

Link Recovery Comparison Between OSPF & EIGRP

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Abstract. This research is a performance comparison of router protocol between OSPF and EIGRP when an internet link fails. Since OSPF and EIGRP protocols are mostly used nowadays, it is interesting to do experiment with these two protocols. The experiment is setup to find out the retransmission time and rerouting time from both protocols when there is a failure link in a data transmission path. Before there is a failure link, the average transmission times are 18.7ms with OSPF and 18.4 with EIGRP. Then the average transmission times increase to 28ms and 27.5ms for OSPF and EIGRP respectively after a link fails. Additionally, the rerouting time is 5s using EIGRP shorter than 8.8s using OSPF. Finally, the research experiment results show that EIGRP is a better than OSPF in both retransmission time and rerouting time after a link fails.

Keywords: router protocol; OSPF; EIGRP; link fail

1. Introduction

A performance comparison between router protocols has been research topics for many years. Since OSPF routing process is less complicate than one in RIP protocol, the routing and convergence times are shorter by using OSPF than RIP in the same network but different area [1]. Also, OSPF is a standard protocol in all routers until CISCO has developed additional EIGRP protocol in their router. EIGRP uses less memory and CPU times than OSPF and EIGRP also uses distance vector instead of link state technique which is used in OSPF [2]. OSPF rerouting time is an experiment objective in the network when there is a failure connection link with the BGP protocol in two separate areas [3]. OPNET is used to do simulation for comparison 3 protocols (OSPF, RIP, and EIGRP) and the results show that EIGRP has the smallest routing time, memory time and CPU time, and the least delay time but OSPF can transmit the most data [4]. OSPF and EIGRP are also compared by OPNET simulation for routing time, delay time and packet loss in video streaming and results show that EIGRP has less packet loss but OSPF has less delay and more throughput [5]. The rerouting time after there is a failure link is experiment with many methods such as equal cost multi-paths, loop free alternates, and U-turn alternate which are compatible in OSPF protocol [6].

In this research, the performance OSPF and EIGRP protocols in router are compared by setting up an real experiment with the situation that there is a failure link in transmission path. The details of routing in both protocols are discussed in section 2. Then experiment setup detail in section 3 and experiment results and graphs in section 4. Finally, conclusion is in the last section.

2. Theory

2.1 Routing Protocol

Routing Protocol is a protocol used to exchange routing table information between network devices that work at the network layer (layer 3), such as the router, so that these devices can send data (IP packet) to the destination computer correctly. The network administrator must edit the routing table of the devices at all times. It is called the new routing protocol for dynamic routing network.

- Static route (default route) is a route as a way to smooth and easy to understand. You can also set up the router is easy to work on, especially with smaller networks.

- Dynamic route is the route in accordance with our requirements and help facilitate the creation of the main functions of the two routing table as it is. Find the best path to send data to the destination, and the routing information to other machines on the network.

2.2 Open Shortest Path First (OSPF)

OSPF stands for Open Shortest Path First, an open standard link-state routing protocol. This routing protocol was built by a committee, which is why it is an open standard. The word *open* means that anyone can read the rules or standard and write an application. The routing protocol as such belongs to no one, but to everyone. OSPF's purpose as a routing protocol is to convey routing information to every router within the organizational network. The technology that has been selected is link-state technology, which was designed to be very efficient in the way it propagates updates, allowing the network to grow.

2.3 OSPF Tables

OSPF have three routing tables.

Neighbor table to keep a list of routers that form a relationship and status of the designated router / backup designated router and the status of the link, hello and dead time interval.

Topology table as a route to all the routers to send packets to the destination, which in OSPF can be applied to distribute the load (load balance) to the routes that are cost equal to 6 routes (4 the value default).

Routing table to store the shortest path that has been derived from SPF algorithms completed.

2.4 SPF Calculation

OSPF will use algorithm Dijkstra (link state) to calculate the shortest path based on the shortest path from one point to another. When it reaches its destination, it will make cumulative cost or value of the link, or bandwidth, by comparison, if any path out from the origin to the end and the cost is the best, that path is the shortest path in CISCO routers with the formula. The OSPF routing path to be taken from the formula [7]

$$(\text{Cost} = 108/\text{Bandwidth}) \tag{1}$$

Where to find the shortest path will take the cost of your outgoing internet interface at one point to another interface at one point added to it until the interactive effects of the destination router and to compare it with other paths. We call this the total of the "cumulative cost".

2.5 Enhanced Interior Gateway Routing Protocol (EIGRP)

The distance vector routing protocol type is similar to IGRP EIGRP can be configured easily and can be used with a variety of network topology and network types.

