International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 5, August 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Performance of Best Route Selection using RIP and OSPF Routing Protocols

Ma Ma Gyi[1], San San Naing[1], Pann Ei San[2]

[1]Department of Electronic Engineering, Technological University, Kyaukse, Myanmar
[2]Department of Electronic Engineering, Technological University, Thanlyin, Myanmar

How to cite this paper: Ma Ma Gyi | San San Naing | Pann Ei San "Performance of Best Route Selection using RIP and OSPF Routing Protocols" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-5, August 2019, pp.1979-1982, **https://doi.org/10.31142/ijtsrd7873**

IJTSRD27873

Copyright © 2019 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (http://creativecommons.org/licenses/by/4.0)

ABSTRACT

Routing protocols determine the best routes to transfer data from one node to another and specify how routers communicate between each other in order to complete this task. There are different classes of routing protocols, two of which are Exterior Gateway Protocol (EGP) and Interior Gateway Routing (IGR). A routing protocol can be dynamic or static, as well as distance-vector or link-state. This paper presents the performance of best route selection using dynamic routing protocols such as Routing Information Protocol (RIP) and Open Shortest Path First (OSPF). The network is designed to connect the site A and site B with seven interconnected routers and two switches. The performances of two routing protocols for a wired network are tested and the best route selection has been analyzed with routing table. It can be traced by using tracert command in order to observe the best route between two sites. This performance analysis has been simulated by applying Packet Tracer Simulator.

KEYWORDS: *Routing Protocols, RIP, OSPF, Routing Table*

I. INTRODUCTION

Routing refers to the process of determining the best route for the transmission of data packets from source to destination and it is based upon routing protocols. Routing protocols are a set of rules which a communication network follows when computers try to communicate with each other across networks. A routing protocol is a protocol that specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network.

Each routing protocols have their own algorithm and have difference in performance basically. Two typical types of routing protocol are chosen as the simulation samples: RIP and OSPF. RIP is one of the oldest routing protocols still in service. Hop count is the metric that RIP uses, and the hop limit limits the network size that RIP can support. OSPF is the most widely used. OSPF is based on the Shortest Path First (SPF) algorithm which is used to calculate the shortest path to each node.

Routing protocols are critical to a network design. Dynamic routing protocols run only on routers that use them in order to discover networks and update their routing tables. Using dynamic routing is easier for the system administrator, than using labor intensive, manually achieved, static routing method but it will cost in term of router CPU process and bandwidth in the network links. The source of the increased bandwidth usage and CPU cycles is the operation of the dynamic routing protocol itself. A router running a dynamic routing protocol shares routing information with its neighboring routers, and it requires additional CPU cycles and additional bandwidth to accomplish that [1-9].

Routing protocols determine the best routes to transfer data from one node to another and specify how routers communicate between each other in order to complete this task. This paper presents the performance of best route selection with RIP and OSPF routing protocols. These two protocols are dynamic protocols, meaning that these protocols route packets within one Autonomous System (AS). RIP is a distance-vector protocol and OSPF is a link state protocol. Data need to be transferred from source to the destination. So, the router is a device which helps in forwarding packets from one network to another or from one node to another in a network. For a router to work efficiently, some protocols are implemented such as the distance vector and link state which include RIP and OSPF protocols.

II. Routing Information Protocol (RIP)

RIP stands for routing information protocol in which distance vector routing protocol. RIP is one of the most commonly used routing protocols for local area network (LAN) and wide area network (WAN). It uses a form of distance as hop count metric. Through limiting the number of hop counts allowed in paths between sources and destinations. RIP prevents routing loops. Typically, the maximum number of hops allowed for RIP is 15. However, by achieving this routing loop prevention, the size of supporting networks is sacrificed. Since the maximum number of hop counts allowed for RIP is 15, as long as the number goes beyond 15, the route will be considered as unreachable. Because of this, RIP is not suitable for large and complex networks.

It consists of two message types. The first one is request message that is used to ask neighboring routers to send an update. The second one is response message carries the update. When RIP is configured on a router, it sends broadcast packets containing the request message out the entire RIP enabled interfaces and then listens for response messages. Routers receiving the request message respond to it by sending their routing tables in the respond message. This process continues until the network is converged.

