

ENSC 427: COMMUNICATION NETWORKS  
SPRING 2014  
FINAL PROJECT PRESENTATIONS

# EVALUATION OF LTE PERFORMANCE

-SIMULATION OF VOIP AND WEB BROWSING ON LTE  
NETWORK USING OPNET

[HTTP://WWW.SFU.CA/~JLA235/427PROJECT.HTML](http://www.sfu.ca/~jla235/427PROJECT.HTML)

Group 06

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# ROAD MAP

- ▶ **1. Motivation**
- ▶ 2. Introduction
- ▶ 3. Main Parameters
- ▶ 4. OPNET Model & Results
- ▶ 5. Conclusion and Future work
- ▶ 6. Question
- ▶ 7. Reference

# MOTIVATION

- ▶ More and More mobile users use LTE network to do web browsing and make free voice calls
- ▶ To evaluate the performance of LTE network for different applications:
  - VoIP
  - Web browsing

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# INTRODUCTION

## ▶ LTE

- Long Term Evolution
- Standard for wireless data communications technology
- Evolution of the GSM/UMTS standards
- Packet Switched radio interface (doesn't support circuit switching)
- Incompatible with 2G and 3G network

## ► Advantage of LTE network

- High data rate (up to 300 Mbit/s for downlink and 75 Mbit/s for uplink)
- Low transfer latency
- Ability to manage fast-moving mobiles and support multi-cast and broadcast streams
- Support both FDD, TDD systems
- Better spectrum flexibility: 1.4 MHz, 3 MHz, 5MHz, 10 MHz, 15 MHz and 20 MHz.

## ► VoIP

- Voice over Internet Protocol
- Provide communication services over Internet rather than public switched telephone network
- Convert voice signal to digital signal
- Packet switching
- Cost saving
- Voice quality depends on network quality

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# MAIN PARAMETERS

## ▶ Jitter

- Variation in time between each receiver
- Can occur at receiver side or carrier network
- Related to voice quality
- The level of jitter should be minimized

## ► End-to-end delay

- time for a packet to be transmitted from the source to the destination
- related to encoding/decoding delay, transmission delay, propagation delay, processing delay and queue delay.
- important parameter for real-time transmission

## ► LTE delay

- Round-trip delay
- Depends on distance and number of users
- Depends on different applications (VoIP or web browsing)

# ► Mean Opinion Score (MOS)

- An indication of the quality of received voice after codecs is transmitted and compressed
- Ranged from 1 (worst) to 5 (best)

Mean opinion score (MOS)		
MOS	Quality	Impairment
5	Excellent	Imperceptible
4	Good	Perceptible but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very annoying

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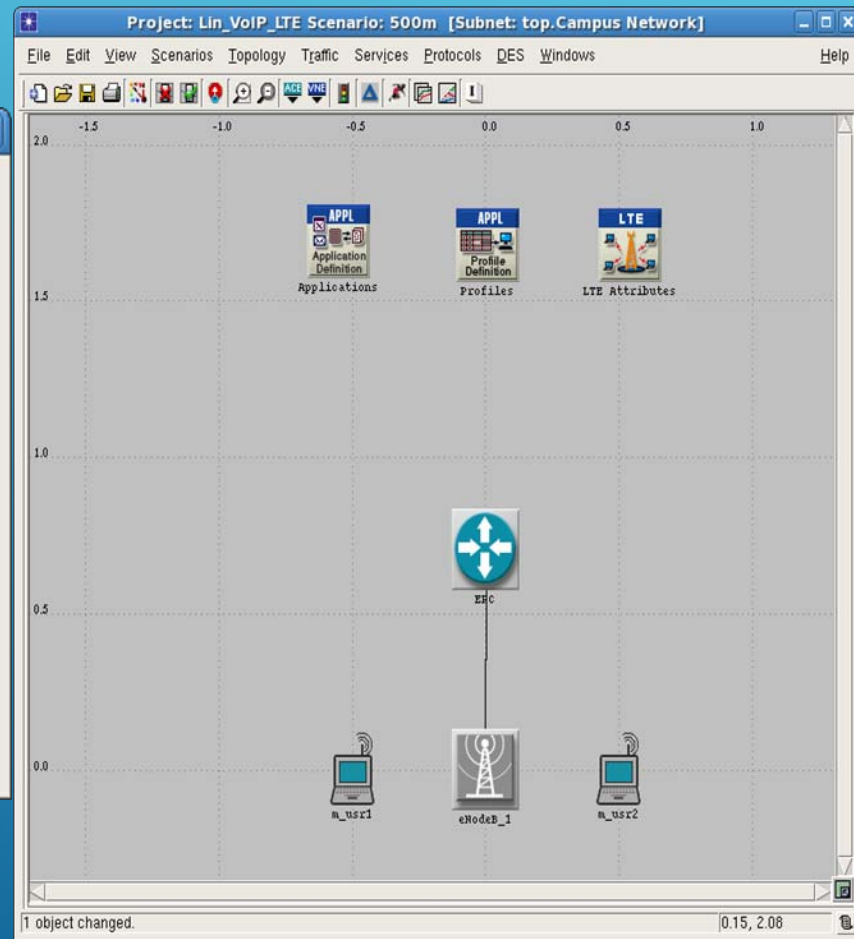
# VOIP

