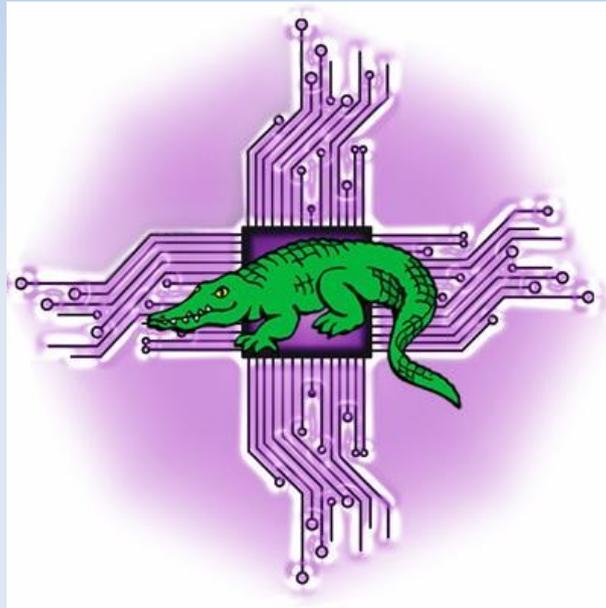


# OpenStack and the Barcelona Summit



**Linux Users of Victoria, February 7, 2017**

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# The Cloud of History

Cloud computing can be defined as an Internet-enabled service (infrastructure, platform, software) that provided various compute resources with rapid deployment. This allows for large sections of in-house compute resources to be shifted to another provide, unless localisation is required.

The major predecessor of cloud services come from both the popularity of Virtual Private Networks in the 1990s to mid-2000s, and hardware virtualisation from around the same period (cf., "*Xen: A Gentle Introduction*", Linux Users Victoria, 2007)

Cloud providers receive their income from applying economies of scale. First major corporate providers were Amazon (August 2006) and Azure (2010). Contemporary market figures concentrate on financial rather than computational aspects can give an inaccurate picture of deployment as a result [1].

Img: Free Software Foundation Europe.

