Volume 3, Issue 8, August 2013 ISSN: 2277 128X

International Journal of Advanced Research in Computer Science and Software Engineering

Research Paper

Available online at: www.ijarcsse.com

Application Based Simulative Selection of Routing Algorithm in MANETS

Ms. Savita Shivani
Suresh Gyan Vihar University
India

Ms. Anuradha
Mtech, Suresh Gyan Vihar University,
India

Abstract: In the past few years, this has been seen a rapid expansion in the field of mobile computing due to the proliferation of inexpensive, widely available wireless devices. However, current devices, applications and protocols are solely focused on cellular or wireless local area networks (WLANs), not taking into account the great potential offered by mobile ad hoc networking. There is a long range of routing protocols in MANETs. There is also a large range of application areas of MANETs like DTN, WSN and pure general purpose MANETs. So it will be beneficial to select routing protocol on the basis of application. In this paper, this process of selection is analyzed between AODV and DSDV on the basis of three parameters: traffic, number of nodes and packet delivery ratio.

Keywords: WLANs, MANETs, Delay tolerant networks (DTN), Wireless sensor networks, AODV, DSDV

I. Introduction

Network is defined as the group of people or systems or organizations among which information is shared collectively. In the context of computer terminology the definition for networks is similar as a group of computers logically connected for the sharing of information or services. A network can be characterized as wired or wireless. Wireless can be distinguished from wired as no physical connectivity between nodes is needed. Mobile Ad hoc networks (MANET) are wireless network, which enable potentially mobile devices to communicate with each other without the need of any pre-existing infrastructure e.g. access to common media in order to keep energy consumption as low as possible. Thus, nodes typically cannot send messages to distant nodes directly but need to route message through MANET using other nodes in between as relays. Nodes are rather considered to be mobile at different movement speed. This results in a fast changing of very unstable MANET routing in which neighbours of a node change in a matter of second. Mobile nodes are not distributed uniformly. The density of nodes is not constant over time or space.

Problems in Mobile Ad Hoc Networks

- **a.** Asymmetric Link: All the wired networks are always fixed. But in case of ad-hoc networks the nodes are mobile and can constantly change their position within network.
- **b.** Routing Overhead: In ad-hoc network nodes continuously keeps on changing their position within the network that results in generation of some stale routes in the routing table which ultimately leads to resulting in unnecessary overhead.
- **c.** Interference: One of the major problems of ad-hoc network is that as the links come and go, depending on the transmission characteristics, results in interference in network and ultimately corrupts the whole network.

II. Literature Survey

Literature of MANETs consists of characteristics, applications and routing. It has been surveyed first for different classes of routing algorithms.

1) **Table Driven Routing Algorithm.**
2) **On demand Routing Algorithm**
3) **Hybrid Routing Algorithm**

1) Table Driven Routing Algorithm

In table-driven routing protocols each node maintains one or more tables having routing information regarding every other node. All nodes update these tables so as to maintain a consistent and up-to-date view of the network. When the network topology changes the nodes propagate update messages throughout the network in order to maintain consistent and up-to-date routing information about the whole network.

a) *Destination-Sequenced Distance-Vector (DSDV)*

The Destination-Sequenced Distance-Vector (DSDV) Routing Algorithm is basically the idea of the classical Bellman-Ford Routing Algorithm with certain improvements. Every mobile station maintains a routing table that lists all available destina-

tions, the number of hops to reach the destination and the sequence number assigned by the destination node. The stations periodically transmit their routing tables to their immediate neighbours. A station also transmits its routing table if a significant change has occurred in its table from the last update sent. So, the update is both time-driven and event-driven.

b) *Wireless Routing Protocol (WRP)*

The Wireless Routing Protocol (WRP) is a table-based distance-vector routing protocol. Each node in the network maintains a Distance table, a Routing table, a Link-Cost table and a Message Retransmission list. The Distance table of a node x contains the distance of each destination node y via each neighbor z of x. It also contains the downstream neighbor of z through which this path is realized. The Routing table of node x contains the distance of each destination node y from node x, the predecessor and the successor of node x on this path. It also contains a tag to identify if the entry is a simple path, a loop or invalid. Storing predecessor and successor in the table is beneficial in detecting loops and avoiding counting-to-infinity problems.

