MARIST
NYS Cloud Computing and Analytics Center
SDN Innovation Lab

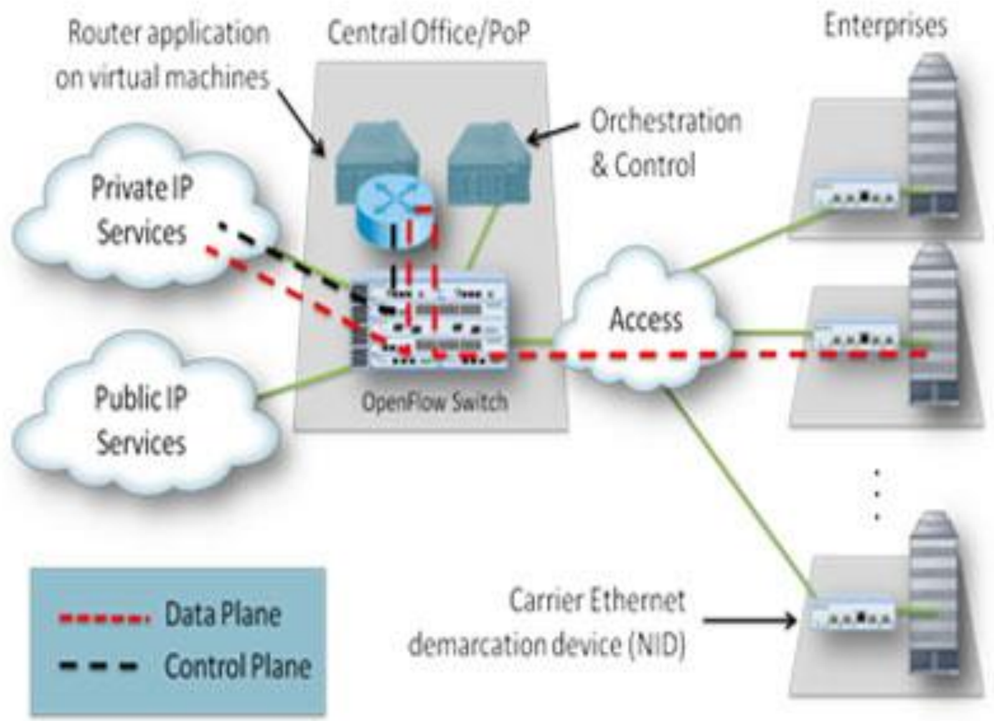
Open Platform for Network Functions Virtualization

OPNFV

Robert M. Cannistra
robert.cannistra@marist.edu

What is Network Functions Virtualization (NFV)?

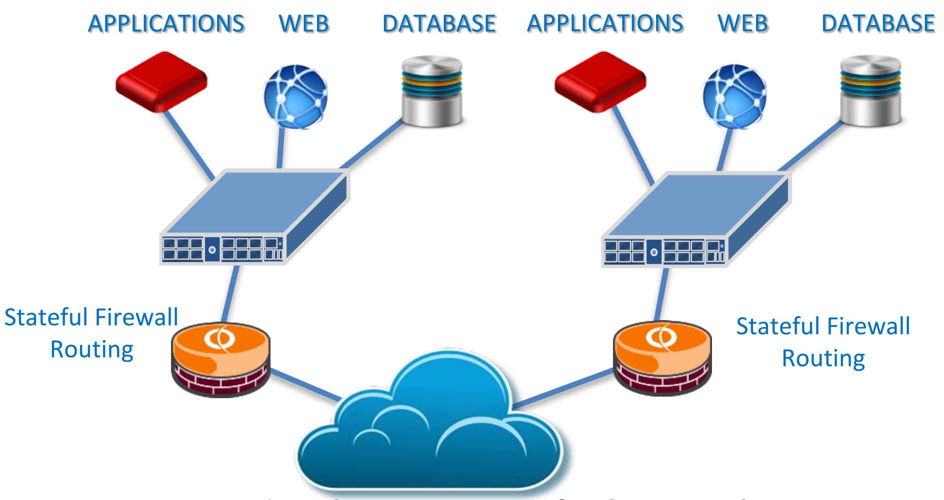
- A network architecture concept to virtualize entire classes of network node functions
- "The aim of NFV is to transform the way communication service providers (CSPs) architect networks and deliver network services. Network operations are transformed as network function software is dynamically instantiated in various network locations in the network as needed, without requiring the installation of new equipment."



source: http://www.overturenetworks.com/virtualization-info/what-is-nfv/

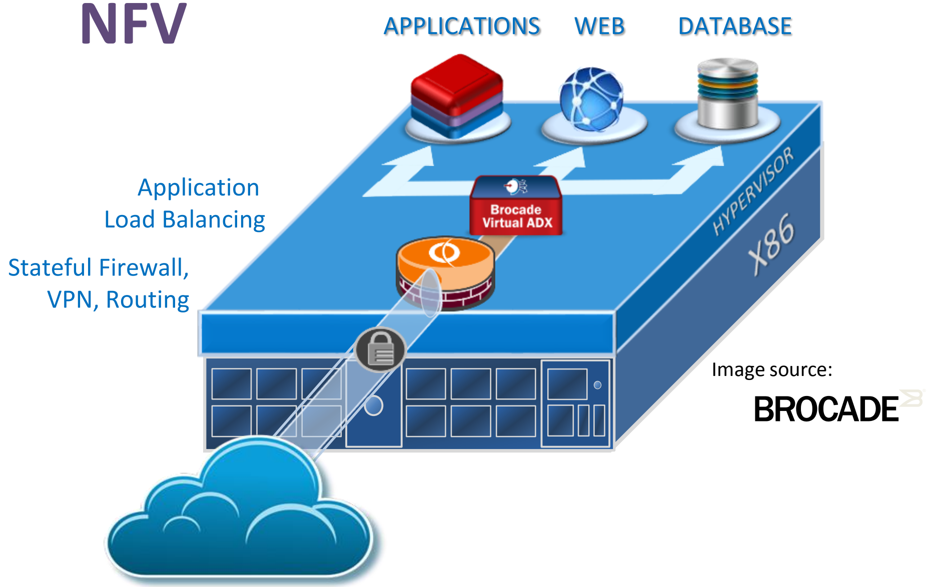
Traditional Network Appliances vs. NFV

Traditional Network Appliances



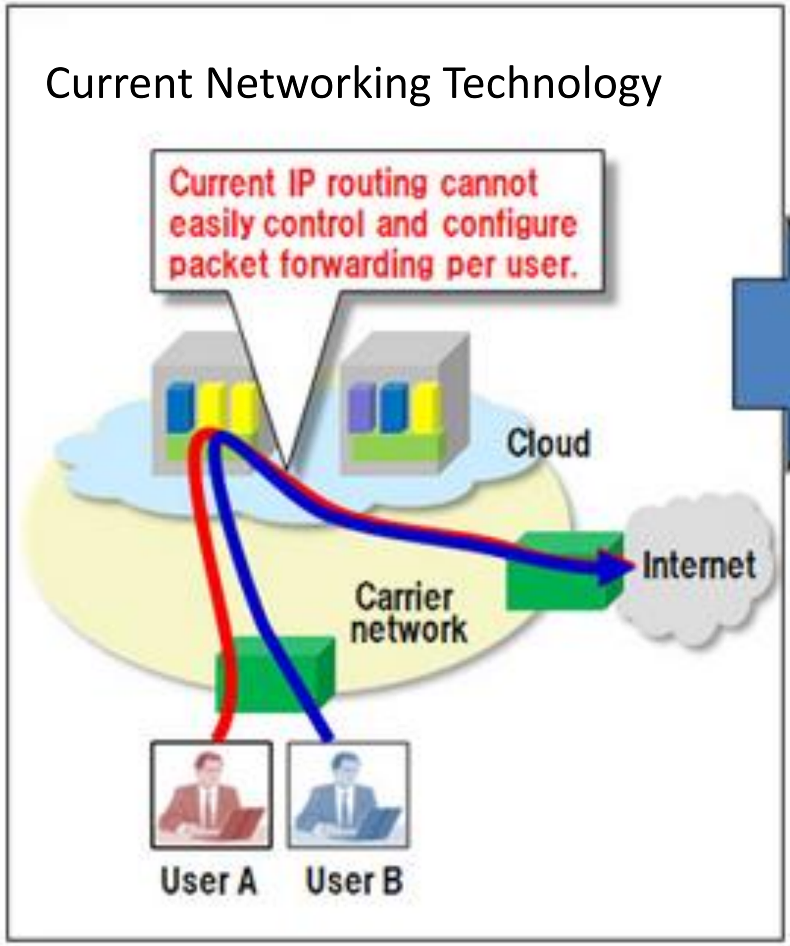
- Static deployment of physical appliances
  - Firewalls
  - VPN (L2/L3)
  - Routing
  - NAT
  - Load Balancers
  - IDS/IPS
- CSP must offer unique and expensive hardware per tenant

