



Performance Analysis of Spatial Reused Bandwidth Reservation in Ad Hoc Networks

Mr. Farif Kurasi

Jeppiaar Engineering College, Chennai

ABSTRACT

In this paper, AN approach for spatial reused information measure reservation in impromptu networks is planned. Resource reservation in wireless networks is a vital element that's required to support multimedia system and realtime applications, like audio/video conferencing. On the opposite hand, aerial technology provides the potential for appreciable increase in spatial utilize, that will increase the potency of communication. In our approach for spatial reused information measure reservation, the supply node tries to find multiple node-disjoint methods that ar capable of satisfying the specified Quality of Service (qos) demand in impromptu networks victimisation directional antennas. The simulation result shows the performance of this spatial reused information measure reservation approach. There's a big gain within the performance with a decrease within the range of methods, still as a rise within the share of with success received knowledge packets and reservation success rate.

1. INTRODUCTION

A mobile impromptu network consists of wireless nodes that communicate with one another within the absence of a hard and fast wireless network infrastructure. Nodes join forces to forward knowledge packets with one another, thus a node can communicate with another node by multi-hop. In the mobile ad hoc network, node mobility causes unpredictable topology change, the research and design of quality of service (QoS) guarantee is more complicated than traditional networks. The ability to provide QoS guarantee is dependent on how well the channel resources are managed by the protocol at the medium access control (MAC) layer [1]. MAC protocols can be classified into two categories: contention-based MAC protocols and scheduled-based MAC protocols. The contention-based nature makes contention-based MAC protocols difficult to allocate and reserve bandwidth, which is desired by real-time multimedia application, such as audio/video conferencing.

Because each node that has been assigned a set of time slots can transmit data packets, schedule-based MAC protocols are potentially better suited to support QoS guarantee by reserving bandwidth and following the rule of the transmission schedule. Scheduled-based MAC protocols can be classified into two categories: topology-dependent scheduling and topology-transparent scheduling. The topologytransparent scheduling does not need any topology information to perform transmission scheduling, and can guarantee that every node has at least one collision-free transmission slot in each schdule cycle (i.e., single-hop QoS support) provided some constrains are satisfied [1]. In the topology-dependent scheduling, each node finds conflict-free time slots by using network topology information. The topology-dependent scheduling concentrats on finding conflict-free schduling which maximizes the system performance by using network topology information [2]. Recently, the Time Division Multiple Access (TDMA) scheme is the most prevalent approach in topologydependent scheduling MAC protocol. In order to provide the guaranteed bandwidth along a path, the bandwidth must be reserved along the entire path. In wireless networks, nodes use their reserved slots to transmit data without collisions. In the assumed Time Division Multiple Access (TDMA) model [2], the use of a time slot for a link depends on the status of its 2-hop reighboring links. TDMA-based QoS routing protocols take the slot assignment and interference into consideration [3, 4]. A stronger channel model Code Division Multiple Access (CDMA)-over-TDMA was adopted to relieve the link interference [5]. The use of a time slot on a link only depends on the status of its 1-hop neighboring links. When the bandwidth requirement is high and the network resource is rare, multi-path QoS routing protocols are developed to provide QoS support in CDMA-overTDMA wireless ad hoc networks [6, 7, 8, 9].

YuhShyan Chen has presented a hexagonal-tree TDMA-based QoS multicasting protocol [13]. In [14], Kapoor proposes a greedy framework for distributed scheduling, which provides an efficient and integrated solution to QoS aware routing and call admission control in distributed WiMAX mesh networks. These TDMAbased bandwidth reservation protocols use the omnidirectional antennas. In [15], Jawhar and Wu have proposed a race-free routing



protocol for quality of service support in TDMA-based wireless networks, which allows a source node to find and reserve a path with a certain required bandwidth (expressed in terms of the number of data slots) to a destination node. This protocol is extended to do path reservation in TDMA-based wireless networks, where the nodes are equipped with directional antennas [16]. During this paper, we propose a scheme for spatial reused bandwidth reservation for multi-path routing protocol in TDMA-based ad hoc networks by using directional MultiBeam Adaptive Array (MBAA)-antennas. It is different from the above protocols in that it is not only on-demand, based on the Dynamic Source Routing (DSR) protocol, but also based on the multi-path search strategy. Our protocol tries to discover multiple node-disjoint paths between the given source node and the destination node, and therefore the total information measure of those methods will satisfy the information measure demand of the appliance. This can be in distinction to on top of protocols that notice an information measure satisfied path between the supply and therefore the destination.

2. CONNECTED WORKS

In wireless networks, nodes transmit knowledge packages by victimisation AN aerial that radiates its power equally altogether directions. This can be a transmission mode of omnidirectional antennas. The transmission mode of directional antennas permits a node transmit knowledge packages in an exceedingly explicit direction. At an equivalent time, a receiving node will focus its antenna in an exceedingly explicit direction.

