

**ENSC 427: Communications Networks**  
**Spring 2015**

**Video Streaming over Wi-Fi**

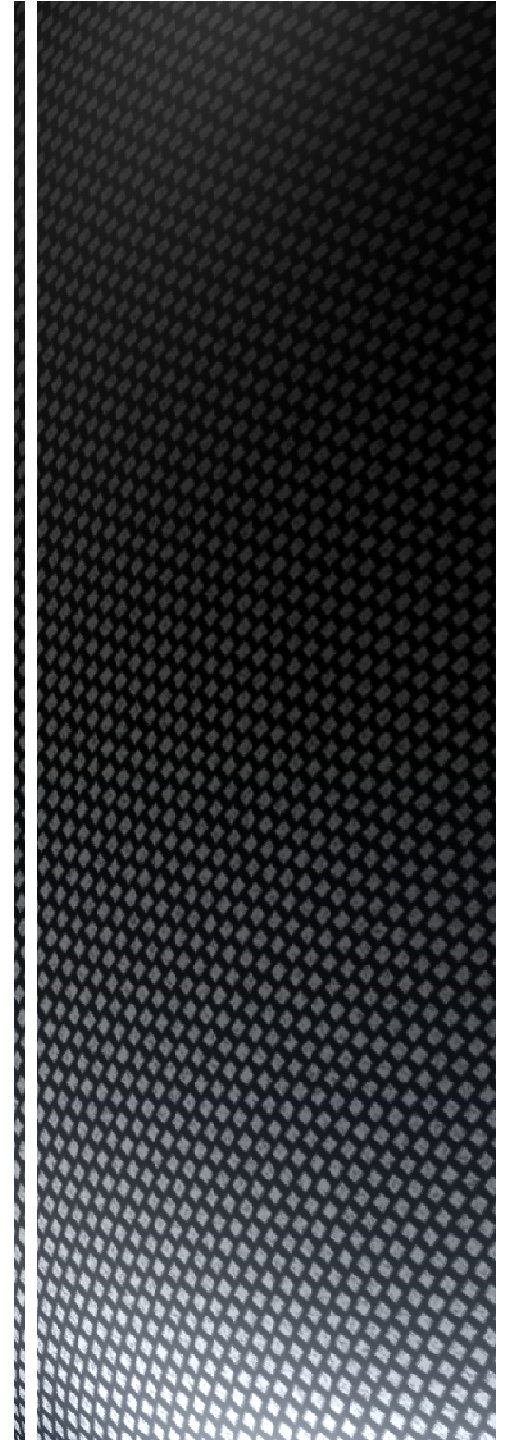
**[www.sfu.ca/~jwk10](http://www.sfu.ca/~jwk10)**

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# Overview

## ○ Introduction

- ❖ Objective
- ❖ Introduction on Wi-Fi
- ❖ Video Streaming Protocols

## ○ Implementation

- ❖ Topology
- ❖ Application

## ○ Simulation & Analysis

- ❖ Increasing Load and Data Rate
- ❖ Comparison of 802.11a/g/n
- ❖ Effect of Distance

## ○ Discussion/Conclusion

# Introduction

- ❖ Objective
- ❖ Introduction on Wi-Fi
- ❖ Video Streaming Protocols

# Introduction

## ❖ Objective

- To analyse the video streaming performance in a typical home Wi-Fi network with various scenarios
- In terms of delay, throughput, jitter and packet received

## ❖ Introduction on Wi-Fi

- WLAN, IEEE 802.11, WPA/WPA2
- 802.11 a/b/g/n/ac (802.11g most popular)
- 2.4 & 5 GHz
- Higher power consumption
- Data rate up to 54 Mbps for 802.11 a/g
- 802.11n (MIMO), data rate up to 600 Mbps
- Range 20 meters (66 feet) indoors

# Introduction

## ❖ Video Streaming Protocols

- Highest BW and Bit Rate
- 100 kbps for low quality, over 3 Mbps for HD
- Streaming stored/live video, Video over IP
- Video Compression and Quality
- Delay Sensitive & Loss Tolerance for Conference
- Streaming Live : Delay Tolerance of 10 sec
- HTTP & UDP, DASH, RTP ...
- Client Buffering