## ► Topology

(Voice) Table

Attribute	Value
Silence Length (seconds)	default
Talk Spurt Length (seconds)	default
Symbolic Destination Name	Voice Destination
Encoder Scheme	G.711
Voice Frames per Packet	1
Type of Service	Interactive Voice (6)
RSVP Parameters	None
Traffic Mix (%)	All Discrete
Signaling	None
Compression Delay (seconds)	0.02
Decompression Delay (seconds)	0.02
Conversation Environment	(...)

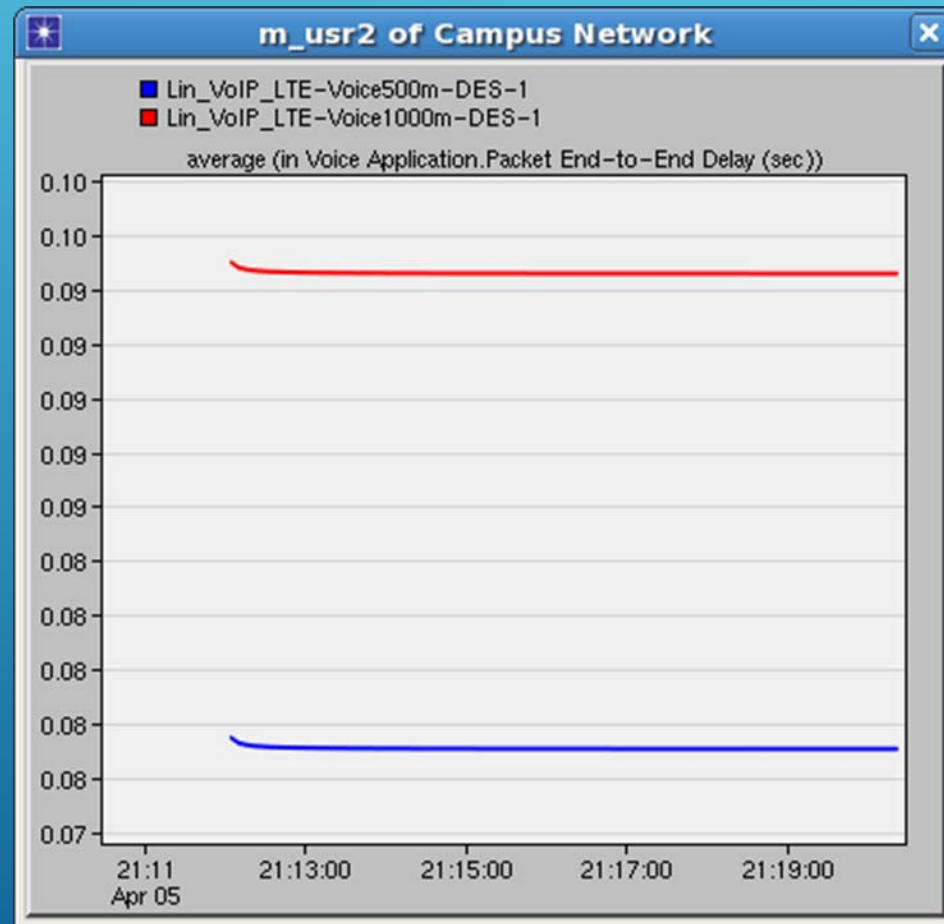
