

Putting **IPv6** to work



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Rocky Mountain IPv6 Task Force



IPv6 Best Operational Practices of Network Functions Virtualization (NFV) With VMware NSX

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Overview

- NSX as it pertains to NFV
- How NSX works
- NSX IPv6 Capabilities & Limitations
- How to deploy IPv6 on NSX
- Using IPv6 on NSX
- IPv6 NSX Demo!



BLUF

- NSX for IPv6 not ready for production...



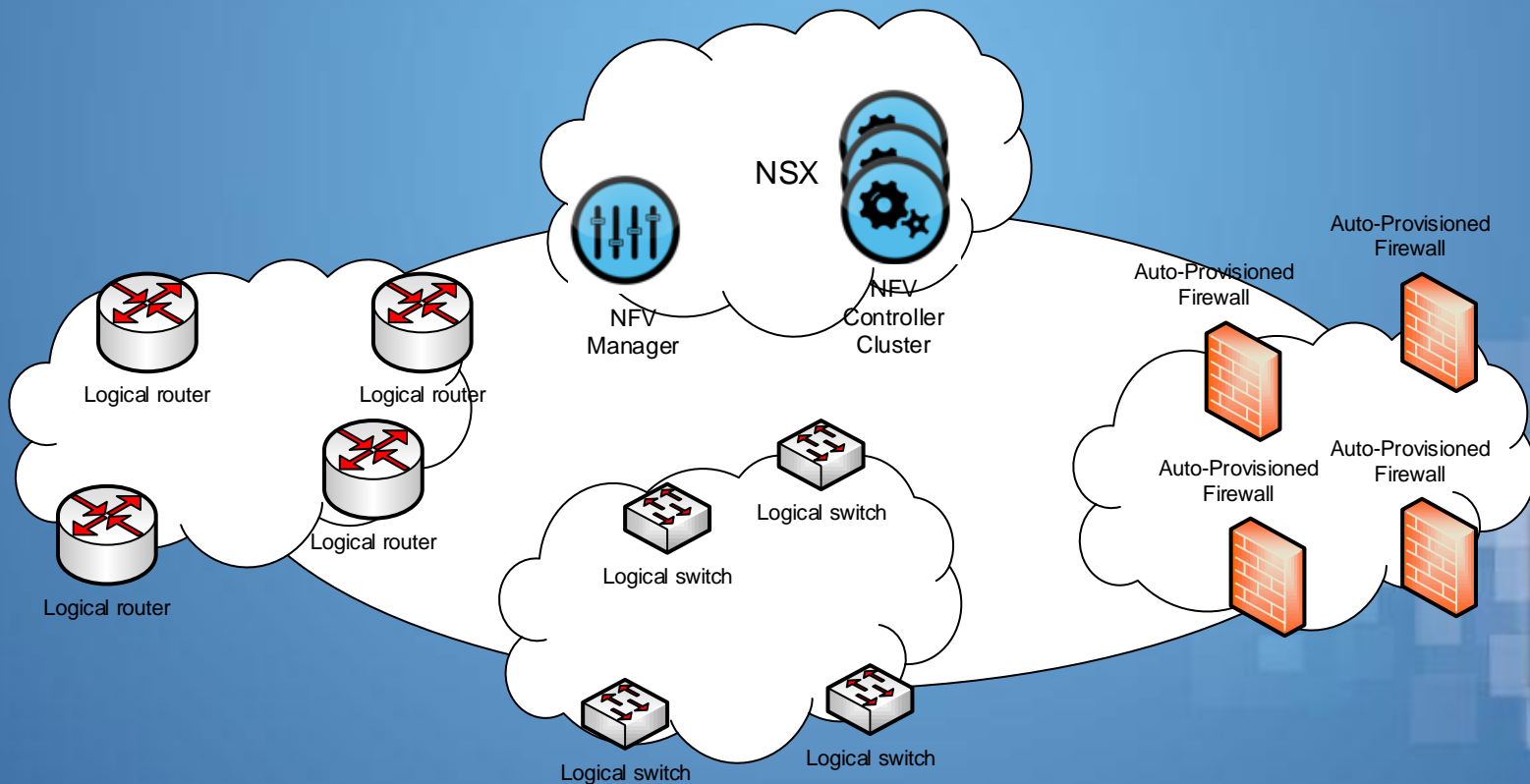
NSX is NFV

- NSX is VMware's answer to Network Functions Virtualization (NFV)
- NSX came from Nicira acquisition
- It provides the same capabilities
 - Distributed switching
 - Logical routing
 - Distributed firewalling
 - Logical load-balancing
 - VXLAN tunneling
 - VPN tunneling services
- Very comparable to OpenStack's Neutron



NSX is NFV, cont.

- It provides this by pushing networking to the hypervisor and managing it with a controller



How NSX Works

- Prerequisites
 - VMware vCenter server 5.5+
 - VMware ESXi hypervisor 5.5+
 - VMware Virtual Distributed Switch (vDS)
 - All ESXi hosts must:
 - Be in a Datacenter Cluster
 - Use vDS version 5.5
 - Uplinks and vDS → MTU 1550+
 - 50 bytes for VXLAN



How NSX Works, cont.

- An NSX Manager installs all of the components
 - NSX Controllers
 - VXLAN transport interfaces
 - Distributed firewall
 - Edge Services Gateway
- The NSX Controllers install all of the virtual networking on the ESXi hosts in a cluster



How NSX Works, cont.

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◀ Home 🔄 📌

Networking & Security

- NSX Home
- Installation**
- Logical Switches
- NSX Edges
- Firewall
- SpoofGuard
- Service Definitions
- Service Composer
- Data Security
- Flow Monitoring
- Activity Monitoring

▼ Networking & Security Inventory



- NSX Managers 1 ▶

Installation

Management Host Preparation Logical Network Preparation Service Deployments

NSX Manager



⚙️ Actions 🔍 Filter

NSX Manager	IP Address	vCenter	Version
 10.1.0.70	10.1.0.70	 TDITWVCV002.corp.tachyondyn...	6.1.3.2591148

