Access to simulation codes with Astrogrid & Astro-Runtime

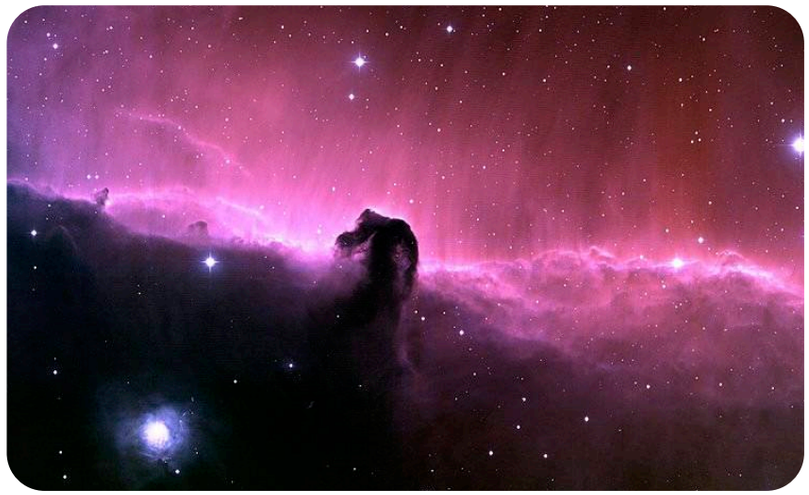
Franck Le Petit
Jonathan Normand
Fabrice Roy
Damien Guillaume

http://vo.obspm.fr/simulation

Usecase and Objectives

Portail Numérique
VO Paris datacenter

A user wants to interpretate absorptions / emissions in interstellar / intergalactic media



He needs access to simulation / modelisation codes :

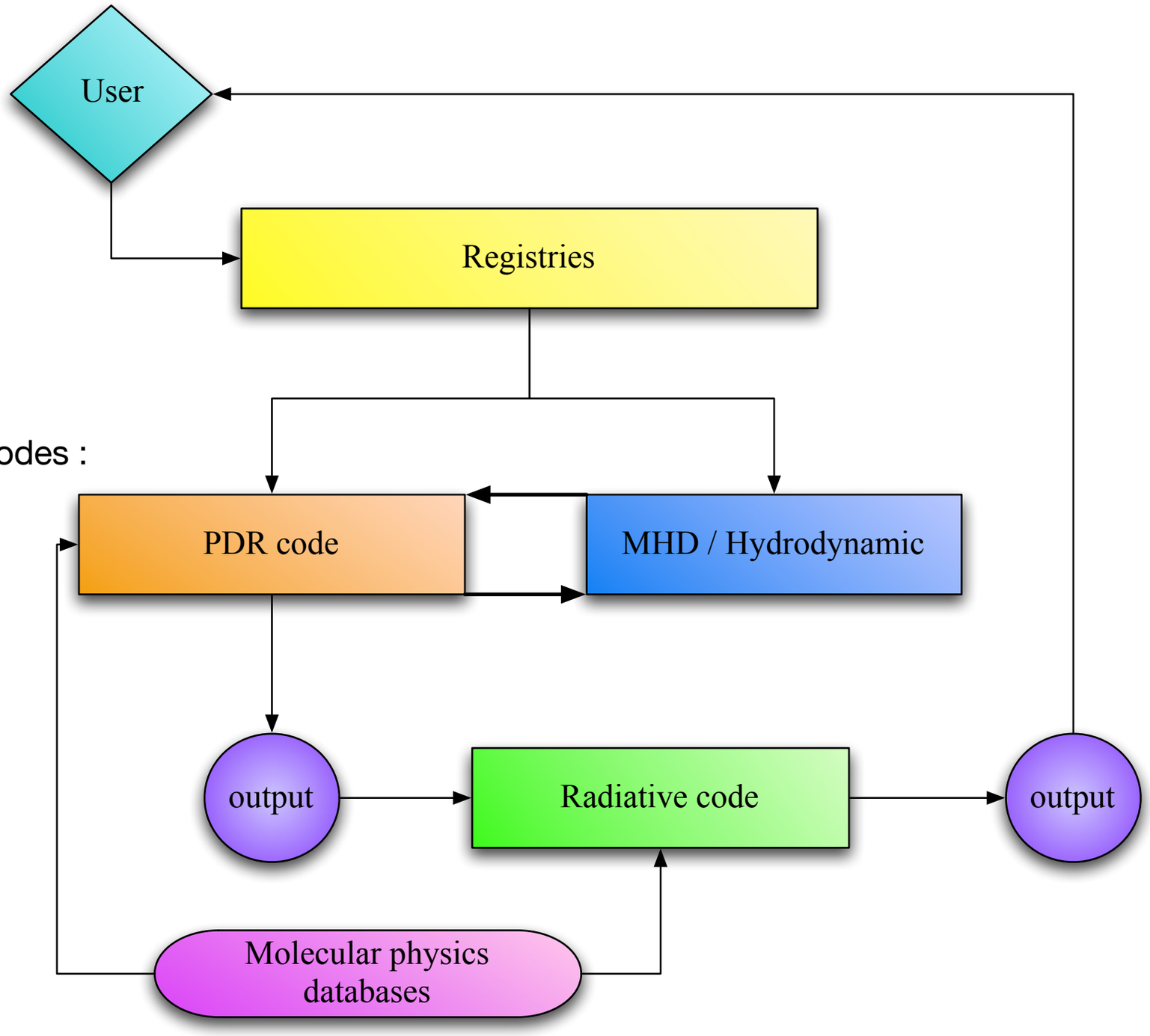
- Photo-dominated regions code (Ex: PDR)
  Photo-ionized regions code (Ex : CLOUDY)

  solves micro-physics :
  chemistry, thermal balance, excitation

- Hydrodynamical / MHD code
  solves dynamics : a collapse, a shock

- Eventually radiative transfer codes

First step : To be able to run simulation codes



Usecase and Objectives

Objectives :

- Find codes in the VO
- Give access to simulation codes
- Give access to computing facilities

- Should be useable by non-specialists
  - documentation
  - friendly interface

- Codes in the VO should allow all possibilities than in non-VO mode

- Association of codes should be easy : Workflows

Registration in Astrogrid

- Installation of **Astrogrid at the Observatory of Paris**
- **Registration of the Meudon PDR code as a CEA service**
- **Description of parameters (xml file)** : generates a generic interface

```
<CmdLineParameterDefn fileRef="true" type="binary" name="chimie">
      <agpd:UI_Name>Chemistry file</agpd:UI_Name>
      <agpd:UI_Description>Name of the chemistry file to use. If no chemistry file ... </agpd:UI_Description>
</CmdLineParameterDefn>
```

```
<CmdLineParameterDefn fileRef="false" type="text" name="srcpp">
          <agpd:UI_Name>External radiation source (type spectral)</agpd:UI_Name>
          <agpd:UI_Description>Add to the UV field the radiation field of a star ... </agpd:UI_Description>
          <agpd:DefaultValue>B 1</agpd:DefaultValue>
          <agpd:OptionList>
              <agpd:OptionVal>O 3</agpd:OptionVal>
              <agpd:OptionVal>O 5</agpd:OptionVal>
              <agpd:OptionVal>O 8</agpd:OptionVal>
              <agpd:OptionVal>B 0</agpd:OptionVal>
              <agpd:OptionVal>B 1</agpd:OptionVal>
```

```
<ExecutionPath>/www/astrogrid-data/commandline-cec/apps/lancement_pdr.tcsh</ExecutionPath>
<LongName>Meudon PDR code</LongName>
<Description>The Meudon PDR code is a tool .... </Description>
<ReferenceURL>http://aristote.obspm.fr/MIS</ReferenceURL>
```

