ISSN XXXX XXXX © 2017 IJESC

Research Article Volume 7 Issue No.6

Performance Analysis of Route Discovery Model based on RSS

Sayali.R.Ghogare[1], A.D.Bhoi[2]
Student[1], Faculty[2]
G. H. Raisoni Institute of Engineering and Technology, Wagholi, Pune, India

Abstract:
Recently wireless communication devices have increased and therefore it has created the need for developing new technologies. There is an increased user demand to communicate with each other without relying on any infrastructure. A Wireless Ad-hoc NET work (WANET) or Mobile Ad-hoc NETwork (MANET) is an infrastructure-less network which does not require centralized control and has not fixed topology. Even at times when direct communication is not possible, then data transmission takes place through single or multiple hops. In ad-hoc network RSS (Received Signal Strength) plays an important role for efficient operation of the network. Objective of this paper is to find an efficient route discovery technique for finding the shortest path. Calculating and analyzing the relationship of RSS with the changing network topology which decides the connectivity amongst the nodes. The simulation and performance analysis of the behavior of routing protocols for MANETS with different scenarios and mobility models are evaluated. A comparative study between AODV and Static Routing protocols on various performance parameters are analyzed.

Keywords: Ad-hoc On-Demand Distance Vector (AODV). Mobile Ad-hoc NETwork (MANETs), Received Signal Strength (RSS). Route Discover, Wireless Ad-hoc NETwork **(**WANETs).

I. INTRODUCTION

Recent demand for wireless network is increasing. This creates a need for building very efficient and performing routing protocols for the network [1]. Due to all the features of ad-hoc networks like no infrastructure, self healing capability and decentralized control, they are used for number of applications. The nodes in ad-hoc network are located randomly which are continuously moving. There is no particular topology for MANETs, so the network adapts to the changing topology and they establish new routes from the source to destination node. For communication to take place between the source and destination node, each node should be assigned a routing protocol. For data transmission in MANETs, the routing path is of single hop or multiple hops [2]. Proper selection and designing of an efficient and reliable routing strategy is very important in MANETs. Routing protocol specifies the technique of proper selection of route between two nodes in a network for transmission of information [3]. The routing techniques are basically divided into two types the dynamic routing and static routing. Routing protocols are divided into three categories i.e. proactive, reactive and hybrid [1]. 1) Proactive protocols (Table-driven protocol) as each node maintain table for each and every route to the node. 2) Reactive protocols (On-demand protocol) a route would be established only on-demand i.e. when it is required. 3) Hybrid protocols are a combination of proactive as well as reactive protocol. The purpose of this paper is to analyze and study the performance of AODV and Static routing protocol [6, 7]. Both the routing techniques concentrate on finding the shortest path between randomly moving nodes. The Static routing performs the activity depending on pre-configured paths in the routing table which can be manually changed. Static routing is considered to be the simplest routing technique. The RSS is used to determine the power level of the received signal. So the development of mathematical model to find the relationship between the RSS values and node distances is important [8]. With the changing number of nodes in the network it brings about changes in RSS along-with the hop count. A comparative study between AODV and Static on various performance parameters is evaluated.

II. LITERATURE SURVEY

The focus on the development of routing protocol for ad-hoc network is explained in the paper [1]. The overall performance analysis of the routing protocol considering parameters as QoS and delay is evaluated. A formal method is used for designing of the complete model of AODV. In the paper "A Low Overhead Reachability Guaranteed Dynamic Route Discovery Mechanism for Dense MANETs" [2] presented a crucial issue for a wireless network. A comparative study between AODV and PRP routing protocol is simulated. From the simulation results the number of rebroadcast rate is improved with higher number of nodes.
The overall performance analysis of the routing protocol considering parameters as QoS and delay is evaluated. A formal method is discussed for designing of the complete model of AODV [3]. An overview on avoiding route breaks in MANETs by using Received Signal Strength (RSS) is explained. The focus is given on reducing the transmission delay and avoiding breakage in the network [4]. An overview of different types of mobility models as well as their characteristics is briefed in paper [5].

