

Comparative Study of Various Hybrid Network Design Techniques

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ABSTRACT

This paper presents the design of hybrid network for different routing protocols. In this paper, Opnet IT guru is used to simulate hybrid network scenario using different IP routing protocols.

The network consists of LANs and WLANs which are connected through router by applying different routing protocol. The parameters such as FTP download and upload response time, FTP traffic sent, FTP traffic received, ATM cell delay, Remote Login Response time are used to measure the performance of the network.

Keywords

Routing Protocols, RIP, BGP, OPNET

1. INTRODUCTION

Routing protocols are the protocols which are used by the routers to make a path determination choice, that is, to determine which routes are available to route packets from source to destination and to select best path from the available routes. These choices are further shared with neighboring routers. Routing protocols are divided into Interior and Exterior gateway protocols. Interior gateway protocols includes Distance vector and link state Protocols. The protocols that fall under Distance vector are RIP and IGRP. The protocols that fall under link state are OSPF and IS-IS. [1]

In the previous papers, hybrid network is simulated using the different routing protocols such as RIP, OSPF, IS-IS etc and comparative study is made [2] [3] [4]. In my paper, same scenario is simulated using two different routing mechanism (RIP & BGP), keeping same settings, and analyzed characteristics such as ATM cell delay, FTP download and upload response time and Remote Login Response Time.

RIP is basically designed for smaller IP based networks. It uses distance vector algorithm. RIP cannot handle more than 15 hops. This is the fact that is used by the RIP to prevent routing loops. Router running RIP broadcast full list of routes after every 30sec and another router which is also running RIP hears about this broadcast, it runs distance vector algorithm to select best possible paths available. [5]

BGP stands for Border gateway protocol which handles routing across the networks. It uses path vector routing algorithm. BGP defines finite state model. The finite state machine has six different states which switch from one to next during the establishment of first TCP connection and later the BGP session. These states are IDLE, CONNECT, ACTIVE,

OPEN, OPEN CONFIRM and ESTABLISHED. The router which is in idle state waits for some event to occur (manual start or automatic start). Once either event occurs it initiate tcp connection to the remote router and listens for the connection that is initiated by that remote router. Then it switches to the next stage CONNECT. At this stage both the routers complete tcp connection. ACTIVE stage appears only when initial CONNECT fails, router again try to establish tcp connection to the other router by sending open message. Once tcp connection is complete, finite state machine switches to the next stage that is OPEN, in this open message is transmitted by both routers. The routers confirm the OPEN message by sending KEEPALIVE message between both the routers. KEEPALIVE message is essential to keep the session running. The BGP speaking device fails to hear this KEEPALIVE message from other BGP speaking device, it removes all the routes from its forwarding information base and declares the session to be dead. In the ESTABLISHED state actual BGP routes are being exchanged. [6]

2. OUR APPROACH

OPNET's IT Guru allows a user to create the virtual network of almost any size. It also allows the user to analyze the results of the virtual network which is created. Communication devices such as routers, switches can be added or removed from the network at ease and their results can be examined and analyzed. The useful statistics such as FTP upload/download response time, remote login response time, ATM cell delay can be analyzed using the software. [7]

3. SCENARIOS & SETTINGS

WLANs are connected to the router R1 by applying the routing protocol such as RIP and also LANs are connected to the same router by applying routing protocol such as BGP [4]. Hybrid Network is the combination of IP network and ATM network connected with FTP Server, ATM and Router. The LANs are connected via 10base T and FDDI and multiple LANs are connected to the router R2 which is further connected to router R1 via ATM backbone cable. The network has FDDI LAN with switched technology and WLANs has FTP and HTTP clients. [4]

Two different scenarios used in this paper are.

Scenario I: Hybrid Network with RIP routing protocol

Scenario II: Hybrid Network with RIP and BGP routing protocols.

