International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 2 Issue: 4 907 – 910

Study of Hybrid Network using different Routing Protocols

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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 client HTTP page and object response time, delay are used to measure the performance of the network.

Keywords-*Routing Protocols,RIP,BGP,OPNET*

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I. 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.

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 [1] [2] [3] [4] [5] [6]. OSPF protocol is applied to computer network which consist of different technologies such as frame relay and Multiprotocol Label Switching (MPLS). When OSPF is applied to the network which consists of only frame relay there is no problem in traffic routing. But when it is applied to network consisting of frame relay and MPLS there is serious problem in traffic routing. The paper proposes three solution access list, redistribute and virtual routing and forwarding. Out of which virtual routing and forwarding is said to be best solution [4]. In my paper, same scenario is simulated using two different routing mechanism (RIP & BGP), keeping same settings, and analyzed characteristics such as delay, client HTTP page and object 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.

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.

II. 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 HTTP page and object response time, delay can be analyzed using the software.

III. SCENARIOS

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 [3]. 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. [3]

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.

ISSN: 2321-8169
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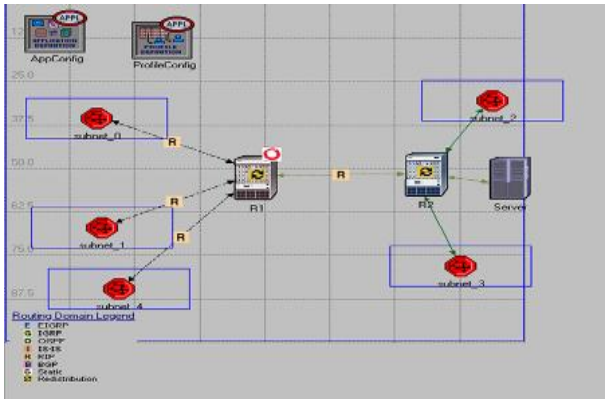

