ENSC 427: Communication Networks
Spring 2011
Final Project Presentation

Video Streaming over the 802.11g and the 802.11n WLAN Technologies

http://www.sfu.ca/~zxa7/

Zhenpeng Xue 301062408

zxa7@sfu.ca

Team #6

Overview

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Introduction

Objective

Background Information

Issues and Situation on Video Streaming over WLAN

Introduction

- **Objective :**

To simulate wireless local area network (WLAN) based on 802.11g and 802.11n to analyze their limited bandwidth usage for video streaming and overload in data traffic.

- **Background Information**

802.11g is a third modulation standard of carrying out WLAN computer communication in the 2.4 GHz frequency bands, which operates at a maximum physical layer bit rate of 54 Mbit/s.

802.11n is a recent amendment which improves the 802.11g standard by adding multiple-input multiple-output antennas (MIMO), which can operate on both the 2.4GHz and the 5 GHz bands at a physical layer bit rate over 108 Mbit/s.

Introduction

- **Situation and Issues on Video Streaming over WLAN**

Most family plus small offices use 802.11g and 802.11n WLAN.

However, 802.11g and 802.11n are not quite suitable for doing **uncompressed** video streaming.

Compressed video format such as H264 AVC supporting High-definition video (HD), which achieves 720p and 1080p quality becomes popular.

Thus, I only consider the **compressed** video format for HD

YouTube HD video streamimg is below 6 Mbit/s.

Implementation Details

OPNET model

Scenarios

Implementation Details

- **The Overall Description**

  3 Scenarios (802_11g) simulate video streaming at 2Mbps, 3Mbps, 6Mbps respectively

  Another 3 Scenarios (802_11n) simulate video streaming at 2Mbps, 3Mbps, 6Mbps respectively

