ENSC 427- Communication Networks
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Quality of service of the wireless networking standard over a Multi user environment

Group 9

Name: Saumya Sangal
Email: ssangal@sfu.ca

Name: Jasmine Liu
Email: zyl2@sfu.ca

Roadmap

- Introduction
- Riverbed Simulation Model
- Riverbed Simulation Analysis/Results
- Discussion
- Future work
- References

INTRODUCTION

- In our project we seek to analyze, compare and scrutinize the wireless networking standards in terms of the quality of service (QoS) they provide to the users.
- We will consider four types of static users: video streaming, gaming, VoIP, and one low bandwidth such as web browsing.
- We then analyze delay and throughput.

- Our analysis is performed on the 802.11n 2.4 GHz standard at a data rate of 26Mbps.

INTRODUCTION

- Wi-Fi is a wireless networking technology that provides a connection between a sender and receiver using Radio Frequency technology (RF) [9].
- Wi-Fi is based on IEEE standard protocol called “802.11” [1].
- 802.11n works in the 2.4 GHz frequency band, the standard has a max data rate of 600Mbps and a range of approximately 40 meters.

TABLE 1: IEEE 802.11 PHY STANDARDS

Release date	Standard	Band (GHz)	Bandwidth (MHz)	Modulation	Advanced antenna technologies	Maximum data rate
1997	802.11	2.4	20	DSSS, FHSS	N/A	2 Mbits/s
1999	802.11b	2.4	20	DSSS	N/A	11 Mbits/s
1999	802.11a	5	20	OFDM	N/A	54 Mbits/s
2003	802.11g	2.4	20	DSSS, OFDM	N/A	54 Mbits/s
2009	802.11n	2.4, 5	20, 40	OFDM	MIMO, up to four spatial streams	600 Mbits/s
2012 (expected)	802.11ad	60	2160	SC, OFDM	Beamforming	6.76 Gbits/s
2013 (expected)	802.11ac	5	40, 80, 160	OFDM	MIMO, MU-MIMO, up to eight spatial streams	6.93 Gbits/s

Introduction

- QoS is a measurement of the network performance seen by users.
- The concepts of QoS is all network traffic are receiving the best effort delivery service.

- **Throughput:** The rate of successfully transfering the data over a communication channel. [3]

- **Delay:** The time delay of transmitting and receiving the message from source to destination.[3]

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Riverbed simulation model

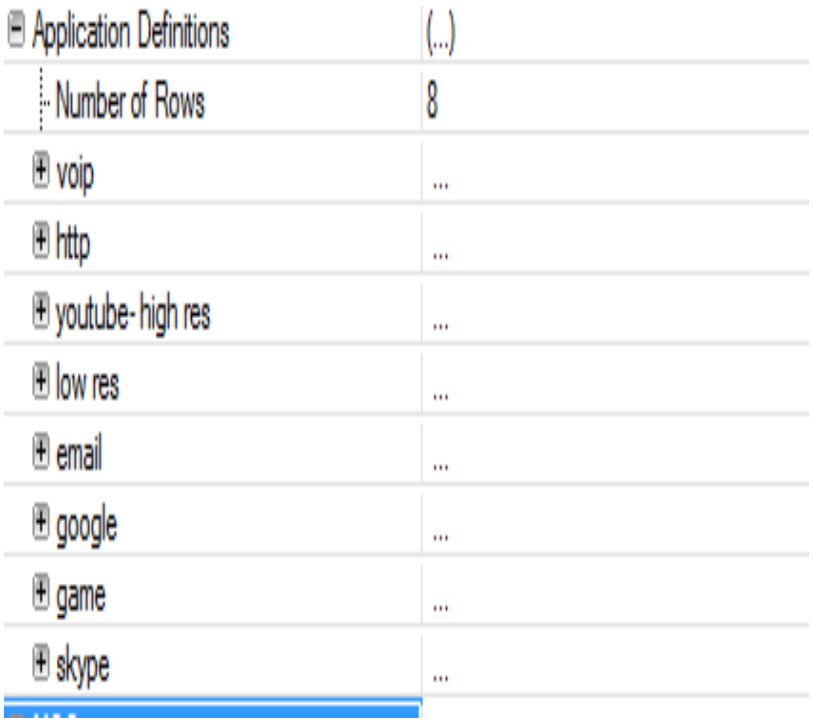
- Our simulation aims to create a relevant and real life scenario incorporating situations which occur on a highly consistent basis.

- The aim is to examine the immediate and short term real life effects on the quality of service for a variety of users when presented with a situation where each user is connected to the same router.

- For the purpose of this report we take a sample size of 100x100 meters with four established and fixed users representing a web browser, Skype user, YouTube video streamer and a Counter strike gamer.

