ENSC- 894 Communication Network
FINAL PROJECT PRESENTATIONS
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Simulation of Routing Protocols
Using Riverbed 18.0
(RIP, OSPF, IS-IS, EIGRP, IGRP)

Graduate Team #2

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Roadmap

Introduction

❑ **Routing** : Selecting the path in the network

❑ Routing Protocols determines the best route to transfer data between data network node.

❑ Major classes of routing protocols:-

✓ **Interior gateway protocols type 1** - link-state routing protocols - **OSPF** and **IS-IS**

✓ **Interior gateway protocols type 2** - distance-vector routing protocols, such as Routing Information Protocol, **RIP**, **IGRP.**

✓ **Exterior Gateway Protocol (EGP) -** between autonomous servers, **BGP**

Roadmap

- ❑ Introduction

- ❑ **Routing Protocols**
    - ✓ **Routing Information Protocol (RIP)**
    - ✓ **Enhanced Interior Gateway Routing Protocol (EIGRP)**
    - ✓ **Open Shortest Path First (OSPF)**
    - ✓ **Intermediate system to intermediate system (IS-IS)**
    - ✓ **Interior Gateway Routing Protocols (IGRP)**

- ❑ OPNET Model of Routing Protocols

- ❑ Simulation scenarios

- ❑ Simulation Result

- ❑ Conclusion

- ❑ References

RIP : Routing Information Protocols

- It is one of a family of IP Routing protocols, and is an **Interior Gateway Protocol (IGP)** designed to distribute routing information within an **Autonomous System (AS).**

- Uses **Hop count** as a **routing metric**

- Implemented on top of **UDP port 520.**

- **The maximum** number of **hops,16**

- It has a **30 sec periodic update,180 sec hold time and 240 sec flush time.**

- **Consume less power and memory.**

- Supports equal cost load balancing.

- **Compatible** with all routing devices.

- **Easy to configure.**

IGRP – Interior Gateway Routing Protocol

❑ IGRP came into being in order to overcome limitations exhibited by RIP

❑ Advantage of IGRP is that it **support multiple metrics** for each route.

❑ Maximum **hop count is 255**

❑ Routing **updates are broadcast every 90 seconds** (by default)

❑ IGRP uses **port number 9** for communication

EIGRP – Enhanced Interior Gateway Routing Protocol

❑ Cisco-proprietary routing.

❑ **EIGRP** does not make use of a port number to identify traffic ,it runs on Cisco's **Reliable Transport Protocol (RTP)**

❑ **EIGRP** is **Advance Distance Vector Protocol** also noted as a hybrid routing protocol.

❑ EIGRP makes use of the **Diffusing Update Algorithm (DUAL)**

❑ No periodic update (only triggered update) communicates with neighbors using "hello".

❑ EIGRP is responsible for maintaining its topology table, Routing table and neighbors as it does not depend on periodic route dumps.

❑ Supports equal cost load and unequal cost load balancing.

OSPF – Open Short Path First

❑ OSPF is used to distribute IP routing information throughout a single **Autonomous System (AS)** in an IP network.

❑ OSPF is a **Layer 3 protocol** that runs on top of IP

❑ OSPF is an open-standard, classless routing protocol that **converges quickly** and uses cost as a metric

❑ OSPF is a **link-state routing protocol**

❑ To determine best path to each network, **Dijkstra's algorithm** is used.go

❑ Cost= 100/BW

IS-IS – Intermediate System to Intermediate System

- ❑ It is a **link state routing protocol** that is part of the OSI family of protocols.

- ❑ It uses **Dijkstra's algorithm.**

- ❑ Integrated **IS-IS can carry IP network information**, but does not use IP as its transport protocol

