Routing Information Protocol Using OPNET

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ABSTRACT
The increasing demand of computer communication networks are growing rapidly day by day. With the growing need to distribute applications across multiple networks and the availability of high capacity, high-performance intermediate switching nodes, and networks, an efficient routing mechanism has become the core requirement. This research primarily focuses on the design and performance of routing information protocol by using OPNET. This allows multiple Ethernet point-to-point links to be bundled into one logical full-duplex channel for Fast Ethernet (10BaseT, 100BaseT, or 1000BaseX). These applications require some QoS support such as guaranteed bandwidth, less delay, less jittering effect and low error rate. This network model is based on OPNET IT GURU Academic Edition. This OPNET simulation showed the impact of IP routing protocol for hybrid networks for different types of applications. OPNET simulation tool is used to design the network; analysis of the results is examined using standard tools.
Keyword : network, capacity, protocol, opnet.

1. Introduction

Most important aspect of communication is routing and routing is done by routing protocols. The objective of this project is to configure and analyze the performance of Routing Information Protocol (RIP) model. We will set up a network that utilizes RIP as the routing protocol. We will analyze the routing tables generated in the routers and observe how RIP is affected by link failures.

After briefing the introduction in section I, Section II Background, section III covers the scenarios we tested, section IV analyses the results and the conclusion is drawn in section V.

2. Background

RIP (Routing Information Protocol) is known as dynamic routing protocol and it was come in the field of routing in 1988 of June and its reference is RFC 1058.It was developed by C. Hedrick from Rutgers University.RIP is a routing protocol for exchanging routing table information between routers. Routing updates must be passed between routers so that they can make the proper choice on how to route a packet.Main goal was to be a robust protocol for routing within an autonomous system. RIP always uses 1 as link metric and straight forward implementation of Distance Vector Routing or a simple intradomain protocol. Each router advertises its distance vector every 30 seconds (or whenever its routing table changes) to all of its neighbors and maximum hop count is 15, with "16" equal to "∞", Or Routes are timeout (set to 16) after 3 minutes if they are not updated.

Routing is done differently within an autonomous system (intradomain routing) and between autonomous systems (interdomain routing).An autonomous system is a region of the Internet that is administered by a single entity.

During this research we use OPNET simulator IT GURU Academic Edition V9.1, Optimized Network Engineering Tools (OPNET) Modeler is the industry's leading simulator specialized for network research and development. It allows users to design and study communication networks, devices, protocols, and applications with great flexibility. OPNET is a simulator built on top of a discrete event system (DES). It simulates the system behavior by modeling each event happening in the system and processes it by user-defined processes. It uses a hierarchical strategy to organize all the models to build a whole network.

3. Implementation

In this section, we will discuss the breakdown of the project implementation from initiating the topologies to setting various protocol and simulation parameters. In the following sections, we will present the obtained simulation results and compare the performance of the RIP. In order to Compare No_Failure Scenario or Failure Scenario is given below.

3.1. No_Failure Scenario creation

1) Start OPNET IT Guru→ Choose File→ New from the file menu→Select Project and Click OK
2) Enter the name of the project to be Prashant_RIP, and the scenario to be NO_Failure and Click OK
3) In the Startup wizard:
   Initial Topology Dialog box→ Create Empty Scenario is selected→ Click Next
   Network Scale List → Select Campus→ Click Next three times→ Click OK

3.2. Creating and Configuring the Network

1) Add two 100BaseT_LAN objects and one ethernet4_slip8_gtwy router to the project workspace.
2) Connect the two LAN objects with the router using 100BaseT links.
3) You can do so by right-clicking on the object and selecting "Set Name"→ close the Object Palette Dialog box→ Save your Project

The network should appear as below:
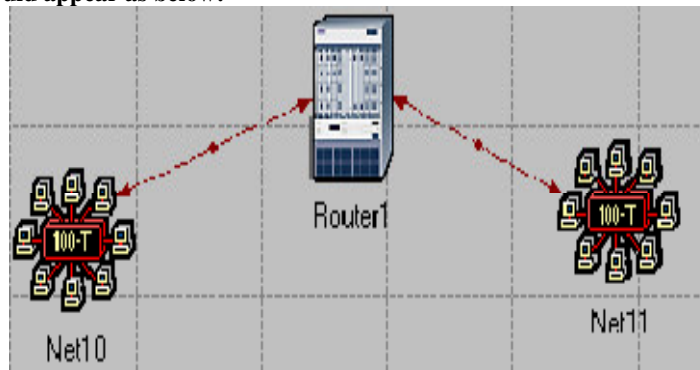
Fig.1 Network Design

