



Cisco Virtual Networking Solution for OpenStack

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Agenda

- Cisco Investments in OpenStack
- Canonical Ubuntu OpenStack Overview
- Cisco Virtual Networking Solution for OpenStack
- Summary

Cisco Investments in OpenStack

Compute



UCS

Network



Nexus Plugins

Architectures (CVD)

Big Data, Hadoop, Orchestration, Flexpod,
Cloud infrastructure, UCS + Nexus on
OpenStack



- Cisco UCS Integration
- Cisco Intercloud, Webex
- Cisco OpenStack Services

- Cisco ACI Neutron Plugin
- Cisco Nexus Neutron Plugin
- Cisco Nexus 1000V Integration

Why Customers are moving to Canonical & Cisco OpenStack



Ubiquity has spoken

Host and Guest OS

P
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C

C
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Cloud Speed Innovation

Regular release cadence

+

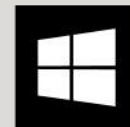
Instagram, Snapchat, Uber, Netflix,
Heroku, Twitpix, FourSquare....

Preferred platform for Cloud Development

>70% of AWS guest images (1)

>65% of DigitalOcean guest images (2)

>60% of Azure Linux guests (3)



+ Joyent *hp*



H
O
S
T

9/10 OpenStack clouds run on Ubuntu

The reference architecture used
by leading companies worldwide

Juju, powerful cross cloud orchestration



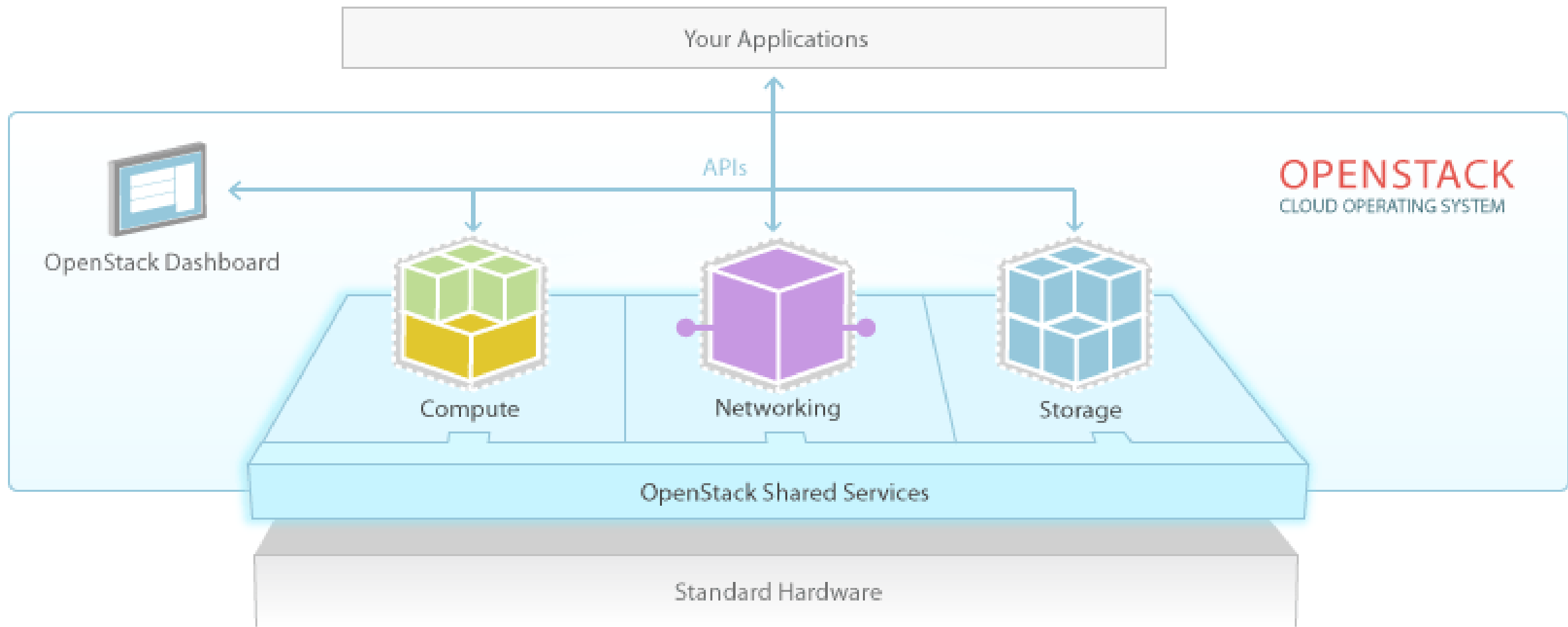
Why Openstack?

- **Control and Flexibility:** Open source platform means you're never locked to a proprietary vendor.
- **Innovation:** Leverage scale of Open Source community
- **Modular:** Integrate with various Cisco technologies.
- **Scalable:** OpenStack is already running in global corporations providing secure public and private cloud infrastructure.
- **Momentum:** Major Telcos, Service Providers, and Enterprises are moving to Openstack

“It is in my best interest to let the community know... We're running a serious business on this technology, and this is what we have to do to remain competitive and flexible in this environment.” - Glen Ferguson Wells Fargo

“AT&T has to move faster to compete, and OpenStack is helping to do that because we can expand to include workloads like Network Function Virtualization in Openstack” - Toby Ford AT&T





