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Quality Assurance Metric Based Comparison of AODV and DSR Routing Protocols

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Abstract— An ad hoc network is a collection of mobile nodes dynamically forming a temporary network without the use of any existing network infrastructure or centralized administration. Routing in ad-hoc network is one of the challenging issues. Several routing protocols have been proposed for ad hoc networks and prominent among them are Ad hoc On Demand Distance Vector Routing (AODV) and Dynamic Source Routing (DSR). This Paper analyses the performance of AODV and DSR routing protocols for the quality assurance metrics. The performance differentials of AODV and DSR protocols are analyzed using NS-2 simulator and compared in terms of quality assurance metric applied.

Keywords— MANET; AODV; DSR; NS2; NAM; PDR.

I. INTRODUCTION

An ad hoc network is a collection of wireless mobile nodes (or routers) that forms a temporary network. An ad hoc network is established without the use of any existing network infrastructure or centralized administration. The ad hoc system model assumes that mobile hosts can form networks without the participation of any fixed infrastructure [1]. As to infrastructure less approach, the mobile wireless network is commonly known as a mobile ad hoc network (MANET) [2]. Due to the mobility of the nodes in a MANET, the network topology may be connected in any arbitrary manner and may change dynamically. Such a topology is randomly changing and is unpredictable [3]. Nodes in the MANET share the wireless medium. The density of nodes and the number of nodes are depends on the applications in which we are using MANET. Each node in the MANET works as intelligent node and works both as a DTE (Data Terminal Equipment) and DCE (Data Communication Equipment). Ad hoc network may operate alone or may be connected to the Internet. Ad hoc networks therefore refer to networks created for a particular purpose. With the increase of portable devices as well as progress in wireless communication, ad hoc networking is gaining importance with the increasing number of widespread applications. Ad hoc networking can be applied anywhere where there is little or no communication infrastructure or the existing infrastructure is expensive or inconvenient to use. Ad hoc networking allows the devices to maintain connections to the network as well as easily adding and removing devices to and from the network. MANETs can be exploited in a wide area of applications, from military, emergency rescue, law enforcement, commercial, to local and personal contexts.

Rest of the paper is organized as: section II describes routing protocols proposed for ad hoc networks. Main features of AODV and DSR are presented in section III and Quality assurance metric is introduced in section IV. Simulation and results in form of graphs are represented in section V. Last Section gives conclusion.

II. ROUTING PROTOCOLS

Routing protocols tells the way how a message is sent from source to the destination. Whenever a packet needs to be transmitted to a destination via number of nodes a routing protocol is required. For ad hoc network numerous routing protocols have been proposed. Routing protocols proposed for ad hoc networks cope well with the dynamically changing topology [4]. Different routing protocols have been proposed and are classified into two major categories as Proactive and Reactive [5].

- Table driven/proactive routing protocols
- On-demand/reactive routing protocols

In Table Driven routing protocols each node maintains one or more tables containing routing information to every other node in the network. All nodes keep on updating these tables to maintain latest view of the network. Some of the existing table driven protocols are optimized linked state routing (OLSR), Destination Sequenced Distance Vector (DSDV).

In On-demand routing protocols, routes are created as and when required. When a transmission occurs from source to destination, it invokes the route discovery procedure. The route remains valid till destination is achieved or until the route is no longer needed. Some of the prominent on demand routing protocols are Dynamic Source Routing (DSR), Ad hoc On Demand Distance Vector (AODV) and Temporally Ordered Routing Algorithm (TORA).

The Paper analyses the performance of AODV and DSR routing protocols for the quality assurance metric.

