Test Details	
Goal of Test	Outline OTV design and configuration steps in a methodical "cook-book" manner.
Data to Record	*show otv* *show otv adjacency* *show otv route* *show otv vlan* *show mac address-table*
Estimated Time Needed	30 min (assuming all pre-requisites are met)

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- 1 Overview
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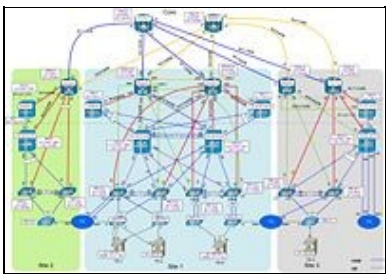
Overview

For additional information regarding Overlay Transport Virtualization (OTV) on Cisco NX-OS devices, refer to the overview chapter available in the *Cisco Nexus 7000 Series NX-OS OTV Configuration Guide, Release 5.x* available at:

http://www.cisco.com/en/US/docs/switches/datacenter/sw/5_x/nx-os/otv/configuration/guide/Cisco_Nexus_7000_Series_N

Diagram

Click on thumbnail to enlarge:



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Design & Prerequisites

With OTV, it is extremely important to ensure that you have a good network design and that your network meets all the pre-requisites to support OTV deployment:

1. Network design - have clear understanding of boundaries between:
    1. L2 and L3 in each site
    2. Functional data center layers (access, aggregation, core) in each site
    3. Each site and provider / WAN network.
2. Ensure that there is L3 connectivity between all the sites.
3. Ensure that provider / WAN network supports IP Multicast. For IP Multicast, ASM / Bidir need to be supported for control plane communication and SSM for any data multicast traffic between sites.
4. Identify number and placement of OTV edge devices in each site. Remember that at FCS, L3 gateway and OTV edge for a VLAN can not reside on the same logical device. This may require provisioning a VDC off aggregation layer N7Ks to serve as OTV edge device.
5. Identify **internal interface** L2 connectivity of each OTV edge device to aggregation layer. Will L2 connection be single-homed to one aggregation switch, multi-homed using STP or multi-homed with VPC?
6. Identify L3 connectivity of each OTV edge device to the provider network / WAN. Will L3 connection be single-homed or multi-homed connecting to 2 or more WAN endpoints? In multi-homed case, consider that there can only be 1 **join-interface**.
7. Decide which VLANs will be extended and how many Overlays will be used for that. Most simple design can just use 1 Overlay, however a more complex design can be used with VLANs split between Overlays for loadbalancing.
8. Note if any of the VLANs being extended are running FHRPs on L3 gateways. If multiple sites have FHRP running for VLAN being extended, **HSRP localization** feature should be used.
9. Designate a **site VLAN** to be used for communication between 2 OTV edge devices in the same site. In case sites ever get merged, it is recommended to use the same VLAN to provision a **site VLAN** in each site, regardless whether it currently has 1 or 2 **edge devices**.

Procedures

These procedures outline the configuration necessary for OTV to be enabled in each site. In this example, it is assumed that certain prerequisites (such as L3 connectivity and Multicast) are already configured.

1. Enable OTV feature.
2. Create a logical **Overlay** interface.
3. Configure IGMP v3 on join-interface.
4. Configure join-interface (you will get a warning about IGMP v3 regardless of completion of STEP 3).
5. Configure multicast groups for control traffic between OTV sites and for any multicast data traffic between OTV sites.
6. Configure VLANs to be extended over this **Overlay**.
7. Repeat steps 2-6 for any additional **Overlays** that need to be configured.
8. Configure **site VLAN** and make sure that between 2 OTV edge devices in a single site, a L2 connectivity exists through that VLAN.
9. Verify proper OTV operation.