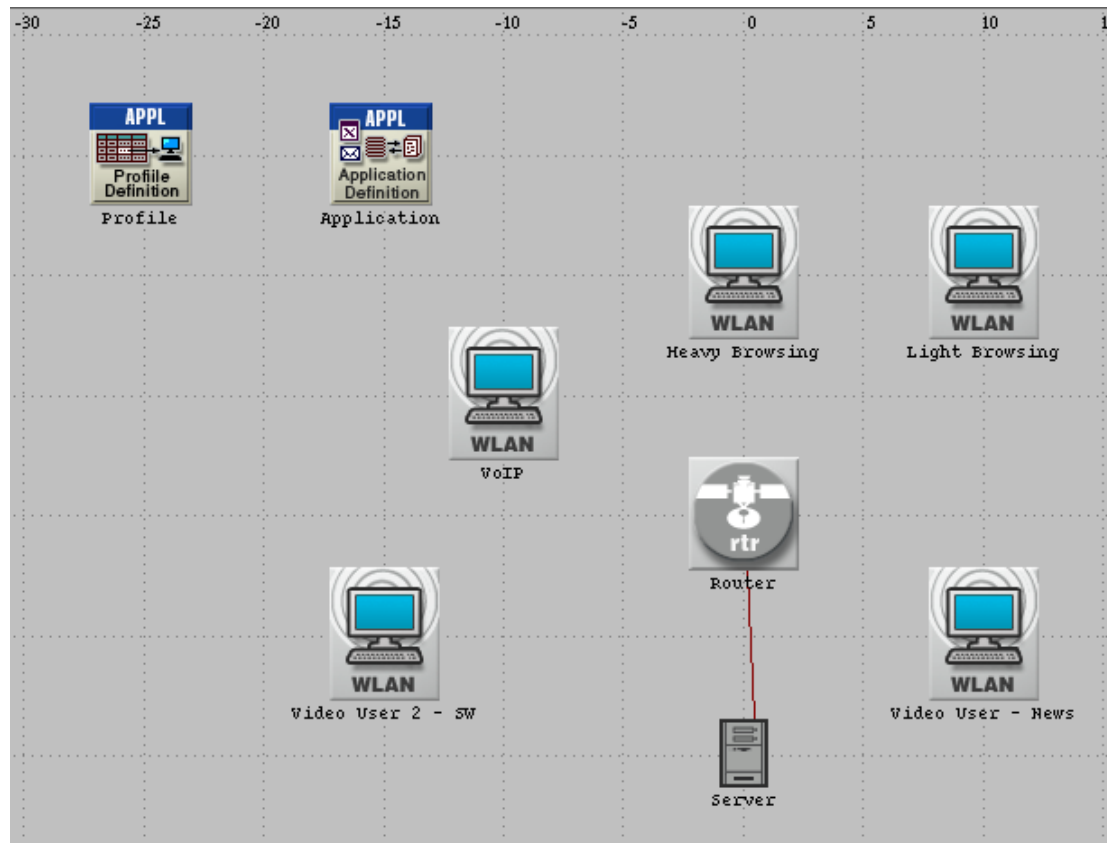
# Implementation

- ❖ **Topology**
- ❖ **Application**

# Implementation

## ❖ Topology

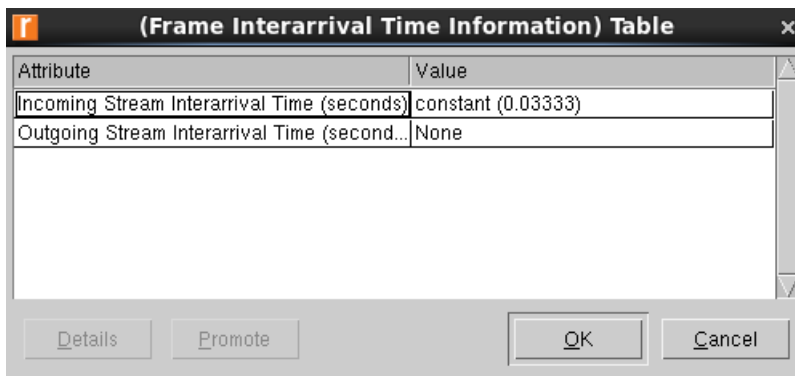
- One WLAN-Ethernet Router, One Ethernet Server, 100BaseT Link
- Users: mobile WLAN Workstations
- Application: VOIP, Browsing, Video (News, Star Wars, LOTR)
- **User of Interest:** News Client