- ❑ Routers exchange topology information with their nearest neighbors, thus every router has a complete idea of the topology of the network.
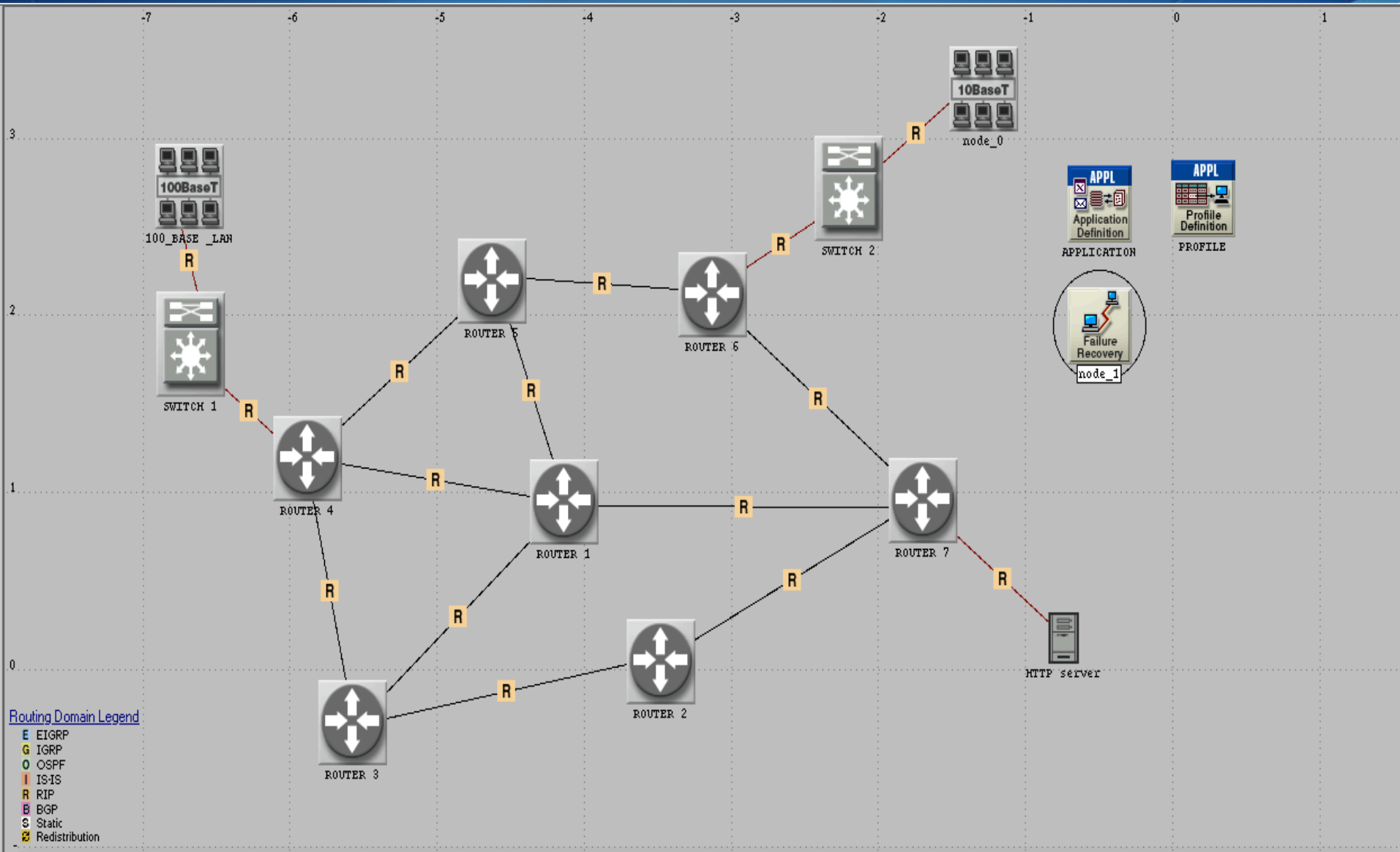
Roadmap

OPNET Model

- ❑ **River Bed Modeler 18.0**

- ❑ **Router (7)**

- ❑ **Ethernet Server (1)**

- ❑ **PPP_DS3 Duplex Link (44.736 Mbps)**

- ❑ **PPP_DS1 Duplex Link (1.544 Mbps)**

- ❑ **Ethernet 100 Base T Duplex Link**

- ❑ **Ethernet Workstation**

- ❑ **Application Configuration**

- ❑ **Profile Configuration**

- ❑ **Failure Recovery**

Roadmap

Simulation scenarios

Simulation Scenario

	Scenario Name	Routing Protocol	Failure Link	Fail Time	Recovery Time
1	RIP	RIP	Router4-1	240	420
2	OSPF	OSPF	Router4-1	240	420
3	IS-IS	IS-IS	Router4-1	240	420
4	EIGRP	EIGRP	Router4-1	240	420
5	IGRP	IGRP	Router4-1	240	420

