

Final Project Presentation

Analysis of Applications Through IP VPN

www.sfu.ca/~leetonyl/Ensc427Group12.html

Group 12

Lee, Tony

301111050

leetonyl@sfu.ca

Nguyen, Anthony

301110184

anthony@sfu.ca

Truong, Henson

301114646

hensont@sfu.ca

Overview

- Introduction
- Related Works
- Background Information
- OPNET Simulation
- Results
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Introduction

Goal

- Analyze the performance of applications through a VPN connection

Motivation

- Corporations deploy VPNs to secure access to their servers and we want to determine trade offs in using a VPN

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Related Works

- Spring 2012 Group 2
 - Analyzed the security of VPN and firewall
- Spring 2012 Group 12
 - Performance of VPN under heavy network load

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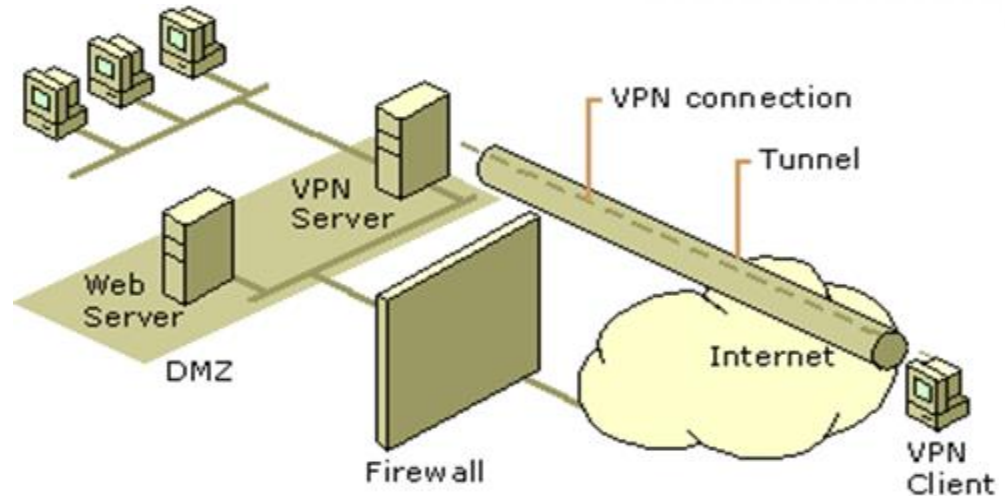
What is Virtual Private Network (VPN)?

- A private network that uses a public network as a pathway to connect remote sites or users together
- Uses Tunneling - encapsulation of packet in another packet before it is transported over the Internet
- Provides end to end security - encrypt packet when being sent out and decrypt packet upon arrival

Establishing a VPN Connection

- To establish a VPN connection, the client creates a tunnel spanning across the Internet and firewall, to the VPN server
- The firewall only allows the packets from the VPN client through

- Composed of 3 components:
 - Client
 - Firewall
 - VPN Server



Two Kinds of VPN

- Remote Access
 - Connection from mobile location to a central resource
 - E.g. Individual connection to a office
- Site to site
 - Connection from a permanent location to a central resource
 - E.g. Offices to other offices
- Our project uses Remote Access