4) Right-click Router1→Edit Attributes → Expand the "IP Routing Routers" hierarchy and set the value of "Routing Table Export" to Once at the end of thesimulation.
5) Make three more copies and make sure that your network look like this
   ➢ Use **PPP_DS3** links to interconnect the router
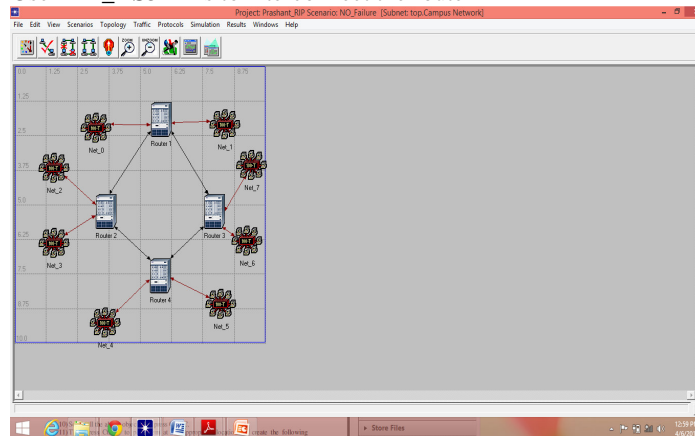
Fig.2 No_failure scenario Network

3.3. Choosing the Statistics

1) Right-click on the project workspace and select "Choose Individual Statistics" then
   • Global Statistics →RIP →Traffic Sent (bits/sec)
   • Global Statistics →RIP →Traffic Received (bits/sec)
   • Nodes Statistics → Route Table → Total Number ofUpdate
   Click OK and then save your project.

3.4. Configuring the Simulation

1) Click on the run simulation icon →Configure Simulation window should appear → Set the duration of the simulation to be 10 minutes.
2) Click on the Global Attributes tab and change the following attributes as shown below:
  (i) IP Dynamic Routing Protocol = RIP
  (ii)IP Interface Addressing Mode = Auto Addressed / Export
  (iii) RIP Sim Efficiency = Disabled

{If the RIP Sim Efficiency is enabled, then RIP will stop after the "RIP Stop Time". But, we need RIP to keep updating the routing table in case there is any change in the network.}

Click Ok and then save the project.
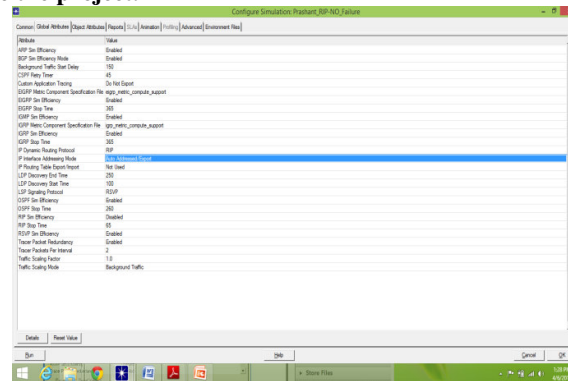
Fig.3 Simulation of No_failure Scenario Network

In the network we just created, the routers will build their routing tables and then they will notneed to update them further because we did not simulate any node or link failures.

3.5. Failure Scenario creation

In this scenario, we will simulate failures so that we can now compare the behavior of the routersin both the cases.