Riverbed simulation model

- Application Definition
  - There are a total of 8 applications in our simulation model varying in the level of throughput and delay.
  - VoIP, Http, High-resolution video streaming, Low-resolution video streaming, Email, Google, Gaming, and Skype



Riverbed simulation model

- Custom Application 1- Counter Strike Game

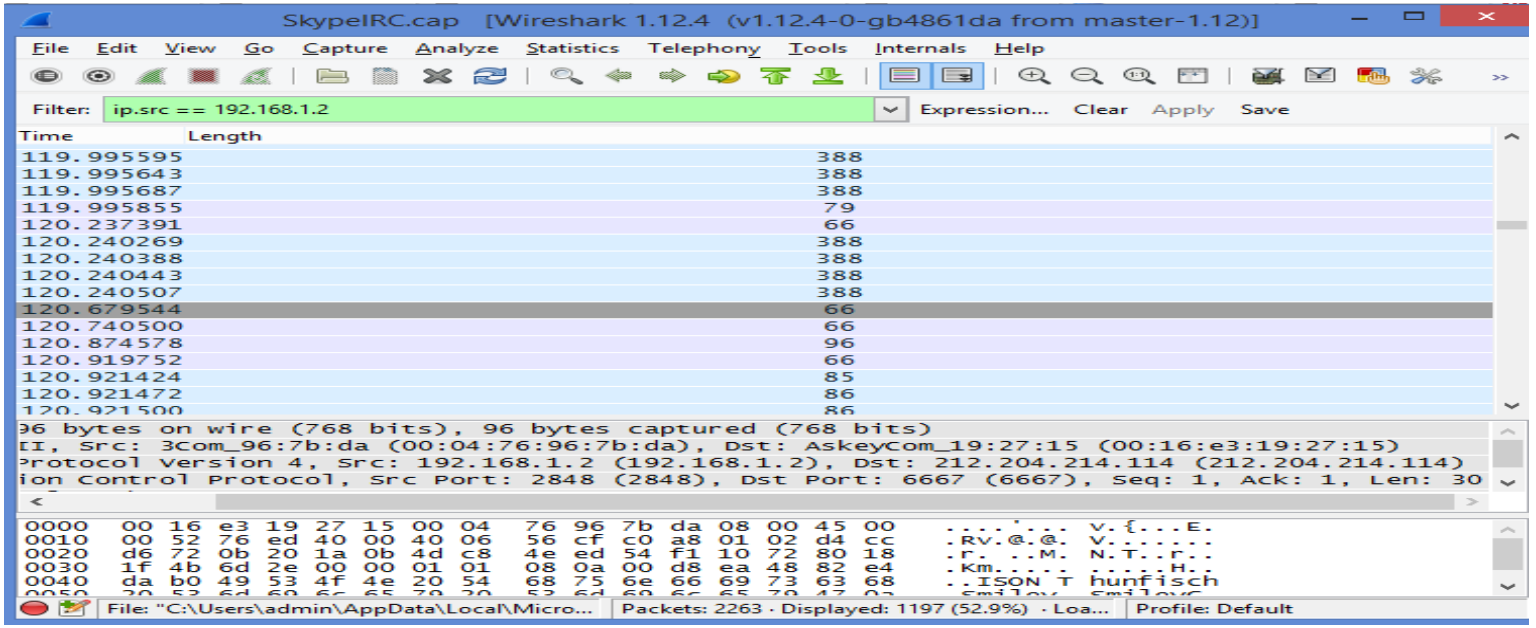
  - Study done by Johannes Färber, Network Game Traffic Modelling ,which describes the statistics involved in a 36 hour capture with 50 participants [15].
  - FPS- First person shooter game.

  - Frequent clicks from user- fast response.

	Server	client
interarrival time (ms)	extreme (55,6)	constant (40)
packet size (bytes)	extreme (120,36)	extreme (80, 5.7)

Riverbed simulation model

- Custom Application 2- Skype
  - Online Data packet capture.
  - Excel used to aggregate inter-arrival time and packet length.