Overview

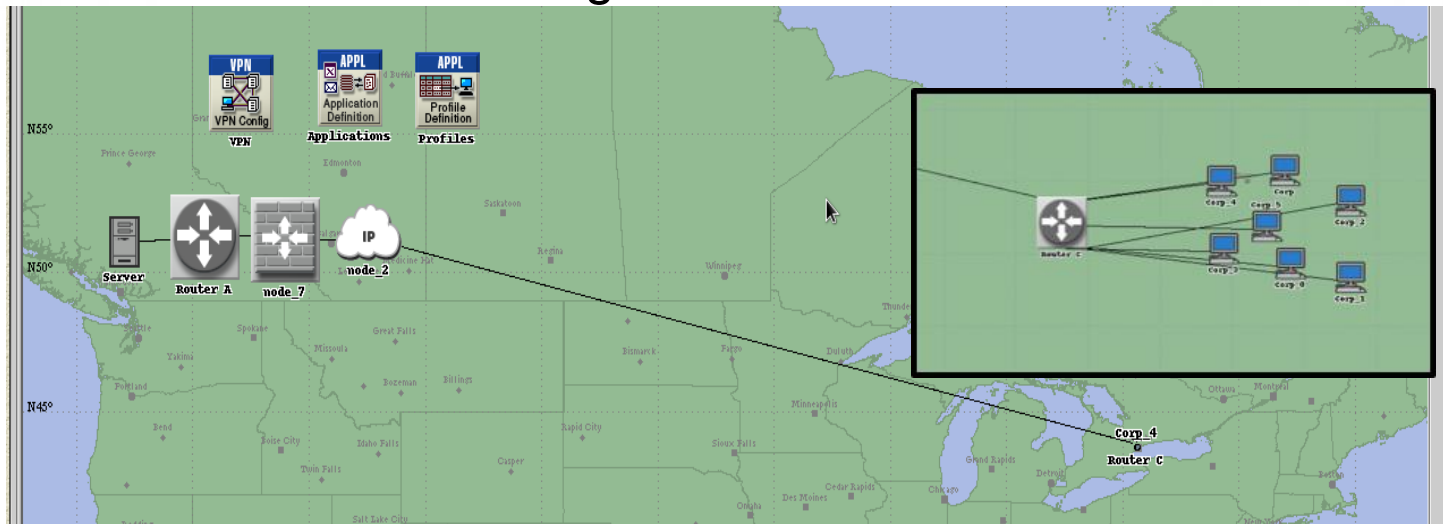
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Simulation

- Multiple clients accessing a central server
- Applications
 - Database
 - File Transfer Protocol (FTP)
 - Email
 - HyperText Transfer Protocol (HTTP)
 - Remote Login
- Compare response time between no VPN vs VPN
- Compare response time between clients of varying distances

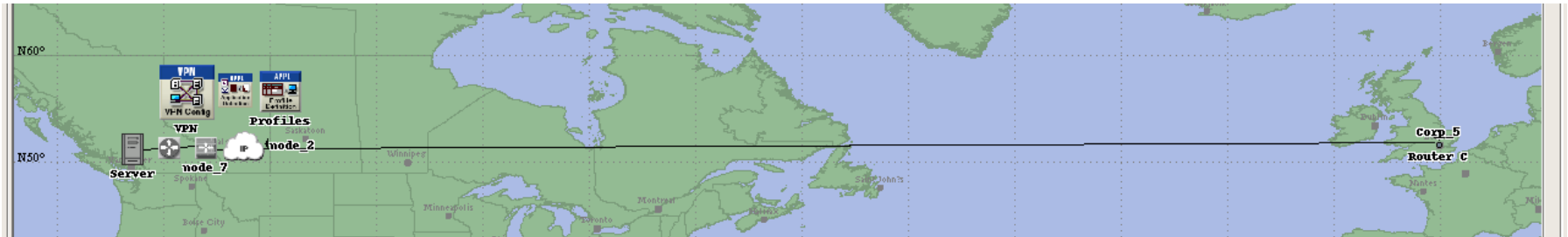
Simulation: Topology #1

- Host Server: Vancouver
- Multiple Clients: Toronto
- PPP DS1 links connecting clients to router and router to IP cloud