Details Promote OK Cancel



# ▶ End-to-End delay

500m average: 0.08s

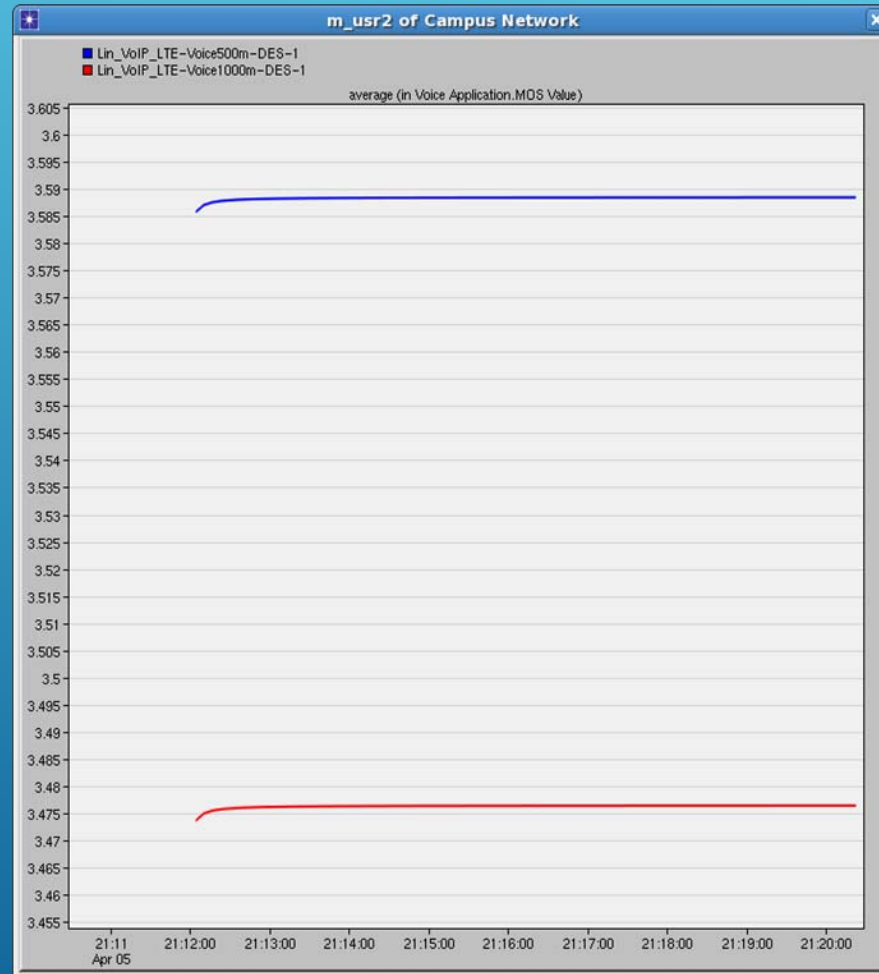
1km average: 0.09s



# ► MOS

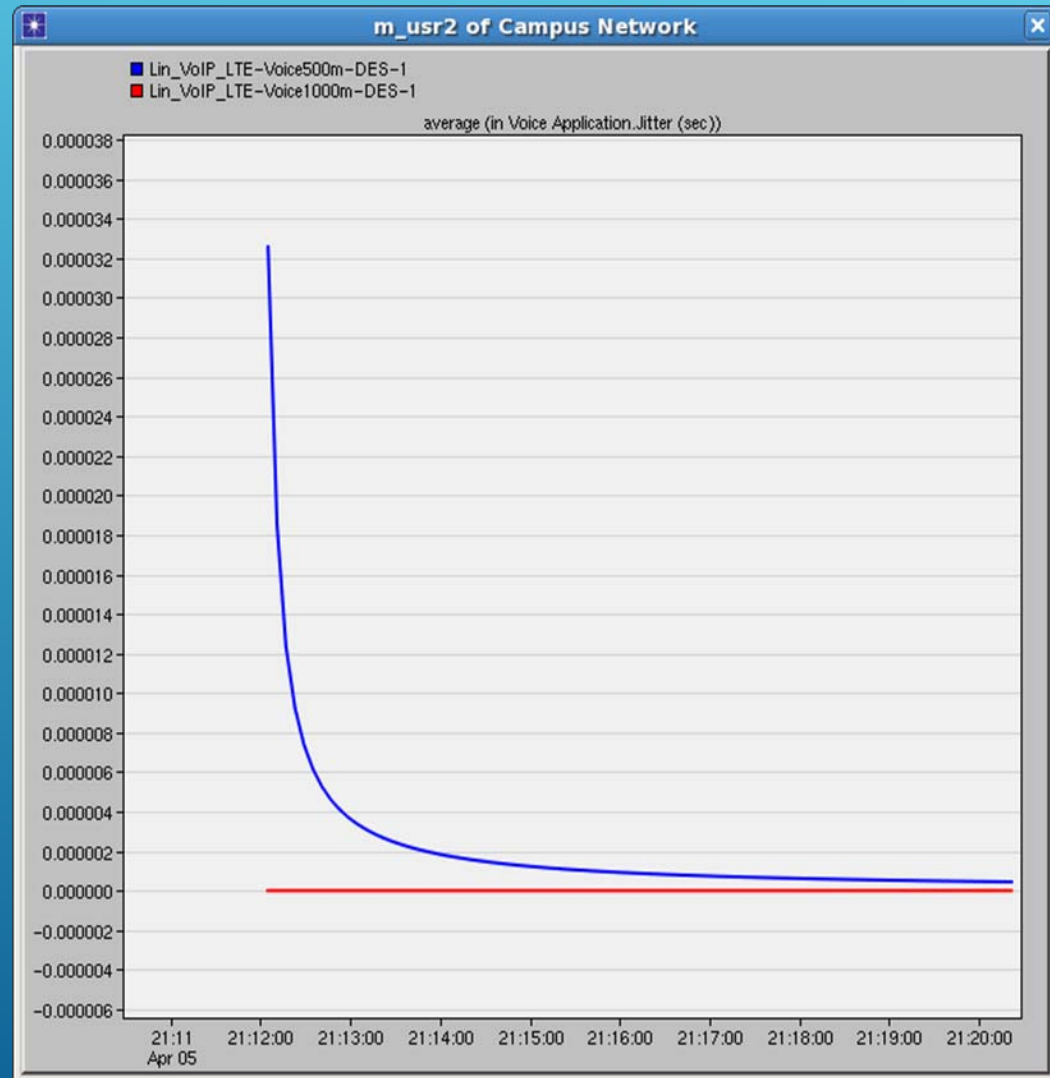
Average MOS of 500m: 3.59

