StratusLab Cloud Distribution

ACGRID-III (Hanoi)

1 November 2011

StratusLab Project

Goal

- Create comprehensive, open-source, IaaS cloud distribution
- Focus on supporting grid services

Information

- 1 June 2010—31 May 2012 (2 years)
- 6 partners from 5 countries
- Budget : 3.3 M€ (2.3 M€ EC)

Contacts

- Site web: http://stratuslab.eu/
- Twitter: @StratusLab
- Support: support@stratuslab.eu

CNRS (FR)

UCM (ES)

GRNET (GR)

SIXSQ (CH)

TID (ES)

TCD (IE)

Project Principles

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Grid and cloud technologies are complementary

- Uniform security model (grid)
- Sharing of resources, algorithms, and expertise (grid)
- Dynamic allocation of resources (cloud)
- Customized environments (cloud)

Only develop new software when necessary

- Integrate existing solutions if possible
- Practical development → real needs of users

Maintain production quality with rapid evolution

- Use agile and scrum methodologies
- Iterative integration: always maintain working distribution
- Public releases approximately every 6 weeks

Infrastructure as a Service (IaaS)

Goal

- Offer remote access to computing resources

Advantages

- Customized environments
- Rapid access via simple API
- Complete control (root access) with "pay as you go" model

Disadvantages

- Non-standard interfaces (vendor lock-in)
- Creating new virtual machines is difficult
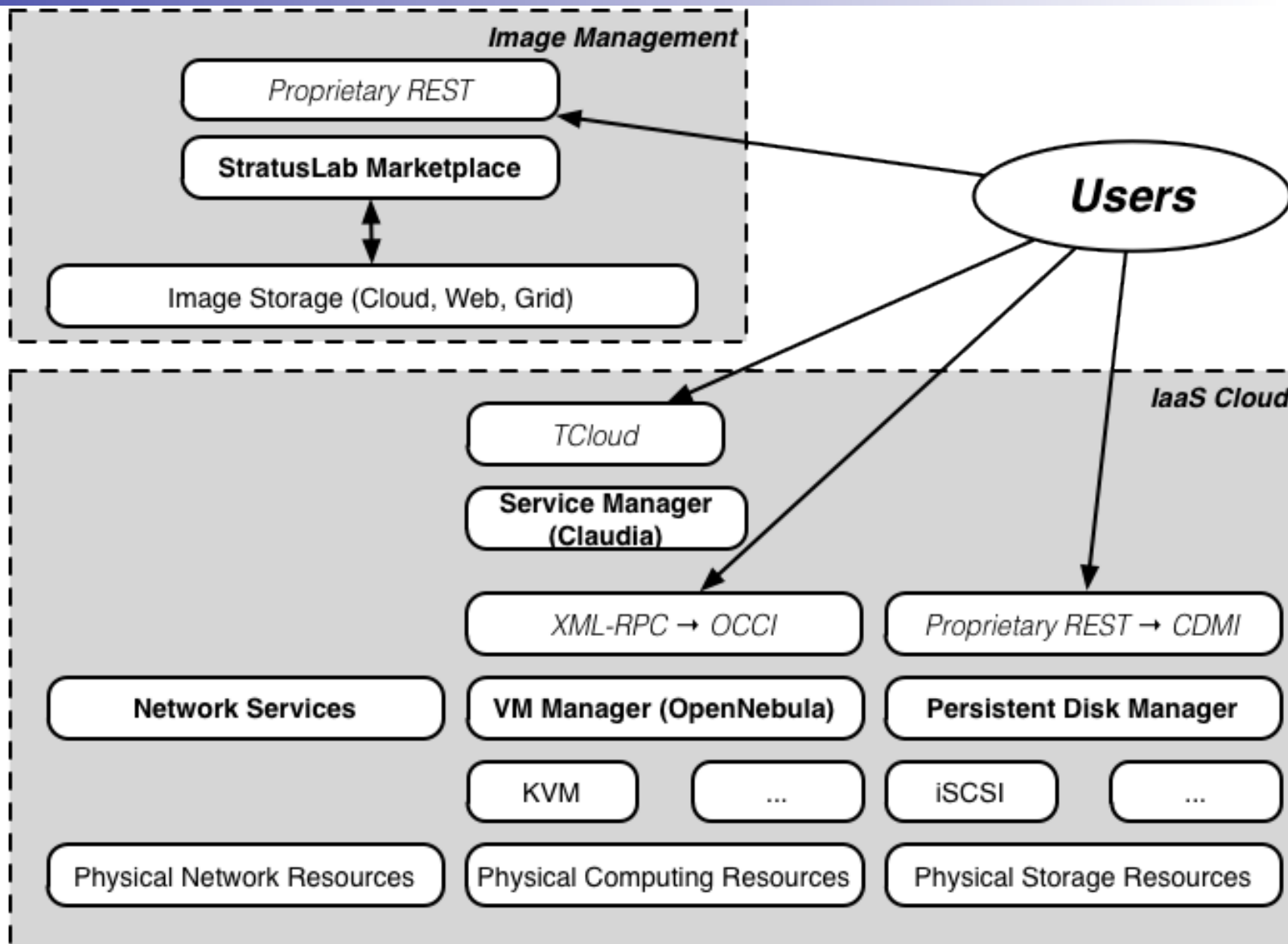
Software as a Service (SaaS)

