

# THE HIGH RESOLUTION VIDEO STREAMING OVER WI-FI, WIMAX AND LTE

Chris Chen, 301069165 (cyc19@sfu.ca)

Sheng Sheng, , 301084558 (ssa116@sfu.ca)

Jeff Yoo, , 301120667 (jyoo@sfu.ca)

Group #15

URL: [www.sfu.ca/~cyc19](http://www.sfu.ca/~cyc19)

# ROADMAP

- Introduction
- Background Information
- Network Topology (Wi-Fi, Wimax and LTE)
- Implementation Details
- Simulation and Results
- Challenges & Future work
- Discussion
- References

# INTRODUCTION

Purpose:

- WiMAX and LTE = The most popular 4G networks system
- Comparing the performances of WiMAX and LTE on YouTube's high resolution video streaming, 1080p
- YouTube = Most Popular applications in video streaming.
- TCP/HTTP Applications
- Demonstration of our analysis by simulating WiMAX and LTE scenarios through OPNET 16.0
- Wi-Fi system

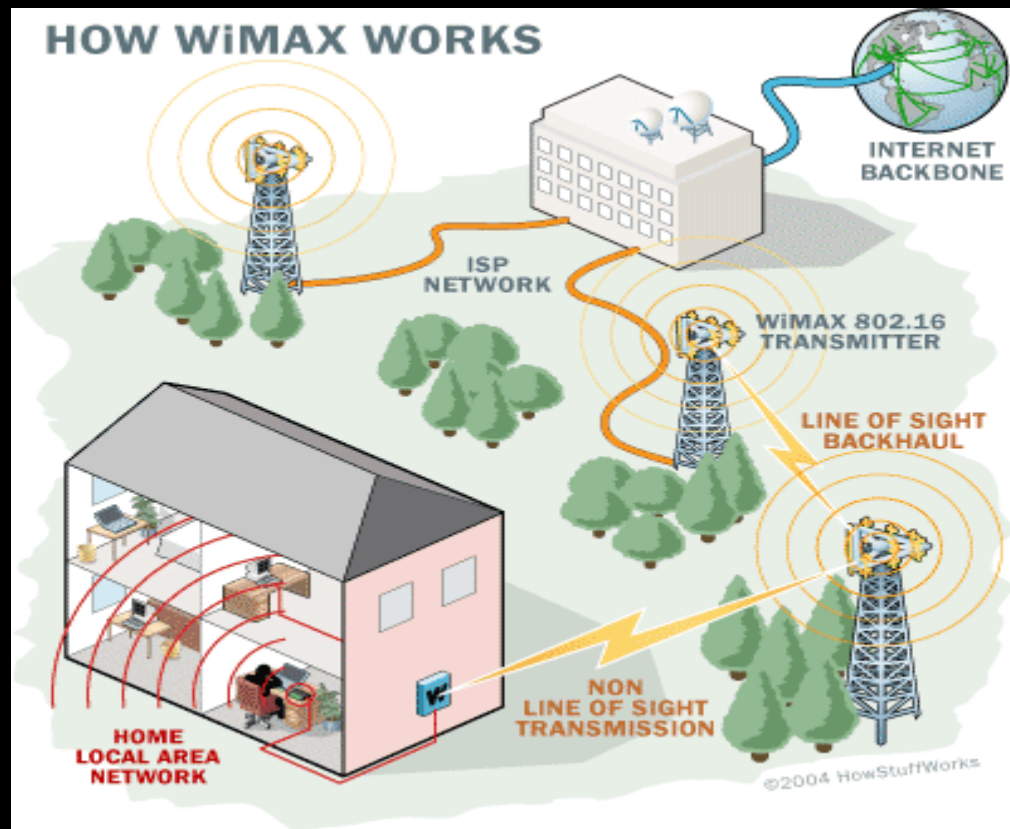
# BACKGROUND INFORMATION: WIMAX

- Worldwide Interoperability for Microwave Access
- Low Cost
- Service: Packet Data, VoIP (Telecommunication)
- Typical Channel BW: 5,7,8.75, 10 MHz
- Framing: 2 to 20 ms
- Area cover up to 50 Km