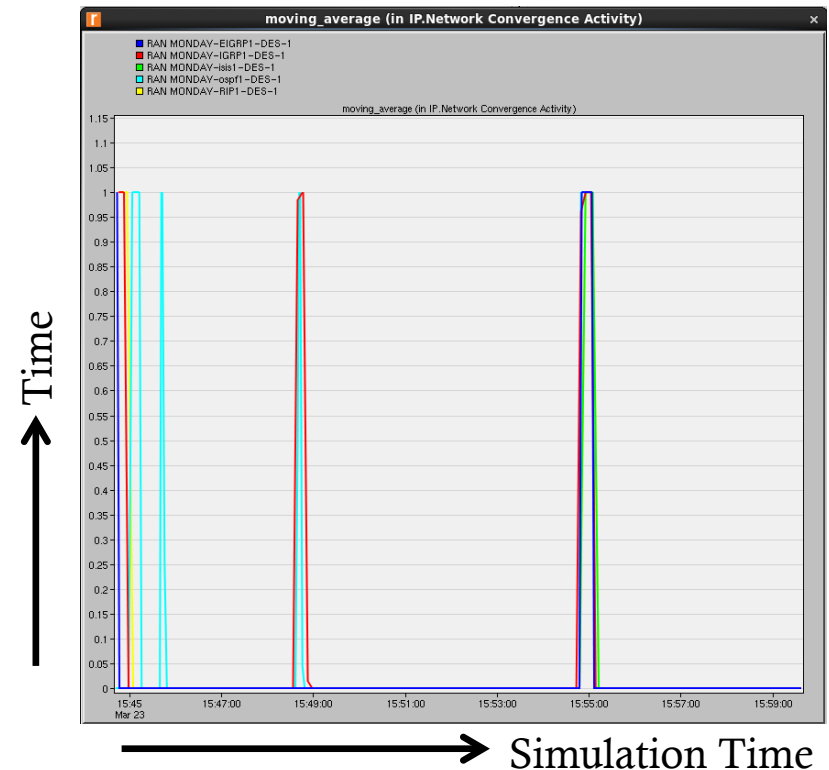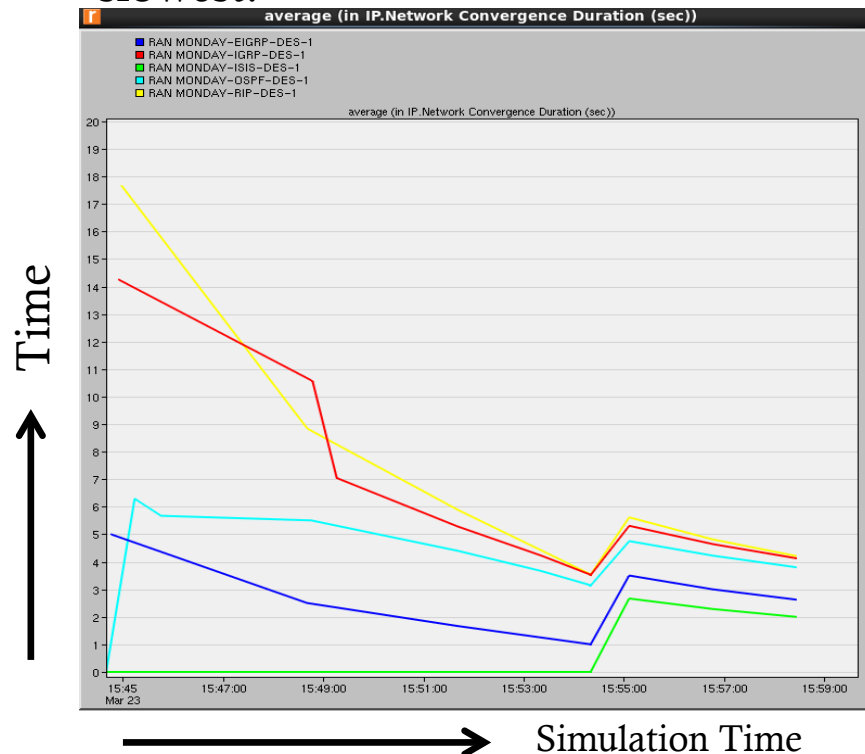| APPLICATIONS	
Video Streaming	Heavy Browsing (HTTP 1.1)

Roadmap

SFU

Simulation Result

Network Convergence Duration

IS-IS is Fastest, followed by OSPF, EIGRP and RIP while as IGRP is slowest.