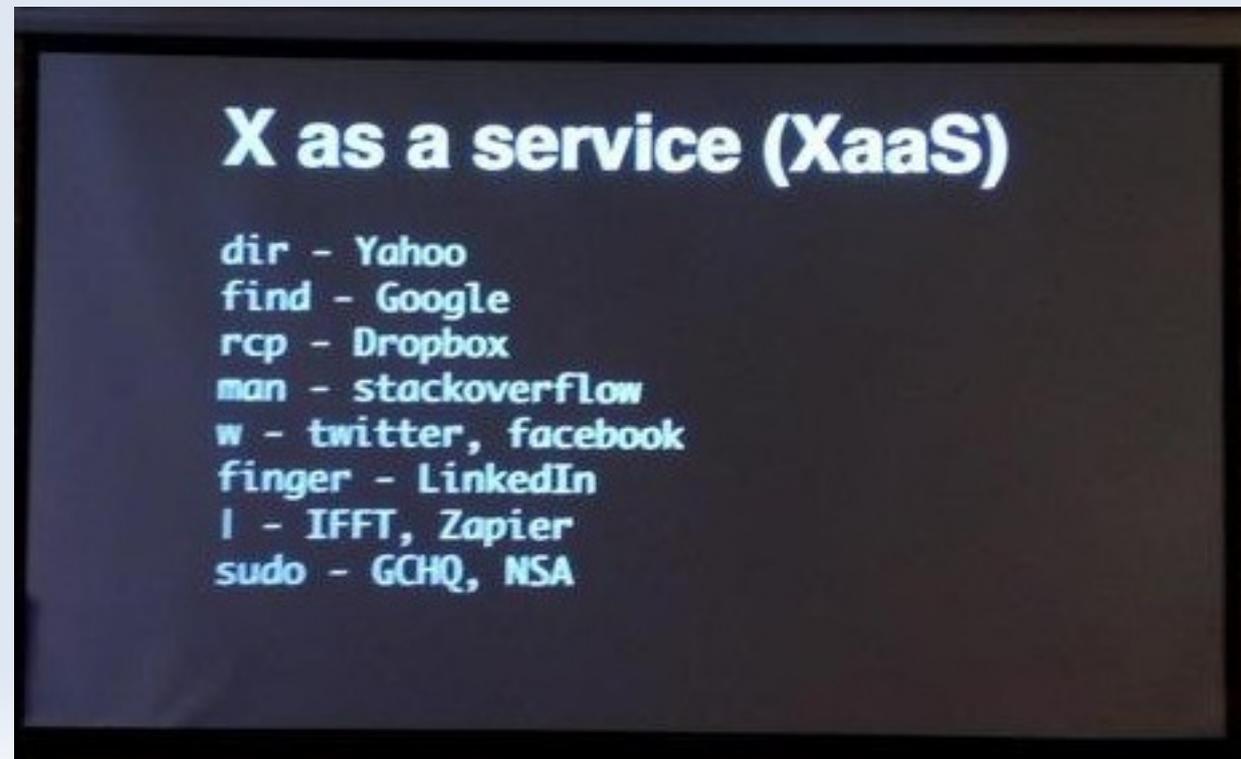


# "X as a Service" and Deployment

The concept of "x as a Service" is fundamental to understanding cloud technologies [2]. At the most broadest level is *\*Infrastructure as a Service\** (IaaS), the provision of compute infrastructure (e.g., virtual machines, storage, network etc) as a service to subscribers. A *\*Platform as a Service\** (PaaS) is the provision of an operating system and select applications. This model is particularly popular among developers.

Finally, at the most basic level is *\*Software as a Service\** (SaaS), which provides user access to particular software applications and related services (e.g., databases). This includes a great variety of web-enabled application services.

Img: According to Chris Dixon,  
Every Unix command eventually  
become an internet service.



# "X as a Service" and Deployment

Another core concept is the type of deployment. A *private cloud* is a cloud infrastructure operated solely for a single organisation or group of organisations (a "community cloud").

A *public cloud* is a cloud infrastructure operated and available for the general public (such as AWS, MS-Azure, Google Drive etc). A *hybrid cloud* hosts some services as private infrastructure and others on public infrastructure.

Core concept: It has more do with ownership of infrastructure than privacy.

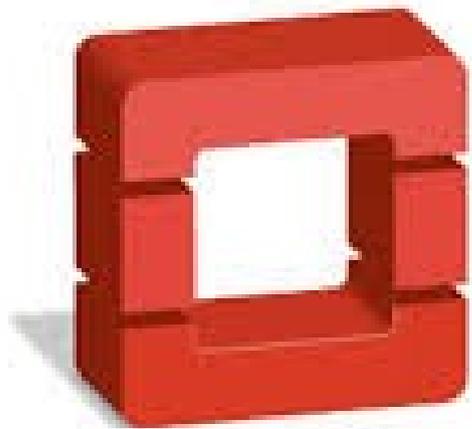
Img: Chaitén volcano and clouds, Chile, 2008



# Open Source Clouds

In mid-2010, Rackspace Hosting and NASA jointly launched an open-source cloud-software initiative known as OpenStack [2] which included a fully distributed object store ("OpenStack Object Storage") from Rackspace's Cloud Files project, and a scalable compute-provisioning engine based on the NASA Nebula cloud ("OpenStack Compute").

It has the largest open-source IaaS installations (e.g., OpenStack CERN, Australia's NeCTAR, China Mobile, India's Snapdeal, State Grid of China, AT&T, Walmart, Comcast etc).



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# Open Source Clouds

However, OpenStack is not the only open source cloud compute service. Also providing IaaS is Apache CloudStack (GPL-ed in 2010) originally from cloud.com and most recently by Citrix, Eucalyptus (2008), originally from Rice University (2003-2008), now Eucalyptus Systems, OpenNebula (2008).

There is also Cloud Foundry (2011), a PaaS initiated from VMWare and Pivotal and now with its own foundation, OpenShift (2011) which also offers container-based PaaS, developed by Red Hat.