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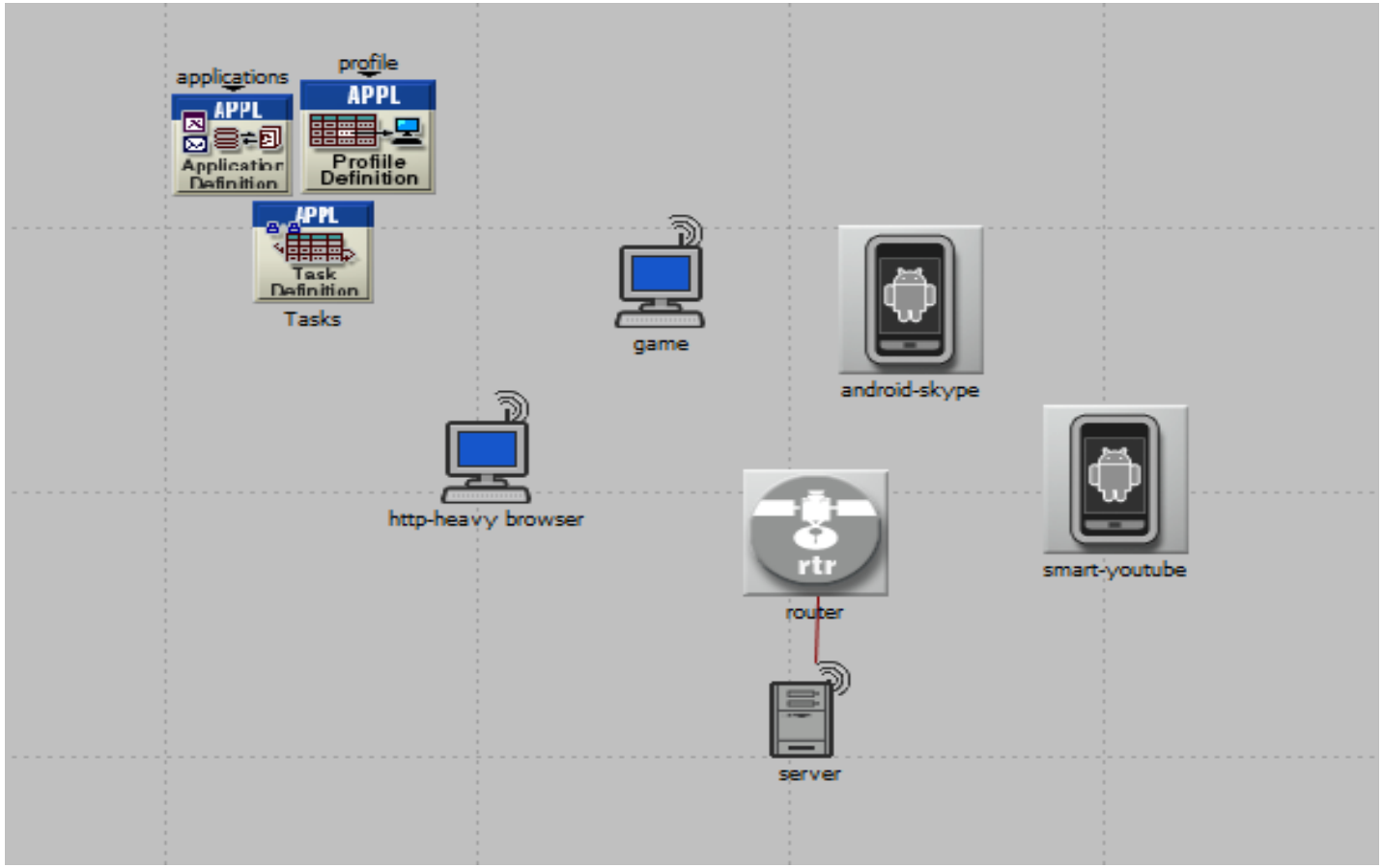
Riverbed Simulation Analysis /Results

- In our simulation we begin by running each scenario/case at the predefined standard of 802.11n 2.4GHzat 26Mbps.
- We have 4 wireless mobile nodes represented in our workspace.
- QoS parameter analysis
  a. Throughput
  b. Delay

Device	Application	Priority level
android	Skype	interactive voice(6)
laptop (mobile workstation)	YouTube	streaming multimedia(4)
laptop	Counterstrike game	interactive multimedia(5)
laptop	Heavy web browsing	standard (2)