III. EVALUATING RSS

The RSS can be calculated by the following formula:

$$P_r(d) = \frac{P_t G_t G_r \lambda^2}{(4\pi)^2 d^2 L} \qquad (1)$$

Where P_r is the received power, P_t is the transmission power of wireless signal, d is the distance between the two nodes,

n=2 (free space) which is the transmission factor that depends on the propagation environment [8, 9]. In equation (1), G_t and G_r are the antenna gain and L is attenuation factor which is considered as unity. The values usually taken for the calculation of received power are G_t =1, G_r =1, L= 1, P_t= -0.30dBm, f (radio frequency) =2.4GHz and the value of d depends on the randomly generated node positions. The Random Waypoint mobility model is used for node mobility [5]. The distance v/s received power is calculated as shown in Figure 1.

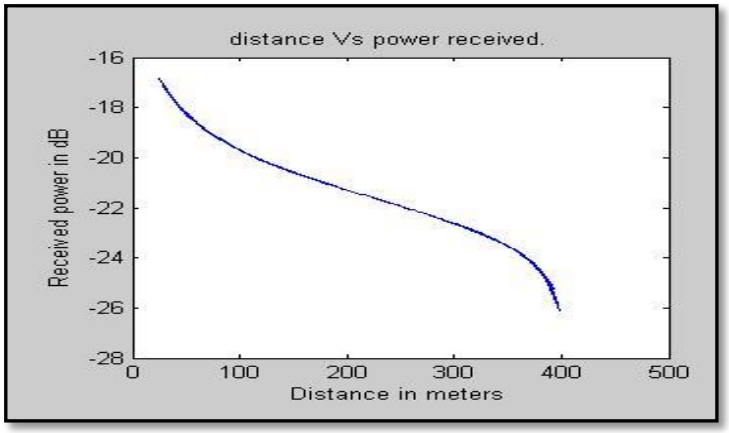


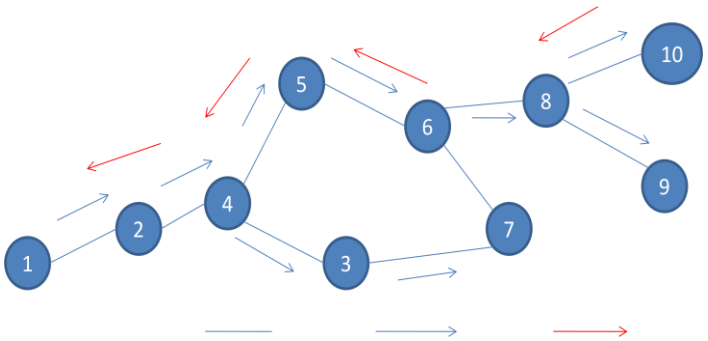
Figure. 1. Distance v/s Power Received

The RSS is varying as the distance between the nodes are changing and which is inverse square law.

IV. MANET ROUTING

A] Ad-hoc On-Demand Distance Vector (AODV):

AODV is a reactive routing protocol which belongs to the class of Distance Vector routing (DV) [6, 7]. It will only establish a path between source and the destination on-demand. AODV functions in the following three steps: 1) Route Discovery step, 2) Route Message Generation step and 3) Route Maintenance step.



Wireless link RREQ message RREP message

Figure.2. AODV Route Discovery Process [7]

The route discovery phase will initiate only when the routes are not in use or discarded. Because of route discovery process the stale routes are reduced as well as route maintenance is not required for unused routes. Figure2 shows the AODV Route Discovery Process [7]. If node1 wants to transmit data to node10, then route request message (RREQ) is generated and send to the neighboring node. When node10 receives the message, then a route reply message is sent back to the source i.e. node1 by forming the shortest path between the source and destination. After route establishment the data transmission takes place, if route break occurs in the route maintenance step, then route error message (RERR) is send to the source node. AODV protocol provides with unicast, multicast and broadcast communication.

