Open networking in a service provider network.

March 2015

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What's the problem?

DECLINING MARGINS

The increased demand for video and cloud services creates an "explosion" in the amount of carried traffic

The revenue per customer (ARPU/ARPA) does not increase linearly with the amount of carried traffic, resulting in declining margins

HIGH COST

Decline of core network equipment cost does not follow Moore's law

Network heterogeneity (multi-technology within and between layers) requires multiple highly specialized operations solutions/teams

Little automation for configuration and provisioning of network resources

LOW ROI

Networks are built for the peak and are overprovisioned most of the time

BUSINESS LOCK

Current mode of operation results in slow service innovation, e.g., lack of network automation and service integration results in long provisioning delays

My task (March 2015).

Architect a platform that can be used across Verizon for running VNFs

Scalable from 1-100+ racks

- Central office to Datacenter
- COTS HW and SW as much as possible
- OpenStack cloud software

Network focus (large percentage of north-south traffic)

- SDN control of connectivity among all the elements
- Low over-subscription
- QoS (priority queue and reserved BW) support
- Connect to all Verizon networks without cross-contamination
- Support for high bandwidth to VMs (SR-IOV)

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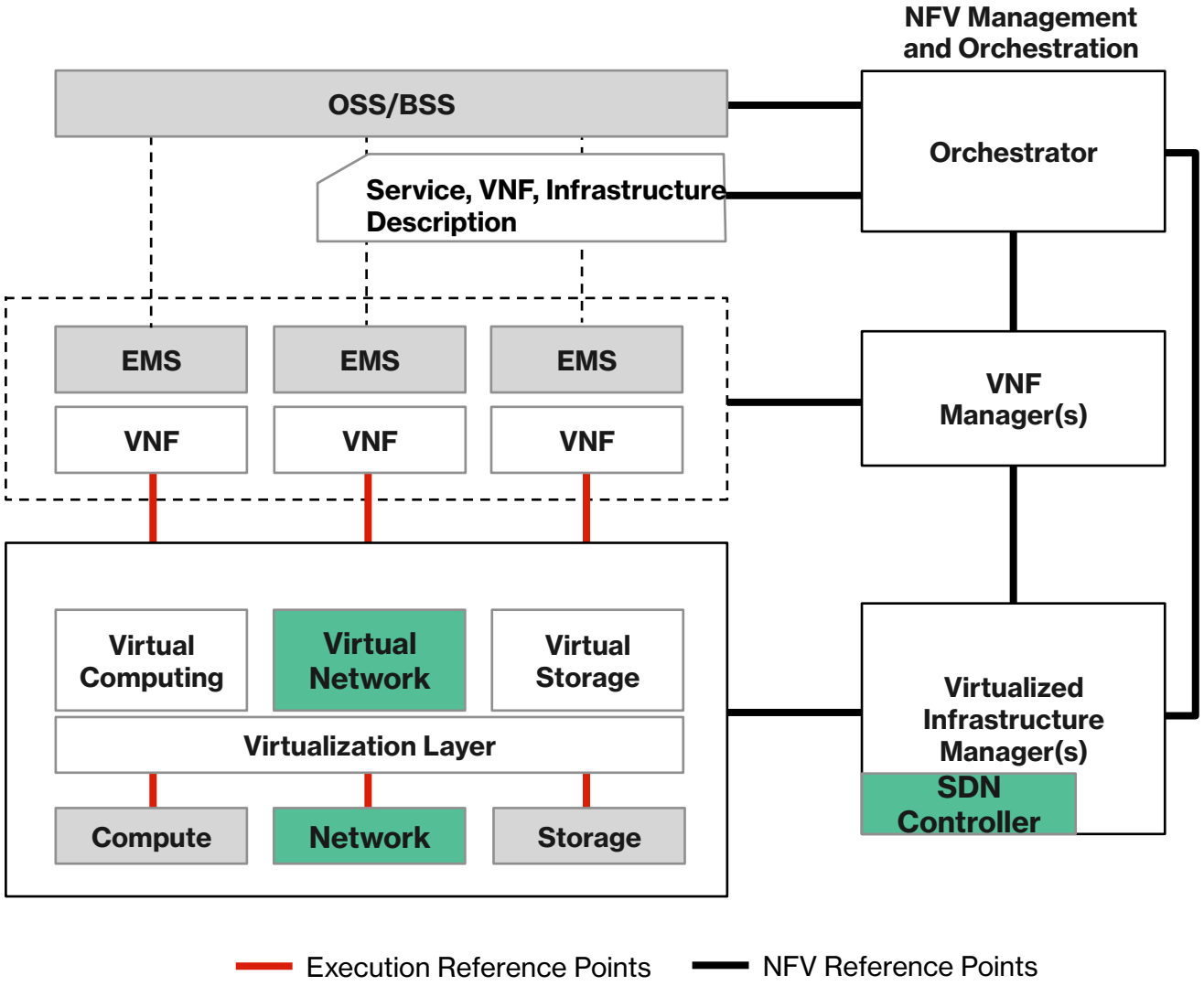
ETSI Network Functions Virtualization architectural framework.



