OpenStack Ecosystem and Xen Cloud Platform

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Agenda

- Introduction
- Rise of OpenStack
- OpenStack Details and Ecosystem
- OpenStack and Xen Cloud Platform - Demo
- Conclusion

Introduction - Simple Cloud Stack

Rise of OpenStack – IaaS Enabler

Cloud Services have three main flavors:

- IaaS
- PaaS
- SaaS

➢For early cloud platforms, IaaS **enablement** was the key focus

➢Help organizations **build** their own public, private, or hybrid clouds

IaaS Enablement Platforms

- AKA Cloud Management Platforms, Cloud Controllers, Fabric Managers, Cloud Orchestration, IaaS Platforms, etc
- Enablement Platforms turn Physical and Virtual IT assets into elastic cloud entities
- Resulting IaaS can provision and manage Compute, Storage, Networking or other resources in some combination

OpenStack Precursor – Eucalyptus

- **Eucalyptus** was very popular IaaS Platform, grew out of project at UCSB
- 25,000 installs and big user community
- NASA used to be one of the big vocal supporters of Eucalyptus
- In May 2010, NASA partnered with Rackspace to announce a competing effort!

Eucalyptus Falters

NASA had two main issues with Eucalyptus

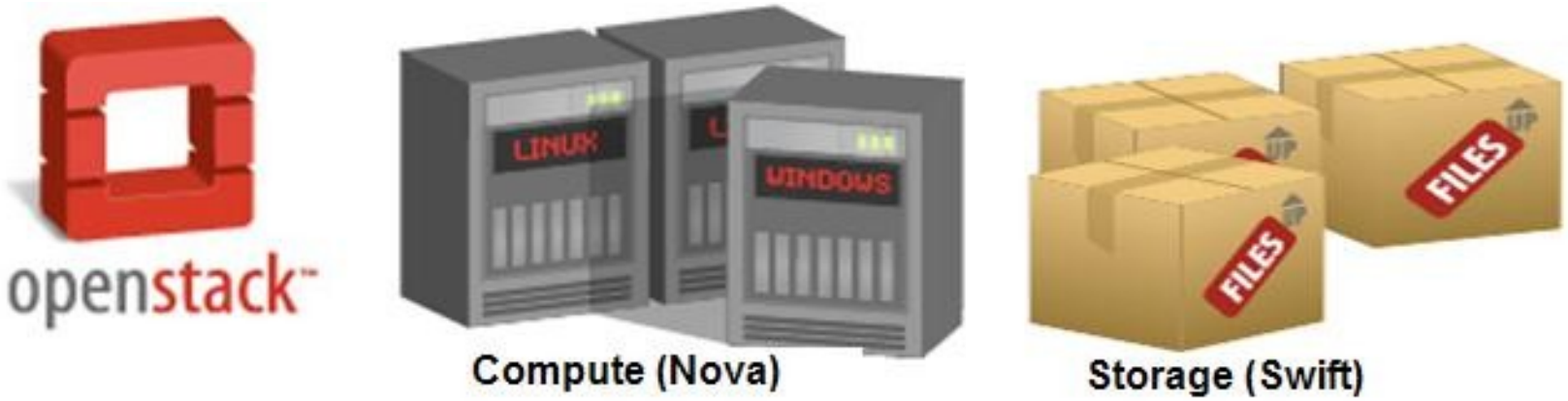
- Scalability of Eucalyptus was insufficient - Nebula project needed massive scalability 1 million machines & 60 million VMs
- **Open Core** Vs **Open Source** – NASA engineers were unable to contribute code to some Eucalyptus Modules due to some parts being closed source

Nebula Project at NASA

Birth of OpenStack: Rackspace+NASA

OpenStack **Rackspace+NASA** collaboration

- Rackspace "Ozone" cloud controller and
- NASA "Nova" cloud fabric on Nebula
- Rackspace "Cloud Files" storage engine



Rackspace Motivations

- Needed something to counter Amazon's rapid pace of innovation
- Shift to open source builds rapid developer mindshare
- Focus on their Strengths –
  - Customer Support
  - Heterogeneity
- Support offerings as new revenue stream

OpenStack Partners

OpenStack Project Objectives

Mission: Create an ubiquitous **open source** cloud computing platform that is **simple to implement** and **massively scalable**

- Open - All code is Apache 2 licensed
- Simple - Architecture is Modular
- Scalable – Massive scale Design Goals:
  - 1 Million Physical machines, 60 Million VMs
  - Billions of Objects stored

