

Are Clouds a Subset of Grid Computing?

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ETSI Workshop Grids, Clouds & Service Infrastructures

... coordinated resource sharing and problem solving in dynamic, multi-institutional virtual organizations.

I.Foster, C.Kesselman, S.Tuecke. The Anatomy of the Grid, 2001

*... coordinates resources that are not subject to centralized control
... using standard, open, general-purpose protocols and interfaces
... to deliver nontrivial qualities of service.*

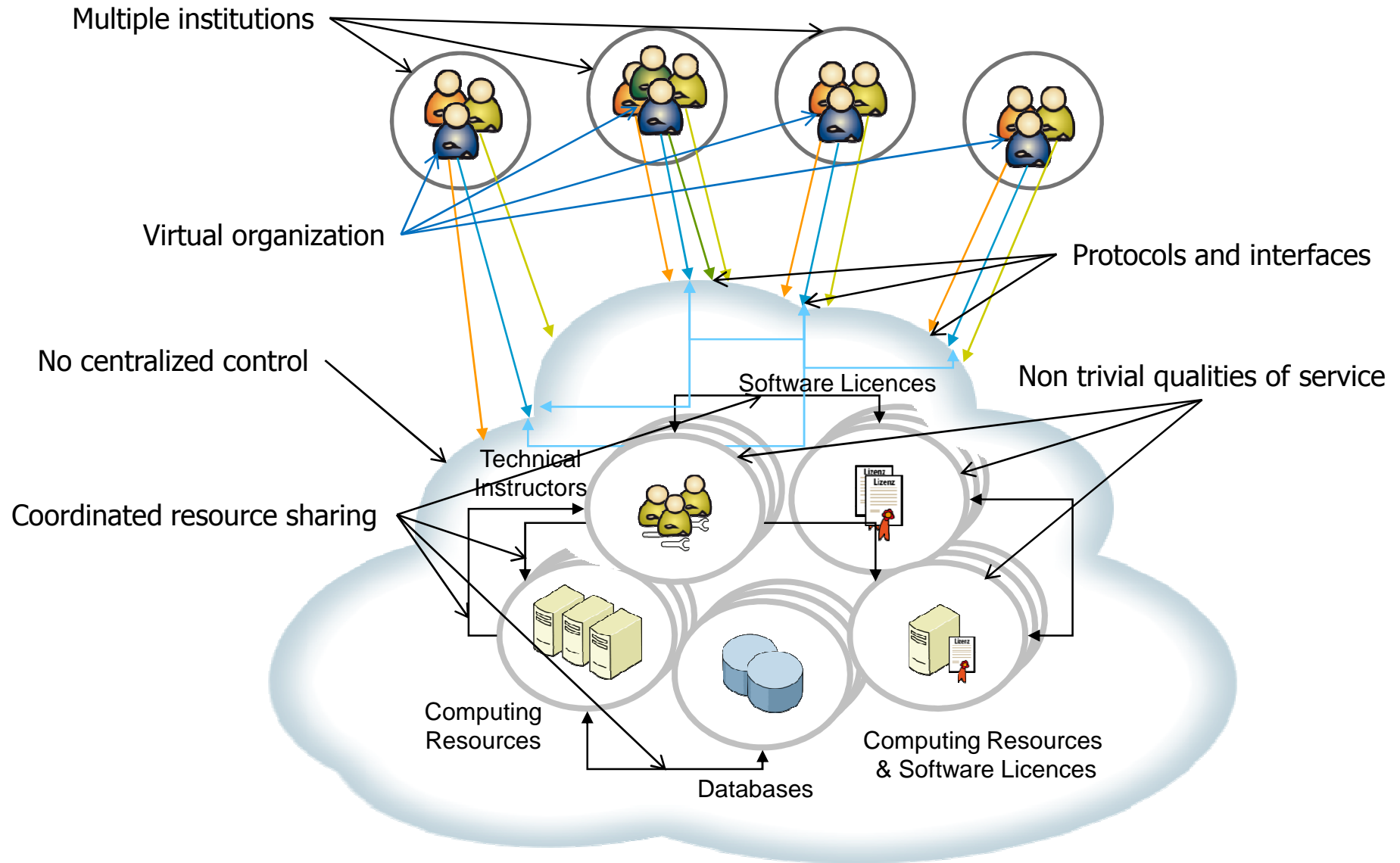
I.Foster. What is the Grid? A Three Point Checklist, 2002

... enables resource virtualization, on-demand provisioning, and service (resource) sharing between organizations.

P.Plaszczak, R.Wellner, Grid computing, 2005

... a service for sharing computer power and data storage capacity over the Internet.

CERN, The Grid Café - The place for everybody to learn about grid computing, 2008



Is the Foster Model Economically Viable?