- **Compare their quality of service(QoS) determining factors:**

Packet End-to-End Delay

Packet Delay Variation

Traffic Received/Traffic Sent

Throughput

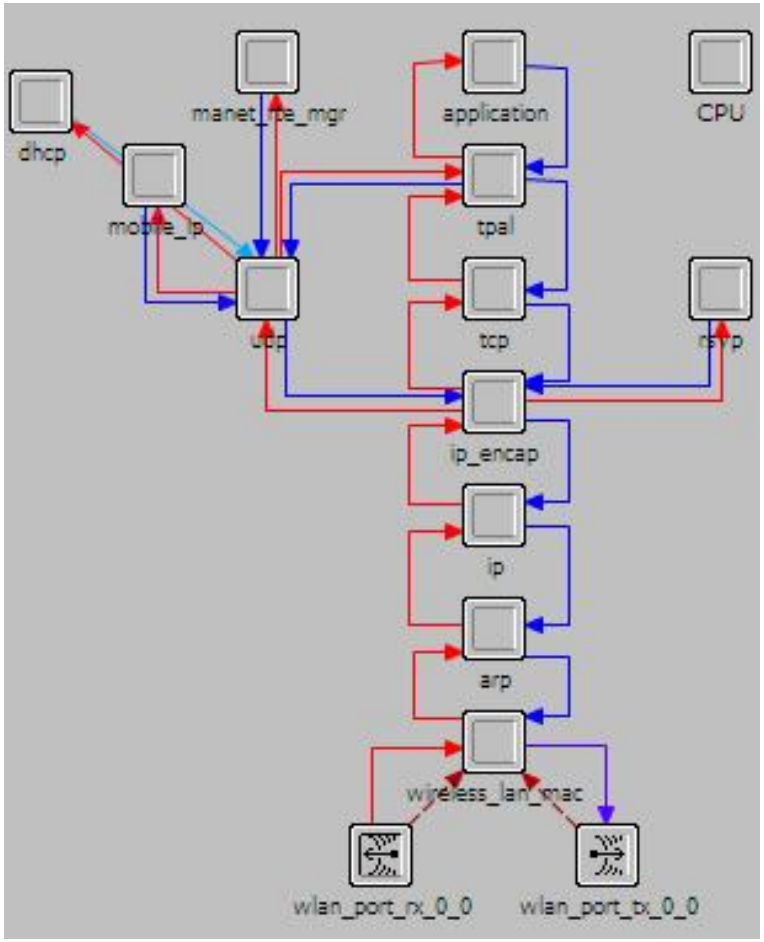
Implementation Details

- **OPNET model : 10 mobile clients and a video server**

Scale: Office
Size: 100 m x 100 m
Model Family
wireless_lan_adv

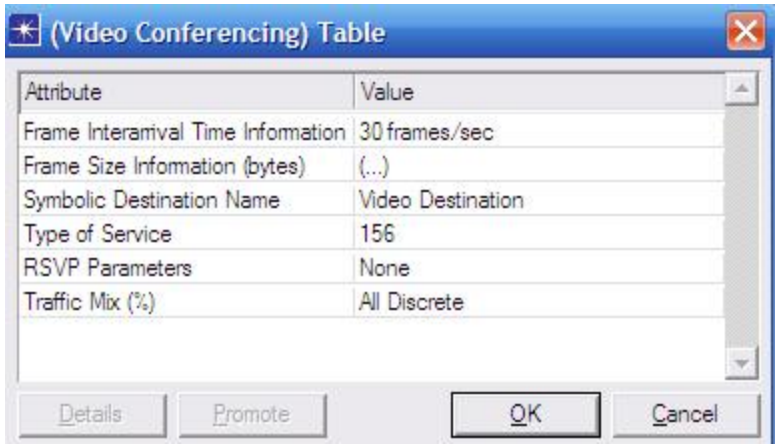
Implementation Details

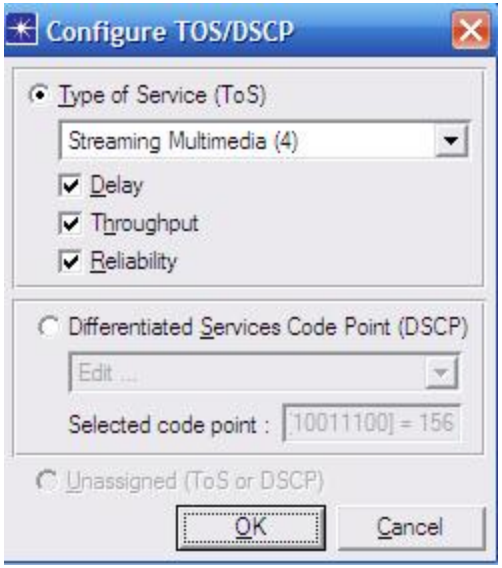
- **OPNET model : the node model of video server**



Implementation Details

- **Set attributes for the model:**





- **For the model of 802.11n:**

