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(Em)Powering Open Hardware with Open Source Software

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Cloud Strategist

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Cloud Specialist Senior Solutions Architect
Founding Member, CloudForms Tiger Team

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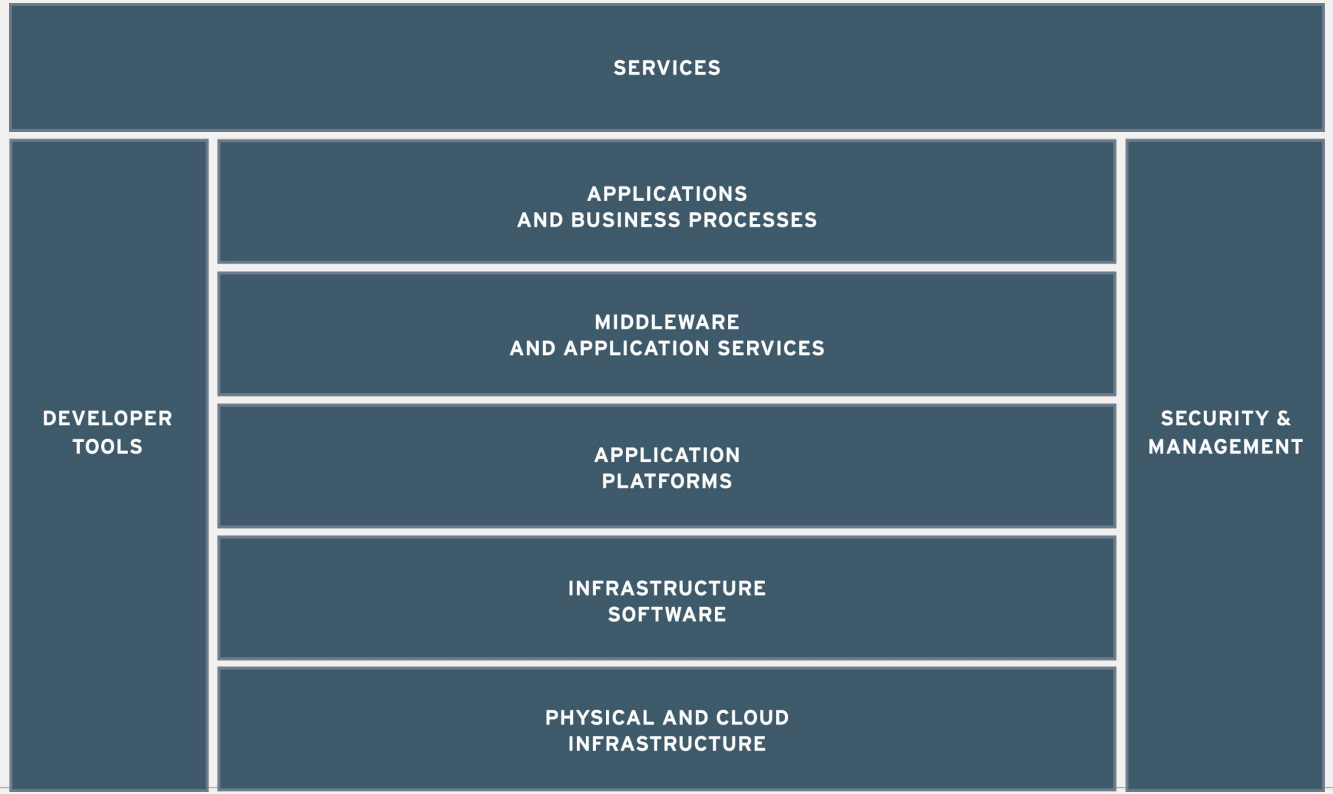
We have YubiKeys for good questions!

Red Hat Vision (What are we building and why)



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Introduction - Who Is Red Hat?

- Red Hat is 100% Open Source focused. We recognize that we have a responsibility to the greater Open Source communities to be good stewards of code and contribute the best code we can.
- Red Hat has been an Open Source solution provider since 1993 (RHL)
- Made the move to enterprise-focused Open Source in 2002 (RHAS 2.1)
- In 2006, we got into app server space with the acquisition of JBoss
- We acquired Qumranet, the brains behind KVM (the top hypervisor used in OpenStack deployments), in 2008
- We got into the PaaS business in 2010, when Makara joined Red Hat (rebranded as OpenShift)

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Introduction - Who Is Red Hat?

- Red Hat started contributing to OpenStack back in 2011, and has been a leading contributor ever since
- Red Hat added software defined storage capabilities with the acquisition of Gluster in 2011
- ManageIQ, a developer of private and public cloud management software, became part of Red Hat in 2012
- Red Hat added FuseSource, a messaging and integration company, to its portfolio in 2012
- Inktank, the company behind Ceph storage, joined the Red Hat family in 2014

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Introduction - Who Is Red Hat?

- Feedhenry was acquired in 2014, putting Red Hat in the mobility space
- Red Hat acquired Ansible in 2015, expanding our automation and management portfolio
- Red Hat has spent well over a billion dollars to acquire Open and closed-source technologies and make sure they are freely available to the community
- Red Hat is the leading innovator of Open Source operating system, infrastructure, storage, cloud, virtualization, and application services. We've been doing this for over two decades

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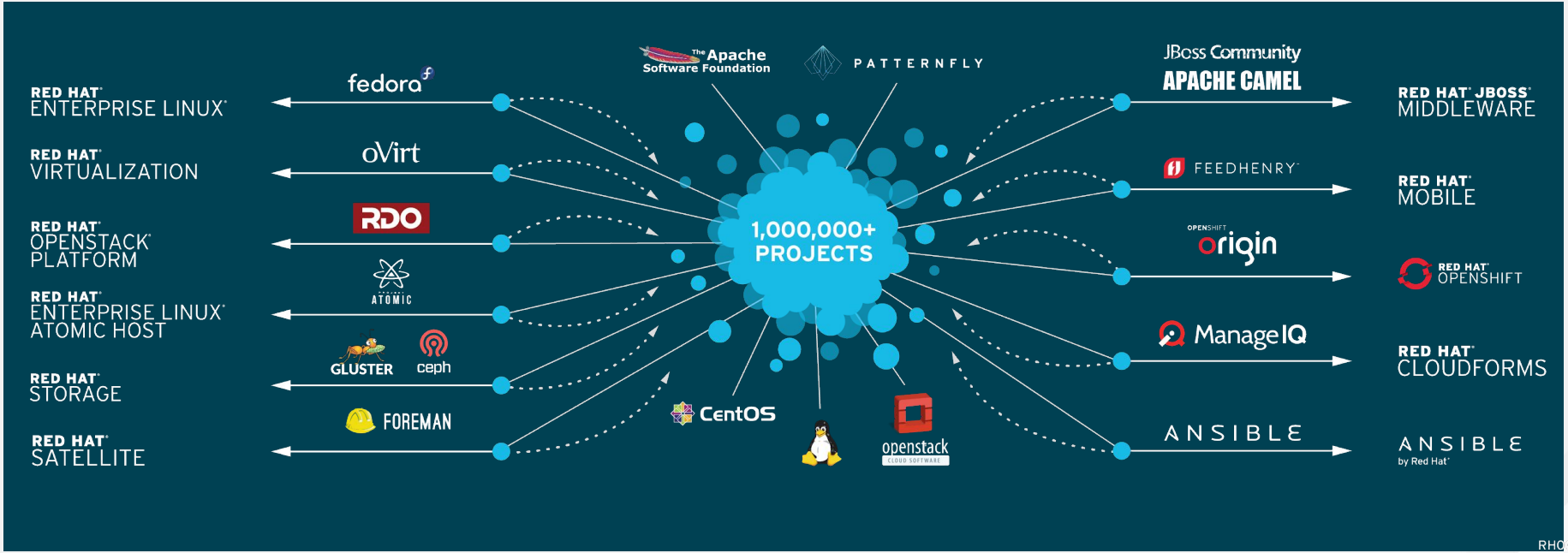
Red Hat Vision (What are we building and why)



Red Hat and the OCP

- Red Hat is ramping up engagement with OCP
- Why are open hardware and open software complimentary
  - Open Hardware = Cut off long tail of maintenance
    - Buy replacement gear from “anyone”
  - Open Software = Greatest amount of innovation
  - Similarities of development and certification models
- Red Hat is a member of the OCP Foundation

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OCP Hardware and Red Hat

- Red Hat is exploring certifying Facebook's OCP spec hardware.
- Facebook blog post at:
  https://code.facebook.com/posts/1155412364497262
  "As more components have become more open, there has been a shift away from relying on redundant hardware and toward retooling software to fail over to a different server in the case of a component failure…"
  "To top it off, bare-metal provisioning and hardware discovery was an absolute breeze using the solutions we tested."

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Questions about Red Hat and the communities?