1 items

NSX Controller nodes

+ × 📅 🔍 🔍 Filter

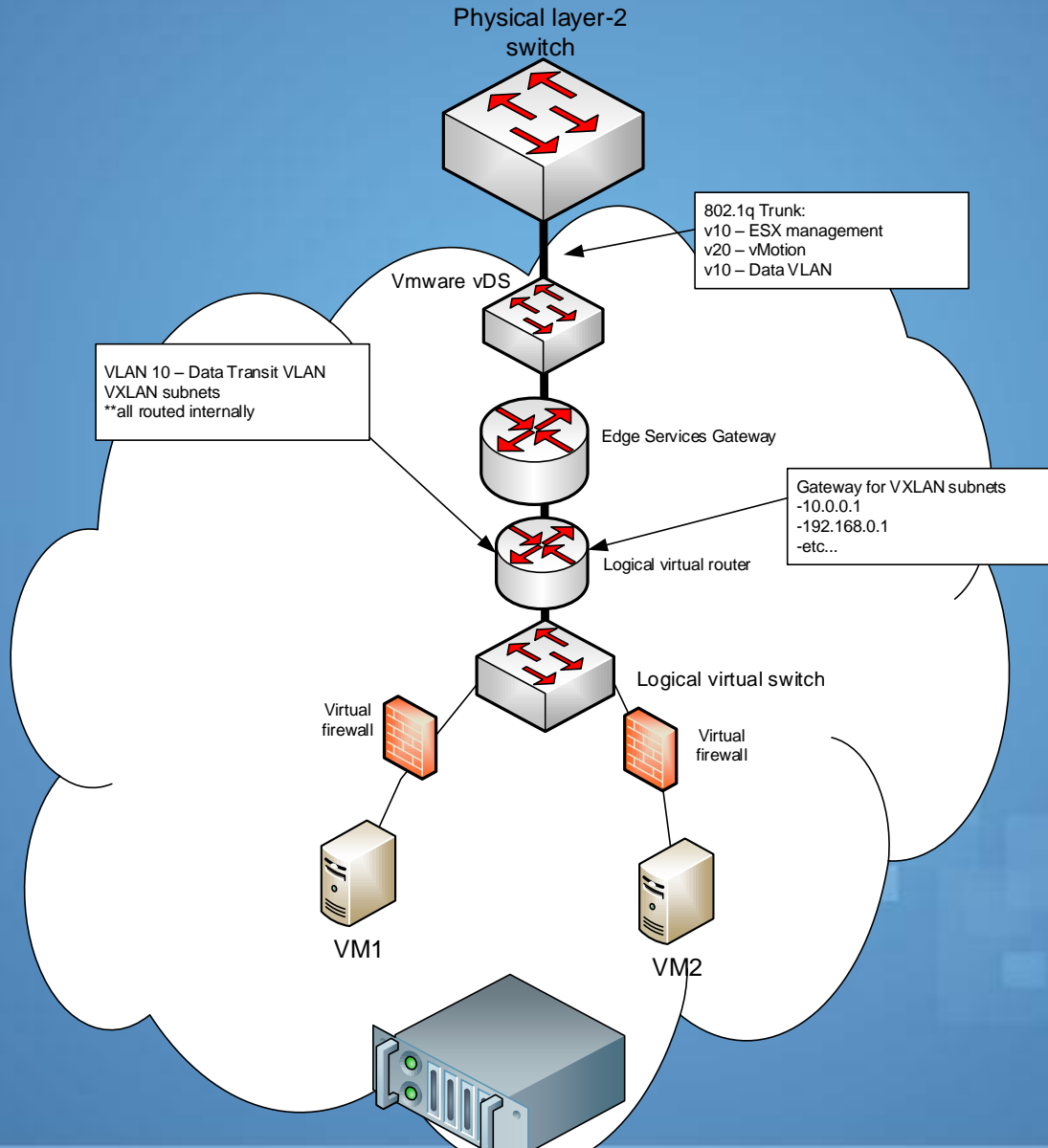
Name	Node	Status	Cluster/Resource P...	Datastore	Host	Software Version	NSX Manager
controller-2	10.1.0.100	✓ Normal	TW / Resources	TDITWESX003-DS	10.253.0.103	6.1.41894	 10.1.0.70
controller-3	10.1.0.101	✓ Normal	TW / Resources	TDITWESX001-DS	10.253.0.101	6.1.41894	 10.1.0.70

How NSX Works, cont.

- VXLAN Transport interfaces created
- NFV tools to deploy:
 - Logical virtual switches
 - Logical virtual firewalls
 - Logical virtual routers
 - Logical virtual-load balancers
 - VPN services



How NSX Works, cont.



IPv6 Capabilities with NSX

- Edge Services Gateway (ESG) can route all IPv6 traffic over VXLAN Tunnel Interfaces
- Full support for IPv6 firewall rule creation
- IPv6 routing on ESG can support full static routing
- Full support for IPv6 load-balancing



IPv6 Limitations with NSX

- VXLAN “underlay” network is IPv4 only
- Logical virtual router does not support IPv6 addressing or routing
 - Edge Services Gateway (ESG) must route all IPv6
- ESG does not have support for IPv6 routing protocols (BGP, OSPFv3, etc)
- ESG does not send Router Advertisements or have DHCPv6 relay functionality



How To Deploy IPv6 on NSX

- Create IPv6-enabled VXLAN Tunnel Interfaces (VTI) on the Edge Services Gateway
- On the Logical Virtual Switch ensure this subnet is added as a VTI in Vcenter
- Attach the VTI to the virtual machine (VM)
- Configure IPv6 firewall rules for each VM
- Configure the IPv6 address on the VM



Using IPv6 on NSX

- Provision a Logical Switch

The screenshot displays the VMware vSphere Web Client interface. The left sidebar shows the 'Networking & Security' menu with 'Logical Switches' selected. The main panel shows the 'Logical Switches' view with a table containing one entry: 'TDI-Switch' with a status of 'Normal'. An 'Edit Settings' dialog box is open, showing the configuration for 'TDI-Switch'. The dialog includes fields for 'Name' (TDI-Switch) and 'Description'. Under 'Replication mode', the 'Unicast' option is selected. Two checkboxes are checked: 'Enable IP Discovery' and 'Enable MAC Learning'. The dialog has 'OK' and 'Cancel' buttons at the bottom right.

