# VOIP MODEL FOR ICT RURAL COMMUNITIES TELECENTRE IN SINTOK

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# VOIP MODEL FOR ICT RURAL COMMUNITIES TELECENTRE IN SINTOK

A project submitted to Dean of Research and Postgraduate Studies Office in partial Fulfilment of the requirement for the degree Master of Science (Information and Communication Technology) University Utara Malaysia

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# **ABSTRACT**

Transmission of Voice over Internet Protocol (VoIP) on packet switching networks is one of the rapidly emerging real-time applications. VoIP is a formation of audio and voice communication. It receive voice signal activities then encoded in digital form and divided into small parts of information as like voice data network packets. These data network packets are decoded and transmitted voice in signals then sender and receiver having a voice conversion. In a voice conversion, the clients send and receive packets in a bidirectional method. Each client work as a sender and as a receiver depends on the direction of traffic flow over network. The aim of this proposal is to propose a VOIP model for ICT rural community's telecaster in Sintok.

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# **CHAPTER ONE**

# INTRODUCTION

This chapter mainly focuses on introducing the research aims, background, and the current issues towards improving the VoIP model for ICT Rural Communities Telecentre. In addition, this chapter addresses the research solutions along with the relevant research questions in way that well avoid the current problem and to improve it, which involves VoIP over a wireless local area network (WLAN) network. Finally, research process is introduced in order.

### 1.0 Introduction

Information and communication technologies (ICTs) have been widely used as solutions to improve organizations. ICT had empowered users in organization to improve productivity through increased efficiency to collect, process, store, and disseminate data and information to enable managers to plan, operate, monitor and make better decisions. Users are able to gain knowledge and improve competency as well as worked together from anywhere, any time through the connectivity to the internet.

Transmission of Voice over Internet Protocol (VoIP) on packet switching networks is one of the rapidly emerging real-time applications. VoIP is a formation of audio and voice communication. It receive voice signal activities then encoded in digital form and divided into small parts of information as like voice data network packets. These data network packets are decoded and transmitted voice in signals then sender and receiver having a voice conversion [1], [2]. In a voice conversion, the clients send and receive packets in a bidirectional method. Each client work as a sender and as a receiver depends on the direction of traffic flow over network [3].

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### REFERENCES

- [1] V. Soares, P. Neves, and J. Rodrigues, "Past, Present and Future of IP Telephony," *International Conference on Communication Theory, Reliability, and Quality of Service, Bucharest*, pp. 19–24, 05, July. 2008.
- [2] R. Beuran "VoIP over Wireless LAN Survey," *Internet Research Center Japan Advanced Institute of Science and Technology (JAIST,) Research report. Asahidai, Nomi, Ishikawa, Japan,* pp. 1-40. 2006.
- [3] K. Nisar, A. Said and H. Hasbullah, "Enhanced Performance of WLANs Packet Transmission over VoIP Network," 2010 IEEE 24th International Conference on Advanced Information Networking and Applications, Workshops, (AINA 2010), supported by IEEE Computer Society, Perth, Western Australia, pp. 485-490, 20-23 April. 2010.
- [4] L. Cai, Y. Xiao, X. Shen, and J. Mark, "VoIP over WLAN: Voice capacity, admission control, QoS, and MAC," *International Journal of Communication System, Published online in Wiley Inter-Science, Waterloo, Ontario, Canada,* Vol. 19, No. 4, pp. 491-508, May. 2006.
- [5] V. Mockapetris, "Telephony's next act," in IEEE Spectrum, Nominum Inc., Redwood City, CA, USA, Vol.43, No. 4, pp. 15-29, 08, May. 2006.
- [6] P. Dely "Adaptive Aggregation of Voice over IP in Wireless Mesh Network," Master's Project, Department of Computer Science, Karlstad University, 28, Jun. 2007.

- [7] M. ALAkhras, "Quality of Media Traffic over Lossy Internet Protocol Networks: Measurement and Improvement," *PhD thesis, Software Technology Research Laboratory, De Montfort University, United Kingdom,* 2007.
- [8] H. Chong and H. Matthews, "Comparative analysis of traditional telephone and voice-over-Internet protocol (VoIP) systems," *Electronics and the Environment,* 2004. Conference Record. 2004 IEEE International Symposium, Pittsburgh, PA, USA, pp. 106-111, 24, May. 2004.
- [9] A. Lindgren, A. Almquist, and O. Schelen, "Evaluation of quality of service schemes for IEEE 802.11 wireless LANs," *26th Annual IEEE Conference on Local Computer Networks, Tampa, FL, USA,* pp. 348-351, 06, August. 2002.
- [10] L. X. Cai, X. Ling, X. Shen, J. Mark, and L. Cai, "Supporting voice and video applications over IEEE 802.11n WLANs," *Journal on Wireless Networks*, *Springer Science*, Victoria, BC, Canada, Vol. 15, No. 4, pp. 443-454, November. 2009.
- [11] S. Ehlert, G. Zhang, and T. Magedanz, "Increasing SIP Firewall Performance by Ruleset Size Limitation," *IEEE PIMRC 2008, VoIP Technologies Workshop, Cannes, France*, September. 2008.
- [12] H. Hasbullah, K. Nisar and A. Said, "The Effect of Echo on Voice Quality in VoIP Network," *International Association for Science and Technology Development* (IASTED) Journal, Calgary, Canada, Advances in Computer Science and Engineering (ACSE) 2009 Phuket, Thailand. 2009.

