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Comparative Analysis of OSPF and Is- Is Routing Protocols with Service Provider Network

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ABSTRACT

OSPF and IS-IS both are the link state routing protocols. Both IS-IS and OSPF use the same algorithm known as Djkstra Algorithm. Basically uses as a interior gateway protocol in internet service provider (ISP). Open shortest path first (OSPF) has its own mechanism and the protocol number is 89. There are two multicasting addresses used by the protocol, one is 224.0.0.5 uses for shortest path first routers and another one 224.0.0.6 uses for designated router and back designated router (DR/BDR). Each ospf routers stores routing and topology information in three tables Neighbor table, Topology table, Routing table. Basically OSPF uses the concept of area. An area is a logically group of network and routers. Area 0 represents the backbone. If any area wants to communicate with each other firstly interact with area 0. A router that has interface in more than one area (area 0 and area 1) called Area Border Router (ABR). Other routing domain networks like Eigrp connects with ospf network called Autonomous System Border Router (ASBR). Intermediate System to Intermediate System (IS-IS) basically designed to move the information reliable within the group of physical connected computer or similar device. It helps to determine the best path or route through the packet switched networks. IS-IS protocol does not carry the ip route. IS-IS basically uses the hierarchical structure with level 1 and level 2 router type. Level 1 router behaves same like intra area routers or having no direct connection outside of its area. Level 2 routers compromise the backbone area which connects different areas similar to ospf area 0. IS-IS uses the hello timer interval upto 10 seconds and dead timer interval upto 30 seconds.BGP uses BGP path attributes (PA) for several purposes. PAs define information about apath, or route, through a network. Border gateway protocol (BGP) use to connect the internet service provider to exchange the routing information. Enterprises and all ISPs use BGP to exchange the routing table.

Keywords: Open Shortest Path First(OSPF), Intermediate System to Intermediate System(IS-IS), Link State Routing Protocols, Shortest Path First(SPF), Link State Advertisement(LSA), Link State Update(LSU), Link state acknowledgment (LS Ack), Link State Protocol Data Unit (LSPDU), BGP path attributes, AS Path attributes.

I.   INTRODUCTION

IP Routing: IP Routing: Routing is defined as when packets are exchanged from one device to another device using network. After that configure the logical network address, such as IP addresses, to all the hosts in the internetwork. In the internetwork router learn about the remote device from the neighbor routers or from an administrator.

Basically, two types of dynamic routing protocol in internet protocol based networks:

- Interior Gateway Protocols – used within an autonomous system for IP routing.
- Exterior Gateway Protocols – used to interact or share the routes between the different autonomous systems.

Interior Gateway Protocol is further divided into two categories:

A.   Distance Vector Protocol

These type of protocols are based on two algorithms that are Bellman-Ford or Ford-Fulkerson. The distance vector protocols choose the best path to a remote network by judge the distance. Each time least number of hops (routers) is determined to be the best route. This Protocol includes – Routing Information Protocol (RIP), Enhanced Interior Gateway Routing Protocol (EIGRP), an advance distance-vector routing protocol use DUAL Algorithms.

B. Link State Protocols

Link State Protocols are always uses the shortest path first algorithm (SPF) by E.W. Dijkstra. Each router creates three

tables. One of these keeps the directly attached routers or directly neighbor tables, one is used to determine the topology of the entire networks and another one is used as a routing table. Routers share their route/link information in the form of Link State Advertisements, or Link State PDU (LSP). This Protocol includes – Open Shortest Path First (OSPF), Intermediate-System-to-Intermediate-System (IS-IS).
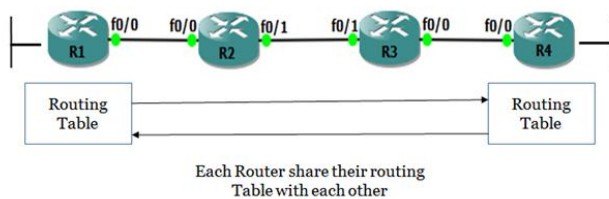

Fig. 1: Distance vector routing protocol

1) *Intermediate System to Intermediate System (IS-IS):*

It is a type of link state routing protocol similar to OSPF, used in SP networks core. It is a part of CLNS stack, Integrated IS-IS is an IP extension of IS-IS and was not an IP protocol originally. It supports both IPv4 and IPv6. IS-IS uses Dijkstra's Shortest Path First algorithm to find the best path. IS-IS uses different addressing format and OSPF uses different addressing format. It uses ISO NSAP Addressing format, the maximum size is 20 bytes and 8 bytes minimum size. It uses two "levels" of adjacency - Level 2(L2) and Level 1(L1). It support both IP and CLNP application and IS-IS is robust protocol.

2) *Open Shortest Path First (OSPF):*

Open Shortest Path First is a link state routing protocol and deployed in service provider networks. Network is divided into different areas. OSPF uses Dijkstra's SPF algorithm to find the best path towards destination. Area 0 is known as backbone area, every area o connects with any other area except area 0, they have to interact via area 0 as transit area. OSPF shares routes from one area to another area then OSPF behaves like a distance vector routing protocol.