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Home | Logical Switches

Networking & Security

- NSX Home
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- SpoofGuard
- Service Definitions
- Service Composer
- Data Security
- Flow Monitoring
- Activity Monitoring
- Networking & Security Inventory
 - NSX Managers 1

NSX Manager: 10.1.0.70

Actions

Name	Status
TDI-Switch	Normal

Edit Settings

Name: * TDI-Switch

Description:

Replication mode:

- Multicast
Multicast on Physical network used for VXLAN control plane.
- Unicast
VXLAN control plane handled by NSX Controller Cluster.
- Hybrid
Optimized Unicast mode. Offloads local traffic replication to physical network.

Enable IP Discovery

Enable MAC Learning

OK Cancel

1 Objects

Using IPv6 on NSX

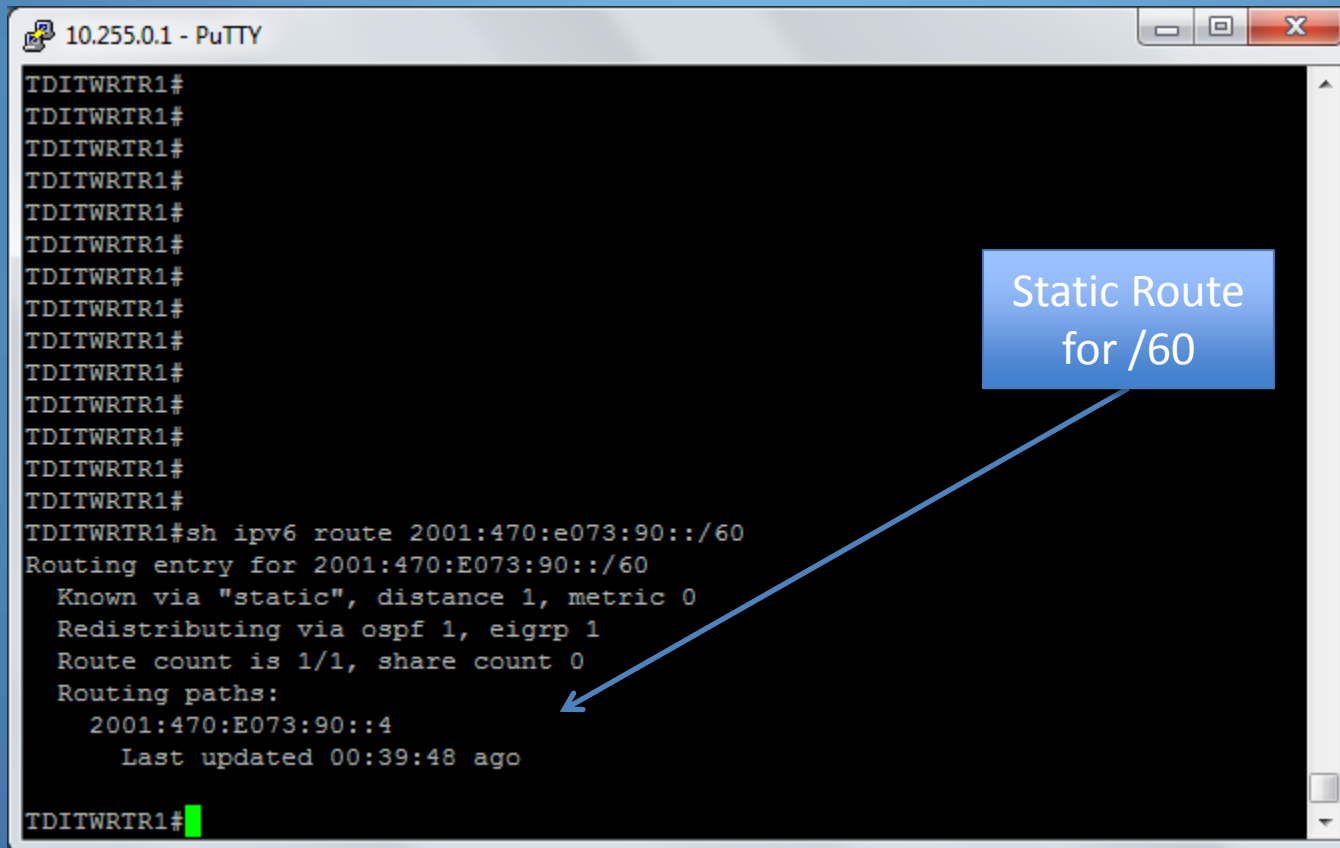
- Provision an Edge Services Gateway

The screenshot shows the NSX Edge Services Gateway configuration interface. The left sidebar contains 'Configuration', 'Interfaces', and 'Certificates'. The main area is titled 'Configure interfaces of this NSX Edge.' and shows