Master' sThesis Proposal

Quality of Service(QoS) aspects of VoIP
in Wireless LAN' s

Submitted to the
Institute of Microelectronics and Information Technology (IMIT)
IT university
Royal Institute of Technology (KTH)

in partial fulfillment of
the requirements for the degree of
Master of Science
by
Victor Yuri Diogo Nunes

Thesis Advisor
Ian Marsh
Swedish Institute of Computer Science (SICS)

Examinator
Olof Hagsand
Associate Professor
Royal Institute of Technology (KTH)

Abstract

The goal of this Master Thesis is take measurements and analyse voice communication performance in wireless LAN's 802.11b networks.

With the fast deployment of WLAN's, Voice over IP has become an important player in the telecommunication industry. VoIP plays an important rule in the convergence between existing networks(cellular, etc.) with the fast growing WLAN's. Since voice sessions will have to share the link with data, video and voice traffic its important to evaluate the quality of service (QoS) in the presence of combined traffic patterns.

We will take measurements quantifying the main QoS aspects and its added effect in different scenarios. Cross-layer information will be collected in order to achieve a deep understanding of its effects in the perceived quality.

Keywords: WLAN, Quality of Service, QoS, performance, VoIP, Sicsophone

Introduction

Few years ago wireless LAN's were mostly used within enterprises and some professional applications. In our days this figure has changed and WLAN's became an ordinary tool and it is replacing wired networks in both residential and commercial applications. With voice applications representing an increasing stake of generated traffic in WLAN's, it is important to estimate the VoIP performance in these networks.

In WLAN environments we face an added effect of the delay, jitter and losses because of the radio link. For this reason quality of service is the most important issue to be solved when deploying commercial VoIP systems.

We will focus our analysis in the most relevant quality of service(QoS) aspects in voice communication, namely: jitter, end-to-end delay and packet losses (other parameters, such as processing delay, may be analysed to reinforce the results consistence).

We will design different experiments in order to achieve results validation and a scaling measurement environment.

Matching application layer losses with MAC layer losses will be done in cooperation with Juan Carlos Martin Severiano[2].

Context

This Master Thesis will be developed in the context of research programs under development in the Swedish Institute of Computer Science(SICS) and will be performed at the Laboratory of communication networks (LCN).
We will create a valuable repository of 802.11b voice communications and quality of service parameters measurements.

Methodology:

       The experiments will be designed in a increasing order of complexity and will be carefully chosen in order to provide repeatable and valid measurements whenever possible.

       In this early phase it is premature to detail the experiments procedures, however we can anticipate the experiments, presented in a increasing order of complexity

- **Direct link between two mobile nodes**

  Is this experiment we will take measurements of the round trip time (RTT) and simulate voice sessions with different distances between the computers. These experiment will give us an understanding of the delay and jitter variation with the distance between the wireless endpoints.
  MAC losses are related to the signal strength, understanding this relation can be useful to design more complex experiments where the node location needs to be precisely defined.
  These simulation will be conducted in free space and preferably in a free spectrum zone.

- **Link between two mobiles nodes using an access point**

  This is the first approach to a more realist system, we will conduct measurements on the delay, jitter, packet losses and MAC losses. We will emulate other traffic patterns to compete with the voice session and analyse the quality of service(QoS) variation.
  These experiment is proposed by Juan Carlos in the context of his Master Thesis.

- **Several voice sessions competing with other traffic on a typical (pre-defined) office network**

  Traffic will be emulated using an appropriate traffic emulator. These will provide a repeatable scenario, important for results validation and reliability. We expected to identify QoS limitations we may face in an operating WLAN network as well as its effects. The main propose of this experiment is to identify the relation between the main QoS aspects.

- **Real environment measurement**

  In this we pretend to have an insight of VoIP in a large scale WLAN environment. We will perform measurements in KTH networks within carefully chosen periods in order to monitor uncontrolled factors such as external load.
  The knowledge acquired in the previous experiment is expected to be extremely helpful in the design and data analysis in this real and complex scenario.

Expected Results:

1) Identify the causes that affect Quality of Service(QoS) parameters focusing in the transport/application layer and merge this results with another master student more focused in the MAC layer losses in order to understand the cause/effect relation in the different networks layers.
2) Find a relation between the VoIP quality of service (QoS) aspects in WLAN' s and how the network environment affect these values.
3) Create a valuable repository of 802.11b voice sessions and quality of service (QoS) analysis results to be used in another studies.
4) Create a valuable and repeatable environment for the measurements (when possible).

References

[1] "Voice Performance in WLAN Networks - An Experimental Study", Farooq Anjum, Moncef Elaoud, David Famolari, Abhrajit Ghosh, Ravichander Vaidyanathan, Ashutosh Dutta, Prathima Agrawal, Telcordia Technologies, Toshikazu Kodama, Yasuhiro Katsube,Toshiba America Research Inc, 2003.

[2] Juan Carlos Martin Severiano is working in another Master Thesis within the same project, focused in MAC layer Losses and its effects in QoS aspects in VoIP/WLAN' s.

[3] "Si csophone: A low delay internet telephony tool", Olof Hagsand, LCN Laboratory, IMIT Department ,KTH, Royal Institute of Technology ,Sweden, Ian Marsh, SICS AB, Stockholm, Sweden, Kjell Hanson, Prosilient Software AB, Stockholm, Sweden, Euromicro, September 2003

[4] Ian Marsh and Fengyi Li, Swedish Institute of Computer Science, Kista, Sweden "Wide Area Measurements of Voice Over IP Quality", 15th May 2003

[5]"802.11b Performance evaluation", Yasir Zahur, Murtaza Doctor, Sadegh Davari, T. Andrew Yang, University of Houston Clear Lake , Houston. *The Proceedings of the 2nd IASTED International Conference on COMMUNICATIONS, INTERNET, & INFORMATION TECHNOLOGY (CIIT 2003).*

[6] "Experimental performance evaluation of an 802.11b Wlan supporting mixed multimedia traffic", Daniel Hertrich, , Institute of Telecommunications, Technical University of Berlin, 18th September 2003