

OTV Adjacency Server

The OTV Adjacency Server feature enables you to provide unicast-only transport between edge devices when IP multicast is not available in the core network over which Overlay Transport Virtualization (OTV) runs. The OTV control plane over a unicast-only transport works exactly the same way as OTV with multicast core, except that in a unicast-core network, each OTV edge device needs to create multiple copies of each control plane packet and unicast them to each remote edge device in the same logical overlay. Because of this head-end replication behavior, the OTV Adjacency Server feature is not recommended for deployment when IP multicast is available in the core network. At the same time, the operational simplification of the unicast-only model makes this deployment option appealing in scenarios where LAN extension connectivity is required only between a few (two or three) data centers.

To use the OTV Adjacency Server feature, you configure one OTV edge device as a primary adjacency server and you can optionally configure another edge device as a secondary adjacency server as a backup. The remaining edge devices in the overlay network are configured to register to these adjacency servers.

This module describes how to configure an OTV adjacency server and edge devices in a unicast-core network.

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Restrictions for OTV Adjacency Server

- Overlay Transport Virtualization (OTV) does not support a hybrid overlay networks where some edge devices are multicast-capable and others are not.
- OTV adjacency is formed between sites having the same overlay interface number only.
- In a unicast-only core network where an adjacency server has been configured, OTV does not perform the following tasks:
  - Map the configured internal site multicast group to a multicast group in the core.
  - Generate Internet Group Management Protocol (IGMP) and Protocol Independent Multicast (PIM) join interfaces to connect to the core network.

- Add the control group to the Layer 2 Forwarding Information Base (L2FIB) for forwarding default broadcast and link-local packets. Instead, in a unicast-core network, OTV adds active unicast replication list (URL) entries so that broadcast and link-local packets are unicast replicated to remote edge devices.

Information About OTV Adjacency Server

Overview of a Unicast-Core Network

Each Overlay Transport Virtualization (OTV) node provides multicast-send capability by replicating multicast packets at the head-end. In other words, each OTV node that sends a multicast packet on a nonmulticast-capable network, unicast replicates the packet. During unicast replication, a copy of a multicast packet, which is originated in the upper layers of the overlay network, is created and sent to each OTV neighbor that is interested in the multicast packet.

To be able to unicast replicate, each OTV node needs to know a list of neighbors to which to replicate multicast packets. Instead of configuring the list of neighbors on each OTV node, a more dynamic mechanism that supports unicast replication list (URL) is used. In this mechanism, no replication server is used for replicating the multicast packets. Therefore, there are no choke points or path delays because of the lack of multicast capability. The multicast data packets, even though they are sent as a unicast message, travel on the same path from the source OTV edge device to each interested party. The only difference from a multicast-core network is that in this case, multiple copies are sent from the OTV edge device source.

Adjacency Servers

Overview of an Adjacency Server

Overlay Transport Virtualization (OTV) provides support for nonmulticast-capable, unicast-only core networks through the OTV Adjacency Server feature. An edge device is configured as an adjacency server (primary or secondary). All other edge devices are configured with the IPv4 addresses of the primary and secondary adjacency servers, after which the edge devices communicate their reachability and capability information to the primary and secondary adjacency servers.

You can configure more than one adjacency server per overlay network. An adjacency server can serve multiple overlay networks.

Functions of an Adjacency Server

An adjacency server is responsible for informing all the other existing edge devices if there is any addition or loss of an edge device. Based on the reachability information, an edge device can further communicate directly with another edge device by using the unicast data path.

An adjacency server distributes the unicast replication list (URL) of all edge device addresses to the members of the overlay network. Each edge device then uses this list to encapsulate multicast packets in a unicast IP header destined for the unicast IP address of each remote edge device.

Unicast-Only Edge Devices

When an Overlay Transport Virtualization (OTV) edge device is configured with primary and secondary adjacency server addresses, the edge device sends Intermediate System-to-Intermediate System (IS-IS) hello (IIH) messages to both the adjacency servers. When these adjacency servers are configured, the edge devices are immediately added to the unicast replication list (URL). An edge device does not process an alternate server's type, length, value (TLV) until it detects that the primary adjacency server has timed out. Primary and secondary adjacency servers are configured on each edge device.

