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Improving the Performance of Video Streaming by Reducing Routing Overhead in Mobile Ad-hoc Networks

Mahanandi.Y
M-Tech Student, Department of CSE, JNTUA College of Engineering,
Ananthapuramu, Andhra Pradesh, India

Abstract*— Video streaming in MANET became a possible phenomenon due to the improvement in technologies. However, MANET devices have limitations in terms of resources. Therefore video streaming through MANET can cause certain issues such as reduced quality, sudden stopping of service, frozen streaming, and sudden jumps. When such problems occur in the network, the mobile users do not have quality of experience. The existing solutions on the traffic splitting may not be able to provide a best solution. In this paper we proposed an algorithm known as QoS based multi-path routing algorithm. The algorithm not only considers hop count but also QoS parameters in mind while handling the traffic pertaining to video streaming. For all the routes identified the routes that meet the QoS criteria are found and then decisions of made instead of just splitting and sending the data. Thus optimal performance of video streaming is achieved due to reduced routing overhead in MANET. We implemented the proposed algorithm using NS2 simulations. The results revealed that the proposed system has performance improvement of video streaming over existing system.

***Keywords*— MANET, QoS parameters, multi-path routing, video streaming**

I. INTRODUCTION

Wireless networks like MANET are widely used in the real world. Especially the MANET devices are resource constrained and hence need to optimize communications. Moreover video streaming in MANET needs mechanisms to improve network capacity and enhance the video streaming quality. As devices have less resources, the video streaming has many issues in MANET. A sample MANET is shown in Figure 1.

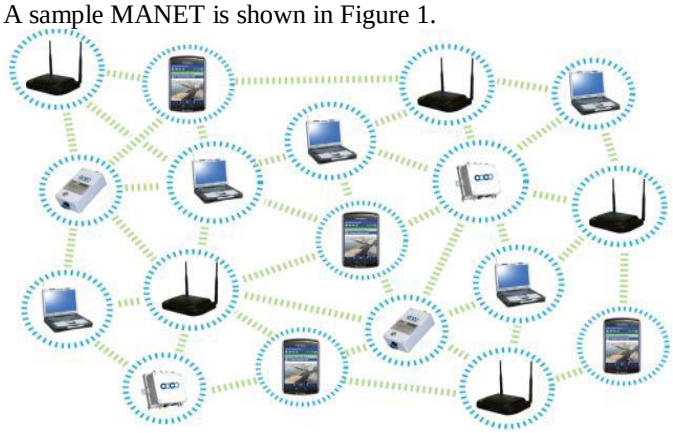

Figure 1 – Shows a sample MANET

The existing system is using the following algorithm.

Step1: Send request for a particular destination.
Step2: Destination will send reply consisting hop count of route.
Step3: Re-arrange these available routes in ascending order according to their Hop Count.
Step4: Update routing table according to the re-arrangement.
Step5: Divide the traffic into 60:40 on available routes as less hop count routes will assign more traffic.
Step6: Now transmit data according to the above division ratio through discovered routes.

The approach used in the existing system has certain limitations. First of all it is purely based on the traffic splitting. It depends heavily on the hop count and available routes with less hop count. It is also based on the routes with less delay, less packet loss and stability. Moreover it causes more routing overhead. To overcome these limitations, in this paper, we proposed a new algorithm that considers QoS needs of video streaming while making multi-path routing decisions.

Or contributions in this paper include the design and implementation of an algorithm that considers QoS requirements while finding multi-path routing for video streaming. The remainder of the paper is structured as follows. Section II provides review of literature. Section III presents the proposed system in detail. Section IV presents experimental results while section V concludes the paper.

II. RELATED WORKS

This section reviews literature on video streaming in wireless networks. As explored in [1] video streaming causes more overhead and demands high Quality of Service (QoS). Mobile Ad Hoc Network which is self organized and configures its devices automatically is also used for video streaming due to technology innovations [2], [3], [4], and [5]. The nodes in MANET can leave and join automatically on the fly. There are wireless protocols like AODV. AOMDV is an improved form explored in [6] which shares many features of AODV. It followed hop-by-hop approach and based on distance vector. The routes are found on demand using discovery procedure in AOMDV. There is concept of Route Request (RREQ) propagation between source and destination. Multiple route replies are possible from destination to source through intermediate nodes. When it comes to video streaming, wireless radio networks have difficulties in rendering reliable service [7].

