Getting Started Hacking on OpenNebula

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OpenNebula**.org**

- What is IaaS?
- What is OpenNebula?
- Demo!
- OpenNebula from the…
  - Cloud provider perspective
  - Cloud integrator perspective
- Advanced Deployments
- OpenNebula Apps
- How to try it out

What is IaaS?

Types of Cloud Computing

	What	Who
Software as a Service	On-demand access to any application	End-user (does not care about hw or sw)
Platform as a Service	Platform for building and delivering web applications	Developer (no managing of the underlying hw & sw layers)
Infrastructure as a Service / **Physical Infrastructure**	Raw computer infrastructure	System Administrator (complete management of the computer infrastructure)
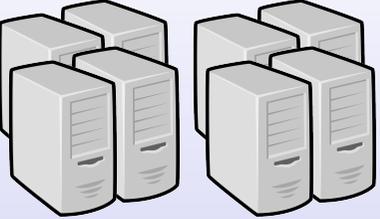
Challenges of IaaS Clouds

- How do I provision a new VM?
  Image Management & Context

- Where do I store the disks?
  Storage

- How do I set up networking for a multitier service?
  Network & VLANs

- Where do I put my web server VM?
  Monitoring & Scheduling

- How do I manage any hypervisor?
  Virtualization

- Who has access to the Cloud's resources?
  User & Role Management

- How do I manage my distributed infrastructure?
  Interfaces & APIs

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- W...
  S...

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  Interfaces & APIs

Uniform management layer that orchestrates multiple technologies

OpenNebula

What is OpenNebula?

IaaS Cloud Computing Tool for Managing a Data Center's Virtual Infrastructure

Data Center Virtualization Manager

- Open-source Apache license
- Interoperable, based on standards
- Adaptable

Private Clouds

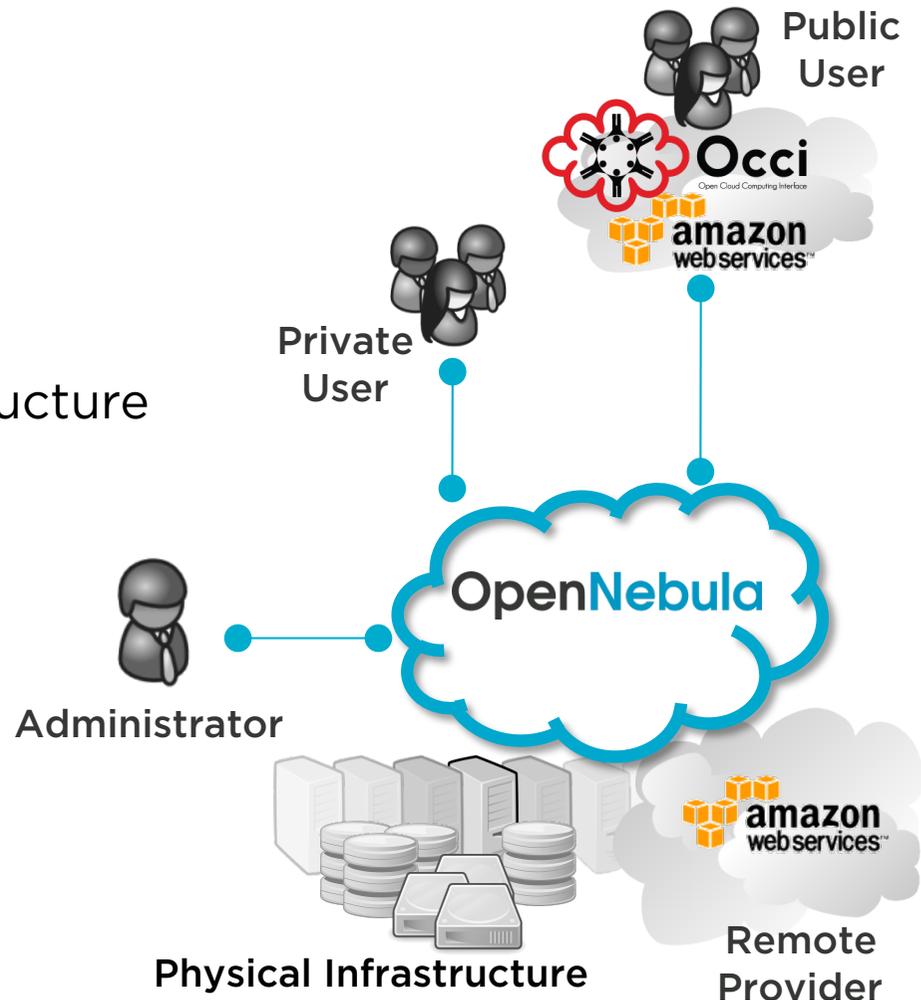- Virtualize your on-premise infrastructure

