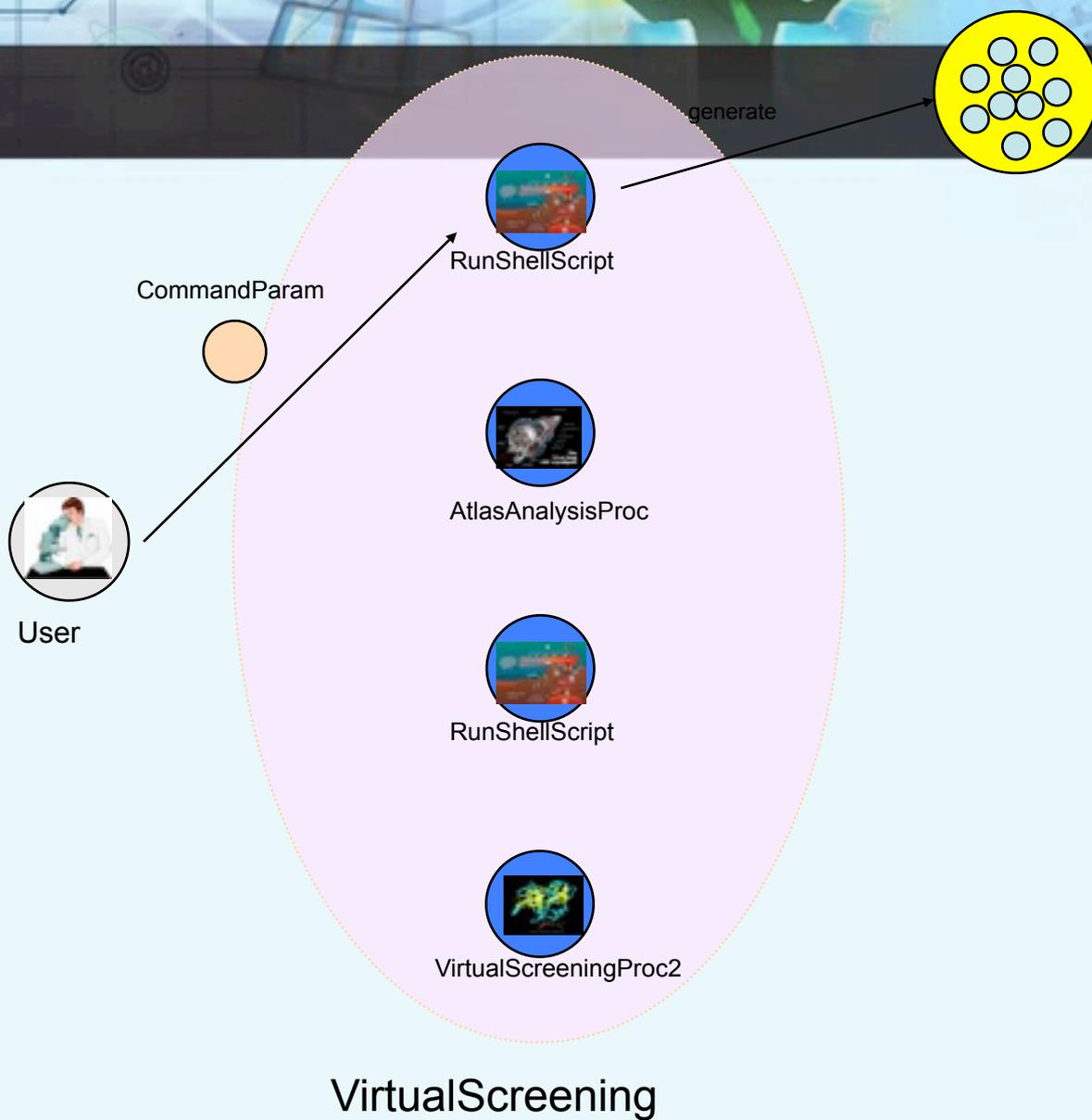
Case Study 2

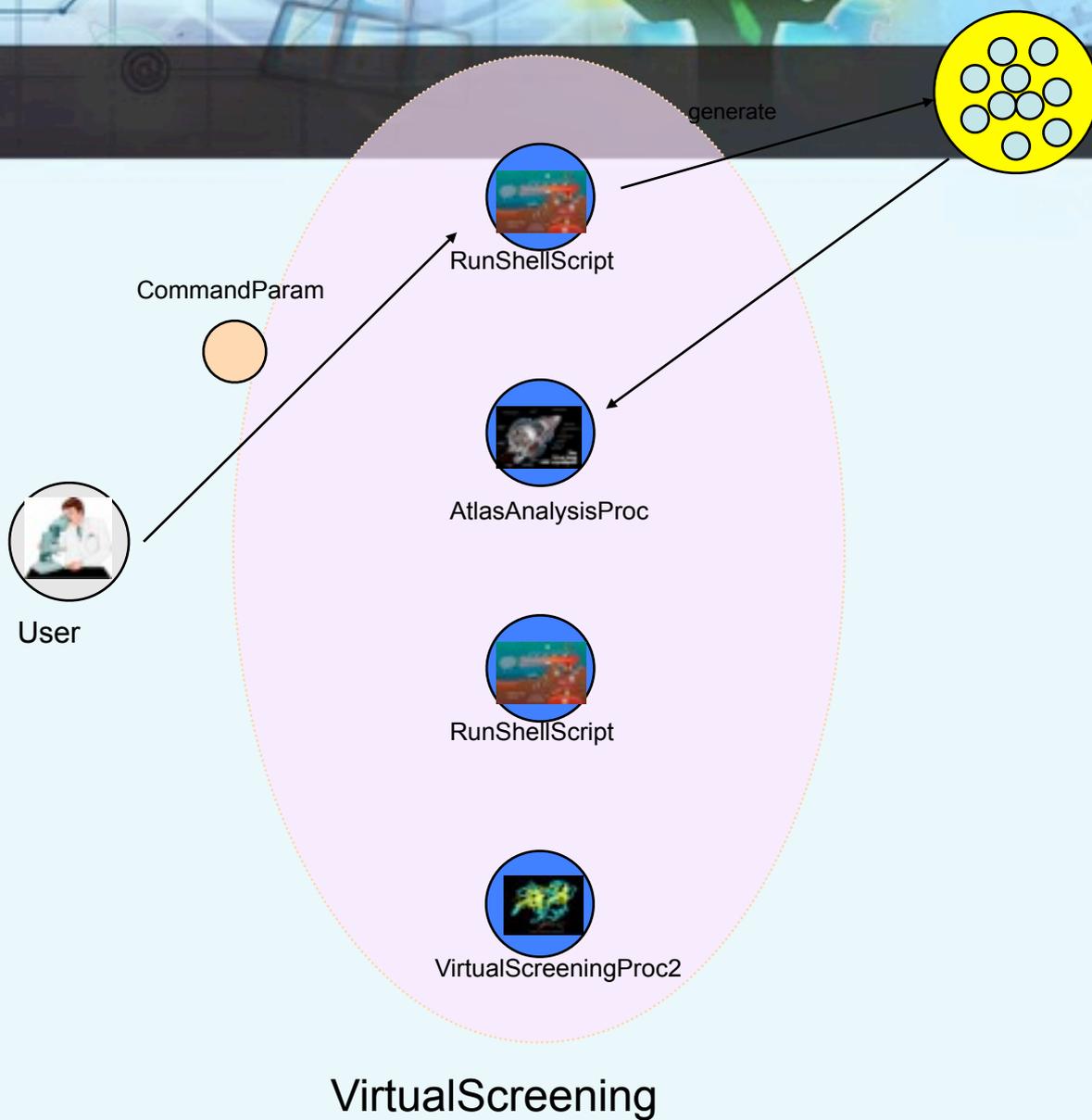


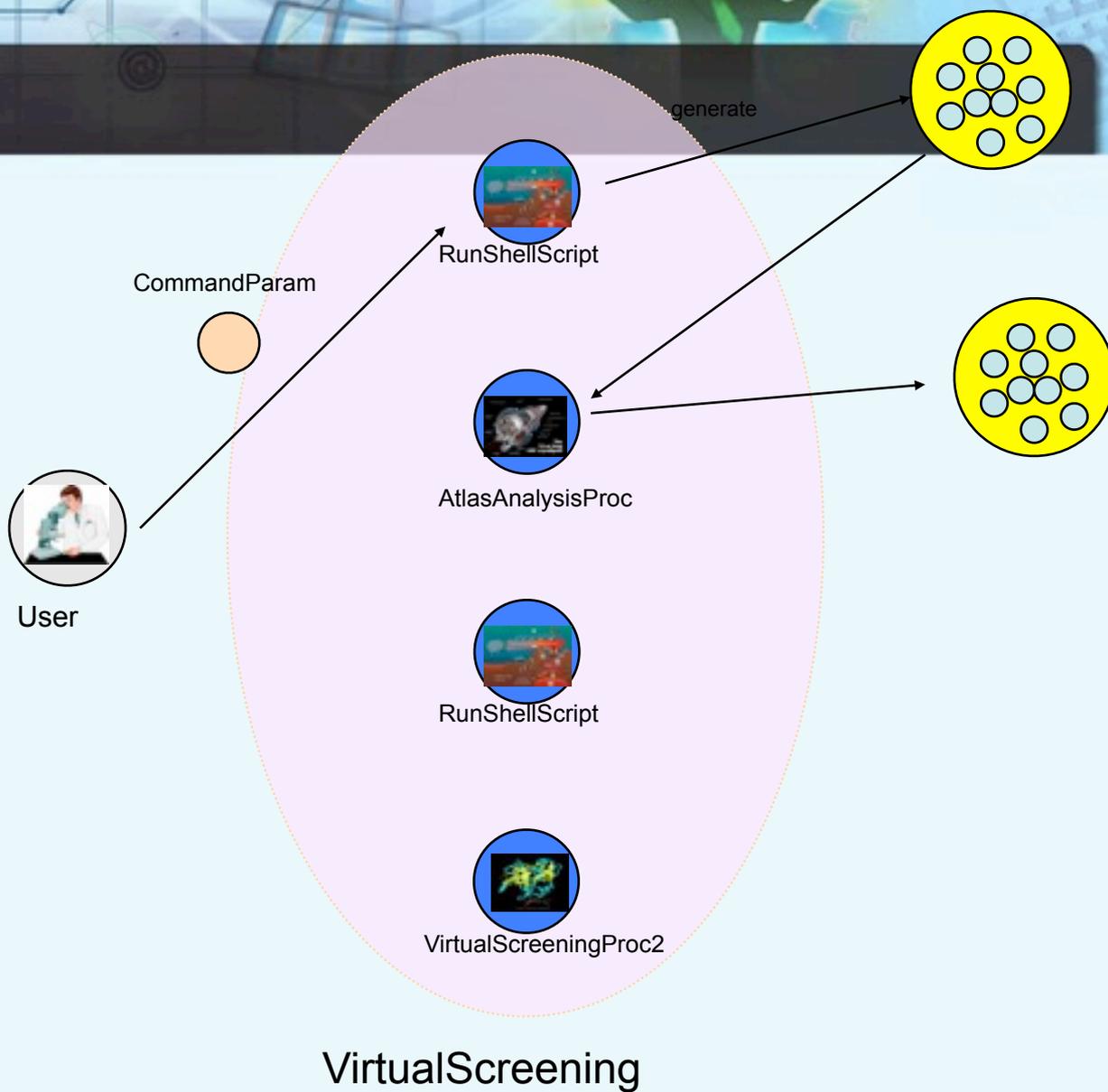
FP7-INFRA-223791



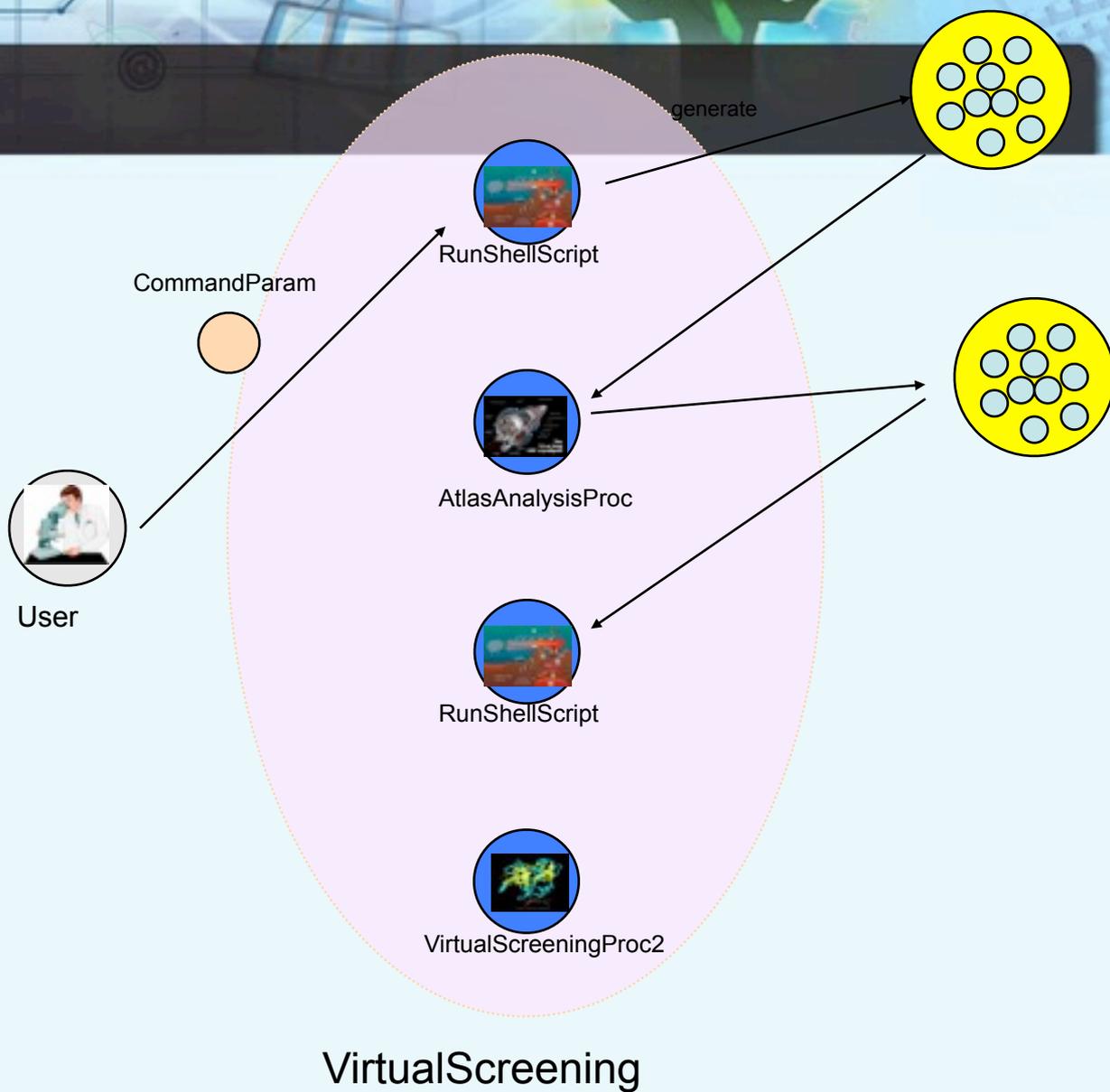
FP7-INFRA-223791

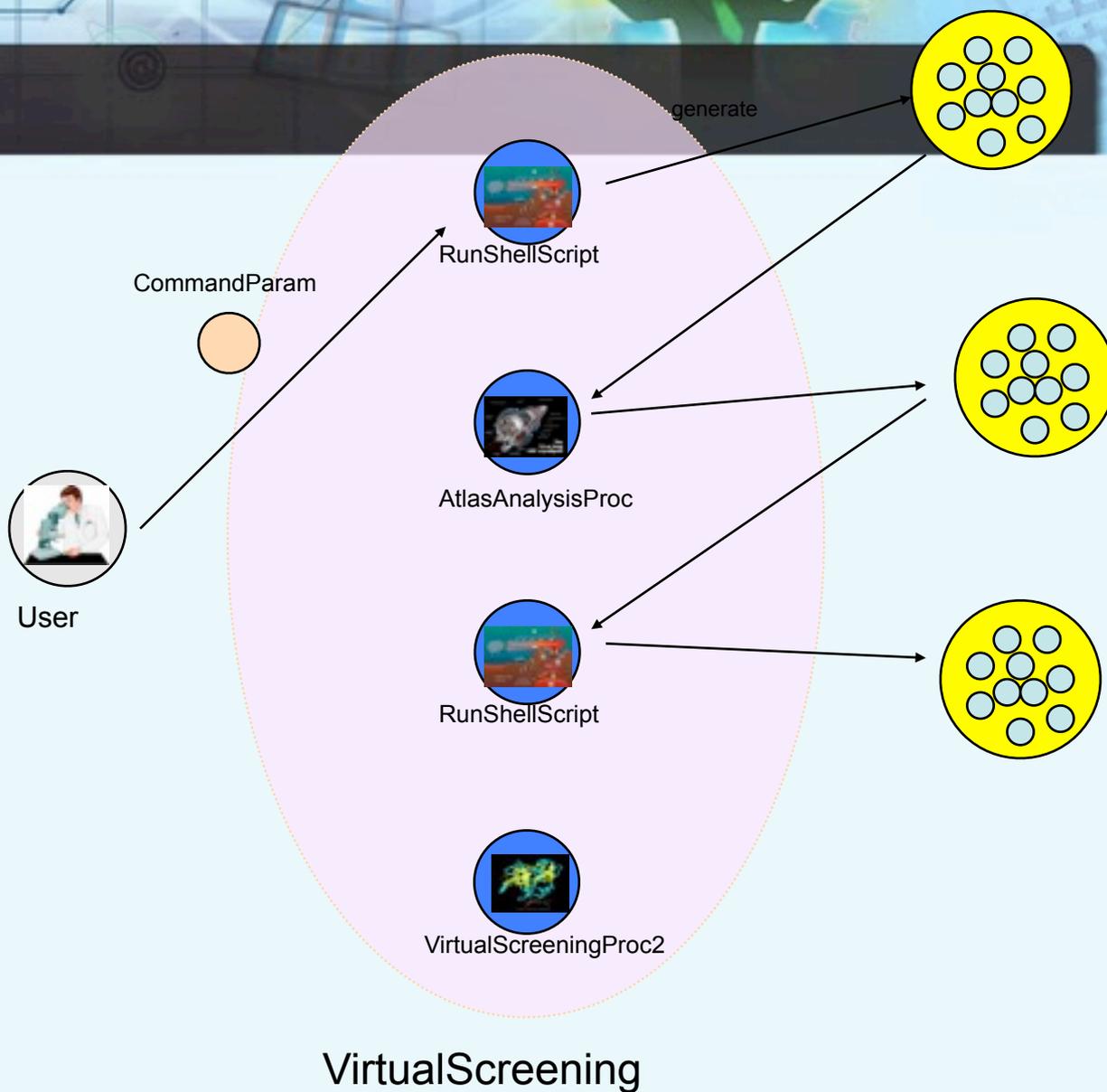




