

HPC Cloud at SURFsara

— Offering cloud as a service

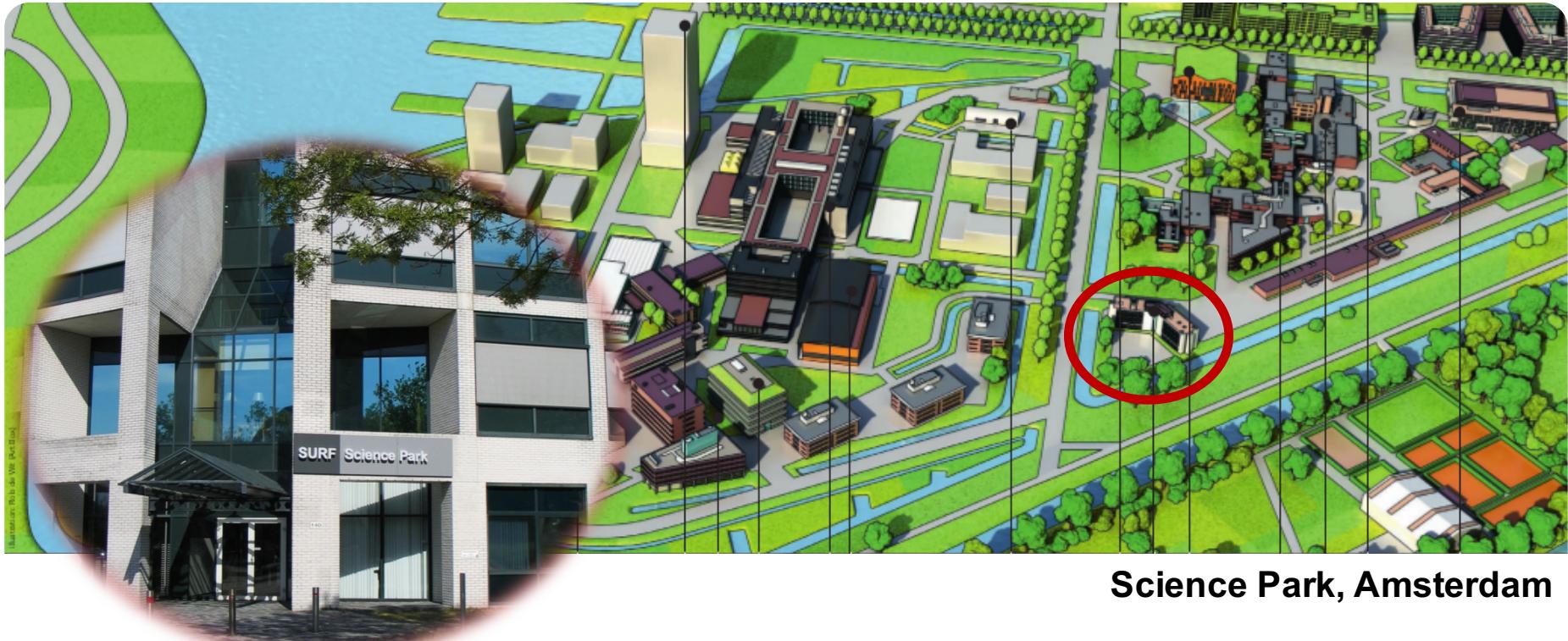
Workshop at UNESCO-IHE

11th December 2015



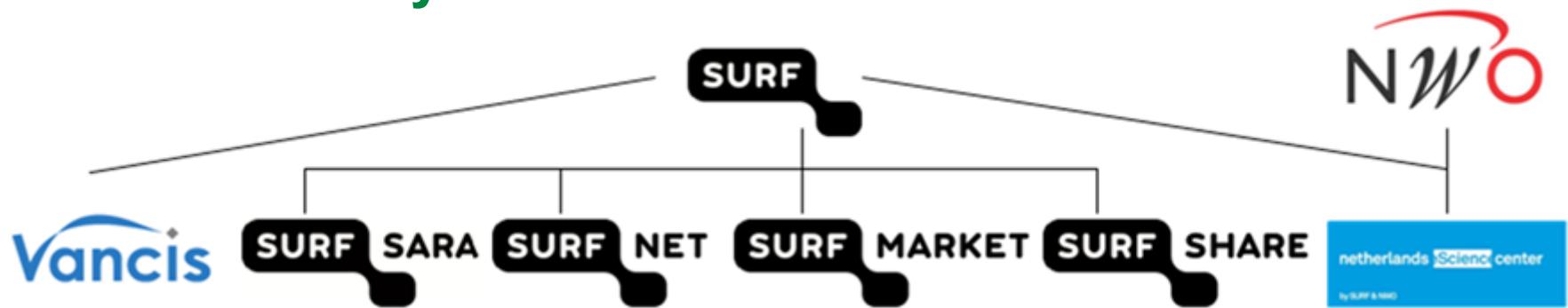
Ander Astudillo <ander.astudillo@surfsara.nl>





Science Park, Amsterdam

The SURF family



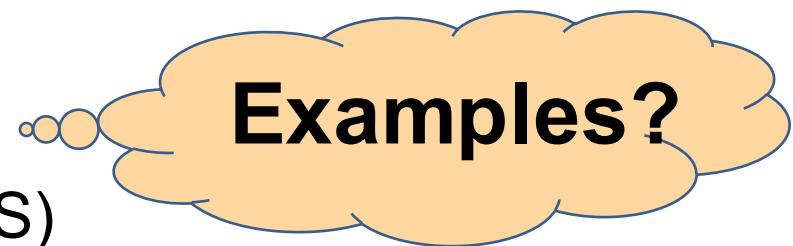
A definition: cloud computing

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?