Putting the Pieces together

1

Network

Neutron
Gateway
Drivers
API's

2

Storage

Glance
Cinder
Swift
Drivers
API's

3

Compute

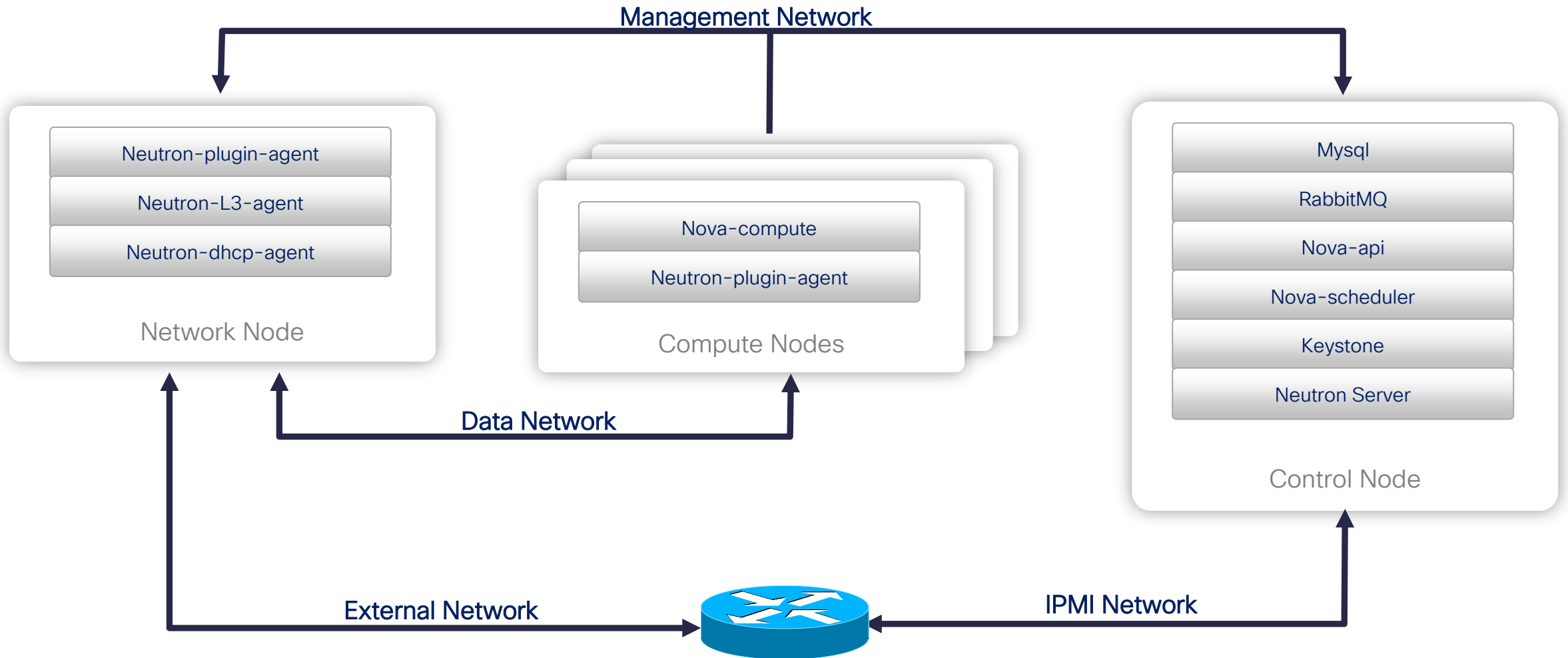
Nova Controller
Nova Compute
API'S



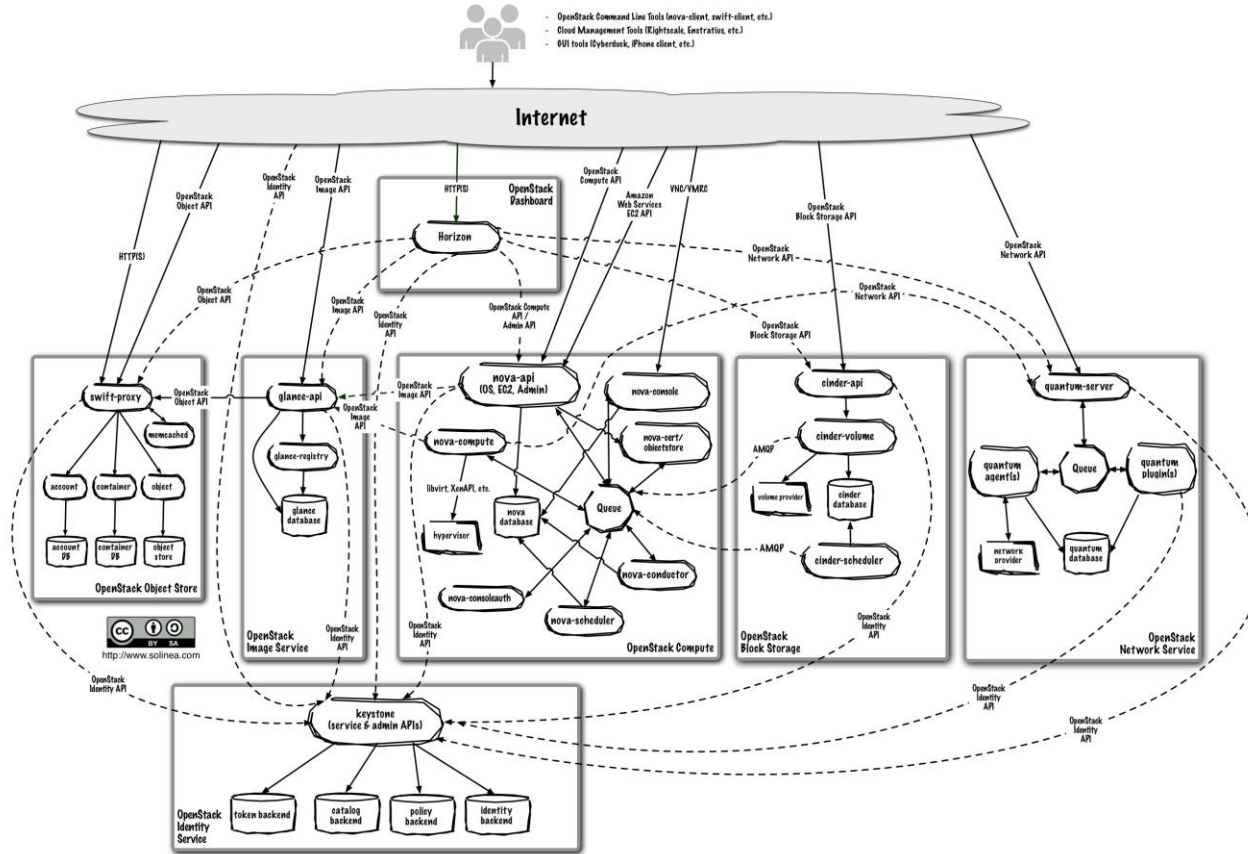
CANONICAL



A simple OpenStack Deployment



The OpenStack Challenge



80% of all Openstack Installation fail due to DIY Implementation and Integration Issues

Complexities faced in DIY Openstack Deployments

- Configuring and running a set of processes in one or more machines.
- Interconnecting the processes that compose the system.
- Setting up physical or virtual machines, provision the operating system.
- Installing the applications and the necessary dependencies.
- Configuring servers, databases, and inter communications
- Dealing with processes including addresses and credentials and authentication
- Life Cycle Management with upgrades, configuration changes
- Integration of new services and high availability



**UBUNTU
CISCO
INTEGRATED
OPENSTACK**
All you need to
deploy a production
OpenStack cloud

Workloads & Apps

OPENSTACK

Virtualisation
(KVM, Xen, ESX etc)

