

Grid computing with IVOA standards and VOTech components

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Grid and the Virtual Observatory
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Topics

- (Euro)VOTech and IVOA
- IVOA/VOTech strategy for grids
- What can be done now
- What can be done soon

EuroVOTech redux

“The VOTECH project is an EU FP6 funded **design study** which aims to complete the technical preparation for the construction of the European Virtual Observatory

“... feasibility studies and design work ... intelligent resource discovery ... data mining ... visualisation ... interoperability standards ... **grid computing** ... **mass scale computational process** ... EGEE backbone...”

(from <http://eurovotech.org/votech.htm>)

EuroVO output

- Experiments
- Prototypes
- Presentations
- Recommendations
- Papers
- **Reference architecture**
 - Taken to mean usable software

Ancestors and descendants

- 2002-2004: AVO, prehistory of EuroVO
- September 2004: VOTech kick-off
- January 2005: VOTech official start
- March 2008: AIDA kick-off
- March 2008: joint AIDA/VOTech workshop
- December 2008: end of VOTech
- January 2009: AIDA carries on tech work

Study groups in VOTech

“The project is divided up into a set of Design Study areas:

DS1: DesignStudyManagement

DS2: TechnicalProjectManagement

DS3: (New) InfraStructure

DS4: (New) UserTools

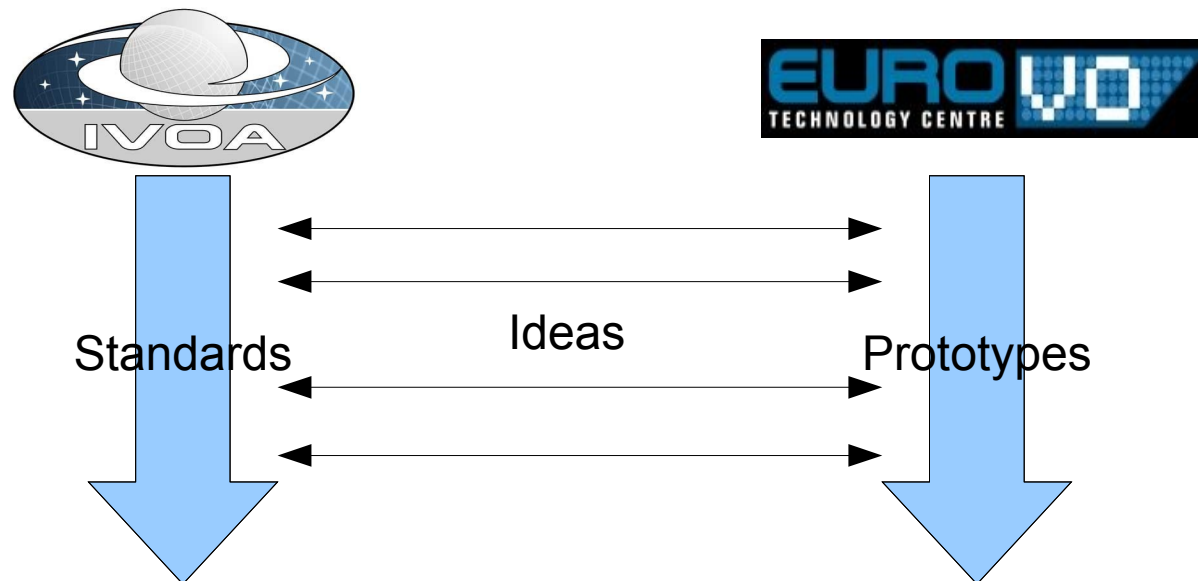
DS5: (Intelligent) ResourceDiscovery

DS6: DataExploration (Data Mining and Visualization)”

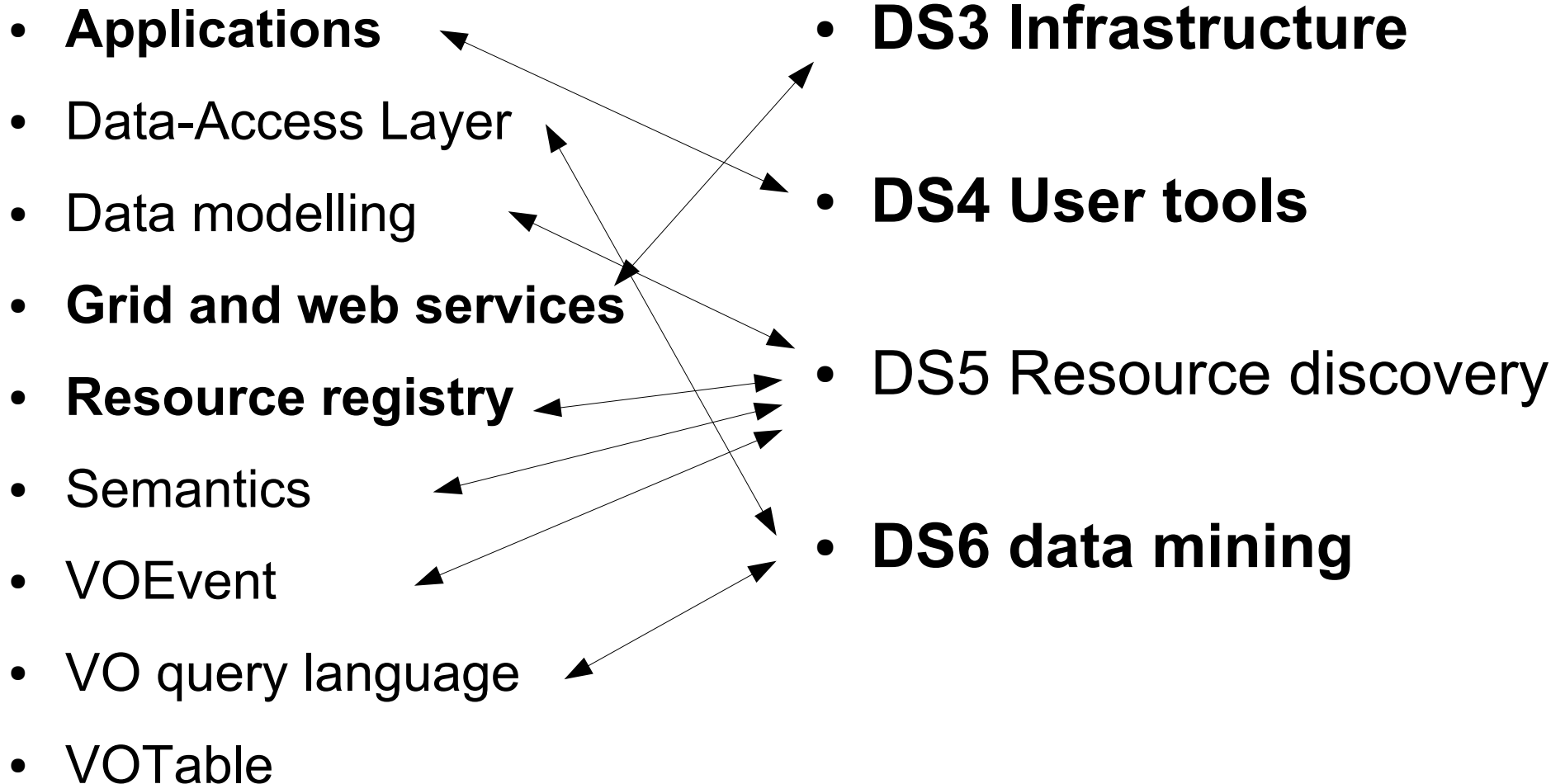
(from <http://wiki.eurovotech.org/bin/view/VOTech/>)

