

HPC Cloud at SURFsara

— Offering cloud as a service

Workshop at IHE Delft

21st February 2018



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Science Park, Amsterdam

The SURF family

SURF

SURF SARA

SURF NET

SURF MARKET

NWO

Nederlandse Organisatie voor
Wetenschappelijk Onderzoek

netherlands
eScience center

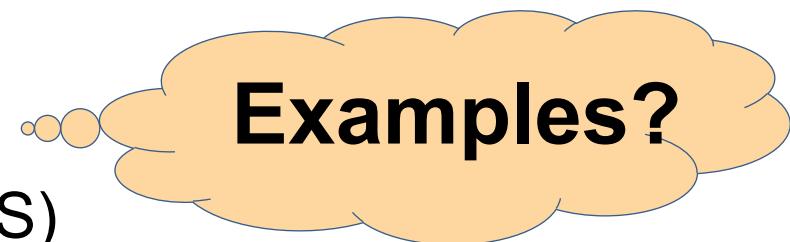
A definition: cloud computing

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 \neq 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

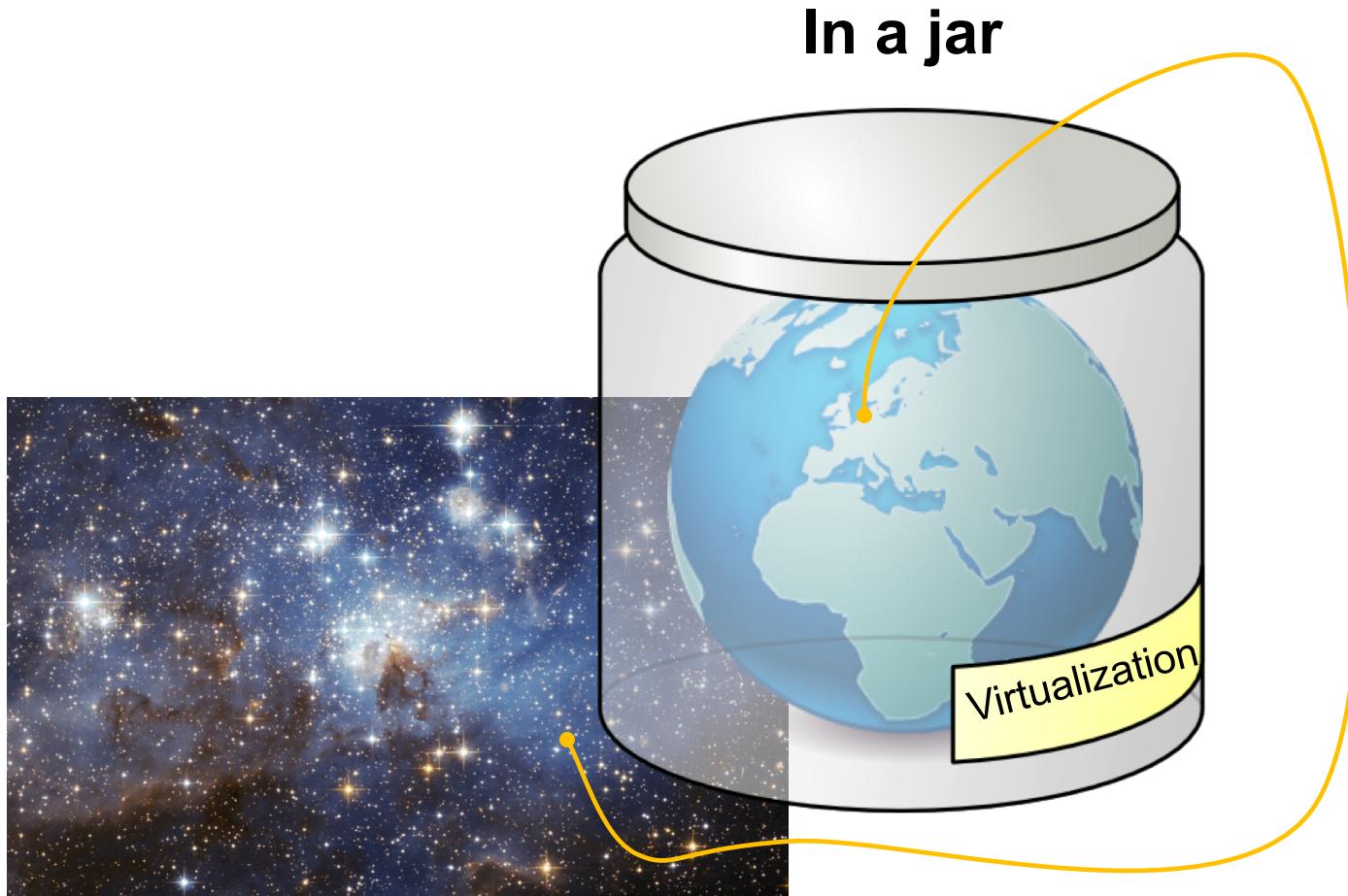
... show

... cooperate

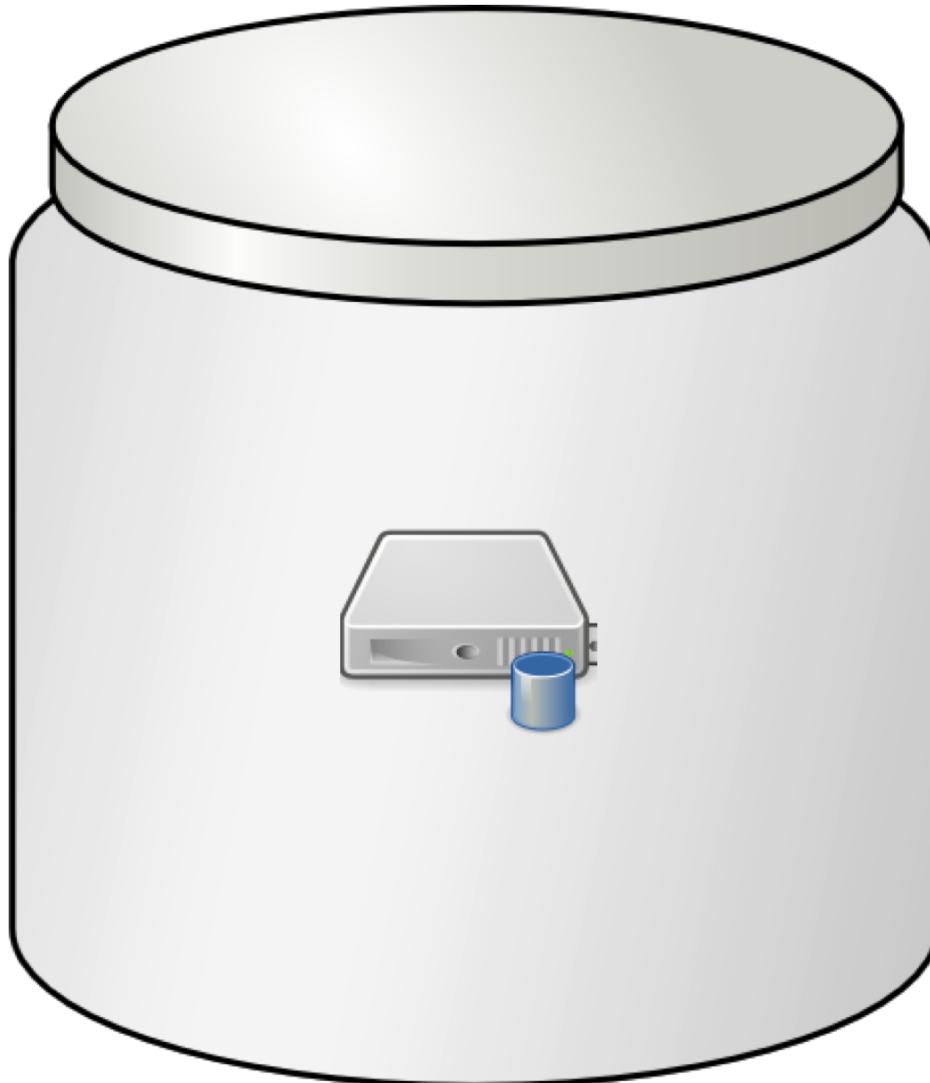
... flexibility

... privacy

What does our HPC Cloud offer?



