OSPF · PART 1 Protocol Header

packetlife.net

Attributes

8 16 24 32

Version Type Length

Router ID

Area ID

Checksum Instance ID Reserved

Data

Link State Advertisements

Router Link (Type 1)

Lists neighboring routers and the cost to each; flooded within an area Network Link (Type 2)

Type

Algorithm

Metric

AD

Standard

Protocols

Transport

Authentication AllSPF Address AllDR Address

Link-State

Dijkstra

Cost (Bandwidth) 110

RFC 2328, 2740 IP

IP/89

Plaintext, MD5 224.0.0.5

224.0.0.6

Generated by a DR; lists all routers on an adjacent segment; flooded within an area

Network Summary (Type 3)

Generated by an ABR and advertised among areas

ASBR Summary (Type 4)

Injected by an ABR into the backbone to advertise the presence of an ASBR within an area

External Link (Type 5)

Metric Formula

cost = 100,000 Kbps\*

link speed

\* modifiable with

ospf auto-cost reference-bandwidth Adjacency States

Generated by an ASBR and flooded throughout the AS to advertise a 1

route external to OSPF

2

NSSA External Link (Type 7)

Generated by an ASBR in a not-so-stubby area; converted into a

3

type 5 LSA by the ABR when leaving the area

4

Down

Attempt Init

2-Way

5 6 7 8

Exstart

Exchange Loading Full

Router Types

Internal Router

All interfaces reside within the same area

Backbone Router

A router with an interface in area 0 (the backbone)

Area Border Router (ABR) Connects two or more areas

AS Boundary Router (ASBR) Connects to additional routing domains; typically located in the backbone

Area Types

Standard Area

Default OSPF area type

Stub Area

External link (type 5) LSAs are replaced with a default route

Totally Stubby Area

Type 3, 4, and 5 LSAs are replaced with a default route

Not So Stubby Area (NSSA) A stub area containing an ASBR; type 5 LSAs are converted to type 7 within the area

DR/BDR Election

· The DR serves as a common point for all adjacencies on a multiaccess segment

· The BDR also maintains adjacencies with all routers in case the DR fails

· Election does not occur on point-to point or multipoint links

· Default priority (0-255) is 1; highest priority wins; 0 cannot be elected

· DR preemption will not occur unless

External Route Types

E1 · Cost to the advertising ASBR plus the external cost of the route E2 (Default) · Cost of the route as seen by the ASBR

Troubleshooting

the current DR is reset

Virtual Links

· Tunnel formed to join two areas across an intermediate

· Both end routers must share a

show ip [route | protocols] show ip ospf interface show ip ospf neighbor

show ip ospf border-routers show ip ospf virtual-links debug ip ospf […]

common area

· At least one end must reside in area 0 · Cannot traverse stub areas

by Jeremy Stretch v2.1

OSPF · PART 2

Network Types

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Nonbroadcast (NBMA)

Multipoint Broadcast

Multipoint

Nonbroadcast Broadcast Point-to-Point

DR/BDR Elected Neighbor Discovery Hello/Dead Timers Defined By

Supported Topology

Yes

No

30/120

RFC 2328 Full Mesh

No

Yes

30/120

RFC 2328 Any

No

No

30/120 Cisco

Any

Yes

Yes

10/40

Cisco

Full Mesh

No

Yes

10/40

Cisco

Point-to-Point

Configuration Example

interface Serial0/0

Router A

WAN

172.16.0.0/18 A

Area 0 Backbone

Area 9

Totally Stubby Area

description WAN Link

ip address 172.16.34.2 255.255.255.252 !

interface FastEthernet0/0

description Area 0

ip address 192.168.0.1 255.255.255.0 !

interface Loopback0

! Used as router ID

Area 1

Stub Area

interface Ethernet0/0 description Area 0

BC

Area 2

Standard Area

ip address 10.0.34.1 255.255.255.0

!

router ospf 100

! Advertising the WAN cloud to OSPF

redistribute static subnets

network 192.168.0.0 0.0.0.255 area 0

!

! Static route to the WAN cloud

ip route 172.16.0.0 255.255.192.0 172.16.34.1

Router B Router C interface Ethernet0/0

description Area 9

ip address 192.168.0.2 255.255.255.0 ip ospf 100 area 0

!

interface Ethernet0/1

description Area 2

ip address 192.168.2.1 255.255.255.0 ip ospf 100 area 2

! Optional MD5 authentication configured ip ospf authentication message-digest ip ospf message-digest-key 1 md5 FooBar ! Give B priority in DR election ip ospf priority 100

!

interface Ethernet0/2

description Area 1

ip address 192.168.1.1 255.255.255.0 ip ospf 100 area 1

!

interface Loopback0

ip address 10.0.34.2 255.255.255.0 !

router ospf 100

! Define area 1 as a stub area

area 1 stub

! Virtual link from area 0 to area 9 area 2 virtual-link 10.0.34.3

ip address 192.168.9.1 255.255.255.0 ip ospf 100 area 9

!

interface Ethernet0/1

description Area 2

ip address 192.168.2.2 255.255.255.0 ip ospf 100 area 2

! Optional MD5 authentication configured ip ospf authentication message-digest ip ospf message-digest-key 1 md5 FooBar ! Give C second priority (BDR) in election ip ospf priority 50

!

!

!

!

!

!

interface Loopback0

ip address 10.0.34.3 255.255.255.0 !

router ospf 100

! Define area 9 as a totally stubby area area 9 stub no-summary

! Virtual link from area 9 to area 0 area 2 virtual-link 10.0.34.2

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