... test

... scratch

... trial and error

... share

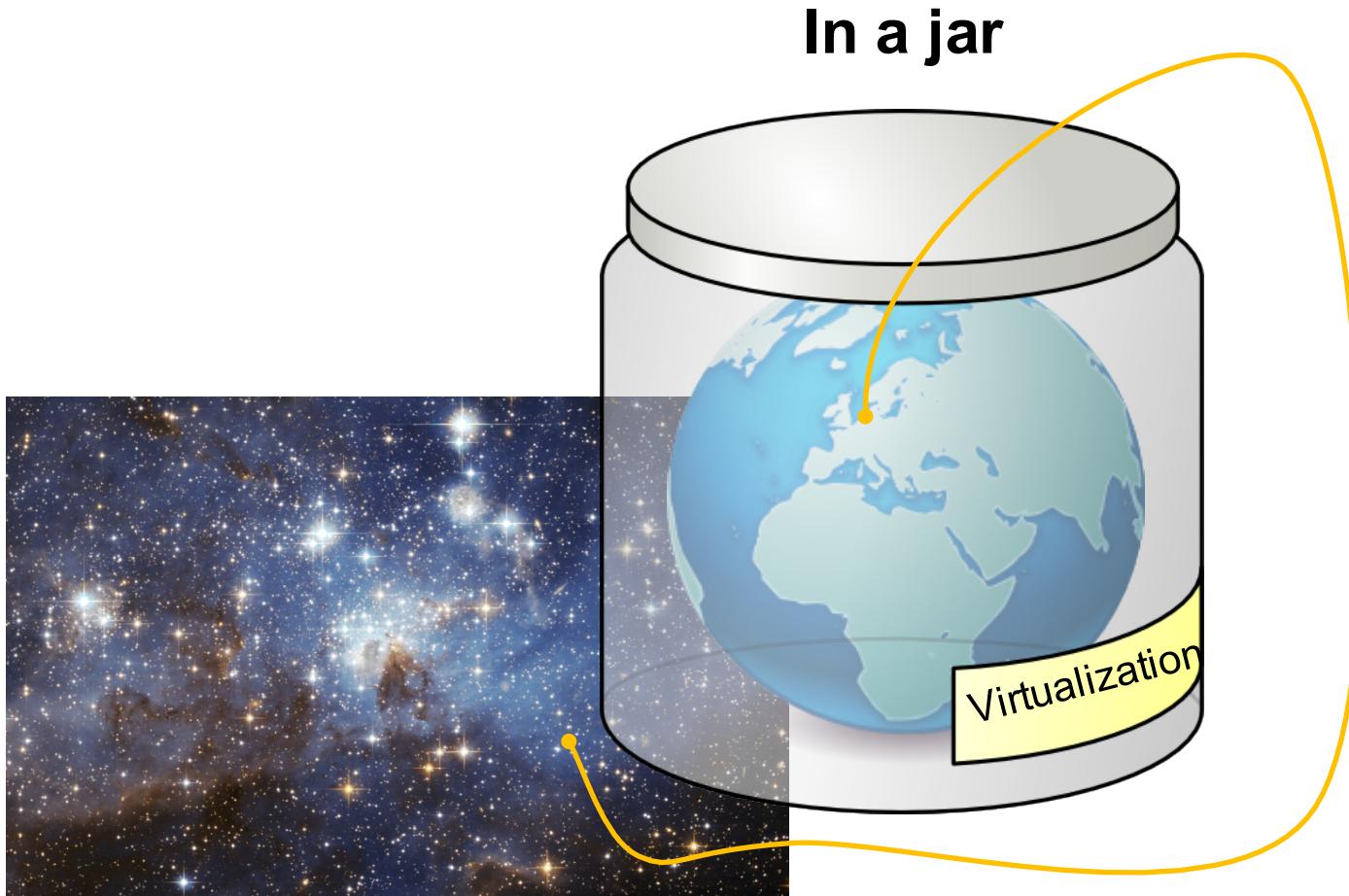
... show

... cooperate

