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Prioritized Multimedia Transmission Using AODV Routing Protocol in NS2

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Abstract

In wireless multimedia streaming, there is a need for allowing client prioritization so that provision of end user can be enabled with alleged quality in direct relationship with client device consequence. Currently, the same priority is given to all clients, independent of their characteristics, often resulting in unfair distribution of throughput. This paper proposes a priority-based scheme for QoS in MANET by classifying the traffic flow in to network into different priority classes and giving different treatment to flow belonging to different classes during routing so that the high priority flows sill achieve best possible throughput. The aim is to reduce the effect of coupling between routes used by high and low priority traffic. The suggested protocol in our project selects the shortest path for high priority traffic and divers the route for low priority traffic that will minimally interface with high priority flow, thus reducing the effect of coupling between high and low priority routes.

Keywords: AODV, MANET, multimedia, priority, routing protocol, WSN

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INTRODUCTION

Ad hoc is a Latin expression which means “for this purpose.” It commonly way for a solution intended for a particular problem or task, non-generalizable, and which cannot be adapted to other drives. Ad-hoc networks have been specifically created to solve communications in environments where it is very difficult or impossible to create a fixed infrastructure. Most of these ad hoc networks are spontaneously created by users. A remarkable fact is that the number of devices capable of maintaining wireless transmissions is growing each day. Ad-hoc networks are useful in a large variety of scenarios, such as universities, museums, emergency rescue, or exploration missions, where the capability to share resources and services is one of the most relevant premises. So, a wireless ad-hoc network is a wireless computer network where there is no fixed infrastructure. All wireless enabled devices within the range of each other can discover and communicate with each other in a peer-to-peer fashion without involving central access points. In the last few years, wireless ad-hoc networks are rapidly gaining importance. The ad-hoc property makes them quite useful in situations where setting up of an infrastructure-based network could be difficult, or even impossible. Because of this reason, wireless ad-hoc networks are being studied especially for their applications in disaster management, military, supply chain management, environment studies, conferences and classrooms, etc. In wireless sensor network (WSN) applications, it is usual to locate nodes close or inside the observed phenomenon. This concept of network needs new network protocols, which adjust to the new raised requirements. Traditional ad-hoc techniques cannot cover those requirements because they cannot adjust to the design principles of this kind of networks.[1–5]

Protocols are been classified depending on how the source finds the destination: proactive protocols, reactive protocols, and hybrid protocols. In proactive protocols, routes were calculated at first, whereas reactive protocol routes were calculated dynamically when needed. Hybrid protocols use a combination of both techniques. So, proactive protocols are better for environment with fixed nodes and reactive protocols for environment with mobile nodes. Other kind of routing protocols are cooperative routing protocols were nodes send data to a central node that join the data to reduce the cost in terms of energy consumption. Recently, a new classification for WSN routing protocols has arisen. It classifies the routing techniques according to packet destination (a single node, a set of nodes, or every node in network).[6] So, the following types can be found: (1) Gossiping and agent-based unicast forwarding; (2) Energy-efficient unicast; (3) Broadcast and multicast; (4) Geographic routing; and (5) Mobile nodes. In most contexts of WSN, the design framework must optimize all performance metrics by sustaining energy-efficiency, memory-efficiency, self-organization, and network performance. To achieve optimal network performance, data throughput must be maximized, end-to-end latency of data transmission must be minimized, fairness among nodes sustained, and bandwidth utilization maximized.[7] An optimal network performance usually guarantees a certain level of quality of service (QoS). Because sensor nodes are low-cost devices, they have very limited memory capacity. As such, they must not perform excessive computation and must avoid storing nonessential or overhead data in memory where possible.[8]

LITERATURE SURVEY

The drive for undertaking this research comes from the author's belief that there are numerous routing protocols for WSNs and how does a person or a company identifies an efficient one. The author has observed that there could be probable factors that developers look for when developing protocols for WSNs. As a result, it is necessary to find these factors in identifying an efficient routing protocol.[9]

A lot of promising opportunities have been recently provided by the brilliance of WSNs. WSN's connectivity provides intrinsic built-in redundancy, and they do not rely on wired communication infrastructures. WSNs are also perfect candidates as communication alternatives in case of emergencies if ever natural means of communications are physically unavailable. Like mobile ad-hoc networks (MANETs), WSNs share many properties as it is built on multi-hop forwarding of data packets from access nodes toward gateways to the fixed network. Most current research effort relating to MANETs is that nodes are assumed to be highly mobile wherein they are mainly battery operated. As a result, protocols and mechanisms try to cope with recurrent changes in topology and conserve energy. These assumptions could actually be relaxed which makes way for designing of new services and protocols. However, it has becoming a challenging task for WSNs to support any application. This is due to the limiting of scalability of WSNs as a result of multi-hop forwarding of packets. Regardless of this, WSNs have proven to be promising as it has a commercial potential.[10] They are supposedly predicted to provide cheap wireless network access and coverage. Traditional approaches to service provisioning and routing should be taken into reconsideration if it is the aim for WSNs. Taking into accounts the complex characteristics of emerging application and those of WSNs. There have been a few problems that arise as we take a look at why there are so many routing protocols.[11] They are:

(1) Lack of standards: One of the reasons for the assortment of routing protocols for WSNs is that there is a lack of standards to which would define WSNs operations.
(2) Variety of applications: Additional cause is the widespread kind of applications. For instance, a wireless military network gaming figures automation or military communication while other do not.
(3) Variety of design methods: When getting on with the progress of routing protocols, there are numerous strategy possibilities to choose from. Several approaches used for the distribution of routing information, paths computation, numerous plans for nodes management, and many data structures for keeping such information making routing protocols work in various ways. A routing protocol will understand the goal which the designer wants it to be complete a selection of elements. To determine a route amid nodes, information about the underlying network topology must be gathered. This information also permits nodes to interconnect with each other. Two methods for gathering information are: proactive and reactive.
(4) Bandwidth: The availability of bandwidth in sensor networks is scarce and the methods which aim to increase the throughput per node will also influence the way the routing protocols operate.
(5) Size: The size of processor and required memory are too large for conventional protocols.
(6) Energy: The conventional protocols are not energy usage aware.