# Implementation

## ❖ Application

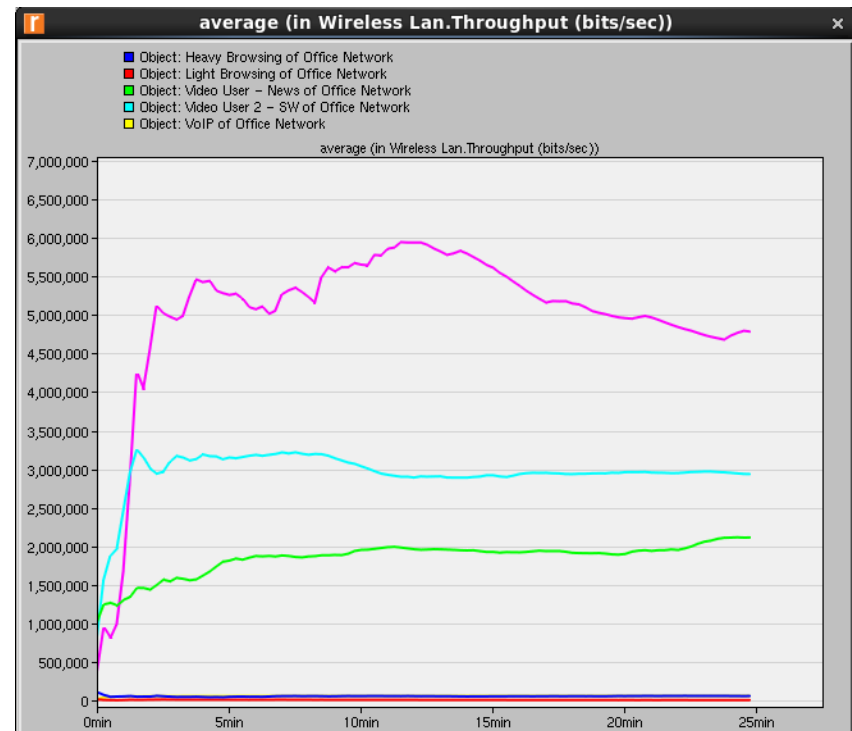
- Video traces e.g. News broadcast at 30 FPS
- Default VoIP and browsing applications



The screenshot shows a dialog box titled "(Frame Interarrival Time Information) Table". It contains a table with two columns: "Attribute" and "Value".

Attribute	Value
Incoming Stream Interarrival Time (seconds)	constant (0.03333)
Outgoing Stream Interarrival Time (second...)	None

At the bottom of the dialog, there are buttons for "Details", "Promote", "OK", and "Cancel".



