



@randybias 

# State of the Stack - 2013

Game. Over. OpenStack is **The Stack.**

June 10th, 2013 - SNIA SPDEcon  
*(first edition delivered at OpenStack Summit, April 2013)*



CCA - NoDerivs 3.0 Unported License - Usage OK, no modifications, full attribution\*  
\* *All unlicensed or borrowed works retain their original licenses*

cloudscaling

# Introduction



# Who

OpenStack Foundation Board of Directors

Prod. OpenStack pioneer, Cloudscaling:

Wins: KT, Internap, LivingSocial, Seagate (EVault),  
IBS Datafort, major U.S. carriers, & others

Part of OpenStack community since July 2010 (launch)

Top 10 Cloud Computing Pioneer

**InformationWeek**



# My Bias

I run an OpenStack product company

I believe the pioneers to emulate are:



I have run big data centers

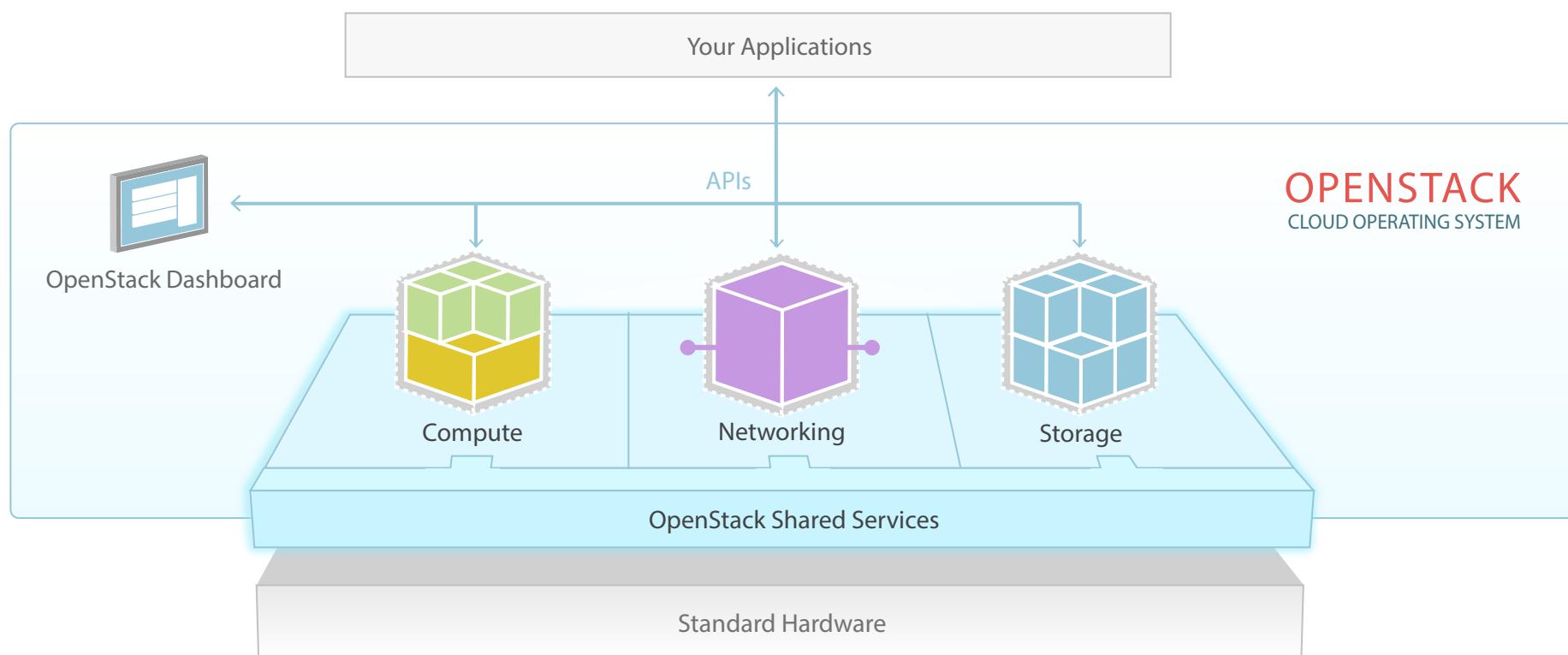
100K+ sq ft, 1,000s of physical servers, 100s of switches

- 1** What is OpenStack?
- 2** Why the Success?
- 3** History & Momentum
- 4** Stackology - a stack taxonomy
- 5** Stacking it Up - a dive into the projects
- 6** Stack Gaps - what's missing?
- 7** Stack Politics - who's playing?
- 8** Who's using it and how?
- 9** Summary

# What is OpenStack?

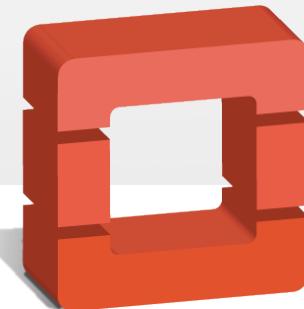


# OpenStack From 10km



# OpenStack Mission

"To produce the ubiquitous Open Source cloud computing platform that will **meet the needs of public and private cloud** providers regardless of size, by being **simple to implement and massively scalable.**"



# OpenStack Foundation Mission

The OpenStack Foundation is an independent body providing shared resources to **help achieve the OpenStack Mission** by Protecting, Empowering, and Promoting OpenStack software and the community around it, including users, developers and the entire ecosystem.

**The ubiquitous cloud computing platform**



# What it is

Some say ...

- ... it's an Infra-as-a-Service (IaaS)
- ... it's a cloud operating system
- ... it's a tool for building private clouds

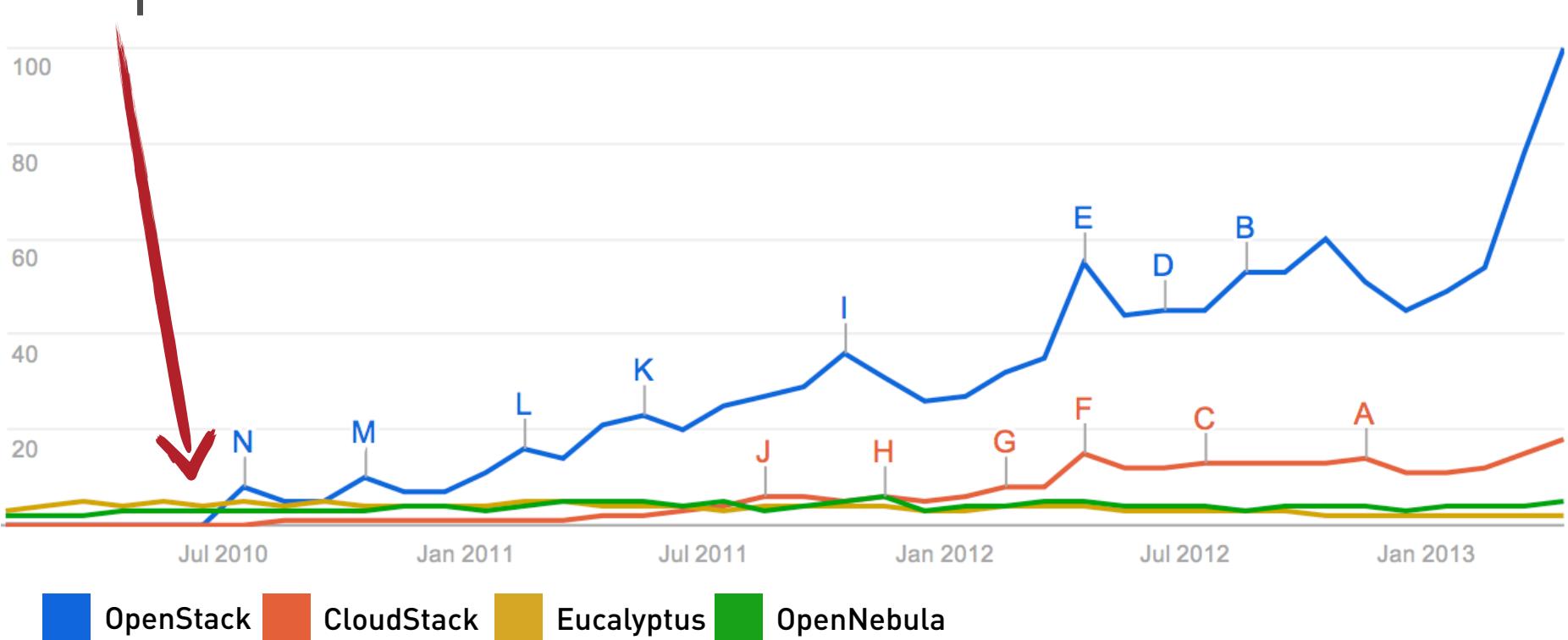


We say it's “The Stack”

- ... think Linux
- ... think Java
- ... think ubiquitous open source cloud toolkit
- ... think *Game Changer*

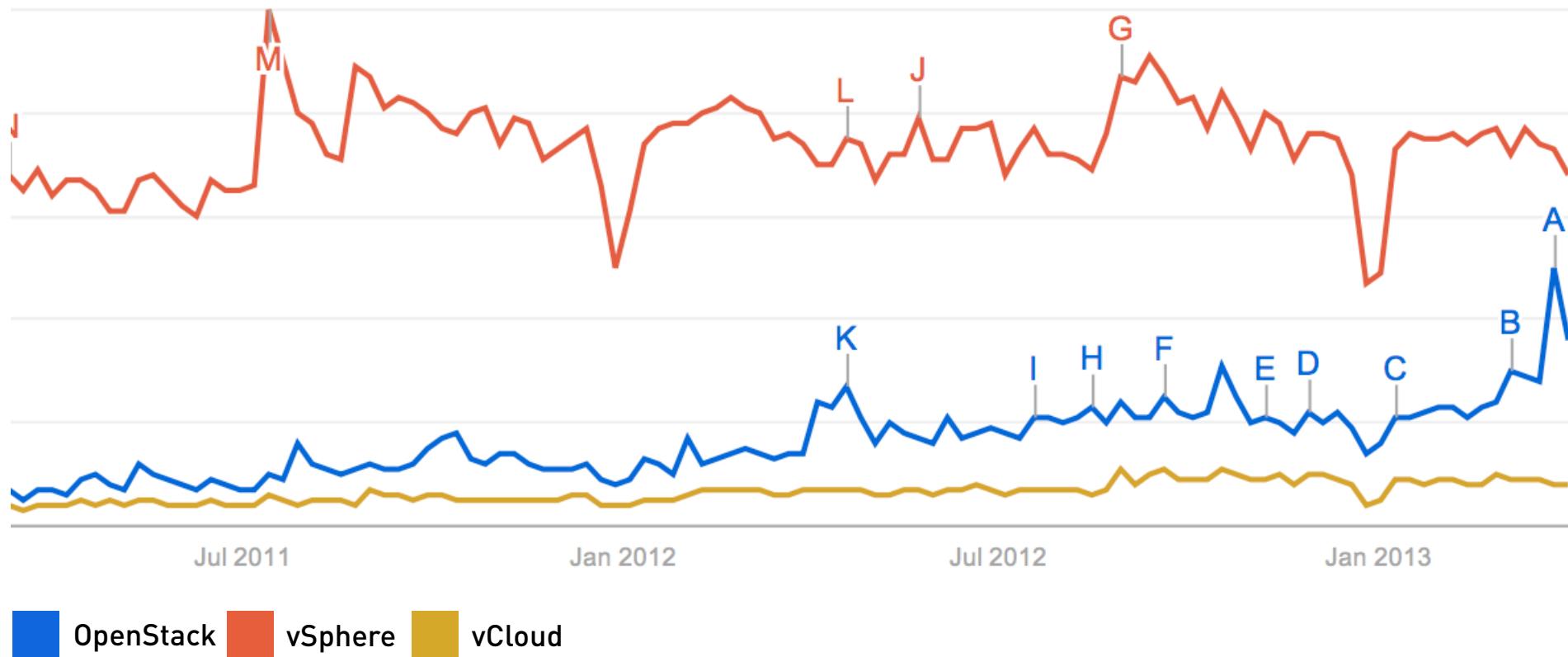
# The Battle is Over (open src)

## OpenStack Launch



Source: [trends.google.com](http://trends.google.com)

# Battle is Nearly Over (closed src)

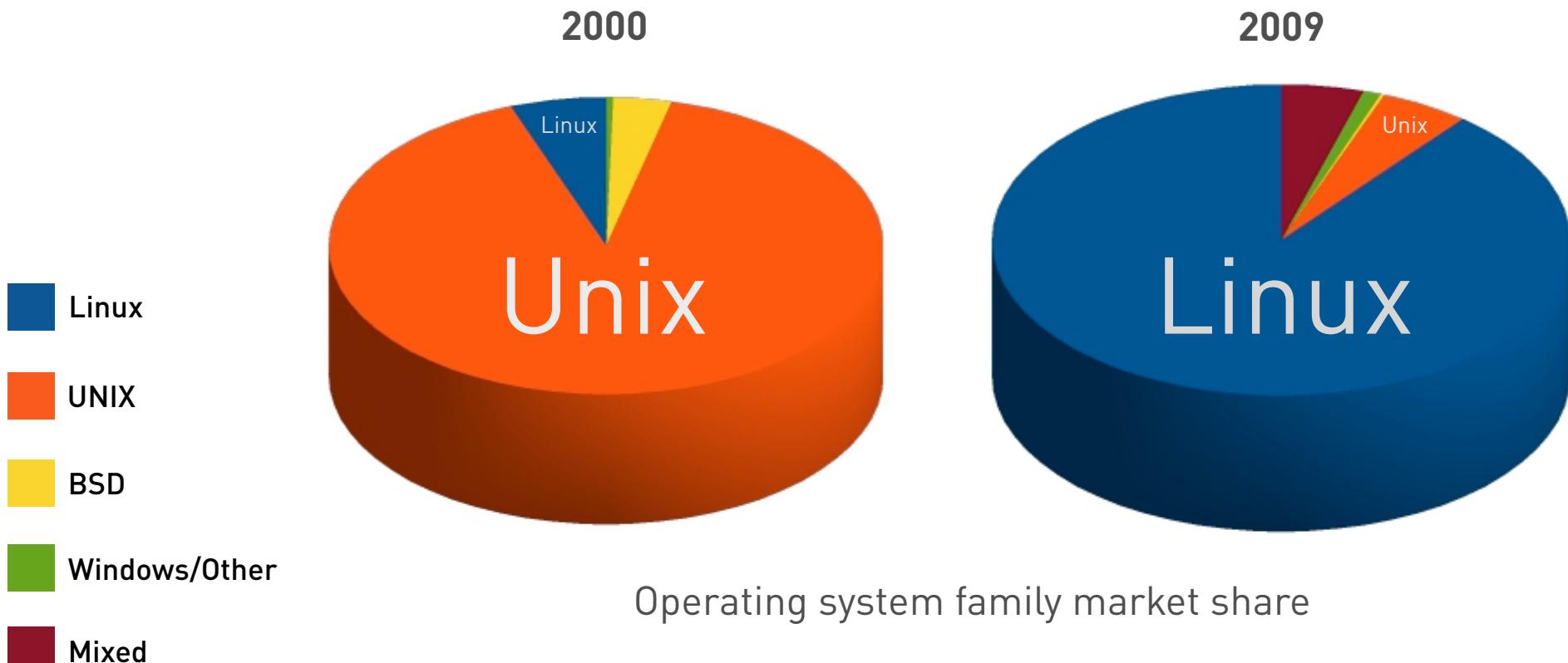


Source: [trends.google.com](http://trends.google.com)



# Linux 2000 vs. Linux 2009

Is this OpenStack's Trajectory?



Source: Linux Magazine  
<http://www.linux-mag.com/id/7749/>



# Fastest Growing Global Open Source Community

COMPANIES

189

INDIVIDUAL MEMBERS

9,000+

TOTAL DEVELOPERS

929

AVERAGE MONTHLY  
CONTRIBUTORS

245

COUNTRIES

100

TOP 10 COUNTRIES

United States, China, India,  
Great Britain, Australia, France,  
Russia, Canada, Ireland, Germany

CODE CONTRIBUTIONS

3,241

“OpenStack appears to be a **more advanced** or **more modern open source** project than some of its predecessors because it's a **highly coordinated** effort.”

– Charlie Babcock  
Information Week



# Grizzly Stats

## CONTRIBUTORS

**517** (+56%)

## PATCHES SUBMITTED

**7,620**

PATCHES / DEV

**~14**

NEW DRIVERS

**15**

## NEW FEATURES

**230**

## TOP 10 CONTRIBUTING COMPANIES

Red Hat, Rackspace, IBM, HP, Nebula, Intel, eNovance, VMware, Cloudscaling, DreamHost

TEST CLOUDS DEPLOYED DAILY

**700**

"OpenStack appears to be a **more advanced** or **more modern open source** project than some of its predecessors because it's a **highly coordinated** effort."