**UBUNTU
CLOUD
ORCHESTRATION
ENGINE**

Juju
MAAS

CISCO
Nexus
1000

Ubuntu and Cisco Integrated Openstack

1

IaaS

Openstack

Cinder
Nova
Neutron
Horizon
Glance

2

Storage

Block/Object
Software
Defined
Storage

3

Network

Nexus 1000
ACI
VxLan

4

PaaS

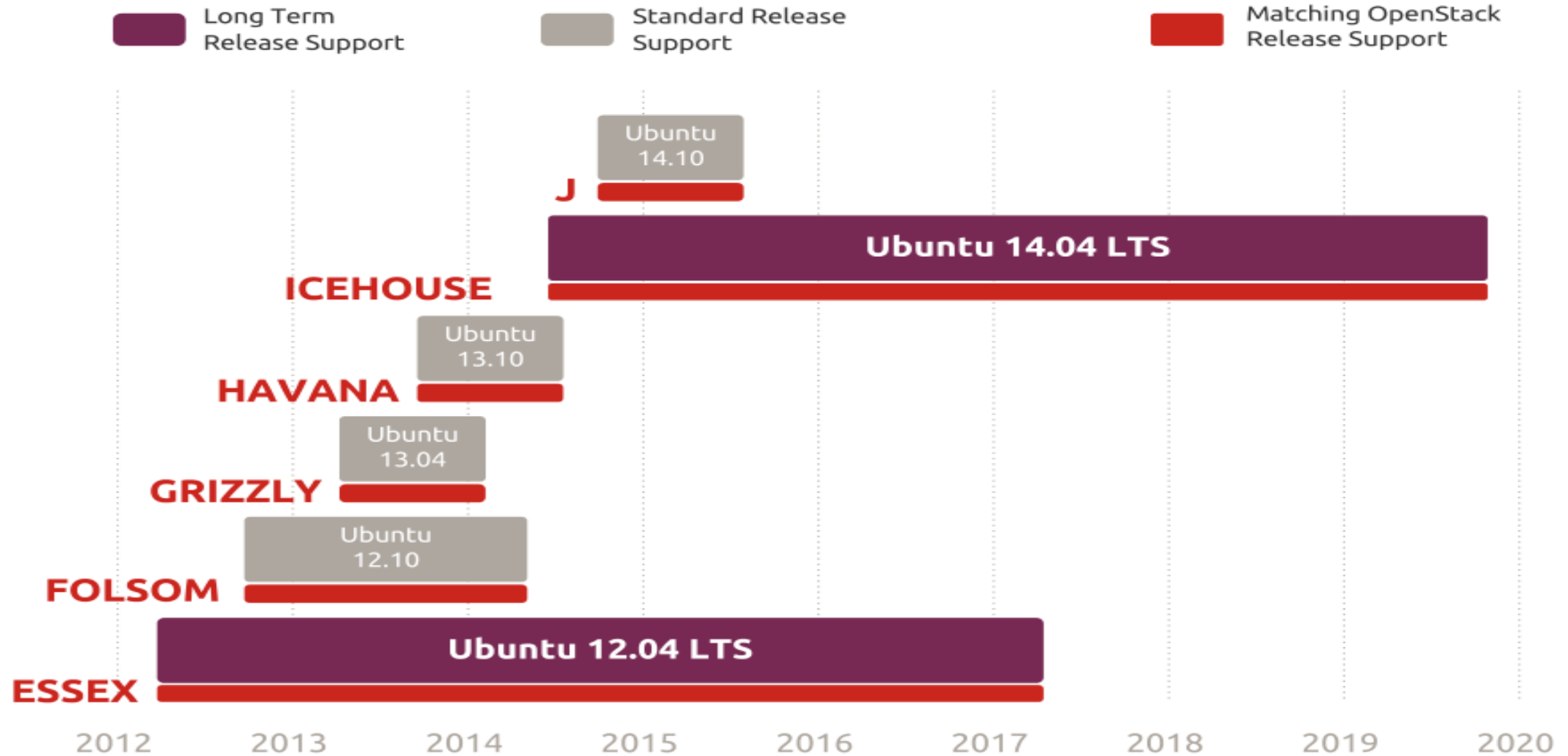
Hadoop
Heroku
Cassandra
Couchbase
Mongodb



Fully Integrated Cisco-Ubuntu Openstack



OpenStack matches Ubuntu cadence



Juju: Demystifies Openstack Deployments



- 1** Deploy and manage OpenStack
- 2** Deploy, Define and Scale workloads into OpenStack
- 3** Powerful service orchestration
- 4** Rich web based GUI
- 5** Speed

MAAS



- 1 Automated bare-metal provisioning
- 2 Dynamic re-purposing of hardware
- 3 Intelligently match hardware to workload for **better efficiency**
- 4 Web based interface

Cisco Virtual Networking for OpenStack – Nexus 1000V Charm



- 1 Easy Deployment ~ Charm for Nexus 1000V
- 2 Integration into Ubuntu Openstack
- 3 Dynamic service scaling based on workload requirements

Search for Charms



Featured (3)

mediawiki:single

Deployed 62 times
2 services | 2 units
precise | Recommended

mongodb:clus...

Deployed 13 times
5 services | 13 units
precise | Recommended

hadoop:cluster

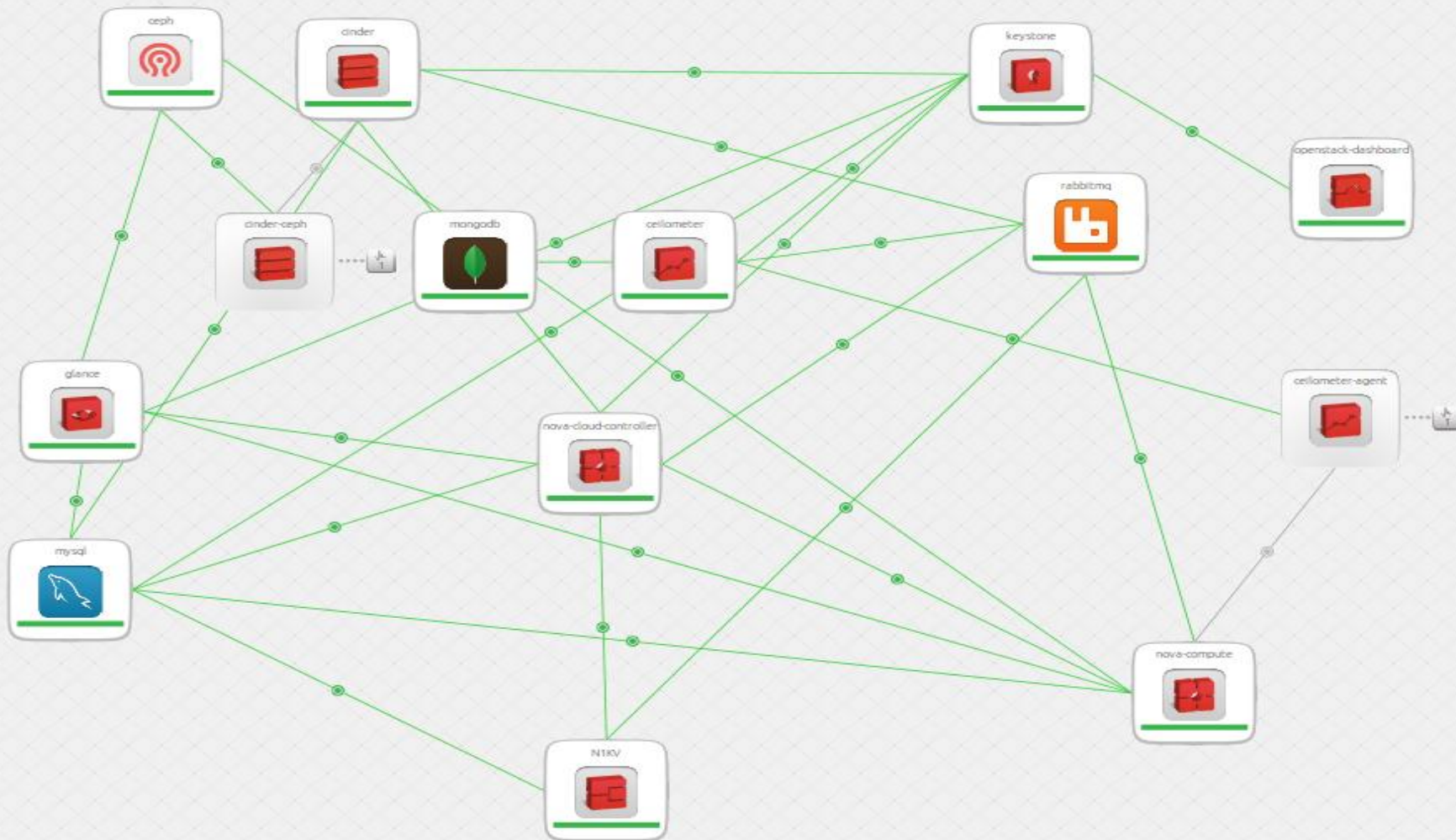
Deployed 21 times
4 services | 7 units
precise | Recommended