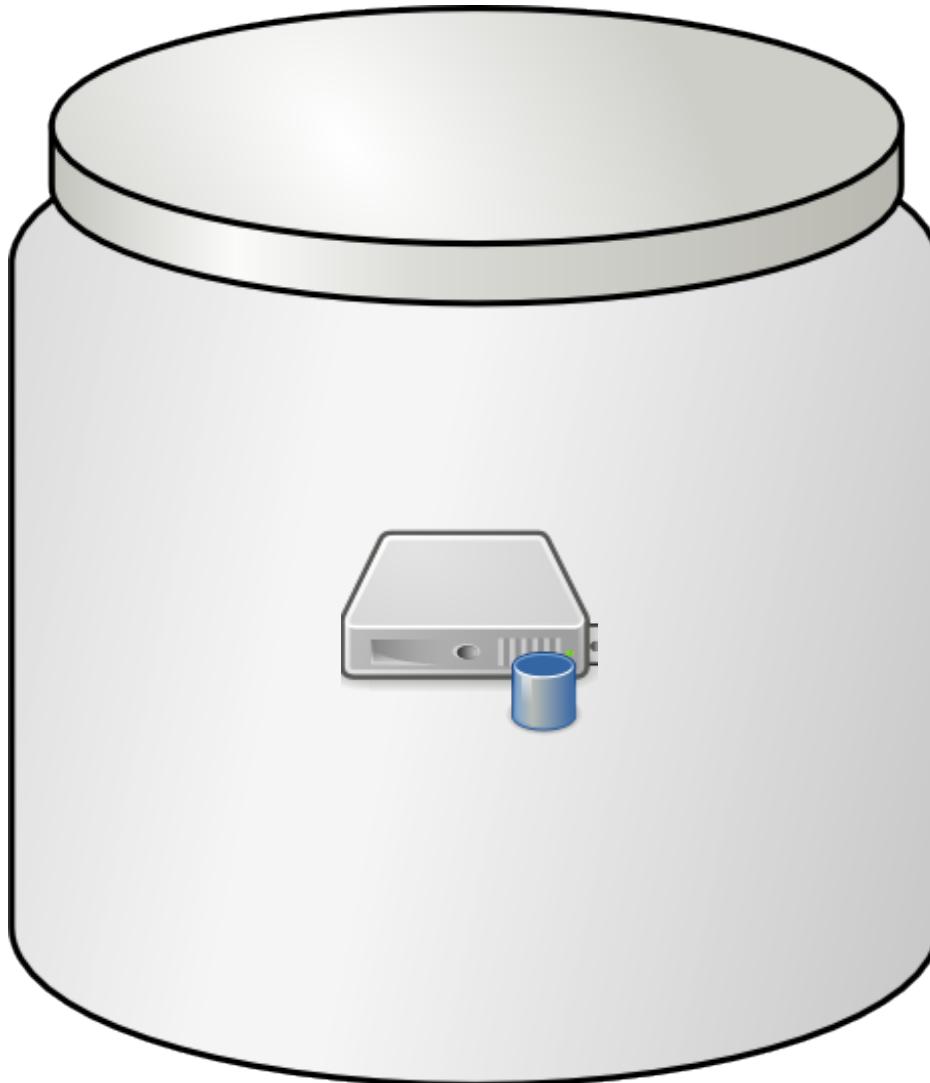
... flexibility

... privacy

What does our HPC Cloud offer?



What do you see, as a user?

