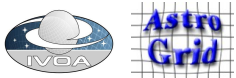


IVOA and the Grid

Guy Rixon

Presentation to DCA WP5
kick-off meeting
Trieste, November 2006



Topics

- Roles of IVOA, VOTech, AstroGrid
- IVOA's approach to grids: desired standards
- AstroGrid prototypes: CEA, MySpace
- IVOA standards: UWS and VOSpace

IVOA's role

- **Mission:** “To facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems, and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating Virtual Observatory.”
- What we really do: make standards.
- Win condition 1: a standard way of doing everything necessary and common in the IVO.
- Win condition 2: reusable code implementing those standards

VOTech DS3's role

- Research/discussion of Vobs infrastructure
- Selects (or invents) standards for EuroVO
 - => proposes standards for data centres
- May commission production of software
- DS3 standards are superset of IVOA standards

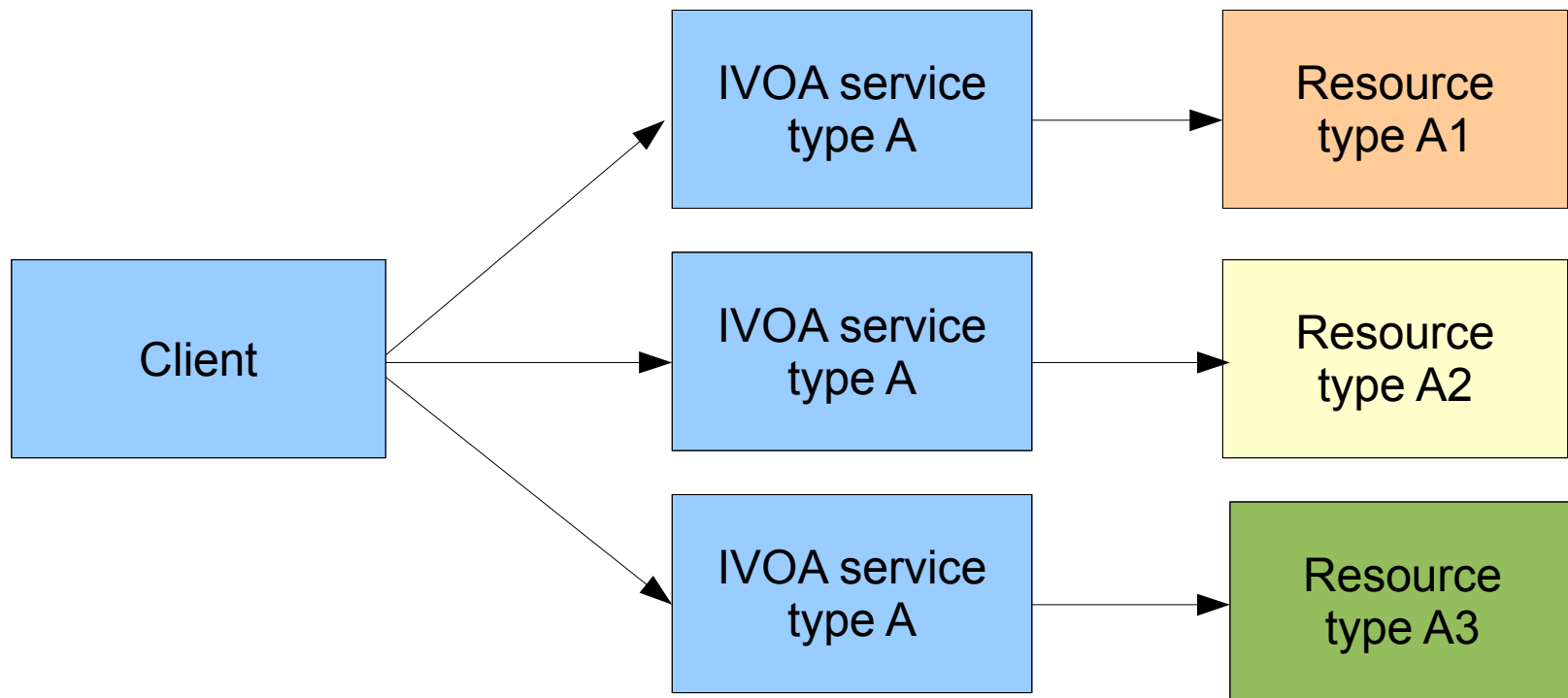
AstroGrid's role

- AstroGrid develops software
 - For data centres (e.g. CEA app-server)
 - For end users (e.g. Workbench)
 - For developers (e.g. Astro Runtime: “AR”)
- AstroGrid implements IVOA and VOTech standards

Grid & Web Services WG

- An IVOA group generating standards.
- Work packages:
 - Basic profile for SOAP interoperability
 - “VO Support Interfaces”
 - Service security
 - Universal Worker Service
 - VOSpace

IVOA standards describe facades



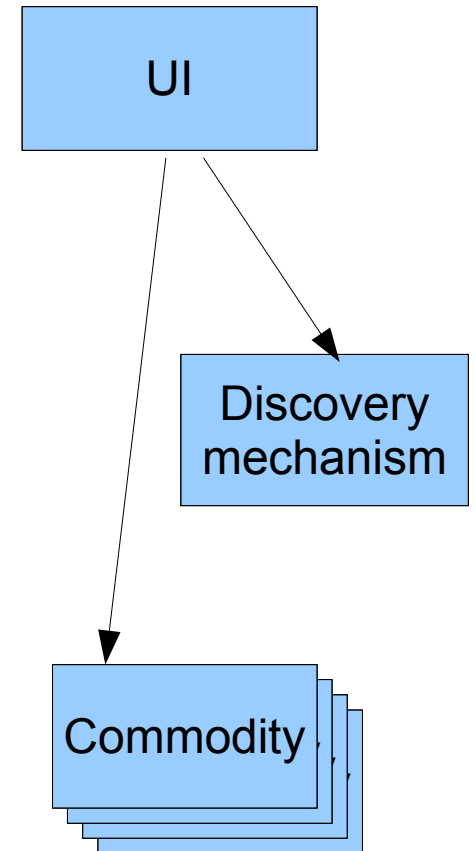
- “Any problem in computer science can be solved with another layer of indirection.” -- David Wheeler