Routing Information Protocol has its own advantages in small networks. It's easy to understand, configure, widely used, and is supported by almost all routers. Since its limited to 15 hops, any router beyond that distance is considered as infinity, and hence unreachable. RIP has very slow network convergence in large networks. The routing updates take up significant bandwidth leaving behind very limited resources for critical IT processes. RIP doesn't support multiple paths on the same route and is likely to have more routing loops resulting in a loss of transferred data. RIP uses fixed hop count metrics to compare available routes, which cannot be used when routes are selected based on real-time data. This results in an increased delay in delivering packets and overloads network operations due to repeated processes [9-11].

III. Open Shortest Path First (OSPF)

OSPF stands for open shortest path first which uses link-state routing algorithm. OSPF is a routing protocol for internet protocol networks. It uses a link state routing algorithm and falls into the group of interior routing protocols. OSPF is the most widely used interior gateway protocol in larger enterprise networks such as big business companies. OSPF routing protocol is commonly used for the same routing domain. Here, the routing domain is an Autonomous System (AS). OSPF gathers link state information from available routers and determines the routing table information to forward packets based on the destination IP address.

Compare to RIP, OSPF has no limitation due to hops. RIP has a limit of 15 hops so any network with more than 15 hops cannot be achieved by RIP. OSPF can handle Variable Length Subnet Masks (VLSM) but RIP cannot. The most important is that OSPF converges much faster than RIP due to its calculation algorithm. This might not be significant in a small size network but in large enterprise networks, this will be a time out [9-11].

IV. Network DESIGN

The proposed network design consists of seven interconnected routers, two switches and two PCs. In this network design, RIP and OSPF routing protocol are utilized to compare the best route selection. The network design with a routing protocol is illustrated in Fig 1.

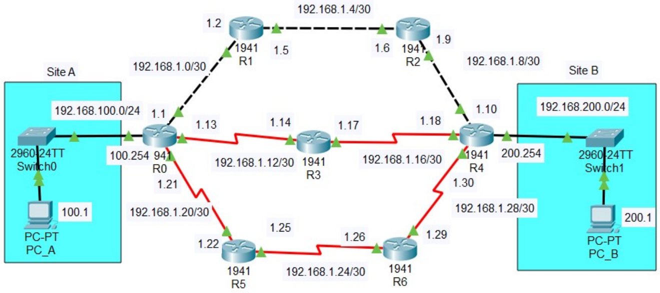

Fig.1 Network Design

The possible routes and metrics to connect from source to destination network are described in Table 1. The total cost of best route from source router R0 to destination router R4 is 3 and so the next router for this path is router R1. The minimum hop count from R0 to R4 is 1 and the next router for this path is router R3.

Table 1 Possible Route and Metrics from Source to Destination

Source	Next routers	Destination	Total Hop Count	Total Cost
R0	R1-R2	R4	3	3
R0	R3	R4	1	128
R0	R5-R6	R4	3	192

The first step is to configure all the personal computers. Each computer needs a unique Internet Protocol (IP) address. OSPF routing protocol is enabled on all routers of Fig. 1 to provide connectivity and reach ability between the different networks. Configuration of IP address on the router R0 can be specified as follow:

```
Router>enable
Router#configure terminal
Router (config) #hostname R0
R0 (comfit) #interface g0/1
R0 (comfit-if) #imp address 192.168.100.254 255.255.255.0
R0 (config-if) #no shutdown
R0 (config-if) #exit
R0 (config) #interface g0/0
R0 (config-if) #ip address 192.168.1.1 255.255.255.252
R0 (config-if) #no shutdown
R0 (config-if) #exit
R0 (config) #interface s0/1/0
R0 (config-if) #imp address 192.168.1.13 255.255.255.252
R0 (config-if) #clock rate 64000
R0 (config-if) #no shutdown
R0 (config-if) #exit
R0 (config) #interface s0/1/1
R0 (config-if) #imp address 192.168.1.21 255.255.255.252
R0 (config-if) #clock rate 64000
R0 (config-if) #no shutdown
R0 (config-if) #exit
```

The OSPF routing protocol is enabled as follow:

```
R0 (config)#router OSPF 1
R0 (config-router)#network 192.168.100.0 0.0.0.255 area 0
R0 (config-router) #network 192.168.1.0 0.0.0.3 area 0
R0 (config-router) #network 192.168.1.12 0.0.0.3 area 0
R0 (config-router) #network 192.168.1.20 0.0.0.3 area 0
R0 (config-router) #exit
R0 (config) #exit
R0#writes memory
```

Other routers are also configured with IP addresses and enabled OSPF protocol. OSPF uses the cost (bandwidth) as the metric and in this configuration single OSPF area is used for all routers.

