MetaCentrum

Scientific Clouds

Introduction

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CESNET

Cloud (Recap)

- Basic terminology
  - IaaS, PaaS, SaaS, XaaS, ...
  - opaque internal structure
  - resources on demand, *pay-as-you-go*
  - multi-tenant, multi-purpose
- Virtualization
  - compute (KVM, XEN, VMWare, HyperV, ...)
  - storage (block, object, fs, ...)
  - network (VLAN, VXLAN, ... *SDN*)
- Application deployment
  - designed for application-level horizontal scaling
  - replication, distributed consensus, self-healing
  - automated life-cycle processes, continuous integration and deployment

Scientific Computing (Recap)

- Computing intensive tasks $\rightarrow$ *HPC*
- Data intensive tasks $\rightarrow$ *Big Data*
- Often requiring assistance as well as resources
- National providers targeting academic/research communities

– HPC Clouds –

Heterogeneous Jobs

- Require flexibility (OS, HW, network, . . .)
- Make use of scalability, even on demand if supported
- User in control of the execution environment
  → additional responsibilities
  → higher skill requirements
- Wide variety of types (GPGPU, legacy, bleeding edge, . . .)

Specific Requirements

- HPC vs. AWS-like end-user services
  $\rightarrow$ scientific grants from Amazon/Microsoft
- No "paying" customers (fairness in resource allocation)
- Expectation of assistance (looking for a research partner)
- Often working with open data, wanting to share the results

Technical Challenges

- No overcommitment of resources
- I/O performance often critical (disks, network)
- Tools for sharing data/results or restricting access
- Heterogeneous infrastructure and user requirements

– MetaCloud –

Infrastructure Example

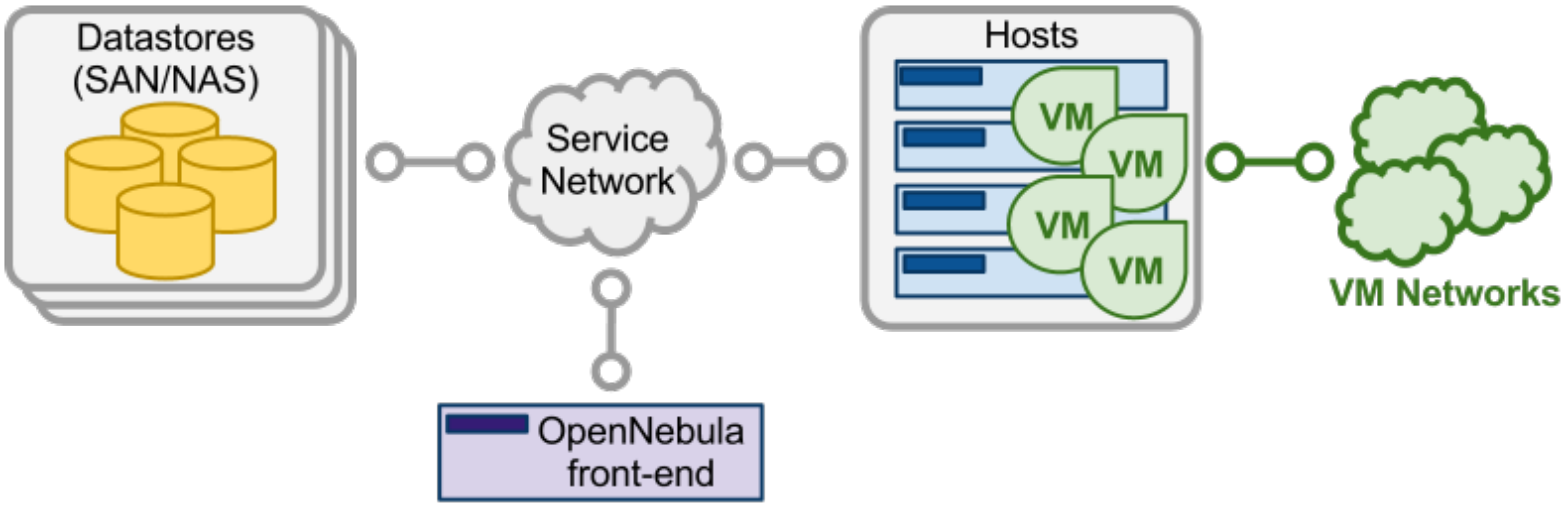
Technical Aspects

- OpenNebula cloud management framework (open source)
- *KVM* with *libvirt* on a mixed fleet of Debian/CentOS nodes
- *Kerberos* and *X.509* authentication for users (GUI and API)

Sandbox and Reference architecture:

- `http://opennebula.org/tryout/sandboxvirtualbox/`
- `https://goo.gl/470wce`

Technical Aspects



How To Get Access?