– Charlie Babcock  
Information Week



# Why the Success?



# Who or What Should We Thank?

Rackspace for Letting Go

OpenStack Foundation & Community

Particularly, all of the companies who realized this could be big

Hype Curve

The OpenStack Infrastructure Team

Oslo Project (openstack-common)

A thankless job allowing shared code & cleaner projects

The Big Enterprises for Driving Interest

PTL Generational Shift



# Infrastructure Team

Massive Effort -> Improved Quality

Gated Commits

All Code Has to Jump Through Gates

Tempest Test Framework

Code Reviews & Continuous  
Integration

Jenkins, Gerrit

At scale: [jenkins.openstack.org](http://jenkins.openstack.org)

ceilometer-tarball	0	0%	0	0%	0	0%	0
cilometer-upstream-translation-update	0	0%	0	0%	0	0%	0
check-gerrit-untests	173	100%	0	0%	0	0%	173
c-docs	0	0%	0	0%	0	0%	0
cinder-branch-tarball	0	0%	0	0%	0	0%	0
cinder-coverage	0	0%	0	0%	0	0%	0
cinder-docs	0	0%	0	0%	0	0%	0
cinder-tarball	0	0%	0	0%	0	0%	0
clarkb-node-tester	0	0%	0	0%	0	0%	0
common-bump-milestone	0	0%	0	0%	0	0%	0
config-compare-xml	0	0%	0	0%	0	0%	0
dev-corvus-test	0	0%	0	0%	0	0%	0
devstack-launch-vms-hpcloud-az1	0	0%	0	0%	0	0%	0
devstack-launch-vms-hpcloud-az2	0	0%	0	0%	0	0%	0
devstack-launch-vms-hpcloud-az3	0	0%	0	0%	0	0%	0
devstack-launch-vms-rackspace	0	0%	0	0%	0	0%	0
devstack-launch-vms-rackspace-dfw	0	0%	0	0%	0	0%	0
devstack-launch-vms-rackspace-ord	0	0%	0	0%	0	0%	0
devstack-reap-vms-hpcloud-az1	0	0%	0	0%	0	0%	0
devstack-reap-vms-hpcloud-az2	0	0%	0	0%	0	0%	0
devstack-reap-vms-hpcloud-az3	0	0%	0	0%	0	0%	0
devstack-reap-vms-rackspace	0	0%	0	0%	0	0%	0
devstack-reap-vms-rackspace-dfw	0	0%	0	0%	0	0%	0
devstack-reap-vms-rackspace-ord	0	0%	0	0%	0	0%	0
devstack-update-completed	0	0%	0	0%	0	0%	0
devstack-update-inprogress	0	0%	0	0%	0	0%	0
devstack-update-vm-image-hpcloud-az1	0	0%	0	0%	0	0%	0
devstack-update-vm-image-hpcloud-az2	0	0%	0	0%	0	0%	0
devstack-update-vm-image-hpcloud-az3	0	0%	0	0%	0	0%	0
devstack-update-vm-image-rackspace	0	0%	0	0%	0	0%	0
devstack-update-vm-image-rackspace-dfw	0	0%	0	0%	0	0%	0
devstack-update-vm-image-rackspace-ord	0	0%	0	0%	0	0%	0
diskimage-builder-branch-tarball	0	0%	0	0%	0	0%	0
diskimage-builder-coverage	0	0%	0	0%	0	0%	0
diskimage-builder-tarball	0	0%	0	0%	0	0%	0
fungi-node-tester	0	0%	0	0%	0	0%	0
gate-glance-python26	0	0%	0	0%	0	0%	0
gate-glance-python27	0	0%	0	0%	0	0%	0
gate-keystone-python26	0	0%	0	0%	0	0%	0
gate-keystone-python27	0	0%	0	0%	0	0%	0
gate-nova-python26	0	0%	0	0%	0	0%	0
gate-nova-python27	0	0%	0	0%	0	0%	0
gate-python-keystoneclient-pep8	0	0%	0	0%	0	0%	0
gate-python-keystoneclient-python26	0	0%	0	0%	0	0%	0
gate-python-keystoneclient-python27	0	0%	0	0%	0	0%	0
gate-python-novacentral-python26	0	0%	0	0%	0	0%	0
gate-python-quantumclient-pep8	0	0%	0	0%	0	0%	0
gate-python-quantumclient-python26	0	0%	0	0%	0	0%	0
gate-python-quantumclient-python27	0	0%	0	0%	0	0%	0
gate-quantum-python26	0	0%	0	0%	0	0%	0
gate-quantum-python27	0	0%	0	0%	0	0%	0
gate-swift-python26	0	0%	0	0%	0	0%	0
gate-swift-python27	0	0%	0	0%	0	0%	0
gate-tempest-pep8	0	0%	0	0%	0	0%	0
gear-pypi-upload	0	0%	0	0%	0	0%	0
gear-tarball	0	0%	0	0%	0	0%	0
gearman-plugin-tarball	0	0%	0	0%	0	0%	0
gerrit-package	173	100%	0	0%	0	0%	173
gerrit-package-maven2	173	100%	0	0%	0	0%	173
gerritbot-pypi-upload	0	0%	0	0%	0	0%	0
gerritbot-tarball	0	0%	0	0%	0	0%	0
gerritlib-pypi-upload	0	0%	0	0%	0	0%	0
git-review-branch-tarball	0	0%	0	0%	0	0%	0
git-review-pypi-upload	0	0%	0	0%	0	0%	0
git-review-tarball	0	0%	0	0%	0	0%	0
glance-branch-tarball	0	0%	0	0%	0	0%	0
glance-coverage	0	0%	0	0%	0	0%	0
glance-docs	0	0%	0	0%	0	0%	0
glance-tarball	0	0%	0	0%	0	0%	0

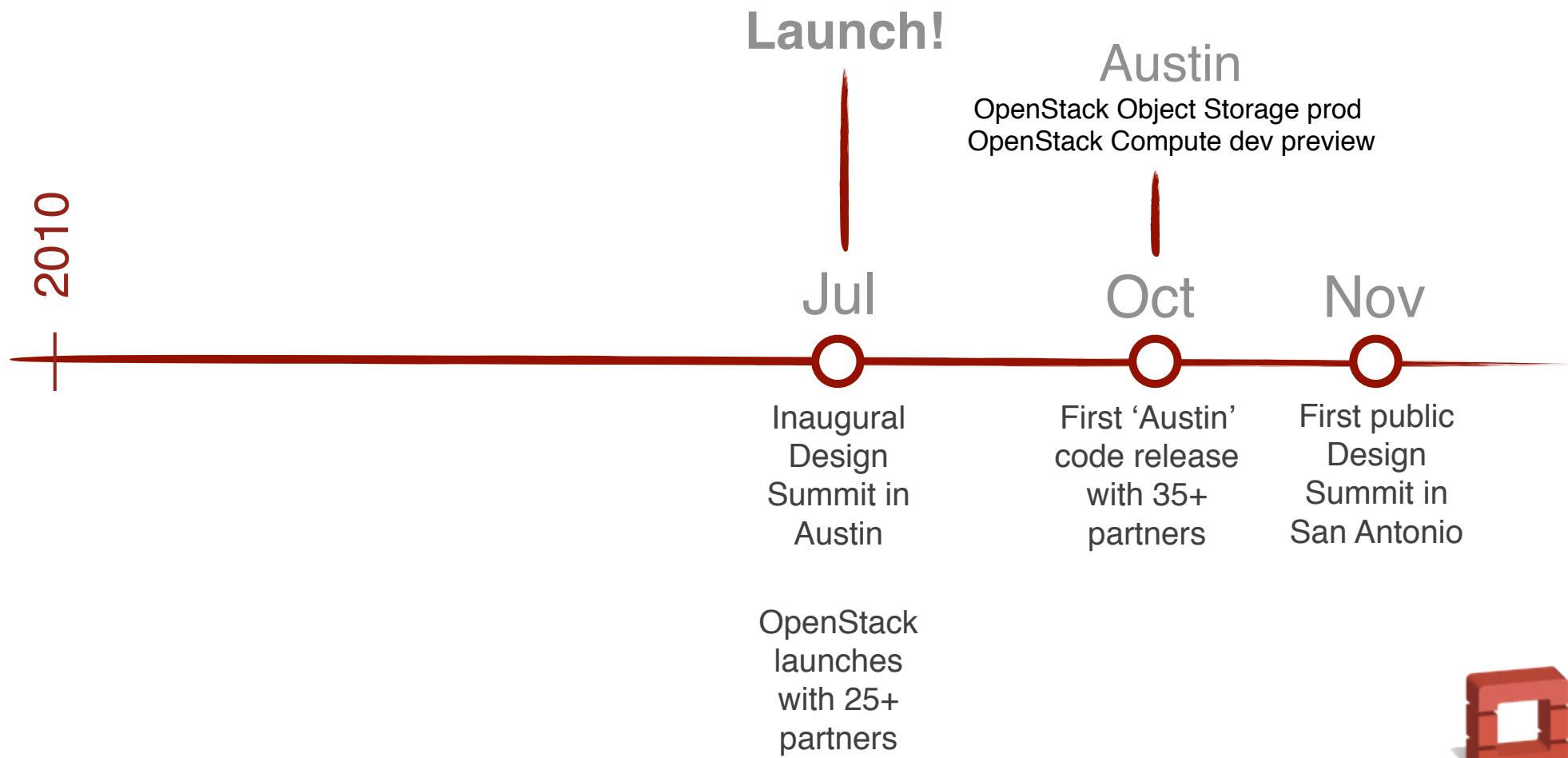
1/4 pages



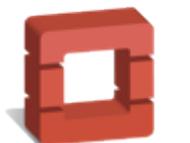
# History & Momentum



# 2010 - The Launch Year



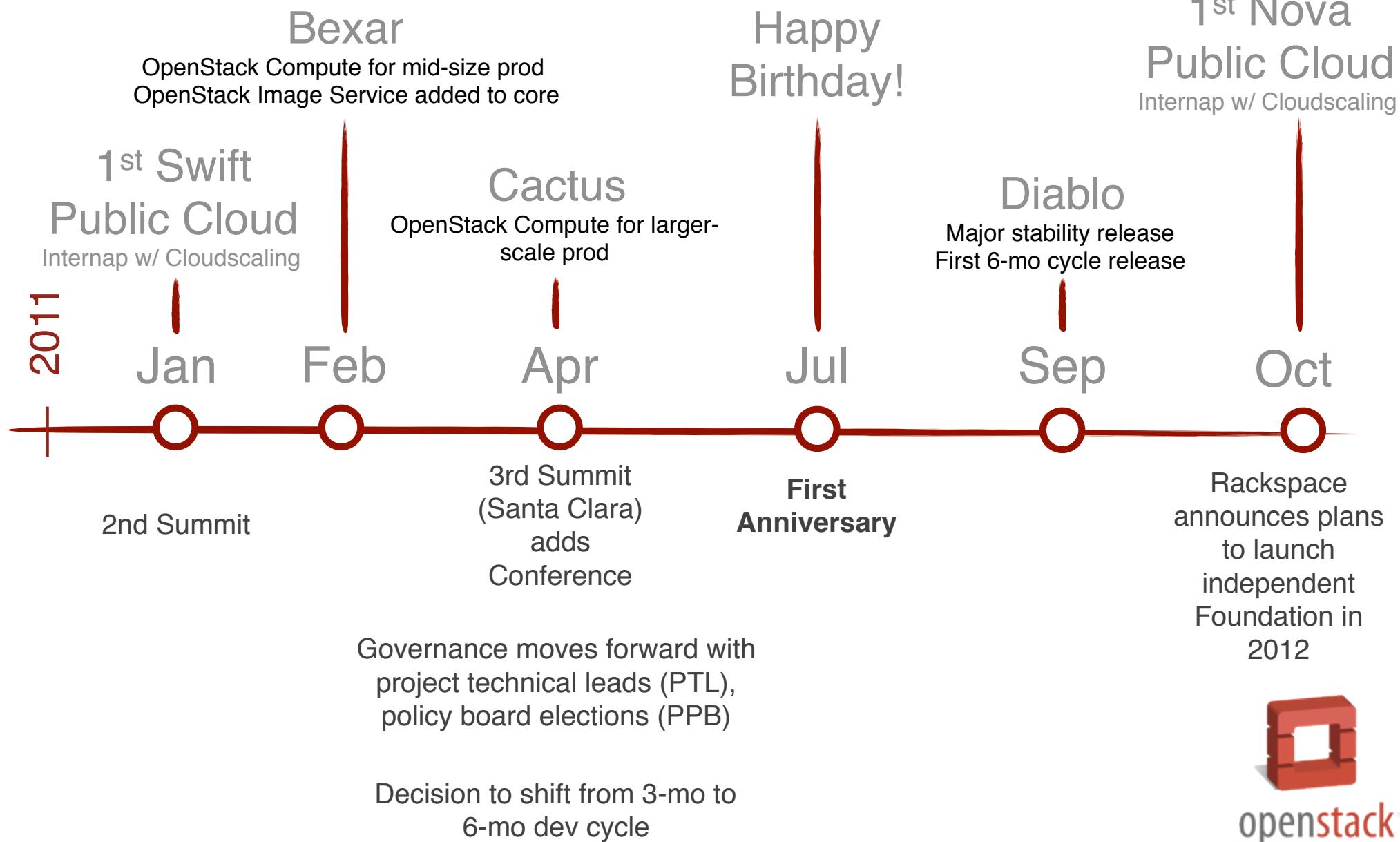
Source: Too many to list; blame me for inaccuracies



