OpenStack
para Funções de Rede Virtualizadas (NFV)

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Meetup OpenStack Parque Tecnológico UFRJ
Agosto/2017

CANONICAL

Canonical, a empresa responsável pelo Ubuntu

Plataforma Linux #1
(Desktop, Server, Cloud)

Desenvolve
Distribui
Comercializa

Ubuntu Advantage

Implantação
Consultoria

Desde 2004

Londres, Boston, Taipei, Beijing

Sobre mim

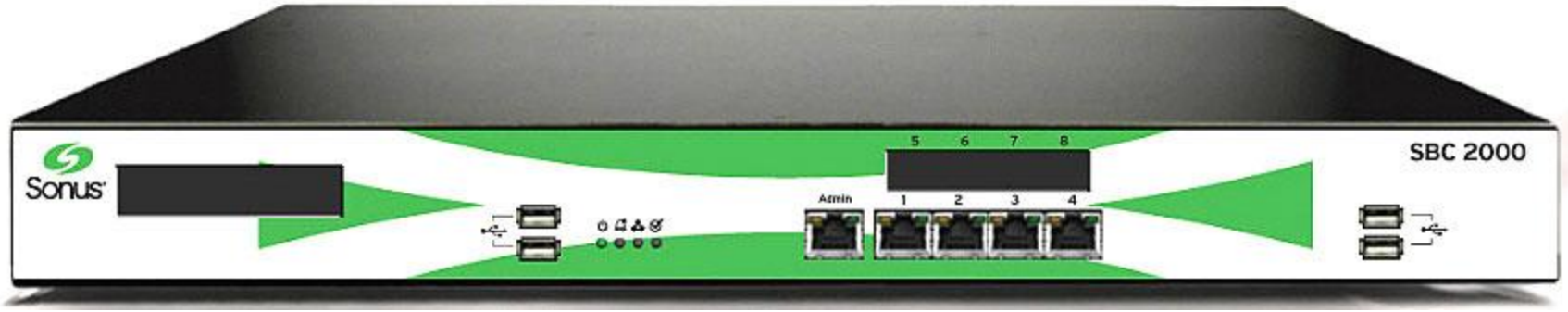
Christian "kiko" Reis, Canonical VP Field Engineering

- Responsável mundial por pré-vendas e implantação

  DTAG, AT&T, Etisalat, Comcast, Sky, Bell.ca, Tele2, Centurylink e mais

- Engenheiro na plataforma Ubuntu desde 2004
- ♡ Lawrence of Arabia, Sisters of Mercy & CRPG Wasteland
- Ciclista competitivo (e San Francisco -> Panama)

NFV: O Essencial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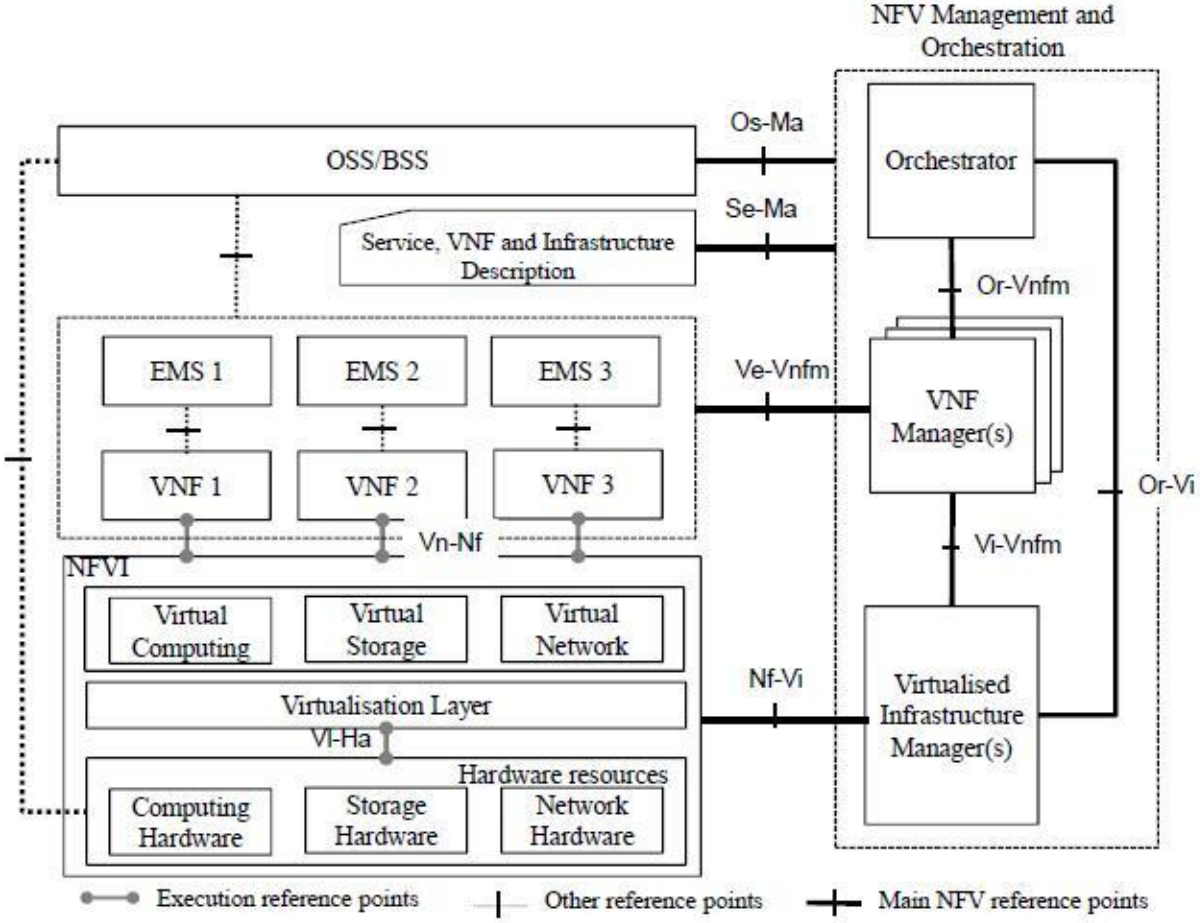
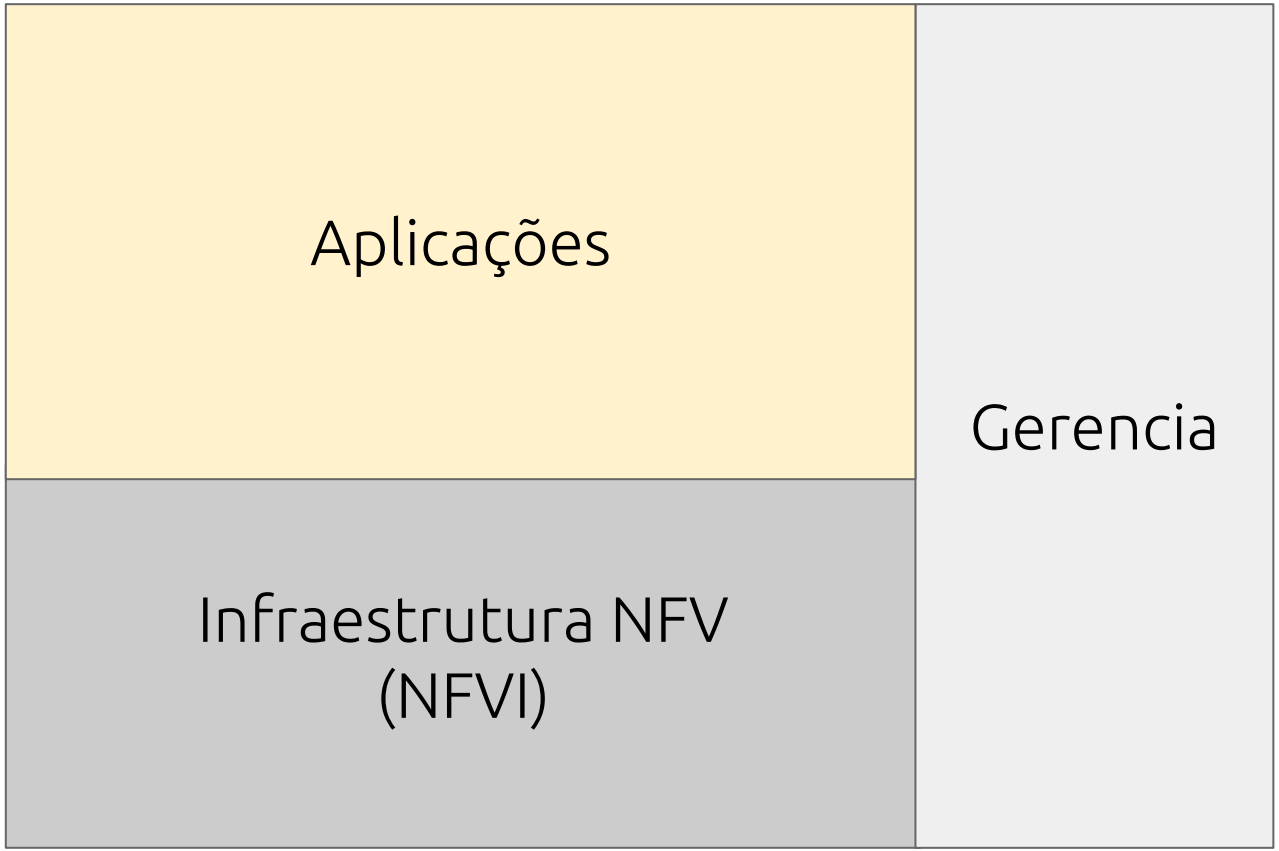
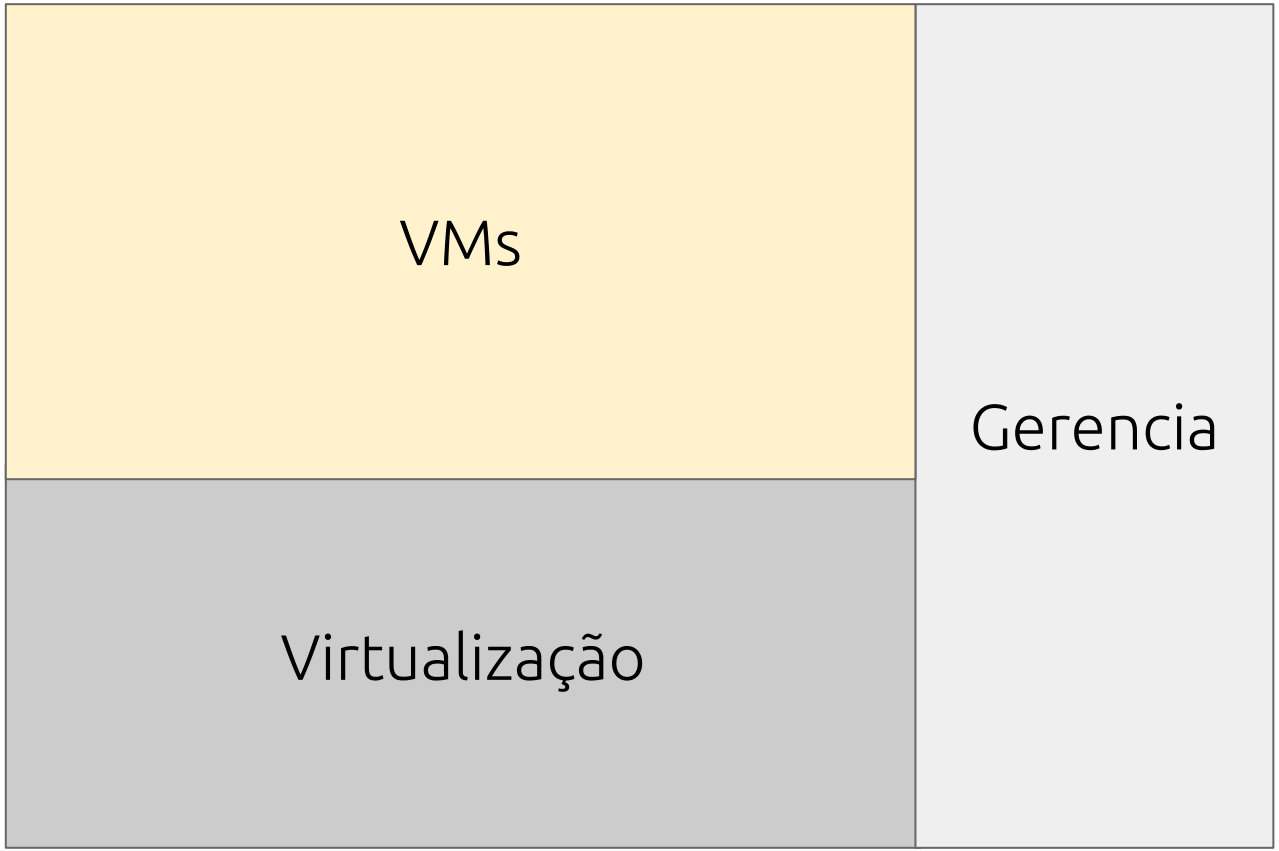
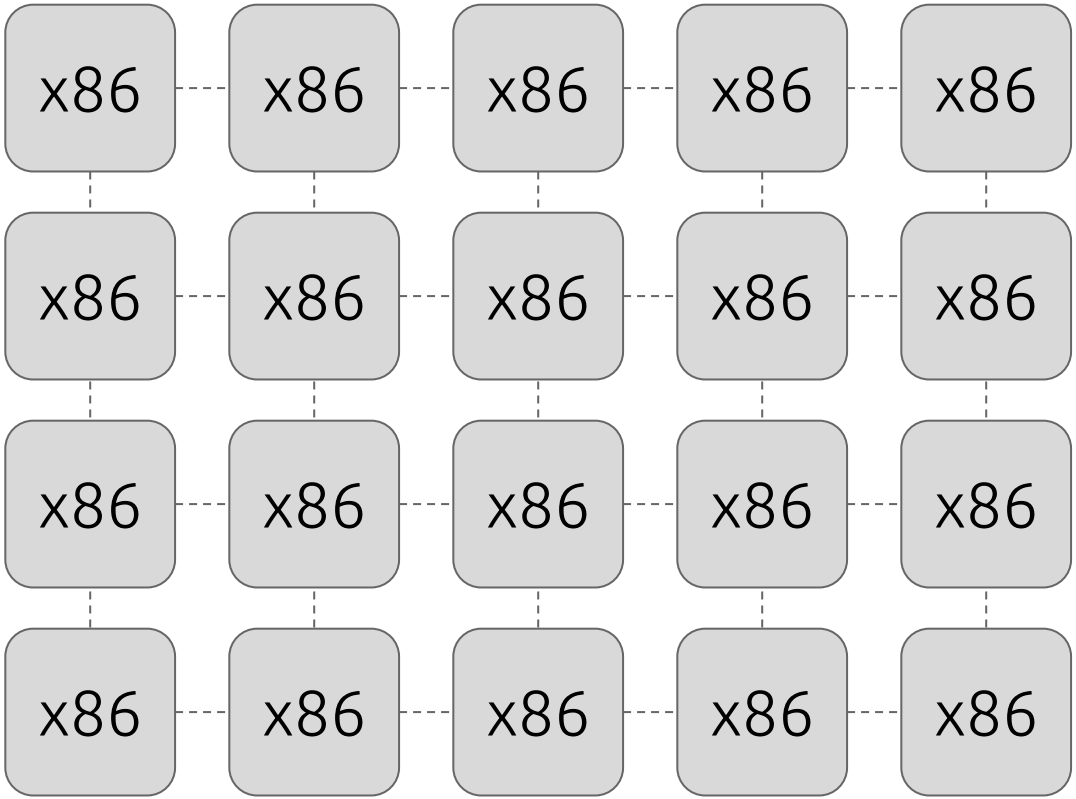

