

Introduction to Cloud Technology

ACGRID-III (Hanoi)

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Ph.D. in High-Energy Physics (<2001)

- E735 (Duke), Fermilab Tevatron
- CDF (Rutgers), Fermilab Tevatron
- ALEPH (CERN), CERN LEP
- ATLAS (UCSC), CERN LHC

Grid and Cloud Technologies (2001—)

- European DataGrid: Deployment and integration of grid middleware
- EGEE, EGEE-II, EGEE-III: Coordinator of user support and liaisons
- Quattor: Developer of the pan configuration language compiler
- StratusLab: Project coordinator

SixSq Sàrl (2007—)

- An SME with 3 partners based in Geneva
- Consulting and tools for automated testing of software systems

Degree in Mechanical Aerospace Engineering (<2004)

- Real-time simulation and test bed development with Canadian and European Space Agencies

Grid and Cloud Technologies (2004—)

- EGEE: Technical coordination, CERN
- ETICS (Build and Test System for Grid middleware): Deputy-Project Coordinator
- StratusLab: Leader of Integration and Test activity

SixSq Sàrl (2007—)

- An SME with 3 partners based in Geneva
- Consulting and tools for automated testing of software systems

Ph.D. in Applied Mathematics (<2005)

- MatraDataVision (EADS)
- OpenCascade S.A.
- PULDV (Paris), UPPA (PAU)

Grid and Cloud Technologies (2006—)

- Integrated Tokamak modelling (ITM):
 - Infrastructure and Integration Software Project (CEA Cadarache)
 - Euforia Project (CEA Cadarache)
- EGEE-III: Grid Applications Porting Support (CEA Saclay)
- StratusLab: User and administrator support and application porting

Researchers and Engineers (End-users)

- Use existing academic and/or commercial software on cloud
- What scientific domains?

Developers

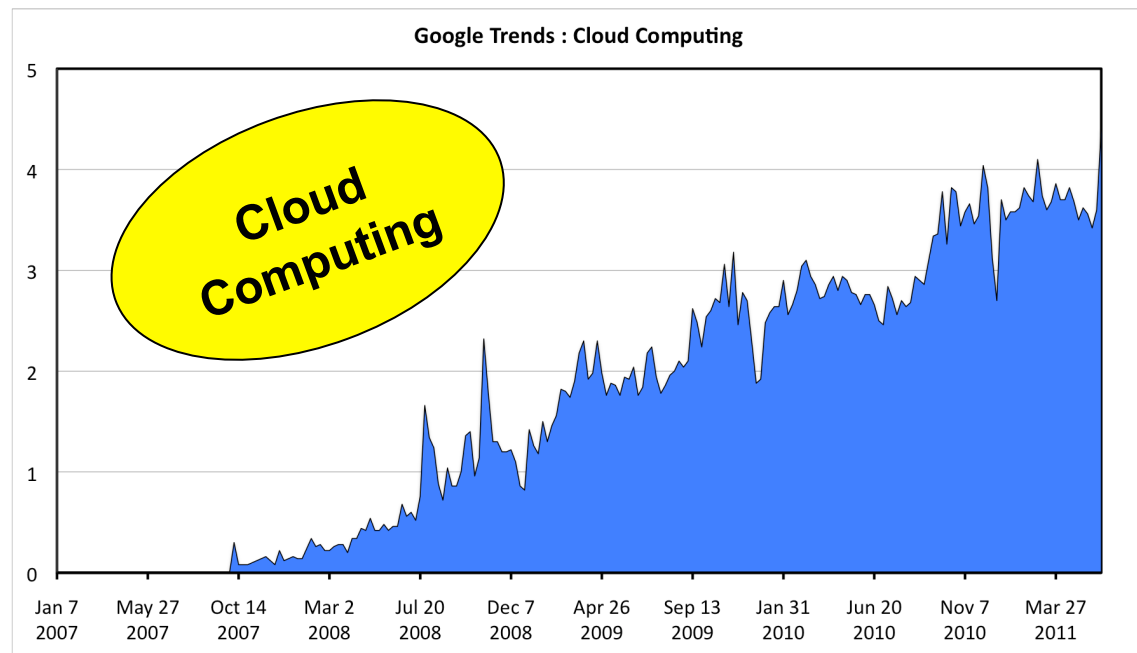
- Modify existing software to use cloud resources
- Create new software for the cloud
- What types of software?