openstack  
CLOUD SOFTWARE

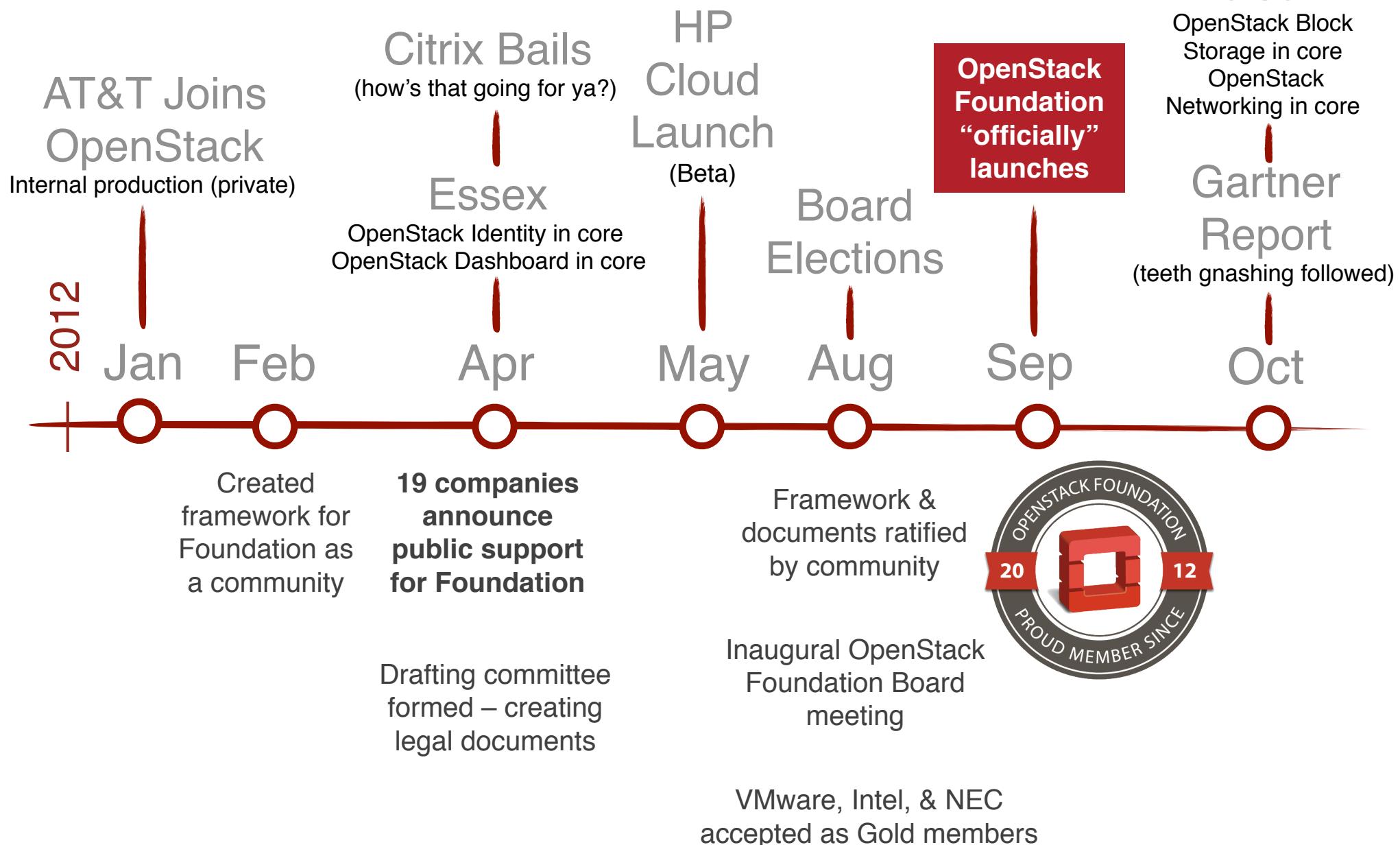


# 2011 - Growing Pains & Early Adopters

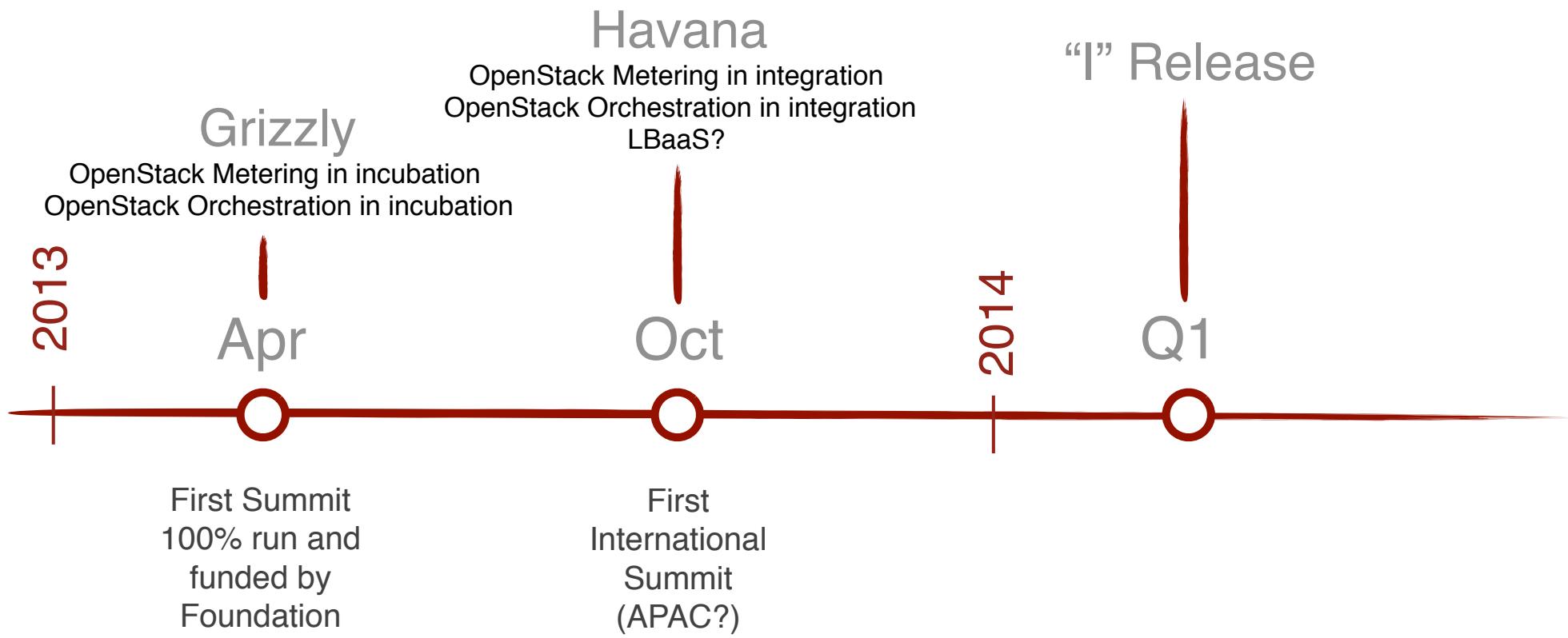


openstack  
CLOUD SOFTWARE

# 2012 - Rise of the Foundation & Prod Deployments

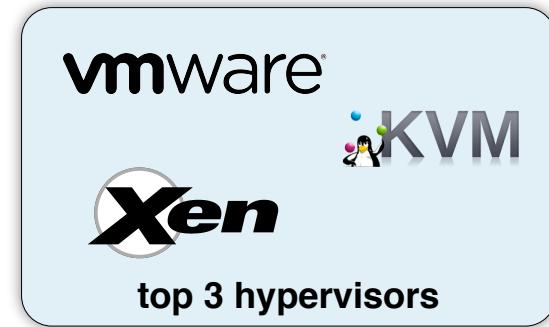


# 2013/2014 - Breakout Growth Years

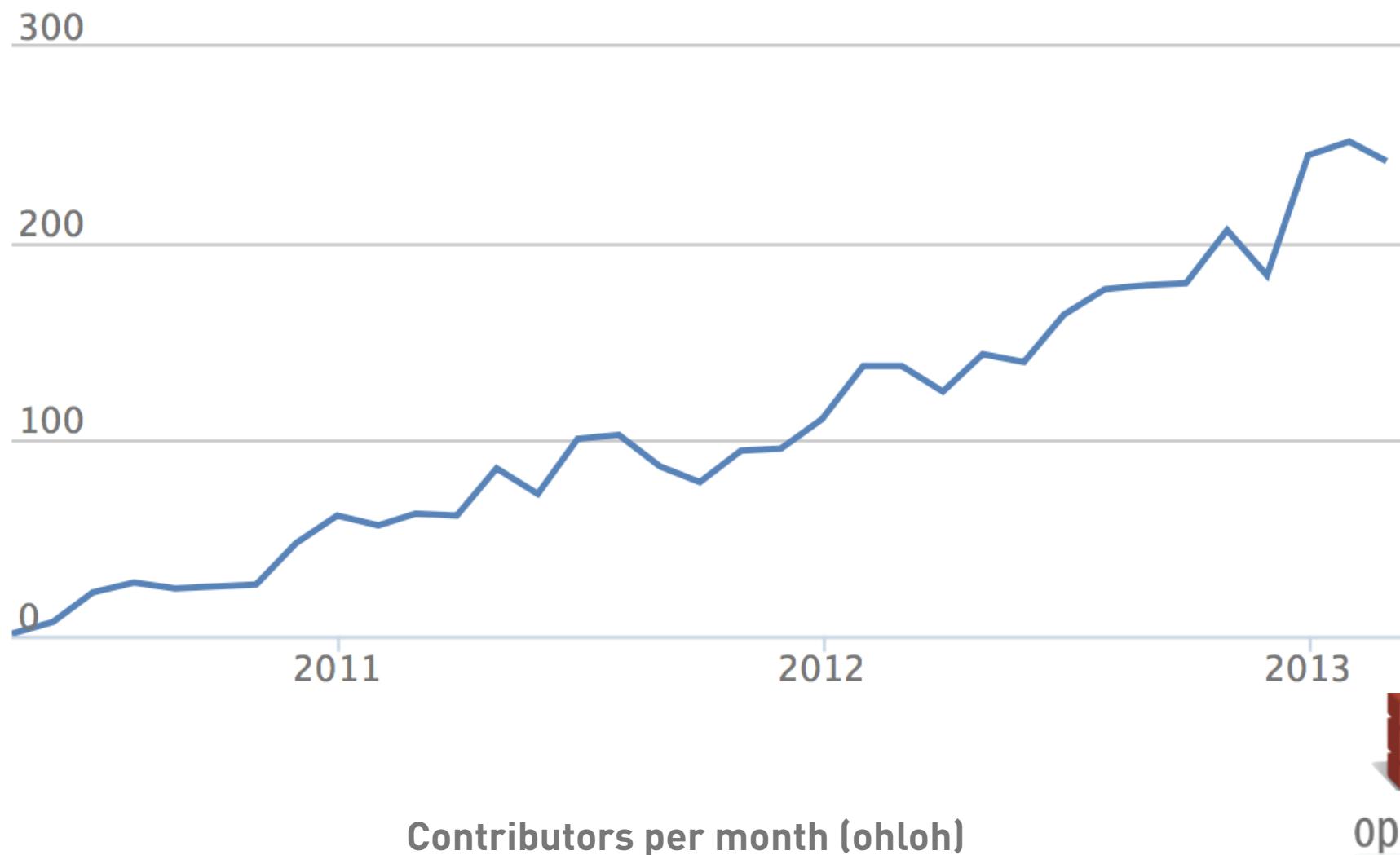


# Incredible Industry Support

In every single category, the top 3 vendors support OpenStack

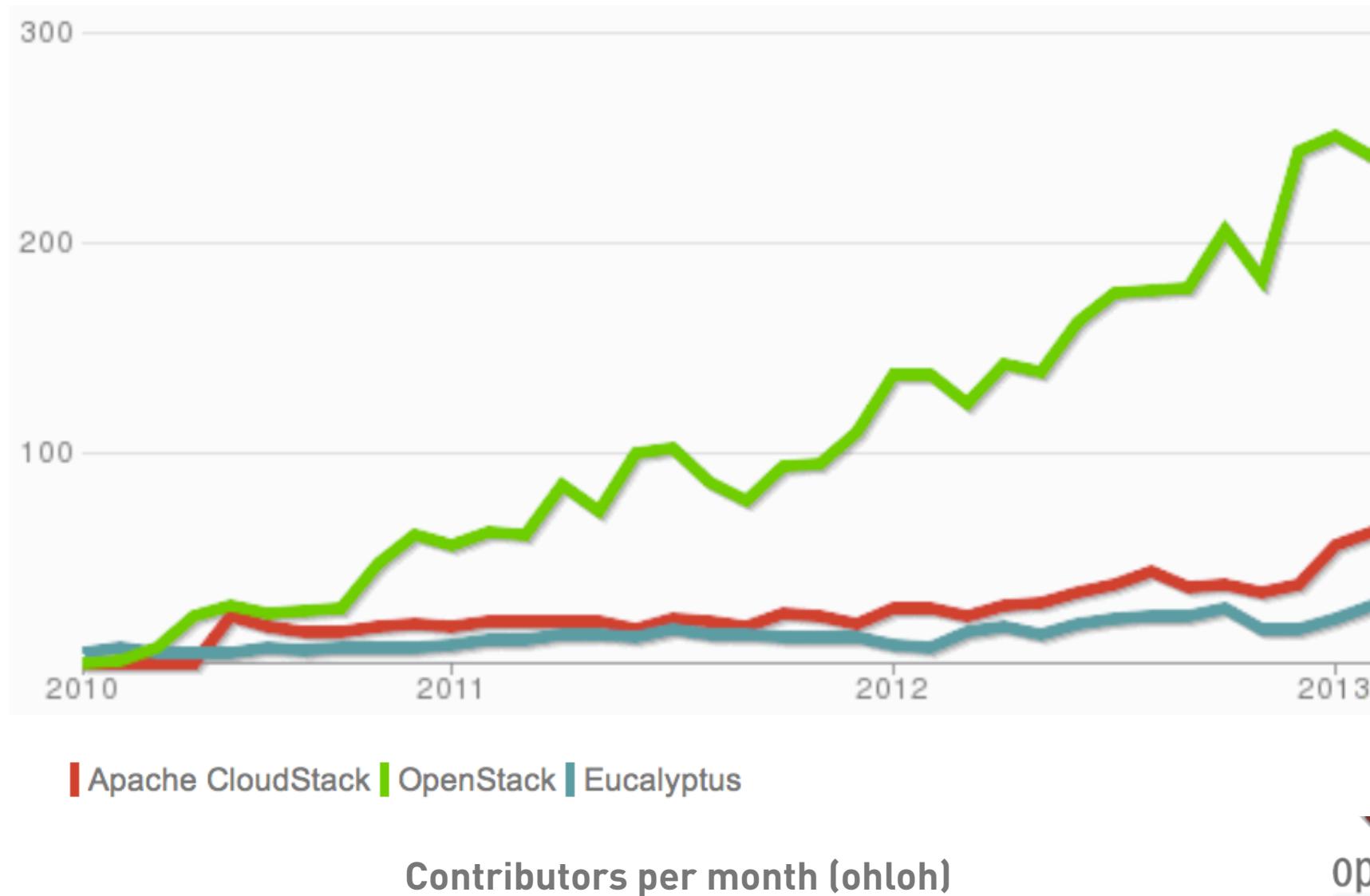


# Developer Growth



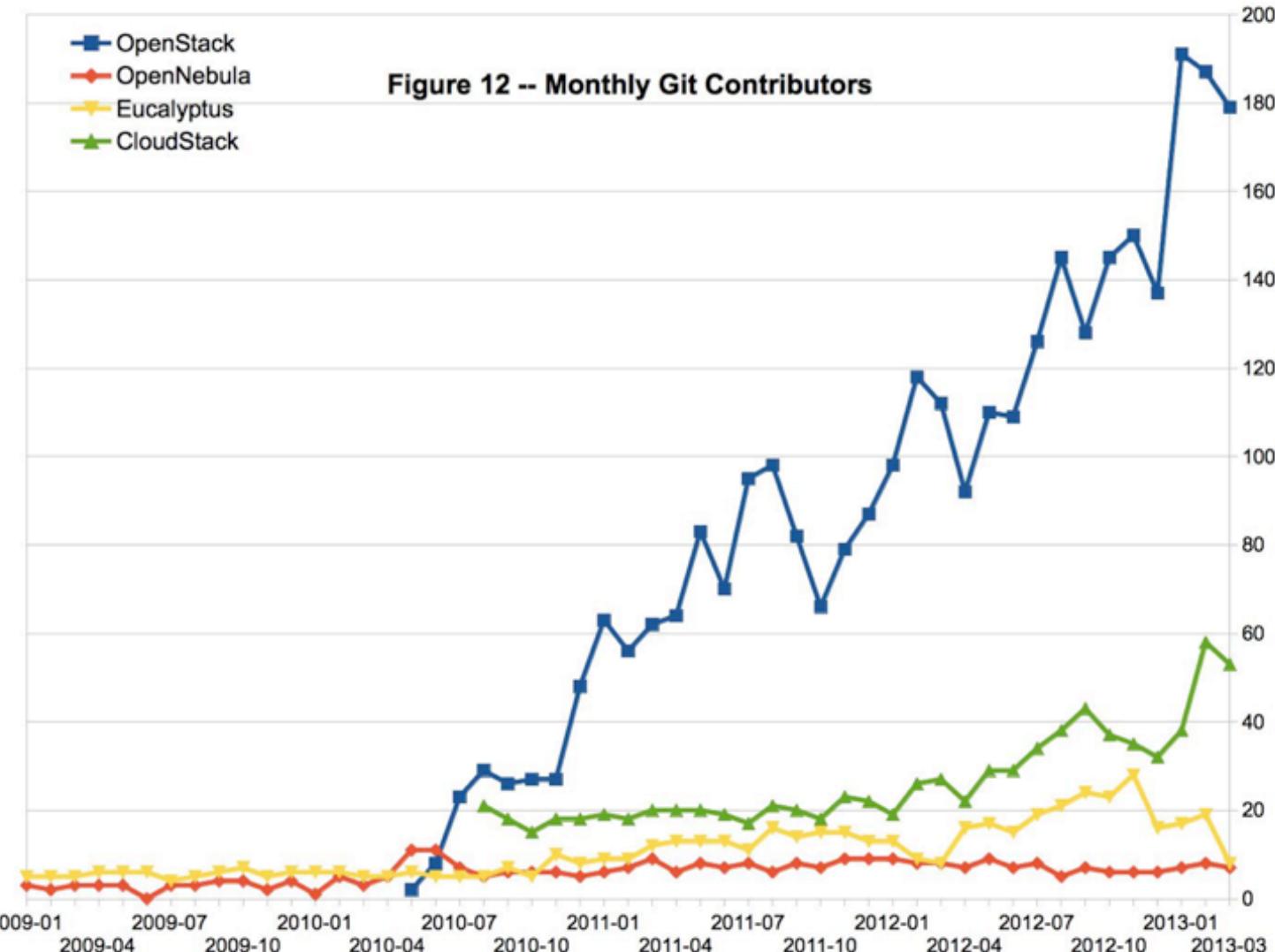
openstack  
CLOUD SOFTWARE

# Developer Growth Comparison



openstack  
CLOUD SOFTWARE

# Dev Growth by Git Contributors



Qingye Jiang (John) - Open Source IaaS Community Analysis CY13 - Q1

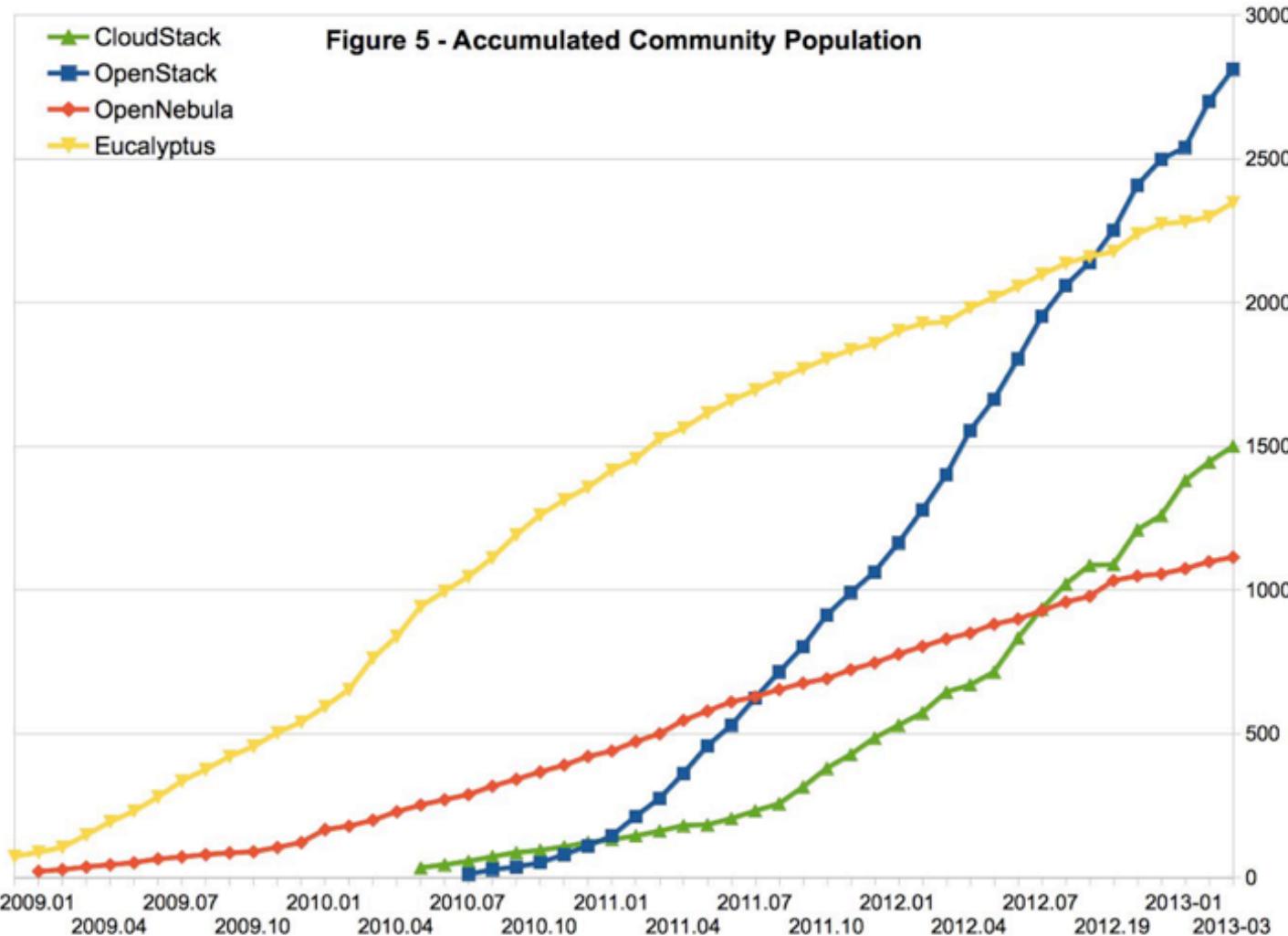
<http://www.qyjohn.net/?p=3120>



openstack  
CLOUD SOFTWARE



# Accumulated Community



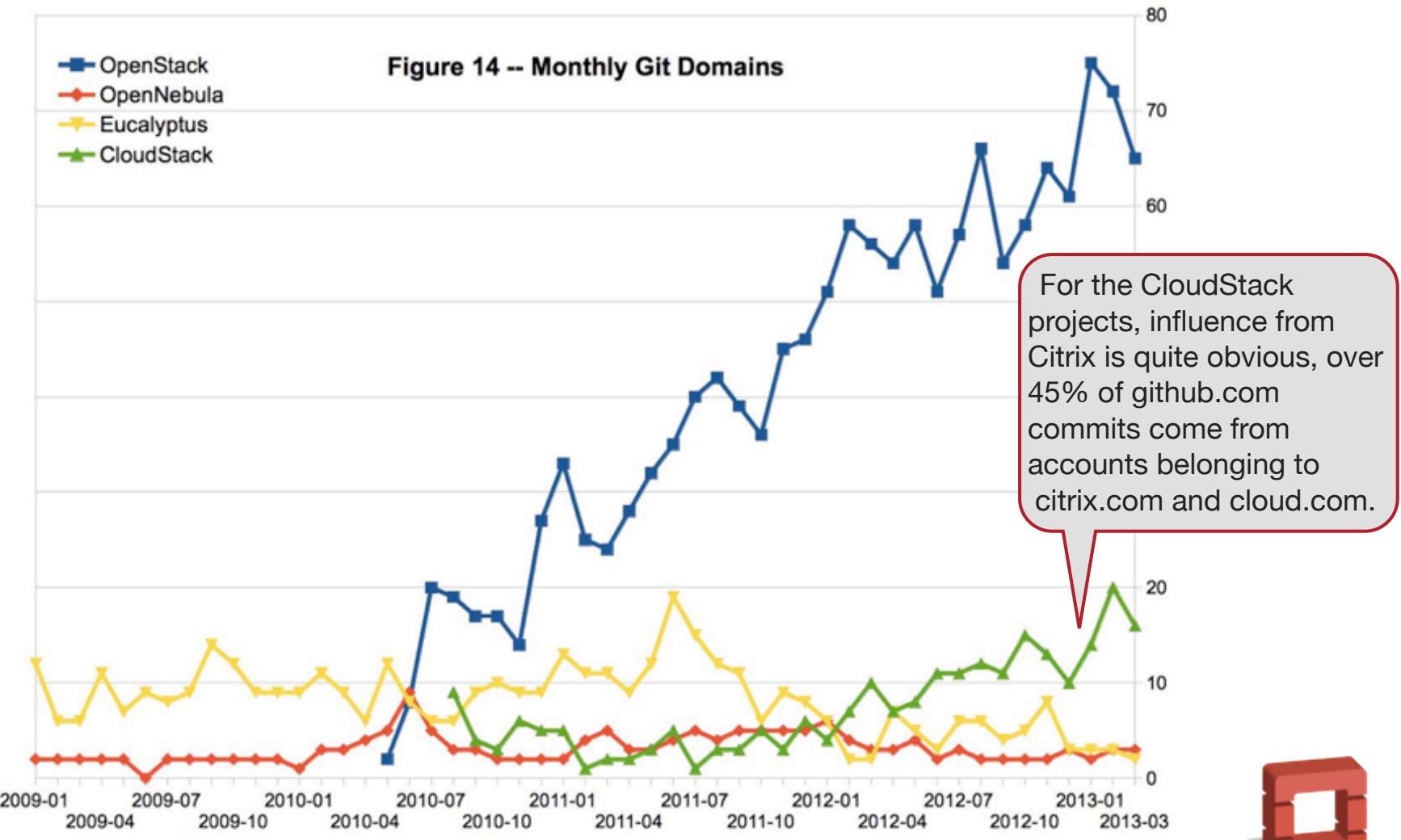
**openstack**  
CLOUD SOFTWARE

Qingye Jiang (John) - Open Source IaaS Community Analysis CY13 - Q1

<http://www.qyjohn.net/?p=3120>



# Growth by Domain (company - roughly)



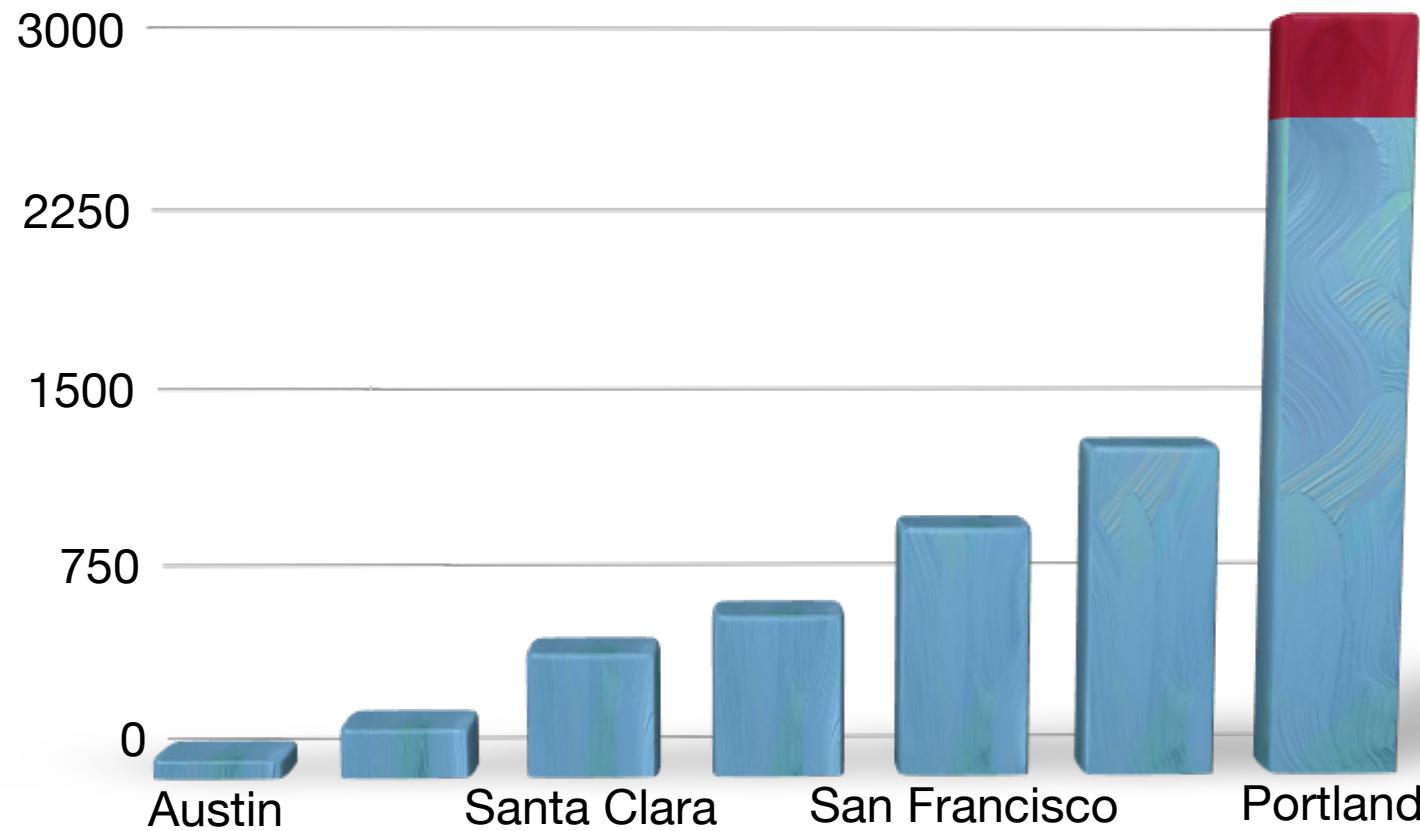
openstack  
CLOUD SOFTWARE

Qingye Jiang (John) - Open Source IaaS Community Analysis CY13 - Q1

<http://www.qyjohn.net/?p=3120>



# Summit Growth



openstack  
CLOUD SOFTWARE



# Established Marketing Reach



OpenStack.org 241k/visits month:

Visits (Global) per Day | Week | Month

More Options ▾

250K

200K

150K

100K

50K

0K

Directly Measured quoxntcast

Mobile Web Online

12/2012

1/2013

3/2013