NFV Management and Orchestration
OSS/BSS
Os-Ma
Orchestrator
Se-Ma
Service, VNF and Infrastructure Description
Or-Vnfm
EMS 1
EMS 2
EMS 3
Ve-Vnfm
VNF Manager(s)
VNF 1
VNF 2
VNF 3
Or-Vi
Vn-Nf
Vi-Vnfm
NFVI
Virtual Computing
Virtual Storage
Virtual Network
Nf-Vi
Virtualisation Layer
Virtualised Infrastructure Manager(s)
Vl-Ha
Hardware resources
Computing Hardware
Storage Hardware
Network Hardware
Execution reference points
Other reference points
Main NFV reference points


Aplicações
Infraestrutura NFV
(NFVI)
Gerencia


VMs
Virtualização
Gerencia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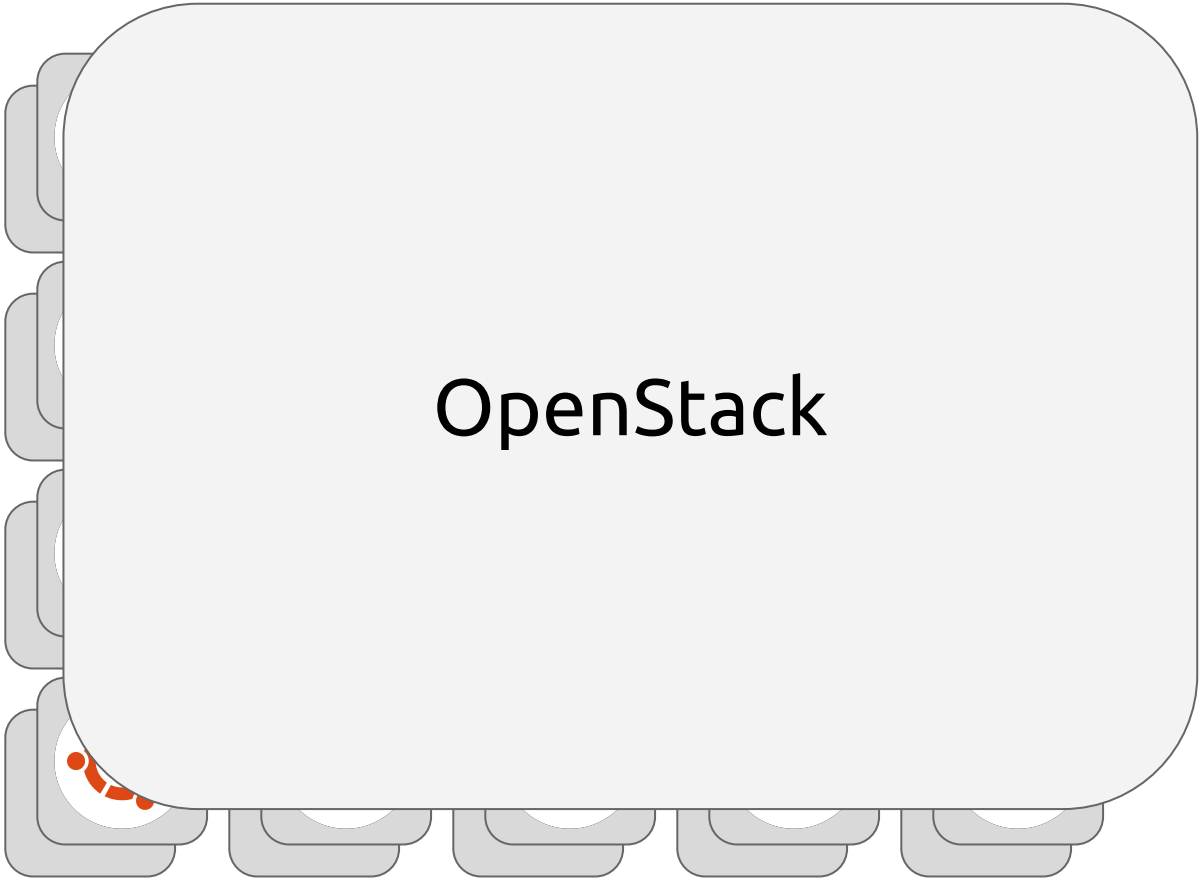
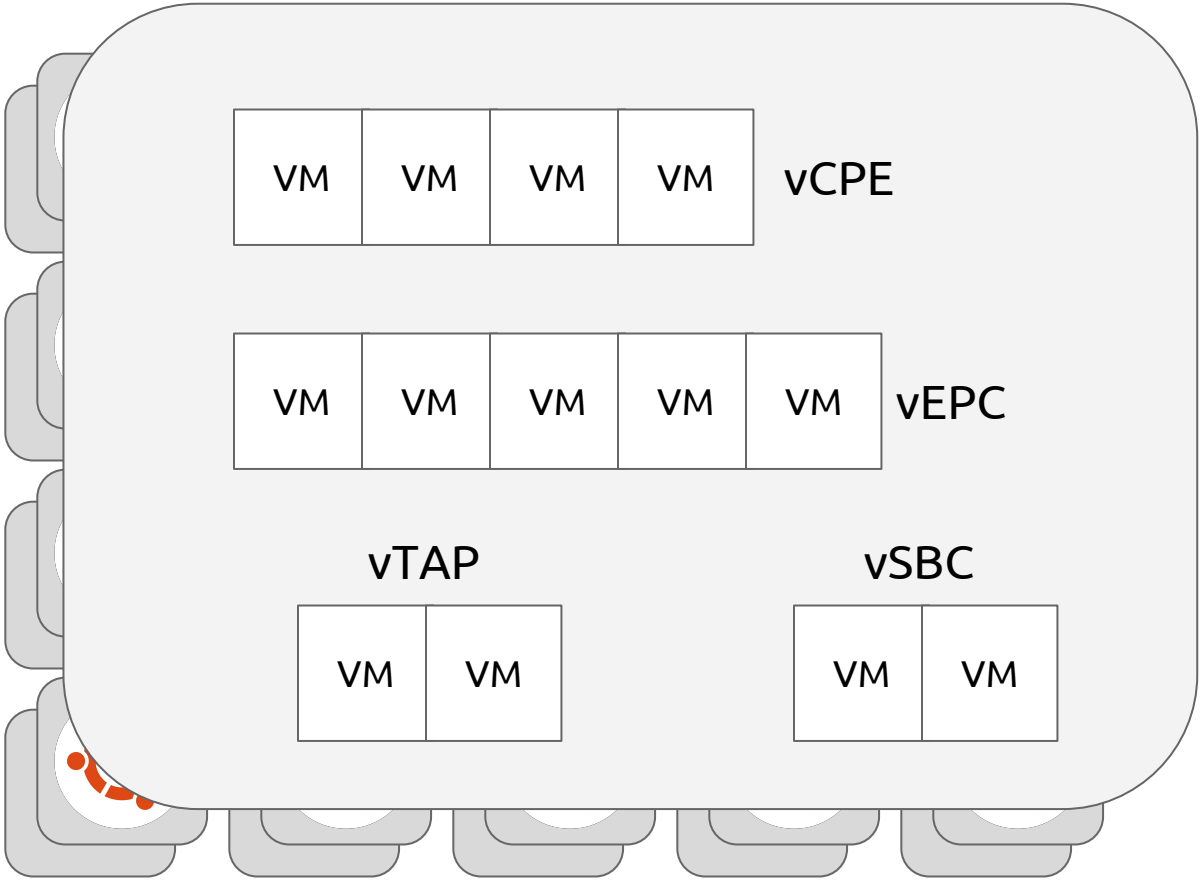