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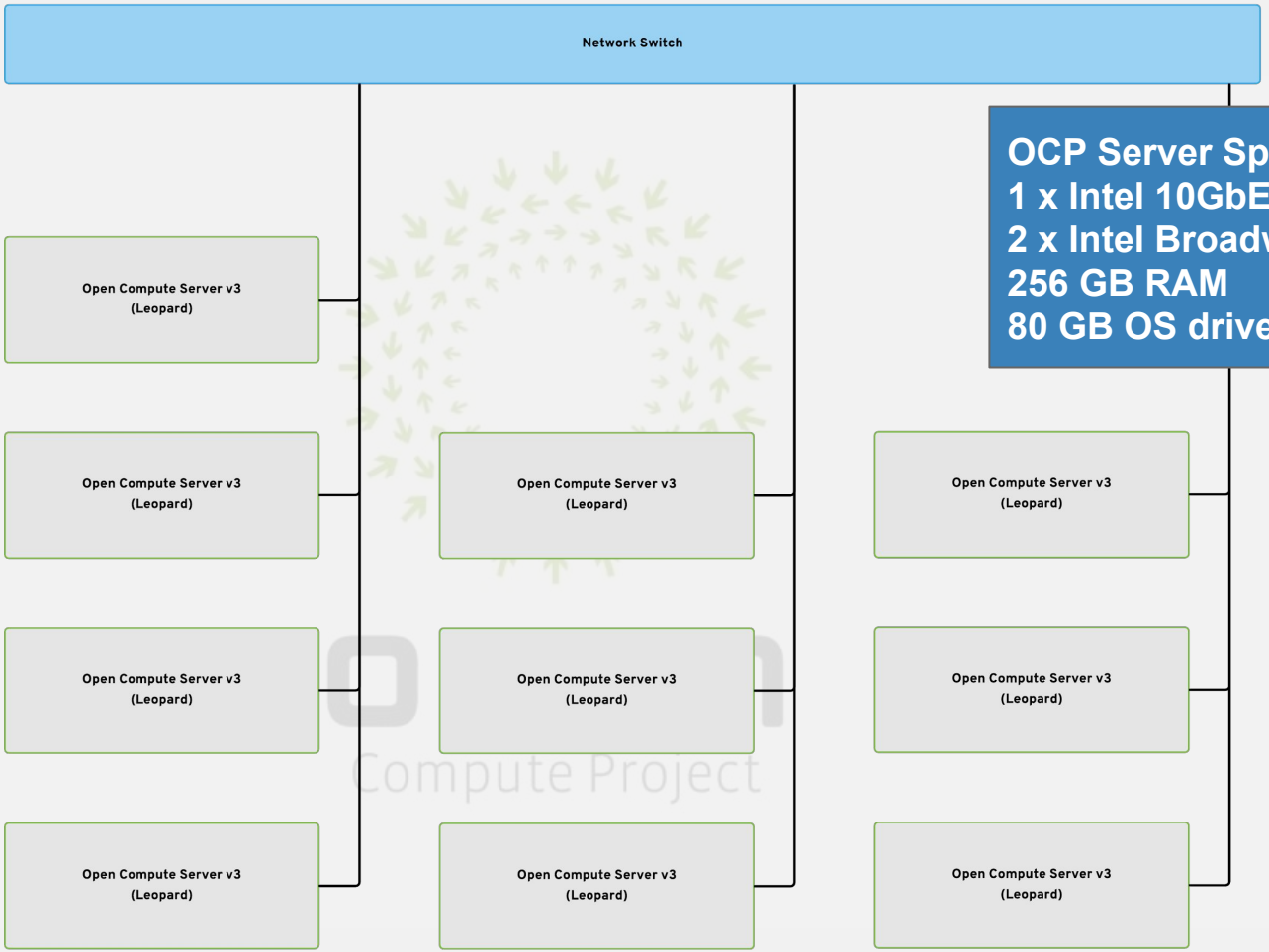
Red Hat at Facebook:
OpenStack Installation on OCP


Network Switch
Open Compute Server v3 (Leopard)
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OCP Server Specifications:
1 x Intel 10GbE NIC
2 x Intel Broadwell CPUs
256 GB RAM
80 GB OS drive (SSD)
Compute Project

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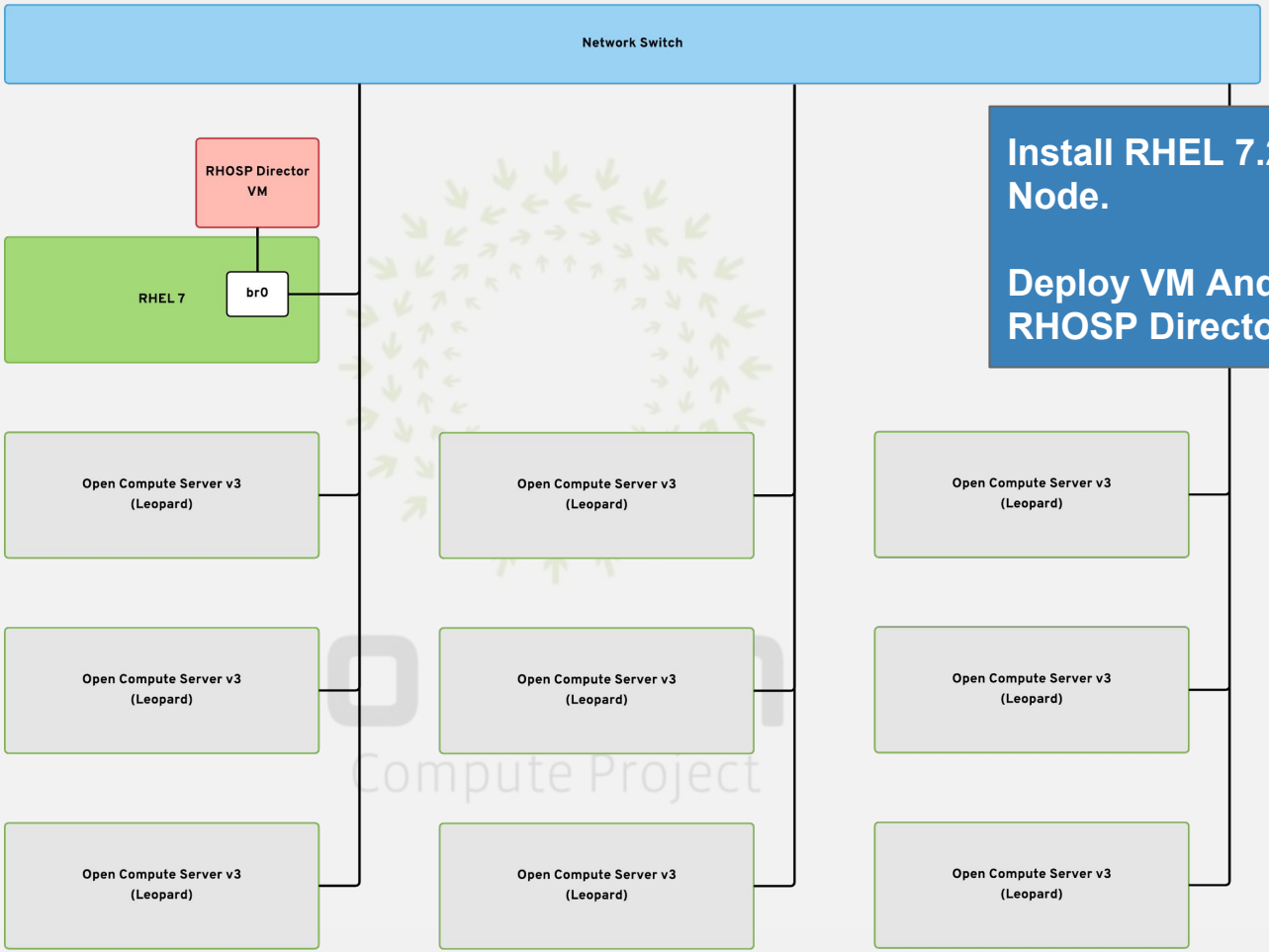
Network Switch
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RHEL 7
br0
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Open Compute Server v3 (Leopard)
Install RHEL 7.2 on one OCP Node.
Deploy VM And install RHOSP Director

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Red Hat OpenStack Platform Director / RDO Manager

- RHOSP Director is a fully tested and integrated Red Hat Open Source solution from the OpenStack RDO Community called RDO Manager.

- RDO Manager is a full integration of Core and Non-Core OpenStack Community projects - eg
  - TripleO
  - Nova
  - Heat
  - Keystone
  - Ironic
  - Glance
  - Swift

- The RDO Manager, or RHOSP Director, VM (undercloud) is a functional OpenStack implementation, specifically designed for provisioning an OpenStack Cloud (overcloud) from baremetal (OCP Hardware!!!)

- Leveraging Community OpenStack Projects for deployment of OpenStack allows us to focus on improving OpenStack itself.

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Red Hat OpenStack Platform Director / RDO Manager

- Capable of deploying multiple Roles:
  - **Control** - This role provides endpoints for REST- based API queries to the majority of the OpenStack services. These include Compute, Image, Identity, Block, Network, and Data processing. The controller can run as a standalone server or as a HA cluster.
  - **Compute** - This role provides the processing, memory, storage, and networking resources to run virtual machine instances. It runs the KVM hypervisor by default.
  - **Block storage** - This role provides external block storage for HA controller nodes via the OpenStack Block Storage service **Cinder**.
  - **Ceph storage** - Ceph is a distributed object store and file system. This role deploys **Object Storage Daemon** (OSD) nodes for Ceph clusters. It also installs the Ceph Monitor service on the Control nodes.
  - **Object storage** - This role provides external Account, Container, and Object (ACO) storage for the OpenStack Object Storage service, Swift, by installing a Swift proxy server on the controller nodes.