## ❖ Desired Statistics

1. Throughput, packets received
2. End-to-end delay
3. Variation in delay



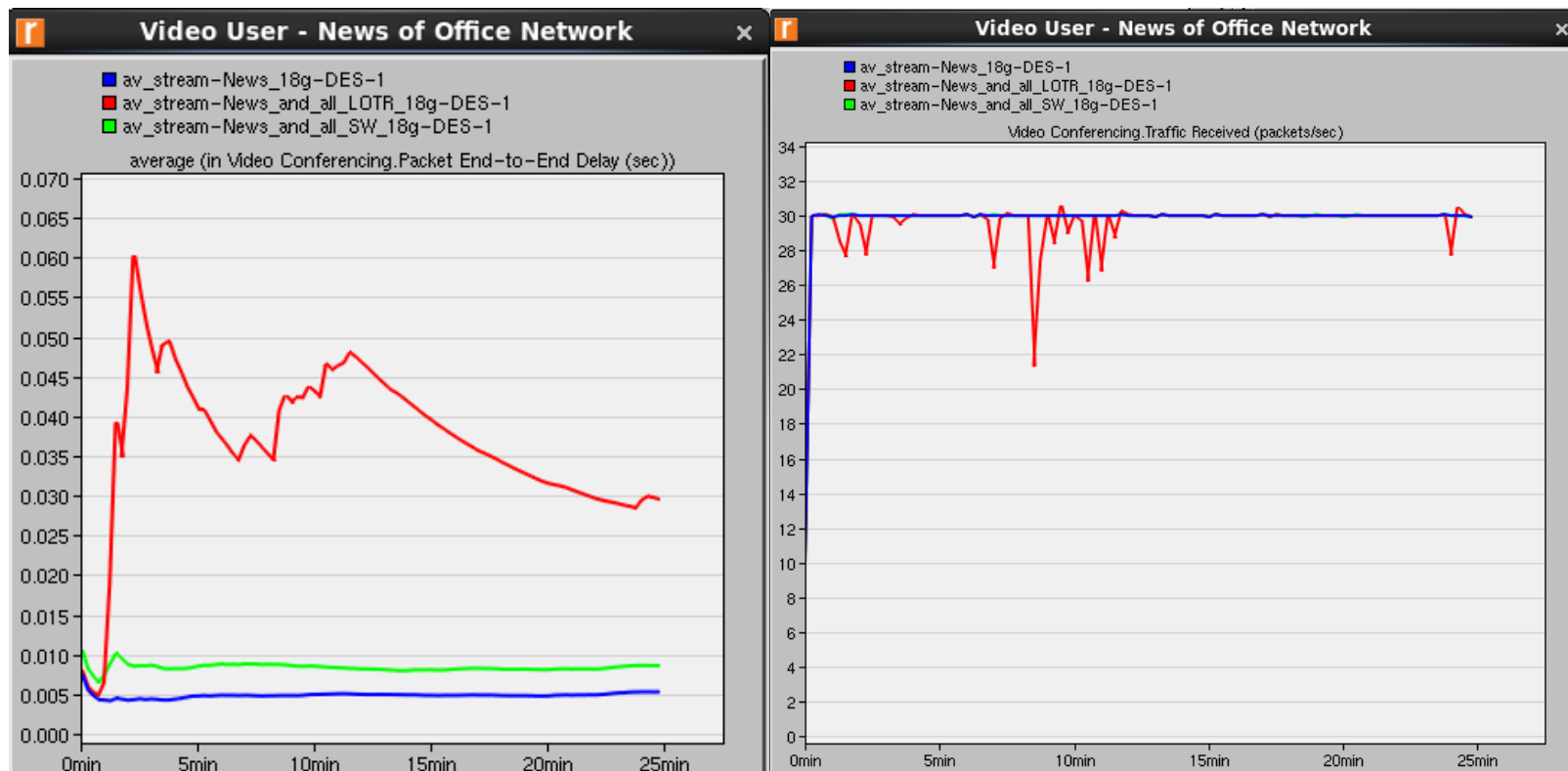
# Simulation & Analysis

- ❖ **Case 1: Increasing Load and Data Rate**
- ❖ **Case 2: Comparison of 802.11a/g/n**
- ❖ **Case 3: Effect of Distance**