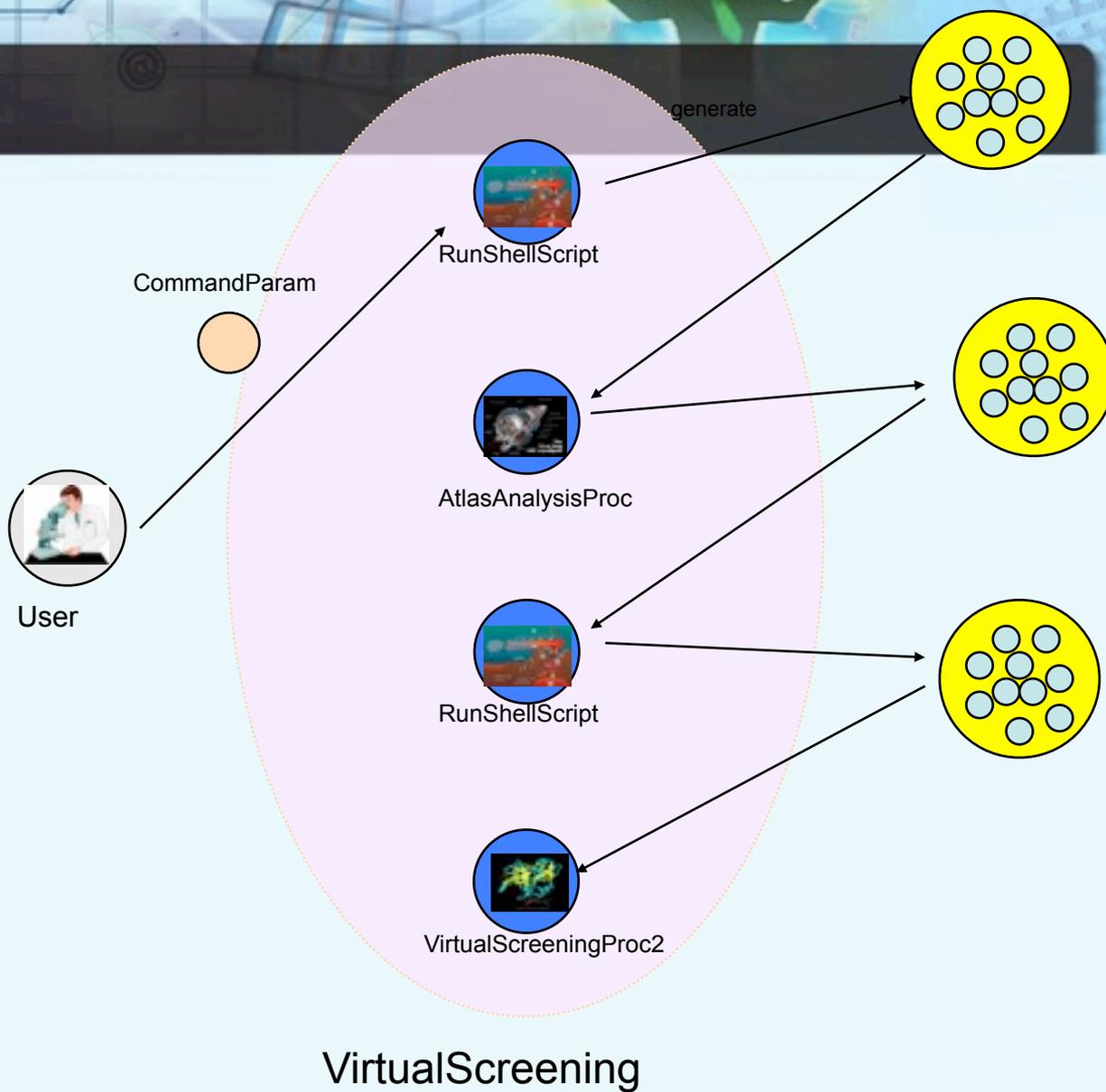


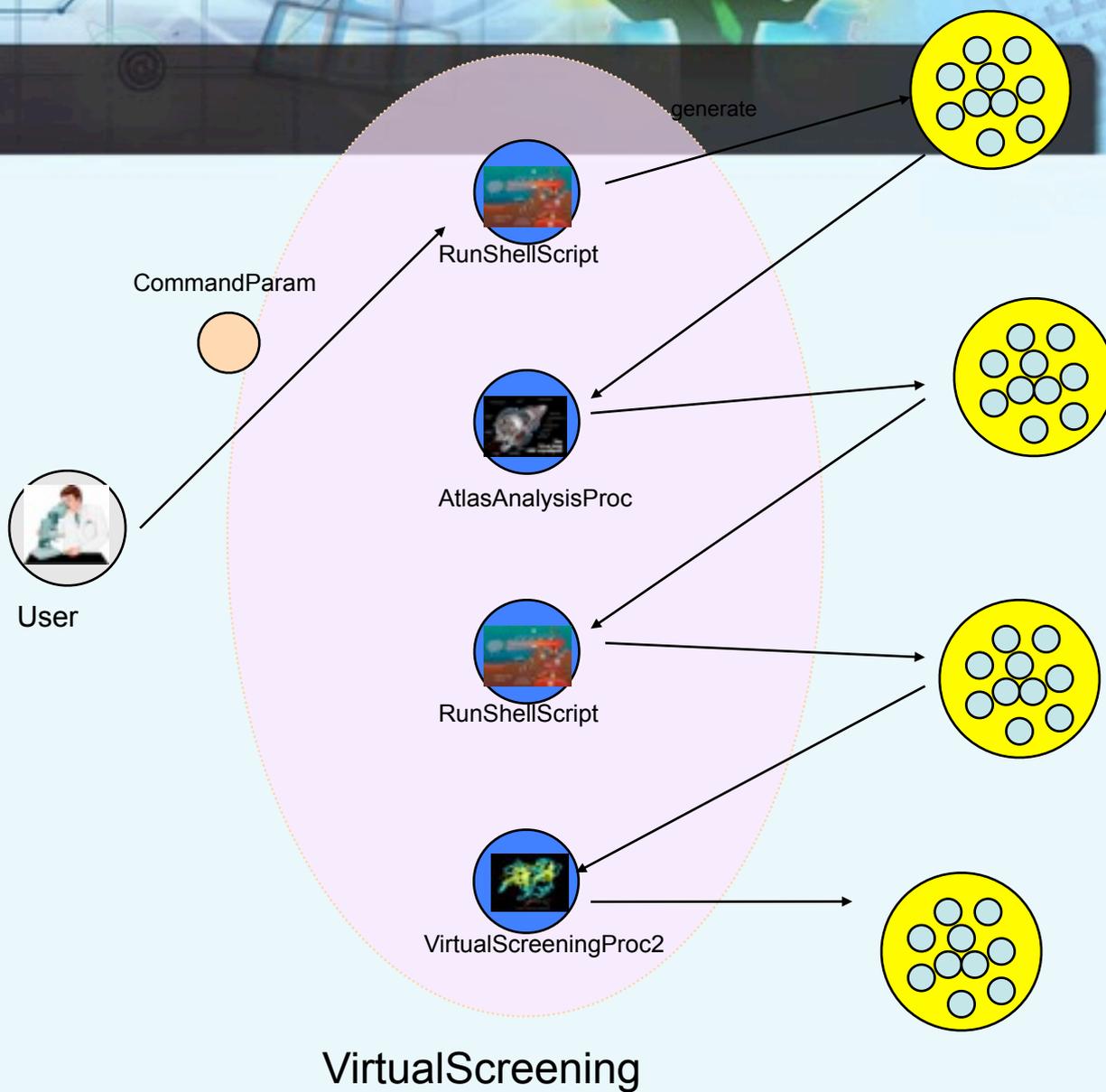
VirtualScreening



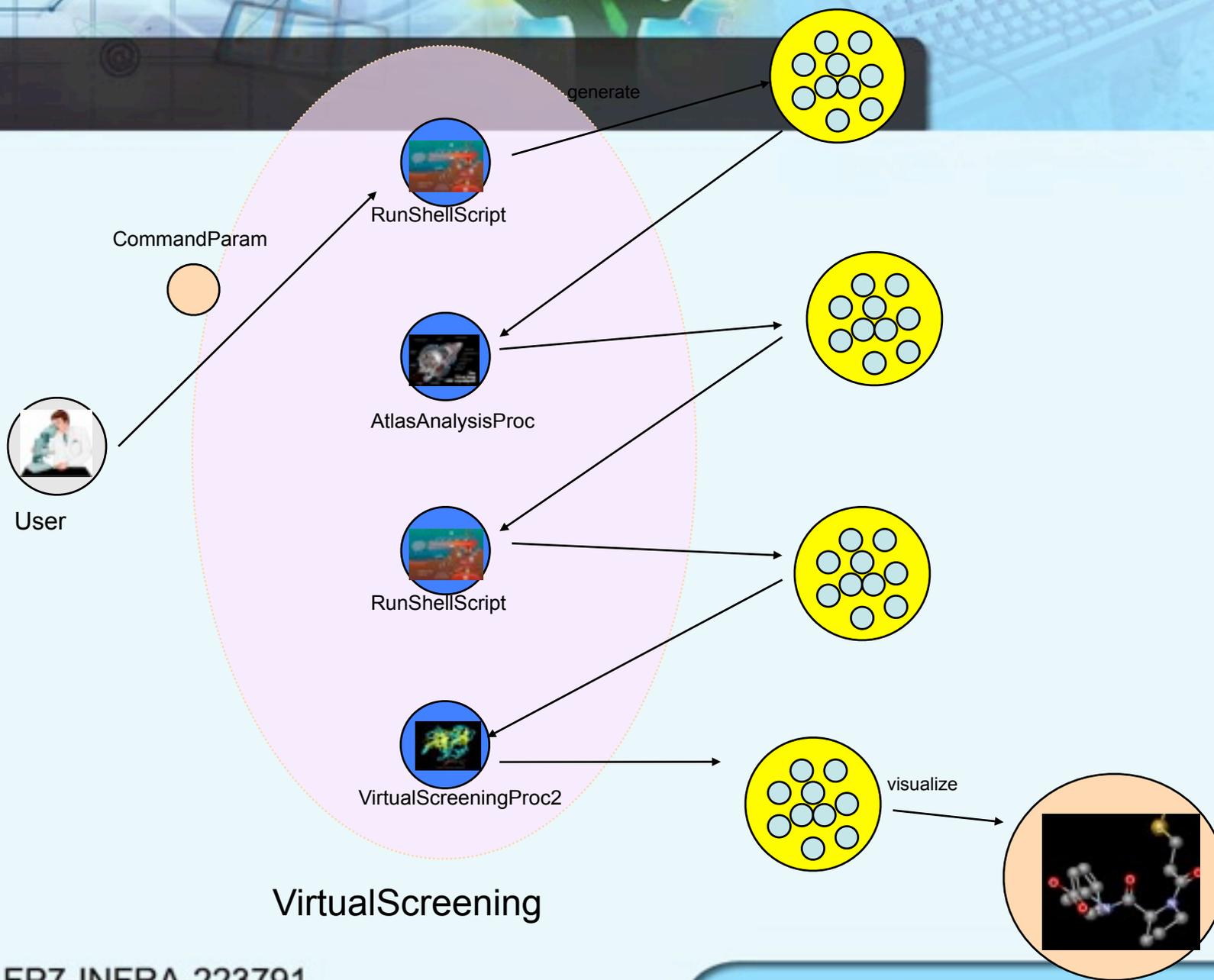


VirtualScreening

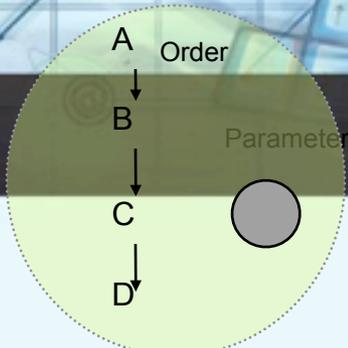




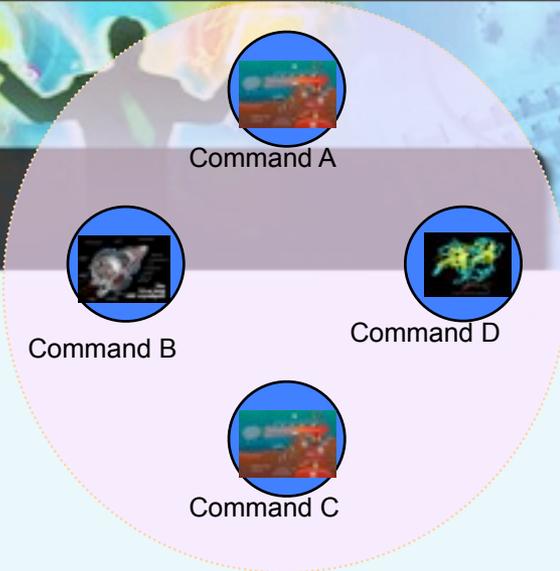