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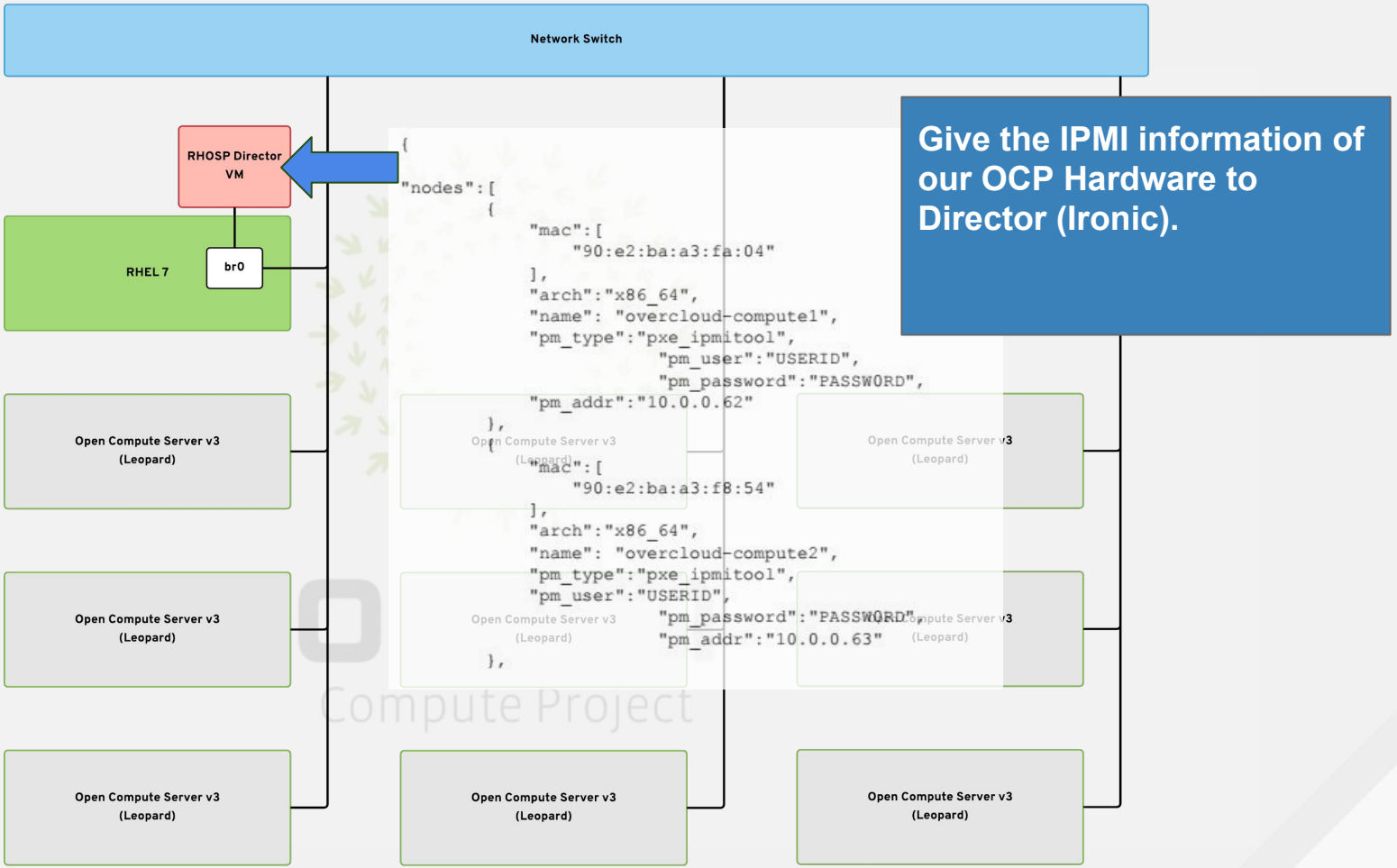
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Open Compute Server v3 (Leopard)
Open Compute Server v3 (Leopard)
{
"nodes":[
{
"mac":[
"90:e2:ba:a3:fa:04"
],
"arch":"x86_64",
"name": "overcloud-compute1",
"pm_type":"pxe_ipmitool",
"pm_user":"USERID",
"pm_password":"PASSW0RD",
"pm_addr":"10.0.0.62"
},
{
"mac":[
"90:e2:ba:a3:f8:54"
],
"arch":"x86_64",
"name": "overcloud-compute2",
"pm_type":"pxe_ipmitool",
"pm_user":"USERID",
"pm_password":"PASSW0RD",
"pm_addr":"10.0.0.63"
},
Give the IPMI information of our OCP Hardware to Director (Ironic).

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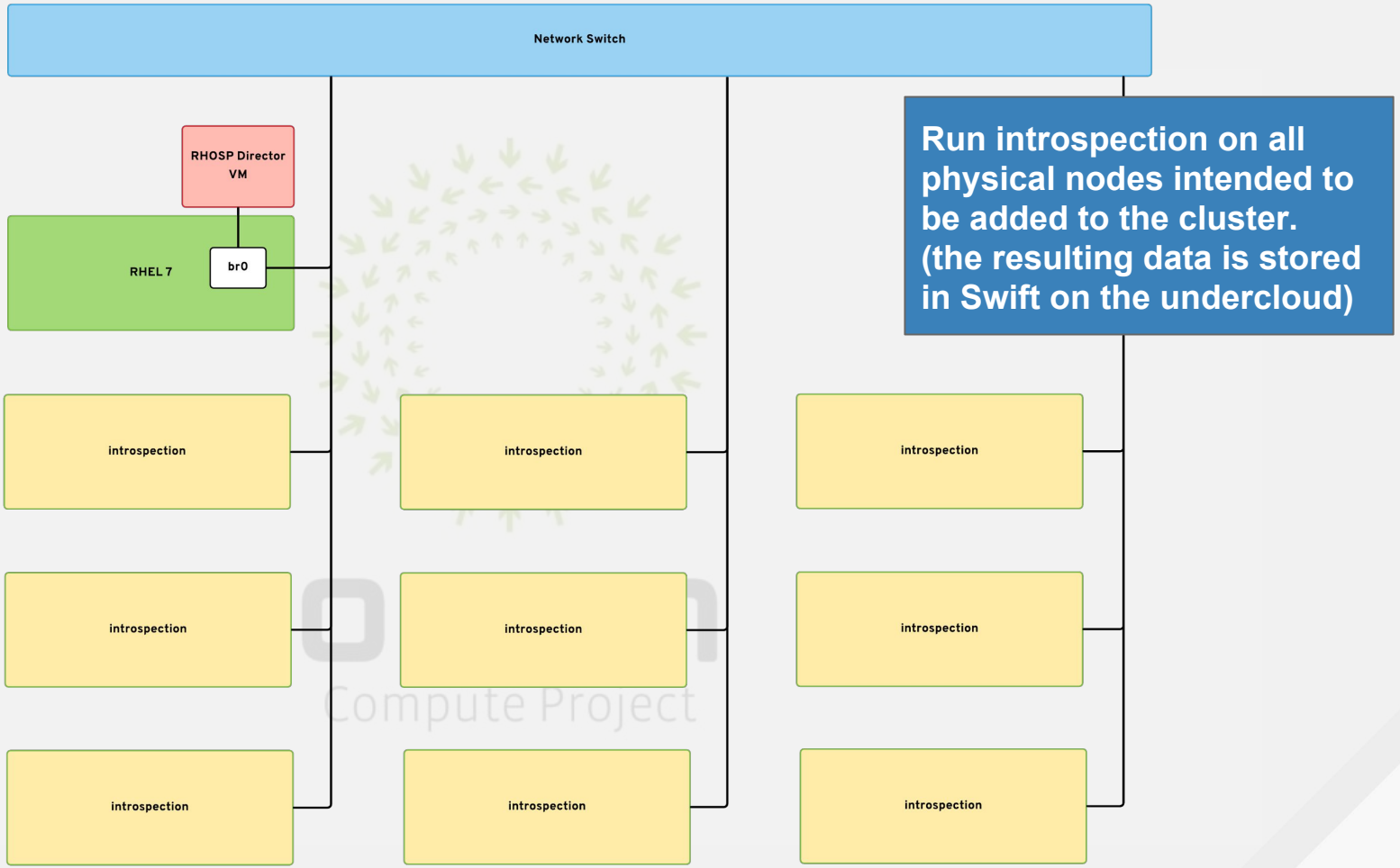
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introspection
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introspection
Run introspection on all physical nodes intended to be added to the cluster. (the resulting data is stored in Swift on the undercloud)

Ironic, Advanced Hardware Config, Profile Matching, and Benchmarking

- OpenStack Ironic is responsible for managing our hardware, such as:
  - Power State
  - Managing dnsmasq for DHCP Services
  - PXE Config
  - Maintaining Hardware profiles
  - Baremetal installs of OpenStack overcloud nodes Operating Systems

- By Benchmarking hardware capability, outliers and other potential performance issues can be identified prior to bringing a node into our overcloud.

- Leveraging Advanced Hardware Config (AHC) and introspection data Stored in Swift, we can dynamically assign OpenStack service profiles to hardware nodes based on:
  - CPUs, Cores
  - Disks, count, size
  - Memory

  This allows for rapid scale without the need for manual process of identification and assignment of roles.