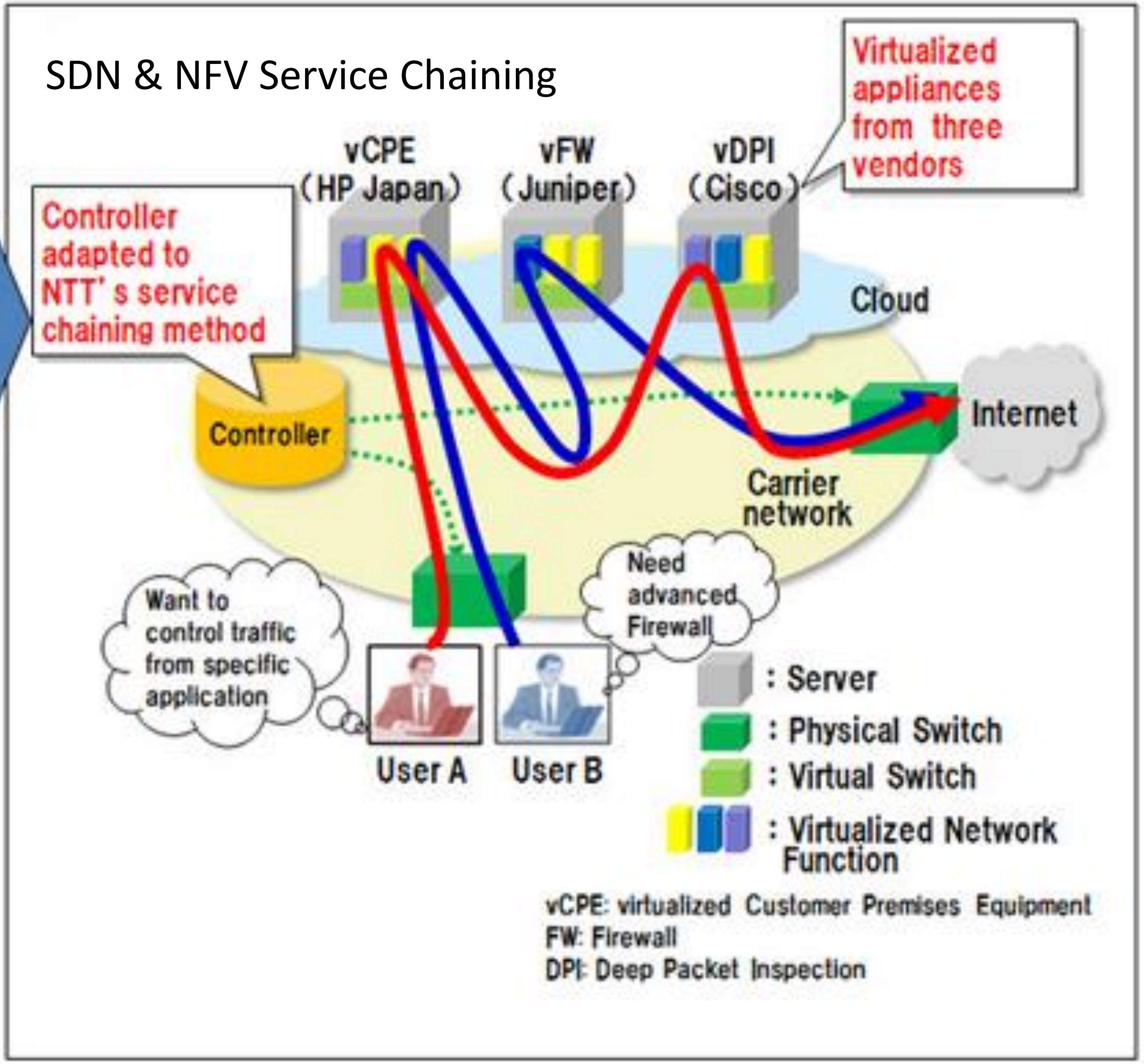
NFV



- Flexible deployment of Virtual Appliances
- Performance Flexibility VM
- Platform Independent x86
- Flexible deployment of Virtual Appliances
- Performance Flexibility VM
- Firewalls, VPN (L2/L3), Routing, NAT, Load Balancing
- CSP can offer each as a unique service per tenant

NFV Advanced Firewall with Service Chaining



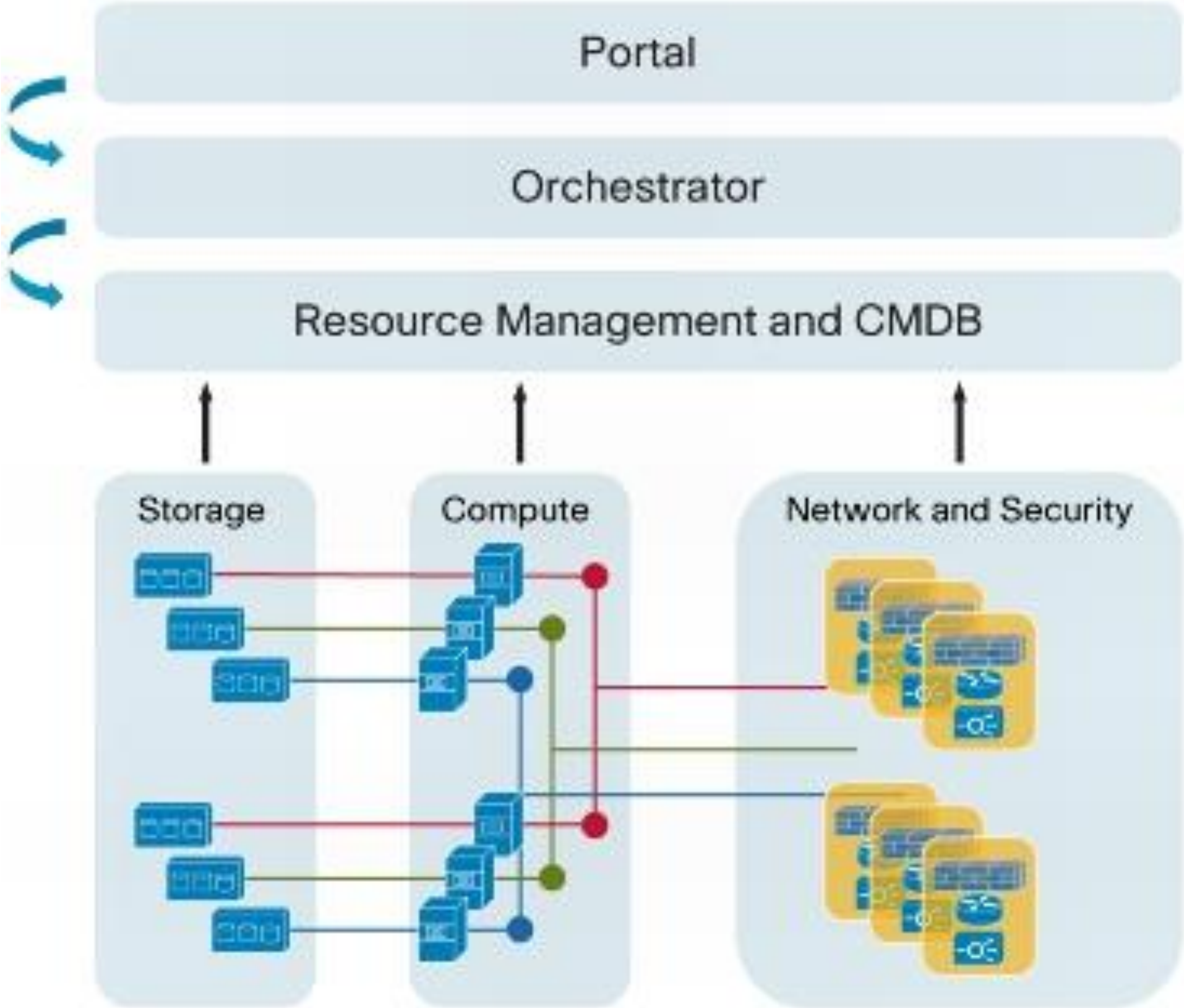


- Rapid service Provisioning based on user selection of network functions
- Verifies service chaining in multivendor environment

image source: http://3.bp.blogspot.com/-rw5o14uwVcU/Uv26i1EfZYI/AAAAAAAA86Y/QPbTq3eZWUo/s1600/ntt-nfv2.png

Orchestration and Optimization

- Patterns are used to describe both the software and infrastructure components, relationships, policies and services levels used to provision and manage resources for a business service
- Automation and optimization is a distributed and collaborative approach that is performed with the context of the workloads and business services
- Policies and service levels are derived from the business services and provided in the context of the resources being managed by each component in the system (software, server, storage, network)