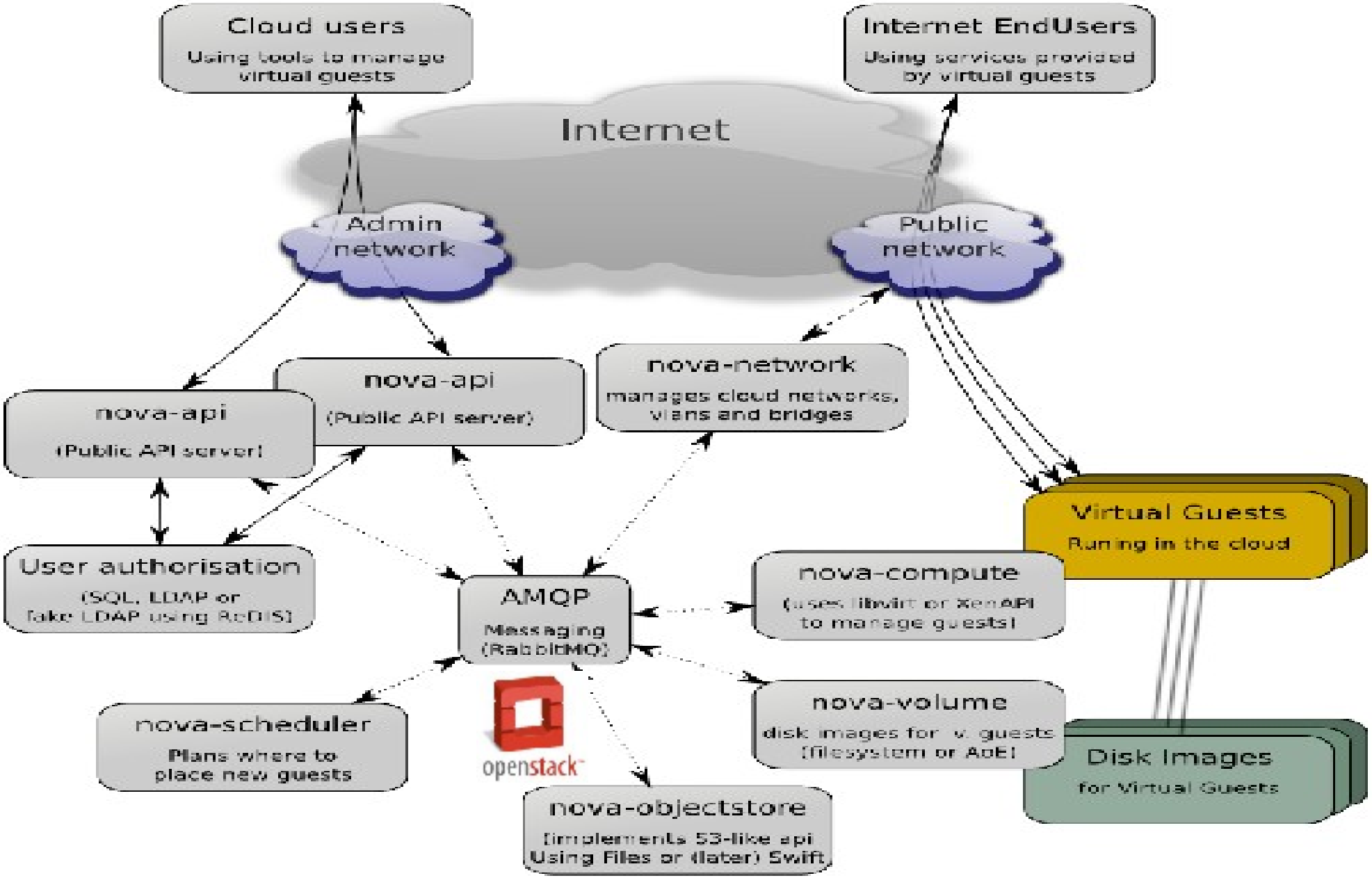
OpenStack Flavors

- OpenStack **Compute** (**Nova**) – service to Provision and Manage millions of VMs (comparable to Amazon EC2)
- OpenStack **Storage** (**Swift**) – service to large-scale, redundant storage of Static Objects (comparable to Amazon S3)
- OpenStack **Image Service** (**Glance**) – service to discover and register virtual disk images for use with Nova

OpenStack Release Train

- Three quick releases in under a year – Next release "**Diablo**" expected in Q3 2011
- Diablo focus - Make OpenStack ready for large-scale deployments

Architecture of OpenStack



Architecture of OpenStack

- Built on a shared-nothing, messaging-based architecture using AMPQ based queues
- **nova-api** process is the heart of the OpenStack Nova – its "Cloud Controller"
  - Provides an endpoint for all API queries
  - Initiates most of the orchestration activities
  - Enforces some policy - mostly quota checks
- **nova-schedule** decides which compute host a given VM should be created on

