

# Enhancement in the performance of quality of service parameters in routing protocols for wireless communication

Kanchan Dhote<sup>1</sup>

Department of Electronics Engineering  
Tulsiramji Gaikwad-Patil College of Engineering &  
Tech.  
Nagpur, Maharashtra, India  
*e-mail: hod.etrx@tgp cet.com*

Dr.G.M.Asutkar<sup>2</sup>

Principal, Priyadarshani Indra Gandhi College of  
Engineering Nagpur, Maharashtra, India  
*e-mail: g\_asutkar@yahoo.com*

**Abstract**— The field of wireless communication networks has thus been a keen area of research in the last decade. One of the crucial parameter for efficient operation of any wireless network is the routing algorithm. Advances in electronics and telecommunication industry in the last few decades have tremendously increased the use of wireless communication systems. However the choice of the routing algorithm depends not only on the physical topology and geography of the network but also on the application. This paper presents performance analysis of various routing protocols namely AODV, AOMDV, DSDV & DSR. These protocols are analyzed on four network parameters: Throughput, Jitter, Delay and Energy consumption. The results are shown in this paper after the analysis for four parameters. Further cluster head selection, Encryption, Compression is applied to improve the performance of protocols and the results are shown with the help of graphs.

**Keywords-** Routing; Protocols; AODV; AOMDV; DSDV; DSR.

\*\*\*\*\*

## Introduction

The use of wireless devices for various commercial and non-commercial applications has increased tremendously in the last few years. Wireless communication is among technology's biggest contributions to mankind [1]. Further on-the-move internet facility and cheaply available wireless devices has added to this increase. Most organizations are potentially moving towards wireless networks today due to its obvious advantages. With the use of modern day digital image and video transmission techniques the amount of data which is getting transmitted through these wireless networks has doubled many folds. These needs researchers have proposed various techniques to improve the efficiency and reliability of these wireless networks.

Routing protocol is the most critical factor determining the efficiency of these wireless networks. Different routing protocols have been proposed in the past and yet are getting modified to achieve better throughput and minimum delay. These routing algorithms to some extent depend on the topology and application of the network. For example a routing algorithm may give superior performance in case of mobile ad-hoc networks as compared to its performance in wireless sensor networks.

This paper presents a comparative performance analysis some of the breakthrough routing protocols for wireless networks. Routing protocols are analyzed on the basis of four network parameters: delay, throughput, jitter and energy consumption. The following section discusses these brief the routing algorithms namely AODV, AOMDV, DSDV, DSR.

## I. LITERATURE SURVEY

Routing protocols has been MANETs proposed so far. Some of them have been a breakthrough in the field of wireless communication networks. Some most commonly used routing protocols are discussed here.

### 1. Ad hoc On-Demand Distance Vector (AODV)

It is a routing protocol for other wireless ad-hoc networks. It is an on-demand routing protocol i.e., processed in a path as when process is started. In AODV protocol the network node that needs a connection first requests for connection using broadcasts which is forwarded by other nodes. Non-used routes in the routing tables are flushed after some time. In case of link failures error is passed to its node of transmission with repetition.

Advantages:

- Established on demand
- Destination has a specified sequence in terms of its destination.
- Lower delay
- In networks with light or moderate traffic requirements this protocol scales perfectly

Disadvantages:

- Unnecessary bandwidth consumption due to periodic beaconing.
- Is problematic for heavy traffic and high mobility networks.
- Intermediate nodes can lead to inconsistent routes.
- Lower BW.

### 2. Ad-hoc on-demand Multipath Distance Vector (AOMDV)

AOMDV computes multiple loop-free paths per route discovery. This helps the protocol to switch routes to a different

path in case a path fails without the need for a new route discovery. Route discovery is initiated only when all paths to a specific destination fails.

Advantages:

- a) Routes established on demand
- b) Link disjoint paths are computed so that paths fail independent of each other.
- c) Better BW as compared to AODV
- d) Is more suited to moderate to high traffic requirements.
- e) Delay is better as compared to alternative routes as compared to AODV

Disadvantages:

- a) Requires much more overheads as compared to AODV.

### 3. Destination sequenced distance vector routing (DSDV)

DSDV is a modified version of the conventional RIP protocol and is based on Bellman-Ford algorithm [4]. It adds a new attribute, sequence number, to each route table entry of the conventional RIP. In DSDV, each node maintains a routing table containing all available destinations routes, the metric and next hop to each destination and a sequence number generated by the destination node. Each node updates the routing table through periodic advertisement.