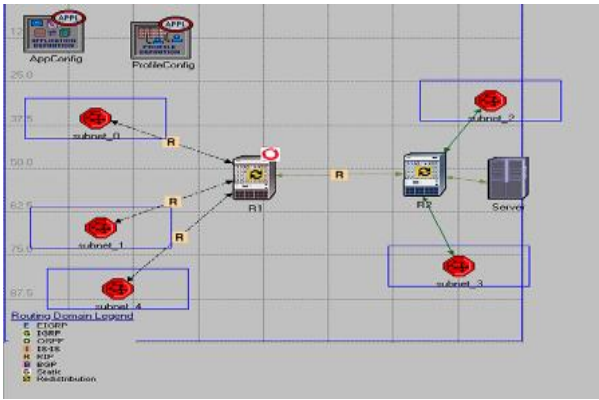


Figure 1: Scenario I

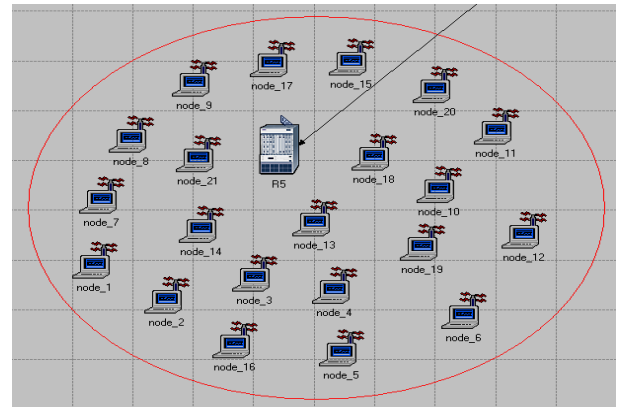


Figure 5: Subnet 4: Mix of FTP and HTTP clients

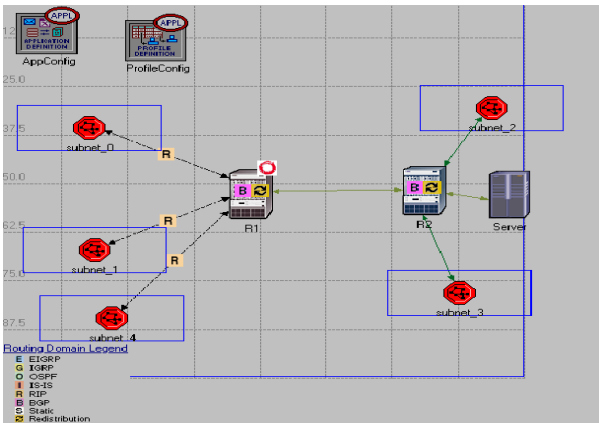


Figure 2: Scenario II

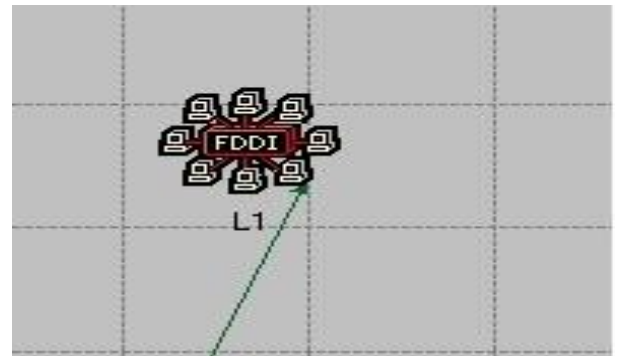


Figure 6: Subnet 2: FDDI LAN with switched Technology

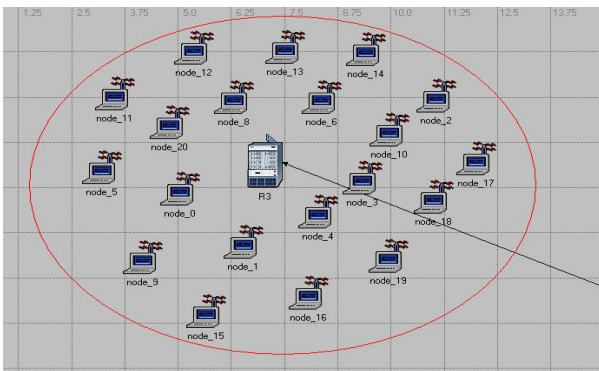


Figure 3: Subnet 3: Mix of FTP and HTTP clients



Figure 7: Subnet 3: FDDI LAN with switched Technology

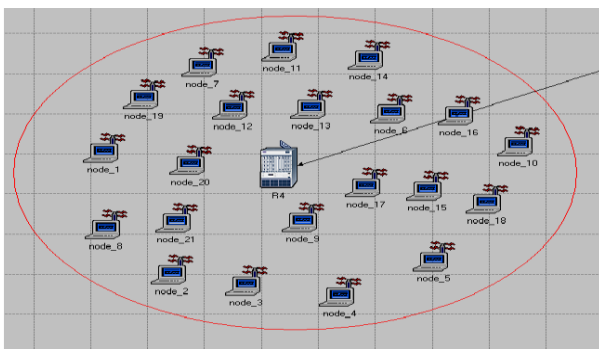


Figure 4: Subnet 1: Mix of FTP and HTTP clients

4. SIMULATION EVALUATION & RESULT ANALYSIS

Simulation performed for both the RIP and modified protocol of RIP and BGP protocol are shown in figures 8 to 15. The FTP download response time with RIP is recorded from 1.47m to 24.39m and with RIP and BGP is 1.45m to 24.39m. [8]FTP upload response is recorded between 1.47m to 24.43m with RIP and RIP and BGP routing protocol. From starting point it increased up to 2.13m and then it remains almost constant and decreases at 2.55m and then remains constant and again increases after some time (RIP and BGP). We have kept the same settings for both scenarios for recording measurements for FTP download and upload response time and also for Remote Login Response time and ATM cell delay [8]. It is observed that with the help of RIP and BGP at the starting point of downloading, the download response time

increased but after some time it decreases and then it again increases as it varies up to 24.39m. Thus, we have analyzed, that in hybrid networks, the results are better with the use of RIP and BGP w.r.t FTP upload response time.