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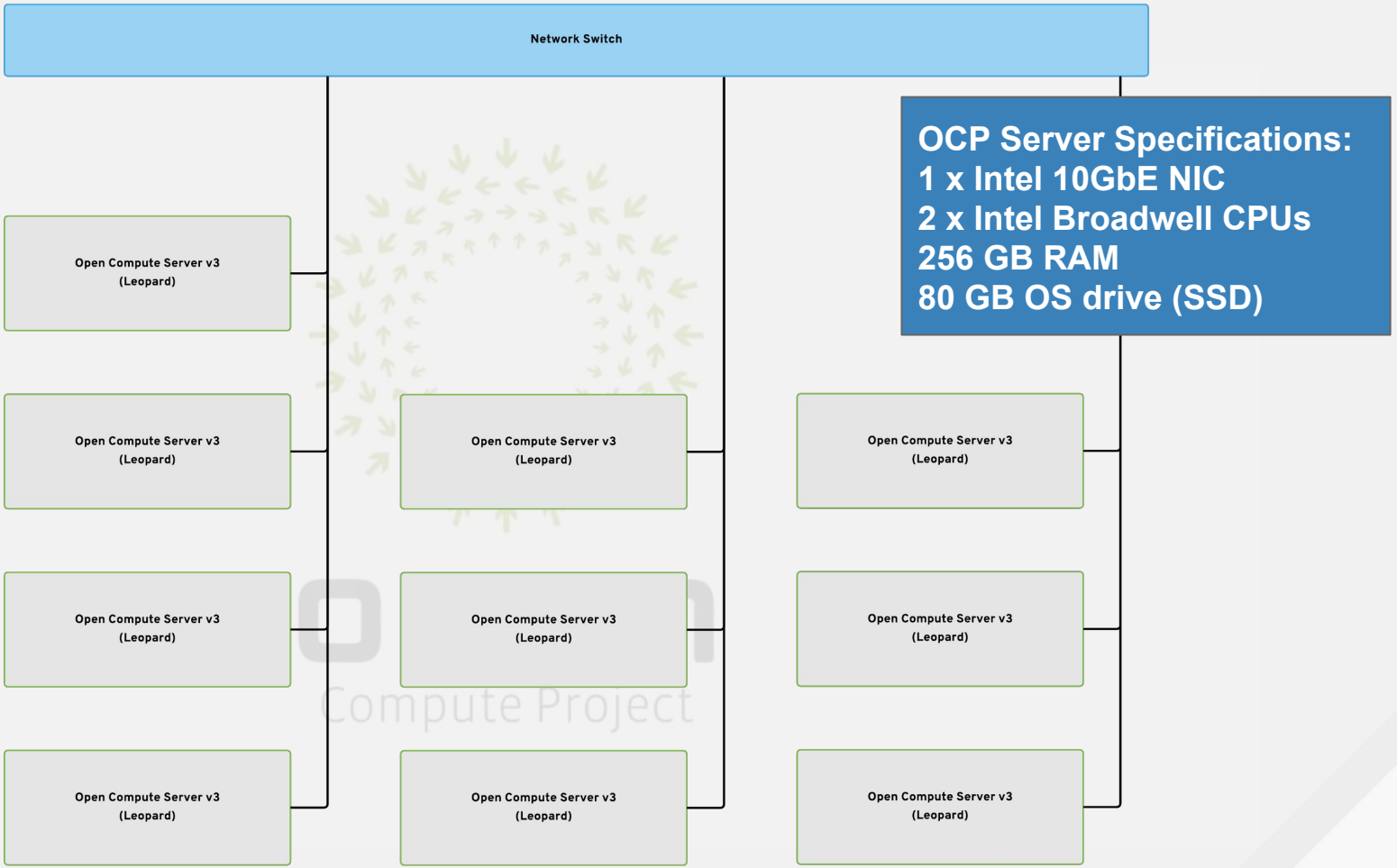
Introspection Data example


```
{
    "all_interfaces": {
        "ens1": {
            "mac": "90: e2: ba: a3: fa: 30",
            "ip": "192.168.254.121"
        }
    },
    "local_gb": 110,
    "error": null,
    "inventory": {
        "cpu": {
            "architecture": "x86_64",
            "model_name": "GenuineIntel(R)CPU0000@2.00GHz",
            "frequency": "2021.328",
            "count": 72
        },
        "memory": {
            "total": 270374457344,
            "physical_mb": 262144
        },
        "system_vendor": {
            "manufacturer": "Wiwynn",
            "product_name": "Leopard-Orv2",
            "serial_number": "WTF1533076ZSA"
        },
        "disks": [
            {
                "size": 120034123776,
                "rotational": false,
                "vendor": "ATA",
                "name": "/dev/sda",
                "wwn_vendor_extension": null,
                "wwn_with_extension": "0x500a075109599f26",
                "model": "Micron_M500_MTFD",
                "wwn": "0x500a075109599f26",
                "serial": "134609599F26"
            },
            {
                "size": 2000398934016,
                "rotational": true,
                "vendor": "ATA",
                "name": "/dev/sdb",
                "wwn_vendor_extension": null,
                "wwn_with_extension": "0x5000cca222e352d8",
                "model": "HitachiHUA72202",
                "wwn": "0x5000cca222e352d8",
                "serial": "JK11A4B8JHPXDW"
            }
        ],
        "interfaces": [
            {
                "mac_address": "90: e2: ba: a3: fa: 30",
                "ipv4_address": "192.168.254.121",
                "switch_chassis_descr": null,
                "switch_port_descr": null,
                "has_carrier": true,
                "name": "ens1"
            }
        ],
        "bmc_address": "10.0.0.61"
    }
}
```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OCP Server Specifications:
1 x Intel 10GbE NIC
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256 GB RAM
80 GB OS drive (SSD)
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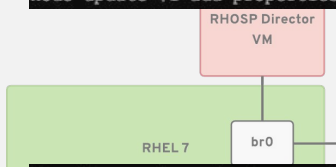
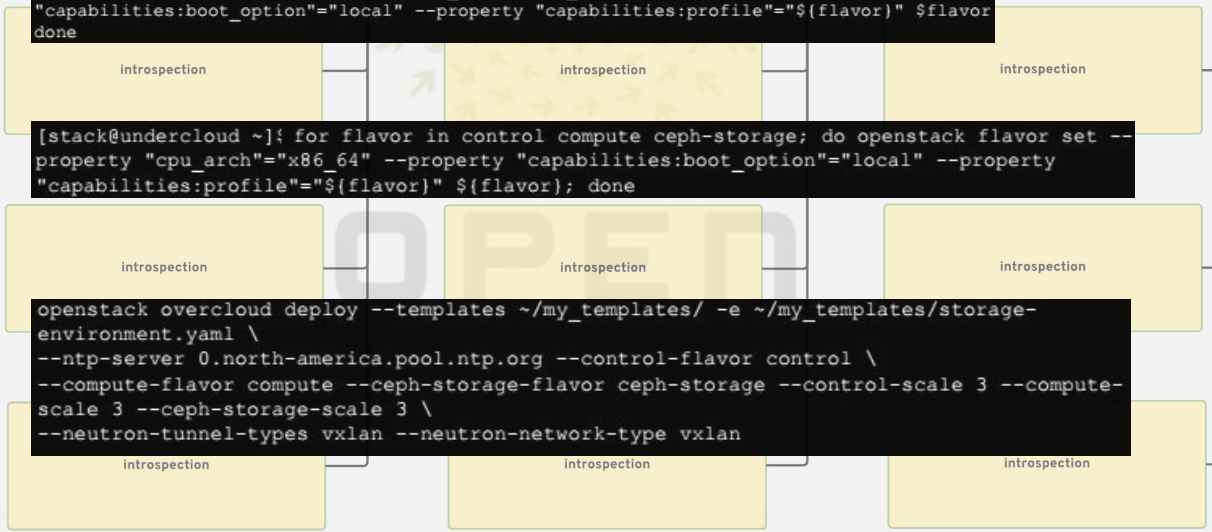
```
[stack@undercloud ~]$ for profile in compute control; do for UUID in $(ironic node-list |
grep ${profile} | awk '{print $2}'); do ironic node-update ${UUID} add
properties/capabilities="profile:${profile},boot_option:local"; done; done

[stack@undercloud ~]$  for i in overcloud-ceph1 overcloud-ceph2 overcloud-ceph3;do ironic
node-update $i add properties/capabilities="profile:ceph- storage,boot_option:local"; done
```




```
for flavor in control compute ceph-storage
do
  nova flavor-delete ${flavor}
  openstack flavor create --id auto --disk 10 --ram 1 --vcpus 1 ${flavor}
  openstack flavor set --property "cpu_arch"="x86_64" --property
"capabilities:boot_option"="local" --property "capabilities:profile"="${flavor}" $flavor
done
```




```
[stack@undercloud ~]$ for flavor in control compute ceph-storage; do openstack flavor set --
property "cpu_arch"="x86_64" --property "capabilities:boot_option"="local" --property
"capabilities:profile"="${flavor}" ${flavor}; done
```

```
openstack overcloud deploy --templates ~/my_templates/ -e ~/my_templates/storage-
environment.yaml \
--ntp-server 0.north-america.pool.ntp.org --control-flavor control \
--compute-flavor compute --ceph-storage-flavor ceph-storage --control-scale 3 --compute-
scale 3 --ceph-storage-scale 3 \
--neutron-tunnel-types vxlan --neutron-network-type vxlan
```

Assign roles, define flavors, and mapping.

Then deploy the overcloud.