Even sequence number denotes link is present and odd number if link is not present or fails. It is dispersed by smaller incremental updates more frequently.

Advantages:

- a) Solves routing loop problem efficiently
- b) Latency of route discovery is low

Disadvantages:

- a) Requires frequent up gradation of various routing tables, which has its use of battery power and bandwidth.
- b) Suffers through route fluctuation because of its criteria of frequent route updates.
- c) Care should be taken to reduce the number of control messages.

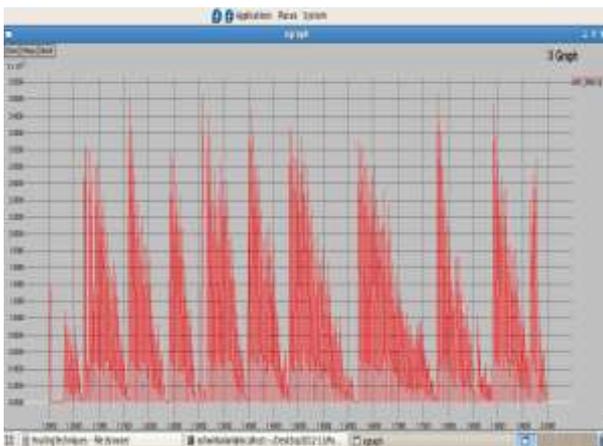
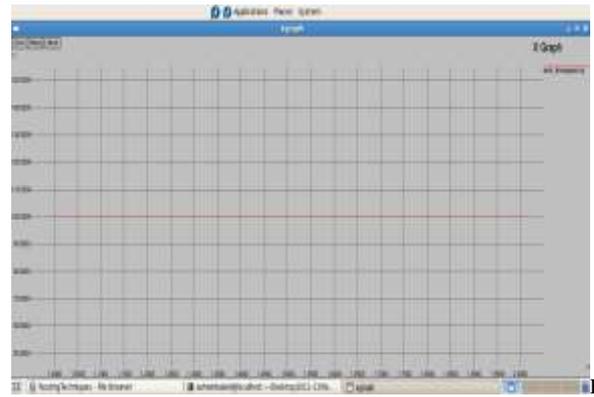


Figure 1.a. Delay graph for AODV



1.b. Throughput graph for AODV

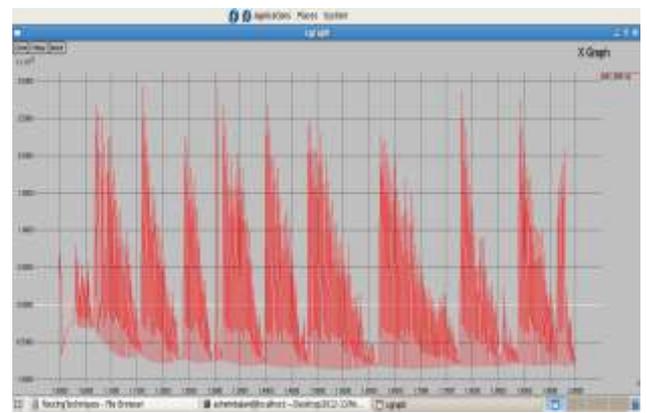


Figure 1.c. Jitter graph for AODV

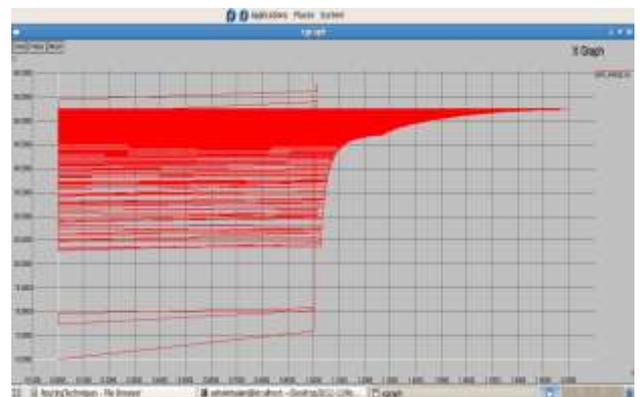


Figure 1.d. Energy consumption graph for AODV

### 4. Dynamic Source Routing (DSR)

DSR is an on-demand routing protocol based on source routing technique in which a sender determines the exact sequence of nodes through which to propagate a packet [5]. In DSR, every node maintains a route cache to store source routes that it has learned. When a host wants to send a packet to some other host, it first checks its route cache for a source route to the destination. In the case a route is found, the sender uses this route to propagate the packet. Otherwise the source node initiates the route discovery process.