Video streaming over dynamic channels is difficult to achieve reliably when compared to that of static channels. The reason behind this is that in dynamic channels the packet loss and delay are not known priori [8]. Thus it is understood that wireless networks need some additional effort to have successful video streaming [9]. There are multiple wireless channels available. It has opportunity to improve communications over them. It also increases network capacity as explored in [10]. There are many advantages of using multiple channels to improve the performance in spite of low bandwidth for video transmission [11].

Routing is the phenomenon used to maintain paths between source and destination. When it comes to video streaming, the main challenge is to find out routes that improve quality of service in rendering video streaming. Multipath routing is said to improve QoS. It is achieved by doing certain things such as breaking capacity of routes, load balancing of routes, and fault tolerance.

III. PROPOSED SYSTEM

The proposed system is the MANET with multi-path routing considering QoS parameters required. As shown in Figure 2, the proposed system is assume to have support for on-demand video streaming and live video streaming through MANET devices. There are many issues as explored earlier such as deterioration of quality, stopping service, jumping and so on. To overcome these issues and to improve the existing system, we proposed a new algorithm in this paper.

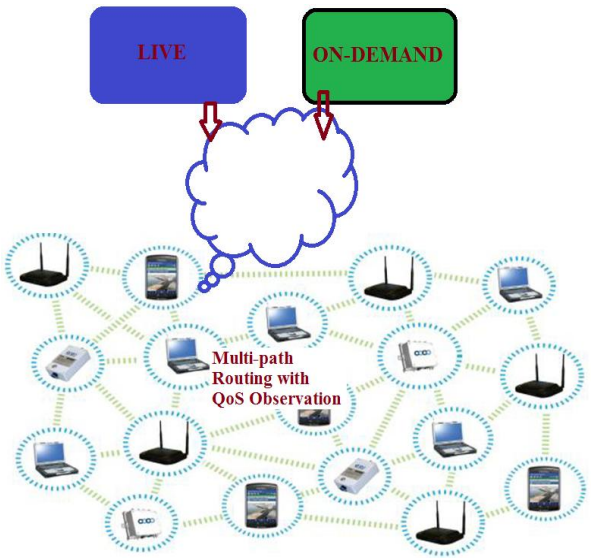

Figure 2 – Shows the MANET with video streaming scenario

As shown in Figure 2, it is evident that multi-path routing with QoS observation is proposed and implemented in the form of a QoS based multi-path routing algorithm. The algorithm not only considered splitting of traffic but also QoS needs and takes well informed decisions in order to improve video streaming quality.

QoS Based Multi-path Routing Algorithm

Here is the proposed algorithm which overcomes the limitations of the existing system.

Algorithm: QoS Based Multi-path Routing Algorithm	
01	Initialize source node as sn
02	Initialize destination node as dn
03	Initialize hop count hc
04	Initialize probe message pmsg
05	Initialize quality of service parameter qos