EIGRP is the autonomous number (AS) was involved with the router, all you need to update routing tables via a routing protocol. EIGRP is necessary to obtain a set number of AS that match, but EIGRP does not feature in the area which is divided into sub-networks as OSPF.

2.6 Main features of EIGRP

- Convergence time is very fast, almost once the network is changed. The meaning is to change the EIGRP network can detect those changes and update the routing tables up to date almost instantaneously.

- It does not use too much bandwidth during normal operation. Only Hello packets are being sent. Something similar to link state routing protocol is the one. Hello packets are used to maintain communication between the current router and other neighboring routers. The routers that run EIGRP, each will create a "neighbor table" (a collection of list addresses of neighboring routers) from packets Hello; it has received from neighboring routers, however, EIGRP will not update the routing table filled out every time (periodic update). The full schedule will go out in the first time and later, when the network has changed. As a result, the routing table will be changed only in the section that has a new update but not the full routing table.

- It is manual summarization. On the interface you want.

- Supported features called unequal cost load balancing with IGRP is to distribute the load on the path to the cost not the same.

2.7 EIGRP Calculation

The EIGRP uses the information of the distance to find transmission path. The calculation of the indicators is usually calculated using two different values, bandwidth and delay of the path by default. All this was done in order to obtain the best route. You can choose more effectively and make sure that the path to use as a loop-free path.

EIGRP have 5 composite to calculate

K1 = Bandwidth

K2 = Load

K3 = Delay

K4 = Reliability

K5 = MTU

The weighting is as follows

$K1=K3=1$ and $K2=K4=K5=0$, Then substitutes all K parameters into the equation as follows [7]

$$\text{Metric} = 256 * [K1 * \text{bandwidth} + (K2 * \text{bandwidth}) / (256 - \text{load}) + K3 * \text{delay}] * [K5 / (K4 + \text{reliability})] \quad (2)$$

By default, then the value of the metric is bandwidth plus delay

Interface Type	Bandwidth (Kbps)	Delay (Microseconds)
Serial	1544	2000
GigE	1,000,000	10
FastE	100,000	100
Ethernet	10,000	1000

Table 1: The Default for Bandwidth and Delay.

3. Experimental methods.

Conducting experiments to see the Router is an experiment on real devices. The network is designed to be tested properly.

Connect all devices (computers and routers) to a network as shown in Figure 1.

Configure settings by using the protocol EIGRP or OSPF in each experiment.
 Test packet size is 1000 byte which is used to record transmission times.
 Then disconnect the main link to the new route of router as shown in Figure 2.
 Record the new transmission time.

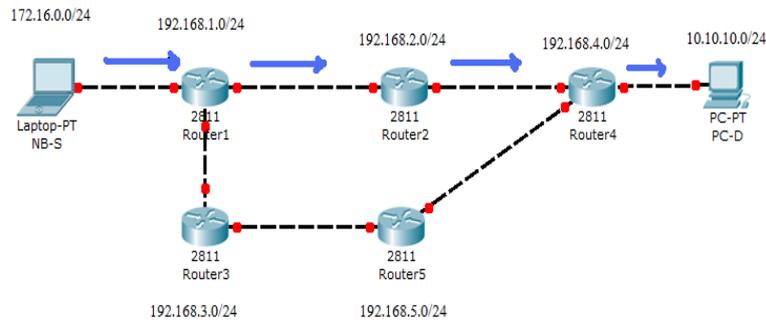


Figure 1: Transmission path before a link fails

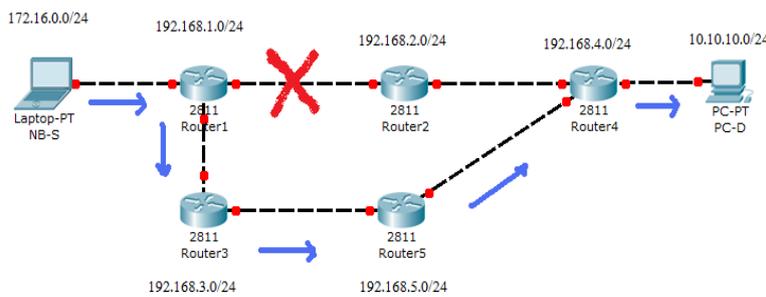


Figure 2: Transmission path after a link fails

3. Results

In experiments, the two routing protocols such as OSPF and EIGRP use the same path in data transmission as shown in table 2.

Directions for use before Link Fail.	Directions for use after Link Fail.
172.16.0.254	172.16.0.254
192.168.1.2	192.168.3.2
192.168.2.2	192.168.5.2
10.10.10.1	192.168.4.1
	10.10.10.1

Table 2: The route of transmission



Figure 3: Throughput capture by Flowalyzer program.