Access to codes in the VO

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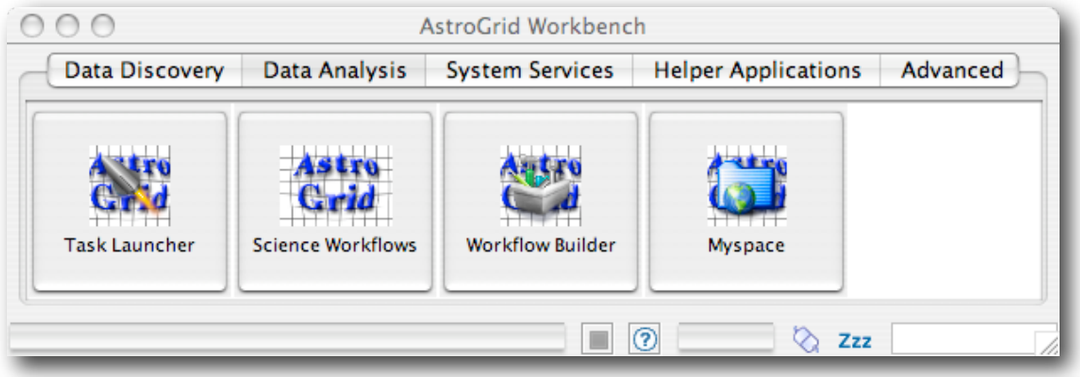
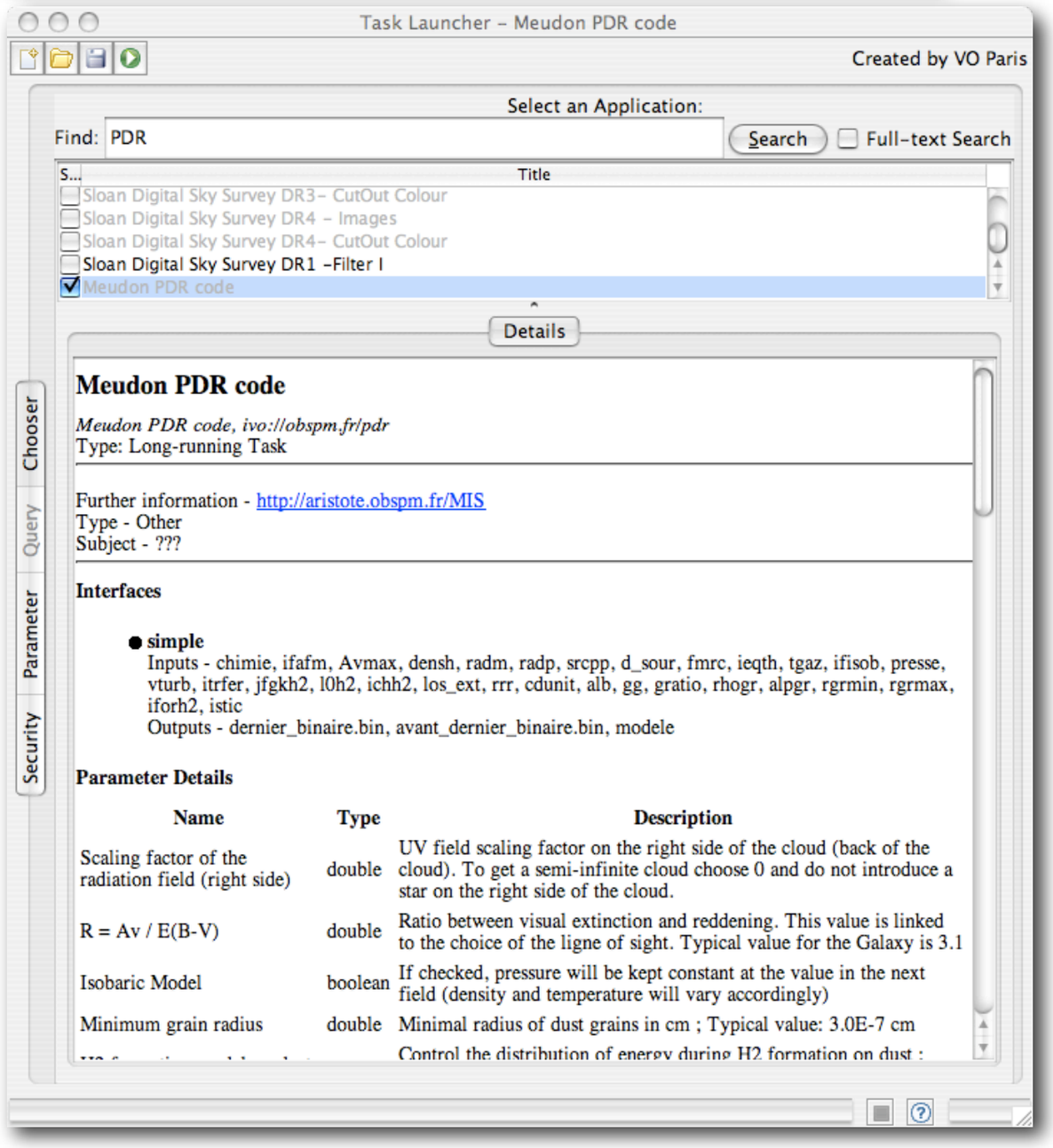
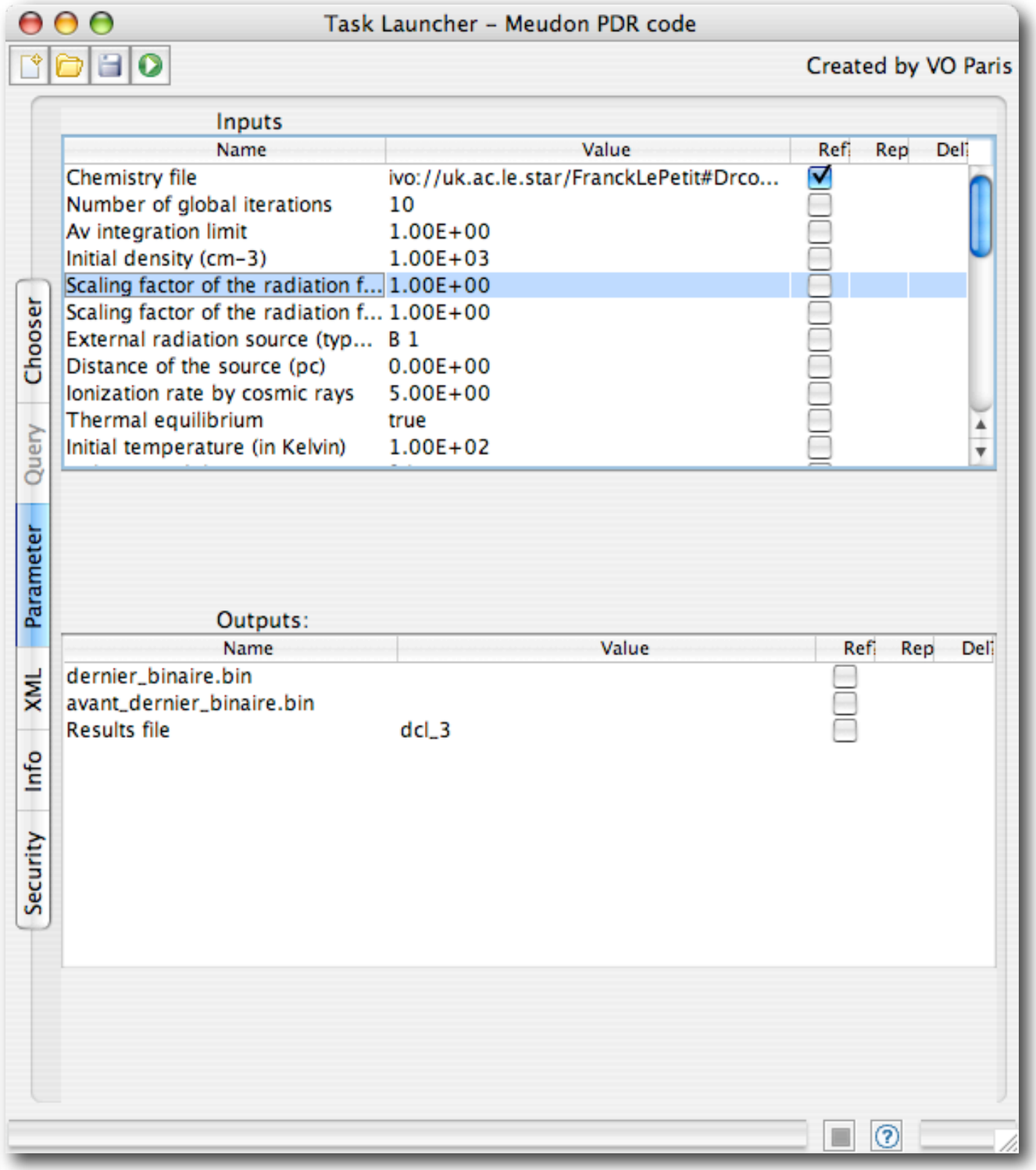
VO Paris datacenter







