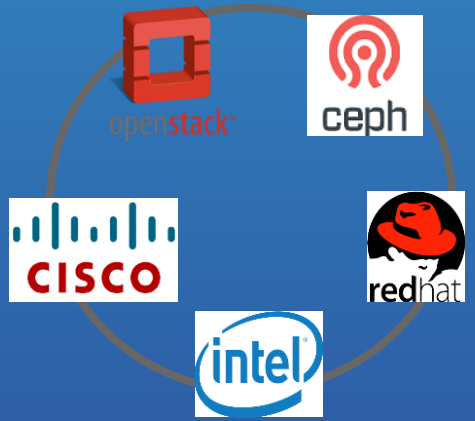
Accelerate into an Open Future with a robust cloud environment by Cisco & Red Hat



Ami Ben-Amram, Data Center Solution Specialist, amib@cisco.com

February, 2017

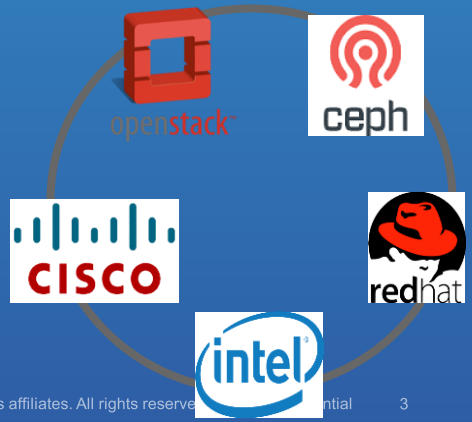
https://www.youtube.com/watch?v=By7q5fZ6XW8

OpenStack Day Agenda

09:45 - 10:00	**Welcoming & Opening**
10:00 - 10:30	**Red Hat & Cisco's joint offering - Providing Enterprise Choice with Integrated Infrastructure for OpenStack** by Ami Ben-Amram, Data Center Solutions Specialist
10:30 - 11:00	What's new in Red Hat OpenStack Platform - When your cloud performs better, so does your business by Yariv Rahamani, Cross NFV Team Lead, Red Hat
11:00 - 11:30	**New Cisco UCS S-Series & Red Hat Software Defined Storage** by Taco Scargo, Senior Solution Architect at Red Hat
11:30 - 11:45	Coffee, Sweets & Networking
11:45 - 12:30	**The power of ACI with OpenStack** by Meir Roth, Systems Engineer at Cisco
12:30 – 13:00	Joint Customer Success Story: Building your Private Cloud with Red Hat OpenStack & Red Hat CEPH Storage - from POC to production deployment in 2 weeks by Orgad Kimchi, Senior Cloud Architect at Red Hat
13:00	Q&A , Lunch & Networking

Red Hat & Cisco's joint offering - Providing Enterprise Choice with Integrated Infrastructure for OpenStack

Ami Ben-Amram, Data Center Solution Specialist, amib@cisco.com



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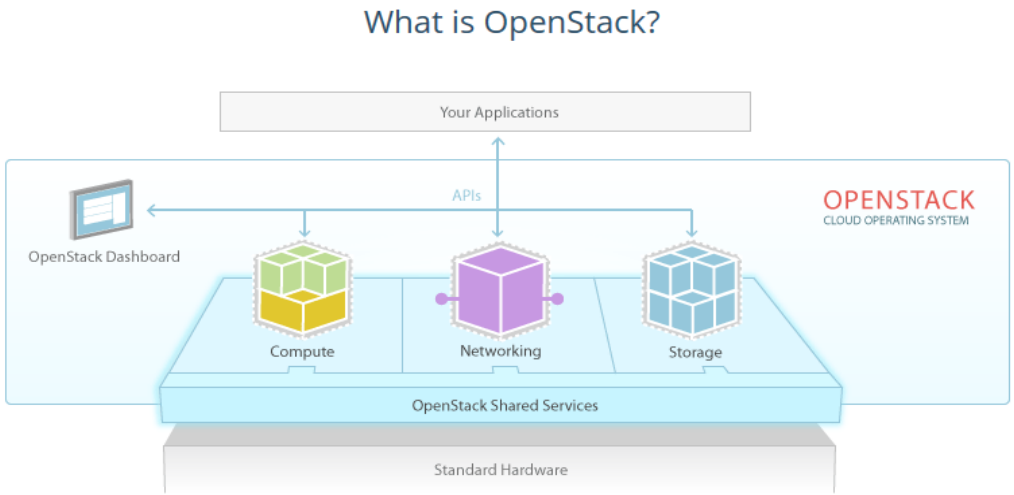
What is OpenStack?

"OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed through a dashboard that gives administrators control while empowering their users to provision resources through a web interface."



Details extracted from openstack.org

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Open stack Components and Services

Neutron (Networking)

Nova (Compute)

Storage

Glance

Swift

Cinder

Ceph

Horizon (GUI Dashboard)

Heat (Orchestration)

Keystone (Identity)

Ceilometer (Telemetry)

Nova and Glance:
Nova service delivers virtualization platform with the images stored in Glance

Neutron:
Networking service between interface devices and other open stack services
Modular Plugins if needed

Storage:
Storage as a service
Swift – Object storage for tenants
Cinder – Block Storage as Service
Ceph – Open source Software integrated

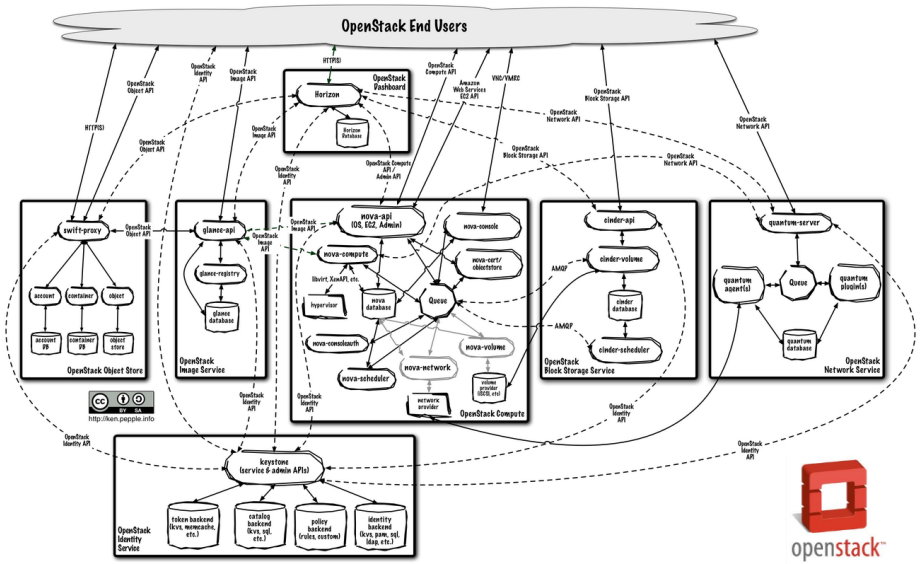
Heat Orchestration:
Automation tool
Integration with Chef and Puppet
Instantiates images, network and storage resources

Keystone:
Identity service and is a data-store for tenants, projects and provides tokens to access API's

Horizon:
GUI dashboard for admins and tenants

Ceilometer:
Part of telemetry project and used for customer billing, resource tracking, etc.

OpenStack is Not Simple



- OpenStack is NOT a single software package
- There is no **1-800-OpenStack number**
- **NO clean upgrade path** when moving to a newer version
- Deployments are highly customizable, if the installer leaves your company, **you are compromised**
- **Scaling OpenStack is very hard**

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IT Challenges of Implementing OpenStack

Support

- Most distributions are community supported
- Support is message boards and email
- No single point of contact

Deployment

- Many deployment methods
- Many package / update systems
- Best practices on specific architectures?

Complexity

- Other OpenStack ancillary projects
- Which distribution?
- Which deployment system?