VOTech working with IVOA

- <http://www.ivoa.net/> (IVOA)
- VOTech **implements** IVOA standards
- VOTech **proposes** standards to IVOA
- VOTech **fills gaps** between IVOA standards



Mapping the working groups



How it really works



Works
like



Works
like



- Global standards
- Slow, stately
- Consensus process

- Union of national work
- Contributions
- This *and* that, not this *or that*
- “Harmonization” of software

Why the above matters

The collision of IVOA and VOTech structures and methods defines an “official” EuroVO approach to grids.

This seems to be a price for keeping EuroVO part of the global Virtual Observatory.

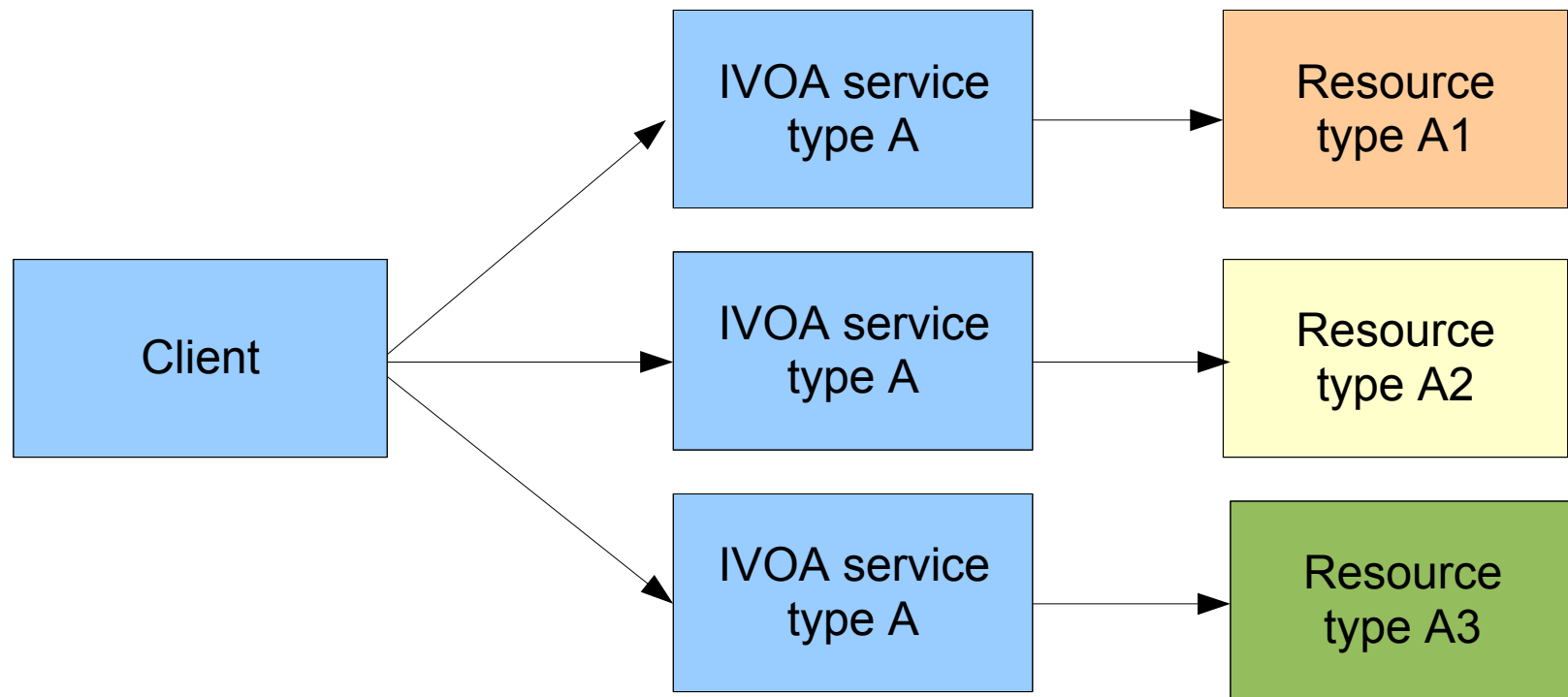
IVOA policy on compute grids

- GWS-WG standard for grid middleware:
 - There *is* no one, true standard
 - We're not going to pick one
 - We're not going to write one
 - Don't expect a standard interface for compute grid in IVO



