International Journal of Current Engineering and Technology
E-ISSN 2277 – 4106, P-ISSN 2347 - 5161

Available at http://inpressco.com/category/ijcet

Research Article

# Performance Analysis of Multimedia Traffic in MANET with varying speed of mobile subscriber using CBR and VOIP

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Accepted 15 Nov 2014, Available online 01 Dec 2014, **Vol.4, No.6 (Dec 2014)**

***Abstract***

*Mobile Ad-hoc network (MANET) is a well-known infrastructure free communication network that can provide service anywhere and anytime with high data rate. It is a peer to peer communication network where number of node are connected to each other through a wireless link and packet transmission from sender to receiver takes place with neighboring. Each node performs as a router as well as host. In this paper, we analyze the Performance of Multimedia Traffic in MANET with varying speed of mobile subscriber using CBR and VOIP connection. The main focus behind is to save resources (bandwidth) and improve the network scalability, Quality of services (QoS), energy utilization, security, privacy measures, bandwidth optimization performance of Multimedia MANET using routing AODV,OLRSv2 and FSR protocols.*

***Keywords:*** *MANET, CBR, VOIP, Multimedia traffic, FSR.*

## 1. Introduction

Today, in the era of Laptops, tablets, and mobile phones, there is often a requirement to set up a network to enable communication among some of these devices. For movable devices, a wireless network is often very suitable. Wireless networks can be with infrastructure, or without pre-specified infrastructure. Now a days the demand of infrastructure free communication network increasing day by day .There are a lots of technologies developed in the field of wireless network that give temporary communication in a specific region at any time anywhere. Mobile ad hoc network is one of them . It is most efficient and well known infrastructure free communication networks that do not use any base station, access point or centralized controlling administration. MANET is a self-organizing, self-creating network that can provide communication where no infrastructure exists. Mobile ad hoc network is a peer to peer communication network where numbers of node are connected to each other through a wireless link and packet transmission from sender to receiver takes place with neighboring. Each node performs as a router as well as host. There are no any fixed topologies used in mobile ad hoc network because nodes are free to randomly move within transmission area.

But congestion is a very big problem in MANET that degrades the performance of network. Congestion occur in network when load on network cross threshold limit of network i.e. when number of packet sent to the network is greater than the capacity of the network, node capacity of MANET is unknown so in MANET congestion problem increases with increases the node. Congestion causes packet loss, transmission delay, bandwidth degradation, wastage of time and energy. Due to heavy burden of traffic and nodes collision, interference, transmission errors also occur in the network. Congestion cannot be completely avoided but with the help of effective routing table congestion problem can minimized.

MANET clearly indicates that QOS support in MANET is an unavoidable task. Specially, the thrust is on the developed of QOS network that will guarantee the delivery of time sensitive multimedia data. Multimedia traffic should get preference over conventional data traffic during communication through some kind of priority based resource reservation to assure a timely and guaranteed delivery of multimedia data, numerous solution to the QOS problem have been proposed in MANET (Tanenbaum *et al*. 2011) and (Huang, *et al.* 2007).

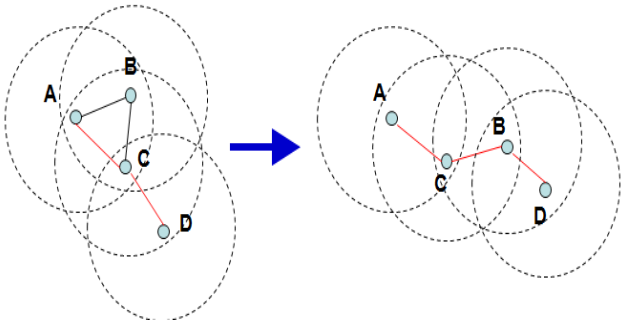


**Fig 1.0** MANET scenario with moving MS

The rest of the paper is organized as follows: Section-2 introduces Overview of AODV, OLSRv2 and FSR

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Routing Protocols; Section-3 gives the briefly introduction of CBR and VOIP traffic model Section-4 gives the Simulation Environment, Section-5 presents Simulation Results and Discussion and performance comparison graphs. Finally, Conclusion is presented in Section-6.