III. FEATURES OF AODV AND DSR ROUTING PROTOCOLS

A. Ad hoc on demand distance vector (AODV)

AODV is very simple, efficient, and effective reactive routing protocol. This routing protocol is intended for use by mobile nodes in ad hoc networks when two hosts wish to communicate with each other and a route is created to provide such connection [6].It initiates a route discovery process only when it has data packets to transmit and does not have any route path towards the destination node so the route discovery in AODV is called as on-demand. Obtaining the routes purely on-demand makes this protocol very useful. AODV belongs to the class of Distance Vector Routing Protocols (DV). In a DV every node knows its neighbors and the costs to reach them. This protocol is motivated by limited bandwidth that is available in the media that are used for wireless communications. It is a combination of both DSR (Dynamic Source Routing) and DSDV (Destination Sequenced Distance Vector). It borrows the basic on-demand mechanism of route discovery and route maintenance from DSR, plus the use of hop-by-hop routing, sequence numbers, and periodic update packets from DSDV. This is an on demand routing protocol with small delay. That means that routes are only established when needed to reduce traffic overhead. AODV use broadcast route discovery mechanism [7]. This protocol is composed of three mechanisms: route discovery process, route message generation and route maintenance. The source host starts a route discovery by broadcasting a route request to its neighbors [8]. Route discovery process is initiated only when routes are not used or expired. The route maintenance process in this protocol is very simple and needed whenever the links in the path between nodes are broken. AODV allows mobile nodes to respond to link breakages and changes in the network topology in a timely manner. When a link is broken due to some erroneous condition, AODV notifies the affected set of nodes so that they may invalidate the routes using the lost link [9]. This protocol has the ability to provide unicast, multicast and broadcast communication. Unicast and multicast routes are discovered on demand and use a broadcast route discovery mechanism [10]. Main features of this protocol are:

- Adaptability to dynamic networks.
- Reduced overhead.
- Lower setup delay
- Requires Periodic updates.
- Sometimes have Inconsistent routes.

B. Dynamic source routing (DSR)

DSR is reactive or on demand routing protocol. It is a simple and efficient routing protocol. It was designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. In this protocol there is no existing infrastructure or administration. The network using DSR as routing protocol is completely self-organizing and self-configuring. In this protocol the route discovery to find a route is on demand. It maintains the active routes. In this protocol there is not any kind of periodic activity like the hello messages used in AODV. This protocol utilizes source routing and uses caches to store routes. In DSR there are two mechanisms one is route discovery and other is route maintenance. These two mechanisms work together and allow nodes to discover and maintain source routes to any destinations in the ad hoc network. All aspects of this protocol operate entirely on-demand. In this routing protocol there is good communication between nodes that are within and the nodes that are not directly within wireless transmission range. To maintain the communication the nodes that are within wireless transmission range cooperate to forward packets for the nodes that are not directly within wireless transmission range. In this routing protocol all routing information such as nodes join or leave the network, change in wireless transmission conditions is automatically determined and maintained by the protocol. The protocol allows nodes to discover a source route to any destination in the ad hoc network. In the protocol for the loop free packet routing the header of each data packet contains the complete ordered list of nodes through which the packet must pass. There is no need to update routing information in all the nodes through which the packet is forwarded. Main features of this protocol are:

- A route is established only when it is required.
- No need to keep routing table.
- Reducing load.
- Have Route overheads.
- Higher delay.
- Not scalable to large networks.
- Requires significantly more processing resources than most other protocols.

IV. QUALITY ASSURANCE METRIC

Quality assurance is a program for the systematic monitoring and evaluation of the various aspects of a service or facility to ensure that standards of quality are being met. For this paper quality assurance metric reliability has been taken into account. Reliability includes the maturity, fault tolerance, and recoverability. Quality attributes reliability is affected by mobile-wireless information systems and for this attribute a scale is decided and applied on the Packet delivery ratio. Packet delivery ratio is defined as the ratio of data packets received by the destinations to those generated by the sources [11]. The quality assurance metric gives us an idea of how well the protocol is performing at different speeds and using different pause time. For evaluation purposes a new scale has been developed. The scale used for this quality attribute is summarized as following:-

Table 1
Reliability Scale

PDR	SCALE
91.1-92	5
92.1-93	6
93.1-94	7
94.1-95	8
95.1-96	9
96.1-97	10
97.1-98	11
98.1-99	12
99.1-100	13

V. SIMULATION AND RESULTS

The simulations have been performed using Network Simulator 2 (Ns-2.34) [12], particularly popular in the ad hoc networking community. The traffic sources are UDP. The source-destination pairs are spread randomly over the network. During the simulation, each node starts its journey from a random spot to a random chosen destination. Different network scenario for different number of nodes and pause times are generated. The model parameters that have been used in the experiments are summarized as following:-

Table 2
Simulation Environment

Parameter	Value
Simulator	NS-2.34
Simulation Area	1000m X 1000m
Mobile Nodes	10,20,50
Pause Time	100,200,300,400,500 Sec.
Speed	1,2,5,7,10 m/s
Channel	Wireless
Routing Protocols	AODV & DSR
Traffic Sources	TCP

Output after applying the reliability scale for varying pause time and speed is as following:-