Popular (10) ~

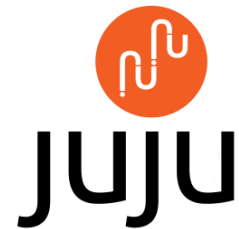
mysql

Deployed 22366 times
precise | Recommended

wordpress

Deployed 11833 times
precise | Recommended

Ubuntu – Cisco OpenStack Deployment demo Using

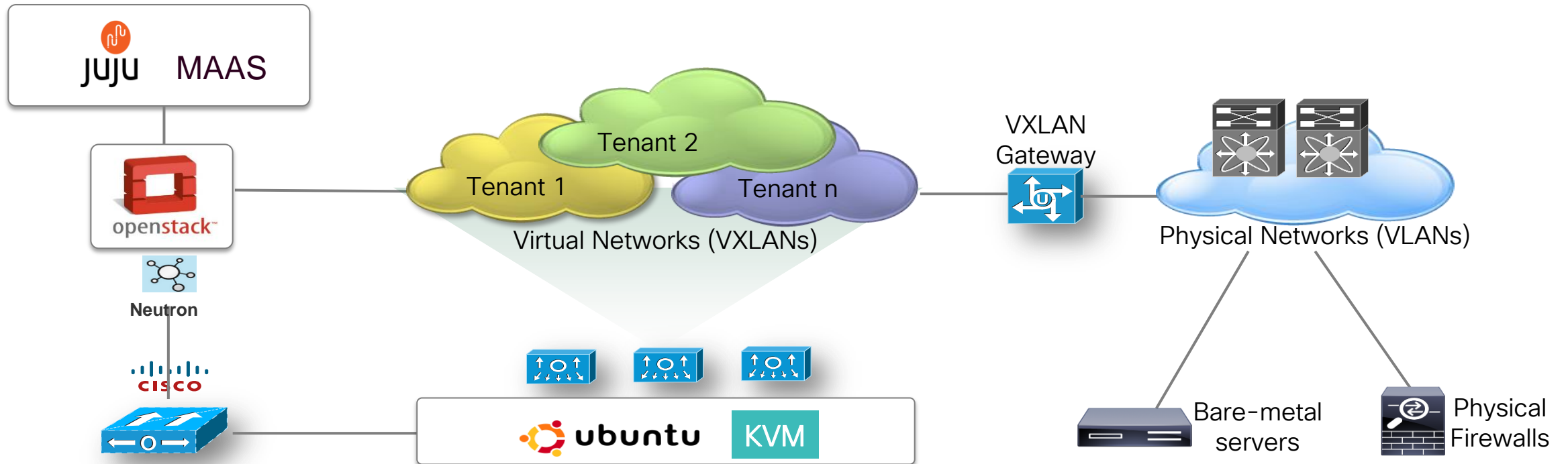
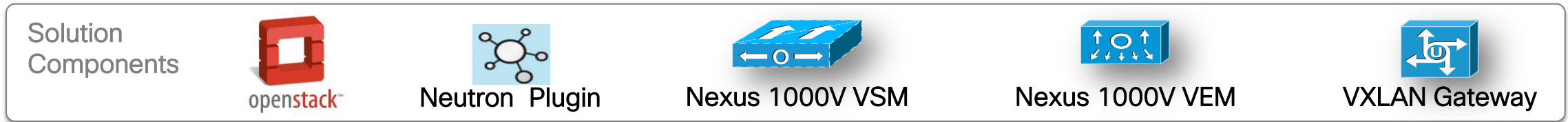


Virtual networking challenges in OpenStack

- Reliable networking
- Scalable, multi-tenant support
- Strong network services eco-system
- Network operations & troubleshooting

