

# ENSC 427 Final Project

## VoIP Over Campus Area Network



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# Overview

- Background
- Project Details
- Implementation Details
- Discussion
- References & Questions

# Overview

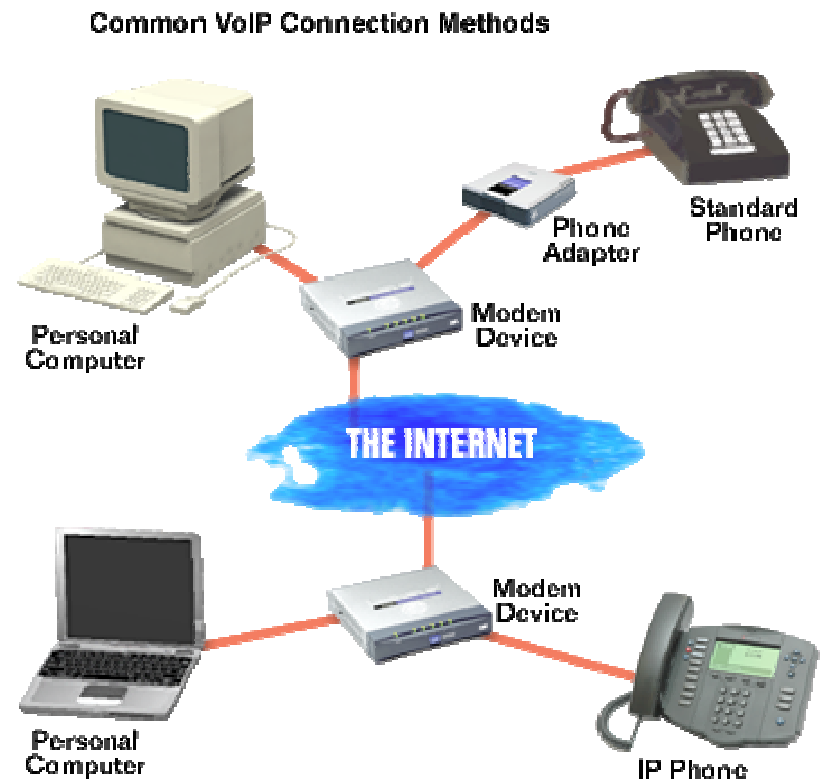
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# What is VoIP?

- Voice Communications over IP networks
- Voice is sampled by a microphone
- Sample is compressed using a Codec
- Data is formed into Packets and sent over IP network
- Packets are received, decoded, and played
- Packets may not arrive in the order that they are sent!!

# What is VoIP?

- A VoIP phone can take the form of:
  - An analog phone using an ATA
  - Dedicated VoIP phone
  - VoIP Software on a PC



# Quality of Service

- Depends mostly on Jitter, Delay, and Packet Loss
- Jitter is variation in delay, can result in choppy voice or temporary glitches
- Packet Loss requires receiving codec to fill in the gaps. (PLC)
- Excess Delay may mean that Packets are dropped simply because they're too old.

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# Past Studies and Related Work

- Performance Evaluation of Voice Over IP on WiMAX and WiFi Based Networks
- Evaluation of VoIP Stability for Long-Distance Call Using OPNET
- An OPNET-based simulation approach for deploying VoIP



# Project Details

## **Motivation:**

- VoIP is rapidly gaining popularity and may eventually take over standard telephone services
- Potential cost saving in using VoIP for Universities or large companies

## **Details:**

- Started with a simple LAN and expanded the number of workstations and background traffic.
- Compared wired to wireless LANs

# Project Details

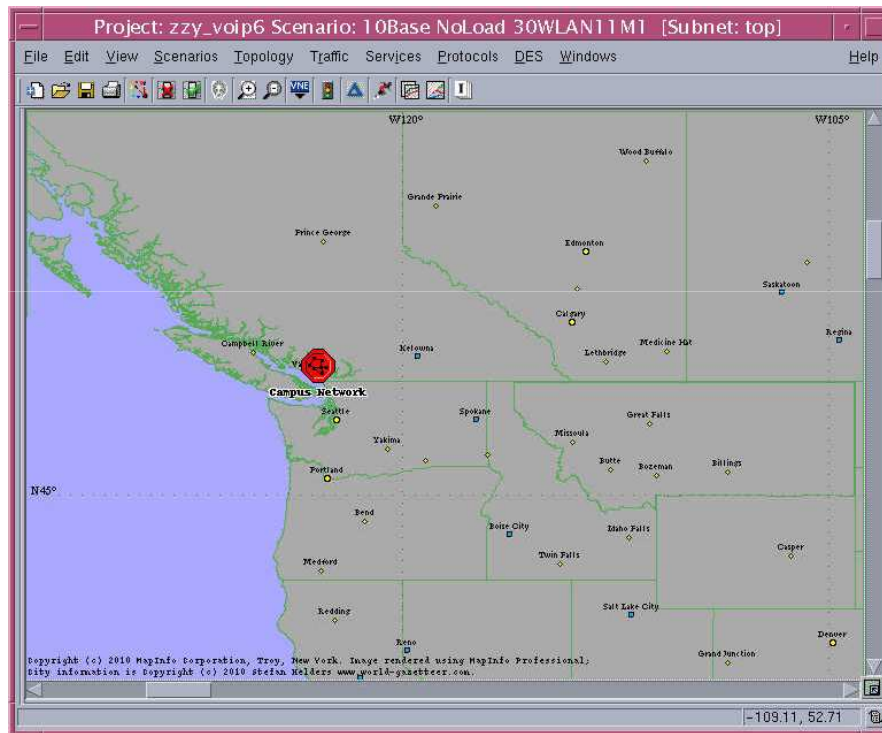
## Simulated:

- Average Jitter (sec)
- Average End to End Delay (sec)
- Mean Opinion Score [MOS]
  - 5: Perfect
  - 4: Fair
  - 3: Annoying
  - 2: Very Annoying
  - 1: Impossible to Communicate

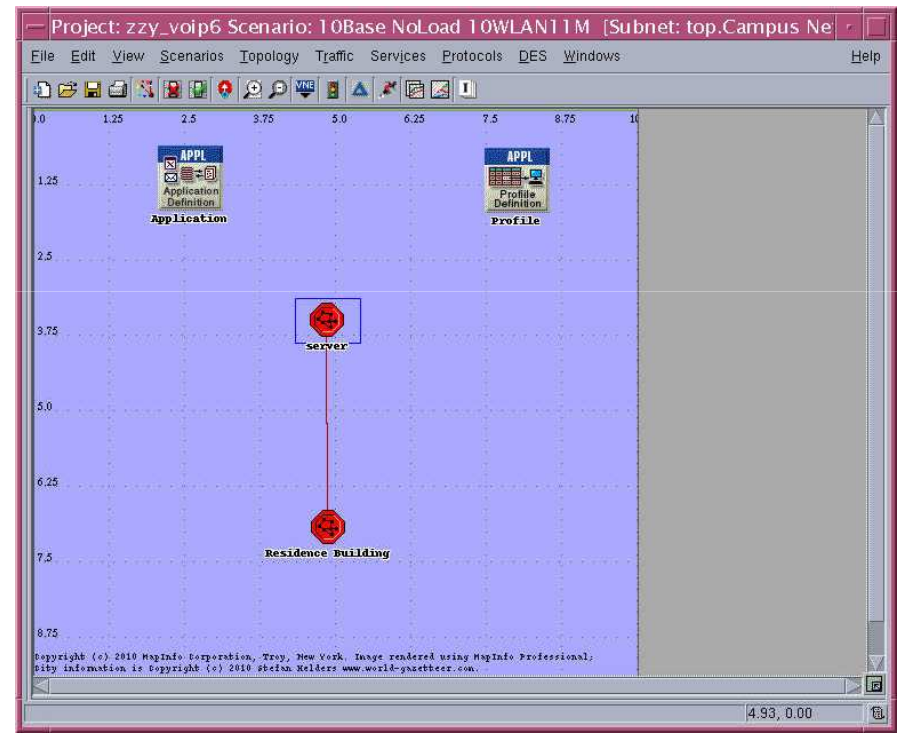
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# Network Topologies

