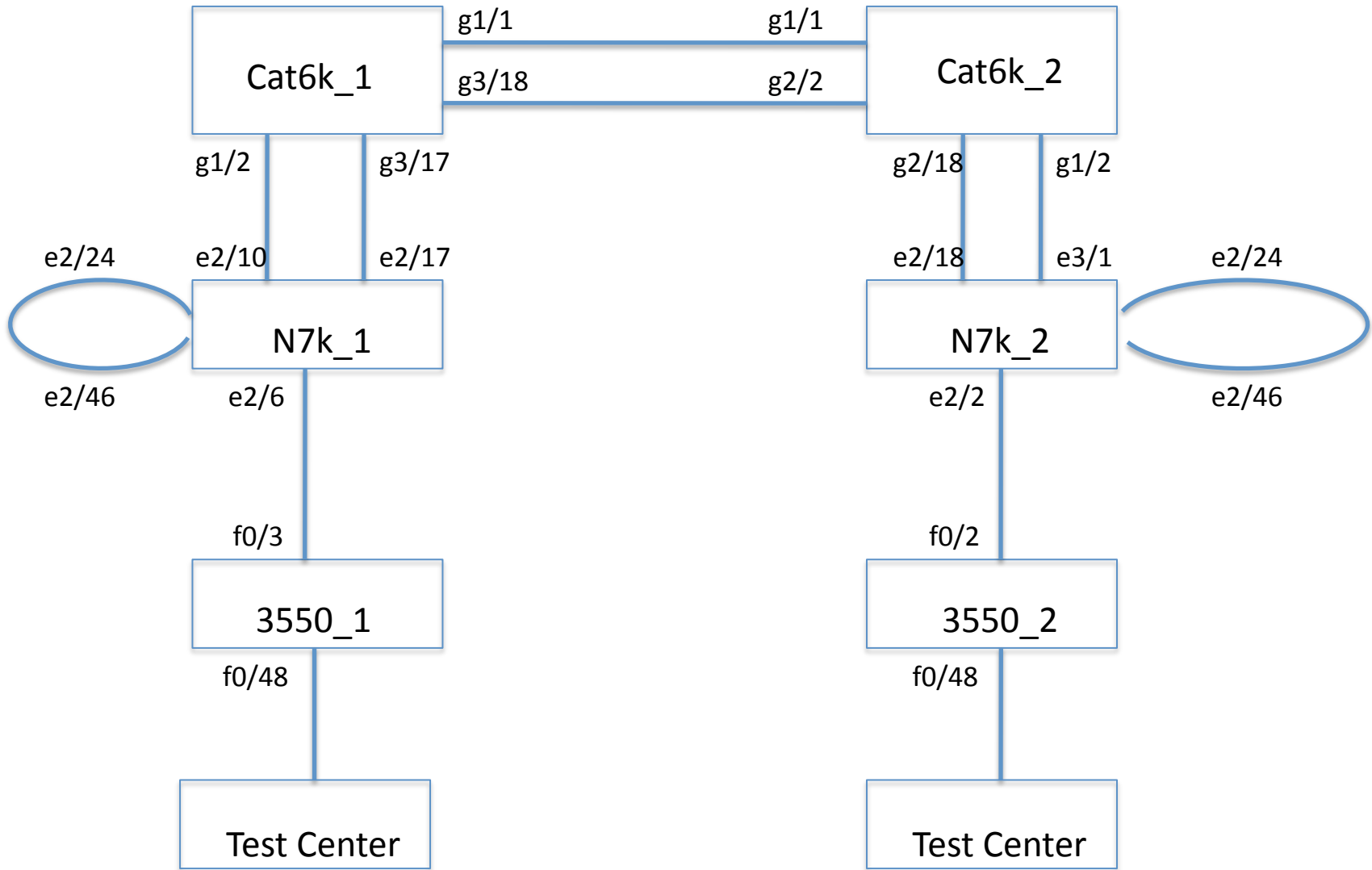