VirtualScreening



VirtualScreening



PipelineParam



perform pipeline



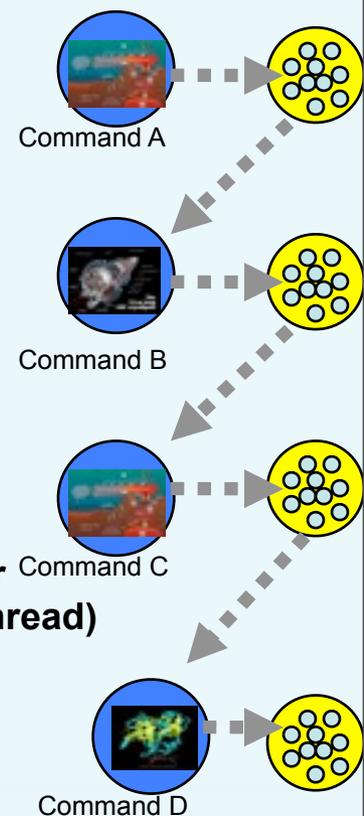
User



Pipeline



**PipelineMgr
(a worker thread)**



VirtualScreening

on this tier, we

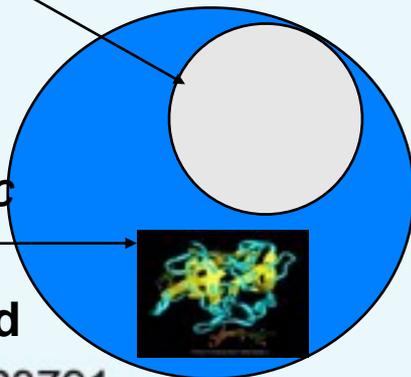


- **try to simply the grid application development.**
 - most of work has done by framework API
 - developers use API depending on it to focus on business logic but not routine work

routine work

Command

business logic



YourCommand

FP7-INFRA-223791

on this tier, we

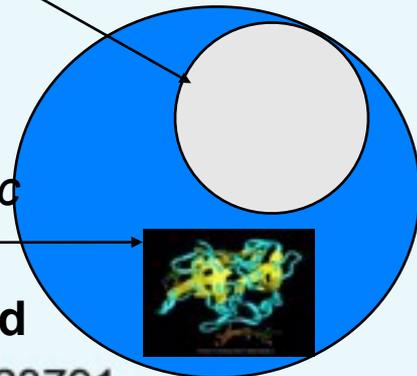


- **try to simply the grid application development.**
 - most of work has done by framework API
 - developers use API depending on it to focus on business logic but not routine work

