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A REVIEW ON FAST CONVERGENCE SCHEME IN OSPF NETWORK

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Abstract- This paper proposes a fast-convergence scheme to update metrics without loop in Open Shortest Path First (OSPF) networks. In OSPF networks, while updating the metrics to improve the routing performance, packets may be routed in a loop in transient states. This results in packet loss and inefficiency in network resources. To avoid transient loops, a conventional scheme gives priority to each router to update metrics. When the updated metrics include both larger and smaller values than the ones before the update, it requires two updating processes, each of which contains either larger or smaller values. It takes time to converge to update all the metrics in the conventional scheme. This paper includes introduction, advantages, limitations and applications, comparison of OSPF with RIP, OSPF Areas and Routers, OSPF network types and convergence scheme in OSPF.

Keywords- Convergence, Routing, Loops, Metrics, OSPF networks, RIP.

I. INTRODUCTION

Open Shortest Path First (OSPF) is a routing protocol used to determine the correct route for packets within IP networks. It uses a link state routingalgorithm and falls into the group of interior routing protocols, operating within a single autonomous system (AS). OSPF detects changes in the topology, such as link failures, and converges on a new loop-free routing structure within seconds. It computes the shortest path tree for each route using a method based on Dijkstra's algorithm, a shortest path first algorithm.An OSPF network may be structured, or subdivided, into routing area to simplifyadministration and optimize traffic and resource utilization. OSPF uses multicast addressing for route flooding on a broadcast domain.As a link state routing protocol, OSPF establishes and maintains neighbor relationships for exchanging routing updates with other routers.

1.1 Advantages

- OSPF supports Variable Length Subnet Masks (VLSM).
- Smaller routing tables
- Changes in an OSPF network are propagated quickly.
- Easier for multi-vendor integration (due to open standard). Redistribution not needed between vendors. Possibly cheaper if using competing vendor hardware.

1.2 Limitations

- OSPF is very processor intensive.
- OSPF maintains multiple copies of routing information, increasing the amount of memory needed.
- Using areas, OSPF can be logically segmented (this can be a good thing and a bad thing).

1.3 Applications

OSPF was the first widely deployed routing protocol that could converge a network in the low seconds, and guarantee loop-free paths. It has many features that allow the imposition of policies about the propagation of routes that it may be appropriate to keep local, for load sharing, and for selective route importing more than IS-IS. IS-IS, in contrast, can be tuned for lower overhead in a stable network, the sort more common in ISP than enterprise networks. There are some historical accidents that made IS-IS the preferred IGP for ISPs, but ISP's today may well choose to use the features of the now-efficient implementations of OSPF,after first considering the pros and cons of IS-IS in service provider environments.

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As mentioned, OSPF can provide better load-sharing on external links than other IGPs. When the default route to an ISP is injected into OSPF from multiple ASBRs as a Type I external route and the same external cost specified, other routers will go to the ASBR with the least path cost from its location. This can be tuned further by adjusting the external cost.In contrast, if the default route from different ISPs is injected with different external costs, as a Type II external route, the lower-cost default becomes the primary exit and the higher-cost becomes the backup only.

The only real limiting factor that may compel major ISPs to select IS-IS over OSPF is if they have a network with more than 850routers. There is mention of an OSPF network with over 1000 routers,but that is quite uncommon and the network must be specifically designed to minimize overhead to achieve stable operation.

II. COMPARISON OF OSPF WITH RIP

OSPF (Open Shortest Path First) is a routerprotocol used within larger autonomous system networks in preference to the Routing Information Protocol (RIP), an older routing protocol that is installed in many of today's corporate networks. Like RIP, OSPF is designated by the Internet Engineering Task Force (IETF) as one of several Interior Gateway Protocols (IGPs).

Using OSPF, a host that obtains a change to a routing table or detects a change in the network immediately multicasts the information to all other hosts in the network so that all will have the same routing table information. Unlike the RIP in which the entire routing table is sent, the host using OSPF sends only the part that has changed. With RIP, the routing table is sent to a neighbor host every 30 seconds. OSPF multicasts the updated information only when a change has taken place [1].