Pubic Clouds

- Expose standard cloud interfaces

Hybrid Clouds

- Extend your private cloud with
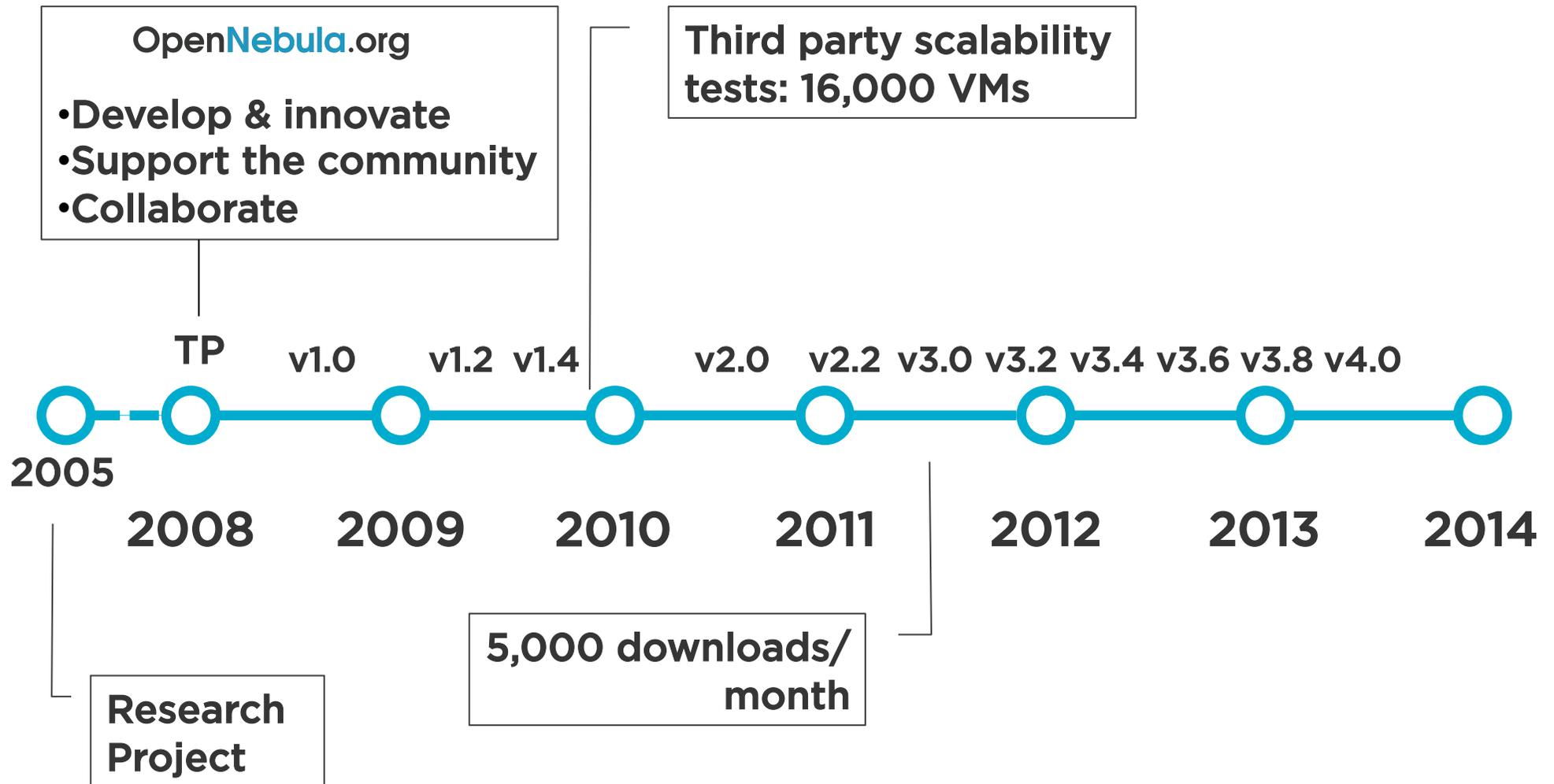
resources from a remote cloud provider

Ready for end-users

- Advanced user management
- CLI and Web Interface

Rigorously Tested, Matured Through Vibrant Community and Many Release Cycles

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- Develop & innovate
- Support the community
- Collaborate

Third party scalability
tests: 16,000 VMs

TP   v1.0   v1.2 v1.4   v2.0   v2.2 v3.0 v3.2 v3.4 v3.6 v3.8 v4.0

2005

2008   2009   2010   2011   2012   2013   2014

Research
Project

5,000 downloads/
month

What is OpenNebula?

OpenNebula (logo, top right)

Widely Used to Build Enterprise Private Clouds in Medium and Large Data Centers

Reference Users

Survey Q2/Q3 2012 (2,500 users http://c12g.com/resources/survey/)
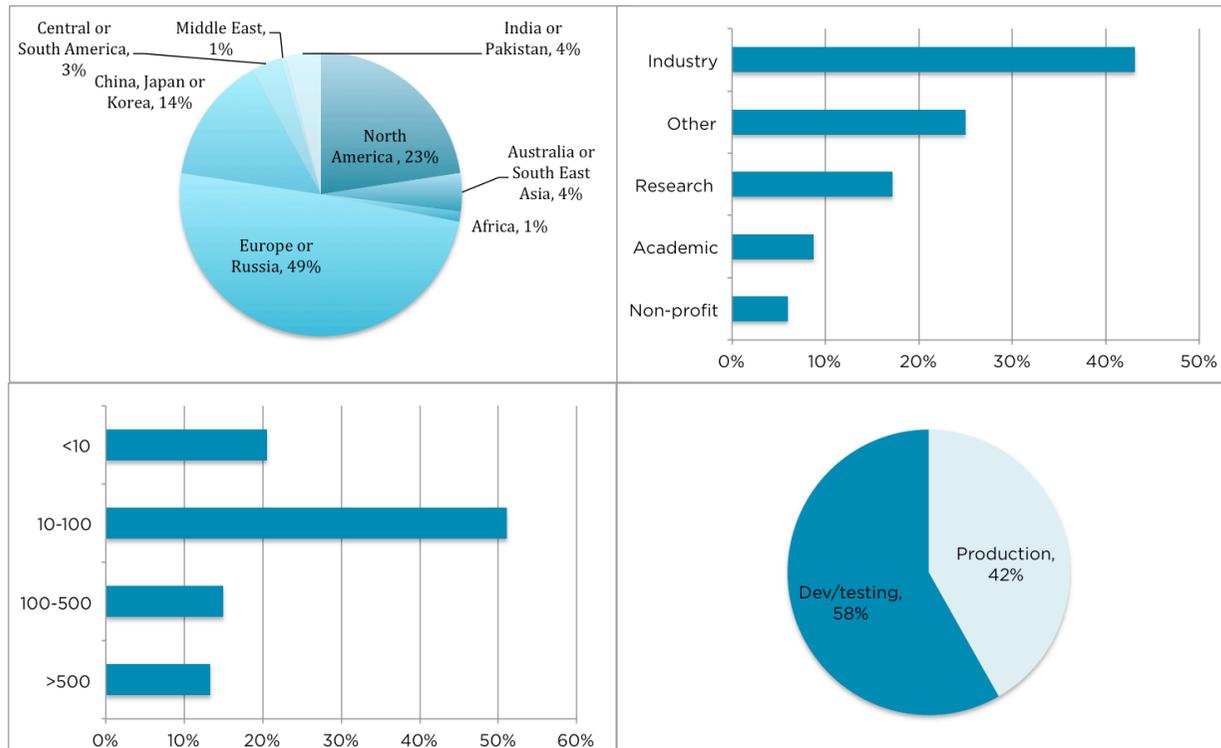
The OpenNebula Model