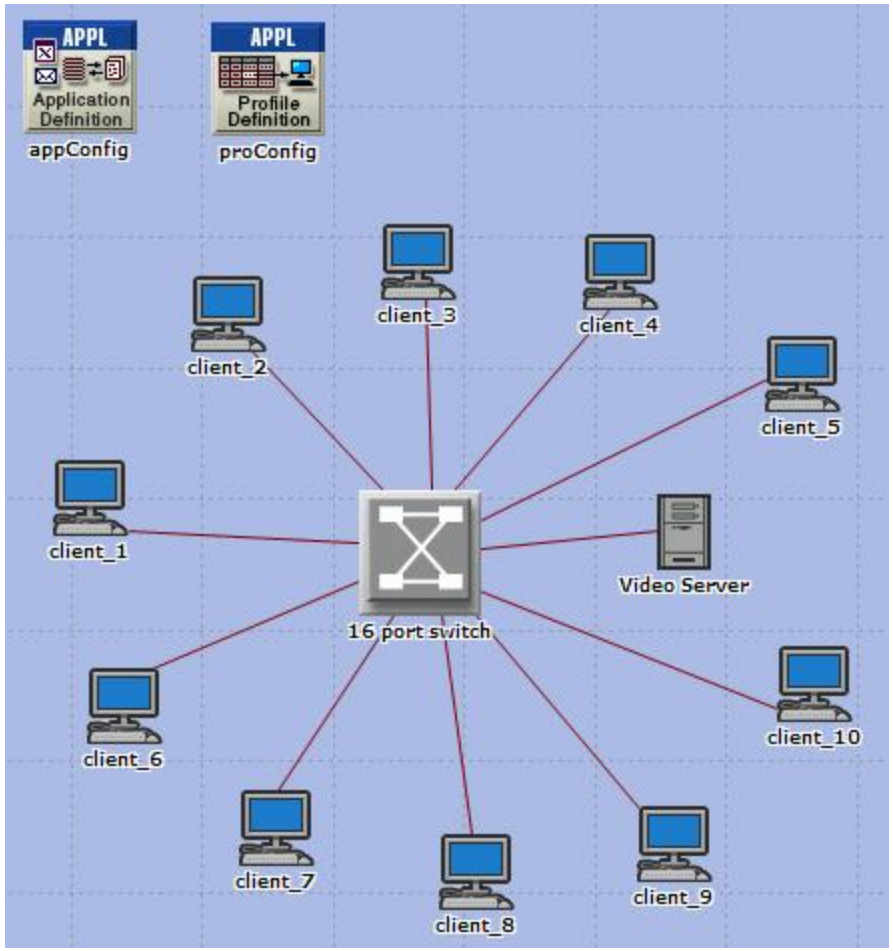
Opnet 14.0 does not declare parameters for 802.11n

Try to include 802.11n standard model into model library , no luck.

Consider other method:

Use 100Mbps Ethernet to build a model for comparison with 802.11g.

OPNET MODEL OF 100MBIT ETHERNET INSTEAD 802.11N:



- 10 clients
- One 16-ports switch
- 1 video server
- wired 100Mbit full duplex connection

Simulation and Results

Simulation Configuration

Statistics Analysis

Simulation and Results

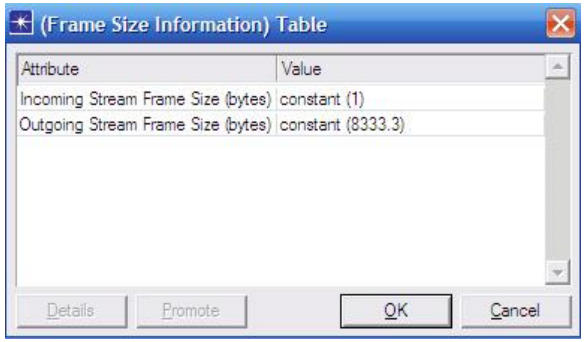
Simulation Configuration

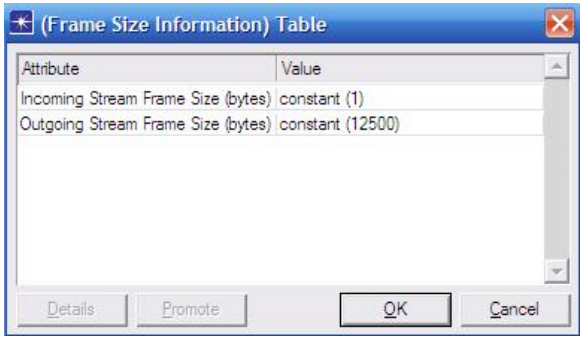
Simulated Time: 1 min (60 seconds)