Rather than simply counting the number of hops, OSPF bases its path descriptions on "link states" that take into account additional network information. OSPF also lets the user assign cost metrics to a given host router so that some paths are given preference. OSPF supports a variable network subnet mask so that a network can be subdivided. RIP is supported within OSPF for router-to-end station communication. Since many networks using RIP are already in use, router manufacturers tend to include RIP support within a router designed primarily for OSPF.

III. OSPF ROUTER TYPES

3.1 Internal Routers

An internal router connects only to one OSPF area. All of its interfaces connect to the area in which it is located and does not connect to any other area.If a router connects to more than one area, it will be one of the following types of routers.

3.2 Backbone Routers

Backbone routers have one or more interfaces in Area 0 (the backbone area).

3.3 Area Border Router (ABR)

A router that connects more than one area is called an area border router or ABR. Usually an ABR is used to connect non-backbone areas to the backbone. If OSPF virtual links are used an ABR will also be used to connect the area using the virtual link to another non-backbone area.

3.4 Autonomous System Boundary Router (ASBR)

If the router connects the OSPF Autonomous System to another Autonomous System, it is called an Autonomous System Boundary Router (ASBR).
OSPF elects two or more routers to manage the Link State Advertisements [2].

3.5 Designated Router (DR)

Every OSPF area will have a designated router and a backup designated router. The Designated Router (DR) is the router to which all other routers within an area send their Link State Advertisements. The Designated Router will keep track of all link state updates and make sure the LSAs are flooded to the rest of the network using Reliable Multicast transport.

3.6 Backup Designated Router (BDR)

The election process which determines the Designated Router will also elect a Backup Designated Router (BDR). The BDR takes over from the DR when the DR fails.

IV. OSPF AREAS

OSPF areas are used to impose a hierarchical structure to the flow of data over the network. A network using OSPF will always have at least one area and if there is more than one area, one of the two areas must be the backbone area. OSPF has only 2 levels to its hierarchy, the backbone, and all other areas attached to it. Areas are used to group routers into

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manageable groups that exchange routing information locally, but summarize that routing information when advertising the routes externally. A standard OSPF network looks something like a big bubble (the backbone area) with a lot of smaller bubbles (stub areas) attached directly to it. Area Border Routers (ABR) are used to connect the areas. Each area will elect a designated router (DR) and a backup designated router (BDR) to assist in flooding Link State Advertisements (LSAs) throughout the area.

4.1 Backbone (Area 0)

The backbone is the first area you should always build in any network using OSPF and the backbone is always Area 0 (zero). All areas are connected directly to the OSPF backbone area. When designing an OSPF backbone area, you should make sure there is little or no possibility of the backbone area being split into two or more parts [3] by a router or link failure. If the OSPF backbone is split due to hardware failures or access lists, sizeable areas of the network will become unreachable.

4.2 Totally Stub Area

A totally stubby area is only connected to the backbone area. A totally stubby / totally stub area does not advertise the routes it knows [4]. It does not send any Link State Advertisements. The only route a totally stub area receives is the default route from an external area, which must be the backbone area. This default route allows the totally stub area to communicate with the rest of the network.

4.3 Stub Area

Stub areas are connected only to the backbone area. Stub areas do not receive routes from outside the autonomous system, but do receive the routes from within the autonomous system, even if the route [5] comes from another area.

4.4 Not-So-Stubby (NSSA)

Frequently, it is advisable to use a separate network to connect the internal enterprise network to the Internet. OSPF makes provisions for placing an Autonomous System Boundary Router (ASBR) within a non-backbone area. In this case, the stub area must learn routes from outside the OSPF autonomous system. Thus, a new type of LSA was required--the Type 7 LSA. Type 7 LSA's are created by the Autonomous System Boundary Router and forwarded via the stub area's border router (ABR) to the backbone. This allows the other areas to learn routes that are external to the OSPF routing domain.

4.5 *Virtual Links*

Virtual links are used when you have a network that must be connected to an existing OSPF system, but cannot be physically connected directly to the routers in the OSPF backbone area. You can configure an OSPF virtual link from the area to a backbone router, creating a virtual direct connection to the backbone area. This virtual link acts as a tunnel which forwards LSAs to the backbone via a second intermediate area.