Average MOS of 1km: 3.475



# ► Jitter

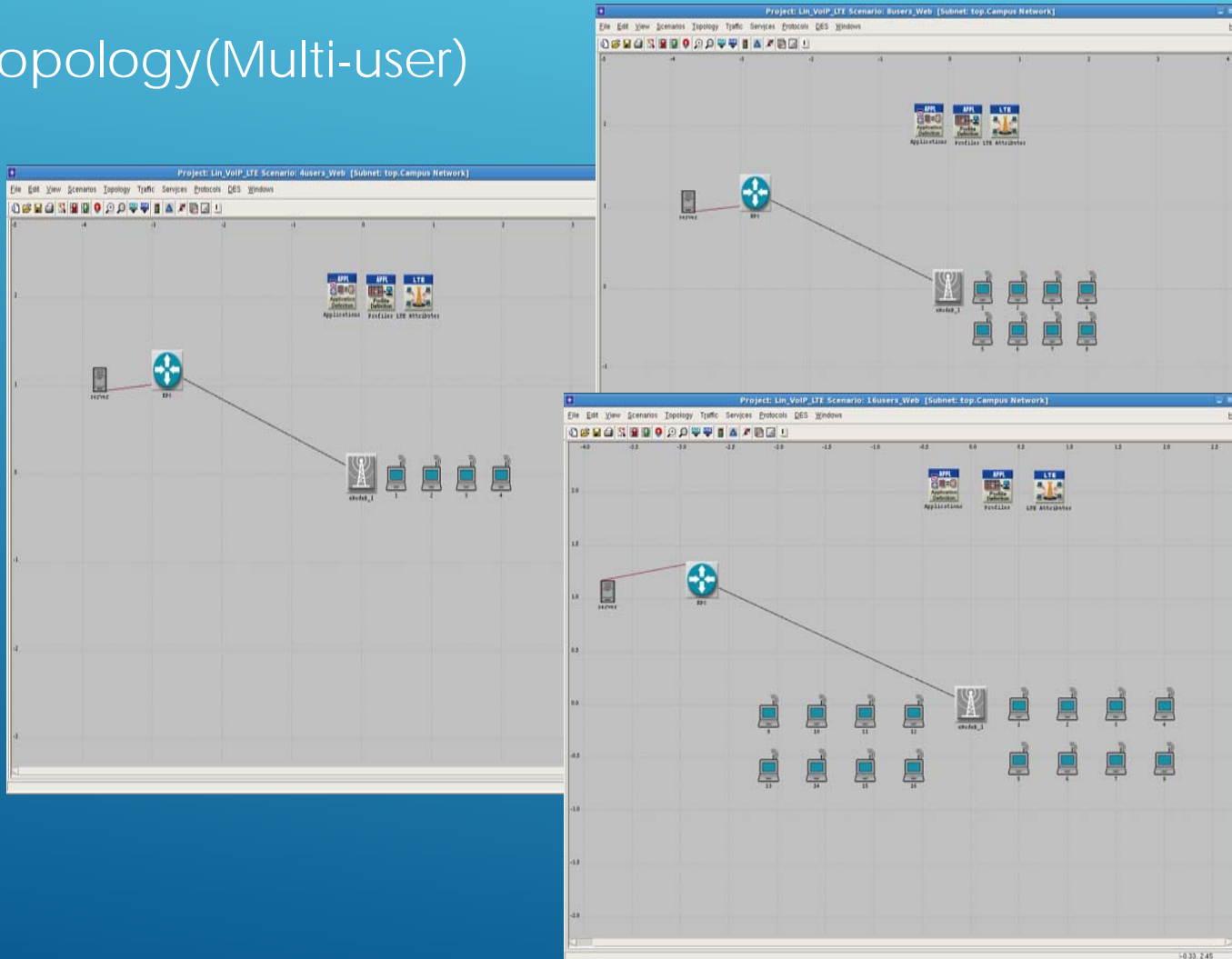
Average Jitter:  
1us



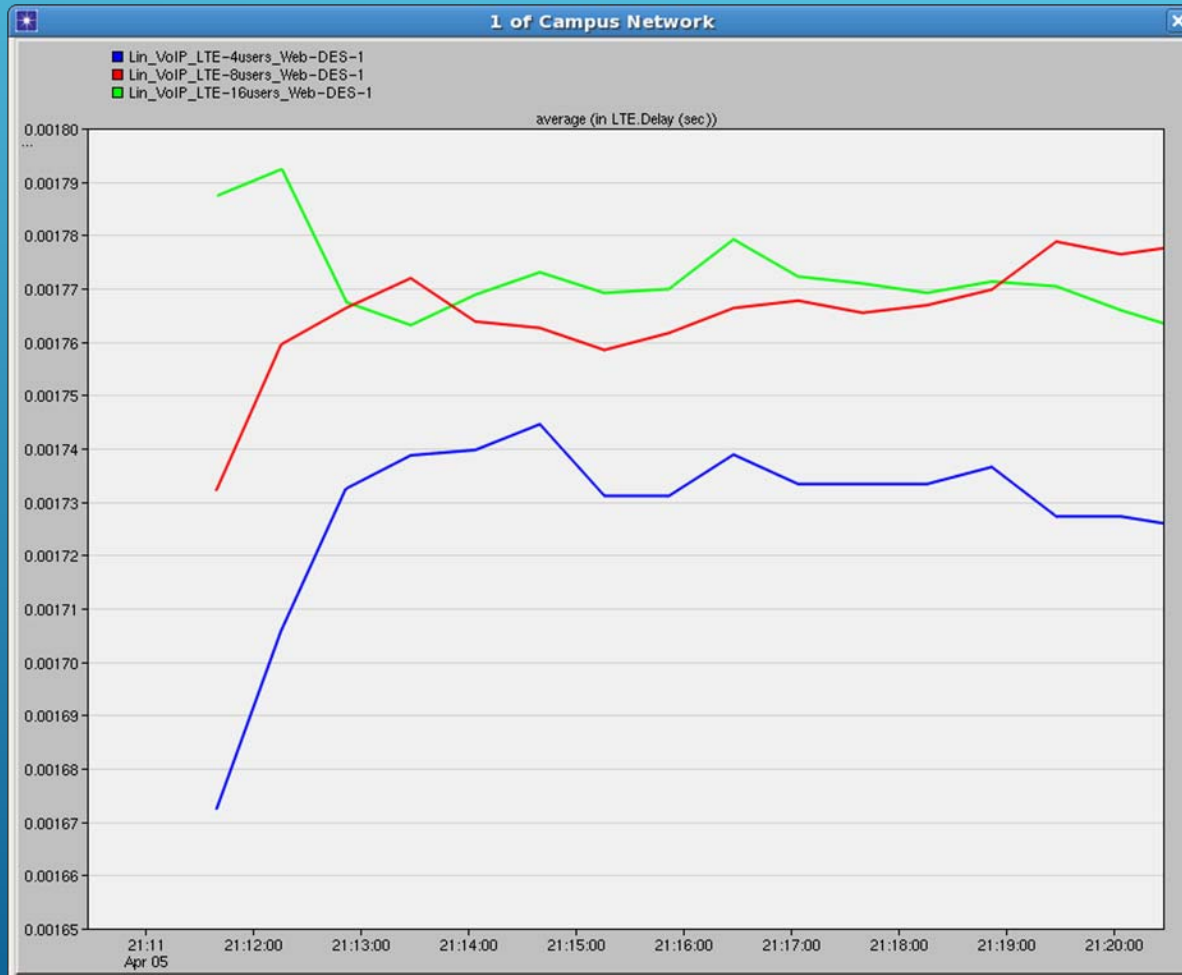


# WEB BROWSING

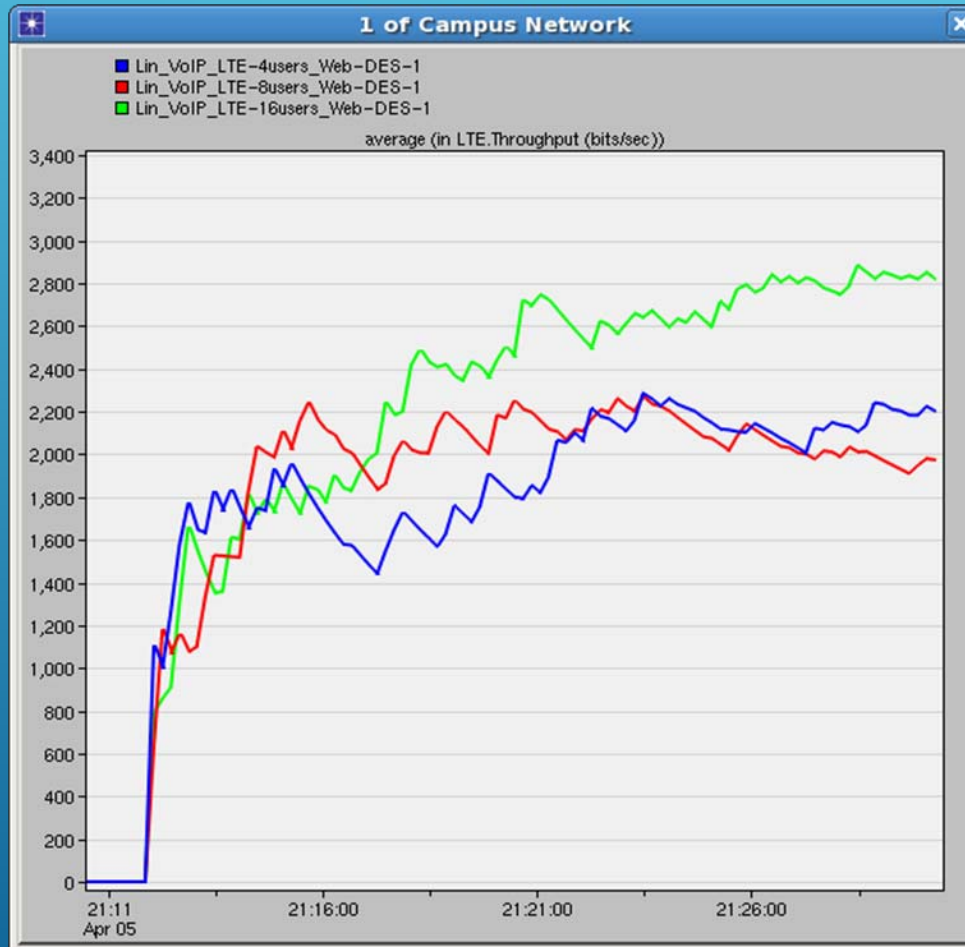
## ► Topology(Multi-user)