When a site is added to a unicast-core OTV network, you need to configure only that OTV edge device with the adjacency server addresses. No other site in the overlay network or other overlay networks need additional configuration.

If you configure an edge device as unicast-only, the following restrictions apply:

- The **otv control-group** command should not be configured.
- The **otv data-group** command should not be configured.
- Because no multicast **otv data-group** command is configured, the **show otv data-group** command does not display any data group mappings.

Unicast Replication List

Overlay Transport Virtualization (OTV) maintains the unicast IP address of each remote edge device in the overlay network in a unicast replication list (URL). One URL is maintained per overlay network. OTV marks each address in the URL as active or inactive depending on the local and remote edge devices' unicast-only status. The addresses that are marked as active are added to the forwarding path so that multicast traffic can be unicast replicated to those addresses. Inactive addresses are not added to the forwarding path.

How Adjacency Servers and Edge Devices Work

An adjacency server includes a new Intermediate System-to-Intermediate System (IS-IS) hello (IIH) type, length, value (TLV) in its IIH messages. At first, an adjacency server has no information about other edge devices because its unicast replication list (URL) is empty. After other Overlay Transport Virtualization (OTV) edge devices start sending IIH messages to the adjacency server, the adjacency server builds up its URL. The contents of the URL are the IP addresses of the edge devices that sent IIH messages. The contents of the URL are advertised in the new IIH TLV and sent to each member of the URL. IS-IS itself does not do the replication. The lower layers perform that task so that the overlay network appears as a multiaccess, multicast-capable logical LAN to the upper layers.

OTV edge devices that receive the new IIH TLV discover other OTV edge devices in that overlay network. The IPv4 addresses of other OTV edge devices are added to the local URL. Then, when subsequent IIH messages are sent by IS-IS, they are unicast replicated at the lower layers to each address in the URL. This allows all OTV edge devices in the network to find each other and bring up IS-IS adjacencies with each other. The rest of the IS-IS protocol runs on the overlay interface as if the overlay interface is a multiaccess, multicast-capable LAN.

Exclusivity Between Multicast- and Unicast-Core Networks

The configuration of multicast-core-specific commands and unicast-core-specific adjacency server commands is mutually exclusive. Therefore, if the **otv control-group** command or the **otv data-group** command is

configured, the adjacency server commands are not allowed until the previous commands are un-configured. Similarly, after an adjacency server command is configured, the **otv control-group** and **otv data-group** commands return errors until the adjacency server commands are configured.

Note An edge device can support a combination of unicast and multicast overlays, but an overlay network can be either unicast or multicast.

In multicast- and unicast-core networks, point-to-point or point-to-multipoint generic routing encapsulation (GRE) tunnels are established among the edge devices for forwarding both unicast and multicast traffic.

How to Configure an OTV Adjacency Server

Configuring an OTV Adjacency Server

Perform this task to configure an Overlay Transport Virtualization (OTV) edge device as an adjacency server in a network where the provider core does not support multicast capability.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface overlay** *interface*
4. **otv adjacency-server unicast-only**
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface overlay** *interface* **Example:** `Device(config)# interface overlay 1`	Creates an OTV overlay interface and enters interface configuration mode. • The range is from 0 to 512.

	Command or Action	Purpose
Step 4	**otv adjacency-server unicast-only** **Example:** `Device(config-if)# otv adjacency-server unicast-only`	Configures an OTV edge device as an adjacency server.
Step 5	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Example

The following is sample output from the **show otv** command in a unicast-core network when an OTV edge device is configured as a primary adjacency server:

```
Device# show otv overlay 3

Overlay Interface Overlay3
 VPN name                 : otv_3
 VPN ID                   : 1
 State                    : UP
 AED Capable              : Yes
 Join interface(s)        : GigabitEthernet0/1/1
 Join IPv4 address        : 10.0.2.8
 Tunnel interface(s)      : Tunnel0
 Encapsulation format     : GRE/IPv4
 Site Bridge-Domain       : 2
 Capability               : Unicast-only
 Is Adjacency Server      : Yes
 Adj Server Configured    : No
 Prim/Sec Adj Svr(s)      : None
```