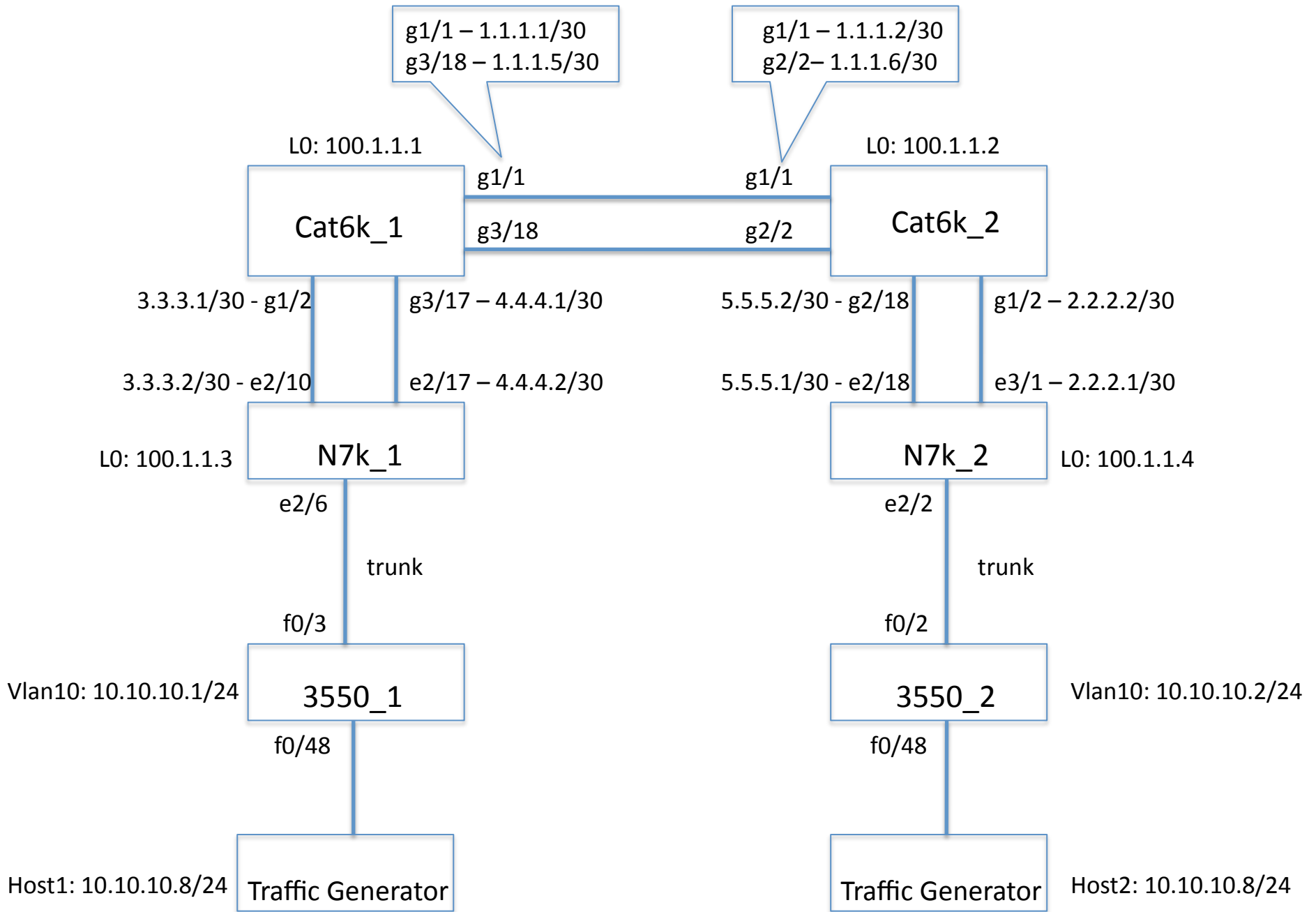