IVOA's initial position on Grids

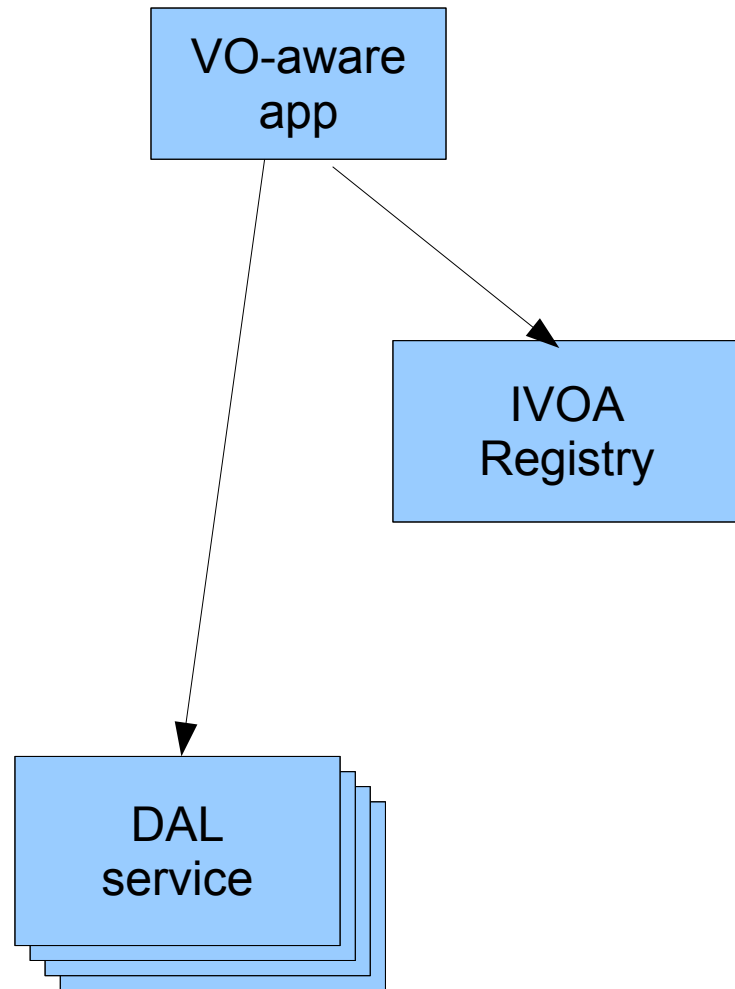
- Bad fit with early IVOA standards
- The IVO *is* a Grid
- What more do you need?
- (Justification follows)

Grid essentials

- *"You can't be a real country unless you have a beer and an airline. It helps if you have some kind of a football team, or some nuclear weapons, but at the very least you need a beer". -- Frank Zappa*
- You can't be a real Grid unless you have a **commodity** and a **discovery mechanism**. It helps if you have some kind of middleware or some supercomputers, but at the very least you need a commodity.



Existing IVO viewed as a Grid



- Checklist:
 - ✓ Commodity (DAL)
 - ✓ Discovery (Registry)
 - ✓ Middleware
 - ✗ Supercomputer
 - ✓ Beer
 - ✓ Airline

Objection!

That's not what we meant by a
Grid, you fool!



Compute grid vs. application grid

I need to run this code X (which I wrote) and I don't care where it runs. It's big; deal with it. Don't bother me with the details.



I want to use this application Y (which I read about in a journal) on these data Z (somewhere in the IVO). Store the results for me. Don't bother me with the details.



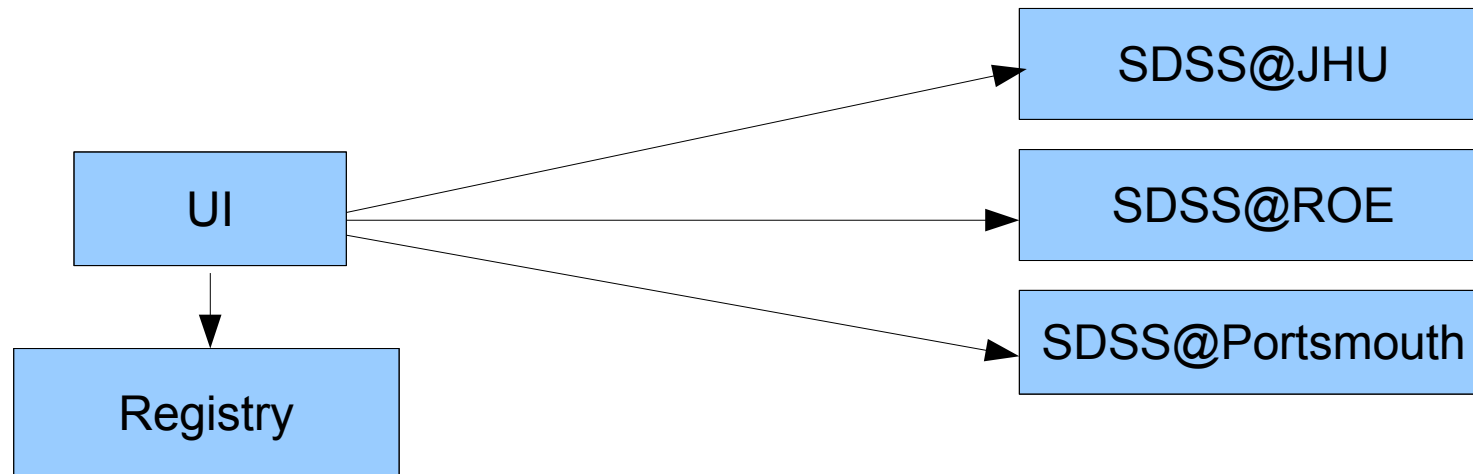
No IVOA standard for Compute Grid

- It's been done
- It's hard
- Why should we duplicate?
- How could we choose between competing systems?
- Compute Grid knows no Astronomy

Current IVOA grid applications

- ✓ Archive access
- ✓ Archive access
- ✓ Archive access
- ✗ Data storage
- ✗ Data processing
- ✗ Theory computation