Access to codes in the VO

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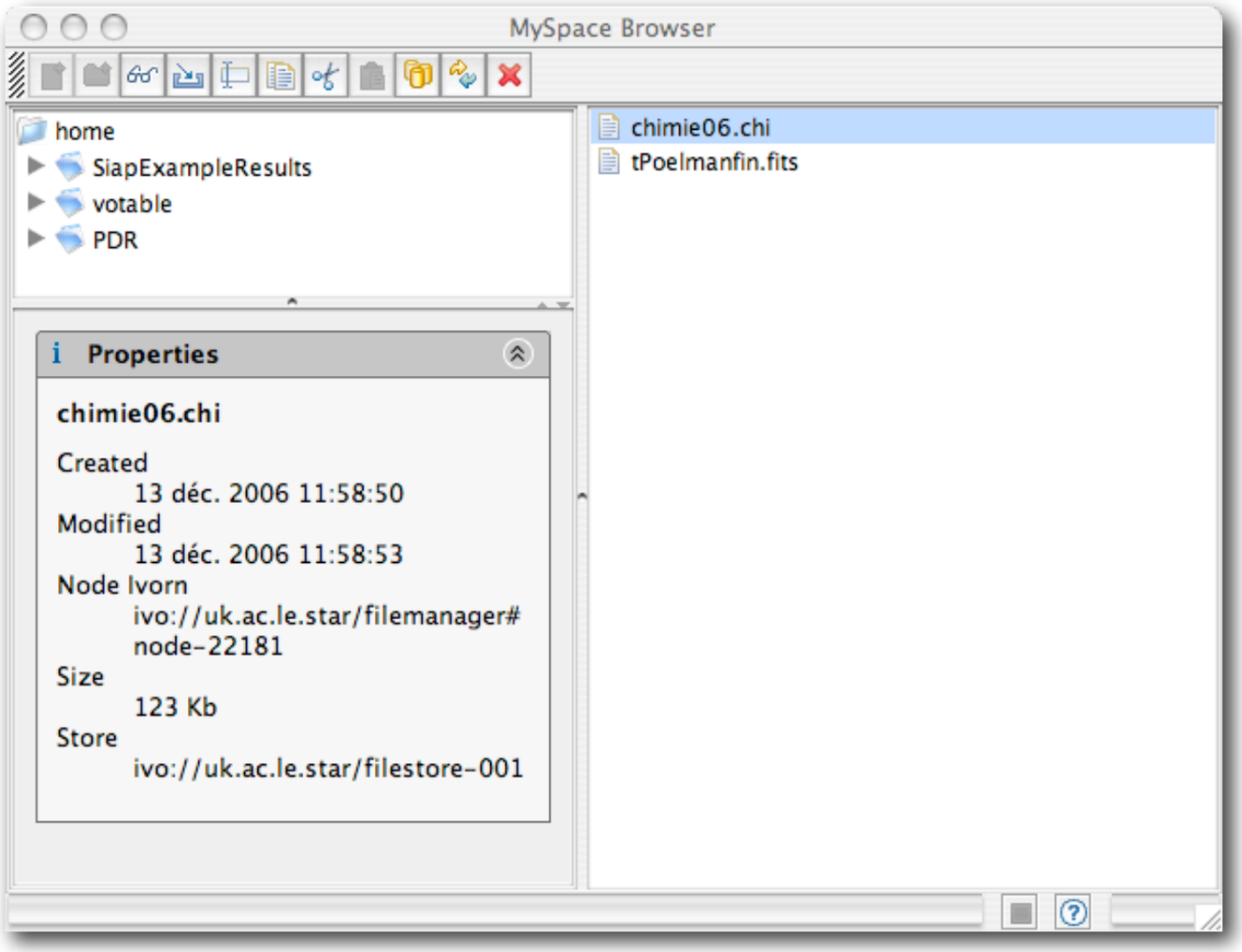
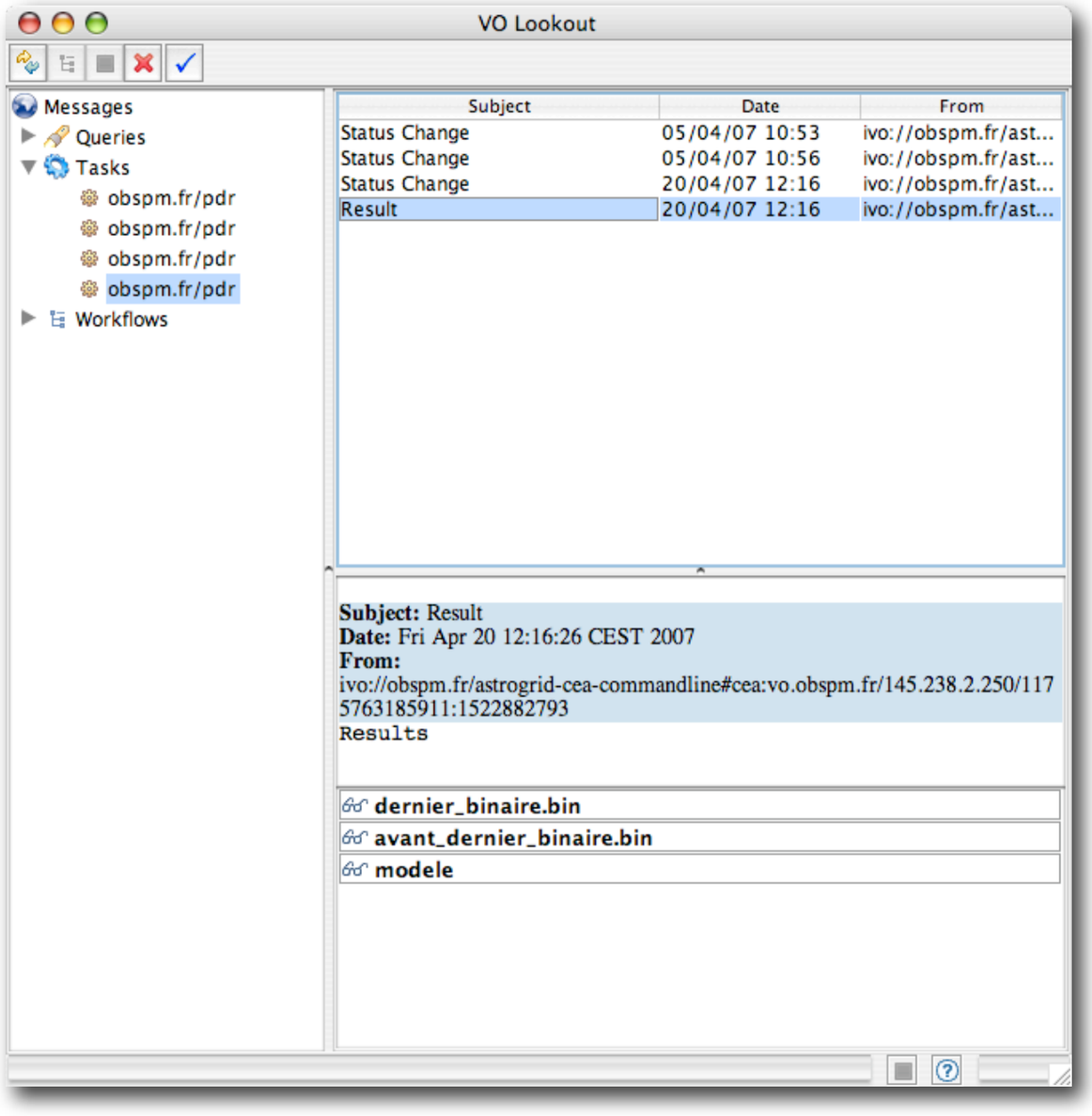
VO Paris datacenter



MySpace



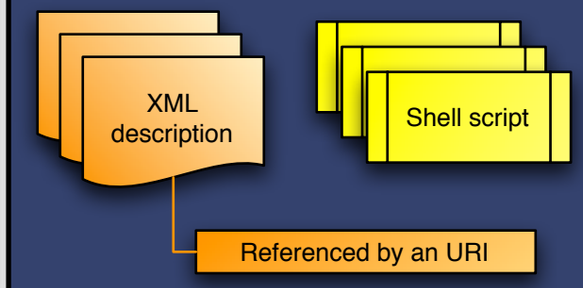
Lookout

Access to codes in the VO

Portail Numérique
VO Paris datacenter

Astrogrid
(England)

VO-Paris
Portal



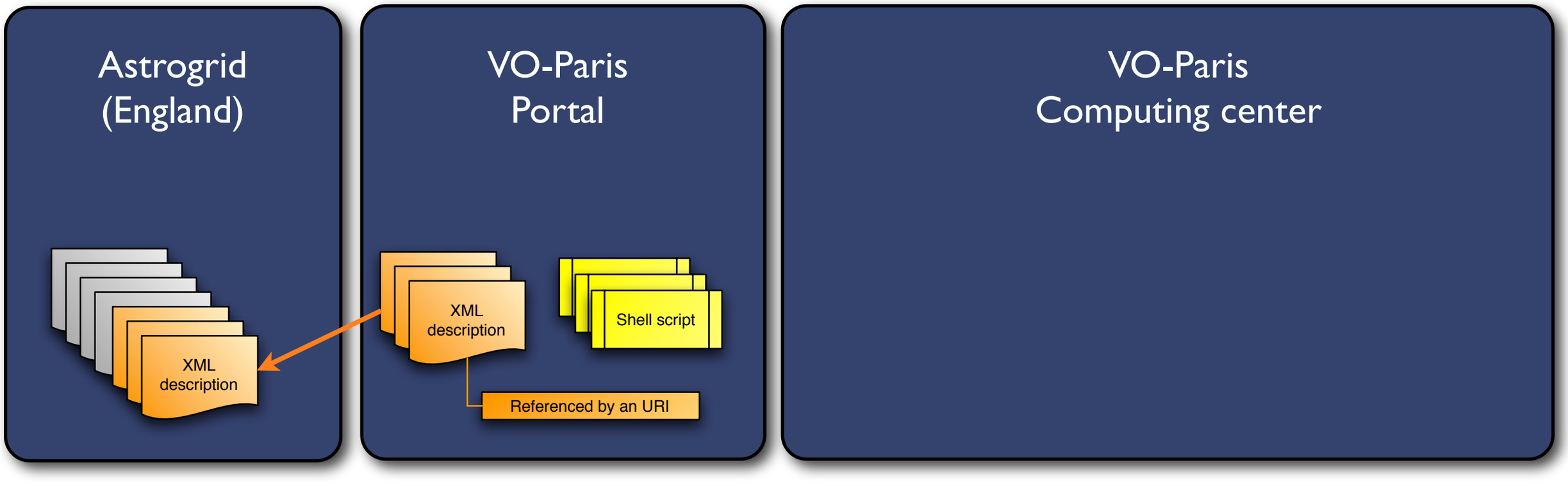
VO-Paris
Computing center

On VO-Paris portal (where Astrogrid is installed)

