



**ENSC 427: COMMUNICATION NETWORKS  
FINAL PROJECT PRESENTATIONS**

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**Performance analysis of mobile VoIP calls over WIMAX network**

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A decorative graphic at the top of the slide consists of two overlapping circles on the left and three separate circles on the right. The circles are light purple, with the leftmost one being solid and the others being hollow outlines.

# OUTLINES

- Introduction
- Background Information
- Implementation
- Simulation Results
- Discussion
- Conclusion

# INTRODUCTION



## ● Goal

- To construct WIMAX network model with mobile station
- To determine environment variables that affects QoS on IP telephony

## ● Motivation

- Speed of the mobile node
- Cell coverage of WIMAX
- Quality Issue

# BACKGROUND INFORMATION

## ● WIMAX - IEEE.802.16

- Telecommunication technology
- Potential to replace existing technology
- Wide range
- Superior than WIFI

## ● Key Issues

- Packet Loss
- Delay and Jitter
- Power and Range

# IMPLEMENTATION



## ● Approach

- A pair of calls - 1 mobile caller, 1 fixed callee
- Compare 2 scenarios with same trajectory
- Case 1 – 1 BS within a cell
- Case 2 – Each 7 cells containing 1BS

## ● Voice Encoding Scheme

- G.729a voice codec

## ● Modulation

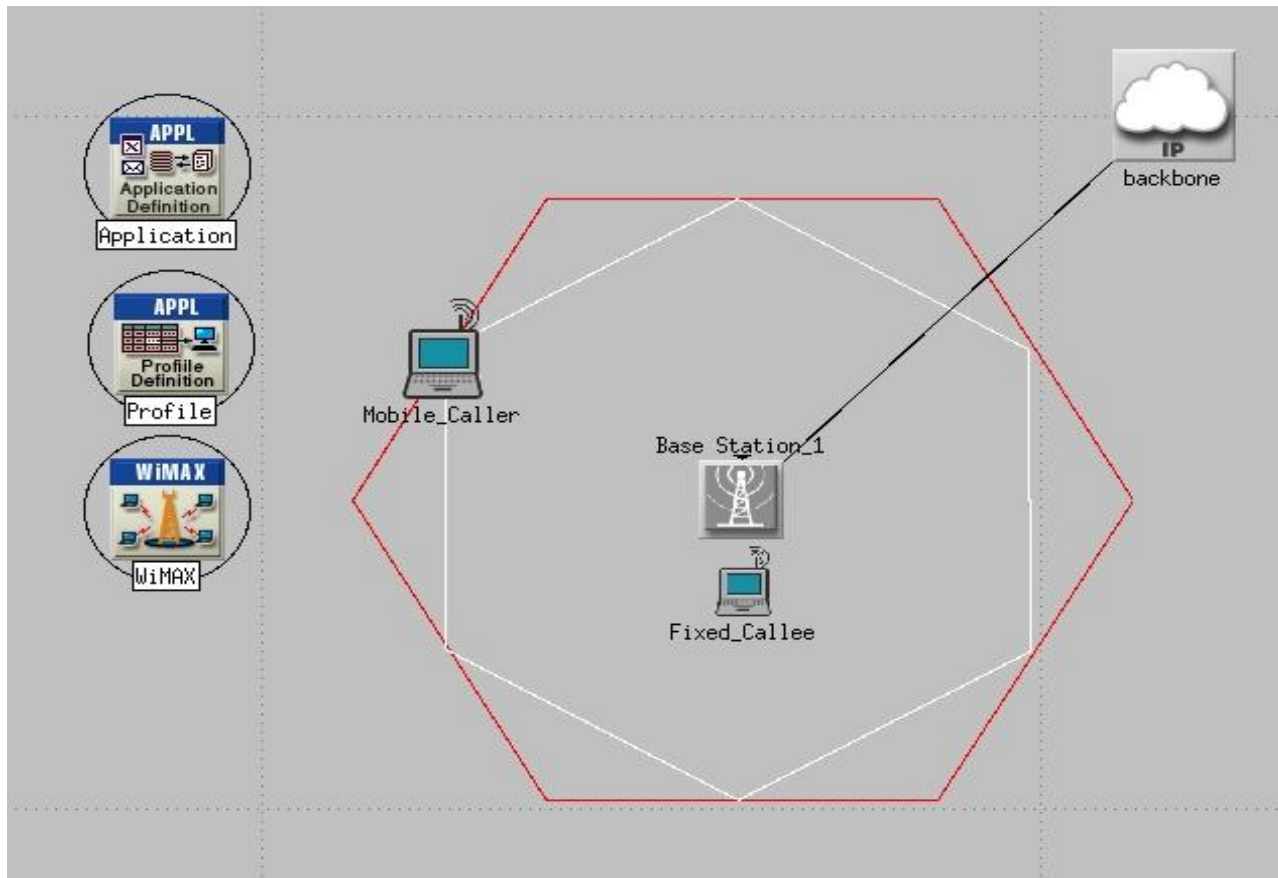
- Uplink/Downlink – 64-QAM

## ● Cell Coverage

- based on NLOS requirement (1 and 2 km)