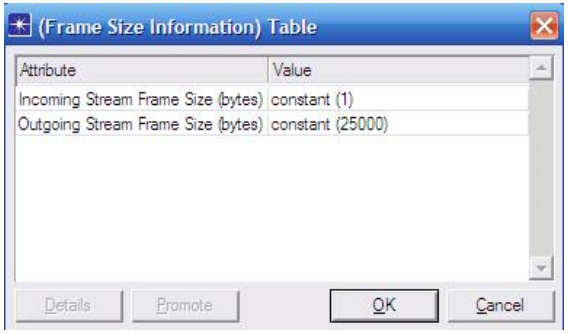
Seed: 128

Streaming Video: constant distribution

2Mbps **3Mbps** **6Mbps**



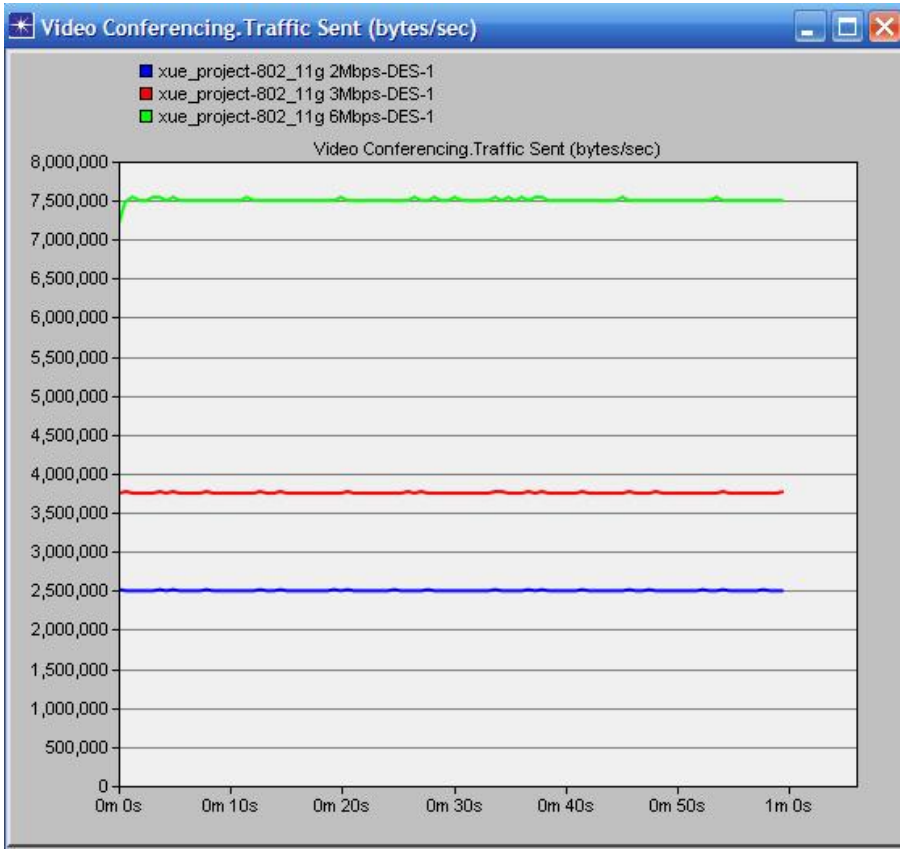


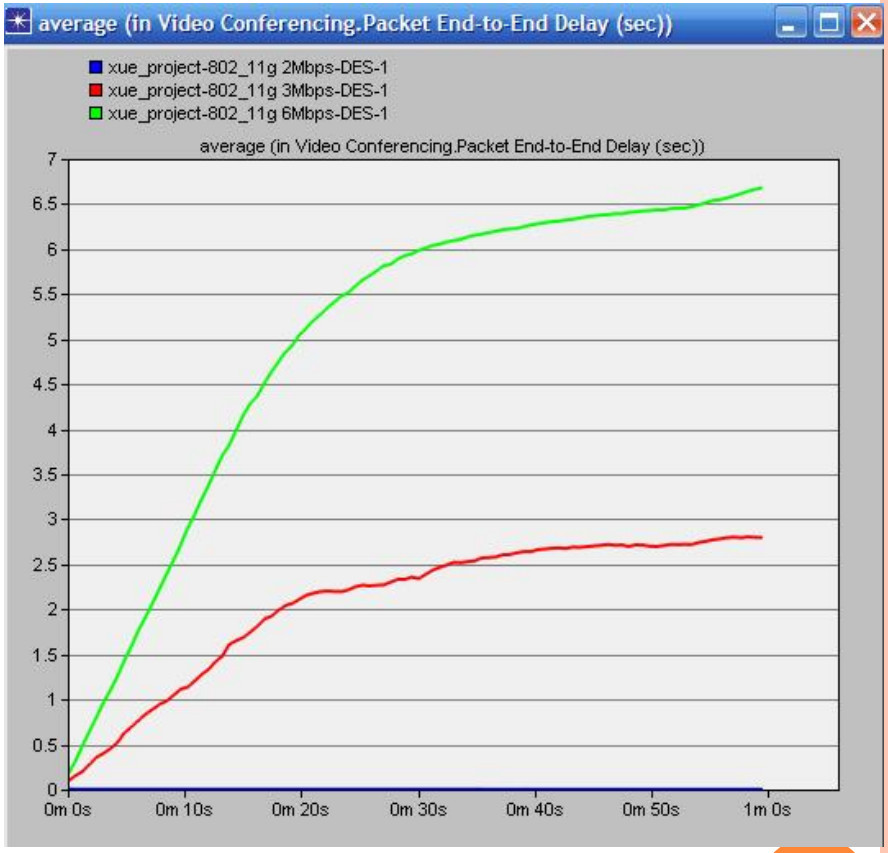