a table of vNICs. Two blue callout boxes labeled 'Uplink' and 'Internal' point to the corresponding rows in the table. The 'Uplink' row (vNIC 0) shows IPv4 address 10.90.0.4* and IPv6 address 2001:470:e073:90::4*. The 'Internal' row (vNIC 1) shows IPv4 address 10.91.0.1* and IPv6 address 2001:470:e073:91::1*.

vNIC#	Name	IP Address	Subnet Prefix Length	Connected To	Type	Status
0	Uplink	10.90.0.4* 2001:470:e073:90::4*	29 64	VLAN90_NSX	Uplink	✓
1	vnic1	10.91.0.1* 2001:470:e073:91::1*	24 64	TDI-Switch	Internal	✓
2	vnic2				Internal	✗
3	vnic3				Internal	✗
4	vnic4				Internal	✗
5	vnic5				Internal	✗

Using IPv6 on NSX

- Configure physical route uplink routing



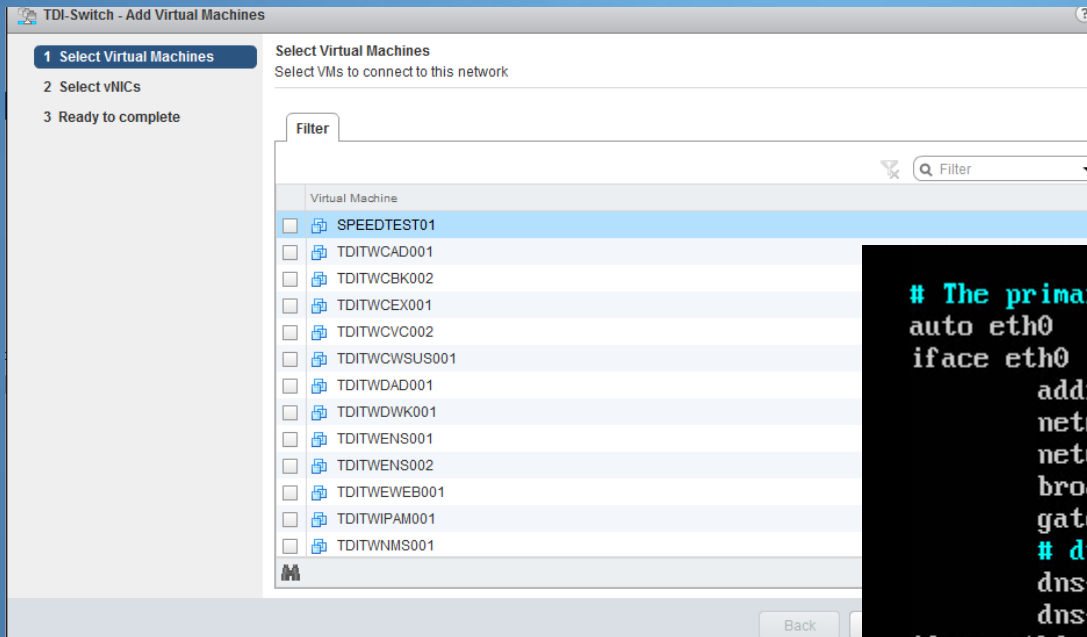
```
10.255.0.1 - PuTTY
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#
TDITWRTR1#sh ipv6 route 2001:470:e073:90::/60
Routing entry for 2001:470:E073:90::/60
  Known via "static", distance 1, metric 0
  Redistributing via ospf 1, eigrp 1
  Route count is 1/1, share count 0
  Routing paths:
    2001:470:E073:90::4
      Last updated 00:39:48 ago
TDITWRTR1#
```