Similarly, RIP routing protocol is enabled on all routers of the same network design described in Fig. 1. RIP uses hop count as the metric. The IP addresses for each interface can be configured as above description. The configuration of RIP routing protocol on router R0 is as follow:

R0 (config)#router RIP
R0 (config-router) #network 192.168.100.0
R0 (config-router) #network 192.168.1.0
R0 (config-router) #network 192.168.1.12
R0 (config-router) #network 192.168.1.20
R0 (config-router) #exit
R0 (config) #exit
R0#writes memory

Other routers are also enabled RIP routing protocol and in this simulation RIP version 1 is used.

V. TEST and RESULTS

This paper presents the performance of route selection using two dynamic routing protocols such as RIP and OSPF. Fig. 2 shows the routing table of router R0 with OSPF protocol using the show ip route command. The routing table displays the details of all the networks and the minimum cost to reach the destination network and the exit interface of the router including the connection type. The connection type, O indicates OSPF connection, C indicates directly connected networks and L indicates the local address respectively. The total cost from source router R0 to destination network 192.168.200.0/24 is 4 via 192.168.1.2. So the next router for this path is router R1.

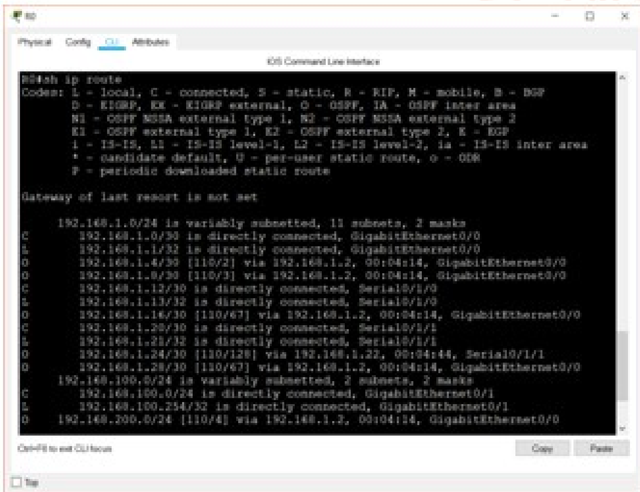

Fig. 2 Routing Table of R0 for OSPF Protocol

The connection from source to destination is tested using the ping command and this result is shown in Fig. 3. The maximum round-trip time from source router to the destination 192.168.200.1 (PC-B) is 1 ms.

