OSPF Cheat Sheet

WWW.NETWORKINGINFO.IN

Version 1.0
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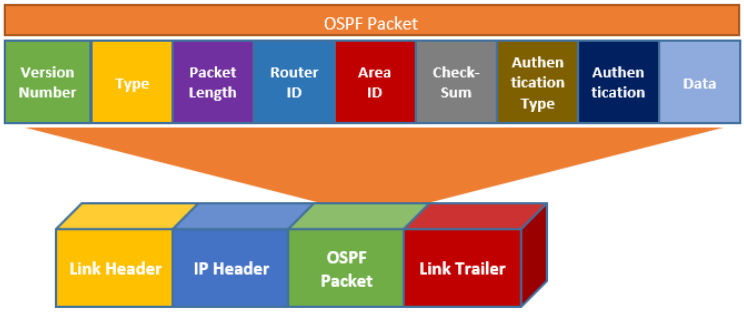
Stands for – Open Shortest Path First

Characteristics and Key features	
Protocol Type	Open Standard Link State
Algorithm	Dijkstra's (Shortest Path First)
Transport Protocol	IP and Port number - 89
LSA	LSA is sent every time if something changes
Metric	**Cost (Bandwidth)**
Multicast	All Routers- **224.0.0.5,** All DRs - **224.0.0.6**
Authentication	Null, Plain Text, MD5
Administrative Distance	110
VLSM Support	Yes, It is a classless routing protocol
Convergence	Fast Convergence
Load Balancing	Equal Load Balancing
Hop Count	No Hop count concept



Metric Calculation
Cost = 10^8/bandwidth in bps
● 10^8 is known as the reference bandwidth

Packet types	
Hello	Discovers neighbors and maintain adjacency
DBD	Describes the contents of an OSPF Router's link-state database
Link-state-request	Request to update the link-state-database
Link-state-update	Update like link-state-advertisement to a neighbour
Link-state-acknowledge	Acknowledgment from recipient

Link type	Hello	Dead Int
NBMA	30 sec	120 sec
Multi-access and P2P	10 sec	40 sec

OSPF Tables	
Neighbour Table	Keeps neighbor information
Database Table	Keeps all the known routes.
Routing Table	Keeps best path information

OSPF Link-State-Update Types	Covering only most useful LSAs
Router LSA	Generated by each router for each area it belongs to
Network LSA	Generated by DR on every multi-access Network
Summary LSA	Originated by ABR
ASBR Summary	Originated by ABR but describes the reachability to the ASBRs
External Link	Originated by the ASBR
NSSA External	Originated by ASBR in NSSA

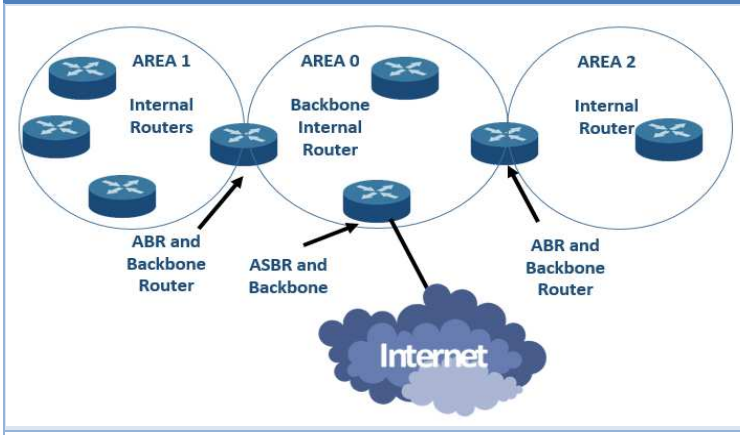
Eligibility to become a neighbour

All Routers must agree to become a neighbour

- Same Area ID
- Same Subnet
- Same Authentication
- Same Hello and Dead Interval
- Same Area type
- Unique Router ID

Neighbour State	
Down	No Hello received
Attempt	Only valid for a manually configured neighbor in an NBMA
Init	Hello received but without Router-ID
2-Way	Hello received with Router-ID and Election of DR, BDR
Exstart	Master-slave between DR and BDR which indicate who is going to start exchange first.
Exchange	Exchanges DBD packet containing only LSA headers.
Loading	Exchanges full link state information and that contains All the DBD
Full	Indicates that everything is working normally and databases are fully synchronized

OSPF Router Types



Backbone Internal: A router with at least one interface in Area 0

Internal Router: All interfaces participate in the same area

Area Border Router: Connects two or more areas

ASBR: Connects OSPF domain to external routing domain. A router running at least two routing processes.