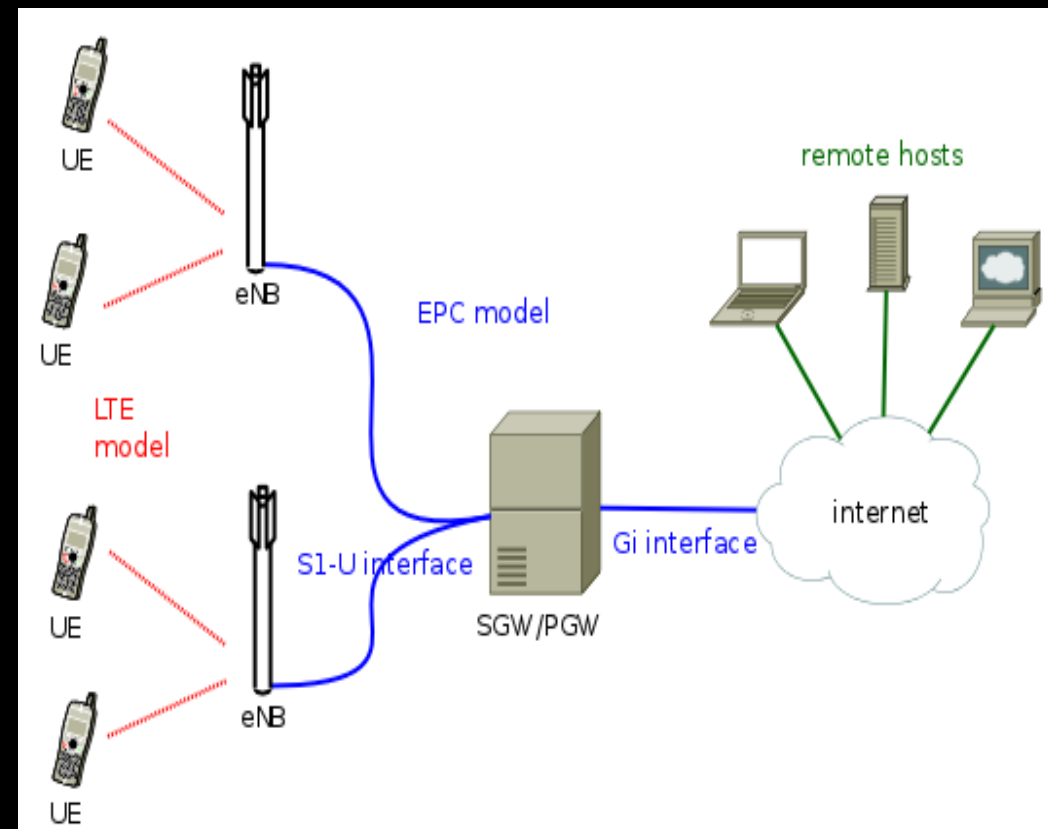
# BACKGROUND INFORMATION: LTE

- Long Term Evolution
- Wide and Various Channel BW: 1.4, 3, 5, 10,15,20 MHz
- Services: Packet Data, VoLTE (Application of VoIP)
- Application of Digital signal processing (DSP)
- Various Channel BW: 1.4, 3, 5, 10,15,20 MHz
- Framing : 1 ms sub-frames
- Theoretical speed of download up to 326.4Mbps & Uploading speeds up to 86.4Mbps