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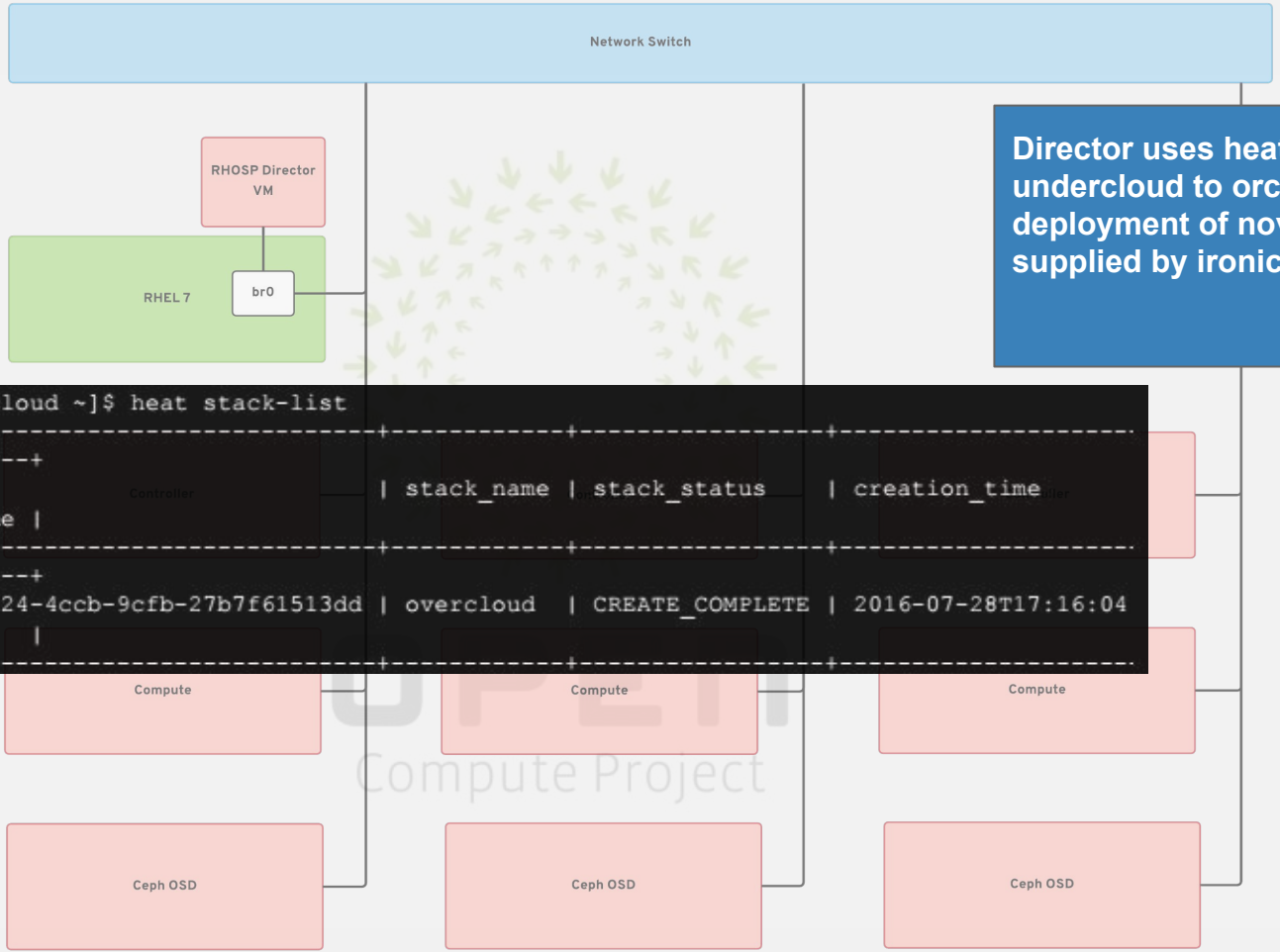

Director uses heat on the undercloud to orchestrate deployment of nova instances, supplied by ironic.

```
[stack@undercloud ~]$ heat stack-list
+--------------------------------------+------------+-----------------+----------------------
+--------------+
| id                                   | stack_name | stack_status    | creation_time
| updated_time |
+--------------------------------------+------------+-----------------+----------------------
+--------------+
| f88f25b9-f224-4ccb-9cfb-27b7f61513dd | overcloud  | CREATE_COMPLETE | 2016-07-28T17:16:04
| None         |
+--------------------------------------+------------+-----------------+----------------------
```


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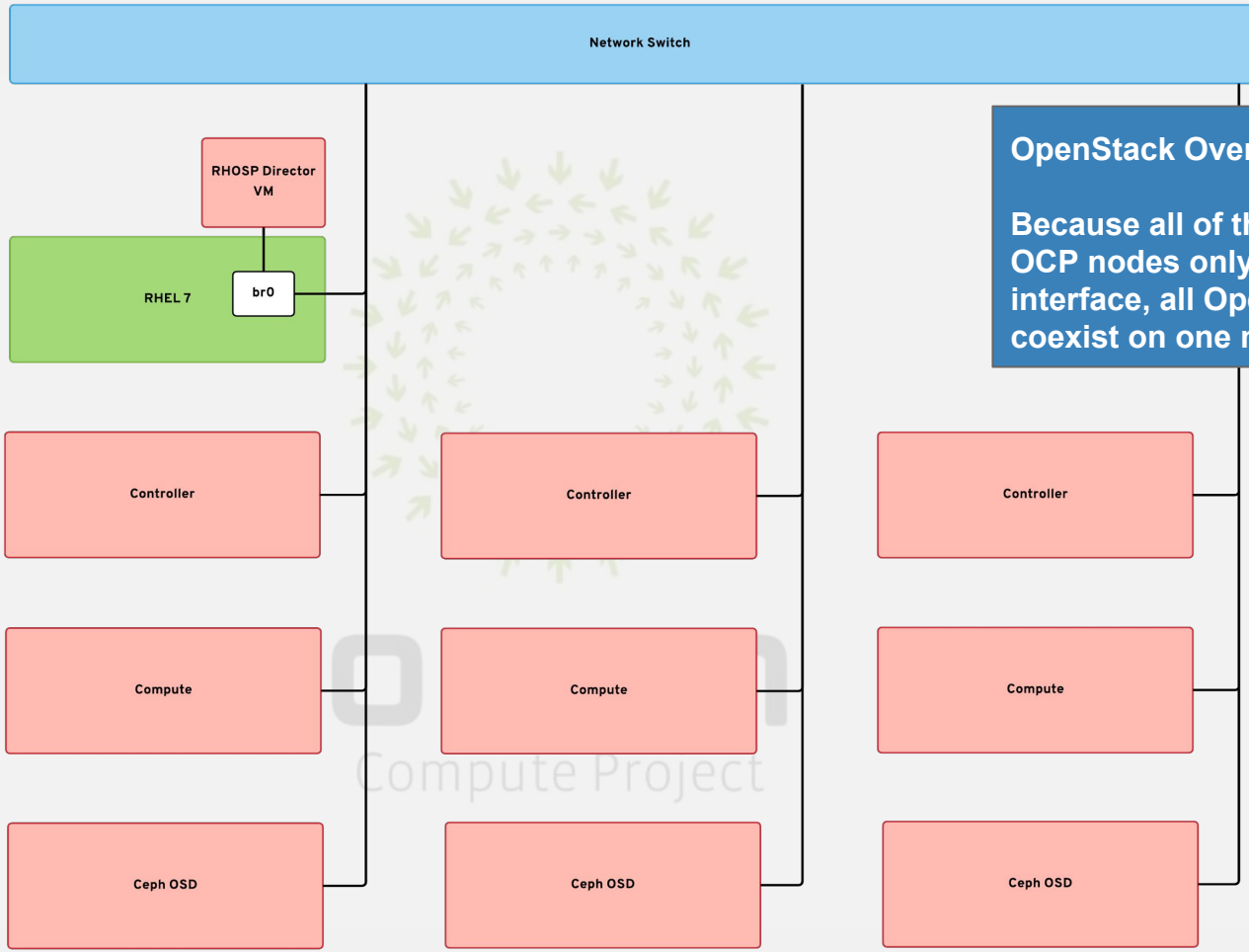

OpenStack Overcloud Deployed.

Because all of these specific OCP nodes only contain one interface, all OpenStack services coexist on one network.

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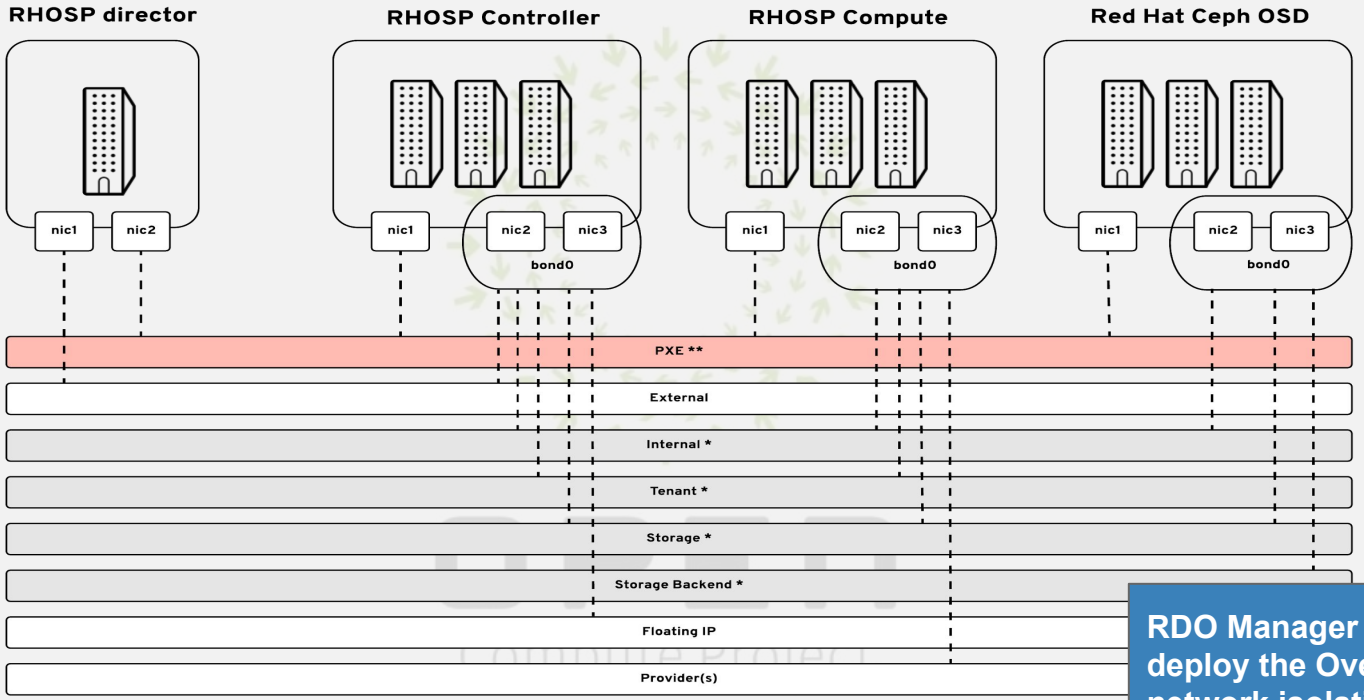
Reference Architecture with Network Isolation and Multiple Network Interfaces