Figure 1.Scenario I

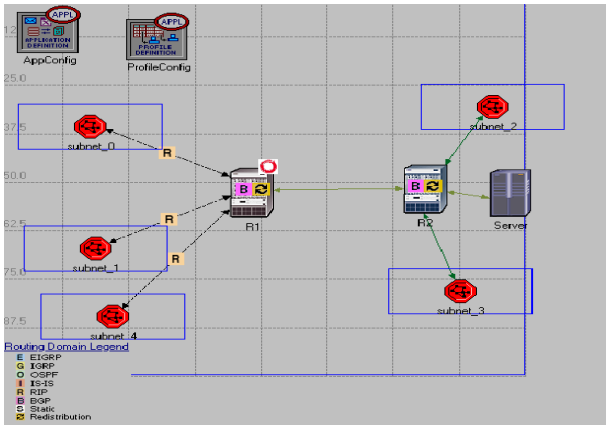

Figure 2.Scenario II

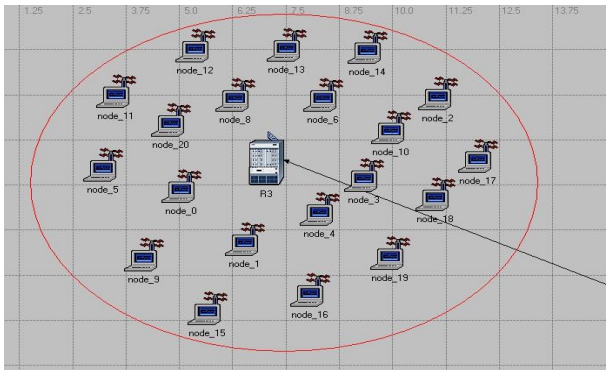

Figure 3.Subnet 3: Mix of FTP and HTTP clients

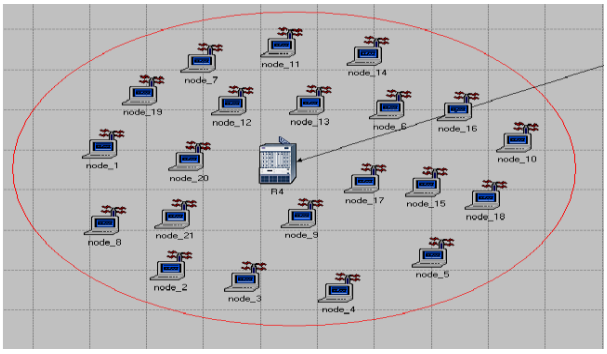

Figure 4.Subnet 1: Mix of FTP and HTTP clients

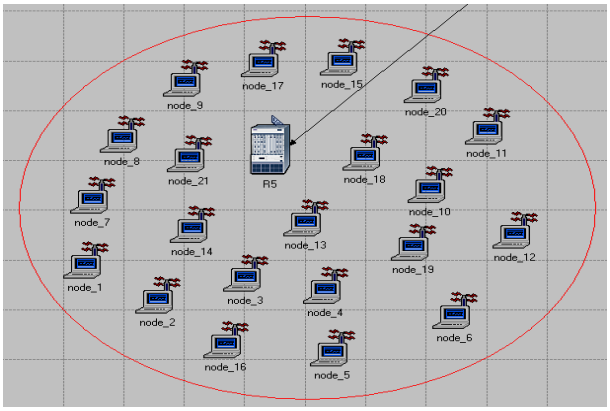

Figure 5.Subnet 4: Mix of FTP and HTTP clients

Figure 6.Subnet 2: FDDI LAN with switched Technology

Figure 7.Subnet 3: FDDI LAN with switched Technology

IV. RESULTS ANALYSIS

Simulation performed for both the RIP and modified protocol of RIP and BGP protocol are shown in figures 8 to 11. The client HTTP page response time with RIP is recorded from 1.30m to 29.42m and with RIP and BGP is 1.30m to 29.42m. [4]The client HTTP object response is recorded between 1.30m to 29.42m with RIP and RIP and BGP routing protocol. From starting point it decreased up to 1.48m and then it remains almost constant and decreases at 4.12m and then remains constant and again increases and decreases after some time as simulation progresses(RIP and BGP).We have kept the same settings for both scenarios for recording measurements for HTTP page and object response time [4]. It is observed that with the help of RIP and BGP at the starting point, the HTTP page response time decreases but after some time it decreases and then it again increases and decreases and it remains

ISSN: 2321-8169
907 – 910

constant as it varies up to 29.42m. Thus, we have analyzed, that in hybrid networks, the results are better with the use of RIP and BGP w.r.t client HTTP page and object response time.