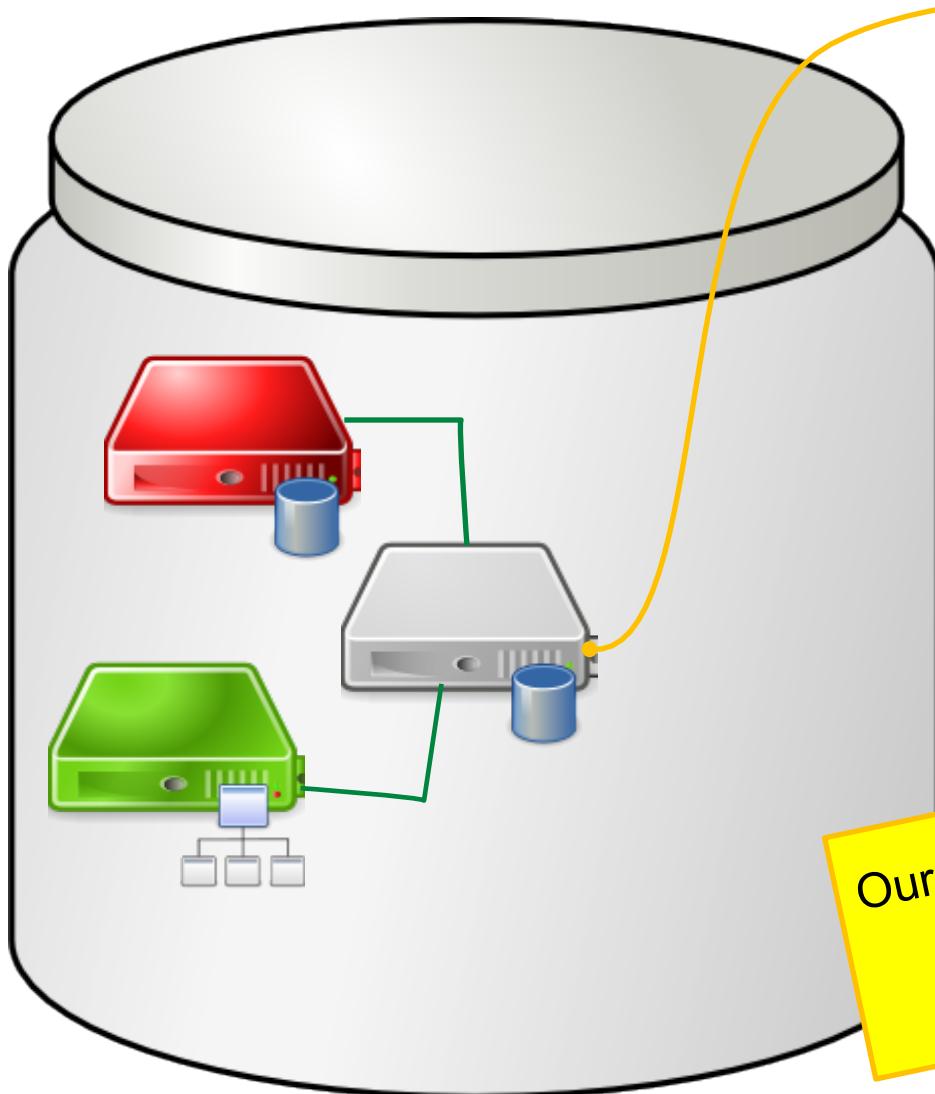


A place to build a running system

Build your own (virtual) machine:

- Hardware
 - CPU
 - Memory
 - Input/Output
 - Disk
 - Network interfaces
- Software
 - Operating System
 - Programs
 - Libraries

What do you see, as a user? (and II)



A place to build a bunch of systems

Build your own cluster:

- Private network
- Internet access



Our say:

IaaS

Powered by...
OpenNebula

User experience

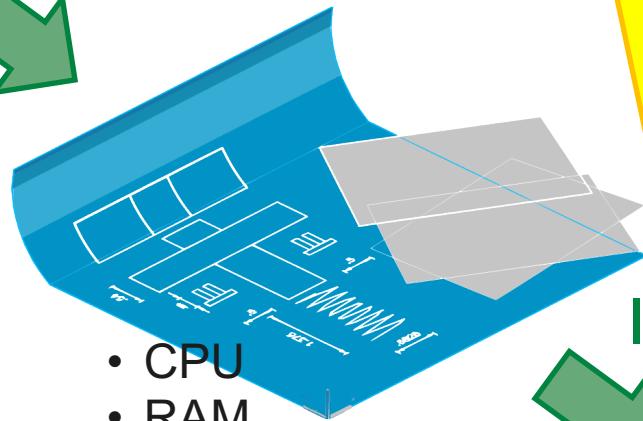


IaaS: Your place to run VMs



- Data store
- Persistence
- ...

Images

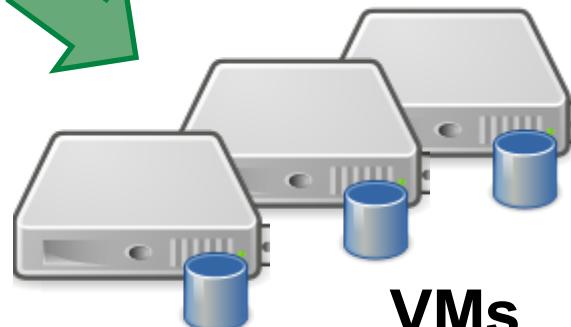


- CPU
- RAM
- I/O
 - Disks
 - Network
- ...