Archives as commodities: mirroring



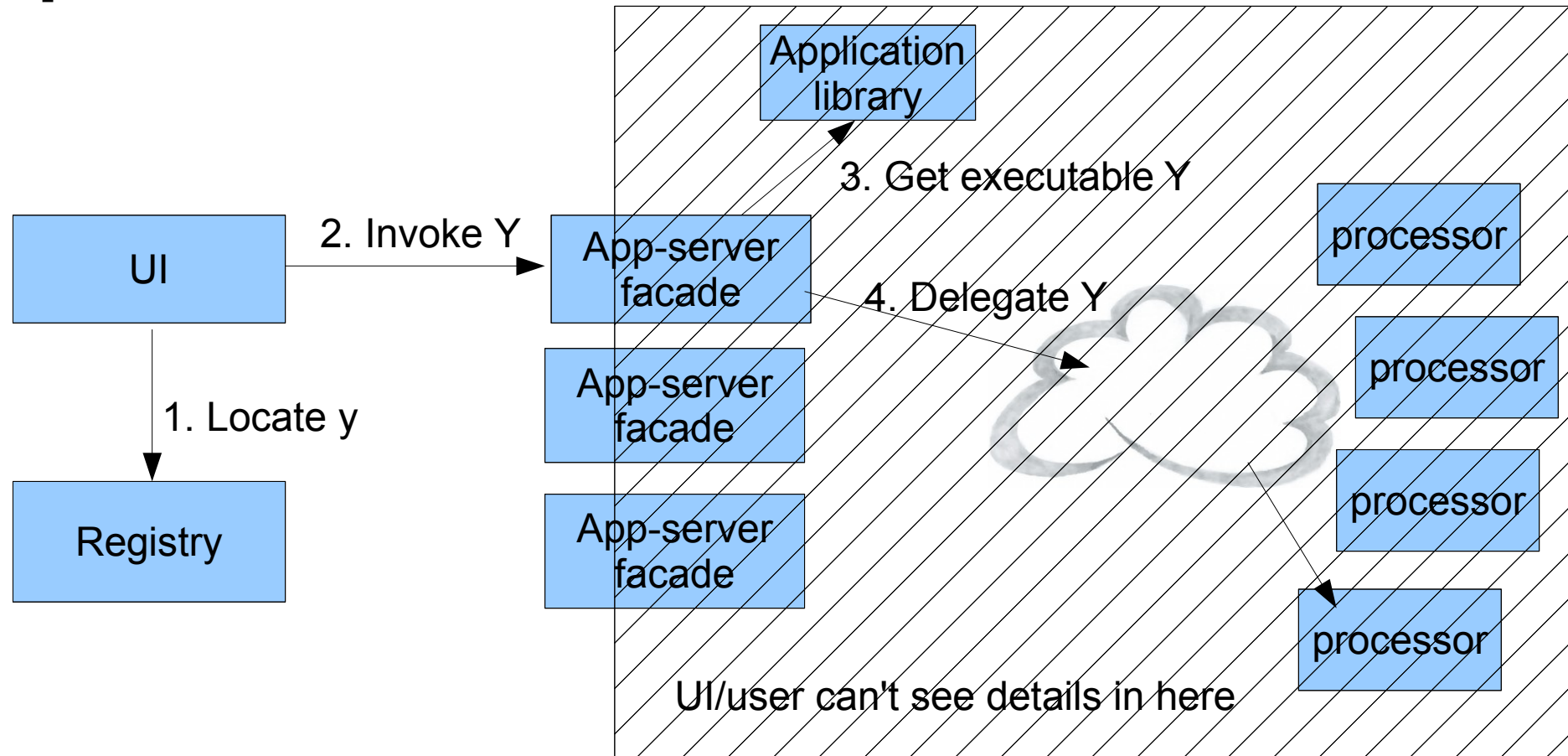
```
<Resource>
  <title>SDSS DR4 object catalogues</title>
  <identifier>ivo://roe/SDSS-DR4</identifier>
  ...
  <relationship>
    <relationshipType>mirror-of</relationshipType>
    <relatedResource>ivo://jhu/SDSS-DR4</relatedResource>
  </relationship>
  ...
```


Standards for data-processing apps

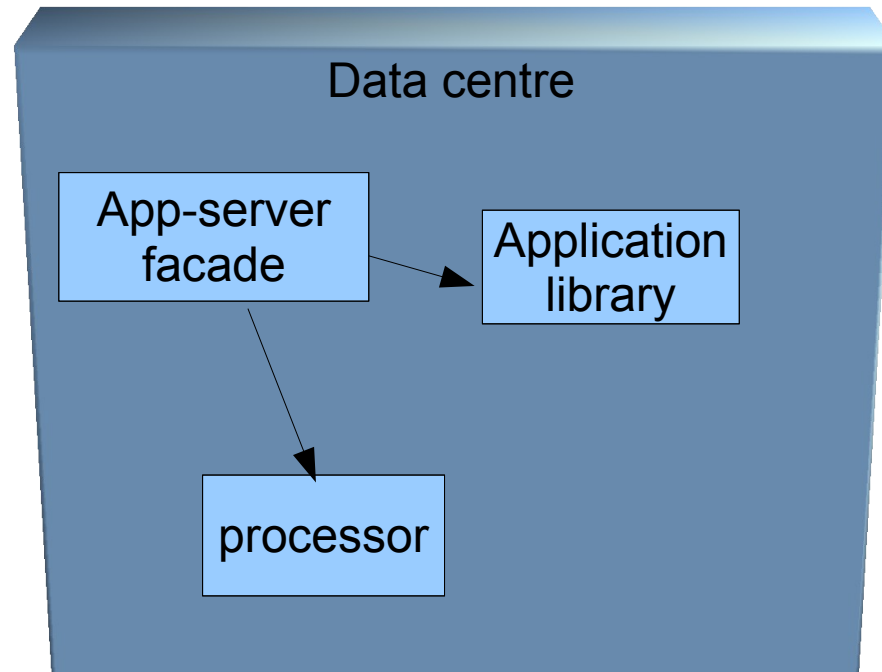
- Desirable
- Not so much prior art
- Some special Astronomy support
- Need to mobilize legacy applications
- Need to extend to data processing

Encapsulation of data processing

- “I want to use this application Y (which I read about in a journal) [...] **Don't bother me with the details.**”



