ENSC 895: Communication Networks
Spring 2010
Final Project Presentation

Simulations of WiMAX using OPNET Simulator

Sukhchandan Lally
lally@sfu.ca

OVERVIEW

- Introduction
- Background Information
- How WiMAX works
- Simulation
- Results
- Conclusion
- References

INTRODUCTION

Overview:

- Performance of WiMAX Networks
- Implementing this technology campus wide

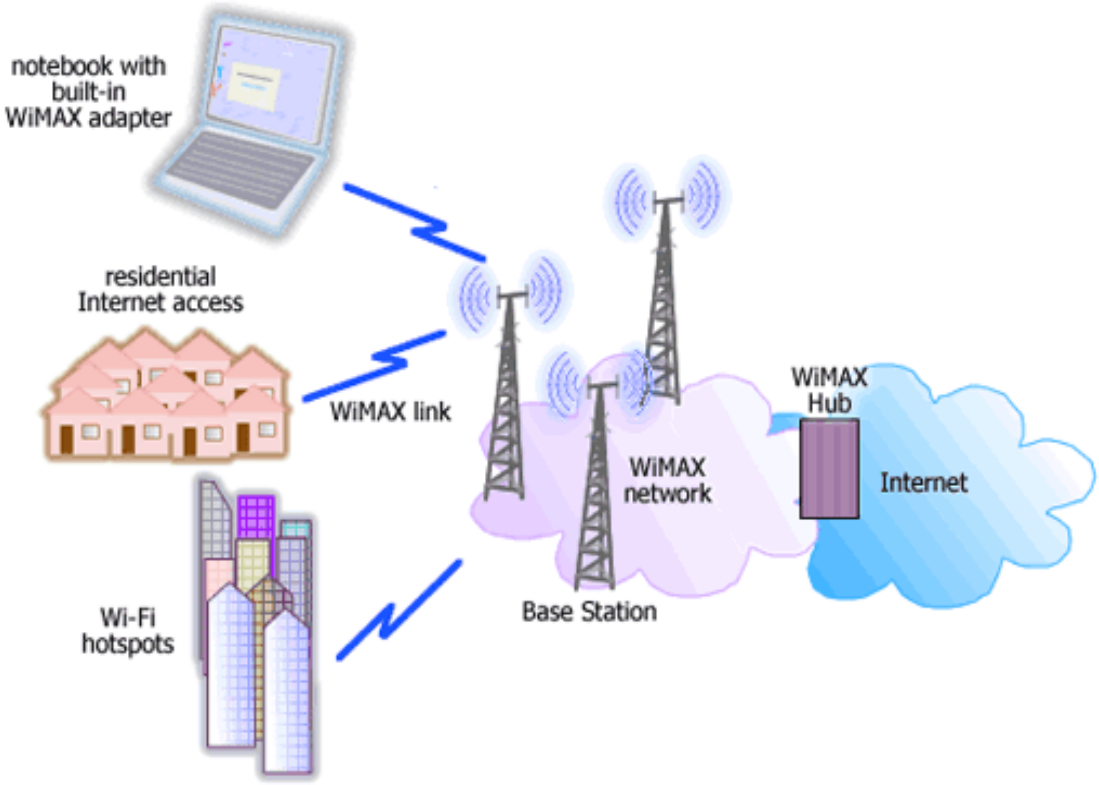
Issues to Analyze:

- WiMAX Load
- Video Conferencing
- Jitter and delay
- Traffic sent and Received

BACKGROUND INFORMATION:

•WiMAX stands for Worldwide Interoperability for Microwave Access.
•It is a telecommunication technology which provides wireless transmission.
•It provides access to Internet and other portable devices.
• It has a transmission speed of 10 Mbps.
•It embodies IEEE 802.16 family of standards that provide fixed and mobile broadband access in telecommunication industry.
•802.16e-2005 uses Scalable Orthogonal Frequency-division Multiple Acess(SOFDMA) rather than Orthogonal Frequency-division Multiplexing(OFDM).
•Multiple duplexing schemes used in WiMAX are Time Division Duplexing (TDD) and Frequency Division Duplexing (FDD).
•It uses Connection oriented MAC (Multiple Access Control) layer.