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Business Challenges of Implementing OpenStack

Speed of Deployment

- Integration and testing components
- Consistency of deployments
- Achieve fast payback and ROI

Risk Management

- Stable platforms
- Supportable configurations
- Cost-efficient scale-out
- Access to skilled staff

Retain Flexibility

- Future agility and choice
- Investment protection
- Avoid vendor lock-in

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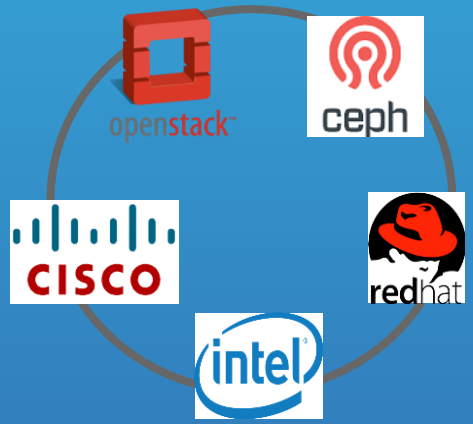

Better understand on how integrated OpenStack solutions … accelerate time to value and reduce risk … so that you can quickly deploy a reliable cloud environment.

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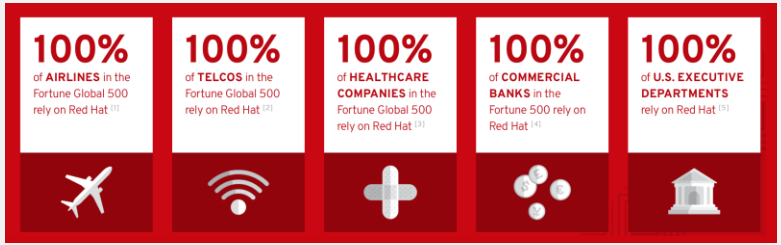
Cisco and Red Hat – Market Leaders

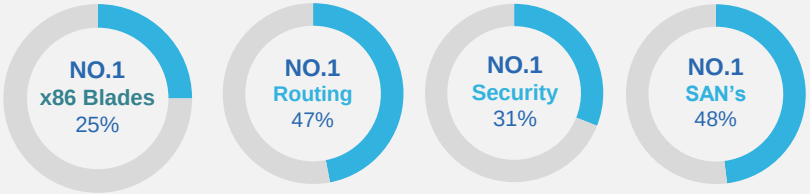
Red Hat – #1 in Enterprise

- World's leading provider of Open Source Software, Services, and Support – largest Linux and OpenStack ecosystem
- 90%+ of the Fortune 500 run Red Hat
- #1 code contributor to OpenStack



Cisco – #1 in Enterprise

- World's leading provider of integrated infrastructure for the datacenter
- Market share leader in x86 Blade Servers with 50,000+ customers
- Pioneering OpenStack partner
- In Israel – 700 customers, MOD Selected server vendor.



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Open stack on Cisco UCS – A Solution !!!

Red Hat Management Software

redhat

OpenStack Suite

openstack™

CISCO PLUG INS

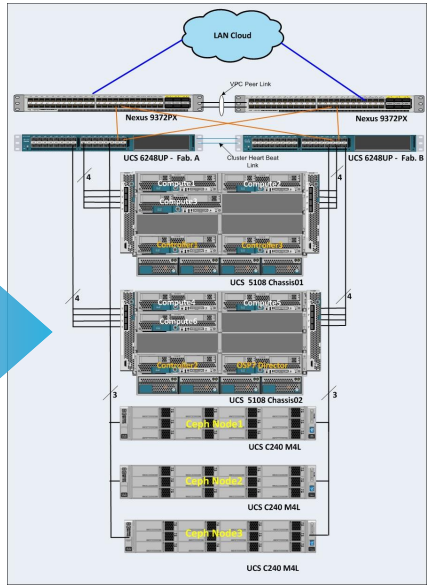
Cisco Converged Infrastructure

NETWORK — Cisco Nexus switches

Cisco UCS Fabric Interconnect

COMPUTE — Cisco UCS blades

STORAGE — Cisco UCS C240 "CEPH"



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Cisco Integrated Infrastructure for OpenStack

Cisco UCS, OSP, CEPH
Kilo & Liberty

RED HAT ENTERPRISE LINUX OPENSTACK PLATFORM

openstack

ceph

Cisco PLUG INS

CISCO redhat intel

Cisco UCS, ACI, OSP, CEPH
Liberty

RED HAT ENTERPRISE LINUX OPENSTACK PLATFORM

openstack

ceph

APIC ACI

OpFlex ML2 Plugin

CISCO redhat intel

Private Cloud IaaS Solutions based on OpenStack

Why Cisco for OpenStack-Based Clouds?

Leading integrated infrastructure platform

Application policy-based infrastructure

Superior security, reliability, and scalability of Cisco infrastructure

Infrastructure plug-ins for easy deployment from OpenStack

Cisco innovation and network expertise help you build, use, and connect open cloud environments

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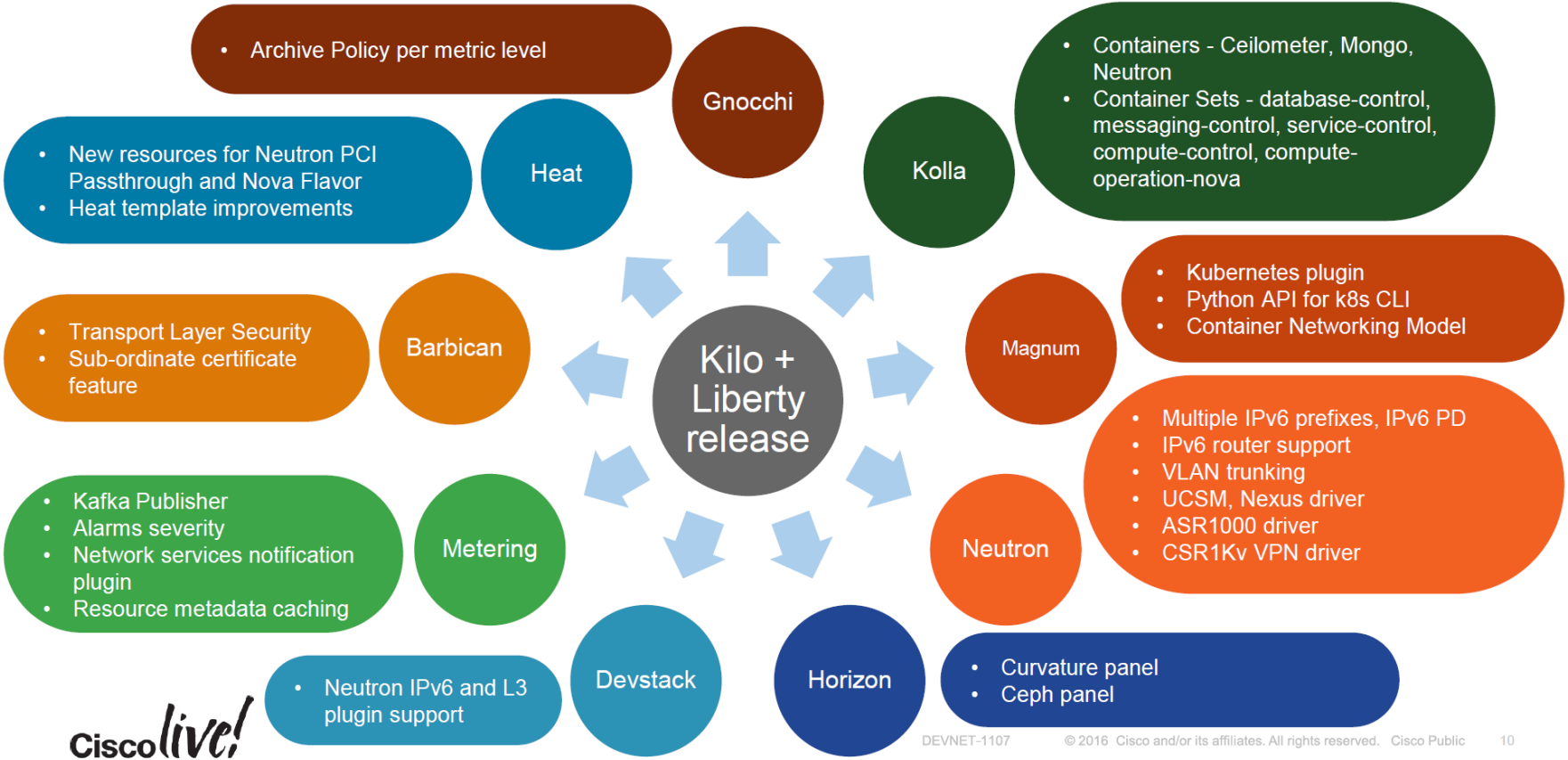
OpenStack primary project code contributions by Cisco



