International Journal of Communication Systems and Network Technologies
Vol.4, No.1, 2015

Performance Analysis of CBR Applications on Completely Different Routing Protocols in MANETs

Shailendra Shakya
Electronics Engineering Department, MITS, Gwalior 474005,India
shailendrashakya4.ec@gmail.com

Karuna Markam
Electronics Engineering Department, MITS, Gwalior 474005 ,India
karuna_ markam@rediffmail.com

Abstract - Mobile Ad hoc Networks (MANETs) area unit special reasonably network where node movement is in pre ordered fashion but with high speed as compared to MANETs because of high mobility of nodes then it move in random way, right information in mobile networks can be an advanced. So information sending is not easy due to varied requirements of varied applications in terms of various resources like information and current time. The research work gives performance analysis of four forms of routing protocols on CBR applications. The present paper gives performance of packet delivery ratio, packet loss and packet ratio percent for CBR applications in many situation varied pause times and most, minimum speed of nodes. The scenario of several routing protocols shows variation in many conditions. The performance analysis of varied parameter in terms of Quality of service parameters like packet deliver ratio, packet loss and packet loss percent has been studied by varied altogether totally different conditions of CBR traffic that has provides an insight to packet delivery ratio that in turn area unit typically used to enhance performance of an application in future.

Keywords: MANETs, Routing protocols, AODV, DSR, DYMO, OLSR, Qualnet, traffic CBR

1. Introduction

A mobile accidental Network (MANET) consists of a set of independent mobile hosts connected by wireless links with none fixed or centralized administration. Manet is characterized by its dynamic topology, multiple hop routing, energy restricted operation and network scalability There are a unit numerous applications like constant bit rate traffic (CBR), There are a unit numerous factors that have an effect on the performance of various protocols beside applications like node density, rate of nodes, mobility patterns, traffic which can be enforced in study. The analysis study primarily analyzes the standard of Service metrics for applications as mentioned on totally different protocols like AODV, DYMO, DSR and OLSR thus on specialize in some parameters wherever improvement are often done in order to optimize the performance of applications. Introduction followed by literature review and simulation and results and conclusion. Ad hoc networks are helpful for the applications security and find conferences lectures where central or fixed infrastructure is not helpful. MANETs are characterized by the mobility of nodes, which might move in different area and at different speed that will result in arbitrary topology and frequent partition the network. The characteristic of the network makes the event of routing protocols mutually of the foremost difficult issue.

II. MANET Routing Protocols

a) Adhoc on Demand Vector Routing Protocol (AODV)

It is strictly on –demand routing protocol. Therefore on acquire the path between source and destination a RREQ message is broadcasted to any or all or any the neighbor nodes that over again still send messages to their neighbors until the destination is reached. Every node maintains two variables sequence varies and broadcast ID therefore on possess loop free and contain update information. The ad hoc on demand distance vector (AODV) [4] is predicated on distance vector routing. However, in order to distance vector, it's a reactive protocol i.e. it requests the route once required. It does not need nodes that maintain routes for destinations that are not actively utilized in communication. The options of AODV routing protocol are loop-free routing and immediate notification is to be sent to the affected nodes on link breakage. The formula uses numerous messages to keep up and see links.

These area unit route request (RREQ), route reply (RREP), and route error (RERR).When a source node needs to determine a communication session; it initiates a path- discovery method. The source nodes rebroadcast a RREQ packet with its IP address, sends ID and sequence numbers of source and destination. Therefore ID and IP address is used to uniquely establish every request. Receiver set the return pointer to the source and generates a RREP packet if it is the destination.

b) Dynamic supply Routing (DSR)

DSR is additionally an on Demand routing protocol that sequence of nodes through that packets will travel is calculated and information is hold on in packet header. The supply nodes sent request packets to any or all or any the neighbors among the network containing the address of the destination node and a reply is distributed back to the source nodes with the list of network nodes through that it should move forward among the strategy. Route maintenance is typically done either by hop by hop acknowledgement at the data link layer and end to end acknowledgements. Hop by Hop technique permits early detection and retransmission of lost or corrupt packets among the link layer. once the wireless transmission between two nodes do not work well then end to end replies on the applying layer or transport layer might even be used to indicate the standing of the route from one host to the alternative. All intermediate nodes on the path simply forward the packet to following node as per the packet header [8].