Simple, local app-server

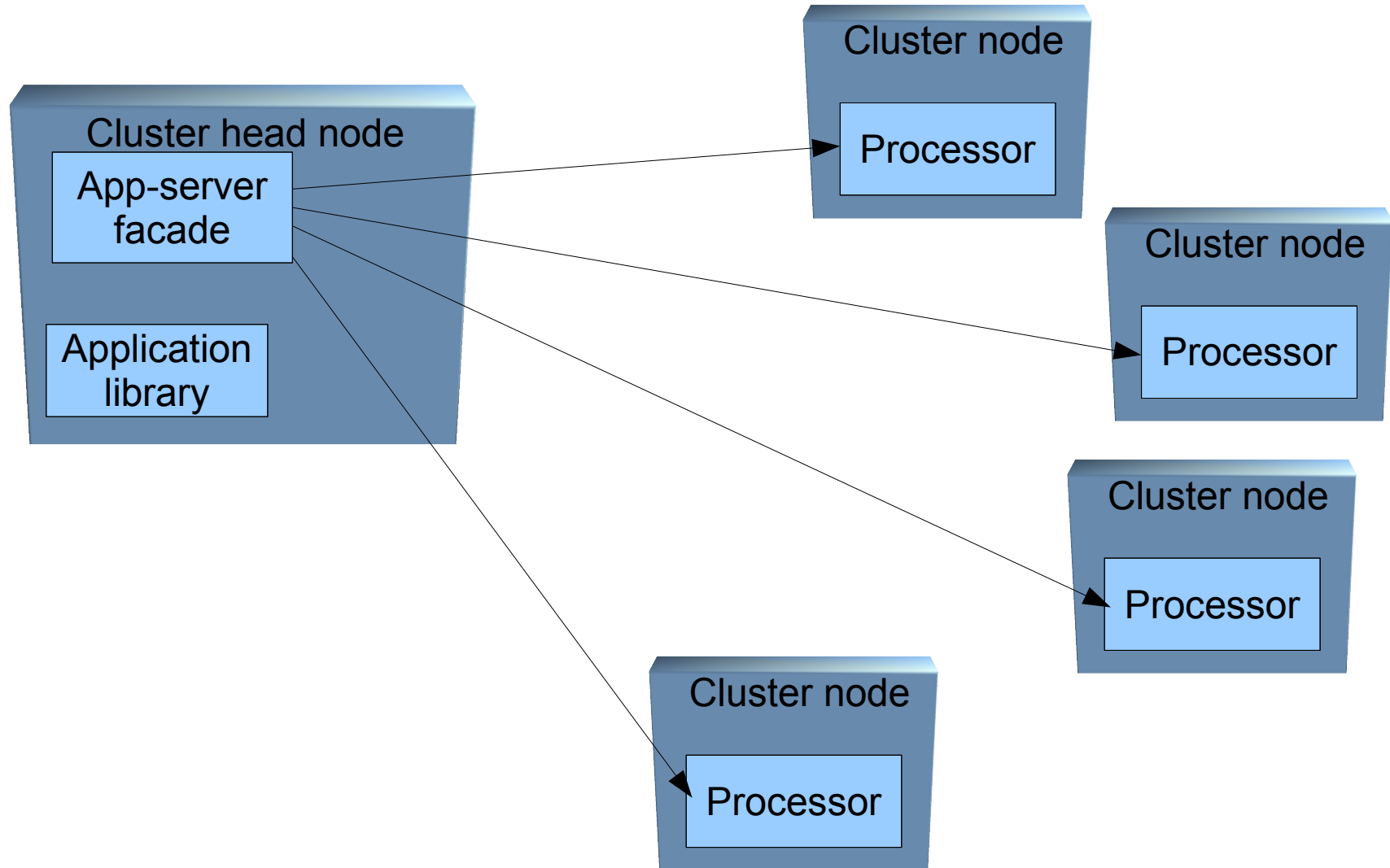


Service-provider's use case

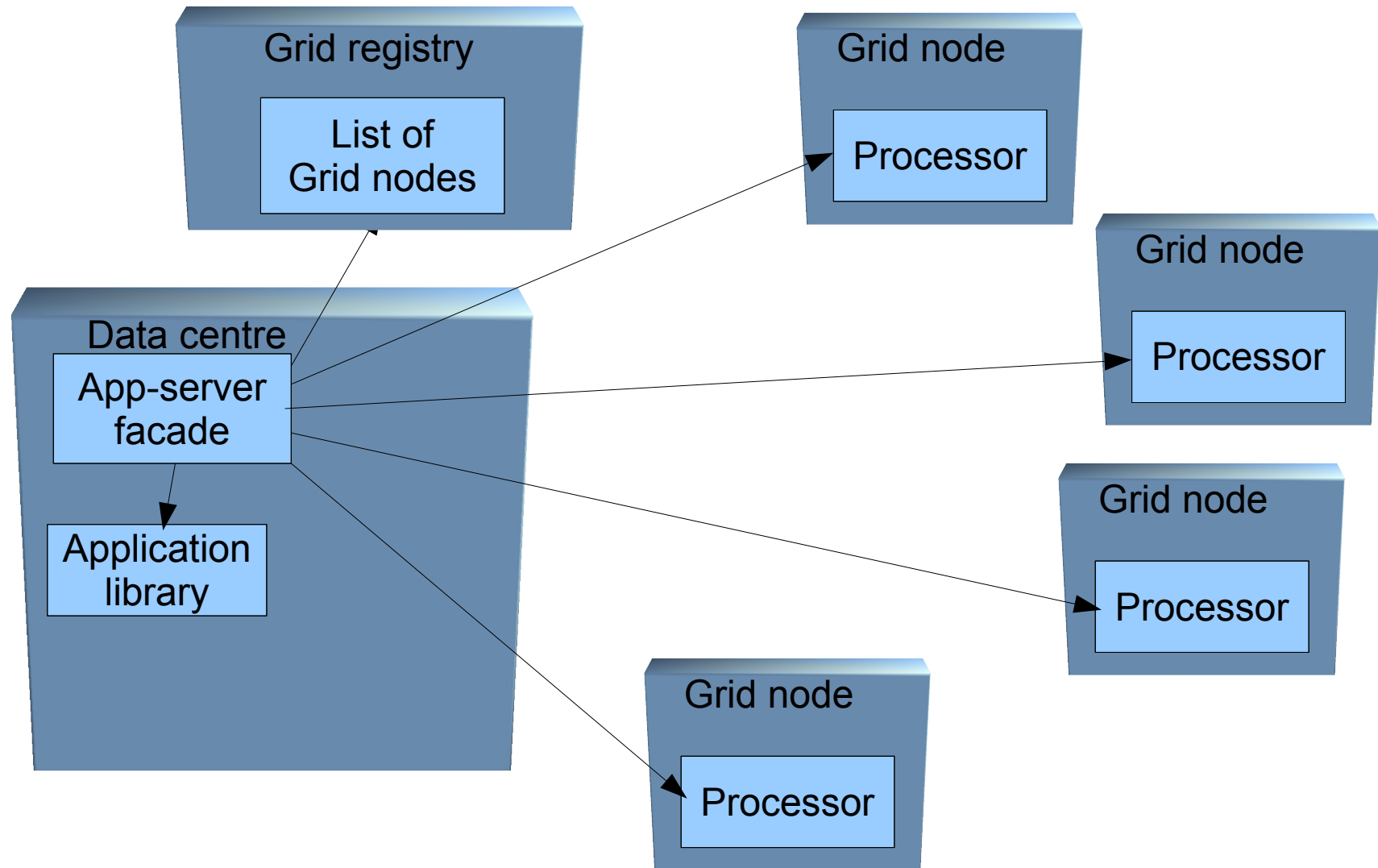
Argh! All these jobs kill my server!
Make them go away!
Dump them to the Grid.
(Don't bother me with the details.)



