CHAPTER 12

VPN and VRF

This chapter describes the level of support that Cisco ANA provides for Virtual Private Networks (VPN) and Virtual Routing and Forwarding (VRF), as follows:

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- Information Model Objects (IMOs), page 12-2
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Technology Description

This section provides the following VPN and VRF technology descriptions:

- VRF
- VRF-Lite (Multi-VRF)
- 6VPE

Please see Part 1: Cisco VNEs in this guide for information about which devices support the various technologies.

VRF

Virtual Routing and Forwarding (VRF) is an IP technology that allows multiple instances of a routing table to coexist on the same router at the same time. Because the routing instances are independent, the same or overlapping IP addresses can be used without conflict. “VRF” is also used to refer to a routing table instance that can exist in one or multiple instances per each VPN on a Provider Edge (PE) router.

VRF-Lite (Multi-VRF)

VRF-Lite is an application based on VRF that extends the concept of VRF to the Customer Edge (CE) router on the customer’s premises. It supports multiple, overlapping, independent routing and forwarding tables per customer.

Any routing protocol supported by normal VRF can be used in a VRF-Lite CE implementation. The CE supports traffic separation between customer networks. As there is no MPLS functionality on the CE, no label exchange happens between the CE and PE.

6VPE

IPv6 on VPN to Provider Edge (6VPE, RFC 2547) permits IPv6 domains to communicate with each other over an IPv4 core network, without explicit tunnel setup, requiring only one IPv4 address per IPv6 domain. 6VPE operates much like a normal IPv4 MPLS VPN provider edge, but with the addition of IPv6 support within VRF. It lets service providers support IPv6 over operational IPv4 MPLS backbones without requiring dual-stacking within the MPLS core, representing a large cost savings over core re-engineering. Only PE equipment must be dual-stack, to support awareness of both IPv4 and IPv6 access devices. 6VPE provides logically separate routing table entries for VPN member devices.

Information Model Objects (IMOs)

This section describes the following IMOs:

- Virtual Routing Forwarding (VRF) Entity (IVrf)
- Virtual Routing Entry (IVrfEntry)
- Multi Protocol BGP Entity (IMpBgp)
- Equivalent Cross Virtual Routing Entry (ICrossVrf)
- Cross Virtual Routing Entry (ICrossVrfRoutingEntry)

Virtual Routing Forwarding (VRF) Entity

The Virtual Routing Forwarding (VRF) Entity object describes the routing and address resolution protocols' independent forwarding component of a MPLS-BGP based VPN router. It is bound by its Logical Sons attribute to all the Network layer IP Interface objects among which it is routing IP packets.

Table 12-1 Virtual Routing Forwarding (VRF) Entity (IVrf)

Attribute Name	Attribute Description	Scheme	Polling Interval
Virtual Routing Table	Array of Equivalent Routing Entries	IPCore	Configuration
Exported Route Targets	Array of route target identifiers	IPCore	Configuration
Imported Route Targets	Array of route target identifiers	IPCore	Configuration
Address Families	List of the address families (IPv4, IPv6, or both)	IPCore	Configuration
Route Distinguisher	Route distinguisher	IPCore	Configuration
ARP Entity	Address Resolution Entity (ARP Entity) (see Internet Protocol)	IPCore	Configuration
Name	VRF name	IPCore	Configuration
Logical Sons	Array of all IP Interfaces among which this Virtual Routing Forwarding (VRF) Entity is routing IP packets	IPCore	N/A
Description	Description of the VRF	IPCore	Configuration

Table 12-1 Virtual Routing Forwarding (VRF) Entity (IVrf) (continued)

Attribute Name	Attribute Description	Scheme	Polling Interval
Import Route-map	Name of the VRF import route map used to import IP prefixes into the VRF.	IPCore	Configuration
Export Route-map	Name of the VRF export route map used to export IP prefixes from the VRF.	IPCore	Configuration

Virtual Routing Entry

The Virtual Routing Entry object describes a routing table's entries.