For this model, Frame size = given Mbps/8bits/30 frames/sec

Simulation and Results

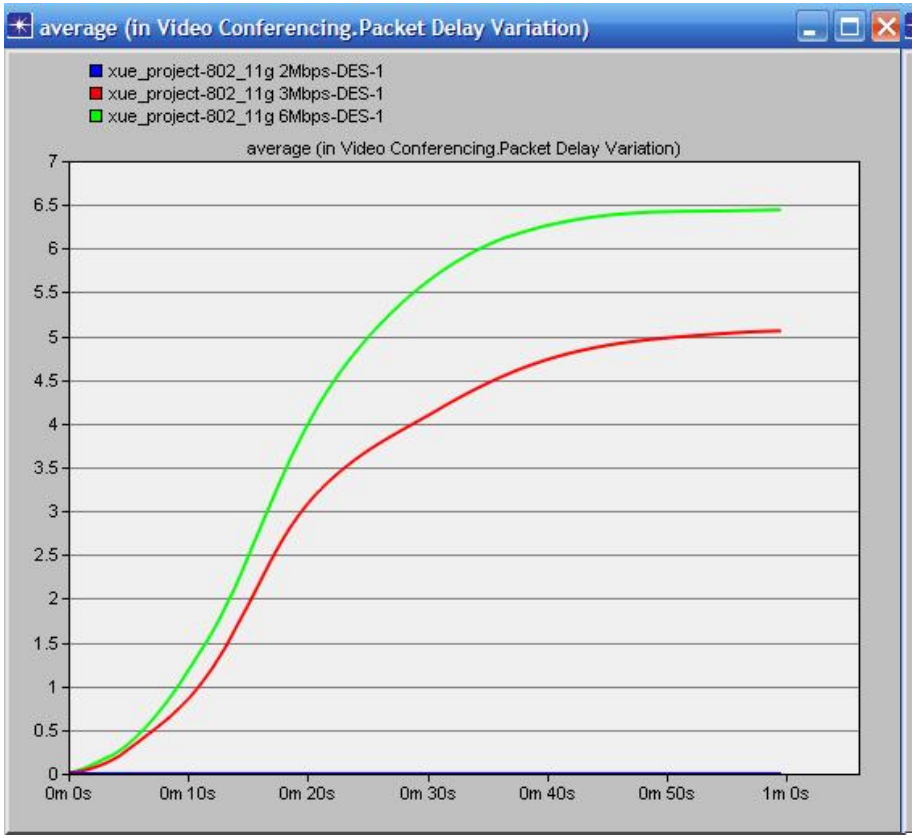
Statistics Analysis for 802.11g

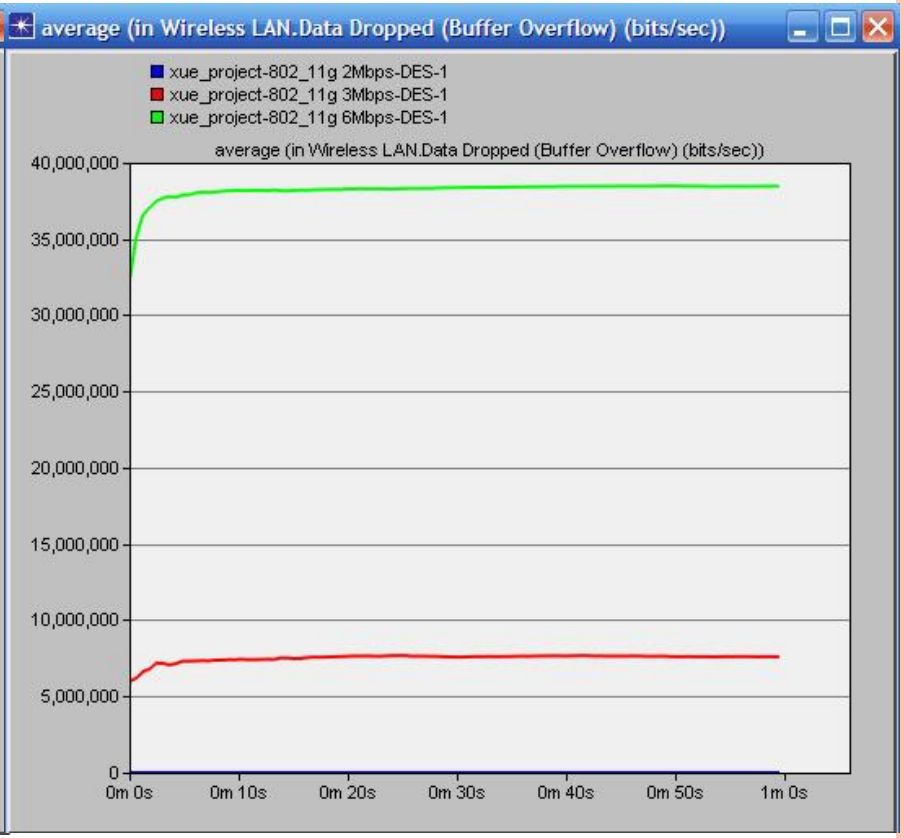