1) Scenarios →Duplicate Scenario → name it Failure→Click OK
2) Add a Failure Recovery object to the workspace, select utilities from the drop down menu and name it Failure as shown below:
3) Right-click on the Failure object and select "Edit Attributes"
4) Expand the Link Failure/Recovery Specification hierarchy and set rows to 1. Set the attributes of the added row as shown below:
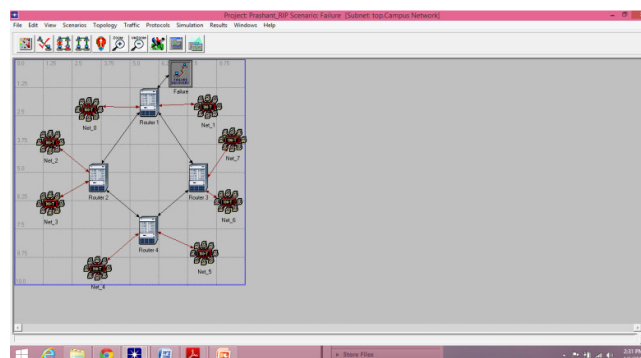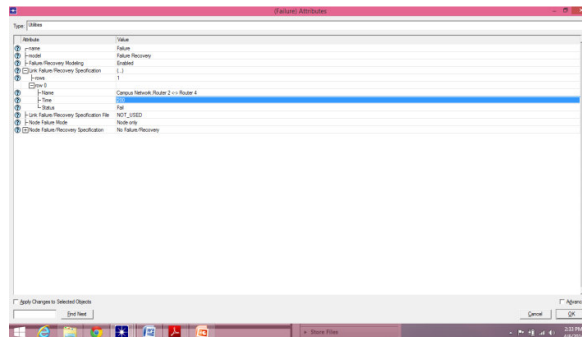

Fig.4 Failure Scenario Network

Fig.5 Attributes of Failure Scenario Network

Click Ok and then save the project→ Run Simulation for the duration of 10 minutes as before.

✓ **Now Let us compare the Result**

a) Right click on the project workspace →Compare Results→Campus Network→Router1→Route Table→Total number of updates → Click Show →right-click and change "Draw Style" to Bar

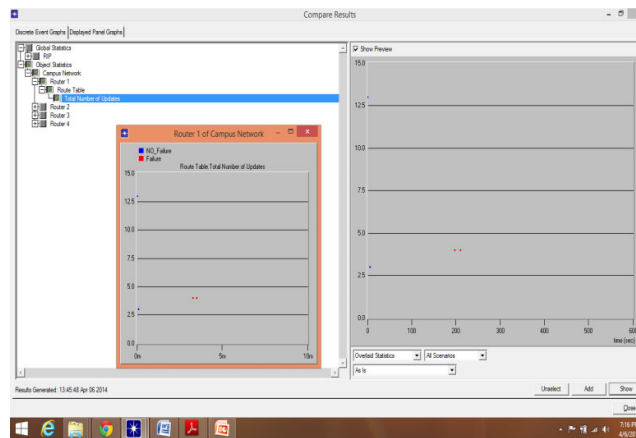Fig.6 Results Compare

b) Capture the figure using PrntScrn.

c) Likewise, obtain figures for the total number of updates at all the other routers.

4. Result Analysis

In No failure scenario, it shows that routing table we created will build their routing table with no update tables as there is no link failure therefore, the routing table is smooth as show in the above part of the fig.

In Failure scenario, we created a link failure where more traffic is sent and set time is 200 seconds to fail the simulation (200 second equal to3minutes and 20 seconds). In result the RIP in effected nodes send out an update of their routing table to place that failure.

For further data traffic and update, we find the IP address of the routers for OPNET interface.

4.1. Obtain the IP addresses of the interface

Before checking the contents of the routing tables, we need to determine the IP address information for all interfaces in the current network. Recall that these IP addresses are assigned automatically during simulation, and we set the global attribute IP Interface Addressing Mode to export this information to a file.

1) Select the File menu. Choose Model Files →Refresh Model Directories.

2) From the File menu, choose Open.

3) Instead of "Project", select "Generic Data File" from the pull-down menu.

4) Select the Prashant_RIP-No_Failure-ip_addresses (Note that the other file createdfrom the Failure scenario should also contain the same information). Click OK.

5) The following is a part of the gdf file. It shows the IP addresses assigned to all interfaces in the network.

Fig.7 No_failure IP addresses

Now let us check the contents of router R1 in both scenarios:

6) Open Results menu. Select "Open Simulation Log". Expand the hierarchy as shownbelow and click on the field "COMMON ROUTE TABLE".

7) You will get the Routing table at Router1. Print the text file.

8) Repeat the above process for all the four routers and print their routing tables.