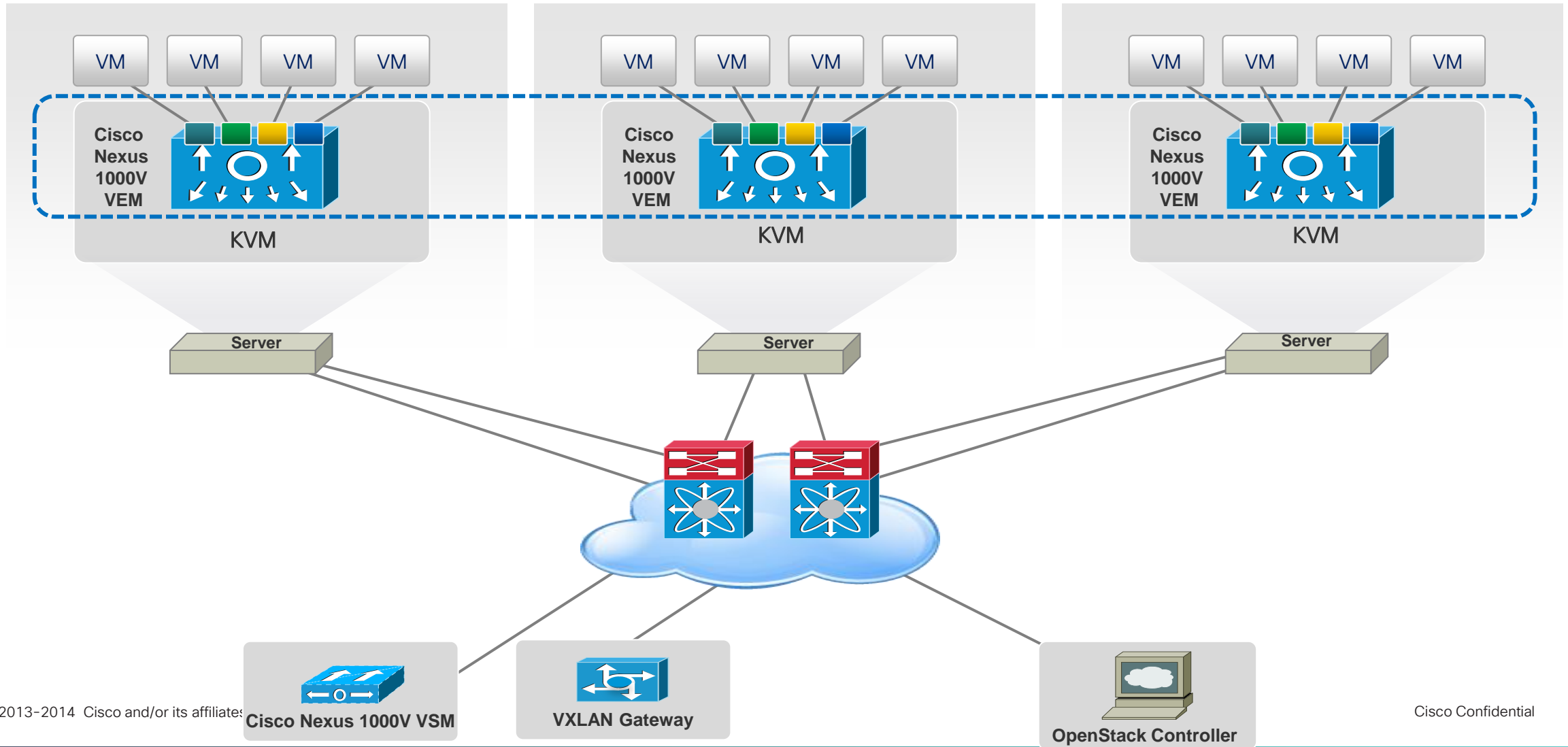
Cisco Virtual Networking Solution Overview

Cisco Virtual Networking Solution for OpenStack



Cisco Virtual Networking Solution for OpenStack

A simple Deployment Scenario



Cisco Virtual Networking Solution for OpenStack

Key Features

| Feature | Description |
|---------------|---|
| Switching | L2 Switching, 802.1Q VLAN Tagging LACP, Port-channeling, VPC Host Mode IGMP Snooping (v.1, 2, 3), Jumbo-frame support |
| Security | Access Control Lists (L2-4 w/ Redirect), Port ACLs, Named ACLs, ACL Statistics, RADIUS, TACACS+ |
| VXLAN | Unicast & multicast modes, Port-statistics, ACLs, Netflow, VXLAN to VLAN Gateway |
| Provisioning | Integration with OpenStack Neutron APIs & Horizon dashboard, VM Policy Provisioning through port-profiles, Ability to create SLA-based network profiles |
| Visibility | Netflow, Port-statistics, VM-level interface statistics |
| Manageability | Cisco NX-OS CLI, SNMP (v.1, 2, 3), CDP, Syslog, NTP ISSU, SSH v2, Telnet, REST-APIs Centralized management through VSM |

Cisco Virtual Networking Solution for OpenStack

What is new with v3.1.1?

- Icehouse Support
 - Ubuntu OpenStack with Ubuntu 14.04
- Improved Scale
 - up to 128 VEMs/VSM
- New VEM architecture for better performance
 - better connection set-up rate, flow optimizations

Cisco Virtual Networking Solution

v3.1.1 Scale numbers

| Features | VEM | DVS |
|--------------------------|-----|------|
| #VEM Hosts | | 128 |
| #veth Ports | 990 | 8000 |
| #network profiles | NA | 2000 |
| #policy profiles | NA | 512 |
| # Veth Per Port profiles | NA | 2000 |
| # Active VLANs | NA | 2000 |
| # Active VXLANs | NA | 2000 |
| # PNICS | 6 | NA |
| #veth Trunks | 8 | 512 |
| # Port Channels | 4 | 128 |
| # VXLAN G/W Pairs | 1 | 8 |
| # VXLAN mapping per G/W | 512 | 4096 |
| # Tenants | NA | 512 |

| Features | VEM | DVS |
|---|------|------|
| # ACL Policies | 128 | 128 |
| # ACE per ACL | 128 | 128 |
| # ACL Interfaces | 1000 | 4000 |
| # NetFlow Policies | 32 | 32 |
| # NetFlow Interfaces | 1000 | 8000 |
| # VLAN Multicast Groups | 1000 | 1000 |
| # ERSPAN Sessions | 64 | 64 |
| # Source Interface per Session | | 128 |
| # Source Vlan per Session | | 32 |
| # Destination interfaces per session | | 32 |
| # Sessions a span source interface can be part of | | 4 |
| # Source profiles per session | | 16 |
| # Destination Profiles per session | | 8 |

OpenStack Neutron Service

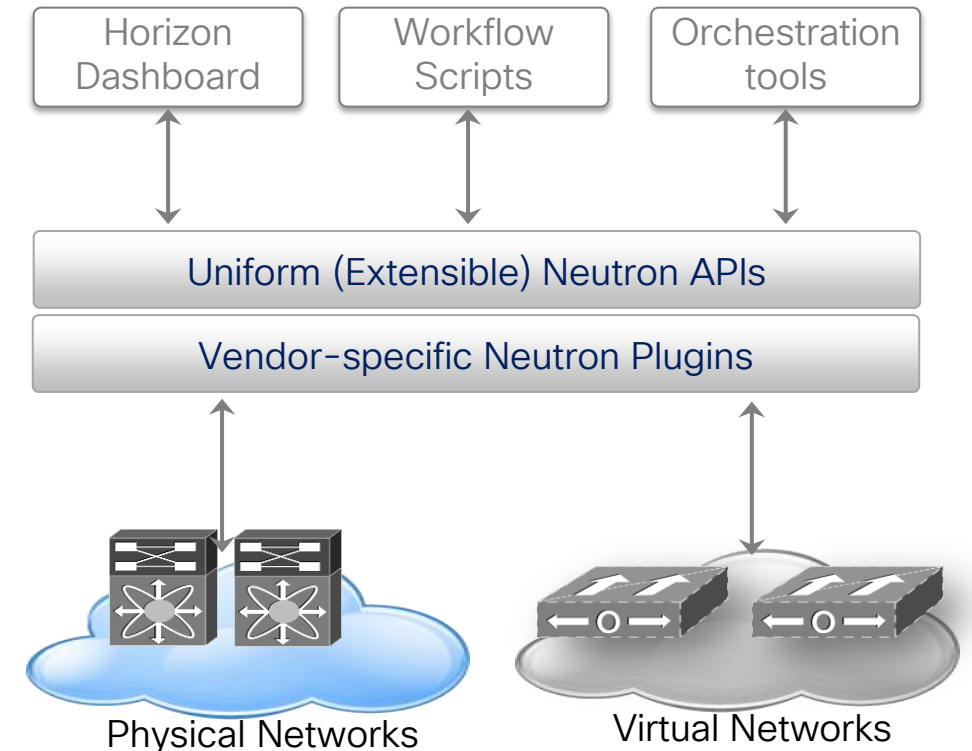
OpenStack Neutron Service

Framework for managing networks

- Uniform north-bound APIs
- Extensible through plugin infra
- Two types of API extensions
 - Resource extensions
 - Attribute extensions