Platform as a Service (PaaS)

Infrastructure as a Service (IaaS)

StratusLab Architecture (v1.0)

Compute Services

OpenNebula (opennebula.org)

- Provides core of virtual machine management (start, stop, kill)
- Plug-in architecture allows use of multiple hypervisors (kvm, …)

Enhancements

- Quarantine of stopped images for forensic analysis
- Improved logging of user and resource information
- Ability to pass error messages from plug-ins to user
- Improved fault tolerance
- Improved management of network addresses
- Support for users, groups, and roles (post-1.0)

Storage Services

Persistent (Read-Write) Disks

- Allows the storage of service state or user data
- Mounted as a disk on VMs
- Disks are persistent and have a lifecycle independent of a single VM
- Can be mounted by single VM at any time
- Only available within a single cloud instance

Static (Read-Only) Disks

- Useful for distribution of quasi-static databases
- Handled and shared like VM images via Marketplace

Volatile (Read-Write) Disks

- Useful for temporary (!) data storage
- Data will disappear when VM instance is destroyed

Other Storage Types

File-based Storage

- Normal client tools can be installed in VMs

- Access services normally from VM (e.g. tools for SRM)

- Unlikely to be implemented by StratusLab, although will provide CDMI interface to persistent storage service

Object Storage

- Simple object storage, usually minimal hierarchy and chunked data

- Won't implement this in StratusLab, could take implementations from elsewhere, e.g. OpenStack

Key-value Pair Database

- Exposes simple API for "database" of key-value pairs (e.g. Cassandra)

- Can deploy VM with persistent disk to provide this service

Networking Services

IP Address Classes & Selection

- Public: Internet-accessible services

- Local: Batch systems or parallel calculations

- Private: Slaves in pilot job systems

Future Services

- IP address reservation

- User specified firewalls

- Dynamic VLANs

- IPv6 use/validation

Marketplace

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Machine image creation is a barrier to cloud adoption

- Creating virtual machine images is time-consuming
- Ensuring that machines are secure and correct is difficult
- Sharing existing machines lowers this barrier

Marketplace facilitates sharing of images

- Registry of metadata for machine & disk images
- Image contents are kept in cloud, grid, or web storage
- Supports trust between creators, users, and administrators

Benefits

- End-users: browse and use existing images for their analyses
- Creators: publicize their work and attract larger user base
- Cloud Admins.: Use metadata to evaluate trustworthiness of images

Other Services

Claudia: Service Manager

- Provides service (ensemble of machines) management
- Dynamic control/scaling based on monitoring feedback
- Currently being integrated with other StratusLab services

Authn/Authz

- Authentication done through common proxy service
- Allows username/password from LDAP or from file
- Allows use of grid certificates and VOMS proxies
- Authorization done in individual services
- Delegation currently not needed/used (will change if machine or disk images are protected)

Other Services

Registration Service

- Web service for user registration
- LDAP DB for easy integration with cloud and other services

Accounting/Monitoring

- Ganglia for monitoring of physical and virtual infrastructure
- Simple scripts to extract accounting information for reports
- No publication of the information for the moment

Accessing Services

StratusLab Client

- Command line scripts in python/java with few dependencies
- Works on Mac OSX, Windows, and Linux

Programming Interfaces

- Most services provide REST interfaces
- Easy to program from any language
- Straightforward resource ←→ URL mapping
- Standard interfaces will be implemented (OCCI, CMDI, …)

Libraries

- jclouds, …?