# Simulation & Analysis

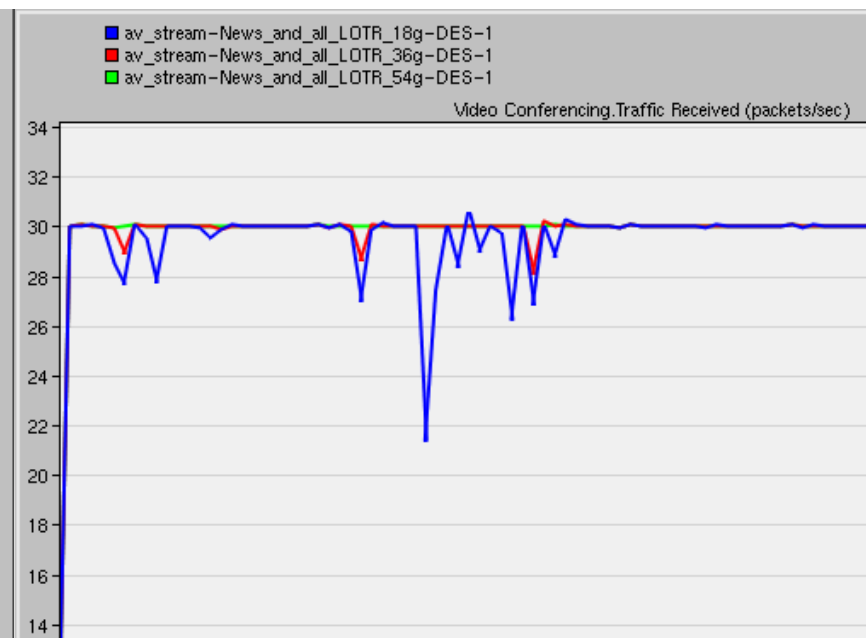
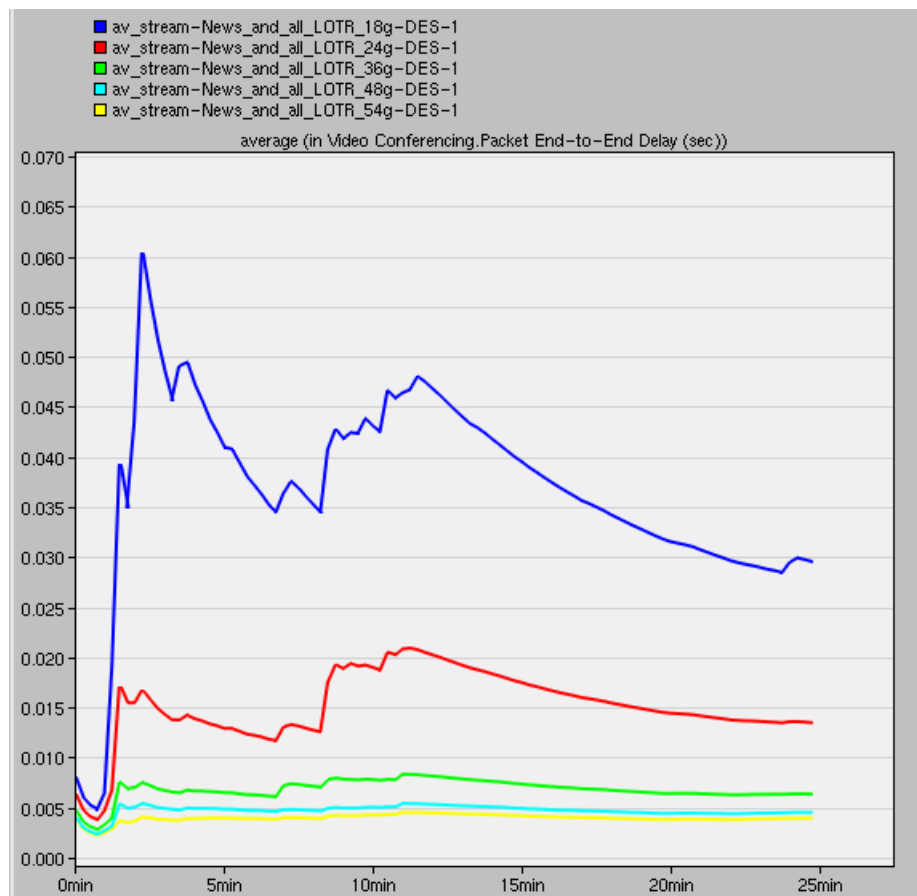
## ■ Case 1:

News User and added clients (Light/Heavy Browsing, VoIP, LOTR) with 802.11g at 18 Mbps