c) The Optimized Link State Routing (OLSR) protocol

OLSR has been designed by the IETF community and it is specified in the Request for Comments 3626 as an experimental protocol. It implements a shortest path routing algorithmic rule that extends the standard link state approach to scale back the overhead of link state updates, particularly in dense ad-hoc networks. As in each link state algorithmic rule, nodes sense their neighborhood by the periodic exchange of HELLO messages. During this manner, nodes learn their local vicinity and therefore the standing of the link with every neighbor (that is, if the link is taken into account unidirectional or bidirectional). This local data is disseminated throughout the total network via periodic Topology control (TC) messages. With the information acquired via hello and TC messages, every node has its own read of the topology and can run the Dijkstra algorithmic rule [32] to get shortest routes to each potential destination. OLSR tags each protocol message with a sequence range to differentiate between stale and contemporary data. The flooding of TC messages could be a very expensive operation in terms of network resources. Busing regular blind flooding, every node would forward a duplicate of the message. To limit the cost of forwarding broadcast messages, OLSR employs the Multipoint Relay (MPR) technique [93] that reduces the amount of nodes that require forwarding a message, though it still reaches the total nonpartitionedpart of network. The MPR approach assumes that a node N has data of its 2-hopneighborhood, that is accomplished in OLSR by enriching hello messages with neighborhood information. Then, N selects a set of relays among its 1-hop neighbors that covers constant2-hop nodes because the complete 1-hop neighborhood will. This set is termed the MPR set of N, and is an MPR selector of every node within the set. If a message is meant to succeed in the total 2-hopneighborhood, only those

DOI-10.18486/ijcsnt.2015.4.1.08
ISSN-2053-6283

nodes selected as MPRs by the source are required to forward the message.

d) Dynamic manet on demand routing protocol (DYMO)

DYMO allows dynamic, reactive, multi hop routing between taking part nodes desire to communicate. The essential operations of the protocol area unit route discovery and management. Using adhoc on demand distance vector (AODV), DYMO borrows "Path Accumulation" from Dynamic source routing and removes redundant route reply (RREP), precursor lists and greeting messages (Route exploration messages) therefore simplifying AODV[10]. It retains sequence numbers and Route error messages from AODV [11]. Once an intermediate node is aware of an active route to the requested destination node, it sends a route reply (RREP) packet back to source node in unicast manner. At the top source node gets RREP and opens the route.

In one in every of the comparative study[12] created by J Haerri, F Filali and C Bonnet title "Performance comparison of AODV and OLSR in VANETs urban environment below realistic mobility pattern ", the motive is to produce the analysis of applicability of the vehicular protocols in several scenarios like variable node density and node mobility. The on top of mentioned protocols are enforced on MANETs very well however their performance on VANETs continues to be not done as VANET nodes have high mobility that is covered during this paper. Moreover, these set of four protocols are implemented on CBR applications to ascertain that however these four protocols can satisfy most QoS parameters and show variations in packet delivery ratio, packet loss and packet ratio. These metrics signify the importance of various routing protocols on completely different applications.

III. Simulation Parameters and Performance Metrics

Qualnet version 5.0.1 could be a distinct event simulator that is getting used here. during this paper, Qualnet is organized by having area 1500x1500 having completely different scenarios. Four protocols area unit taken into thought i.e. AODV,DSR,DYMO and LAR with varied network sizes , mobility of nodes by varied speeds of the nodes, pause time and vary size of packet ,simulation time. Completely different scenarios area unit created keeping a number of the issues constant and alter one at a time to ascertain the impact of that specific factor on QoS metrics beneath observation. Important different traffic types can have different set of results keeping an equivalent protocols once simulated in one in every of the situation. During this study completely different formulae are used for calculation of packet delivery ratio, packet loss and packet ratio.

3.1 PERFORMANCE METRICS

Packet Delivery ratio is vital metric to measure the performance of routing protocol .Packet Delivery ratio is outlined because the ratio of the entire packets received by all destination nodes and also the total packets sent by all source nodes[5]. Packet Loss is that the ratio of the number of packets that never reached the destination to the number of packets originated by the source [5]

$$\mathrm{PL\%} = \frac{\text{n sent packets} - \text{n received packets}}{n\ sent\ packets} * 100$$