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06  Initialize quality of service threshold t
07  Initialize best routes vector BR
08  sn sends request to dn
09  dn sends hop count of route
10  Different routes R to dn and hc are known
11  Sort routes in ascending order
12  For each route r in R
13     send pmsg in the route
14     analyse qos
15     IF qos > t and route has less hc THEN
16        add r to BR
17     END IF
18  End For
19  Find count c of BR
20  Split packets into c parts
21  Initialize i to 1
22  while i<=c
23     send a part of data to ith route of BR
24  End
```

Algorithm 1 - QoS Based Multi-path Routing Algorithm

The algorithm finds different routes to destination and hop count as well. However, it further finds out the QoS requirements and filters out the available routes. Thus the proposed algorithm is capable of finding paths that can improve quality of video streaming.

IV. SIMULTIONS AND RESULTS

NS2 simulations are used to demonstrate the proof of concept. Table 1 shows simulation environment. It is followed by the simulation results.

Table 1 – Simulation parameters

S.No	Parameter Type	Parameter Value
1	Channel Type	Wireless Channel
2	Radio-Propagation	Propagation/TwoRayGround
3	Network Interface	WirelessPhy
4	Interface Queue Type	DropTail
5	Antenna Model	OmniAntenna
6	Interface Queue Length	50
7	Routing Protocol	AOMDV
8	MAC Type	MAC 802.11
9	X Co-ordinate	800
10	Y Co-Ordinate	800

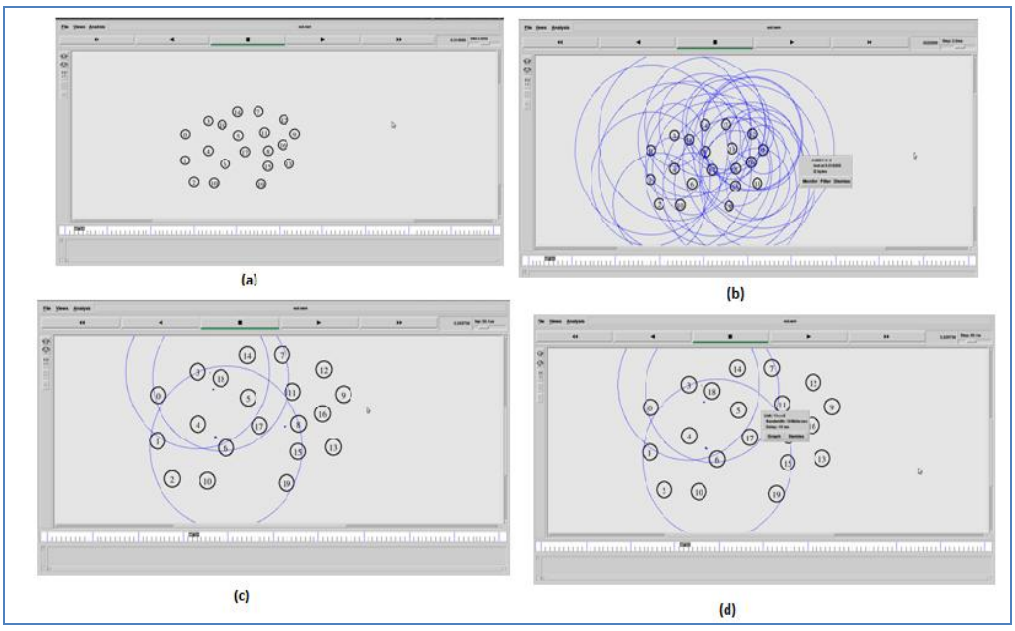

Figure 3 – Shows simulations

As shown in Figure 3, wireless network with 20 nodes (a), he wireless network with protocol propagation, the green circles shows the AOMDV protocol propagation (b), the multi-hop network with multiple packets sending from multiple sources to multiple destinations (c) and the multi-hop network with multiple packets sending from multiple sources to multiple destinations and multiple links (d).

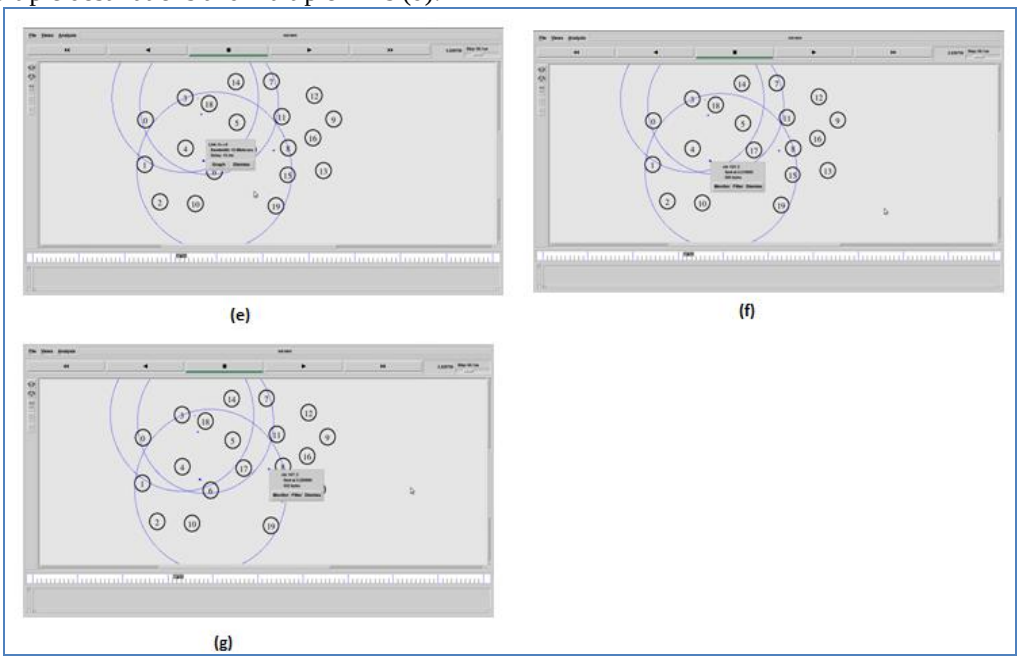

Figure 4 – Shows simulations (contd...)

As shown in Figure 4, the multi-hop network with multiple packets sending from multiple sources to multiple destinations and multiple links (e), the multi-hop network with multiple packets sending from multiple sources to multiple destinations with CBR packets (f), and the multi-hop network with multiple packets sending from multiple sources to multiple destinations with CBR packets (g).

Table 2 – Performance evaluation

Simulation Time	0	2	4	5	8	10	12	14	16	18	20