Administrators

- Provide cloud resources to researchers, engineers, and/or developers
- What types of users? Local, multi-institute, ...?

“Cloud” is currently very trendy, used everywhere

- Many definitions that are often incompatible
- Very often used to market pre-existing (non-cloud) software
- But, interesting and useful concepts and tools coming from “cloud”



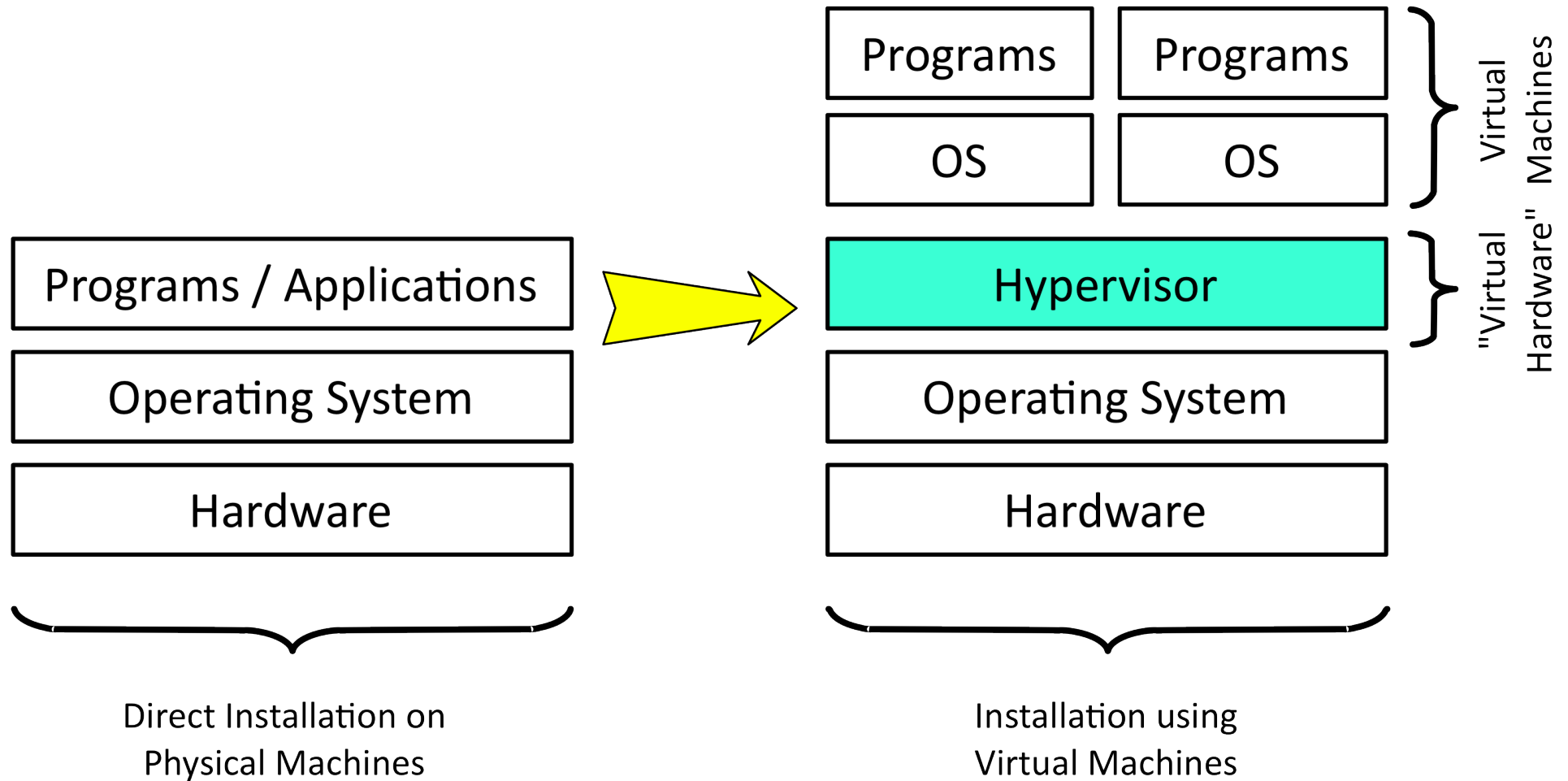
Many previous cloud-like initiatives:

- Commodity Computing (Sun, 2005)
- Utility Computing (IBM, HP, Microsoft, ...)
- Amazon EC2 (2006), EBS (2008)

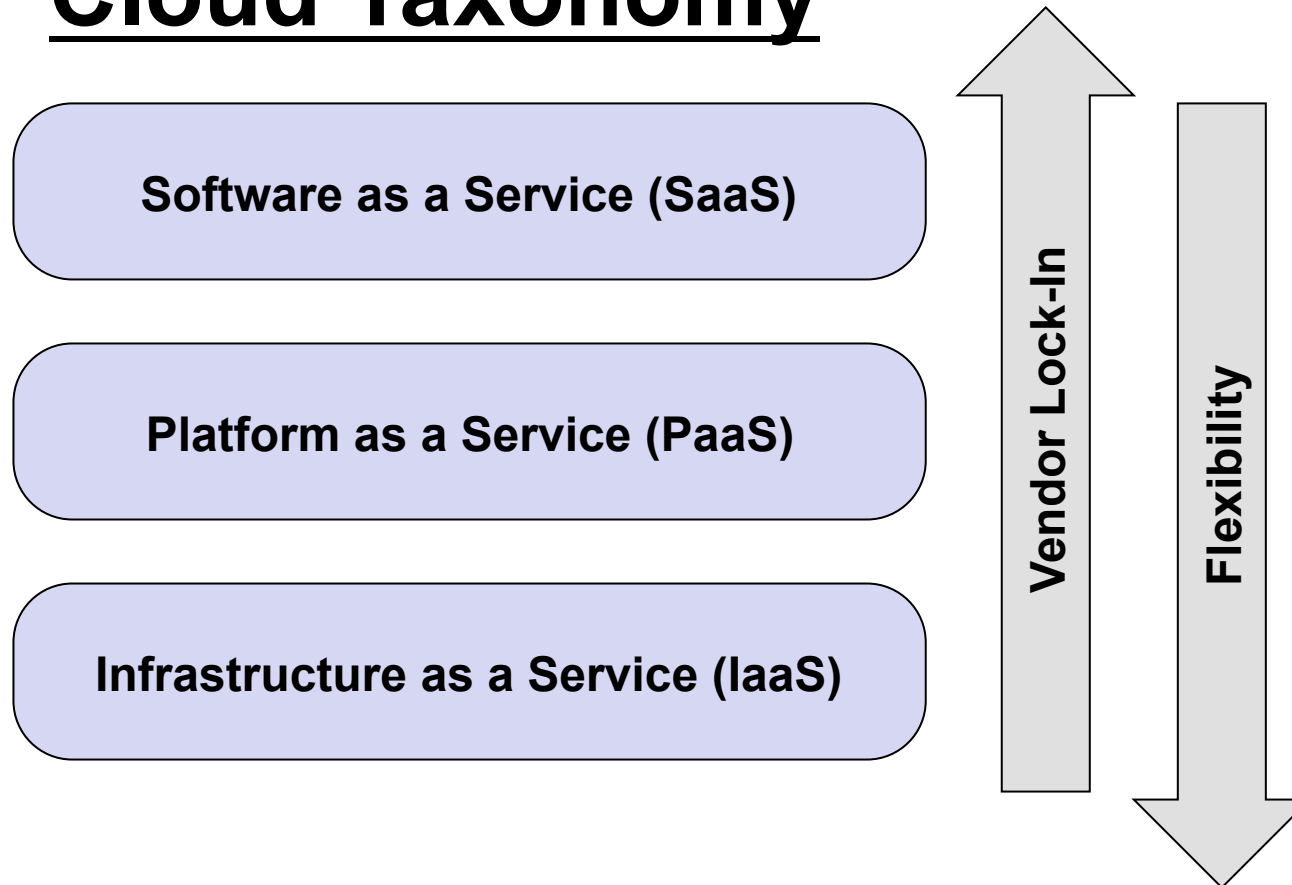
Cloud is the convergence of several concepts:

- Mature virtualization technology with little performance degradation
- Appearance of simplified APIs (REST, XMLRPC, ...)
- Significant excess of commercial computing capacity (Amazon, Google, ...)

Virtualization



Cloud Taxonomy



Best definitions come from NIST (USA):

<http://csrc.nist.gov/publications/PubsDrafts.html#SP-800-145>

Architecture

- Access to remote virtual machines

Advantages

- Customized environment
- Simple and rapid access
- Access as “root”
- Pay-as-you-go model

Disadvantages

- Non-standardized interfaces (vendor lock-in)
- Virtual machine creation is difficult and time-consuming

Software as a Service (SaaS)

Platform as a Service (PaaS)

Infrastructure as a Service (IaaS)



Platform as a Service (PaaS)



Architecture

- Platform and infrastructure for creating web applications

Advantages

- Load balancing, automatic failover, etc.
- Programmers can forget about the low-level “plumbing”

Disadvantages

- Restricted number of languages
- Applications are not portable between different providers

Software as a Service (SaaS)

Platform as a Service (PaaS)

Infrastructure as a Service (IaaS)



Architecture

- Essentially web-hosting

Advantages

- Very simple use: web interface with no software installation
- Very accessible: laptop, smartphone, ...

Disadvantages

- Questions about data: access, ownership, reliability, etc.
- Integration of different services is often difficult

Software as a Service (SaaS)

Platform as a Service (PaaS)