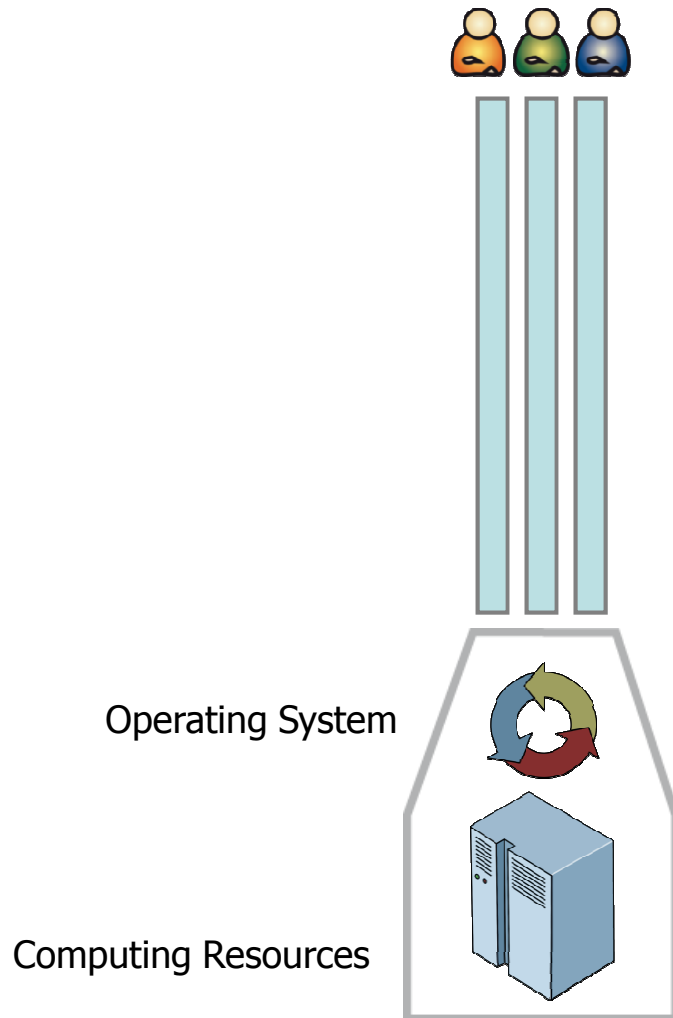
- Can we implement the model with our technology?
 - ◆ It seems so, but the implementation is involved.

- Is there a market for this Grid model?
 - ◆ Claims are largely based on assumptions.
 - ◆ No proof has been provided yet.

- Are there legal and organizational obstacles?
 - ◆ Several obstacles have been discovered.
 - ◆ Few have been resolved so far.

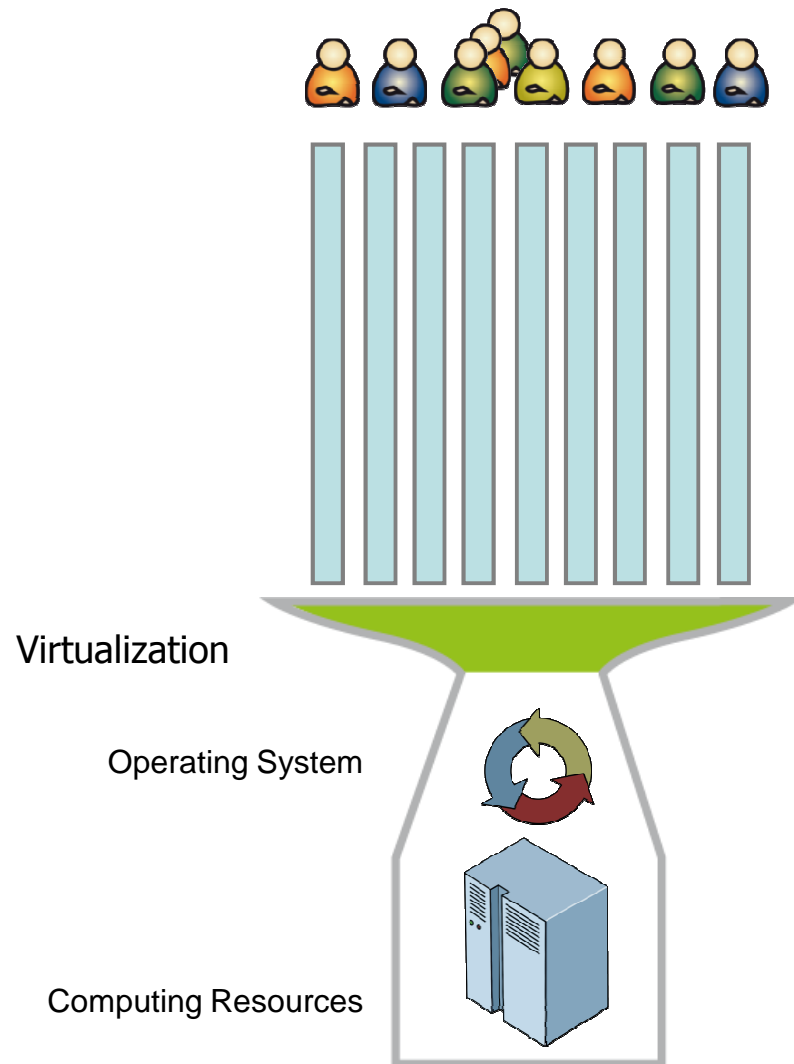
- Are there suitable financing models?
 - ◆ Very few models have been discussed so far.