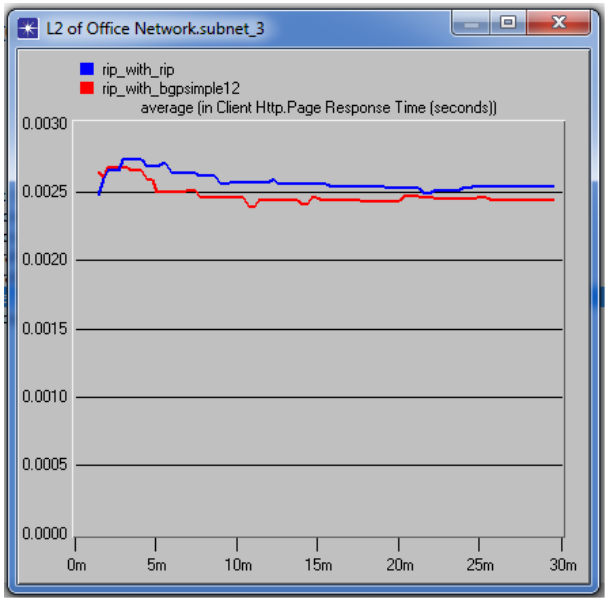

Figure 8.Client HTTP page response time

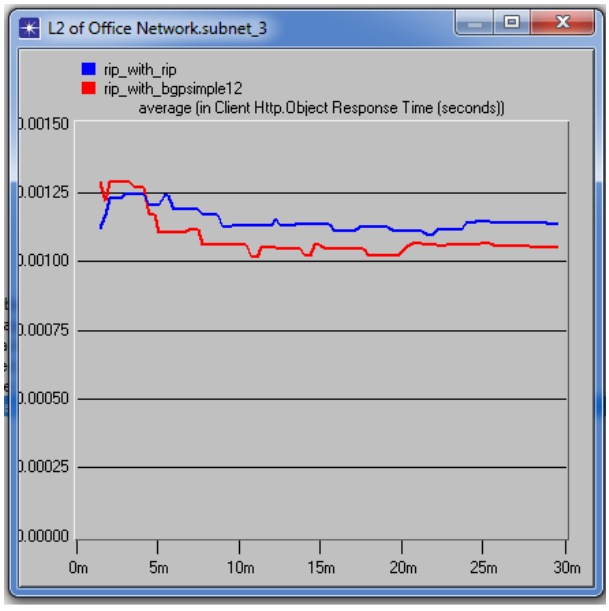

Figure 9.Client HTTP object response time

It has been observed that in both the cases the LAN delay is less in scenario where RIP and BGP protocol is used. In Fig LAN delay with RIP and RIP and BGP varies from 0.0ms to 29.24ms. The delay increases and remains constant after some time as the simulation progress in both scenarios as shown in Figure 11. Therefore it is concluded that the results are better with RIP and BGP routing protocol.

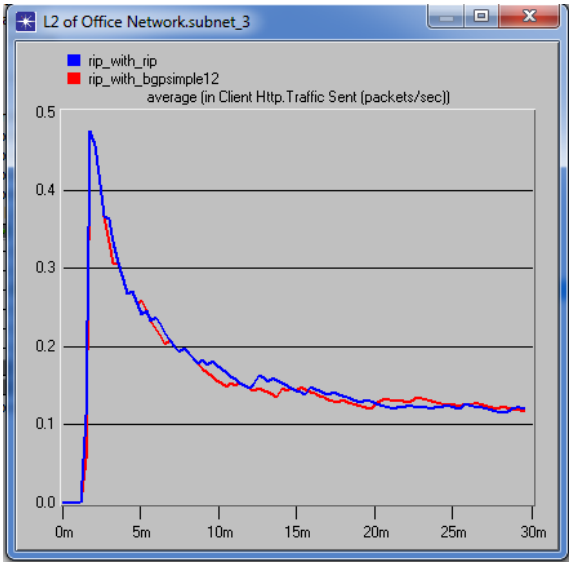

Figure 9.Client HTTP Traffic sent

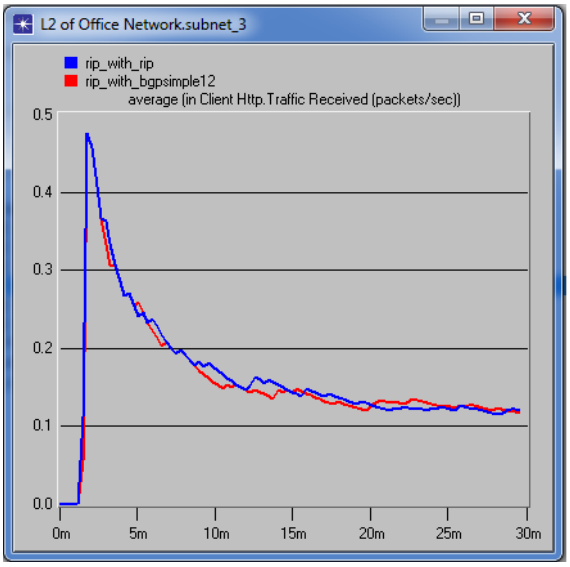

Figure 10.Client HTTP Traffic received

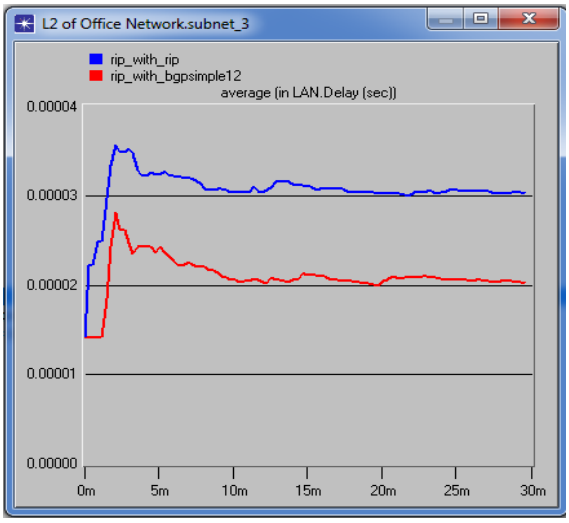

Figure 11 LAN delay (subnet_3)

V. CONCLUSION

The comparative study is done for both RIP and RIP and BGP protocol. The performance metric such as client HTTP page and object response time is recorded for both scenarios.

There is improvement in client HTTP page and object response time in case of modified protocol.

From the obtained results delay is also decreased. The client HTTP traffic sent and received is same in both scenarios.

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

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