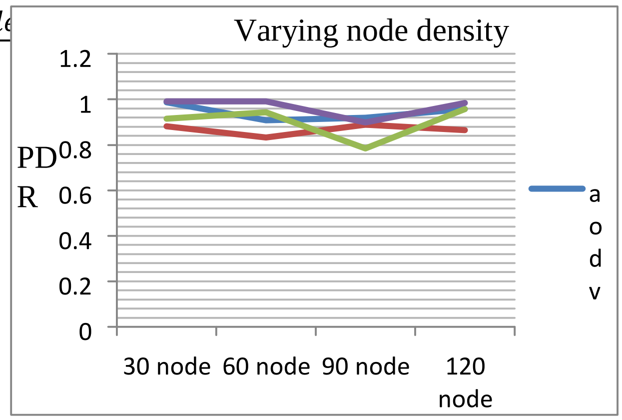
Table 3.1 Simulation arameter

Parameter	Value
Protocols	AODV, DSR, DYMO, OLSR
Number of Node	30, 60, 90, 120,
Pause time	20s, 60s, 100, 120,
Simulation time	30s
Traffic type	CBR
Simulation Range	250m
Mobility Model	Random Way Point Model
Simulation Area	1200x1200
Node Speed	0, 10, 20, 60, 90, Km/h
Simulator	Qualnet
MAC Protocols	802.11
Packet Size	1024
Radio Propagation Model	Two Ray Ground

DOI-10.18486/ijcsnt.2015.4.1.08
ISSN-2053-6283

In the present paper four scenarios are simulated on the idea of that sure results are obtained and a few outcomes and inferences area unit drawn. The impact of all the four protocols i.e AODV,DSR,DYMO and olsr area unit studied on each kind of traffic like constant bit rate traffic and variable bit rate traffic in terms of packet delivery ratio, packet loss and packet loss (%).

$$\text{PDR} = \frac{\sum(total\ packet\ received\ by\ all\ destination\ nodes)}{\sum(total\ packets\ send\ by\ all\ source\ nodes)}$$



$$\text{PL} = \frac{n\ sent\ packets - n\ received\ packets}{n\ sent\ packets}$$

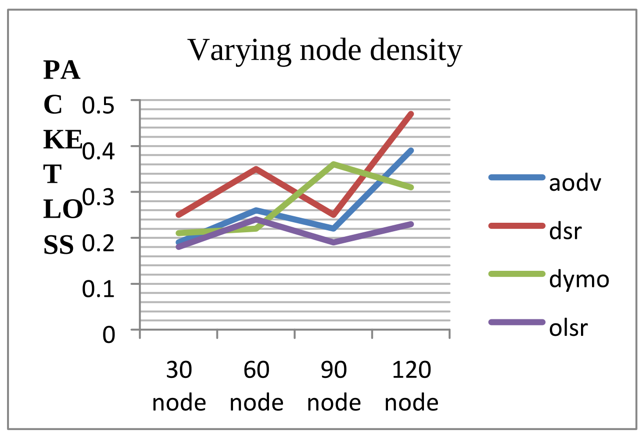


Figure 3.1 (e) Packet loss for CBR Traffic with varying Node Density

Figure 3.1(d) Packet Delivery Ratio for CBR Traffic with varying Node Density

DOI-10.18486/ijcsnt.2015.4.1.08

ISSN-2053-6283

It is discovered here that Packet Delivery ratio has been decreasing with increasing node density really for cbr traffic, AODV and DSR there has been reduction in packet delivery ratio however once nodes area unit increased to 120, a gain in PDR has been discovered. Similar is that the case for DYMO however olsr keeps a gradual pace for packet delivery ratio successively keeping packet ratio a lot of or

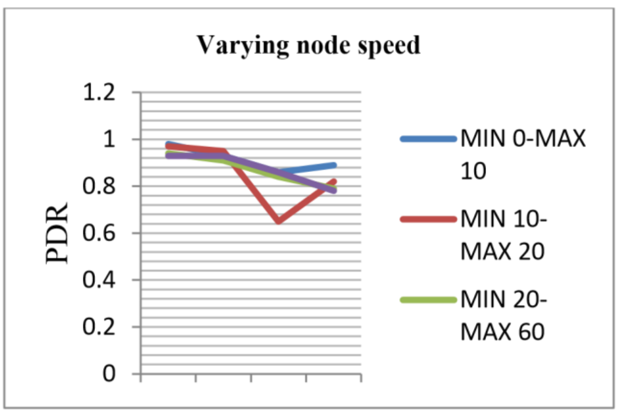
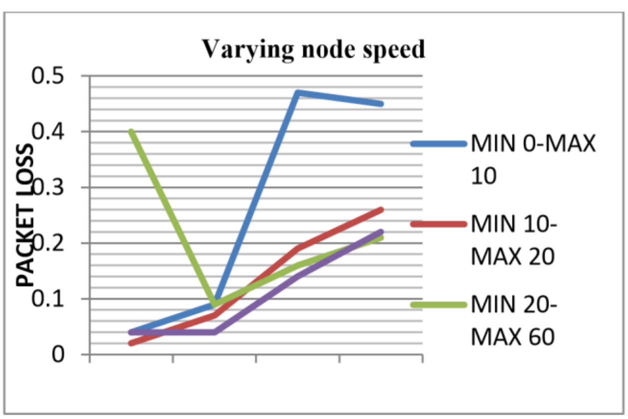