B] Static Routing Protocol:

In Static routing technique the routes are manually set by the administrator. A static routing table is created, maintained, and updated by a network administrator, manually. Routing paths are pre-computed and are set in the table. Optimal path are set between the source node and destination. If a fault occurs in the routing paths then there is no correction technique available in the Static protocol for its correction. Static protocol does not have any controlling mechanism if a fault occurs. Static routers are also known as non-adaptive routers as they do not adapt to the changing node scenarios. Static routing is suitable for smaller network. As compared to other routing protocols, Static technique is simple to implement and design [10, 11]. The advantages are minimum memory requirement, low bandwidth, reducing RAM overhead and granular control on traffic routing.

V. METHODOLOGY

The topology created by Simulink model is shown in figure 3. For model the number of nodes considered is 10, in which the source node is node1 and destination node is node4. All other nodes are represented as red dots along with the blue colored dash line circle representing the communicating range of 50m.

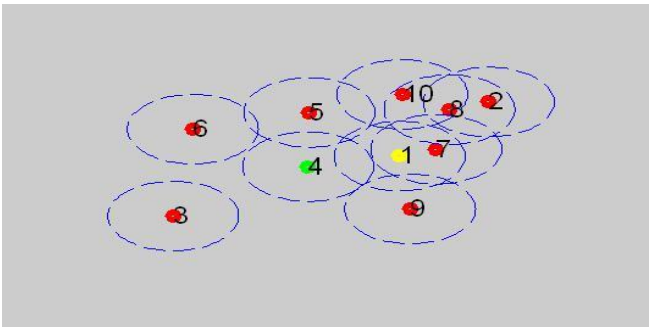


Figure.3. Topology created by Simulink model

The table 1 shows the set values for simulation model. The nodes are randomly moving in the given area of 350mX350m where the source node1 (yellow dot) and the destination node4 (green dot) are specified. For communication to take place a path should be established between the source and the destination node. In figure 3 the node1 establishes connection with node4 without hop as they are in coverage range of each other. In other scenarios the route to destination node may be of single hop or multiple hops. The protocols assigned are AODV and Static.

Table.I. Simulation Set-up Parameters

PARAMETERS	SET VALUES
No. of nodes	10,15,20,25
Mobility Model	Randomn Waypoint
Protocol Assigned	AODV and Static
Area	350X350m
Mobility Range	20m
Node Coverage Range	50m

The figure 4 shows the number of hops required for communicating between node1 (source) and the node4 (destination) at each changing phase of the network. With increase in the distance between the nodes the number of hop counts increases. As seen from figure 4, at 100th iteration the hop count is 0 that means there is direct path formation between source and destination. So it is concluded that increase in node density will increase the chances of path establishment and also decrease the number of hops. The aim is to avoid route breaks in Mobile Ad hoc Network (MANET) while routing the data packets by using Received Signal Strength (RSS) [4, 6]. In figure 4, the graph below the zero level shown in red colored determines the link breakage between the nodes. When node1 and node4 would not be in the communication range, there will not be any path establishment and also no data transmission. The graph below zero shows that received signal strength is below threshold level, and therefore transmission is not possible.

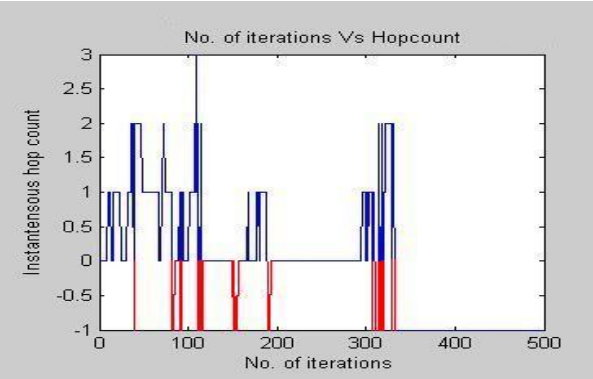


Figure.4. Hop count for various iterations

VI. RESULTS

A] Success rate:

Figure 5 shows the route request success rate for 500 different iterations for AODV and Static protocol. The Matlab program is simulated for 10 times and the average values of success rate are displayed in the graph. The average percentage success rate for AODV is 81.4% and for Static protocol is 47.4%. From the graph, it is concluded that AODV has higher average success rate as compared to Static protocol.

