CHAPTER 3

Routing Protocols “BGP/OSPF”

This chapter describes the level of support that Cisco ANA provides for BGP/OSPF, as follows:

Technology Description

BGP

The Border Gateway Protocol (BGP) is an inter-autonomous system routing protocol. An autonomous system is a network or group of networks under a common administration and with common routing policies. BGP is used to exchange routing information for the Internet and is the protocol used between Internet Service Providers (ISP). Customer networks, such as universities and corporations, usually employ an Interior Gateway Protocol (IGP) such as RIP or OSPF for the exchange of routing information within their networks. Customers connect to ISPs, and ISPs use BGP to exchange customer and ISP routes. When BGP is used between Autonomous Systems (AS), the protocol is referred to as External BGP (EBGP). If a service provider is using BGP to exchange routes within an AS, then the protocol is referred to as Interior BGP (IBGP).

BGP is a very robust and scalable routing protocol, as evidenced by the fact that BGP is the routing protocol employed on the Internet. To achieve scalability at this level, BGP uses many route parameters, called attributes, to define routing policies and maintain a stable routing environment. BGP neighbors exchange full routing information when the TCP connection between neighbors is first established. When changes to the routing table are detected, the BGP routers send to their neighbors only those routes that have changed. BGP routers do not send periodic routing updates, and BGP routing updates advertise only the optimal path to a destination network.

MP-BGP

The Multi-Protocol BGP feature adds capabilities to BGP to enable multicast routing policy throughout the Internet and to connect multicast topologies within and between BGP autonomous systems. That is, multi-protocol BGP is an enhanced BGP that carries IP multicast routes. BGP carries two sets of routes, one set for unicast routing and one set for multicast routing. The routes associated with multicast routing are used by the Protocol Independent Multi-cast (PIM) to build data distribution trees.

OSPF

Open Shortest Path First (OSPF) is a routing protocol developed for Internet Protocol (IP) networks by the Interior Gateway Protocol (IGP) working group of the Internet Engineering Task Force (IETF). It was derived from several research efforts, which among other includes the early version of OSI’s Intermediate System to Intermediate System (IS-IS) routing protocol.

OSPF has two primary characteristics. The first is that the protocol is open, which means that its specification is in the public domain (RFC 1247). The second principal characteristic is that OSPF is based on the Shortest Path First (SPF) algorithm, which sometimes is referred to as the Dijkstra algorithm, named for the person credited with its creation.

OSPF is a link-state routing protocol that calls for the sending of Link-State Advertisements (LSAs) to all other routers within the same hierarchical area. Information on attached interfaces, metrics used, and other variables are included in OSPF LSAs. As OSPF routers accumulate link-state information, they use the SPF algorithm to calculate the shortest path to each node.

Inventory and Information Model Objects (IMOs)

This section includes the following tables:

- BGP Neighbor Entry (IBgpNeighbourEntry)
- OSPF Entry (IOspfEntry)

BGP Neighbor Entry

The following BGP Neighbor Entry object describes both the configuration and the outcome information of running the Border Gateway Protocol (BGP) within a group of participating routers within a BGP Neighborhood. It contains information about the connection with a remote BGP peer. It is the entry of the BGP Neighbors Table attribute of the Multi Protocol BGP Entity object (see Virtual Private Networks “VPNs”), representing the BGP routing service concept in the IMO.

Table 3-1 BGP Neighbor Entry (IBgpNeighbourEntry)

Attribute Name	Attribute Description
Remote Identifier	Identifier of the remote peer (*IP Address*)
Neighbor Type	Neighbor type (*Null, Client, Non Client)*
Distributing Interface	Distributing IP interface
Remote Address	Remote peer IP address
Remote Autonomous System	Remote peer autonomous system

Table 3-1 BGP Neighbor Entry (IBgpNeighbourEntry) (continued)

Attribute Name	Attribute Description
Status	Status (*Null, Idle, Connect, Active, Open Sent, Open Confirm, Established*)
Hold Time	Established hold time in seconds
Keep Alive Time	Established keep alive time in seconds

OSPF Entry

The following OSPF Entry object describes both the configuration and the outcome information of running a single Open Shortest Path First (OSPF) protocol interface within a group of participating OSPF routers and it is aggregated by a Traffic Descriptor Container object (see Common (Shared by Several)).

Table 3-2 OSPF Entry (IOspfEntry)

Attribute Name	Attribute Description
Area Identifier	Area identification (*IP Address*)
IP Address	IP address
Type	OSPF type (*Null, Broadcast, NBMA, Point-to-Point, Point-to-Multipoint*)
Administrative Status	Administrative status (*Null, Enabled, Disabled*)
Operational Status	Operational status (*Null, Down, Loop Back, Waiting, Point-to-Point, Designated Router, Backup Designated Router, Other Designated Router*)

Network Topology

The discovery of Border Gateway Protocol (BGP) Neighborhood topology is done by comparing BGP router parameters on either side of potential BGP neighbors. In particular a comparison is made between the local and remote BGP router identification and autonomous system as well as the connection states on both sides.

Service Alarms

The following alarms are supported for this technology:

- BGP Neighbor Loss/BGP Neighbor Found
- BGP Process Down/BGP Process Up

Note For a detailed description of these alarms and for information about correlation see the *Cisco Active Network Abstraction Fault Management User Guide, 3.6.*