OpenStack Architecture Cont'd

- Three Primary Infrastructure Modules
  - **nova-compute** process primarily creates and terminates virtual machine instances.
  - **nova-volume** manages the creation, attach & detach of persistent volumes to VMs
  - **nova-network** manipulate the network e.g. configure VLANs, change iptables rules, etc
- SQL DB stores run time state of cloud infrastructure such as Instances in use, Networks available, Volumes attached, etc

OpenStack Component Specifics

- Written almost entirely in Python
- Available pre-built on Ubuntu and RHEL
- RabbitMQ is the AMPQ product of choice
- Supports MySQL and PostgreSQL
- Libvirt, Xen API used in instance creation
- Support for EC2 API and S3 semantics
- Supports wide variety of Hypervisors

OpenStack – Hypervisor Support

- Hypervisor agnostic – support for:
  - Hyper-V 2008
  - KVM - Kernel-based Virtual Machine
  - QEMU
  - User Mode Linux
  - VMWare - ESX/ESXi 4.1 update 1
  - Xen - XenServer 5.5
- Supports OVF (open virtualization format)

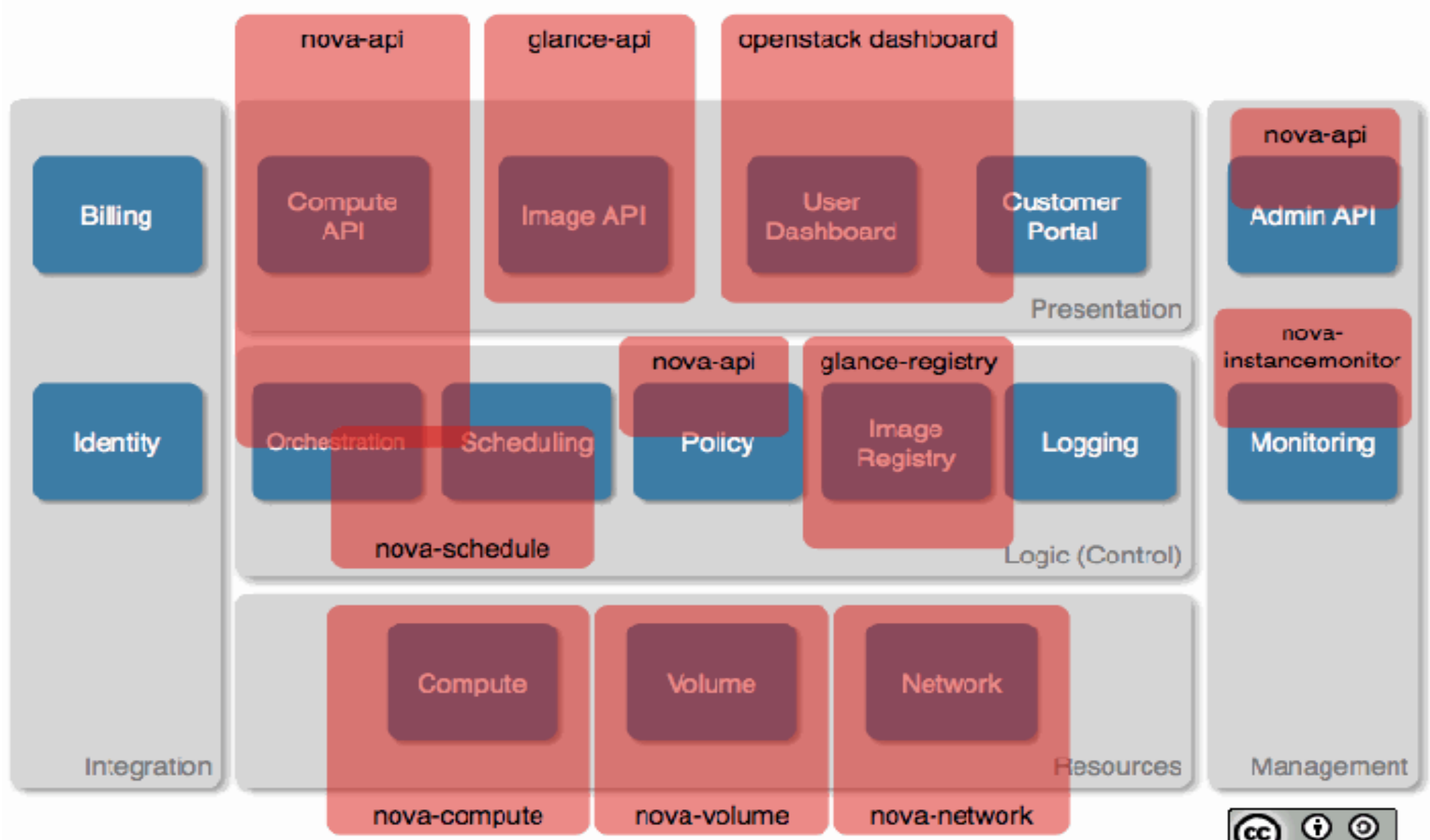
Competitors and Implementers

- Eucalyptus – Still very popular