RDO Manager / Director can also deploy the Overcloud with full network isolation of all OpenStack networks, using multiple network interfaces and creating network bonds.

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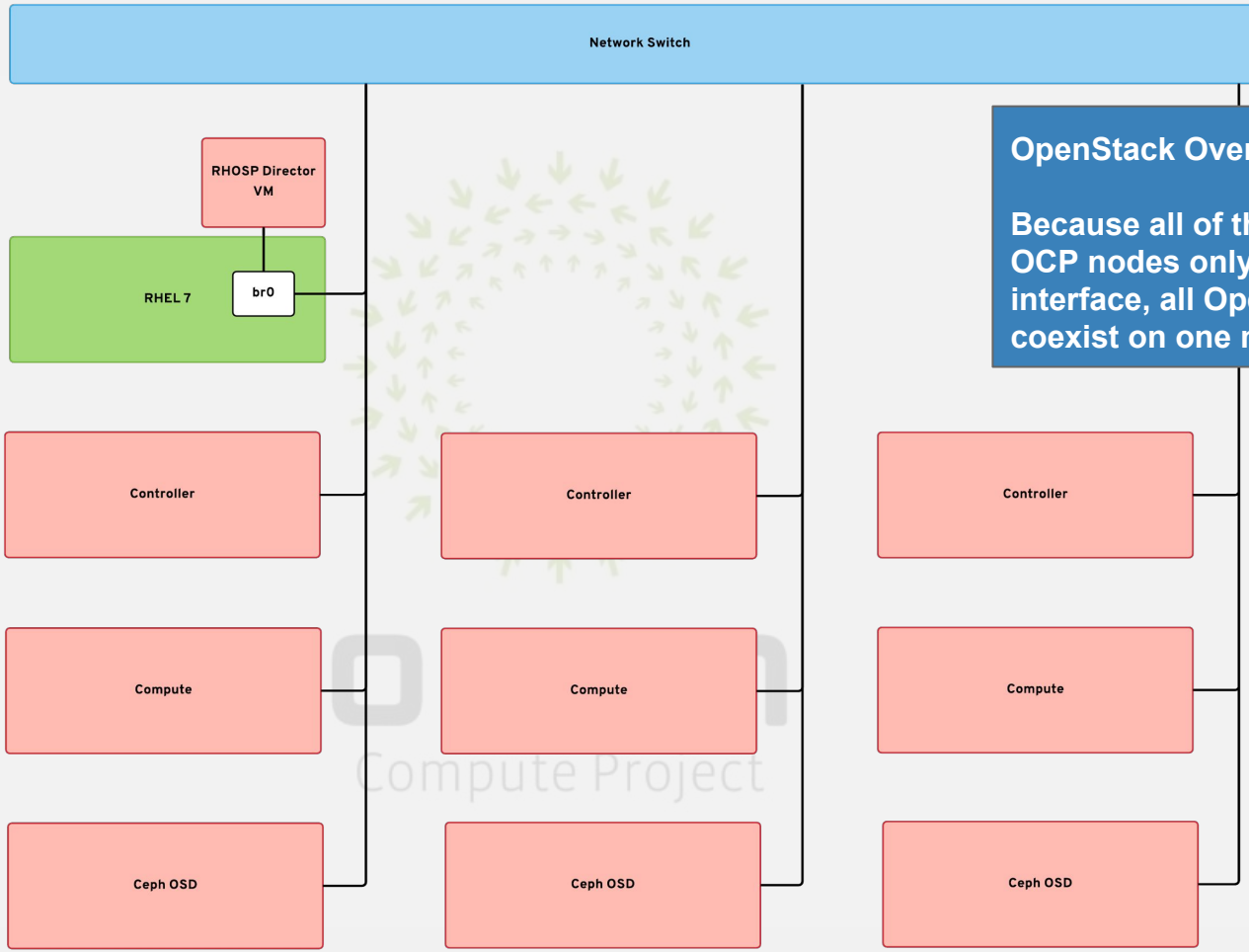

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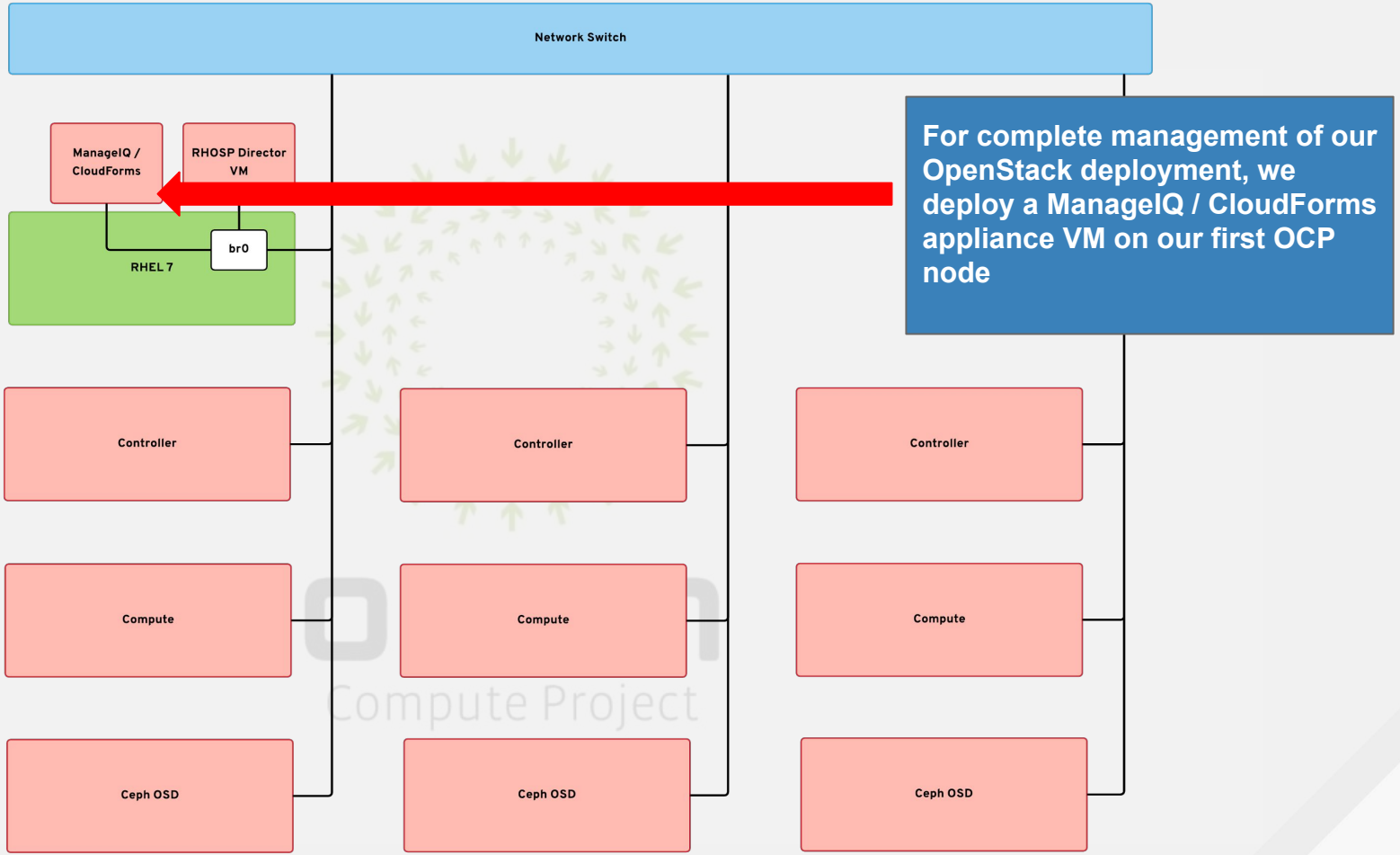
Network Switch
ManageIQ / CloudForms
RHOSP Director VM
br0
RHEL 7
For complete management of our OpenStack deployment, we deploy a ManageIQ / CloudForms appliance VM on our first OCP node
Controller
Controller
Controller
Compute
Compute
Compute
Ceph OSD
Ceph OSD
Ceph OSD