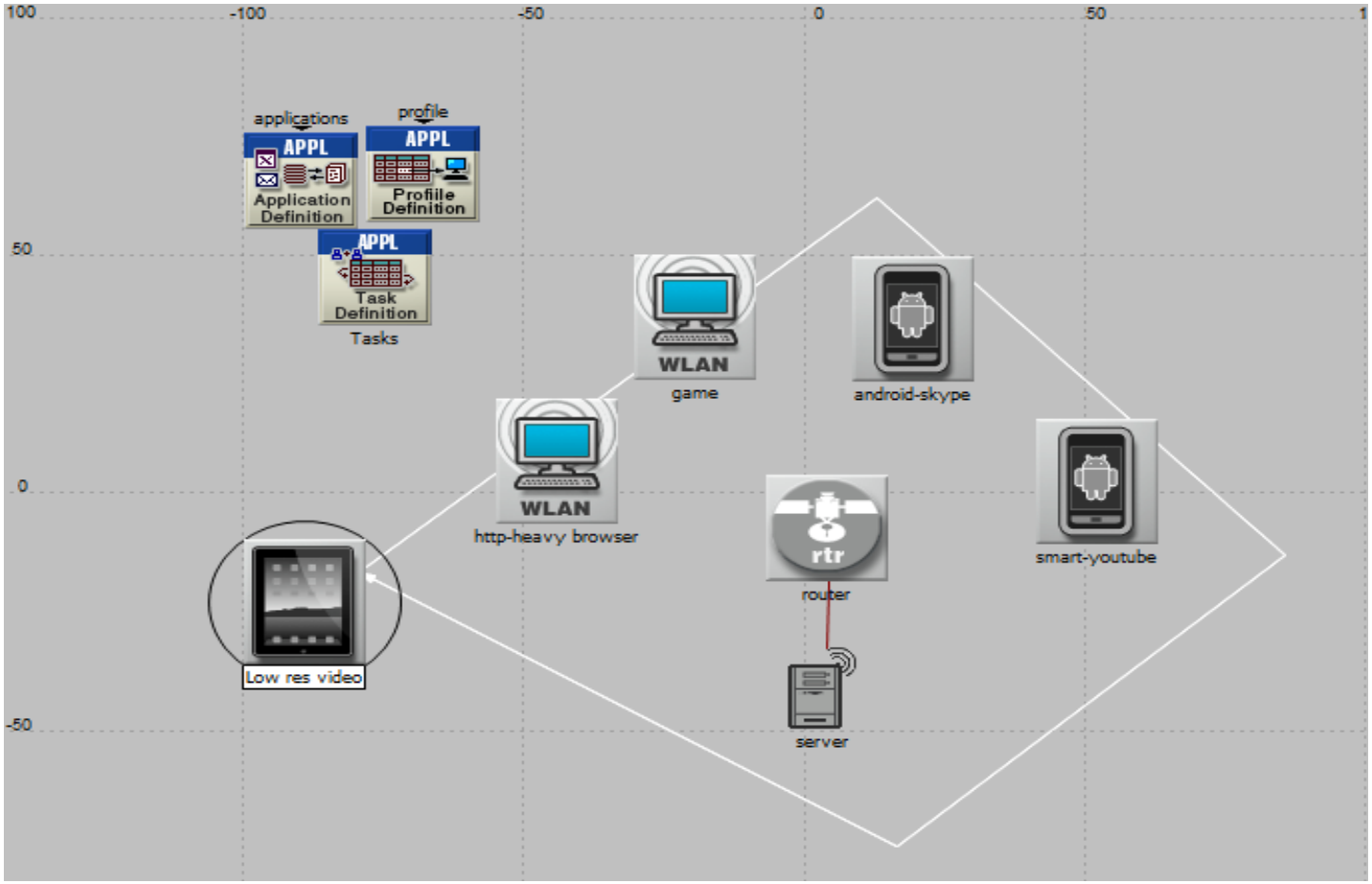
Riverbed Simulation Analysis /Results

- Main Sample work space



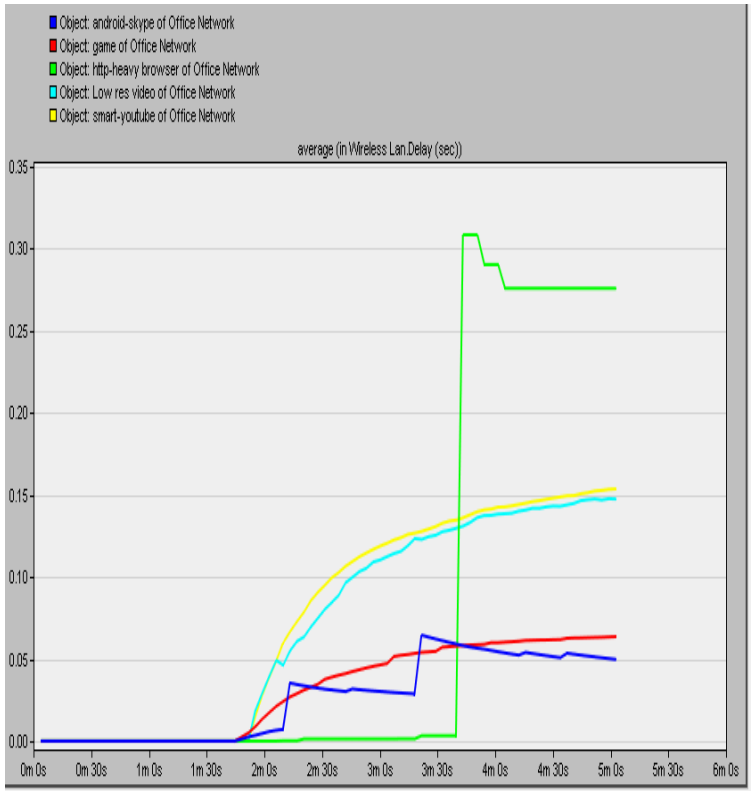
Riverbed Simulation Analysis /Results

- New user- TRAJECTORY defined