## 2. Wireless Routing Protocols

### *2.1 Ad Hoc On-demand Distance Vector Routing (AODV) protocol*

AODV is a reactive routing protocol. The AODV Routing protocol uses an on-demand approach for finding routes, that is, a route is established only when it is required by a source node for transmitting data packets. AODV enables dynamic, self-starting, multihop routing between mobile nodes wishing to establish and maintain an ad-hoc network. AODV allows mobile nodes to find out routes quickly for new destinations, and does not require nodes to maintain routes to destinations that are not in active communication. It allows nodes to respond to link breakages and a change in network topology in a timely manner. The operation of AODV is loop-free. When a route to a new destination is required, the source broadcasts a RREQ message to find a route to the required destination. A route can be determined when the RREQ message reaches either the destination itself, or an intermediate node with a 'fresh enough' route to the destination [4]. A 'fresh enough' route is a valid route entry for the destination whose associated sequence number is at least as great as that contained in the RREQ. The route is made available by uni-casting a RREP message back to the origination of the RREQ message. Each node receiving the request caches a route back to the originator of the request, so that the RREP can be unicast from the destination along a path to that originator, or likewise from any intermediate node that is able to satisfy the request (Raju *et al*. 2010) and (Mittal *et al.* 2009).

### *2.2 Fisheye State Routing*

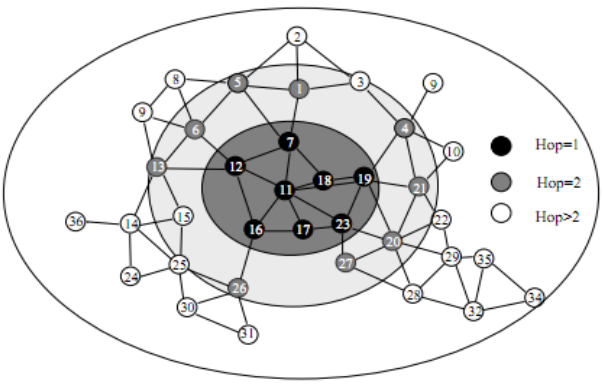


**Fig.2.2** Scope of Fisheye

Fisheye State Routing (FSR) is an implicit hierarchical routing protocol. Also considered a proactive protocol and is a link state based routing protocol that has been adapted to the wireless ad hoc environment. Relays on link state protocol as a base, and it has the ability to provide route information instantly by maintaining a topology map at each node. Thus will maintain updated information from the neighbor node through a link state table. In each node the network, a full topology map is stored then utilized. Fisheye approach translates to maintaining accurate distance and path quality information about the immediate neighborhood of a node, with progressively less detail as the distance increases (Stevens *et al.*1971).

FSR routing protocol perform three major tasks.

1) Neighbor Discovery: responsible for establishing and maintaining neighbor relationships.
2) Information Dissemination: responsible for disseminating Link State Packets(LSP), which contain neighbor link information, to other nodes in the network.
3) Route Computation: responsible for computing routes to each destination using the information of the LSPs.

Initially every node starts has an empty topology table and an empty neighbor list. Invoking the Neighbor discovery mechanism in order to acquire neighbors and to maintain current neighbor relationships After its local variables are initialized. By using the Information Dissemination mechanism, the distribution of LSP in the network is produced. Each node has a database consisting of the collection of LSPs originated by each node in the network. From this database, the node uses the Route Computation mechanism to yield a routing table for the protocol. This process is periodically repeated.

### *2.3 OLSRv2*

OLSRv2 is currently being developed within the IETF. It maintains many of the key features of the original including MPR selection and dissemination. Key differences are the flexibility and modular design using shared components: packet format packet b, and neighborhood discovery protocol NHDP.