Static Route for /60



Using IPv6 on NSX

- Attach a virtual machine to the Logical Switch & address with 2001:470:e073:91::/64 subnet



```
# The primary network interface
auto eth0
iface eth0 inet static
    address 10.91.0.10
    netmask 255.255.255.0
    network 10.91.0.0
    broadcast 10.91.0.255
    gateway 10.91.0.1
# dns-* options are implemented by the resolvconf package
dns-nameservers 8.8.8.8
dns-search tachyondynamics.com
iface eth0 inet6 static
    address 2001:470:e073:91::10
    netmask 64
    gateway 2001:470:e073:91::1
iface eth0 inet6 auto
```

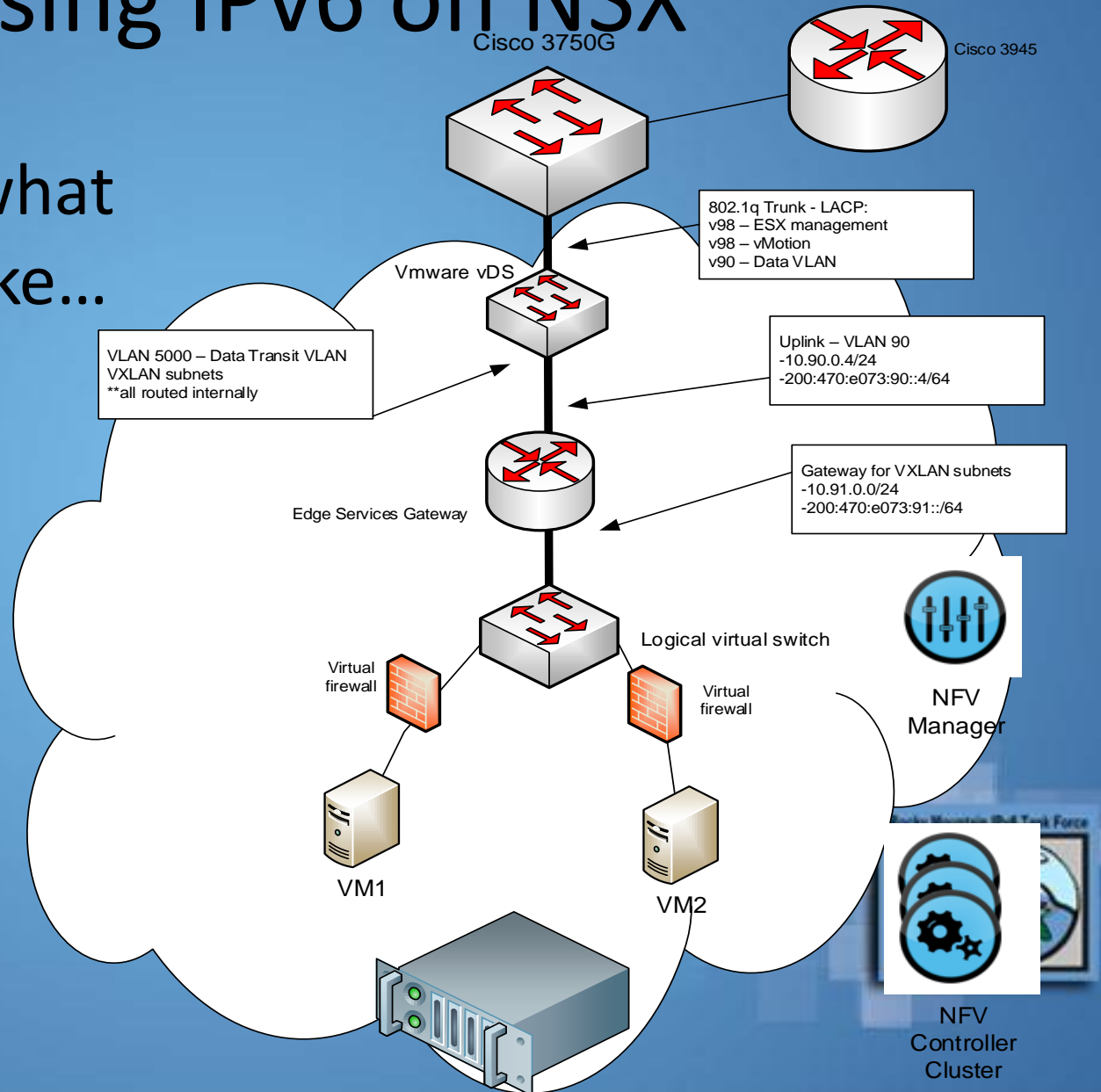
Using IPv6 on NSX

- All happy to Google

```
root@test-web-nsx:~#  
root@test-web-nsx:~# ping6 google.com  
PING google.com(iad23s26-in-x03.1e100.net) 56 data bytes  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=1 ttl=54 time=19.4 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=2 ttl=54 time=19.1 