Customer Solution

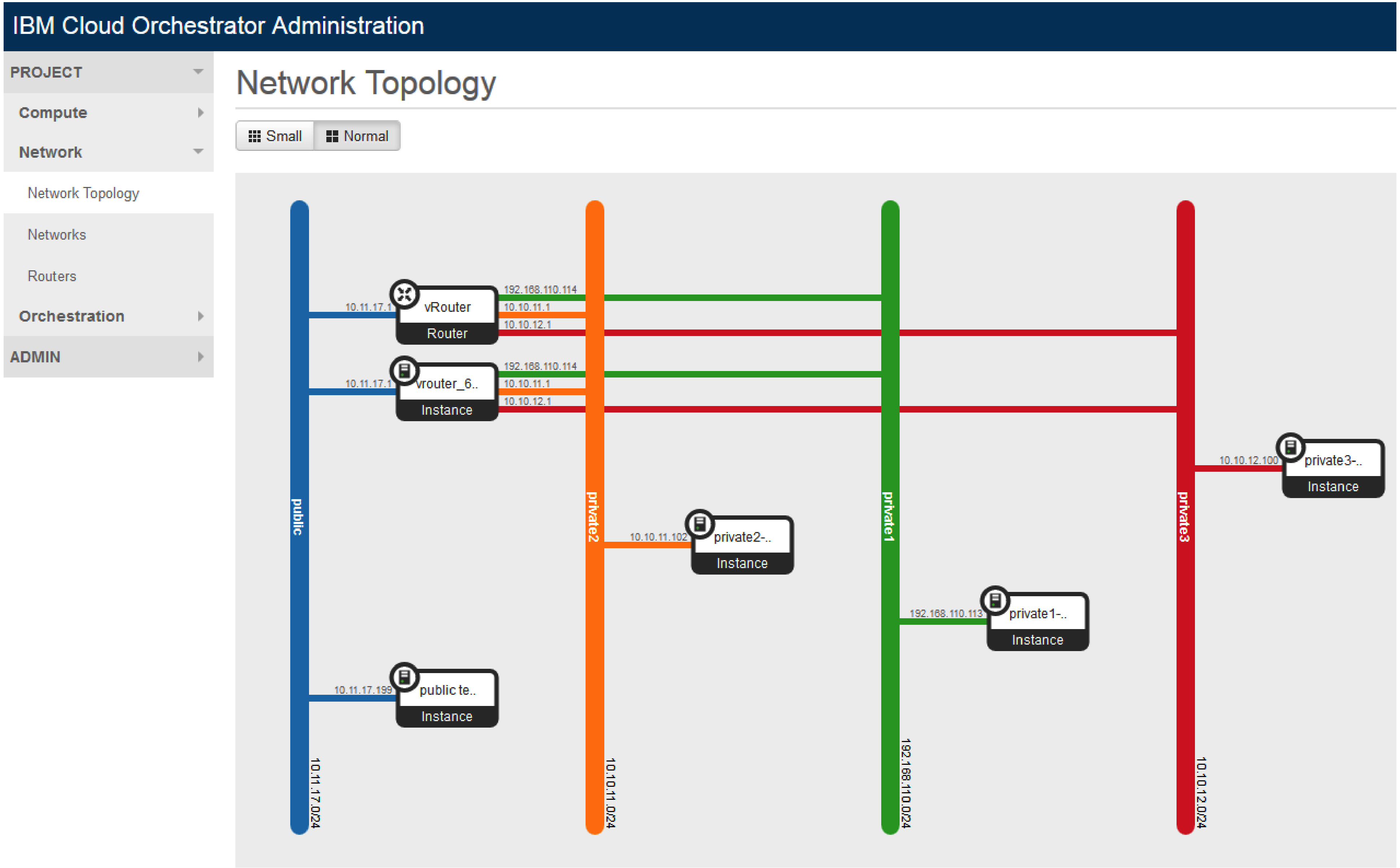
Software Patterns

Infrastructure Patterns

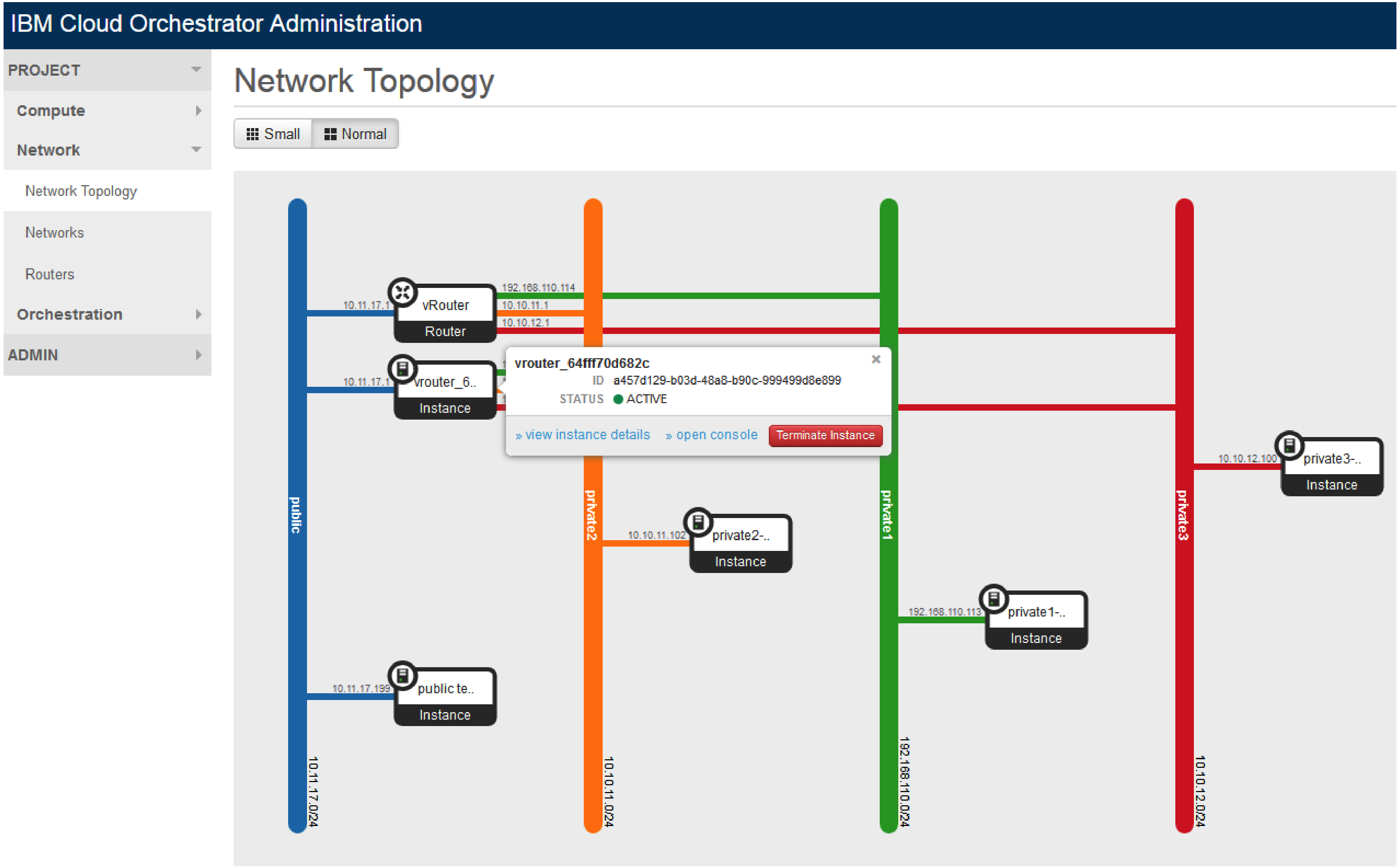
Software Defined Infrastructure

Hardware/Physical Infrastructure

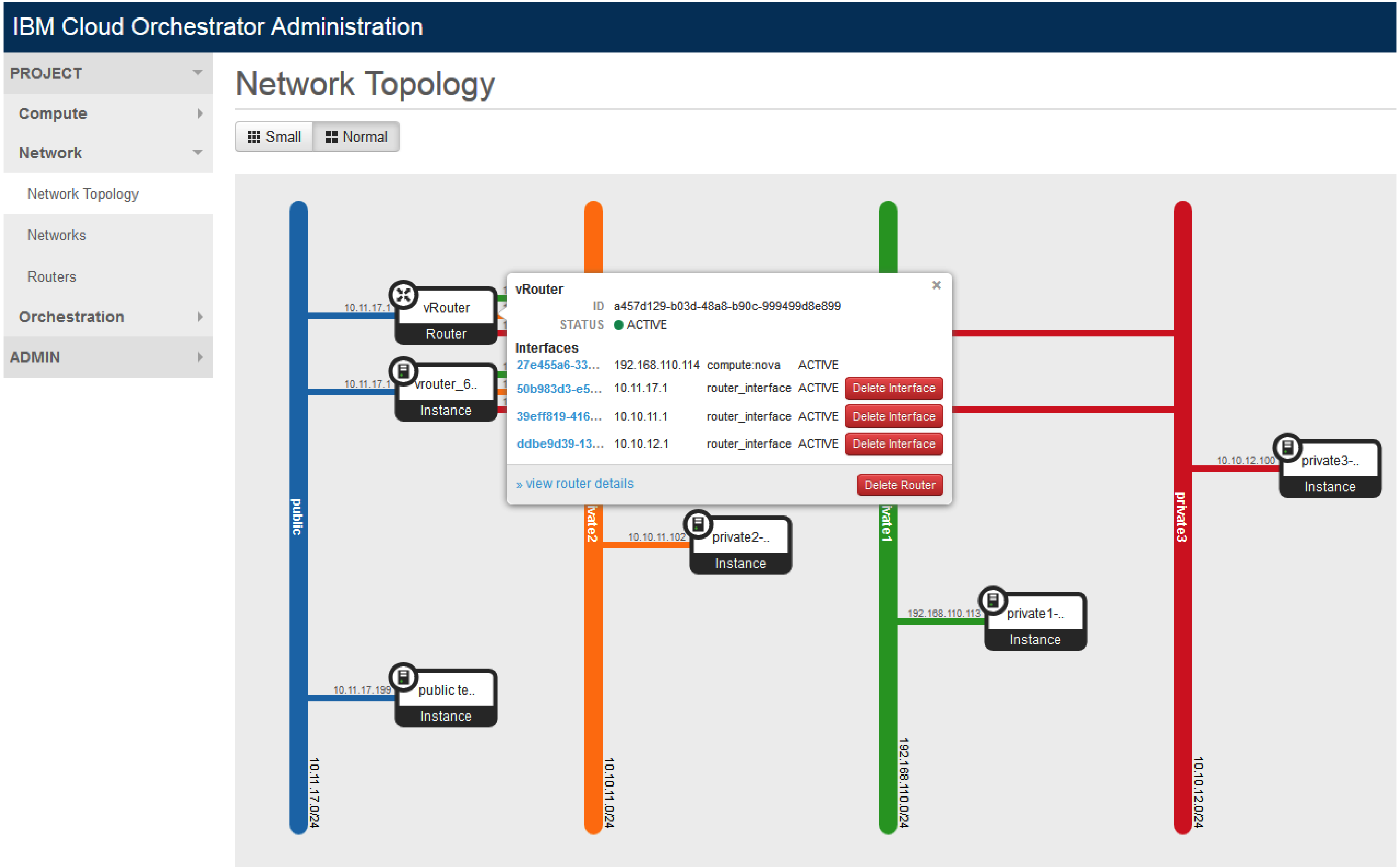
Brocade Vyatta vRouter, IBM Cloud Orchestrator, and OpenStack Integration



Brocade Vyatta vRouter, IBM Cloud Orchestrator, and OpenStack Integration



Brocade Vyatta vRouter, IBM Cloud Orchestrator, and OpenStack Integration



VNF Instances within ICO

IBM Cloud Orchestrator Administration

PROJECT
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Orchestration
ADMIN

Instances

Instances

	Instance Name	Image Name	IP Address	Size
☐	vrouter_64fff70d682c	Vyatta vRouter	**private3** 10.10.12.1 **private2** 10.10.11.1 **private1** 192.168.110.114 **public** 10.11.17.1	m1.small | 2GB RAM | 1 VCPU | 20.0GB Disk
☐	private3-test	Cirros	10.10.12.100	m1.tiny | 512MB RAM | 1 VCPU | 1.0GB Disk
☐	private2-test	Cirros	10.10.11.102	m1.tiny | 512MB RAM | 1 VCPU | 1.0GB Disk
☐	private1-test	Cirros	192.168.110.113	m1.tiny | 512MB RAM | 1 VCPU | 1.0GB Disk
☐	public test	Cirros	10.11.17.199	m1.tiny | 512MB RAM | 1 VCPU | 1.0GB Disk