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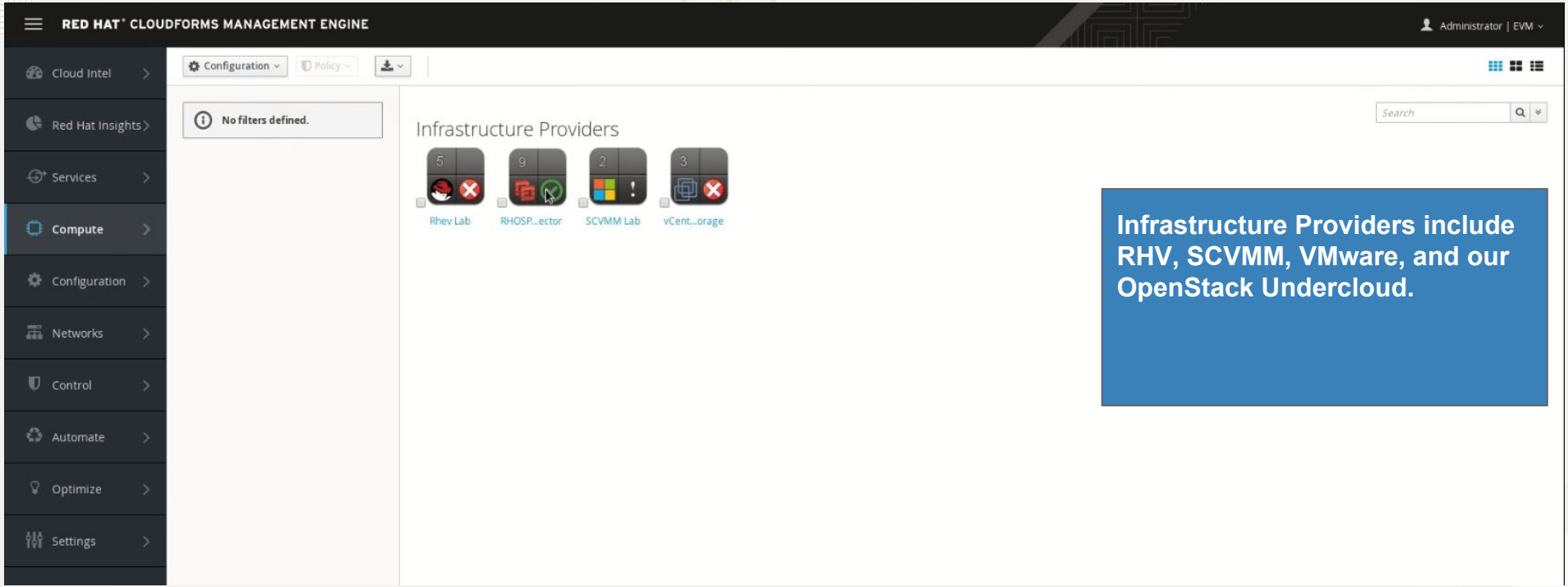
ManageIQ / Red Hat CloudForms



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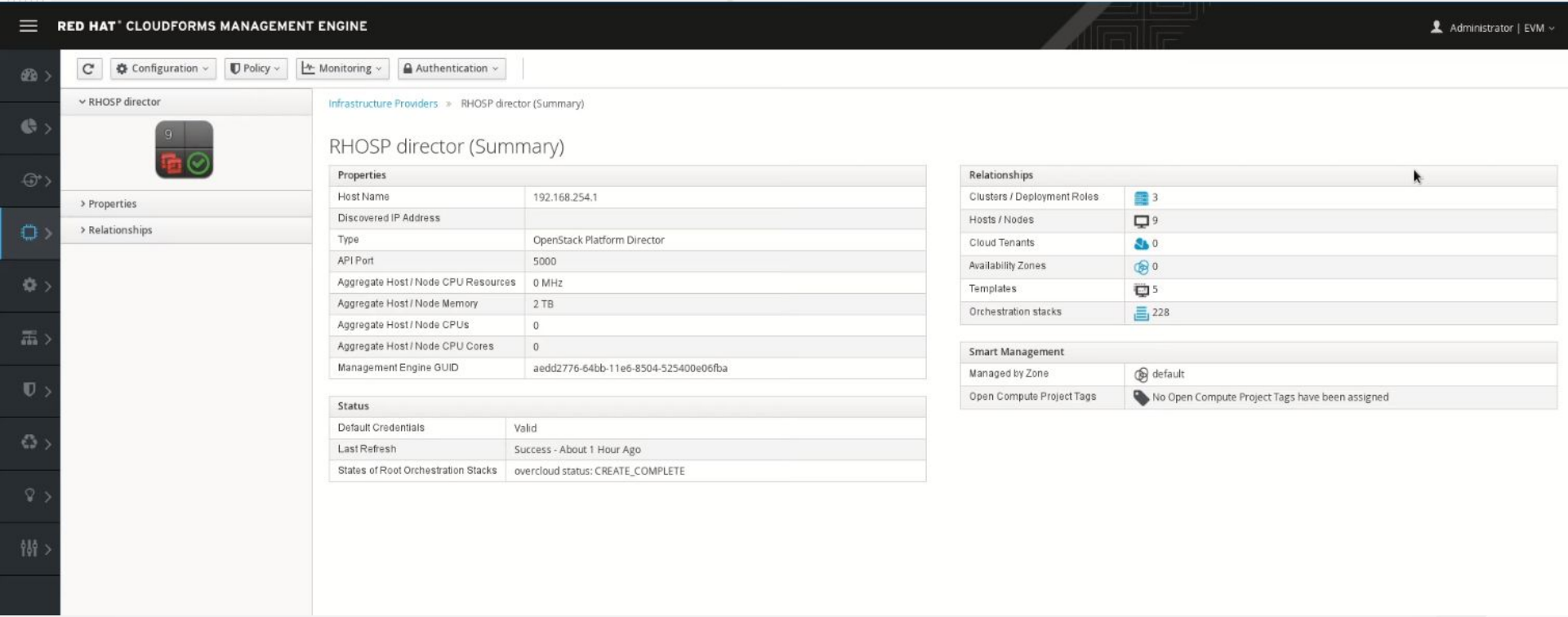
ManageIQ / Red Hat CloudForms



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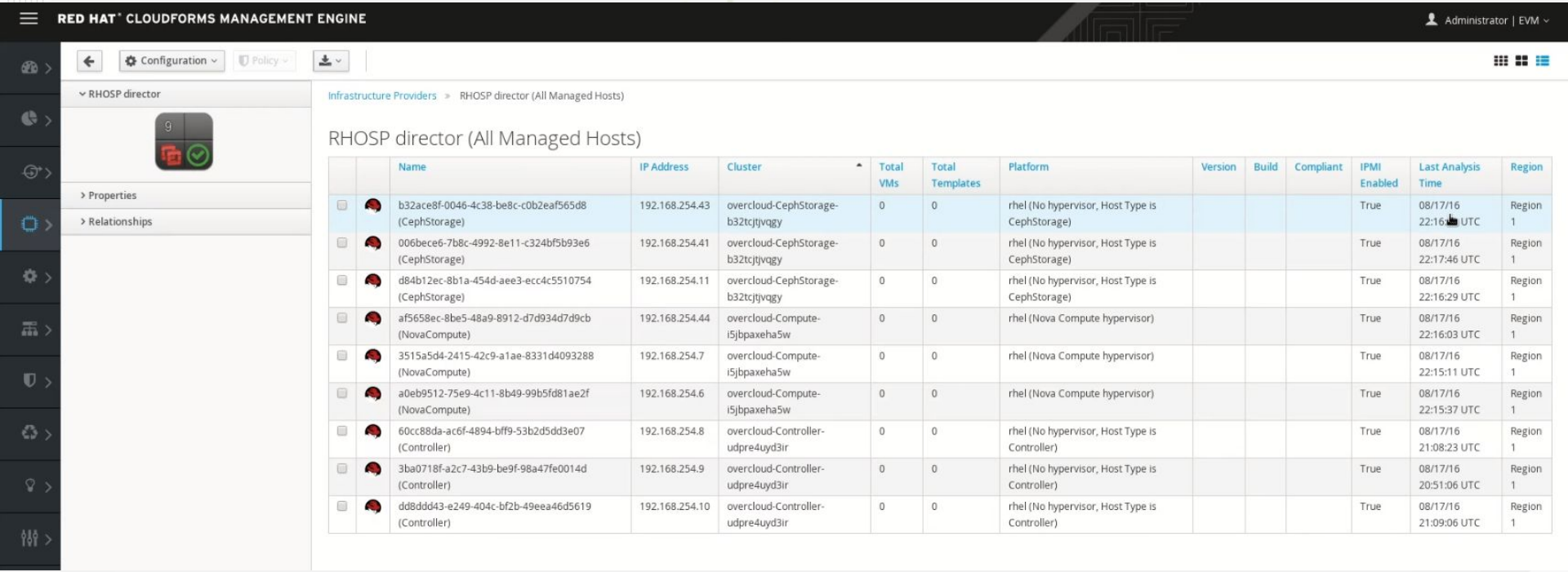