- **Adaptable**: Integration capabilities to fit into any data center

- **Enterprise-ready**: Upgrade process and **commercial support**

- **No Lock-in**: Infrastructure and platform independent

- **Light**: Efficient & simple

- **Proven**: Rigorously tested, mature and widely used

- **Scalable**: single instance & multi-tier architectures

- **Interoperable**: rich set of API's & Interfaces
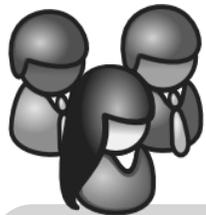

- Open Source: **Apache License v2**

Demo Time!

A Quick Tour of OpenNebula's Main Features

OpenNebula

What are the Main Components to Build a Cloud Infrastructure?
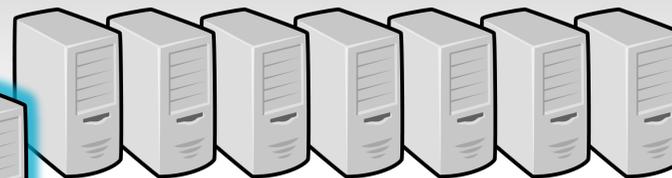
VM Instance Networks

- Public and private networks

Internet

Front-end

- Authentication
- Authorization
- ACLs, roles, groups...
- Accounting
- Logging
- Resource quotas

Hosts

- No need to install any software
- Multiple hypervisors
- Up to 500 hosts
- Automatic failover and HA
- Resource pools
- Automatic resource allocation

Service Networks

- Monitoring, control...
- Live migration...
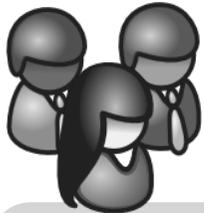- Storage access...

Datastores

- VM image storage
- Multiple datastores
- Heterogeneous configurations
- Shared or non-shared
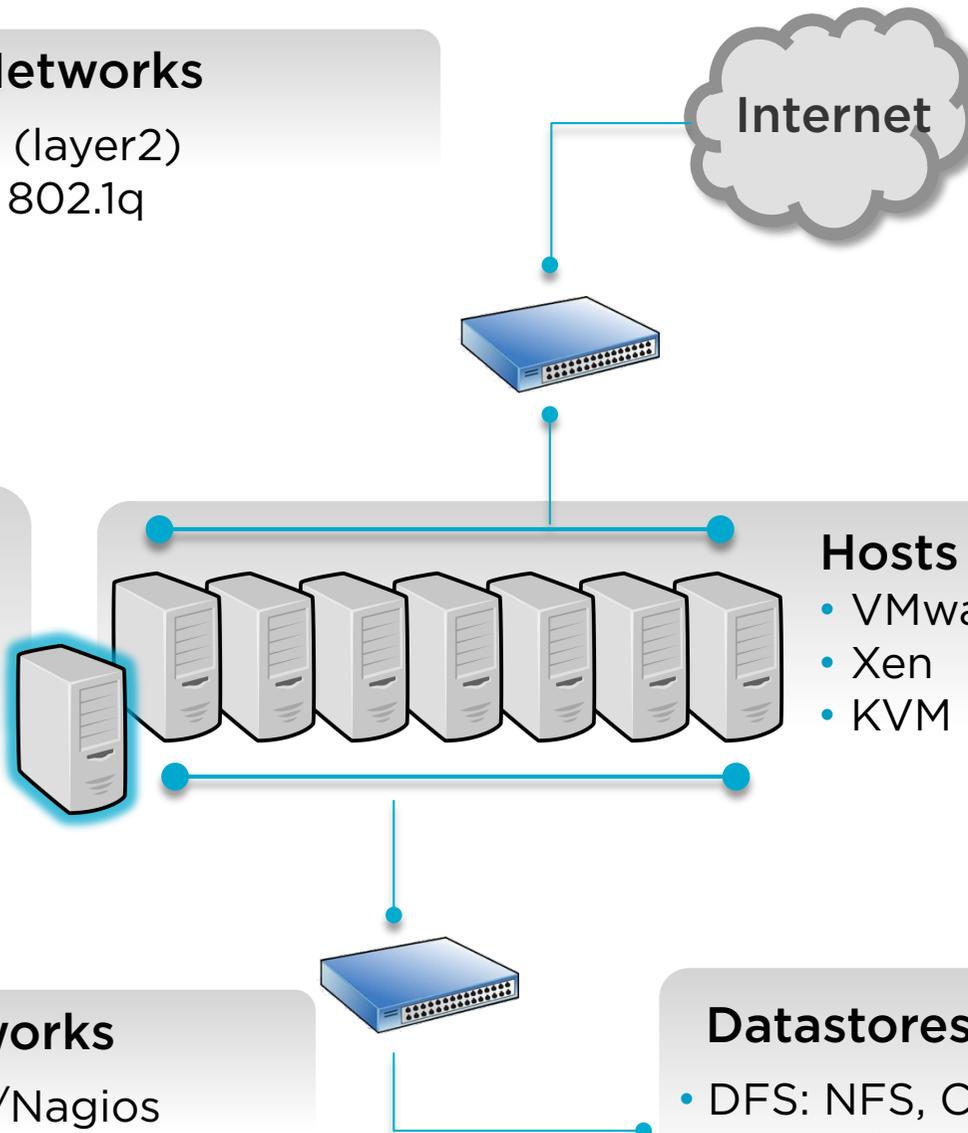
Broad Commodity and Enterprise Platform Support