Appliances

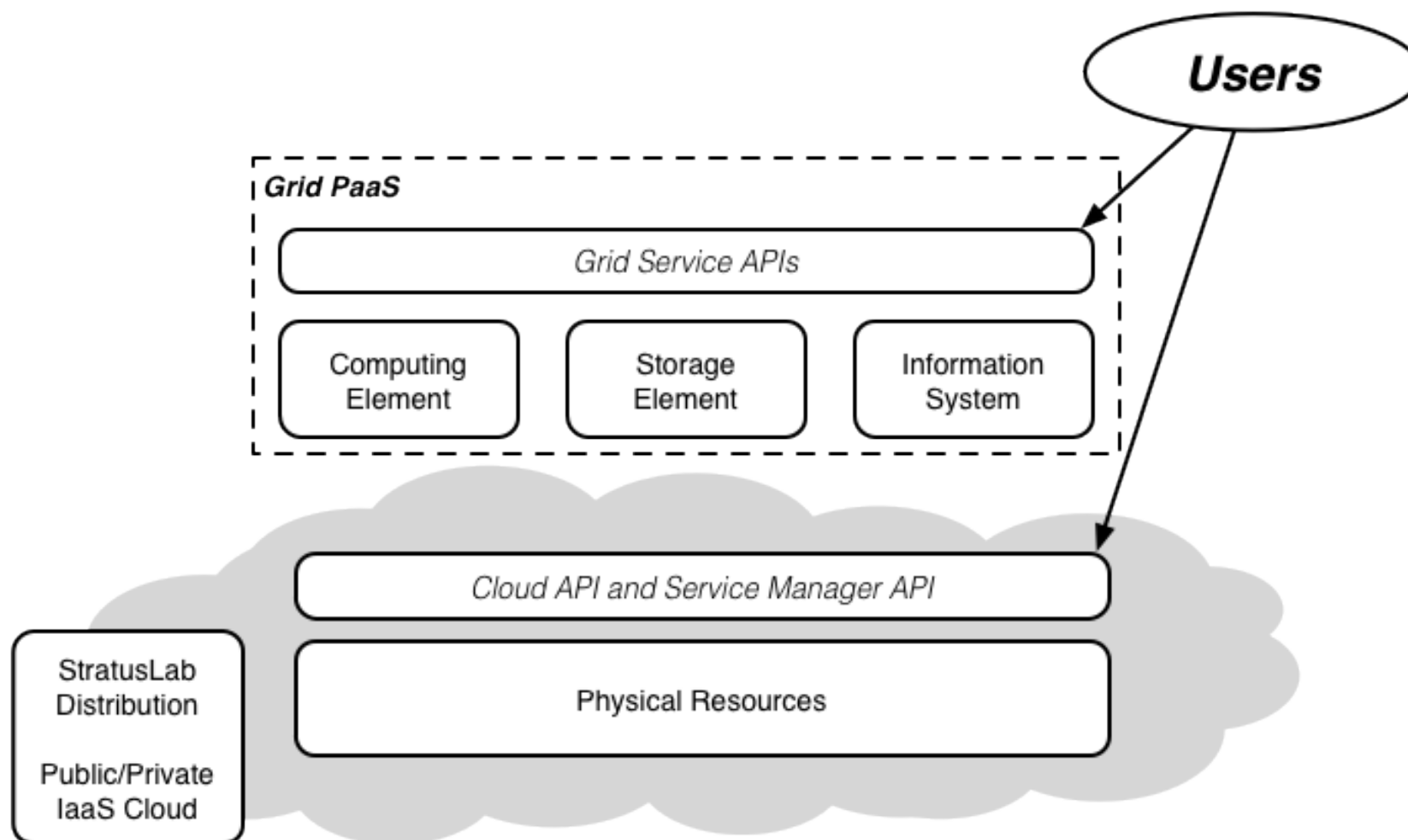## Appliances

- Provide pre-configured, pre-installed software and services
- Makes it easier to get started quickly using cloud resources
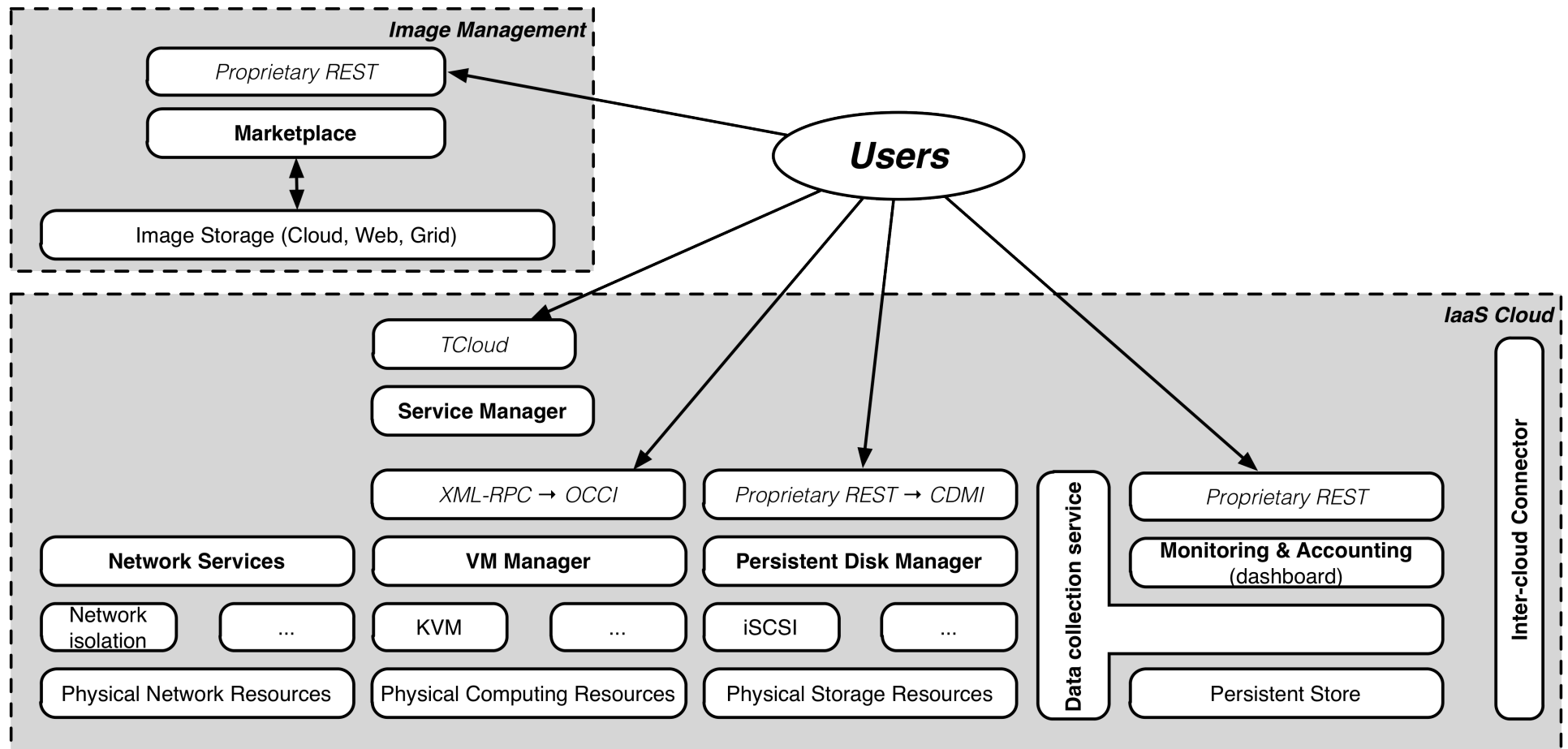- Can make and publish your own appliances

StratusLab-Provided Appliances

- Base images: ttylinux, CentOS 5.5, Ubuntu 10.04, OpenSuSE (?)
- Grid: CE, SE, WN, APEL/BDII, UI
- Bioinformatics: Data server and analysis images

Grid and Cloud Together

StratusLab Architecture (v2.0)