OpenStack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vCPE
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vEPC
vTAP
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vSBC
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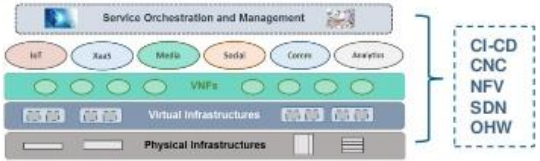
VM

Por que NFV?

What We Focused On

Aspirations: Agility like the cloud … like

Grounded in Frameworks:



Agile Service Delivery Framework

Incubation of NFV:

Now:

Options

Questions — Efficiency, Versatility, Scale, Integration, TCO, ROI?

Needed — **Experience, Evidence**

What We Analyzed:

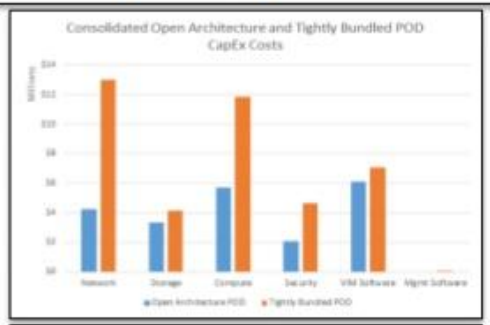
- ❑ Tier 1 SP NFV Platform Deployment
- ❑ Multi-site [7], Multi-tenant [n]
- ❑ CI|CD, PaaS Operating Model
- ❑ 2 Alternative Designs Compared
- ❑ 5-Year Cumulative TCO [capex, opex]
- ❑ New Service Creation Agility
- ❑ Life Cycle Workflows Opex Model
- ❑ Equivalent Architectures Capex Model

Relatório ACG Research+DELL, MWC 2017

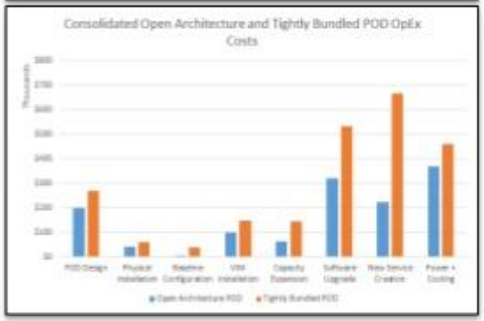
What We Found

- **Significant Design + Architecture Differences**
  1. Significant VIM <-> NFVI integration
  2. Unified P+V network fabric
  3. Freedom to innovate on either side of platform interfaces
  4. Substantial workflow-oriented automation
- **And pervasive software integration between elements and layers**
- **Profound Economic Advantages for the Open Architecture Platform vs. the Tightly Bundled Alternative**
  - 5 Yr. Cumulative TCO **53%** of TBP
  - Overall Capex **47% less** than TBP
  - Overall Opex **57%** of TBP
  - New Service Creation Agility **3x Faster & 3x Less** Costly than TBP