VM Instance Networks

- VLAN per user (layer2)
- Open vSwitch, 802.1q
- Ebtables

Internet

Front-end

- X509, LDAP, ssh keys
- ACLs, permissions, groups
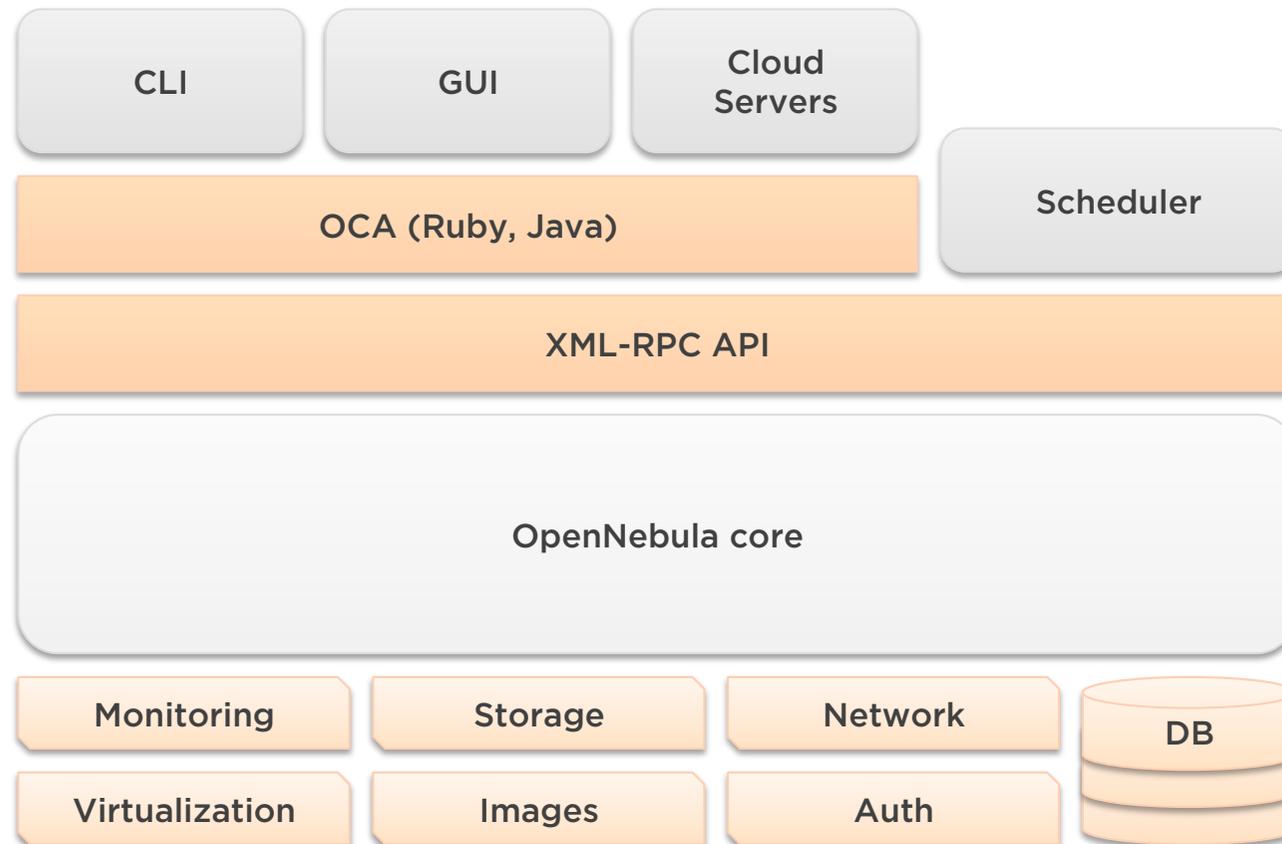
Hosts

- VMware
- Xen
- KVM

Service Networks

- SSH, Ganglia/Nagios
- Additional monitor agents

Datastores

- DFS: NFS, Ceph, Gluster, GlusterFS...
- SAN: Fibre Channel, iSCSI, LVM...
- SSH

The Cloud Integrator Perspective

Internal OpenNebula Architecture

CLI	GUI	Cloud Servers

OCA (Ruby, Java)	Scheduler

XML-RPC API

OpenNebula core

Monitoring	Storage	Network	DB
Virtualization	Images	Auth	

Design Principles

- Modularity
- Lightness
- Openness

Languages

C++		39%
Ruby		23%
JavaScript		20%
shell script		5%
Other		13%

Sysadmin-centric Approach

CLI	GUI	Cloud Servers

OCA (Ruby, Java)   Scheduler

XML-RPC API

OpenNebula core

Monitoring | Storage | Network | DB
Virtualization | Images | Auth
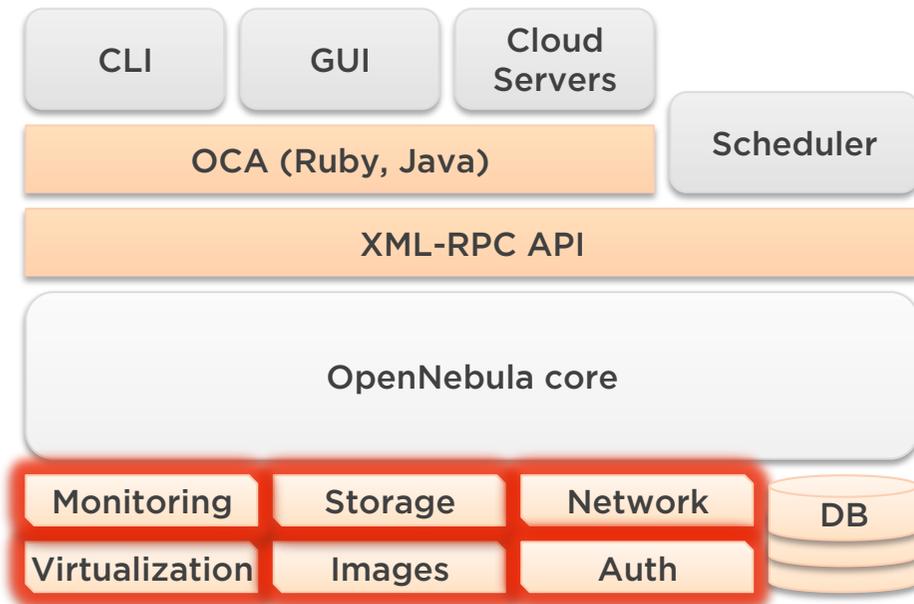
Easy to adapt