- [13] K. Nisar, A. Said and H. Hasbullah, "Enhanced Performance of Packet Transmission Using System Model Over VoIP Network," *International Symposium on Information Technology 2010 (ITSim 2010), IEEE, KLCC, Kuala Lumpur, Malaysia*, pp. 1005-1008, June, 17. 2010.
- [14] K. Nisar, A. Said and H. Hasbullah, "Enhanced Performance of IPv6 Packet Transmission over VoIP Network," *2nd IEEE International Conference on Computer Science and Information Technology, 2009, ICCSIT, Beijing, China,* pp.500-504, August, 11. 2009.
- [15] K. Nisar, A. Said and H. Hasbullah, "Internet Call Delay on Peer to Peer and Phone to Phone VoIP Network," *International Conference on Computer Engineering and Technology 2009 (ICCET 2009) IEEE, Singapore*, Vol. 2, pp. 517-520, 24, January. 2009.
- [16] Y. Xiao, "IEEE 802.11n: enhancements for higher throughput in wireless LANs," *IEEE Wireless Communications, TN, USA,* Vol. 12, No. 6, pp. 82-91, 19, December. 2005.
- [17] A. Floros, M. Avlonitis AND P. Vlamos "Frequency-Domain Stochastic Error Concealment for Wireless Audio Applications," *Mobile Networks and Applications, SpringerLink, Corfu, Greece*, Vol. 13 No. 3, pp. 357-365, 4, August. 2008.
- [18] K. Yasukawa, A. Forte and H. Schulzrinne "Distributed Delay Estimation and Call Admission Control in IEEE 802.11 WLANs," *Proceeding of the 2009 IEEE International Conference on Communications, IEEE ICC 2009, Ericsson Research Japan*, pp. 5057-5062, 18, June. 2009.

- [19] P. Wang, and W. Zhuang "A Token-Based Scheduling Scheme for WLANs Supporting Voice/Data Traffic and its Performance Analysis," *IEEE Transactions on Wireless Communications, Waterloo, Ontario, Canada,* Vol. 7, No 4, pp.1-11, April. 2008.
- [20] D. Leith, P. Clifford, D. Malone, and A. Ng, "TCP Fairness in 802.11e WLANs," *IEEE Communications Letters, Hamilton, Ireland,* Vol. 9, No. 12, pp. 1-3, December. 2005.
- [21] T. Li, Qiang Ni, D. Malone, D. Leith, Y. Xiao and T. Turletti, "Aggregation with Fragment Retransmission for Very High-Speed WLANs," *IEEE/ACM Transactions on Networking (TON), Piscataway, NJ, USA,* Vol. 17, No. 2, pp. 591-604, April. 2009.
- [22] M. Abusubaih, S. Wiethoelter, J. Gross, and A. Wolisz, "A new access point selection policy for multi-rate IEEE 802.11 WLANs," *International Journal of Parallel, Emergent and Distributed Systems, Berlin, Germany,* Vol. 23, No. 4, pp 1-20, August. 2008.
- [23] Mansor, S. A. (2009). Convergence: Going for Growth. myCONVERGENCE, 3(13).
- [24] Gurstein, M. (2010). Gurstein's Community informatics? Retrieved from http://gurstein.wordpress.com/ on 15 Sep 2010.
- [25] A. Bailey, and O. Ngwenyama, "Social Ties, Literacy, Location and the Perception of Economic Opportunity: Factors Influencing Telecentre Success in a Development Context", *Proceedings of the 42nd Hawaii International Conference on System Sciences- 2009*, pp. 1-11, 2009.

- [26] D. Kleine, "ICT4What? Using the Choice Framework to operationalise the Capability Approach to Development", *Proceeding* pp. 108-117.
- [27] H. Hansson, P. Mozelius, S. Gaiani, and N, Meegammana, "Women Empowerment in Rural Areas through the Usage of Telecentres - A Sri Lankan Case Study", 2010 International Conference on Advances in ICT for Emerging Regions (ICTer), pp. 1-6, 2010.
- [28] Aderinto, A. (2007). A Survey of The Reform Programmer. Nigeria's reform programme: issues and challenges, 66.
- [29] Beebe, J. (2001). Rapid assessment process: An introduction: AltaMira Press.
- [30] Copes, H., Vieraitis, L. M., River, N., & Hall, P. (2005). Evaluation Research in the Social Sciences: Upper Saddle River, NJ: Prentice Hall.
- [31] Creswell, J. W. (2007). Qualitative inquiry & research design: Choosing among five approaches: Sage Publications, Inc.
- [32] Kothari, C. (2008). Research methodology: methods and techniques: New Age International.
- [33] Patton, M. Q. (2002). Utilization-focused evaluation (U-FE) checklist. Evaluation Checklists Project.
- [34] Welman, C., Kruger, F., & Mitchell, B. (2005). Research methodology: Oxford University Press.
- [35] Yin, R. K. (2009). Case study research: Design and methods (Vol. 5): Sage publications, INC.