Examples

Following contains configuration example from one of OTV edge devices:

```
!STEP 1:

 feature otv

 !STEP 2:
 interface Overlay1

 !STEP 3:
 interface Ethernet1/9
   ip igmp version 3

 !STEP 4:
  otv join-interface Ethernet1/9

 !STEP 5:
   otv control-group 239.1.1.1
   otv data-group 232.1.1.0/24

 !STEP 6:
   otv extend-vlan 110

 !STEP 8:
 otv site-vlan 200
```

Verification of OTV operation and connectivity between multiple sites:

SITE 1

```
!STEP 9:
 ! From SITE 1, OTV EDGE 1:
 show otv

 OTV Overlay Information

 Overlay Interface Overlay1
  VPN Name                 : Overlay1
  VPN ID                   : 230
  State                    : UP
  IPv4 multicast group     : Overlay1-239.1.1.1
  IPv6 multicast group     : [None]
  Mcast data group range(s): 232.1.1.0/24
  External interface(s)    : Ethernet1/9
  External IPv4 address    : 10.4.9.2
  External IPv6 address    : 0::
  Encapsulation format     : GRE/IPv4
  Site-vlan                : 200
  Capability               : Multicast-Reachable
  Is Adjacency Server      : NO
  Adj Server Configured    : NO
  Prim/Sec Adj Svr(s)      : [None] / [None]

 OTV_EDGE1_SITE1# show otv adjacency

 Overlay Adjacency database
```

```
Overlay-Interface Overlay1  :
System-ID        Dest Addr        Adj-State TM_State  Up Time   Adj-State
001b.54c2.43c1   10.3.8.2         default   default   1w3d      UP
001b.54c2.43c3   10.5.10.2        default   default   1w3d      UP
001b.54c2.43c4   10.7.11.2        default   default   2d17h     UP

OTV_EDGE1_SITE1# show otv isis adjacency

OTV-IS-IS process: default VPN: Overlay1
OTV-IS-IS adjacency database:
System ID       SNPA            Level  State  Hold Time  Interface
N7010-I4-OTV_E  001b.54c2.43c1  1      UP     00:00:25   Overlay1
OTV_EDGE2_SITE  001b.54c2.43c3  1      UP     00:00:27   Overlay1
OTV_EDGE_SITE3  001b.54c2.43c4  1      UP     00:00:07   Overlay1


OTV_EDGE1_SITE1# show otv route
OTV Unicast MAC Routing Table For Overlay1

VLAN MAC-Address    Metric Uptime   LastUpdt Owner              Next-hop(s)
!100 MACs from SITE 1 - local
110  0000.6e01.010a 1      2d16h    2d16h    lmac               port-channel1
110  0000.6e01.010b 1      2d16h    2d16h    lmac               port-channel1
...
110  0000.6e01.016c 1      2d16h    2d16h    lmac               port-channel1
110  0000.6e01.016d 1      2d16h    2d16h    lmac               port-channel1

!100 MACs from SITE 2
110  0000.6e02.020a 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
110  0000.6e02.020b 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
...
110  0000.6e02.026c 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
110  0000.6e02.026d 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2

!100 MACs from SITE 3
110  0000.6e03.030a 42     2d16h    2d16h    isis_otv-default   Overlay1-10.7.11.2
110  0000.6e03.030b 42     2d16h    2d16h    isis_otv-default   Overlay1-10.7.11.2
...
110  0000.6e03.036c 42     2d16h    2d16h    isis_otv-default   Overlay1-10.7.11.2
110  0000.6e03.036d 42     2d16h    2d16h    isis_otv-default   Overlay1-10.7.11.2