ACG RESEARCH



ACG RESEARCH



ACG RESEARCH

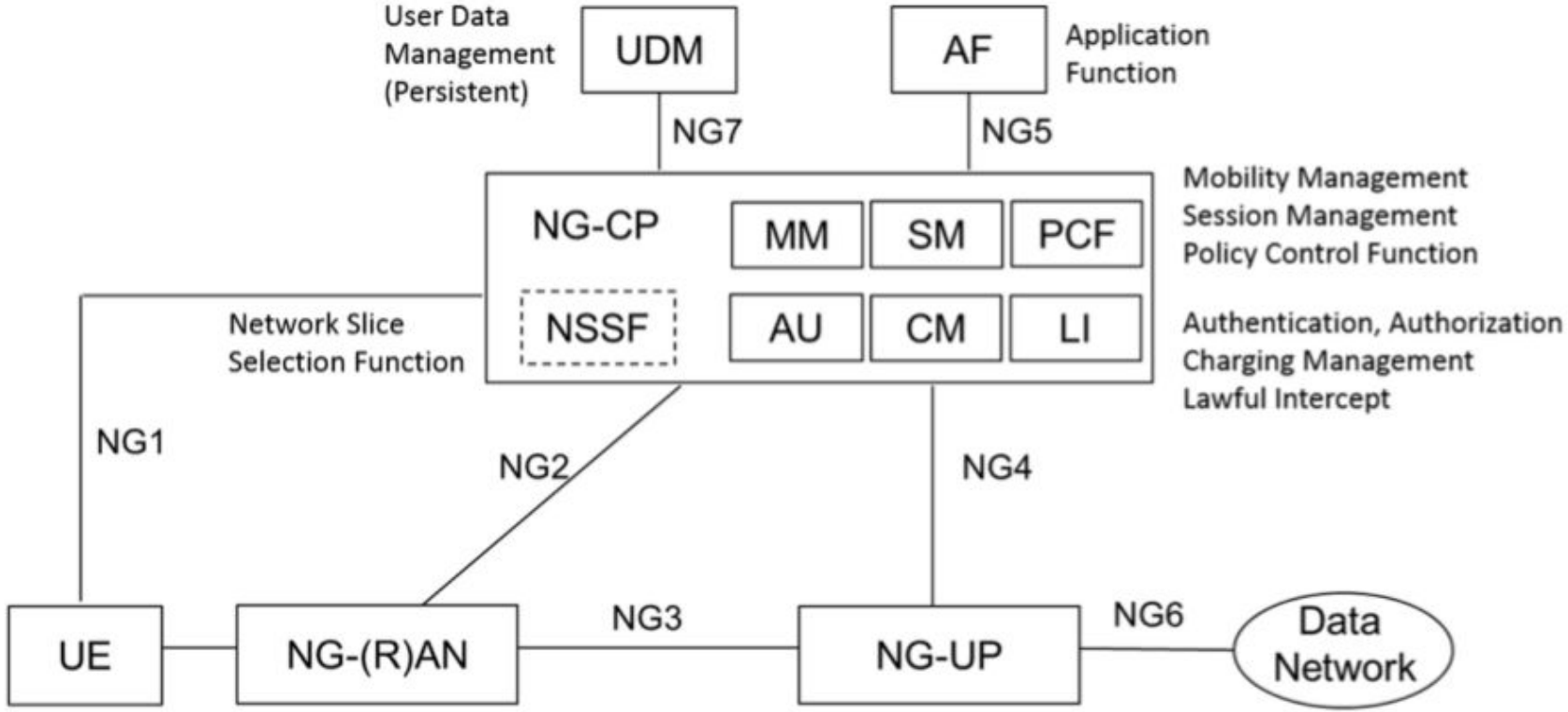
DELL Technologies

#1 Agility & Economics

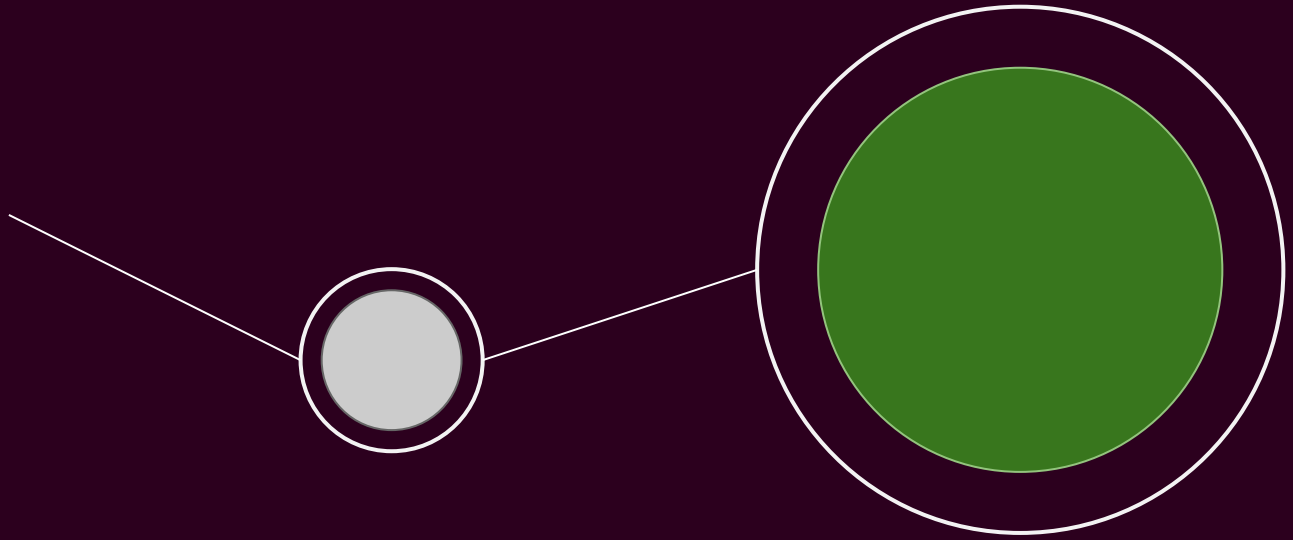
#2 Transição de ecossistema

#3 Complexidade de aplicação

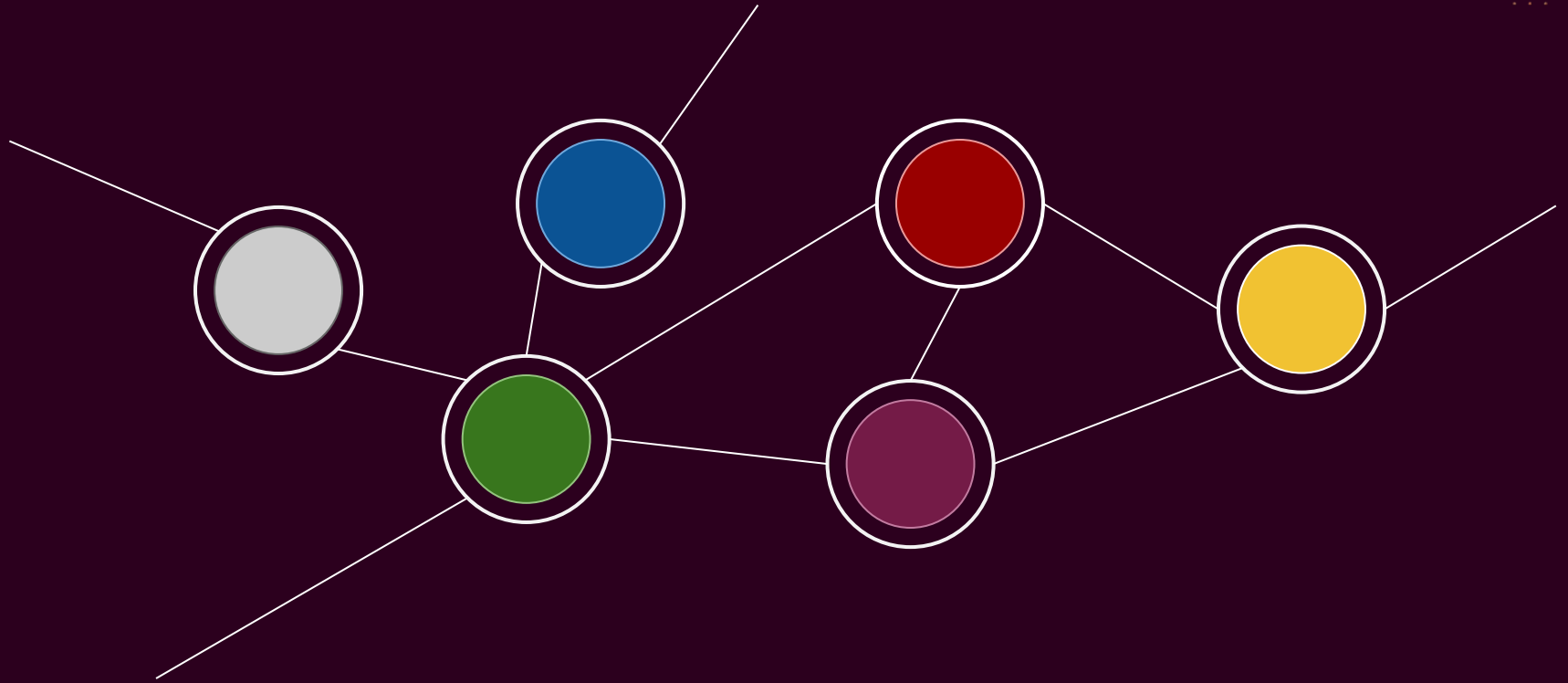
Figure 6: High Level View of NG Core Architecture (Proposed)



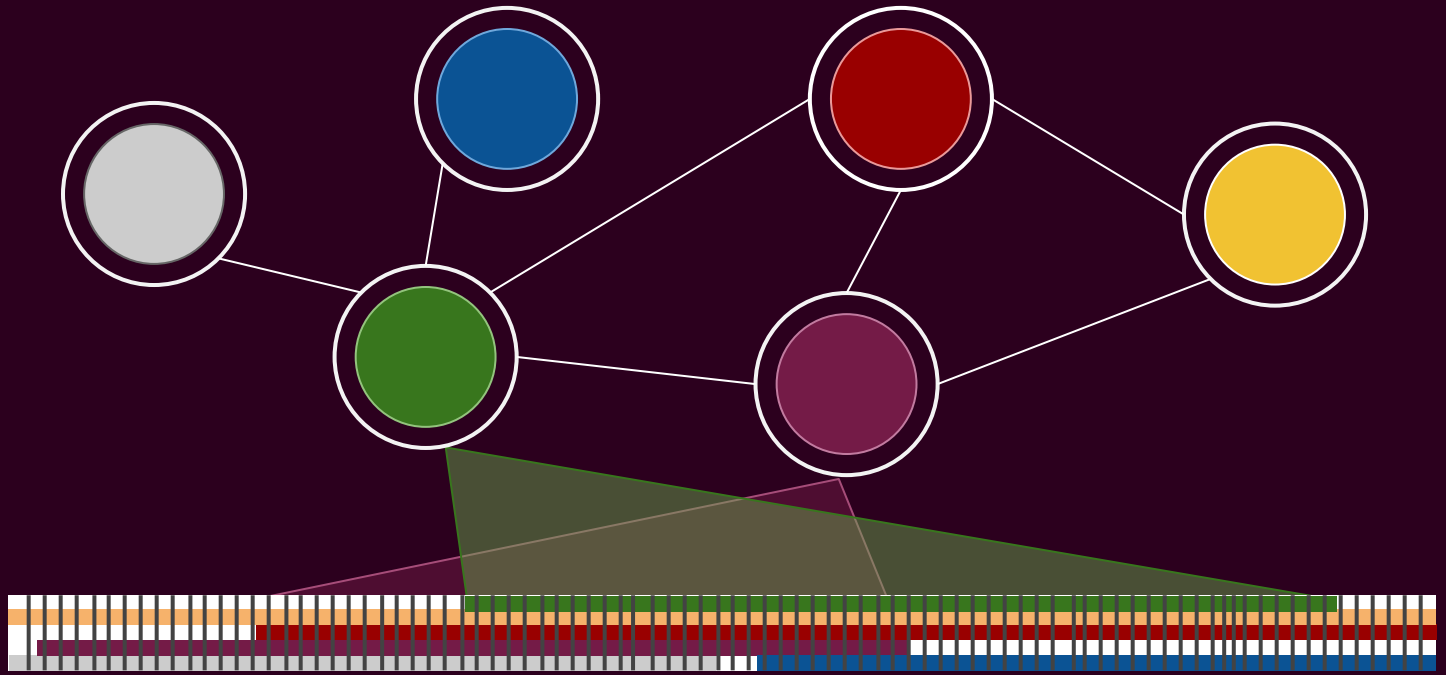
Source: 3GPP, Adapted from TR 23.799 v0.8.0, September 2016 (Figure 7.2.4-1)