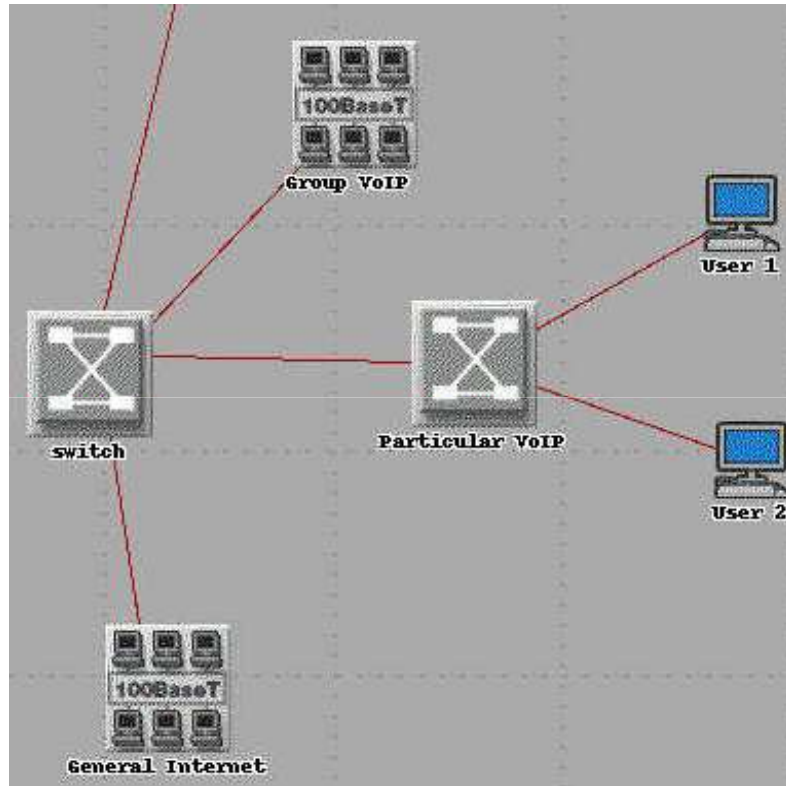


- Campus Location

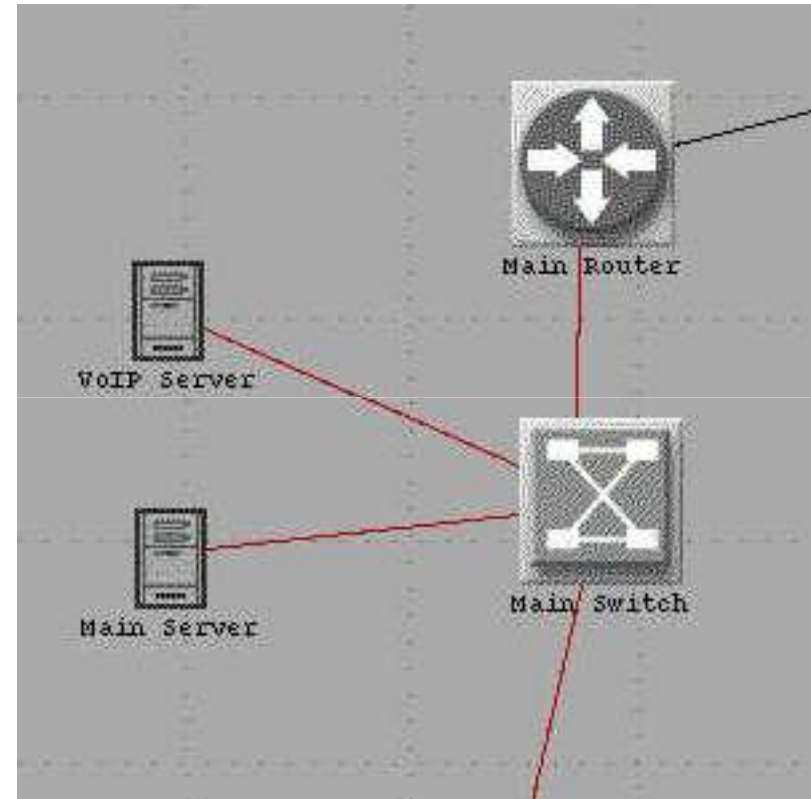


- Campus Network

# Wired Network Topologies

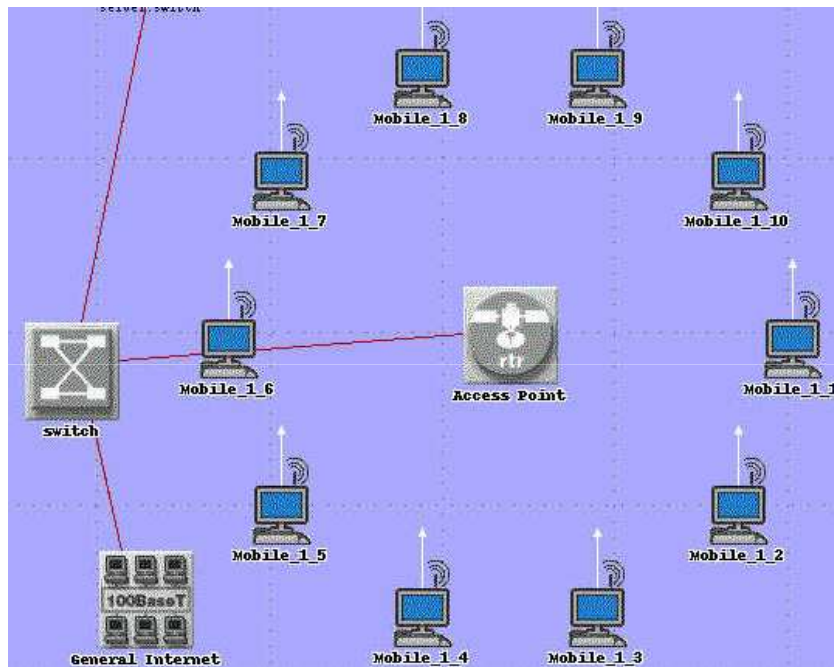


- Residence Building