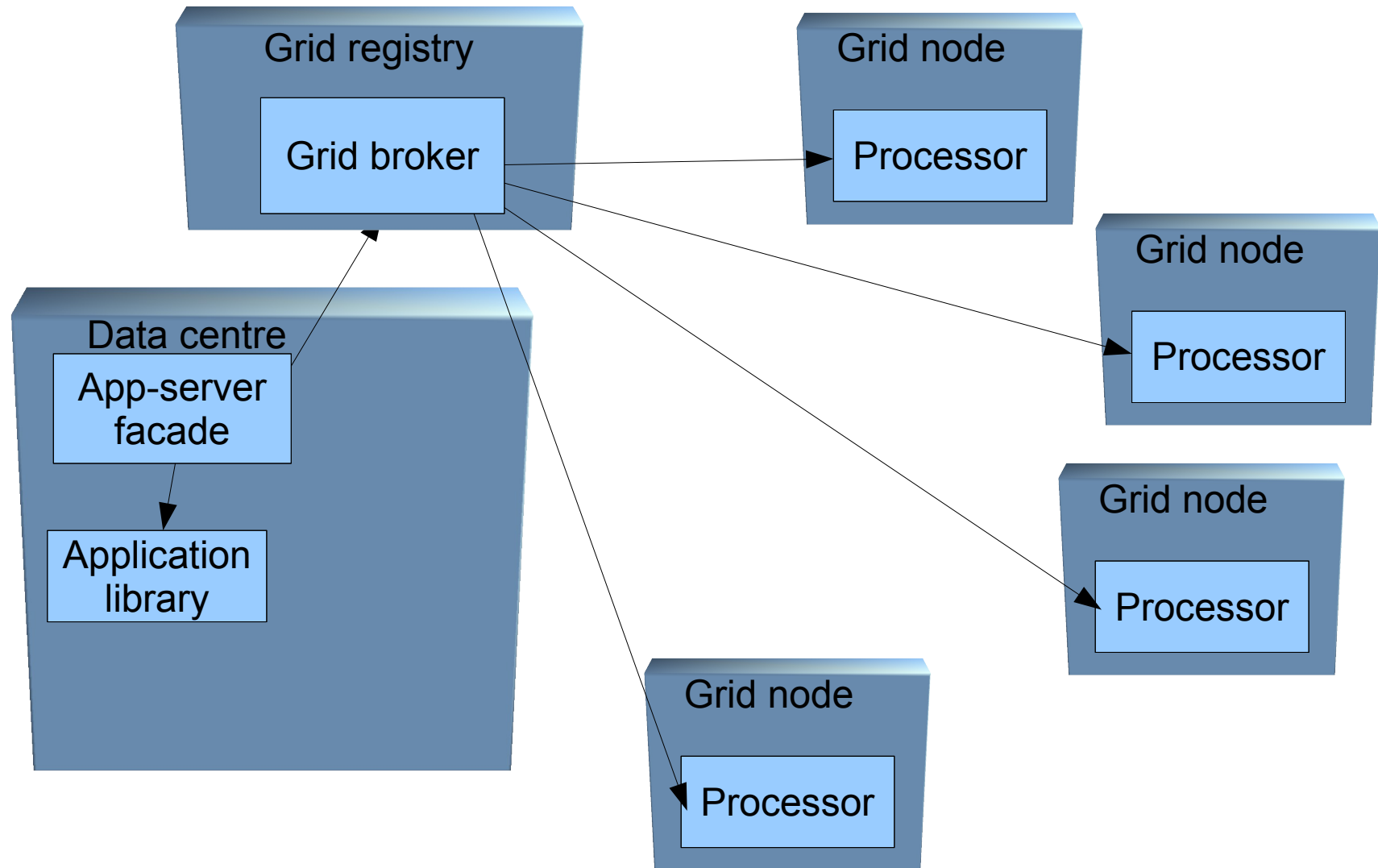
IntraGrid (local cluster)



ExtraGrid (simple)