- XML description of services
- Shell scripts corresponding to services

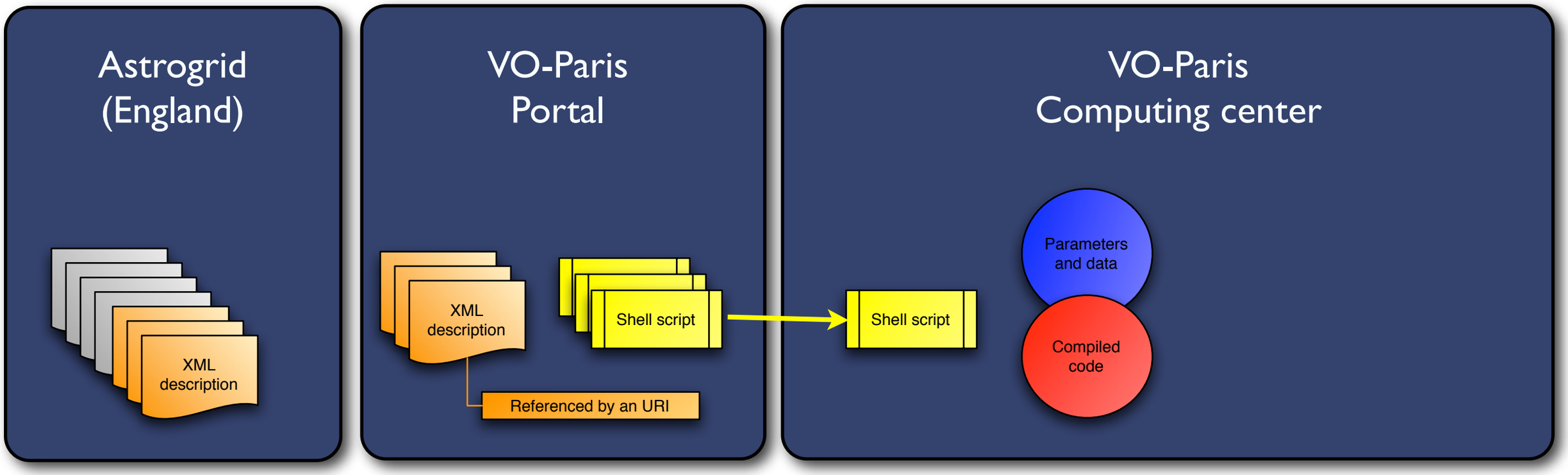
Access to codes in the VO

Portail Numérique
VO Paris datacenter



- Services are harvested by Astrogrid
- Identified by an URI

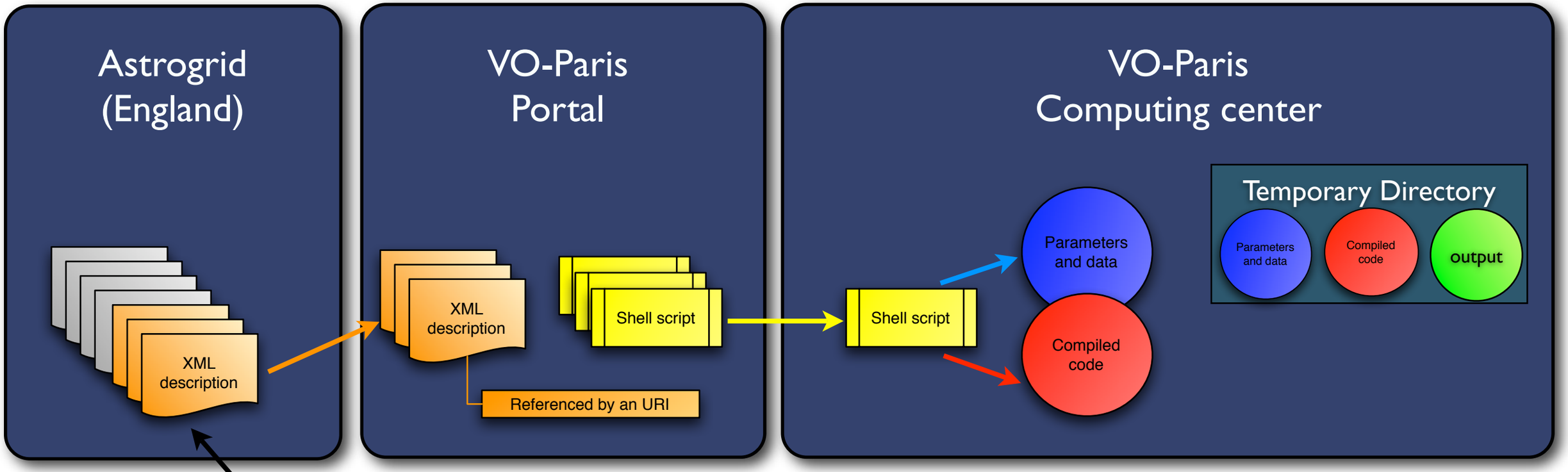
Access to codes in the VO

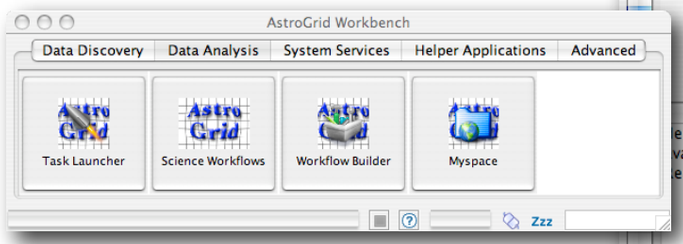


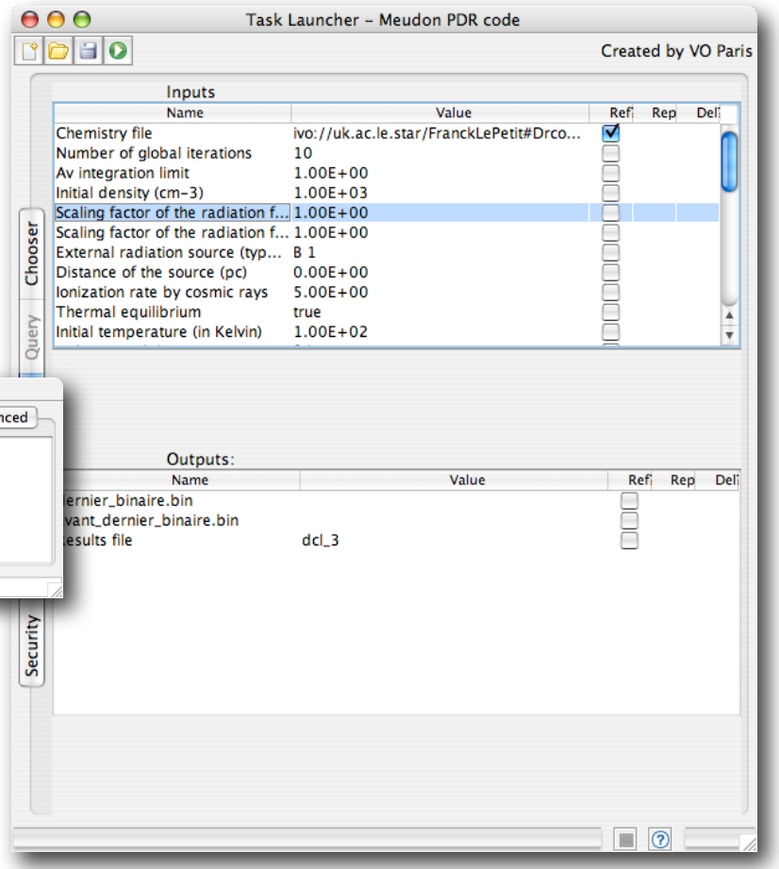
Computing center
- Shell script to command the execution
- Compiled code