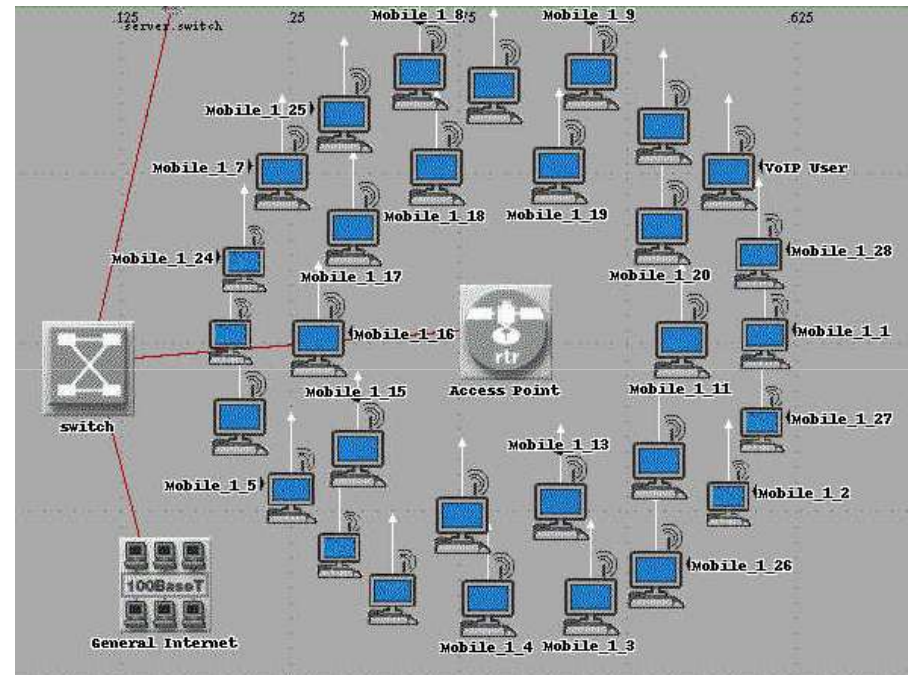


- Server Node

# Wireless Network Topologies



•10 Workstations

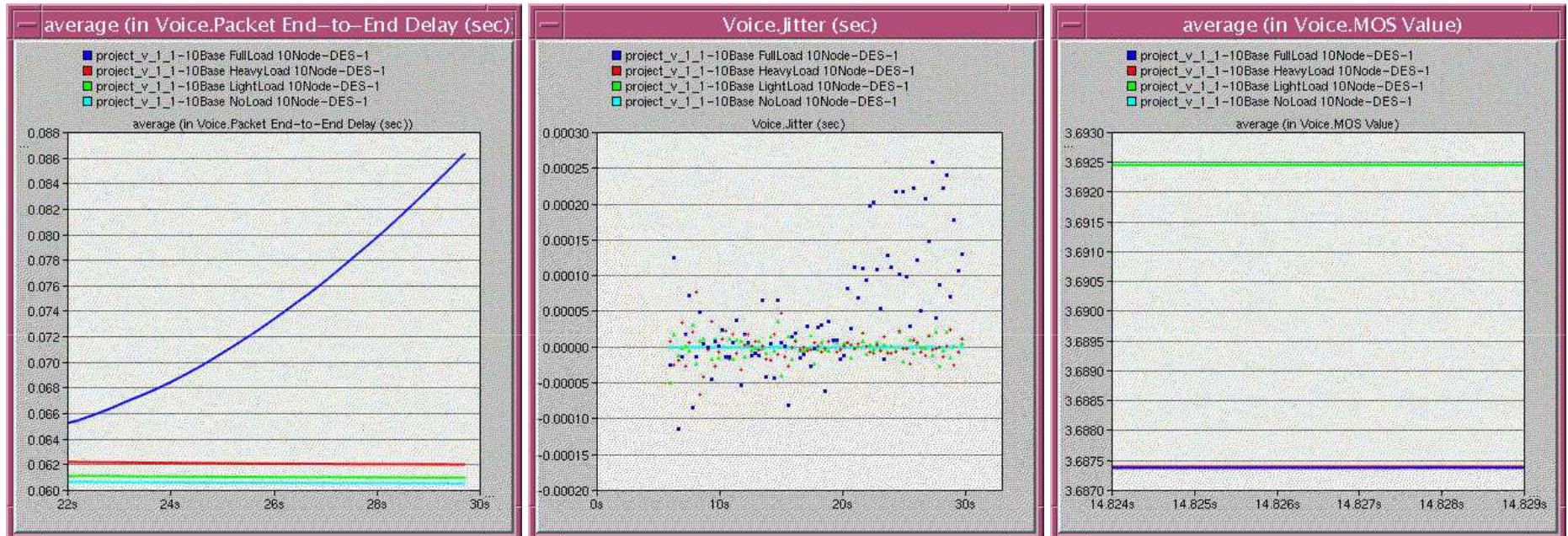


•30 Workstations

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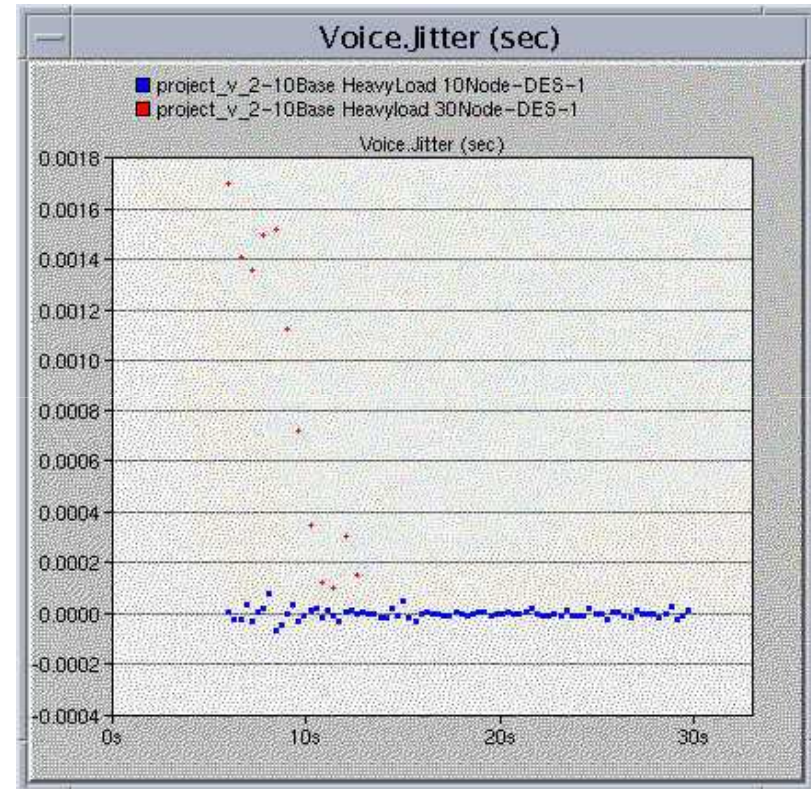
