ENSC 427: Communication Networks

Final Project Presentation

Performance Evaluation of Gaming Traffic Over WiMAX

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Roadmap

- Introduction
- WiMAX Fundamentals
- Related Work
- Implementation Methods
- Expected and Observed Results
- Conclusion

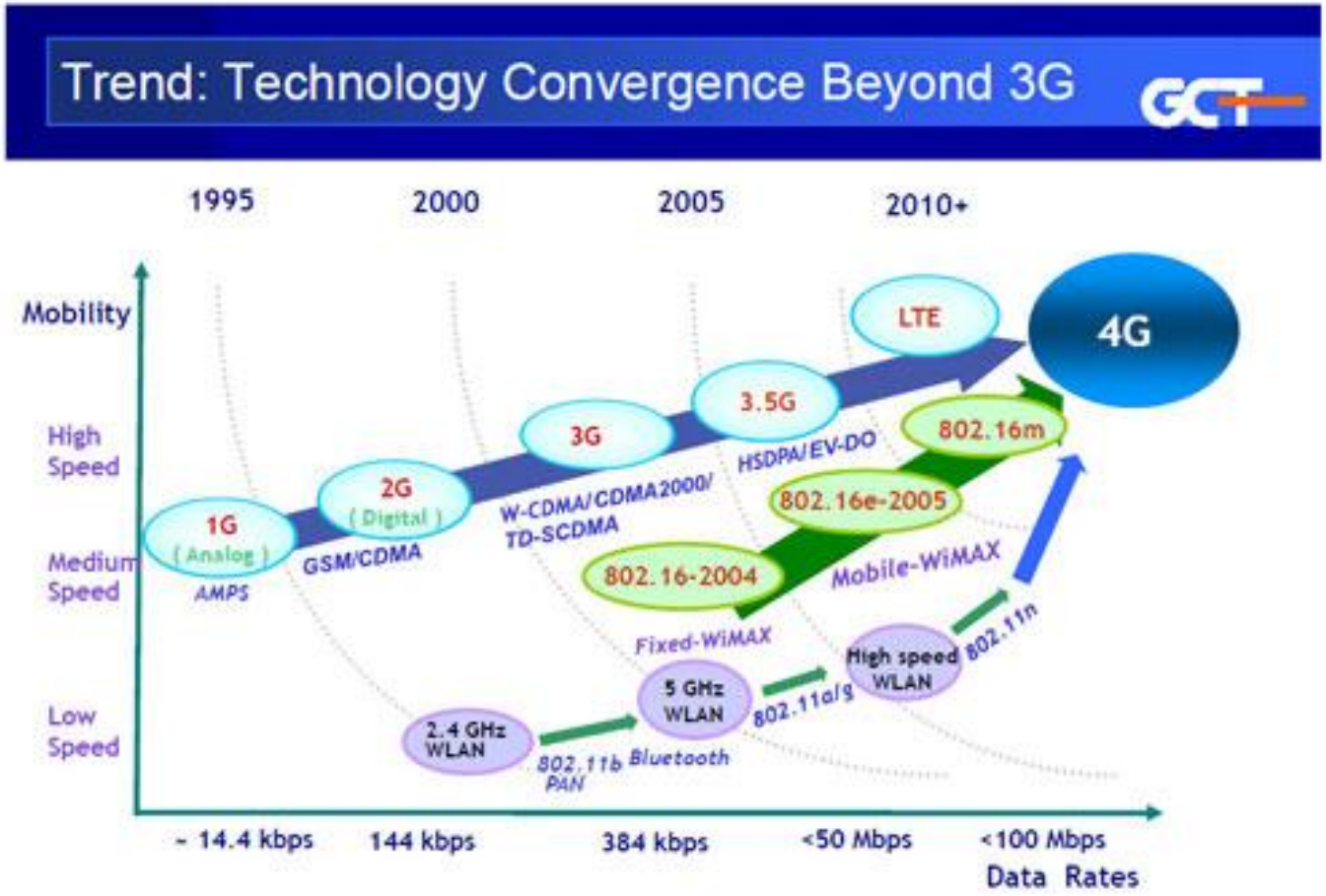
Introduction

- Main Topic
  - Can WiMAX replace traditional methods of internet connectivity for gaming traffic?
- Motivation
  - Provides another method of “Last Mile” services to areas do not have a landline access. (e.g. MiFi)
  - Increasing demand to be connected anywhere at anytime – Mobile Internet
  - “3-4% of all packets in the Internet backbone can be associated with 6 popular games” [1]