These problems lead to fundamental limits of WSN. The debate starts with the basic questions of what the maximum sustainable throughput and the maximum lifetime of a network are.[12–14] The answers to these and similar other questions are of great importance to both the theoretical and practical aspects of wireless sensor networking research.

PRIORITIZED MULTIMEDIA SCHEME

An MANET is an infrastructure less network where the nodes involved in it pertain to dynamic positions at various time spans. With the advancements in the mobile communication, the regular demands of the customer have risen. Not only network lifetime, but the security of communicating system from attacks, minimal interference from adjoining wireless apparatuses as well as the time expended in the communication among the intermediary nodes and in due course the time for the communication between source and destination nodes has nowadays become the vital constraints put forward by the customers. Thus, it is appropriate to address these necessities, which is tried by the proposal of this paper. Mobile nature of the joining nodes led to the employment of ad-hoc on-demand vector routing (AODV). Using this mechanism, the data packet is sent only to those nodes which respond to the listening packet sent by the source node. Without priority-based routing the packet collision may occur due to high traffic flow.[15]

This research attempts to identify the different factors to consider in determining the appropriate characteristics of a certain protocol that enhances the performance of

WSNs. To meet the above need and to solve the research problem the following objectives are to be met:

(1) Enormous literature survey on the basic principle of traditional and existing WSNs, their architecture will be carried out along with the available routing protocols and features of each routing protocol.
(2) Simulating routing protocols to evaluate their performances under severe working conditions using an appropriate network simulator and identify the shortfalls of the different protocols in these conditions.
(3) Find the factors that determine an efficient-routing protocol.
(4) Design and implement by simulation, a new protocol that improves upon the weaker areas of existing protocols to come up with an efficient routing protocol.

For the priority-based routing study, we incorporate the packet priority as takes after (in order of priority) routing and unicast. We first talk about our outcomes for the infinite buffer case. To think about the execution of the priority-based routing, we first investigate the system execution with no connection disappointments. We watch a sensational abatement in the instantaneous delay and jitter & delay for unicast traffic increments over the non-priority simulations.[16]

We see that without any disappointments, the priority-based routing algorithm gives better QoS to those administrations with a higher priority. The paper presents simulation results laying out the advantages of applying the calculation, outlining the change in data bandwidth allotment and in general end user perceived quality. The video delivery over cellular mobile channels may be influenced by connection outages and bit rate varieties because of the changing channel condition. These impacts for the most part rely on upon the utilized wireless interface.

Because of asset limitations and dynamic topology of MANETs, supporting nature of service (QoS) in MANETs is a challenging task. Albeit bunches of examination have been done on supporting QoS in the Internet and networks, they are not suitable for the MANET environment. Although conventional protocol layering is a critical deliberation to diminish multifaceted nature of network design in wired systems, it is not appropriate to wireless networks to give complex functionalities like QoS because of interdependencies of distinctive layers. This paper gives a brief survey of the momentum looks into on QoS support in MANETs uniquely the diverse existing QoS models and proposes a general structure which depends on a cross layer methodology.

A thorough investigation of the different techniques at different layers and their adaptation has led to this simple framework which gives better performance under different traffic loads and mobility scenarios.

The hypothesis of this paper is that by prioritizing data within a network stream the user experience can be improved. In a typical application data will be prepared and transferred to the transport layer where it is segmented into packets. A packet is queued and then sent when it reaches the head of the queue, after all other data before it has been transmitted. This however takes no account of time requirements on the delivery of data, but only considers the possibility of different priority for different packets. It is proposed by having cross-layer communication around the type and the time constraints for the data, that the data can be reordered or dropped and that more of the most important data can be transmitted. This paper discusses a scheme where the transport layer, in cooperation with the application, determines which packets should be sent and in what order they should be sent in. The motivation for this is two-fold. It seems reasonable for the transport layer to prioritize the sending of the most useful data first, and even discarding packets which will no longer be useful for the receiver. It would also seem reasonable for audio packets to be sent before video packets, as the audio is more important than video to a user's experience in a real time media situation. It is important to deliver the "right'' data as well as increasing the throughput. With real time media applications it is not sufficient to just deliver more data – it is also important to deliver the highest priority data.

This paper proposes a prioritized adaptation scheme which adapts multimedia content during streaming based on priorities statically assigned by the user to the end device. The paper then presents simulation-testing results that make use of a basic model which deploys the scheme and delivers multimedia data in different usage conditions using the NS-2 simulator. Conclusions and further work are then presented.

SIMULATIONS AND RESULTS

Simulations were carried out using the NS-2 Simulator v2.34. The prioritized adaptation scheme outlined in section Prioritized Multimedia Scheme was implemented by a simulation model, and a number of tests were carried out to evaluate the scheme's performance. IEEE 802.11b was used for the wireless simulation. A basic client server topology, consisting of 13 clients and one server, was used for testing. CBR/UDP multimedia was transmitted using 1000 byte packets.[17]

The Figures 1–10 show the simulation screen shots in NS2.