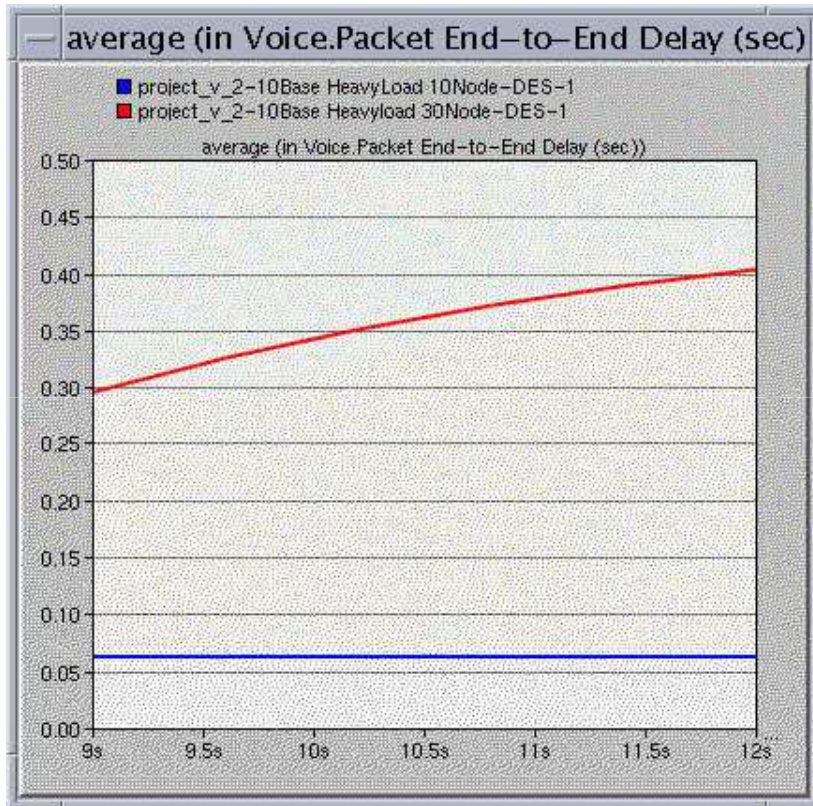
# Simulation Results for 10 Nodes



- As background load increases End to End Delay and Jitter increase
- MOS is approximately the same so User will not notice the difference.