OTV_EDGE1_SITE1# show mac address-table

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
---------+-----------------+--------+---------+------+----+------------------
G     -    001b.54c2.43c2    static       -       F    F  sup-eth1(R)
!100 MACs from SITE 1 - local
* 110      0000.0c07.ac6e    dynamic   0          F    F  Po1
* 110      0000.6e01.010a    dynamic   0          F    F  Po1
...
* 110      0000.6e01.016c    dynamic   0          F    F  Po1
* 110      0000.6e01.016d    dynamic   0          F    F  Po1

!100 MACs from SITE 2 learned via Overlay
O 110      0000.6e02.020a    dynamic   0          F    F  Overlay1
O 110      0000.6e02.020b    dynamic   0          F    F  Overlay1
...
O 110      0000.6e02.026c    dynamic   0          F    F  Overlay1
O 110      0000.6e02.026d    dynamic   0          F    F  Overlay1
```

```
!100 MACs from SITE 3 learned via Overlay
O 110      0000.6e03.030a    dynamic   0          F    F  Overlay1
O 110      0000.6e03.030b    dynamic   0          F    F  Overlay1
...
O 110      0000.6e03.036c    dynamic   0          F    F  Overlay1
O 110      0000.6e03.036d    dynamic   0          F    F  Overlay1


OTV_EDGE1_SITE1# show otv site
OTV Overlay Information
Site-VLAN                : 200
Site Adjacency database
Overlay: Overlay1-239.1.1.1, Adjacencies: 2
  System-ID                   Priority    Ordinal
* 001b.54c2.43c2                     0          0
  001b.54c2.43c3                     0          1

OTV_EDGE1_SITE1# show otv vlan
OTV VLAN Configuration Information
VLAN-ID  VlanState           Switchport/    External       Overlay
                             Forward Count  Interface      Group
110      UP                  1/1            Ethernet1/9    Overlay1-239.1.1.1

 !Will only show up at AED - so we know EDGE 1 is AED
OTV_EDGE1_SITE1# show otv vlan auth

OTV VLAN Configuration Information
VLAN-ID  VlanState           Switchport/    External       Overlay
                             Forward Count  Interface      Group
110      UP                  1/1            Ethernet1/9    Overlay1-239.1.1.1

OTV_EDGE1_SITE1# show otv arp

OTV ARP/ND L3->L2 Address Mapping Cache
Overlay Interface Overlay1
VLAN/MAC Address      Uptime    Layer-3 Address     Exp Time Left
0110-001b.54c2.4c41   2w4d      110.2.2.1           00:19:55
0110-0000.6e02.020a   00:06:05  110.2.2.10          00:13:54
0110-0000.6e02.020b   00:06:05  110.2.2.11          00:13:54
0110-0000.6e02.020c   00:06:05  110.2.2.12          00:13:54
...
0110-0000.6e02.026c   00:06:05  110.2.2.108         00:13:54
0110-0000.6e02.026d   00:06:05  110.2.2.109         00:13:54
0110-0000.6e03.030a   00:06:06  110.3.3.10          00:13:53
0110-0000.6e03.030b   00:06:06  110.3.3.11          00:13:53
0110-0000.6e03.030c   00:06:05  110.3.3.12          00:13:54
...
0110-0000.6e03.0348   00:06:05  110.3.3.72          00:13:54
0110-0000.6e03.0349   00:06:05  110.3.3.73          00:13:54
0110-0000.6e03.034a   00:06:05  110.3.3.74          00:13:54
0110-0000.6e03.034b   00:06:05  110.3.3.75          00:13:54
```