Como era

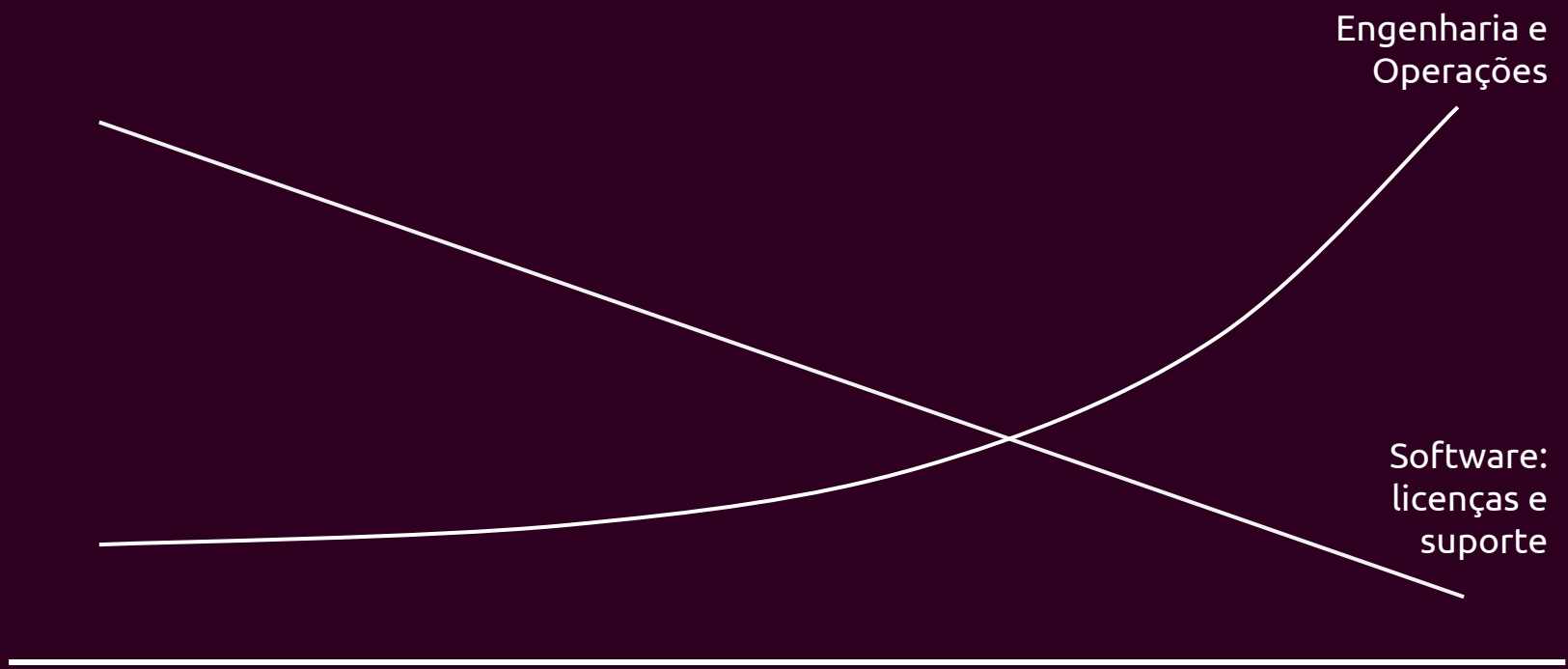


Como ficou



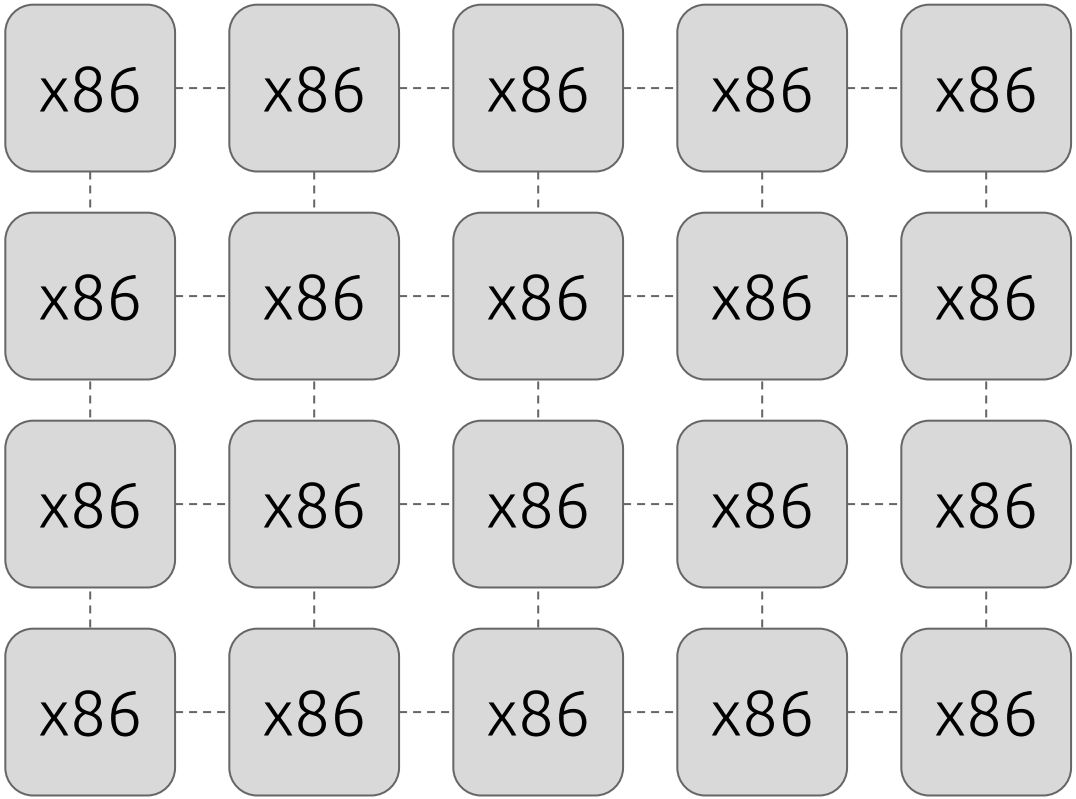
Complexidade combinatorial

Custo operacional passa a dominar



Implementação NFV na Prática

1. Hardware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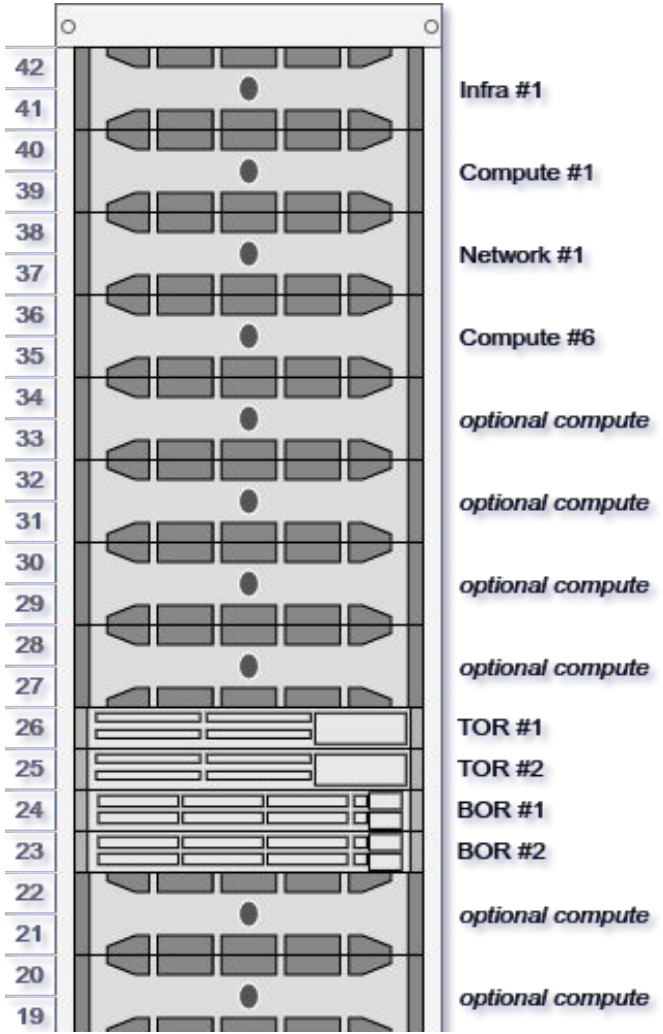


- Mínimo 3 Zonas
  - Failure domain
  - Tipicamente são racks
- Em cada rack
  - 2x switch ToR
  - 2x switch BoR
  - 1x Infra
  - Compute/Storage/ Network

	Infrastructure		Cloud	
	Recommended	Minimum	**Recommended**	Minimum
# Servers	3	3	9	9
CPUs (per server)	2x Intel Xeon E5-2680E5-2690 v4 (2.6GHz, 14-Core) or greater	12 cores	2x Intel Xeon E5-2680E5-2690 v4 (2.6GHz, 14-Core) or greater	12 cores
Memory	256Gb	128Gb	512Gb	256Gb
Spinning Disks	2x 4TB LFF 7.2K 6G SATA	2x 2TB LFF 7.2K 6G SATA	6x 4TB LFF 7.2K 6G SATA	4x 2TB LFF 7.2K 6G SATA
SSD	1x 1.2TB 800GB Intel SSD DC P3600+ Series	1x 400GB PCIe SSD	1x 1.2TB 800GB Intel SSD DC P3600+ Series	1x 400GB PCIe SSD
Networking	2x 10GB 1 x BMC	2x 10GB 1 x BMC	4x 10G 1x BMC	4x 10G 1x BMC

(e blades não, por favor)

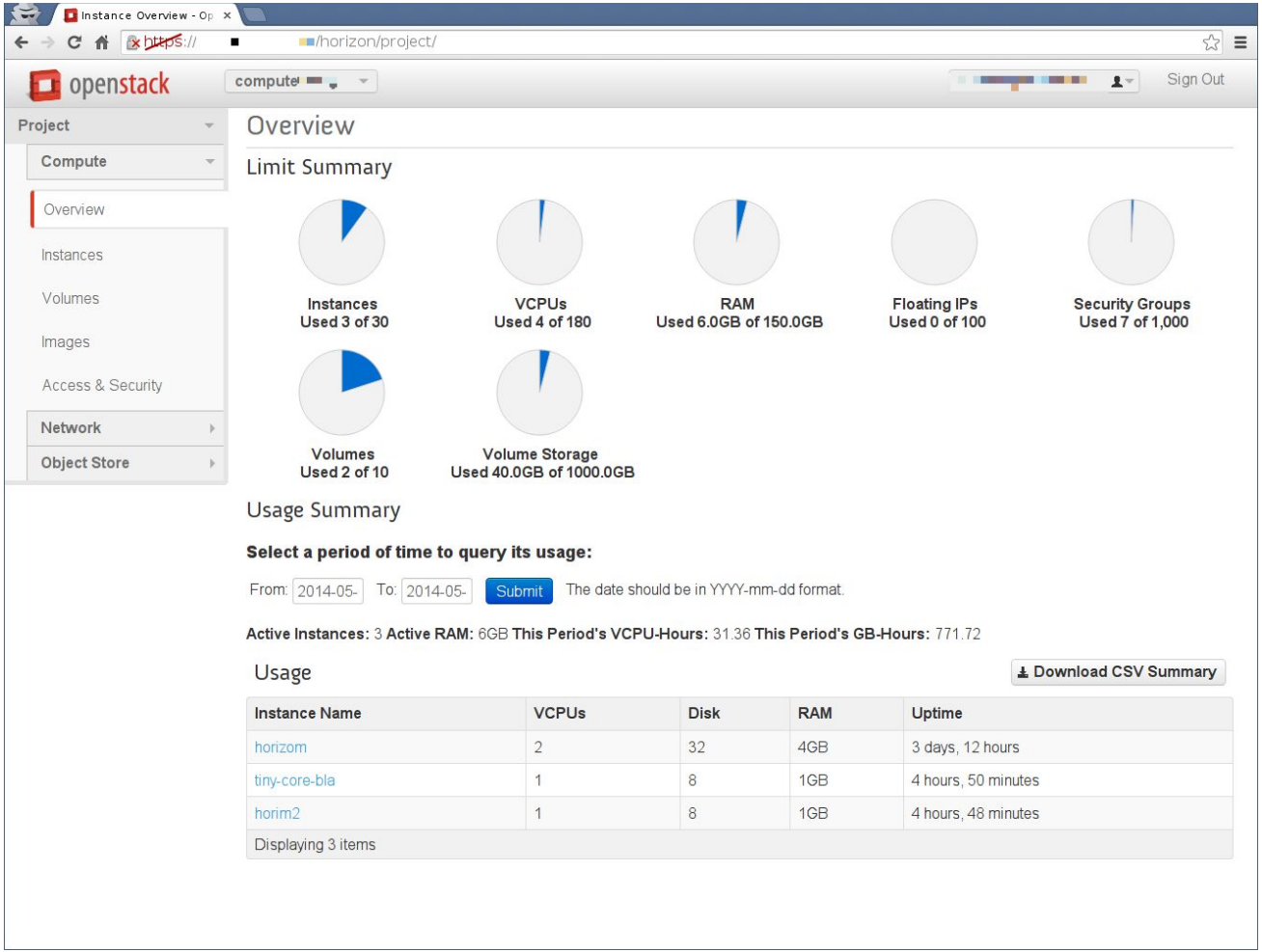
2. Plataforma

VMware

- Simples
- Robusto
- Licença cara
- Single-vendor
- Em declínio

OpenStack

- Flexível.. e complexo
- Robusto*
- Open Source
- Multiple vendors
- Evolução ativa


