Final Project Presentation

Analysis of Applications Through IP VPN

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

<table>
<thead>
<tr>
<th>Group 12</th>
<th>Lee, Tony</th>
<th>301111050</th>
<th><a href="mailto:leetonyl@sfu.ca">leetonyl@sfu.ca</a></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nguyen, Anthony</td>
<td>301110184</td>
<td><a href="mailto:anthony@sfu.ca">anthony@sfu.ca</a></td>
</tr>
<tr>
<td></td>
<td>Truong, Henson</td>
<td>301114646</td>
<td><a href="mailto:hensont@sfu.ca">hensont@sfu.ca</a></td>
</tr>
</tbody>
</table>
Overview

- Introduction
- Related Works
- Background Information
- OPNET Simulation
- Results
- Conclusion
- Future work
- References
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
Overview

- Introduction
- Related Works
- Background Information
- OPNET Simulation
- Results
- Conclusion
- Future work
- References
Related Works

- Spring 2012 Group 2
  - Analyzed the security of VPN and firewall

- Spring 2012 Group 12
  - Performance of VPN under heavy network load
Overview

• Introduction
• Related Works
• Background Information
• OPNET Simulation
• Results
• Conclusion
• Future work
• References
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
  o Connection from mobile location to a central resource
  o E.g. Individual connection to a office

• Site to site
  o Connection from a permanent location to a central resource
  o E.g. Offices to other offices

• Our project uses Remote Access
Overview

• Introduction
• Related Works
• Background Information
• **OPNET Simulation**
• Results
• Conclusion
• Future work
• References
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
Overview

• Introduction
• Related Works
• Background Information
• OPNET Simulation
• Results
• Conclusion
• Future work
• References
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
Overview

• Introduction
• Related Works
• Background Information
• OPNET Simulation
• Results
• Conclusion
• Future work
• References
Conclusion

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

For DDOS scenario
• Server protection from DDOS attacks
  o Only authorized external clients via VPN

• VPN provides security in exchange for application delay
Overview

• Introduction
• Related Works
• Background Information
• OPNET Simulation
• Results
• Conclusion
• Future work
• References
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
  o more clients and central servers
• Incorporating VoIP and video conferencing through a VPN
References