# Simulation & Analysis

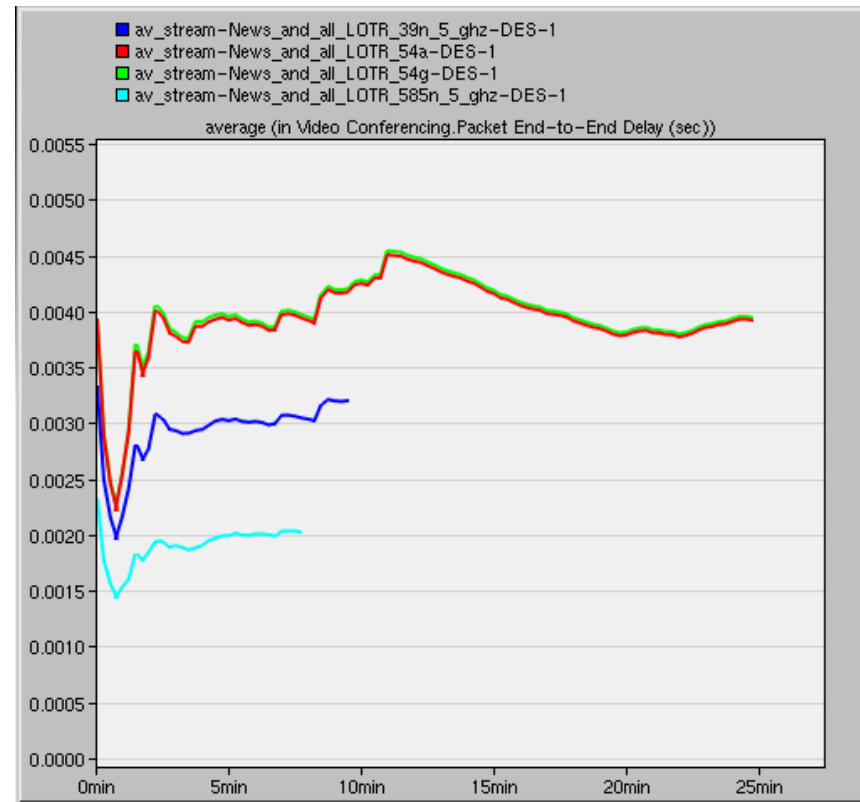
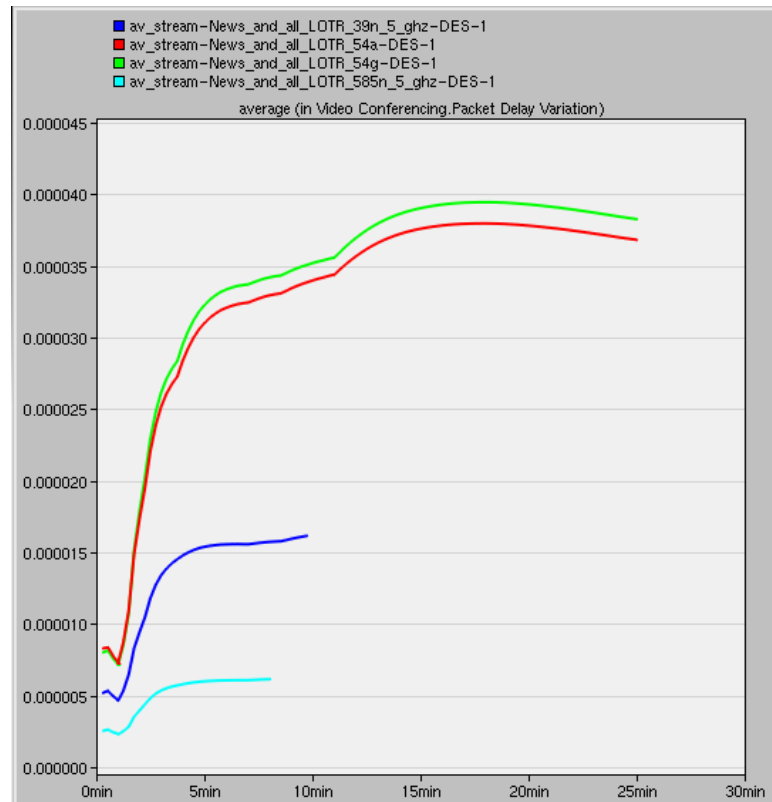
- **Case 1: 802.11g, Increase Data Rate (18-54 Mbps)**
  - Increasing data rate lowers end-to-end delay and improves throughput
  - Recommend at least 48 Mbps based on results