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Product Innovation Built on OpenStack

Cisco UCS OpenStack

Optimized OpenStack Computing

Nexus

Application Centric Infrastructure (ACI)

Group Based Policy (GBP)

Rich OpenStack Plugins

Wide range of plugins optimizing both virtual and physical infrastructure

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Cisco UCS Integrated Infrastructure Features

- Integrated design
- Programmability
- Cisco UCS Manager and Cisco UCS Central Software
- Service profiles
- Autodiscovery
- Unified fabric
- Virtualization-aware network
- Form-factor independence

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Cisco UCS—One Management Platform

UCS Manager

UCS Director

UCS Mini

Fourth Generation UCS

VM VM VM

HyperFlex Systems

ceph

UCS S3260

Mainstream Computing Rack & Blade Servers	Converged / Integrated Infrastructure	Hyperconverged Infrastructure	Scale Out, Storage & Back Servers

Edge — Core Data Center — Cloud

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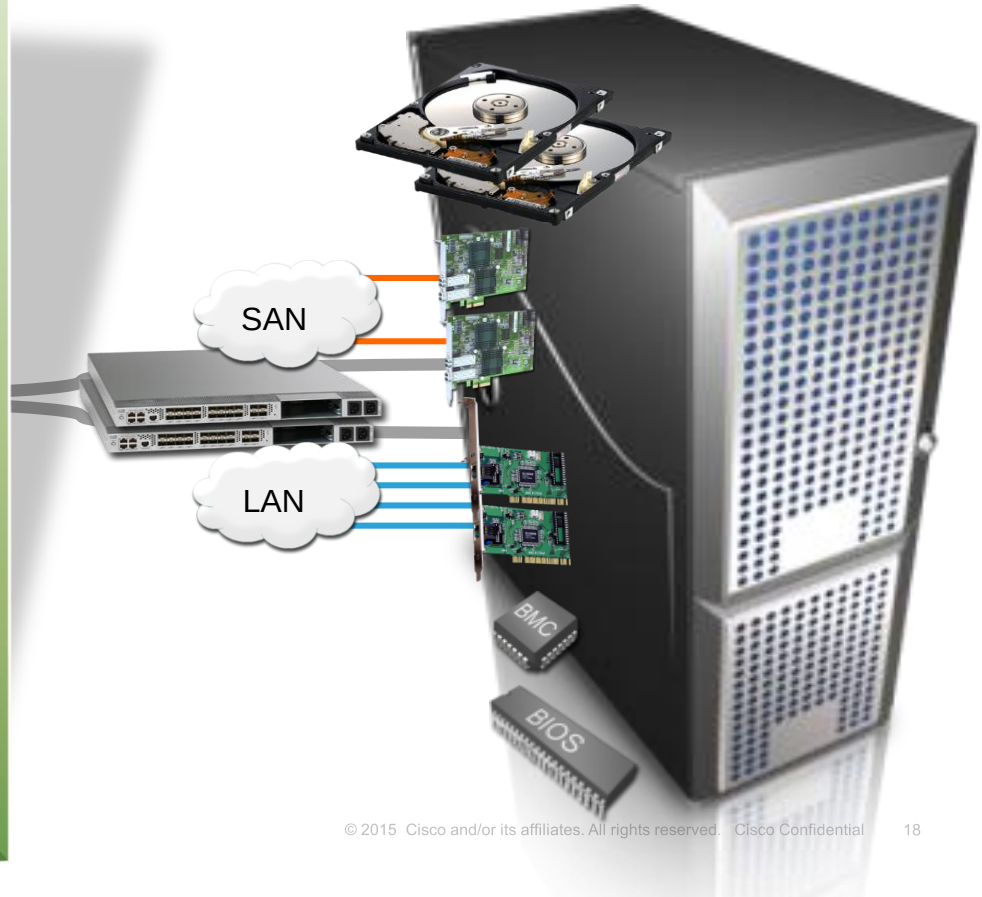
Stateless Computing: UCS Service Profiles

Cisco UCS Service Profile

- NIC MACs
- HBA WWNs
- Server UUID
- VLAN Assignments
- VLAN Tagging
- FC Fabrics Assignments
- FC Boot Parameters
- Number of vNICs
- Boot order
- PXE settings
- IPMI Settings
- Number of vHBAs
- QoS
- Call Home
- Template Association
- Org & Sub Org Assoc.
- Server Pool Association
- Statistic Thresholds
- BIOS scrub actions
- Disk scrub actions
- BIOS firmware
- Adapter firmware
- BMC firmware
- RAID settings
- Advanced NIC settings
- Serial over LAN settings
- BIOS Settings



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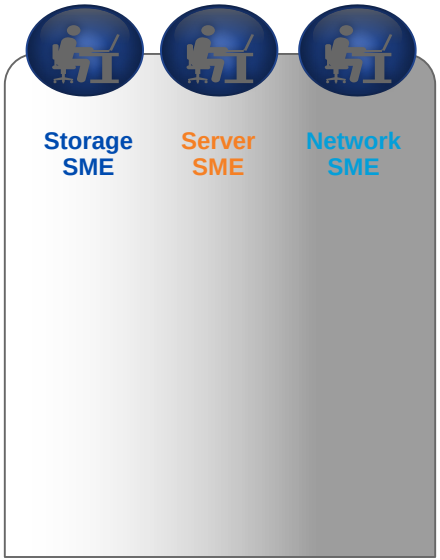
UCS: Embedded Automation for Blade and Rack Servers

Integrated, Policy-Based Infrastructure Management



1. Subject matter **expert** define policies
2. **Policies** used to create service profile **templates**
3. Service profile templates create **service profiles**
4. Associating service profiles with hardware **configures** servers automatically

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Nexus 9372, 48x10G, 6x40G.

Figure 2. Cisco Nexus 9372PX-E Switch

The Cisco Nexus 9372TX and 9372TX-E Switches are 1RU switches that support 1.44 Tbps of bandwidth and over 1150 mpps across 48 fixed 10-Gbps BASE-T ports and 6 fixed 40-Gbps QSFP+ ports (Figure 3). The Cisco Nexus 9372TX-E is a minor hardware revision of the Cisco Nexus 9372TX. Enhancements in the hardware are transparent in NX-OS mode and offer feature parity.

