The ScienceCloud: Architecture and Abilities

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Questions I will try to answer:

- What is ScienceCloud?
- Is it useful for me?
- Is it hard to use?
- How big is it? (not that I care, but I need 1000 cores because I need to publish my paper yesterday...
What is a ScienceCloud?

A cloud infrastructure is:

*An infrastructure to provide users with the most flexible way to allocate computational power and storage space.*

- quickly provide a customized research infrastructure
- integrate infrastructure provisioning in your data analysis.
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Why would you care?

Researchers’ FAQ:

- How can I run this data analysis on 1000 cores since on my laptop is too slow? (btw, I need to submit for publication by end of this month)

- Where can I put this 100TB of data that I need to analyze? (did I tell you I have a deadline end of this month?)

- How can I automate all of this? Can you do it for me?

- Do I need to adapt my application to run on your system? Can you do it for me?
The infrastructure adapts to the use case

ScienceCloud is not an isolated service.

$S^3$IT provides solutions for your data analysis use case:

- Usecase analysis
- Solution engineering and implementation
- Tools to run large scale data analysis and to automate the infrastructure provisioning:
  - GC3Pie
  - Elasticcluster
- Development to implement large-scale data analysis solutions
- And the infrastructure where to run it.
Design requirements

An University wide infrastructure like this needs to be

- flexible

- horizontally scalable

- reliable

- fast
Flexibility (why)

- Reduce time to get actual results
- Tools that allow to run on multiple infrastructures (portability)
- Automation (more research, less development for you)
**Flexibility (how)**

- virtualization

- network APIs
  - custom *glue* scripts

- flexible/extendible storage
Scalability

To keep up with the always changing needs of researchers we need to grow quickly and effectively.

- Fast acquisition of hardware
- Automated deployment
- Compute: OpenStack
- Storage: Ceph
Reliability

In big infrastructures

- Something breaks every month.
- Maintenance downtimes are painful for the users

Solution:

- All main services are redundant
- Network fully redundant
- Power fully redundant
- Storage replicated on 3 failure domains (by default)

Caveat:

Single VMs are not highly available: S\textsuperscript{3}IT can help you implementing the desired reliability model for your application (which is what business applications are doing nowadays, btw).
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Speed

speed is *time to solution*

- Fast startup of VMs
- Support in design/implement of the infrastructure
- Fast cpu/network/storage
Training/support

- help@s3it.uzh.ch for any request/suggestion
- Online documentation on the S³IT wiki (please provide feedback!)
- One day per month allocated for ScienceCloud training (starting from October 2015.)
- Ad-hoc training and site visits on demand

Subscribe to the cloud mailing list to stay tuned on ScienceCloud developments.
Hardware

Now:
- 1536 cores with HyperThreading
  - 6 blade chassis
  - 96 dual-socket E5-2640 v3 16 cores (Haswell), 128GB RAM each
- 12TB RAM total
- 1PB **usable** storage
- 36 storage nodes

End of 2015:
- 3648 cores (7296 threads)
- 19TB RAM total
- 1.7 PB
Thanks to

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Take-home message

- S$^3$IT provides support from the application to the infrastructure
- This is just the beginning: new features and initiatives will come
- ScienceCloud is in production starting from NOW
- Login: cloud.s3it.uzh.ch