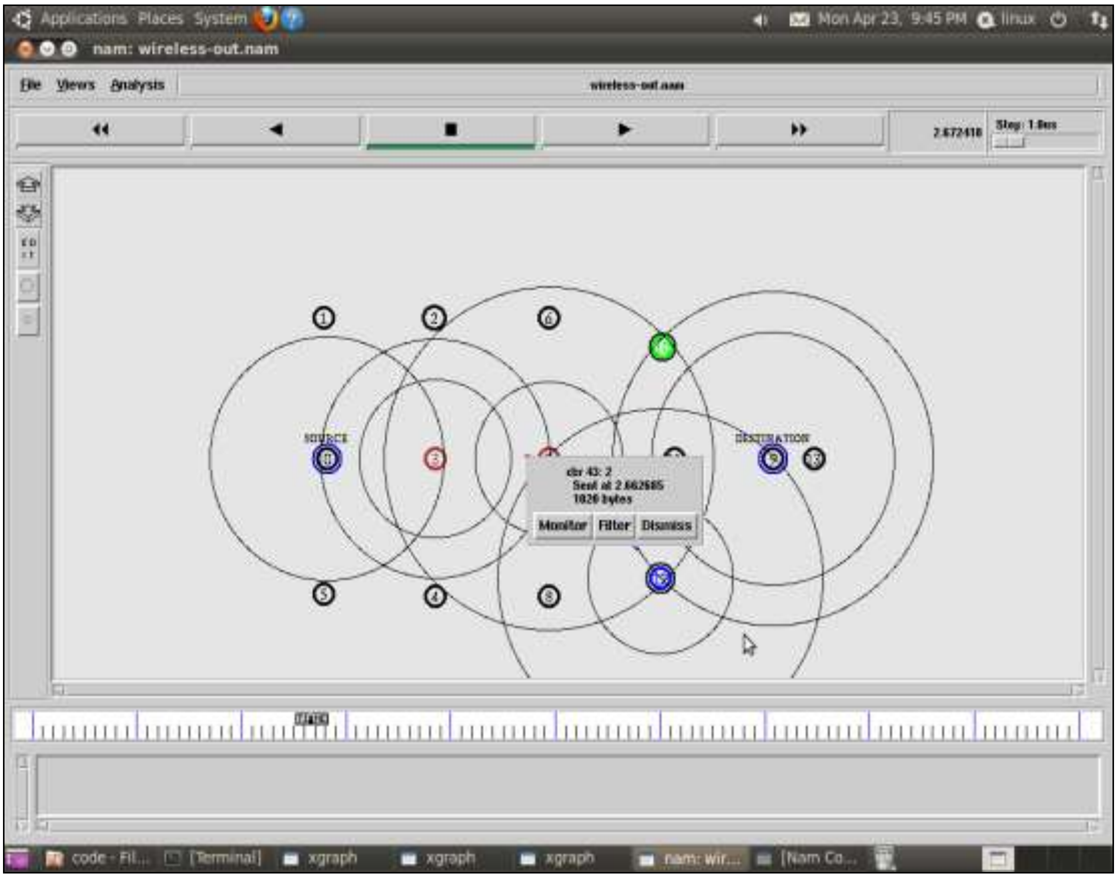

Fig. 1. *Nodes Showing Source and Destination in Wireless Ad-Hoc Network.*

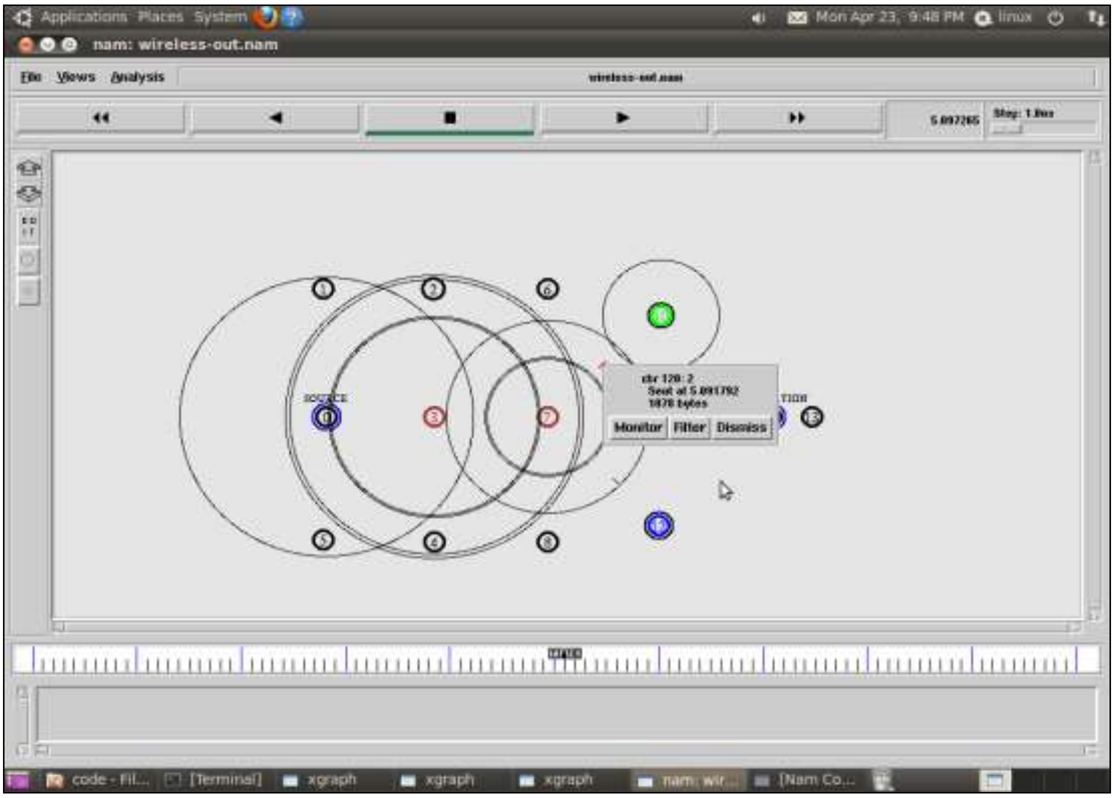

Fig. 2. *Video (red) and Data (Brown) Transfer Path CBR 120:2.*

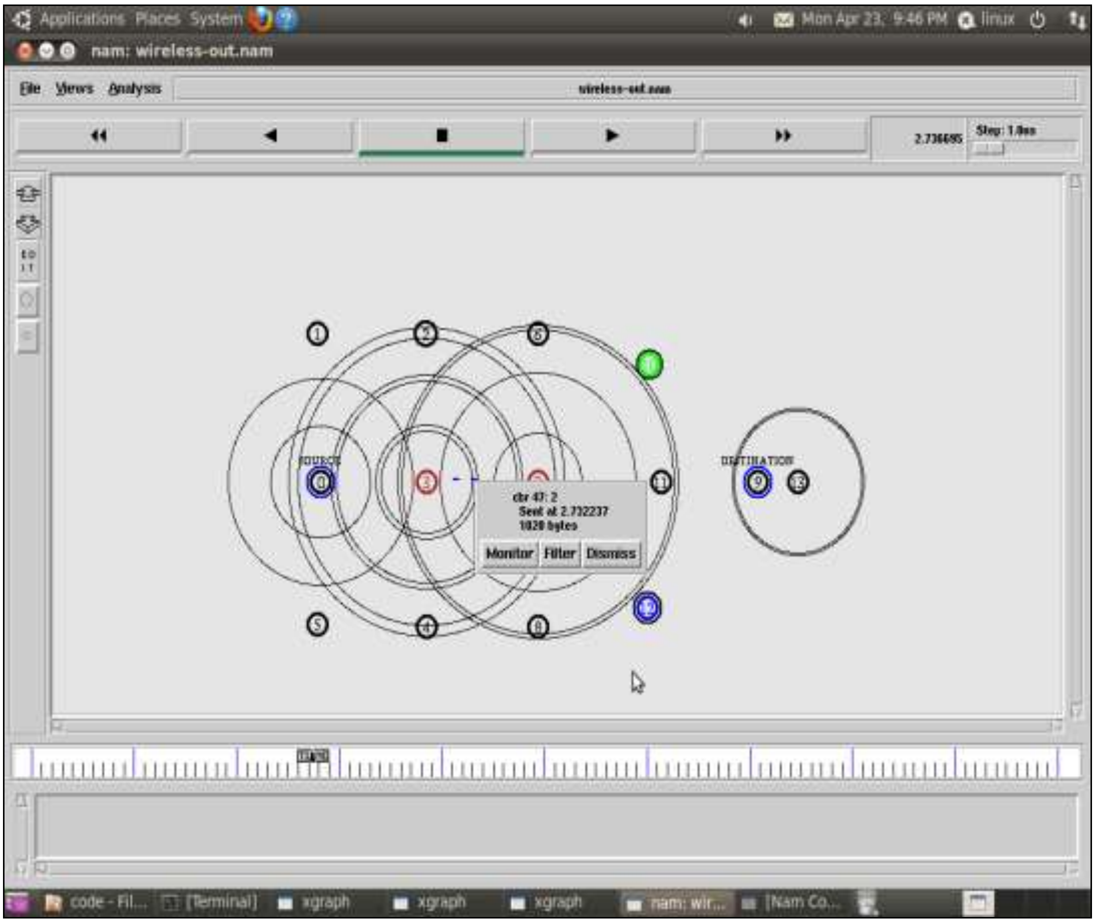

Fig. 3. *Audio (Blue) Transfer Path and CBR 47:2.*