What do you see, as a user?

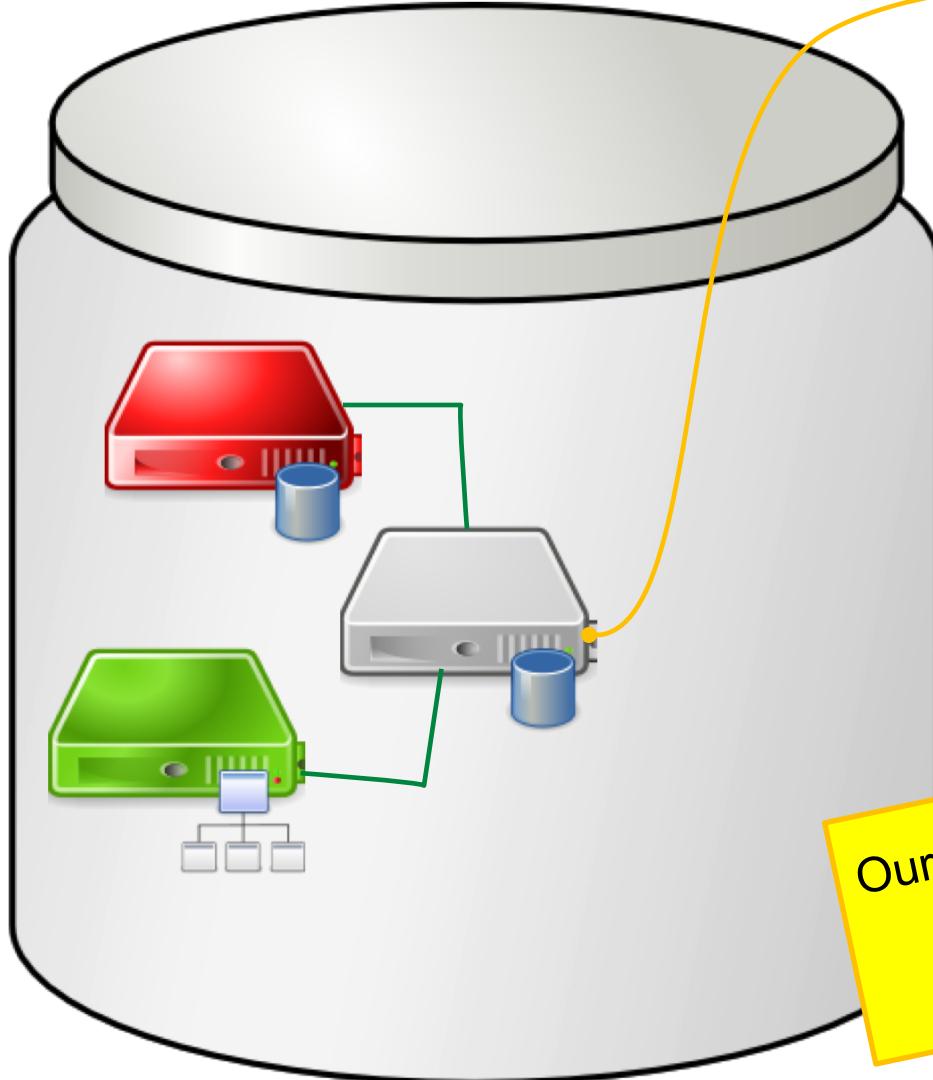


A place to build a running system

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

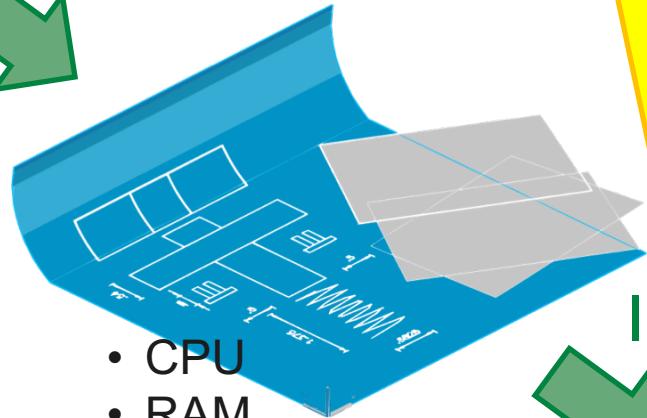


IaaS: Your place to run VMs



- Data store
- Persistence
- ...