Instance Overview - Op
https://
/horizon/project/
openstack
compute
Sign Out
Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
Overview
Limit Summary
Instances
Used 3 of 30
VCPUs
Used 4 of 180
RAM
Used 6.0GB of 150.0GB
Floating IPs
Used 0 of 100
Security Groups
Used 7 of 1,000
Volumes
Used 2 of 10
Volume Storage
Used 40.0GB of 1000.0GB
Usage Summary
Select a period of time to query its usage:
From: 2014-05-
To: 2014-05-
Submit
The date should be in YYYY-mm-dd format.
Active Instances: 3 Active RAM: 6GB This Period's VCPU-Hours: 31.36 This Period's GB-Hours: 771.72
Usage
Download CSV Summary
Instance Name
VCPUs
Disk
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Uptime
horizom
2
32
4GB
3 days, 12 hours
tiny-core-bla
1
8
1GB
4 hours, 50 minutes
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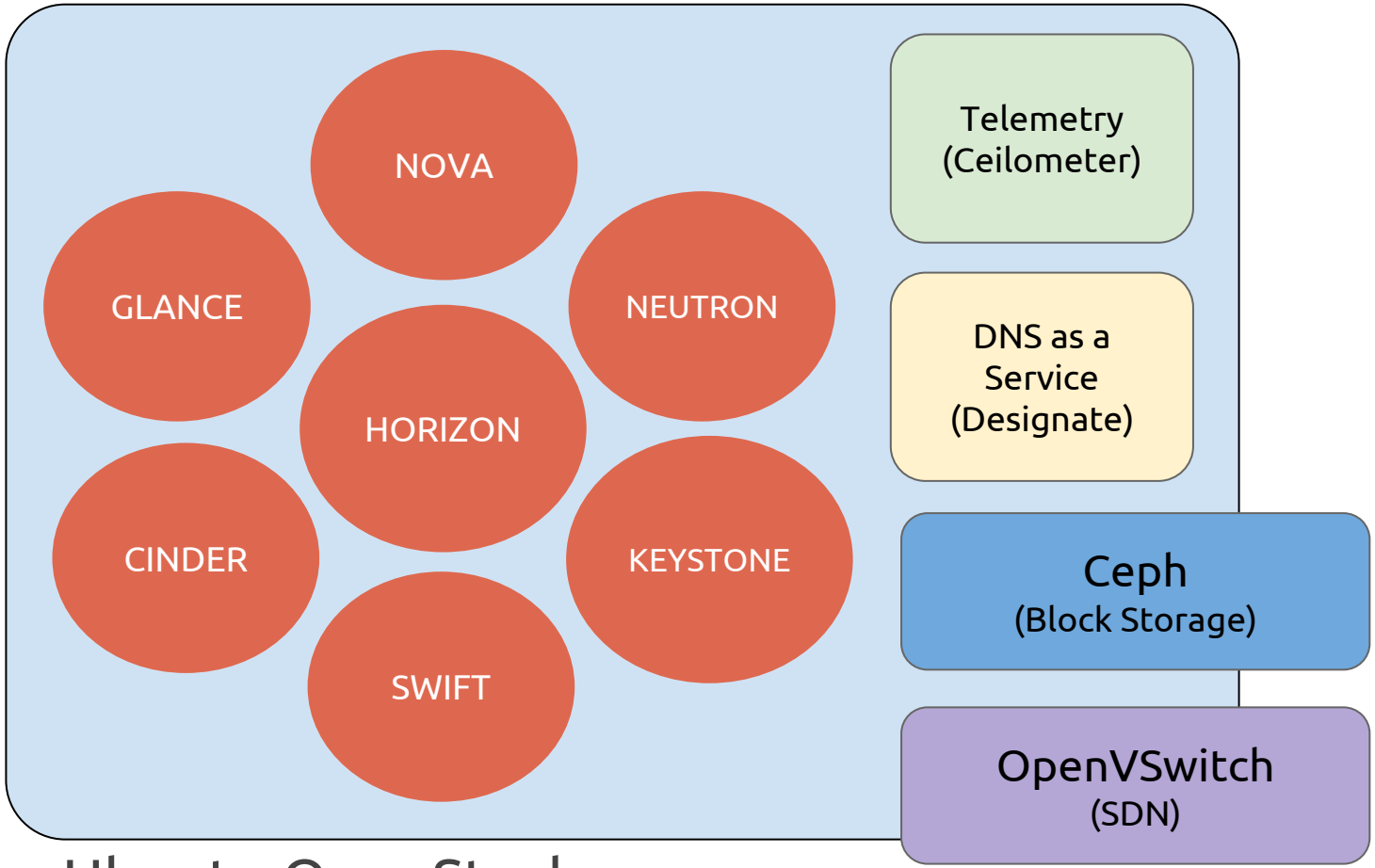
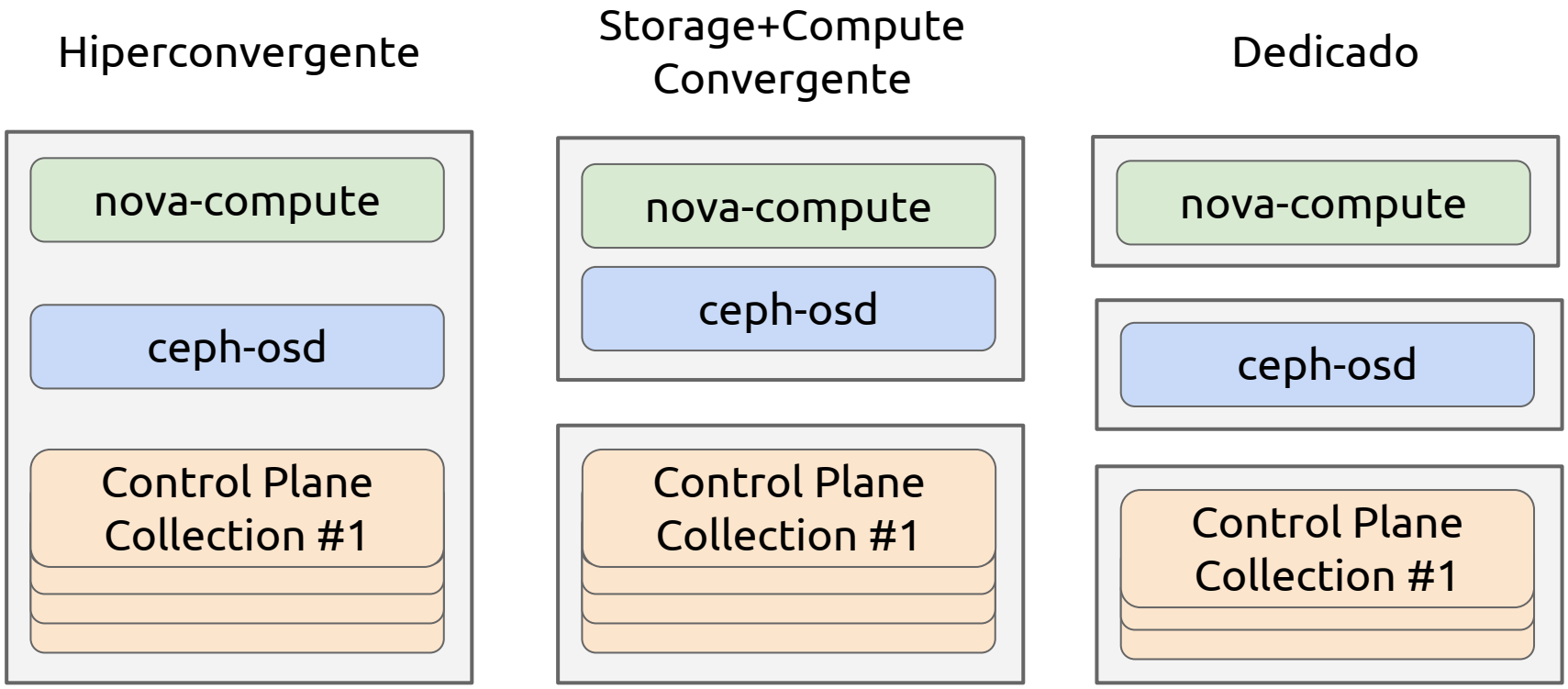
4 hours, 48 minutes
Displaying 3 items

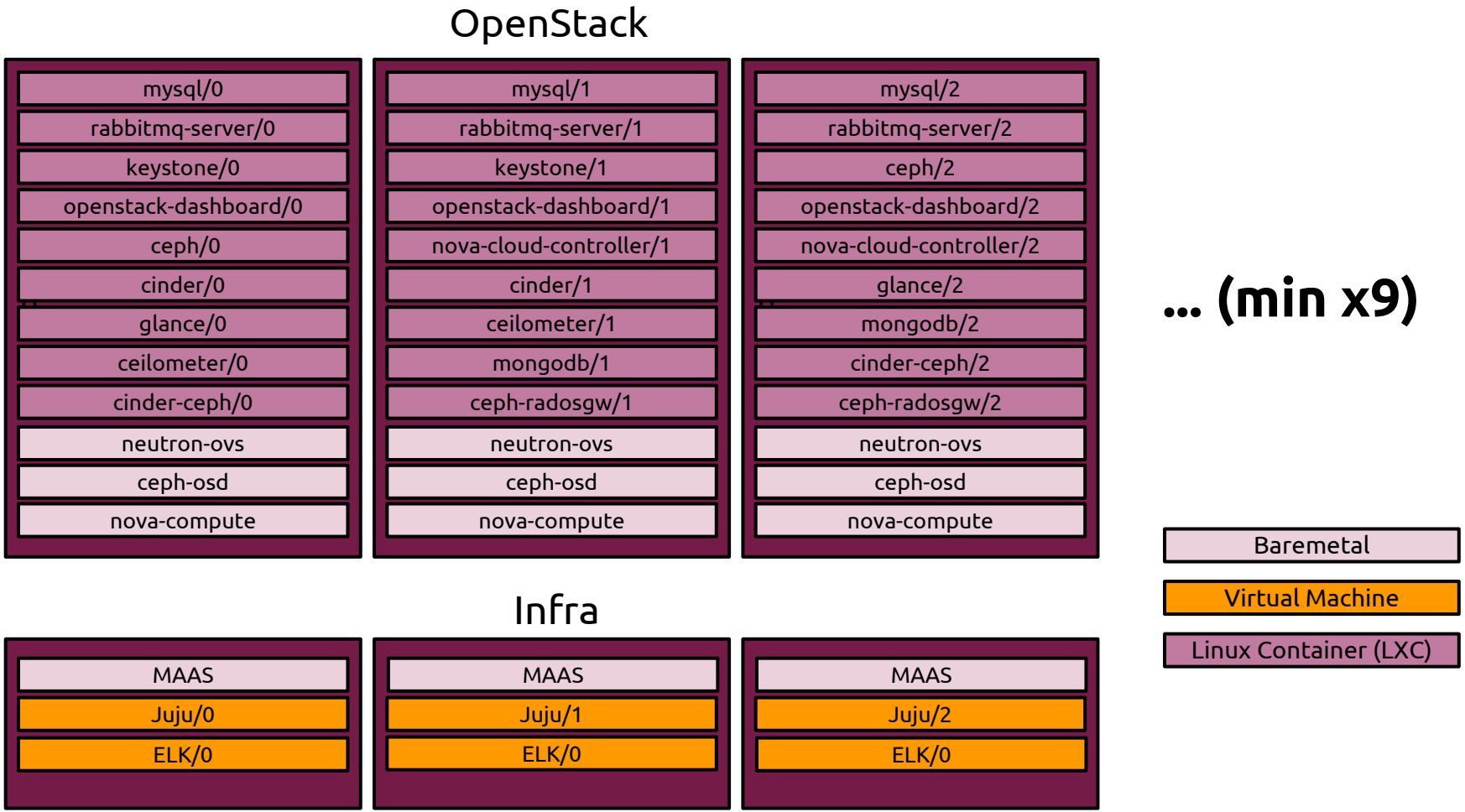


Ubuntu OpenStack

- Mínimo de 12 máquinas para HA completo
- Ideal para infraestrutura centralizada
- (E no edge?)