# BACKGROUND INFORMATION TOPOLOGY

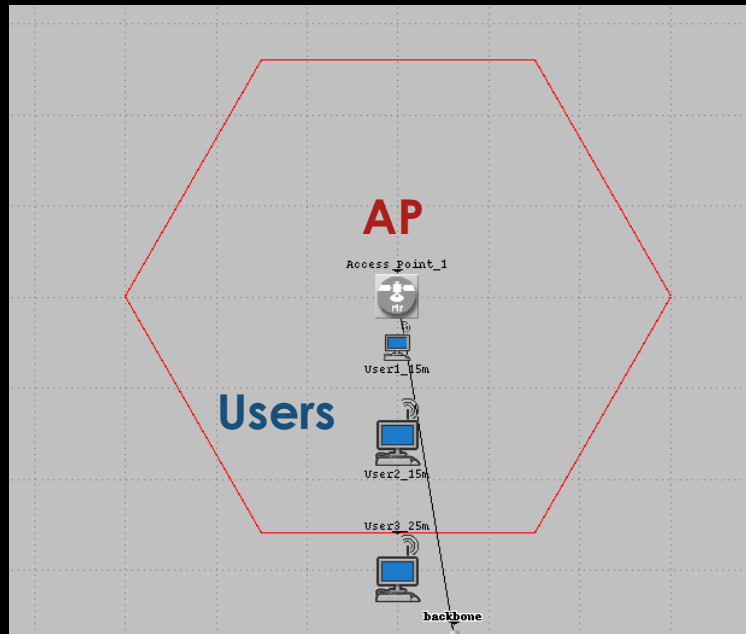


WiMAX

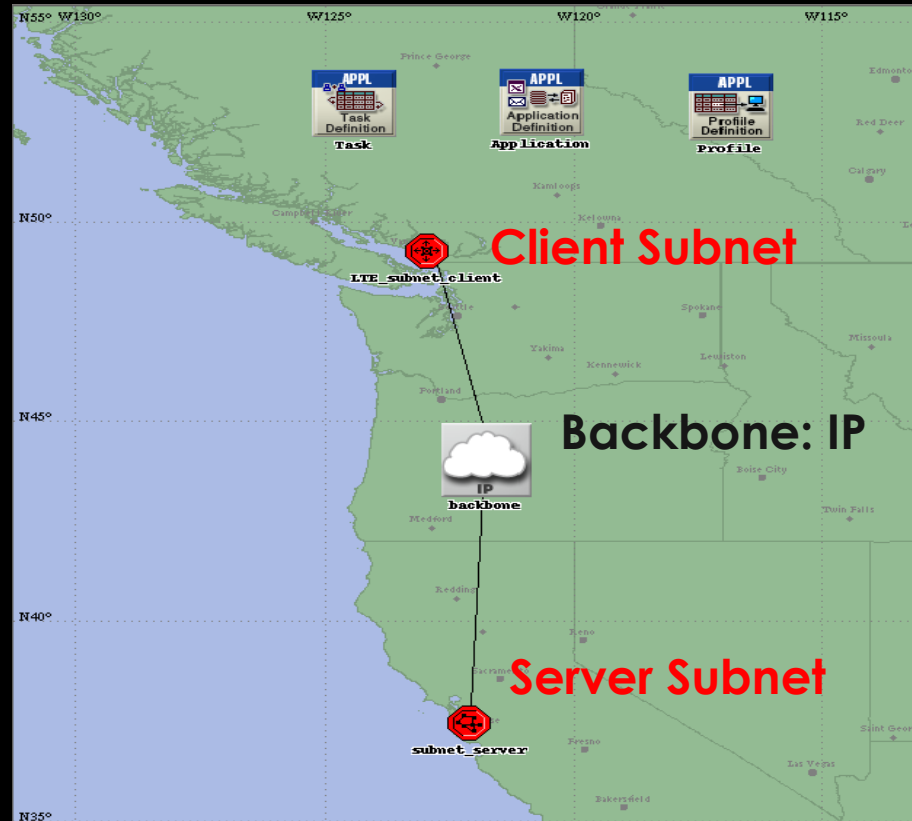


LTE

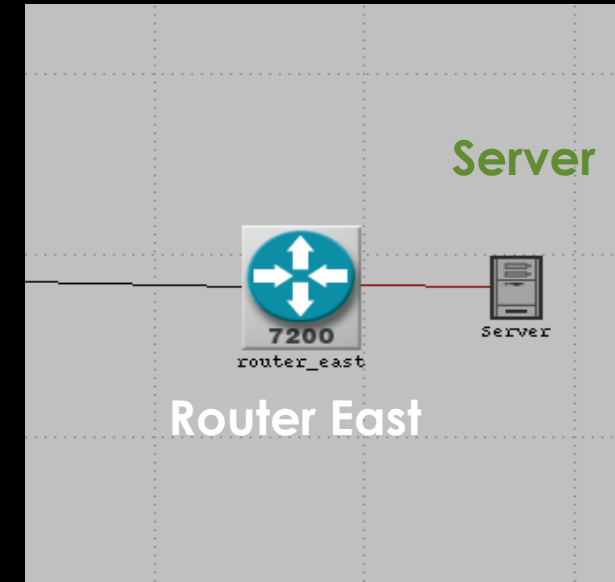
# TOPOLOGY IN SIMULATION - WI-FI



Client\_subnet

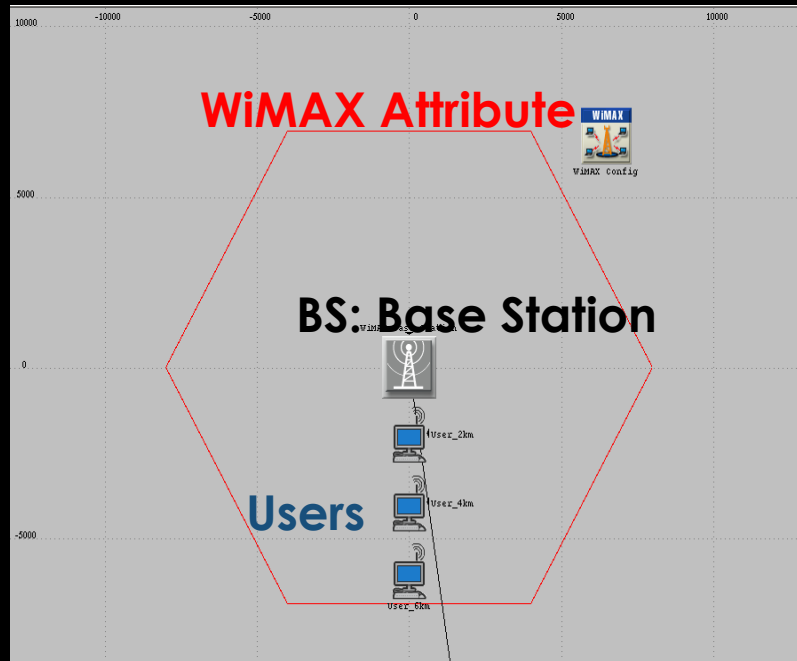


LTE\_overview

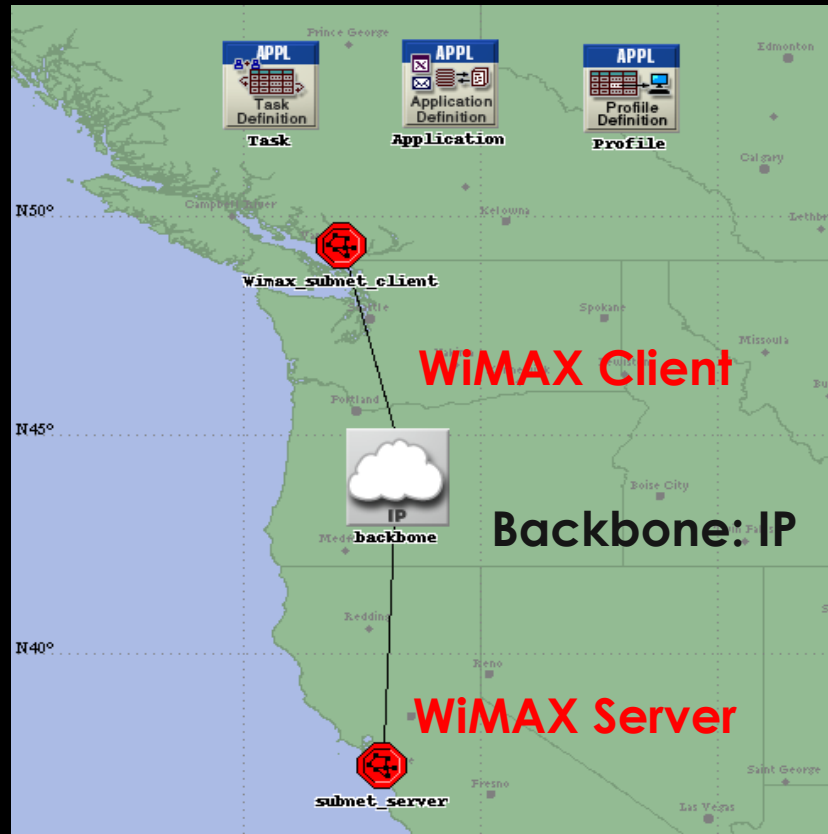


Server\_subnet

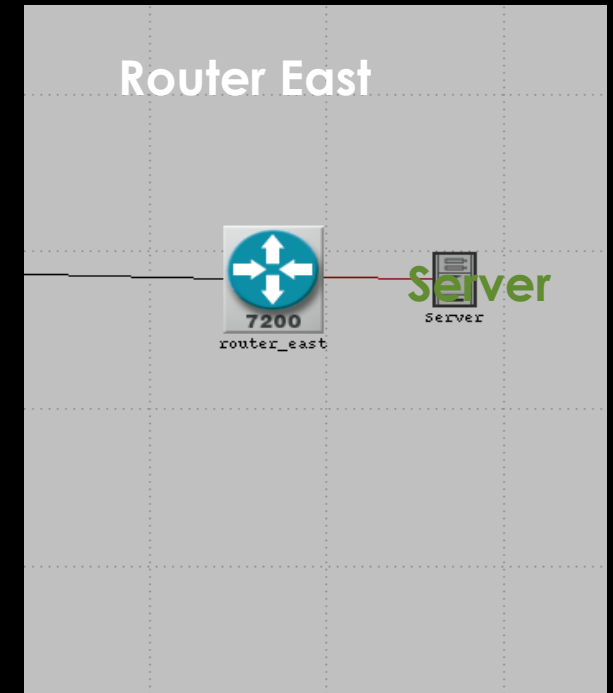
# TOPOLOGY IN SIMULATION - WIMAX



WiMAX client



WiMAX overview

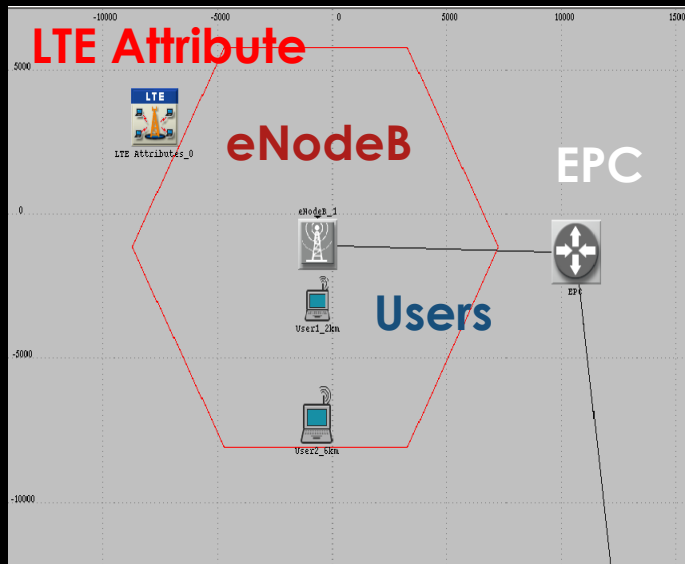


WiMax server

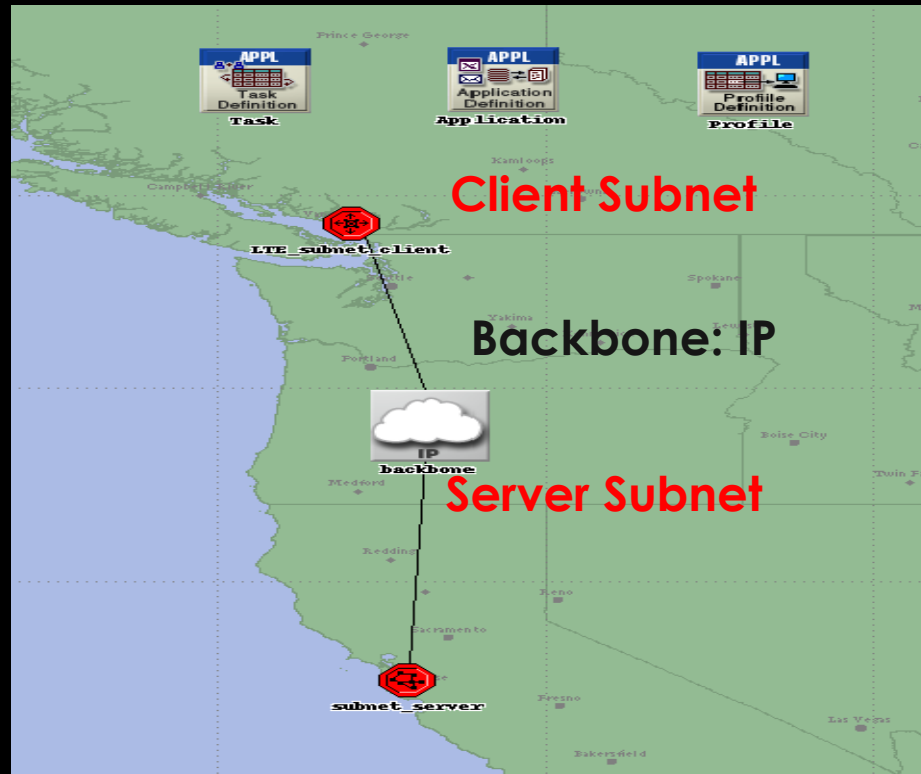