Access to codes in the VO

Portail Numérique
VO Paris datacenter



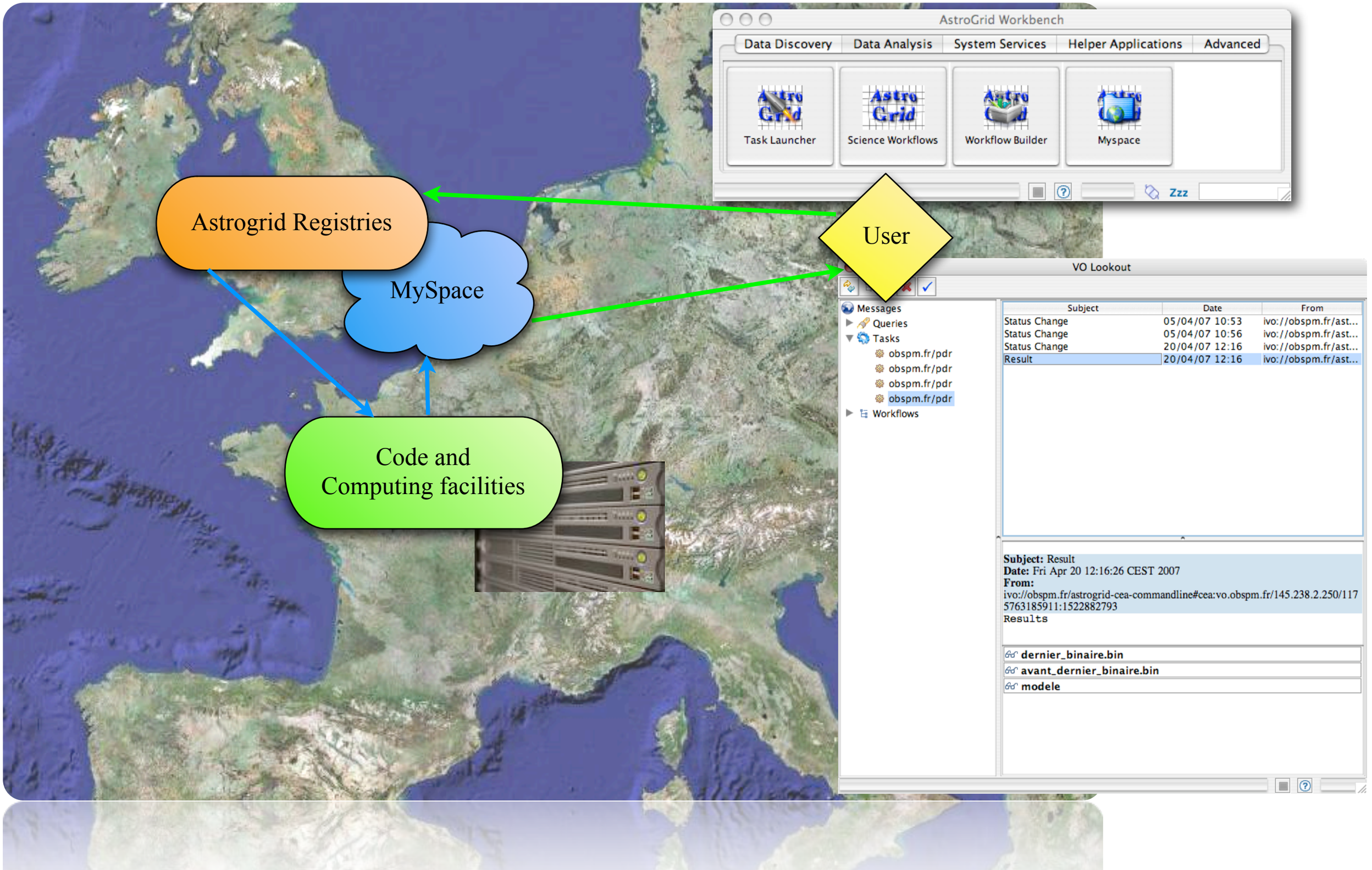




- Parameters are transmitted as command lines parameters
- Shell script on Computing center transforms them in the input file waited by the code
- multi-user :
  copy of the executable + parameters and data

Access to codes in the VO

Portail Numérique
VO Paris datacenter



Codes in Astrogrid

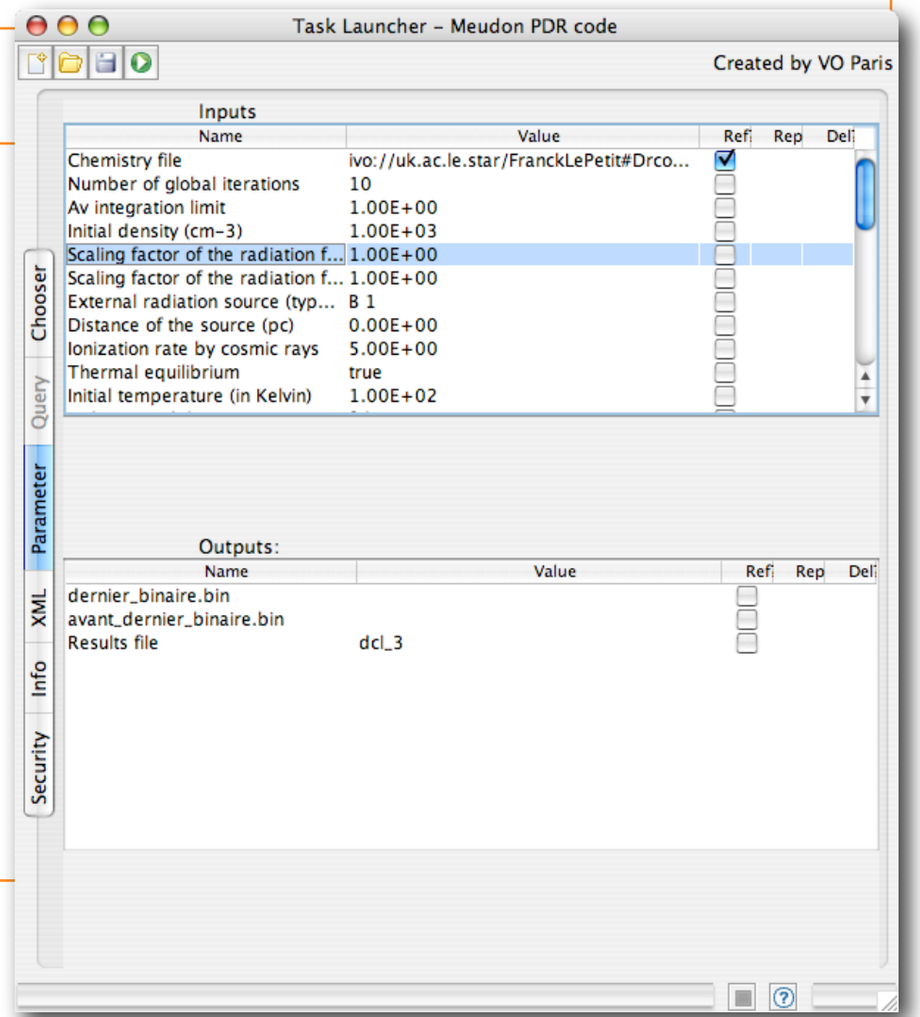
Portail Numérique
VO Paris datacenter

Advantages :

- Easy to use
- Produces automaticaly a generic interface
- Description of parameters, default values
- Use “Identification” from Astrogrid
- Can run codes on computing centers
- Access to MySpace (disk storage accessible from anywhere)

Drawbacks :

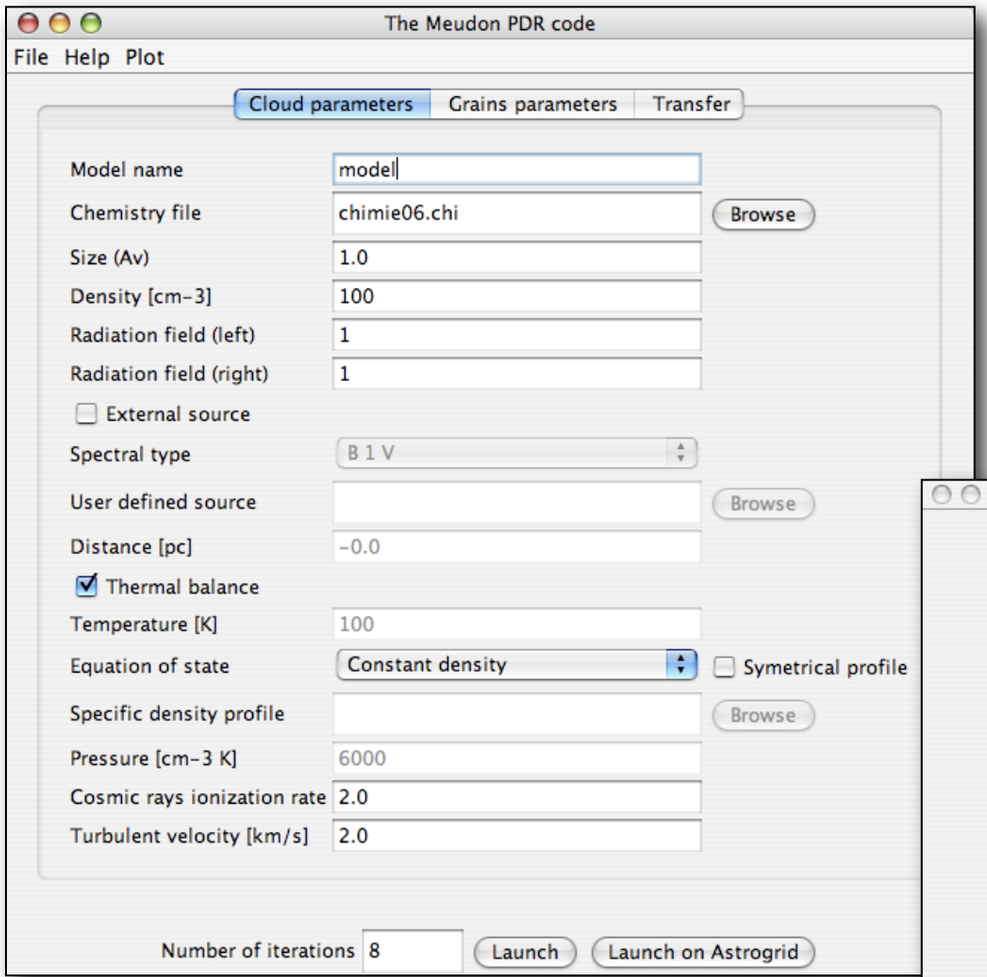
- Generic interface
- Not adapted to non specialists
- Not linked to the code
  - Developpement of the code more complex
  - No verification of parameters
  - No link between parameters
- Not possible to visualize parameters (curves)