2) On Demand Routing Algorithm

In contrast to table-driven routing protocols all up-to-date routes are not maintained at every node, instead the routes are created when required. When a source wants to send a packet to a destination, it invokes the route discovery mechanisms to find the path to the destination. The route remains valid till the destination is reachable or until the route is no longer needed. The Dynamic Source Routing Protocol is a source-routed on-demand routing protocol. A node updates entries in its route cache as and when it learns about new routes. The two major phases of the protocol are: route discovery and route maintenance. When the source node wants to send a packet to a destination, it looks up its route cache to determine if it already contains a route to the destination. If it finds that an unexpired route to the destination exists, then it uses that route to send the packet. But if the node does not have such a route, then it initiates the route discovery process by broadcasting a route request packet. The route request packet contains the address of the source and the destination, and a unique identification number. Each intermediate node checks whether it knows route to the destination. If it does not, it appends its address to the route record of the packet and forwards the packet to its neighbours.

3) Hybrid Routing Algorithm

a) *MPR (Multi Point Relaying)*

Multipoint relays have been introduced in the proactive protocol. OLSR in order to optimize the flooding overhead of control traffic it simply explains a reactive protocol known as MPRDV (Multipoint relay distance vector protocol). Route repairs are performed by new route request flooding. In MPRDV route request and route response are all flooded via Multipoint relays (MPR). Each node must select a MPR set among its neighbour. The set must cover two hop neighbourhood of the node. Smaller the value in the MPR set, the better it is. Although the optimal MPR set is an NP hard problem, there exists simple heuristic approach with optimally a good factor. In some networks model the number of multipoint relay is given as O (log M) where M is the neighbour size of node.

b) *DIR (Directional Routing Algorithm)*

DIR is a flooding routing protocol that concentrates on a specified zone using location provided by location service. It restricts the broadcasts region to all nodes and does not require maintenance of a separate neighbours' table. DIR determine the location of the current node that will direct the packet towards the destination even though uses all these information to determine the distance or area covered, it requires trigonometric computation which will further incur delay if computed in kernel space.

c) MFR (Most forward with Radius)

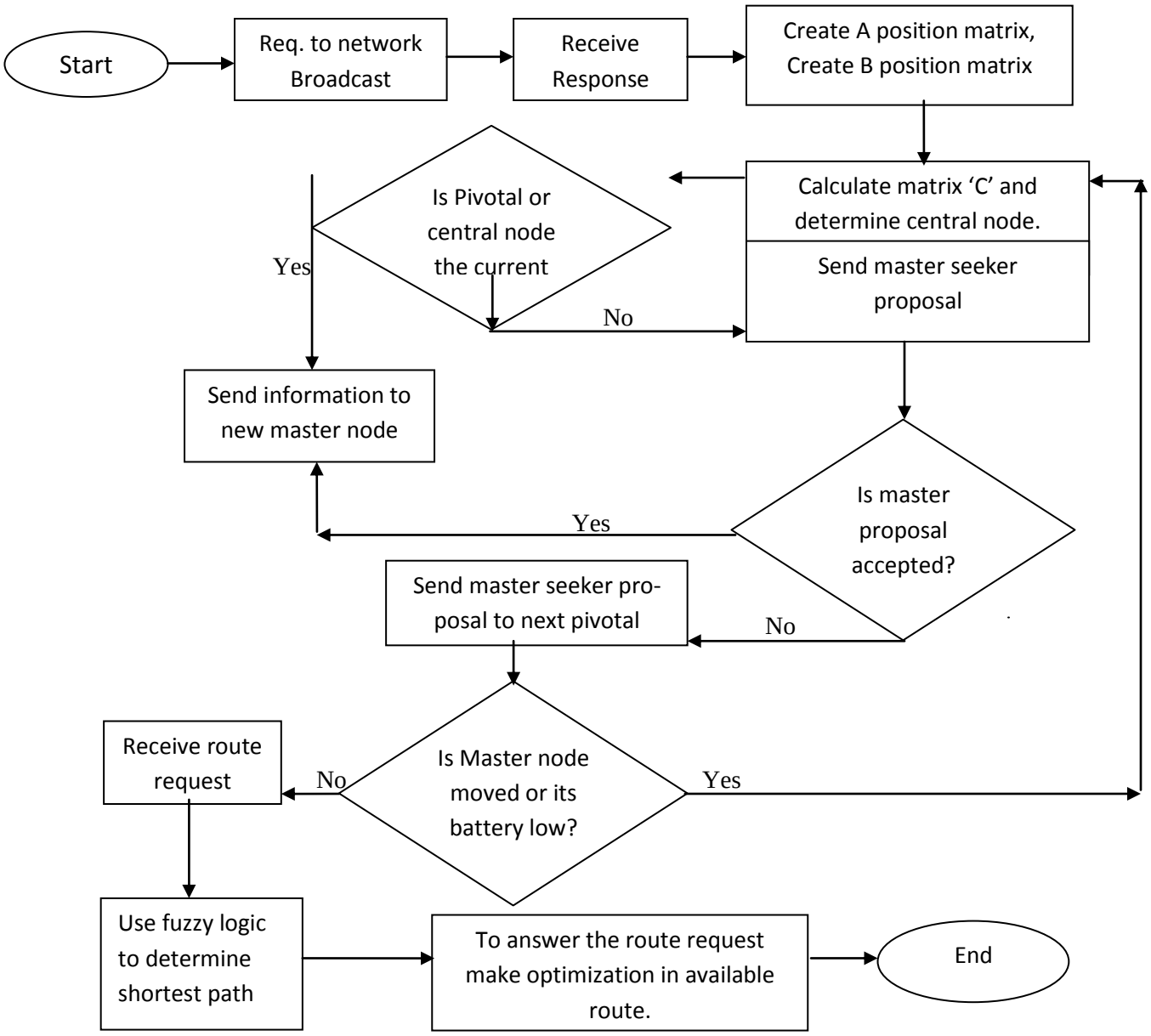
Most forward with radius (MFR) was first position based routing algorithm in which a packet with destination D is forwarded to the next neighbour in forward direction maximizing the progress towards destination D. The widely used Greedy forwarding strategy proposed by Finn applies the same principle but considers distance instead of progress i.e. a node forwards a packet to the neighbour with smallest distance 'd' to the destination of signal strength cannot be adjusted. It is a good choice to maximize the advances in each step, since it attempts to minimize the number of hops, a packet has to travel, even if signal strength is a fixed parameter, sending a packet to a distant neighbour in border area of transmission range results in a higher probability of packet loss due to signal attenuation and node mobility.