# TOPOLOGY IN SIMULATION

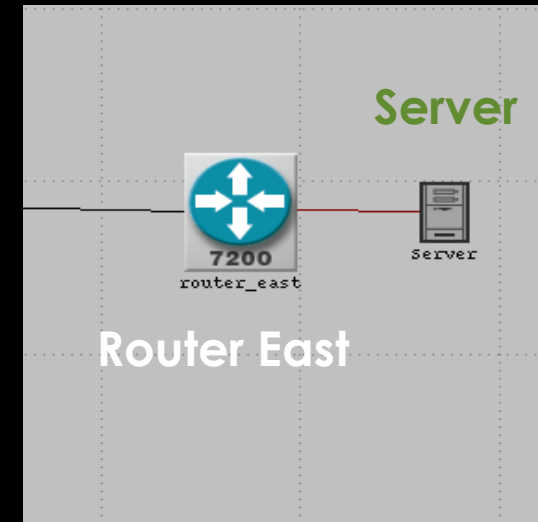
## - LTE



Client\_subnet



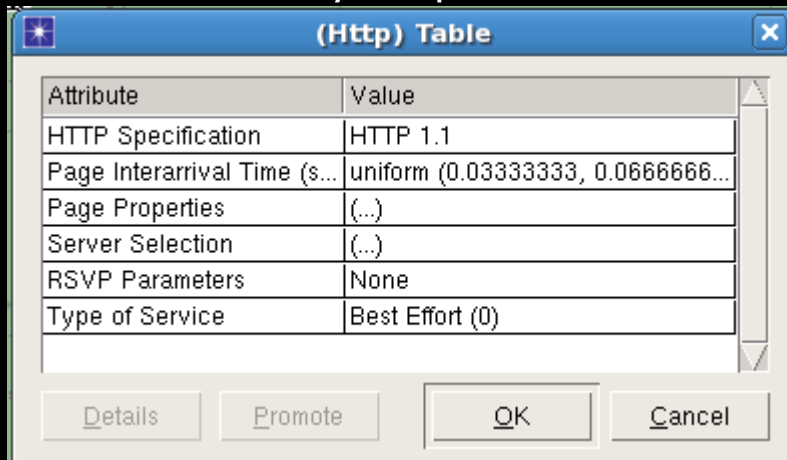
LTE\_overview



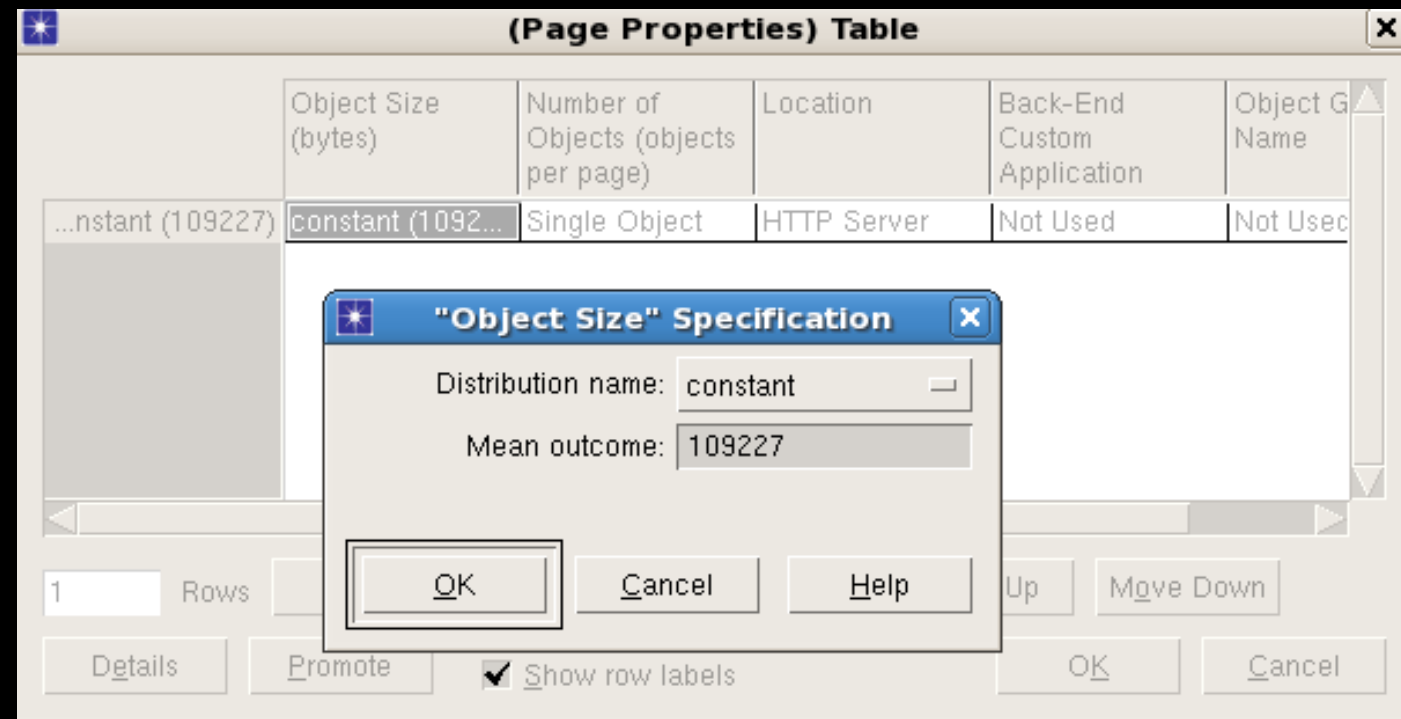
Server\_subnet

# IMPLEMENTATION DETAILS

- Application:
- YouTube@1080P (20~30fps)
- HTTP/TCP
- H.264 format
- Bit & Frame Rate: 25Mbps/30fps
- 109227 byte per frame



Attribute	Value
HTTP Specification	HTTP 1.1
Page Interarrival Time (s...)	uniform (0.03333333, 0.06666666...)
Page Properties	(...)
Server Selection	(...)
RSVP Parameters	None
Type of Service	Best Effort (0)