Example Neutron APIs

```
CRUD Operations for networks (networks, subnets, ports)
CRUD Operations for Security Groups & Group Rules
CRUD Operations for Tenant Quotas (#networks, #ports etc.)
CRUD Operations for logical router
```



OpenStack Neutron Core Resources

Network

- Isolated L2 network
- Can be backed by either a VLAN or a VXLAN

Subnet

- IP-address range to be allocated for a set of VMs or physical hosts

Port

- A connection point for attaching a single device, such as the NIC of a virtual server, to a virtual network

- CRUD Operations are supported for each of the above objects.
- These CRUD operations can be invoked either through CLI or Horizon Dashboard.
- Cisco specific resource extensions:
 - network-profile & policy-profile
- Cisco specific attribute extensions:
 - profile-id (for network & port objects)

Cisco Virtual Networking - Integration with OpenStack

Network Profiles & Policy Profiles

- Network Profile: logical collection of network segments
 - 3 types of network profiles: VLAN, VXLAN & Trunk profiles
 - Tenants can use network profiles to create new networks
- Policy profiles: port-profiles created on VSM to capture policy information
 - Propagated to OpenStack through the neutron plugin

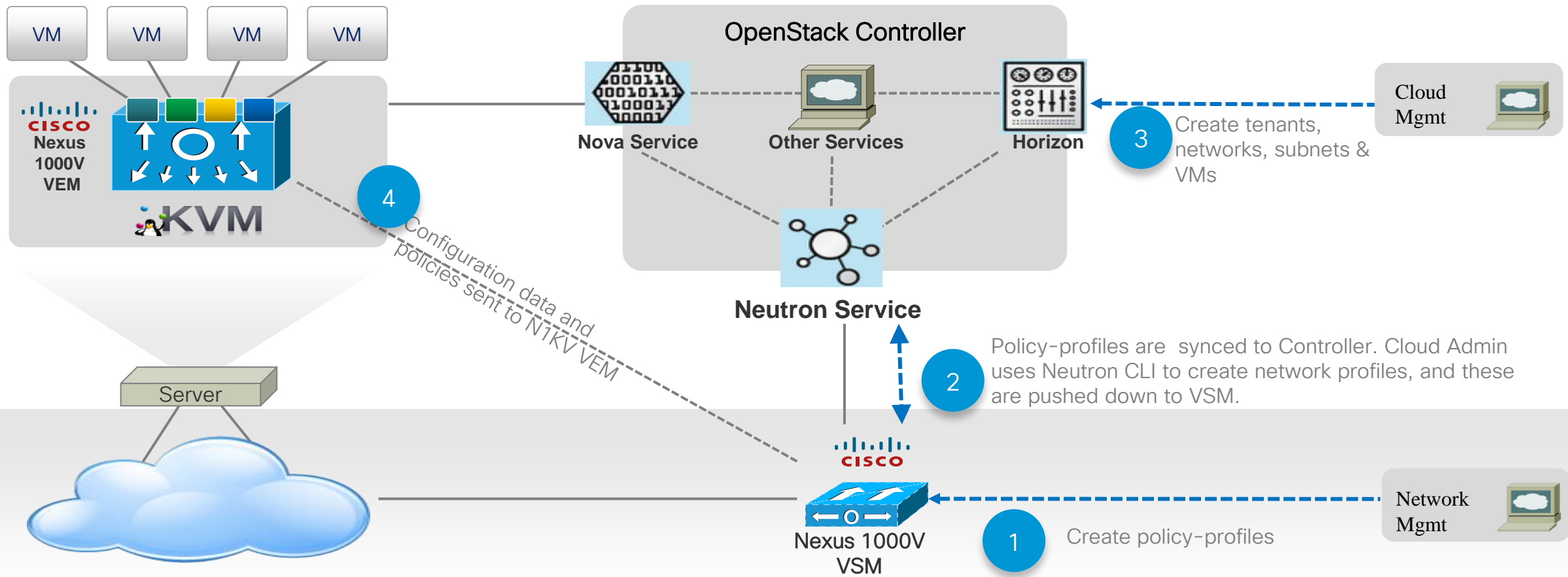
```
cisco@openstack-controller:~$ quantum cisco-network-profile-create vm-pool1 vlan --segment_range 50-60 --physical_network phyl  
Created a new network_profile:
```

| Field | Value |
|--------------------|--------------------------------------|
| id | ee8f73e9-11b6-41dd-9014-ef4753fa90e2 |
| multicast_ip_range | |
| name | vm-pool1 |
| physical_network | phyl |
| segment_range | 50-60 |
| segment_type | vlan |
| sub_type | |

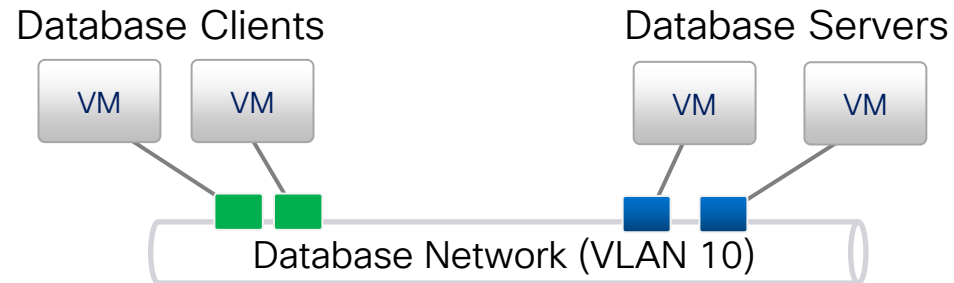
```
cisco@openstack-controller:~$ quantum cisco-policy-profile-list
```

| id | name |
|--------------------------------------|-----------|
| 08cca889-191b-4cec-8b23-6cb07c6bd637 | dhcp_pp |
| 3fe8b939-f6ed-477b-8b47-1b08a2f08aff | vm_policy |

Operational workflow



Network segments are created from network profiles.