WiMAX Deployment

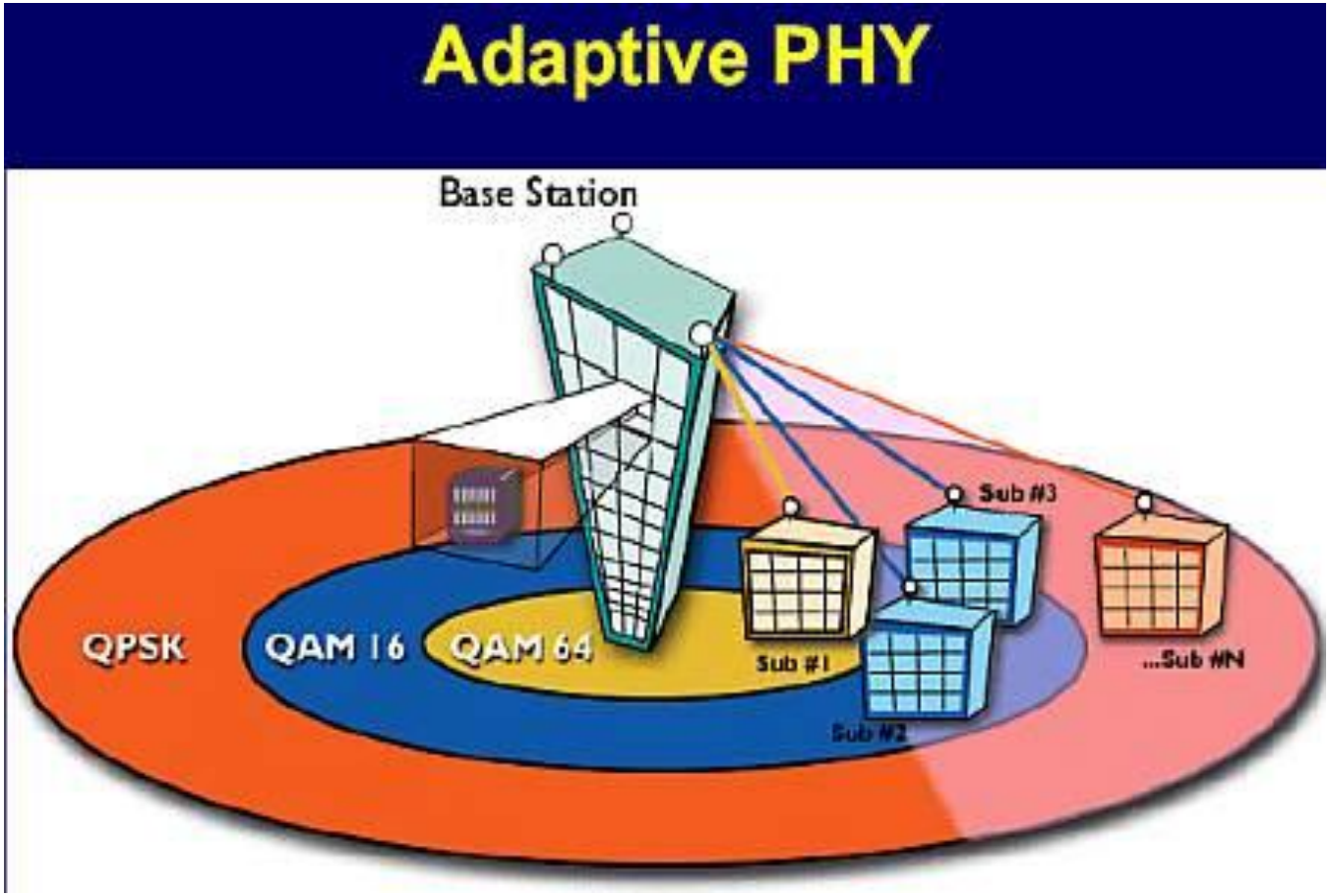
Source: *WiMAXmaps.org*

Motivation



Source: *Dailywireless.org*

Modulation Schemes



Source: *Dailywireless.org*

Related Work

- Gaming Traffic in wired connections (Starcraft, Counterstrike, Quake)
- Gaming Traffic in wireless connections (Counterstrike) [2]
- WiMAX Video and VoIP simulations [3]
  - Effects of packet loss
  - Effects of Jitter and Latency

Implementation Details

- Project Overview
  - Simulate a variable amount of fixed workstations (clients) connected to a WiMAX base station
    - Deployed at differing distance from the base station
  - Simulate one server connected to the same WiMAX base station
- Included Model
  - Project will be utilizing the WiMAX model library