# OpenStack Core Services

In the basic sense OpenStack is a software application written in Python. It is designed to run on Linux, with standard installations on Debian, Ubuntu, (Open)SuSE, Red Hat/CentOS. The core services are:

- *Keystone (Identity)*: Provides an authentication and authorization service for other OpenStack services. Provides a catalogue of endpoints for all OpenStack services.
- *Nova (Compute)*: Manages the lifecycle of compute instances in an OpenStack environment; spawning, scheduling and decommissioning of machines on demand.
- *Glance (Images)*: Stores and retrieves virtual machine disk images. OpenStack Compute makes use of this during instance provisioning.
- *Neutron (Networking)*: Enables network connectivity as a service for other OpenStack services, such as OpenStack Compute. Provides an API for users to define networks and the attachments into them.
- *Cinder (Block Storage)*: Provides persistent block storage to running instances. Its pluggable driver architecture facilitates the creation and management of block storage devices.
- *Swift (Object Store)*: Stores and retrieves arbitrary unstructured data objects via a RESTful, HTTP based API. It is highly fault tolerant with its data replication and scale out architecture.

# OpenStack Optional Services

There are many optional services at various levels of development. The following are some the most utilised and mature.

- *Horizon (Dashboard)*: Provides a web-based self-service portal to interact with underlying OpenStack services (e.g., launching an instance, assigning IP addresses, configuring access control).
- *Heat (Orchestration)*: Orchestrates multiple composite cloud applications in plain-text by using either the native HOT template format or the AWS CloudFormation template format.
- *Ceilometer (Telemetry)*: Monitors and meters the OpenStack cloud for billing, benchmarking, scalability, and statistical purposes.
- *Ironic (Bare-Metal provisioning)*: Provision bare metal machines instead of virtual machines, forked from the Nova baremetal driver.
- *Designate (DNS Service)*: Designate provides DNSaaS service, integrated with Keystone for authentication, and Nova and Neutron for auto-generation, and support for PowerDNS and Bind9.

# OpenStack Optional Services

- *Trove (Database)*: Provide scalable and reliable Cloud Database as a Service (CDaaS) provisioning functionality for both relational and non-relational database engines.
- *Magnum (Containers)*: Provides container orchestration for engines such as Docker Swarm, Kubernetes, and Apache Mesos available in OpenStack.
- *Murano (Application Catalogue)*: Provides an application catalogue for developers and administrators to speed up development and deployment.
- *Sahara (Elastic Map Reduce)*: Provides a simple means to provision a data-intensive application cluster (e.g., Hadoop or Spark) on OpenStack.
- *Manila (Shared Filesystems)*: Provides a shared file system service, coordinating access to shared or distributed file systems.
- *Barbican (Key Management)*: Provides a REST API designed for the secure storage, provisioning, passwords, encryption keys and X.509 Certificates etc.
- *Zaqar (Messaging Service)*: Provides a REST API for multi-tenant cloud messaging service for web and mobile developers.
- *Congress (Governance)*: Provides policy as a service across cloud services in order to offer governance and compliance for dynamic infrastructures.

# OpenStack Summits

OpenStack is big enough to have major conferences, "summits", twice year since 2010, correlating with an OpenStack software release, typically in April-May and October-November. They attract *thousands* of users. The October 2016 summit was held in Barcelona, with upcoming summits to be held in Boston (May 8-11) and Sydney (Nov 6-8). In addition there is "OpenStack Days", regional conferences, held a few times a month which attract hundreds of users.

Apart from vendor and user contributions, the Summits are very important for OpenStack developers. In addition to the "normal" sessions there is also a "design summit", where developer project teams brainstorm topics and get specific work planned and done. Collaborative note taking is done via Etherpad and then documented for various mailing lists.