Object Size (bytes)	Number of Objects (objects per page)	Location	Back-End Custom Application	Object Group Name
constant (109227)	Single Object	HTTP Server	Not Used	Not Used

"Object Size" Specification	
Distribution name:	constant
Mean outcome:	109227

# IMPLEMENTATION DETAILS (CONTINUED)

Wifi	Operational Mode	Data Rate	Transmit Power
	802.11b	11Mbps	9E-05W

WiMAX	Antenna Gain	Max Transmission Power	PHY Profile	Base Frequency
	15dBi	0.01328W	20MHz	5GHz

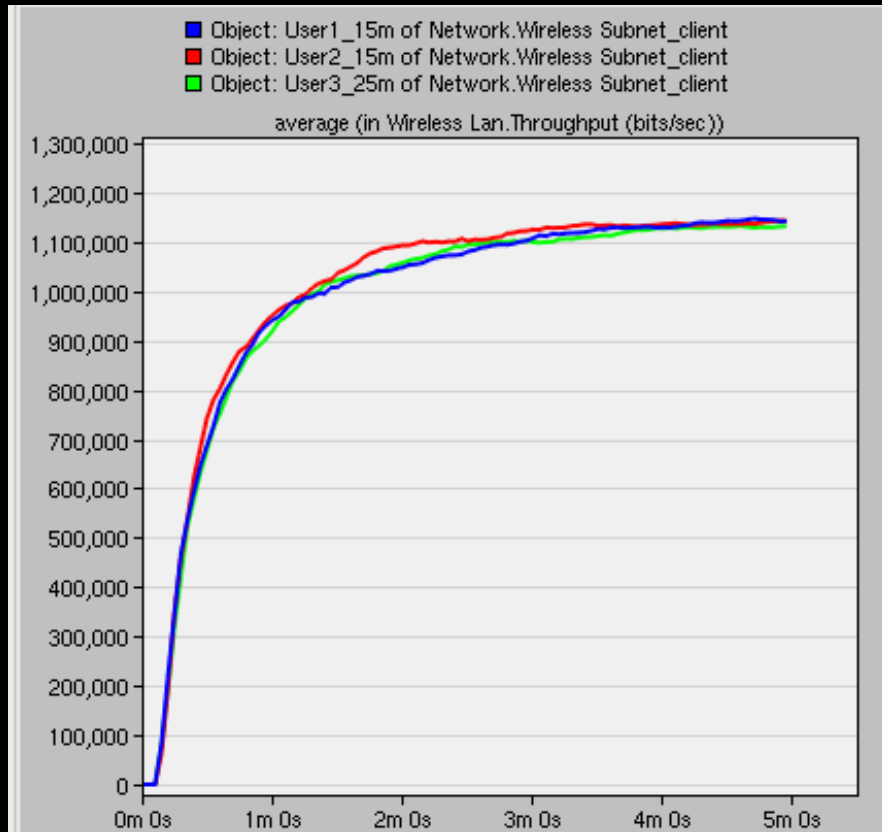
LTE	Antenna Gain	Max Transmission Power	Operating Power	PHY Profile
	15dBi	0.5W	10W	10MHz