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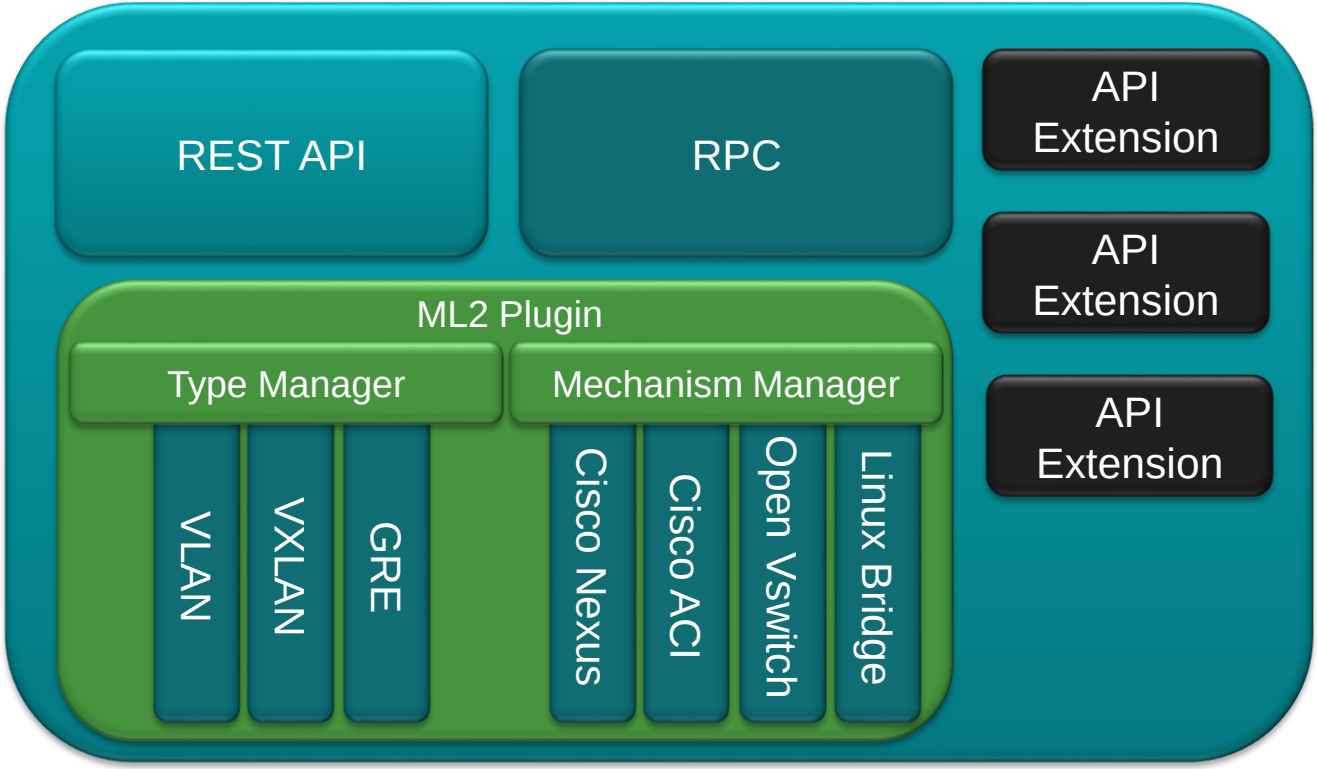
Neutron Service



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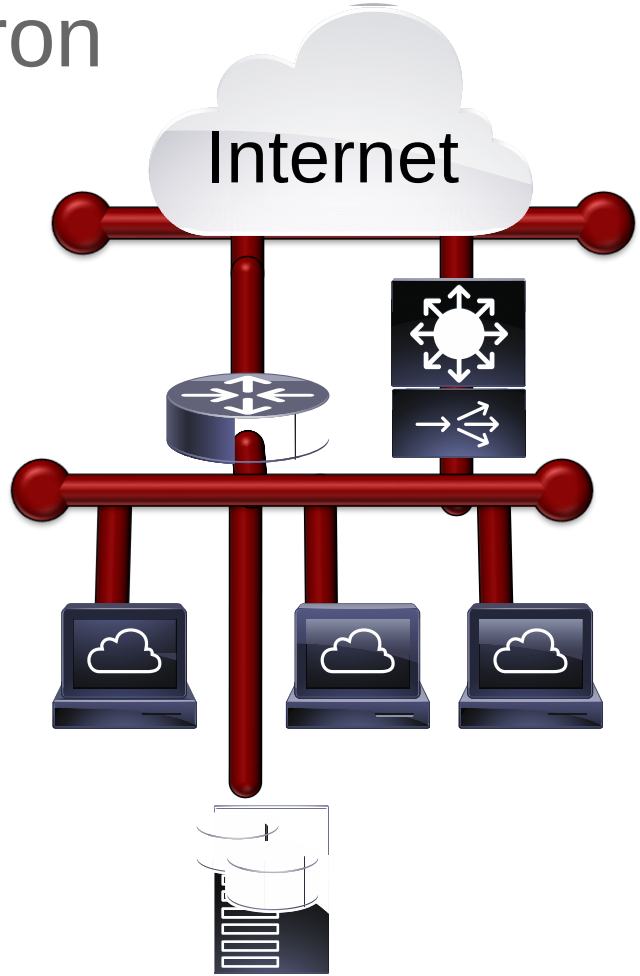
Use case: What does Neutron enable DevOps to Do?

Application Developer Would Like to:

- Create two networks
- Connect three web servers
- Connect new network to public network
- Create a load balancer
- Connect a DB instance
- Update firewall configurations automatically



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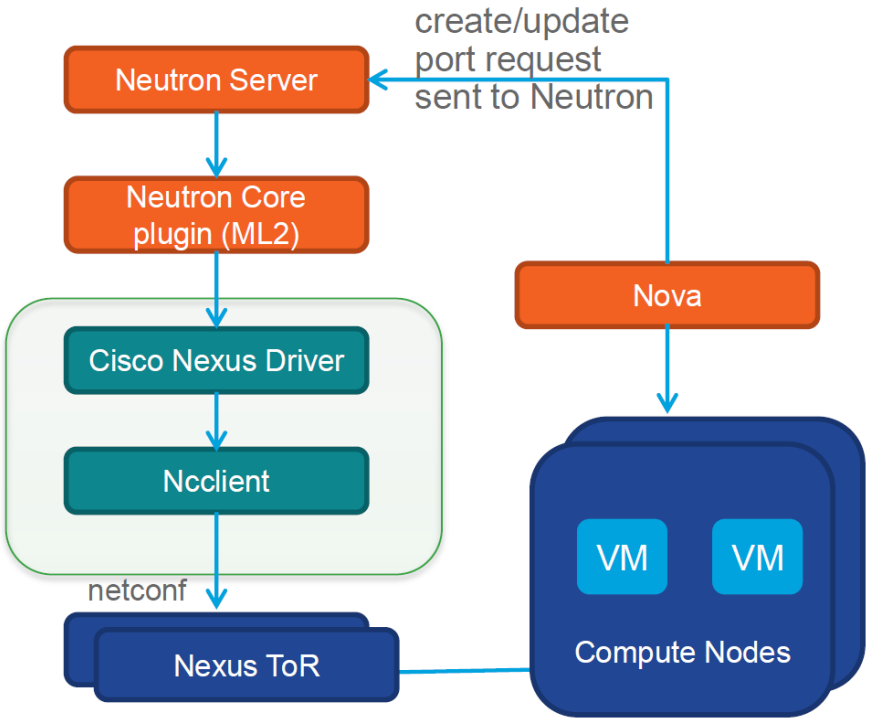
Neutron Cisco Nexus Driver



Features

- Works with multiple Nexus platforms
- VLAN configuration
- VXLAN configuration
  - Nexus_VXLAN Type Driver
  - Multicast
  - VLAN to VNI association

Benefits

- No Trunk all tenant VLANs on compute node interfaces on ToR
- Dynamic provisioning/deprovisioning on ToR
- Network based overlays

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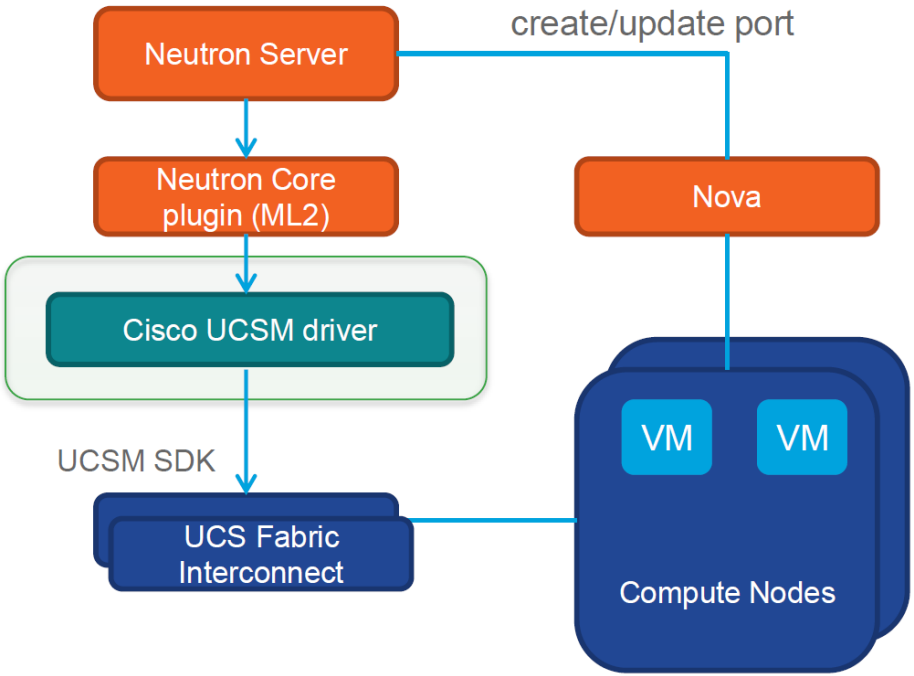
Neutron Cisco UCSM Driver (KVM)



Features:

- Supports VLAN configuration of SR-IOV ports (using port profiles) and vNIC ports (using Service Profiles)
- Nova and Neutron enhancements to support SR-IOV
- Enables configuration of VLAN profiles and automatic association with network ports
- Support for multiple UCSM domains and discovery of blades (hosts) to Service Profile mapping

Benefits

- SR-IOV and non SR-IOV based UCS Fabric Interconnect configurations
- High network performance bypassing hypervisor switch

OpenStack Cisco Plugins/Drivers and Community Projects

https://developer.cisco.com/site/openstack/downloads/openstack-integration/

The following table captures the various Cisco infrastructure based products that have integration with OpenStack.