Figure 3.1 (f) PDR of CBR traffic with varying speed of nodes



less same. Packet loss and packet ratio is reciprocally proportional to packet delivery ratio as packet loss is a lot of once more of error packets are there and additional retransmissions.

Figure 3.1 (g) PL of CBR traffic with varying speed of nodes

Packet delivery ratio has been absolutely decreasing with the increasing rate of nodes for cbr traffic is showing irregularities in its behavior in terms of packet delivery ratio. DSR is vastly reducing packet delivery

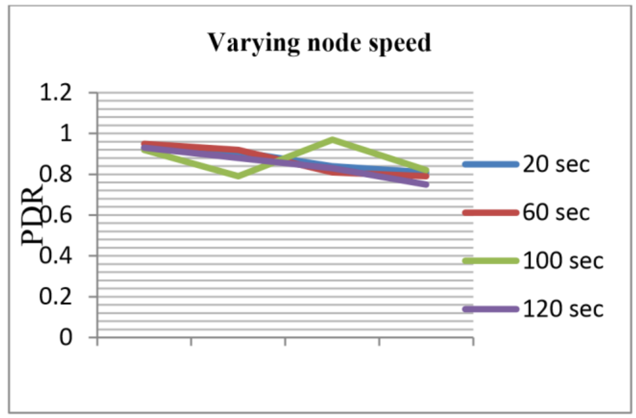


Figure 3.1 (h) Effect of changing pause times on CBR in terms of PDR

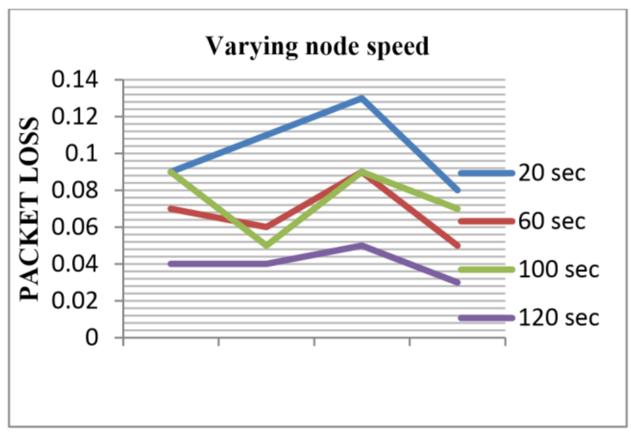


Figure 3.1 (i) Effect of changing pause times on CBR in terms of PL

ratio once increasing speed of nodes for cbr traffic whereas AODV, OLSR and DYMO are a lot of or less behaving in same manner. it is discovered that olsr is giving most packet delivery ratio even with variable and highest speed of minimum 20 and most 90 mps.

When pause times are varied, important decrease has been seen in packet delivery ratio for cbr traffic particularly once pause time is formed 60s whereas for pause time 100s, there has been reduction in packet delivery ratio for AODV and DSR. DYMO doesn't amendment packet delivery ratio however olsr will increase PDR.

Table 2 CBR Traffic With Varying Node Density In Terms of PDR, PL, and PL(%)

Node Density	30	30	30	60	60	60	90	90	90	120	120	120
	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%
AODV	0.98	0.19	19	0.90	0.26	26	0.91	0.22	22	0.95	0.39	39
DSR	0.88	0.25	25	0.83	0.35	35	0.88	0.25	25	0.86	0.47	47
DYMO	0.91	0.21	21	0.94	0.22	22	0.78	0.36	36	0.95	0.31	31
OLSR	0.99	0.18	18	0.99	0.24	24	0.89	0.19	19	0.98	0.23	23