Advantages:

- a) It eliminates essence of flooding the network containing table messages.

- b) Use of route cache reduces the control overhead
- Disadvantages:
  - a) Requires route supervision with reliability to rectify broken link.
  - b) Connection setup delay is high.
  - c) The performance degrades rapidly with increasing mobility.

II. RESULTS

To analyze these routing protocols we have implemented a wireless sensor network on NS-2 consisting of 20 wireless nodes. Figure 1 below shows all the graphs for AODV protocol. Figure 2 to 9 below show only the delay and throughput graphs for other routing protocols. Table 1 below shows the comparison on the basis of all four parameters: throughput, delay, energy and jitter.

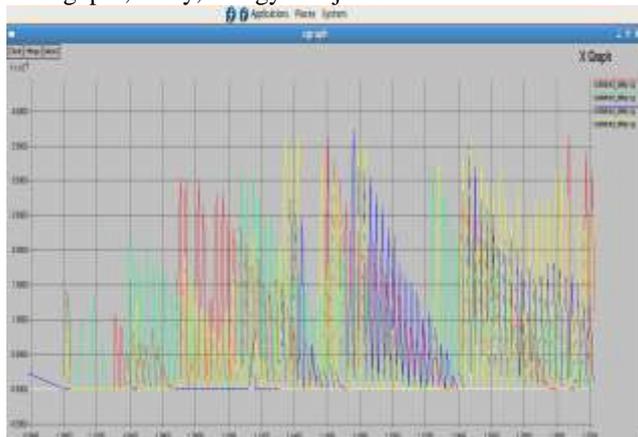


Figure 2. Combined graphs of four protocols for DELAY



Figure 3. Combined graphs of four protocols for Energy

Parameter \ Protocol	Delay	Throughput	Jitter	Energy Consumption
AODV	High	Better	High	High
AOMDV	Medium	Best	High	High
DSDV	Low	Better	Medium	Highest
DSR	Low	Good	Highest	High

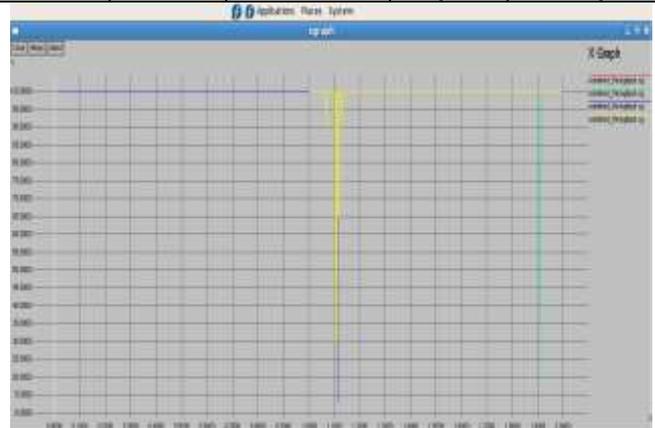


Figure.4. Combined graphs of four protocols for Throughput

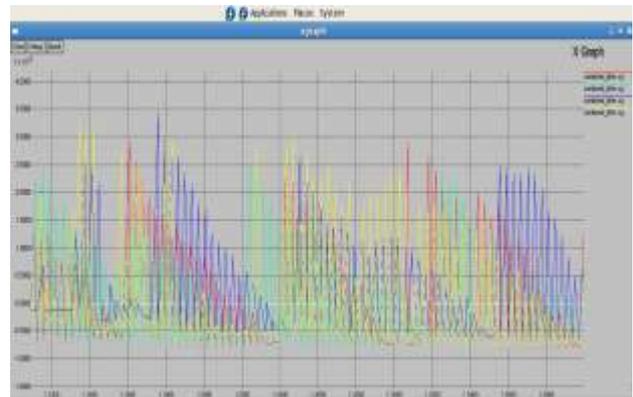


Figure 5. Combined graphs of four protocols for Jitter

In the given graphs, red color indicates AODV protocol, blue color indicates DSDV protocol, yellow color indicates DSR protocol and green color indicates AOMDV protocol.