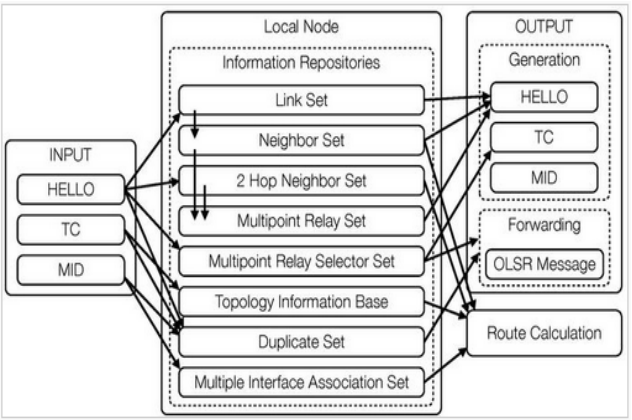


**Fig.2.3** Data flow through OLSRv2 routing protocol.

These components are being designed to be common among next generation IETF MANET protocols. Differences in the handling of multiple address and interface enabled nodes is also present between OLSR and OLSRv2. In OLSRv2, each node obtains a view of

topology and bandwidth information of the whole network. Based on the obtained information, a source node determines a logical path with the maximum available bandwidth to satisfy application-level QOS requirements (Clausen *et al*. 2006).

## 3. Multimedia Traffic

In this paper, To analyse the performance of multimedia traffic in MANET with varying speed of mobile subscriber, there are two type traffic model used first is CBR and second one is Voice over IP (VOIP).

### *3.1 VOIP*

Voice over Internet Protocol (VoIP) is a technology for communicating using Internet protocol instead of traditional analog systems. Some VoIP services need only a regular phone connection, while others allow you to make telephone calls using an Internet connection instead. Some VoIP services may allow you only to call other people using the same service, but others may allow you to call any telephone number - including local, long distance, wireless and international numbers. VoIP converts the voice signal from your telephone into a digital signal that can travel over the Internet. If you are calling a regular telephone number, the signal is then converted back at the other end. Depending on the type of VoIP service, you can make a VoIP call from a computer, a special VoIP phone, or a traditional phone with or without an adapter. In addition, new wireless hot spots in public locations such as airports, parks and cafes allow you to connect to the Internet, and may enable you to use VoIP service wirelessly. If your VoIP service provider assigns you a regular telephone number, then you can receive calls from regular telephones that don't need special equipment, and most likely you'll be able to dial just as you always have. Here is one example of how VoIP service works:

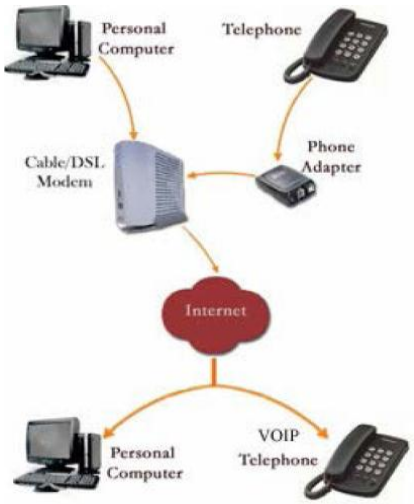


**Fig 3.1** VOIP traffic model

### *3.2 CBR*

The constant bit rate traffic is very well known traffic model for mobile Ad-hoc network. CBR traffic generate data packet at a constant rate. This constant rate packet generational good enough for text data packets. The multimedia applications generally generate packet which some time increases and might be some time followed by some ideal period. CBR traffic model does not accommodate specific feature of multimedia data. Constant bit rate encoding means that the rate at which a codec's output data should be consumed is constant. CBR is useful for streaming multimedia content on limited capacity channels since it is the maximum bit rate that matters, not the average, so CBR would be used to take advantage of all of the capacity. CBR would not be the optimal choice for storage as it would not allocate enough data for complex sections (resulting in degraded quality) while wasting data on simple sections.

## 4. Simulation model and Platform

In this paper, Qualnet simulator tool are used to evaluate the performance of multimedia MANET with varying speed of mobile subscriber for different routing protocol like AODV, OLSRv2 and FSR using CBR and VOIP traffic model. The MAC protocol 802.16 is used in this simulation. In this paper, there are two simulation model is designed over an area of 1500m x 1500m simntaneously with 50 and 100 mobile stations connected to each other with random way point mobility model that moving with speed 0 to 20 mps and channel frequency of 2.4GHz.For multimedia transmission we are also using H.323encoded video sequence to evaluate the performance of routing protocol in terms of throughput, end to end delay, jitter and data received packet in the receiver.H.323 responsible for performing various function like number of received call, number of rejected TCP connection and number of initiated and established call. The simulation is performed by using the network simulator Qualnet 6.1for evaluating different parameters which is shown in table 1 to identify which of protocols gives better performance among other routing protocols.