Network Convergence Activity

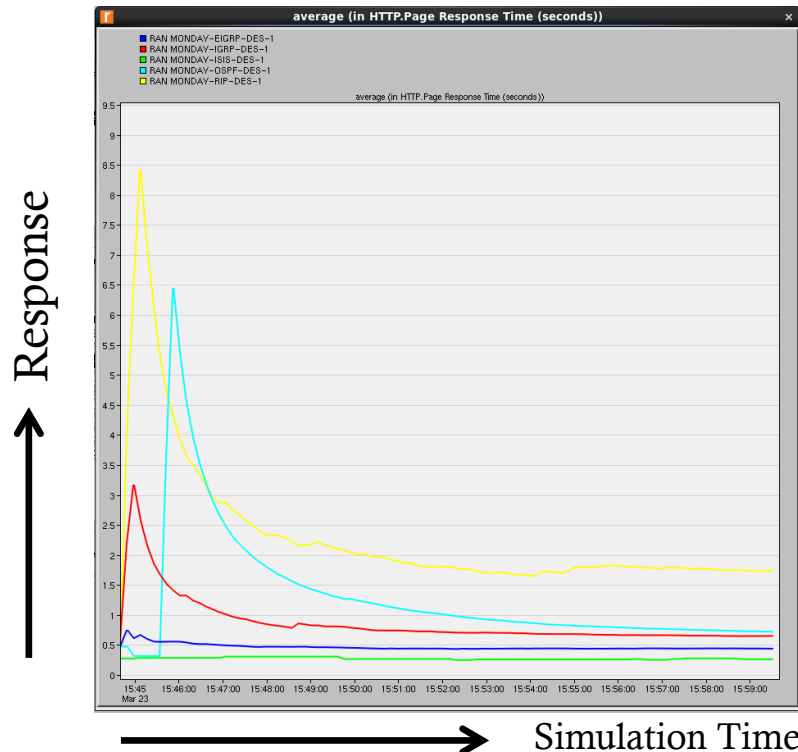Network Convergence is the shortest for IGRP, and longest for EIGRP
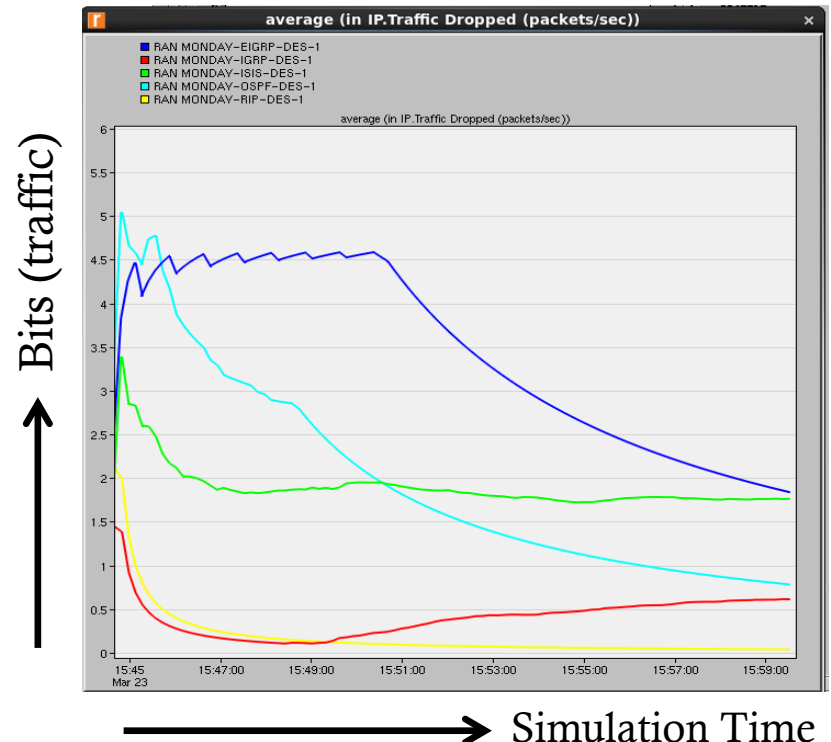
Simulation Result
Heavy Browsing