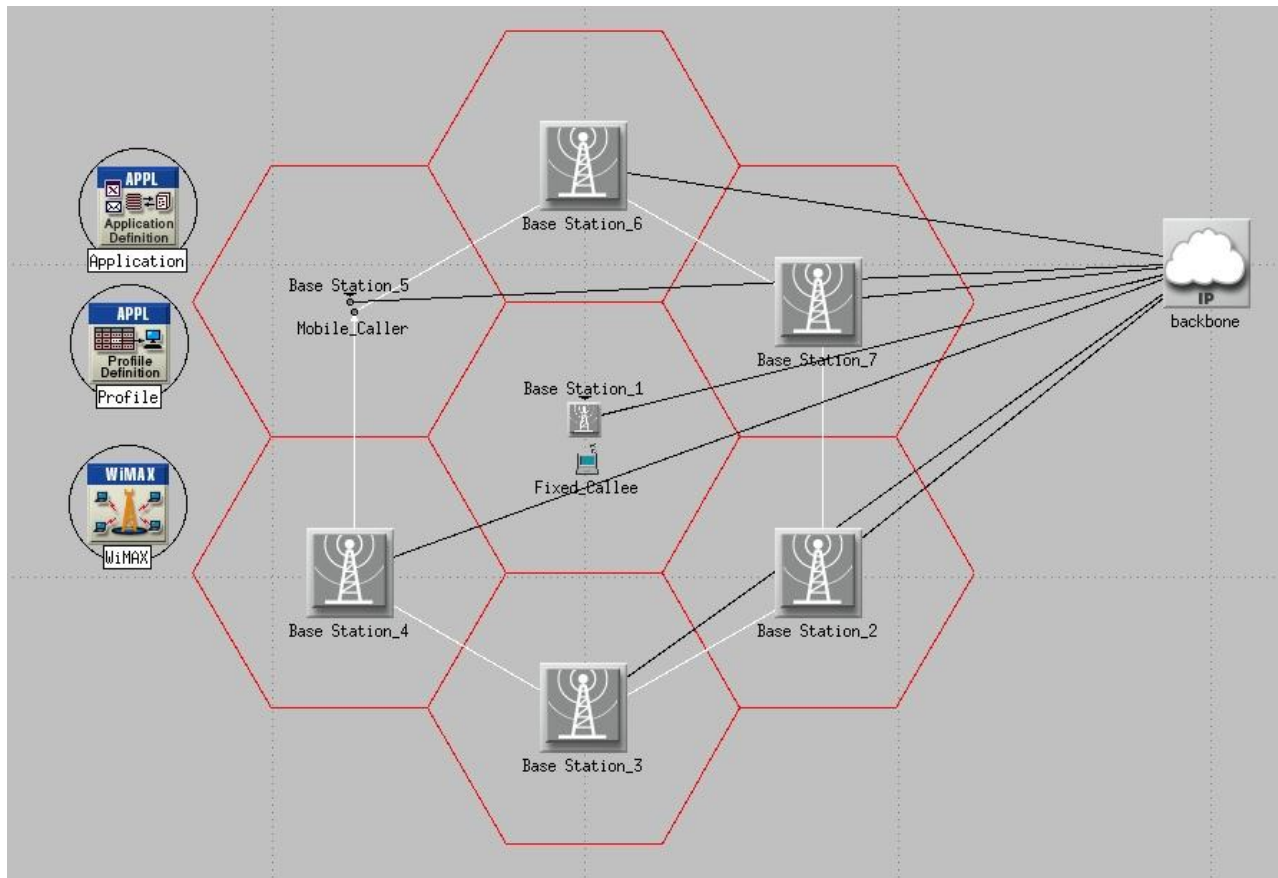
# NETWORK TOPOLOGY

- 1<sup>st</sup> Scenario: single cell



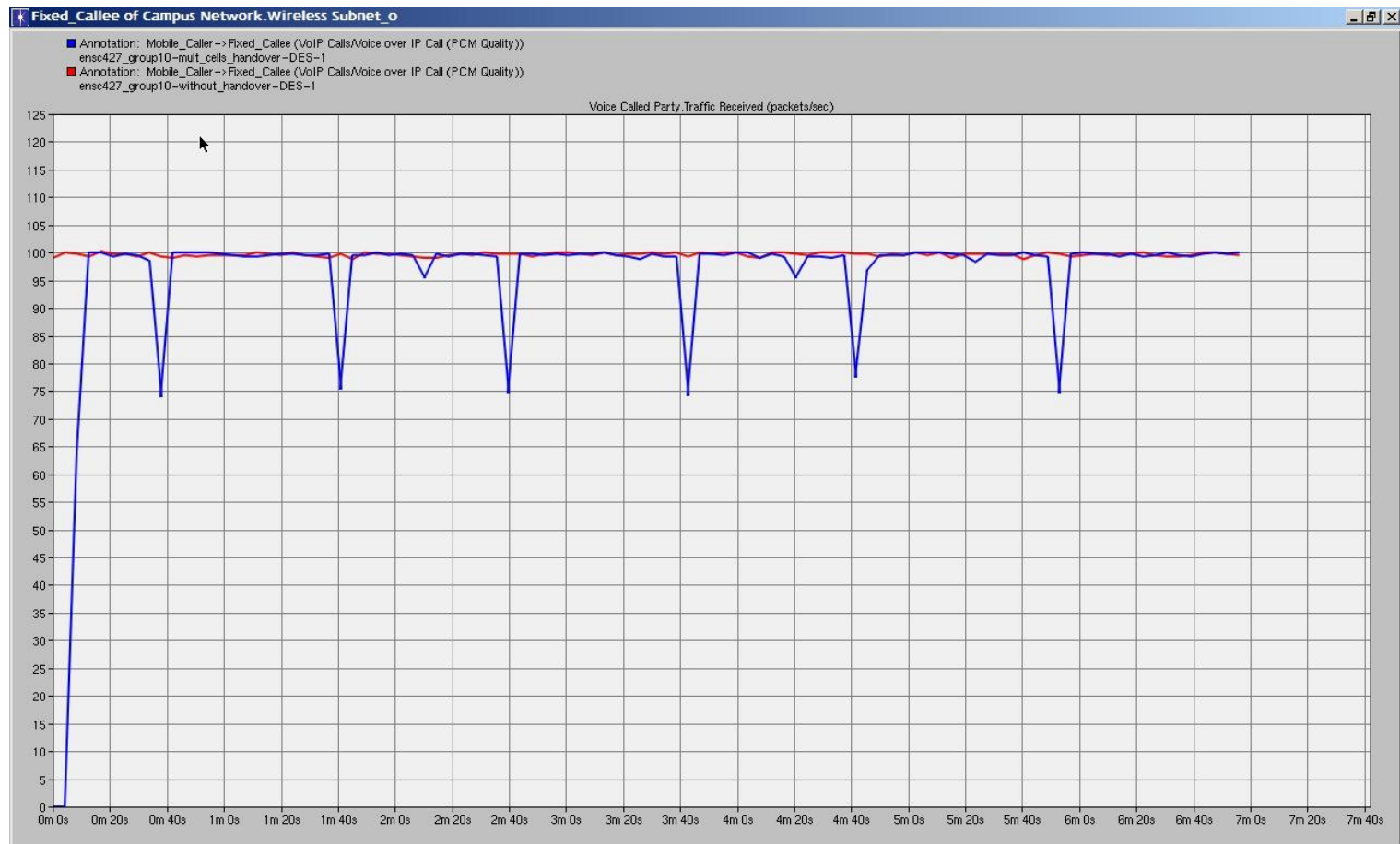
# NETWORK TOPOLOGY

- **2<sup>nd</sup> Scenario: 7 cells**



# SIMULATION RESULTS

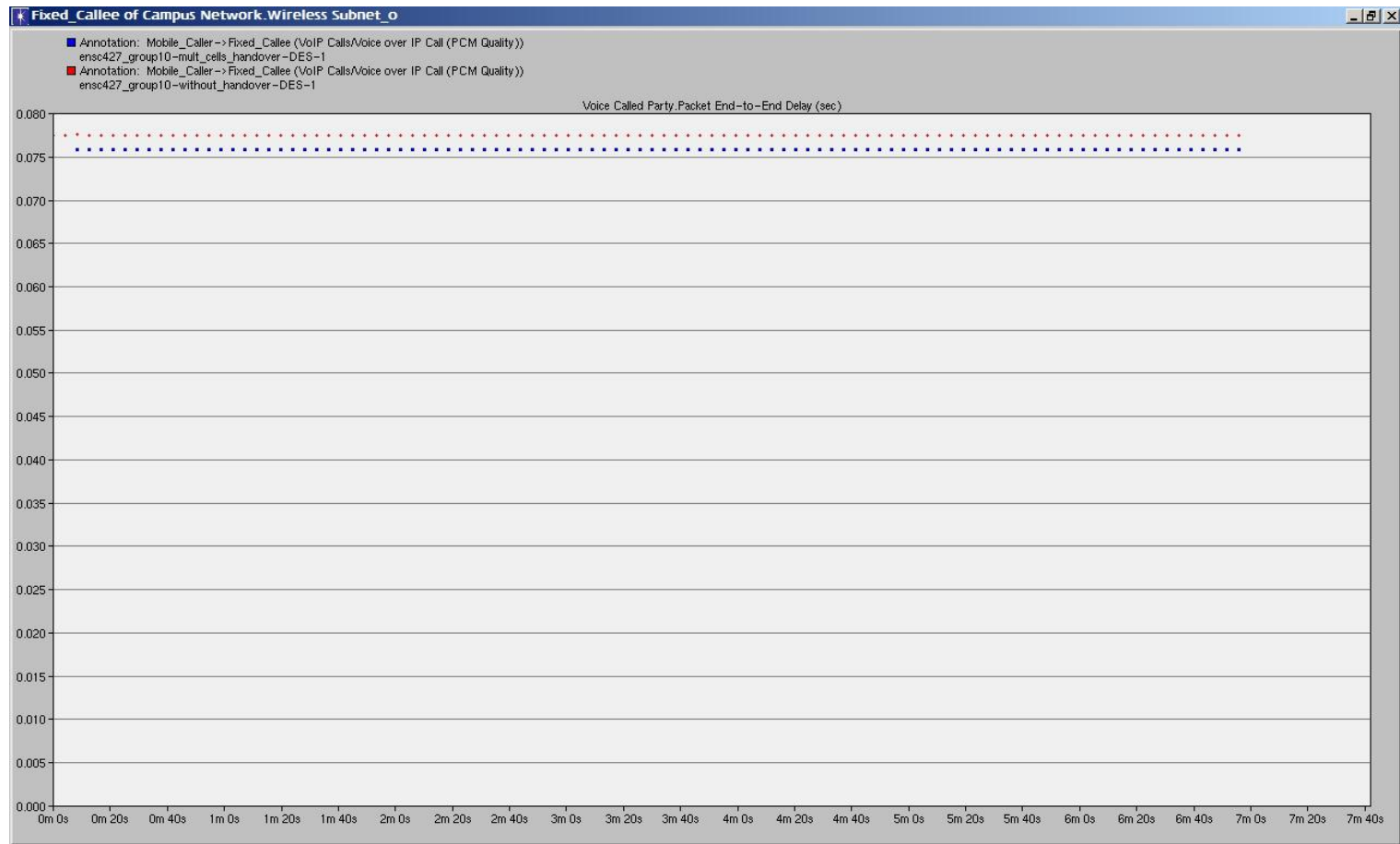
## ● Packet Loss





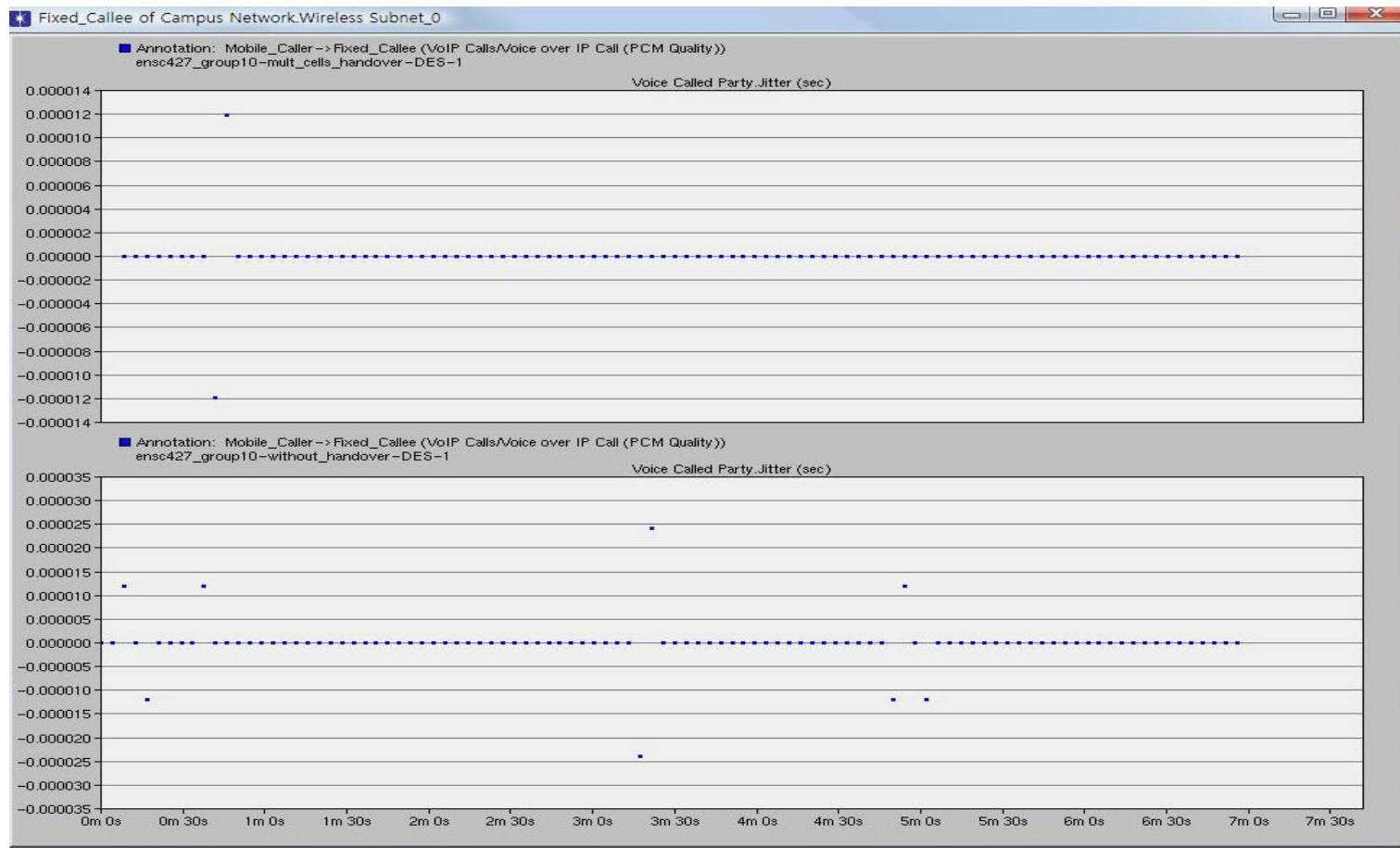
# SIMULATION RESULTS

## ● End-to-End Delay

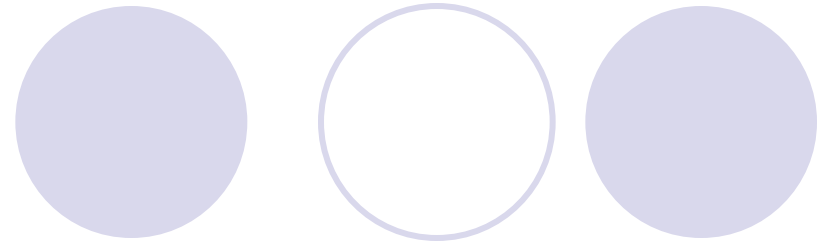