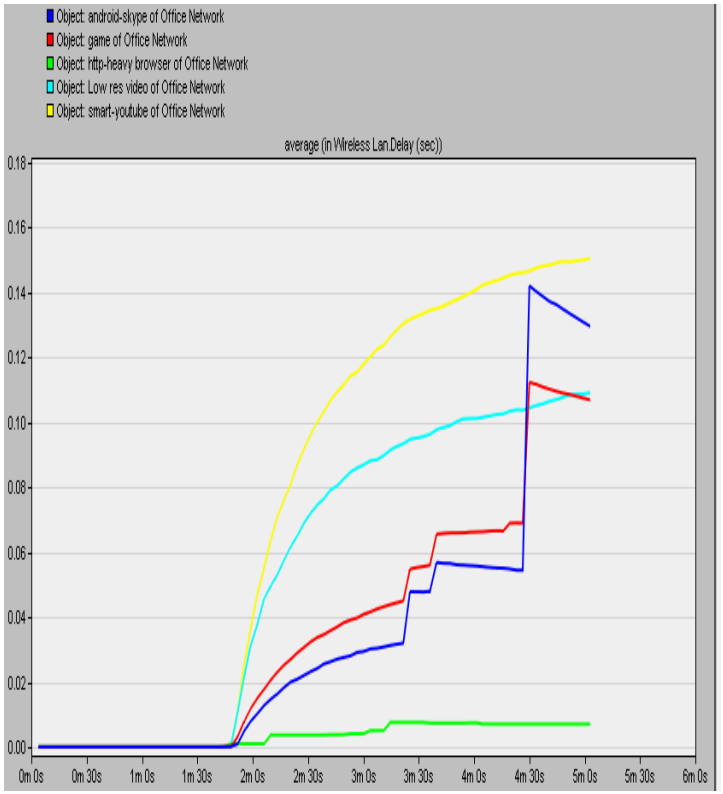
Case 1: Introduction of streaming device

- Part A: Stationary new user



Delay

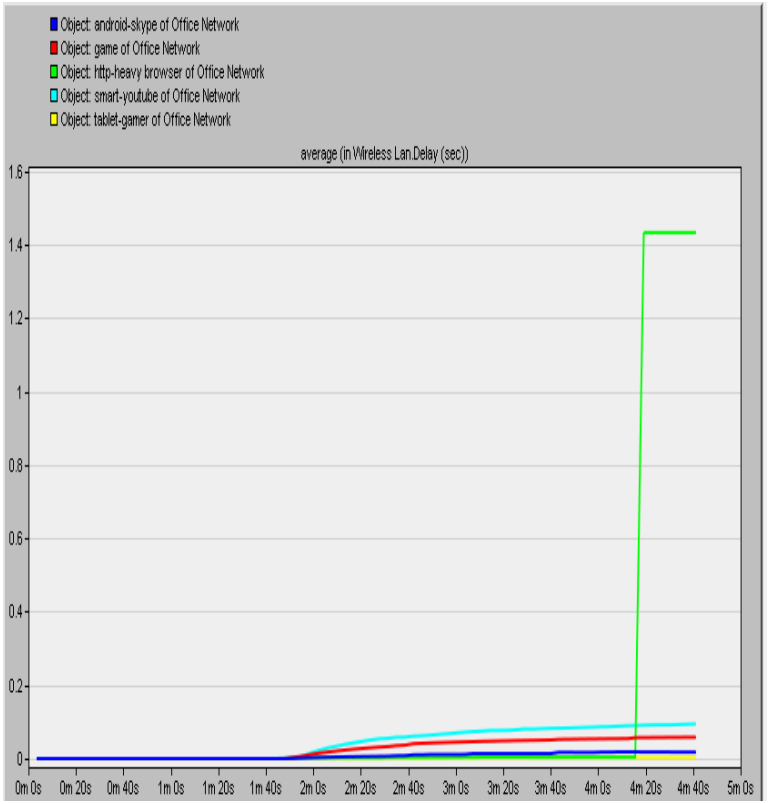
- Part B: Trajectory defined for new user