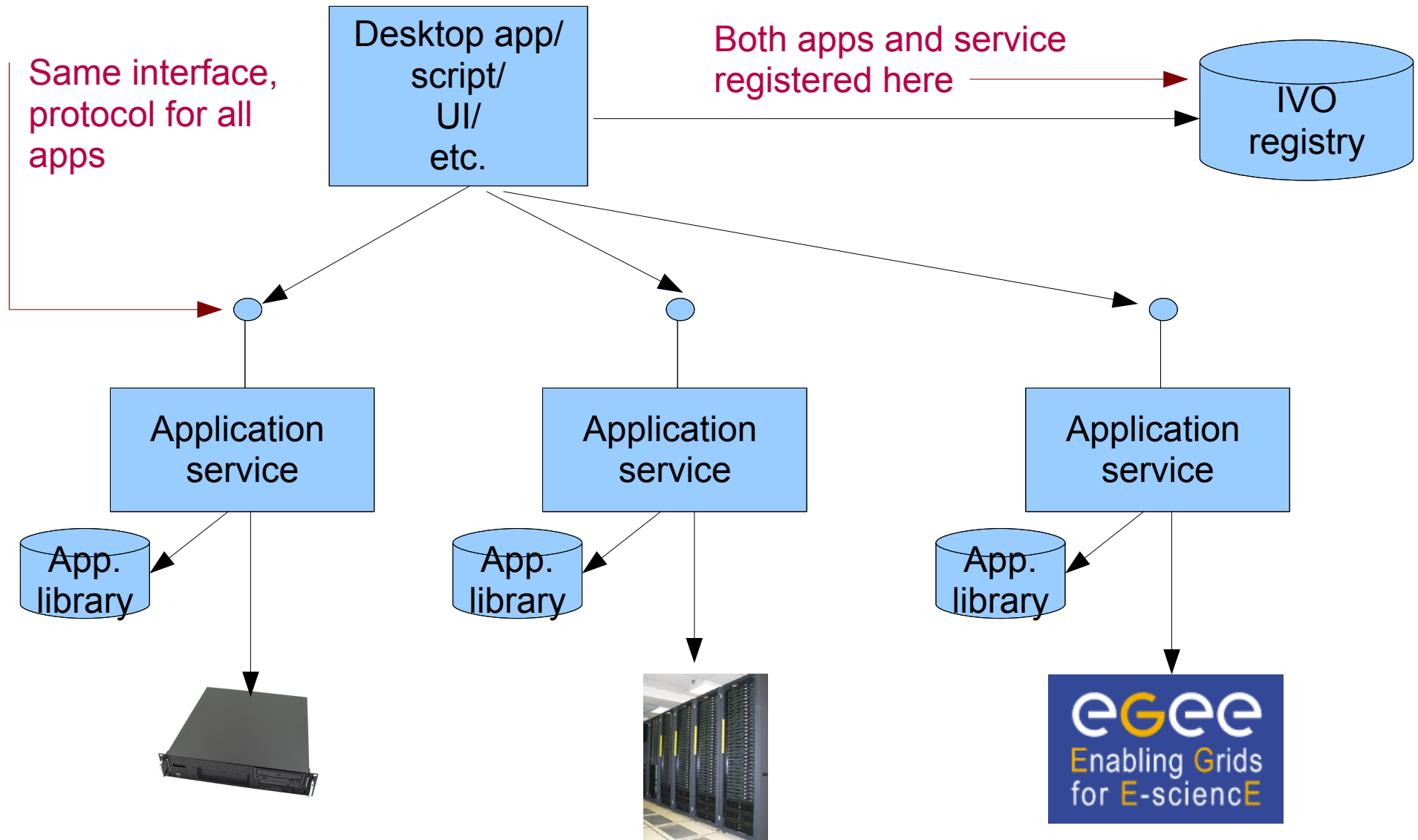
Unicore
GLite
Globus
Condor
Sun Grid Engine
PBS
UTC&A

IVOA standards describe facades



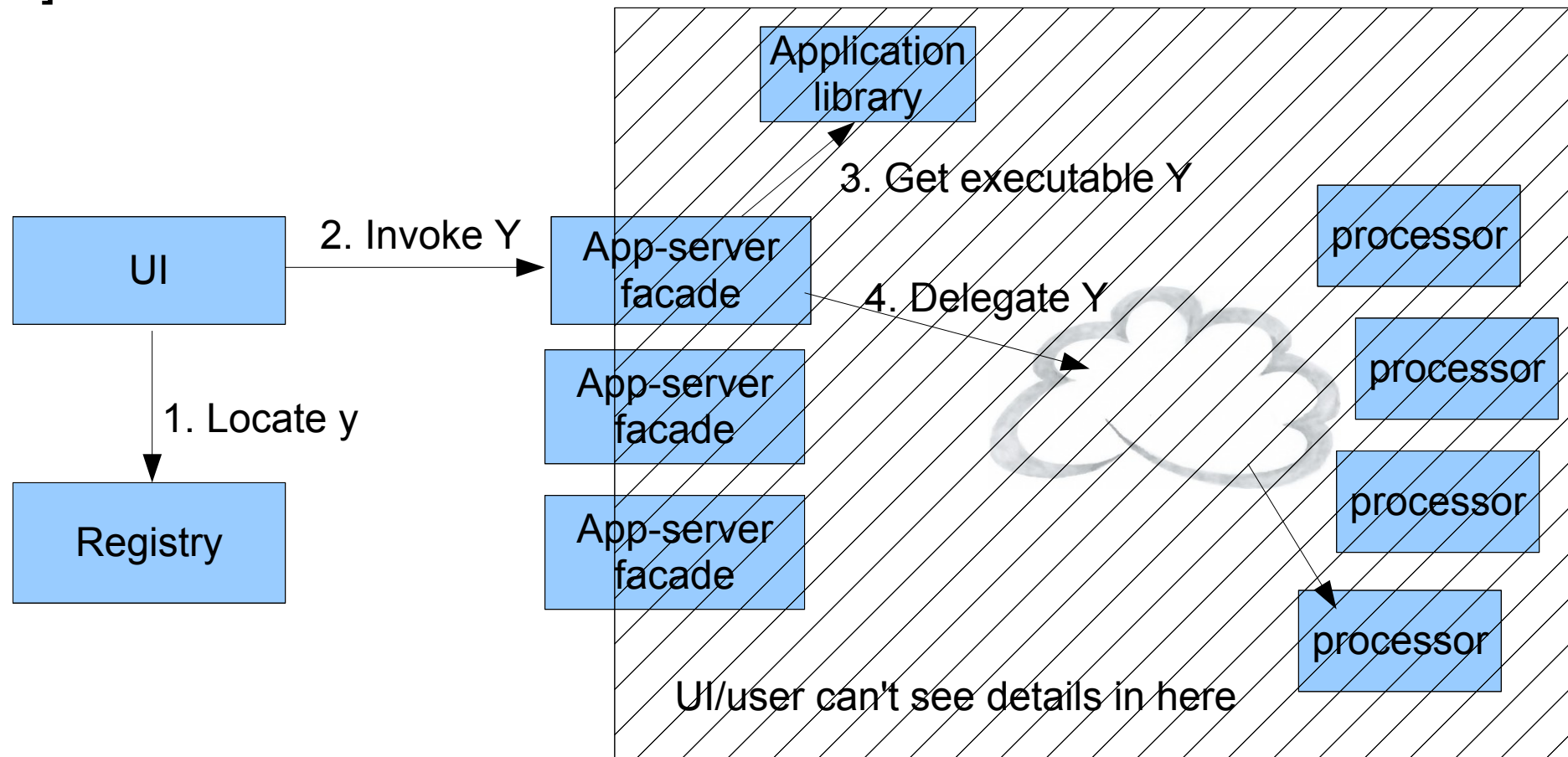
- “Any problem in computer science can be solved with another layer of indirection.” -- David Wheeler

