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IMPROVED ROUTING ALGORITHM BETWEEN NODES ENABLING RIPNG AND OSPFV3 IN IPV6 WIDE AREA NETWORK

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Abstract- *An efficient dynamic routing protocol is necessary for the future broadband networks where a variety of Quality of Services are integrated. RIPng and OSPFv3 are the most frequently used dynamic routing protocols in the field of computer communication. This paper proposes an approach in which the outcome of deployment of RIPng and OSPFv3 on a network is explored on three aspects: a) variation of packet loss in RIPng and OSPFv3 network b) Variation of convergence time of RIPng and OSPFv3. c) Variation of latency in RIPng and OSPFv3 d) Variation of throughput in RIPng and OSPFv3. The various routing concepts are analyzed in IPv6 network in terms of packet loss and convergence time. Results manifest that the proposed approach yields better performance improvement over the existing strategies.*

Keywords- *IP networks, routing, QoS,Outputs Dijkstra algorithm.*

1. INTRODUCTION

The goal of this paper is to investigate the behavior of routing convergence. It begins with an explanation of IP addressing. The report discusses the two routing protocols: Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) into great detail. The report then examines the structure of a routing table and the route selection process.

In order to be practical in the investigation of the routing convergence, we perform an experiment that involved routers. It is assumed that an end customer requires redundancy for its Wide Area Network (WAN) connection. The customer purchases WAN connectivity from two different ISPs that are, running two different routing protocols hence routing information must be redistributed. We conduct the experiment such that network convergences under different failure situation are examined. We will also modify the timers of RIP and OSPF to inspect any improvement.

2. THE ROUTING PROTOCOL

RIP protocol is a distance vector routing protocol, which means it uses distance to determine the best path to the road from jumping to measure. Distance vector routing protocol packet sent to the terminal site is based on the number of decisions, the information provided by the neighboring router. Distance vector routing protocol is not suitable for hundreds of large-scale networks or routers need to be updated network. In large networks, routing table update process may be too long, so that the farthest router's routing table is unlikely to synchronize with other routing table update. In this case, the link state routing protocol is preferable to more. To use RIP protocol of the router, in a path can not be used when an alternative path must go through the decision process, this process is called convergence. RIP protocol spend a lot of time to convergence, which is a major issue. The RIP protocol recognizes that the path cannot be achieved, it is set to wait until it has missed six times updated a total of 180 seconds. Then, using the new path to update the routing table before it is to wait for another possible path for the next message to arrive. This means that the backup path to be used after at least 3 minutes, which for most applications is quite a long time. Another fundamental problem of RIP protocol is that when you select the path when it ignores the connection speed. Due to the limitations of RIP protocol, so in the larger network, often choose a routing protocol based on link state ---OSPF. OSPF is a link state routing protocol. This means that changes in routing the network routers based on the state of the physical connection and speed, and the change is immediately flooded to every router in the network. OSPF router through flood circular their links and communication received by the link state information. From this construct the network topology database. Each router by running the shortest path first algorithm (also known as Dijkstra algorithm) calculated the best route to reach the destination, and the lowest cost links add to the routing table. The OSPF convergence rate is quick, and the agreement itself overhead to a minimum, to adapt to networks of all sizes, up to thousands. OSPF uses Dijkstra algorithm and based on the improvements.

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3. IMPROVED DIJKSTRA ALGORITHM

Data stream through a router queuing delay from time to time, send delay, through a communication link propagation delay from time to time, but also consider the bandwidth factor, because the traffic congestion may result in additional delay. Dijkstra algorithm is the most efficient algorithm which is applicable to the calculation of all the paths, but it has only considered the cost of the edge, without considering the cost of the node can not be completely characterize the state of the network. Improved Dijkstra algorithm for edges and nodes in order to have a price graph *G*□*V*, *E*□, it is the shortest path algorithm from a given node *s* to other nodes in the graph. First, each node *i* in *G* assigns to the cost *c*□*i*□called the *i* tags. Initially, in addition to the node *s* is marked as fixed on the outer, all other marks are temporary. Each iteration will turn a temporary marker into a fixed mark. To show the difference, with $c^*(i)$ expressed the node *i* obtained the fixed mark. After finite iterations, all nodes of the mark will become a fixed mark, this time computing finished, obtains the shortest path tree.