The Electrical Power Grid Model

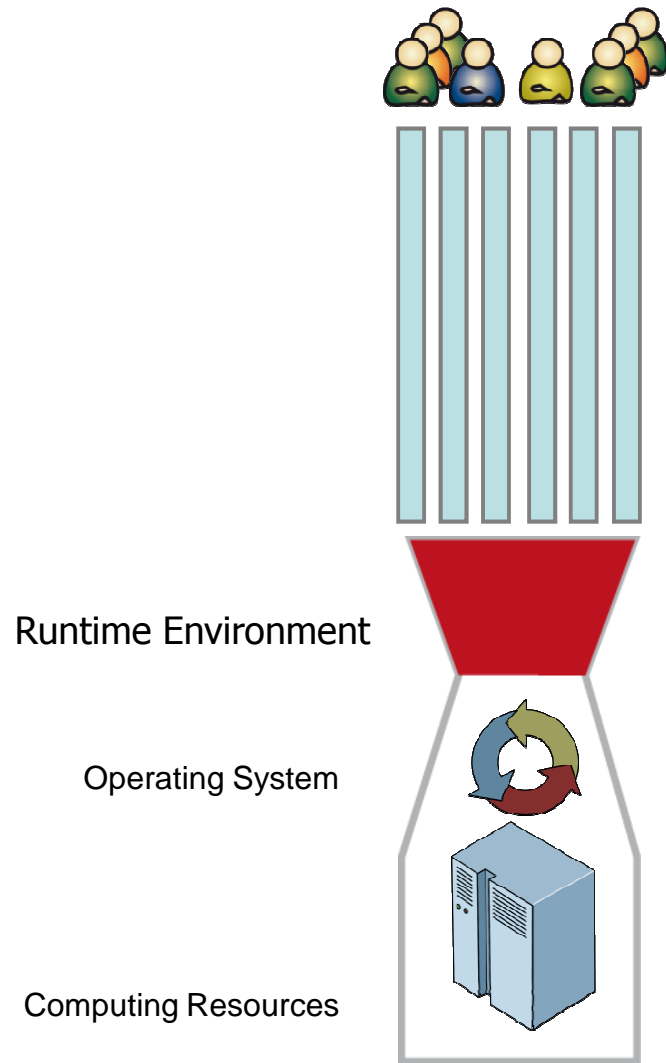


- Independent users
 - ◆ No virtual organizations
- Trivial services and resources
 - ◆ Computing and storage
- Internet connectivity
 - ◆ Existing organizational and legal structure
- On demand computing
 - ◆ Pay for your consumption

Infrastructure as a Service



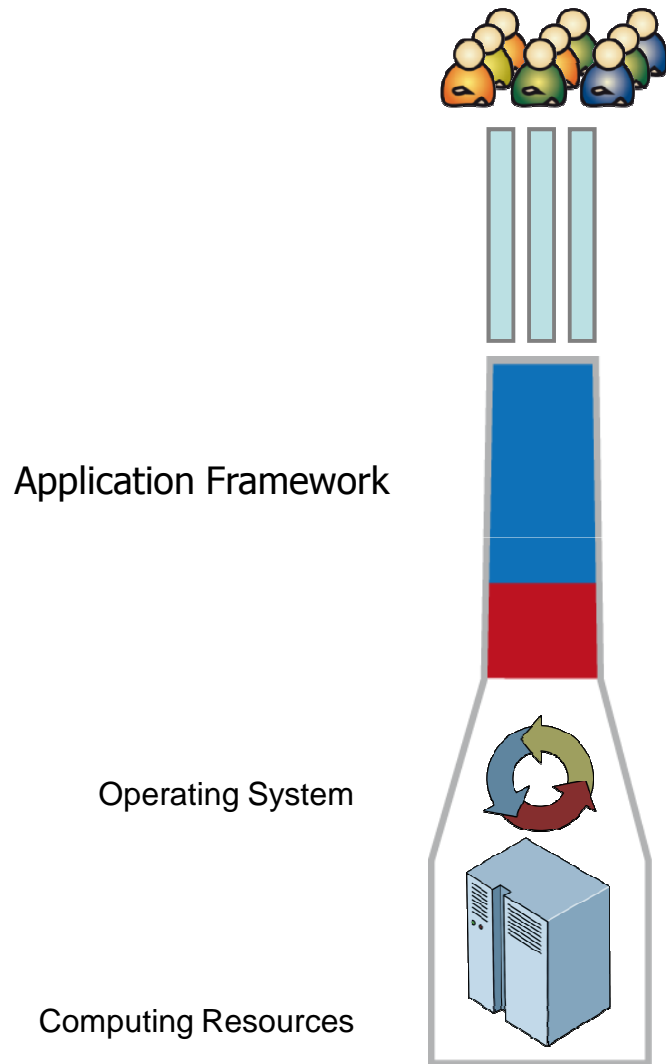
- The technology problem
 - ◆ Hardware and OS dependence
 - ◆ The market may be too small!
- The solution
 - ◆ Virtualization hides system properties and improves system utilization.
 - ◆ VM dependence
- Users are responsible for the application development.
 - ◆ Experience is required.



- More user support
 - ◆ Platform provisioning

- More services
 - ◆ Less development effort
 - ◆ Potentially larger market

- Platform dependence
 - ◆ Potentially smaller market



- A further step in the same direction
 - ◆ Application framework
- Framework dependence
 - ◆ Potentially smaller market
 - ◆ Careful selection of the application areas

- Resource and service sharing
 - ◆ Compute (and storage) resources
 - ◆ Platform (PaaS) and framework (SaaS) services