Simulation and Results

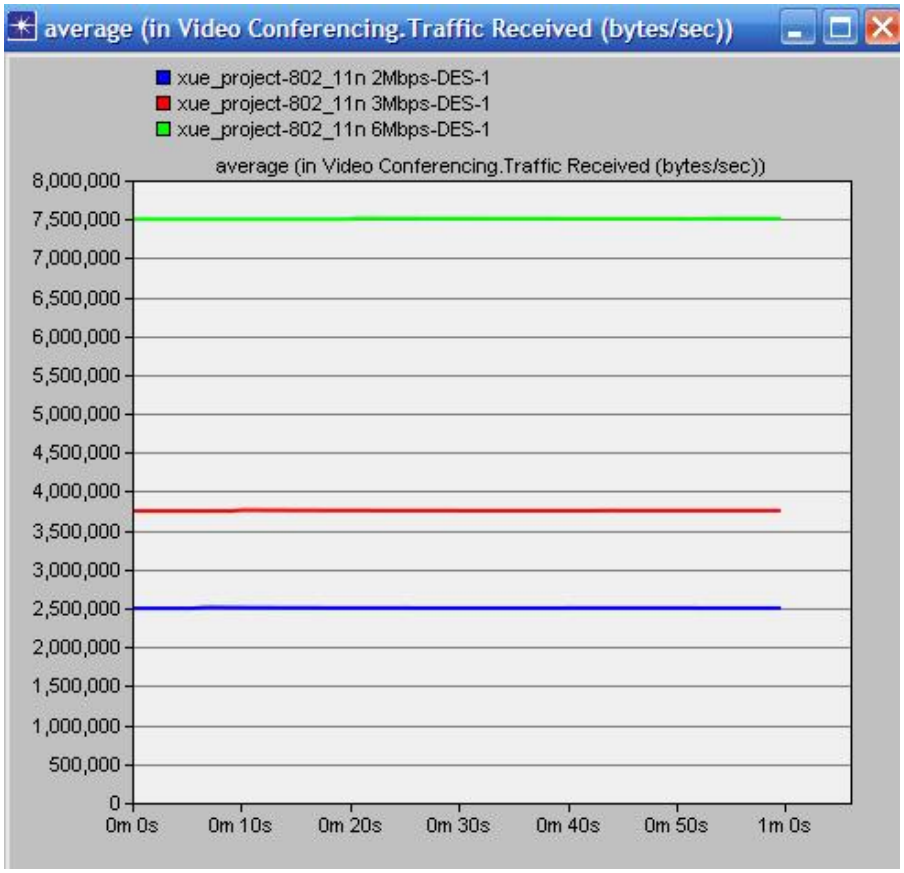
Statistics Analysis for 802.11g

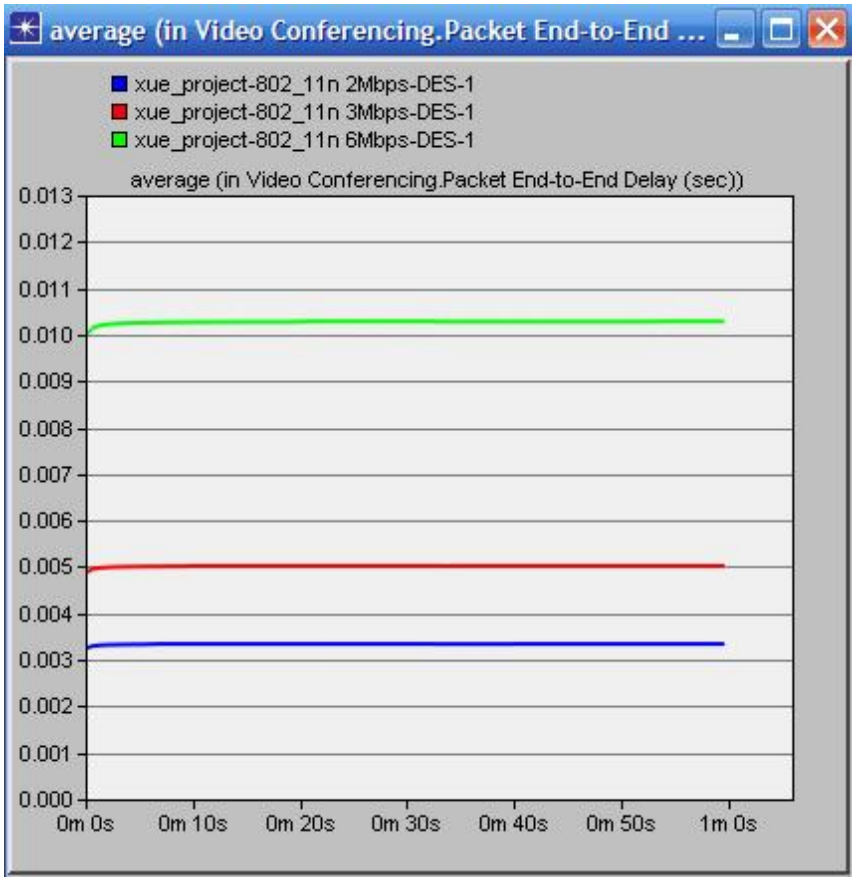




Simulation and Results

Statistics Analysis for 100Mbit/s Ethernet