4. OPERATION OF RIP

The Routing Information Protocol (RIP) is a distance-vector routing protocol, which employs the hop count as a routing metric. RIP prevents routing loops by implementing a limit on the number of hops allowed in a path from the source to a destination. The maximum number of hops allowed for RIP is 15. This hop limit, however also limits the size of networks that RIP can support. A hop count of 16 is considered an infinite distance and used to deprecate inaccessible, inoperable, or otherwise undesirable routes in the selection process.RIP implement

The split horizon, route poisoning and hold down mechanisms to prevent incorrect routing information from being propagated. These are some of the stability features of RIP. It is also possible to use the so called RMTI (Routing Information Protocol with Metric-based Topology Investigation) algorithm to cope with the count-to-infinity problem. With its help, it is possible to detect every possible loop with a very small computation effort.

Originally each RIP router transmitted full updates every 30 seconds. In the early deployments, routing tables were small enough that the traffic was not significant. As networks grew in size, however, it became evident there could be a massive traffic burst every 30 seconds, even if the routers had been initialized at random times. It was thought, as a result of random initialization, the routing updates would spread out in time, but this was not true in practice. Sally Floyd and Van Jacobson showed in 1994 that, without slight randomization of the update timer, the timers synchronized over time. In most current networking environments, RIP is not the preferred choice for routing as its time to converge and scalability are poor compared to EIGRP, OSPF, or IS-IS, and (without RMTI) a hop limit severely limits the size of network it can be used. However, it is easy to configure, because RIP does not require any parameters on a router unlike other protocols.

5. OPERATION OF OSPF

Open Shortest Path First (OSPF) is an adaptive routing protocol for Internet Protocol (IP) networks. It uses a link state routing algorithm and falls into the group of interior routing protocols, operating within a single autonomous system (AS). It is defined as OSPF Version 2 in RFC 2328 (1998) for IPv4. The updates for IPv6 are specified as OSPF Version 3 in RFC 5340 (2008). It gathers link state information from available routers and constructs a topology map of the network. The topology determines the routing table presented to the Internet Layer which makes routing decisions based solely on the destination IP address found in IP packets. OSPF detects changes in the topology, such as link failures, very quickly 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. The link-state information is maintained on each router as a link-state database (LSDB) which is a tree-image of the entire network topology. Identical copies of the LSDB are periodically updated through flooding on all OSPF routers. It will advertise only Link State Advertisement. The OSPF routing policies to construct a route table are governed by link cost factors (external metrics) associated with each routing interface. Cost factors may be the distance of a router (round-trip time), network throughput of a link, or link availability and reliability, expressed as simple unit less numbers. This provides a dynamic process of traffic load balancing between routes of equal cost. OSPF handles its own error detection and correction functions. OSPF uses multicast addressing for route flooding on a broadcast network link. For non-broadcast networks special provisions for configuration facilitate neighbor discovery. OSPF multicast IP packets never traverse IP routers, they never travel more than one hop. OSPFv3 running on IPv6, no longer supports protocol-internal authentication. Instead, it relies on IPv6 protocol security (IPsec).

5.1 DEFAULT COST METRIC

Cost metric is related to the bandwidth

$$\text{Cost metric C} = \frac{108}{\text{Bandwidth}}$$

Bandwidth is amount of information that to be processed by node at given time

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5.2 COST

1. For Ethernet C=10
2. For Fast Ethernet C= 1
3. For Gigabit Ethernet C= 0.1

5.3 VIRTUAL LINK

In OSPF all areas must be connected to a backbone area. If there is a break in backbone continuity, or the backbone is purposefully partitioned, you can establish a virtual link. The two end points of a virtual link are Area Border Routers. The virtual link must be configured in both routers. The configuration information in each router consists of the other virtual endpoint (the other ABR), and the non backbone area that the two routers have in common (called the transit area). Note that virtual links cannot be configured through stub areas. This connection, however, can be through a virtual link. For example, assume area 0.0.0.1 has a physical connection to area 0.0.0.0. Further assume that area 0.0.0.2 has no direct connection to the backbone, but this area does have a connection to area 0.0.0.1. Area 0.0.0.2 can use a virtual link through the transit area 0.0.0.1 to reach the backbone. To be a transit area, an area has to have the transit attribute, so it cannot be stubby in any way.