routine work

Command

business logic



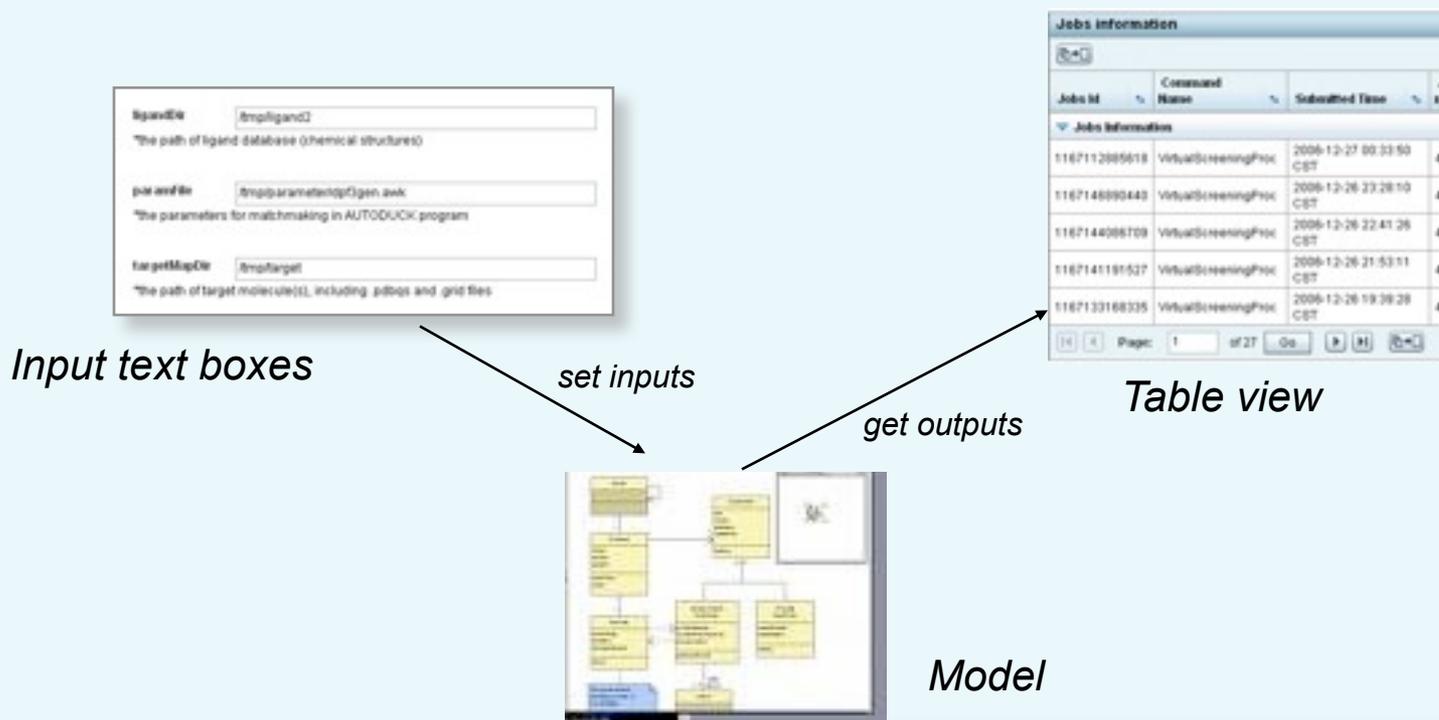
YourCommand

FP7-INFRA-223791

1. By inheritance
 - get all functionality from our framework
2. By overwriting methods
 - define user's logic

on this tier, we

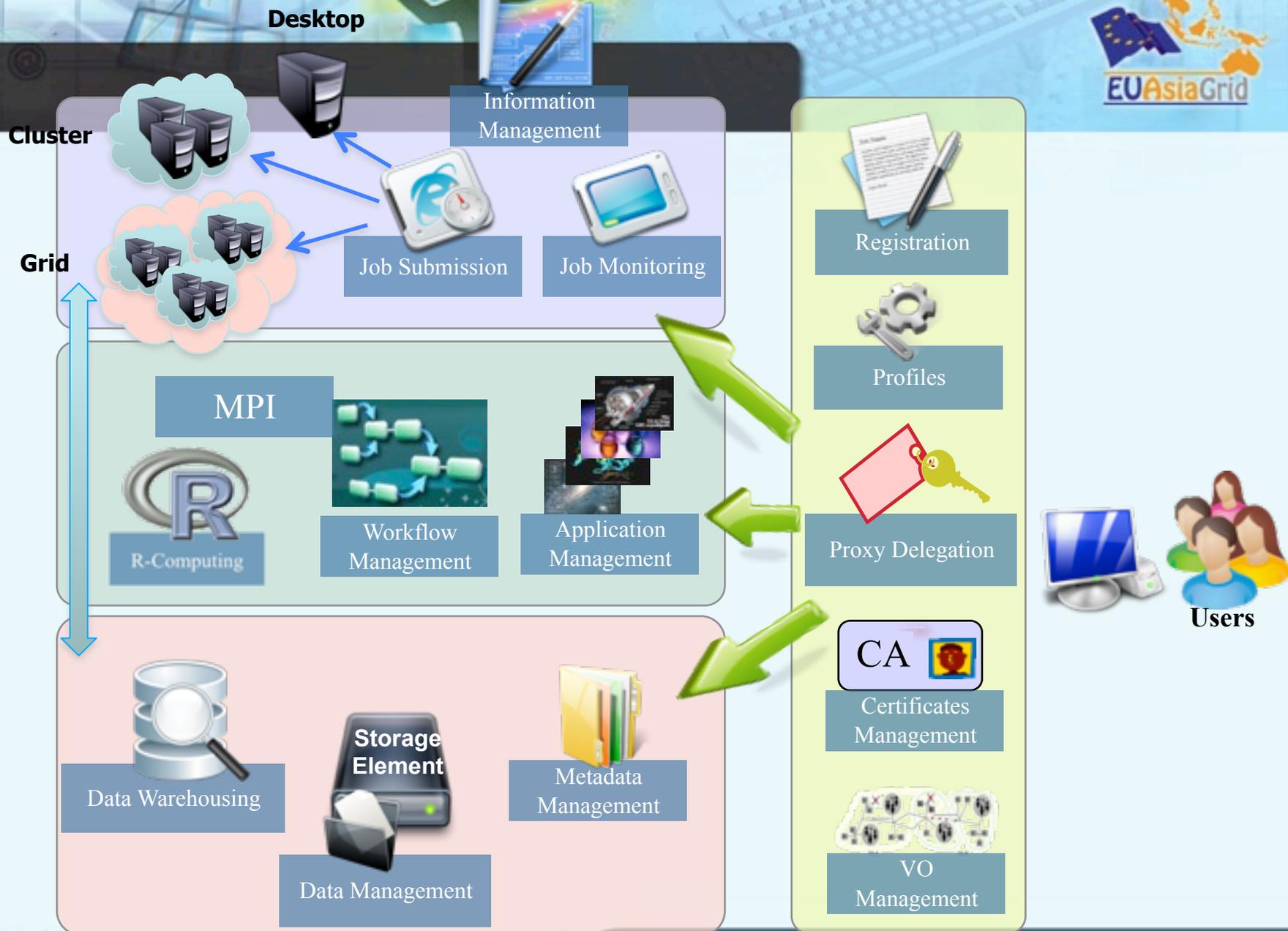
- **try to separate the model and presentation**
 - model can adapt UI technology to give friendly interface like Web UI, Windows UI ...and so on.