Opções de Arquitetura




OpenStack
mysql/0
rabbitmq-server/0
keystone/0
openstack-dashboard/0
ceph/0
cinder/0
glance/0
ceilometer/0
cinder-ceph/0
neutron-ovs
ceph-osd
nova-compute
mysql/1
rabbitmq-server/1
keystone/1
openstack-dashboard/1
nova-cloud-controller/1
cinder/1
ceilometer/1
mongodb/1
ceph-radosgw/1
neutron-ovs
ceph-osd
nova-compute
mysql/2
rabbitmq-server/2
ceph/2
openstack-dashboard/2
nova-cloud-controller/2
glance/2
mongodb/2
cinder-ceph/2
ceph-radosgw/2
neutron-ovs
ceph-osd
nova-compute
... (min x9)
Infra
MAAS
Juju/0
ELK/0
MAAS
Juju/1
ELK/0
MAAS
Juju/2
ELK/0
Baremetal
Virtual Machine
Linux Container (LXC)

Estudo de caso Telco NFV

Componentes

- **Canonical** - Ubuntu, OpenStack, MAAS, Juju, Ceph, KVM
- **Cisco** - SDN (ACI) Spine/Leaf, conectividade 25Gb
- **Huawei** - Hardware Compute/Storage
- **Dell** - Hardware Compute/Storage

Serviços Gerenciados Canonical

- Carrier Grade Bootstack
- Add-on Telco SLA

Arquitetura

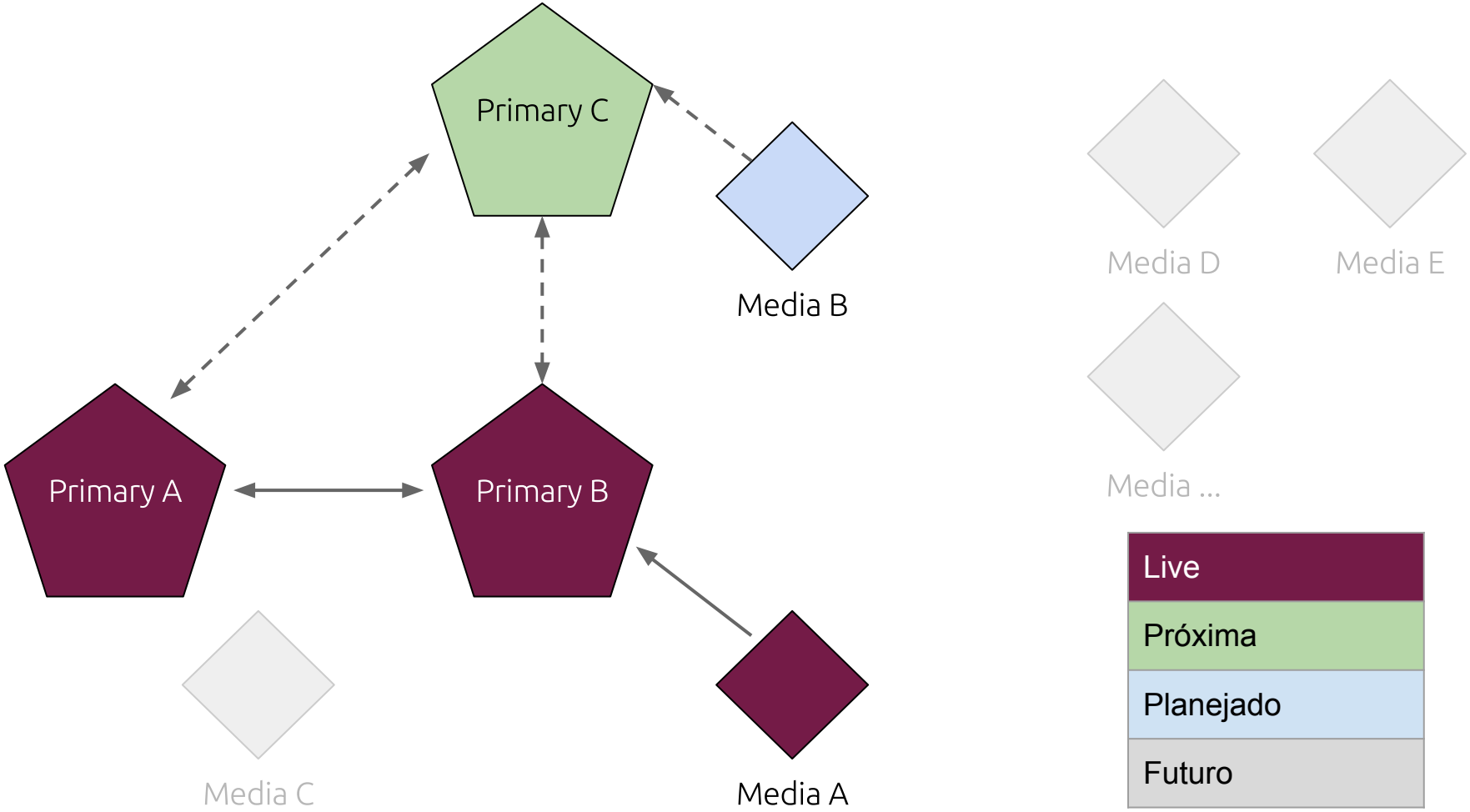
- Hiperconvergente
- Use cases de VNF e TI na mesma infra
- Rede multi-região/país
- Minimum Compute Flavours
- Storage Ceph Block &
  Swift Object

Use Cases

- **Nokia** vEPC
- vIMS

Destaques da Arquitetura

- OpenStack Mitaka
  - Juju, MAAS, Canonical OpenStack Charms
- Ubuntu 16.04 LTS
- Arquitetura padrão Foundation, mais:
  - Funcionalidade requerida pelas VNFs
    - SR-IOV, NUMA & CPU Pinning, explicit Huge Pages
  - Integração Keystone e Active Directory
  - Replicação de imagens entre sites
- DPDK na próxima iteração


Primary C
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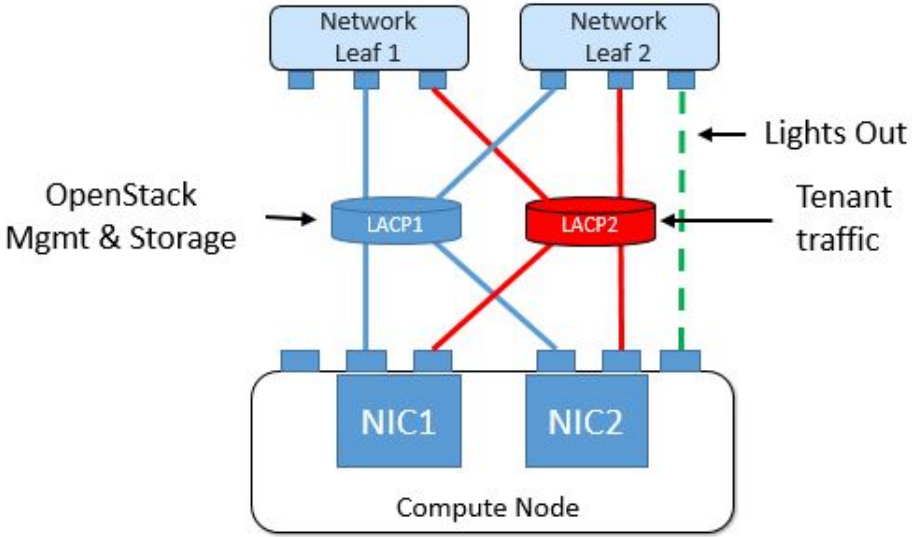
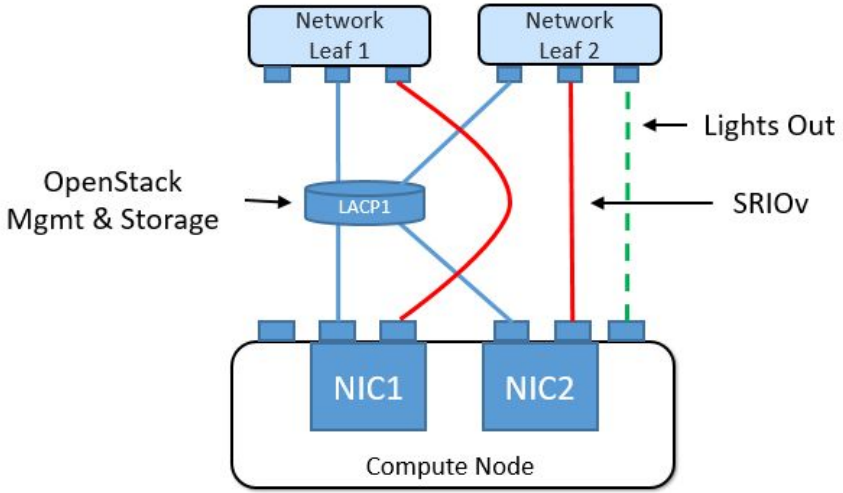
Media D
Media E
Media ...
Primary A
Primary B
Live
Próxima
Planejado
Futuro
Media C
Media A

Configuração do hardware

Type	CPU	Memory	Disk	# of NICs
Compute	2*14 cores	512GB	1*800GB PCIe SSD, 8*4TB Sata	1*BMC, 4*25GB (bonded x2)
Management	1*8 cores	128GB	2*4TB SATA	1*BMC 4*25GB (bonded x2)





Obrigado!

Para perguntas e discussão posterior:

kiko+openstack@canonical.com


CANONICAL

Horizontal NFVI

An NFVI must be able to run multiple use cases
with VNFs from multiple vendors

Vertical NFVI

One NFVI, one vendor

Vertical NFVI

(bigger, more expensive, PNF)

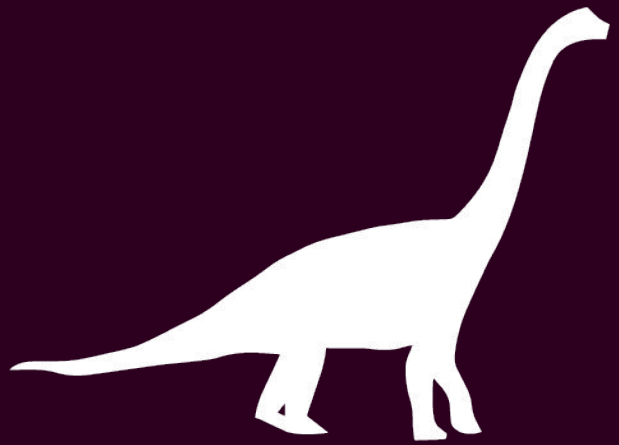
	Horizontal	Vertical
Design & Architecture	Customer-defined	Vendor-supplied
SLA model	Multi-vendor	Single-vendor
Software	Multiple VNFs, multiple vendors	Single VNF vendor
Hardware	Commodity can source from any certified vendor	Who knows?