Easy to create new ones

OpenNebula drivers

- Small script for each action, written in any language
- Simple interaction done through arguments, std/err output, exit code
- Different drivers can co-exist in heterogeneous environments
- Can be executed locally or in the remote Host
- The Host monitorization updates the remote driver directory

How to Develop Drivers

An example: the migrate script

- Each script performs a small, synchronous task
- Helper scripts provide commonly-used functions for log, ssh execution, error reporting, etc.

```
.
|____xen
|  |____save
|  |____shutdown
|  |____restore
|  |____reboot
|  |____xenrc
|  |____deploy
|  |____poll
|  |____cancel
|  |____migrate
|  |____poll_ganglia
```

```
1  #!/bin/bash
2
3  source $(dirname $0)/xenrc
4  source $(dirname $0)/../../scripts_common.sh
5
6  deploy_id=$1
7  dest_host=$2
8
9  exec_and_log "$XM_MIGRATE $deploy_id $dest_host" \
10     "Could not migrate $deploy_id to $dest_host"
11
```

How to Interact with OpenNebula
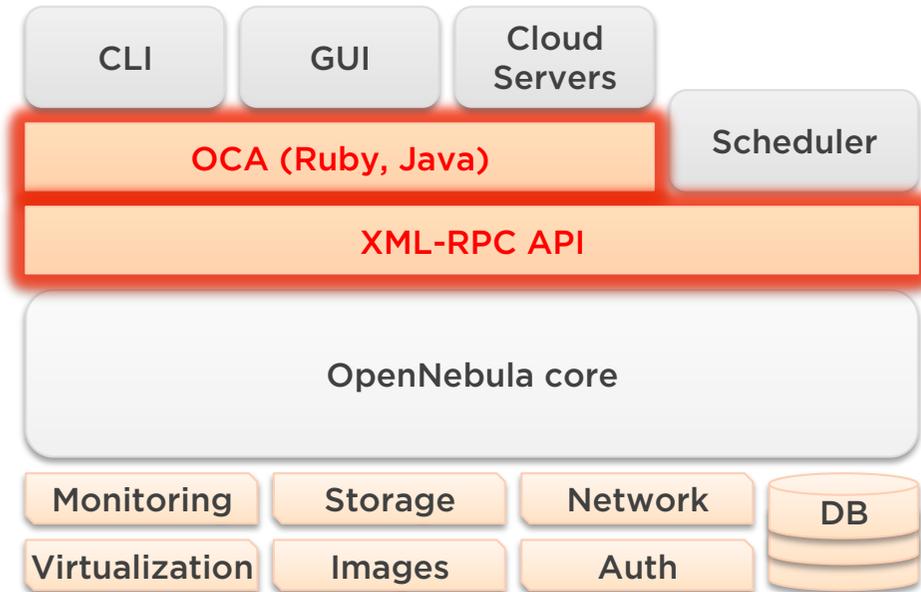
XML-RPC

- Simple, fast
- Works in any language

OCA (OpenNebula Cloud API)

- High level bindings
- Complete functionality
- Ruby, Java, Python

The Cloud Integrator Perspective

## How to Interact with OpenNebula

OCA Ruby Example:

Shutdown all my Virtual Machines

```ruby
1   #!/usr/bin/env ruby
2
3   require 'OpenNebula'
4
5   CREDENTIALS = "oneuser:onepass"
6   ENDPOINT    = "http://localhost:2633/RPC2"
7
8   client = OpenNebula::Client.new(CREDENTIALS, ENDPOINT)
9
10  vm_pool = VirtualMachinePool.new(client, OpenNebula::Pool::INFO_MINE)
11
12  rc = vm_pool.info
13  if OpenNebula.is_error?(rc)
14      puts rc.message
15      exit -1
16  end
17
18  vm_pool.each do |vm|
19      rc = vm.shutdown
20      if OpenNebula.is_error?(rc)
21          puts "Virtual Machine #{vm.id}: #{rc.message}"
22      else
23          puts "Virtual Machine #{vm.id}: Shutting down"
24      end
25  end
26
27  exit 0
```
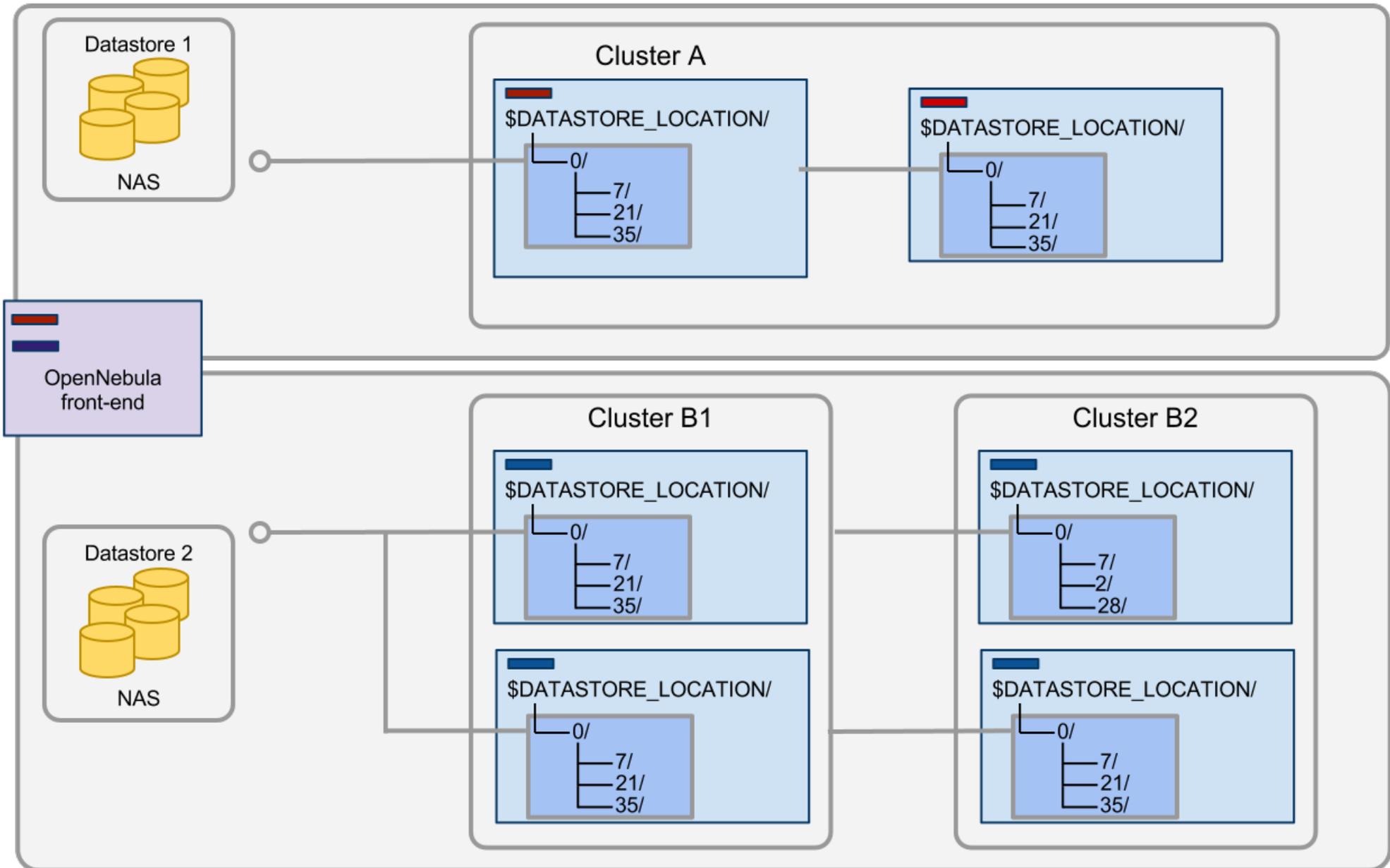
Clustering the Physical Resources