A facade for compute grids



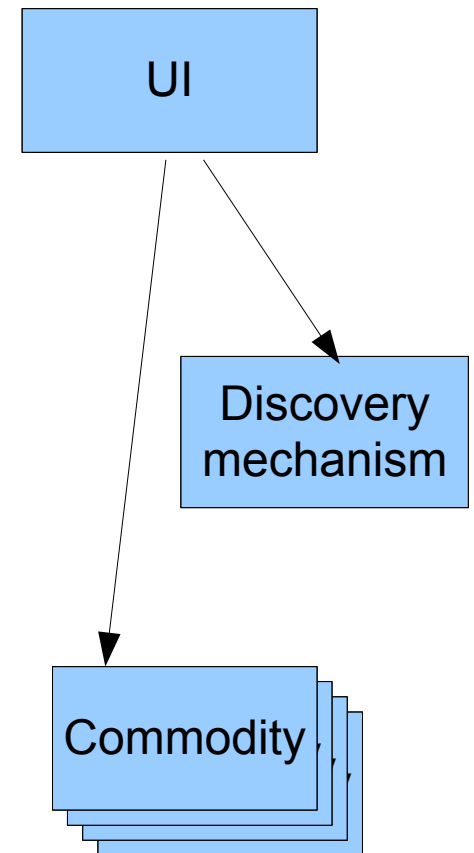
Encapsulation of data processing

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

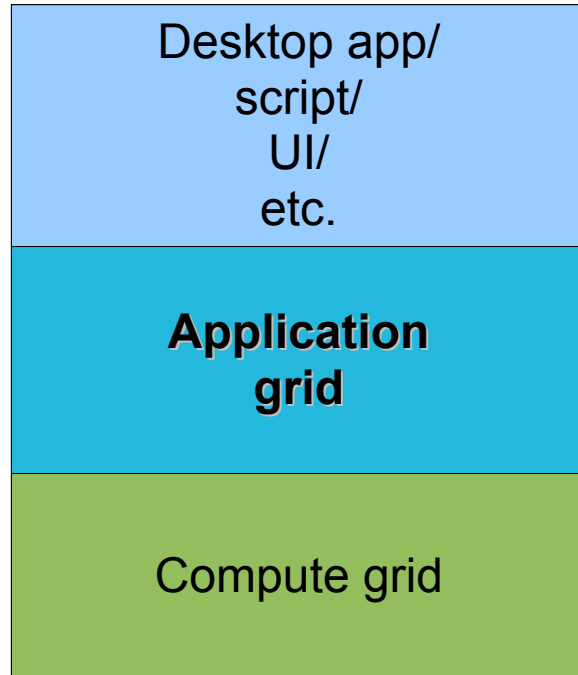


Grid essentials

- *“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.



EuroVO *is* a Grid?