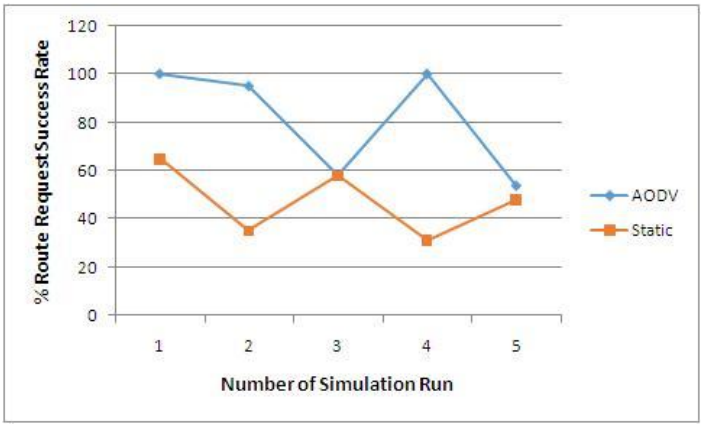


Figure.5. % Route Request Success Rate for Number of Simulation Run

B] End to End Delay: The average end to end delay for AODV and Static routing protocols are shown in figure 6. The Matlab program is simulated for 10 times and the average values for end to end delay are displayed in the graph. From the figure it is concluded that the average delay is more for Static technique as compared to AODV protocol. The average delay for AODV is 0.37µs and for Static protocol is 0.36µs. So the time taken for the route formation is more in case of AODV as compared with Static. Because the path is already set in terms of Static type whereas in AODV the route is established on-demand which takes time.

Figure.6. End to End Delay for Number of Simulation Run

C] Hop Count:

The path for Static routing protocol is fixed and therefore the hop count=2, whereas for AODV protocol the average hop count depends upon the source and destination node positions and also the adjoining nodes between them. From figure 7, the average hop count for AODV protocol is 0.08.

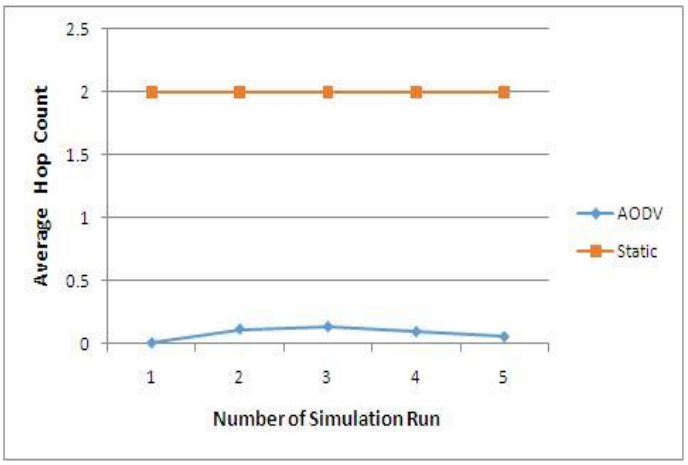


Figure.7. Average Hop Count for Number of Simulation Run

D] Impact of Node Density:

The results shown in figure 8 represent the average percentage throughput performance for 4 different node densities 10, 15, 20, 25. For example for 10 nodes, the network is not fully connected so communication routes are weak and for nodes=25 the connectivity between nodes is much better for AODV protocol. So the results say that AODV work better for dense network as compared to Static technique. Figure 9 represents the effect of changing node densities on the latency parameter.