In figure 3, the throughput of data transmission is captured by Flowalyzer program at difference points on transmission path. The top and middle graphs are throughput at the transmission source and the next router to the data source. The last graph show the throughput of a failure link in the red area.

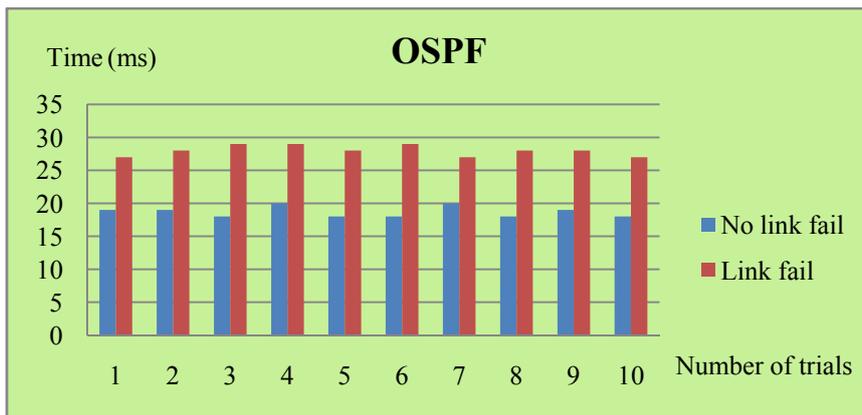


Figure 4: Data transmission time before and after the link fail using OSPF.

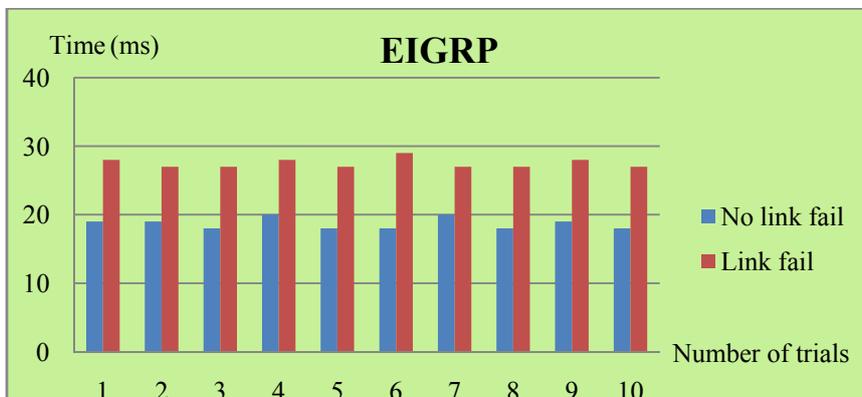


Figure 5: Data transmission time before and after the link fail using EIGRP.

The experimental figures 4 and 5 show that the average data transmission time before the link fail with protocol EIGRP is 18.4 ms faster than OSPF average at 18.7 ms. After the link fails, protocol EIGRP

packet data transmission time averages 27.5ms compare to OSPF packet data average at 28 ms, is used to transmit data path is based on the same route both before and after the link fail. Estimates standard deviation based on a sample before the link fails of the OSPF 0.823 EIGRP 0.699 after the link fail to OSPF 0.816 EIGRP 0.707.

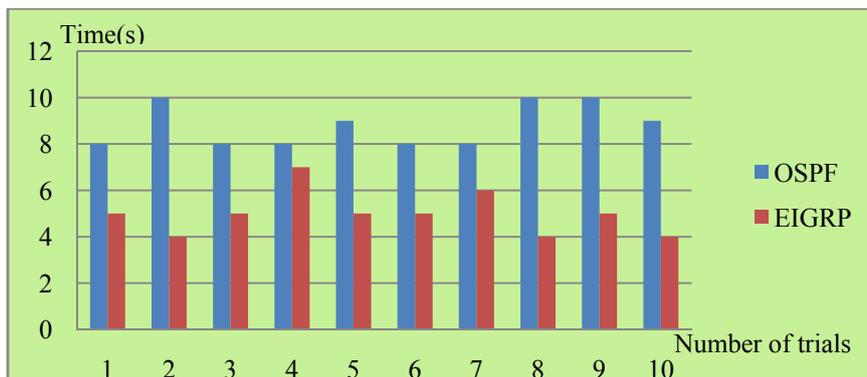


Figure 6: Rerouting table time of OSPF and EIGRP.

The time takes to find a new route; the average time of 5 seconds faster than EIGRP to OSPF uses the average time of 8.8 seconds by the two protocols cannot maintain the information in them.

4. Conclusion

The data transmission time before and after there is a failure link using EIGRP protocol is less than OSPF protocol. Also the rerouting time for finding new transmission path in EIGRP is shorter than OSPF. From experiment results, EIGRP has a bit better performance than OSPF.

5. References

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