# SIMULATION AND RESULTS

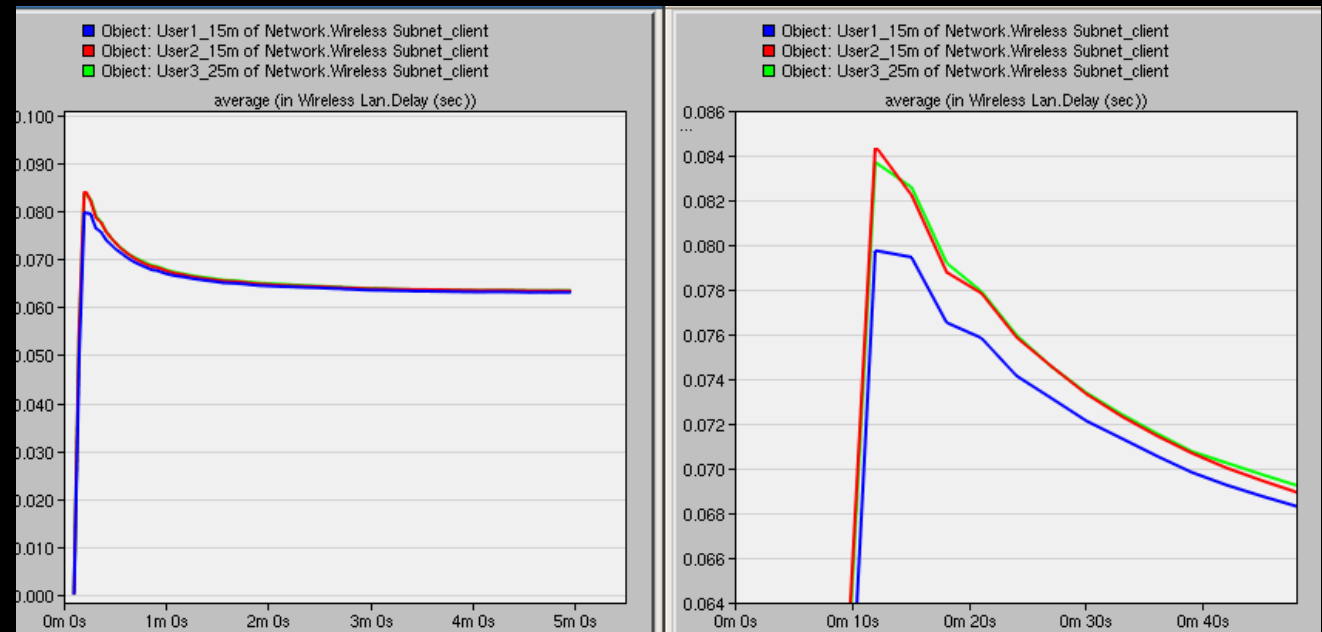
- Results for Wi-Fi, WiMAX and LTE scenarios by OPNET
- Improvement
- Comparison