Clusters

- **Pools of hosts** that share datastores and networks
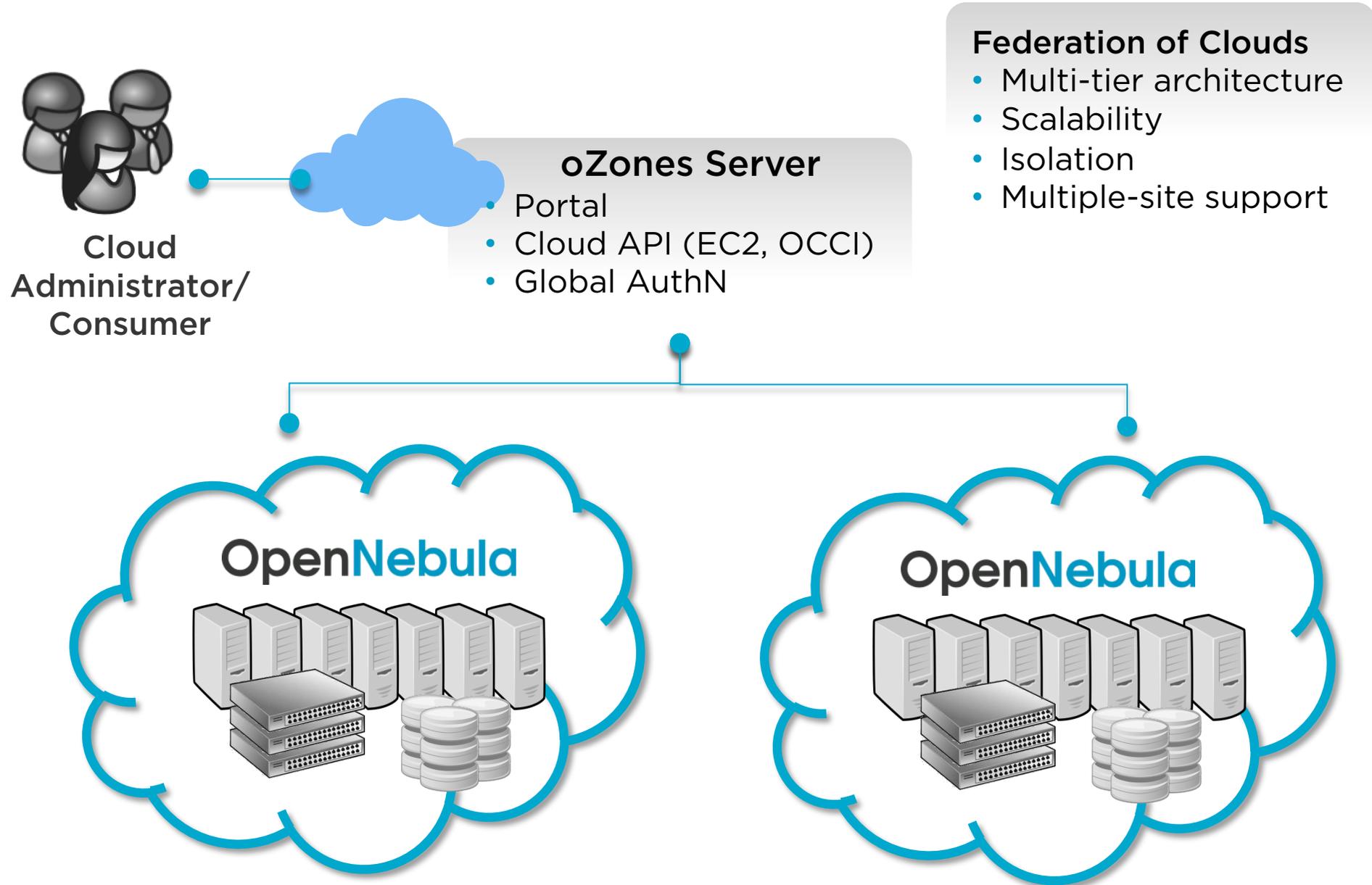- Used for **load balancing**, **high availability**, and **high performance** computing
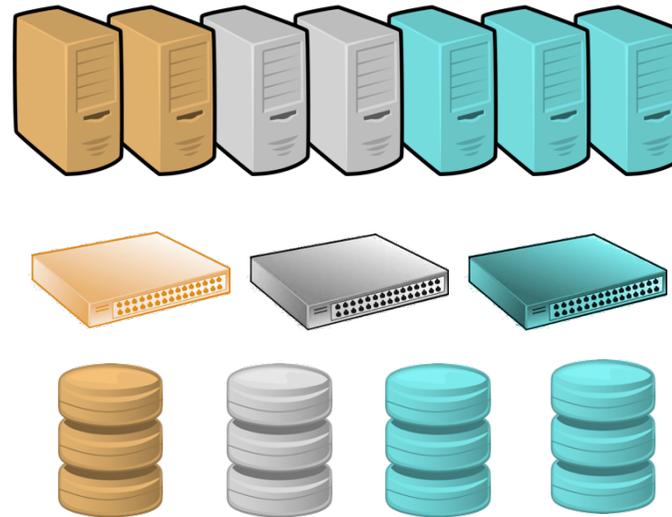
Multiple Datastores per Cluster