Delay

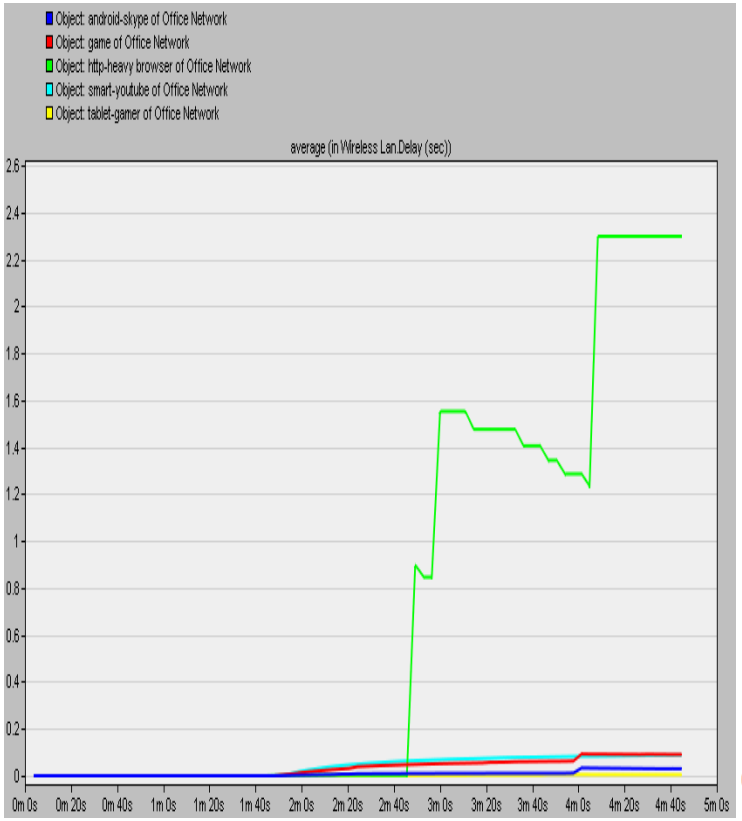
Case 2: Introduction of gaming device

- Part A: Stationary new user



Delay

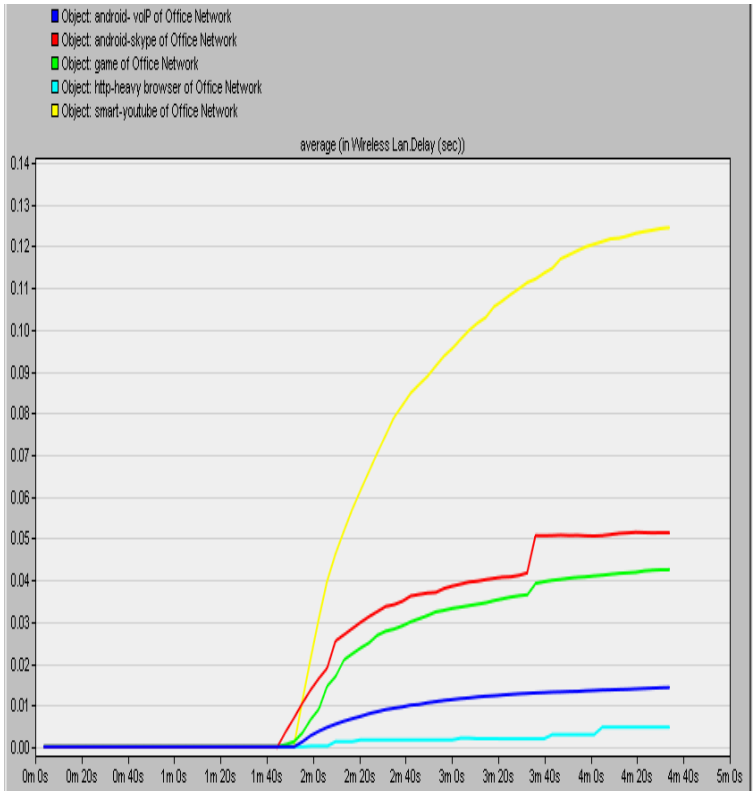
- Part B: Trajectory defined for new user