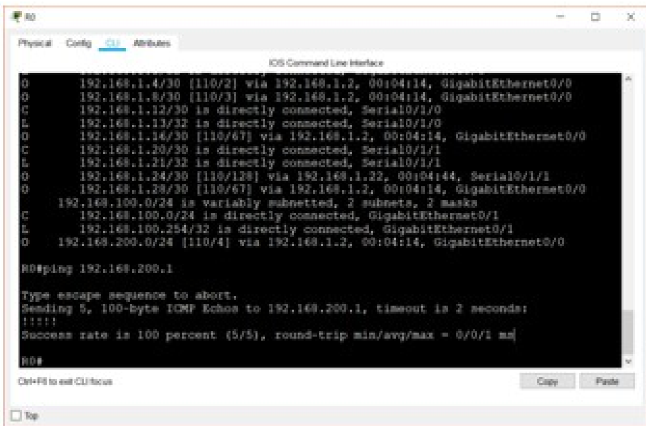

Fig. 3 testing the connection from R0 to the destination 192.168.200.1

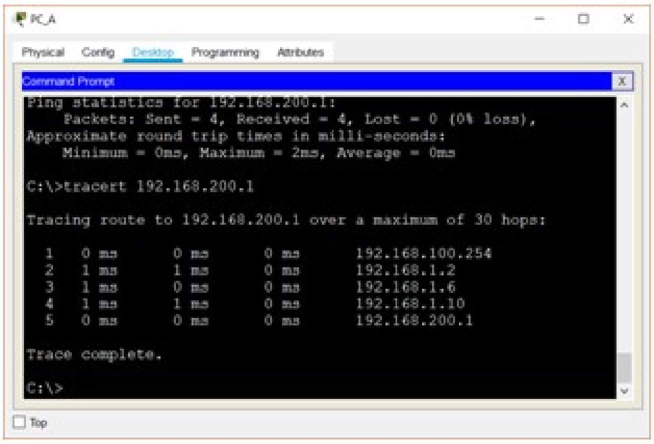

Fig. 4 Tracing the route from PC-A to PC-B

To trace the route from source to destination, the tracert command is used. The result of tracing route from PC-A to PC-B is shown in Fig. 4. To reach PC-B, PC-A starts the route with the gateway 192.168.1.2 of router R0 via 192.168.1.6 and 192.168.1.10. So, the route from PC-A to PC-B is R0-R1-R2-R4.