Physical topology





Core Configuration

Cat6k_1

```
interface GigabitEthernet1/1
ip address 1.1.1.1 255.255.255.252
ip pim sparse-mode

interface GigabitEthernet1/2
ip address 3.3.3.1 255.255.255.252
ip pim sparse-mode

interface GigabitEthernet3/17
ip address 4.4.4.1 255.255.255.252
ip pim sparse-mode

interface GigabitEthernet3/18
ip address 1.1.1.5 255.255.255.252
ip pim sparse-mode

interface Loopback0
ip address 100.1.1.1 255.255.255.255
ip pim sparse-mode
```

Cat6k_2

```
interface GigabitEthernet1/1
ip address 1.1.1.2 255.255.255.252
ip pim sparse-mode

interface GigabitEthernet1/2
ip address 2.2.2.2 255.255.255.0
ip pim sparse-mode

interface GigabitEthernet2/2
ip address 1.1.1.6 255.255.255.252
ip pim sparse-mode

interface GigabitEthernet2/18
ip address 5.5.5.2 255.255.255.252
ip pim sparse-mode

interface Loopback0
ip address 100.1.1.2 255.255.255.255
ip pim sparse-mode
```

Core Configuration (continue)

Cat6k_1

```
ip multicast-routing
```

```
ip pim rp-address 100.1.1.1
```

```
router ospf 1
```

```
log-adjacency-changes
```

```
network 1.1.1.1 0.0.0.0 area 0
```

```
network 1.1.1.5 0.0.0.0 area 0
```

```
network 3.3.3.1 0.0.0.0 area 0
```

```
network 4.4.4.1 0.0.0.0 area 0
```

```
network 100.1.1.1 0.0.0.0 area 0
```

Cat6k_2

```
ip multicast-routing
```

```
ip pim rp-address 100.1.1.1
```

```
router ospf 1
```

```
log-adjacency-changes
```

```
network 1.1.1.2 0.0.0.0 area 0
```

```
network 1.1.1.6 0.0.0.0 area 0
```

```
network 2.2.2.2 0.0.0.0 area 0
```

```
network 5.5.5.2 0.0.0.0 area 0
```

```
network 100.1.1.2 0.0.0.0 area 0
```

Aggregation Configuration

```
N7k_1-aggr

version 5.0(3)

feature ospf
feature pim

interface Ethernet2/10
 ip address 3.3.3.2/30
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
 no shutdown

interface loopback0
 ip address 100.1.1.3/32
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode

router ospf 1

ip pim rp-address 100.1.1.1 group-list 224.0.0.0/4
ip pim ssm range 232.0.0.0/8
```

```
N2k_2-aggr

version 5.0(3)

feature ospf
feature pim

interface Ethernet3/1
 ip address 2.2.2.1/30
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode
 no shutdown

interface loopback0
 ip address 100.1.1.4/32
 ip router ospf 1 area 0.0.0.0
 ip pim sparse-mode

router ospf 1

ip pim rp-address 100.1.1.1 group-list 224.0.0.0/4
ip pim ssm range 232.0.0.0/8
```

Aggregation

```
N7k_1-aggr# show ip ospf neighbors
```

```
OSPF Process ID 1 VRF default
```

```
Total number of neighbors: 1
```

Neighbor ID	Pri	State	Up Time	Address	Interface
100.1.1.1	1	FULL/BDR	00:14:30	3.3.3.1	Eth2/10

```
N7k_1-aggr# show ip pim neighbor
```

```
PIM Neighbor Status for VRF "default"
```

Neighbor	Interface	Uptime	Expires	DR Priority	Bidir- Capable	BFD State
3.3.3.1	Ethernet2/10	00:15:05	00:01:24	1	no	n/a

```
N2k_2-aggr# show ip ospf neighbors
```

```
OSPF Process ID 1 VRF default
```

```
Total number of neighbors: 1
```