Displaying 5 items

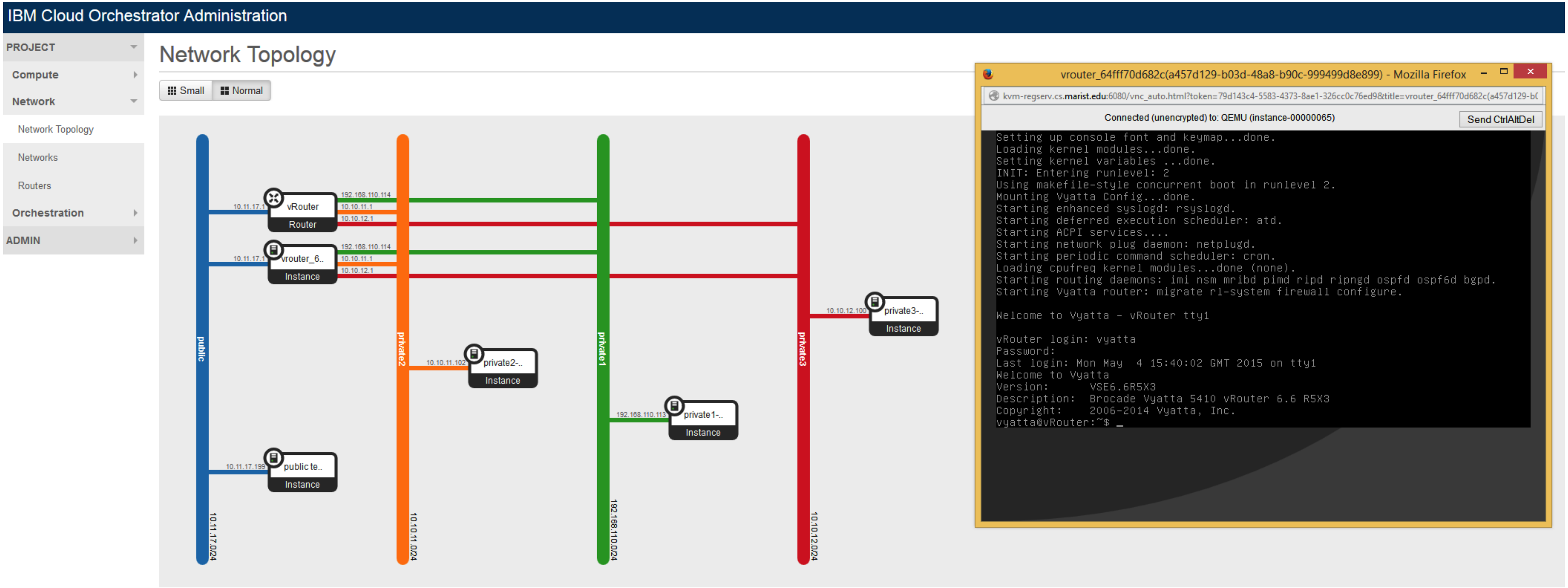
VNF Instances within ICO *(continued)*

admin admin IBM.

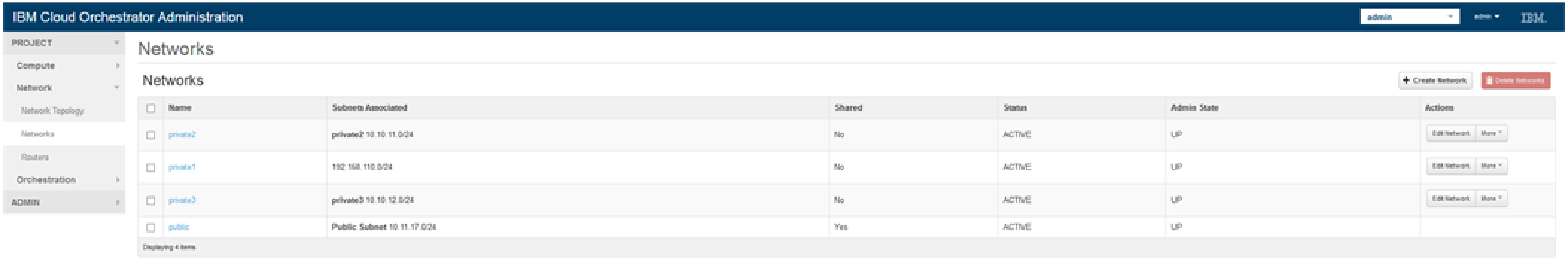
Name | Filter | Filter | + Launch Instance | Soft Reboot Instances | Terminate Instances

Key Pair	Status	Availability Zone	Task	Power State	Uptime	Actions
-	Active	nova	None	Running	35 minutes	Create Snapshot More
-	Active	nova	None	Running	1 month	Create Snapshot More
-	Active	nova	None	Running	1 month	Create Snapshot More
-	Active	nova	None	Running	1 month	Create Snapshot More
-	Active	nova	None	Running	1 month	Create Snapshot More

Vyatta vRouter Instance Console



ICO Networks

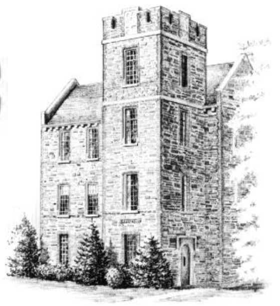


With ICO, Vyatta vRouter running on OpenStack, we are able to:

- Allocate Resource Pools
- And provide end-to-end Orchestration

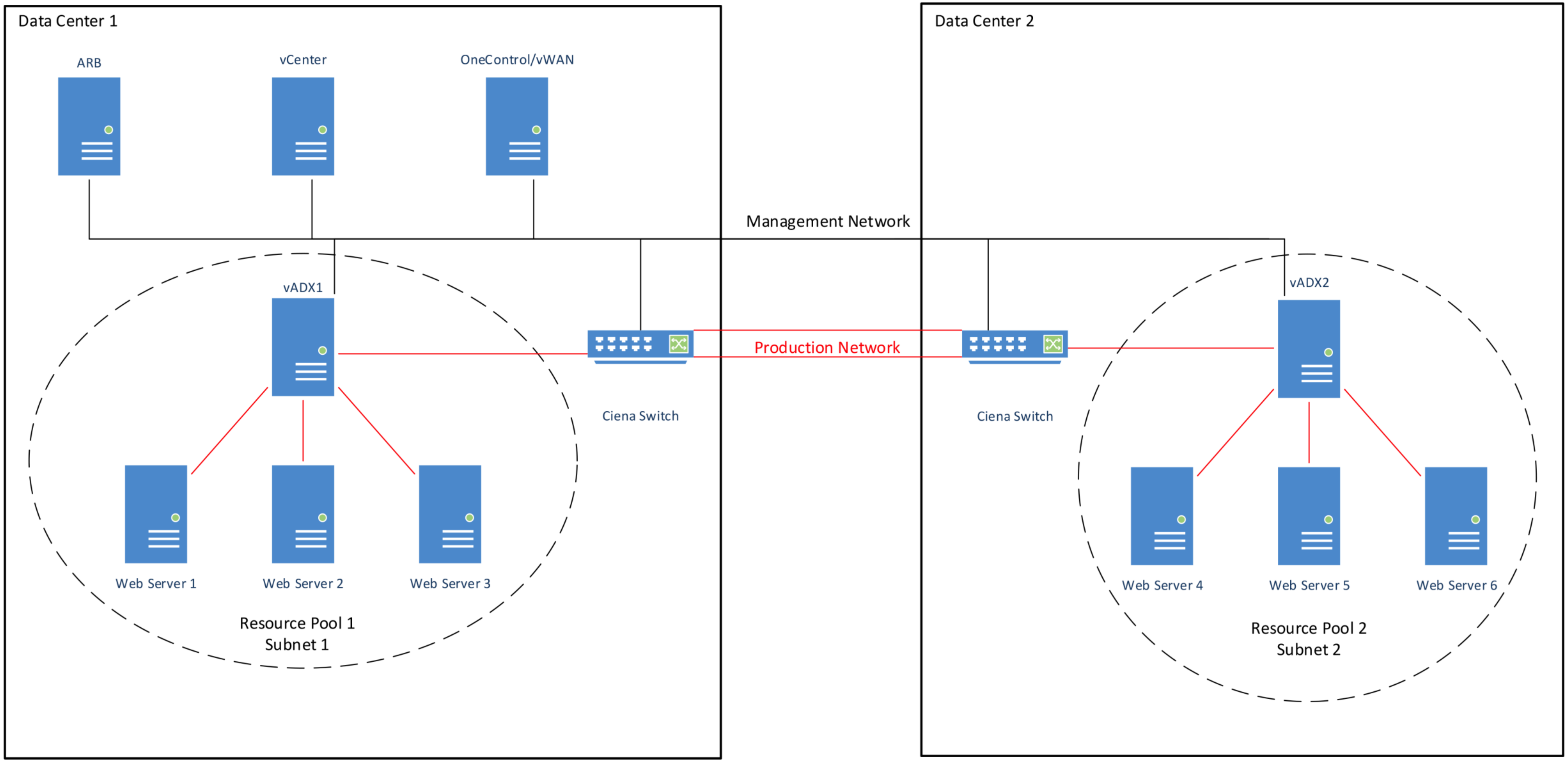
Using standardized and customized APIs

Cloud Orchestration Engines – Key Traits



- Integration of cloud capabilities across heterogeneous
- Self-service portal for selection of storage, compute and networking nodes
- Reduced need for intervention to allow lower ratio of administrators to physical and virtual servers
- Automated high-scale provisioning and de-provisioning of resources with policy-based tools
- Ability to integrate workflows and approval service chains
- Real-time monitoring of physical and virtual cloud resources, accounting chargeback capabilities to track and optimize system usage
- **Prepackaged automation templates and workflows for most common resource types to ease adoption of best practices and minimize transition time

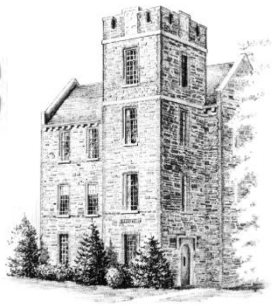
SDN and NFV-enabled Cloud Environment with Resource Pools



Networks Are Evolving

- Growth of data traversing the network
- Cloud computing changing the way applications are delivered and consumed
- Service Providers are under pressure to meet demands for services from consumers, enterprises and the Internet of Things
- Industry shift towards Software-Defined Networking (SDN) and Network Functions Virtualization (NFV)

Key Industry Needs



- Increased service agility
- Improved operational efficiency
- Cloud-based delivery models
- Elasticity (ie: Dynamic bandwidth allocation)
- Common standards for core network elements
- Integration of existing open source NFV building blocks
- Ecosystem collaboration, coordination and testing
- Carrier-grade service performance

What is OPNFV?

- In short…
  - OPNFV is a carrier-grade, integrated, open source reference platform
- The scope of OPNFV's initial release is:
  - focused on building NFV Infrastructure (NFVI) and Virtualized Infrastructure Management (VIM) by integrating components from upstream projects such as OpenDaylight, OpenStack, Ceph Storage, KVM, Open vSwitch, and Linux.
  - These components form the basic infrastructure required for Virtualized Network Functions (VNF) and Management and Network Orchestration (MANO) components.