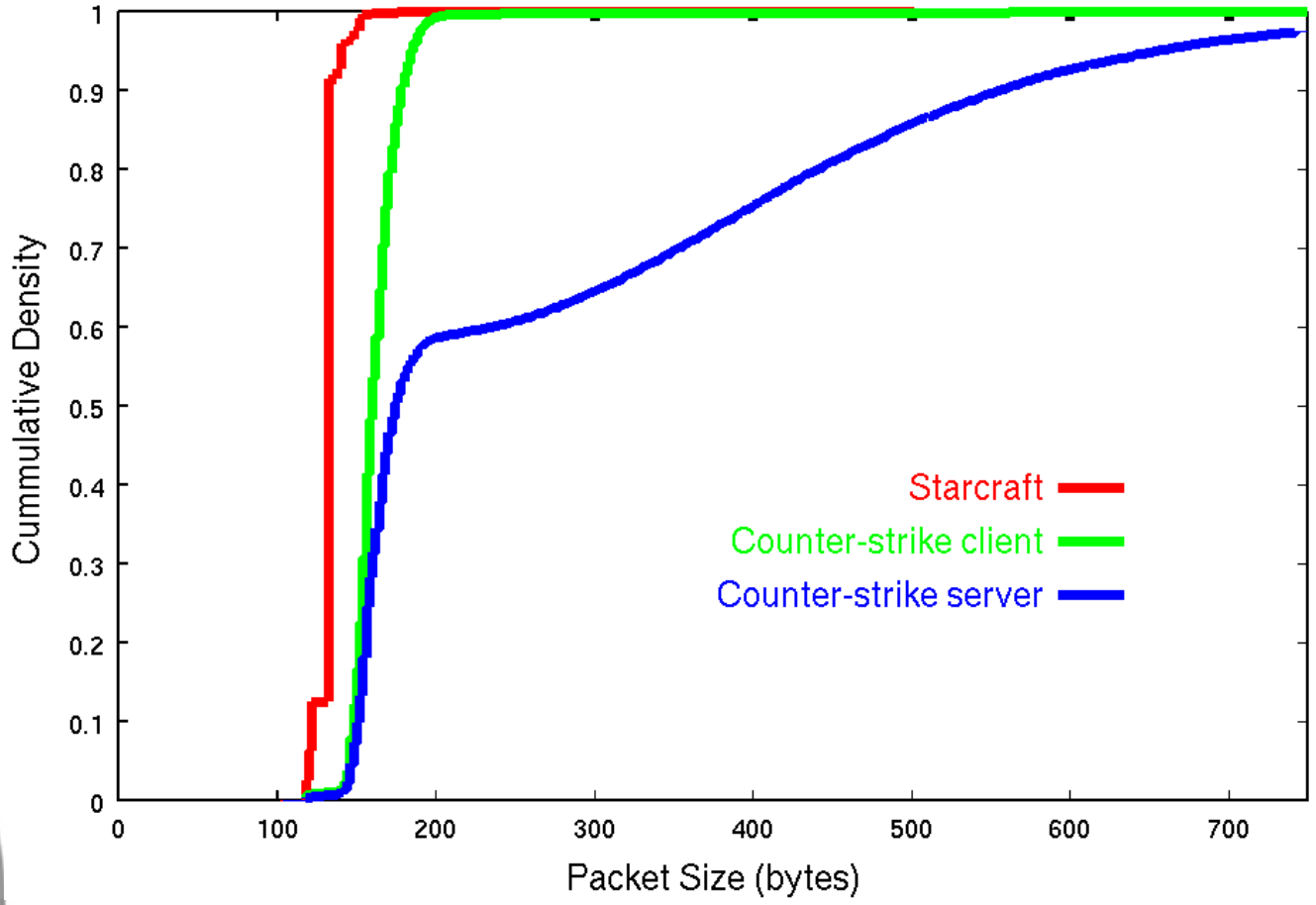
Implementation Details

- Traffic Modelling
  - Three different types of traffic
    - FPS: First Person Shooter
    - RTS: Real-Time Strategy
    - MMORPG: Massive Multiplayer Online Role Playing Game
  - Network Game Data Traces