3) *Exterior Gateway Protocols:*

BGP uses BGP path attributes (PA) for several purposes. PAs define information about a path, or route, through a network. Some BGP PAs describe information that can be useful in choosing the best BGP route, using the best path algorithm; BGP also uses some other PAs for other purposes besides

choosing the best path. Border gateway protocol (BGP) use to connect the internet service provider to exchange the routing information. Enterprises and all ISPs use BGP to exchange the routing table.BGP routers also prevent routing loops using the ASNs listed in the AS Path. The router ignores that route, when a BGP router receives an update, and a route advertisement lists an AS Path with its own ASN. The reason behind that, to believe the route, the route has already been advertised through the local ASN and then advertise it further might cause routing loops.

II. LITERATURE SURVEY

D. Oran[1] has presented information exchange between systems IS to IS Intra-Domain routing exchange protocol for use in Conjunction with the Protocol for providing the Connectionless- mode Network Service Technologies.

H. Ould-Brahim, et al.[2] describes latest BGP attribute, the Traffic Engineering attribute, that enables BGP to carry Traffic Engineering information. The scope of this attribute excludes its use for non-VPN reachability information

J. Moy[3] it is designed to be implement internally to a single Autonomous System. Each OSPF router has an identical database describing the Autonomous System's topology. A routing table is calculated from this database by constructing a SP tree. OSPF again calculates routes quickly in the face of topological changes. OSPF gives support for equal-cost multipath.

K. Lougheed, et al.[4] has presented a Proposed Standard for an inter-autonomous system routing protocol for the Internet.

Lindem, et al.[5] has presented the OSPFv2 Instance ID to enable another OSPFv2 protocol instances on the same interface. Unlike OSPFv3 where the Instance ID can be used for multiple purposes.

M. Bhatia, et al.[6] has presented the new OSPFv2 cryptographic authentication mechanism is vulnerable to both inter-session and intrasession replay attacks. The existing cryptographic authentication mechanism does not cover the IP header.

P. Murphy[7] has presented an optional type of OSPF area that is referred to as "not-so-stubby" area. NSSAs are same as the existing OPSF stub area configuration option with additional capability of importing AS external routes.

R. Coltun et al.[8] has presented the modifications to OSPF to support version 6 of the Internet Protocol. The fundamental mechanisms of OSPF Designated Router election, area support, Shortest Path First, remain same. Due to changes in protocol semantics between IPv4 and IPv6, some changes have been necessary or to handle the increase address size of IPv6. These modifications will incrementing the protocol version from version 2 to version 3.

Toni Farley, et al. [9] describes for providing relatively stable interdomain routing, BGP has been quite successful. TCP MD5 Signatures, serve to add much needed security measures enhancements to the protocol.

Y. Rekhter, et al.[11] has presented an inter-autonomous system routing protocol for the Internet. A BGP-4 defines the BGP protocol specification and this document describes the usage of the BGP in the Internet.

III.   TYPES OF LINK STATE PROTOCOLS

A. Intermediate System to Intermediate System (IS-IS)

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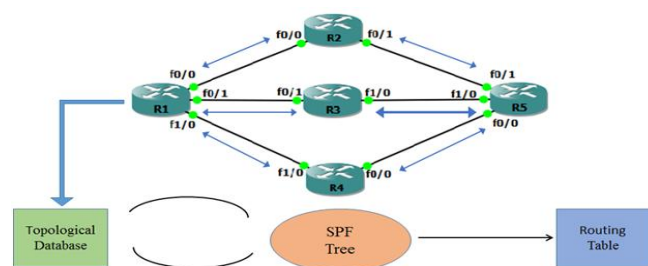

Fig. 2: Link state routing protocol

C. Exterior Gateway Protocols

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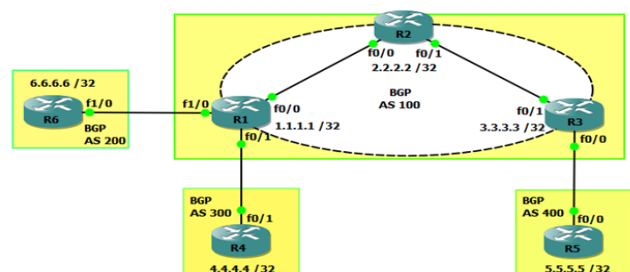

Fig. 3: Exterior gateway protocol

IV. CONCLUSION

Both link state routing protocols uses in the internet service provider because of bulk of features in it. Where auto configration requirement is essential in the network just plug in a router it automatically use OSPFv3 for intra domain routing. Intermediate system to intermediate system (IS-IS) provide the information regarding flooding to all its peers however the current flooding scopes are limited in the domain scope or area scope. Many instances allow the isolation of all the resources that is directly attached with each instance.

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