Cisco product integrations with OpenStack

Purpose	Using	Cisco Product	OpenStack Service Integration	Kilo Code Availability	Liberty Code Availability
Network Layer 2	Virtual Switch	Nexus 1000v	Neutron N1Kv Mechanism Driver	OpenStack Cisco Networking Kilo	OpenStack Cisco Networking Liberty
	SR-IOV, non-SR-IOV	UCS Fabric Interconnect	Neutron UCS Mechanism Driver	OpenStack Cisco Networking Kilo	OpenStack Cisco Networking Liberty
	Physical Switch	Nexus	Neutron Nexus Mechanism Driver	OpenStack Cisco Networking Kilo	OpenStack Cisco Networking Liberty
Network Layer 3	Virtual Router	Cloud Services Router 1000v	Neutron Advanced Services L3 Plugin/Driver	OpenStack Cisco Networking Kilo	OpenStack Cisco Networking Liberty
	Physical Router	ASR1K	Neutron Advanced Services L3 Plugin/Driver	Not Upstream	OpenStack Cisco Networking Liberty
Network Services	Virtual Firewall and VPN	Cloud Services Router 1000v	Neutron Firewall and VPN Service Plugin	Firewall - OpenStack Neutron Firewall Kilo VPN - OpenStack Neutron VPN Kilo	Firewall - OpenStack Neutron Firewall Liberty VPN- OpenStack Neutron VPN Liberty
Network Layer2, Layer3, Services	Controller	Application Policy Infrastructure Controller - DC	Neutron APIC Mechanism Driver, L3 Advanced Service Plugin	APIC L2 - OpenStack Cisco Networking Kilo APIC L2 - OpenStack Networking-Cisco Kilo Group Based Policy Neutron - OpenStack Group Based Policy Kilo	APIC L2 - OpenStack Cisco Networking Liberty APIC L3 - OpenStack Cisco Networking Liberty Group Based Policy Neutron - OpenStack Group Based Policy Liberty
		Open SDN Controller	Neutron ODL Mechanism Driver	OpenStack Networking ODL Kilo	OpenStack Networking ODL Liberty
Storage Control Management	Zones	MDS	Cinder FC Zoning Plugin	OpenStack Cinder Kilo	OpenStack Cinder Liberty
Bare Metal Server Management	UCSM Service Profiles	UCS B and C series server	Ironic PXE Driver	Not Upstream	Cisco UCS Ironic Liberty

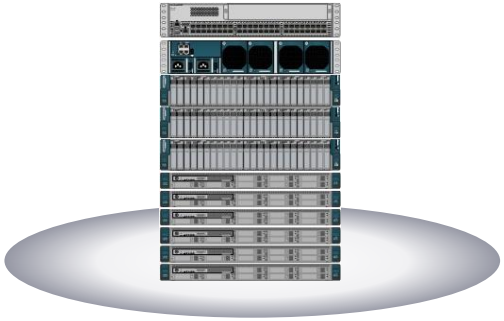
To Clear The Mess: Cisco Validated Design Faster Time-to-Value for OpenStack Clouds

Cisco UCS Integrated Infrastructure and Red Hat Enterprise Linux OpenStack Platform

- Cisco Validated Design and Deployment Guides

Key Benefits:

- Easier, faster deployment and agile configuration
- Lower OpEx with Cisco UCS Integrated Infrastructure
- Less risk with proven OpenStack distribution
- Policy-driven, software-defined infrastructure management with Nexus 9000 and ACI ready



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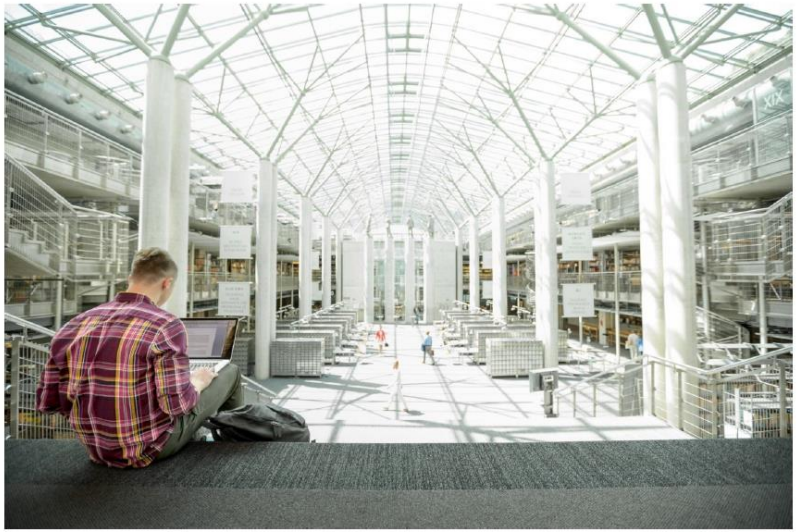

Cisco UCS Integrated Infrastructure with Red Hat OpenStack Platform 8 and Red Hat Ceph Storage

Deployment Guide

Last Updated: November 13, 2016

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What's in it for customers?
Two words: *minimized risk.*

- There is always risk in any large-scale IT initiative.
- There are two types of risk:
  - *integration risk*, risk that products won't work together
  - *performance risk*, risk that they won't perform as promised.

Using a CVD minimizes both these risks.

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"הכל צפוי והרשות (לא) נתונה"

Table 1 Required Hardware Components

	Hardware	Quantity	Firmware Details
OSP director	Cisco UCS B200M4 blade	1	
Controller	Cisco UCS B200M4 blade	3	
Compute	Cisco UCS	6	
Storage			
Fabrics Interconne			
Nexus Swi			

Table 2 Software Specificati

Operating System
OpenStack Platform
Plugins

Bill of Materials

This section contains the Bill of Materials used in the configuration.

Table 3 Bill of Materials

Component	Model	Quantity
OpenStack Platform director Node	Cisco UCS B200M4 blade	1
Controller Nodes	Cisco UCS B200M4 blades	3
Compute Nodes	Cisco UCS B200M4 blades	6
Storage Nodes (only one of LFF/SFF)	Cisco UCS C240M4L Rack Servers	3