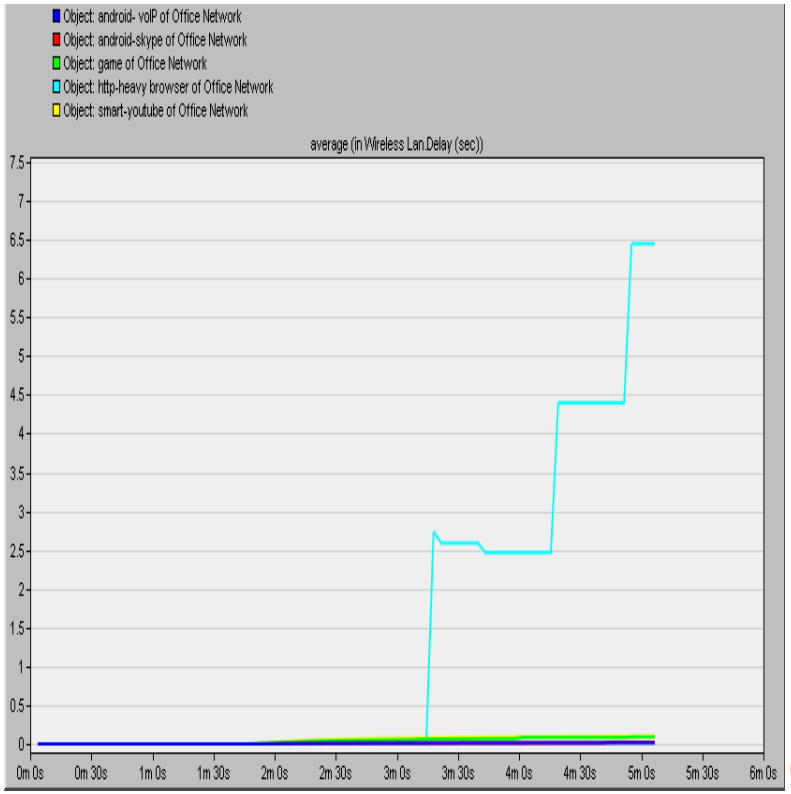
Delay

Case 3: Introduction of VoIP device

- Part A: Stationary new user
- Part B: Trajectory defined for new user



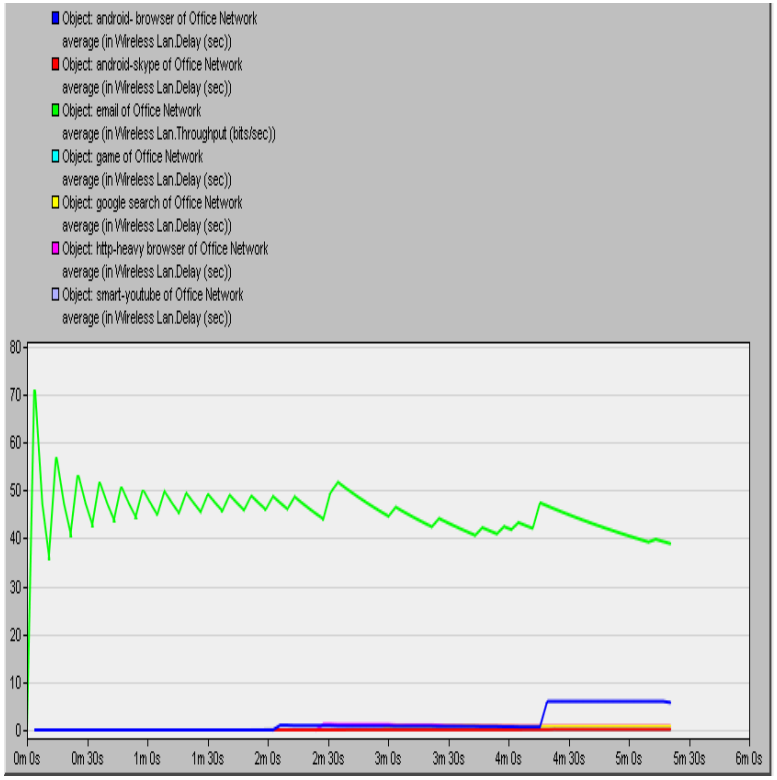
Delay



Delay

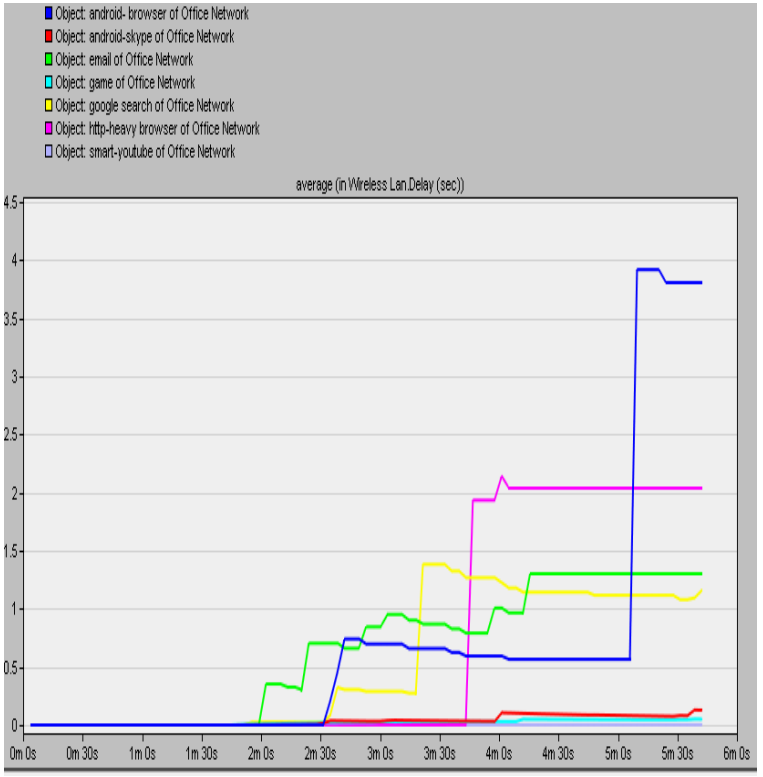
Case 4: Introduction of low bandwidth device