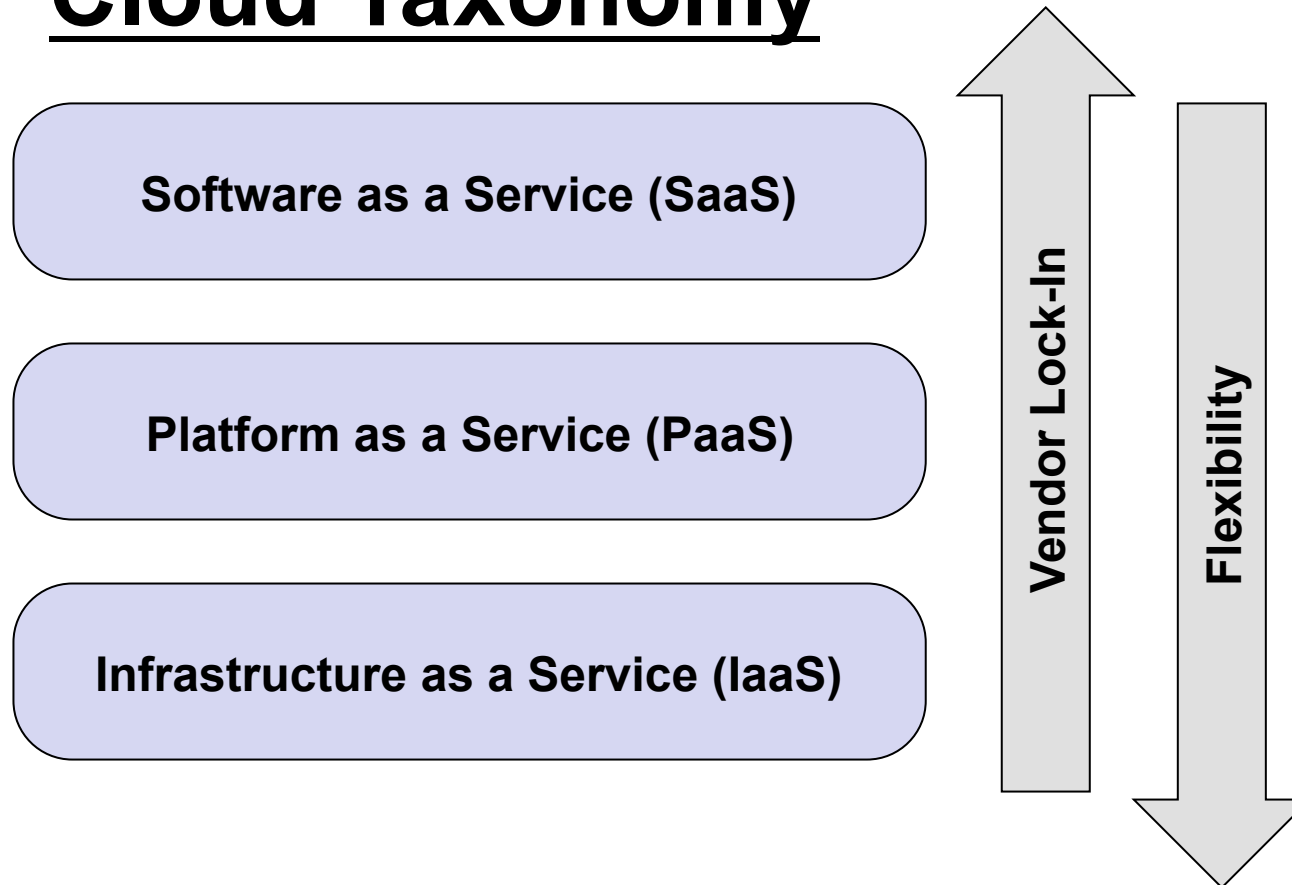
Infrastructure as a Service (IaaS)

Doodle®



salesforce.com®
Success On Demand.

Cloud Taxonomy



Best definitions come from NIST (USA):