PAGE RESPONSE TIME

IS-IS has the lowest and RIP has the highest

TRAFFIC DROP

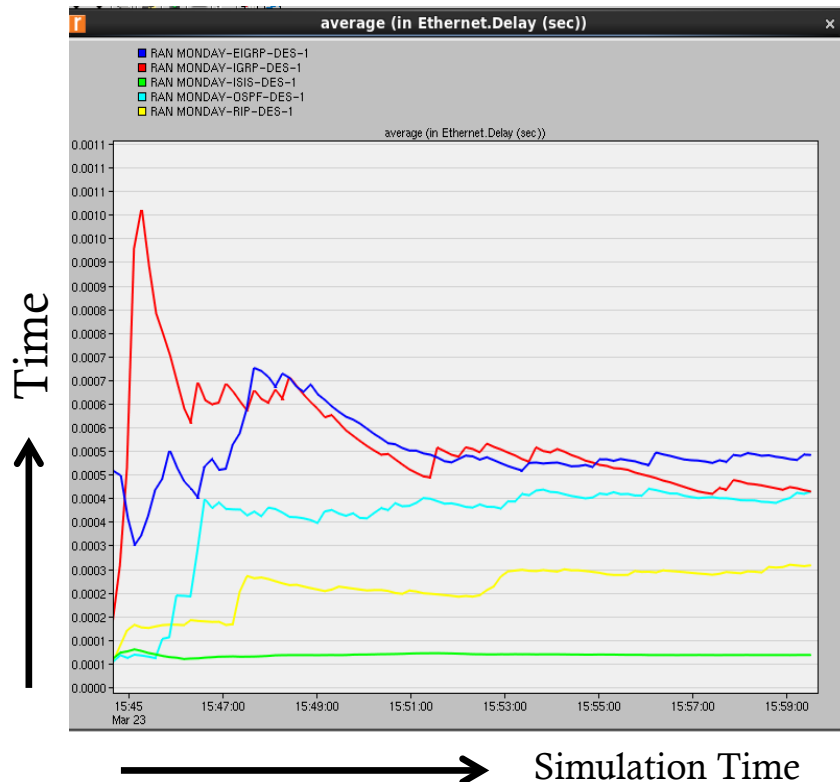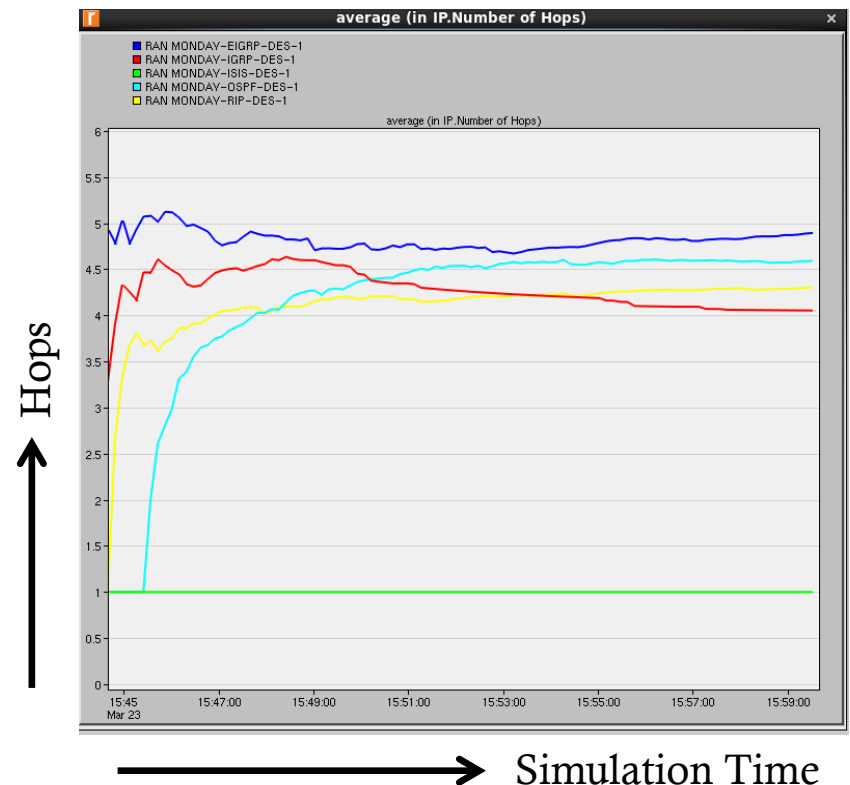RIP has the lowest and EIGRP has the highest