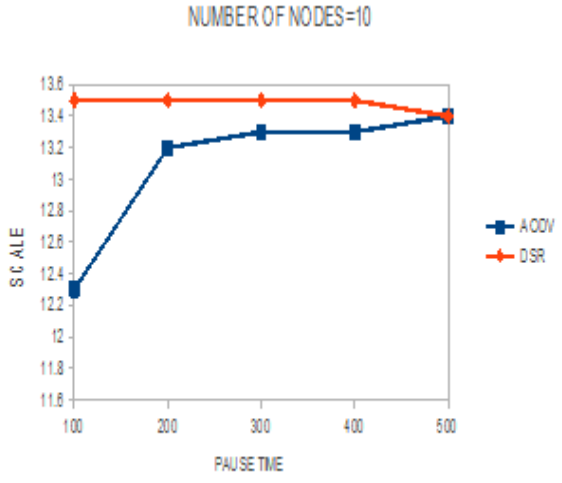

Fig. 1 Reliability on pause time for 10 nodes

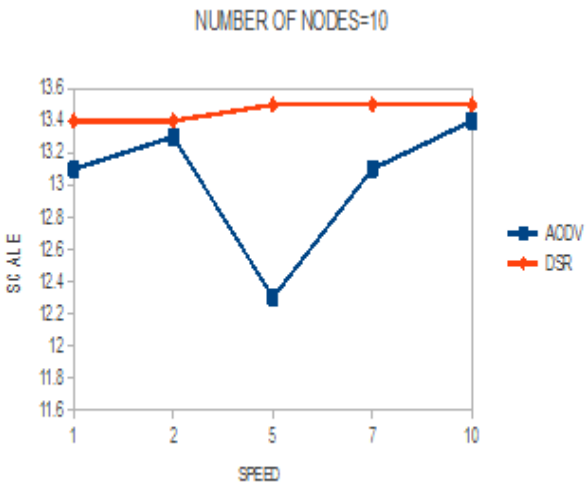

Fig. 2 Reliability on speed for 10 nodes

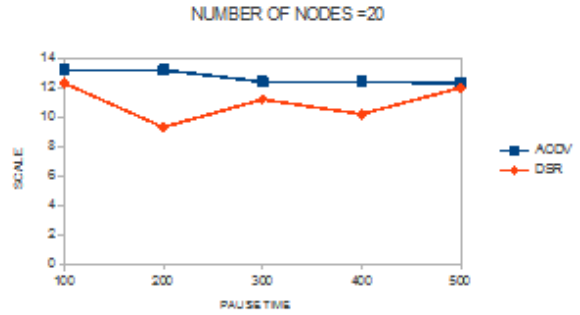

Fig. 3 Reliability on pause time for 20 nodes

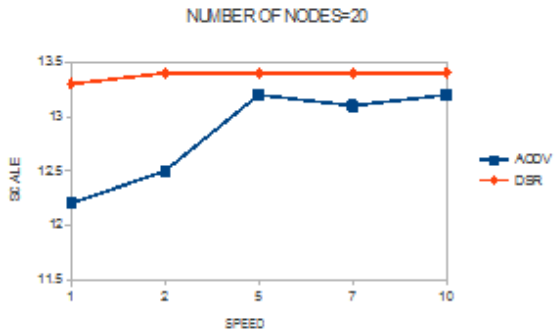

Fig. 4 Reliability on speed for 20 nodes

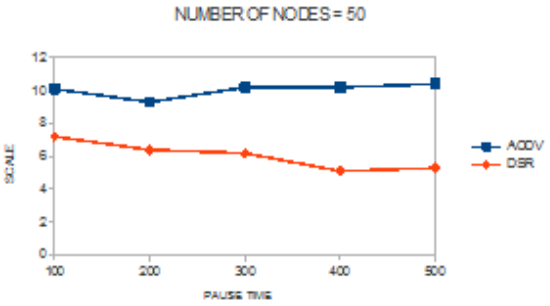

Fig.5 Reliability on pause time for 50 nodes

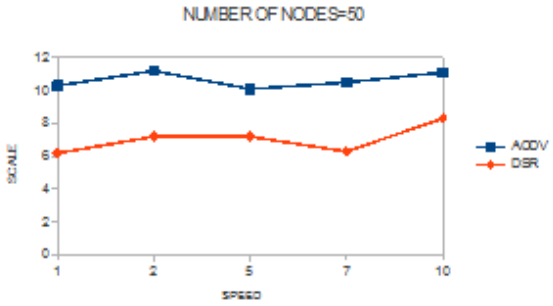

Fig.6 Reliability on speed for 50 nodes

In figures 1, 3, 5 for nodes 10, 20, 50 respectively the rreliability scale has been evaluated for DSR and AODV with the varying pause time from 100 to 500. In fig.1 when pause time is 100 to 400 DSR gives better results than AODV and both protocols give approximately same results when pause time is 500. In fig. 3 when pause time is 100 to 400 AODV gives better results than DSR and both protocols give approximately same results when pause time is 500. In fig.5 AODV gives better results than DSR.