**Table.1** Simulation parameter

| | |
|---|---|
| Routing protocols | AODV, OLSRV2, FSR |
| Radio type | 802.11n |
| No. of Channels | One |
| Channel frequency | 2.45 Ghz |
| Simulation time | 500 sec |
| FFT | 1024 |
| Standard protocol | H.323 |
| Mobility modal | random way point |
| Mobility speed of MS | 0 to 20 mps |
| Traffic type | CBR and VOIP |
| Simulation area | 1500x1500 |
| No of nodes | 50 and 100 |
| Simulator | Qualnet 6.1 |

## 5. Result and Discussions

In this simulation network simulation model is designed over an area of 1500m x 1500m where 50 mobile stations connected to each other with random way point mobility model that moving with speed 0 to 20 mbps and channel

frequency of 2.4GHz. performance of MANET multimedia traffic analyze with the help of throughput, end to end delay, jitter and data received packet in the receiver with AODV, OLSRv2 and FSR routing protocol for CBR and VOIP at 0 to 10 mbps as well as 0 to 20 mbps speed of MS. The IEEE 802.11n for MANET is used as the MAC layer protocol with constant bit rate (CBR) and VOIP are used as a application layer for transmitting packets between source and destination.

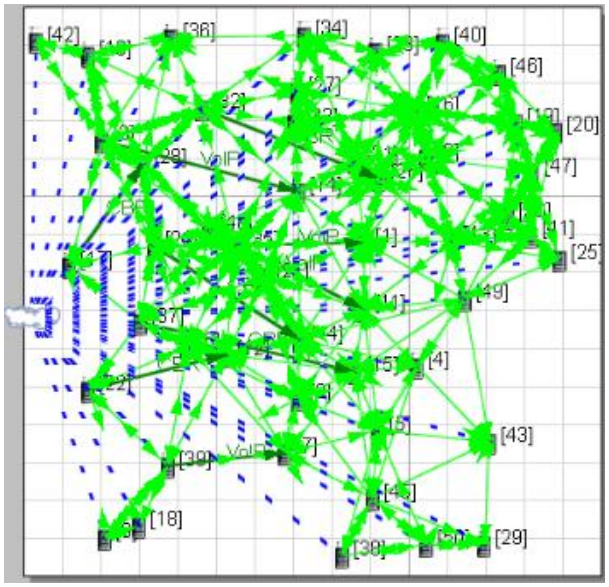

**Fig.5 (a)** Simulation scenario of MANET with 50 nodes for multimedia traffic

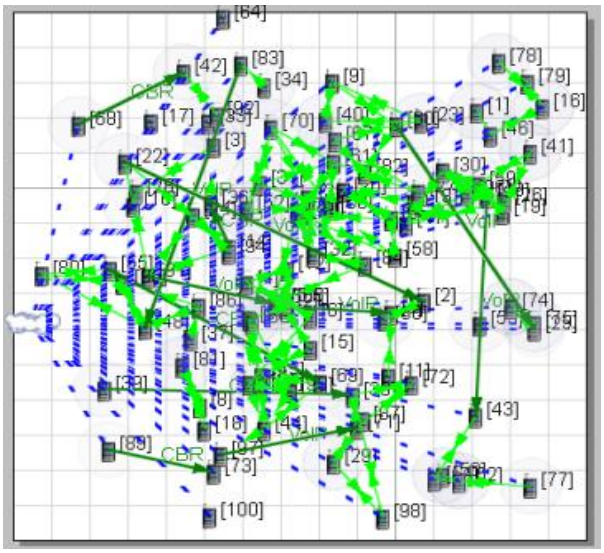

**Fig.5 (b)** Simulation scenario of MANET with 100 nodes for multimedia traffic

*5.1 Throughput*

Throughput is defined as the average rate of successful delivery of packet at the receiver. There are three different routing protocols with 50 and 100 nodes densities where MS moving with speed 0 to 10 mbps and 0 to 20 mbps. Figure 5.1(a) and 5.1(b) show throughput performances of AODV, OLSRv2 and FSR routing protocol for CBR and VOIP with 0 to 10 mbps as well as 0 to 20 mbps speed of MS .from result Throughput performance of routing protocol for CBR and VOIP at 0 to 10 mbps is better than CBR and VOIP at 0 to 20 mbps. Throughput performance of VOIP is good than CBR connection.

