HPC Cloud at SURFsara
— Offering cloud as a service

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The SURF family
A definition: cloud computing

**Essential characteristics:**

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

**Service models:**

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)
Agenda

1.- SURFsara’s HPC Cloud service

2.- User experience

3.- Demo

4.- SURFsara’s HPC Cloud implementation
SURFsara’s HPC Cloud service
What do we (SURFsara) want to offer?

Services for **scientists**

...scientists ≠ systems gurus

... complex users’ problems

- **Data**: big, dirty, non-structured...
- **Computation**: complex (e.g.: modeling, simulation)
  - Libraries nightmare
  - 3rd party, incompatibility, maintenance...

**Familiar?**

... cooperate

... test

... scratch

... share

... show

... trial and error

... flexibility

... privacy
What does our HPC Cloud offer?

1.- Our service

In a jar

Virtualization
What do you see, as a user?

A place to build a running system

Build your own (virtual) machine:
- Hardware
  - CPU
  - Memory
  - Input/Output
    - Disk
    - Network interfaces
- Software
  - Operating System
  - Programs
  - Libraries
Build your own cluster:
• Private network
• Internet access

A place to build a bunch of systems

Our say:  IaaS

Powered by... OpenNebula
User experience
IaaS: Your place to run VMs

Check out the Apps!

Images
- Data store
- Persistency
- ...

Template
- CPU
- RAM
- I/O
  - Disks
  - Network
  - ...

Instantiate

VMs
IaaS: your interconnected VMs

2.- User experience
You get

HPC
- Many nodes
  - Big nodes
- Fast interconnect
- Plenty of storage
  - Diverse storage
- Large memory

Service
- Project-based
  - Own quotas
  - Private network
  - Block storage
- Dynamic DNS
- Documentation
- Support

Cloud
- Multi-purpose versatility
- Shape elasticity
- Self-service on-demand

OpenNebula
- Web interface
- User groups
- Pre-built Apps
- Accounting
Accounting

Per project

User accounts

Ceph

CPU time

Local SSD

2.- User experience
2.- User experience

User applications

Users like & leverage...

- Flexible software mix
- Big VMs
- Elasticity
- Provide their own service to their own users
- Software that requires licenses
- Set up, test and deploy workflows
- Deliver training; courses
- Intensive computing

...from diverse fields:
- Biology
- Genetics
- Informatics
- Chemistry
- Ecology
- Linguistics
- Robotics
- Business
- Social sciences
- Engineering
- Humanities
- Water management
- ...
Recently **added**

and near **future** features:

- **OpenNebula**
  - Latest release of OpenNebula

- **Ceph storage; expansion**
  - Distributed object store and file system
  - Cope with increasing load

- **GPU processing**
  - Highly parallel structure
  - Program specifically to use it

- **SURFconext; federated authentication**
Demo
SURFsara’s HPC Cloud implementation
Network overview

Test environment

675 TiB Ceph storage

2×10Gbps

50×10Gbps

14 GPU nodes

38 HPC nodes

Service Nodes

Virtualised:
- UI (Sunstone)
- Apps
- OpenNebula (DB, daemons...)
- ...

38 HPC nodes

14 GPU nodes

3.- Implementation
Request: https://e-infra.surfsara.nl
UI: https://ui.hpccloud.surfsara.nl
Doc: https://doc.hpccloud.surfsara.nl

Credits

Images: Wikipedia, Science Park, RRZE icons, NIST, nVidia, Ceph
Slides: SURFsara colleagues

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