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Private

- Single administrative domain

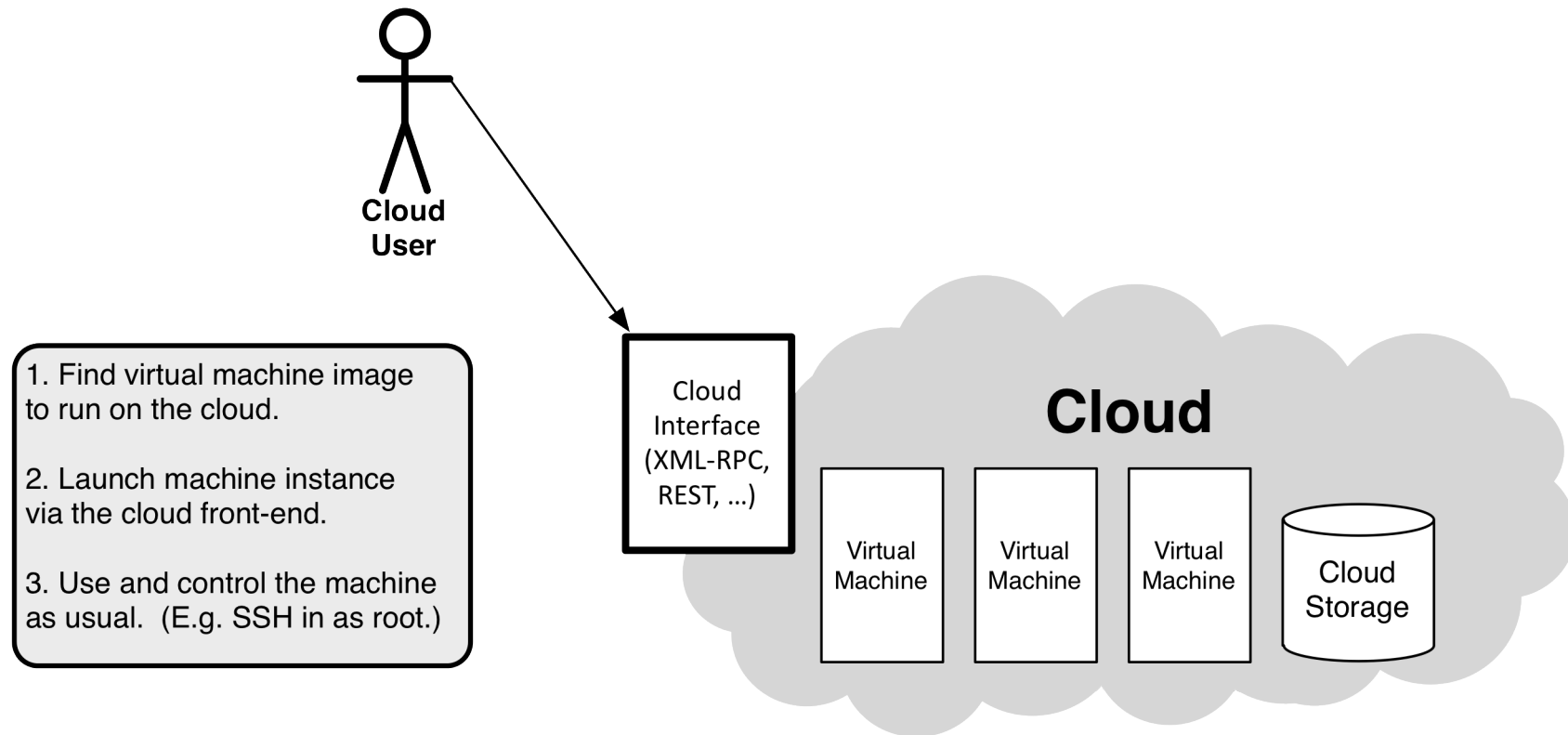
Community

- Different administrative domains but with common interests/procedures

Public

- People outside of institute's administrative domain, general public

Using an IaaS Cloud



Why use an IaaS cloud?



Customized Environment

- Deployment of software with a large number or difficult dependencies
- Use an environment that has already been validated

Development and Testing of Software

- Easy access to many different operating systems
- Change computing environment without impacting other developers
- Test software systems that consist of several machines