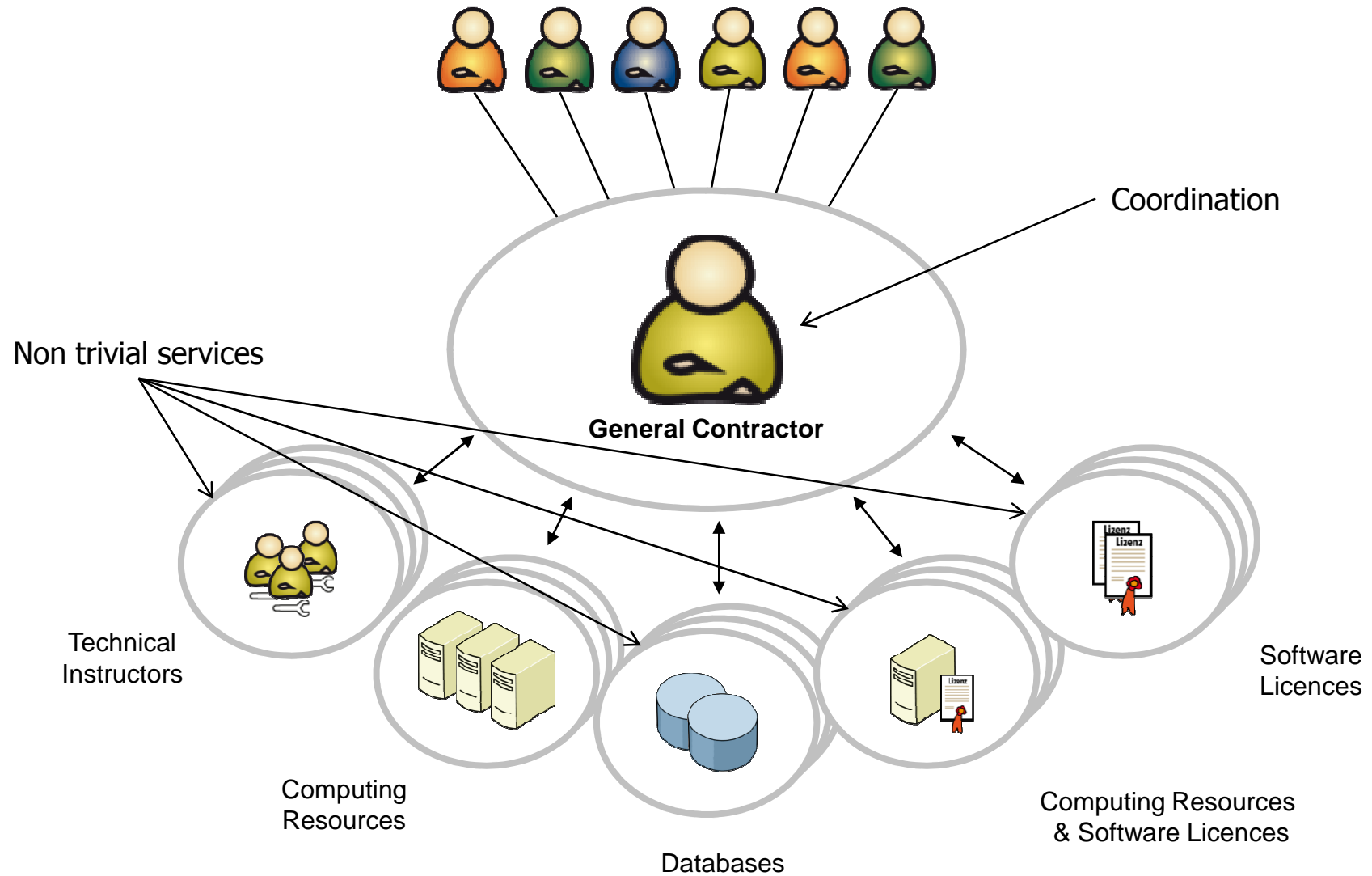
- Resource virtualization
 - ◆ Open, general purpose protocols and interfaces