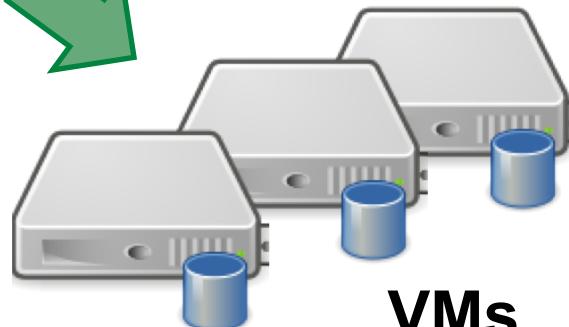
Images



Template

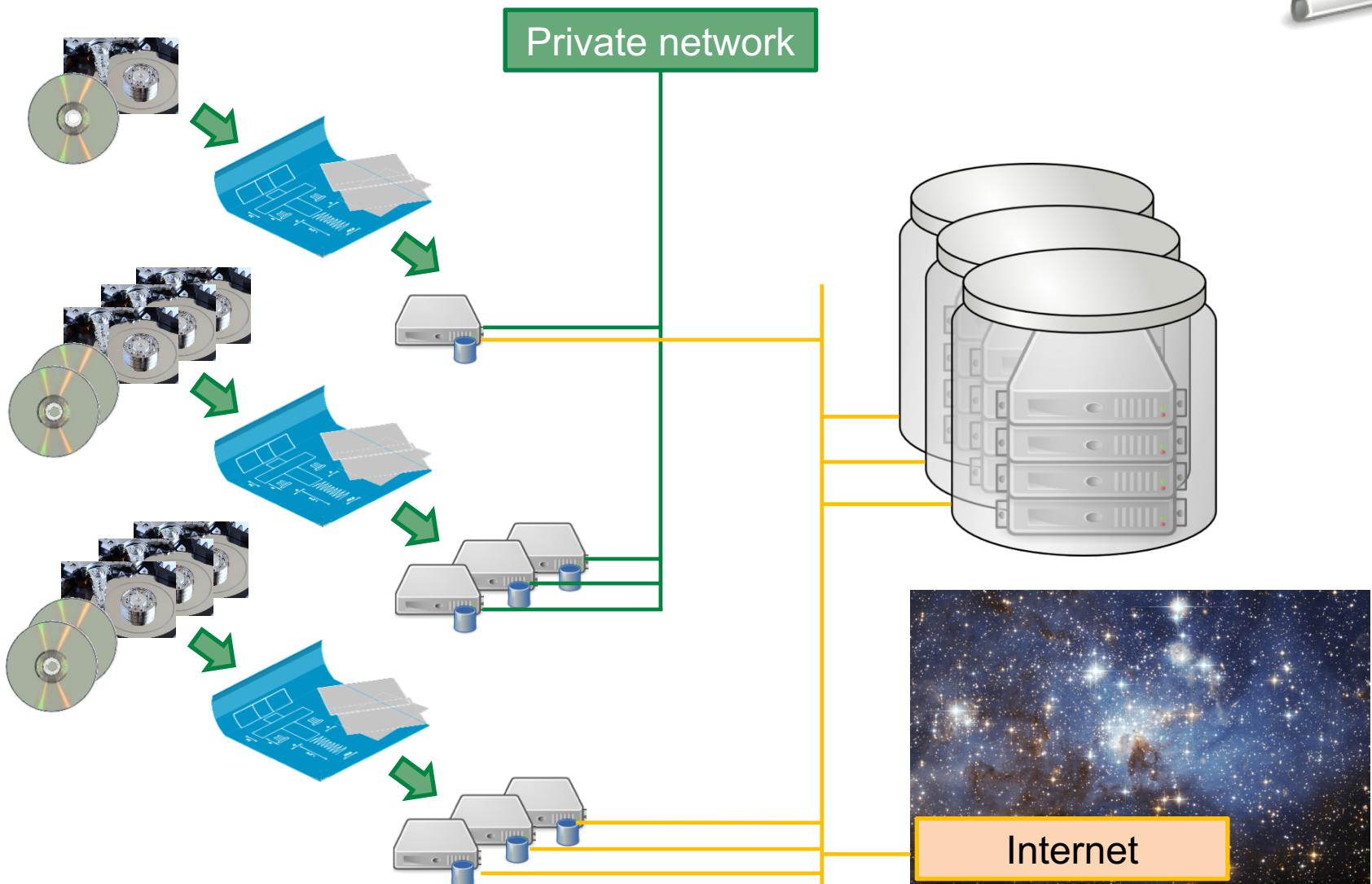


Instantiate



VMs

IaaS: your interconnected VMs





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
- Pre-built Apps
- Accounting