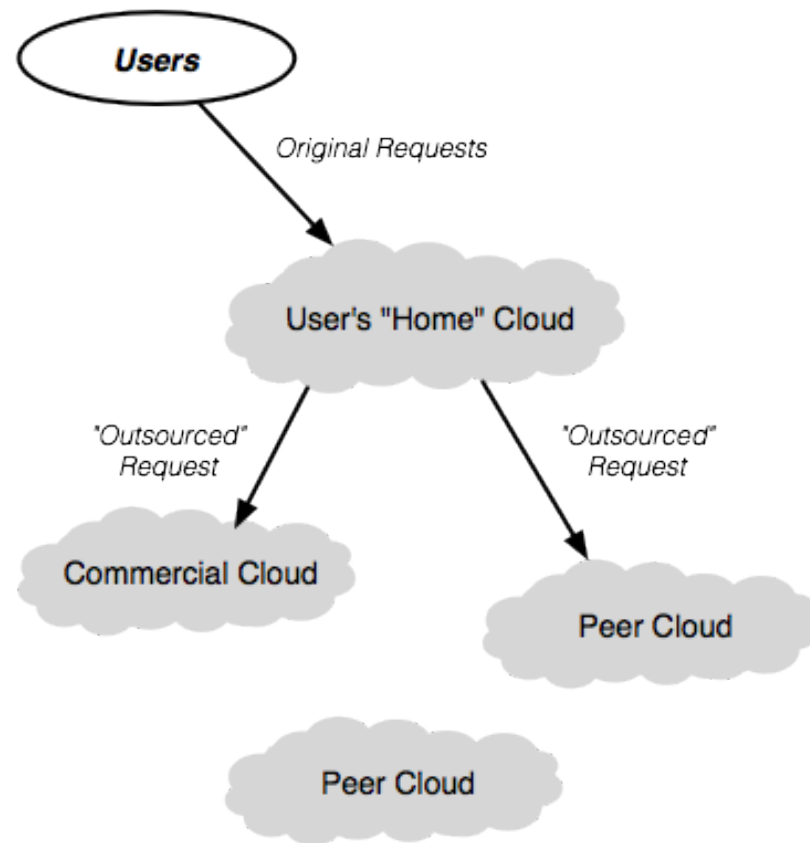**Existing releases provide complete IaaS cloud solution.**

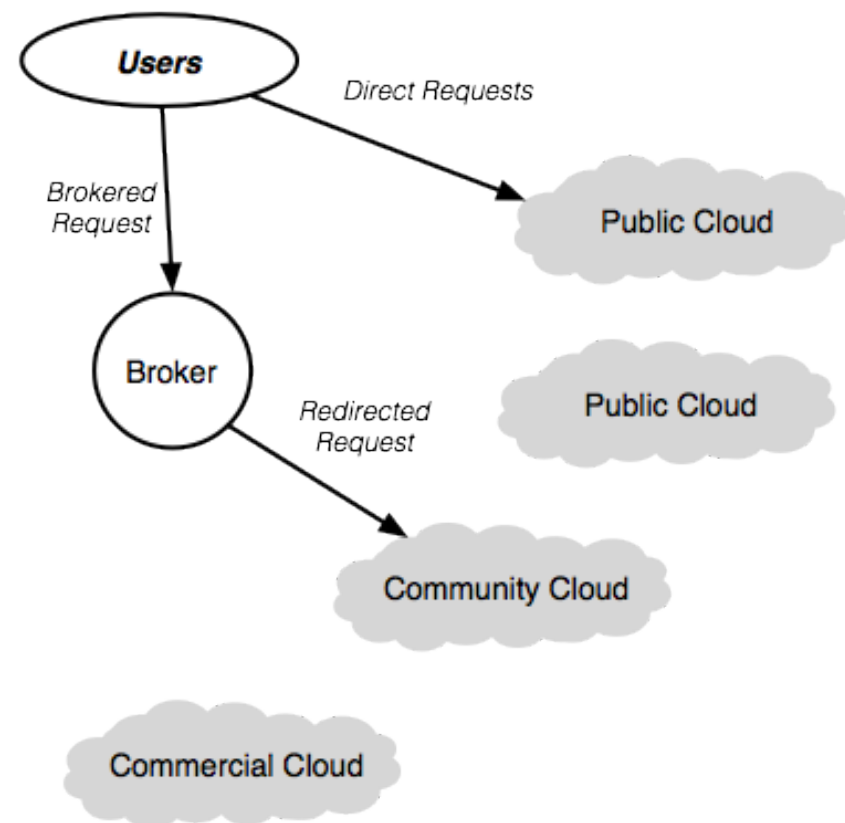**Future work concentrates on monitoring, accounting, and federation.**

Hybrid Clouds and "Sky" Computing

Peer Federation or Bursting

Users → Original Requests → User's "Home" Cloud

User's "Home" Cloud → "Outsourced" Request → Commercial Cloud

User's "Home" Cloud → "Outsourced" Request → Peer Cloud

Peer Cloud

Brokered Federation

Users → Direct Requests → Public Cloud

Users → Brokered Request → Broker

Broker → Redirected Request → Community Cloud

Public Cloud

Commercial Cloud

Questions and Discussion