How WiMAX works:



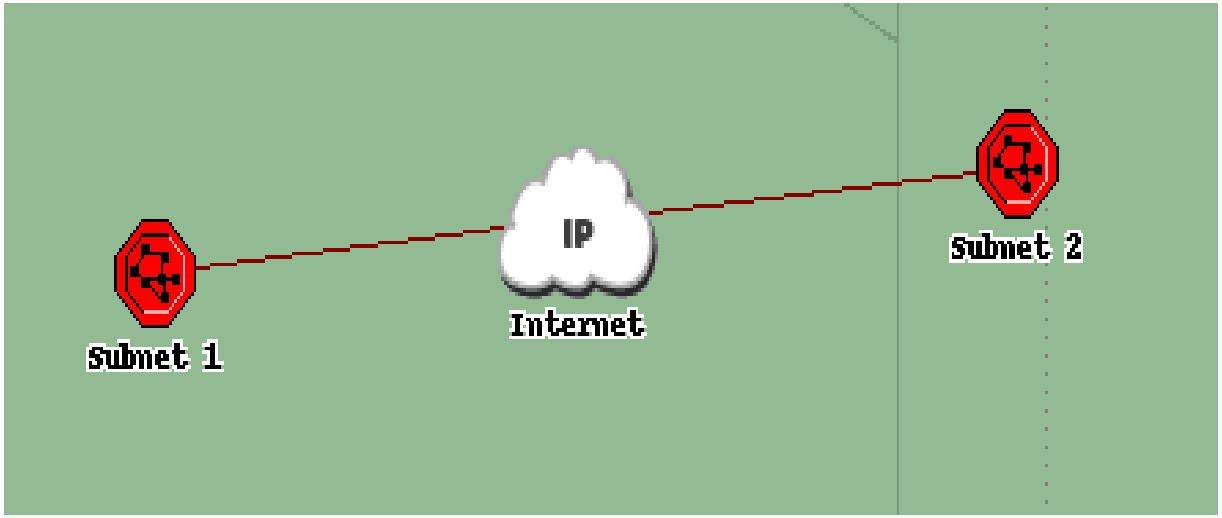
SIMULATION

- **Two subnets connected to internet**
- **Subnet 1 consists of:**

a) Server
b) Switch
c) Router

- **Subnet 2 consists of:**

a) Application Configuration
b) Profile Configuration
c) Base Station
d) WiMAX Configuration
e) Mobile station
f) Fixed Communication Station


IP
Internet
Subnet 1
Subnet 2

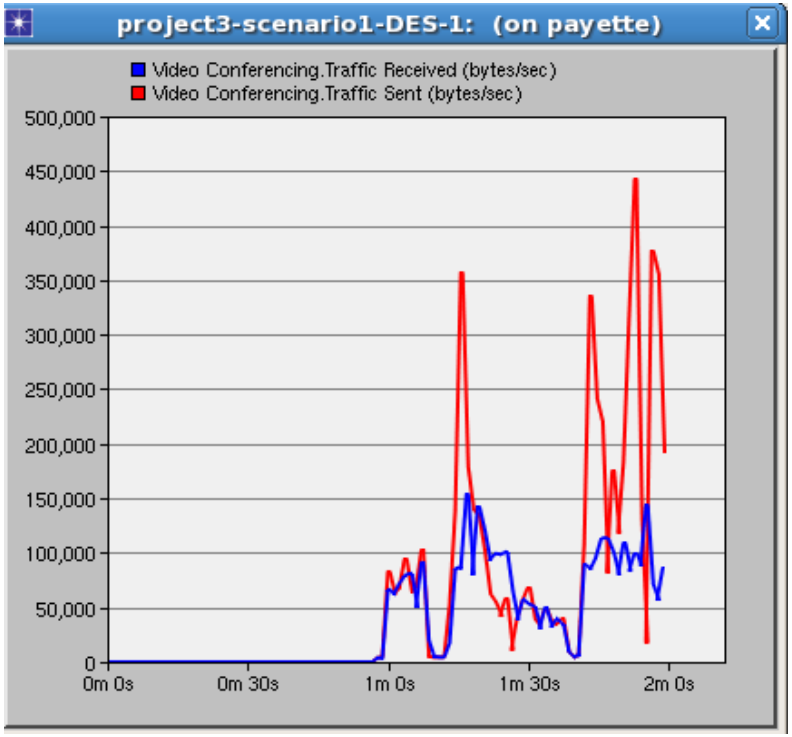
TERMS:

Jitter:
The delay in packet transmission that leads to pulse displacement. It is also known as “shaky pulse”

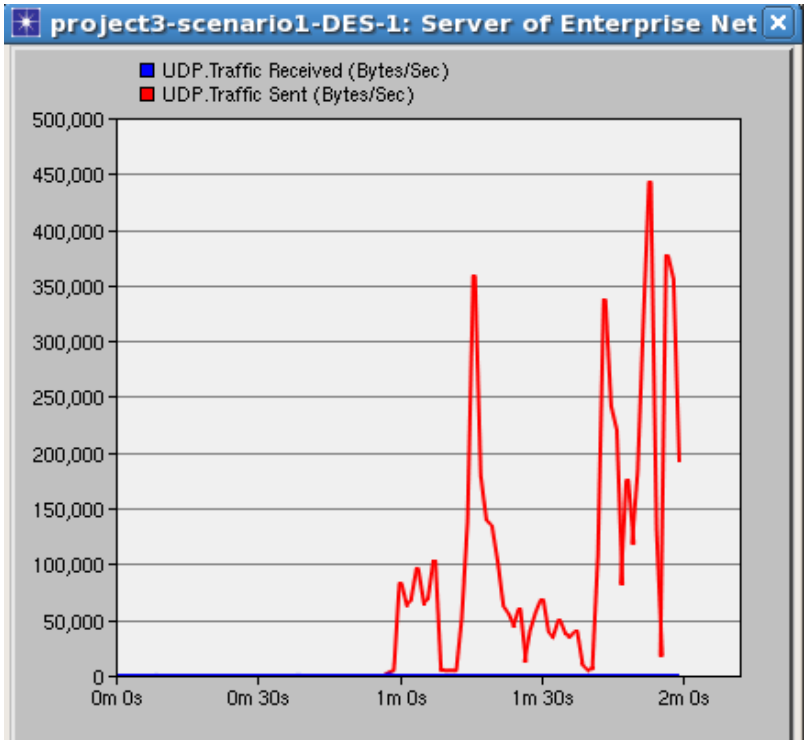
Delay Variation:
The difference measurement in end to end delay between packets

End to End Delay (ETE Delay):
The time required for a packet to travel from source through network to destination.