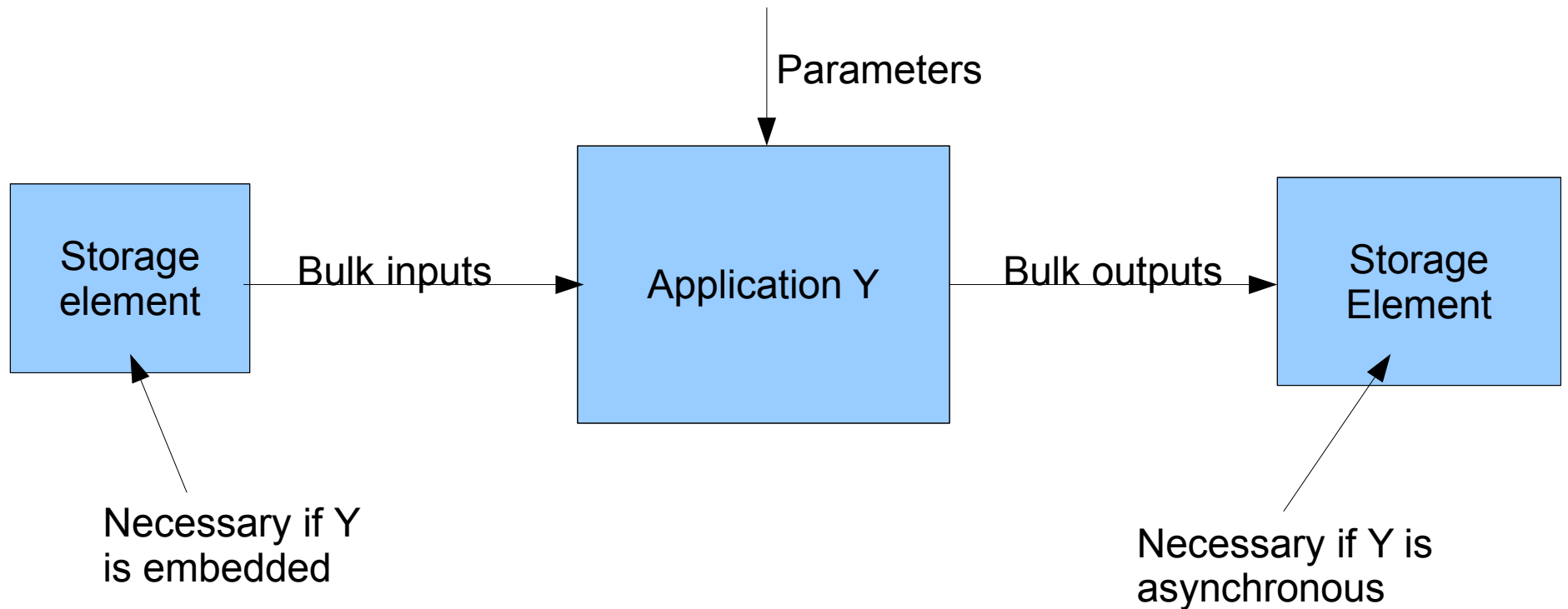


ExtraGrid (brokered)



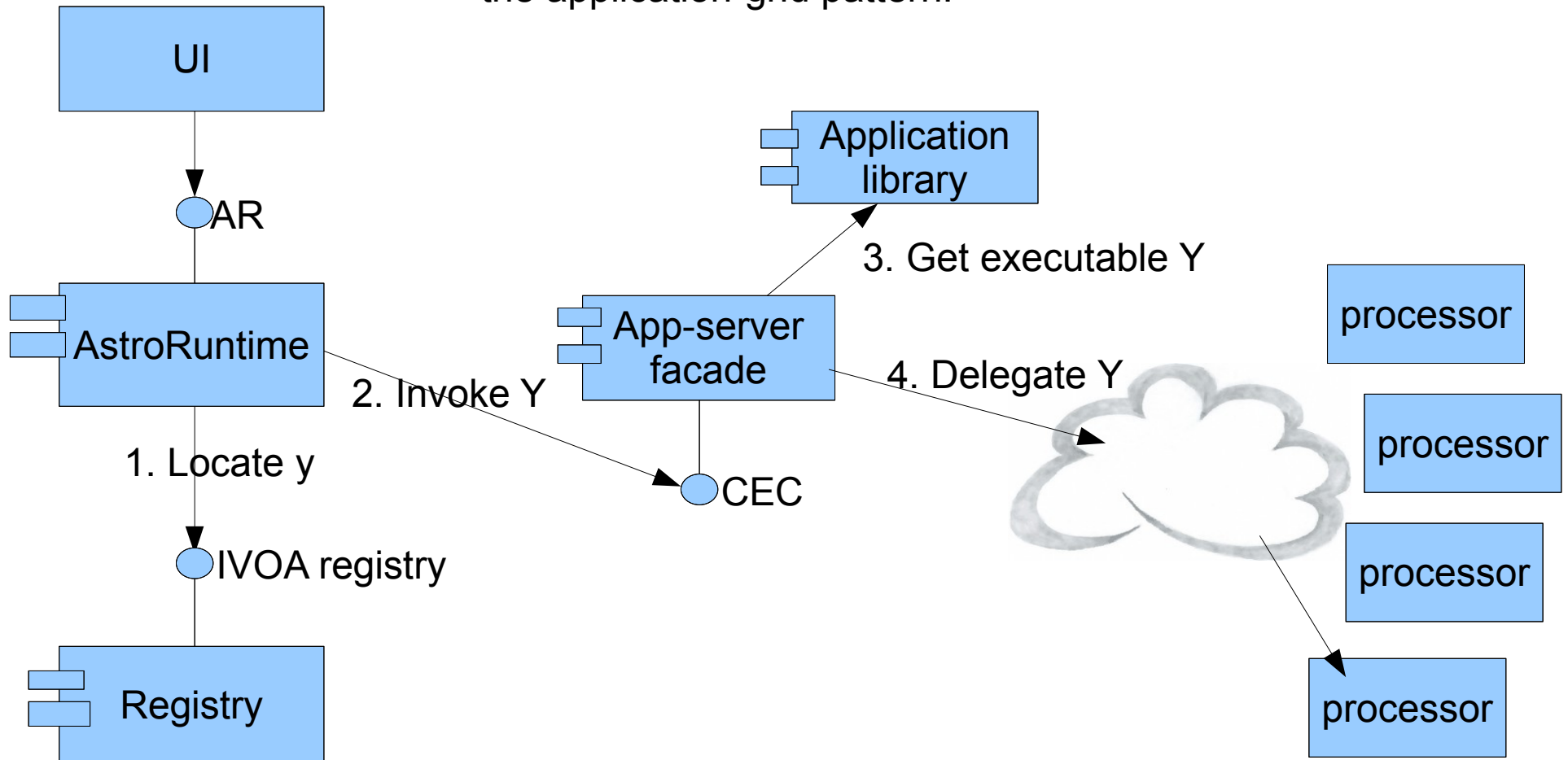
Data grid: required

- “I want to use this application Y (which I read about in a journal) on **these data Z (somewhere in the IVO)**. **Store the results for me.** Don't bother me with the details.”



Common Execution Architecture (1)

EuroVOTech infrastructure components implementing the application-grid pattern.



Common Execution Architecture (2)

Task Launcher

Select an Application:

Find: PEGASE.2 Full-text Search

S...	Title
<input type="checkbox"/>	PEGASE.2

Details Tree View XML entry

PEGASE.2

PEGASE.2, ivo://uk.ac.cam.ast/PEGASE.2

PEGASE.2 is a code which computes the spectral evolution of galaxies. The evolution of the stars, gas is computed according to user selected star formation laws and initial stellar mass function. The stellar evolution tracks extend from the main sequence to the white dwarf stage. The emission of the gas in HII regions is taken into account. The effect of extinction by dust is also modelled using a radiative transfer code.