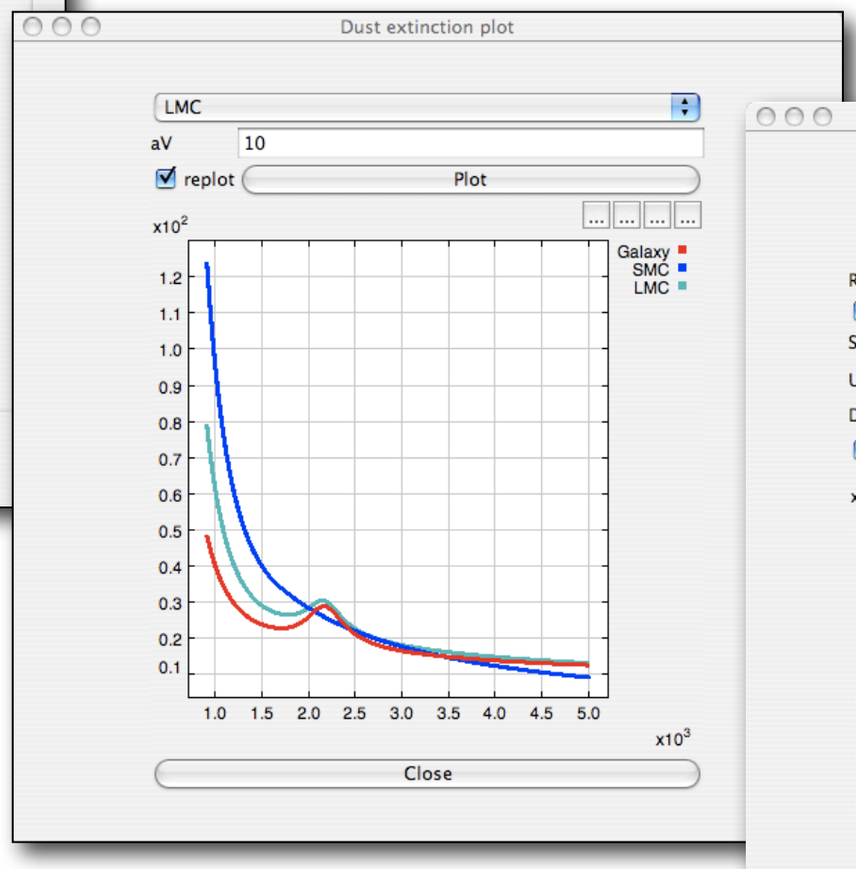


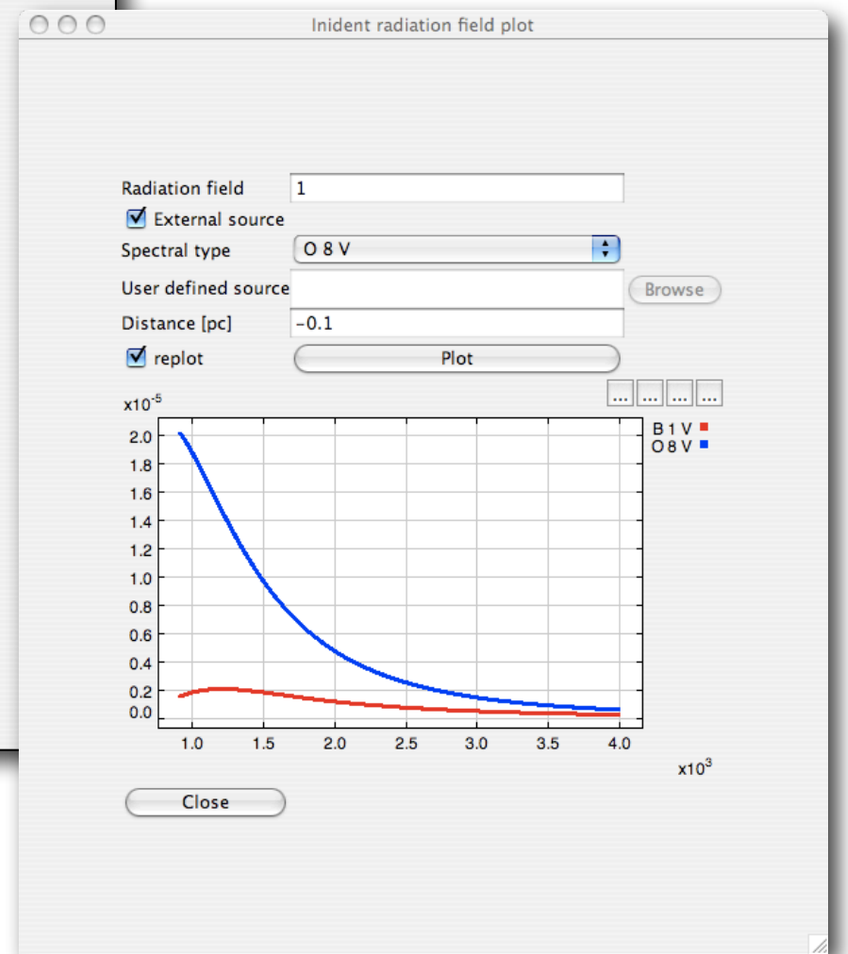
Codes in Astrogrid

Portail Numérique
VO Paris datacenter

Specific interface communicating with Astrogid : ASTRO RUNTIME







- Structuration of parameters
- Relations between parameters
- Link between code and interface
  - Code is more easy to develop
- Documentation
- Vizualisation tools

Usecase

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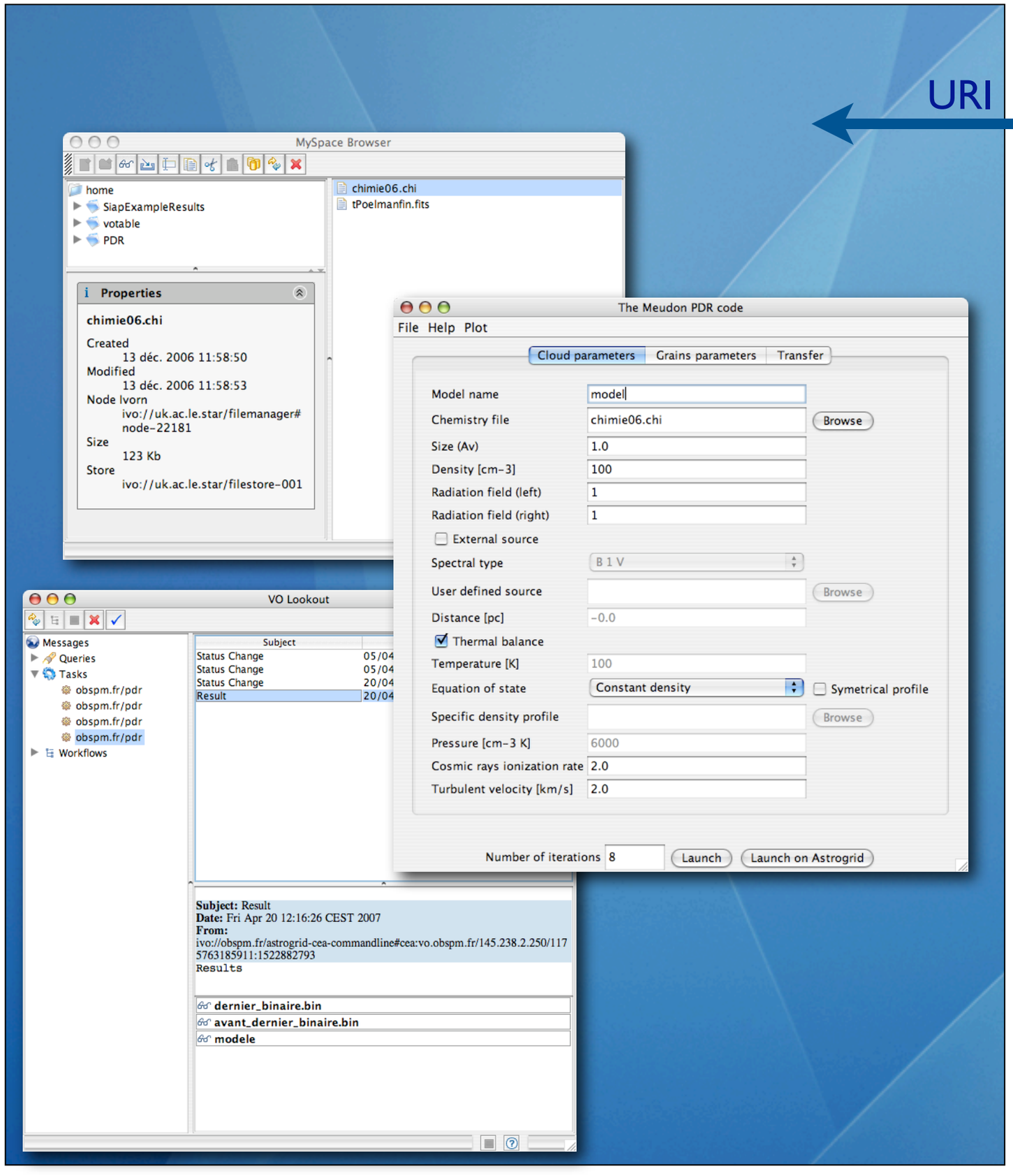
VO Paris datacenter



