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A COMPREHENSIVE REVIEW ON IMPROVING QOS FOR VOIP IN WIRELESS MESH NETWORKS

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Abstract: Voice over Internet Protocol (VoIP) is one of the most important technologies in the world of communication. Around 20 years of research on VoIP, some Quality of Service (QoS) problems of VoIP are still remaining. The newly emerging wireless mesh network has fundamental difficulties in supporting VoIP applications due to the MAC overheads introduced by huge amounts of small packets. Packet aggregation is a promising application to mitigate these overheads. Packet aggregation increases the capacity of IEEE 802.11-based WMNs by aggregating small packets into larger ones and thereby reducing overhead.

INTRODUCTION

The provisioning of **Quality of Service** (QoS) can be considered a mandatory requirement for any telecommunication system able to support multimedia services. However, the current Internet lacks a widely deployed framework for supporting QoS. One of the reasons is that QoS mechanisms are mostly needed when network resources are scarce and real world experience has proved that is often cheaper to upgrade to higher capacity links or equipments (over-provisioning) than to deploy Internet-wide QoS solutions. On the other hand, the current bottleneck is represented by the last mile of the Internet connection. Therefore, techniques able to provide QoS over access networks are believed to represent a viable solution to enhance the accessibility to multimedia services.

Wireless Mesh Network is a promising wireless technology for several emerging and commercially interesting applications like, broadband home networking, community neighbourhood networks and coordinated network management. WMN is dynamically self-organized and self-configured WMNs scalability problems pose additional constraints so that ensuring the required QoS parameters appears a challenging task even for a small number of hops (2–3). But, despite this it is considered a strategic goal to achieve, little efforts have been dedicated to investigate efficient techniques for supporting QoS in WMNs. Hence the research in WMNs field lacks from a comprehensive QoS perspective. In this work, we aim at enhancing the quality of service using packet aggregation in IEEE 802.11-based WMNs [1]. **Packet aggregation** means to assemble one large aggregation packet from multiple small packets. The sender adds an aggregation header so that the receiver can deaggregate the packets correctly. The packet aggregation reduces the physical and MAC layer overhead and thereby saves transmission time.

WMNs have brought unique challenges because its broader coverage calls for accommodation of increased number of clients with varied service demands. J.Okech and Y.Haman proposed a paper in which a dynamic packet aggregation algorithm that adjusts the size of aggregation packet to improve VoIP QOS in WMNs was discussed [2].

VoIP supports to make free of charge or very cheap soft-phone and hard phone calls locally and globally. For audio speech quality in packet switch applications, the main concerns are end to-end delay and packet loss. Kashif Nasir, Abas Md Said and Halabi Hasbullah represented the VoIP-Telephony deployment model using OPNET Simulator [3]. An experimental setup was configured and various methods to improve voice quality was analyzed. Experimental results with varying packet loss using distributed coordination function (DCF-Voice) were presented.

As 802.11 based wireless mesh networks also gain more attraction, wireless VoIP system is emerging providing the caller more convenience. Carrying voice over the WLAN provides incentive also with no wire for the handset to have an access with the network. In the case where the wired network is not easy to install or even expensive for deployment, wireless mesh network can be a very attractive way to extend the network coverage into the dead zone. However, the end-to-end throughput drops significantly as the number of nodes or hops in a wireless network increases.

Our focus in this work is how to improve the VoIP performance and increase the number of supported good quality VoIP calls in wireless mesh networks. The major challenge is to alleviate MAC protocol overhead with the small size of payload which consumes largely bandwidth. We investigate this problem in 802.11- based wireless mesh network that has no centralized control and evaluate packet aggregation mechanisms. The goal is to reduce the overall overhead and propose the distributed packet aggregation mechanism to increase the network performance as well as to reduce the resource requirement.

To achieve high throughput values at the network layer, research should focus not only on higher physical layer data rates but also on more efficient media access control (MAC) strategies as the latest WLAN evolution has shown. Besides WLAN many existent fixed wireless access (FWA) networks also have the same problem on the low uplink throughput due to inefficient MAC protocols. Therefore the design of efficient MAC protocols has great significance to

improve the overall system throughput at IP level. The advantage of reservation schemes over random access schemes is based on the fact that reservation schemes reduce access collisions and thereby improve the throughput. So far the reservation based MAC protocols can generally be divided into two categories: explicit and implicit reservation MAC protocols. Packet reservation multiple access (PRMA) protocol proposed by Goodman et al. in [2], [3] is a typical implicit reservation MAC protocol [4]. From the statistics of existent wireless data networks using PRMA protocol, it shows that the system throughput is quite low because of the inconsecutive small packets. In order to improve the throughput, packet aggregation scheme is considered to be applied in PRMA.

ARCHITECTURAL OVERVIEW

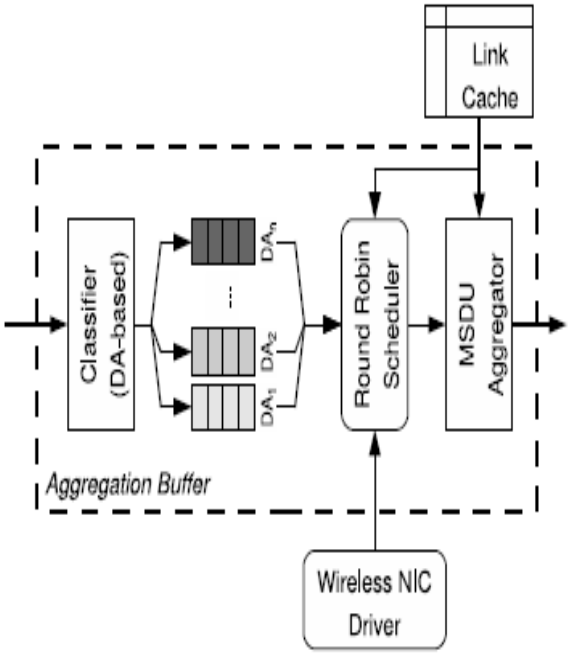

Figure. 1. Block diagram for the packet aggregator

The building blocks of the Aggregation Buffer and their relationships are sketched in Fig. 1. Incoming MAC frames are first classified according to their destination address and then fed to a different queue. Each Aggregation Buffer maintains a pool of unused queues and an hash table that associates the MAC destination addresses with the corresponding queue. Unused queues are moved from the hash table to the pool, this is done in order to alleviate the need for repeated memory allocation as neighbors come and go. For each queue, an A-MSDU is generated when either an aggregation timer is expired or a burst of optimal length can be generated.

CONCLUSION

This paper has demonstrated a survey on improving QoS for VoIP , using aggregation mechanism. Although, VoIP can tolerate packet loss to some extend, it is very sensitive to delay factor. Furthermore, WMN has fundamental difficulties in supporting VoIP application due to the mac overheads. Accordingly, this paper has discussed Packet aggregation to mitigate the problem of overhead. Various schemes like dynamic packet aggregation that determines the packet size was discussed and Packet reservation multiple access protocol is used to solve that problem.

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