Nexus 1000V for VMware vSphere

```
# port-profile db-client
switchport mode access
switchport access vlan 10
ip port access-group dbclient in
no shut
state enabled
```

```
# port-profile db-server
switchport mode access
switchport access vlan 10
ip port access-group dbserver in
no shut
state enabled
```

Nexus 1000V for KVM

Create a DB network-profile using Neutron CLI. Use this to create a DB Network segment (vlan 10).

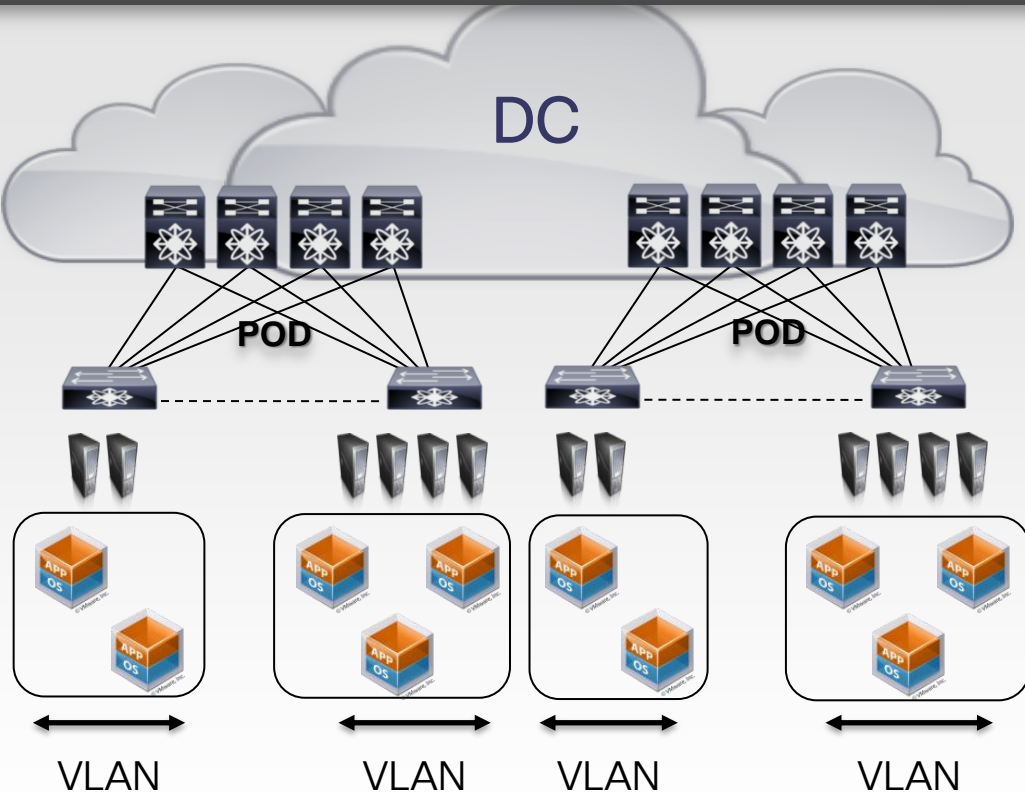
```
# port-profile db-client
ip port access-group dbclient in
no shut
state enabled
```

```
# port-profile db-server
ip port access-group dbserver in
no shut
state enabled
```

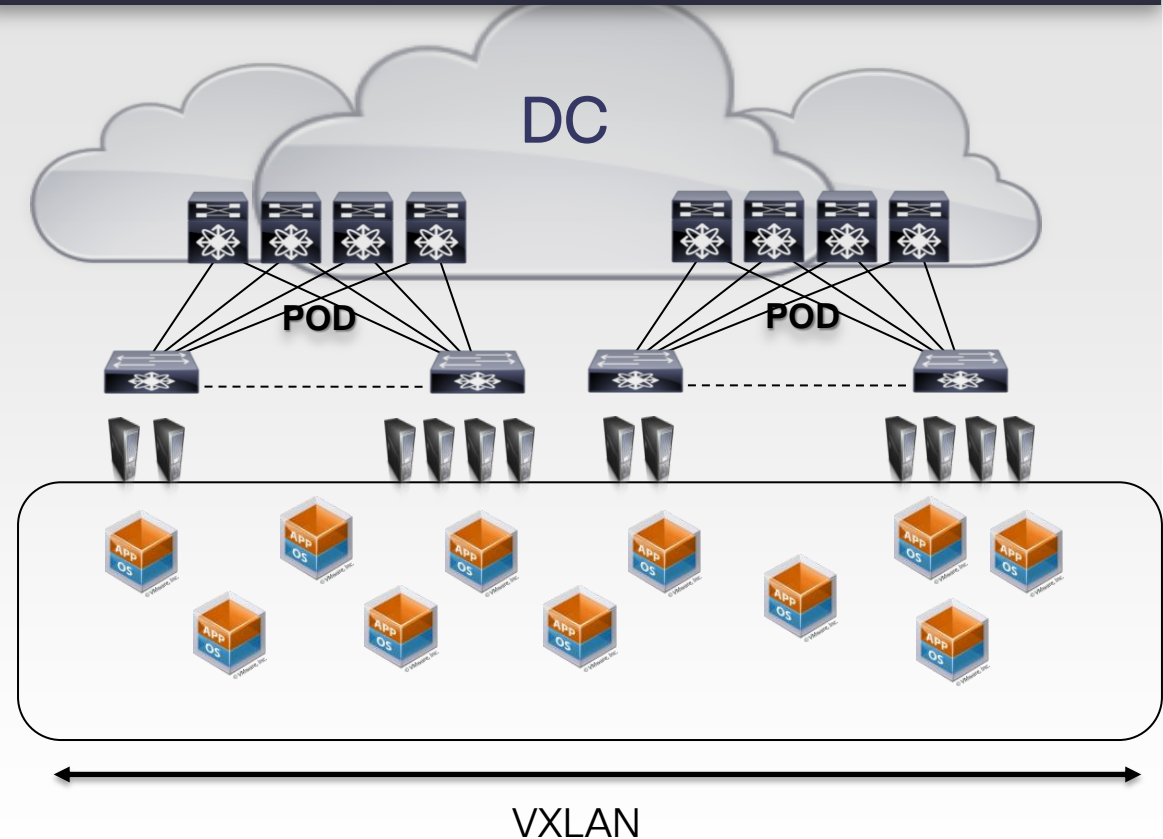
Support for standard & enhanced VXLAN

Provides infrastructure Flexibility & Better Resource Utilization

Limited Rack-wide VM Mobility



Virtual/Cloud Data Center



No multicast requirement on the infrastructure

Automation through REST APIs

Support for Neutron API v2.0

Neutron URI: `http://<VSM-IP-address:port>/v2.0/<resource-name>`
N1KV URI: `http://<VSM-IP-address:port>/api/<resource-name>`

CRUD Operations through VSM REST-ful APIs

| | |
|-------------------|-------------|
| Create an object* | HTTP POST |
| Read an object | HTTP GET |
| Update an object | HTTP POST |
| Delete an object | HTTP DELETE |