Directional antenna technology provides the subsequent blessings [16]: (1) a smaller quantity of power may be used; (2) different nodes will use the encircling space within the different directions to transmit, that will increase the spatial reuse; (3) route has shorter hops and smaller end-to-end delay. In this paper, a MultiBeam accommodative Array (MBAA) system in [19] is employed and is capable of forming multiple beams for cooccurring transmissions or receptions in several directions. In wireless impromptu networks, providing quality of service support could be a difficult task. The rationale comes from the dynamic topology of network, which can not permit consistent resource reservation. One path might not be able to offer enough information measure resources therefore on meet higher quality of service demand once the network load is significant. Therefore, it's necessary to contemplate satisfying higher quality of service demand through resources that will be reserved on multiple methods from a supply to a destination.

The TDMA channel model is assumed to be timeslotted. TDMA frame consists of an effect subframe and an information subframe [3]. The management subframe consists of ND fixed-length knowledge slots. The information subframe contains Tar Heel State fixed-length management slots. In wireless networks, the hidden terminal downside and exposed terminal downside may occur. In Figure. 3, node A and node B are 1-hop neighbors, node B and node C are 1-hop neighbors, and node A and node C aren't 1-hop neighbors. The transmissions of node A and node C can collide at node B. This can be referred to as hidden terminal downside.

3. SIMULATION

In this section, a simulation study is performed by victimisation ns two to gauge the performance of our planned the spatial reused information measure reservation for multi-path QoS routing in TDMA-based impromptu networks. Suppose that there are thirty nodes arbitrarily placed in 300m x 300m space. The transmission range of the nodes is 100m. The interference range of the nodes is 200m. Suppose that each association request is generated with an arbitrarily chosen source-destination pair. The amount of data slots in an exceedingly frame is thirty two. The information rate of a slot is 512Kbps. The top speed of node is 1m/s. The information measure demand for each session could be a distribution from one to four slots. Whereas evaluating the performance of our planned the spatial reused information measure reservation theme, we have a tendency to specialise in the subsequent parameters: (1) average range of quality of service paths; (2) share of data packets received successfully; (3) reservation success magnitude relation. In our experiment, the simulations are in serious trouble 3 completely different cases: (1) one antenna; (2) 2 antennas; (3) four antennas. Within the 1st case, one antenna implies that the node has aerial. Within the second case and therefore the third case, the nodes have directional antennas. Once the information measure demand is two slots, Figure vi shows the common range of QoS methods as a function of the information arrival rate. The common range of QoS methods vary from one.53 to 1.68 within the aerial case. The common range of QoS methods vary from one.135 to 1.25 within the four antennas case. While using directional antennas, our spatial reused bandwidth reservation scheme with four antennas has lower number of QoS paths than the omnidirectional antenna. When the data arrival rate is 2 messages / second, Figure 7 shows the average number of QoS paths as a function of the bandwidth requirement. When the bandwidth requirement increases, the numbers of QoS paths of three cases increase. The spatial reused bandwidth reservation with four antennas has lower number of QoS paths than the omnidirectional antenna.

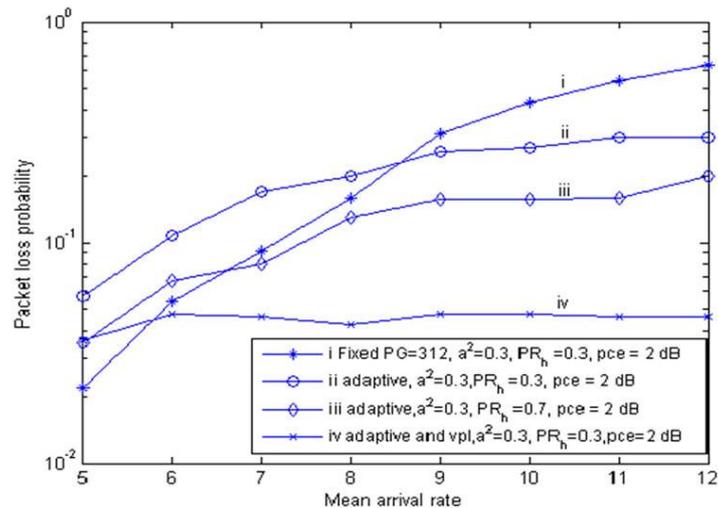


Figure 1. Average number of QoS paths VS. data arrival rate

4. CONCLUSION

In this paper, we propose a novel spatial reused bandwidth reservation for multi-path routing in TDMA based ad hoc networks. The source node tries to discover multiple node-disjoint paths that are capable of providing the desired bandwidth requirement. This novel scheme takes advantage of the significant increase in spatial reuse provided by the directional antenna environment. The simulation results clearly show a significant gain in the performance with a decrease in the number of paths, as well as an increase in the percentage of successfully received packets and reservation success rate.

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