# WIFI SIMULATION DATA

## Throughput (bit/sec)

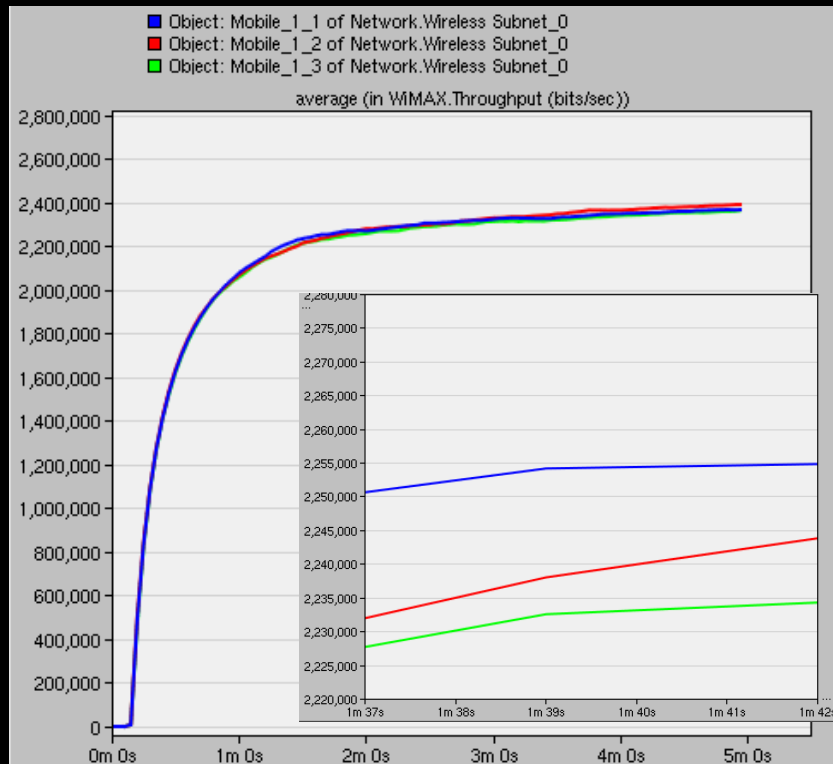


## Delay (sec)

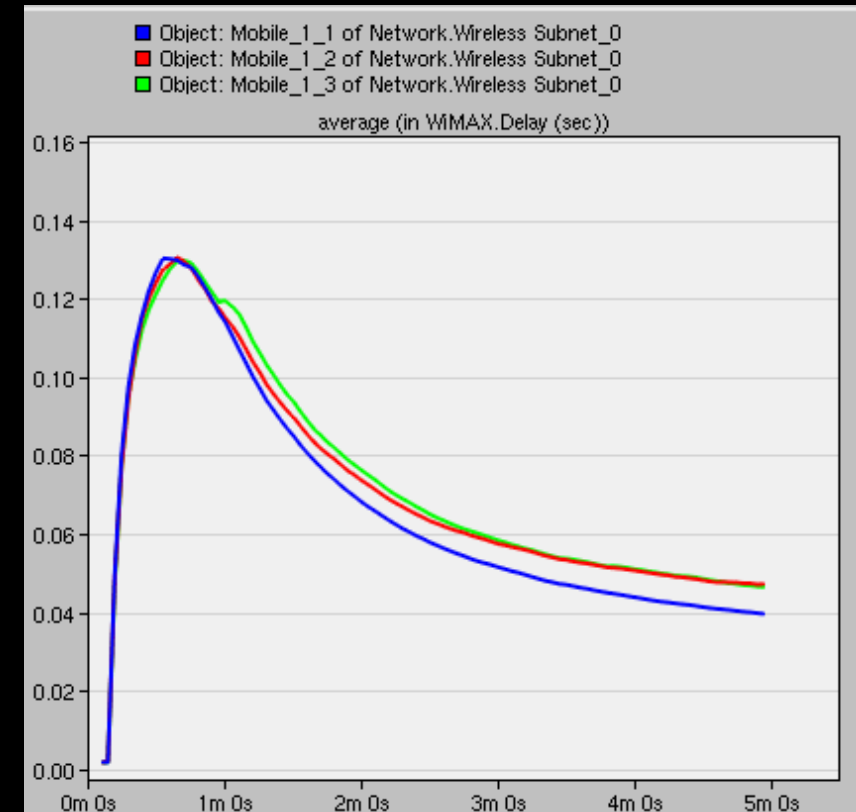


# WIMAX SIMULATION DATA

## Throughput (bit/sec)

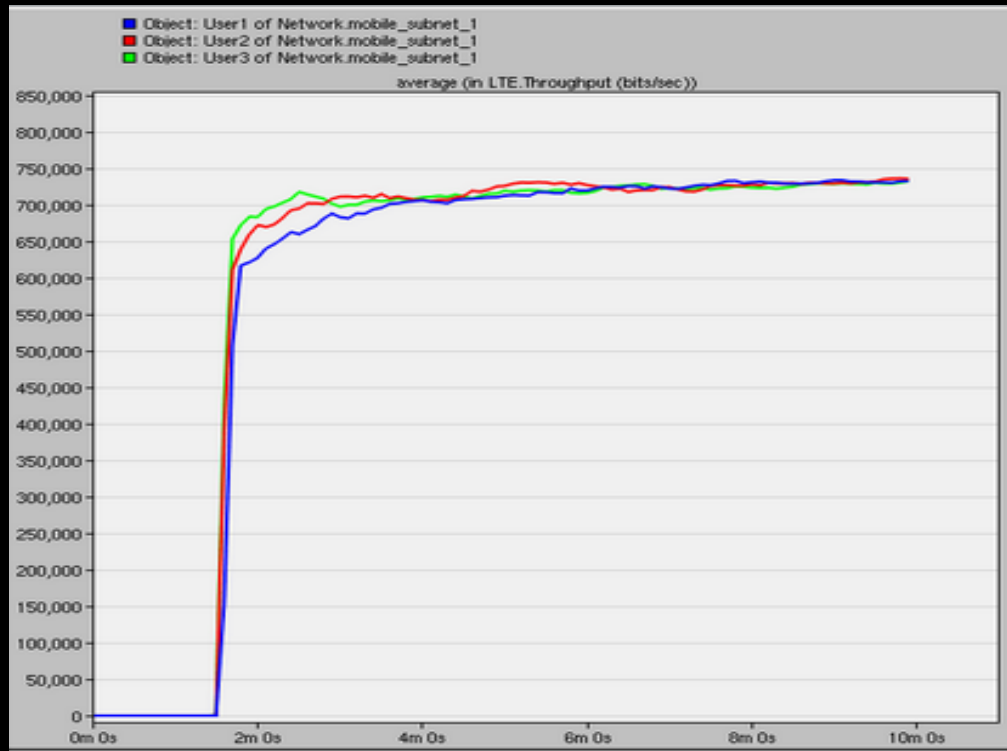


## Delay (sec)

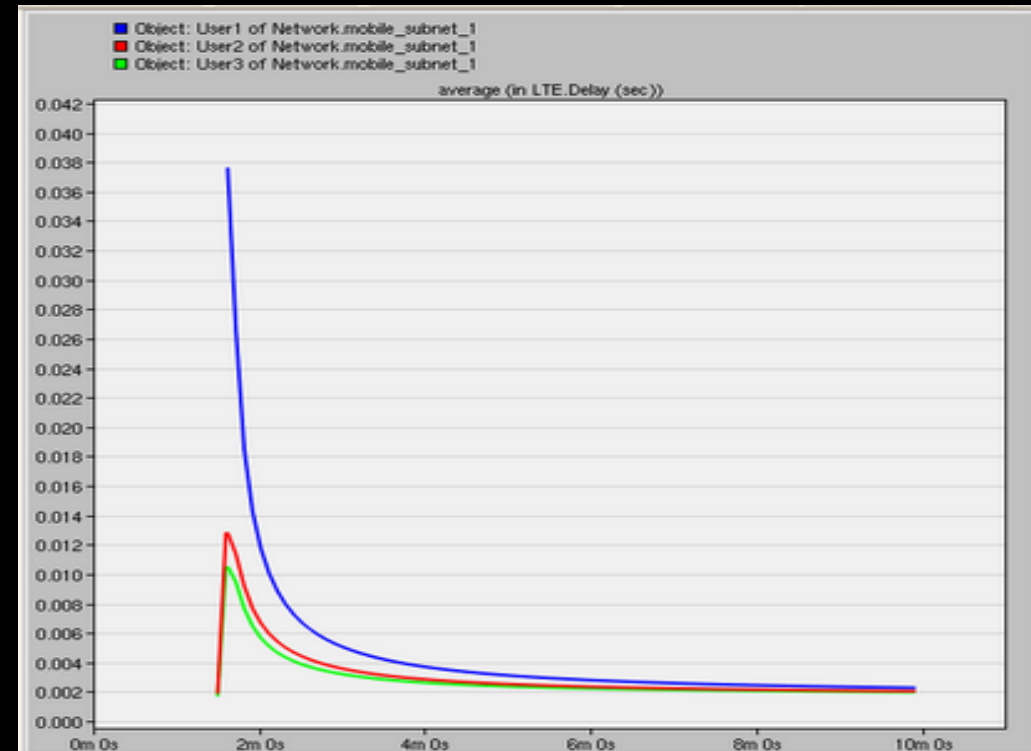


# LTE SIMULATION DATA

## Throughput at 10 MHz



## Delay at 10 MHz



# SIMULATION INFORMATION AND ANALYSIS

- How can we reduce **the Delay?**

## LTE

a) PHY PROFILE (Change in Bandwidth Channel)