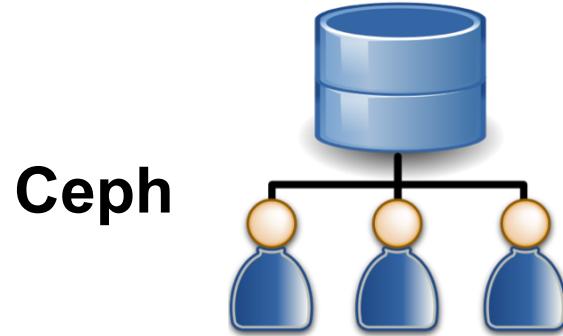
Per project



User accounts



CPU time



Ceph



Local SSD



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 • Ceph storage; expansion

- Distributed object store and file system
- Cope with increasing load



• **GPU processing**

- Highly parallel structure
- Program specifically to use it

SURF

• **SURFcontext; federated authentication**

Demo

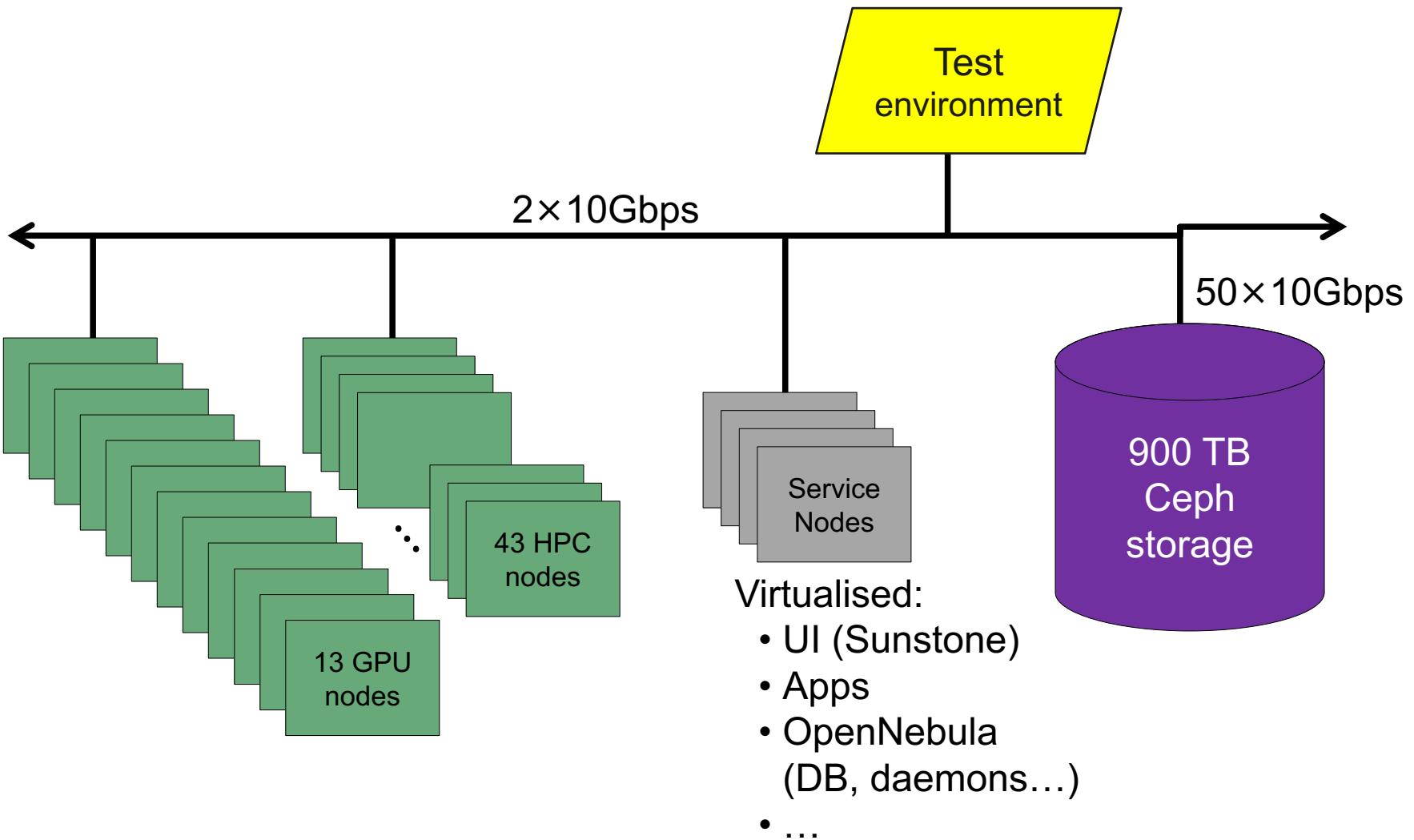
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SURFsara's HPC Cloud implementation



Network overview



Hardware



| | |
|-------------------------------------------|------------|
| Node01..21 | [22 nodes] |
| Intel(R) Xeon(R) CPU E5-2698 v3 @ 2.30GHz | |
| | 64 |
| | 243,9GB |
| | 2,9TB |
| Node30..40 | [11 nodes] |
| Intel(R) Xeon(R) CPU E5-4650 0 @ 2.70GHz | |
| | 64 |
| | 243,9GB |
| | 1,1TB |
| Node56..65 | [10 nodes] |
| Intel(R) Xeon(R) CPU E5-2698 v4 @ 2.20GHz | |
| | 80 |
| | 503,9GB |
| | 3,4TB |

HPC

HPC Cloud nodes

Aug. 2017

Storage
900TB Ceph
& 85.5 TB
local SSD

Node41 [1 node]

Intel(R) Xeon(R) CPU E7- 4850 @ 2.00GHz

| | |
|--|-------|
| | 40 |
| | 2TB |
| | 2,9TB |

High-Mem

Node42..50, 52..53 [11 nodes]

Intel(R) Xeon(R) CPU E5-2640 v3 @ 2.60GHz

| | |
|--|---------|
| | 32 |
| | 243,8GB |
| | 731,3GB |

GK104GL [GRID K2]



4

Node54..55 [2 nodes]

Intel(R) Xeon(R) CPU E5-2609 v4 @ 1.70GHz

| | |
|--|---------|
| | 32 |
| | 243,8GB |
| | 731,3GB |

GP100GL [Tesla P100 PCIe 12GB]



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GPU

Icons: <http://www.iconarchive.com/show/outline-icons-by-iconsmind.html>
and: <https://thenounproject.com/term/gpu/1132940/>

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, publicdomainpictures.net, publicdomainvectors.org, cs.unc.edu/~weicheng
Slides: SURFsara colleagues, CERN

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