9) Then, go to the Failure Scenario (by selecting Scenarios→ Switch Scenario) and then open Results menu.

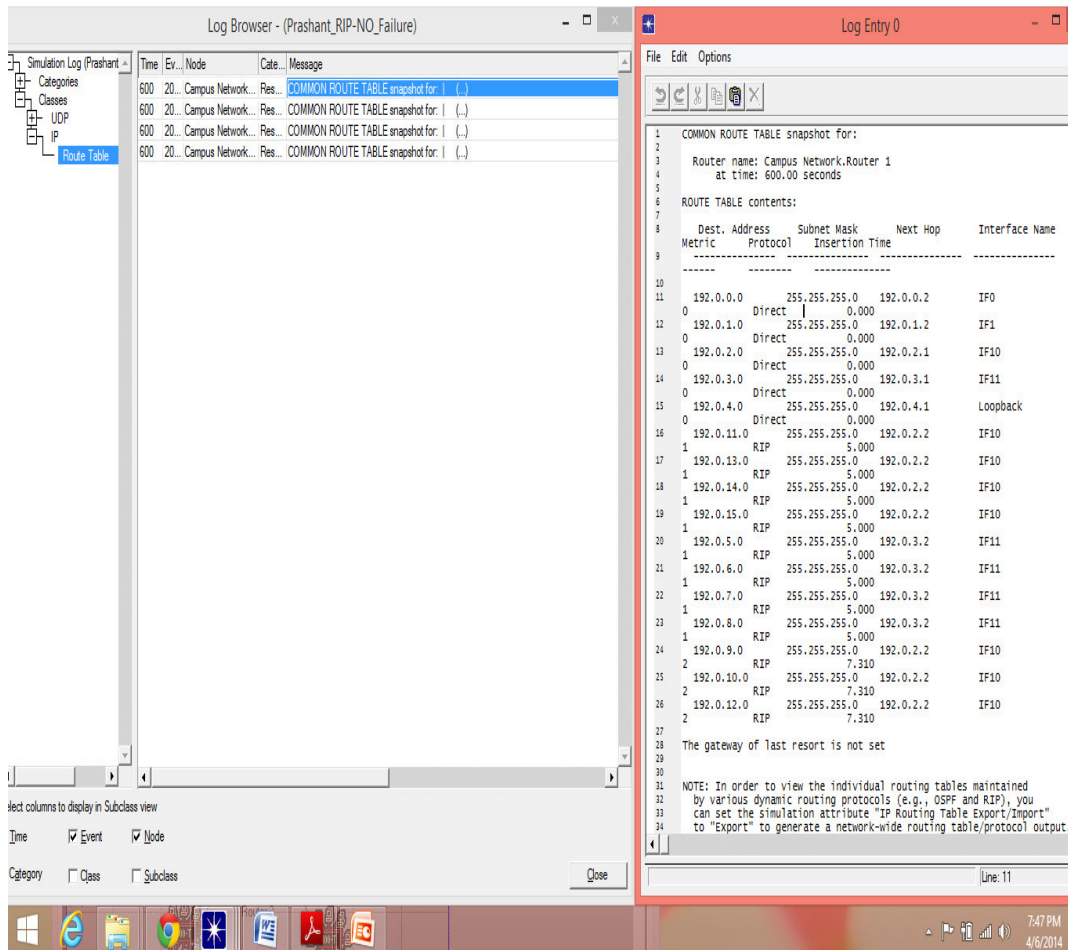10) Now, try to get the routing tables for the four routers in this scenario. Print them.

Fig.8 Routing With IP Addresses

5. Conclusion

Conclusion The research paper the RIP updates process and when fail node updates occurred in the network topologies. RIP (Routing information protocol) commonly used protocol in networking. During this research work, accessible the comparative study of elected protocol RIP and OPNET. Proportional investigation conducted for real time data by using RIP protocol within same network. In simulation environment specific parameters has been set for check performance of routing protocol especially RIP. Network topology called three tires has been used.RIP implements the split horizon, route poisoning and hold down mechanisms to prevent incorrect routing information from being propagated. These are some of the stability features of RIP. It is also possible to use the Routing Information Protocol with Metric-Based Topology (RMTI)algorithm to cope with the count-to-infinity problem.

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