    - FPS – Counterstrike
    - RTS – Starcraft
    - MMORPG – World of Warcraft

Implementation Details

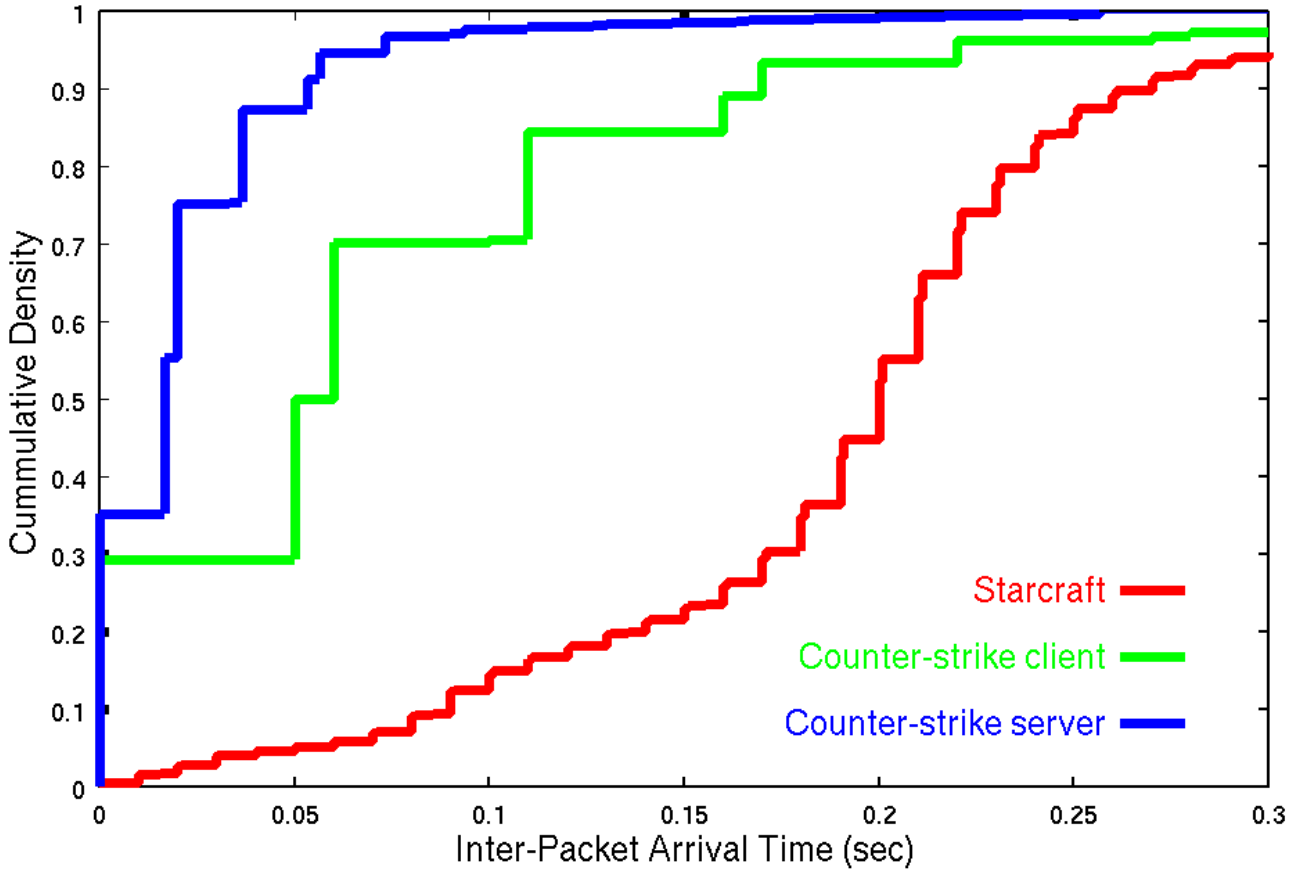
- Game Traffic Issues:
  - Packet Loss
  - Jitter
  - Latency
  - Range & Power
  - Reliability