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

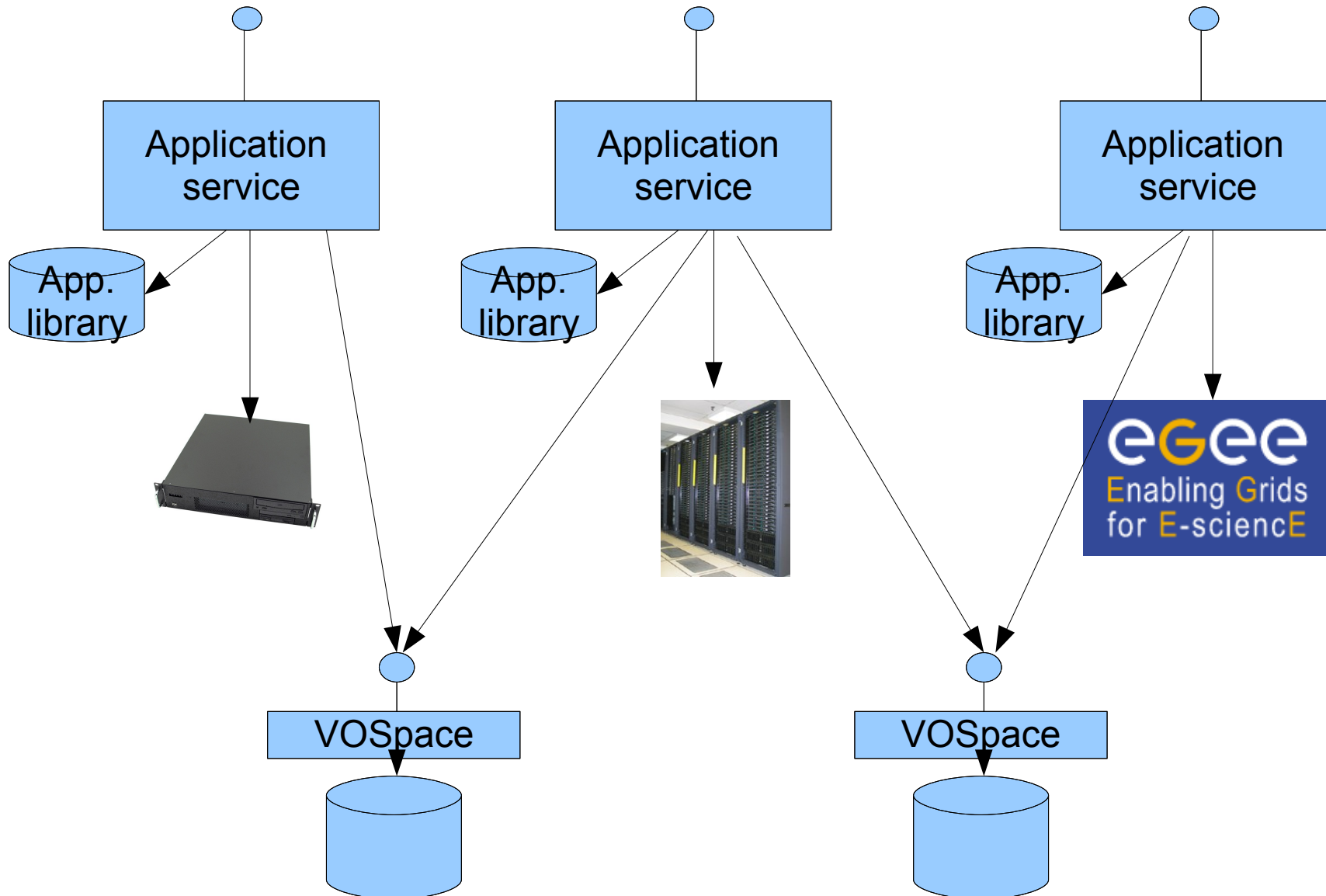
Naming the technology

- EuroVO's app grid uses EuroVO's own middleware
- **CEA** = “Common Execution Architecture”; the whole thing, including metadata standards
- **CEA v1**: what AstroGrid (UK) donated
- **CEA v2**: revised by VOTech and IVOA; emergent
- **CEC** = “Common Execution Connector”; standard web-service interface
- **UWS** = “Universal Worker Service”; IVOA replacement for CEC

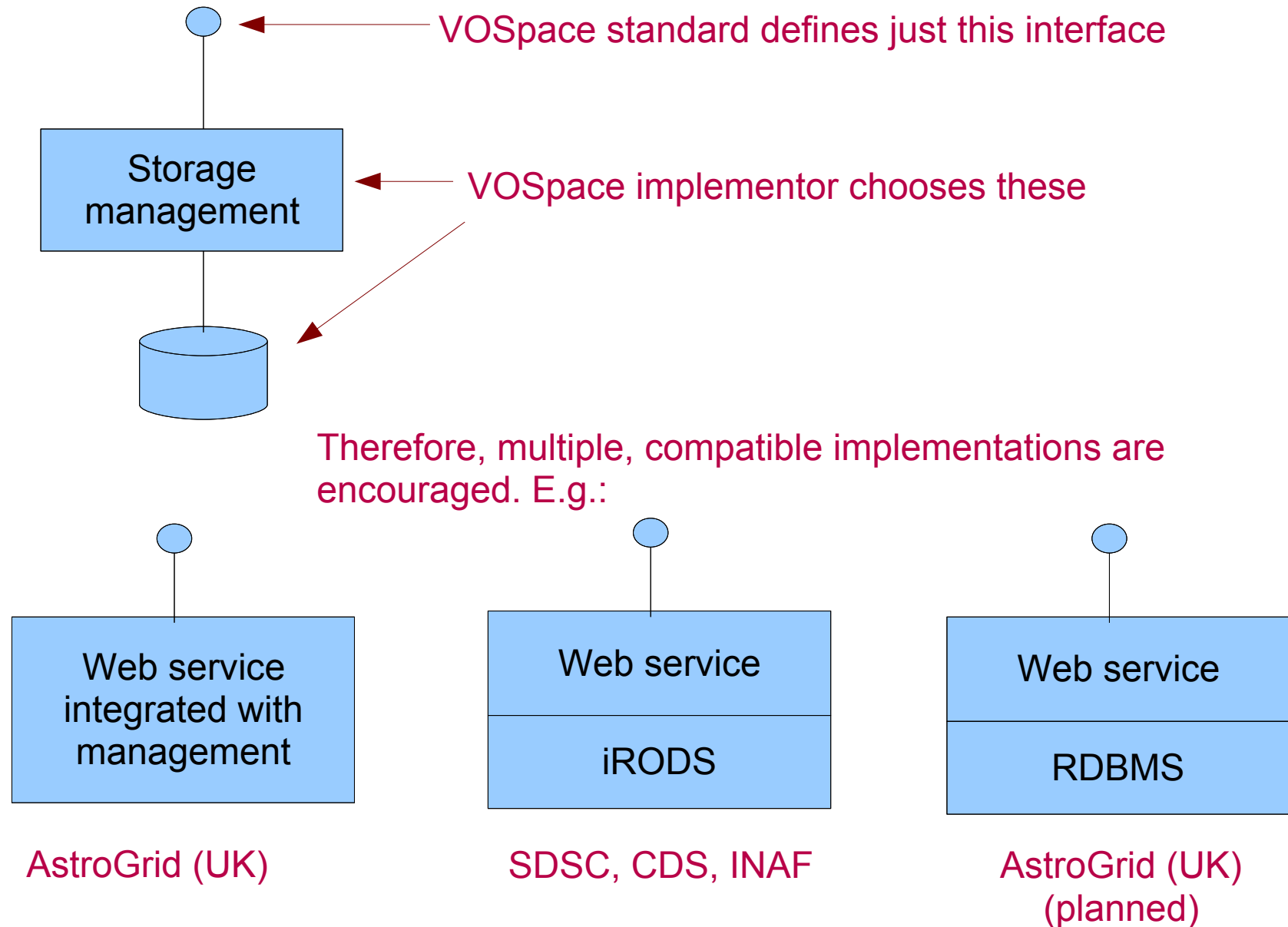
Large vs. small jobs

- Few, large jobs
- One job in app grid → many CE
- Distribution handled in app.
- “Distributed computing”
- Helps power users
- Many small jobs
- One job in app. grid → one CE
- Distribution handled in middleware
- “Load balancing”
- Helps service providers