d) DREAM (Distance routing effect algorithm for mobility)

DREAM protocol is a restricted flooding communication protocol used in unstructured architecture. Each node may maintain a location table about the position of all node of network and frequently flood a location packet called control packet to update the position information maintained by its neighbor. Each location packet submitted by a node A to other node to update their location table contains A's coordinate along with its speed and time the location packet was transmitted. DREAM uses the principle of distance effect in which the location table update frequency is determined by distance of registered node. In other words, the closer to another node, more update sent to this node. The frequency of sending a control packet is adjusted based on moving speed of source node.

e) Location based Hybrid routing

Usually algorithms used in MANET are of three types which are table driven routing, on demand routing and hybrid routing. Hence Location based hybrid routing is one of the class which lies in main category of hybrid routing.



Flow Chart of Location Based Hybrid Routing

III. Analyzing Applications

This paper examined the applications of MANETs nowadays. The report not only reviews the pure general-purpose MANETs, but also other specified MANETs. The mostly discussed application scenario for pure general-purpose MANETs is Battlefield or disaster-recovery networks. These types of application are not truly achieved.

Mesh networks are built upon a mix of fixed and mobile nodes interconnected via wireless links to form a multi-hop ad hoc network. Unlike pure MANETs, a mesh network introduces a hierarchy in the network architecture by adding dedicated nodes (called mesh routers) that communicate wirelessly to construct a wireless backbone.

- Public Internet Access
- Intelligent Transportation Systems

Wireless mesh networks appear to be the natural solution to address the needs of law enforcement agencies and city governments. Currently, several mesh networks are operating to provide public safety applications.

Applications of Opportunistic or delay tolerant networking are wildlife monitoring and internet connectivity to rural or developing areas.

VANETs use ad hoc communications for performing efficient driver assistance and car safety. The communications include data from the roadside and from other cars. VANET research aims to supply drivers with information regarding obstacles on the road and emergency events, mainly due to line-of-sight limitations and large processing delays.

IV. Simulative Analysis

The simulation of routing protocols DSDV and AODV is done on Network Simulator (NS2-2.35). NS2 is built using object oriented methods in C++ and OTcl (object oriented variant of Tcl).

We wrote different tool command language (.tcl) file for simulation. These .tcl files accepts as input a *scenario file* that describes the exact motion of each node and the exact packets originated by each node, together with the exact time at which each change in motion or packet origination is to occur. The detailed trace file created by each run is stored to disk, and analyzed using a variety of scripts, particularly one called file *.tr that counts the number of packets successfully delivered and the length of the paths taken by the packets, as well as additional information about the internal functioning of each scripts executed. This data is further analyzed with AWK file and using "grep" command to extract the data and MATLAB to produce the graphs also we generate the movement file.