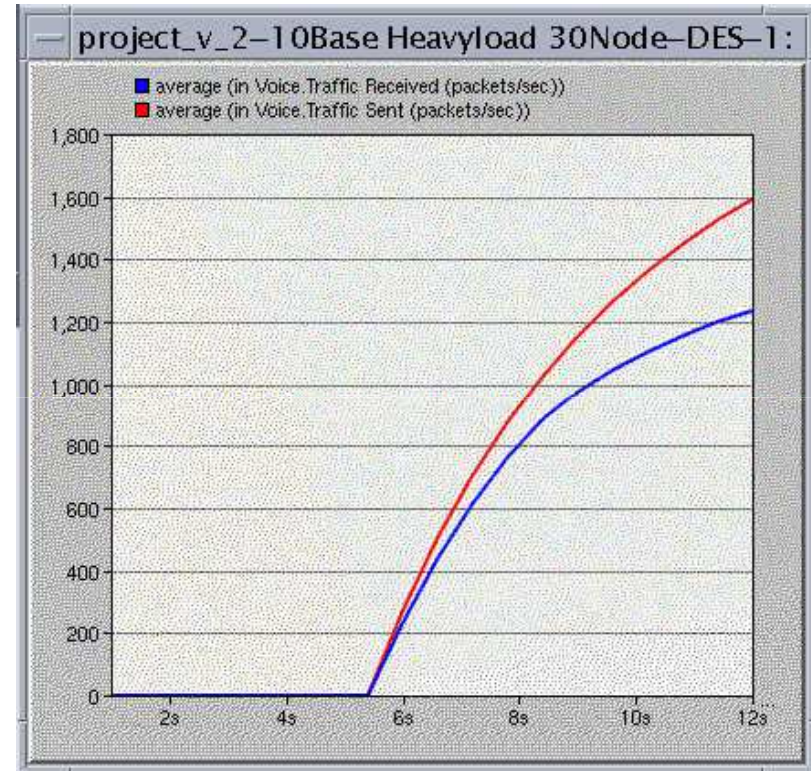
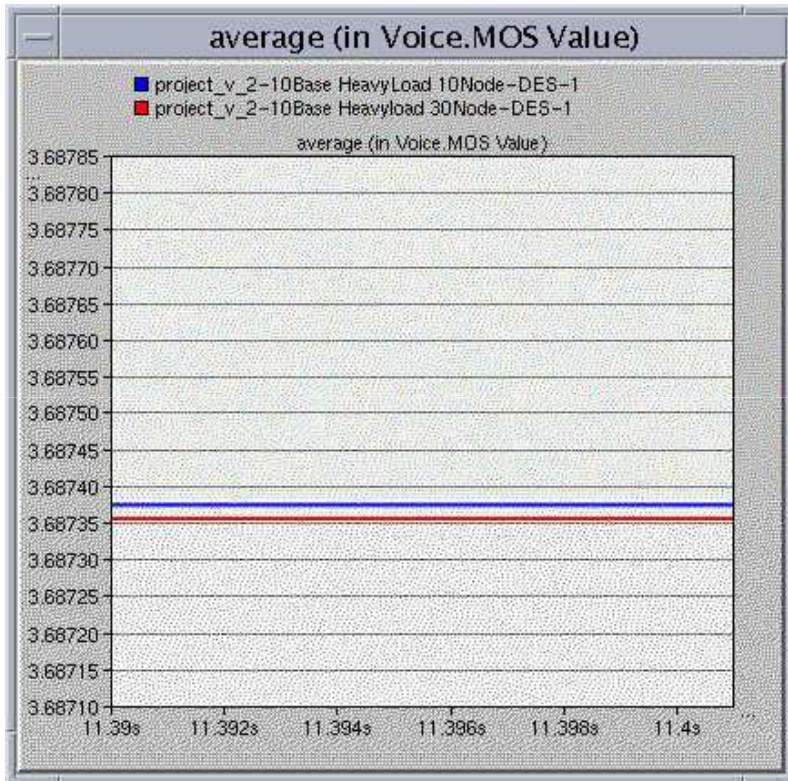


# 10 Nodes VS 30 Nodes



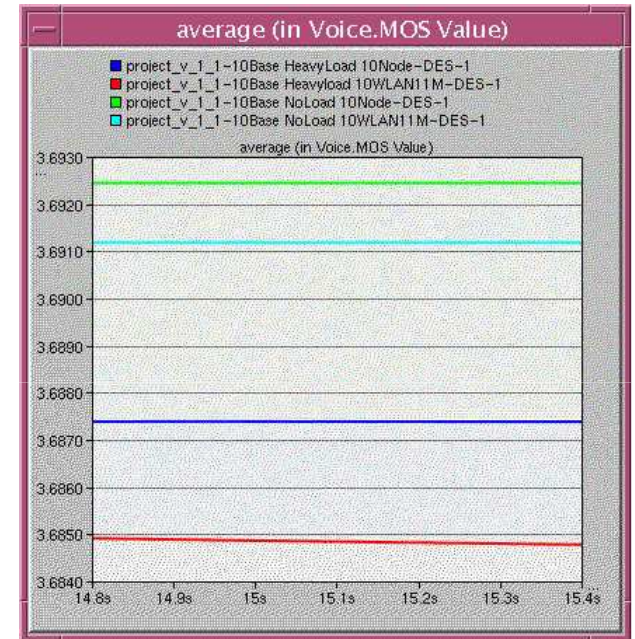
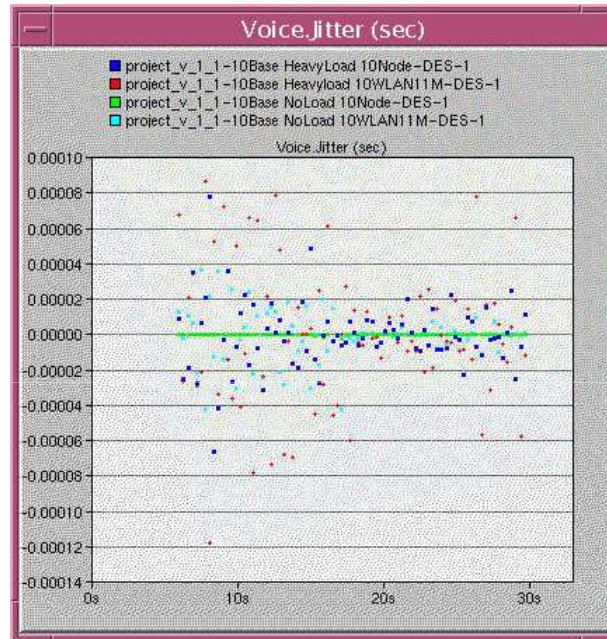
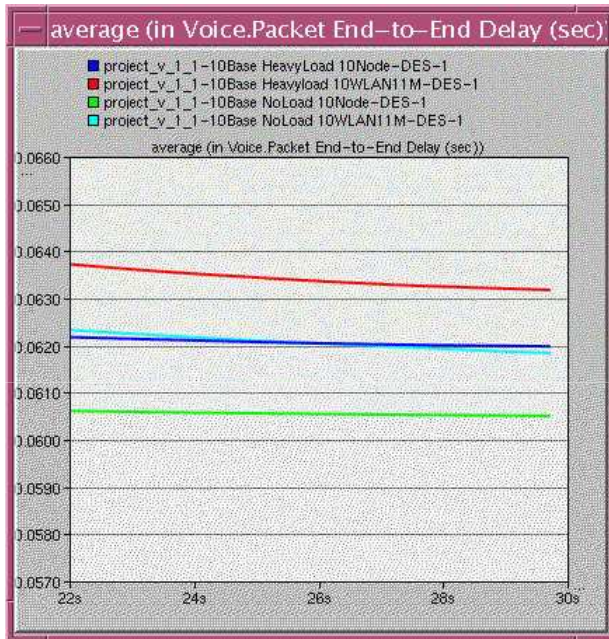
- Big Packet loss