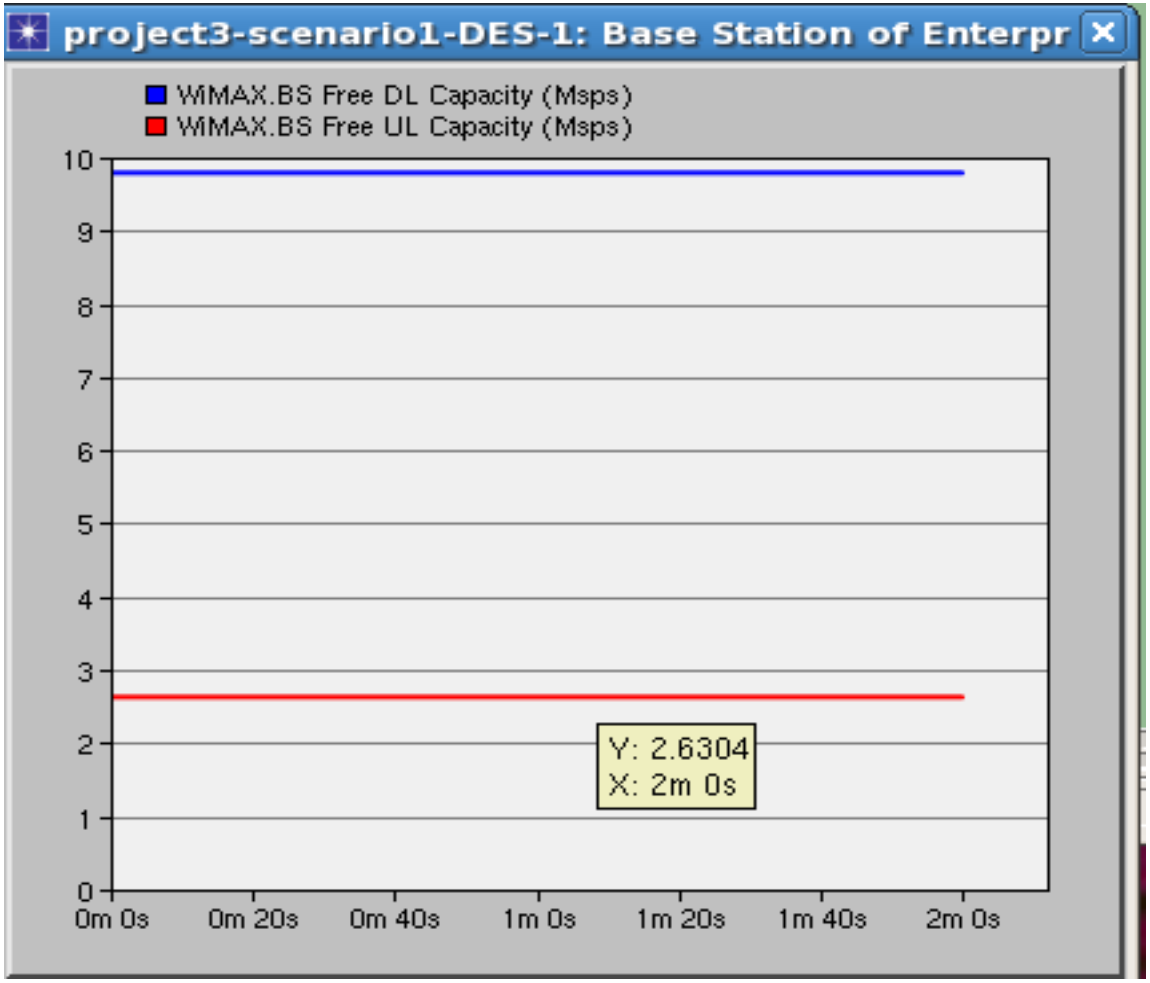
RESULTS



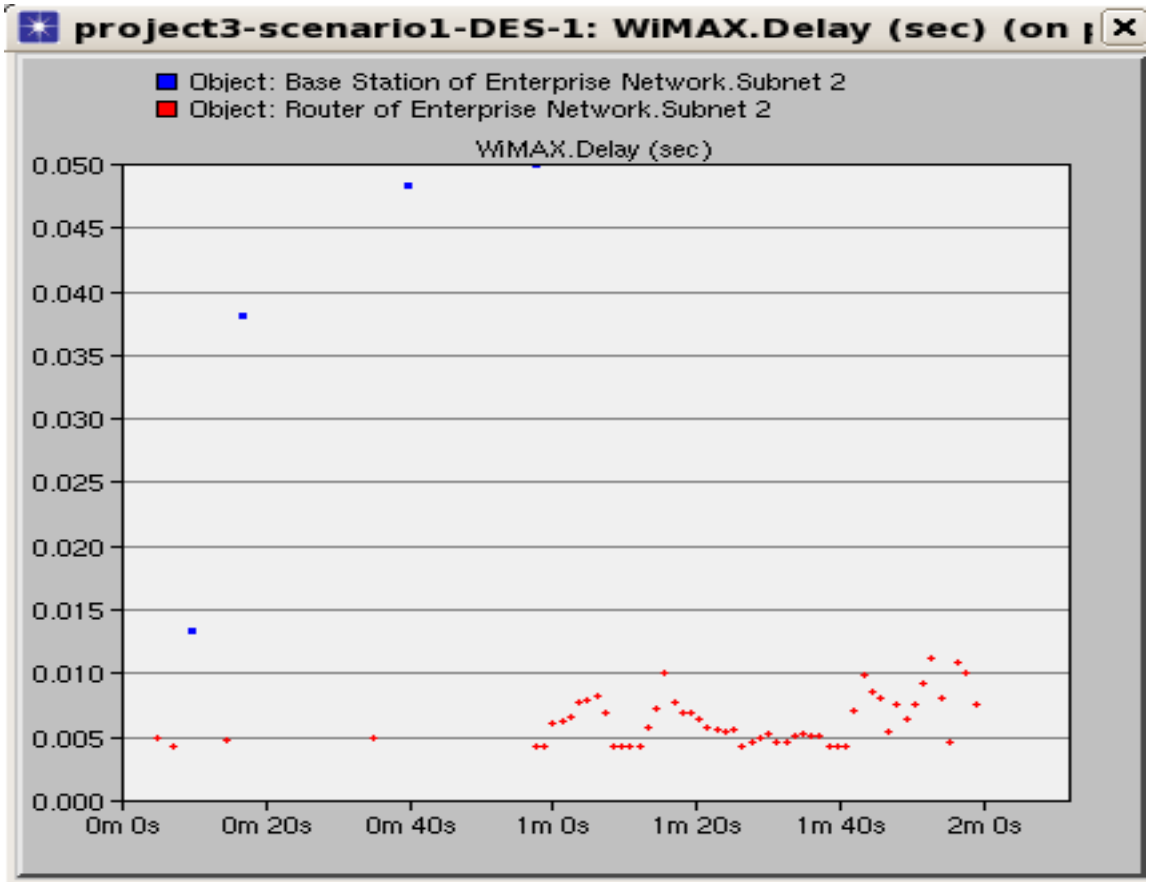
Video Conferencing:
Traffic Received vs Traffic Sent