V. OSPF METRICS

OSPF uses *path cost* as its basic routing metric, which was defined by the standard not to equate to any standard value such as speed, so the network designer could pick a metric important to the design. In practice, it is determined by the speed (bandwidth) of the interface addressing the given route, although that tends to need network-specific scaling factors now that links faster than 100 Mbit/s are common. Cisco uses a metric like 10^8/bandwidth (the base value, 10^8 by default, can be adjusted). So, a 100Mbit/s link will have a cost of 1, a 10Mbit/s a cost of 10 and so on. But for links faster than 100Mbit/s, the cost would be <1.

Metrics, however, are only directly comparable when of the same type. Four types of metrics are recognized. In decreasing preference, these types are (for example, an intra-area route is always preferred to an External route regardless of metric):

- Intra-area
- Inter-area
- External Type 1, which includes both the external path cost and the sum of internal path costs to the ASBR that advertises the route
- External Type 2, the value of which is solely that of the external path cost

VI. OSPF NETWORK TYPES

OSPF message addresses are determined by the type of network to which the OSPF interface is connected. One of the

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following OSPF network types must be selected when configuring an interface on an OSPF router.

6.1Broadcast

A network that can connect more than two routers with a hardware broadcast facility where a single packet sent by a router is received by all routers attached to that network. Ethernet, Token Ring, and FDDI are broadcast networks. OSPF messages sent on broadcast networks use IP multicast addresses.

6.2 Point-to-Point

A network that can connect only two routers. Leased-line WAN links such as Dataphone Digital Service (DDS) and T-Carrier are point-to-point networks. OSPF messages sent on point-to-point networks use IP multicast addresses.

6.3 Non-Broadcast Multiple Access

A network that can connect more than two routers but has no hardware broadcast facility. X.25, Frame Relay, and ATM are Non-Broadcast Multiple Access (NBMA) networks. Because multicasted OSPF messages do not reach all the OSPF routers on the network, OSPF must be configured to unicast to the IP addresses of the routers on the NBMA network.

VII. CONVERGENCE SCHEME IN OSPF

OSPF convergence is extremely fast when compared to other protocols; this was one of the main features included within its initial design. To keep this desirable feature fully functional in your network, you need to consider the three components that determine how long it takes for OSPF to converge:

- The length of time it takes OSPF to detect a link or interface failure
- The length of time it takes the routers to exchange routing information via LSAs, rerun the Shortest Path First algorithm, and build a new routing table
- A built-in SPF delay time of five seconds (default value)

Thus, the average time for OSPF to propagate LSAs and rerun the SPF algorithm is approximately 1 second. Then the SPF delay timer of five seconds must elapse. Therefor OSPF convergence can be a anything from 6 to 46 seconds, depending upon the type of failure, SPF timer settings, size of the network, and size of the LSA database. The worst case scenario is when a link fails but the destination is still reachable via an alternate route, because the 40 second default dead timer will need to expire before the SPF is rerun.

VIII. CONCLUSION

This paper described about OSPF networks and its convergence schemes to rapidly update metrics without loop in OSPF networks. This scheme transforms a set of the updated metrics into another equivalent set of metrics that are equal to or either larger or smaller values than the ones before the update, while the targeted routes in the proposed scheme are exactly the same as those of the conventional scheme.

References

[1] Pratik N. ,Katolkar Sneha R. Burnase, " New generation of Networking with OSPF"National Conference on Innovative Paradigms in Engineering & Technology(NCIPET-2012)Proceedings published by International Journal of Computer Applications® (IJCA).

[2] Douglas Comer, Internetworking with TCP/IP, Volume Principles, Protocols, and Architecture, 3rd Edition, Prentice Hall, 1995.

[3] http://en.wikipedia.org/wiki/Open_Shortest_Path_First.

[4] http://www.nongnu.org/quagga/docs/docs-info.html#OSPFv2

[5] Perlman, Radia (1999). Interconnections: Bridges, routers, switches, and Internetworking Protocols (2 ed.). Addison-Wesley.

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