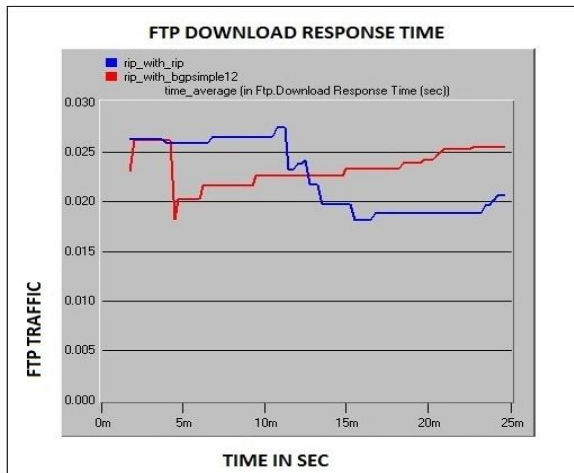


Figure 8: FTP Download Response Time

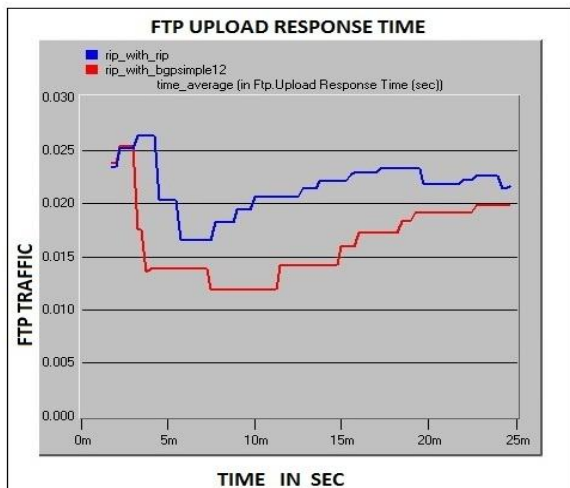


Figure 9: FTP Upload Response Time

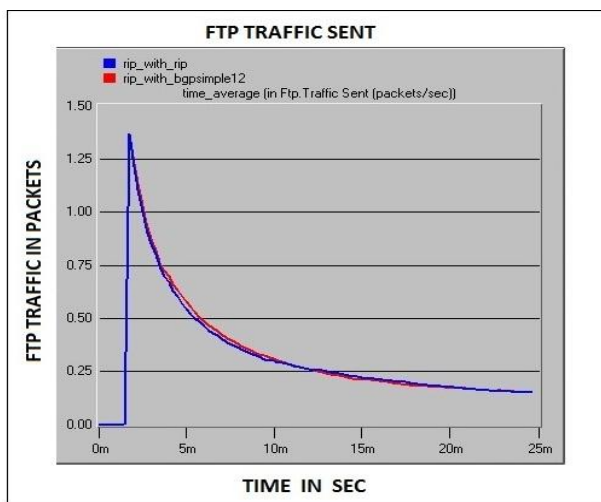


Figure 10: FTP Traffic sent

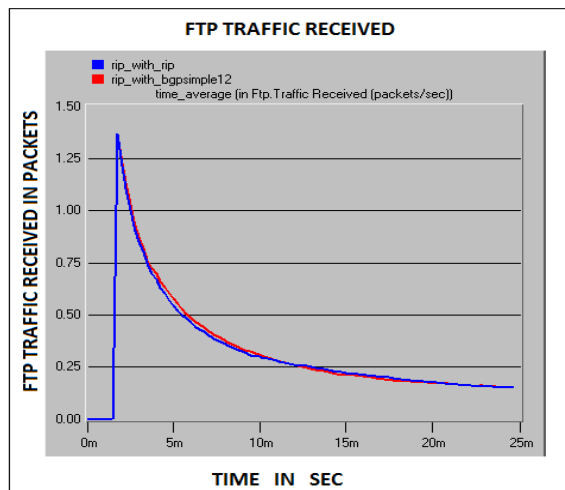


Figure 11: FTP Traffic Received

It has been observed that in both the cases the ATM Cell delay is less in scenario where RIP and BGP protocol is used. In Fig ATM cell delay with RIP and RIP and BGP varies from 0.0ms to 24.42ms. The cell delay increases and remains constant after some time as the simulation progress in both scenarios as shown in Figure 12. Therefore it is concluded that the results are better with RIP and BGP routing protocol.