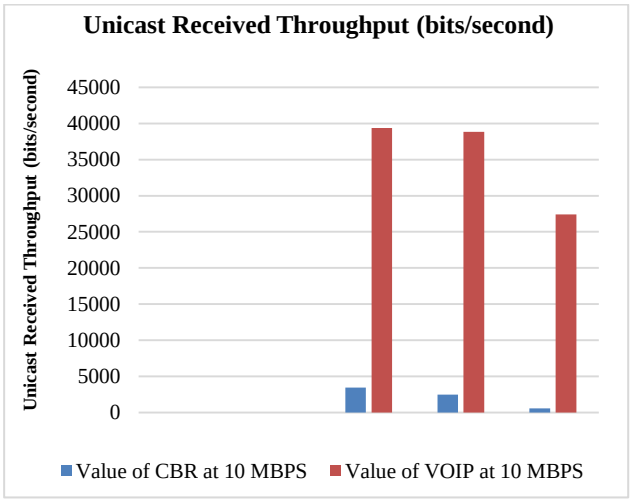


**Fig.5.1 (a)** Unicast received throughput for CBR and VOIP at 0 to 10 mbps

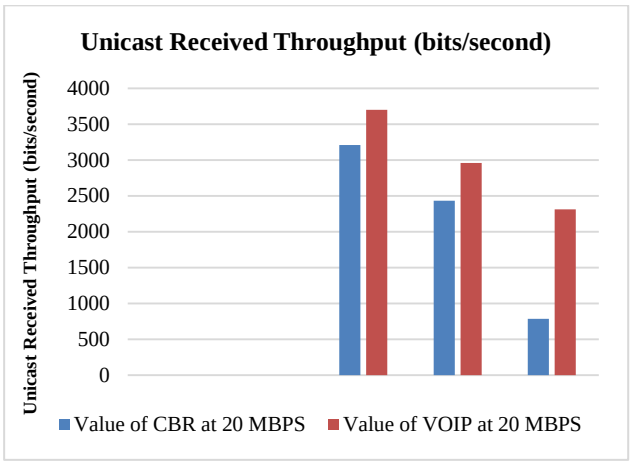


**Fig.5.1 (b)** Unicast received throughput for CBR and VOIP at 0 to 20 mbps

*5.2 Average End-To-End Delay*

End-to-end defined as, the time taken by the packet to travel from sender to receiver. It represents the average data delay an application or a user experiences when transmitting data. There are three different routing protocols with 50 and 100 nodes densities where MS moving with speed 0 to 10 mbps and 0 to 20 mbps. Figure 5.2(a) and 5.2(b) show Average End-To-End Delay performances of AODV, OLSRv2 and FSR routing protocol for CBR and VOIP with 0 to 10 mbps as well as 0 to 20 mbps speed of MS .From result Average End-To-End Delay performance of routing protocol for CBR and VOIP at 0 to 10 mbps is better than CBR and VOIP at 0 to 20 mbps. Average End-To-End Delay performance of VOIP is good than CBR connection.

