SIMULATION BASED NETWORK CONVERGENCE ACTIVITY ANALYSIS OF DYNAMIC ROUTING PROTOCOLS OSPF & RIP BY USING DS3 LINES

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Introduction

With the increasing of internet demands, high definition resolution images with high frame rate and quality of sound for achieving best quality of experience QoE for user experience with Quality of services QoS over internet is big challenge for Internet service providers to manage their networks. Importance of selection of best Routing protocols and Network design is back bone of every network whether it's ISDN, Optical Fiber, Satellite, GSM, ADHOC, Wired or Wireless network. Every Network has their own routing protocols for managing network, IP schemes and their routing tables. Routing tables are necessary for every routing for digital network for transmitting/receiving data on right place with delivery report with other characteristic like throughput of network, end to end delay, Media access delay, efficiency, number of hops, network load and how much it is fast in convergence if change in routing e.g. node down congestion load balancing shortest path selection and other factors for delivering message, it is the same like we are using navigation system for excursion on the Earth. There are three main types of network routing protocols Reactive, Proactive and Hybrid [1]. In this paper famous Interior Gateway routing protocols like Routing Information Protocol (RIP), Open Shortest Path First (OSPF), are used compared for testing the route convergence performance [2]. In all over the world all ISP's are connected with other ISP's to make a big worldwide network. Every router connected with other site router and redundant paths are back bone of all networks for 99.99% uptime. ISP's must have to provide 99.99% uptime to provide best quality of service to their customers. Some customers are business customers that cannot afford route down problem. If any route is down due to congestion or because of router interface down problem, routing protocols rapidly start recalculating the shortest path again according to their algorithms. In computer networks for communication the first routing protocol maintains routing tables to communicate between nodes by sharing their routing tables [3, 4], some nodes can be directly connected and some nodes can be connected with some distance. Every routing protocol has their own pros and cons according to their routing algorithms. OSPF & ISIS routing protocols are link state routing protocols using for Interior gateway routings. RIP & EIGRP are distance vector routing protocols also using for Interior gateway routing.

RIP routing protocol uses Bellman ford algorithm for route calculation with 120 administrative distance. OSPF routing protocol uses Dijkstra algorithm for path calculation with administrative distance 110. EIGRP protocol uses DUAL algorithm for path calculation with administrative distance 90. IS-IS protocol uses Dijkstra algorithm for path calculation with administrative distance 190. This administrative distance term is used in routers for managing routing protocols. We can configure more than one routing protocols on routers with different administrate distances, directly connected node has the lowest administrative distance and then dynamic protocols have their default administrative distances [5] according to their RFC's.

Performance Metrics

Network Convergence Activity: this activity regarding path recalculating if there is change in routes due to route or interface down problem.

Network Convergence Time (Sec): the length of the time intervals during which converged was of the networks IP forwarding tables has been achieved.

Experimental Setup & Result Analysis

In this paper, purposed network has been simulated by using OPNET simulator tool and the route convergence performance of the network has been analyzed in real world scenarios. This simulation is divided in 3 scenarios, every scenario has different route fail and up time to calculate route convergence time of routing protocols. In simulation in order to make robust network design there are 5 different routes to reach Router2 from Router1. All routers are connected with each other in mesh topology with Point to Point DS3 and DS1 lines. Scenarios route fails and uptime information are provided in Table1, Table2 and Table3, respectively.

Components for the network simulation are Cisco 7200 series Router and 2 PC's with Video Conference traffic.

Table 1. Components of network

Component of network	Specifications
Router	Cisco 7200 series
Links b/w Routers	PP DS1 and DS 3
Routing Protocols	RIP & OSPF

Table 2. Simulation information

Simulation Tool	OPNET 14.5
Simulation Area	Real World Scenario
Simulation Time	15 Minutes
Simulation Kernel	Hybrid

Table3. Profile configuration parameters

Attribute	Value
Profile Configuration	Profile config.
Profile Name	Video Conferencing (high video quality)
Operation Mode	Serial (ordered)
Start Time	Uniform(100,110)
Duration	End of simulation
Repeatability	Once a start time

Table 4. Route down & uptime in seconds

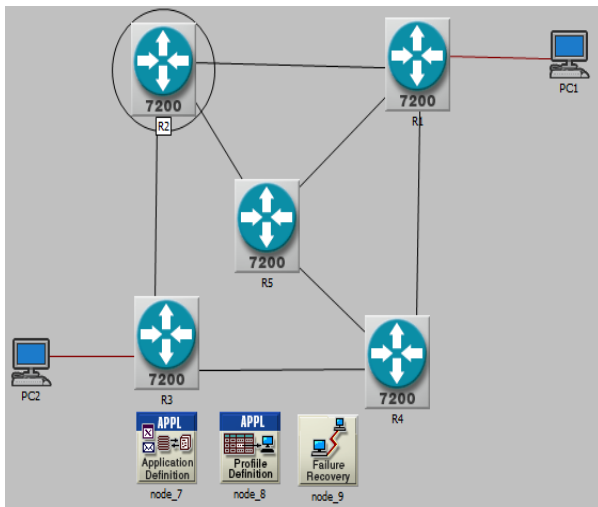| Route Status	1st Scenario Time(Sec)	2nd Scenario Time(Sec)	3rd Scenario Time(Sec)
Fail	240	240	30
Recover	420	480	60
Fail	520	720	90
Recover	580	960	120
Fail	610	1200	150
Recover	620	1440	180
Fail	625	-	210
Recover	626	-	240
Fail	726	-	270
Recover	826	-	300
Fail	-	-	330
Recover	-	-	360

Figure 1. Simulation environment

Results

In the first scenario RIP protocol has less Network Convergence Activity as compared to OSPF protocol but OSPF protocol has less Average Network Convergence Duration (sec) as compared to RIP Protocol.

In the 2nd Scenario RIP protocol has less Network Convergence Activity as compared to OSPF protocol but OSPF protocol has less Average Network Convergence Duration (sec) as compared to RIP.

In the 3rd Scenario OSPF routing protocol has less Network Convergence Activity as compared to RIP but RIP protocol has less Average Convergence Duration (sec) as compared to OSPF protocol.

Table 5.Results.

IP Network Convergence Activity	IP Network Convergence Duration (sec)	Protocol	Scenario
0.03761	5.752	OSPF	1st
0.01983	4.308	OSPF	2nd
0.16428	8.666	OSPF	3rd
4.310	0.02857	RIP	1st
0.01079	2.5125	RIP	2nd
0.02589	0.7046	RIP	3rd

Thus, this simulation shows that the small network RIP protocol shows fast convergence as compared to OSPF although OSPF protocol is much advance protocol than RIP but it is not good approach to use OSPF for small network.

References

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