# ► Delay

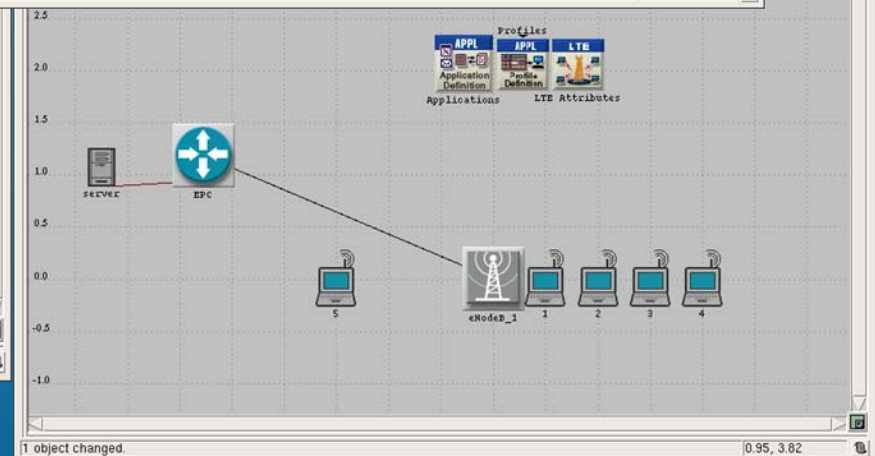
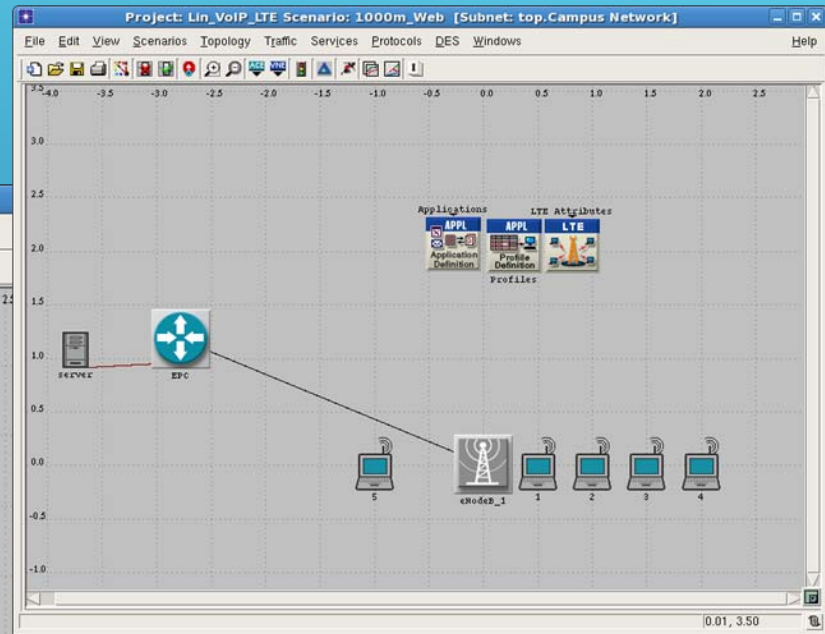
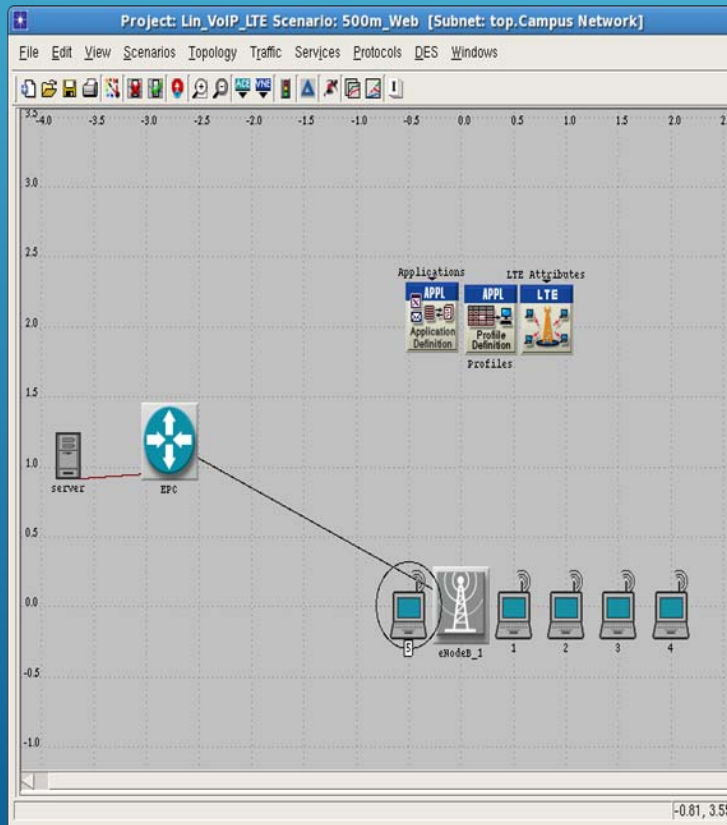