App grid backed by data grid



VOSpace



Therefore, multiple, compatible implementations are encouraged. E.g.:

Opting out

Feedback

Do you think the EuroVO app-grid is:

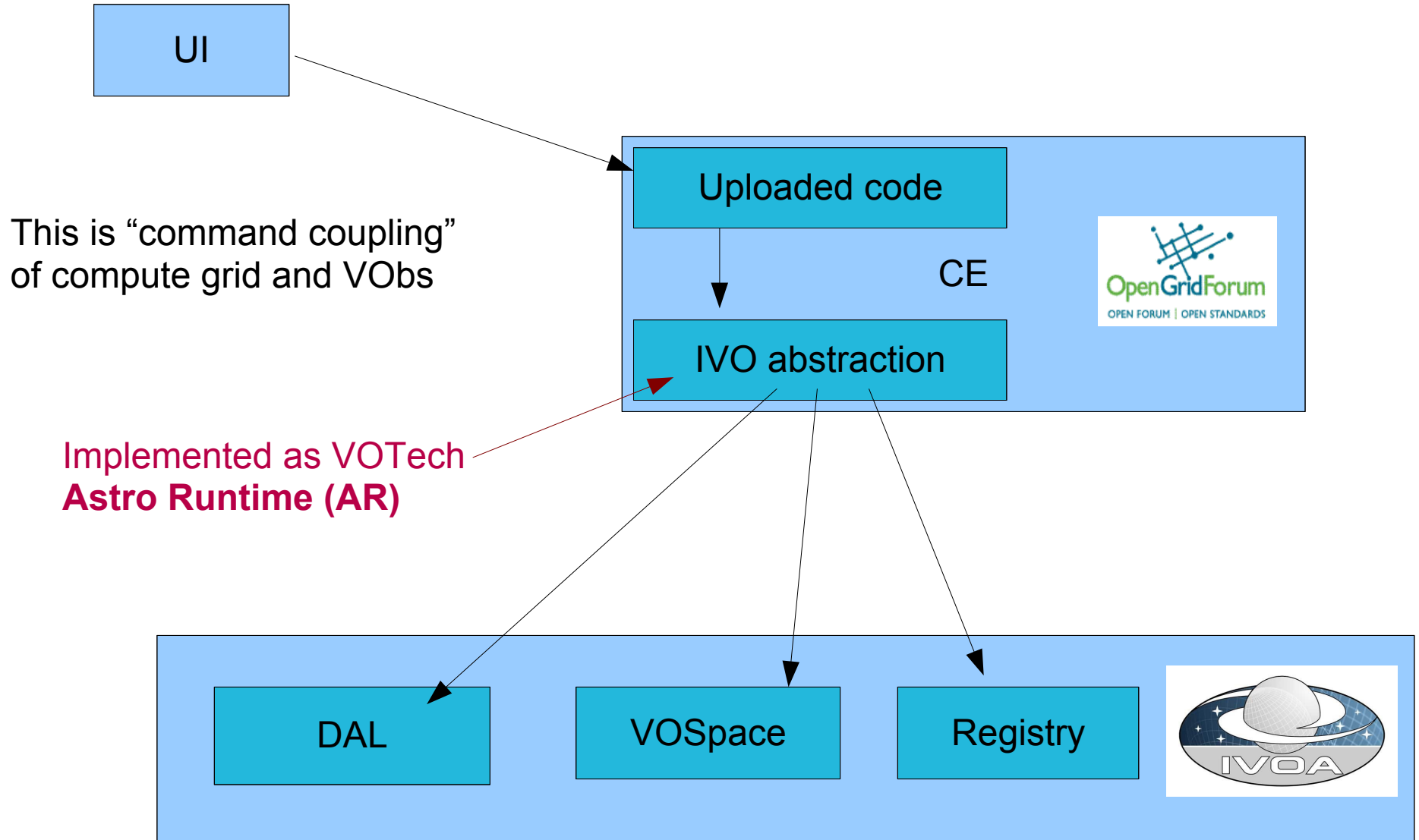
- Useful
- Pointless
- Confusing
- Threatening to your pet project
- Other (please explain)

Interesting, but I already run on the Grid (EGEE). Do I have to change to app grid? If not, can I still use EuroVO?

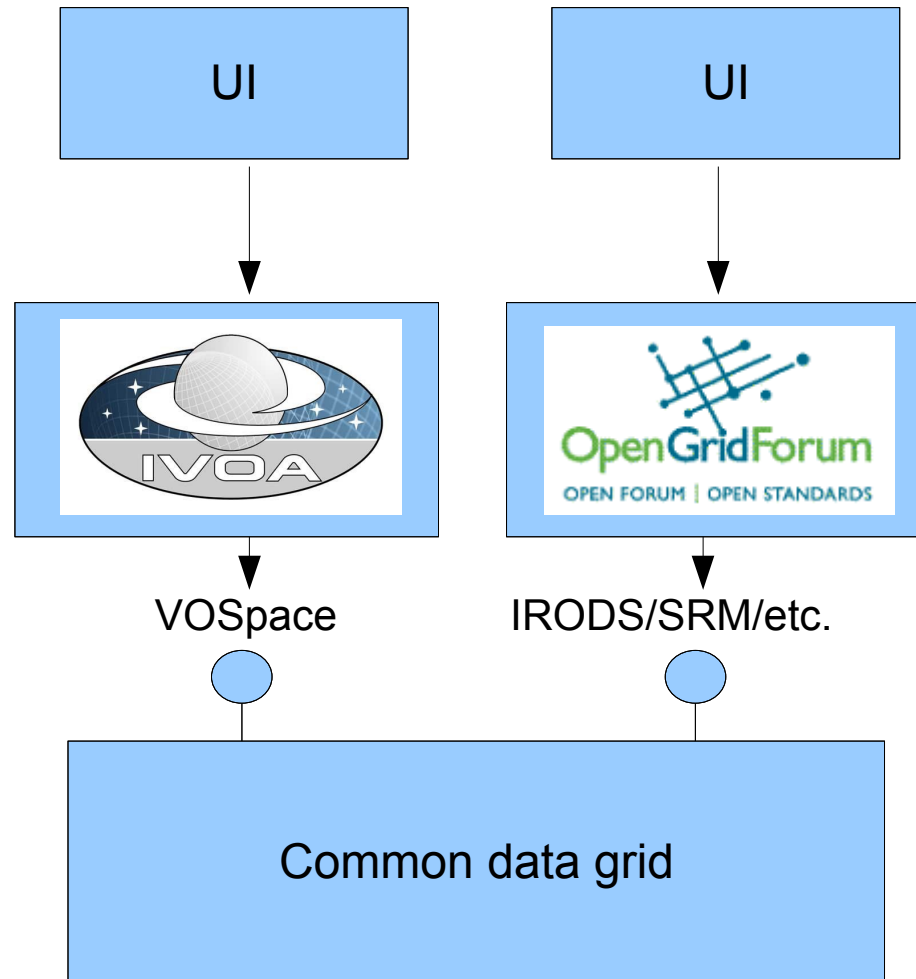
Answers to above questions:

1. No need to switch to the app grid unless you want to. Enjoy!
2. Yes you can “use” (= get data from) EuroVO from the compute grid

Grid job as EuroVO client



Data-grid coupling



An alternative to command coupling between comp. grid and IVO.
Think “mailbox”.

Votech broker

- Places jobs on compute grids
- Speaks many protocols
- Used in Edinburgh, for DS6 work
- Not “released” yet (could be)

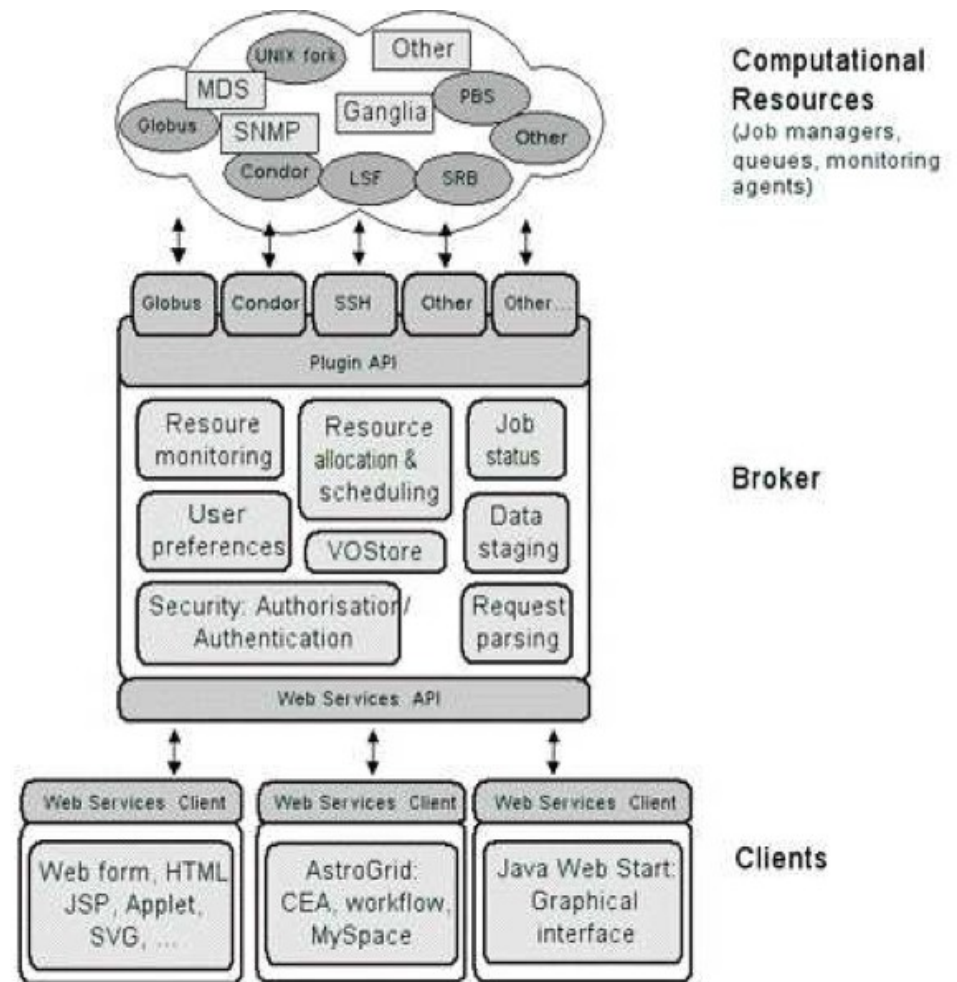
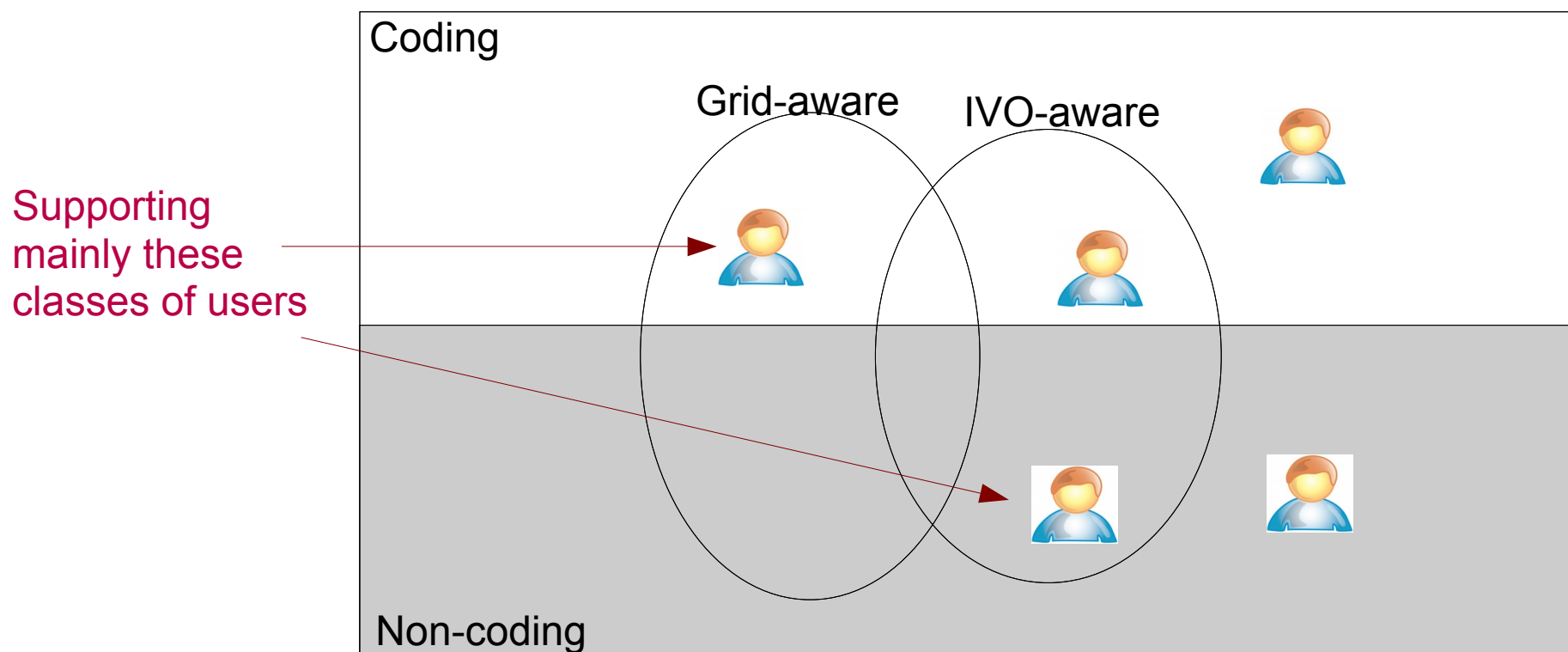