Neighbor ID	Pri	State	Up Time	Address	Interface
100.1.1.2	1	FULL/BDR	00:03:39	2.2.2.2	Eth3/1

```
N2k_2-aggr# show ip pim neighbor
```

```
PIM Neighbor Status for VRF "default"
```

Neighbor	Interface	Uptime	Expires	DR Priority	Bidir- Capable	BFD State
2.2.2.2	Ethernet3/1	00:04:37	00:01:26	1	no	n/a

Goal: Configure OTV to connect edge devices at site A to site B

Terminology used in this lab demo

Edge device: A Layer 2 switch that performs OTV functions.

Edge device at site A => N7k_1

Edge device at site B => N7k_2

Internal interface: A Layer 2 interface that connects to local site devices (switches/routers).

Internal interface at site A => N7k_1 e2/6

Internal interface at site B => N7k_2 e2/2

Join interface: A Layer 3 routed interface facing the core. The IP address of this interface is used to advertise reachability of a MAC address present in the local site. IGMPv3 needs to be enable on this interface.

Join interface at site A => N7k_1 e2/17

Join interface at site A => N7k_2 e2/18

Terminology used in this lab demo (continue)

Overlay interface: A logical multi-access multicast-capable interface. It encapsulates Layer 2 frames in IP multicast headers.

Overlay interface at site A => N7k_1 Overlay0

Overlay interface at site B => N7k_2 Overlay0

Multicast control-group: A multicast address used to encapsulate and exchange OTV control-plane protocol updates. All edge devices in the same Overlay network share the same control-group address.

Multicast control-group in Overlay0 => 239.1.1.1

Multicast data-group: Multicast address use to handle multicast data-traffic.

Multicast data-group in Overlay0 => 239.1.2.0/28

Site-vlan: The vlan used to communicate with other edge devices in the local site.

Site-vlan at site A => vlan 100

Site-vlan at site B => vlan 200

Extended-vlan: The vlans to be extended the core from the local site to the remote site.

Vlan 10 and 20

OTV Configuration

- 1) Configure a L3 core face interface to be a routed interface and with IGMPv3 enabled. This will be our OTV join-interface.

```
N7k_1-otv
```

```
interface Ethernet2/17
ip address 4.4.4.2/30
ip router ospf 1 area 0.0.0.0
ip igmp version 3
no shutdown
```

```
N2k_2-otv
```

```
interface Ethernet2/18
ip address 5.5.5.1/30
ip router ospf 1 area 0.0.0.0
ip igmp version 3
no shutdown
```

- 2) Check to see if the OSPF neighbor relationship is formed successfully.

```
N7k_1-otv# show ip ospf neighbors
```

```
OSPF Process ID 1 VRF default
```

```
Total number of neighbors: 1
```

Neighbor ID	Pri	State	Up Time	Address	Interface
100.1.1.1	1	FULL/DR	00:57:26	4.4.4.1	Eth2/17

OTV Configuration (continue)

```
N2k_2-otv# sh ip ospf nei
OSPF Process ID 1 VRF default
Total number of neighbors: 1
Neighbor ID   Pri State           Up Time  Address    Interface
100.1.1.2    1 FULL/DR         01:28:30 5.5.5.2    Eth2/18
```

3) Enable OTV feature.

```
N7k_1-otv(config)# feature otv
```

```
N7k_2-otv(config)# feature otv
```

4) Configure the OTV site-vlan.

```
N7k_1-otv(config)# otv site-vlan 100
```

```
N2k_2-otv(config)# otv site-vlan 200
```

5) Check to see if the site-vlan is active.