- Part A: Stationary new user



Delay

- Part B: Trajectory defined for new user



Delay

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DISCUSSION

- **Q1: What is the effect that the new user has on the quality of service to the existing users with our sample space?**

It is worth noting here that in each case we present, we introduce a user using an application that varies in its level of throughput to the existing users in some way regardless of it being the same nature. It is for this purpose that we define a total of 8 applications.

Discussion

- **Q2: What is the effect on the quality of service to the existing users if these new mobile users now move around the sample space during our simulation?**

We wish to compare the changes between the situations where the new user is stationary and when the user is moving in the sample space. For this purpose we built trajectories and assigned the new users to traverse along them.

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Future work

- Use the 802.11 ac standard.
- Replace all pre-defined applications.
- Additional resources for campus wide analysis.

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REFERENCES

[1] Vangie.B, "What is wifi," 2014. [Online] (Accessed Feb 12, 2015)
Available: http://www.webopedia.com/TERM/W/Wi_Fi.html

[2] National Instruments "WLAN - 802.11 A,b,g and N." [Online] (Accessed Mar 12, 2015)
Avaliable: http://www.ni.com/tutorial/7131/en/

[3] Microsoft, "What is QoS," 2003. [Online] (Accessed Feb 12, 2015)
Available: https://technet.microsoft.com/en-us/library/cc757120(v=ws.10).aspx

[4] Topher.K "Diagnosing and addressing Wi-Fi signal quality problems," 2011.
[Online](Accessed Feb 12, 2015)
Available: http://www.cnet.com/news/diagnosing-and-addressing-wi-fi-signal-quality-problems

[5] Learning Centre "Wireless Networking," 2014. [Online] (Accessed Feb 12, 2015)
Available: http://www.vicomsoft.com/learning-center/wireless-networking

REFERENCES

[[6] Khaled. A, Ljiljana.T "Performance Analysis of VoIP Codes over Wi-Fi and WiMAX Networks" 2012.

[Online] (Accessed Mar 12, 2015)

Available: http://www2.ensc.sfu.ca/~ljilja/papers/OPNETWORK2012_final_final.pdf

[7] Kritika.S, Nitin.B, Namarta.K "Performance Evaluation of 802.11WLAN Scenario in OPNET

Modeler" 2011. [Online] (Accessed Mar 12, 2015)

Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.206.3886&rep=rep1&type=pdf

[8] "Introduction to use OPNET Modeler" 2012. [Online] (Accessed Mar 12, 2015)

Available: http://www.sce.carleton.ca/faculty/lambadaris/courses/5001/opnet_tutorial.pdf

[9] webopedia "Wi-Fi". [Online] (Accessed Mar 12, 2015)

Available: http://www.webopedia.com/TERM/W/Wi_Fi.html

[10] Rajesh.G, Srikanth.K "WiFi Traffic Analysis Project Report" [Online] (Accessed Mar 12, 2015)

Available: http://www3.cs.stonybrook.edu/~rgolani/docs/Wireless_Report.pdf

REFERENCES

[11] "Wireless LAN Capture" [Online] (Accessed Mar 12, 2015)
Available: https://wiki.wireshark.org/SampleCaptures#Wifi_.2F_Wireless_LAN_captures_.2F_802.11

[12] Sophia.C, Curtis.R, Thomas.S "Performance Analysis of a Wireless Home Network" 2014.
[Online] (Accessed Mar 12, 2015)
Available: http://www.sfu.ca/~tszajner/FinalReport_Group4_Spring2014.pdf

[13] Kelvin.H, Titus.C, Glen.N "Evaluation of Gaming Traffic Over WiMAX" 2010.
[Online] (Accessed Mar 12, 2015)
Available: http://www2.ensc.sfu.ca/~ljilja/ENSC427/Spring10/Projects/team3/ct_Report.pdf

[14] "802.11 Wireless Standards" [Online] (Accessed Mar 12, 2015)
Available: http://compnetworking.about.com/cs/wireless80211/a/aa80211standard.html

[15] Pi Huang "Understanding IEEE 802.11ac VHT Wireless" [Online] (Accessed Mar 12, 2015)
Available: http://electronicdesign.com/communications/understanding-ieee-80211ac-vht-wireless

[16] Johannes Farber, Network game traffic modeling, Proceedings of the 1st workshop on Network and system support for games, p.53-57, Apr 16-17, 2002, Braunschweig, Germany