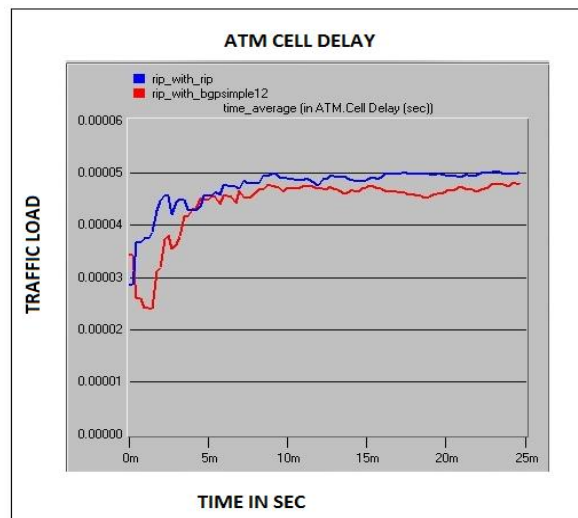


Figure 12: ATM cell delay

Figure 15 shows the simulation results for the traffic received by the Remote Login Response Time. The Remote Login Response time is recorded for both scenarios for 1.45ms to 24.41ms. The Remote Login Response Time with RIP routing protocol is 1.45m initially and then gradually decreases up to 24.41m [8]. The Remote login Response time for RIP and BGP, it remains constant initially up to 3.13m but after this it decreases up to 15.17ms value and gradually decreases up to 24.41ms as the simulation progresses.

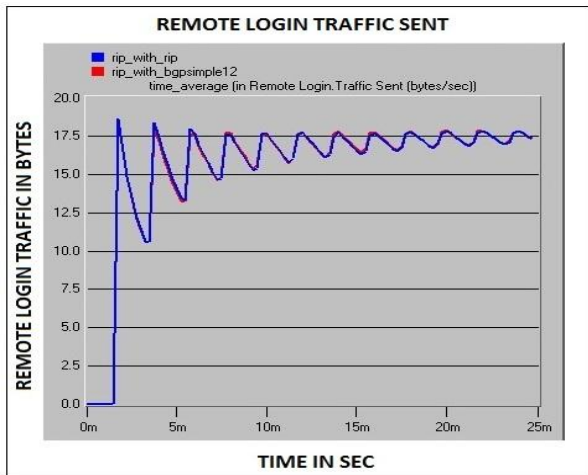


Figure 13: Remote Login Traffic sent

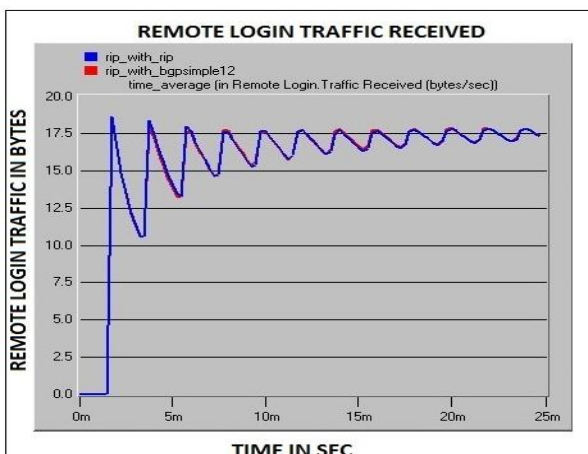


Figure 14: Remote Login Traffic Received

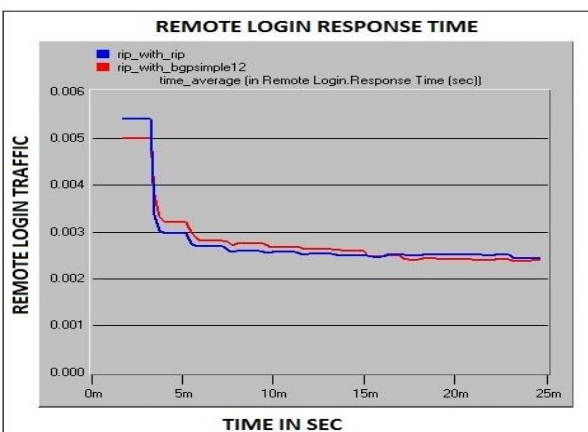


Figure 15: Remote Login Response Time

5. CONCLUSION

The comparative study is done for both RIP and RIP and BGP protocol. The performance metric such as ATM cell delay, Remote Login Response Time and upload and download response time for FTP traffic is recorded for both scenarios.

There is significant improvement in the FTP upload response time which is reduced for the modified protocol. ATM cell delay and remote login response time decreased. FTP traffic

sent and received and remote login traffic sent and received is same in both scenarios.

There is also improvement in Server task proceeding time with the same server load.

The future work can be done on performance analysis with FRIP and other existing methods.

6. REFERENCES

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