OSPF DR BDR Election Criteria

1. Highest Priority (Default is 1) (0 means no DR, BDR)
2. Highest Router ID (32bit number)
3. Highest Loopback IP
4. Highest Physical Interface IP

OSPF Network Types

Broadcast	DR, BRD Election Hello/Dead = 10/40
Non-Broadcast	DR, BDR Election Hello/Dead = 30/120 Unicast Neighborship
Point-to-Point	No DR, BDR Election Hello/Dead = 10/40
Point-to-Multipoint	No DR, BDR Election Hello/Dead = 30/120
Point-to-Multipoint Non-Broadcast	No DR, BDR Election Hello/Dead = 30/120 Unicast Neighborship
Loopback	No DR, BDR Hello/Dead = 10/40

Route Types and Preferences

Intra-Area	Routes coming from the same area, Denoted by "O"
Inter-Area	Routes coming from different areas. Denoted by "I OA"
External	A route to a network that is external to the OSPF routing domain. Denoted by "E1", "E2" E1 - Metric cost to the ASBR + External cost of the route E2 – Same cost as it was advertised by ASBR **(Default)**
Route Preferences	1. Intra-Area > Inter Area 2. Inter-Area > External type-1 (E1) 3. External Type-1 > External Type-2

Why OSPF Areas?

OSPF runs the SPF algorithm which requires a lot of processing power and memory. If the size of a network grows it can cause slower convergence and can become a nightmare for a router to handle it

To the solution, we configure two types of areas

1. Backbone (Area 0)
2. Non-backbone (Area other than 0)

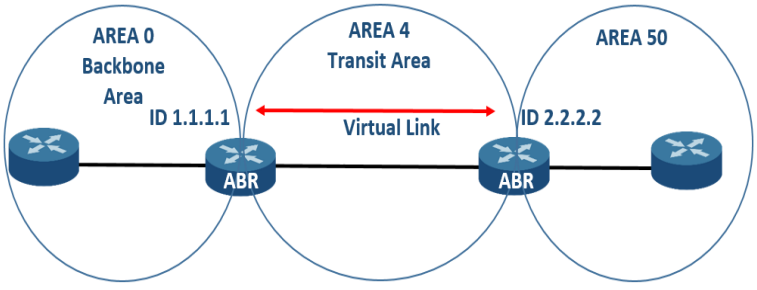
Note – All non-backbone areas must have at least one connection to the Backbone area.

OSPF Area Types

Normal Area	Default OSPF Area
Stub Area	Stops Type 4 and Type 5 LSA but replaces them with a type 3 default route
Totally Stubby Area	Stops Type 3, 4 and Type 5 LSA but replaces them with a Type 3 default route
Not so Stubby Area	NSSA allows Type-5 to be advertised into the OSPF in the form of Type-7 while retaining the characteristics of a stub area to the rest of the OSPF AS.
NSSA Totally Stubby	Allows only summary default routes and filters everything else

OSPF Virtual Link

All areas must be physically connected to the backbone area 0. If not, then we make a virtual link to form a tunnel to join two areas. Transit area cannot be a stub area.



OSPF Configuration commands

! Enabling OSPF
R1(config)# Router OSPF **<1-65535>**

! Enable routing on an IP network
R1(config-router)# network <**IP address**><**wildcard mask**>

! Defining auto-cost reference bandwidth
R1(config-router)# auto-cost reference-bandwidth **<in mbps>**

! Defining the router ID
R1(config-router)# router-id **<A.B.C.D>**

! Defining the distance
R1(config-router)# distance **<1-255>**

! Suppress routing updates on an interface
R1(config-router)# passive-interface **<Interface Name>**

! Injecting default route
R1(config-router)# default-information originate
Below command only when we don't have default-route configured
R1(config-router)# default-information originate always

! Defining stub area
! Below command is on all the routers in the area
R1(config-router)# area <Area ID> stub

! Defining Totally Stubby Area
! Below command is on ABR
R1(config-router)# area <Area ID> stub no-summary
! Below command is on all other routers in the area
R2(config-router)# area <Area ID> stub

! Redistribute information from another routing protocol
R1(config-router)# redistribute **{bgp|connected|eigrp|rip|static}** subnets

! Enabling virtual-link
1(config-router)# area **<Area ID>** virtual-link **<dst router-id>**

OSPF Interface level commands
! Enable OSPF on the interface
R1(config-if)# ip OSPF **<process ID>** area **<Area ID>**

! Peform MD5 authentication
R1(config-if)# ip ospf authentication message-digest
R1(config-if)# ip ospf message-digest-key **<Key-ID>** md5 **<string>**

! Configure OSPF Hello interval and Dead interface
R1(config-if)#ip ospf hello-interval <**seconds**>
R1(config-if)#ip ospf dead-interval <**seconds**>

! Changing OSPF network types
R1(config-if)# ip ospf network **{point-to-point|broadcast|non-broadcast|point-to-multipoint no-broadcast}**

! Changing the OSPF priority
R1(config-if)# ip OSPF priority **<0-255>**

Verification and troubleshooting command
Show ip ospf neighbor
Show ip ospf database
Show ip ospf interface {brief | <Interface ID>
Show ip protocols
Show ip ospf virtual-link
Debug ip ospf {hello | adj | events}
Show ip ospf border-routers
Show ip ospf <process-id>