OTV Configuration (continue)

```
N7k_1-otv# show vlan id 100
```

VLAN Name	Status	Ports
-----	-----	-----
100 VLAN0100	active	Eth2/6

```
N2k_2-otv# show vlan id 200
```

VLAN Name	Status	Ports
-----	-----	-----
200VLAN0200	active	Eth2/2

6) Configure the OTV Overlay interface.

```
N7k_1-otv
interface Overlay0
  otv join-interface Ethernet2/17
  otv control-group 239.1.1.1
  otv data-group 239.1.2.0/28
  otv extend-vlan 10, 20
  no shutdown
```

OTV Configuration (continue)

```
N7k_2-otv
interface Overlay0
  otv join-interface Ethernet2/18
  otv control-group 239.1.1.1
  otv data-group 239.1.2.0/28
  otv extend-vlan 10, 20
  no shutdown
```

7) Now, check if the OTV adjacency formed successfully.

```
N7k_1-otv# show otv adjacency
Overlay Adjacency database

Overlay-Interface Overlay0 :
Hostname      System-ID      Dest Addr      Up Time  Adj-State
N2k_2-otv    0026.51bf.adc3 5.5.5.1        00:06:19 UP
```

OTV Configuration (continue)

```
N2k_2-otv# show otv adjacency
Overlay Adjacency database
```

```
Overlay-Interface Overlay0 :
```

Hostname	System-ID	Dest Addr	Up Time	Adj-State
N7k_1-otv	0024.986f.3b43	4.4.4.2	00:06:08	UP

8) Some “show” commands to display the OTV status.

```
N7k_1-otv# show otv overlay 0
```

```
OTV Overlay Information
```

```
Overlay interface Overlay0
```

```
VPN name      : Overlay0
VPN state     : UP
Extended vlans : 10 20 (Total:2)
Control group : 239.1.1.1
Data group range(s) : 239.1.2.0/28
Join interface(s) : Eth2/17 (4.4.4.2)
Site vlan     : 100 (up)
```

```
N2k_2-otv# show otv over0
```

```
OTV Overlay Information
```

```
Overlay interface Overlay0
```

```
VPN name      : Overlay0
VPN state     : UP
Extended vlans : 10 20 (Total:2)
Control group : 239.1.1.1
Data group range(s) : 239.1.2.0/28
Join interface(s) : Eth2/18 (5.5.5.1)
Site vlan     : 200 (up)
```

OTV Configuration (continue)

```
N7k_1-otv# show otv site
```

```
Site Adjacency Information (Site-VLAN: 100) (* - this device)
```

```
Overlay0 Site-Local Adjacencies (Count: 1)
```

Hostname	System-ID	Ordinal

* N7k_1-otv	0024.986f.3b43	0

```
N2k_2-otv# sh otv site
```

```
Site Adjacency Information (Site-VLAN: 200) (* - this device)
```

```
Overlay0 Site-Local Adjacencies (Count: 1)
```

Hostname	System-ID	Ordinal

* N2k_2-otv	0026.51bf.adc3	0

Verify Connectivity

```
3500_1#ping 10.10.10.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms
```

```
3500_1#show ip arp 10.10.10.2
```

```
Protocol Address      Age (min) Hardware Addr  Type  Interface
```

```
Internet 10.10.10.2      1 0024.97af.4ec1 ARPA  Vlan10
```

```
3500_1#show mac address-table address 0024.97af.4ec1
```

```
Mac Address Table
```

```
-----
```

```
Vlan  Mac Address      Type      Ports
```

```
----  -
```

```
10   0024.97af.4ec1  DYNAMIC  Fa0/3
```

```
Total Mac Addresses for this criterion: 1
```