Simulation Result
Heavy Browsing

Ethernet Delay

IS-IS is the lowest and IGRP the highest.

Time → Simulation Time

HOPS

Least number of hops in IS-IS and EIGRP has the maximum
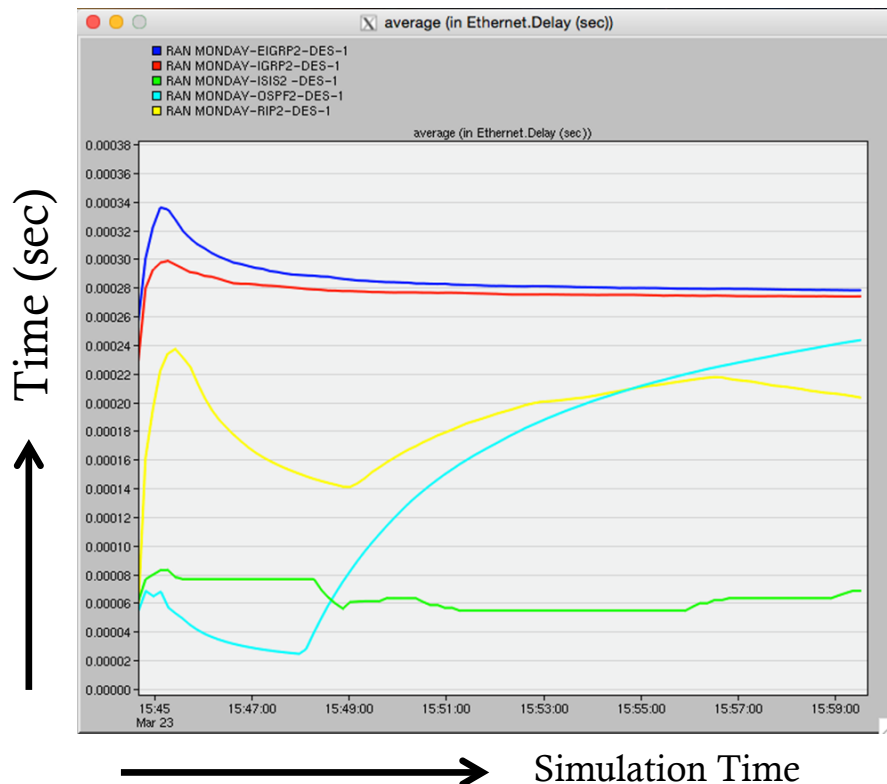