Packets Received	0	10	20	30	40	50	60	70	80	90	100
Packets Lost	0	0	0	0	0	0	0	0	0	0	0

As shown in Table 1, the results revealed that the number of packets received is increasing as simulation time goes on. At the same time it can be observed that the packet loss is not there in the proposed system.

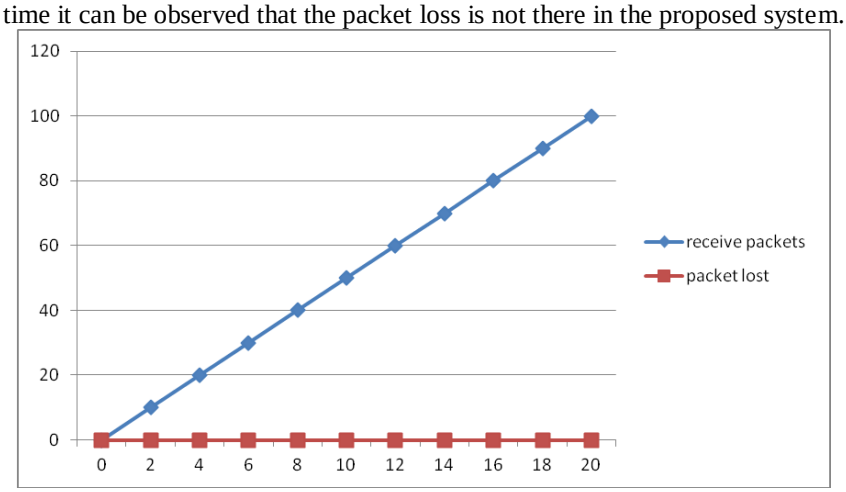

Figure 5 - The graph shows the network performance, X -axis represent the simulation time and Y-axis represents the packets. In graph red curve represent receive packets and green curve represents packet lost.

V. CONCLUSIONS AND FUTURE WORK

In this paper we studied video streaming in MANET. Video streaming needs more resources. However MANET has constrained resources. Therefore it is important to use resources optimally and ensure that video streaming is successful. Many existing algorithms focused on splitting of data into multiple paths so as to improve video streaming performance. However, we found that are certain limitations in this approach. Importantly it does not consider QoS

parameters. It simply ensures that traffic is split and it reaches destination. In this paper we studied the need for QoS parameters and developed an algorithm known as QoS Based Multi-path Routing Algorithm. This algorithm not only considers The algorithm not only considers hop count but also QoS parameters in mind while handling the traffic pertaining to video streaming. For all the routes identified the routes that meet the QoS criteria are found and then decisions of made instead of just splitting and sending the data. Thus optimal performance of video streaming is achieved due to reduced routing overhead in MANET. We implemented the proposed algorithm using NS2 simulations. The results revealed that the proposed system has performance improvement of video streaming over existing system. This research can be extended further to have a hybrid approach that can improve quality of experience further.

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AUTHOR'S PROFILE

Mahanandi.Y obtained B.Tech degree in Computer Science Engineering from Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal Affiliated to Jawaharlal Nehru Technological University, Anantapur, A.P, India. Currently pursuing M.Tech in Software Engineering from Jawaharlal Nehru Technological University Anantapur College of Engineering, JNT University, Anantapur, A.P, India, during 2014 to 2016