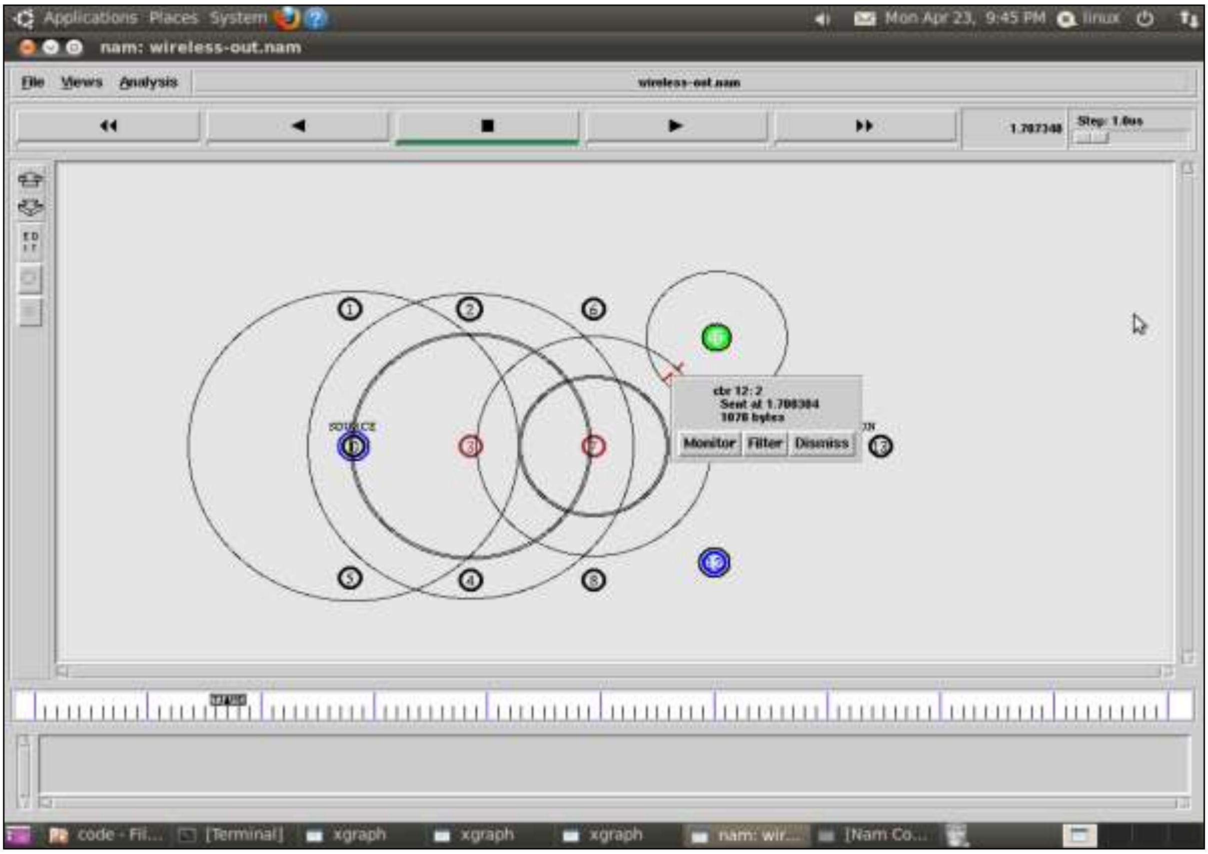

Fig. 4. *Video (Red) Transfer Path and CBR 12:2.*

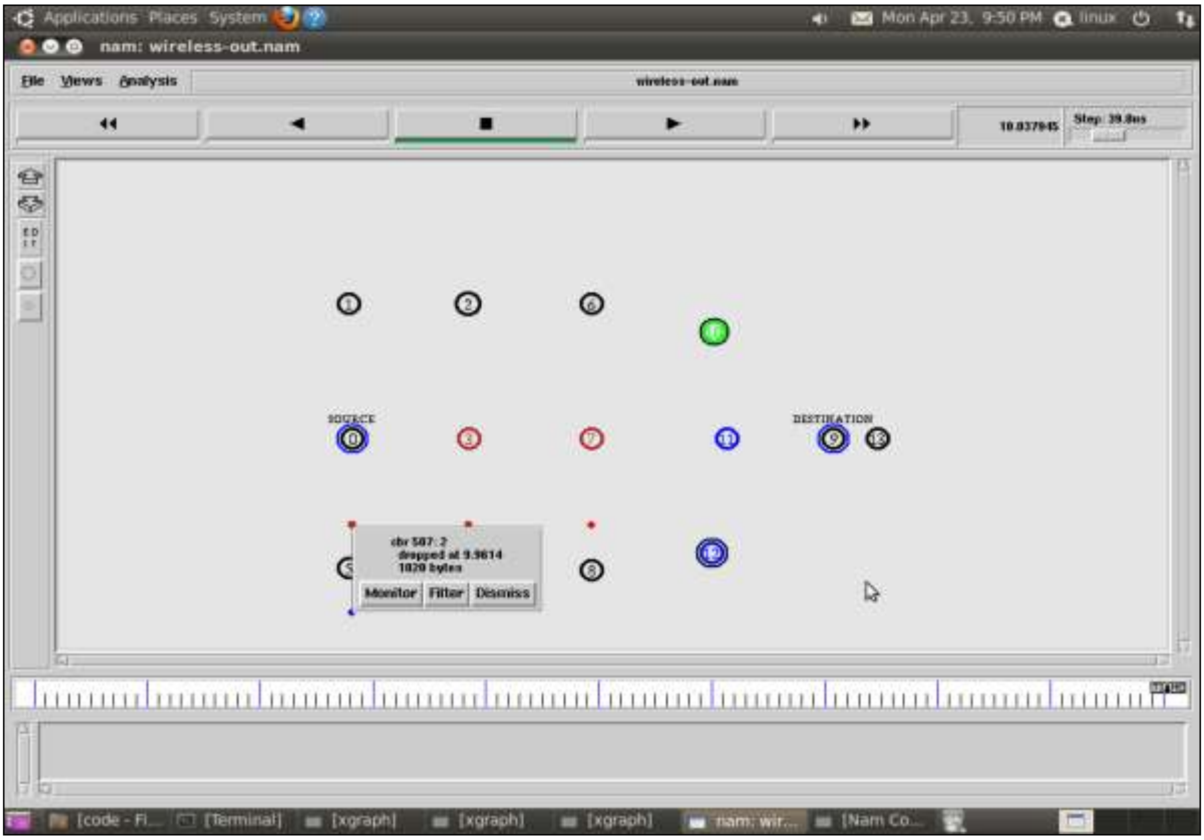

Fig. 5. *Video Dropped at 9.9614 With CBR 507:2.*

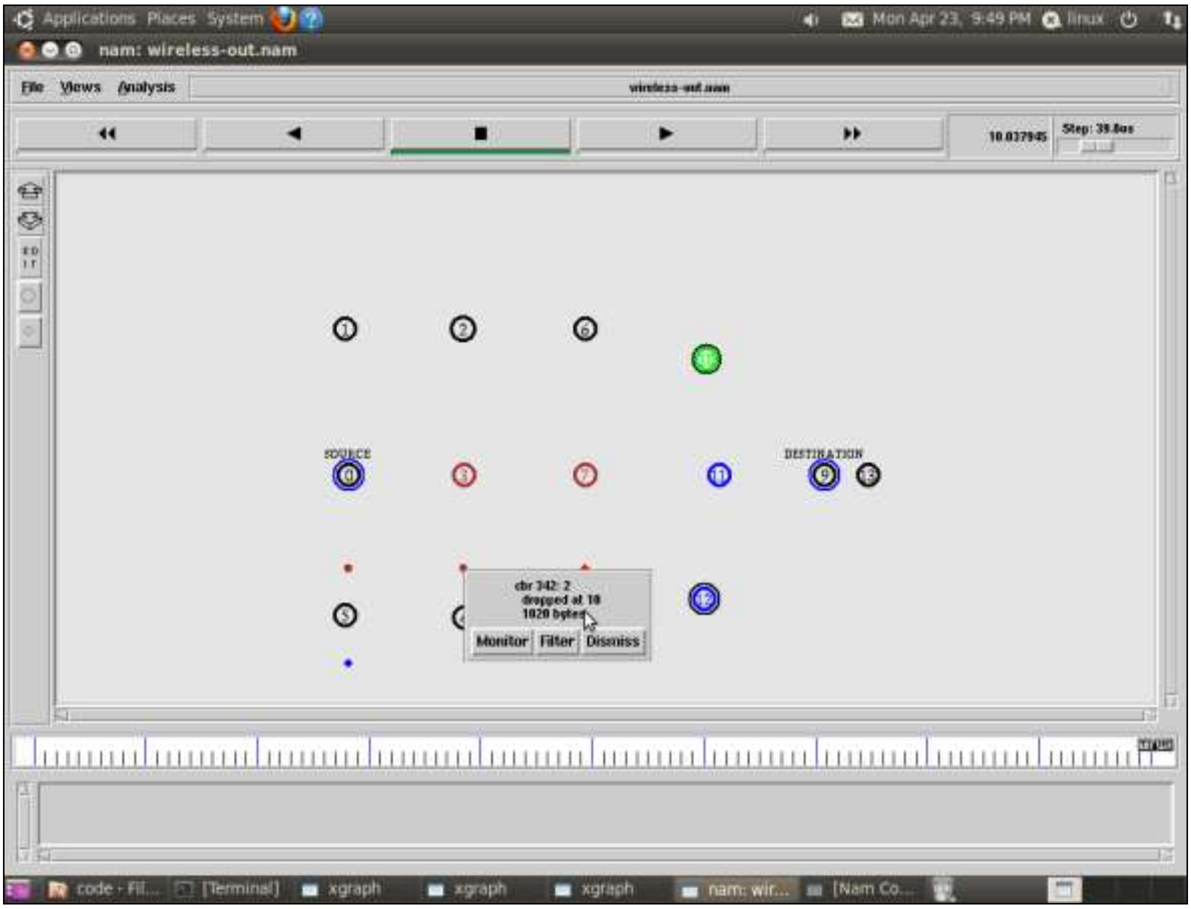

Fig. 6. *Data Dropped at 10 With CBR 342:2.*

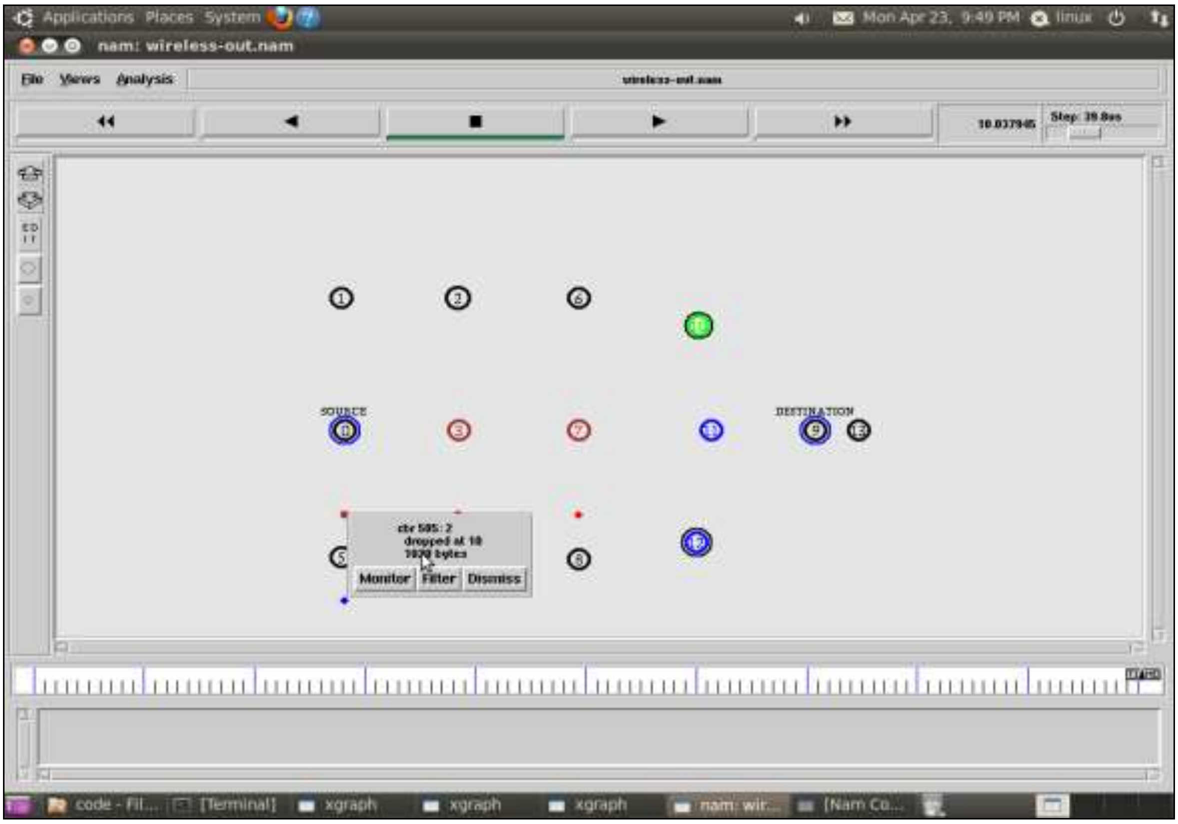