Table 12-2 Virtual Routing Entry (IVrfEntry)

Attribute Name	Attribute Description	Scheme	Polling Interval
Next Hop BGP Address	Next hop BGP IP address	IPCore	Configuration
Incoming and Outgoing Inner Label	Incoming and outgoing inner MPLS label	IPCore	Configuration
Outer Label	Outer MPLS label	IPCore	Configuration
Destination IP Subnet	Final destination IP subnet	IPCore	Configuration
Next Hop IP Address	Next hop IP address	IPCore	Configuration
Type	Route entry type (*Null, Other, Invalid, Direct, Indirect, Static*)	IPCore	Configuration
Routing Protocol Type	Routing protocol type (*Null, Other, Local, Network Managed, ICMP, EGP, GGP, Hello, RIP, IS-IS, ES-IS, Cisco IGRP, BBN SPF IGP, OSPF, BGP, EIGRP*)	IPCore	Configuration
Outgoing Interface Name	Outgoing IP interface name	IPCore	Configuration

Multi Protocol BGP Entity

The Multi Protocol BGP Entity object describes the BGP component of a MPLS-BGP based VPN router. It is bound by its Logical Sons attribute to all Virtual Routing Forwarding (VRF) Entity objects among which it is routing IP packets.

Table 12-3 Multi Protocol BGP Entity (IMpBgp)

Attribute Name	Attribute Description	Scheme	Polling Interval
BGP Identifier	Border Gateway Protocol (BGP) identifier	IPCore	Configuration
Local Autonomous System	Local peer autonomous system	IPCore	Configuration
Cross Virtual Routing Table	Array of Equivalent Cross Virtual Routing Entry	IPCore	Configuration
BGP Neighbors	Array of BGP neighbor entries (see Routing Protocols)	IPCore	Configuration
Logical Sons	Array of all Virtual Routing Forwarding (VRF) Entity objects among which this Multi Protocol BGP Entity is routing IP packets	IPCore	N/A

Equivalent Cross Virtual Routing Entry

The Equivalent Cross Virtual Routing Entry and Cross Virtual Routing Entry objects describe the first dimension of a cross virtual routing table, as an array of Cross Virtual Routing Entry objects sharing a single Virtual Routing Forwarding (VRF) Entity destination.

Table 12-4 Equivalent Cross Virtual Routing Entry (ICrossVrf)

Attribute Name	Attribute Description	Scheme	Polling Interval
Virtual Routing Entries	Array of Cross Virtual Routing Entry objects sharing a single destination	IPCore	Configuration
Virtual Routing Entity Name	Virtual Routing Entity (VRF) name	IPCore	Configuration

Cross Virtual Routing Entry

Table 12-5 Cross Virtual Routing Entry (ICrossVrfRoutingEntry)

Attribute Name	Attribute Description	Scheme	Polling Interval
Outgoing Virtual Routing Entity Identifier	Outgoing virtual routing entity Object Identifier (OID)	IPCore	Configuration
Incoming and Outgoing Virtual Routing Tags	Incoming and outgoing virtual routing tags	IPCore	Configuration
Destination IP Subnet	Final destination IP subnet	IPCore	Configuration
Next Hop IP Address	Next hop IP address	IPCore	Configuration
Type	Route entry type (*Null, Other, Invalid, Direct, Indirect, Static*)	IPCore	Configuration
Routing Protocol Type	Routing protocol type (*Null, Other, Local, Network Managed, ICMP, EGP, GGP, Hello, RIP, IS-IS, ES-IS, Cisco IGRP, BBN SPF IGP, OSPF, BGP, EIGRP*)	IPCore	Configuration
Outgoing Interface Name	Outgoing IP interface name	IPCore	Configuration

Vendor-Specific Inventory and IMOs

There are no vendor-specific inventory or IMOs for this technology.

Network Topology

Cisco ANA discovers MPLS-BGP-based VPN network topology by searching for the existence of the local Virtual Routing Forwarding (VRF) Entity's imported route targets in any remote side's VRF entity exported route targets.

Please see Chapter 38, "Cisco ANA VNE Topology".

Service Alarms

There are no faults or alarms associated with this technology.