5.4 ENABLING THE RIPng OSPF PROTOCOL

R1>en
R1#configure terminal
R1(config)#interface fastethernet 0/0
R1(config-if)#ipv6address 2001:aaaa::1/64
R1(config-if)#no shutdown
R1(config)#exit

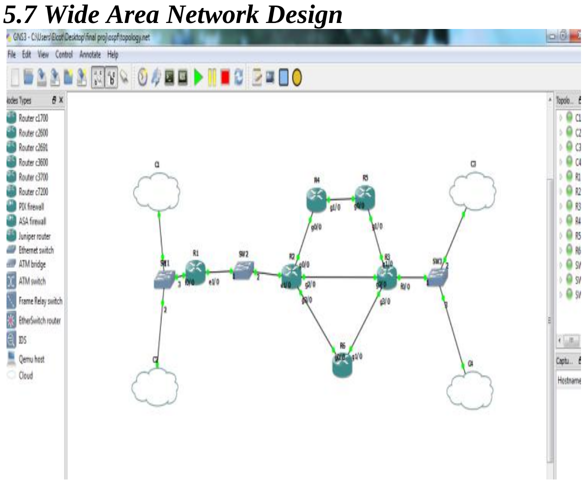
5.5 FOR RIPng PROTOCOL

R1#configure terminal
R1(config)#ipv6 unicast-routing
R1(config)#ipv6 router rip vpmm
R1(config-rtr)#exit
R1(config)#interface fastethernet 0/0
R1(config-if)#ipv6 rip vpmm enable
R1(config-if)#exit
R1(config)#^

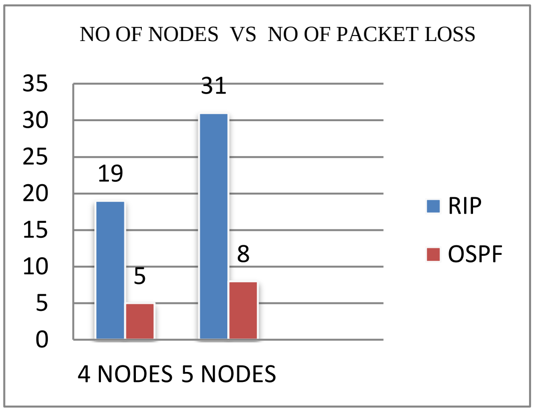
5.6 FOR OSPF PROTOCOL

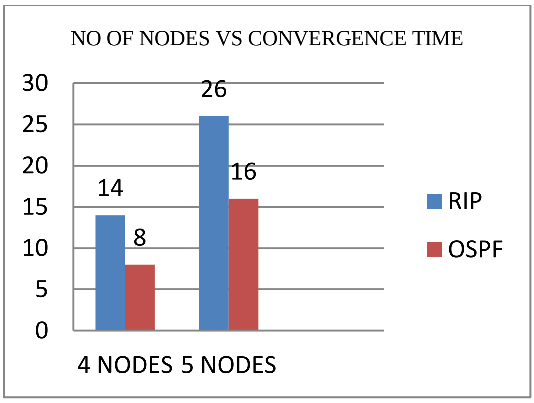
ROUTER 1
R1#configure terminal
R1(config)#ipv6 unicast-routing
R1(config)#ipv6 router ospf 10
R1(config-rtr)#router-id 1.1.1.1
R1(config-rtr)#exit
R1(config)#interface gigabitethernet 1/0
R1(config-if)#ipv6 ospf 10 area 4
R1(config-if)#exit
R1(config)#^z
R1#
ROUTER 2
R2#configure terminal
R2(config)#ipv6 unicast-routing
R2(config)#ipv6 router ospf 20
R2(config-rtr)#router-id 2.2.2.2
R2(config-rtr)#exit
R2(config)#interface gigabitethernet 1/0
R2(config-if)#ipv6 ospf 20 area 0
R2(config-if)#exit
R2(config)#^z
Exit

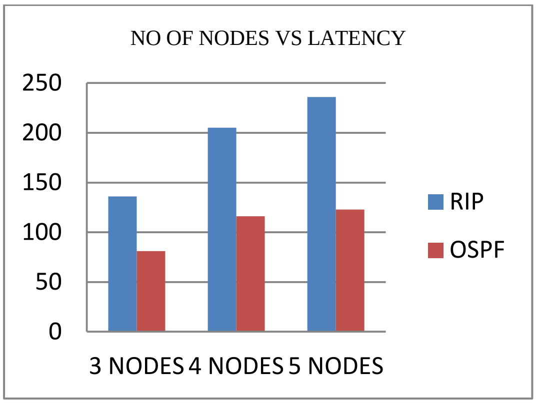
5.7 Wide Area Network Design



6. OUTPUTS







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