Table 1: Network Parameters

Parameters	**Values**
Channel type	Channel/wireless channel
Netif	Phy/wireless phy
Mac protocol	Mac/802_11
Queue length	50
Number of nodes	Variable
Routing Protocol	DSDV/AODV
Grid Size	670x670m^2
Packet size	512 Bytes
Simulation Time	400 sec
Topology	Random
IFQ	Queue/Drop tail/Pre-queue
IFQLEN	50 (Max packet in IFQ)
ANT	Omni antenna
Transmission range of a node	250 meter

V. GRAPHS AND RESULTS:

There can be two types of applications of Manets. One for low traffic uses and other is for high traffic. Some applications doesn't need high Packet delivery ratio. Like application to provide intermittent Internet connectivity to rural and developing areas.

a) At low Traffic: Graph between packet delivery ratio and number of nodes in the network for AODV and DSDV on a low traffic parameter.

Figure 1: **Packet delivery ratio v/s no. of node for DSDV at low traffic**

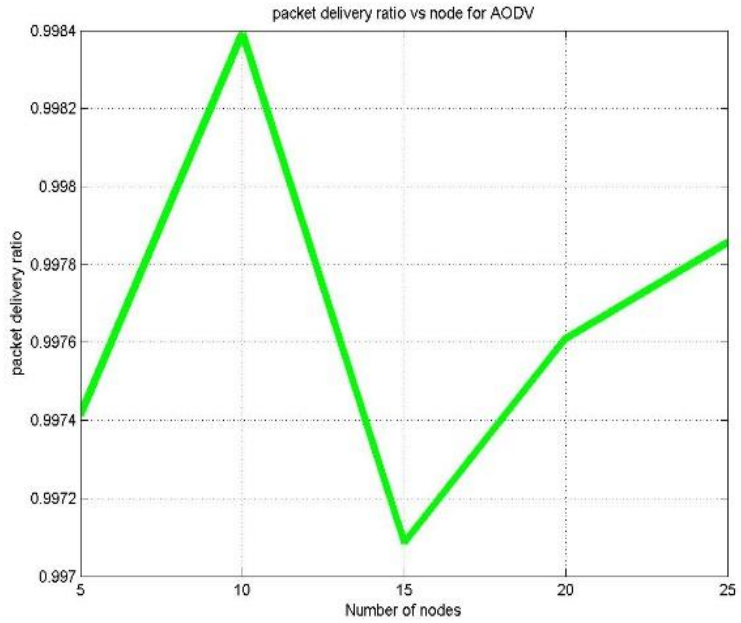


Figure 2: Packet delivery ratio v/s no. of node for AODV at low traffic

Packet delivery ratio v/s no. of node for DSDV 2) Packet delivery ratio v/s no. of node for AODV

It is clear from the graph that in DSDV at a low traffic when number of nodes are increased then first packet delivery ratio decreases then after reaching a minimum limit the packet delivery ratio starts increasing. But a more ZIGZAG graph can be seen in AODV. At first it increases then a steep decrease comes after that it again starts increasing.

As it is clear to see when the traffic is very low (<10) , Packet delivery ratio of DSDV (Table Driven Protocol) is better than that of AODV at less no. of nodes but as number of nodes increases Packet delivery ratio of AODV becomes better than that of DSDV.

If this analysis will be drawn to the application areas then some points can be easily analyzed by the graph. Like in wildlife monitoring system, there will not be much traffic but there can be a large no. of nodes. So at less traffic, it can be said that if less no. of nodes are present then it will be better to use DSDV and at increased no. of nodes, it will be better to use AODV.

b) At high Traffic: Graph between packet delivery ratio and number of nodes in the network for AODV and DSDV on a high traffic parameter.