Table I: Comparison Table

After the comparison we come to the conclusion that AOMDV protocol is the best out of four protocols.,Further the cluster head selection process ,Compression & Encryption method is applied to the AOMDV and the Quality of Service parameters are improved.It is proved though the following grap

Compression and Encryption

As in terms of the analysis it has been obtained in the following given below parameters:-

- A) Run Length Encoding (RLE)

B) Elliptic Curve Cryptography (ECC);

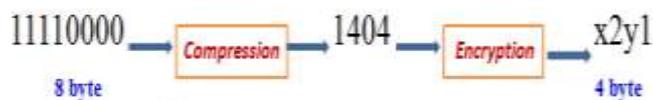


Figure 2. Compression and Encryption process

Let us assume as per the provided Figure 2. We proceed with the analysis patterns with reference to:-

1. For 1 byte if energy required is 0.1 millijoule
2. 8 byte it required 0.8 millijoule
3. 4 byte only 0.4 millijoule energy will be required.

A) Run Length Encoder (RLE)

With the implementation Compression technique we use as such:

1. Represents data using value and run length
2. Run length defined as number of consecutive equal values

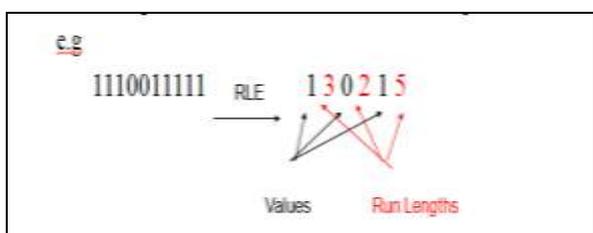


Figure 3. Run Length Encoder Example and process

B) Elliptic Curve Cryptosystems

- It has been seen that device consideration to be much smaller with less storage and process based computational power.
- Application of Elliptic Curve Cryptosystems :-
  - Used in varied communication devices having non-wired communications.
  - Payroll enabled cards.
  - Server side enrolled for web based tasks.

The red colour in the below shown graphs, shows the performance of routing protocol before applying Clustering, Compression & Encryption and the green colour shows the results after the application of Clustering, Compression & Encryption.

**Comparative Graph of Quality of Service Parameters after applying Clustering, Compression & Encryption.**



Figure 6. Comparative graph for delay

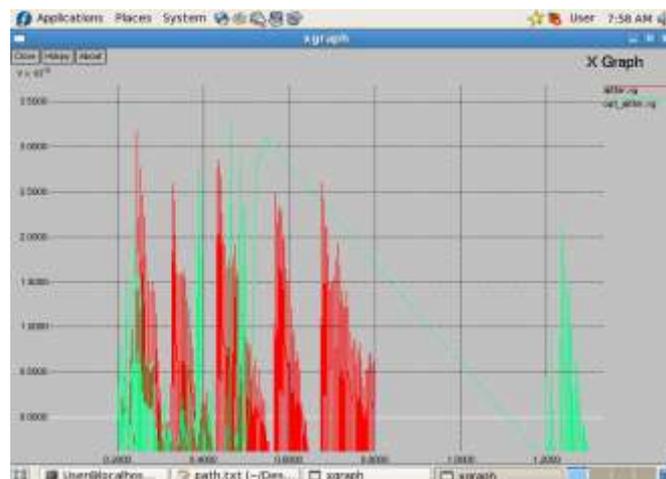


Figure 7. Comparative graph for Jitter

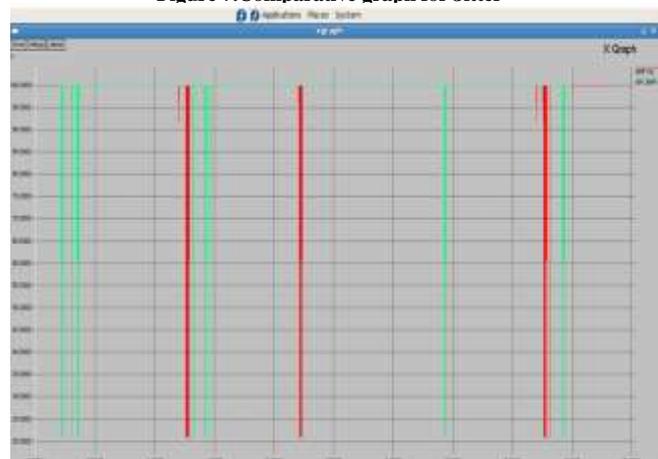


Figure 8. Comparative graph for Packet Delivery Ratio (PDR)

