Cloud Services for Higher Education and Research

V 1.01

Service Models & Different Cloud Types

Infrastructure as a Service (IaaS)

Provides cloud service users the ability to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run software, which can include operating systems and virtualized hardware as well as applications (e.g. Amazon Web Services, IBM's Smart Business Cloud, Microsoft's Azure Database).

Platform as a Service (PaaS)

Provides cloud service users the ability to deploy their own applications onto cloud infrastructure (e.g. Google Apps Premier).

Software as a Service (SaaS)

Provides cloud service users the ability to use cloud service providers' applications running on a cloud infrastructure (e.g. Gmail, Facebook, Salesforce, Dropbox). Users do not control operating systems, hardware or network infrastructures.

PRIVATE CLOUD

Operated and customised solely for one organisation.

Use cases / when to use

- For customised applications and services
- In case of highly sensitive data
- For extremely mission critical and high-load appliances
- As a first stap in a cloud migration strategy
- When high performance is necessary
- Full control is demanded (legal, privacy)

Requirements

- High level of expertise needed
- Operational and system management resources needed

Examples and Tools

- Local Grid or HPC clusters (IaaS)
- Any organisation with a high degree of virtualisation, common in OTAP environment (IaaS)
- IaaS tools: Openstack, VMware, Eucalyptus (virtual machine deployment including storage)

COMMUNITY CLOUD

Shared by several organisations and supporting a specific community. Governance model may be federated or brokered.

Use cases / when to use

- Well-identifiable community with common interest and specific demands (performance, legal & privacy aspects)
- Collaboration between institutions and researchers
- Sharing of resources to reduce costs
- Procurement of cloud services in shared context easier

Requirements

- Broker or trusted third party
- Governance structure
- Consensus on offered functionality

Examples and Tools

- Federative model: eduRoam and SURFfederatie (IaaS)
- SURFnet mailfilter, FileSender and SURFmedia (SaaS)
- SURFconext (PaaS, interface to public/private cloud)
- LHC storage & grid (PaaS)
- CLARIN content federation for humanities (IaaS)
- IaaS tools: Openstack, Eucalyptus, Cloud.com, Greenclouds, OpenNebula (virtual machine deployment including storage)

PUBLIC CLOUD

Available for personal and business use

Use cases / when to use

- Incidental or ad-hoc need for resources
- Commodity or standardised IT services (e.g. mail, document transfer)
- Public sharing of research results
- When IT staff resources and knowledge is limited

Requirements

- Check if legal and privacy conditions are met
- Consider fall-back and migration scenarios
- Must match with commodity facilities
- Risk management assessment essential

Examples and Tools

- Open Universiteit and University of Utrecht student mail
- DANS as a repository for research content (publications and data) and 3TU Datacenter
- Microsoft Azure cloud resource for NSF researchers
- SaaS: gmail, Dropbox
- PaaS: Google Apps Engine
- IaaS: Amazon, Rackspace (virtual machine deployment including storage)

Hybrid cloud: a composition of two or more of the above clouds. The clouds remain unique entities, but are tied together by standardised technology that allows a degree of data and application portability.

Authors: Arjan Peddemors (Novay), Bob Hulsebosch (Novay), and Rogier Spoor (SURFnet)

This publication is licensed under Creative Commons "Attribution 3.0 Unported".
More information on this license can be found at http://creativecommons.org/licenses/by/3.0/