*Objects can be networks, subnets, and port-profiles
Write/Update Operations are only supported on limited set of objects

Construct the URI using
the above template

Arguments are
passed to APIs
in JSON format

Use a browser
or CURL to
query VSM

Parse JSON
response to get
the required
information

Deployment Workflow for Cisco/Canonical Solution

Cisco Virtual Networking Components

Nexus 1000V Image Components

VSM VM Image

VXLAN VM Image

VEM Executable

Neutron Plugin

Horizon Tab

Charms Scripts for VSM

Charm Scripts for VEM

Charm Scripts for VXLAN G/w

All of these are hosted on private canonical archive

Deployment is automated through juju charms

Ubuntu OpenStack Deployment with Cisco Virtual Networking Solution

Canonical Archives

- Hosts kernel, Server OS (Ubuntu), OpenStack
- Launchpad is the code repository for Canonical
- 14.04 (Trusty Tahr), 12.04 (Precise Pangolin)
- <http://archive.canonical.com/>

Juju Charm Store

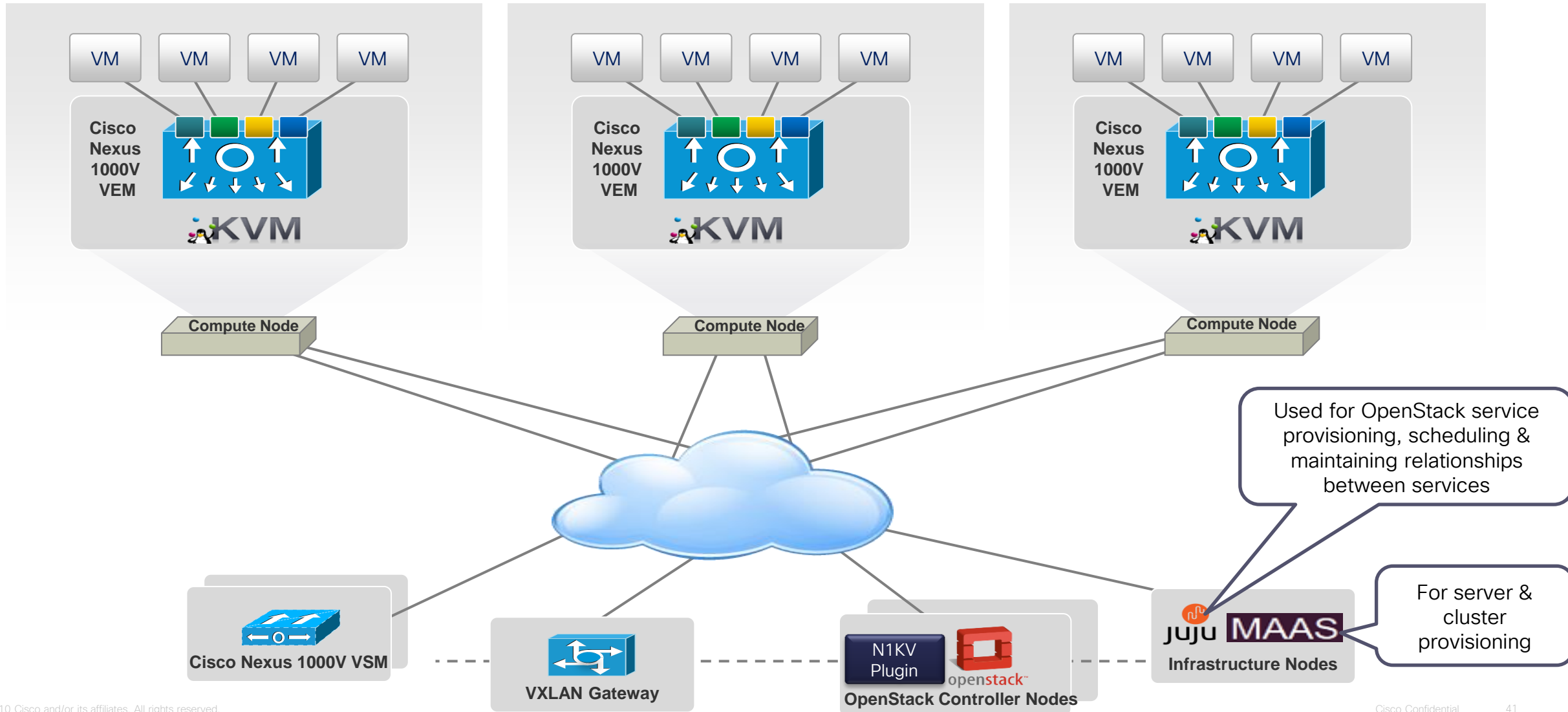
- Charm -how services are deployed
- Bundle - a collection of charms
- Store - where bundles are published
- <https://jujucharms.com/>

Cisco Private Cloud Archive

- Neutron Plugin changes, Horizon Tab Changes
- N1KV Images: VSM, VEM, VXLAN Gateway
- N1KV images will also be hosted on Cisco.com
- launchpad.net/~cisco-n1kv

- Obtain OpenStack Components using the usual Canonical archives
- Obtain the OpenStack & N1KV deployment charms from Juju Charm Store
- Obtain the N1KV components from either Canonical/Cisco PPA or Cisco.com

OpenStack Deployment with Cisco Virtual Networking



OpenStack Deployment with Cisco Virtual Networking

Install & Configure MAAS

- Install the Maas Packages (region & cluster controllers, dhcp)
- Import boot images for the services
- Configure DHCP

Install & Configure Juju

- Install juju-core
- Customize juju configuration file in MAAS mode
- Create a MAAS bootstrap node

Install & Configure OpenStack Services

- Use juju charms to deploy all OpenStack services
- Includes N1KV Plugin & N1KV dashboard tab

Install & Configure Cisco Nexus 1000V

- Use juju charms to deploy VSMS
- Use juju charms to deploy VEMs
- Use juju charms to deploy VXLAN Gateway

Customer Benefits

Reduced Operational & Technology risk

- Hardened Nexus Operating System
- Advanced networking feature-set
- Reliable support

Simplified Operational process

- Leverage existing monitoring & management tools
- No staff retraining required

Highly available and secure cloud environment

- Strong ecosystem of network services
- Strong security feature-set

Additional Resources

- Cisco Resources
 - Cisco Nexus 1000V for OpenStack: <http://www.cisco.com/c/en/us/products/switches/nexus-1000v-kvm/index.html>
 - Cisco Nexus 1000V Portfolio: <http://www.cisco.com/go/1000v>
 - Cisco OpenStack initiative: <http://www.cisco.com/go/openstack>
 - N1KV Community Site: <http://www.cisco.com/go/1000vcommunity>
- Canonical Resources
 - <http://www.canonical.com/>
 - <http://www.ubuntu.com/cloud>

Thank you.