# Simulation & Analysis

## Case 2 :

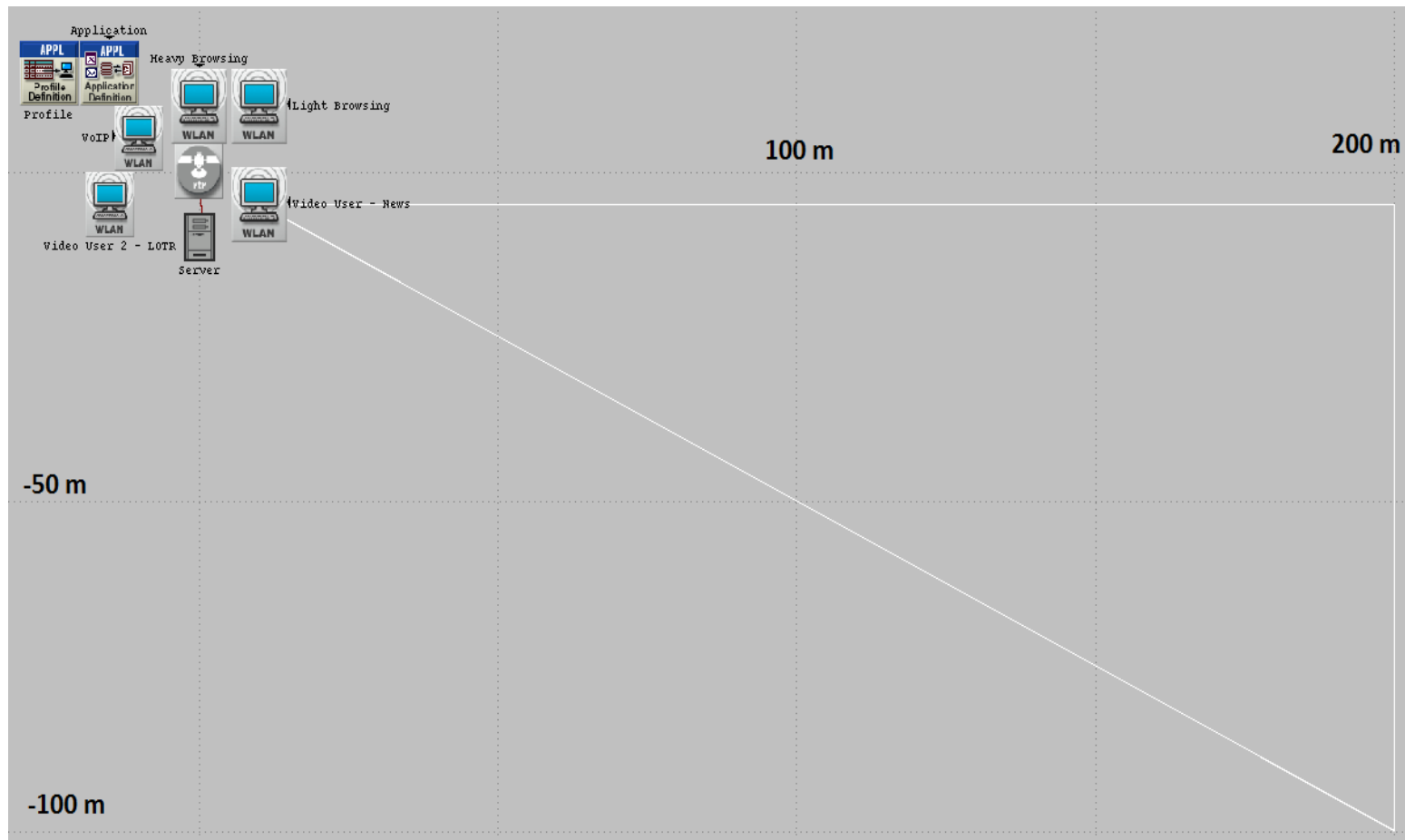
- Comparison of a, g & n standards
- n: 39 & 58.5 Mbps with 5 GHz band, g/a: 54 Mbps
- 802.11n outperforms others