Simulation and Results

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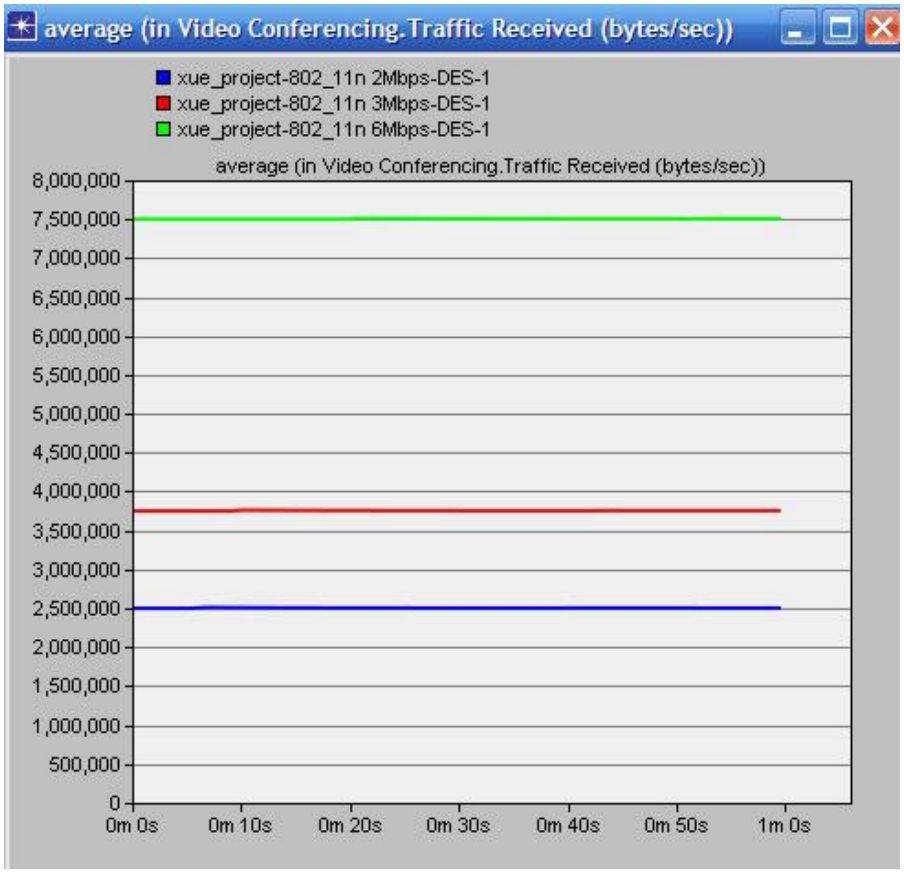
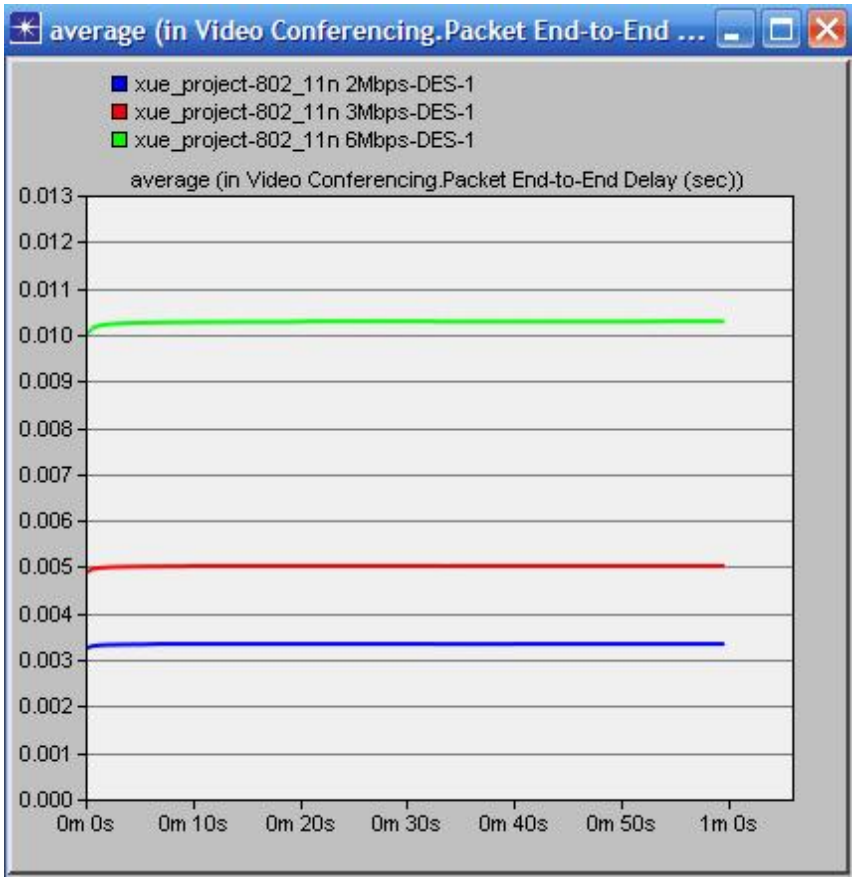
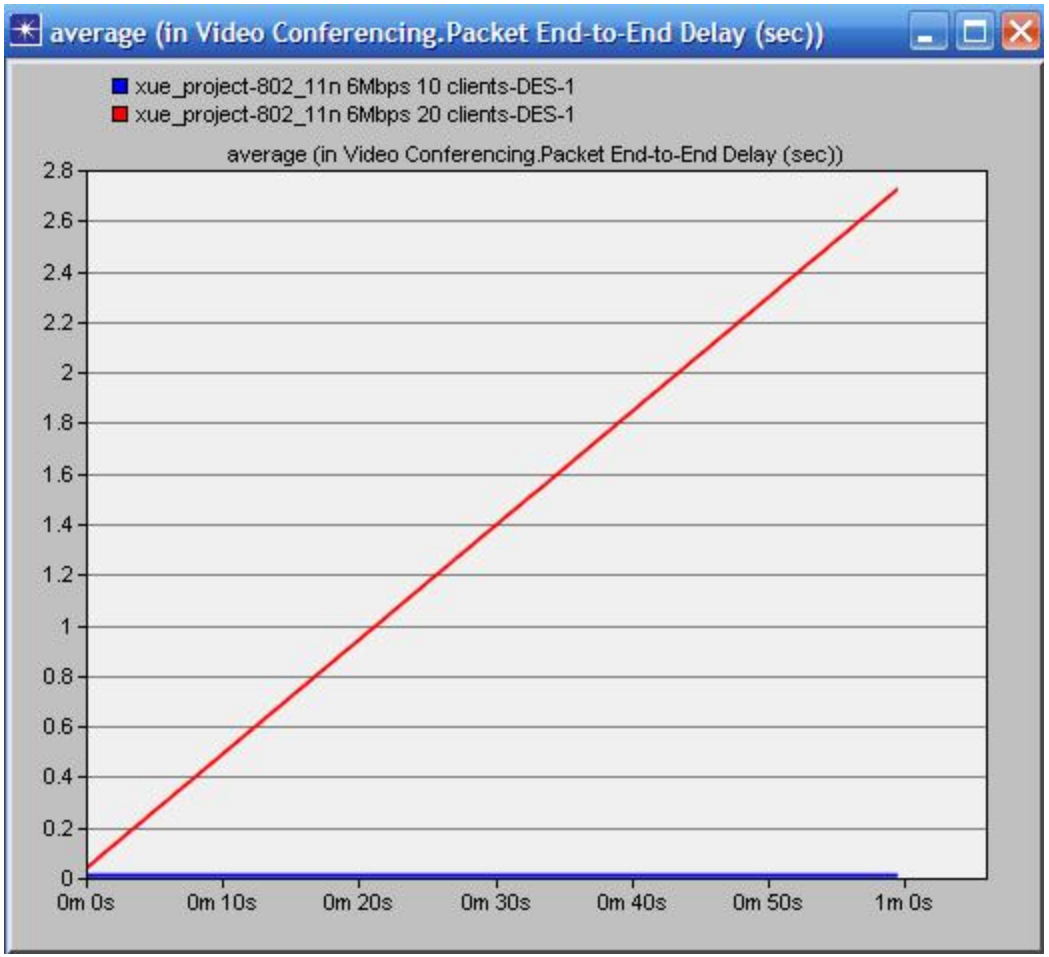