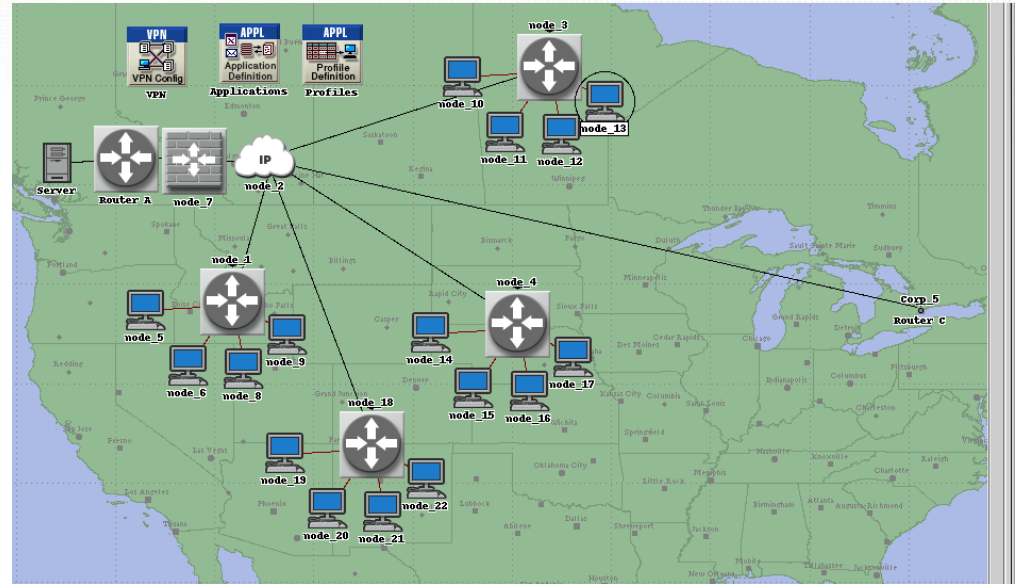
Simulation: Topology #2

- Host Server: Vancouver
- Multiple Clients: London, England
- PPP DS1 links connecting clients to router and router to IP cloud



Simulation: DDOS Scenario

- Additional attacker clients in the Internet
- Attacker client profiles
 - heavy applications
- Server access
 - Unrestricted vs. VPN only