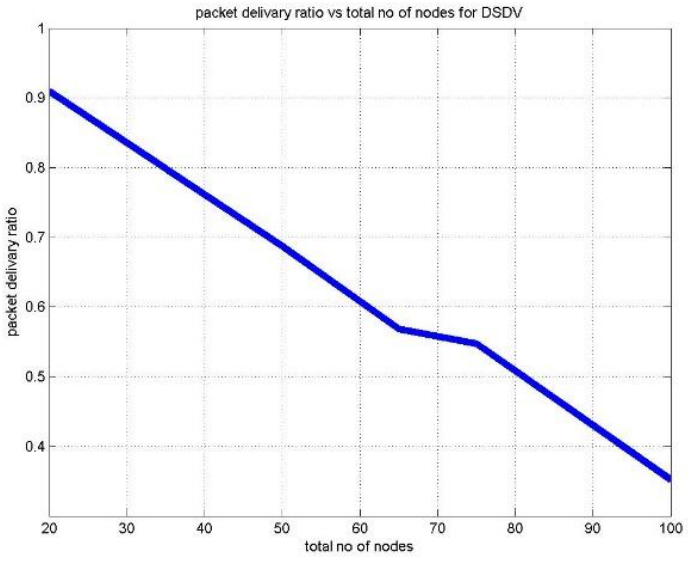


Figure 3: Packet delivery ratio v/s no. of node for DSDV at high traffic

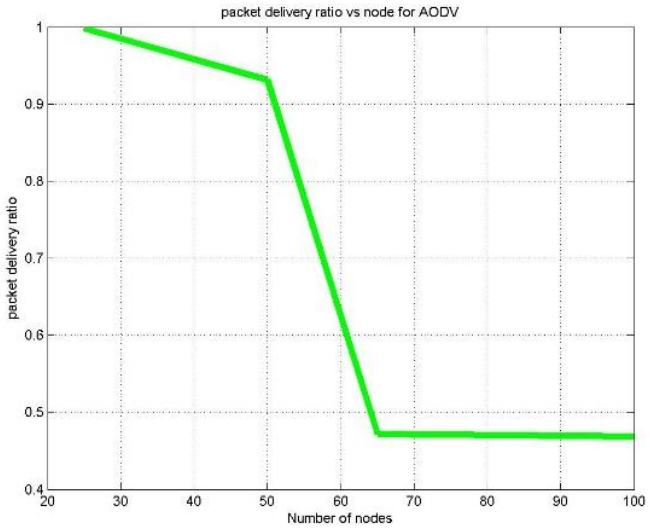


Figure 4: Packet delivery ratio v/s no. of node for AODV at high traffic

The graph of DSDV at high traffic is always decreasing with the number of nodes in network. But in AODV a steep decrease of packet delivery can be seen in the graph. After a minimum limit the graph becomes saturated. It means that very less decrement can be seen after a fixed no. of nodes. Same Analysis can be done for high traffic applications, like packet switched networks or for intelligent public transportation systems. So for the applications of high traffic and very large no. of nodes AODV can be more beneficial than DSDV.

VI. CONCLUSION AND FUTURE WORK

Mobile Ad hoc networks (MANET) are wireless network, which enable potentially mobile devices to communicate with each other without the need of any pre-existing infrastructure. For these types of networks application based analysis or selection of routing protocol is really needed. This paper shows a basic graphical or simulative selection of routing protocols (AODV and DSDV) based on the application. Some applications are traffic driven, some applications needs large no. of nodes and some needs high packet delivery ratio. So this analysis can help to select protocol on the basis of application. The future work of this paper is to do analysis of this type by taking other different protocols and implement or simulate those protocols on that application.

References

1) Abolhasan M, Wyosocki T, Dutkiewicz E (2004). A review of routing protocols for mobile ad hoc networks. ad hoc networks 1: 1-22.
2) S. Murthy and J.J. Garcia-Luna-Aceves, "An Efficient Routing Protocol for Wireless Networks", ACM Mobile Networks and App. J., Special Issue on Routing in Mobile Communication Networks, Oct. 1996, pp. 183-97.
3) Tsu-Wei Chen and Mario Gerla, "Global State Routing: A New Routing Scheme for Ad-hoc Wireless Networks" Proc. IEEE
4) A. Iwata, C.C. Chiang, G. Pei, M. Gerla, and T.-W. Chen, "Scalable Routing Strategies for Ad Hoc Wireless Networks
5) " A Survey on the Applications of MANET", Jiazi YI Polytech'Nantes
6) Lin X, "GPS based localized routing algorithms for wireless Networks," Bsc Thesis, Ottawa- Carleton Institute for Computer Science School of Information Technology and Engineering, pp. 25- 29,1999
7) Directional Routing Protocol in Wireless Mobile Ad Hoc Network L.A.Latiff1, N. Fisal2, S.A. Arifin3 and A. Ali Ahmed4.
8) Corson S, Macker J (1999). Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation,Considerations. IETF; http://www.ietf.org/rfc/rfc2501.txt.
9) Ad hoc routing protocols with multipoint relaying. G´eraud Allard, Philippe Jacquet and Laurent Viennot.