- **Balance I/O operations** between storage servers
- Define different **SLA policies** (e.g. backup) and **performance features** for different VM types or users

Advanced Deployments

Multiple and Heterogeneous back-ends

Advanced Deployments

Centralized Management of Multiple OpenNebula Instances (Zones)

Federation of Clouds
- Multi-tier architecture
- Scalability
- Isolation
- Multiple-site support

Cloud Administrator/ Consumer

oZones Server
- Portal
- Cloud API (EC2, OCCI)
- Global AuthN

OpenNebula

OpenNebula

Virtual Data Centers

Virtual Private Cloud Computing

- Typical scenario in large organizations and cloud providers
- On-demand provision of fully-configurable and isolated VDC with full control and capacity to administer its users and resources
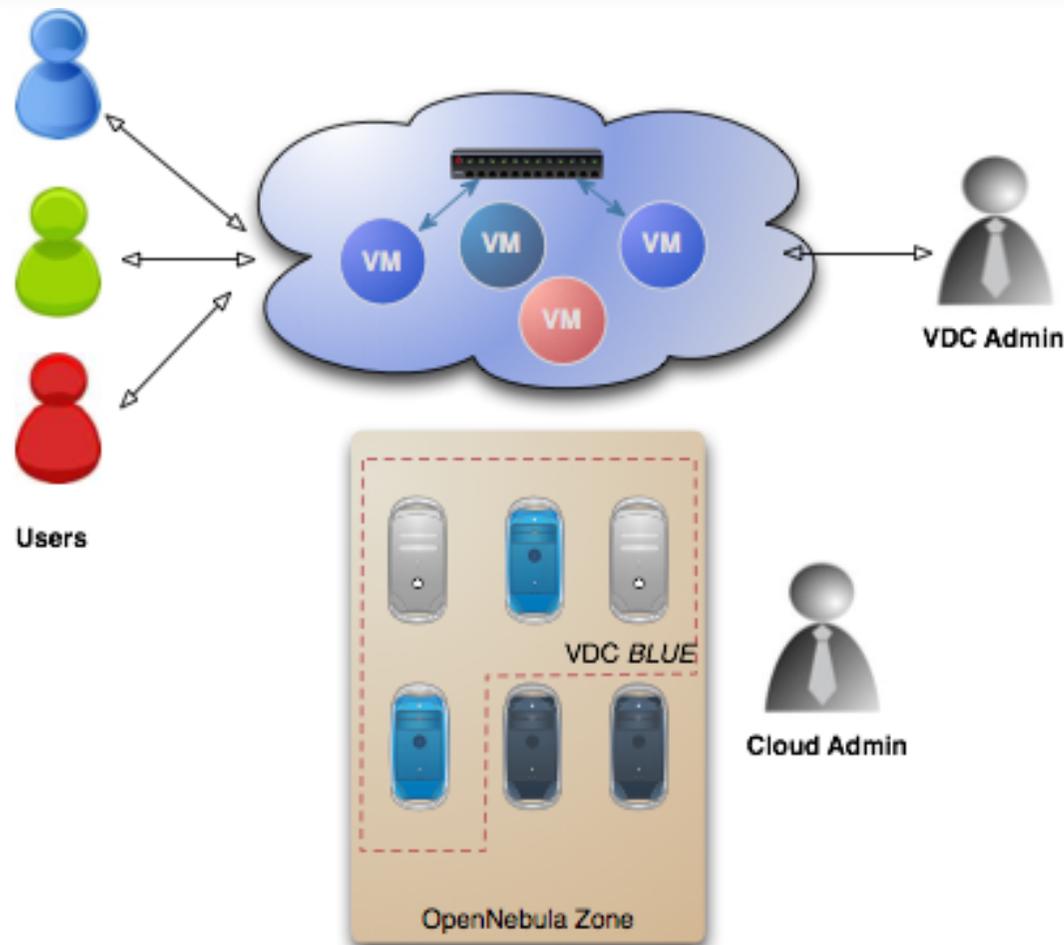
Hybrid Cloud Computing

- Extension of the local private infrastructure with resources from remote clouds
- Cloudbursting to meet peak or fluctuating demands