Figure 4 Network Layout

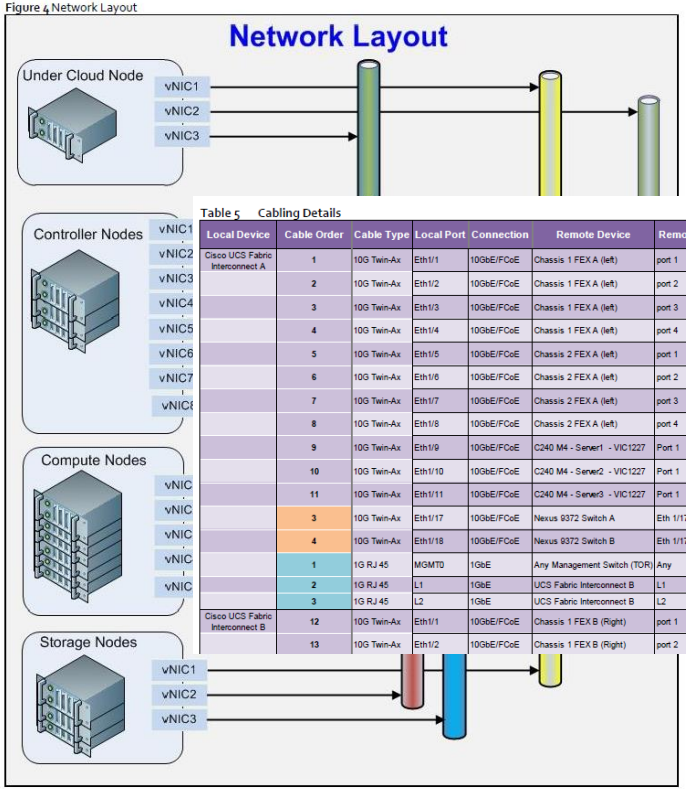


Table 5 Cabling Details

Local Device	Cable Order	Cable Type	Local Port	Connection	Remote Device	Remote Port	Purpose
Cisco UCS Fabric Interconnect A	1	10G Twin-Ax	Eth1/1	10GbE/FCoE	Chassis 1 FEX A (left)	port 1	To connect UCS chassis1 to UCS Fabric InterconnectA
	2	10G Twin-Ax	Eth1/2	10GbE/FCoE	Chassis 1 FEX A (left)	port 2	To connect UCS chassis1 to UCS Fabric InterconnectA
	3	10G Twin-Ax	Eth1/3	10GbE/FCoE	Chassis 1 FEX A (left)	port 3	To connect UCS chassis1 to UCS Fabric InterconnectA
	4	10G Twin-Ax	Eth1/4	10GbE/FCoE	Chassis 1 FEX A (left)	port 4	To connect UCS chassis1 to UCS Fabric InterconnectA
	5	10G Twin-Ax	Eth1/5	10GbE/FCoE	Chassis 2 FEX A (left)	port 1	To connect UCS chassis2 to UCS Fabric InterconnectA
	6	10G Twin-Ax	Eth1/6	10GbE/FCoE	Chassis 2 FEX A (left)	port 2	To connect UCS chassis2 to UCS Fabric InterconnectA
	7	10G Twin-Ax	Eth1/7	10GbE/FCoE	Chassis 2 FEX A (left)	port 3	To connect UCS chassis2 to UCS Fabric InterconnectA
	8	10G Twin-Ax	Eth1/8	10GbE/FCoE	Chassis 2 FEX A (left)	port 4	To connect UCS chassis2 to UCS Fabric InterconnectA
	9	10G Twin-Ax	Eth1/9	10GbE/FCoE	C240 M4 - Server1 - VIC1227	Port 1	To connect UCS C240 Srv1 to UCS Fabric InterconnectA
	10	10G Twin-Ax	Eth1/10	10GbE/FCoE	C240 M4 - Server2 - VIC1227	Port 1	To connect UCS C240 Srv2 to UCS Fabric InterconnectA
	11	10G Twin-Ax	Eth1/11	10GbE/FCoE	C240 M4 - Server3 - VIC1227	Port 1	To connect UCS C240 Srv3 to UCS Fabric InterconnectA
	3	10G Twin-Ax	Eth1/17	10GbE/FCoE	Nexus 9372 Switch A	Eth 1/17	To connect UCS FI-A Networks to Nexus 9k switch A
	4	10G Twin-Ax	Eth1/18	10GbE/FCoE	Nexus 9372 Switch B	Eth 1/17	To connect UCS FI-B Networks to Nexus 9k switch B
	1	1G RJ 45	MGMT0	1GbE	Any Management Switch (TOR)	Any	To Connect Management of UCS Fabric Interconnect
	2	1G RJ 45	L1	1GbE	UCS Fabric Interconnect B	L1	Cluster connection between UCS FIs.
	3	1G RJ 45	L2	1GbE	UCS Fabric Interconnect B	L2	Cluster connection between UCS FIs.
Cisco UCS Fabric Interconnect B	12	10G Twin-Ax	Eth1/1	10GbE/FCoE	Chassis 1 FEX B (Right)	port 1	To connect UCS chassis1 to UCS Fabric InterconnectB
	13	10G Twin-Ax	Eth1/2	10GbE/FCoE	Chassis 1 FEX B (Right)	port 2	To connect UCS chassis1 to UCS Fabric InterconnectB

Instance creation work flow

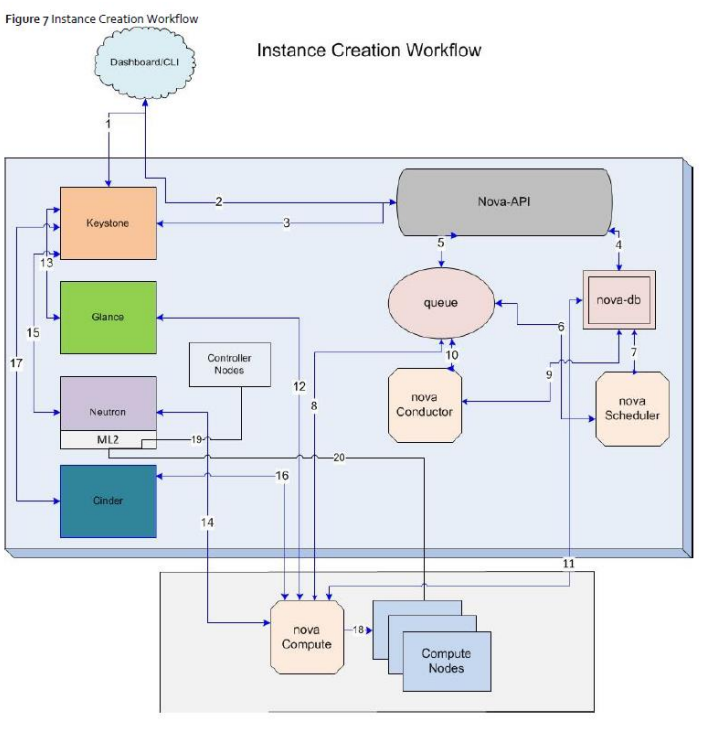
Instance creation work flow

To create a virtual machine, complete the following steps:

1. Dashboard/CLI authenticates with Keystone.
2. Dashboard/CLI sends nova-boot to nova-api.
3. nova-api validates the token with keystone.
4. nova-api checks for conflicts, if not creates a new entry in database.
5. nova-api sends rpc.call to nova-scheduler and gets updated host-entry with host-id.
6. nova-scheduler picks up the request from the queue.
7. nova-scheduler sends the rpc.cast request to nova-compute for launching an instance on the appropriate host after applying filters.
8. nova-compute picks up the request from the queue.
9. nova-compute sends the rpc.call request to nova-conductor to fetch the instance information such as host ID and flavor (RAM, CPU, and Disk).
10. nova-conductor picks up the request from the queue.
11. nova-conductor interacts with nova-database and picks up instance information from queue.
12. nova-compute performs the REST with auth-token to glance-api. Then, nova-compute retrieves the Image URI from the Image Service, and loads the image from the image storage.
13. glance-api validates the auth-token with keystone and nova-compute gets the image data.
14. nova-compute performs the REST call to network API to allocated and configure the network
15. neutron server validates the token and creates network info.
16. Nova-compute performs REST to volume API to attach volume to the instance.
17. Cinder-api validates the token and provides block storage info to nova-compute.
18. Nova compute generates data for the hypervisor driver.