Table 3 Effect Of Mobility Of Nodes On CBR Traffic In Terms Of PDR, PL, PL Ratio

Node speed	0-10	0-10	0-10	10-20	10-20	10-20	20-60	20-60	20-60	20-90	20-90	20-90
	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%
AODV	0.98	0.04	4.0	0.93	0.09	9.0	0.86	0.47	47	0.89	0.45	45
DSR	0.97	0.02	2.0	0.95	0.07	7.0	0.65	0.19	19	0.82	0.26	26
DYMO	0.94	0.05	5.0	0.91	0.09	9.0	0.84	0.16	16	0.79	0.21	21
OLSR	0.93	0.04	4.0	0.93	0.04	4.0	0.86	0.14	14	0.78	0.22	22

Table 4 CBR Traffic With Different Pause Time

Pause time	20s	20s	20s	60s	60s	60s	100s	100s	100s	120s	120s	120s
	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%	PDR	PL	PL%
AODV	0.93	0.09	9.0	0.91	0.11	11	0.84	0.13	13	0.81	0.08	8.0
DSR	0.95	0.07	7.0	0.92	0.06	6.0	0.81	0.09	9.0	0.79	0.05	5.0
DYMO	0.92	0.09	9.0	0.79	0.05	5.0	0.97	0.09	9.0	0.82	0.07	7.0
OLSR	0.93	0.04	4.0	0.88	0.04	4.0	0.83	0.05	5.0	0.75	0.03	3.0

DOI-10.18486/ijcsnt.2015.4.1.08

ISSN-2053-6283

IV. Conclusion

The on top of qualitative results show that AODV has been found to be acting higher in most of the scenarios followed by olsr. AODV and olsr have shown showing very little variations in PDR with relevance node density whereas DSR has shown large variation in PDR. With relevance the amendment in mobility of nodes, all the four protocols have shown a decline in packet delivery ratio and increase in packet loss and packet ratio for each cbr traffic. Packet loss could be a metric that could be able to offer USA range of error packets and retransmissions whereas disseminating knowledge which might be utilized for change the retransmissions and reducing route error packets. In future, we have a tendency to propose to think about metrics like delay and noise on tcp traffic. The analysis of the various research has indicated that by combining two or a lot of protocols the packet ratio will any be reduced with improvement in PDR by mitigating error propagation in knowledge transmission.

References

[1]. Vaishali and ketan Katocha "Simulation based performance evaluation of routing protocols in Vehicular Adhoc Networks" International Journal of scientific and research publications Volume 3 Issue 10 Oct 2013

[2]. Savita Gandhi, Nirbhay Chaubey, Naren Tada, Surshiti Trivedi , "Scenario Based Performance Comparison of Reactive, Proactive and Hybrid Protocols in MANET",International Conference on Computer Communication and Informatics,Jan.10-12, 2012, IEEE,2012.

[3]. GS Tomar, Jung-Yoon Kim, Laxmi Shrivastava, SS Bhadauria, Won-Hyung Lee,"Load Balanced Congestion Adaptive Routing for Mobile ad hoc Networks", HindawiInternational Journal of Distributed sensor Networks, Vol. 2014, pp 1-10, Feb 2014.

[4]. Zahian Ismail, Rosilah Hassan, "A Performance Study of Various Mobility Speed on AODV Routing Protocol in Homogeneous and Heterogeneous MANET" ,Seventeenth Asia-Pacific Conference on Communivations,2nd-5th October 2011,Malaysia, IEEE,2011,pp637-642.

[5]. Laxmi Shrivastava, SS. Bhadauria, G.S. Tomar, "Influence of Traffic Load on the performance of AODV, DSR and DSDV in MANET", International Journal of Communication Systems and Network Technologies, Vol.1 Issue 1. pp 22-34, Apr 2013.

[6]. Li Layuan, Li Chunlin nd "Performance evaluation and simulations of routing protocols in ad hoc networks" In science direct, (2007), pp. 1890–1898.

[7]. Khushboo Agarwal and Vikash Sejwar, "Effect on Throughput Due to Changes in Transmission Power of Nodes in MANETs", International Journal of Future Generation Communication and Networking Vol. 8, No. 3 (2015), pp. 207-

[8]. GS Tomar, Laxmi Shrivastava, SS Bhadauria, "Load Balanced Congestion Adaptive Routing for Randomly Distributed Mobile Adhoc Networks", Springers International Journal of Wireless Personal Communication, Vol.75, No.2(II), pp 2723-2733, Feb 2014.

[9]. Dipali Koshti, Supriya Kamoji, "Comparative study of Techniques used for Detection of Selfish Nodes in Mobile Ad hoc Networks"International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1, Issue-4, September 2011 .

DOI-10.18486/ijcsnt.2015.4.1.08

ISSN-2053-6283