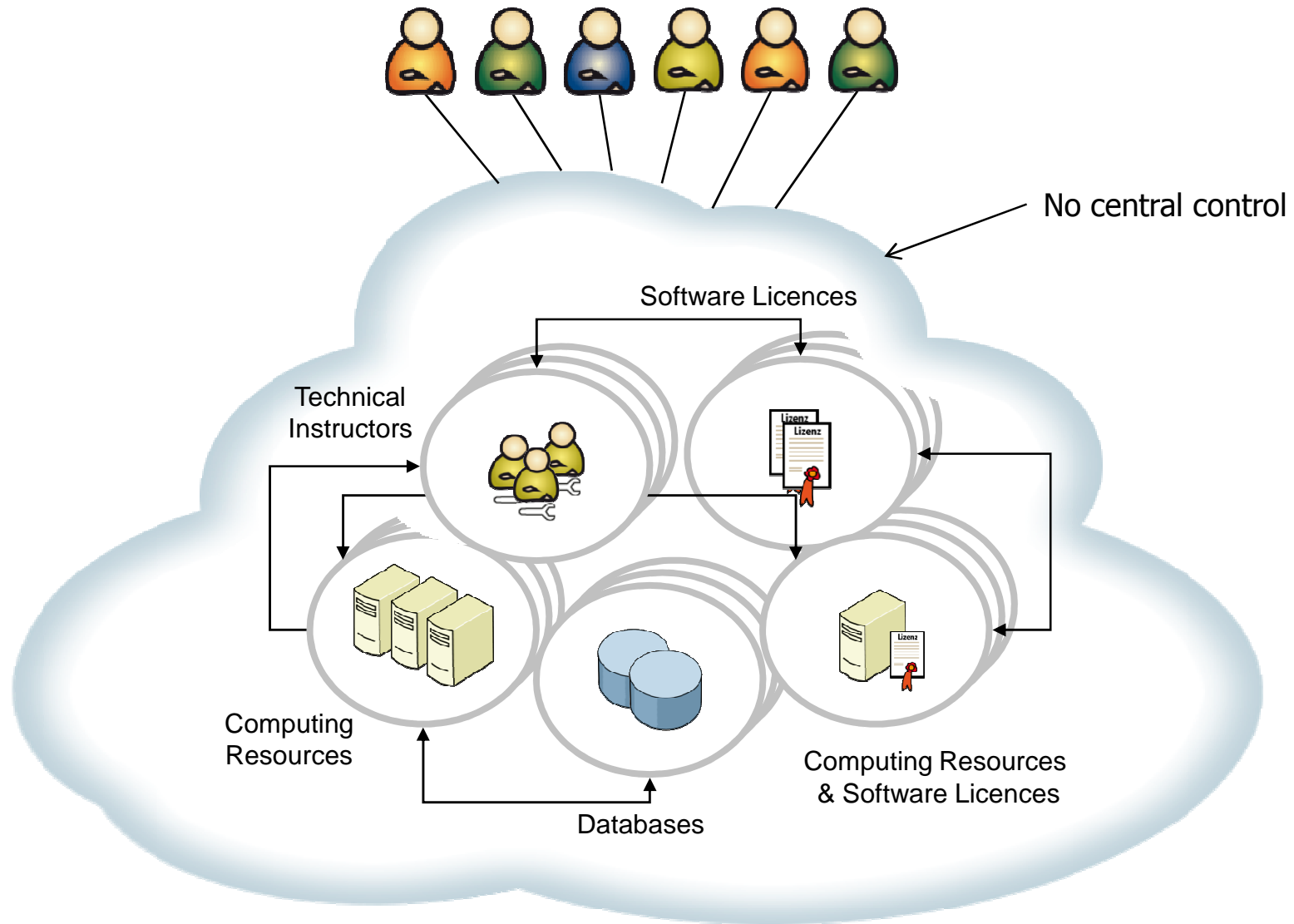
- On demand provisioning

- Provisioning over the Internet

- Are there any non trivial services?

Coordination and the Cloud Concept



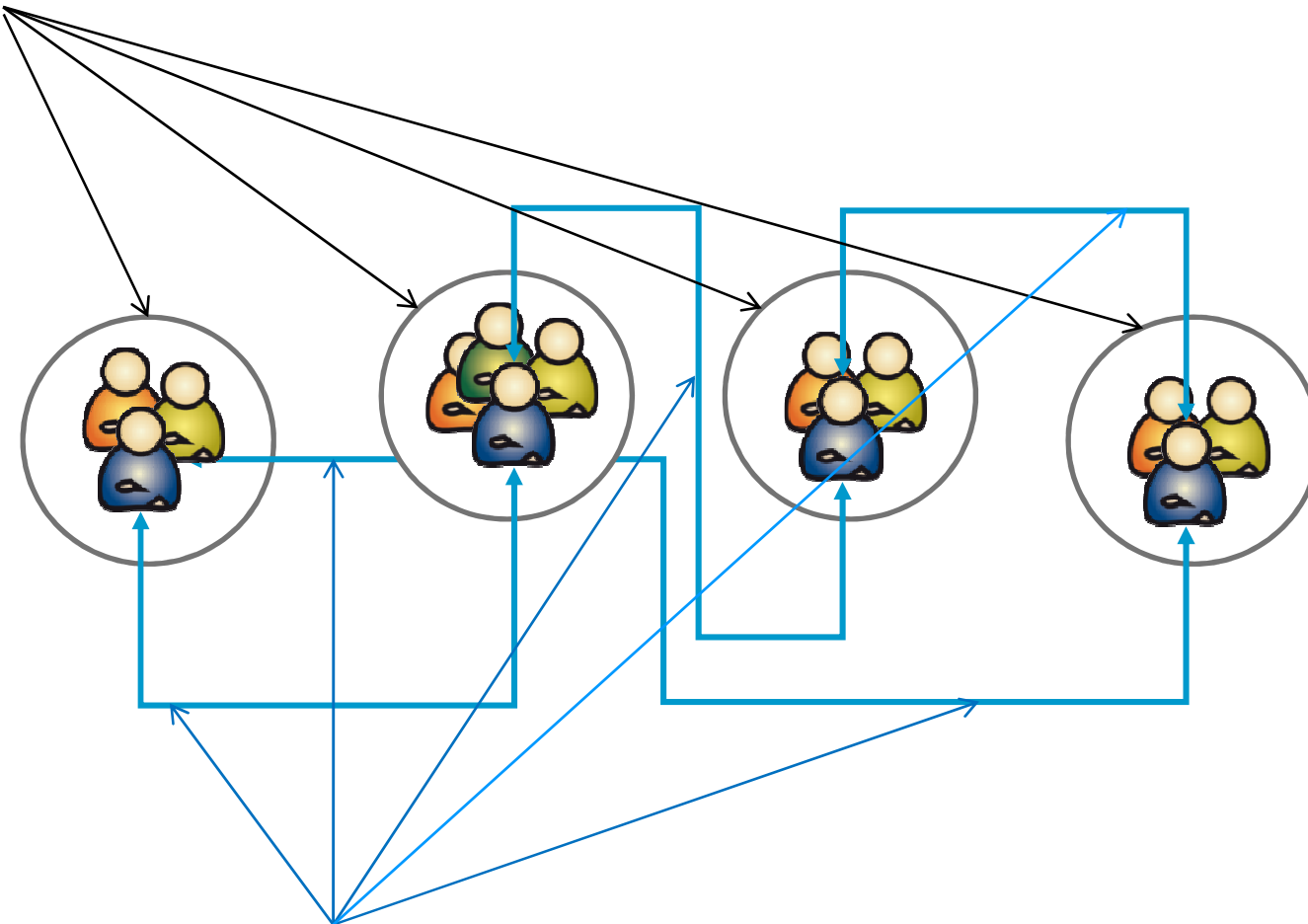


- Who is willing to provide non trivial services for a cloud?
 - ◆ Business model for the provider of these services

- General contractor
 - ◆ Business model and market for such a contractor
 - ◆ Effort to orchestrate the services

- Coordination without central control
 - ◆ Are the main cloud providers willing to provide the required interfaces?
 - ◆ Who will implement the coordination engine?