- Open to everyone in the Czech academic community
- Resources from MetaCentrum (CESNET) and CERIT-SC (MU)
- User payment $\rightarrow$ publications

- Registration – `https://goo.gl/3gGGjW`
- GUI – `https://cloud.metacentrum.cz/`

API Access

1. Get a personal certificate at `http://goo.gl/CDsdIj`
2. Register your personal certificate at `https://goo.gl/NL2zB8`
3. Export your certificate from the browser
   → see a step-by-step conversion guide at `http://goo.gl/GzKjJX`

For more information, see `https://goo.gl/fDosgK`

Deployment over API

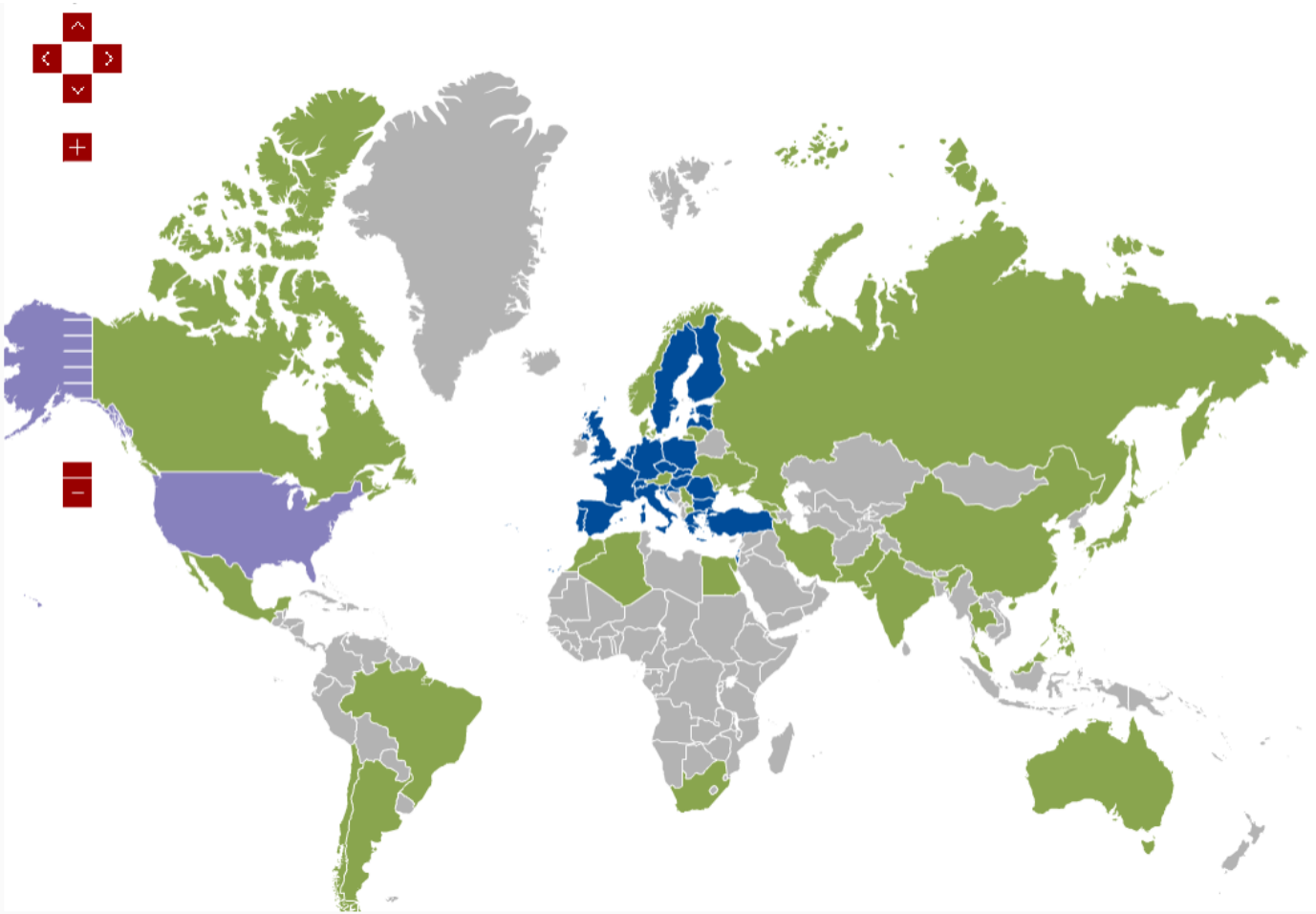
```
$ oneuser login $USERNAME --x509 --force \
                --cert usercert.pem --key userkey.pem

$ onetemplate list
...
3397 oneadmin metacloud METACLOUD-Ubuntu-Docker-14.04
...

$ onetemplate instantiate 3397 --name MyPA200Instance
ID: ...

$ onevm show $INSTANCE_ID
...
VM NICS
## IP address(es) HERE
...

$ onevm shutdown $INSTANCE_ID --hard
```

Adding "--xml" to commands gives machine-readable output!