Further information - <http://www2.iap.fr/users/fioc/PEGASE.html>
Type - Other
Subject - Galaxy evolution, spectral synthesis, theory

Interfaces

- simple
Inputs - IMF, LMASS, UMASS, SNMODEL, WINDS, BINFRAC, METALICITY, INFALL, INFALLTIME, INFALLMETAL, SFSCENARIO, SFRP1, SFRP2, CONEVOL, SMETAL, GALWIND, GALWINDAGE, NEBEMISS, GLOBALEXTINCTION
Outputs - SPECTRA, COLOURS

Found 1 resources

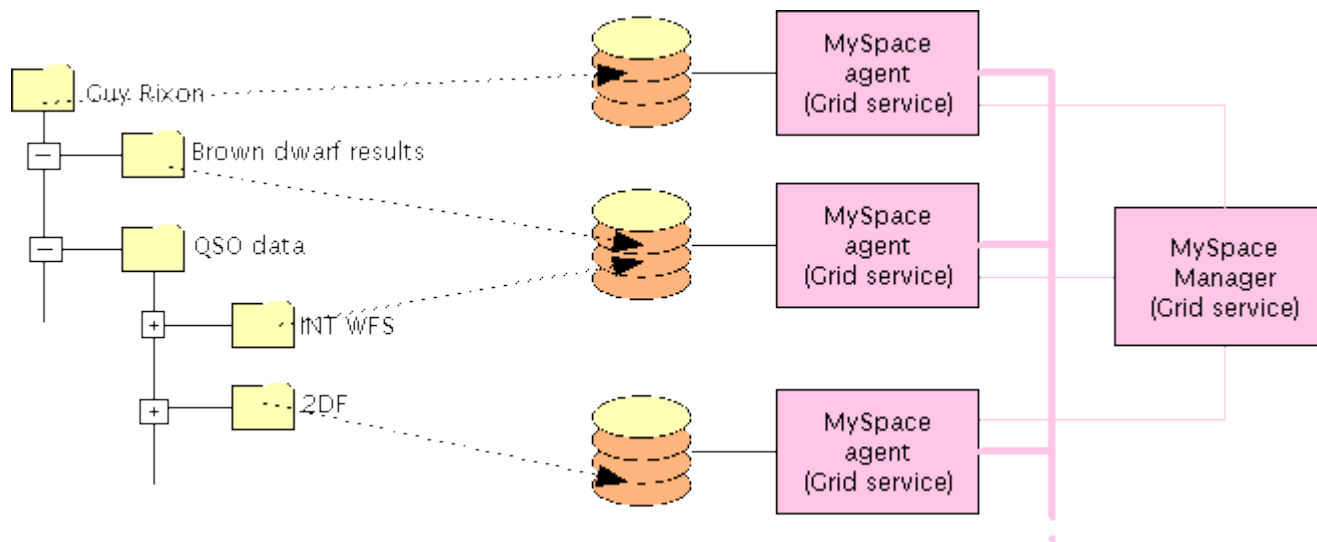
Task Launcher - PEGASE.2
Created by M. Fioc and B. Rocca-Volmerange

Inputs		Ref?	Rep?	Del?
Name	Value			
Initial Mass Function	4	<input type="checkbox"/>		
Lower mass	0.1	<input type="checkbox"/>		
Upper mass	120.0	<input type="checkbox"/>		
SN Model (A/B/C)	B	<input type="checkbox"/>		
Stellar Winds	Y	<input type="checkbox"/>		
binary fraction	0.05	<input type="checkbox"/>		
Metalicity	0.0	<input type="checkbox"/>		
Infall	n	<input type="checkbox"/>		
Infall Timescale	0.10000E+04	<input type="checkbox"/>		<input type="checkbox"/>
Infall Metallicity	0	<input type="checkbox"/>		<input type="checkbox"/>

Outputs:		Ref?	Rep?	Del?
Name	Value			
Synthesized spectra		<input type="checkbox"/>		
Synthesized colours		<input type="checkbox"/>		