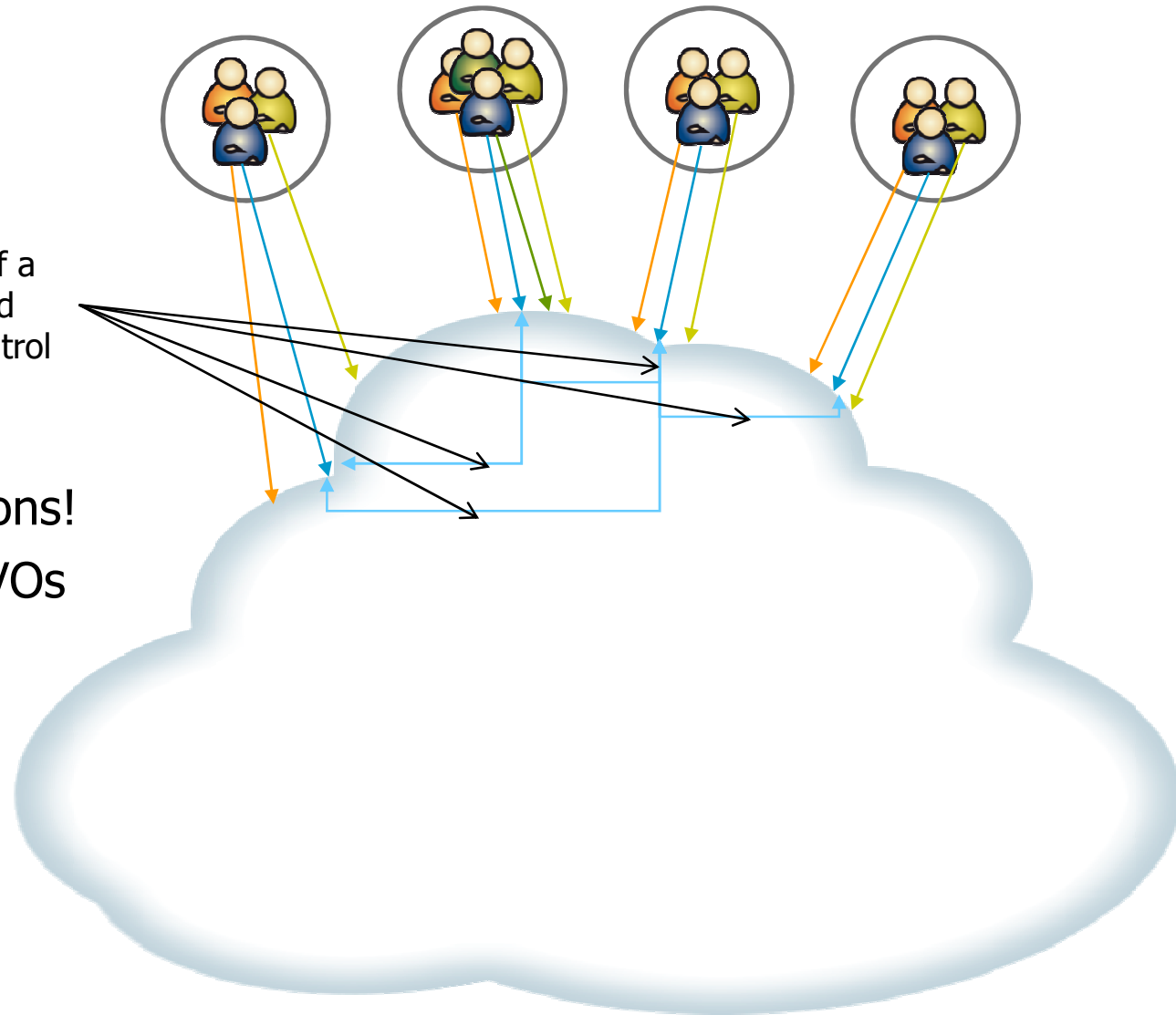
Multiple institutions

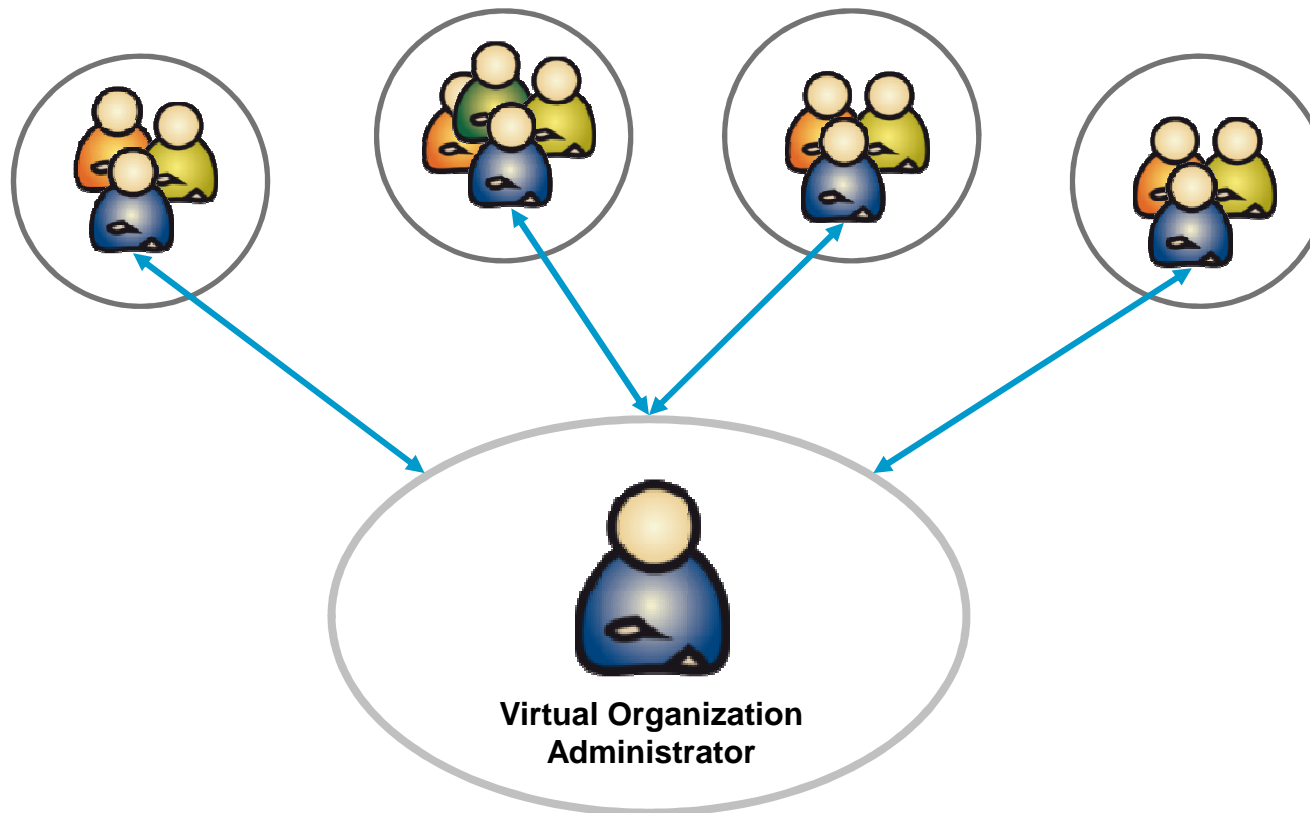


Virtual organization with communication paths

Implementation of a
VO within a cloud
without central control

- Open legal questions!
 - ◆ International VOs
 - ◆ Liability



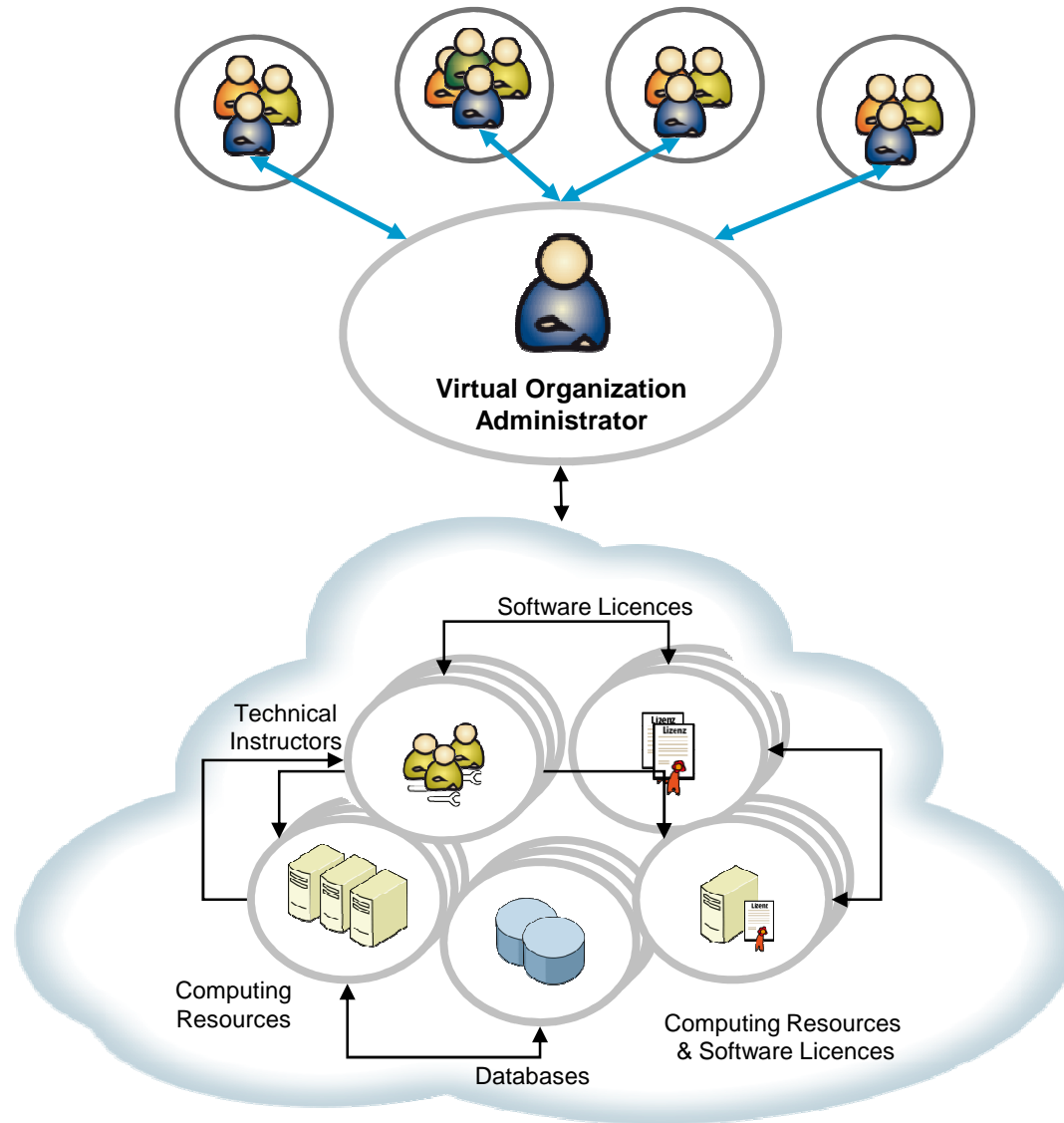