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Centralized control functions and distributed local compute

Deployable in small sites and in centralized data centers

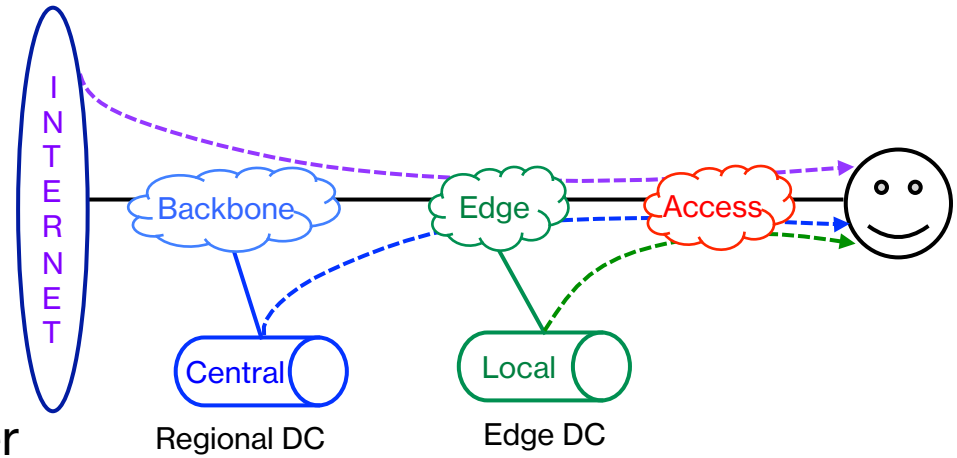
Value

Reduce latency to a customer

Reduce core network usage

Large scale at the regional DC

- 20-50 racks per regional DC
- Relatively low BW 10Gb per server



Small scale, high bandwidth at the edge DC

- 2-6 racks per edge DC
- Up to 100 Gb per server

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Network selection criteria.

Switches that support ONIE loadable OS

OpenStack Neutron/Nova integration

- vSwitch/SR-IOV control

CLOS fabric

VMs directly visible on provider networks

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Lab environment.

64x scalable servers (4 sleds in 2U)

- 2x 8 core CPUs, 128GB RAM, 6x drives, 2x 10/40Gb NIC

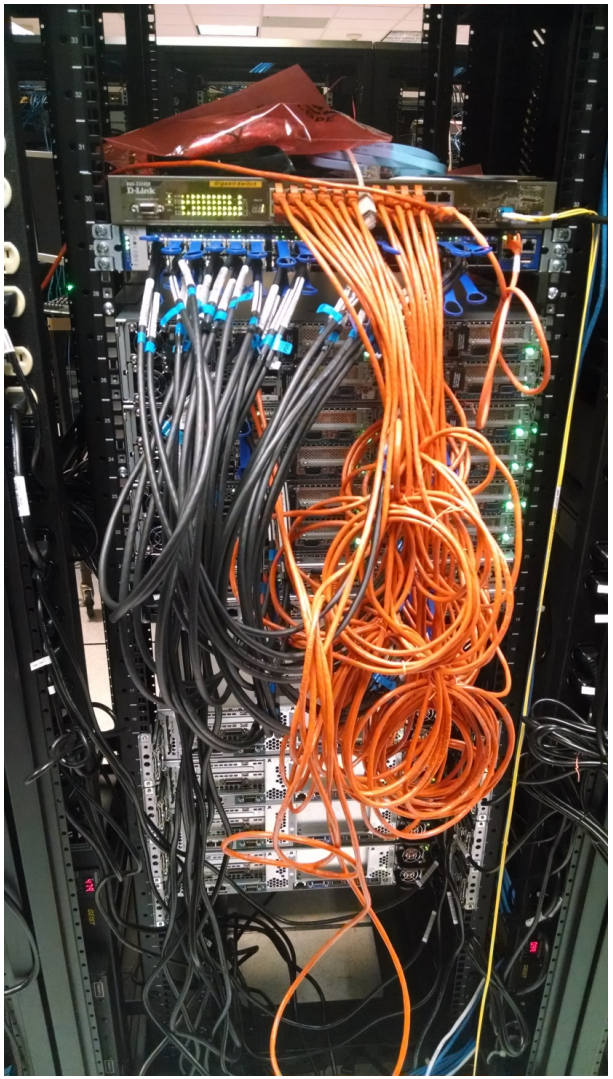
4x 1U rack servers (provisioning and monitoring)

4x 48x 10Gb + 6x 40Gb ONIE TII switches

4x 32x 40Gb ONIE capable TII switches

Possible to build several different topologies

External routers



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L2 segmentation or L3 with encapsulation?

Scale

- L2 VLAN limit!!!

Fault containment

Multicast support

Multi-path control

- No spanning tree

VxLAN vs. NVGRE

Decided to use L2 fabric with an SDN controller

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Candidates

L2 Switch OS

- Open Network Linux with OF-DPA
- Cumulus
- Big Switch Switch Light OS
- Proprietary switch OS with OpenFlow

SDN Controller

OpenDaylight

RYU

Floodlight

Big Switch Big Cloud Fabric

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Conclusions as of May 2015

Open Source not quite ready at the time

Best fit for our requirements was a supported proprietary solution

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Thank you.

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