# ► Throughput

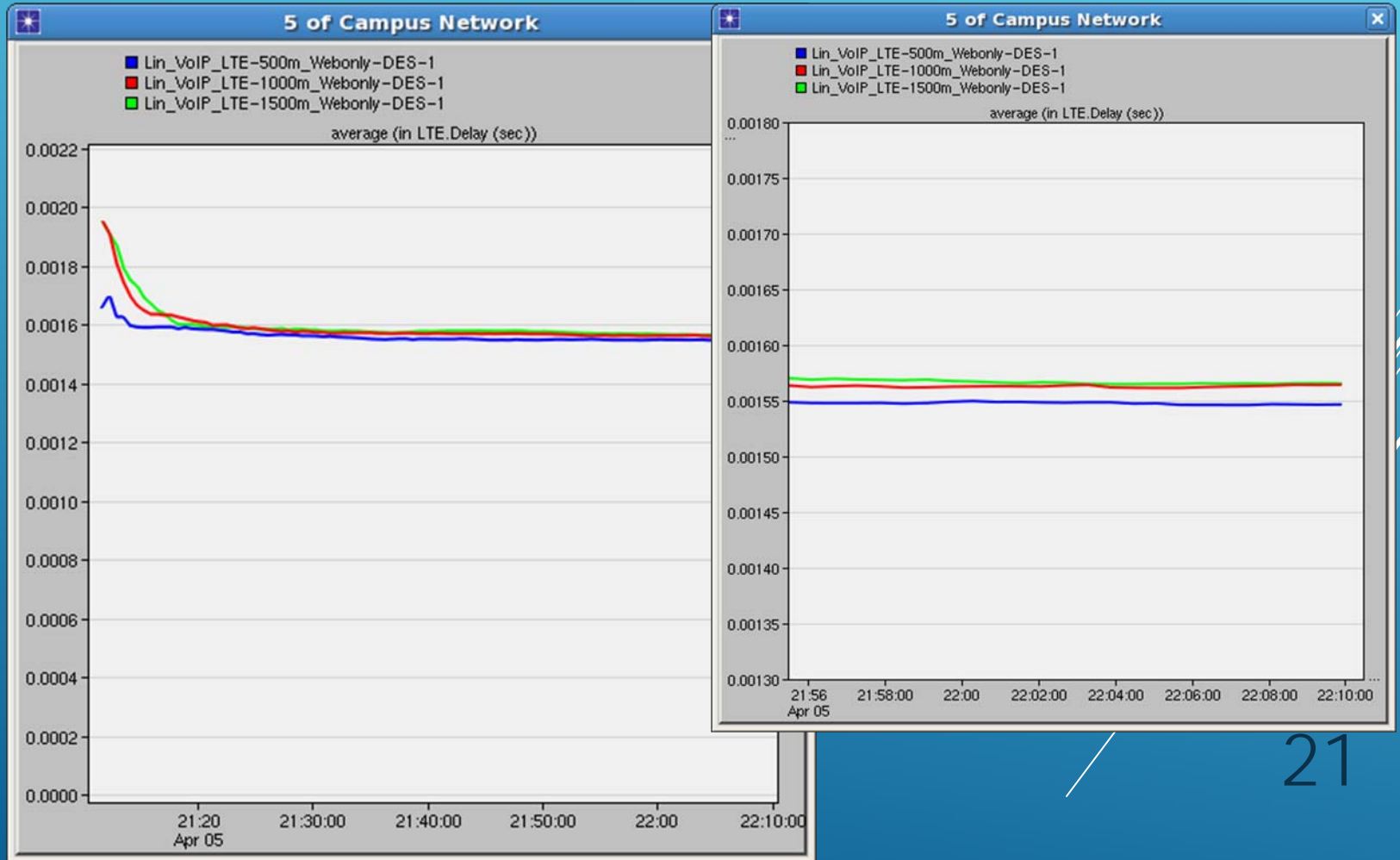


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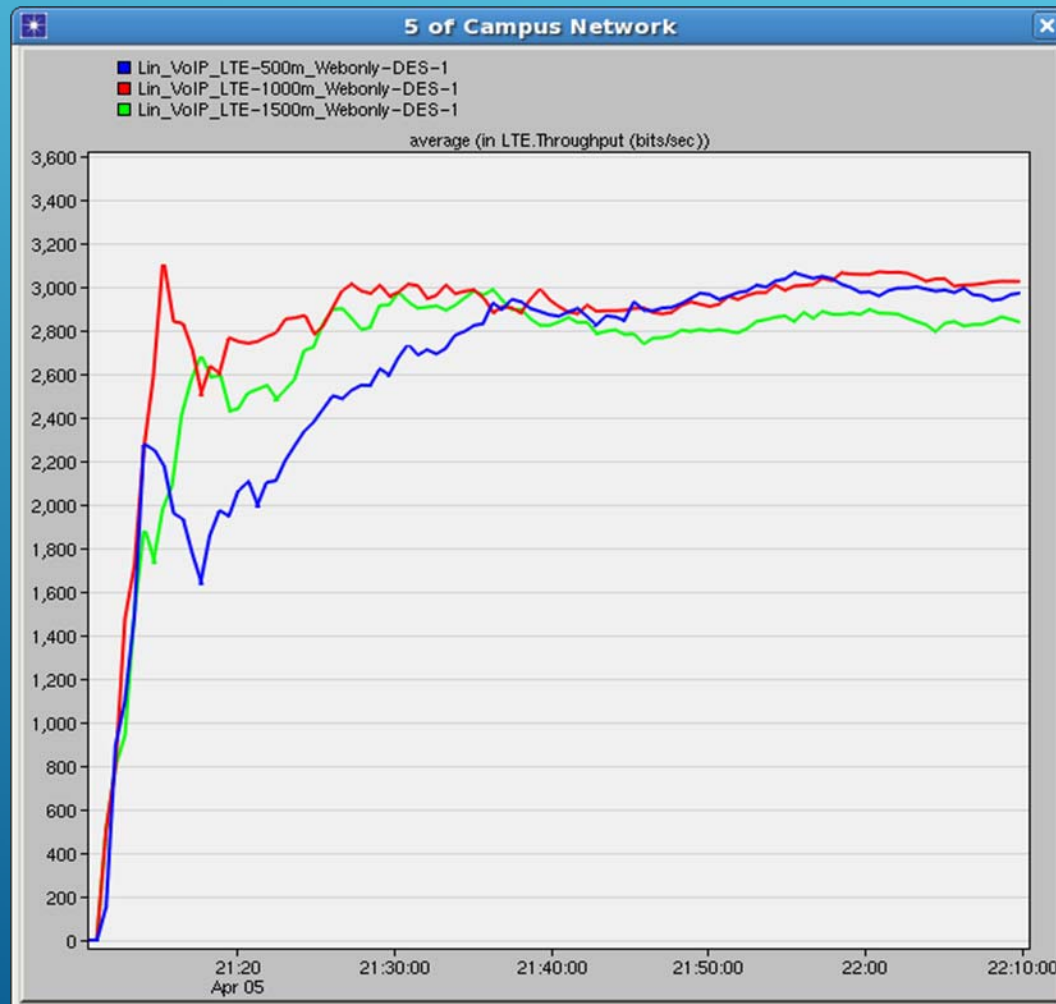
## ► Topology(Distance)



# ► Delay



# ► Throughput



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# CONCLUSION

## ▶ VoIP

- End to End delay increased as distance increased
- MOS decreased as distance increased



## ► Web Browsing

- delay increased as No. of IP users increased and distance increased but almost same
- Maximum throughput increased as the NO. of IP users increased
- Maximum throughput increased as the distance decreased

# FUTURE WORK

- ▶ 1. Multi VoIP User in Single Cell
- ▶ 2. VoIP work in multi cells
- ▶ 3. VoIP and Browsing work in different network, such as WIFI, WIMAX etc.
- ▶ 4. Compare VoIP and Browsing performance in different network
- ▶ 5. we can compact multiple traffic models together to analyse the performance in LTE network



# REFERENCES

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- ▶ [4] Torad, Mohammad, Dr. "Comparison between L TE and WiMAX Based on System Level Simulation Using OPNET Modeler (release 16)." 28 Th NATIONAL RADIO SCIENCE CONFERENCE (2011): n. pag. Print.
- ▶ [5] The Mobile Broadband Standard, 3GPP TS 22.173, IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1
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