3/2013

▼ Mar 13, 2013 - Apr 11, 2013	
Mobile Web	Visits 12,629
Visits / Unique	1.6
Online	Visits 228,657
Visits / Unique	1.7

Software: 300K downloads

Membership: 9000+, Over 90% subscribe to newsletter

Relationships with Tier 1 publications and analysts



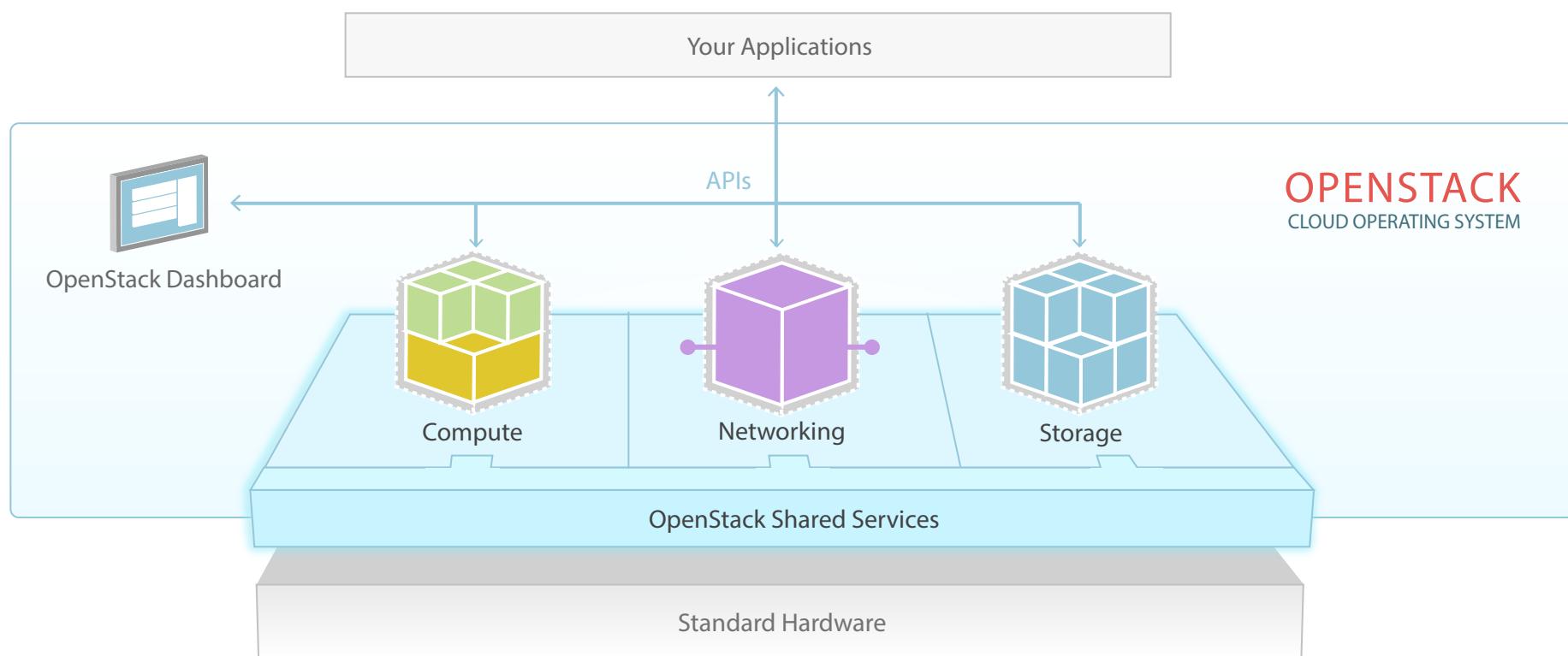
openstack  
CLOUD SOFTWARE



# Stackology

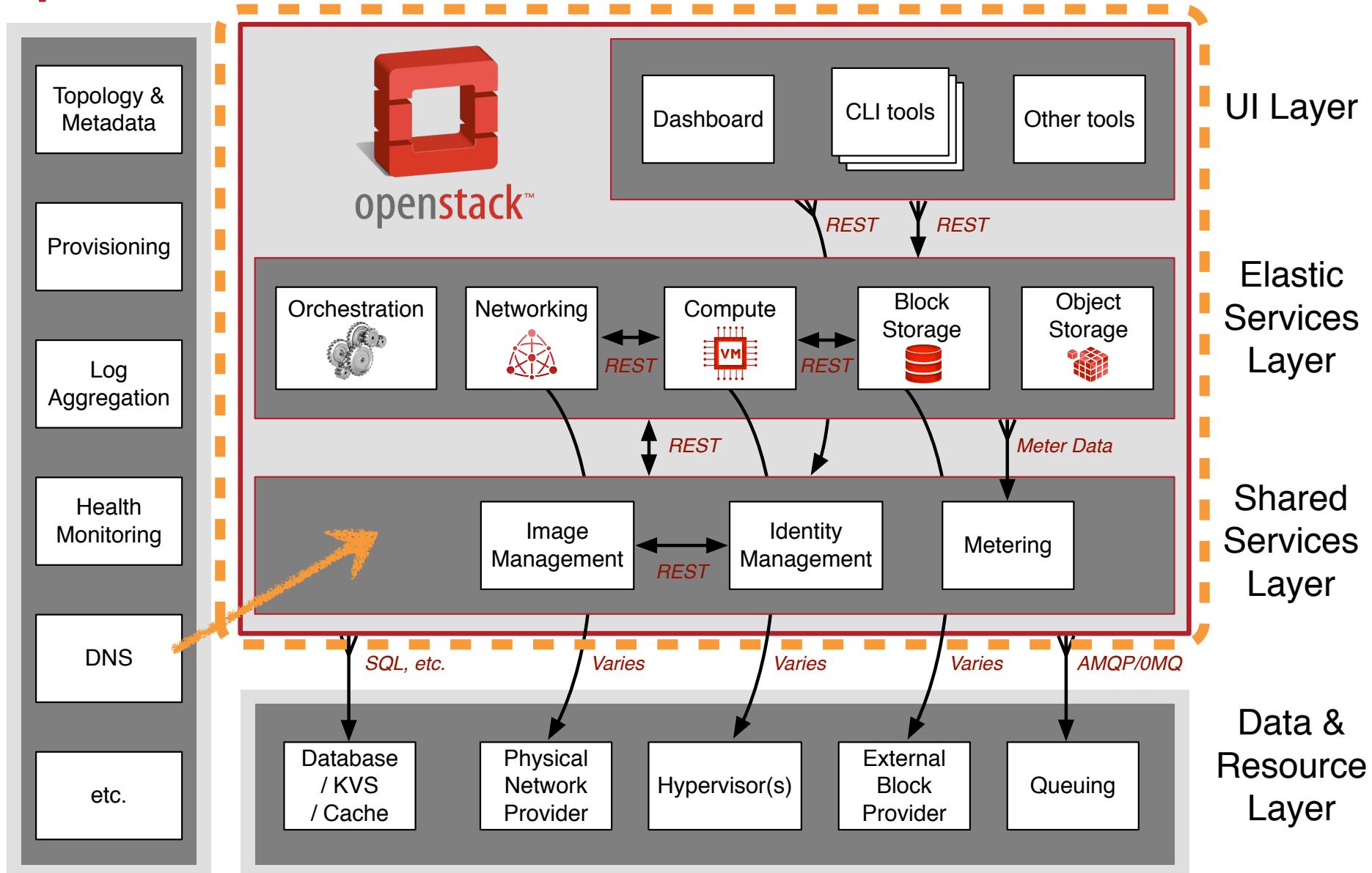


# OpenStack From 10km



# OpenStack (m)Architecture Slide

Other stuff, you probably need/want



Project Name	Description	Layer	AWS Equivalent	Codename
Dashboard	Self-service, role-based web interface for users and administrators	UI	Console	Horizon
Compute	Provision and manage large pools of on-demand computing resources	Elastic Service	EC2	Nova
Block Storage	Volumes on commodity storage gear, and drivers for turn-key block storage solutions	Elastic Service	EBS	Cinder
Object Storage	Petabytes of reliable storage on standard gear	Elastic Service	S3	Swift
Networking	L2-focused on-demand networking with some L3 capabilities	Elastic Service	VPC	Quantum
Orchestration	Application orchestration layer that runs on top of and manages OpenStack Compute	Elastic Service	CloudFormation, CloudWatch	Heat
Metering	Centralized metering data for all services for integration to external billing	Shared Service	N/A	Ceilometer
Identity	Multi-tenant authentication system that ties to existing stores (e.g. LDAP) and Image Service	Shared Service	None	Keystone
Image Management	Upload, download, and manage VM images for the compute service	Shared Service	VM Import/Export	Glance