– EGI Federated Cloud –

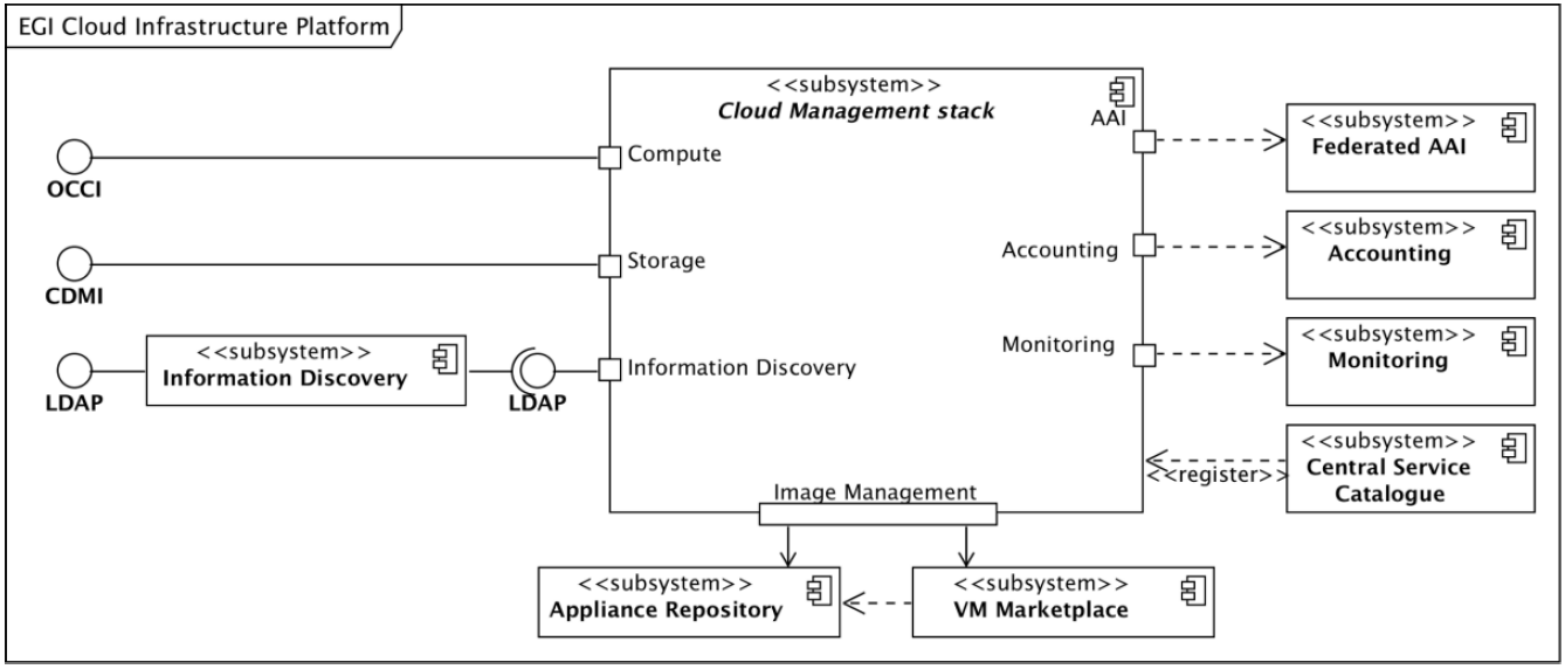
Infrastructure Example

Geo Distribution



Caption (as of July 2015)
blue: EGI council members
green: integrated resource infrastructure providers
purple: peer resource infrastructure providers

Technical Aspects



– How To Use Cloud? –

Provisioning

- Automated and repeatable installation (and configuration)
- Possible approaches:
  - custom scripting (bash, powershell)
  - Ansible – `https://www.ansible.com/`
  - SaltStack – `https://saltstack.com/`
  - Chef – `https://docs.chef.io/chef_solo.html`
  - Puppet – `https://puppet.com/`
- Often used in combination with containers

The End

– That's All Folks! –

...

Contact Info

Do you have any questions?

- ask **NOW!**
- ask us directly at parak@cesnet.cz or sustr4@cesnet.cz
- send your questions to cloud@metacentrum.cz