Hops → Simulation Time

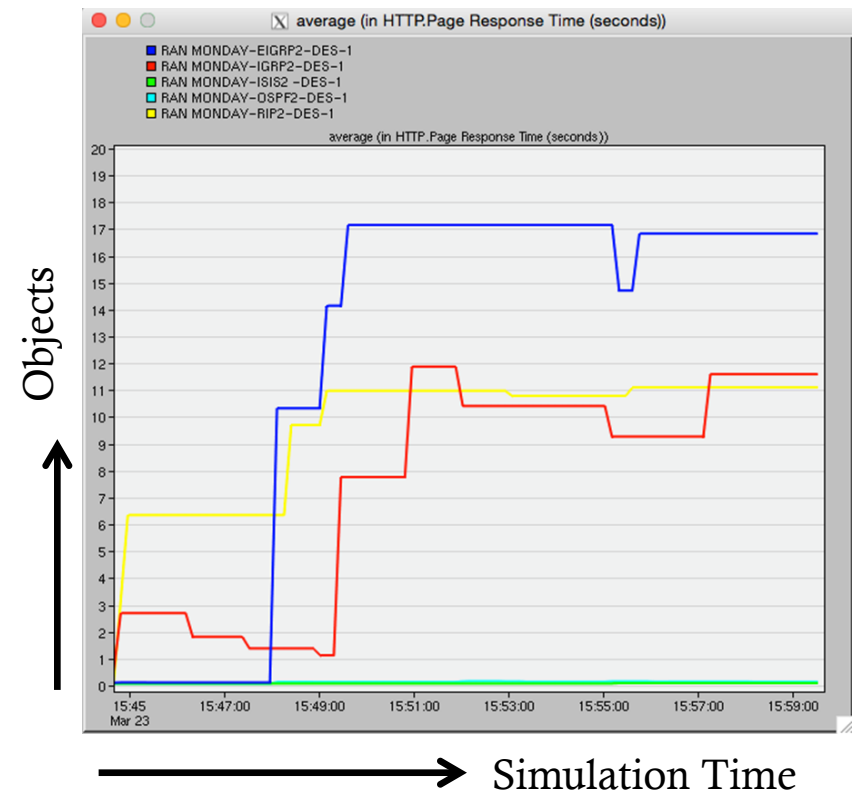# Simulation Result
Video Streaming

Ethernet Delay

IS-IS has the lowest Ethernet delay followed by RIP, OSPF and IGRP while as EIGRP is highest of them all

Page Response Time

IS-IS has the fastest response time followed by RIP and IGRP while as EIGRP is slowest of all

RESULT

❑ IS-IS

✓ lowest Ethernet delay and lest number of hops

✓ Fast network convergence and lowest page response time

❑ RIP

✓ Least number of hops and low traffic drop

✓ High page response time

❑ OSPF

✓ fast converge, better for large network

✓ More complex

RESULT

❑ IGRP:

✓ Slow network convergence duration

✓ Shortest network convergence activity

✓ Highest Ethernet delay

❑ EIGRP:

✓ Highest traffic drop in case of heavy browsing

✓ Longest network convergence activity while maximum, with high traffic drop

✓ Maximum number of hops

✓ While in case of video streaming it has high Ethernet delay with slowest page responsible time

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    - ✓ Open Shortest Path First (OSPF)
    - ✓ Intermediate system to intermediate system (IS-IS)
    - ✓ Interior Gateway Routing Protocols (IGRP)

- ❑ OPNET Model of Routing Protocols

- ❑ Simulation scenarios

- ❑ Simulation Result

- ❑ **Conclusion**

- ❑ References

Conclusion

- ❑ In this project we have presented a comparative study of selected routing protocols such as IS-IS, OSPF, RIP, EIGRP, IGRP .

- ❑ The comparative analysis has been done in the same network with different protocols for real time applications.

- ❑ Performance has been measured on the basis of some parameters that aimed to figure out the effects of routing protocols.

- ❑ Select the most suitable routing protocols and optimize the network operation efficiency.

Roadmap

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References

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[3] M. G. Sheeba, A. Nachiappan, and P. S. L. Gokulnath, "Improving link quality using OSPF routing protocol in a stable Wi-Fi mesh network," *International Conference on Communications and Signal Processing*, Chennai, India, April 2012, pp. 23-26.

[4] P. Rakheja and P. Kaur, "Performance analysis of RIP, OSPF, IGRP and EIGRP routing protocols in network," *International Journal of Computer Applications* 48.18, 2012, pp. 6-11.

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[6] D. Xu and Lj. Trajkovic, "Performance analysis of RIP, EIGRP, and OSPF using OPNET," *OPNETWORK 2011*, Washington DC, August 2011.

[7] S. G. Thornier, "Dynamic routing protocol implementation decision between EIGRP, OSPF, and RIP based on technical background using OPNET Modeler," in *Proc. Second International Conference on Computer and Network Technology (ICCNT)*, Bangkok, Thailand, Apr. 2010, pp. 191.195.

QUESTIONS

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Graduate Group 2

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