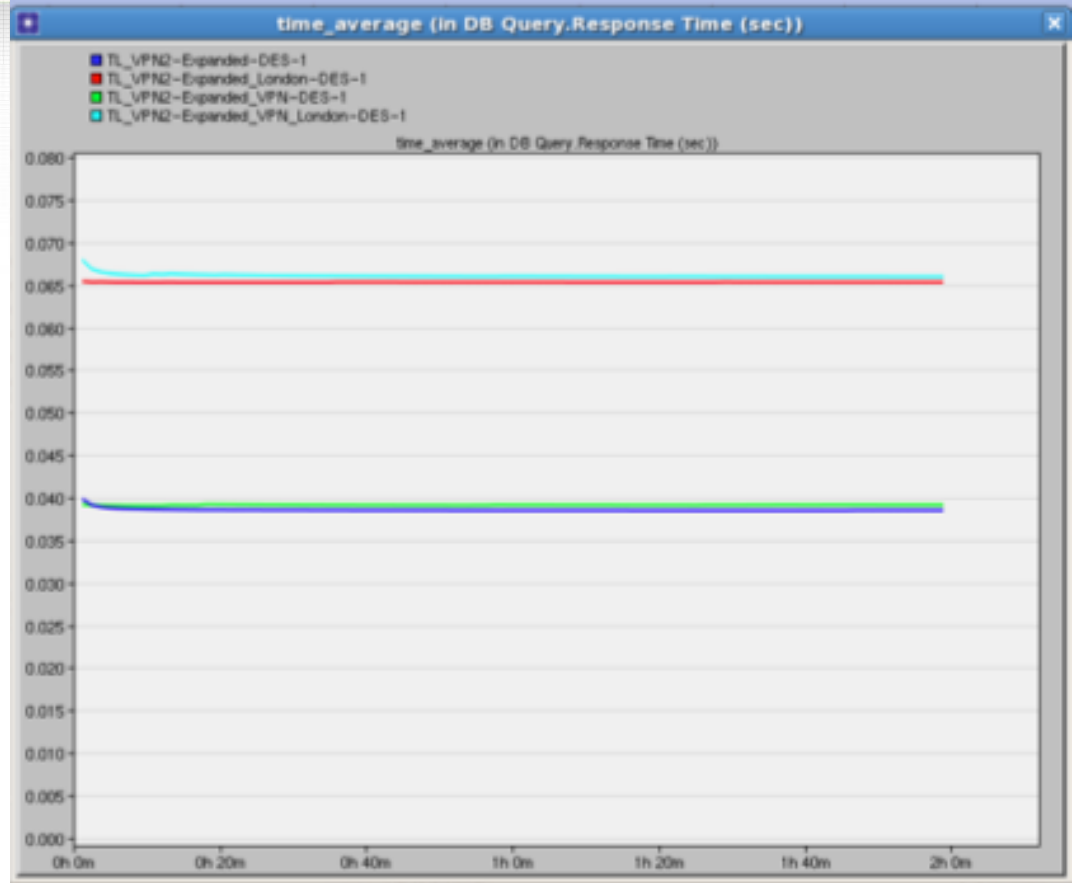


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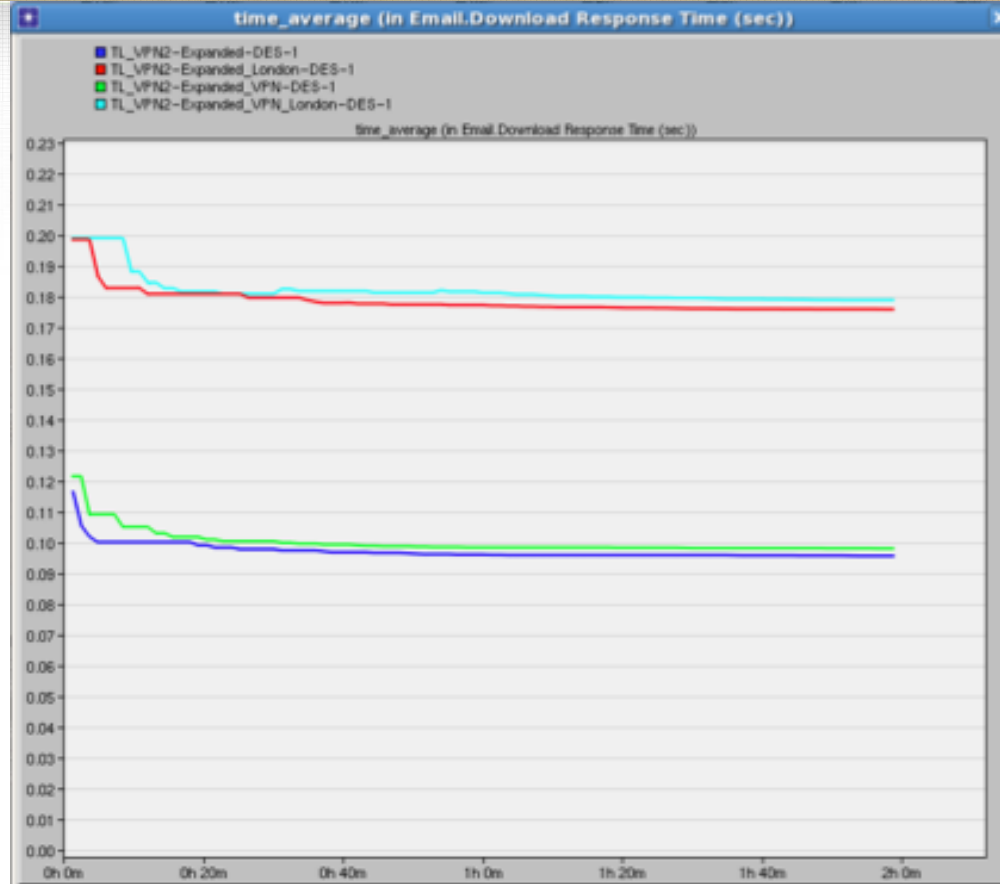
Results: Database Response Time

- **Response Time:**
 - Time elapsed between sending a request and receiving the response packet
- 25ms longer to London
- London: 0.7ms VPN delay
- Toronto: 0.7ms VPN delay