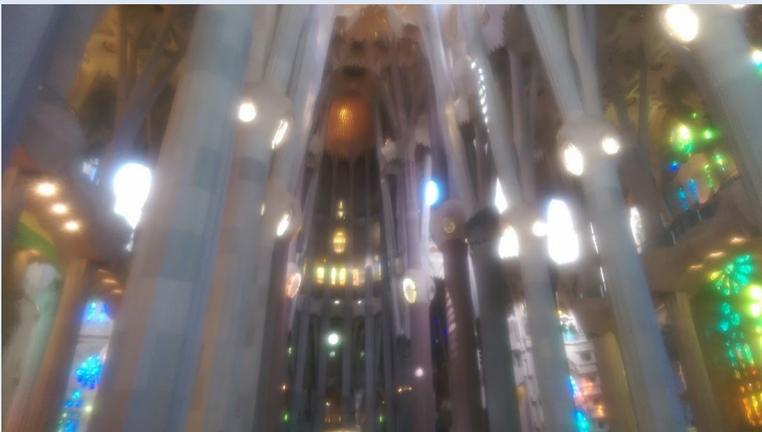


# (Mostly Off-topic tangent)

## Barcelona

Barcelona is awesome :) Located in the NE corner of Spain, it is the capital of the Catalonia region. Average high between 15 (Dec-Jan) and 29 (Aug), rains between 3 (Jul) and 9 days a month (Oct). Primary languages are Castilian and Catalan. Around 1/2 the population of Melbourne and 1/10th of the size. Public transport is cheap and efficient. Busiest passenger port in Europe. Fourth most significant city in the EU by GDP, highest GDP per capita in Spain. Historic and strong autonomy/independence movement. Extraordinary collection of historic and modern buildings and visionary modernist urban design.

The Barcelona Summit was held at *Centre de Convencions Internacional de Barcelona Plaça* (CCIB) and consisted of over 5000 attendees, almost 1000 organisations and companies, and 500 sessions, spread out over three days, plus one day of "Upstream University" prior to the main schedule, plus one day after the main schedule for contributor working parties. It coincided with the release of "Newton".



# Major Announcements with "Newton"

The previous release of OpenStack, "Mitaka", concentrated on integration and management. This included developing a client to have a common command-line across all projects. "Newton" included a very long list of incremental updates, as well as improvements in security, container support, and networking.

There were significant improvements in security, including encrypted credentials in Keystone. OpenStack previously assumed integration with external identity systems (e.g., LDAP). It can now reach security compliance standards e.g., PCI-DSS (Payment Card Industry Data Security Standard).

There has been strong development between the the Neutron network project and Kuryr container networking project. Every system that implements Neutron API can now be used for container networking.

Full support for Neutron networking within the OpenStack client.

Integration between Ironic bare-metal deployment with Magnum container orchestration for containers.

# OpenStack's Future

Barcelona was the last traditional OpenStack Summit. It included a 'Design Summit' as part of the general summit for developers. After Barcelona, the OpenStack Summit (e.g., Boston, Sydney etc) will include the OpenStack Forum, designed for strategic tasks, and the new Project Team Gathering (PTG), which occurs prior to the summits and concerns itself with technical implementations.

As a result, the Octata Design Summit occurred at Barcelona, the Pike Project Teams Gathering (PTG) was held in Atlanta, in Feb 2017, which also included the Octata release. The Forum will be held in Boston in May, etc.

Major changes include: ephemeral disks for containers and PCI passthrough devices to Hyper-V instances (Nova)., resource tags for subnet, port, subnetpool and router resources (Neutron), and many more minor upgrades and development: <https://releases.openstack.org/octata/>

## **Conclusion**

OpenStack is already big and growing fast. Because it is free and open-source some IT commentators have significantly underestimated its utilisation.

# References

- [1] Louis Columbus, Roundup Of Cloud Computing Forecasts And Market Estimates, Forbes, March 13, 2016
- [2] Alex Amies, Harm Sluiman, Qiang Guo Tong, Guo Ning Liu, Developing and Hosting Applications on the Cloud, IBM Press, 2012
- [3] Jim Curry, Introducing OpenStack, July 19, 2010  
<https://www.openstack.org/blog/2010/07/introducing-openstack/>

See also: Videos of all presentations at OpenStack Barcelona Summit, 2016

<https://www.openstack.org/videos/summits/show/7>

Stig Telfer, *The Crossroads of Cloud and HPC: OpenStack for Scientific Research*, Open Stack, 2016

Thanks to the University of Melbourne for supporting the attendance to the OpenStack Barcelona Summit and for Martin Paulo for reviewing this document.

**THANKS FOR WATCHING**



**& LISTENING PATIENTLY**