- Management of the VO
 - ◆ Policy and membership

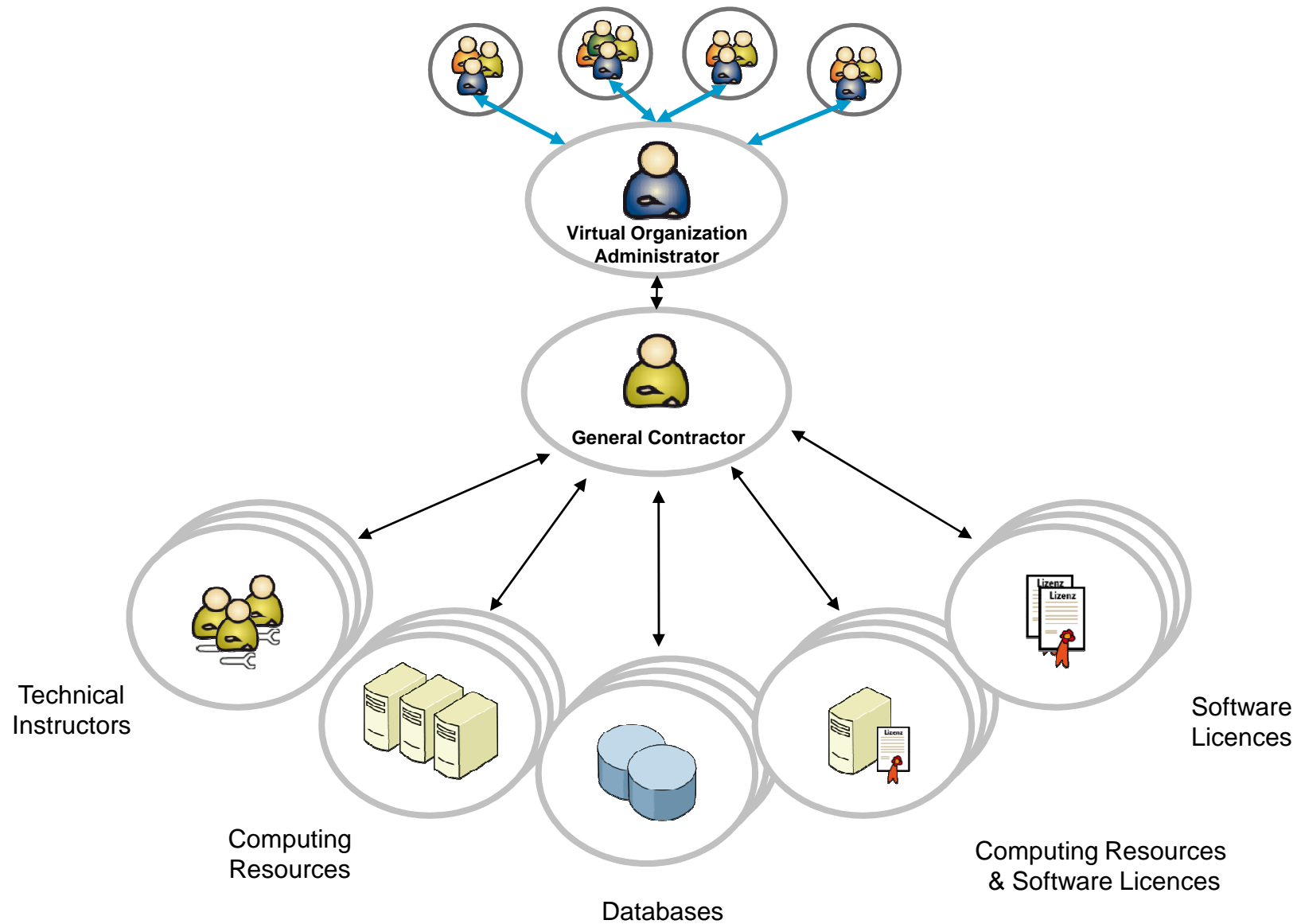
- Negotiation with providers
 - ◆ Contract frameworks

- Legal framework

Legal Structure of the Foster Model



Is the Lack of Central Control Necessary?



- Cloud computing satisfies a subset of Grid computing properties based on common Grid definitions.
- The simplicity of Cloud computing leads to convincing business models.
- Central control supports the administration of virtual organizations.
- Is there a sufficiently large market for the Foster model?
- Is the lack of central control beneficial?