# 6 month integrated release cycle

Every 6 months, we coordinate and integrate:

Thousands of patches & commits

Across hundreds of developers

And 9 “integrated” or “core” projects

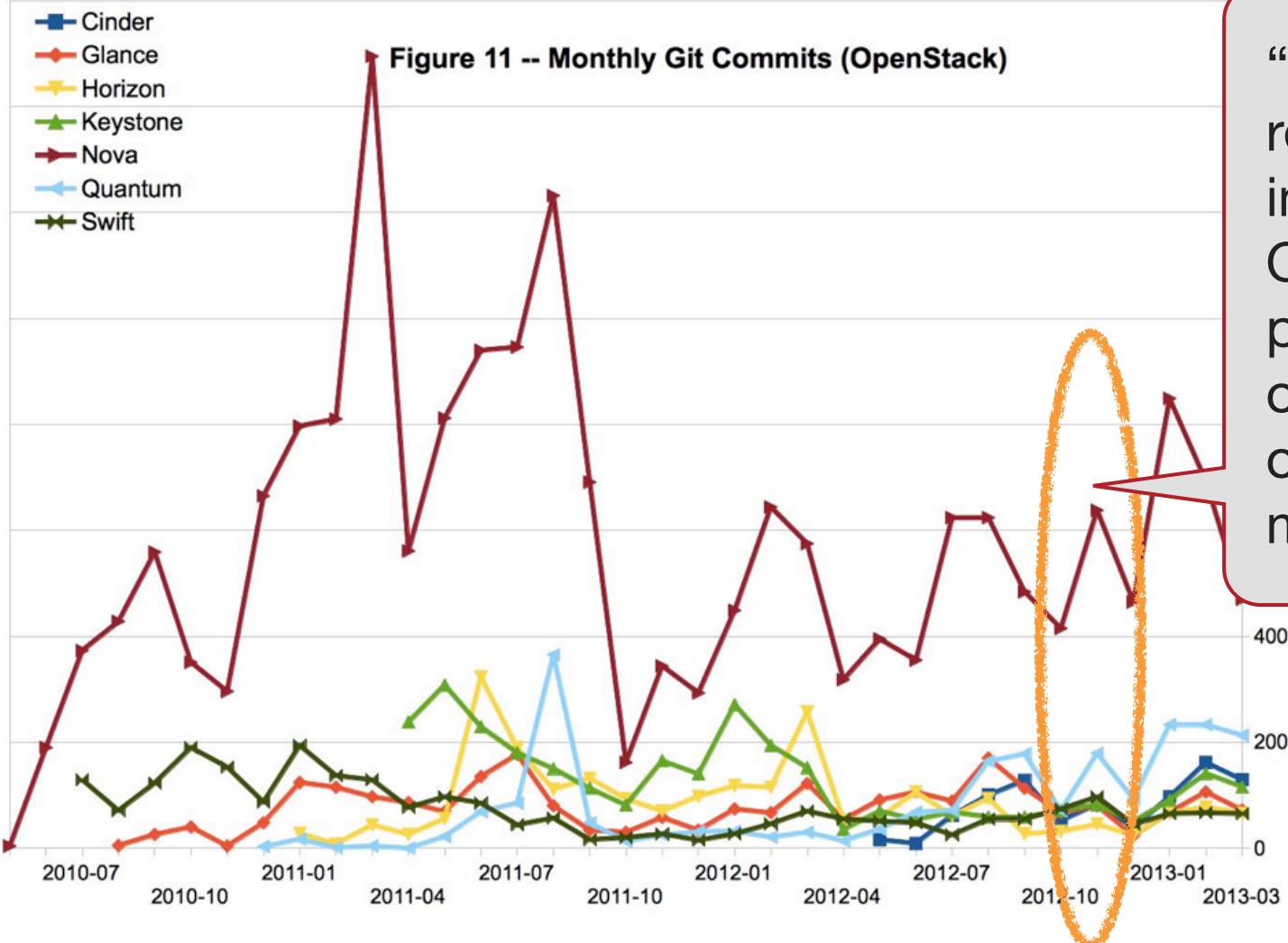
Completely impossible without:

The OpenStack infrastructure team (CI, etc.)

Dedicated PTLs and individual developers

No other similar project does this

# OpenStack is Well Organized



“[the coordinated releases are] an indicator that the OpenStack project is well organized in terms of sub-project management.”



openstack  
CLOUD SOFTWARE

Qingye Jiang (John) - Open Source IaaS Community Analysis CY13 - Q1

<http://www.qyjohn.net/?p=3120>



# Stacking It Up



# A Quick Note of Thanks

These diagrams would not have been possible without the prior work of:

Ken Pepple, Solinea (@ken\_pepple)

Dina Belova, Mirantis

... and the help of several Cloudscalers:

Eric Windisch (@ewindisch)

Joe Gordon (<http://github.com/jogo>)

Matt Joyce (@openfly, <http://www.music-piracy.com>)

Dan Sneddon (@dxs)

Joseph Glanville (@jpgvm)



# Caveat Emptor

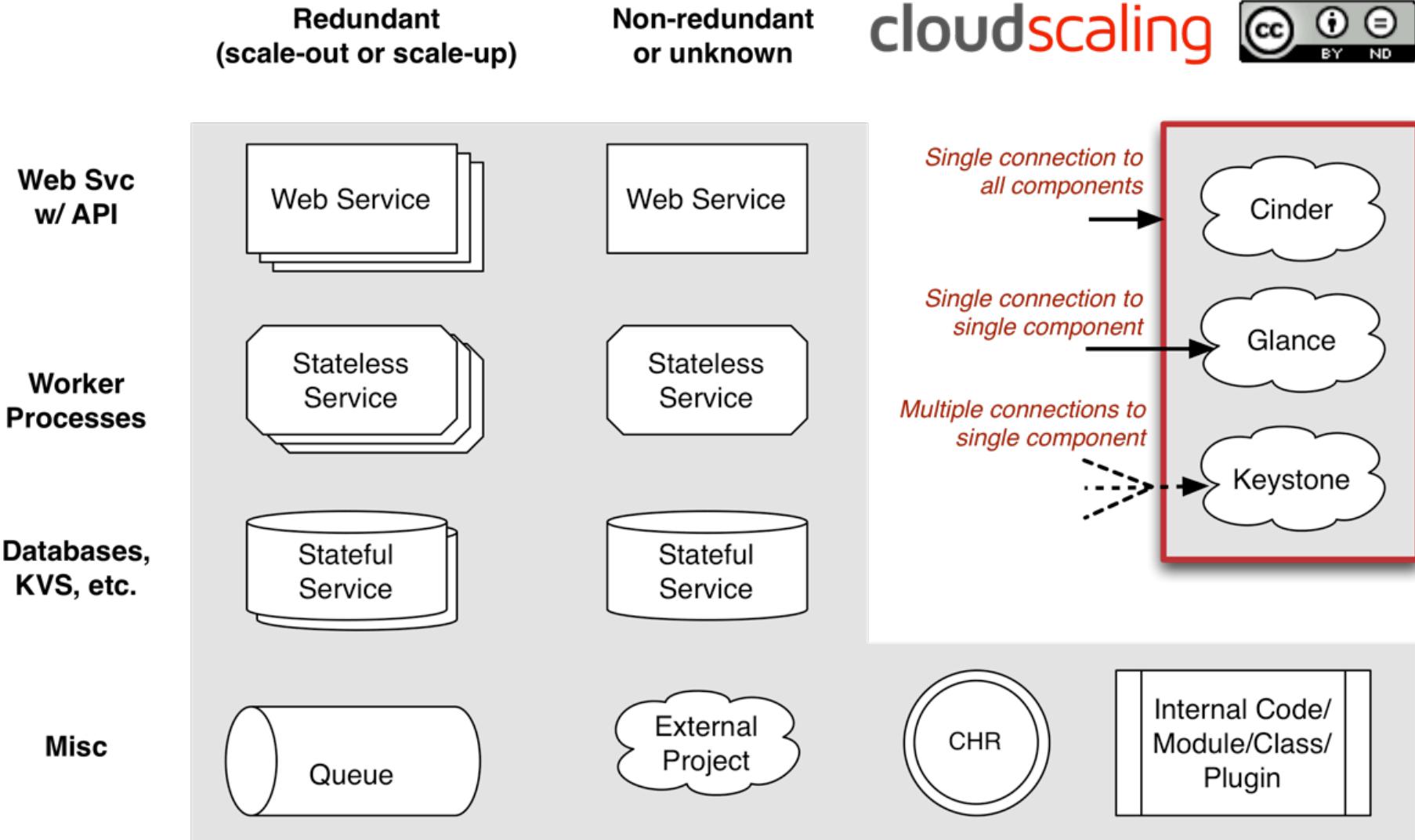
The focus for these diagrams was ease of reading, not accuracy.

See Ken Pepple's originals or the code if you need truth.

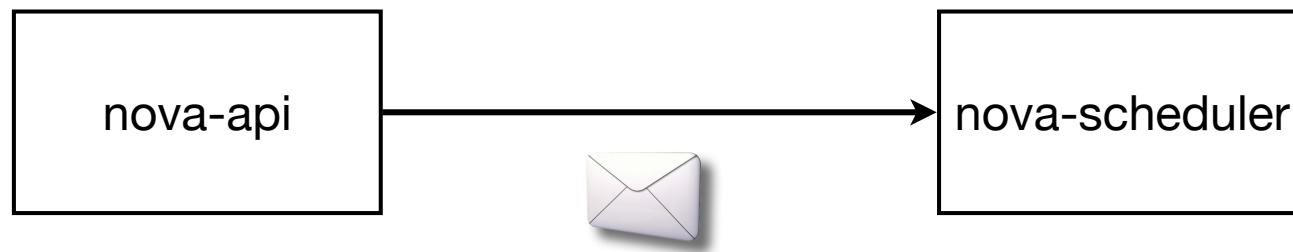
That being said, our team tried **really** hard for accuracy.

Blame me for any errors.

# Architecture Diagrams Legend



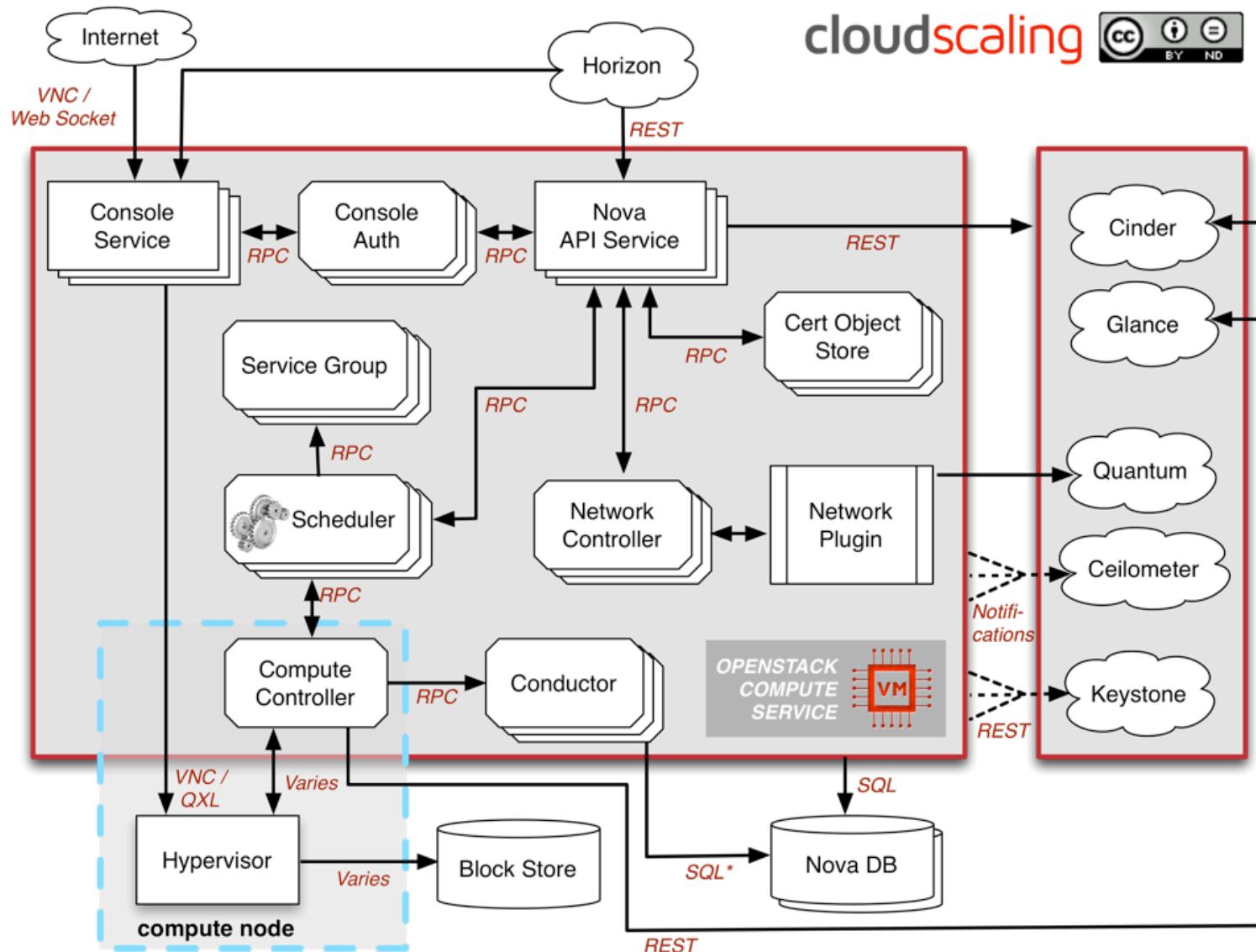
# OpenStack RPC



Remote Procedure Call  
(invoked via (a)synchronous message passing)

```
{  
    'oslo.version': '2',  
    'oslo.message': json ( {  
        'method': 'method_name',  
        'args': { 'keyword': 'value' }  
    } )  
}
```

# OpenStack Compute (Nova)



cloudscaling



# Compute Thoughts

Nova still runs best w/ KVM

Do we need another hypervisor? What's the biz case?

Multiple Availability Zones still not solved

Cells are for making one AZ bigger  
complex, tight-coupling

We need a clean sharding mechanism for AZes  
also what about Cinder and Quantum?