OPNFV Project Goals

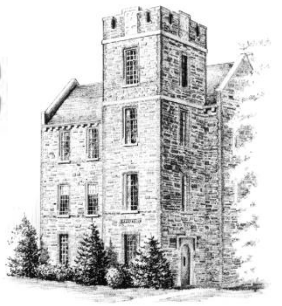
- Develop an integrated and tested open source platform that can be used to build NFV functionality, accelerating the introduction of new products and services
- Include participation of leading end users to validate OPNFV meets the needs of user community
- Contribute to and participate in relevant open source projects that will be leveraged in the OPNFV platform; ensure consistency, performance and interoperability among open source components
- Establish an ecosystem for NFV solutions based on open standards and software
- Promote OPNFV as the preferred open reference platform

Why Open Source?

- The promise of open source is better quality, higher reliability, more flexibility, lower cost and the opportunity to drive open standards.
- Faster, lower cost and higher quality development through sharing of resources via collaboration.
- Community decisions about new features and roadmaps.
- A common environment for uses and App developers.
- Ability to focus resources on differentiating development.

***Bottom Line**: The open source model significantly accelerates consensus, delivering high performing, peer-reviewed code that forms a basis for an ecosystem of solutions.*

Upstream OSS Projects Integration



- Work directly with upstream standards bodies (ETSI and others)
- Work directly with upstream open source projects (OpenDaylight, OpenStack, KVM, Ceph, and many others)
- Leverage existing codebases
- Integrate existing open source components
- Identify gaps to create new code
- Provide a point of integration, testing and performance optimization

***Result*: Best reference platform for carrier-grade NFV implementations**

Membership List (Building the Ecosystem)

Platinum Members

at&t · BROCADE · 中国移动 China Mobile · CISCO · DELL · NTT docomo · ERICSSON · hp · HUAWEI

IBM · intel · JUNIPER NETWORKS · NEC · NOKIA · redhat · TELECOM ITALIA · vodafone · ZTE中兴

Silver Members

6WIND · Alcatel-Lucent · ARM · Array NETWORKS · BROADCOM · CableLabs · CAVIUM · CenturyLink · ciena · CITRIX

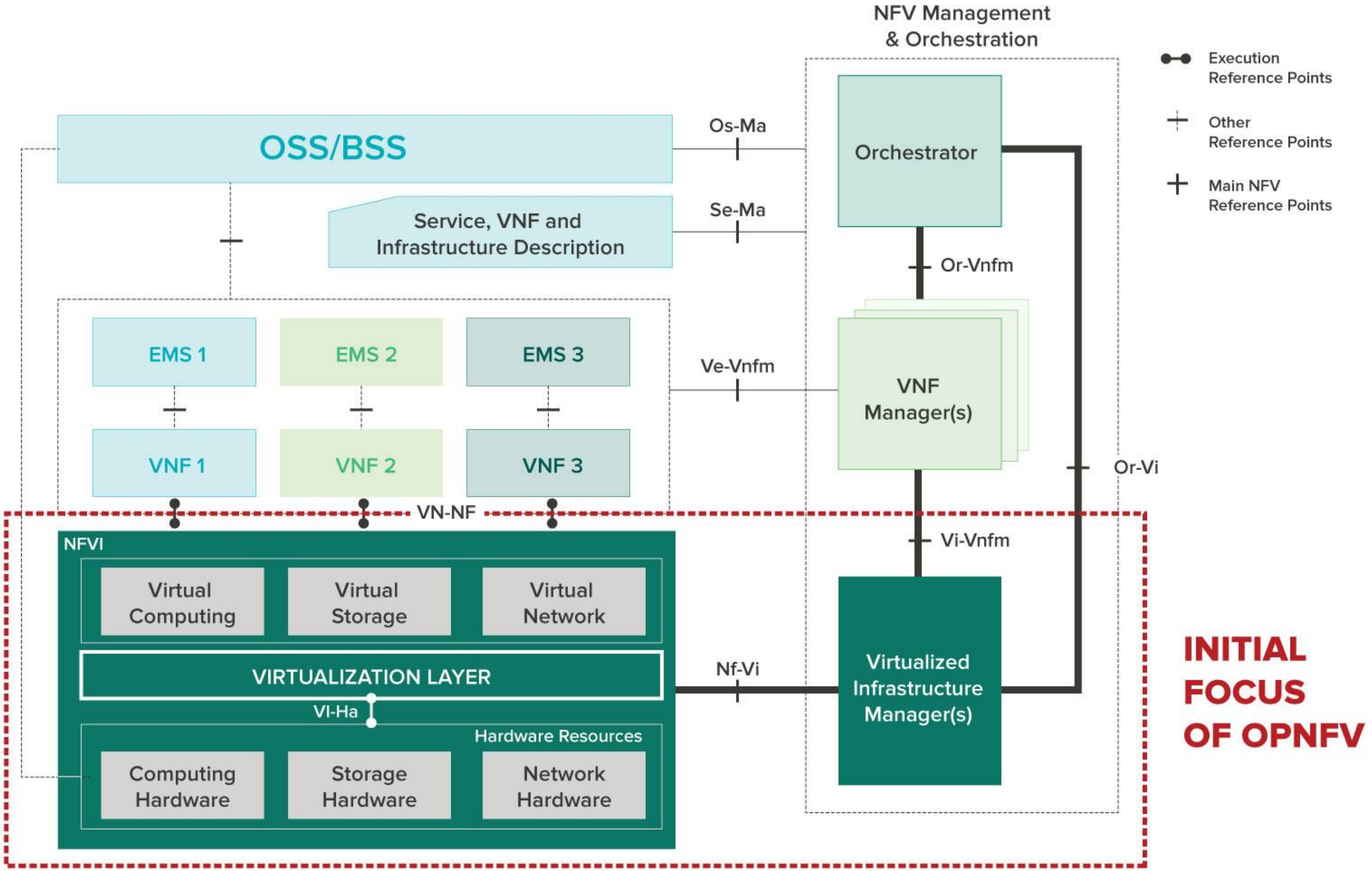
ClearPath networks · CONTEXTREAM · Coriant · cyan · dorado SOFTWARE · ENEA · ixia · kt · Metaswitch Networks · midokura

MIRANTIS · ooredoo · orange · OVERTURE · sandvine · SK telecom · SPIRENT · Sonus · Sprint · WIND RIVER · XILINX