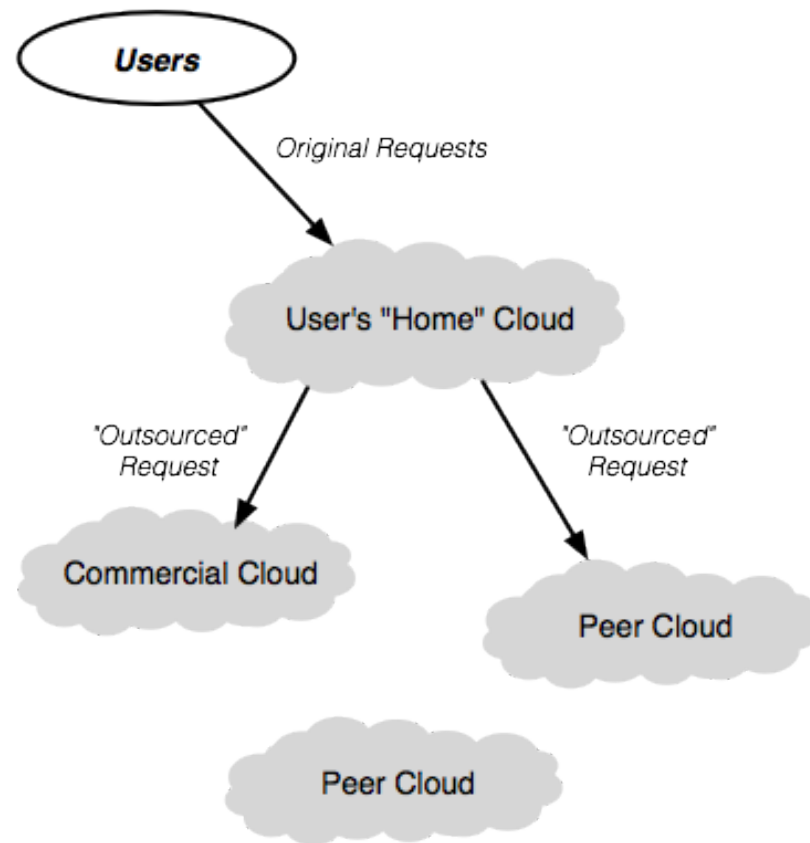
Service Deployment

- Deploy services without the intervention of the local site administrator
- Create platforms (PaaS) pour scientific communities

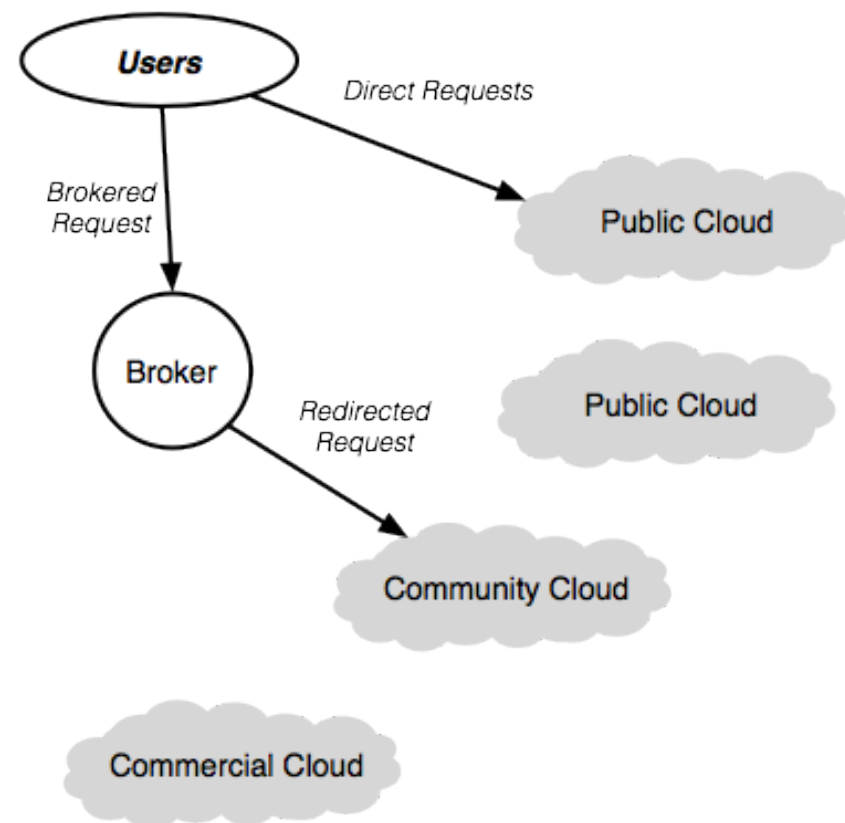
Dynamic access to very significant computing resources

Hybrid Clouds and “Sky” Computing StratusLab

Peer Federation or Bursting



Brokered Federation



Questions and Discussion

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