Integ. to Cinder & Quantum needs rethink

More information needs to be able to be passed back

# Compute (Networking) Thoughts

nova-network still required

Quantum has been L2 focused & L3 gap still exists

centralized nova-networking is #fail

decentralized is more #fail

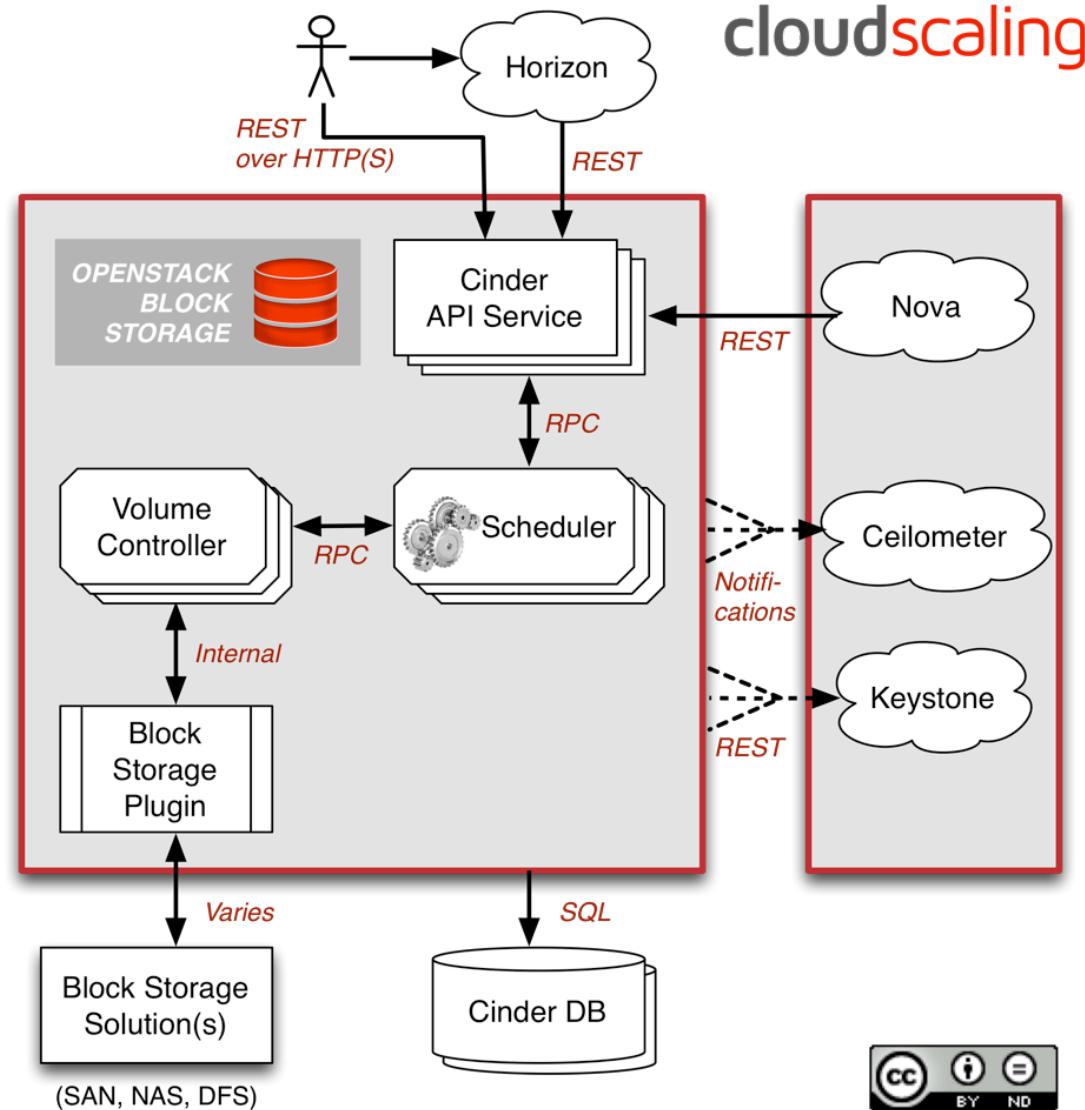
nova-conductor security for hypervisor obviated

nova-metadata-api & nova-network on every hypervisor?  
security implications

reconciling Quantum and nova-network?

Quantum needs more L3 capability, but ...

# OpenStack Block Storage (Cinder)



# Block Storage Thoughts

Default “nova-volume” func. is too minimal

When people think Block Storage service they assume:

Persistent, Network-based, & Performant - it isn't

Cinder scheduler needs info from Nova

Assuming you want to do anything interesting

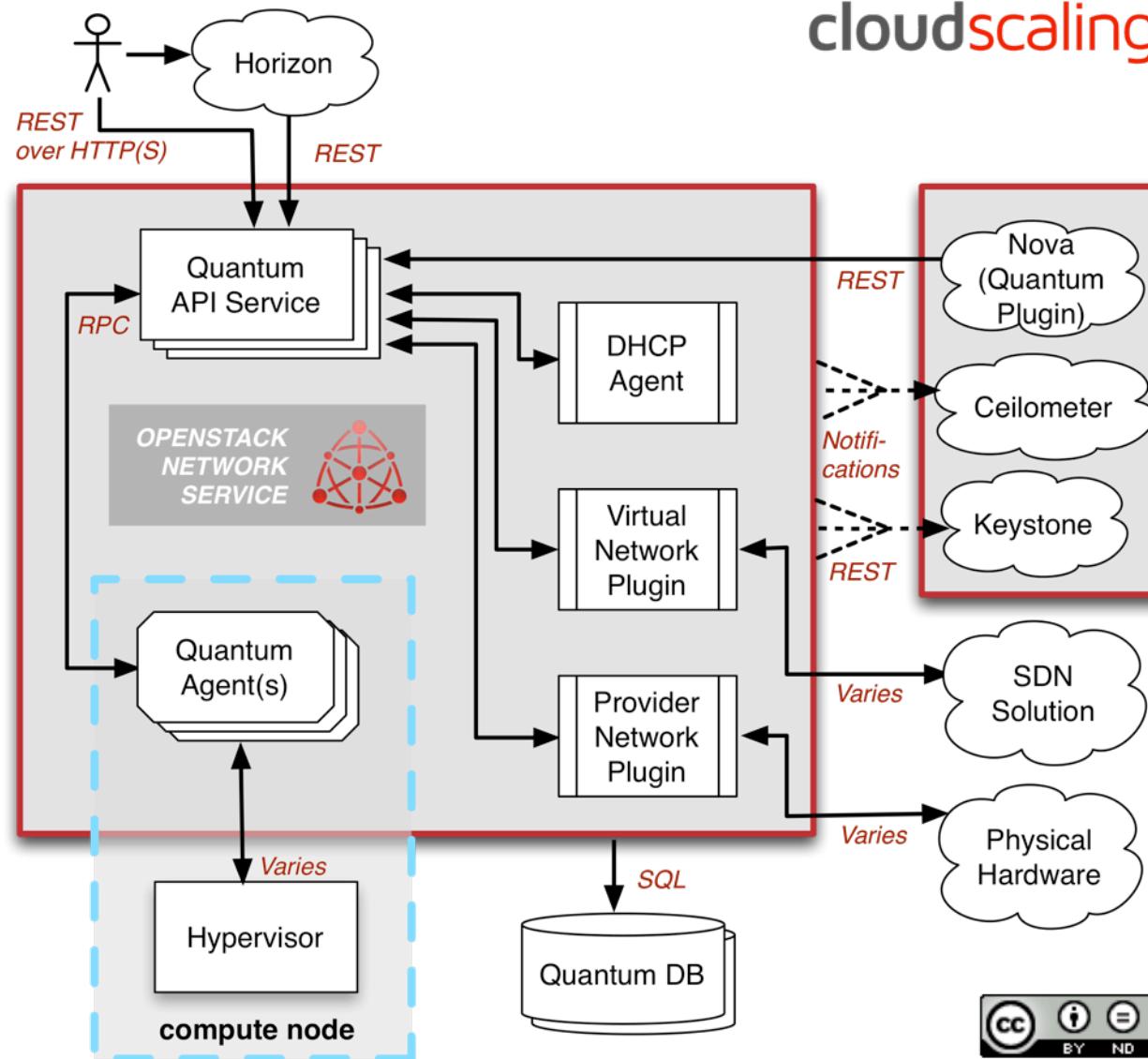
Point of lock-in since default isn't useful

You have to place a bet on a block storage solution

These are expensive, experimental or proprietary

# OpenStack Networking (Quantum)

cloudscaling



# Networking Thoughts

Default networking functionality is minimal

The APIs have been L2-centric

L3 functionality is same as existed with nova-network

Same architecture, same basic layout, with all of the downsides

Needs a Quantum plugin for full func.

Can't run more than one plugin at a time per function

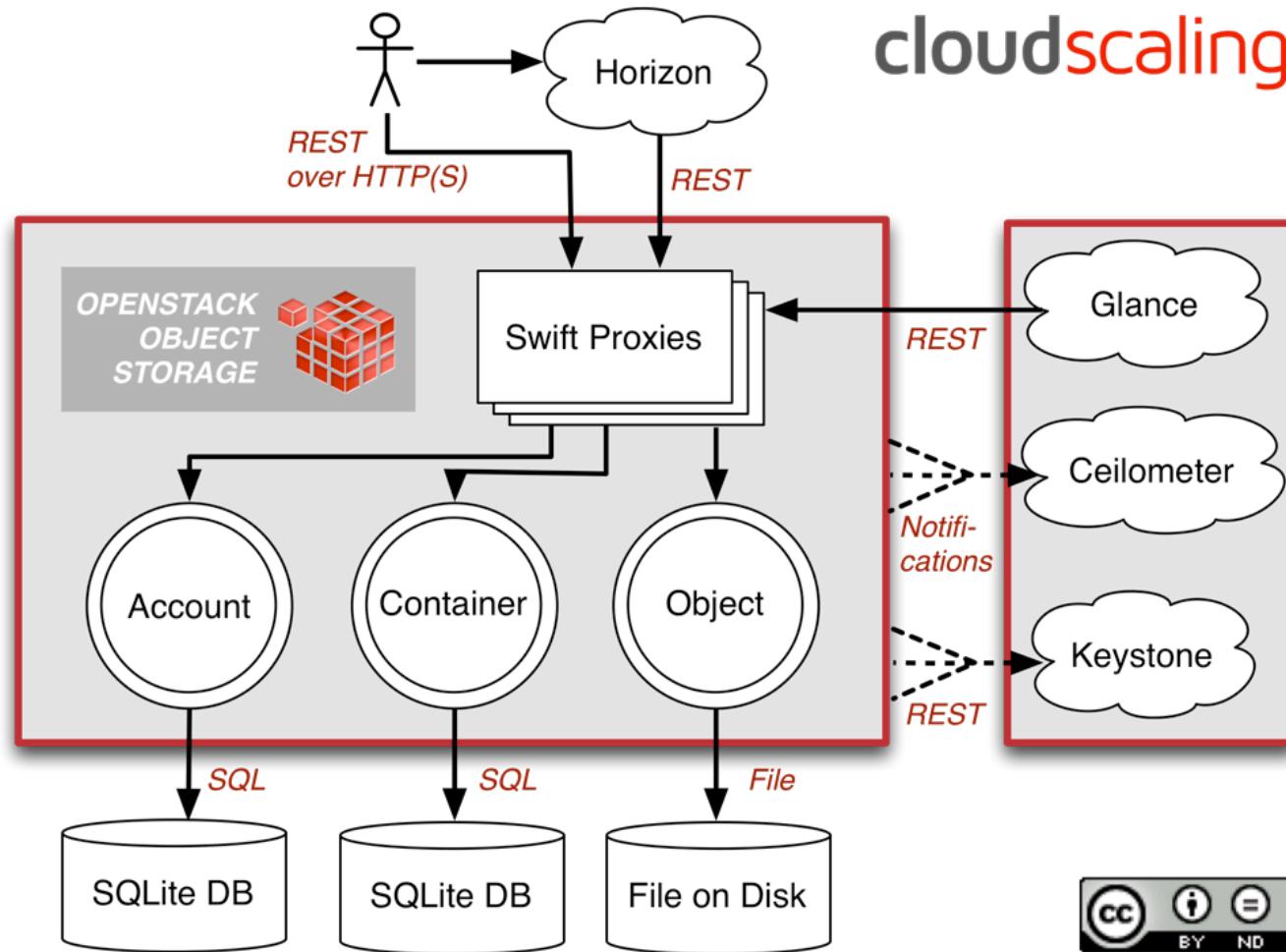
Only truly baked plugin is probably Nicira?

Others in process, but it's not clear how many production deployments there are

Good news is that this area is hot

So hopefully this is unstuck soon

# OpenStack Object Storage (Swift)



# Object Storage Thoughts

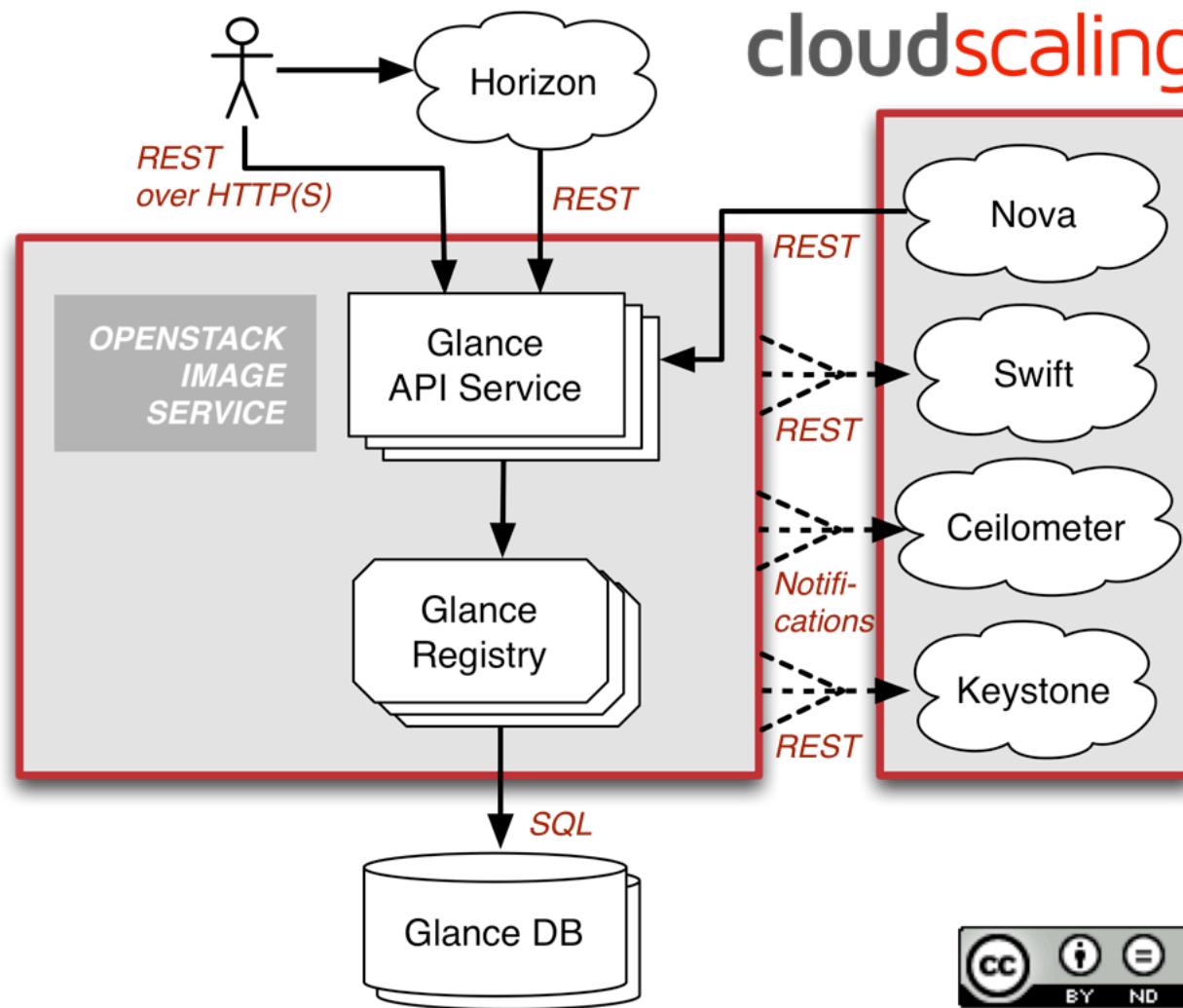
Swift has continued to lag OpenStack dev  
3 yrs on, auditor is slow & does not prioritize replication  
Container replication is a bad hack

Ugly stepchild of OpenStack

Keystone authentication woes (integration, performance)  
Isn't universally loved like Nova  
Sad, since it was the more mature of the two projects at launch in 2010

Good news: this area has new players  
EVault, Seagate, SwiftStack

# OpenStack Image Mgmt (Glance)



# Image Mgmt Thoughts

Still not clear why this is standalone project

Really a sub-function of Compute

Semi-pluggable (but not really)