26

Figure 7 Instance Creation Workflow



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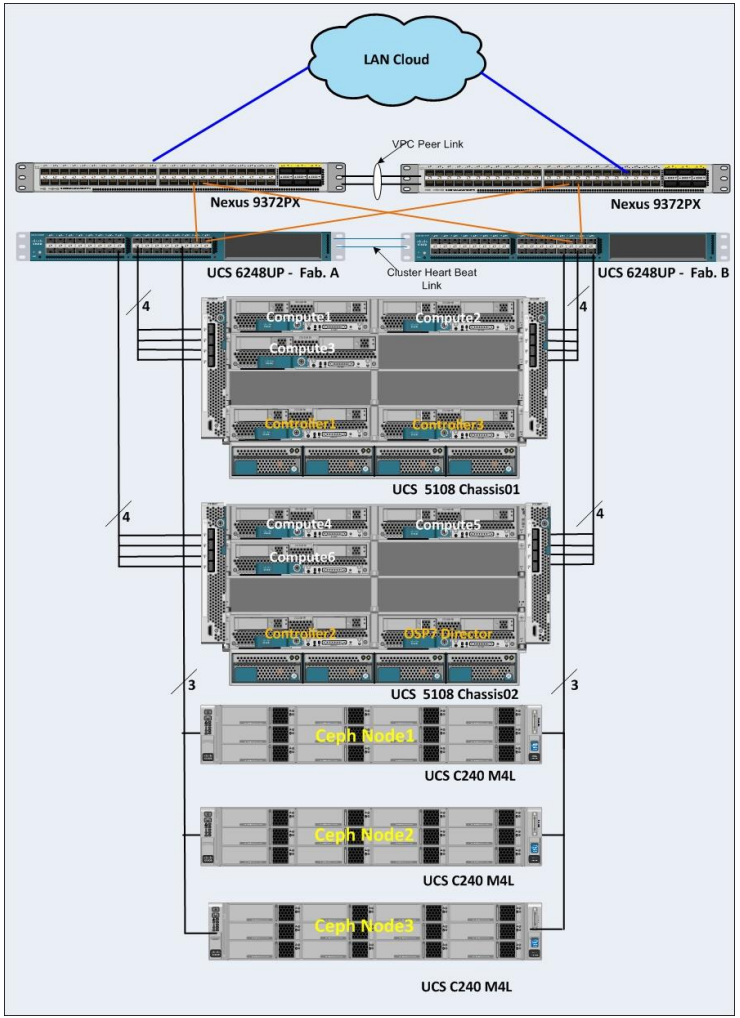
Physical Topology

Nexus Switches – 2 x 9372
Fabric Interconnects – 2 x 6248
Controller Blades – 3 x B200M4
Director Blade – 1 x B200M4
Compute Blades – 6 x B200M4
Ceph Storage Nodes – 3 x C240M4L

POD tested with both C240M4L and C240M4S

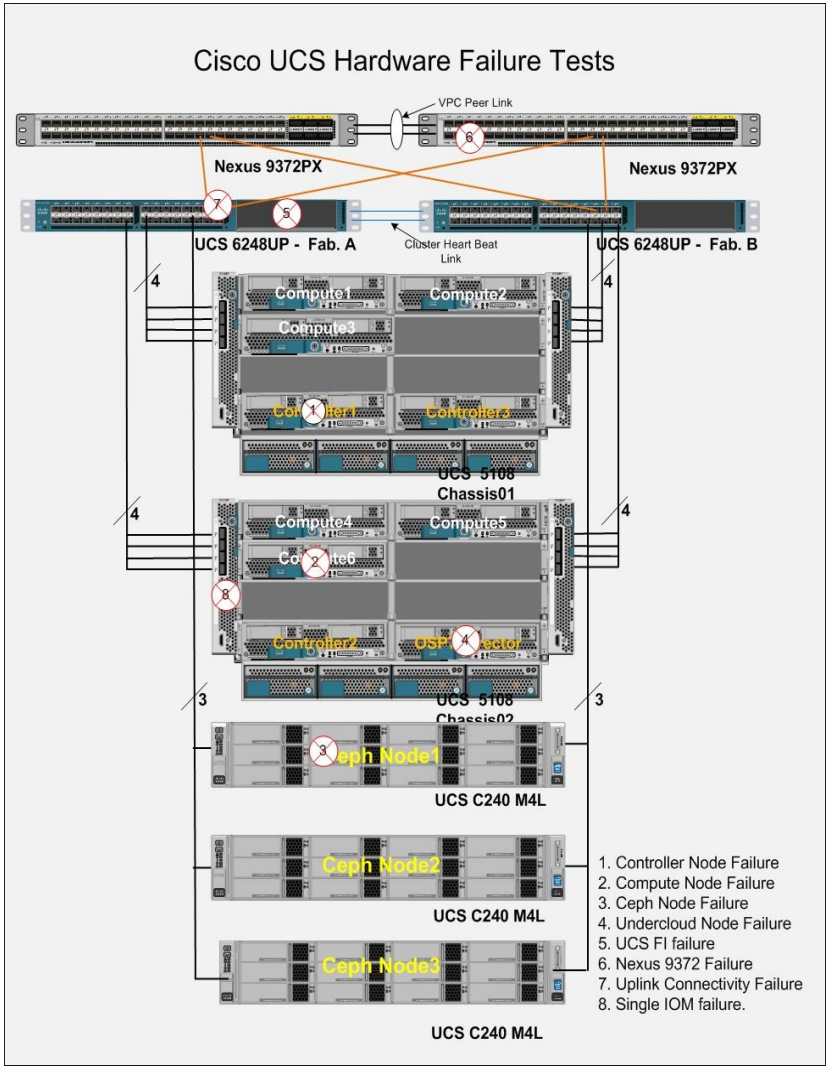


High Availability

	HA Test	Status
1	Reboot Controller Node	Passed
2	Reboot Compute Node	Passed
3	Reboot Ceph Node	Passed
4	Reboot Undercloud Node	Passed
5	Reboot UCS Fabric Interconnects	Passed
6	Reboot Nexus Switches	Passed
7	Uplink Connectivity	Passed
8	IOM Failures	Passed

	HA Test	Status
1	Pull Controller blade and rebuild	Workarounds
2	Pull Compute Node and rebuild	Passed
3	Power off Ceph node and rebuild	Passed
4	Power off Undercloud Node and rebuild	Backup server for rebuild

An alternative method to replace completely a controller was evolved and documented in the CVD