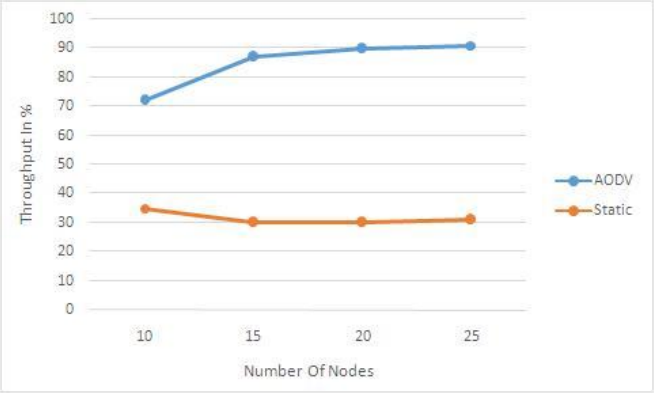


Figure. 8. Throughput (%) vs. Node Density

Figure.9. Latency (µs) vs. Node Density

VII. CONCLUSION

In this work using RSS, an efficient route discovery method is analyzed to find shortest path between the nodes that are randomly moving. A comparative performance study between AODV and Static Routing protocols is analyzed. With the help of MATLAB simulation it is observed that with increase in node density, the average route request success rate increases whereas the average hop count is less for AODV as compared to Static protocol. The throughput for AODV increases with increase in number of nodes. It concludes that AODV works better for higher node density as compared to Static routing method.

VIII. REFERENCES

[1].Tahreem Saeed, Zafar Iqbal, Hamra Afzaal and Nazir Ahmad Zafar (2016) "Formal modeling of traffic based flooding procedure of AODV for Mobile Ad hoc Networks" IEEE Department of Computer Science.

[2]. Sharmila Sankar and Dr. V. Sankaranarayanan "A Low Overhead Reachability Guaranteed Dynamic Route Discovery Mechanism for Dense MANETs".

[3]. Randa K. Ahmed, Dina M. Ibrahim and Amany M. Sarhan (2016) "Communication Load Balanced Dynamic Wireless Sensor Network Topology Management Algorithm Based on AODV (CLB-AODV)" IEEE Department of Computers and Control Engineering, Faculty of Engineering, Tanta University, Tanta, Egypt.

[4]. Rajan Pravinchandra Modi and Dr.K.Thirunadana Sikamani (July 3, 2013) "Minimization Of Link Failure In Mobile Ad Hoc Network By Using RSS Based AODV Routing Protocol" International Conference on Current Trends in Engineering and Technology, ICCTET'13,pp 171-173.

[5]. Mihail L. Sichitiu "Mobility Models for Ad Hoc Networks" Dept. of Electrical and Computer Eng., Campus Box 7911, NC State University, Raleigh, NC, 27695.

[6]. C.E. Perkins and E.M. Royer (Issue February 1999)" Ad-hoc on-demand distance vector routing" in Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications(WMCSA '99), New Orleans, LA, pp. 90- 100.

[7]. Mr. L Raja , Capt. Dr. S Santhosh Baboo,(3 March 2013) "Comparative study of reactive routing protocol (AODV, DSR, ABR and TORA) in MANET", International Journal Of Engineering and Computer Science, Volume 2, pp. 707-718.

[8]. Jiuqiang Xu, Wei Liu, Fenggao Lang, Yuanyuan Zhang, Chenglong Wang," (June 18, 2010) Distance Measurement Model Based on RSSI in WSN".

[9]. Prof. B.N. Jagdale, Prof. Pragati Patil, Prof. P. Lahane and Prof. D. Javale (March 2012)"Analysis and Comparison of Distance Vector, DSDV and AODV Protocol of MANET" International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.2, pp 121-131.

[10].Aaron Balchunas (2007) "Static vs. Dynamic Routing" I[Online].Available:www.routeralley.com/guides/static_dynamic_routing.pdf.

[11]. Sikkim Manipal University "Differentiate between a) Static and Dynamic b)Interior and Exterior routing gateway protocols" [Online]. Available: https://sites. google. com/ site/ assignments solved/mca/semester6/mc0087/10