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=3 ttl=54 time=19.3 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=4 ttl=54 time=19.3 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=5 ttl=54 time=19.2 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=6 ttl=54 time=19.0 ms  
6/6 packets, 0% loss, min/avg/ewma/max = 19.029/19.254/19.344/19.479 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=7 ttl=54 time=19.2 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=8 ttl=54 time=19.8 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=9 ttl=54 time=19.5 ms  
64 bytes from iad23s26-in-x03.1e100.net: icmp_seq=10 ttl=54 time=25.8 ms
```

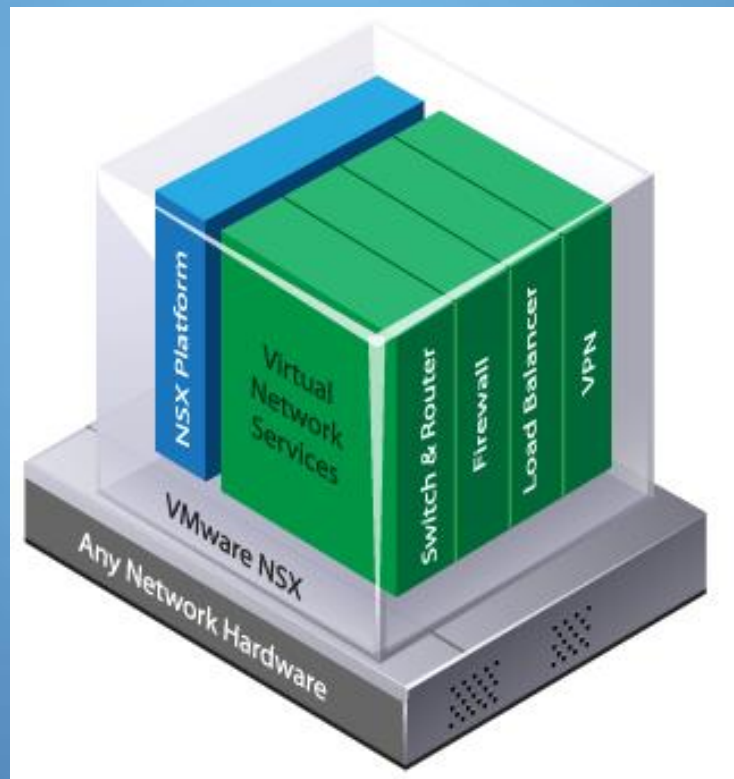
Using IPv6 on NSX

- And this is what it all looks like...



IPv6 with NSX Demo!

- Using the Vcenter Web Console
- Tachyon Dynamics live network!



Questions?

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