OpenNebula Apps
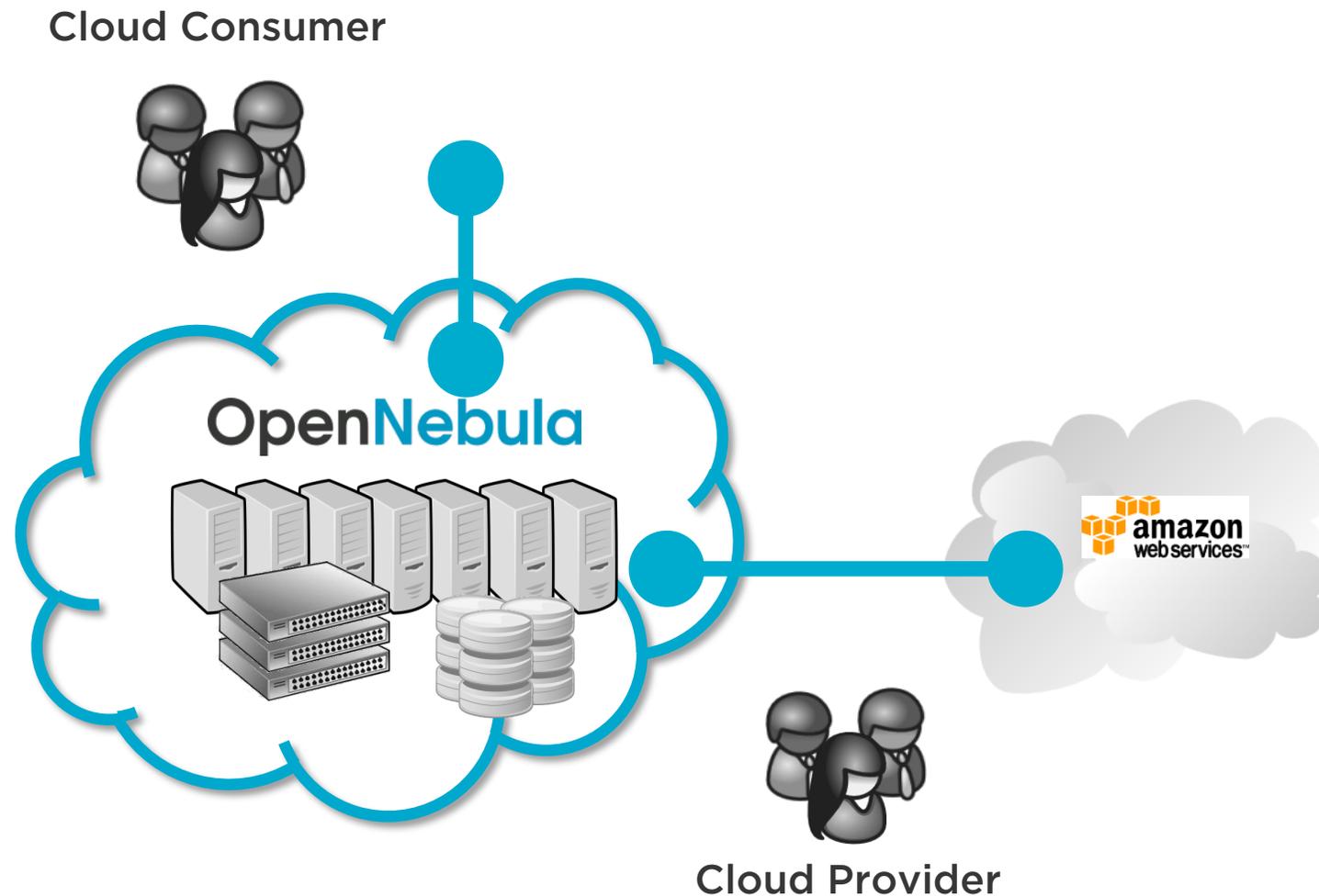
Suite of Tools for Users and Administrators

App Flow

- Manage muti-tiered applications as single entities
- Deployment dependencies
- Elasticity rules

App Stage

- Automate the customation of VMs
- Chef recipes

App Market

- Host your own marketplace
- Centralized catalog to share and distribute virtual appliances across OpenNebula instances
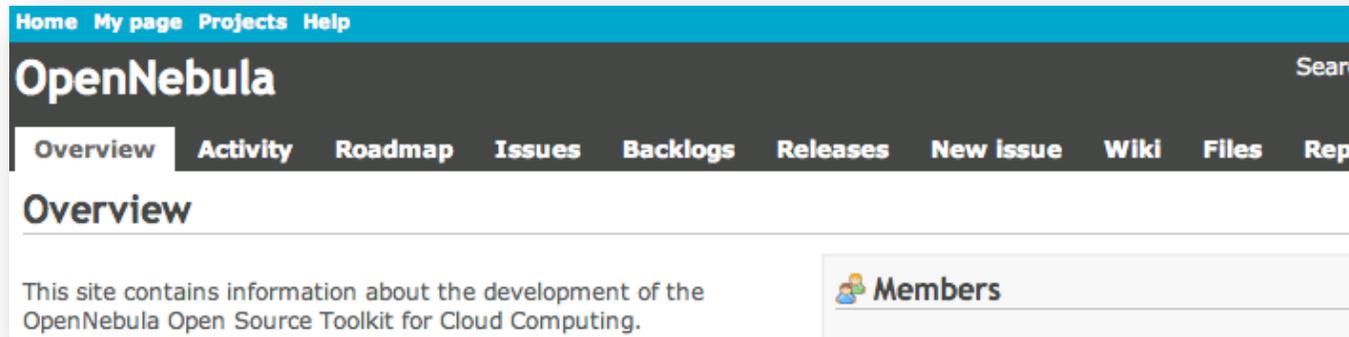
Try it Out!

OpenNebula Sandboxes

● OpenNebula pre-installed in a VM: VirtualBox, KVM, VMware, Amazon

How to contribute

- Join our mailing list
- Follow the development at **dev.opennebula.org**

Ecosystem projects

- OpenNebula hosts an ecosystem catalog
- Promote and discuss ecosystem projects in our ecosystem mailing list

IRC Channel

- #opennebula on irc.freenode.net

Join Us in the OpenNebula Conf 2013!

OpenNebula Conf 2013

24 - 26 September in Berlin

The OpenNebula Project is proud to announce the first OpenNebula Global Conference. The Conference will serve as a meeting point for OpenNebula cloud users, developers, administrators, builders, integrators and researchers and a unique opportunity for discussion and collaboration with other projects. See you in Berlin!

September 24-26, 2013
Starting at 02:00 pm

Berlin
NH Hotel Alexanderplatz

tickets from **€ 595**

REGISTER TODAY >

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- **Free workshop** on the first day of the conference
- Amazing **evening event** on the second day
- Free Wi-Fi during the conference
- **Two nights accommodation** (GOLD)
- Additional dinner on the first day (GOLD)

Visit our Partners' booths at LinuxTag

We Will Be Happy to Answer any Question

TL; DR: OpenNebula is awesome, go check it out!

 @opennebula