- OpenNebula – Used at FermiLabs, CERN
- CloudStack – Cloud.com's IaaS platform
- CloudForms – Red Hat's IaaS offering (beta)

OpenStack in the commercial space:

- Ubuntu Enterprise Cloud (UEC) – Switched from Eucalyptus to OpenStack as base
- Project Oylumpus – Citrix branded OpenStack
- Internap – Rackspace competitor switching

OpenStack Ecosystem



OpenStack Partners Ecosystem

- Gaps in Stack filled in by Partners:
  - Billing - Chargeback and Showback
  - Integrated Metering, Capacity Planning
  - Full-Spectrum Monitoring, Analytics
  - Advanced Networking Capabilities
  - Management Systems
- Cisco has come out with a Networking as a Service (NaaS) Proposal for OpenStack
- Zenoss and CloudKick for monitoring

Ecosystem-Facebook OpenCompute

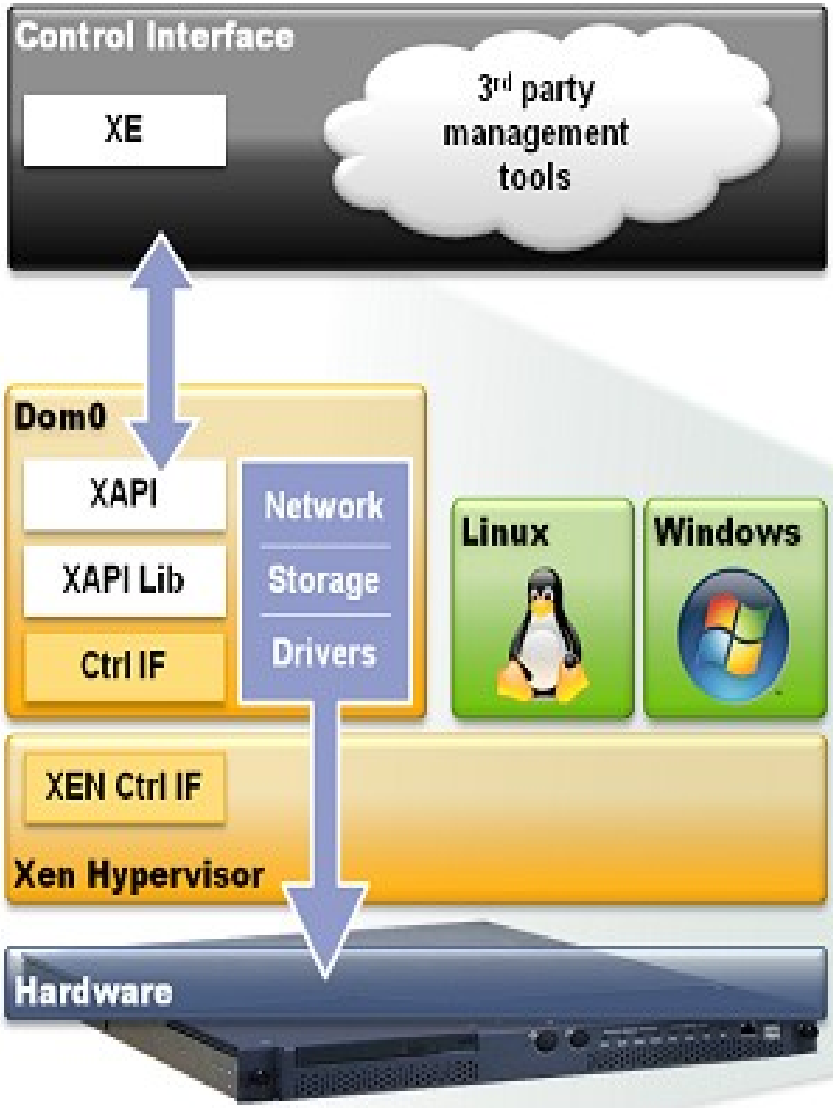
- Facebook recently open sourced their proprietary datacenter designs under OpenCompute project
- Puts all the "secret sauce" of their **datacenter** and **sever** design on the web
- Collaborating with OpenStack to ensure seamless deployment on Open Compute
- Power savings of 38%, cost savings 24%