The following is sample output from the **show otv** command in a unicast-core network when another OTV edge device is configured as a secondary adjacency server:

```
Device# show otv overlay 3

Overlay Interface Overlay3
 VPN name                 : otv_3
 VPN ID                   : 1
 State                    : UP
 AED Capable              : Yes
 Join interface(s)        : GigabitEthernet0/3/3
 Join IPv4 address        : 172.16.1.8
 Tunnel interface(s)      : Tunnel0
 Encapsulation format     : GRE/IPv4
 Site Bridge-Domain       : 2
 Capability               : Unicast-only
 Is Adjacency Server      : Yes
 Adj Server Configured    : Yes
 Prim/Sec Adj Svr(s)      : 10.0.2.8
```

Configuring an OTV Edge Device in a Unicast-Core Network

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface overlay** *interface*
4. **otv use-adjacency-server** *primary-address* [*secondary-address*] **unicast-only**
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface overlay** *interface* **Example:** `Device(config)# interface overlay 2`	Creates an OTV overlay interface and enters interface configuration mode. • The range is from 0 to 512.
Step 4	**otv use-adjacency-server** *primary-address* [*secondary-address*] **unicast-only** **Example:** `Device(config-if)# otv use-adjacency-server 10.10.2.2 unicast-only`	Configures an OTV edge device to register to an adjacency server.
Step 5	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and returns to privileged EXEC mode.

Example

The following is sample output from the **show otv adjacency-server replication-list** command:

```
Device# show otv adjacency-server replication-list

OTV Overlay Replication List
 Overlay  Destination Address  Capability
 1        10.15.87.91          Unicast-only
```

```
1        10.99.60.99          Multicast-capable
5        10.66.32.49          Unicast-only
```

The following is sample output from the **show otv** command when an OTV edge device is configured to use primary and secondary adjacency servers:

```
Device# show otv overlay 3

Overlay Interface Overlay3
 VPN name                 : otv_3
 VPN ID                   : 1
 State                    : UP
 AED Capable              : Yes
 Join interface(s)        : GigabitEthernet0/1/1
 Join IPv4 address        : 192.168.1.5
 Tunnel interface(s)      : Tunnel1
 Encapsulation format     : GRE/IPv4
 Site Bridge-Domain       : 2
 Capability               : Unicast-only
 Is Adjacency Server      : No
 Adj Server Configured    : Yes
 Prim/Sec Adj Svr(s)      : 10.0.2.8/172.16.1.8
```

Configuration Examples for OTV Adjacency Server

Example: Configuring an OTV Adjacency Server

The following example shows how to configure an edge device as an adjacency server:

```
Device> enable
Device# configure terminal
Device(config)# interface overlay 1
Device(config-if)# otv adjacency-server unicast-only
Device(config-if)# end
```

Example: Configuring an OTV Edge Device in a Unicast-Core Network

The following example shows how to configure an edge device to register to an adjacency server in a unicast-core network:

```
Device> enable
Device# configure terminal
Device(config)# interface overlay 1
Device(config-if)# otv use-adjacency-server 10.10.1.2 unicast-only
Device(config-if)# end
```

Additional References for OTV Adjacency Server

Related Documents

Related Topic	Document Title
Wide-area networking commands: complete command syntax, command mode, defaults, usage guidelines, and examples	Cisco IOS Wide-Area Networking Command Reference
Unicast-Only Transport Infrastructure	OTV Technology Introduction and Deployment Considerations
Configuring OTV Adjacency Servers	*Cisco Nexus 7000 Series NX-OS OTV Configuration Guide*

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for OTV Adjacency Server

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for OTV Adjacency Server

Feature Name	Releases	Feature Information
OTV Adjacency Server	Cisco IOS XE Release 3.9S	The OTV Adjacency Server feature enables you to provide unicast-only transport between edge devices when IP multicast is not available in the core network over which Overlay Transport Virtualization (OTV) runs. To use the OTV Adjacency Server feature, you configure one OTV edge device as a primary adjacency server and you can optionally configure another edge device as a secondary adjacency server as a backup. The remaining edge devices in the overlay network are configured to register to these adjacency servers. In Cisco IOS XE Release 3.9S, support was added for the Cisco ASR 1000 Series Routers and Cisco CSR 1000V Series Routers. The following commands were introduced or modified: **otv adjacency-server unicast-only**, **otv use-adjacency-server unicast-only**, **show otv adjacency-server replication-list**.