# 10 Nodes VS 30 Nodes



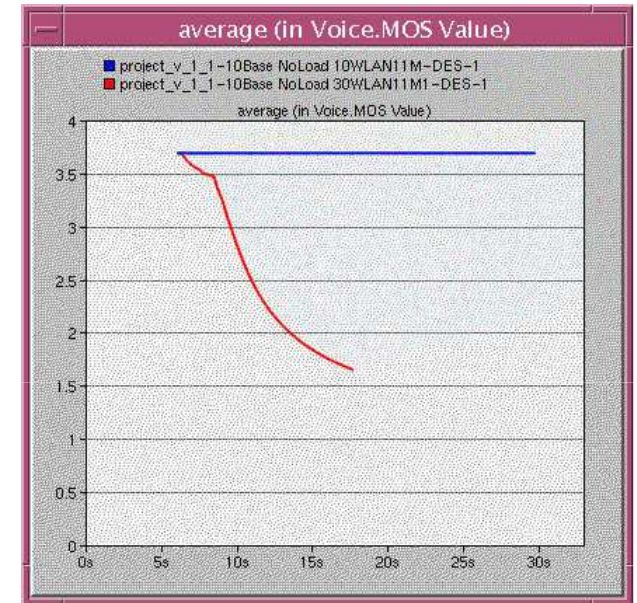
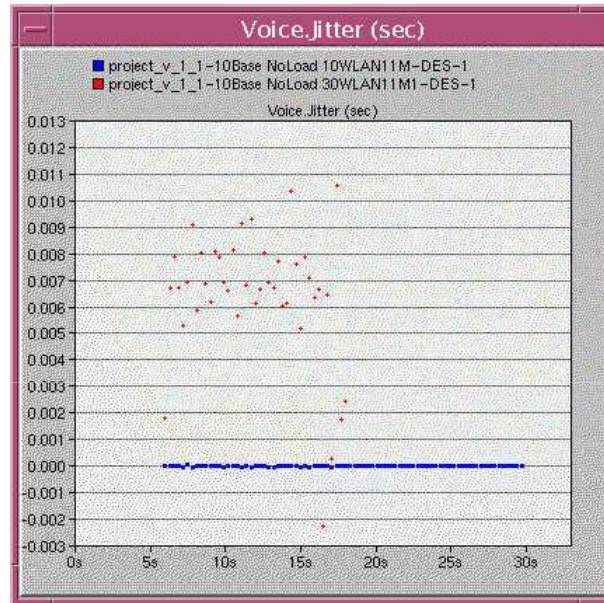
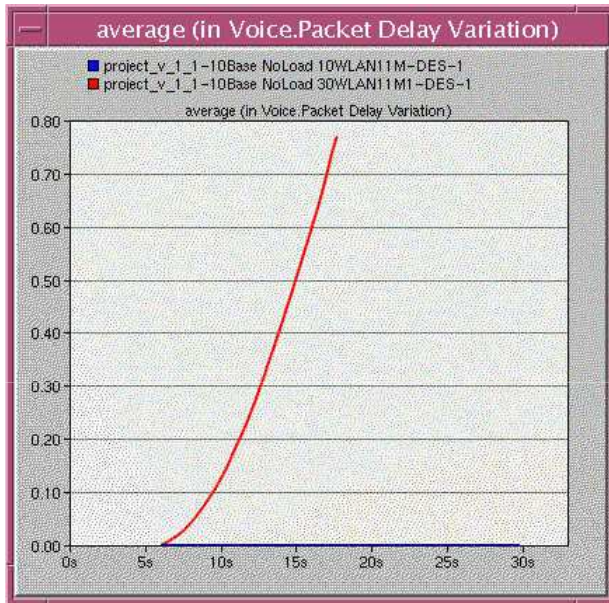
- Big Packet loss