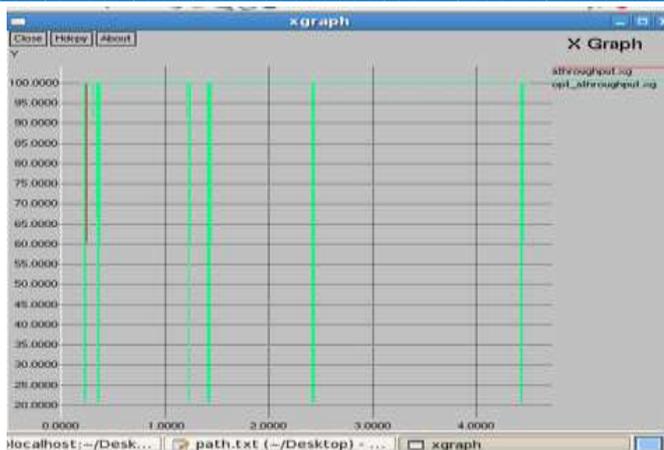


Figure 9. Comparative graph for Throughput

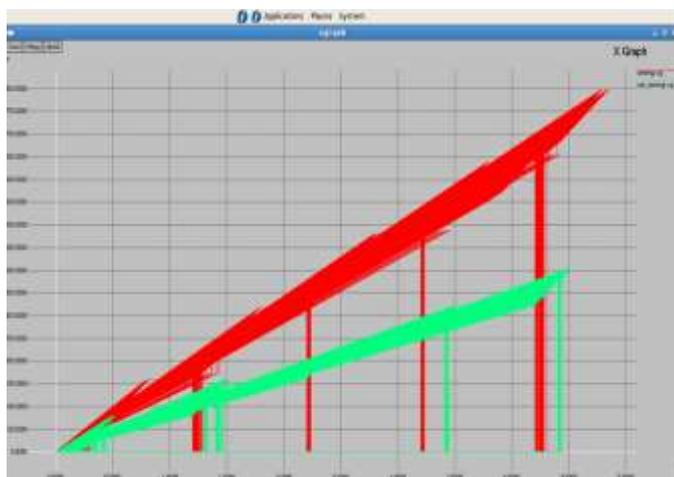


Figure 10. Comparative graph for Energy Consumption

### III. CONCLUSION

In this paper, we have presented a performance analysis of four different routing protocols for wireless network communication. These protocols have been implemented in NS-2 and are analyzed on the basis of four crucial parameters: Throughput, delay, jitter and energy consumption. After analysing the graphs, we conclude that AOMDV is better in comparison to AODV, DSR and DSDV as it has best throughput but suffers from high jitter and energy. AOMDV is thus suitable for networks where nodes are having sufficient energy. After applying the clustering, Compression & Encryption, the Quality of service parameters are improved.

### REFERENCES

- [1] "Information technology - telecommunication and information exchange between systems - local and metropolitan area networks - specific requirements - part 11
- [2] Wireless lan medium access control (mac) and physical layer (phy) specifications," IEEE Standard, Tech. Rep., 1999
- [3] C. Perkins, E. Belding-Royer, S. Das. Ad hoc On-Demand Distance Vector (AODV) Routing. Feb. 2003. <http://www.ietf.org/internet-drafts/draftietf-manet-aodv-13.txt>
- [4] H.D.Trung, W.Benjapolakul, P.M.Duc, "Performance evaluation and comparison of different ad hoc routing protocols", Department of Electrical Engineering, Chulalongkorn University, Bangkok, Thailand, May 2007
- [5] Charles E. Perkins et al. "Highly Dynamic Destination -Sequenced Distance-Vector Routing (DSDV) for Mobile Computers", published in SIGCOMM, London, UK, 1994, pp.234-244.
- [6] D. B. Johnson and D. A. Maltz, "Dynamic Source Routing in Ad-Hoc Ad hoc Networks," Mobile Computing, ed. T. Imielinski and H. Korth, Kluwer Academic Publishers, 1996, pp. 153-181.
- [7] V.D.Park and Scott.M.Corson, "A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks", Proceedings of INFOCOM 1997.
- [8] Yan Yu, Ramesh Govindan and Deborah Estrin, "Geographical and Energy Aware Routing: A Recursive Data Dissemination Protocol for Wireless Sensor Networks", UCLA Computer Science Department Technical Report UCLA/CSD-TR-01-0023, May 2001.
- [9] Lilin Wang, Jie Liu, Wei Wang. "An Improvement and Simulation of LEACH Protocol for Wireless Sensor Network" International Conference on Pervasive Computing, Signal Processing and Applications, 2010.
- [10] NS -2. <http://www.isi.edu/nsnam/ns>