URI

Astro Runtime

An API for the VO

get XML template

Astro Grid

Registries

Services identified by URI

MySpace

Computing center (VO-Paris)

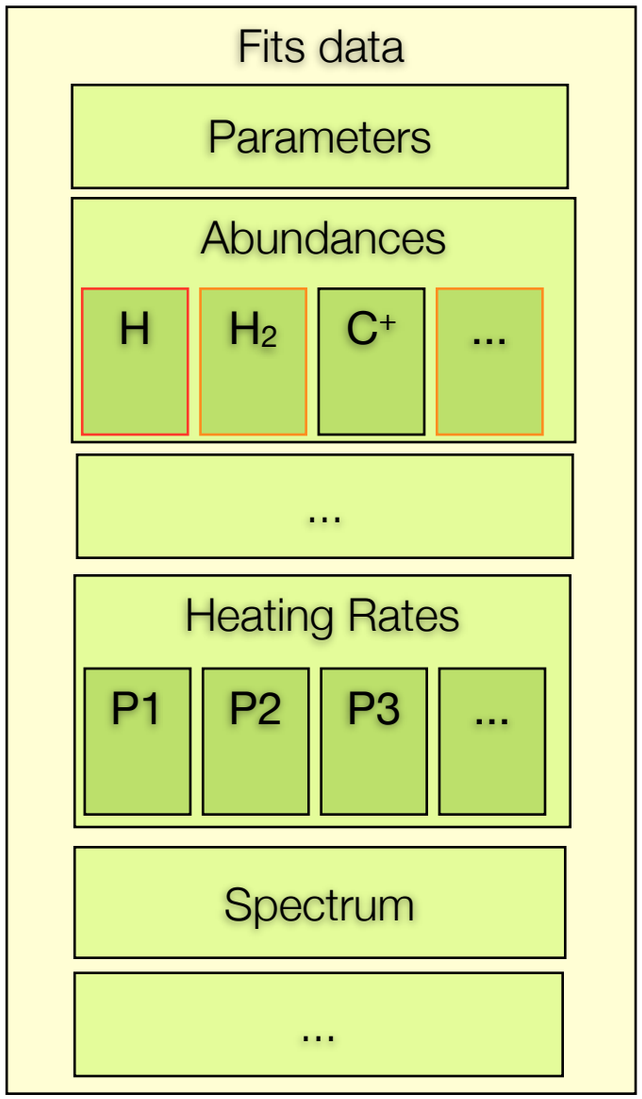
Outputs

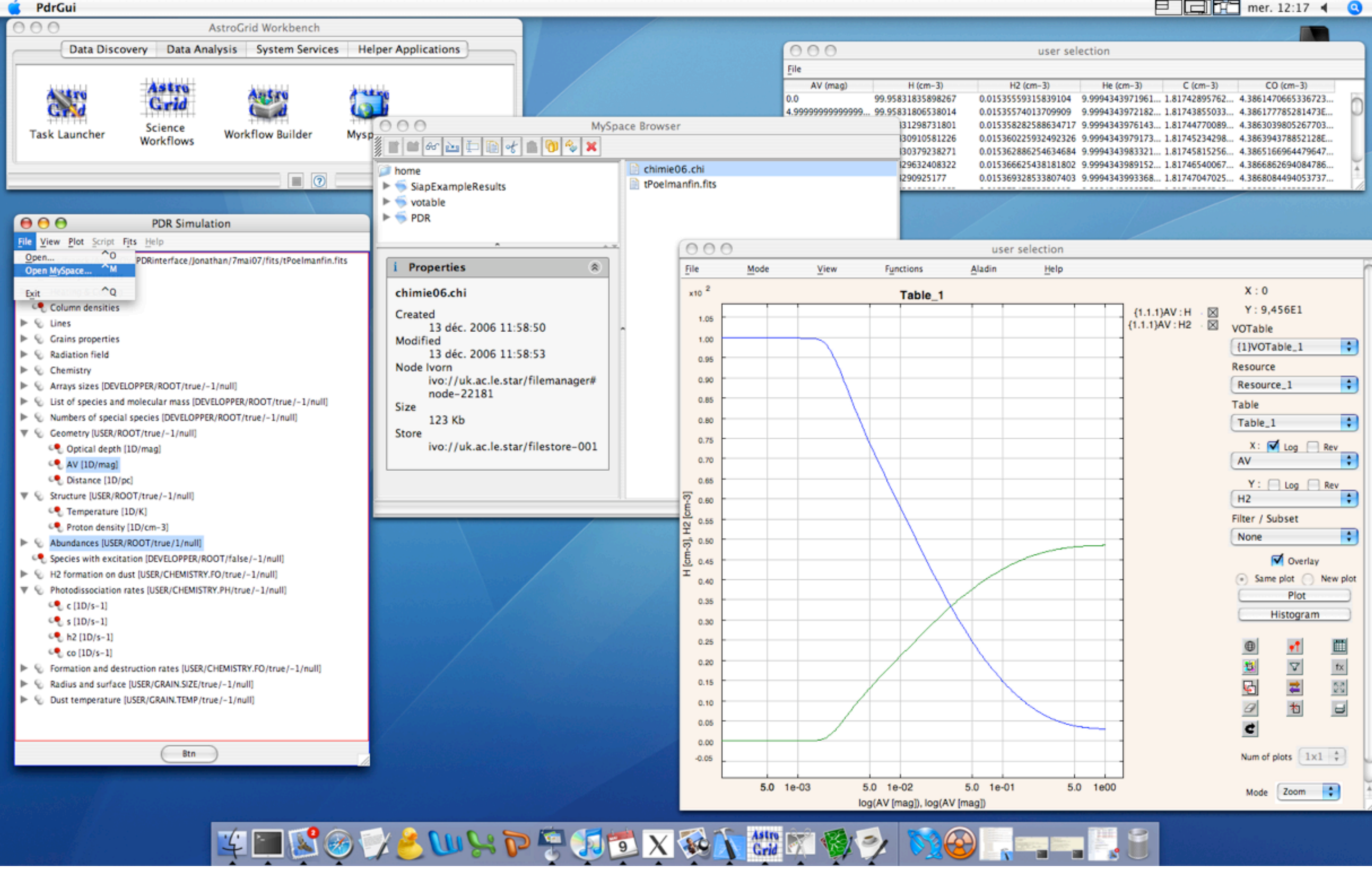
- Problem of portability :
  - fits (only data at present - metadata will come later in VO-Table)

- Outputs of models / simulation codes
  - Some are observables : Spectrum, intensities, column densities
  - Some are not observables : abundances, excitation, physical processes ...