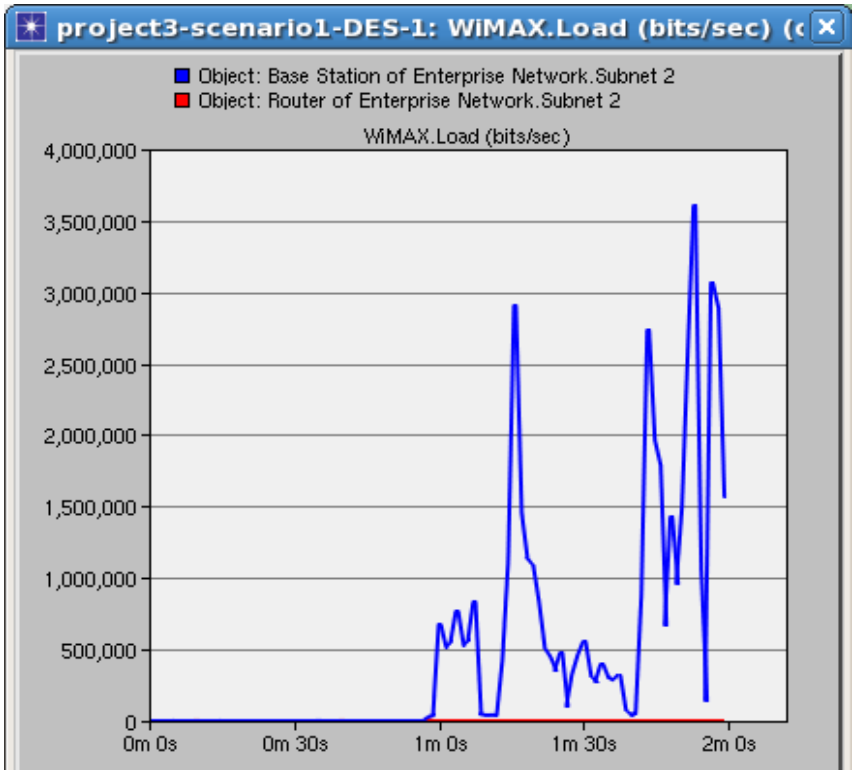
UDP:
Traffic Received vs Traffic Sent



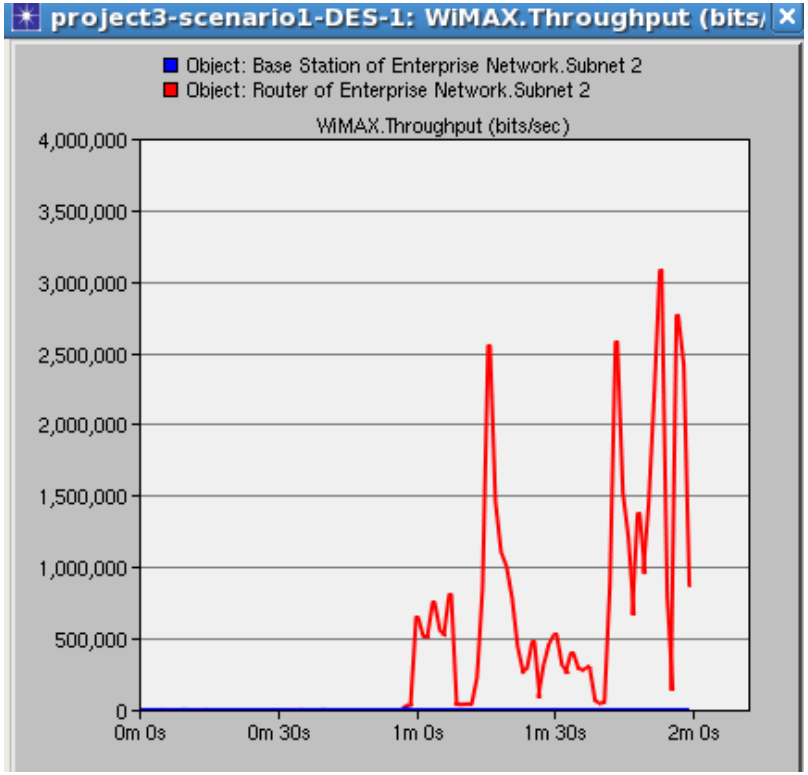
Base Station:
Downlink Capacity vs Uplink Capacity