Results: Email Download Response Time

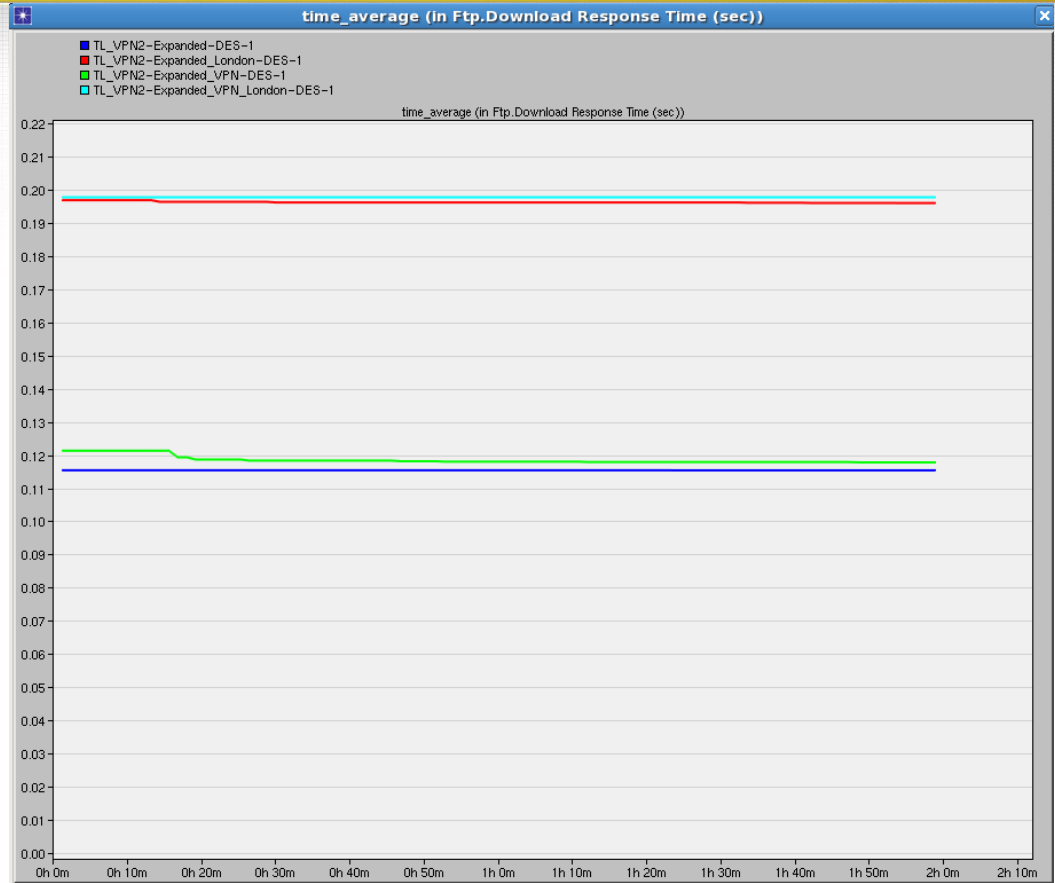
- **Download Response Time:**
 - Time elapsed between sending request for email and receiving emails from email server
- 80ms longer to London
- London: 3ms VPN delay
- Toronto: 3ms VPN delay