# SIMULATION RESULTS

## ● Jitter



# DISCUSSION



## ● **Difficulties**

- Debugging, Slow simulation
- Not enough information on transmission power and coverage range

## ● **Future Work**

- More analysis required for jitter and delay
- Addition of OPNET library for WiMAX handover
- Multiple ways of calls
- How to diminish the effect of handover in packet loss

# CONCLUSION



- Speed of the mobile caller does not affect overall performance
- Oversized cell coverage leads to data collection failure
- Handover causes packet losses, (delay, jitter)

# REFERENCES

- [1] J. G. Andrews, *Fundamentals of WiMAX : understanding broadband wireless networking* / Jeffrey G. Andrews, Arunabha Ghosh, Rias Muhamed, Upper Saddle River, N.J. Prentice Hall, 2007.
- [2] R. K. Rao, *WiMAX : a wireless technology revolution* / G.S.V. Radha Krishna Rao, G. Radhamani, Boca Raton, Auerbach Publications, c2008
- [3] M. Baratvand, M. Tabandeh, A. Behboodi, and A. F. Ahmadi, "Jitter-Buffer Management for VoIP over Wireless LAN in a Limited Resource Device," *IEEE Fourth International Conference on Networking and Services*, Tehran, Iran, March 2008, pp 90-95.
- [4] E. Crozier and A. Klein. (2007) WiMAX's technology for LOS and NLOS environments. [Online]. Available: <http://www.wimaxforum.org>
- [5] Breeze Wireless Communications Ltd. (2003) Radio Signal Propagation. [Online]. Available: <http://didier.quartier-rural.org>
- [6] J. Yoo (2009) Performance Evaluation of Voice Over IP on WiMAX and Wi-Fi Based Networks. [Online]. Available: <http://www.sfu.ca/~jty/ensc427/>

# Q&A