Template

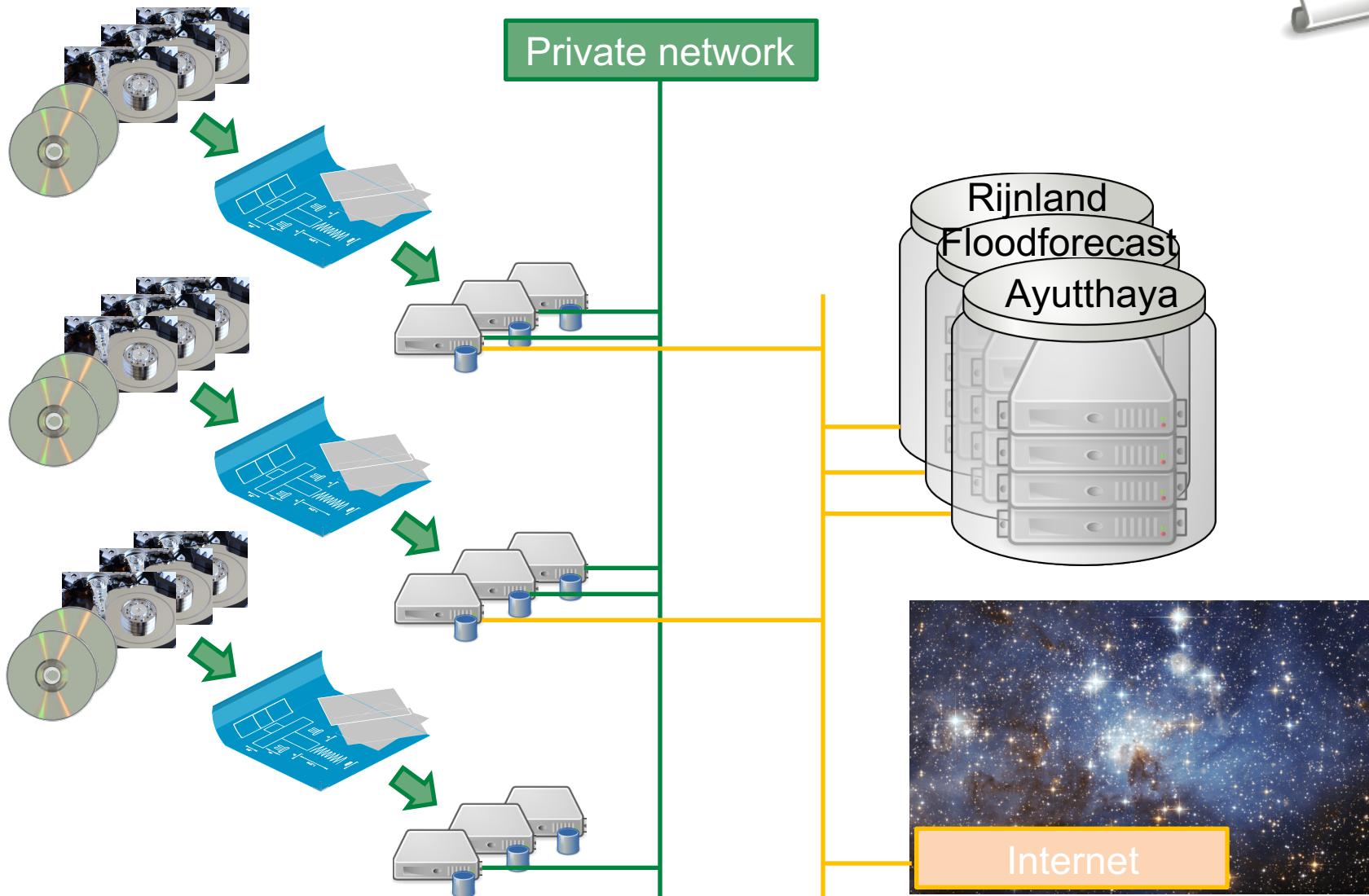


Instantiate



VMs

IaaS: your interconnected VMs



You get



HPC

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

Cloud

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

Service

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

OpenNebula

- Web interface
- User groups
- (Custom) AppMarket
- Accounting



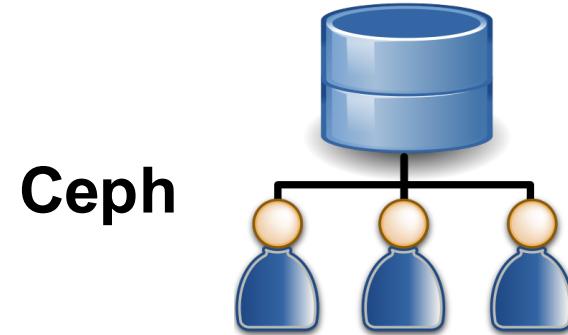
Per project



User accounts



CPU time



Ceph



Local SSD

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:

Open**Nebula** • 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

Demo

3



SURFsara's HPC Cloud implementation



Hardware



1 High-mem node

1x 40-core Intel(R) Xeon(R)
CPU E7- 4850 @ 2.00GHz

2 TB RAM

Ethernet 2x10GE
2.9 TB local SSD disk

32 HPC nodes

11> 64 core Intel(R)
Xeon(R) CPU E5-2640
v3 @ 2.60GHz
256 GB RAM
Ethernet 2x10GE
1.1 TB local SSD disk

21> 64 core Intel(R)
Xeon(R) CPU E5-2698
v3 @ 2.30GHz
256 GB RAM
Ethernet 2x10GE
2.9 TB local SSD disk

12 GPU nodes

12> 32with HT Intel E5-2640
256 GB RAM
Ethernet 2x10GE
800 GB local SSD disk
4x Nvidia K2 Grid GPU