Results: FTP Download Response Time

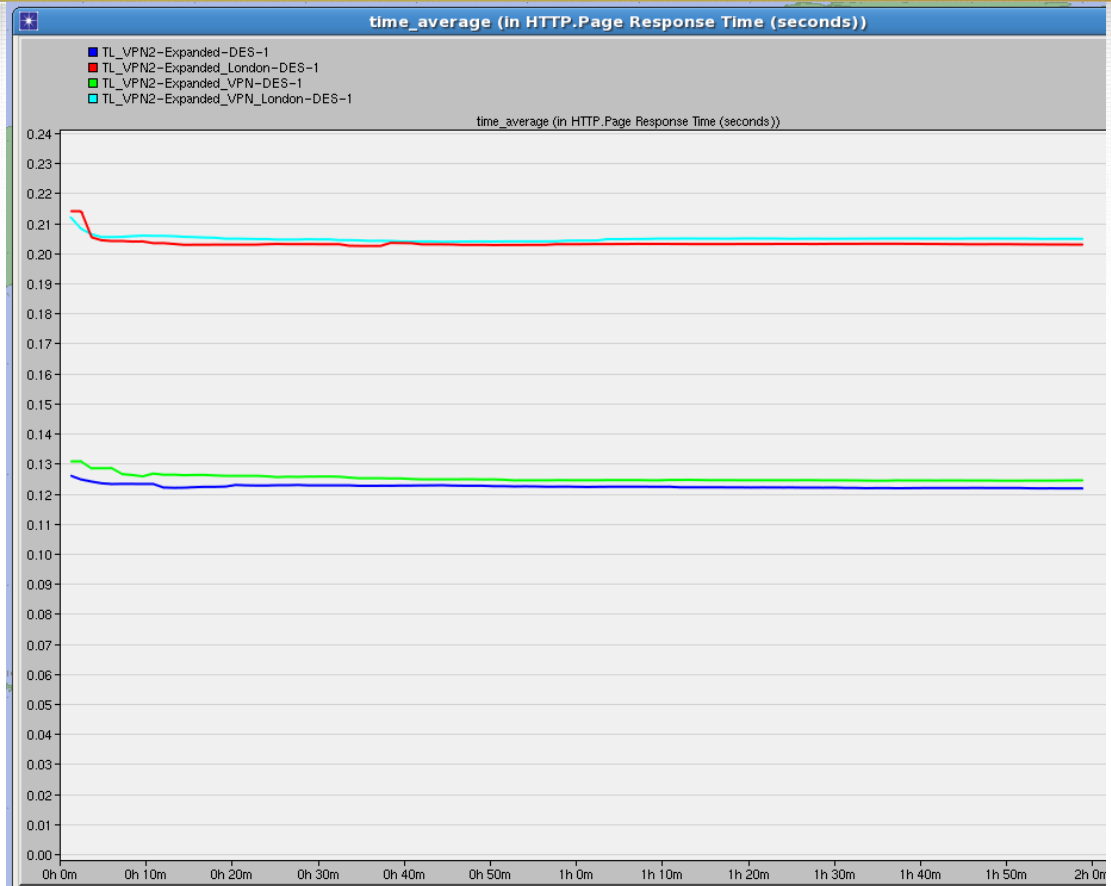
- **Download Response Time:**

- Time elapsed between sending a request and receiving the response packet
- 80ms longer to London
- London: 2ms VPN delay
- Toronto: 2ms VPN delay



Results: HTTP Page Response Time

- **Page Response Time:**
 - Time required to retrieve the entire page with all the objects
- 80ms longer to London
- London: 2ms VPN delay
- Toronto: 2ms VPN delay