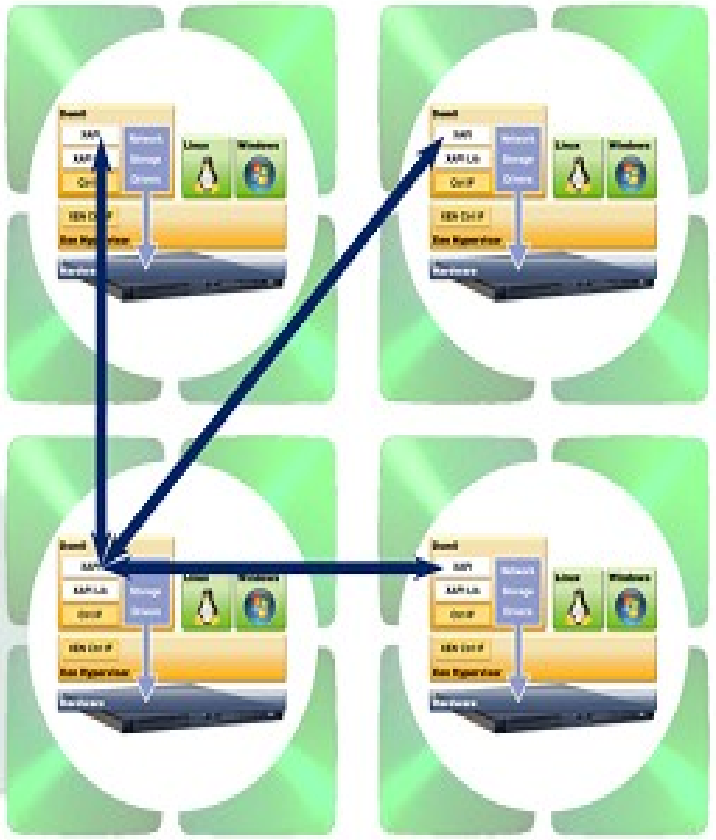
Ecosystem – Xen Cloud Platform

- Xen Cloud Platform 

  Open source platform to build clouds
- Virtualization platform including
  - Xen hypervisor
  - Network and Storage support
  - Originally derived from XenServer – GPL2

XCP Architecture



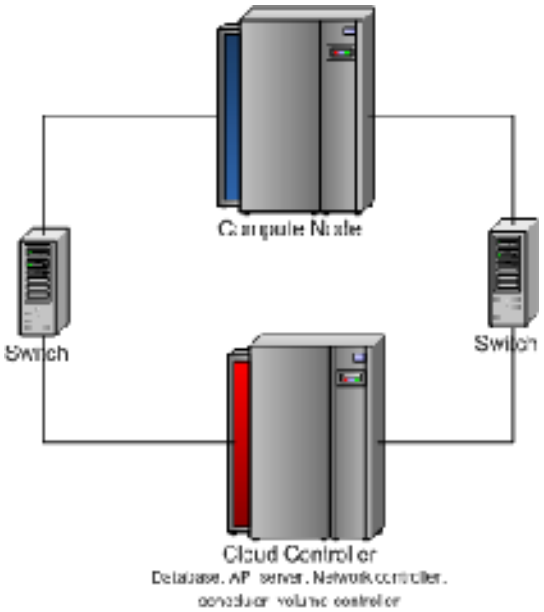


Resource pool

OpenStack and XCP

- OpenStack is hypervisor independent
  - Designed to work with XenServer & XCP
- Xen Cloud Platform (XCP) is the cloud optimized and Open source version of Xen
- OpenStack plays the role of cloud orchestration platform
- XCP to be the virtualization platform

OpenStack and XCP



- OpenStack supports XCP through XenAPI
  - XenAPI: Management API exposed by XCP
- OpenStack compute interacts with the XCP hypervisor (XEN)

OpenStack Limitations (Cactus)

- Nova codebase = merger of Rackspace &NASA Cloud controllers – Still Maturing
- Swift code base is mature and Ready for primetime
- HA, fault tolerance support in Cactus Release is in proposal stage
- Lack of good documentation on Setup/usage
- "Diablo" Release will be recommended for wide adoption

Conclusions

- OpenStack is becoming a default open source cloud fabric in IaaS space
- Ecosystem is an excellent opportunity to contribute to this exciting effort
- Wide adoption by Industry heavyweights guarantees major traction
- Lots of room for improvement but fast release cycles ensure quick fixes

Q & A

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Back-up Slides

Nova - instance launching