Figure 1. The architecture of the VOTechBroker

Graphic from Nichol et al. 2005, *Massive Science with VO and Grids in proc. ADASS XV*

Available now

- App-grid: yes (CEA 1)
- Comp grid command coupled to VObs: yes (AR)
- Comp grid data coupled to Vobs: soon (VOSpace)



Showcase: app-grid providers

- **Meudon PDR code** by OPM
 - Modelling code established in the app grid
 - Exploits local grid inside OPM
 - Has custom UI for CEA app
- **VONeural** by INAF
 - Neural-network tools for data mining
 - Delegates to external compute-grid
- **MERLIN imager** by JBO
 - Generates radio maps from MERLIN (u, v) archive
- **Catalogue cross-matchers** by AstroGrid (UK)
 - Mirrored app, multiple services in app grid

Come on in!

- You can use this too!
 - Be an end-user of the emerging app-grid
 - Provide new apps to the app-grid
 - Call the VObs from your compute-grid application
- See the AstroGrid-tools talk for some examples



App-grid futures (1)

- CEA v2 is being standardized in IVOA
 - Hope to spread it outside EuroVO
- CEC interface (SOAPy) to be replaced by UWS (RESTful)
 - UWS may have applications other than in CEA
- CDS/AstroGrid collaboration is adding UWS to Euro-VO app-grid service

App-grid futures (2)

- Possibility of reusable s/w for connecting app grid to EGEE etc.
 - See INAF report in this meeting
 - AstroGrid might be able to contribute
 - If not by VOTech, then should be done by AIDA

Data-grid futures (1)

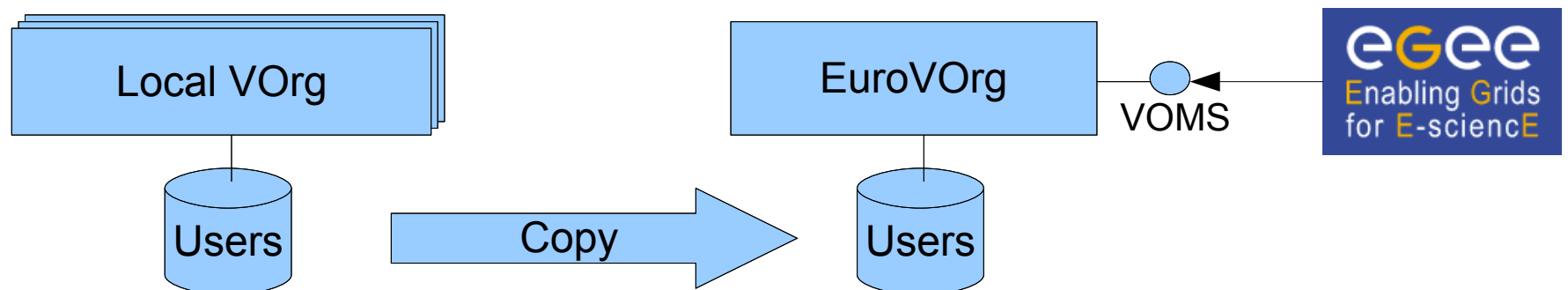
- VOSpace 1.0 is IVOA standard; but incomplete
- VOSpace 1.1 should be IVOA W/D in May
 - Adds directory structure, links
 - Necessary minimum for EuroVO
- VOSpace 2 is intended to be a RESTful version
 - No real idea when this will appear
- Three projects to put VOSpace 1.x on IRODS.

Data-grid futures (2)

- VOSpace concept allows “magic” nodes
 - E.g. put images and they turn into a SIAP service
 - E.g. Put a VOTable and it turns into a DB in a RDBMS, accessible via TAP
- Allows casual data publishing
- Anybody want to exploit this?

Concerning EGEE

- Biggest hurdle for end users is VOrg membership
- Proposed that all EuroVO members get EGEE access automatically
 - Form an umbrella VOrg within EGEE for all astronomers
 - EuroVO users need accounts for app-grid & VOSpace
 - All EuroVO accounts get added to the VOrg



Summary

- VOTech has a grid mandate
- Works with IVOA for global compatibility
- Allows local alternatives
- Supports two approaches:
 - App-grid
 - Compute/data grid calling Vobs
- You can use this tech now
- It will be bigger and better soon