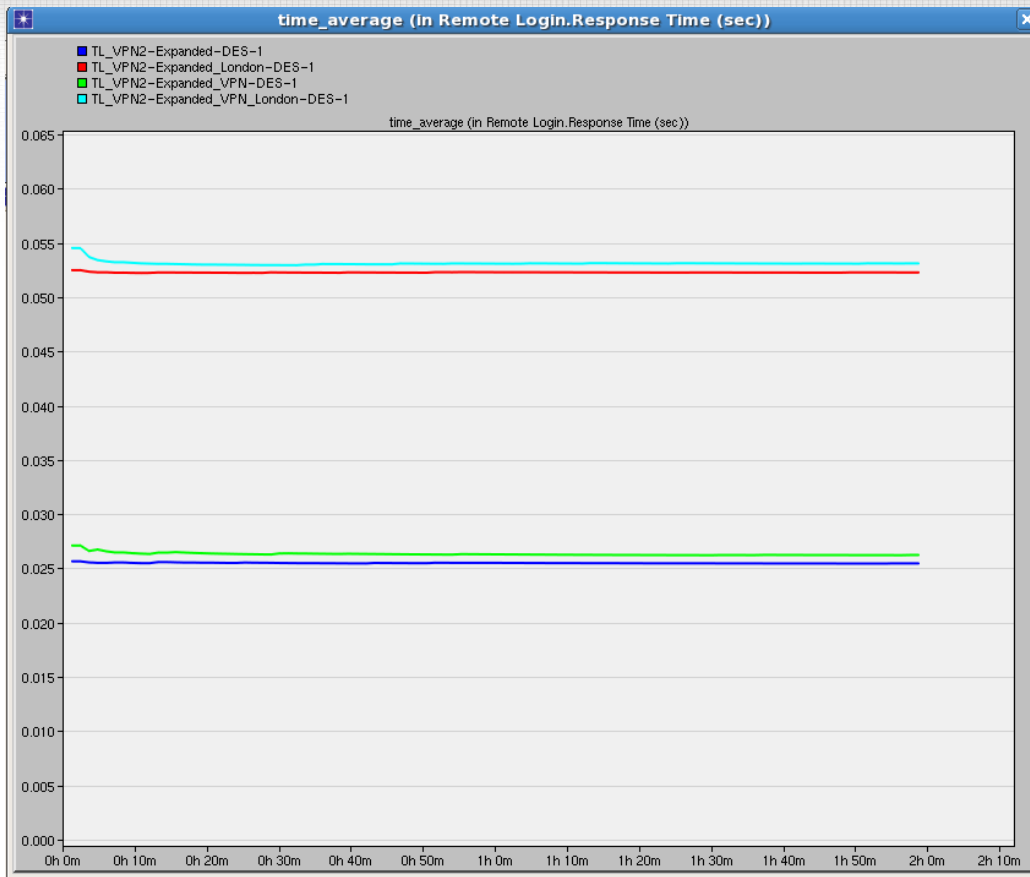


Results: Remote Login Response Time

- **Response Time:**

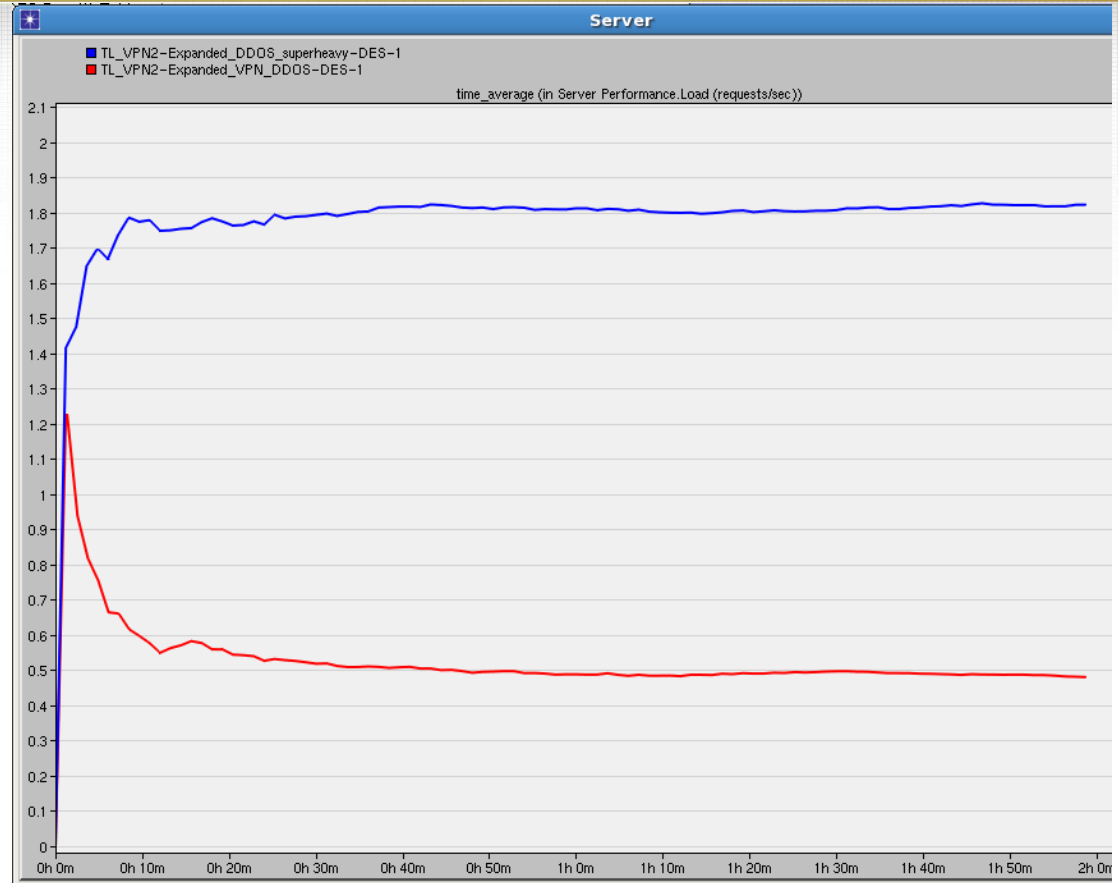
- Time elapsed between sending a request and receiving the response packet

- 30ms longer to London
- London: 1ms VPN delay
- Toronto: 1ms VPN delay



Results: DDOS - Server Performance Load

- **Server Load:**
 - Rate at which requests for any application arrives at the server



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Conclusion

- VPN introduces an increase delay in response
 - OK for Database,Email,FTP,HTTP
 - Bad for Remote Login
 - real time
 - user experience

For DDOS scenario

- Server protection from DDOS attacks
 - Only authorized external clients via VPN
- VPN provides security in exchange for application delay

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Future work

- Implementing a scenario where wireless networks are involved (e.g. WiMAX) because many users work out in the field
- Simulating a more realistic scenario
 - more clients and central servers
- Incorporating VoIP and video conferencing through a VPN

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References

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