Uses different backends for image storage

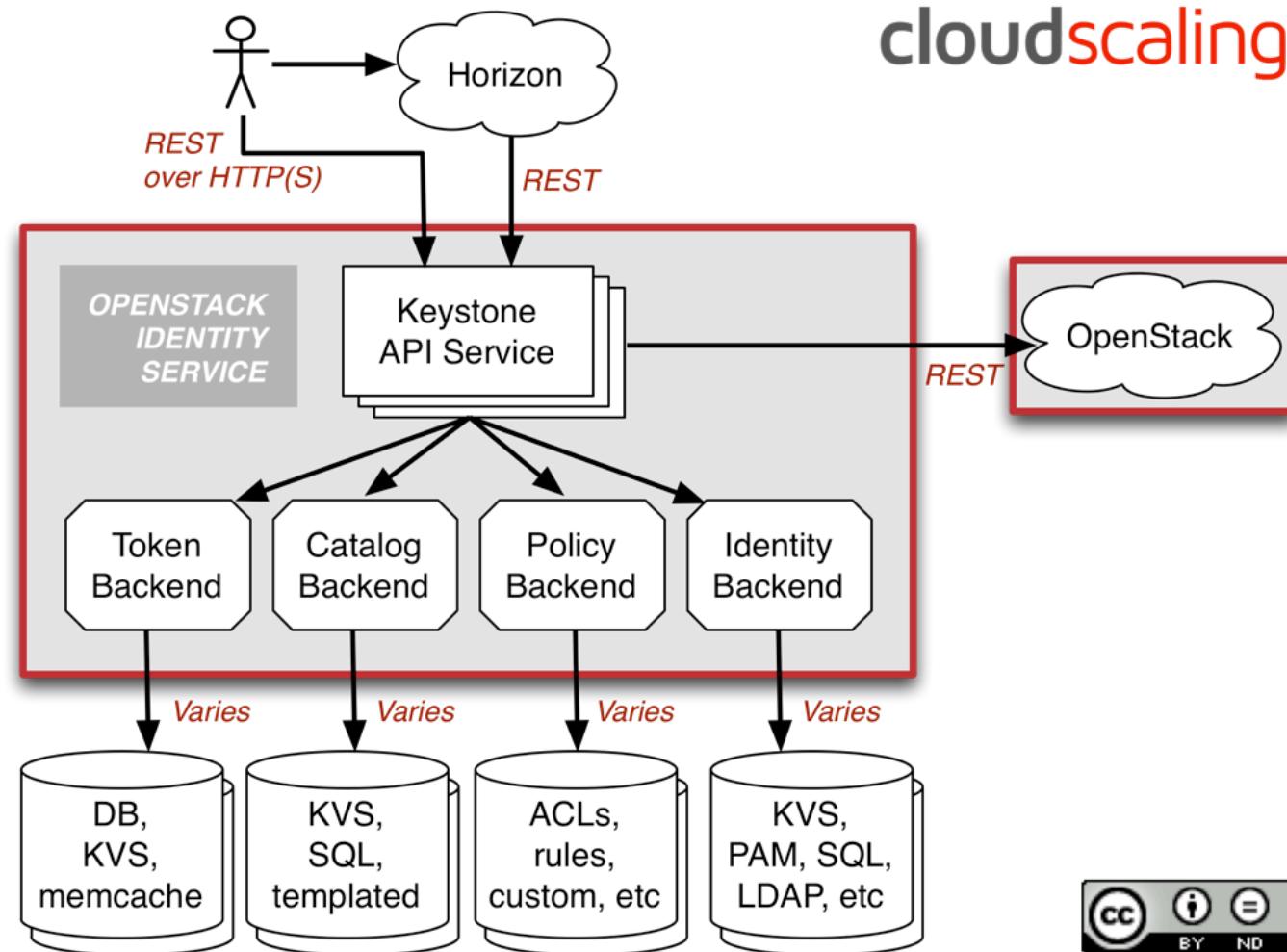
To be really useful it needs more features:

P2V, V2V, and other image conversion

Ability to slipstream PV drivers into images

Convert from popular formats: OVF, AMI, etc.

# OpenStack Identity (Keystone)



# Identity Mgmt Thoughts

Mixed identity / schizophrenia

Verifies identity, authorization, AND service registry

Service registry is one of many

Nova, Cinder, et al have their own internal registries

Slows everything down

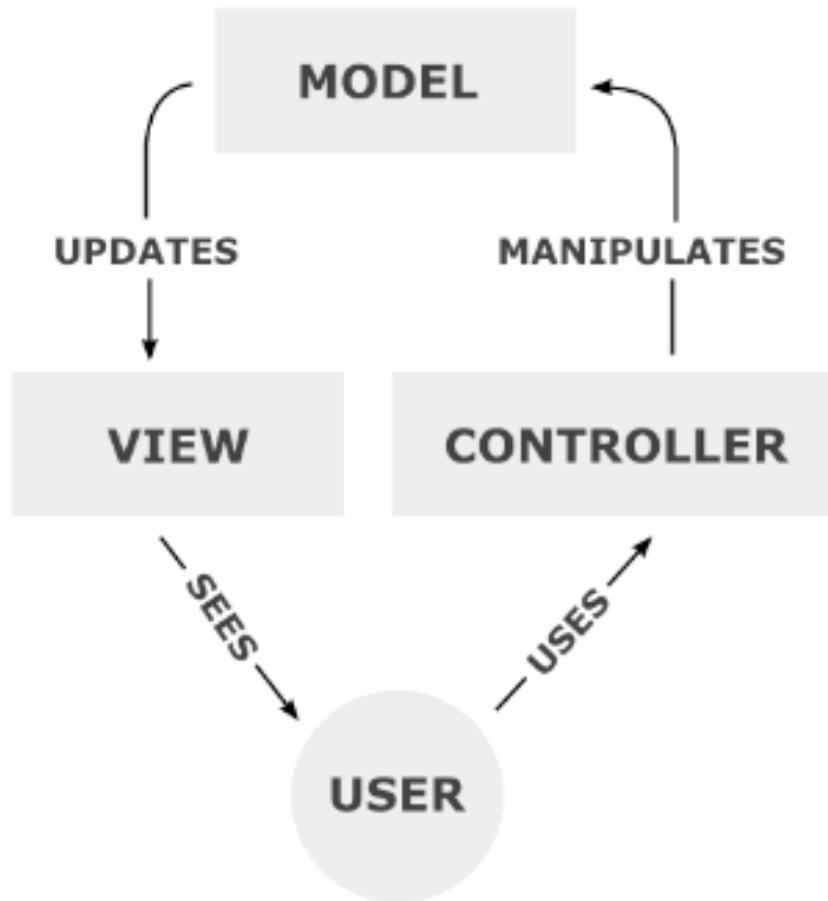
See LivingSocial preso from Folsom Summit

See caching tricks with memcache some projects use

OpenStack needed to reinvent wheel here?

This could have just been LDAP with a schema + caching

# OpenStack Dashboard (Horizon)



Source: Wikipedia (<http://en.wikipedia.org/wiki/Model-view-controller>)

# Dashboard Thoughts

It's gotten a lot better

Same UI for end-user and admin is bad idea

CloudStack did this and it was a mess

The workflows and views are too different

Security considerations exist

General lag: many things aren't accessible

e.g. Heat

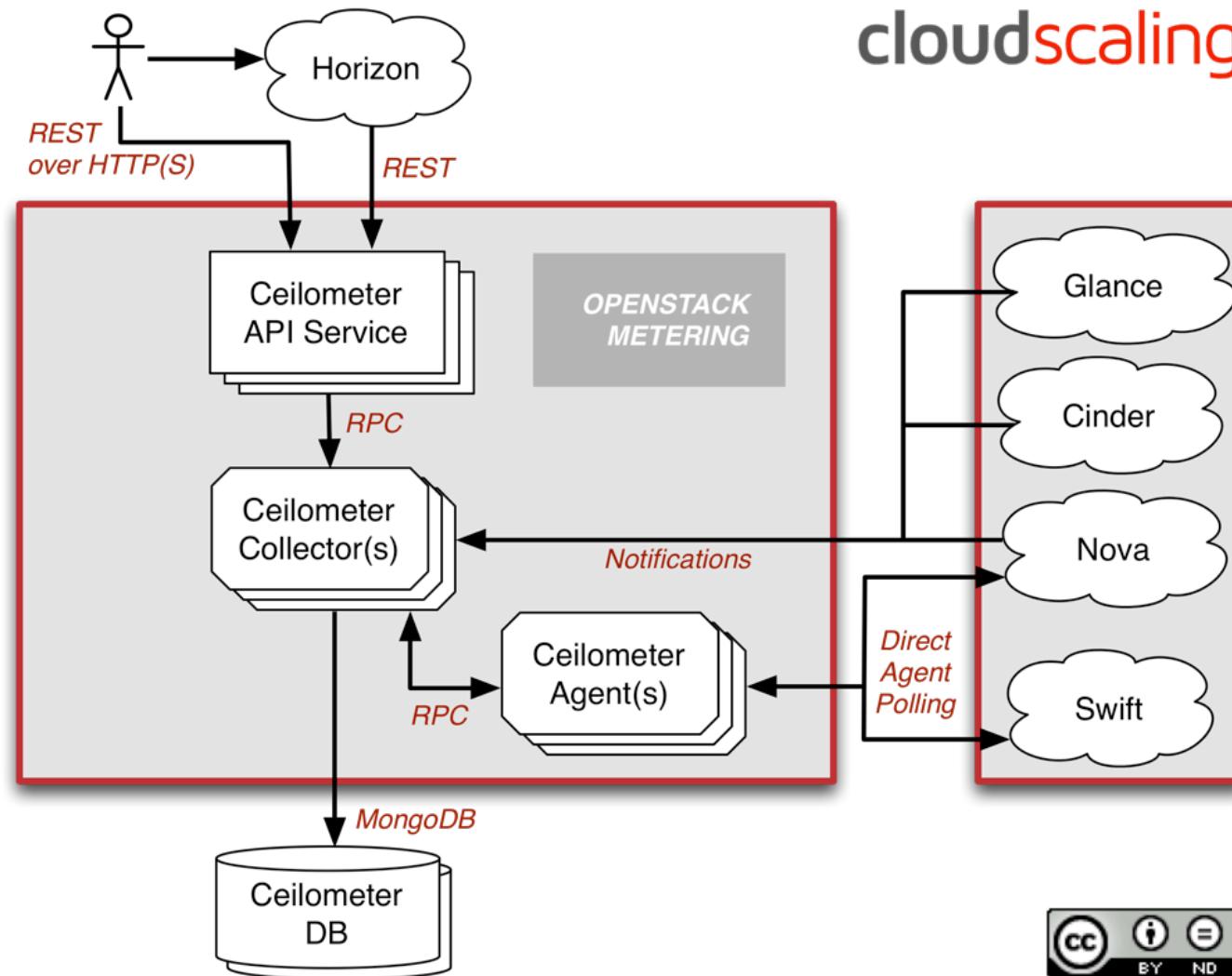
Need better docs on extending, w/o harm

Customers, product companies, SPs all want to modify

Allow for customizations, while supporting upgrades, etc.



# OpenStack Metering (Ceilometer)



# Metering Thoughts

Metering systems are hard

Bad or incomplete data for SPs is existential

Metering system should be \*very\* baked (is 1yr enough?)

No tokenized meter data

Instance hours not enough

How do you bill for Windows, Oracle, RHEL licenses?

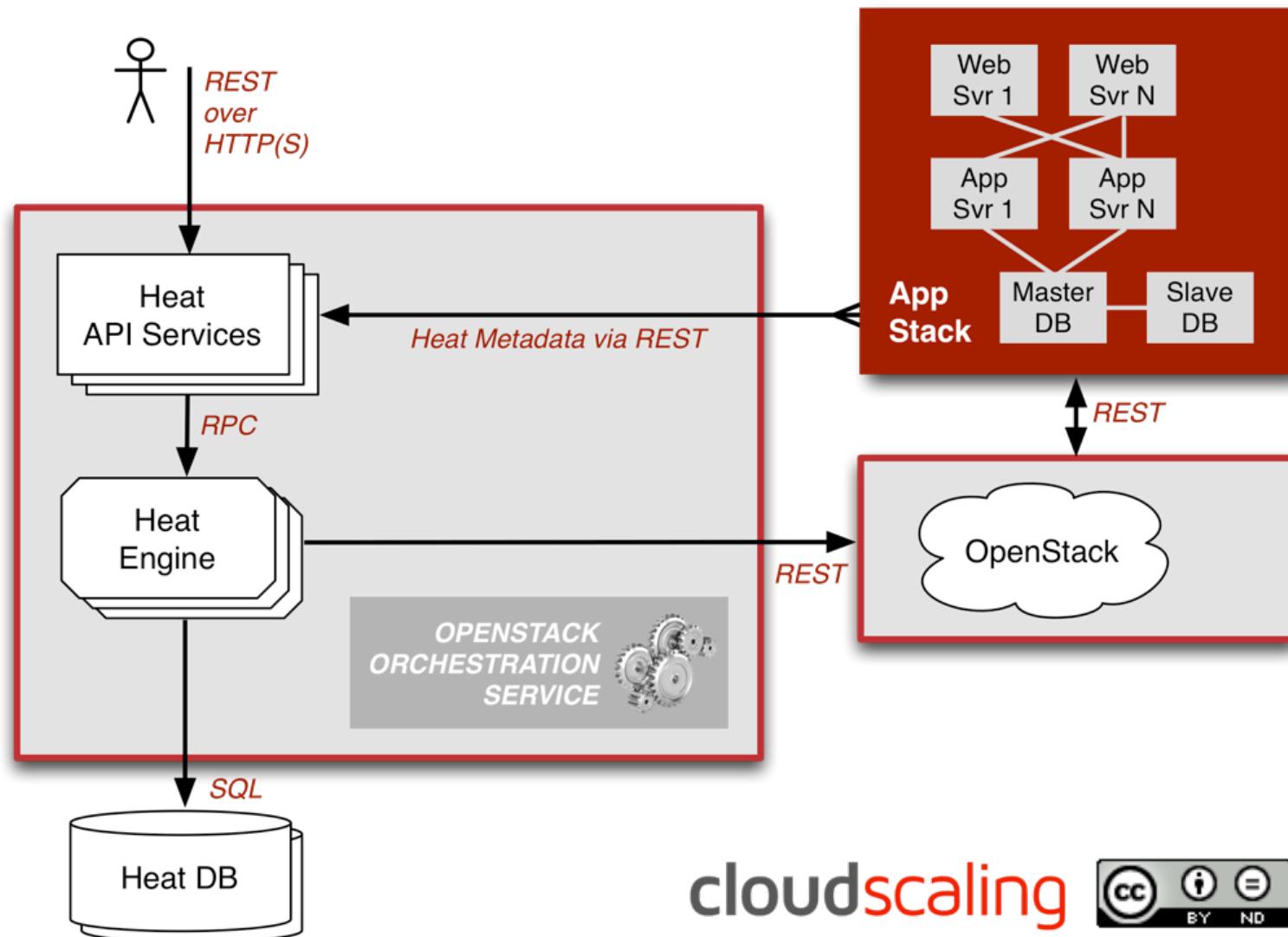
Tokens stack: size of instance, OS and app licenses, etc.

Needs to get flow data from edge switches

Netflow and/or Sflow support for physical switches

Data from the vSwitches is not the best source in the real world

# OpenStack Orchestration (Heat)\*



cloudscaling



\* Source: <http://www.slideshare.net/dbelova/openstack-heat-slides>

# Orchestration Thoughts

Huge potential

Adds additional AWS func: CloudWatch, CloudFormation

Provides clean templates for stacks, which means:

OpenStack on OpenStack (0o0) for testing, etc.

First primary project that rides “on top”

Clear differentiator over other projects

Initiative: Heat templates for Ref Arch

Vendors, customers, etc. could feed to prov systems:

Crowbar, Piston, Cloudscaling, etc.