In figures 2, 4, 6 for nodes 10, 20, 50 respectively the rreliability scale was evaluated for DSR and AODV with the varying speed from 1m/s to 10 m/s. In fig. 2 the observation reveals that the DSR gives better results than AODV when speed is between 1m/s and 10 m/s. AODV protocol gives batter results when speed is between 1m/s to 2m/s its performance degrades at the speed of 5 m/s and again it gives batter results when speed is between 5m/s to 10m/s. In fig. 4 DSR gives better results than AODV. The DSR performance upgrades when speed is between 1m/s to 10 m/s. AODV performance upgrades when speed is between 1m/s to 5m/s. At speed of 7 m/s its performance degrades and AODV performance upgrade at the speed of 10 m/s. In fig.6 AODV gives better results than DSR. AODV performance upgrades when speed is between 1m/s to 2 m/s. At speed of 5 m/s its performance degrades and again AODV protocol gives batter results when speed is 7m/s and 10 m/s. The DSR protocol gives batter results when speed is between 1 m/s to 5m/s. DSR performance degrades at speed of 7 m/s and again it gives batter results when speed is 10 m/s.

VI. CONCLUSION

The paper analyses the performance of AODV and DSR routing protocols for the quality assurance metric. In this paper, an effort has been made to concentrate on the comparative study and performance analysis of two prominent on demand routing protocols. The performance evaluation is done on the basis of reliability scale applied on packet delivery ratio (PDR), in different environments specified by varying pause time, speed and number of nodes. It was difficult to mark one protocol over other in terms of quality assurance parameter applied in this work. Still it can be revealed that in sparse medium DSR has an edge over AODV but in denser mediums and at higher speeds AODV is better. More work is under progress to apply more metrics for quality assurance and then it will be feasible to mark one protocol better than other.

REFERENCES

[1] I. Chatzigiannakis, S. E. Nikoletseas and P. G. Spirakis (2001).An efficient routing protocol for hierar-chical ad-hoc mobile networks. Proc. of the 15th International Parallel and Distributed Processing Symposium.

[2] M. Frodigh, P. Johansson, and P. Larsson (2000).Wireless ad hoc networking: the art of networking without a network. Ericsson Review, No.4, pp. 248-263.

[3] G. Narsimha, A. V. Reddy and S. S. V. N. Sarma(2007).The effective multicasting routing protocol in wireless mobile Adhoc network. Proc. of the 6th IEEE International Conference on Networking.

[4] D. B. Johnson and D. A. Maltz. (1996). Dynamic source routing in ad-hoc wireless networks. Mobile Computing.

[5] D. Lang(2003).A Comprehensive Overview about Selected Ad Hoc Networking Routing Protocols. Master Thisis, Technische Uni. Munich, Germany.

[6] C. Perkins, E. Belding and S. Das(2003).Ad hoc on-demand distance vector (AODV) routing. Request for Comments: 3561.

[7] M.S.Corson and A.Ephremides(1995).A distiributed routing algorithm for mobile wireless networks..ACMJ.Wireless Networks, 1(1).

[8] Samyak Shah, AmitKhandre, Mahesh Shirole and GirishBhole(2008). Performance Evaluation of Ad Hoc Routing Protocols Using NS2 Simulation. Mobile and Pervasive Computing.

[9] S. Basagni, M. Conti, S. Giordano and G. Ivan (2004) Mobile Ad Hoc Networking, Wiley.

[10] C.E. Perkins and E. M. Royer(1999).Ad hoc On Demand Distance Vector Routing. Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications pages 90-100 New Orleans LA.

[11] Pankaj Rohal, Ruchika Dahiy and Prashant Dahiya(2013).Study and Analysis of Throughput, Delay and Packet Delivery Ratio in MANET for Topology Based Routing Protocols (AODV, DSR and DSDV). International journal for advance research in engineering and technology, Vol. 1, Issue II, ISSN 2320-6802.

[12] Kevin Fall and KannanVaradhan(2010).*The ns Manual*. The VINT Project,file = http://www.isi.edu/nsnam/ns/doc/ns doc.pdf, keywords = Simulation, ns-2, Manual.