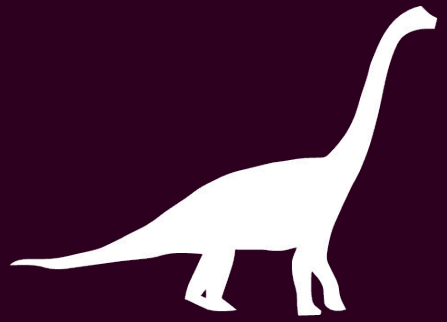
	Horizontal
Design & Architecture	Customer-defined
SLA model	Multi-vendor

Upshot:

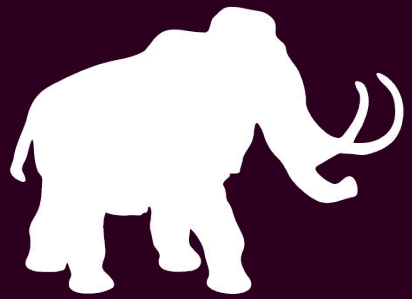
With Horizontal NFVI, you own the design — and the SLA

Intermission:
Geology of VNFs





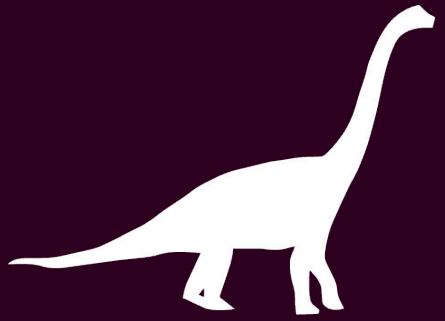
Yesterday:
Lift and Shift



Tomorrow:
Virtualized

The future:
Cloud Native

We are mostly here



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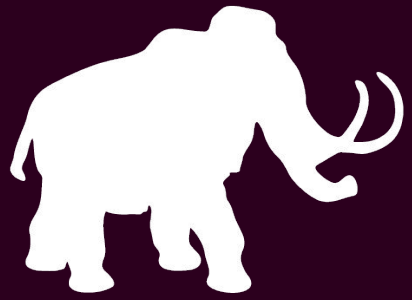
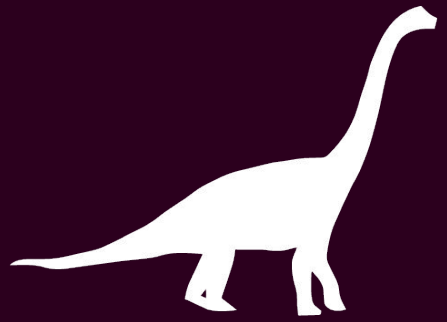


Tomorrow:
Virtualized

The future:
Cloud Native

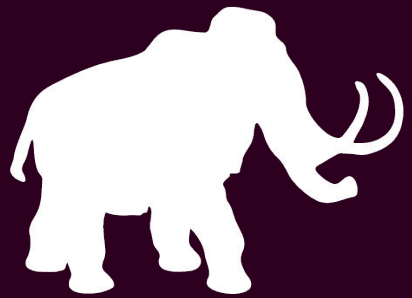


Scale-up

RTOS,
homegrown Linux

Legacy
automation

Customized
hypervisor



Partially scale-out

Mostly
commodity Linux

Some common
automation

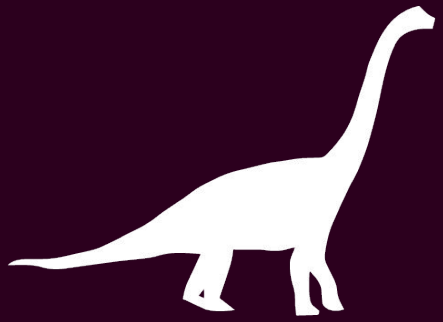
Customized
hypervisor

Fully scale-out

Commodity
Linux

Standardized
automation

Standard
hypervisor



Scale-up

RTOS,
homegrown Linux

Legacy
automation

Customized
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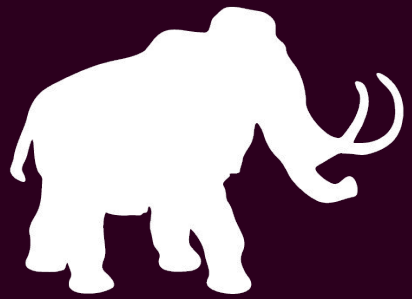


Partially scale-out

Mostly
commodity Linux

Some common
automation

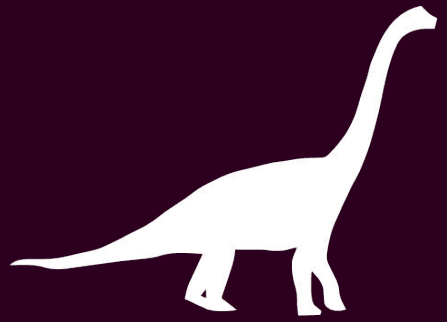
Customized
hypervisor

Fully scale-out

Commodity
Linux

Standardized
automation

Standard
hypervisor

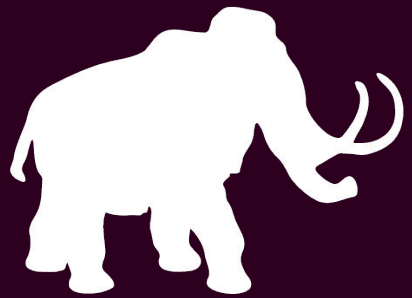


2 pairs of HA VMs

VxWorks

Virtual SD card mounts

Custom hypervisor & NIC tuning, 24 vCPU



Up to 8 VMs

Linux

Vendor-provided VNF manager

Custom hypervisor kernel, also tuning

Fully scale-out

Ubuntu Linux

Generic VNFM

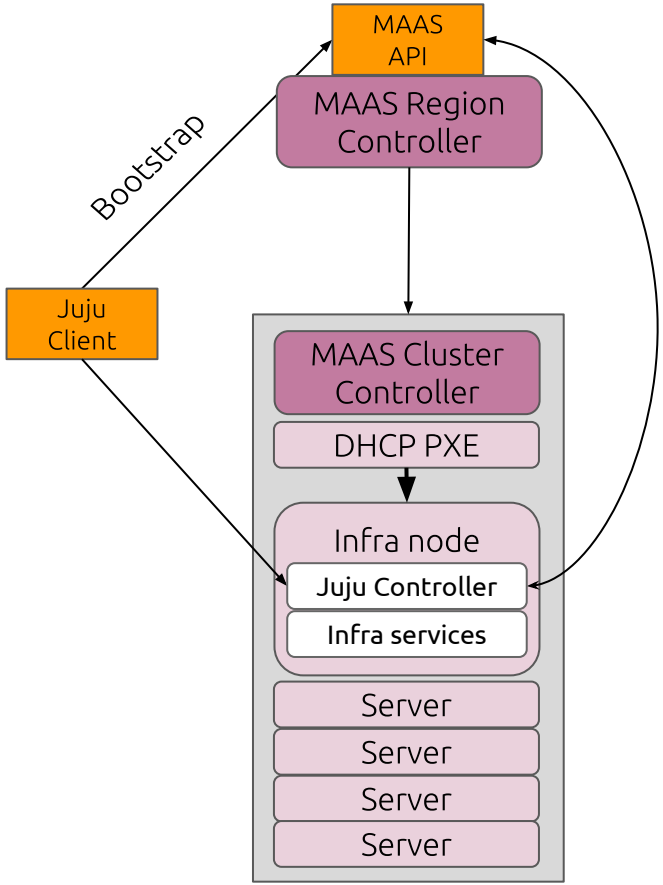
Standard hypervisor

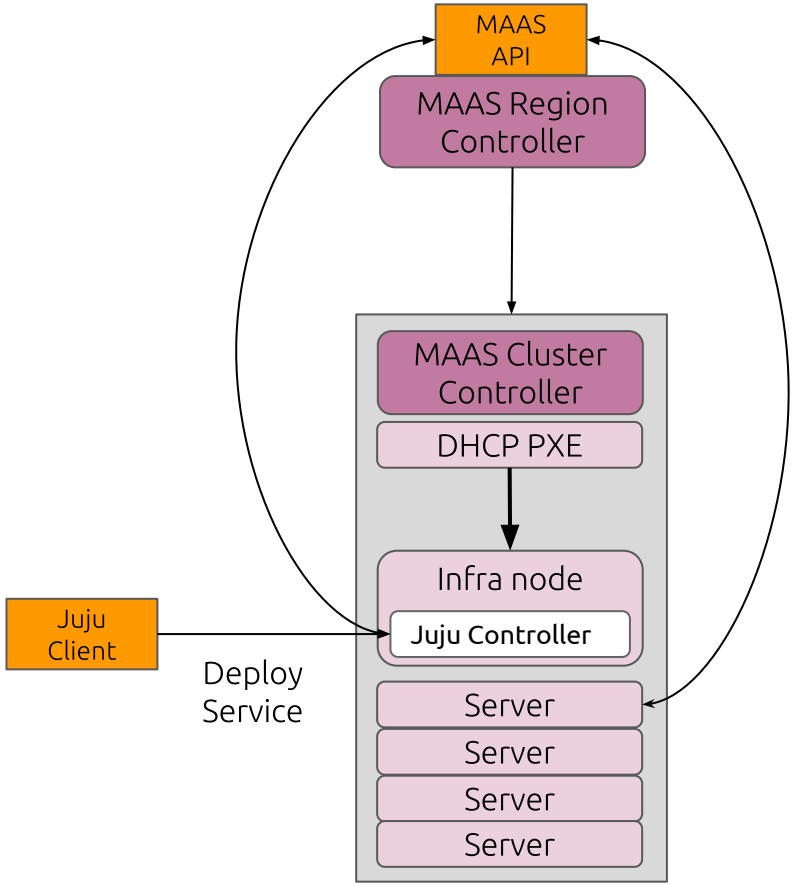
Canonical OpenStack: Infrastructure

Role	Component	Details
Physical Provisioning	MAAS	Provides DHCP & PXE Automated hardware inventory & config
Service Modeling	Juju	Installation, config, upgrade and management of infra & control plane components
Systems Management	Landscape	Managed upgrades & compliance reporting
Log Aggregation	ELK	Centralizes logs, provides structured searching and dashboards for analysis
Monitoring & Alerting	Nagios	Tracks service availability and key metrics into SPOG with flexible, built-in alert integration
Capacity Planning	Prometheus	Tracking & forecasting of available capacity

Canonical OpenStack: Core Components

Role	Component	Details
Instance Storage	bcache-backed DAS & Ceph options	bcache-backed local storage for high-IOPS service with best economics; Ceph available for use by legacy workloads
Core Block Storage	Ceph with bcache	Always deployed and made available as default Cinder backend. Additional storage backends available as options.
Object Storage	Swift	For use cases where first-class Object Storage is required, Swift is always deployed.
Networking	OVS or vendor SDN	OpenVSwitch as default SDN, with additional SDN options for telco requirements
Hypervisor	KVM & LXD	Dual hypervisor options ensure maximum compatibility for legacy applications, and maximum density for cloud-native


MAAS
API
MAAS Region
Controller
Bootstrap
Juju
Client
MAAS Cluster
Controller
DHCP PXE
Infra node
Juju Controller
Infra services
Server
Server
Server
Server


MAAS
API
MAAS Region
Controller
MAAS Cluster
Controller
DHCP PXE
Infra node
Juju Controller
Juju
Client
Deploy
Service
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