SITE 3

```
!On SITE 3

 OTV_EDGE_SITE3#
 show otv

 OTV Overlay Information
```

```
Overlay Interface Overlay1
 VPN Name                  : Overlay1
 VPN ID                    : 245
 State                     : UP
 IPv4 multicast group      : Overlay1-239.1.1.1
 IPv6 multicast group      : [None]
 Mcast data group range(s): 232.1.1.0/24
 External interface(s)     : Ethernet1/17
 External IPv4 address     : 10.7.11.2
 External IPv6 address     : 0::
 Encapsulation format      : GRE/IPv4
 Site-vlan                 : 1
 Capability                : Multicast-Reachable
 Is Adjacency Server       : NO
 Adj Server Configured     : NO
 Prim/Sec Adj Svr(s)       : [None] / [None]



OTV_EDGE_SITE3#
show otv adjacency

Overlay Adjacency database

Overlay-Interface Overlay1  :
System-ID        Dest Addr        Adj-State TM_State  Up Time   Adj-State
001b.54c2.43c1   10.3.8.2         default   default   2d17h     UP
001b.54c2.43c2   10.4.9.2         default   default   2d17h     UP
001b.54c2.43c3   10.5.10.2        default   default   2d17h     UP

OTV_EDGE_SITE3#
show otv arp

OTV ARP/ND L3->L2 Address Mapping Cache
Overlay Interface Overlay1
VLAN/MAC Address      Uptime    Layer-3 Address     Exp Time Left
0110-001b.54c2.39c1   3d05h     110.1.1.2           00:19:55
0110-001b.54c2.8541   2w3d      110.1.1.3           00:19:55
0110-0000.6e01.010a   00:06:06  110.1.1.10          00:13:53
0110-0000.6e01.010b   00:06:06  110.1.1.11          00:13:53
0110-0000.6e01.010c   00:06:06  110.1.1.12          00:13:53

show otv isis adjacency

OTV-IS-IS process: default VPN: Overlay1
OTV-IS-IS adjacency database:
System ID       SNPA            Level  State  Hold Time  Interface
N7010-I4-OTV_E  001b.54c2.43c1  1      UP     00:00:29   Overlay1
OTV_EDGE1_SITE  001b.54c2.43c2  1      UP     00:00:31   Overlay1
OTV_EDGE2_SITE  001b.54c2.43c3  1      UP     00:00:29   Overlay1


OTV_EDGE_SITE3# show otv route

OTV Unicast MAC Routing Table For Overlay1

VLAN MAC-Address    Metric Uptime   LastUpdt Owner              Next-hop(s)
!100 MACs from SITE 1
110  0000.6e01.010a 42     2d16h    2d16h    isis_otv-default   Overlay1-10.4.9.2
110  0000.6e01.010b 42     2d16h    2d16h    isis_otv-default   Overlay1-10.4.9.2
...
110  0000.6e01.016c 42     2d16h    2d16h    isis_otv-default   Overlay1-10.4.9.2
110  0000.6e01.016d 42     2d16h    2d16h    isis_otv-default   Overlay1-10.4.9.2
```

```
!100 MACs from SITE 2
110  0000.6e02.020a 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
110  0000.6e02.020b 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
...
110  0000.6e02.026c 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2
110  0000.6e02.026d 42     2d16h    2d16h    isis_otv-default   Overlay1-10.3.8.2

!100 MACs from SITE 3 - local
110  0000.6e03.030a 1      2d16h    2d16h    lmac               Ethernet1/19
110  0000.6e03.030b 1      2d16h    2d16h    lmac               Ethernet1/19
...
110  0000.6e03.036c 1      2d16h    2d16h    lmac               Ethernet1/19
110  0000.6e03.036d 1      2d16h    2d16h    lmac               Ethernet1/19


OTV_EDGE_SITE3#
show mac address-table

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
---------+-----------------+--------+---------+------+----+------------------
!100 MACs from SITE 1
O 110      0000.6e01.010a    dynamic   0          F    F  Overlay1
O 110      0000.6e01.010b    dynamic   0          F    F  Overlay1
...
O 110      0000.6e01.016c    dynamic   0          F    F  Overlay1
O 110      0000.6e01.016d    dynamic   0          F    F  Overlay1

!100 MACs from SITE 2
O 110      0000.6e02.020a    dynamic   0          F    F  Overlay1
O 110      0000.6e02.020b    dynamic   0          F    F  Overlay1
...
O 110      0000.6e02.026c    dynamic   0          F    F  Overlay1
O 110      0000.6e02.026d    dynamic   0          F    F  Overlay1

!100 MACs from SITE 3 - local
* 110      0000.6e03.030a    dynamic   0          F    F  Eth1/19
* 110      0000.6e03.030b    dynamic   0          F    F  Eth1/19
...
* 110      0000.6e03.036c    dynamic   0          F    F  Eth1/19
* 110      0000.6e03.036d    dynamic   0          F    F  Eth1/19

OTV_EDGE_SITE3# show otv site
OTV Overlay Information

 Site-VLAN                : 1

Site Adjacency database
Overlay: Overlay1-239.1.1.1, Adjacencies: 1
  System-ID                   Priority    Ordinal
* 001b.54c2.43c4                     0          0


OTV_EDGE_SITE3#
show otv vlan

OTV VLAN Configuration Information
VLAN-ID  VlanState           Switchport/    External       Overlay
                             Forward Count  Interface      Group

110      UP                  1/1            Ethernet1/17   Overlay1-239.1.1.1
```

```
OTV_EDGE_SITE3#
show otv vlan auth

OTV VLAN Configuration Information
VLAN-ID  VlanState           Switchport/    External       Overlay
                             Forward Count  Interface      Group
110      UP                  1/1            Ethernet1/17   Overlay1-239.1.1.1
```

Additional Resources

For more detailed information on OTV, please see the following link:
OTV IETF draft

Cisco Nexus 7000 Series NX-OS OTV Configuration Guide, Release 5.x

Acronyms

OTV - Overlay Transport Virualization
ASM - Any Source Multicast
DCI - Data Center Interconnect
SSM - Source Specific Multicast
WAN - Wide Area Network
FCS - First Customer Ship
SP - Service Provider