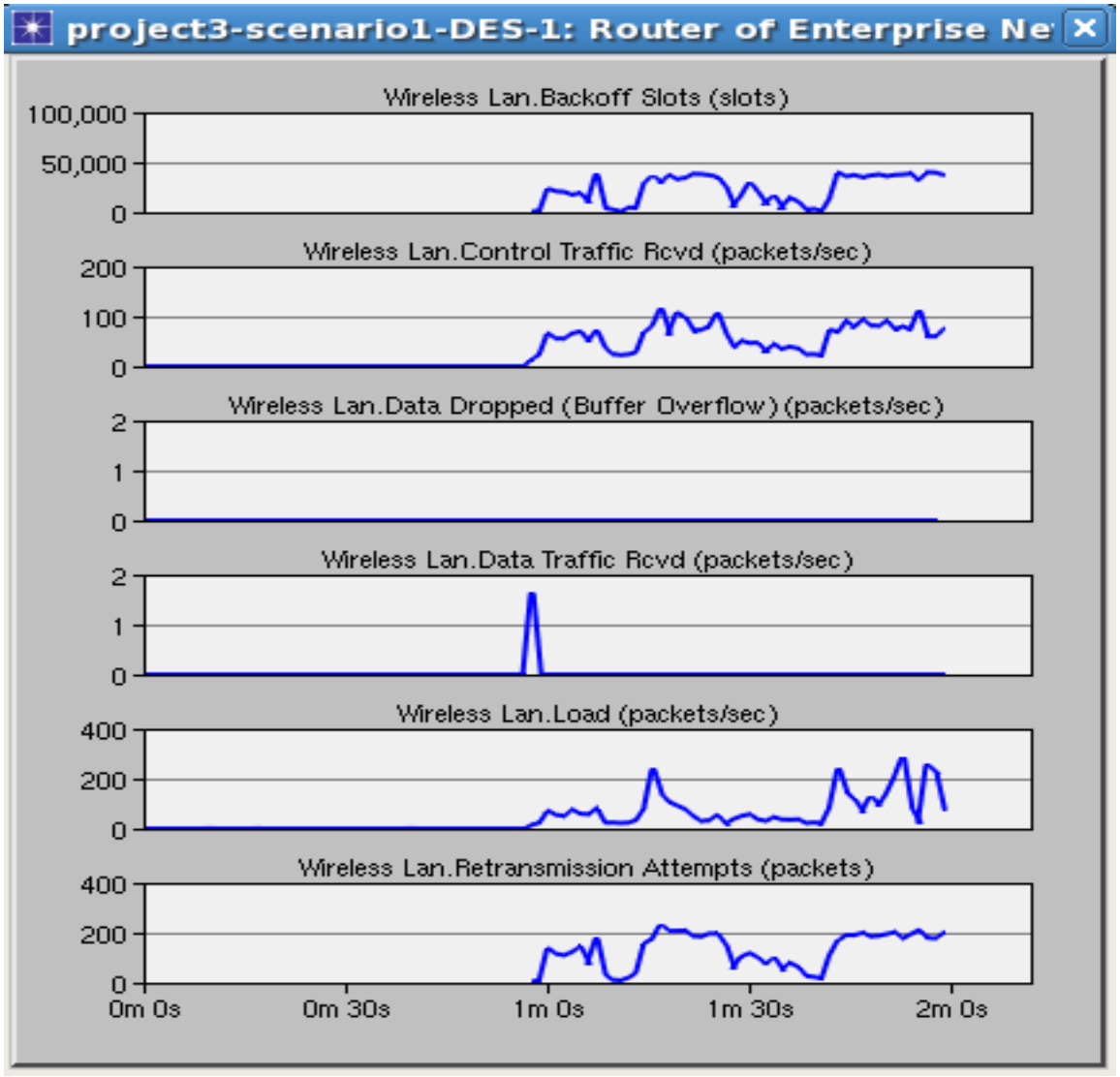
WiMAX Delay for Base Station and Router



WiMAX Load



WiMAX Throughput


project3-scenario1-DES-1: Router of Enterprise Ne
Wireless Lan.Backoff Slots (slots)
100,000
50,000
0
Wireless Lan.Control Traffic Rcvd (packets/sec)
200
100
0
Wireless Lan.Data Dropped (Buffer Overflow) (packets/sec)
2
1
0
Wireless Lan.Data Traffic Rcvd (packets/sec)
2
1
0
Wireless Lan.Load (packets/sec)
400
200
0
Wireless Lan.Retransmission Attempts (packets)
400
200
0
0m 0s
0m 30s
1m 0s
1m 30s
2m 0s

WLAN

APPLICATIONS:

- Connecting Wi-Fi hotspots to the Internet.
- Providing a wireless alternative to cable and Digital Subscriber Line (DSL) for broadband access.
- Providing data, telecommunications and Internet Protocol television (IPTV) services.
- Providing portable connectivity.
- Providing a source of Internet connectivity as part of a business continuity plan. That is, if a business has both a fixed and a wireless Internet connection, especially from unrelated providers, it is less likely to be affected by the same service outage.
- Providing a network to facilitate machine to machine communications.

CONCLUSION:

1.Packet Loss is a big issue in video conferencing
2.There are trade-offs between quality and delay
3. Various concepts affect the QoS (Quality of Service) of WiMAX such as

a) Packet Loss
b) End to end Delay
c) Throughput

REFERENCES

1. OPNET Technologies,OPNETWORK2007 proceedings(online).Available: http://www.opnet.com/opnetwork2007.

2. W.Hrudey and Lj.Trajkovic “Streaming Video Content Over IEEE 802.16/WiMAX Broadband Access,”OPNETWORK2008,Washington,DC,Aug. 2008.

3. WiMAX Forum Online.Available: http://www.wimaxforum.org/news/pressreleases.

4. H.Nyberg, C.Johansson ,B.Olin, “A streaming video traffic model for mobile access network,” in Proc.IEEE VTC 2001 Rhodes, Greece, Sep. 2001.

5. H.Schulzrinne, S.Casner, R.Frederick and V.Jacobson, “Real time Protocol,” RFC 3550, Jul. 2003.

6. Wikipedia, “WiMAX,” *Wikipedia*. [Online]. Available: http://en.wikipedia.org/wiki/Wimax.

7. J. Burke and K. Lopez. (2008, Nov. 24). WIMAX TRANMISSION POWER [Online].Available: http://www.wimaxcom.net/2008/11/wimax-transmit-power.html.

Questions?????

Thank You