# SWOT: OpenStack

## Strengths:

- De facto winner
- Incredible community
- Unstoppable velocity
- Clear innovation curve

## Weaknesses:

- No benevolent dictator
- Lack of IaaS experience for many developers
- Interoperability will be difficult
  - Not impossible, \*difficult\*

## Opportunities:

- Build an SQL92 base for cloud compute (see Threats)
- Public cloud compatibility as first order initiative
- vCloud private cloud compatibility as first order initiative

## Threats:

- Splintering, fragmentation, and customization
- Forking or ivory tower thinking

# Stack Gaps



# What's In a Complete Cloud OS?

	OpenStack Relationship	Who?	OpenStack Score	Ecosystem Score	Vendor Target*
User Interface(s)	Horizon, CLI, ...	OpenStack, Vendor, Ecosystem	4	2	4
Elastic Resource Management	Nova, Swift, Quantum, Cinder, ...	OpenStack, Vendor, Ecosystem	4	1	4
Service Discovery	Scattered: Nova, Keystone, ...	OpenStack, Vendor	2	0	4
Authentication, Authorization, and Access Controls (AAA)	Keystone (authen/author), various projects (ACLs)	OpenStack	2	0	4
HW/SW Life Cycle Management	N/A	Vendor, Ecosystem	1	2	4
Service Management	N/A	Vendor	0	1	4
Health & Logging	N/A	Vendor, Ecosystem	0	0	4
Topology & Inventory	N/A	Vendor	0	0	4
Hardware Certifications	N/A	OpenStack, Vendor, Ecosystem	1	1	2**

\* We're all trying to close this gap

\*\* It's a hard problem no one will solve individually



# Your Basic Choices

- 1 Download OpenStack and DIY
- 2 OpenStack Distributions
- 3 Turn-key Systems  
powered by OpenStack

# Stack Politiks

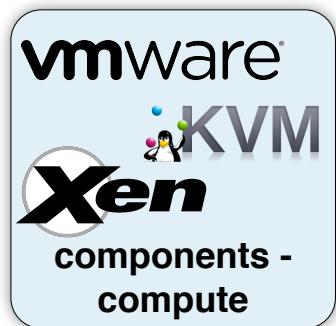


# Types of OpenStack Players

Type	Description	Example
<b>Hardware Vendor</b>	Selling hardware that integrates or supports OpenStack	<b>Juniper, NetApp, Cisco, EMC</b>
<b>Component Vendor</b>	Point solution, usually software, that provides subset of OpenStack functionality or supports it	<b>Midokura, Nexenta</b>
<b>Distribution / Packager</b>	Basic packaging, some installation/setup, etc.	<b>RedHat, SUSE, Canonical</b>
<b>Turn-key System</b>	Complete, integrated, OpenStack solution, with value adds	<b>Cloudscaling, Nebula, Piston</b>
<b>Service Companies</b>	Professional or managed services to customize or operate OpenStack	<b>Mirantis, Metacloud, Rackspace Private</b>
<b>Public Clouds</b>	Public IaaS	<b>HP, Rackspace Public</b>
<b>PaaS / ISVs</b>	Value add on top of OpenStack deployments	<b>Scalr, ActiveState (Stackato), CloudFoundry</b>
<b>Private Clouds</b>	Users	<b>Wikimedia, AT&amp;T, Yahoo!</b>



# Who's Playing the OpenStack Game?



# Player Motivations

Sell Hardware  
**hardware**

Sell SDN Software  
**components - network**

Sell Storage Software  
**components - storage**

Sell HV Software & Support  
**components - compute**

Sell Turn-key Systems & Support  
**systems**

Sell Labor (T&M), Monthly Management, etc,  
**service companies**

Sell Software on Top of IaaS  
**PaaS / layered ISVs**

Sell Support via “owning” the community  
**Linux distros**

Sell Online Cloud Resources  
**public clouds**

Use OpenStack for Business Leverage  
**private clouds**

# Who's Using It?



# First OpenStack Survey

414 survey responses

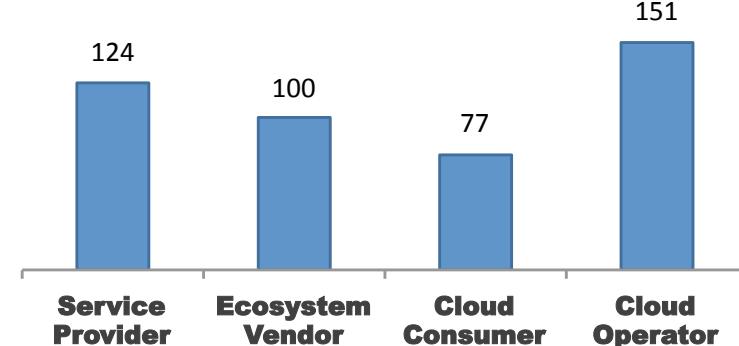
## Country



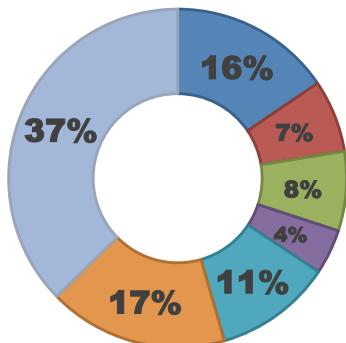
56  
countries



## Type of Involvement



## Company Size



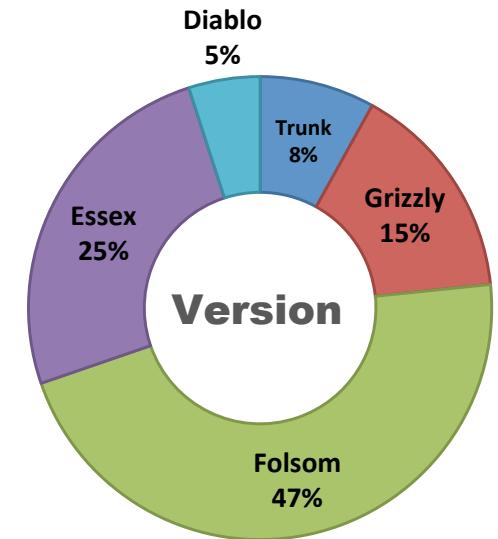
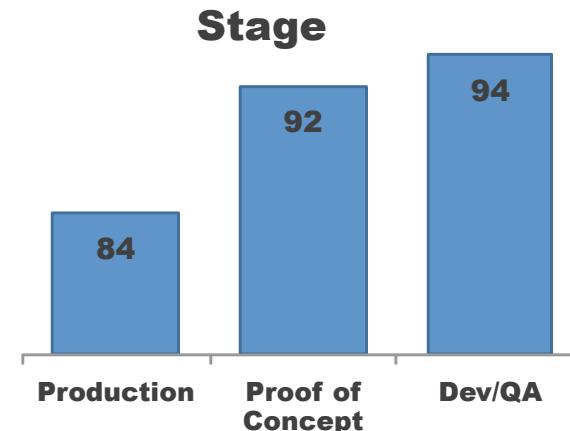
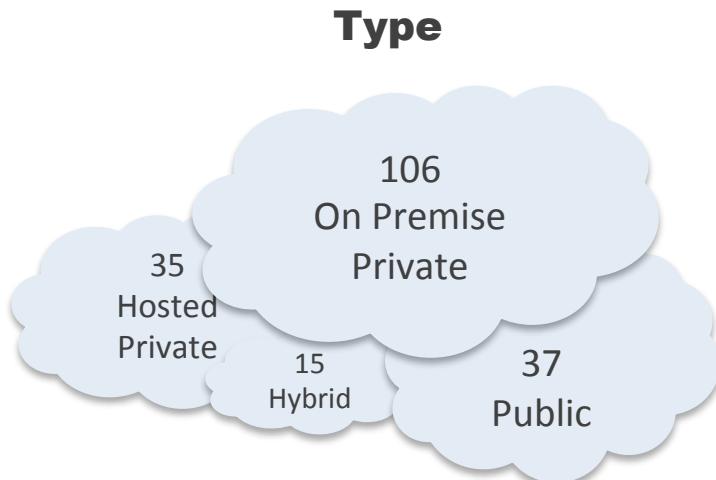
- More than 10,000 employees
- 5,001 to 10,000 employees
- 1,001 to 5,000 employees
- 501 to 1,000 employees
- 101 to 500 employees
- 21-100 employees
- 1-20 employees

## Industries

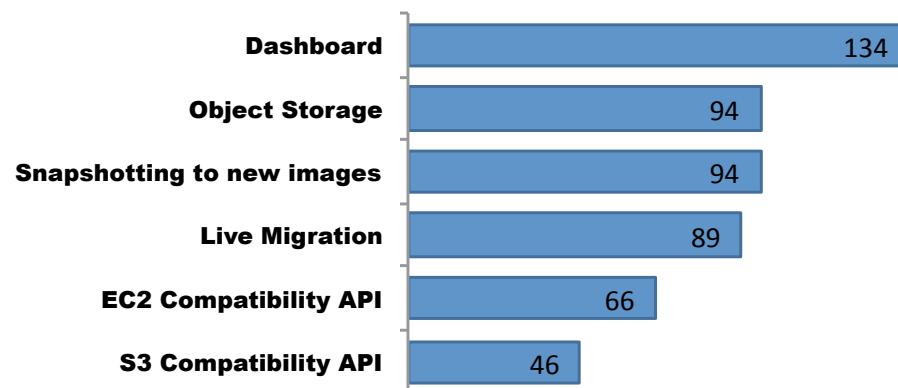


# Deployments at a Glance

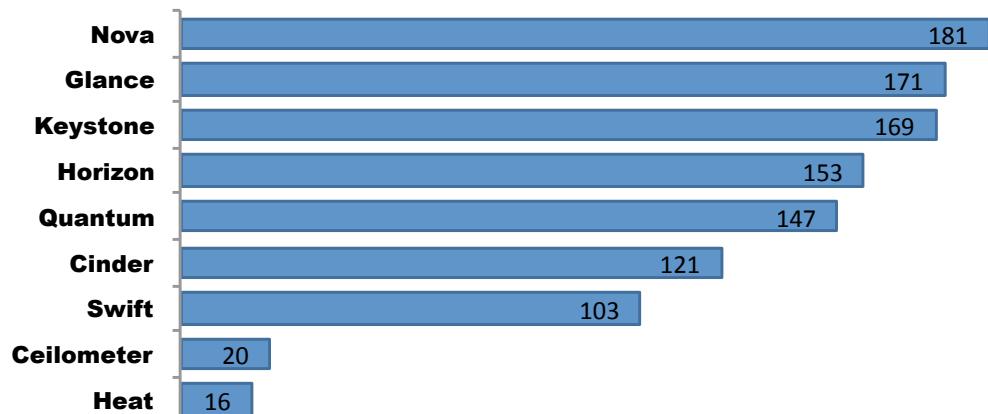
197 Deployments



## Features

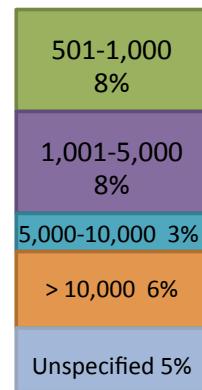
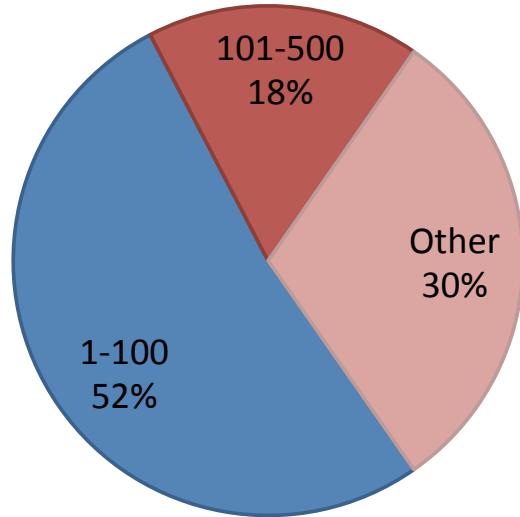


## Components

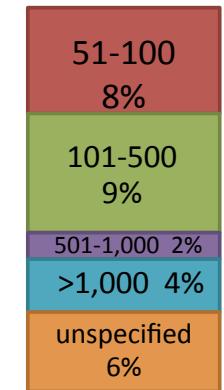
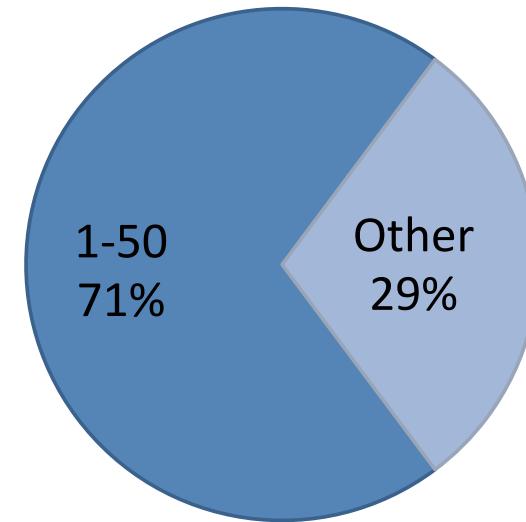


# Size of 98 Production Compute Systems

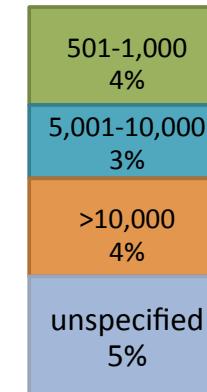
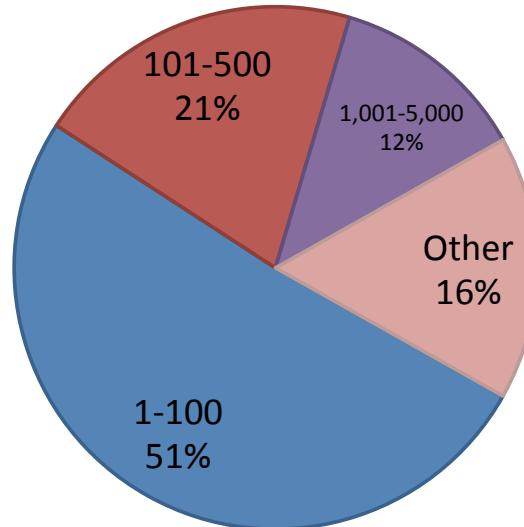
**Instances**



**Nodes**

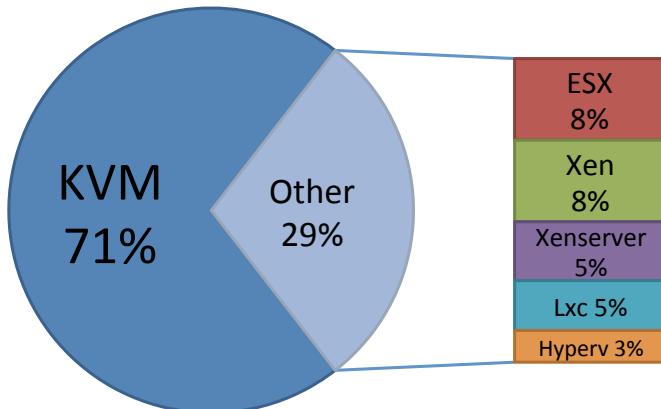


**Cores**

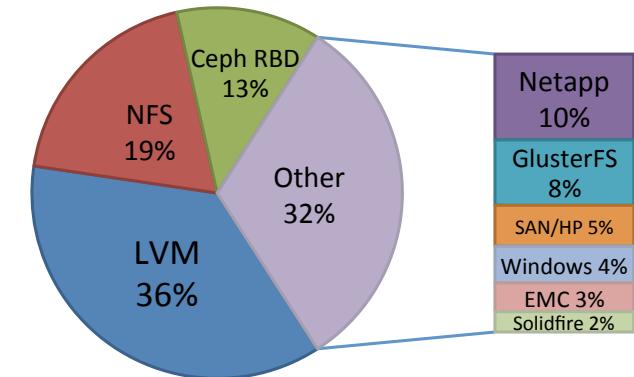


# Usage: KVM, LVM, OVS & SQL

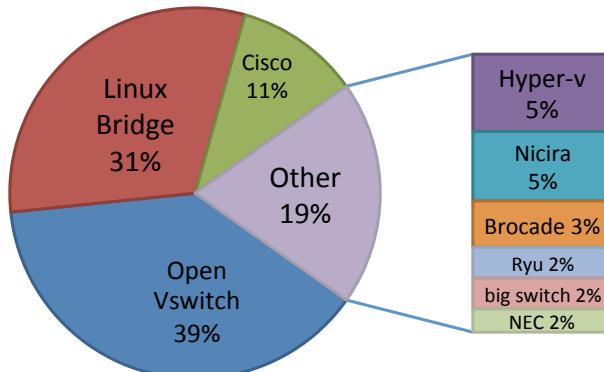
Hypervisors



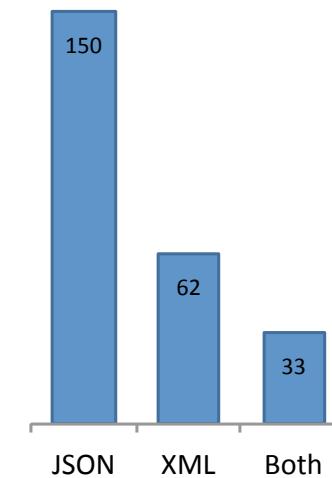
Storage Drivers



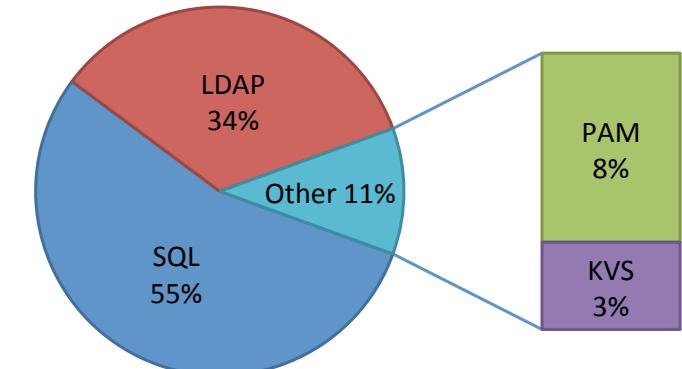
Network Drivers



API Format



Identity Drivers



# Summary



# OpenStack by TKO?

OH: “Finish him!”

We still have work to do

Your participation matters

Regardless of whether you: build, develop, or operate

Get involved

<http://is.gd/openstack>



Original Summit Slides are at:

<http://engineering.cloudscaling.com/portland13>

# Q & A

Randy Bias

CTO & Co-founder, Cloudscaling  
Director, OpenStack Foundation  
@randybias

**simplicityscales**  
**engineering blog**  
<http://simplicityscales.com/>