# Wired LAN Vs Wireless LAN



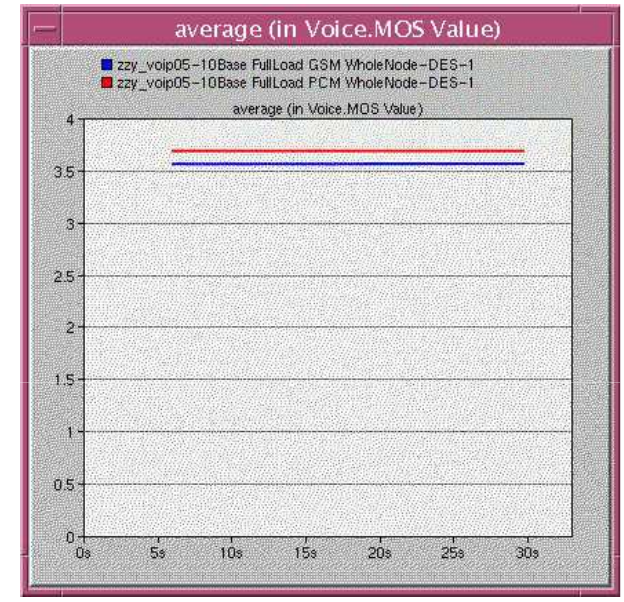
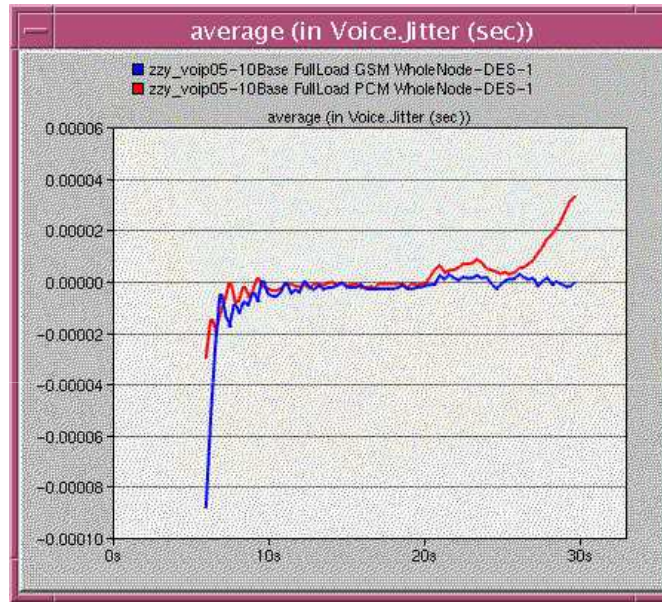
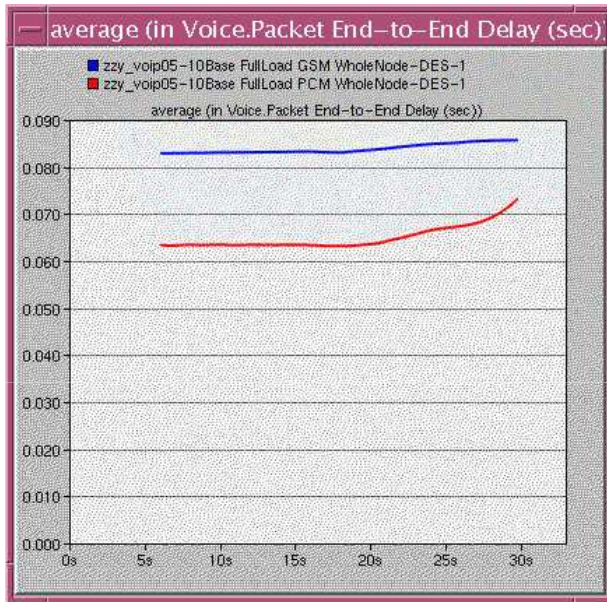
- Voice quality is still acceptable

# 10 Wireless Workstations Vs 30 Wireless Workstations



- Voice quality drops significantly as the number of workstations increases

# Pulse Code Modulation Vs Global System for Mobile Communications



•Voice quality is still acceptable

# Conclusions

## Wired LAN

- Voice quality is still acceptable with large numbers of workstations or with large amounts of background traffic

## Wireless LAN

- Voice quality is unacceptable with a large number of workstations.

# Future Work

- Simulate larger Campus Area Networks
- Include Mobile Users
- Include WIMAX
- Trace Individual Traffic within the Network

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# References

- [1] Olejniczak, Stephen P., i° Reviewing VoIP Basicsj±, VoIP deployment for dummies, Hoboken, N.J.,2009, pp.10-12.
- [2] Dwivedi, Himanshu., i°An Introduction to VoIP Securityj±, Hacking VoIP, Sebastopol, Calif.,2009, pp.10-12.
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- [4] Hersent, Olivier., i°Voice Qualityj±, Beyond VoIP Protocols: Understanding Voice Technology and Networking Techniques for IP Telephony, Hoboken, NJ, 2005, pp.377-380.
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# Questions