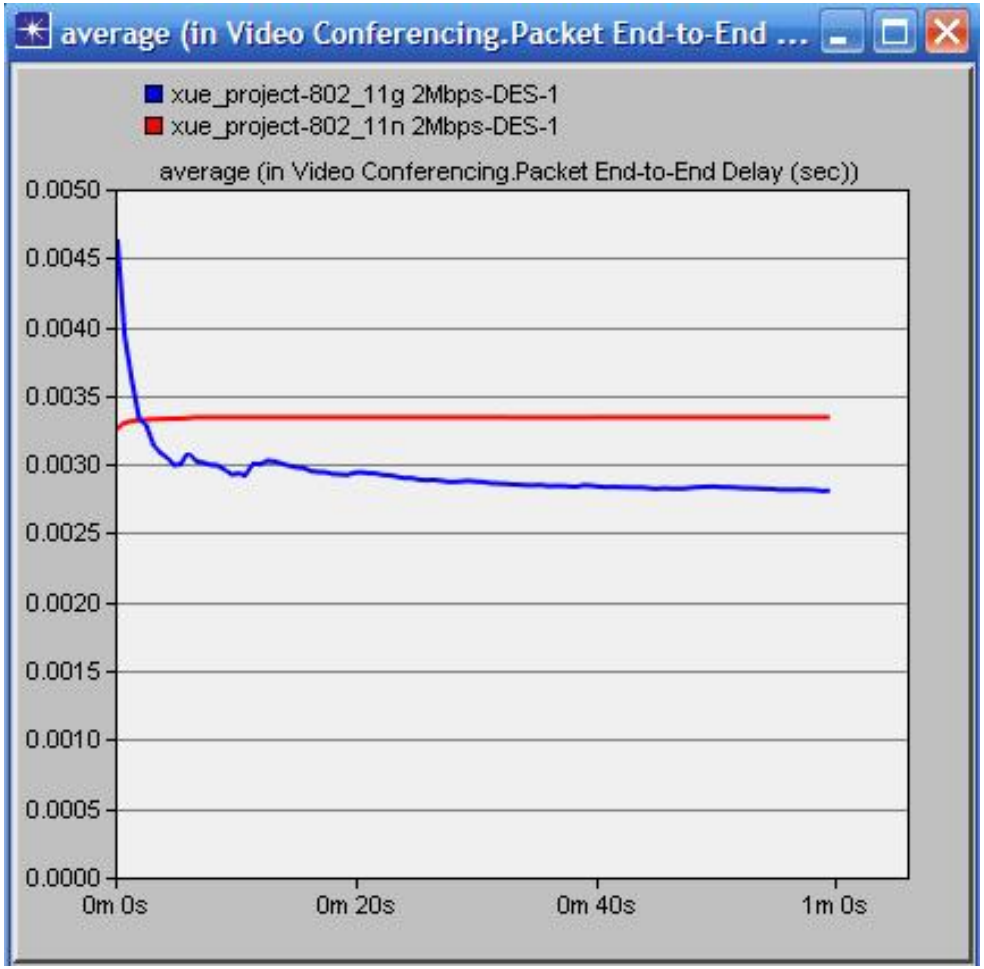
Simulation and Results

For 100Mbit/s Ethernet (increase clients to 20 at 6Mbps)



Simulation and Results

Compare 802.11g and 100Mbit/s Ethernet :



Simulation and Results

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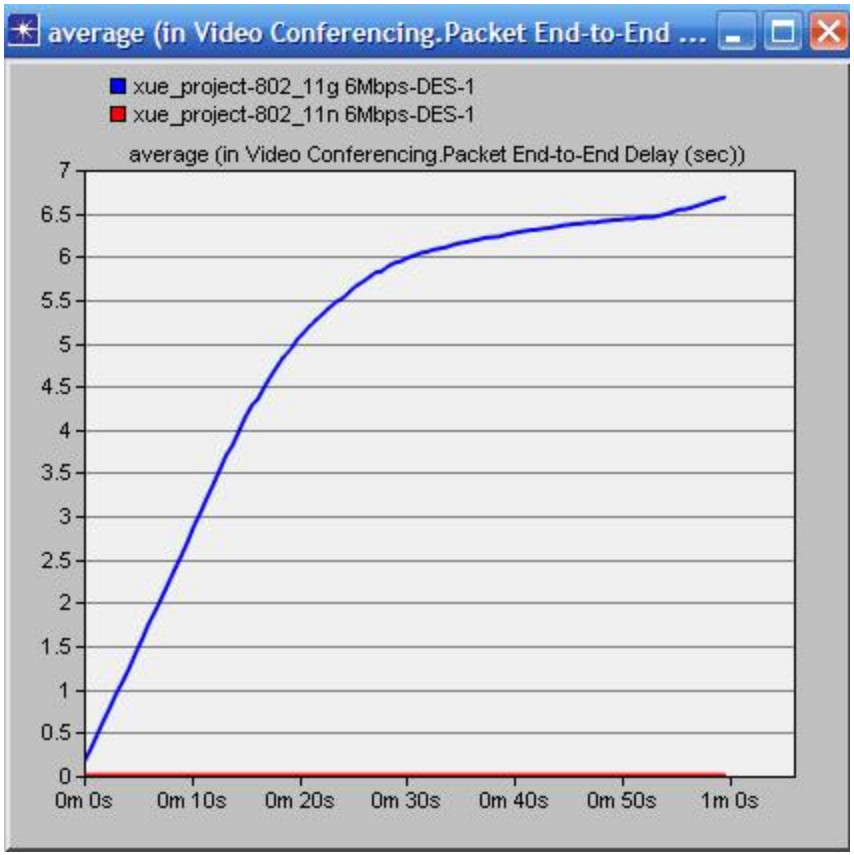

Conclusion and Discussion

I. **802.11g is not suitable for HD video streaming, but it's good for SD video below 2Mbps.**

II. **100Mbit/s Ethernet supports compressed HD video streaming, and is much better than 802.11g does in the small group clients , which indicates much lower packet delay variation and packet end-to-end delay.**

III. **Although 100Mbps Ethernet should work similarly as 802.11n in some content in theory, they may have some differences. Wireless tends to have congestion issues and suffer from interference signals and blocks. On the other hand, Ethernet works more smoothly for video streaming based on the previous curves.**
Some Enterprise AP testing/benchmarking to read over:
http://www.novarum.com/documents/Enterprise802.11nSingleAPBenchmarkTestingv1.3.pdf

IV. **If I am able to set 802.11n model in Opnet 14.0, the results may be more convinced.**

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