- Access to output
  - on the computer it has run
  - on MySpace (with Astro-runtime)
    - Data are not big compared to cosmological codes

  ➞ download all results





Read .fits output file (local computer or MySpace)

- Send results in VO-Plot
- ASCII file
- *VO-Table*

- Comparison of models
- Plastic

Outputs

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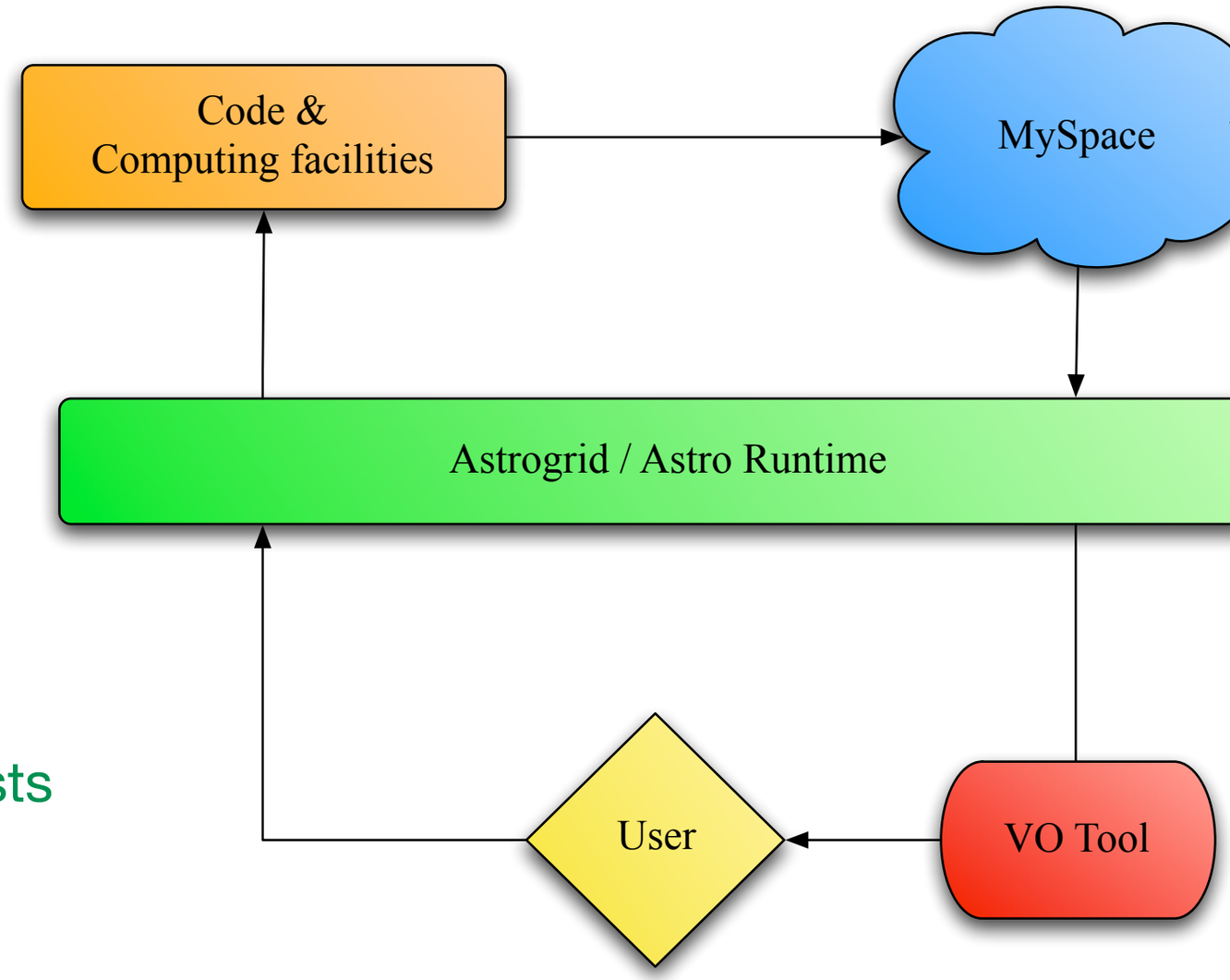


Next step :

- Workflows

Workflows

PDR codes / Photo-ionization codes:

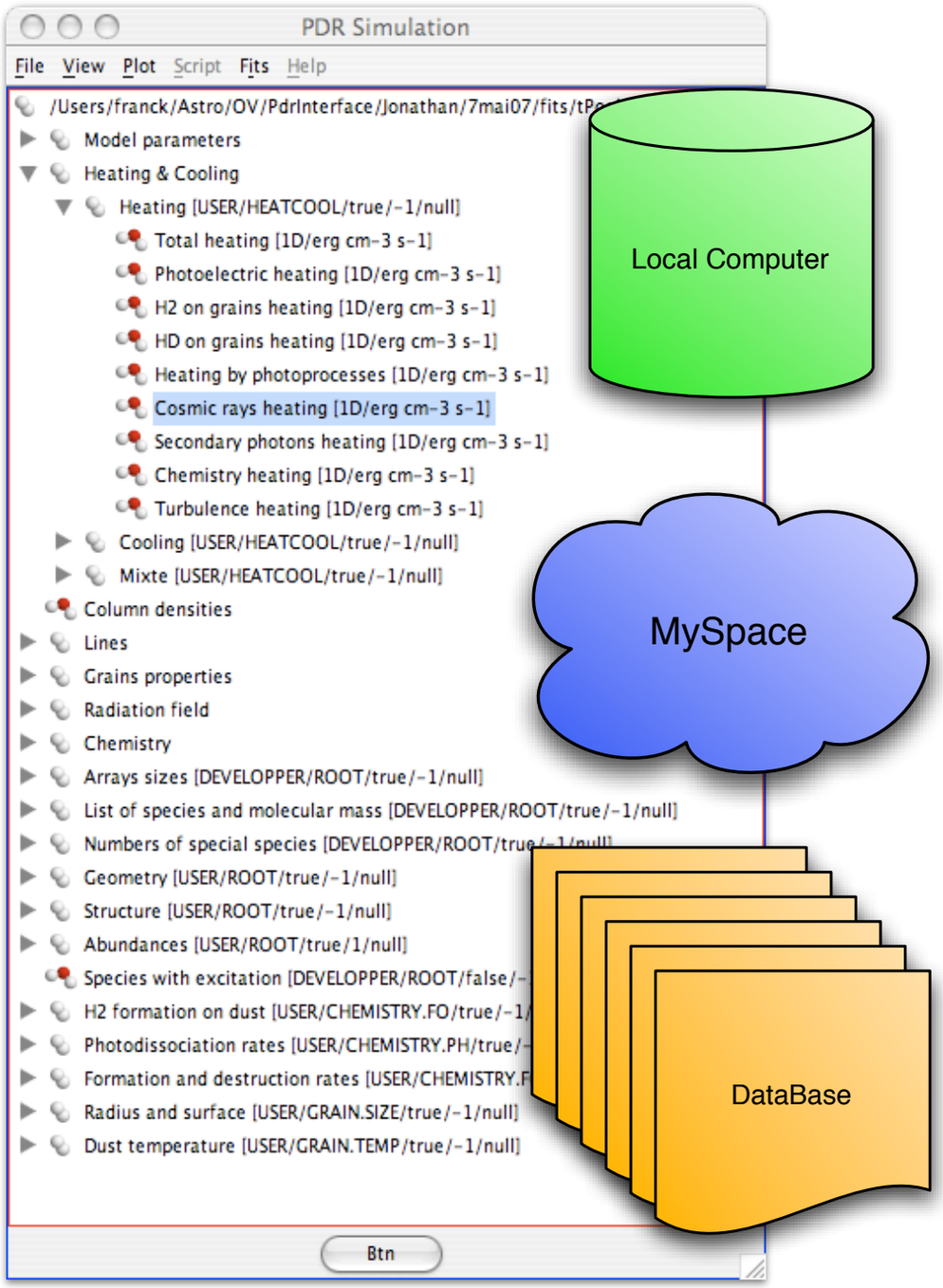
1 dimension ➡ few points

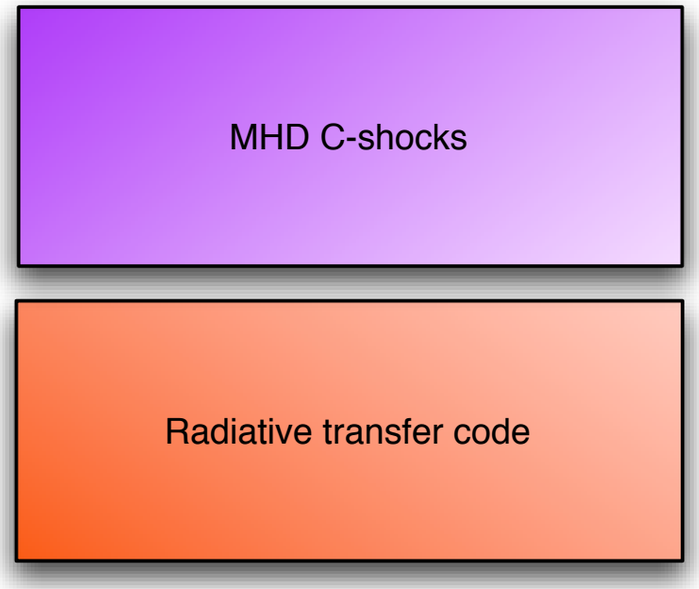
Lots of physical quantities

Hydrodynamic / N-body

3 dimensions ➡ lots of points

few physical quantities



SNAP

get some physical quantities for all spatial points