CS Traffic Model



Source: *Network Analysis of Counter-strike and Starcraft [3]*

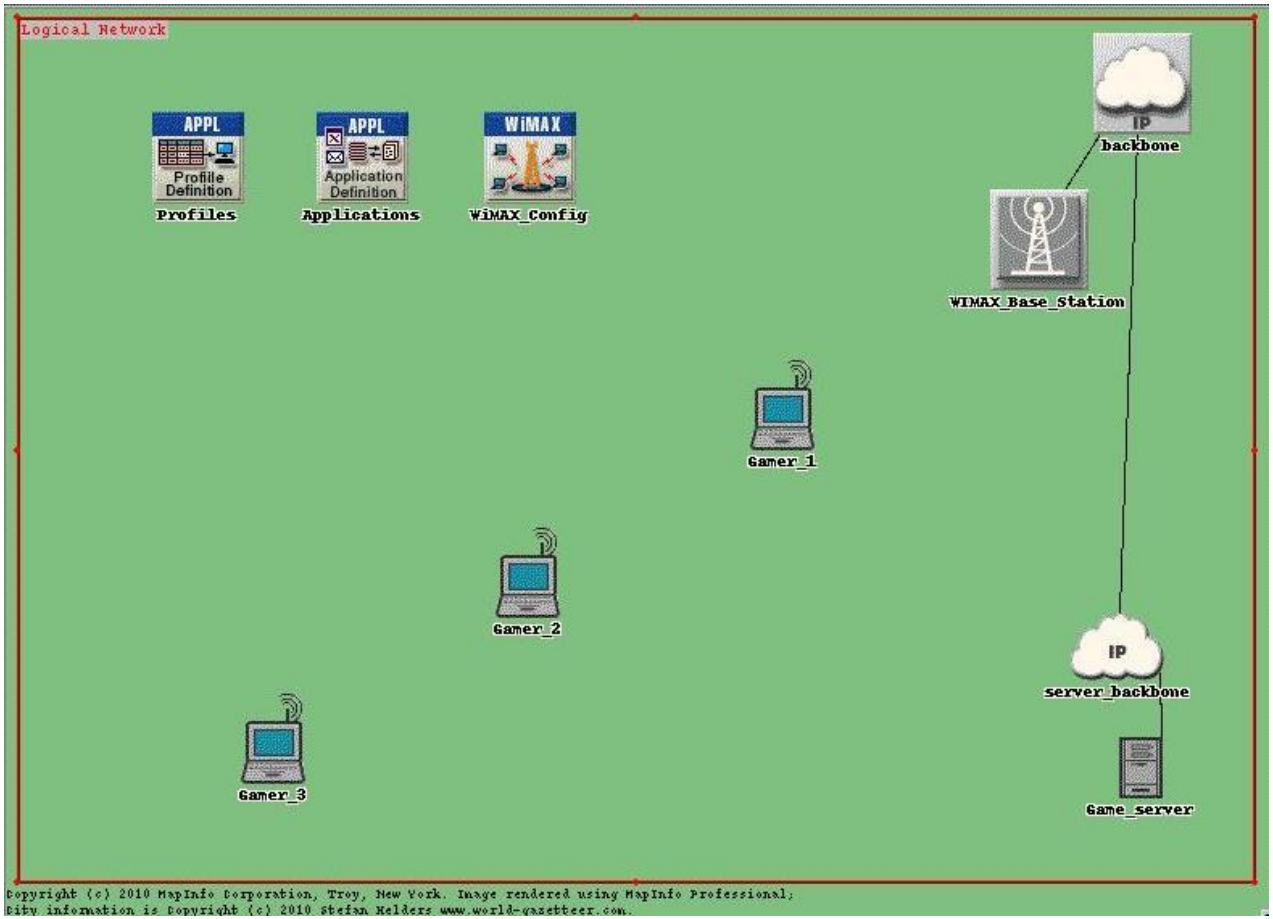
CS Traffic Model



Source: *Network Analysis of Counter-strike and Starcraft [3]*

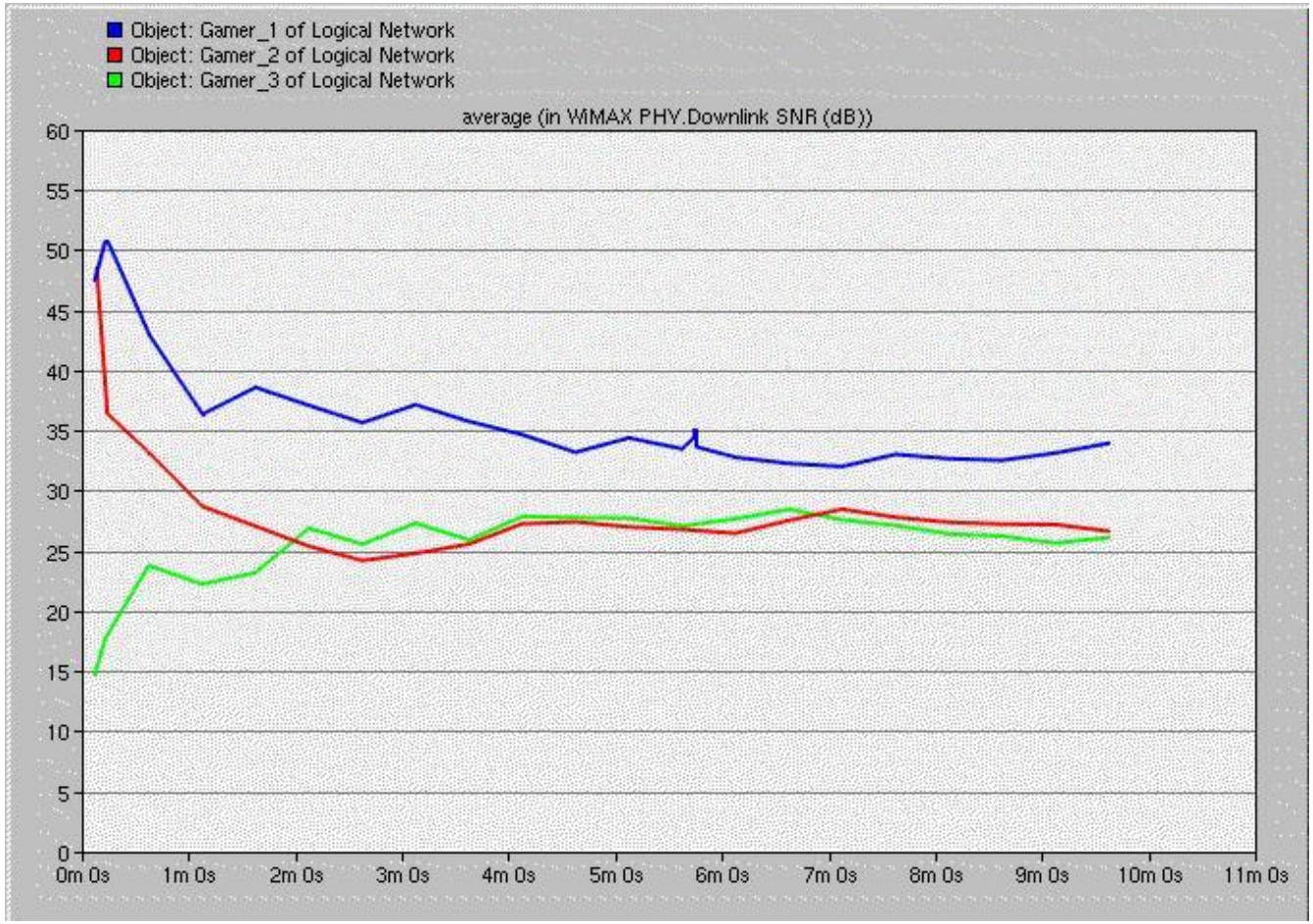
Network Topology

- Network model for 3 clients



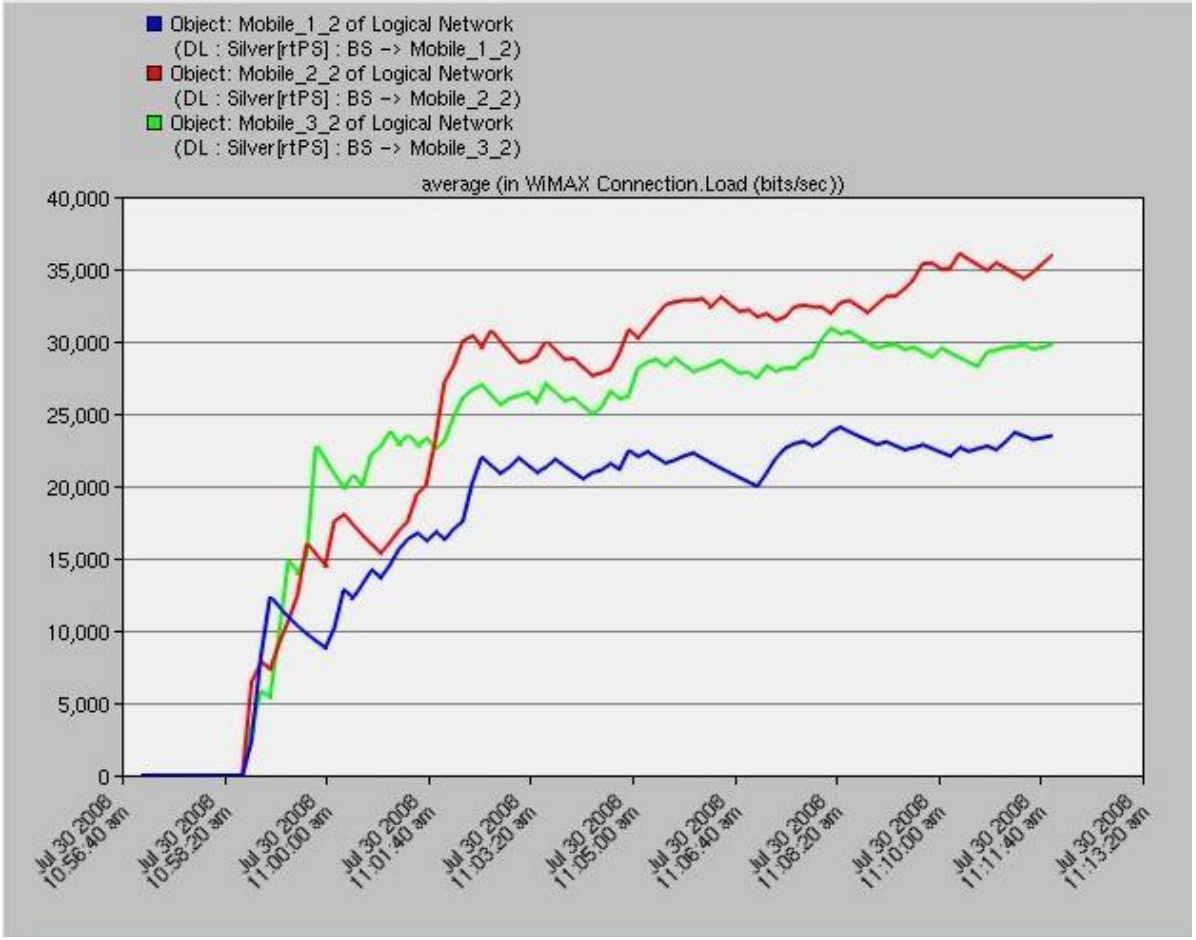
Observed Results

- Downlink SNR for 3 clients



Observed Results

- Load for 3 clients



Expected Results

- Still running simulations
  - According to WiMAX studies with VoIP and Video, WiMAX may be suitable in terms of bandwidth, latency, and jitter [5].