# Simulation & Analysis

## Case 3 :

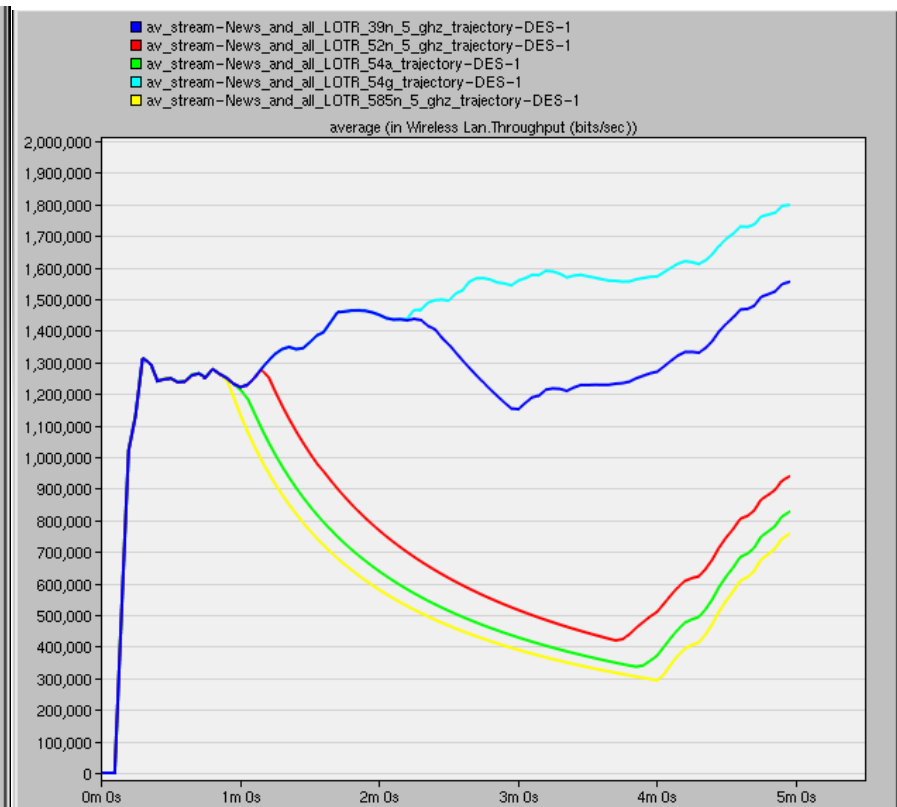
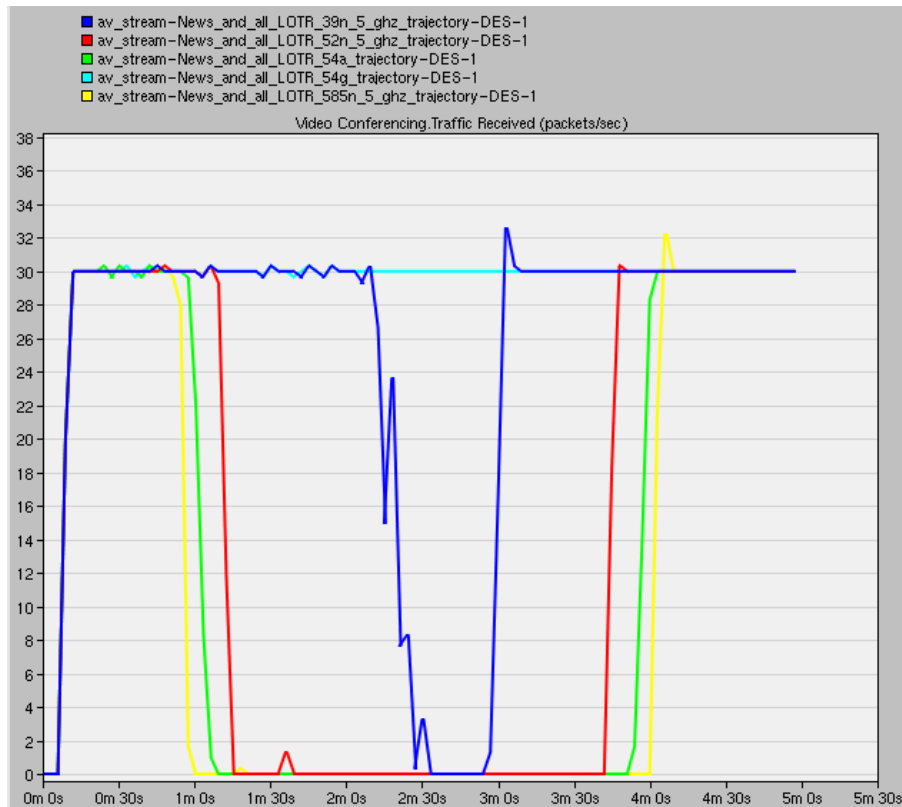
- Effect of Distance: News User Moving along the path below



# Simulation & Analysis

## ■ Case 3 :

- Trade off between high frequency & range
- Trade off between data rate & range
- Shortest range with 802.11n (58.5 Mbps, 5 GHz), longest range with 802.11g (54 Mbps, 2.4 GHz)



# Discussion/Conclusion

- Difficulties
  - Unfamiliar with Modeler's video conferencing, browsing, VoIP applications
  - Decisions on topology, scenarios, and test cases
  
- Future Work
  - 802.11ac and compare to 802.11n
  - WiFi's competitors
    - HiperLAN (European 802.11)
    - Ethernet
    - WiMAX
  - Add more throughput intensive applications
  
- Things learned
  - High throughput applications have the most effect on a network
  - Typical characteristics of video: high bit rate and throughput, sensitive to delay
  - Higher rate of transmission increases throughput and decreases delay
  - 802.11n tends to perform better than 802.11a/g in terms of delay
  - Standards using 2.4 GHz band have longer range
  - Trade-off between high data rate vs. shorter range

**Thank You!**

**Questions?**





# References

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