Verify Connectivity (continue)

```
N7k_1-otv# show mac address-table address 0024.97af.4ec1
```

```
Legend:
```

```
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
```

```
age - seconds since last seen,+ - primary entry using vPC Peer-Link
```

```
VLAN  MAC Address  Type  age  Secure NTFY  Ports
```

```
-----+-----+-----+-----+-----+-----+-----  
O 10   0024.97af.4ec1  dynamic  0    F  F Overlay0
```

```
N7k_1-otv# show otv arp-nd-cache
```

```
OTV ARP/ND L3->L2 Address Mapping Cache
```

```
Overlay Interface Overlay0
```

```
VLAN  MAC Address      Layer-3 Address  Age      Expires In  
10    0024.97af.4ec1    10.10.10.2      00:06:04 00:01:55
```

```
N7k_1-otv# show otv route 0024.97af.4ec1
```

```
OTV Unicast MAC Routing Table For Overlay0
```

```
VLAN  MAC-Address      Metric  Uptime      Owner      Next-hop(s)  
----  -  
10    0024.97af.4ec1    42     00:06:51   overlay    N2k_2-otv
```


Verify Connectivity (continue)

```
N2k_2-otv# show mac address-table address 0024.97af.4ec1
Legend:
  * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
  age - seconds since last seen,+ - primary entry using vPC Peer-Link
VLAN  MAC Address  Type  age  Secure NTFY  Ports
-----+-----+-----+-----+-----+-----
* 10   0024.97af.4ec1  dynamic  210   F  F Eth2/2
```

Response:

```
3500_2#show ip arp 10.10.10.1
Protocol Address      Age (min) Hardware Addr  Type  Interface
Internet 10.10.10.1    4  0024.97ae.e441 ARPA  Vlan10

3500_2#show mac address-table address 0024.97ae.e441
Mac Address Table
-----
Vlan  Mac Address      Type  Ports
----  -
10    0024.97ae.e441  DYNAMIC  Fa0/2
```

Verify Connectivity (continue)

```
N2k_2-otv# show mac address-table address 0024.97ae.e441
```

```
Legend:
```

```
* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
```

```
age - seconds since last seen,+ - primary entry using vPC Peer-Link
```

```
VLAN  MAC Address  Type  age  Secure NTFY  Ports
```

```
-----+-----+-----+-----+-----+-----+-----  
O 10   0024.97ae.e441  dynamic  0    F  F Overlay0
```

```
N2k_2-otv# show otv arp-nd-cache
```

```
OTV ARP/ND L3->L2 Address Mapping Cache
```

```
Overlay Interface Overlay0
```

```
VLAN  MAC Address      Layer-3 Address  Age      Expires In  
10   0024.97ae.e441    10.10.10.1      00:10:18 00:01:35
```

```
N2k_2-otv# show otv route 0024.97ae.e441
```

```
OTV Unicast MAC Routing Table For Overlay0
```

```
VLAN MAC-Address  Metric Uptime  Owner  Next-hop(s)  
-----  
10 0024.97ae.e441  42    00:10:55  overlay  N7k_1-otv
```

Verify Connectivity (continue)

```
N7k_1-otv# show mac address-table address 0024.97ae.e441
```

Legend:

* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC

age - seconds since last seen,+ - primary entry using vPC Peer-Link

VLAN	MAC Address	Type	age	Secure	NTFY	Ports
* 10	0024.97ae.e441	dynamic	120	F	F	Eth2/6