Class	Application	Bandwidth Guideline		Latency Guideline		Jitter Guideline	
1	Multiplayer Interactive Gaming	Low	50 kbps	Low	< 25 msec	N/A	
2	VoIP & Video Conference	Low	32-64 kbps	Low	< 160 msec	Low	<50 msec

  - As the distance away from the base station increases, the packet loss should increase to a point where the game will start experience stuttering and a lowered QoE.

Conclusion

- WiMAX may be able to provide a “last mile” service that will fulfill the application classes and “Quality of Experience” [3].
- Gaming Traffic has no standard – Some may use TCP/IP or UDP and the traffic will vary among various games [6].
- The prevalent packet loss in WiMAX may be an issue with games demanding real time reaction (Some studies show a 10% Packet loss) [6].

Future Improvements

- Inclusion of Mobile WiMAX stations (including hand-off scenarios)
- Simulations with a busy WiMAX base station (inclusion of different types of traffic)
- Analysis of game traffic on newer games
  - Classification and categorization of generic genre of game traffic

Thank You!

Any Questions?

References

[1] J. Färber, "Network game traffic modelling", University of Stuttgart, April 16-17, 2002

[2] S. Chiu, "Evaluation of Interactive Gaming Traffic over 802.11 Network", ENSC 835: High Performance Networks Final Project, Simon Fraser University, Apr. 2006.

[3] W. Hrudey, "Streaming Video Content over IEEE 802.16 / WiMAX Broadband Access", April 2008.

[4] "Starcraft and Counterstrike game traces," [Online]. Available: http://perform.wpi.edu/downloads/#net-game

[5] "WiMAX Application Classes," [Online]. Available: http://www.wimaxforum.org/technology/downloads/Mobile_WiMAX_Part1_Overview_and_Performance.pdf p. 48 [Accessed: Mar 23, 2010].

[6] "Quality of Experience Requirements," [Online]. Available: http://www.broadband-forum.org/technical/download/TR-126.pdf p.79 [Accessed: Mar 24, 2010].