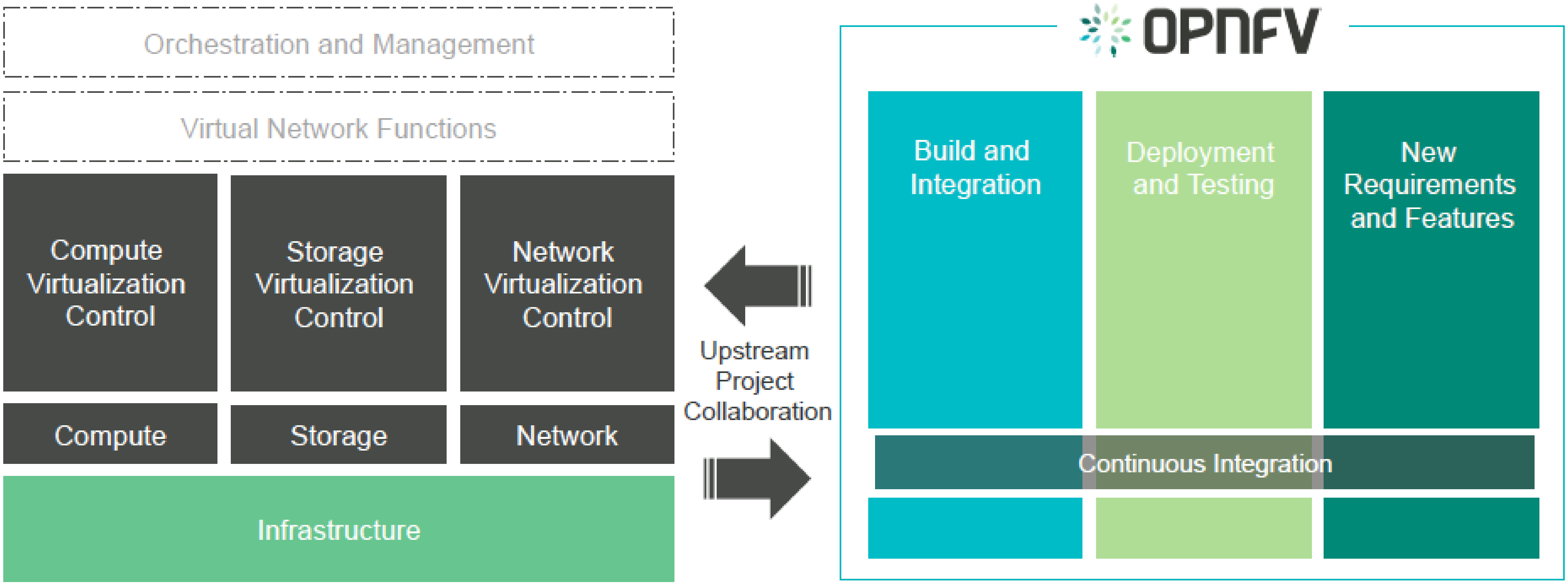
QOSMOS · CANONICAL

Initial Launch was: Sept 30th, 2014

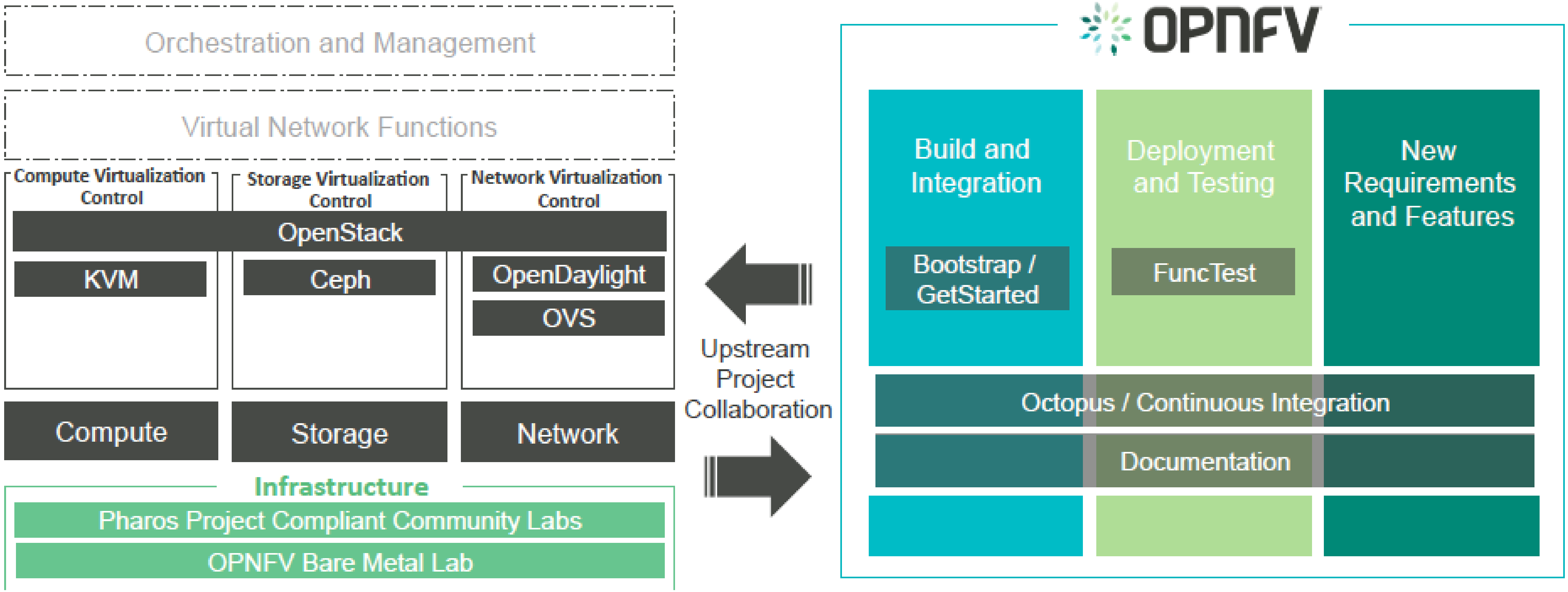
ETSI Architecture Framework



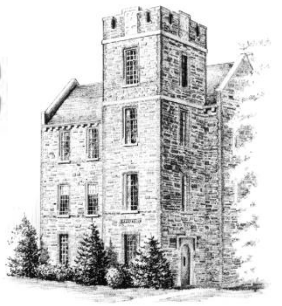
OPNFV Platform Foundation



OPNFV Arno Release



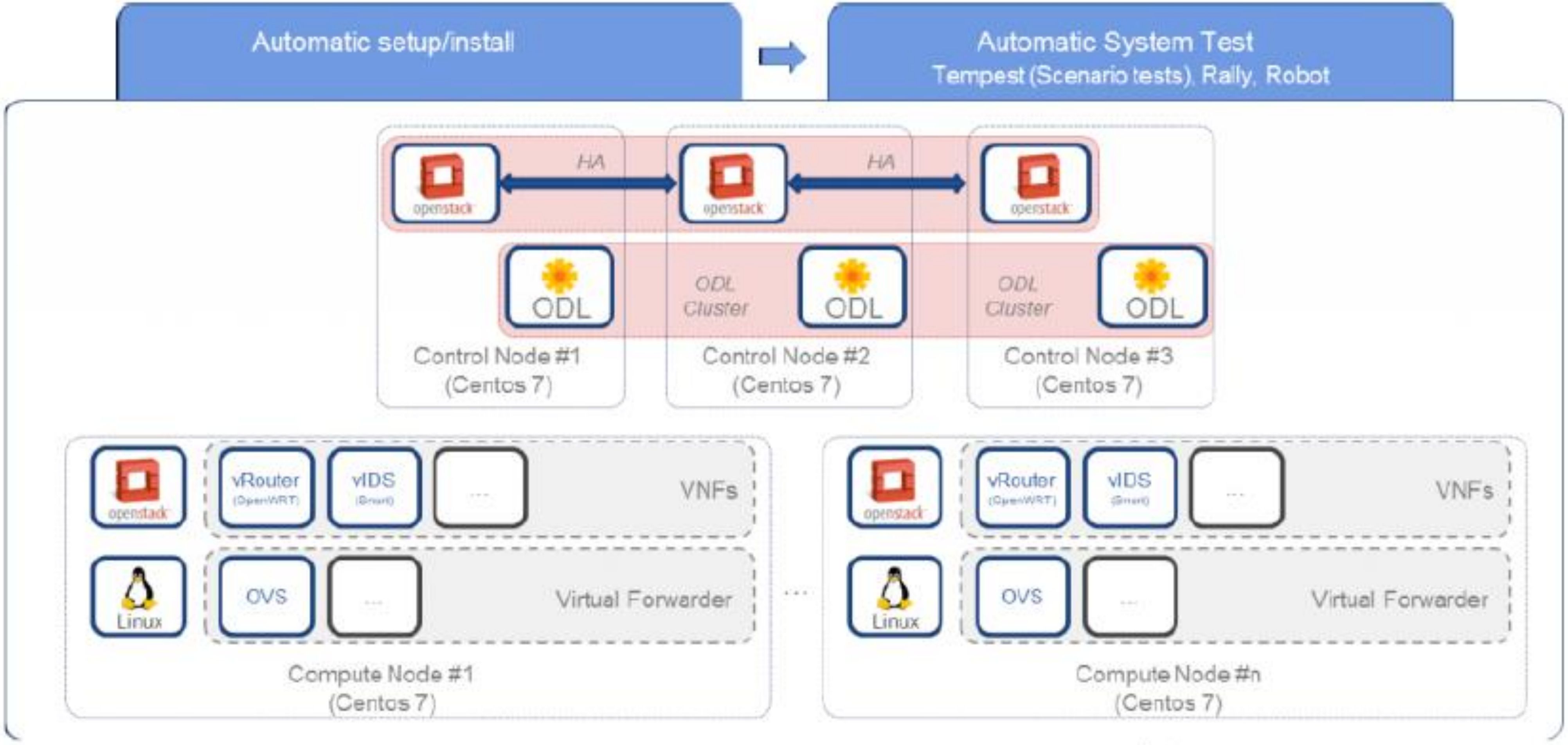
First Ask the Impossible!



- Try, then learn what is possible
  - Arno is intended to be:
    - One vision, one platform, one release within six months
  - BGS, what is it?
    - “Bootstrap & Get Started” launched our activities
    - While the release demanded:
      - octopus – continuous automated integration & installation
      - pharos – A global federated devops R&D environment
      - gunctest – basic platform validation
      - opnfvdocs – well, release docs…