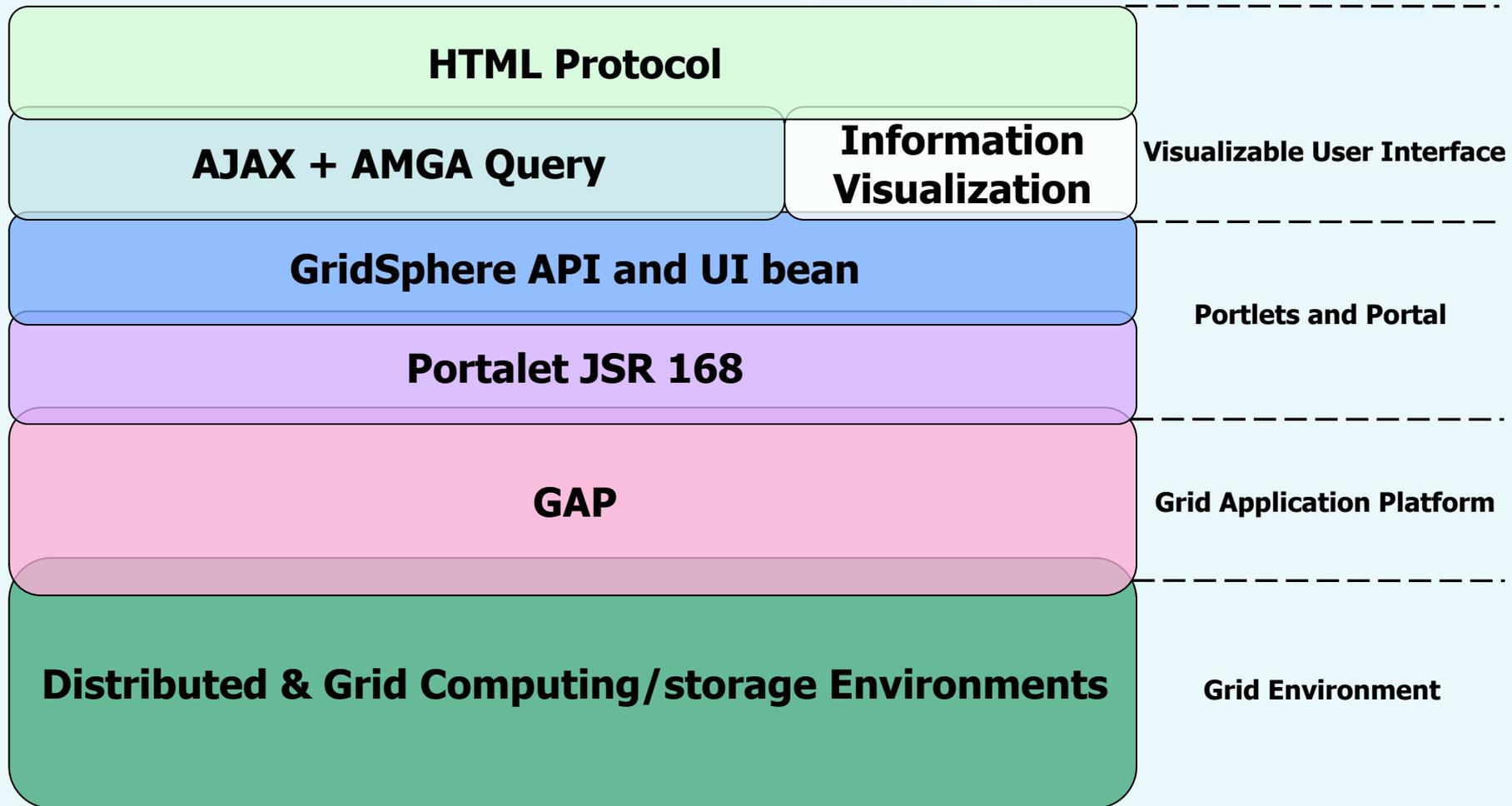
The GAP Presentation Framework

Functions

- **Personal Profile**
- **Personal Certification/VO Management**
- **Proxy Management**
- **Data Management (DPM)**
- **Job Management**
- **Information Management**
- **Resource Management**
- **Application Management**
- **Workflow Management**



Technical Architecture



User Login and Proxy Delegation



Login

User Name

Password

Remember my login

[Forgot your password?](#)

ASGC Grid Portal Login

User Name:

Password:

CA Pass Phrase:

Proxy Lifetime: hours

Virtual Organization: --Select--

ASGC Grid Portal Login

LOGIN SUCCESS !!

User Name:

Password:

CA Pass Phrase:

Proxy Lifetime: hours

Virtual Organization: --Select--

Carbon Flux Sites Searching and Data Management



Flux Computing Services

Query

Results:



Fluxnet

- CarboEurope IP
- Unaffiliated
- TROP-DRY
- FLUXNET
- AmerFlux
- CARBOAFRICA
- ChinaFLUX
- Safar2000
- AsiaFlux
- MOIS Subsets
- Fluxnet-Canada
- Inactive

Job Submission

[Select Flux Data]
Start Time: - End Time: The date format should be "yyyy-mm-dd"

[Select R]
 Select R from local
 Select R from SE:

[Set Parameter]
Worker Num: To assign how many workers to run your jobs

Data Searching and Job Submission

Flux Computing Services

Query:

Results:
[Chilan \(TWCL\)](#), [Huisun Forest Station \(TWH5\)](#), [NCHU \(TWNCHU\)](#), [NCU \(TWNCU\)](#), [Taibao \(TWTB\)](#), [TARI \(TWTARI\)](#),

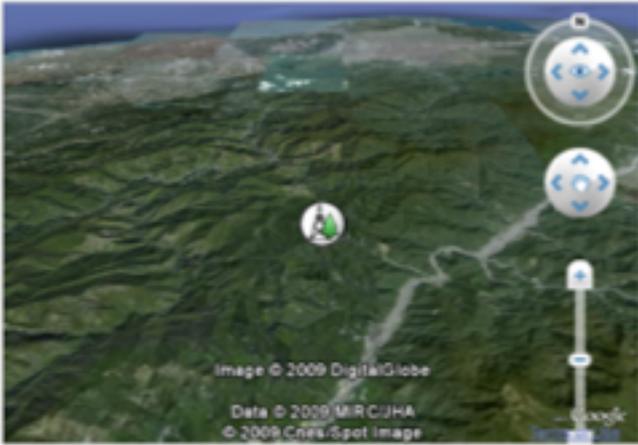


Image © 2009 DigitalGlobe
Data © 2009 MIRC/JHA
© 2009 CNRS/Spot Image

Fluxnet

- CarboEurope IP
- Unaffiliated
- TROPICDRY
- FLUXNET
- AmeriFlux
- CARBOAFRICA
- ChinaFLUX
- Satah2000
- AsiaFlux
- MOIS Subsets
- Fluxnet-Canada
- Inactive

[Site Data Document](#)

emil_title
Data of Chilan Flux site

abstract
In order to understand the relationship between environmental change and terrestrial ecosystems, the Environmental Protection Administration is providing a network of carbon dioxide flux monitoring station in Taiwan. The Chilan flux monitoring station has operated since May, 2005. Fluxes of carbon dioxide, water vapor, and sensible heat fluxes over the forest canopy were measured by the eddy covariance method. A 3-D sonic anemometer and an open-path analyzer were mounted on top of a 24-meter instrument tower over a natural regenerated stand consists mainly of the tree species of Taiwan cypress.