What we should see in the core switches:

```
cat6k_1#show ip mroute
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel

Y - Joined MDT-data group, y - Sending to MDT-data group

Outgoing interface flags: H - Hardware switched, A - Assert winner

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 224.0.1.40), 19:49:08/00:02:58, RP 100.1.1.1, flags: SJCL

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

GigabitEthernet3/18, Forward/Sparse, 19:49:04/00:02:44

Loopback0, Forward/Sparse, 19:49:08/00:02:58

(* , 239.1.1.1), 19:49:08/00:03:21, RP 100.1.1.1, flags: SJC

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

GigabitEthernet3/18, Forward/Sparse, 19:48:04/00:03:21

GigabitEthernet3/17, Forward/Sparse, 19:49:08/00:01:22

(4.4.4.2, 239.1.1.1), 19:49:08/00:03:21, flags: T

Incoming interface: GigabitEthernet3/17, RPF nbr 0.0.0.0, RPF-MFD

Outgoing interface list:

GigabitEthernet3/18, Forward/Sparse, 19:48:04/00:03:28, H

(5.5.5.1, 239.1.1.1), 19:49:08/00:02:51, flags: JT

Incoming interface: GigabitEthernet3/18, RPF nbr 1.1.1.6, RPF-MFD

Outgoing interface list:

GigabitEthernet3/17, Forward/Sparse, 19:49:13/00:01:18, H

“show ip mroute” output from Cat6k_2:

<----- snip----->

(* , 239.1.1.1), 19:49:07/stopped, RP 100.1.1.1, flags: SJCF

Incoming interface: GigabitEthernet2/2, RPF nbr 1.1.1.5, Partial-SC

Outgoing interface list:

GigabitEthernet2/18, Forward/Sparse, 19:49:07/00:02:33, H

(4.4.4.2, 239.1.1.1), 19:48:06/00:02:51, flags: JT

Incoming interface: GigabitEthernet2/2, RPF nbr 1.1.1.5, RPF-MFD

Outgoing interface list:

GigabitEthernet2/18, Forward/Sparse, 19:48:07/00:02:32, H

(5.5.5.1, 239.1.1.1), 19:49:08/00:03:21, flags: FT

Incoming interface: GigabitEthernet2/18, RPF nbr 0.0.0.0, RPF-MFD

Outgoing interface list:

GigabitEthernet2/2, Forward/Sparse, 19:48:13/00:03:25, H

<----- snip----->

Additional info:

How the packet looks like in the core (unicast traffic sourced from host1 destined to host2):

```
Ethernet II, Src: Cisco_a9:88:c0 (00:09:44:a9:88:c0), Dst: Cisco_bf:ad:c3 (00:26:51:bf:ad:c3)
Internet Protocol, Src: 4.4.4.2 (4.4.4.2), Dst: 5.5.5.1 (5.5.5.1)
Generic Routing Encapsulation (MPLS label switched packet)
MultiProtocol Label Switching Header, Label: 42, Exp: 6, S: 1, TTL: 254
Ethernet II, Src: 00:00:00_00:00:aa (00:00:00:00:00:aa), Dst: 00:00:00_00:00:bb (00:00:00:00:00:bb)
Internet Protocol, Src: 10.10.10.8 (10.10.10.8), Dst: 10.10.10.9 (10.10.10.9)
Data (90 bytes)
```

```
0000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0040 00 00 00 00 00 00 80 b8 ec 16 6c c3 64 5f 9f a4 .....l.d_..
0050 3c 46 f3 a3 4e 18 89 01 1b 65          <F..N....e
```

Additional info:

How the packet looks like in the core (multicast traffic sourced from host1):

```
Ethernet II, Src: Cisco_28:79:c0 (00:26:0b:28:79:c0), Dst: IPv4mcast_01:02:00 (01:00:5e:01:02:00)
Internet Protocol, Src: 4.4.4.2 (4.4.4.2), Dst: 239.1.2.0 (239.1.2.0)
Generic Routing Encapsulation (0x8848 - unknown)
MultiProtocol Label Switching Header, Label: 42, Exp: 6, S: 1, TTL: 255
Ethernet II, Src: 00:00:00_00:00:aa (00:00:00:00:00:aa), Dst: IPv4mcast_0a:0a:0a (01:00:5e:0a:0a:0a)
Internet Protocol, Src: 10.10.10.8 (10.10.10.8), Dst: 239.10.10.10 (239.10.10.10)
Data (90 bytes)
```

```
0000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0040 00 00 00 00 00 00 6d 4d 3c 73 3c 6f 60 c9 2f cf .....mM<s<o`./
0050 26 8a 32 81 b2 1f 2a cc 53 40                &.2...*.S@
```