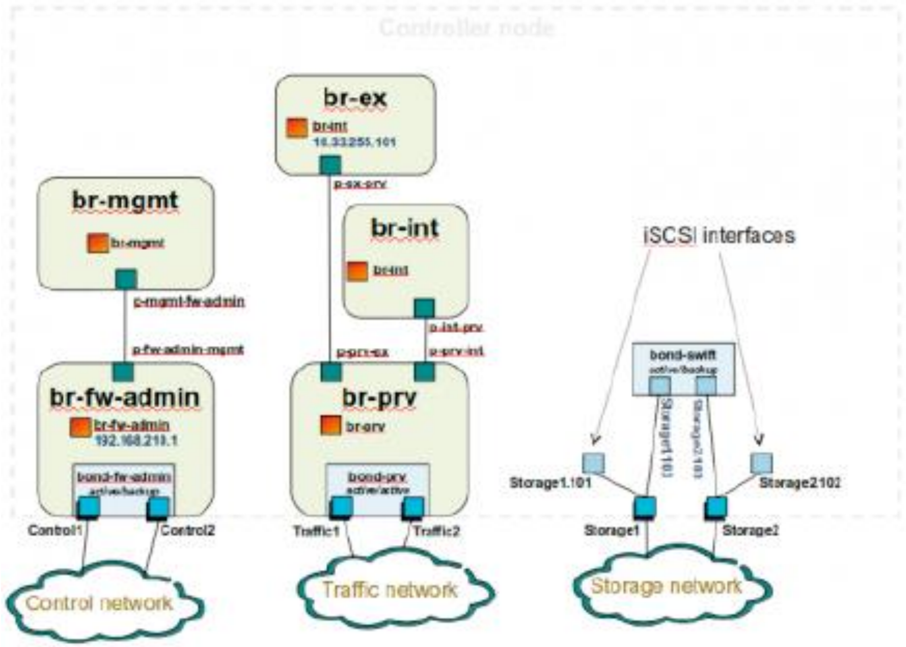
Get Started with Bootstrap

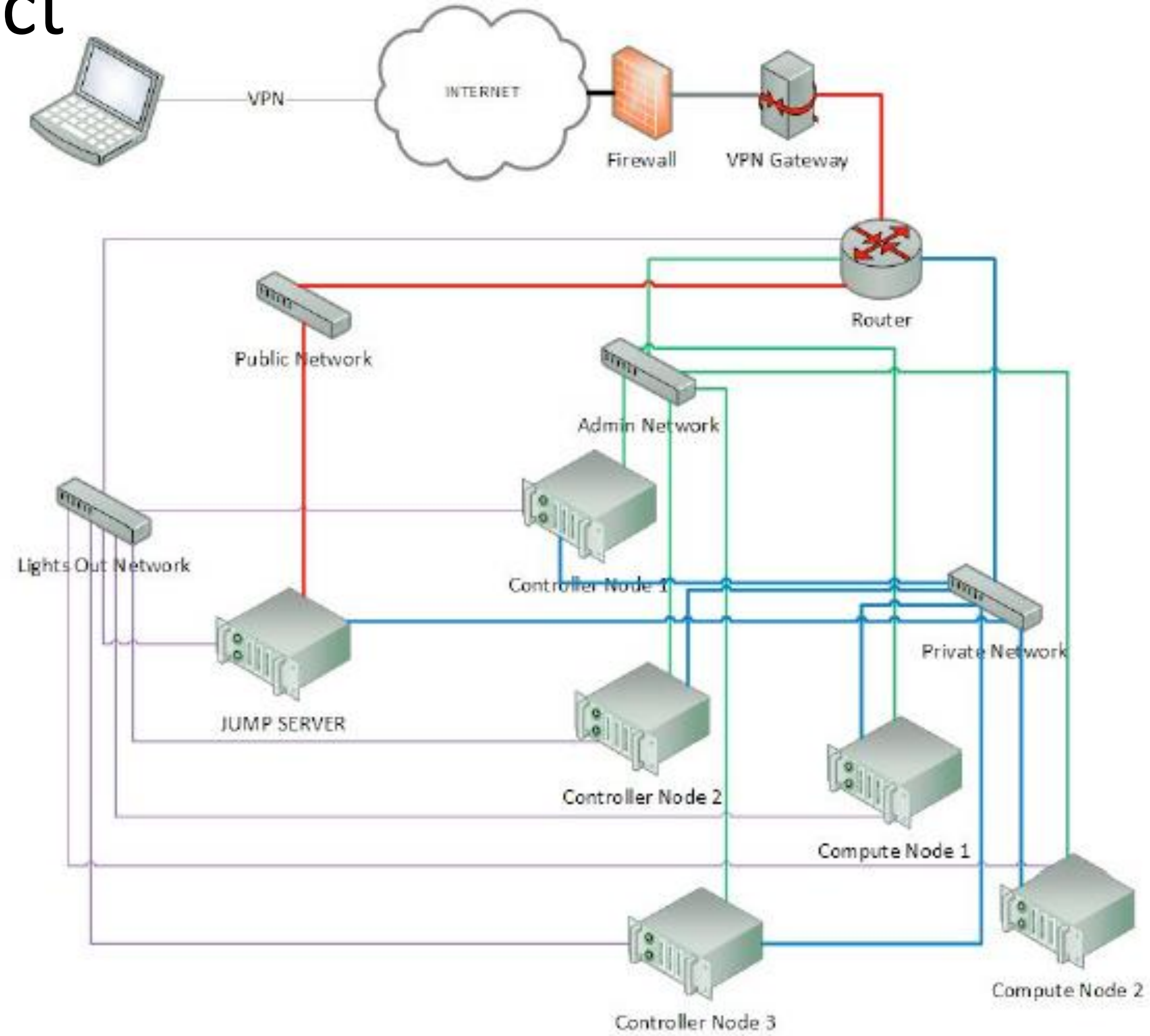
- Defines the minimum baseline platform and config



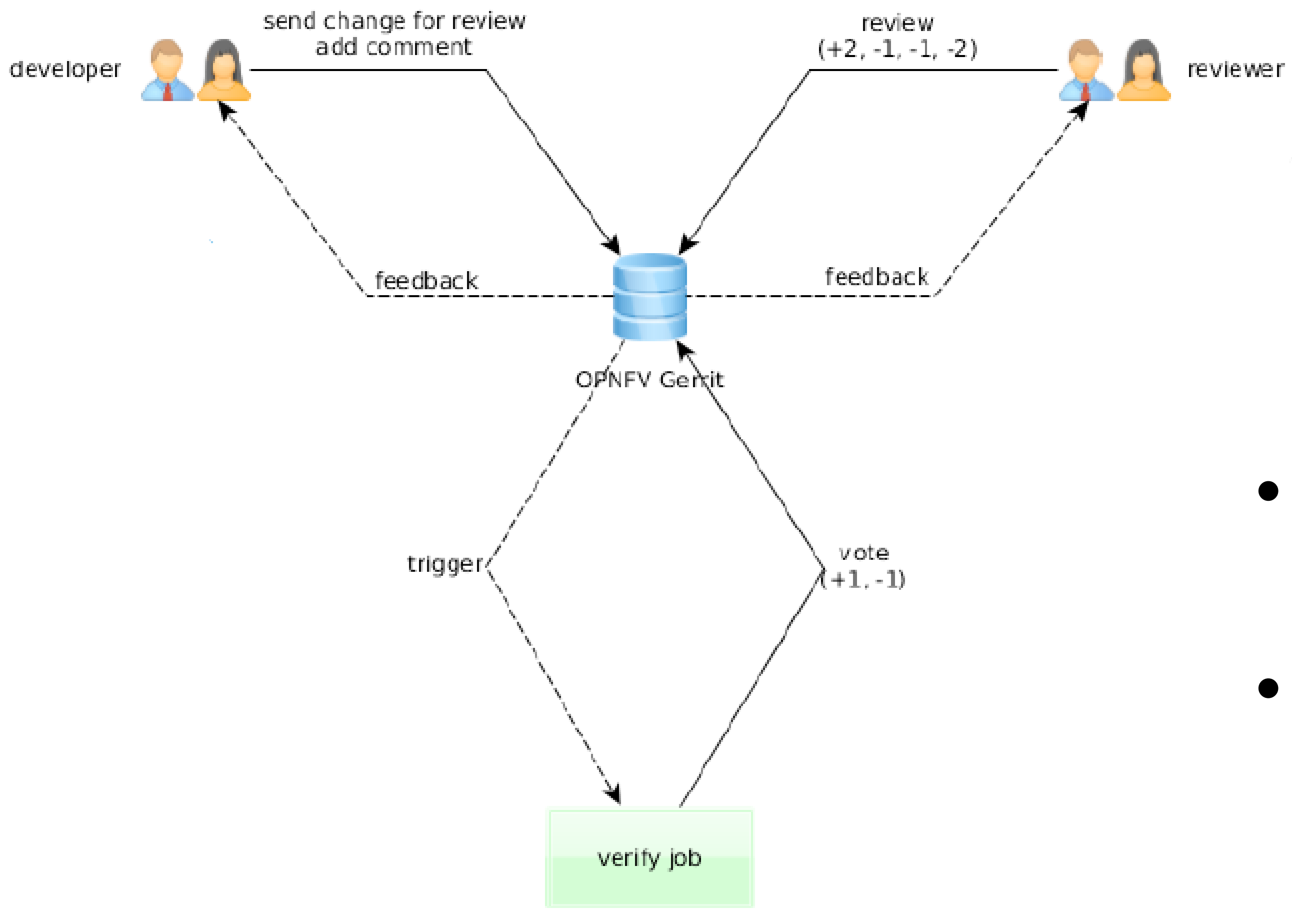
Pharos

- The OPNFV federated lab project





Octopus



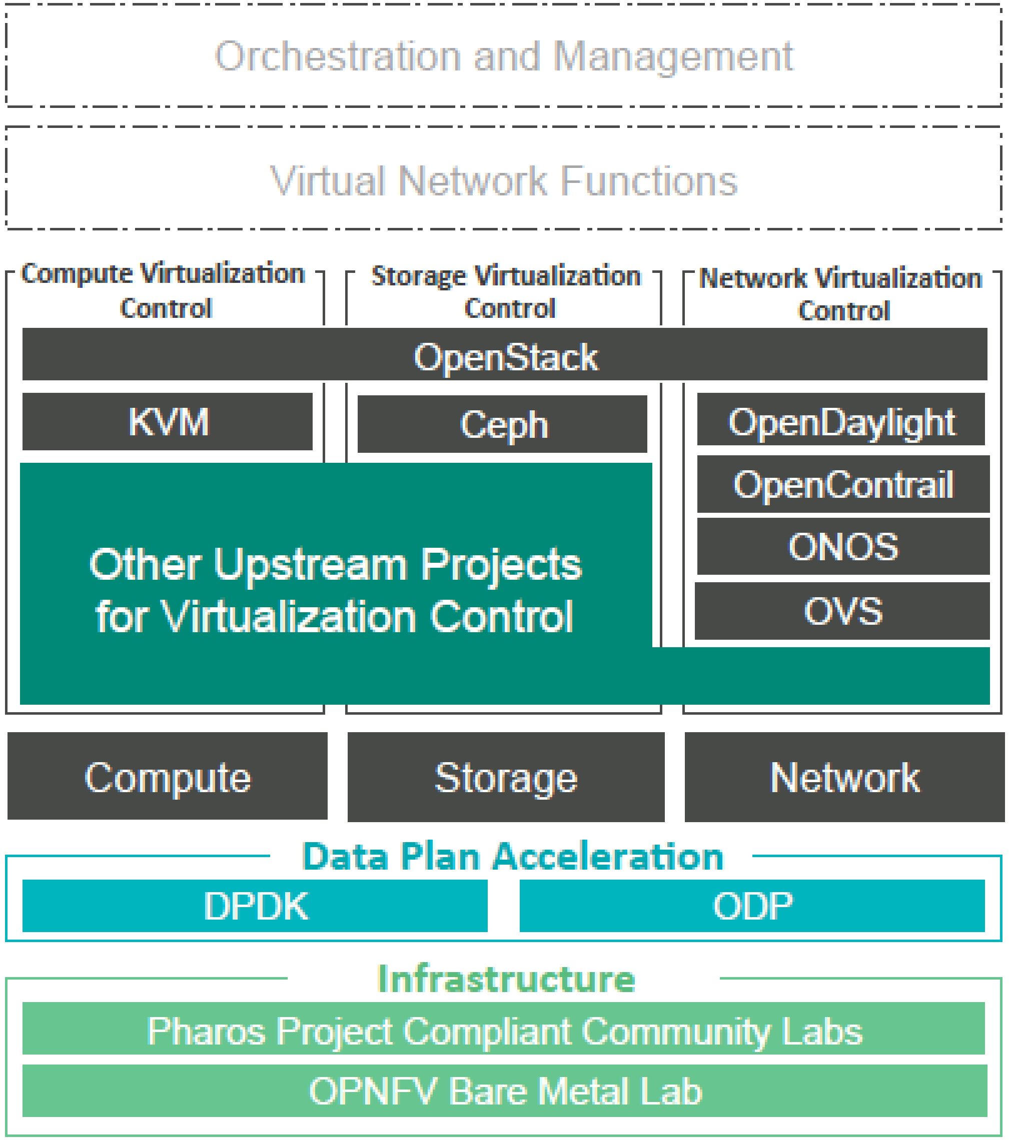
- Provides CI for all projects
  - Documentation, code, testing
  - End-to-end development:
    - Review
    - Merge
    - Artifact storage
- From
  - Spinning up a validation task
- To
  - Deploying the platform to the global lab

Functest

- OPNFV – Base system functionality testing…

- Here's the current functests available?
  - Rally Bench https://jira.opnfv.org/browse/FUNCTEST-1
  - Rally Tempest https://jira.opnfv.org/browse/FUNCTEST-2
  - vPing https://jira.opnfv.org/browse/FUNCTEST-3
  - vIMS https://jira.opnfv.org/browse/FUNCTEST-4
  - ODL https://jira.opnfv.org/browse/FUNCTEST-5