Name	IP Address	Cluster	Total VMs	Total Templates	Platform	Version	Build	Compliant	IPMI Enabled	Last Analysis Time	Region
b32ace8f-0046-4c38-be8c-c0b2eaf565d8 (CephStorage)	192.168.254.43	overcloud-CephStorage-b32tcjtjvqgy	0	0	rhel (No hypervisor, Host Type is CephStorage)				True	08/17/16 22:16:[illegible] UTC	Region 1
006bece6-7b8c-4992-8e11-c324bf5b93e6 (CephStorage)	192.168.254.41	overcloud-CephStorage-b32tcjtjvqgy	0	0	rhel (No hypervisor, Host Type is CephStorage)				True	08/17/16 22:17:46 UTC	Region 1
d84b12ec-8b1a-454d-aee3-ecc4c5510754 (CephStorage)	192.168.254.11	overcloud-CephStorage-b32tcjtjvqgy	0	0	rhel (No hypervisor, Host Type is CephStorage)				True	08/17/16 22:16:29 UTC	Region 1
af5658ec-8be5-48a9-8912-d7d934d7d9cb (NovaCompute)	192.168.254.44	overcloud-Compute-i5jbpaxeha5w	0	0	rhel (Nova Compute hypervisor)				True	08/17/16 22:16:03 UTC	Region 1
3515a5d4-2415-42c9-a1ae-8331d4093288 (NovaCompute)	192.168.254.7	overcloud-Compute-i5jbpaxeha5w	0	0	rhel (Nova Compute hypervisor)				True	08/17/16 22:15:11 UTC	Region 1
a0eb9512-75e9-4c11-8b49-99b5fd81ae2f (NovaCompute)	192.168.254.6	overcloud-Compute-i5jbpaxeha5w	0	0	rhel (Nova Compute hypervisor)				True	08/17/16 22:15:37 UTC	Region 1
60cc88da-ac6f-4894-bff9-53b2d5dd3e07 (Controller)	192.168.254.8	overcloud-Controller-udpre4uyd3ir	0	0	rhel (No hypervisor, Host Type is Controller)				True	08/17/16 21:08:23 UTC	Region 1
3ba0718f-a2c7-43b9-be9f-98a47fe0014d (Controller)	192.168.254.9	overcloud-Controller-udpre4uyd3ir	0	0	rhel (No hypervisor, Host Type is Controller)				True	08/17/16 20:51:06 UTC	Region 1
dd8ddd43-e249-404c-bf2b-49eea46d5619 (Controller)	192.168.254.10	overcloud-Controller-udpre4uyd3ir	0	0	rhel (No hypervisor, Host Type is Controller)				True	08/17/16 21:09:06 UTC	Region 1

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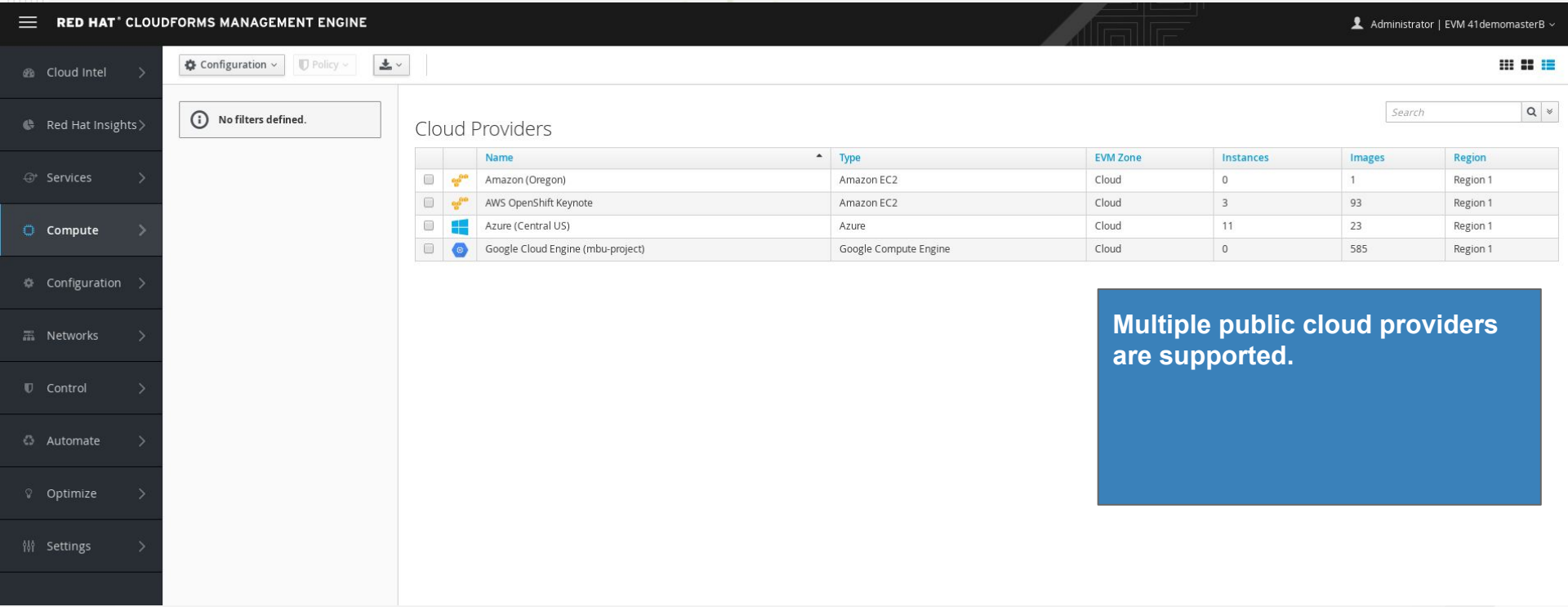

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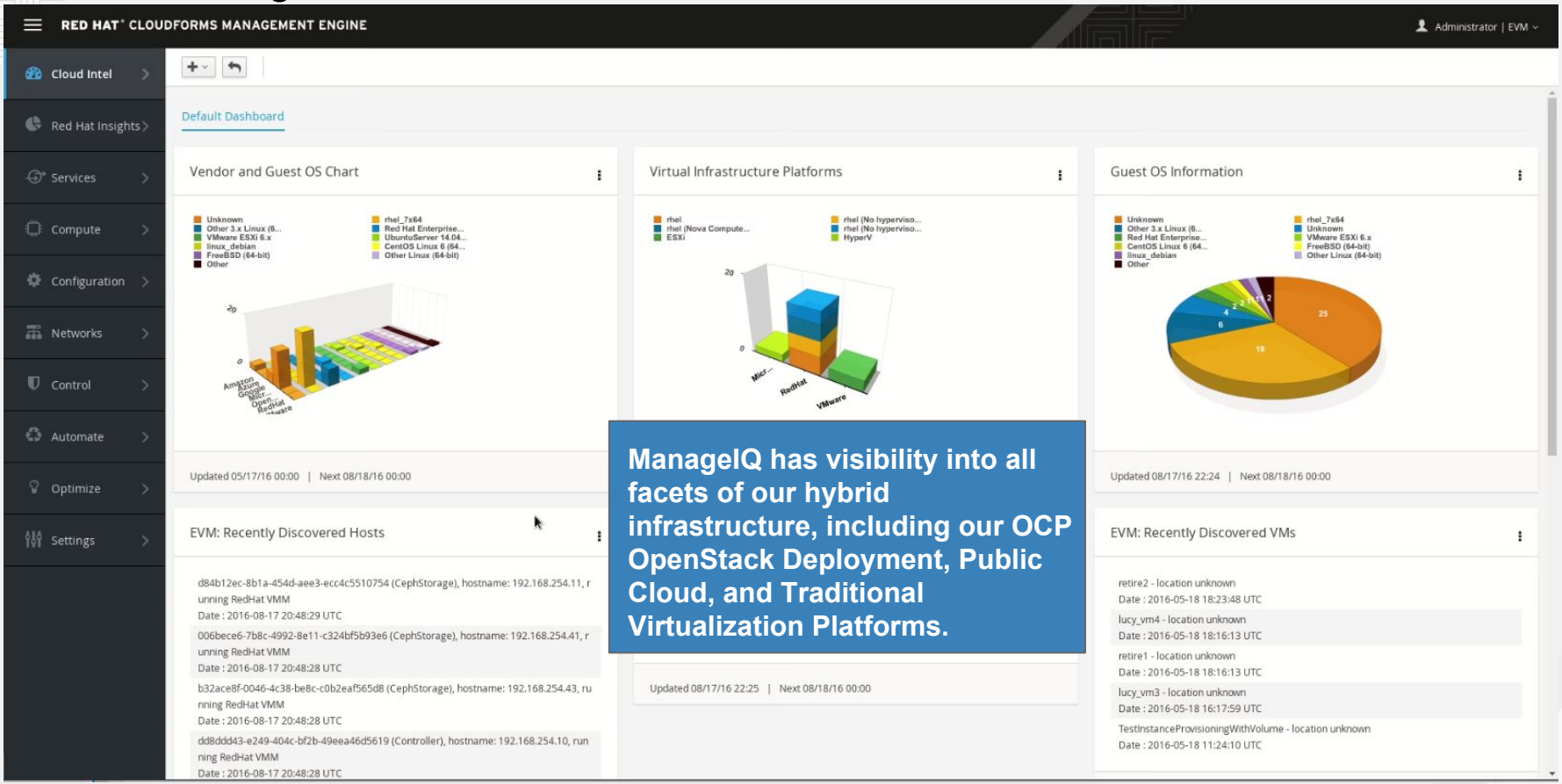

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Questions on the deployment?

Call to Action

- Join in and participate in the upstream communities
- Support these communities by buying subscriptions
- Join the Open Source SW and HW communities:
  - Opencompute.org
  - OCP Meetups
  - RHUGS
  - Upstream SW communities:
    - ManageIQ.org
    - Gluster.org
    - Ceph.com
    - Ovirt.org
    - OpenStack
    - RDOProject.org
    - Ansible

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