Fig. 7. *Audio Dropped at 10 With CBR 505:2.*

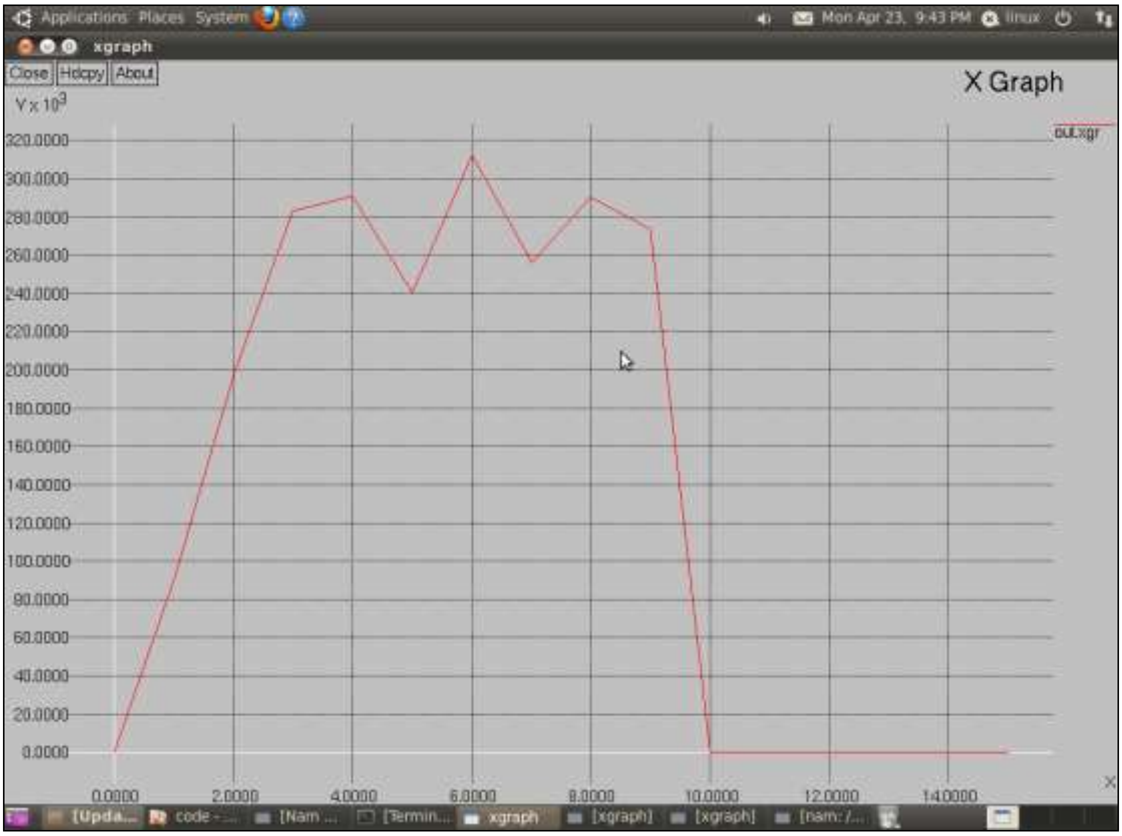

Fig. 8. *Efficiency of the MAC Layer Over the Simulation.*

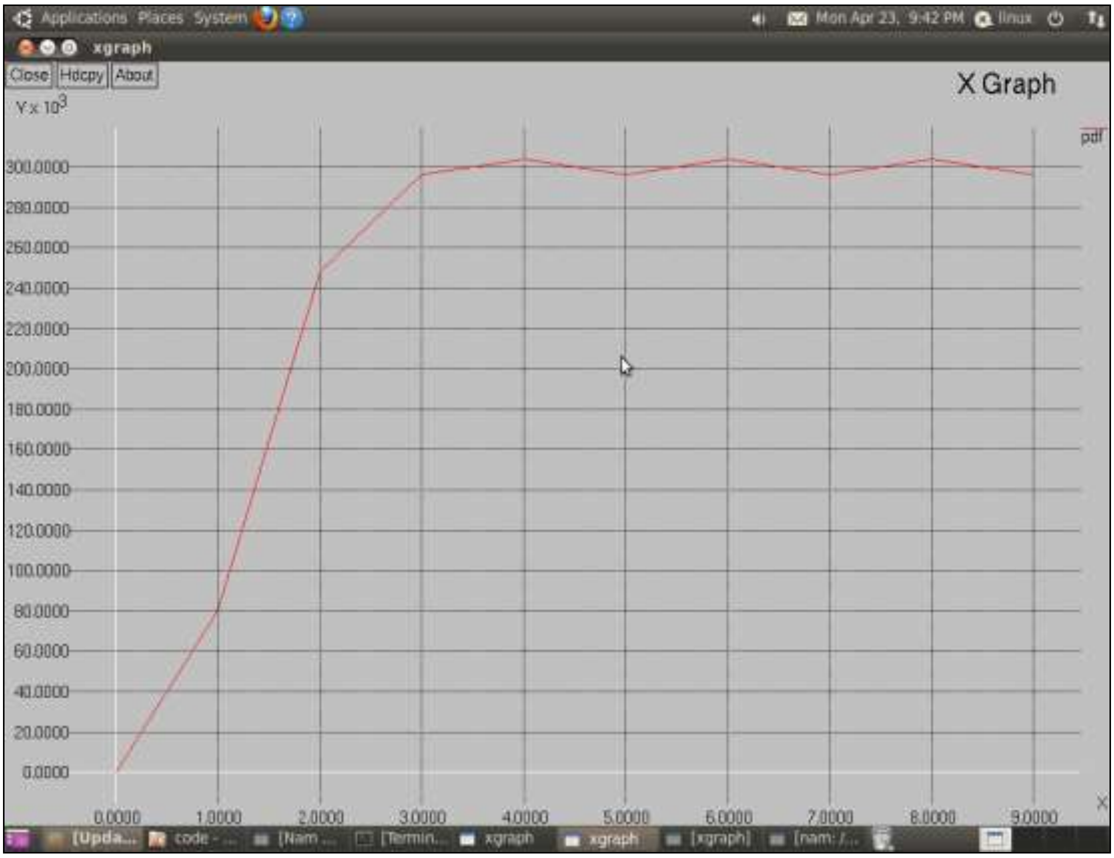

Fig. 9. *Graph Showing the Packet Delivery Over the Simulation in Network.*

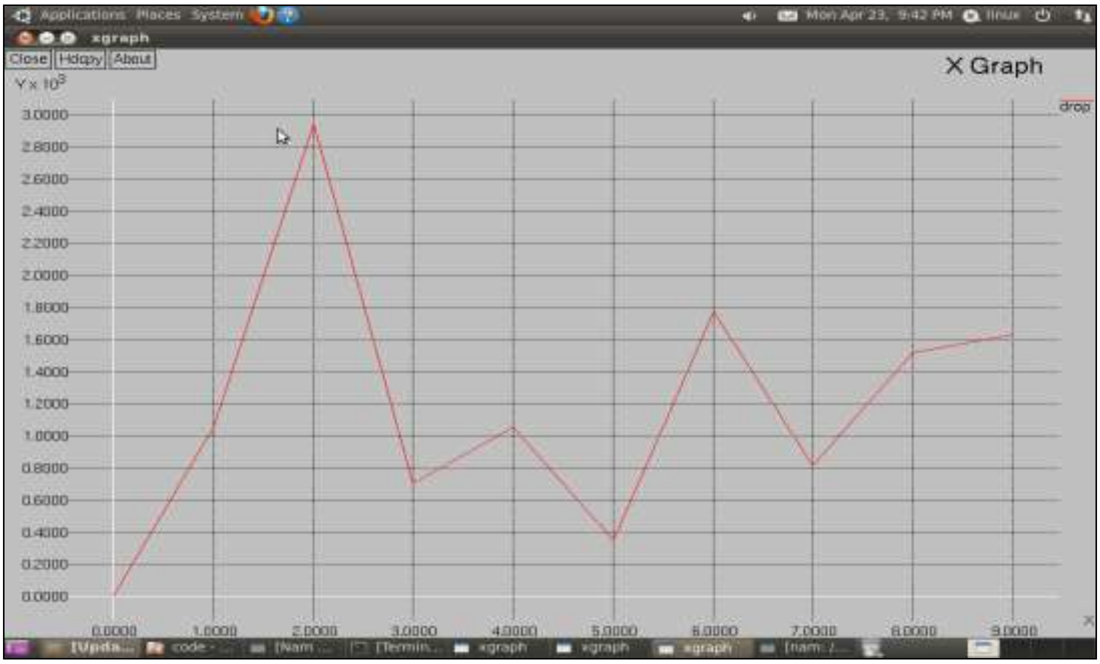

Fig. 10. *Graph Showing the Packet Drop in the Network Simulation.*

CONCLUSION

This paper proposed a prioritized adaptive scheme for wireless multimedia streaming along with the architecture of the system that deploys it. Its various components and their interaction were explained. Simulation results, carried out in NS2, were shown and the results show a decrease loss and at least a 7.9% increase in throughput was obtained using the proposed scheme. A reduction in throughput fluctuation was also achieved as well as a degree of prioritized traffic differentiation.

The basic prioritized scheme can be further implemented for the real time multimedia applications with real time and buffer constraints. The popular and well defined protocols like AOMDV, AODV, DSR, and DSDV can be applied for the real time multimedia applications to conclude the better protocol in all constrained situations.

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