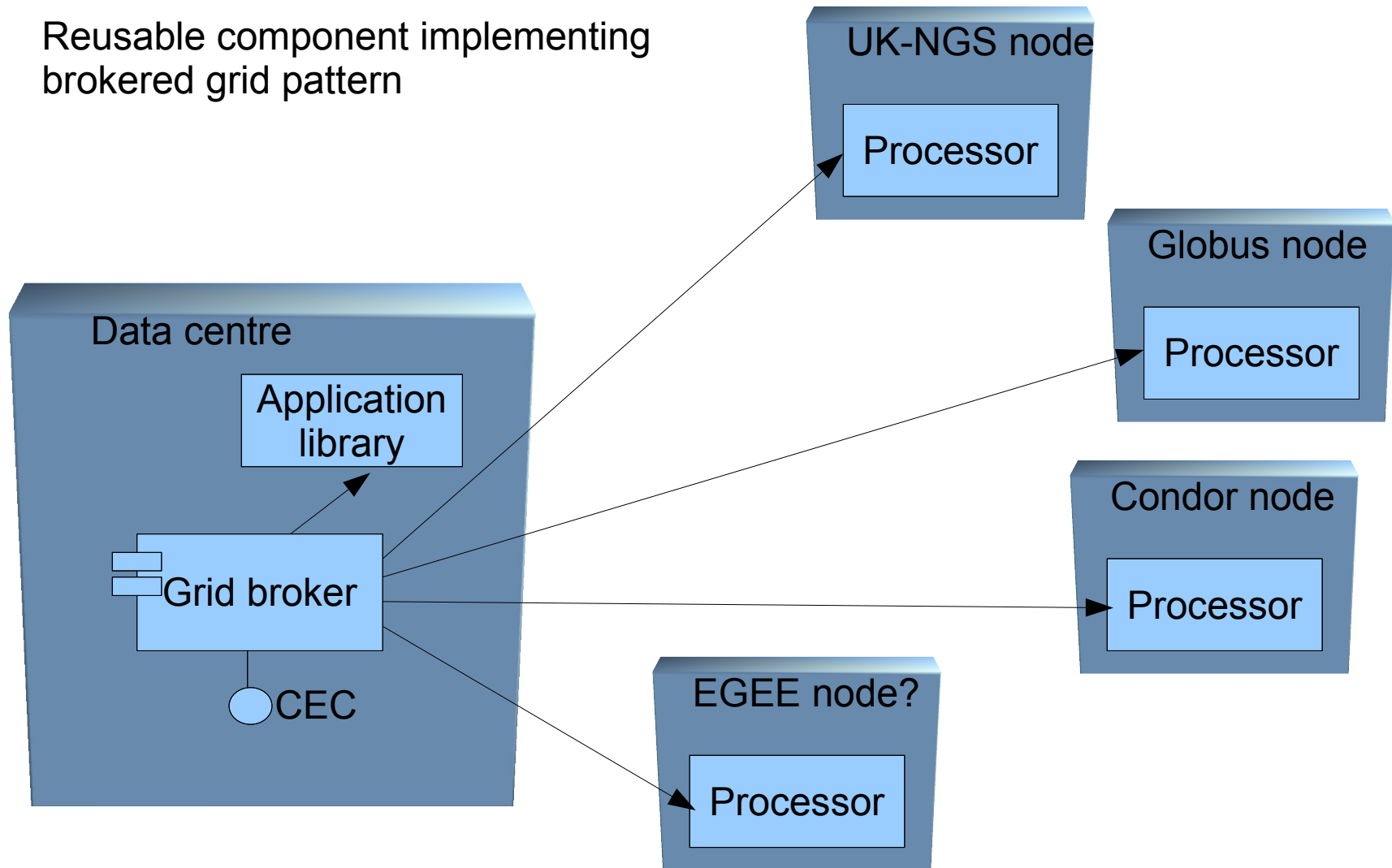
AstroGrid MySpace

- Basic data-grid for files.



VO Tech broker

Reusable component implementing brokered grid pattern



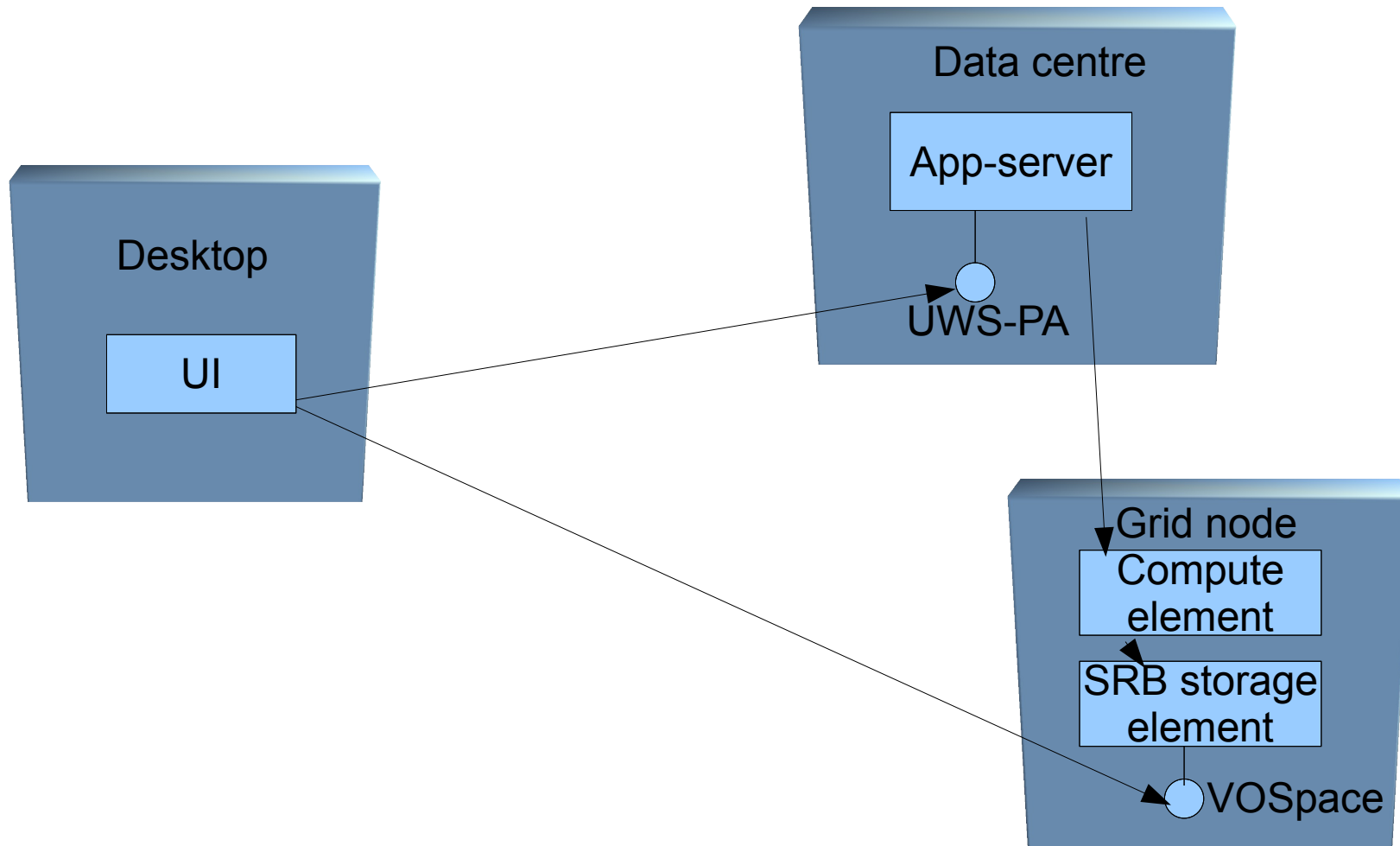
UWS-PA

- IVOA-standard version of CEA
- UWS = Universal Worker Service
 - Pattern for asynchronous services
- UWS-PA = UWS for Parameterized Applications
 - Service contract for app-grid service
- UWS-PA interface will be added to AstroGrid/VOTech CEA components

VOSpace

- IVOA-standard MySpace BUT with more features and better design
 - Flatter service structure
 - More data-transport protocols
 - Handles writeable RDB
 - Integrates with, e.g. SRB

VOSpace + SRB + compute Grid



Security (briefly)

- As stated in EGEE talk at this workshop
 - X.509, proxies, delegation
 - Maybe not VOMS; undecided yet
- Supports national-level CAs
- Supports institution-level CAs
- Two modes of authentication:
 - As end user
 - As data-centre agent
 - Who pays?