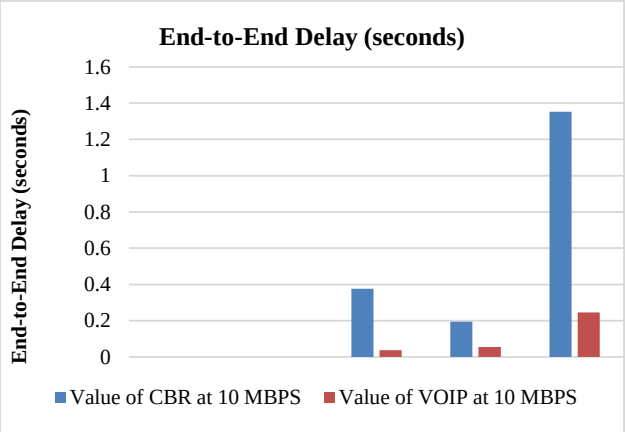


**Fig.5.2 (a)** Average unicast end to end delay for CBR and VOIP at 0 to 10 mbps

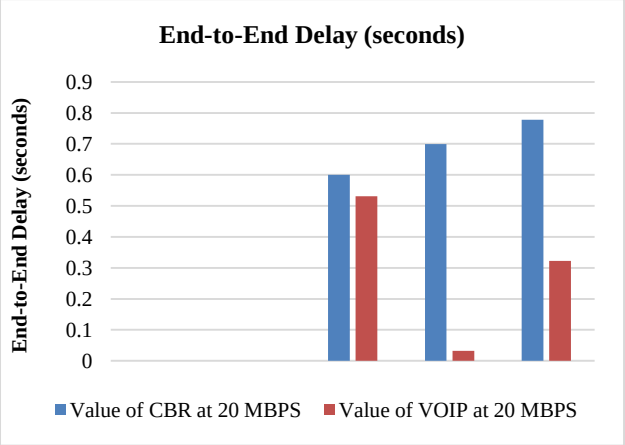


**Fig.5.2 (b)** Average unicast end to end delay for CBR and VOIP at 0 to 20 mbps

*5.3 Data received*

It is defined as the successful delivery of data packet at the receiver.

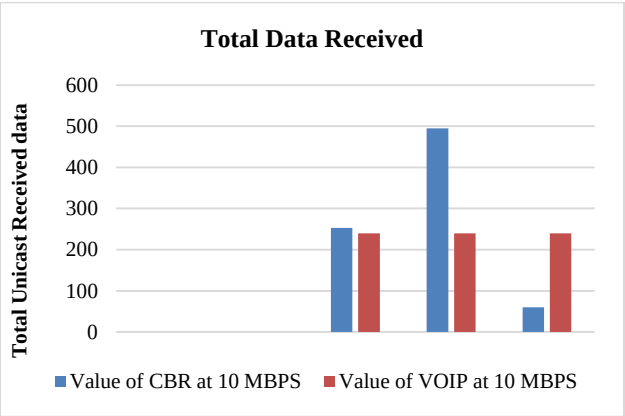


**Fig.5.3 (a)** Total Unicast Data Received (bytes) for CBR and VOIP at 0 to 10 mbps

Figure 5.3(a) and 5.3(b) show Data received performances of AODV, OLSRv2 and FSR routing protocol for CBR and VOIP at 0 to 10 mbps as well as 0 to 20 mbps speed of MS. From result number of successful delivery of packet for CBR and VOIP at 0 to 10 is better than CBR and VOIP at 0 to 20 mbps.

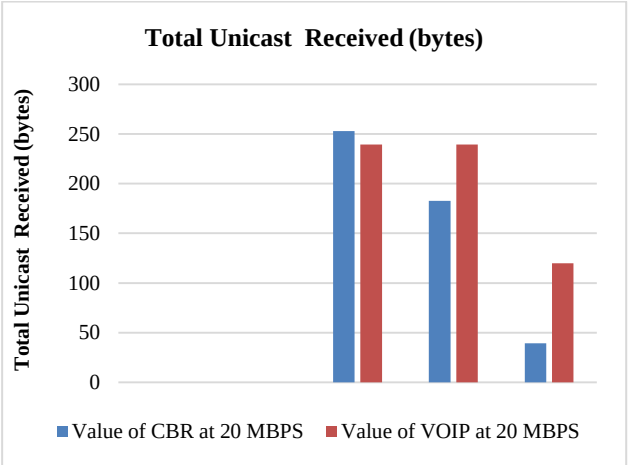


**Fig.5.3 (b)** Total Unicast Data Received (bytes) for CBR and VOIP at 0 to 20 mbps

## Conclusion

In this paper, the performance of routing protocol has been analyzed by using Qualnet simulator 6.1 after analyzed the performances of AODV, OLSRv2 and FSR routing protocol for CBR and VOIP at 0 to 10 mbps as well as 0 to 20 mbps speed of MS. It is concluded that the overall performance of routing protocol for CBR and VOIP at 0 to 10 mbps is better than CBR and VOIP at 0 to 20 mbps.

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