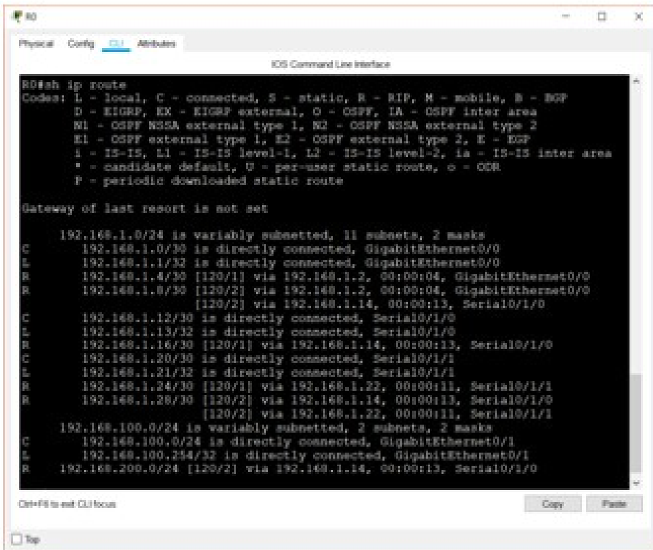

Fig. 5 Routing Table of R0 for RIP Protocol

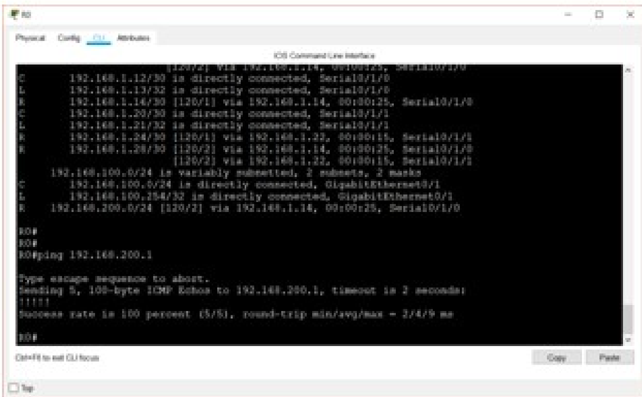

Fig. 6 testing the connection from R0 to the destination 192.168.200.1

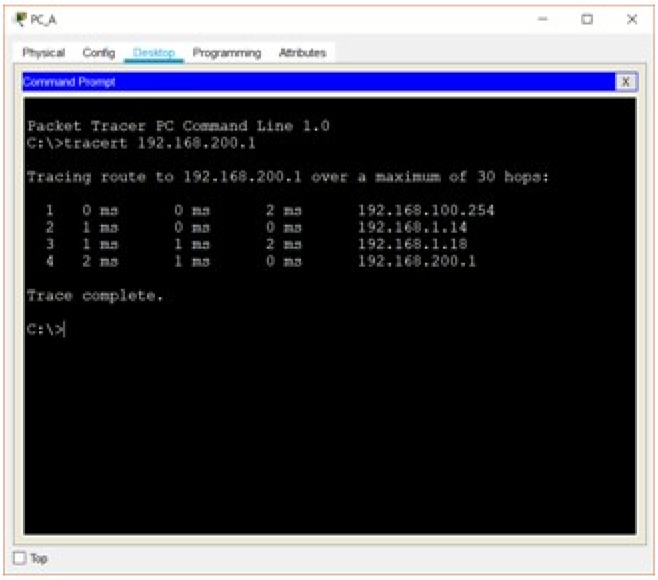

Fig. 7 Tracing the route from PC-A to PC-B

The routing table of router R0 for RIP is illustrated in Fig. 5. The routing table shows the best route for all connected networks. The routing table displays the details of all the networks and the minimum hop count to reach the network and the exit interface of the router including the connection type. The connection type, R indicates RIP connection and C indicates directly connected networks respectively. The best route for destination network 192.168.200.0/24 is via 192.168.1.14 and the minimum hop count is 2. So the route for this destination network is R0-R3-R4. The maximum round-trip time from source to destination network is 9 ms as shown in Fig. 6. Fig. 7 shows the tracing result of PC-A and PC-B and the best route source to destination is R0-R3-R4.

VI. CONCLUSION

The network design is demonstrated using Packet Tracer simulator with two routing protocols. The results show that the best route from site A to site B for OSPF protocol is R0-R1-R2-R4 and maximum round trip time is 1 ms. The best route from site A to site B for RIP is R0-R2-R4 and maximum round trip time is 9 ms. The routing information protocol (RIP) has many limitations, it generates high traffic that can cause a congestion in slow networks, and it maximum hop count is 15 hop, that limits the use of RIP in a small fast networks. OSPF has no hop limitations and is fast convergence time. It can be performed efficiently in large networks. Therefore, OSPF routing protocol can be used for large networks. However, RIP routing protocol can be used for small networks.

VII. ACKNOWLEDGEMENTS

The author would like to thank to all her teachers, parents and colleagues who support the help in their job. She also wants to express special thanks to her all family members. Moreover, she also expresses special thanks to all people who shared knowledge for this research.

REFERENCES

[1] Balchunas, Aaron. “Routing Information Protocol (RIP v1.03)”, Retrieved 25 April 2014. http://www.routeralley.com.

[2] Justin Deng, “Comparison of RIP, OSPF and EIGRP Routing Protocols based on OPNET”, (2014).

[3] Archana C, “Analysis of RIPv2, OSPF, EI GRP Configuration on router Using CISCO Packet tracer”, International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 4, Issue 2, India, mars-2015.

[4] Vangala Rekha Andal, “Evaluation of EIGRP and OSPF Routing Protocols for Greener Internetworking”, International Journal of Emerging Trends in Technology and Sciences, Volume - 2, ISSUE - 3, may-2014.

[5] Syed Yasir Jalali, Sufyan Wani, Et Majid Derwesh, “Qualitative Analysis and Performance Evaluation of RIP, IGRP, OSPF and EGRP using OPNET TM”, Advance in Electronic and Electric Engineering, Volume 4, Number 4, India, apr-2014.

[6] N. Nazumudeen et C. Mahendran, “Performance Analysis o f Dynamic Routing Protocols using Packet Tracer”, International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, Special Issue 1, févr-2014.

[7] Dounia EL Idrissi, Fatima Lakrami, Najib Elkamoun, Rachid Hilal, “Performance Comparison of Protocols Combination based on EIGRP and OSPF for Real-Time Applications in Enterprise Networks”, International Journal of Advanced Computer Science and Applications (IJACSA), Volume 8, No. 5, 2017.

[8] Mrs. Lalitha, Sugand Rao Rathod, “Comparison of Dynamic Routing Protocols: RIP and OSPF”, International Journal of Computer Trends and Technology (IJCTT), Volume 4, Issue 6, June 2013.

[9] J. F. Kurose, K. W. Ross, “Computer Network A Top to Down Approach”, 6th ed. Pearson Education.

[10] Wendell Odom, “CCENT/CCNA ICND1 100-105 Official Cert Guide”, Copyright©2016 Cisco Systems, Inc.

[11] Wendell Odom, “CCENT/CCNA ICND1 200-105 Official Cert Guide”, Copyright© 2017 Pearson Education, Inc.