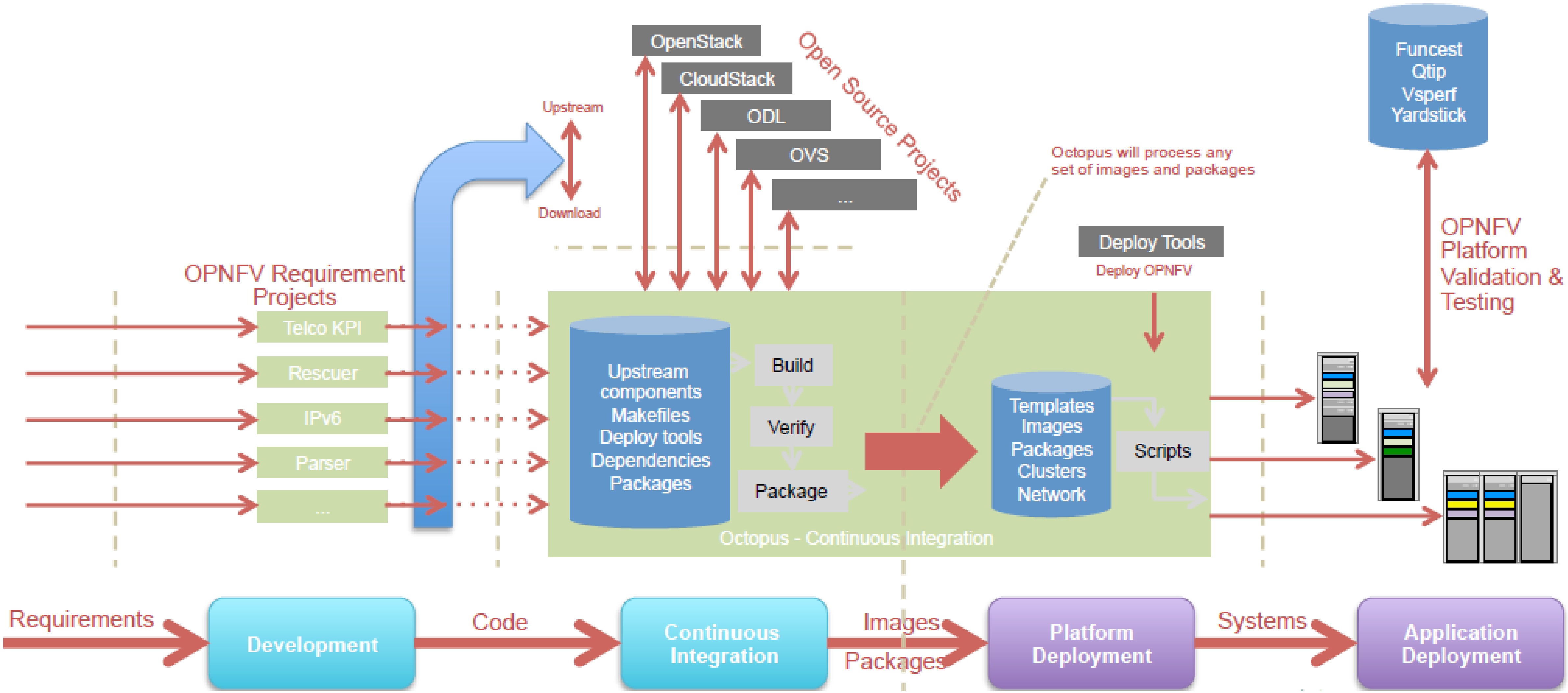
Post-Arno Stack Evolution



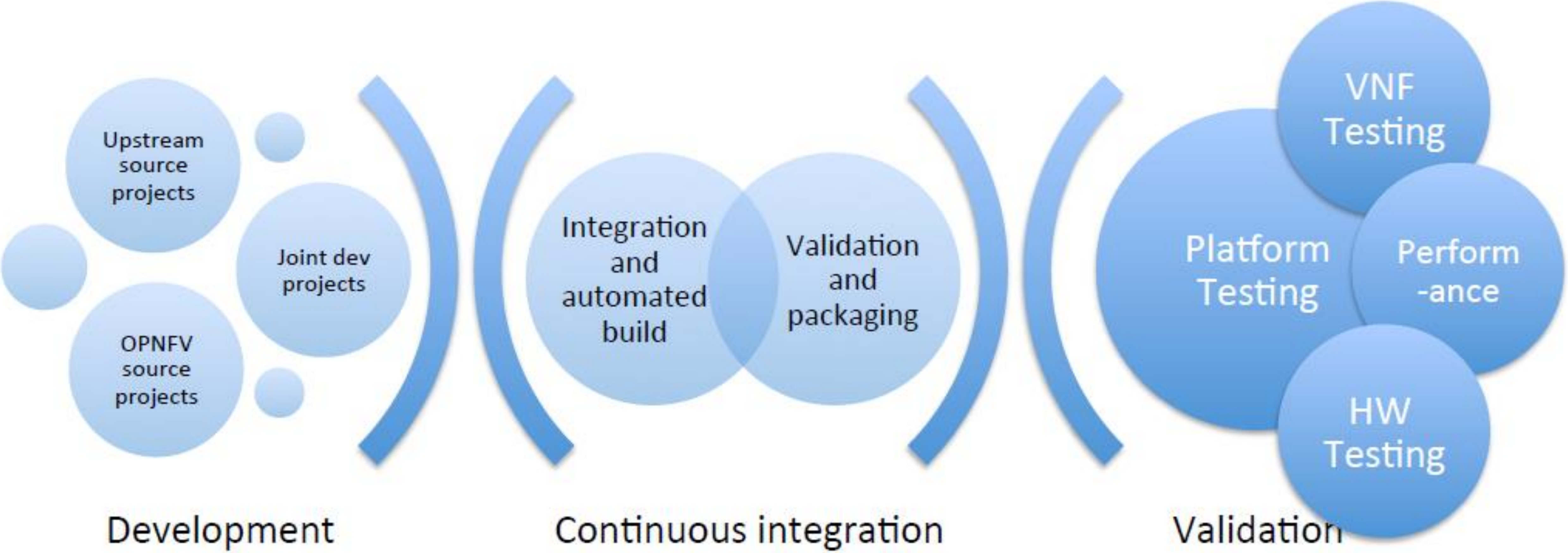
Data Plane Acceleration

MARIST

Bringing OPNFV All Together

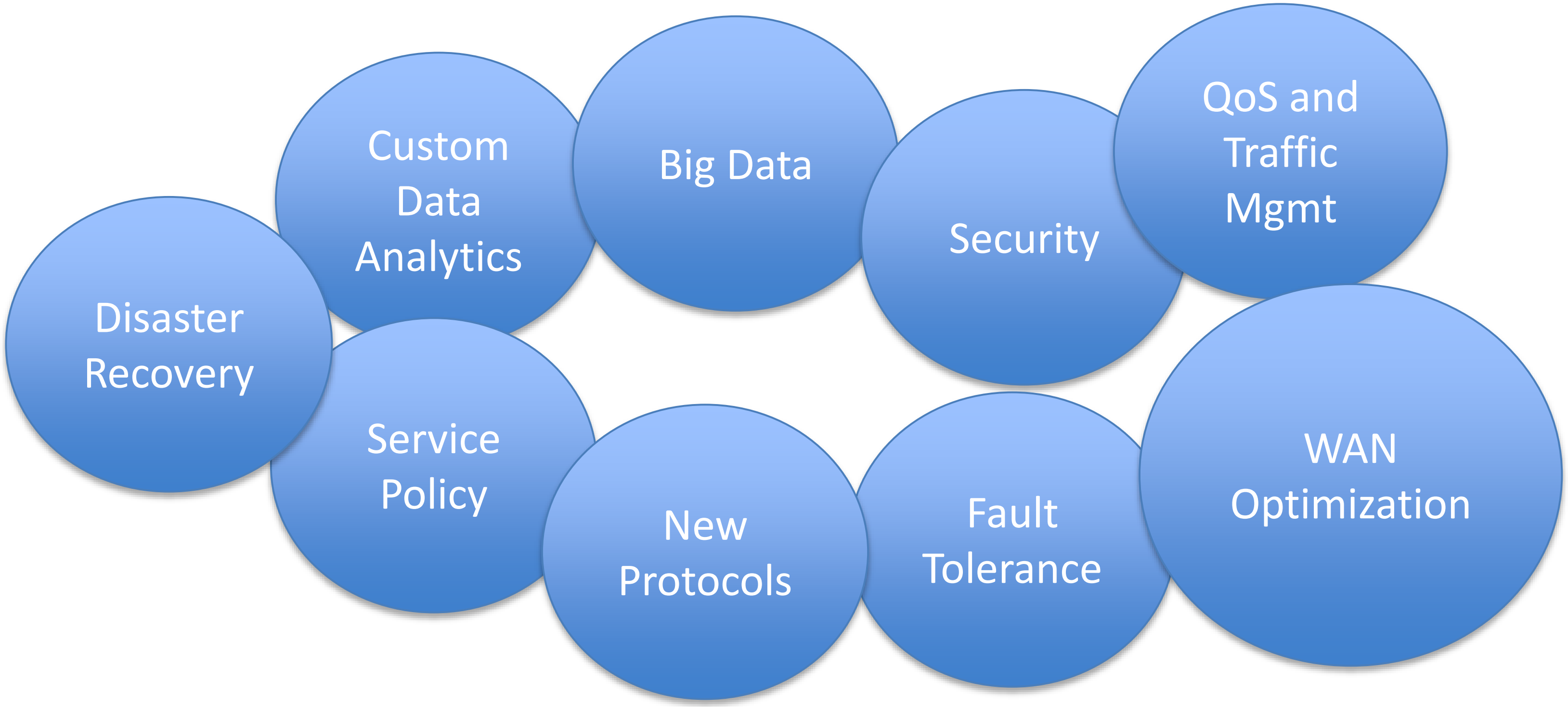


Simplifying the Overall View



What’s Next?

- Use Cases and Collaboration…



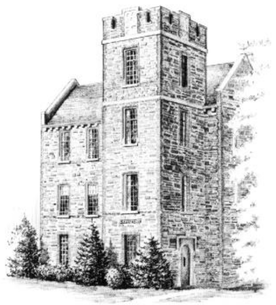
- Predictive Analytics


Questions?

MARIST

NYS Cloud Computing and Analytics Center

SDN Innovation Lab



Thank you!!!

Robert M. Cannistra

robert.cannistra@marist.edu