Network

(Arista DCS-7504)

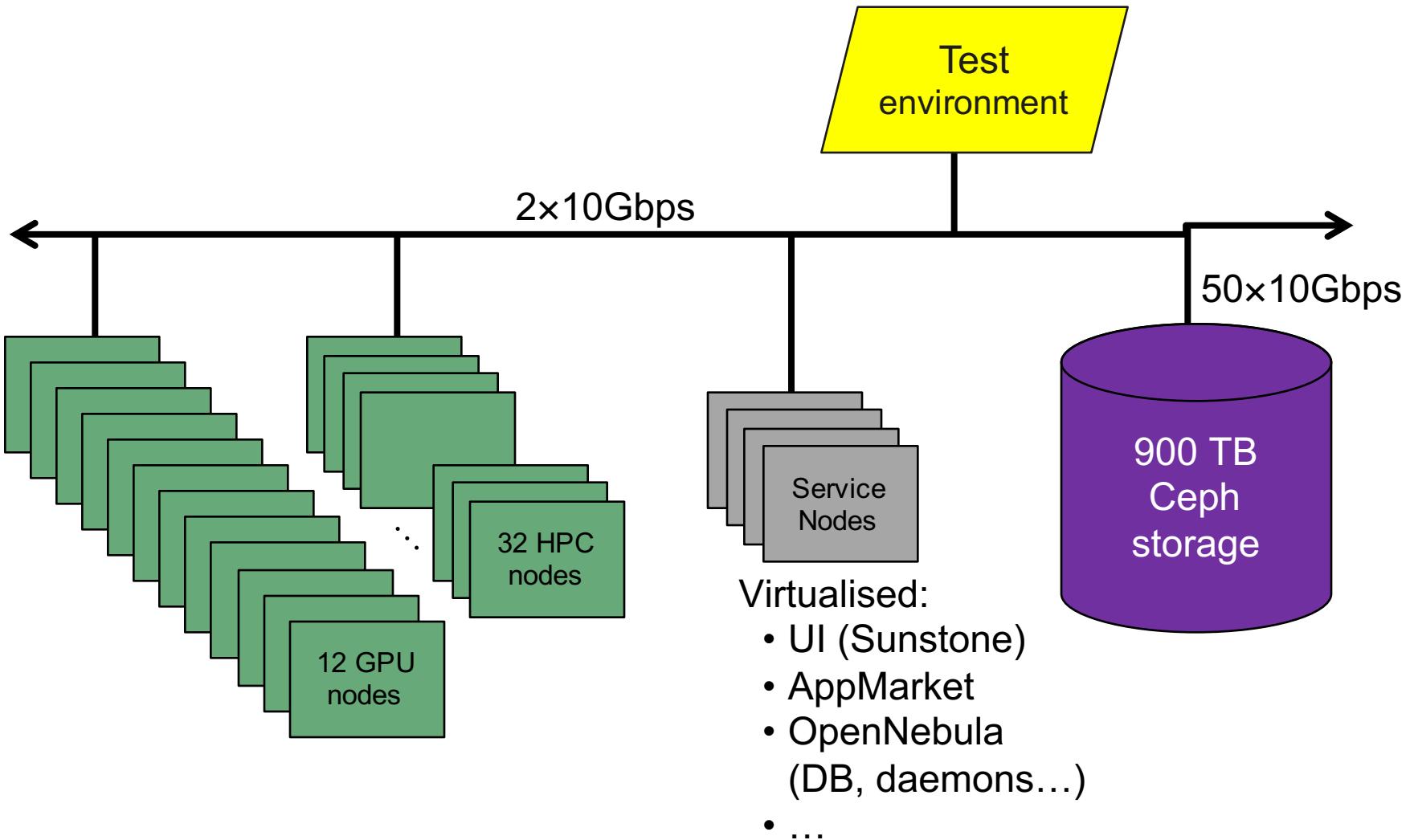
144 ports **10GE, 1-hop**

Storage

900TB Ceph

& 85.5 TB
local SSD

Network overview



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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