Job Submission

[Select Flux Data]
 Start Time: -- End Time: The date format should be "yyyy-mm-dd"

[Select R]
 Select R from local:
 Select R from SE:

[Set Parameter]
 Worker Num: To assign how many workers to run your jobs

Job Monitoring

Job ID	Submit Time	Start Time	Finish Time	Status	LSA Type
aed2b5d81205c0be2e5	2009-03-31 10:18:07 GMT			QUEUE	
aed2b5d81205c0be2e6	2009-03-31 10:18:06 GMT			QUEUE	

Job Monitoring Services



Job Monitor Services

Job Monitor Services

Data per page 10

JobGroup ID	Command	Submitted Time	Num. JobGroup	Status	Success Rate	Monitor Jobs
1238492608742	RunShellScript	2009-03-31 17:44:09.0	2	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1237186366072	RunShellScript	2009-03-16 14:57:30.0	2	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1237186366062	RunShellScript	2009-03-16 14:53:03.0	5	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236936005468	RunShellScript	2009-03-13 17:20:20.0	5	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236932416125	RunShellScript	2009-03-13 16:20:31.0	2	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236930598722	RunShellScript	2009-03-13 15:52:29.0	2	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236930598718	RunShellScript	2009-03-13 15:50:10.0	1	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236851387937	RunShellScript	2009-03-12 17:50:03.0	2	RUNNING	0.00 %	<input type="button" value="Monitor"/>
1236838996546	RunShellScript	2009-03-12 14:23:26.0	1	DONE	0.00 %	<input type="button" value="Monitor"/>
1236832374583	RunShellScript	2009-03-12 12:33:46.0	2	DONE	0.00 %	<input type="button" value="Monitor"/>

Next to: 1 2 page

Monitoring.....

Job ID	Submit Time	Start Time	Finish Time	Status	LSA Type
ae2b5d8:11fa166e23	2009-03-12 09:49:55 GMT			QUEUE	
ae2b5d8:11fa166e22	2009-03-12 09:49:55 GMT			QUEUE	

FP7-INFRA-223791

Application Management and R Computing Services



Grid R-Computing Services

Job Submission

[Select R]
Select R for computing: 瀏覽...

[Select Data]
Select Data for computing: 瀏覽...

Submit Job

Data Management and Warehousing

Data Warehouse Services

Key World Search

XML Document Level

Title	LSID
Denitrification associated N loss in mangrove soil	urn:lsid:metacat.tn.gov.tw:richen:7.2 MORE
No Effect of Host Tree Species on the Physiology of the Epiphytic Orchid <i>Bulbophyllum japonicum</i> in a Subtropical Rain Forest in Northeastern Taiwan	urn:lsid:metacat.tn.gov.tw:rept:3.5 MORE
Soil fluxes of mineral elements and dissolved organic matter following manipulation of leaf litter input in a Taiwan <i>Chamaecyparis</i> forest	urn:lsid:metacat.tn.gov.tw:ctduh:21.7 MORE
Soil respiration in a subtropical montane cloud forest in Taiwan	urn:lsid:metacat.tn.gov.tw:cpwang:3.3 MORE

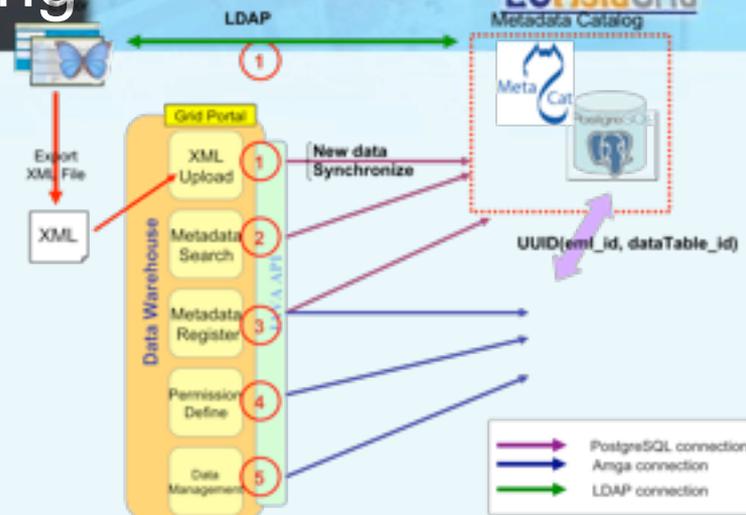
Data Table Level

Name	Description
Table 1	Chemical soil properties at the Yyl site MORE
Table 2	Element fluxes with natural aboveground litterfall from January to December 2004 MORE
Table 3	Amounts of elements added in the litter manipulation MORE
Table 4	Flux weighted average element concentrations in throughfall, forest floor percolates, and seepage from September 2003 to November 2004 MORE
Table 5	Water and element fluxes in throughfall, forest floor percolates and seepage from September 2003 to November 2004, Significant difference (p<0.05) between 3-fold and 1-fold litter treatments is represented by * MORE

Data Set Level

2005
 05
 06
 2006
 2007
 2008
 2009

NO.	File Name	Preview
0	chilan_tower2_20070301000000.csv	
1	chilan_tower2_20070301003000.csv	
2	chilan_tower2_20070301010000.csv	
3	chilan_tower2_20070301013000.csv	



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  system="knb"
  xsi:schemaLocation="eml://ecoinformatics.org/eml-2.0.1
  eml.xsd">
- <dataset scope="document">
  <title>Data of Chilan Flux site</title>
- <<creator id="1180938667156" scope="document">
  - <individualName>
    <givenName>Yue-Joe</givenName>
    <surName>Hsia</surName>
  </individualName>
    <organizationName>Graduate Institute of Natural
    Resources, National Donghwa University,
    Taiwan.</organizationName>
    <positionName>Professor.</positionName>
  - <address scope="document">
    <deliveryPoint>1, Sec. 2, Da Hsueh Rd, Shou-
    Feng</deliveryPoint>
    <city>Hualien</city>
    
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Questions?

Thank you for your attention and great inputs!