Cisco Solution Support for OpenStack

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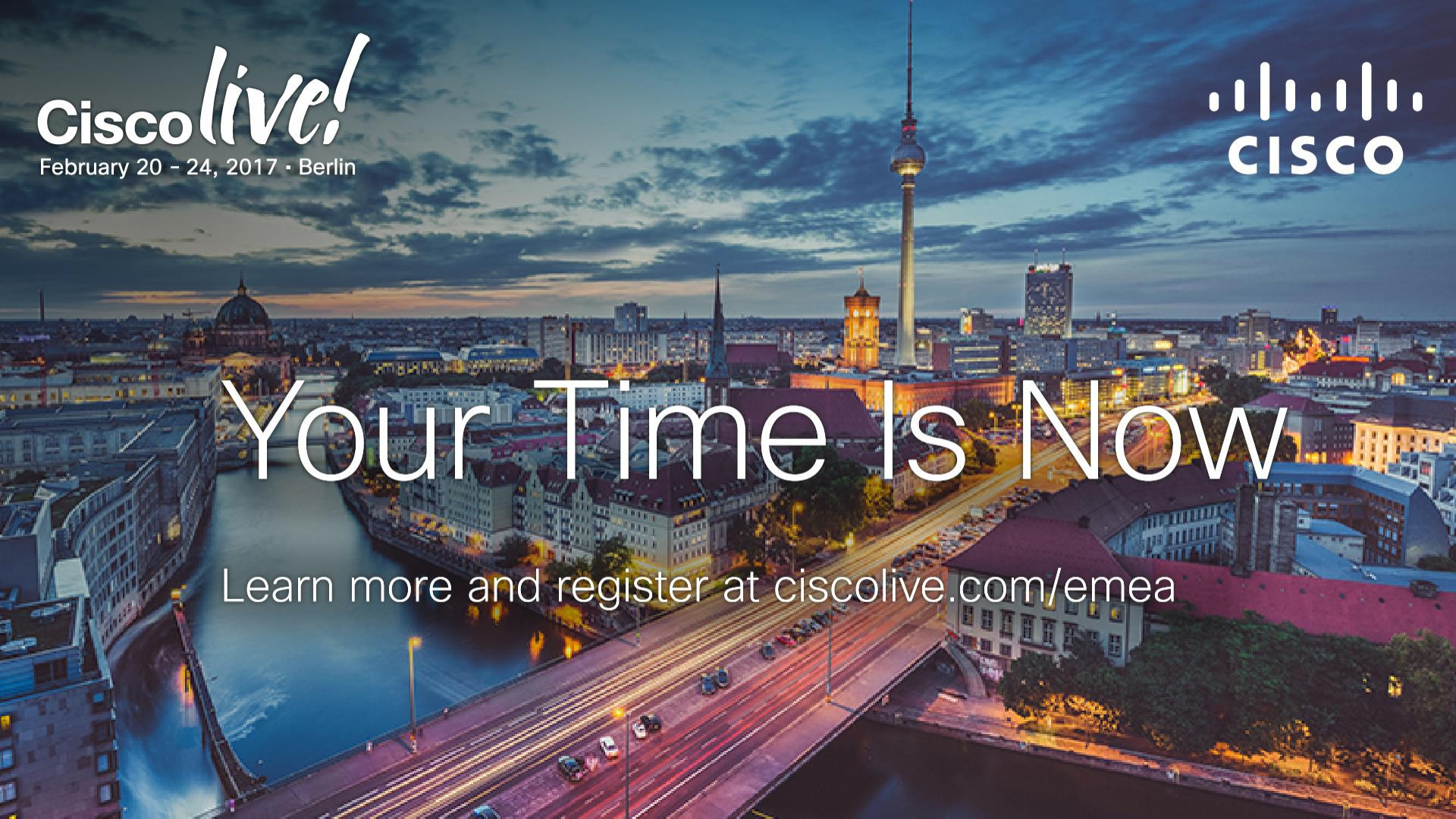
Where to go for help and additional resources?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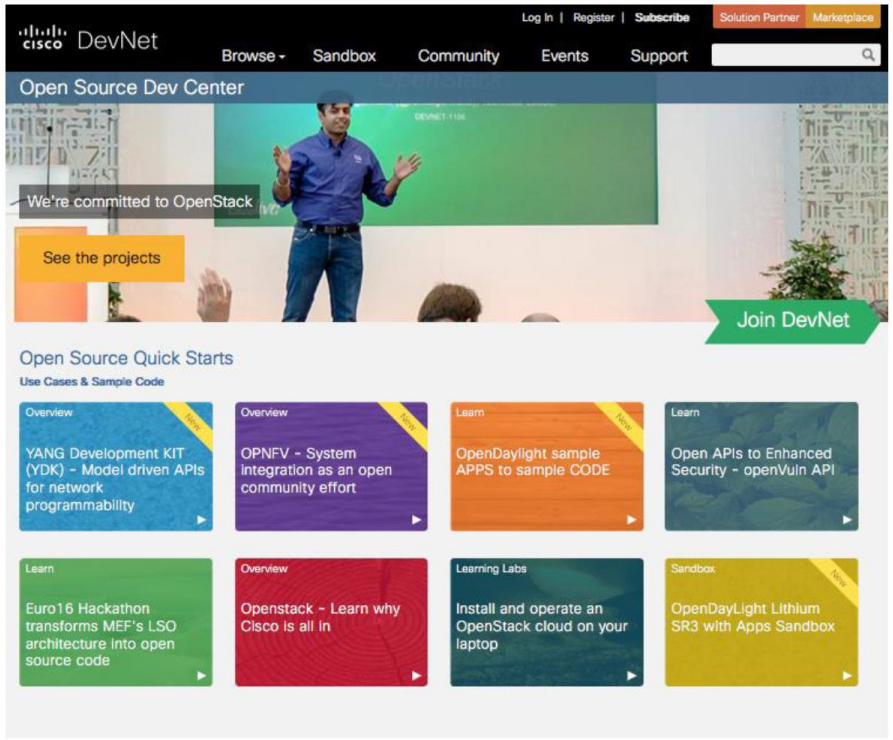

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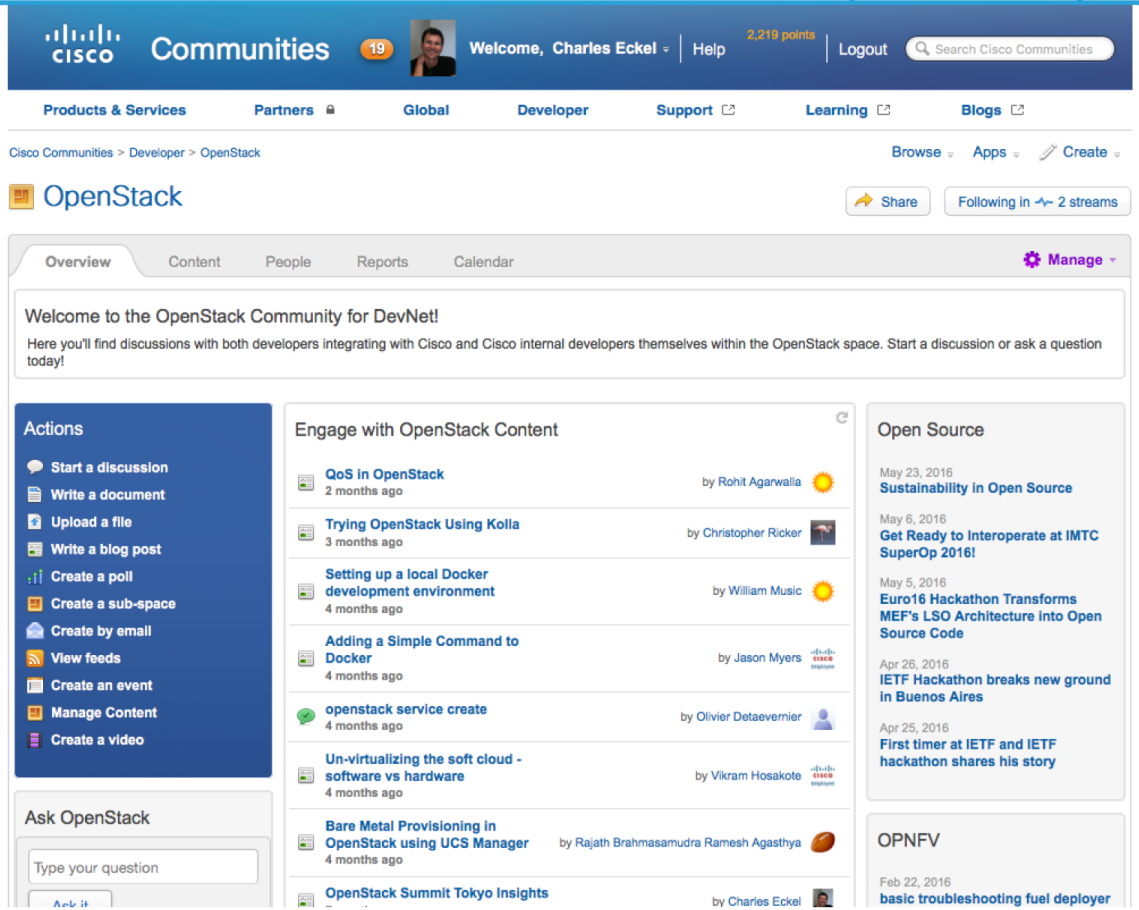
https://communities.cisco.com/community/developer/openstack



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Summary: Cisco UCS Integrated Infrastructure with Red Hat OpenStack Platform

- End-to-end cloud solutions
- Certified partner ecosystem
- Comprehensive expert services and support
- Advanced innovation with less risk
- Open technology commitment
- Trusted technology partners and familiar infrastructure

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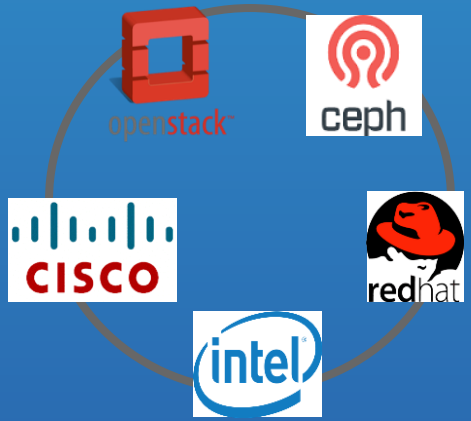
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