## WiMAX

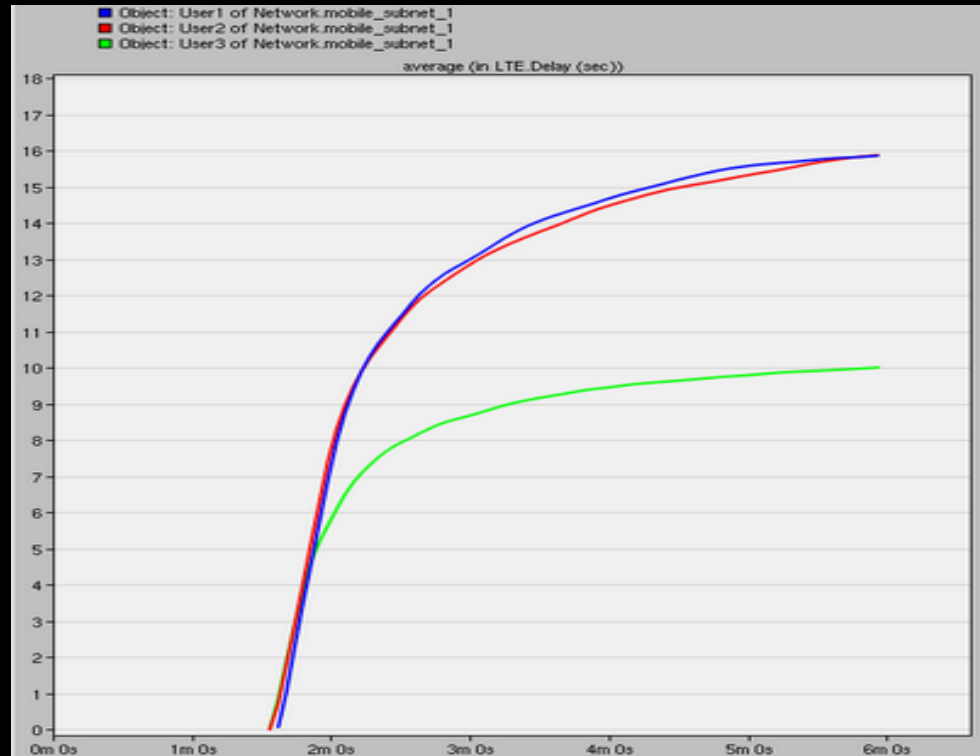
b) Maximum Transmission Power

c) Operating Power

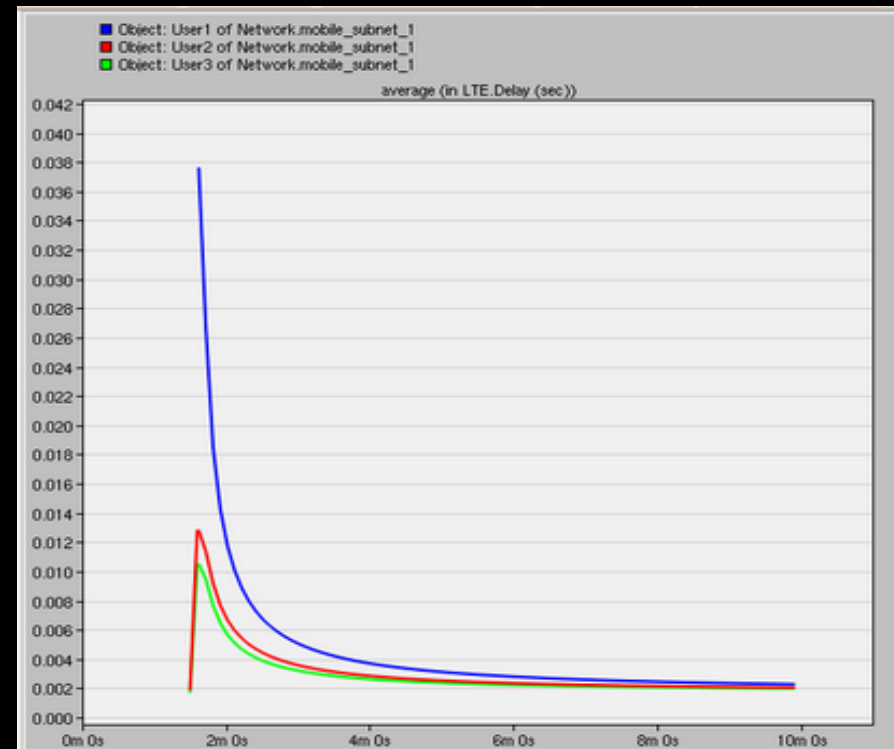


# PROOF: LTE

## Delay at 1.4 MHz



## Delay at 10 MHz



# RESULTS COMPARISON

Technologies	Throughput (bit/sec)	Peak Delay (ms)
Wi-Fi	1,150,000	84
WiMAX	2,400,000	130
LTE	730,000	38

- Coverage range: WiMAX > LTE > Wi-Fi
- Throughput: WiMAX > Wi-Fi > LTE
- Delay: WiMAX > Wi-Fi > LTE

# CHALLENGES & FUTURE WORK

- Not enough virtual memory for 4K resolution online video
- Use custom application instead of HTTP application
- Implement more conditions scenarios

# DISCUSSION

Any Questions???

# REFERENCES

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**THANKS  
FOR  
LISTENING !!!**