WEIGHTAGE FACTOR BASED SCHEME FOR PERFORMANCE IMPROVEMENT IN AD HOC NETWORKS

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ABSTRACT : Ad-hoc networks are a new wireless networking paradigm for mobile hosts. Ad hoc networks don't require any fixed infrastructure such as base stations or mobile switching centers. Node mobility in an ad-hoc network causes frequent changes of the network topology. Routing protocols are used to discover routes between the nodes. Many mobile ad-hoc networks protocols such as AODV construct route only when desired by the source node. This paper maintains prior history information about the mobility of node in Ad-hoc network. Every path that is inserted into route table must be analyzed and assign a weightage factor to that path. If weightage factor of path is greater than given threshold value, insert this path in a separate fast route table. The targeted characteristics are: reduce searching time and provide good connectivity.

Keywords: Ad-hoc networks, AODV protocol, weightage factor, Fast Routing Table (FRT).

1. INTODUCTION

Wireless networks are classified as infrastructure wireless network and infrastructure-less network. Infrastructure-less network are fully dynamic and Ad-hoc network is in class of infrastructure-less network. A Mobile Ad-hoc network (MANET) is a self organizing and adaptive in nature. The nodes are free to move in arbitrary direction with any arbitrary speed. There are no fixed routers in the Ad-hoc network. Nodes are working as a router in network. A MANET working group [2] has been found within the Internet Engineering Task Force (IETF) to develop a routing framework for IP-based protocols in Ad-hoc network. Various routing protocols proposed for Ad-hoc networks cope well with the dynamically changing topology. Different variation of routing protocols exists like Ad-hoc On Demand Distance Vector protocols exists like Ad-hoc On Demand Distance Vector (AODV), Dynamic Source Routing (DSR), Fish eye Source Routing (FSR), and Temporally Ordered Routing algorithm (TORA) etc [7-9]. In this paper we are concentrating on improvement of AODV protocols. The AODV [5, 6], is a dynamic routing protocols for Ad-hoc network. Various research papers are there to improve the performance of AODV routing protocol [1, 3, 4].

In this paper optimization schemes of the AODV protocol will be presented. This optimization aim to reducing the searching time in AODV Route Table during phase 1, by analyzing node movement behavior.

The reminder of this paper is organized as follows: in section 2, a short overview of the AODV Routing Protocol is given. In section 3, we introduce AODV protocol with weightage factor. In section 4, a conceptual comparison is made between these two AODV protocols. Paper is concluded in section 5.

2. AODV OVERVEW

The AODV is a reactive protocol [5, 6]. Reactive means it reacts to the changes and maintains only the active routes in the caches or tables for a pre-specified expiration time. Distance vector specify
as a set of distant nodes, this defines the path to
destination. For example, A-B-C-D is a distance vector, where A is source node and D is destination node. In AODV, a distance vector is provided on demand during forwarding of a packet to destination by a node in the path. Every node consists a next-hop routing table, which contains the destinations to which it currently has a route. A routing table entry expires if it has not been used for pre-defined expiration time.

There is two phase of AODV protocol. In phase 1, the next hop routing table is generated. A node uses hello messages to notify its existence to its neighbors. So, the link status to the next hop in an active route is continuous monitored.

In phase 2, source node initiates a route discovery process if no route is available in the routing table. It broadcasts the demand through the Route Request (RREQ) packets. If the receiving node is the destination or has a current route to the destination, it generates a Route Reply (RREP). The RREP is unicast in a hop-by hop fashion to the source. As the RREP propagates, each intermediate node creates a route to the destination. When the source receives the RREP, it records the route to the destination and can begin sending data.

3. AODV WITH WEIGHTAGE FACTOR

This system model is based on some history movement behavior of user or node in different time stamp and assigns a weightage factor (WF) from given source to destination. Consider the following figure 1; a weightage factor is assigned to each path. Weightage factor is according to probability of successful communication from a given source to destination in different time stamp. Example, A-B, and B-D describe that there is 38% probability of node A and B as neighboring position and successful communication while 55% probability of D to be neighboring of B. A-B is bidirectional means both side communication is possible. However it is not necessary to

have same weightage factor in case of bidirectional but here we have assume same weightage factor. There are following path from source node A to D with weightage factor.

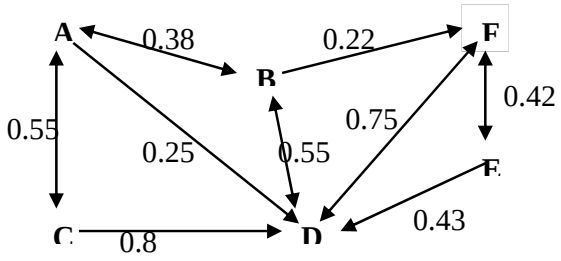

Figure 1: Ad-hoc Network

Path **Weightage Factor**
A-B-D: 0.38 * 0.55 = 0.209
A-C-D: 0.3 * 0.18 = 0.44
A-D: 0.25
A-B-F-D 0.38 * 0.22 * 0.75 =0.0625
A-B-F-E-D 0.38 * 0.22 * 0.42 * 0.43 = 0.015

Maximum weightage factor of path A-C-D ensure maximum possibility of successful communication and path A-B-F-D has minimum possibility of successful communication. There may be various reason of this minimum possibility.

- Long distance.
- High user mobility
- Weak signal problem
- Low battery back up.

Take a threshold value say 0.4, when weightage factor of path is greater than or equal to this threshold value then insert this path in a separate fast route table (FRT). Let node A wish to send a message to D by using AODV protocol then first it will look in FRT if path is available then perform according first phase of AODV protocol, if path is not available then search in normal routing table and do according first phase of AODV protocol otherwise initiates route discovery process if no route is available in routing table [phase 2].

4. PERFORMANCE COMPARISON:

A conceptual comparison is made between these two algorithms. Table 1, is designed with comparing each path with threshold value.

Path	Weightage Factor
B-D	0.55
A-C-D	0.44
F-E	0.42
E-F	0.42

Table 1: Fast Route Table [FRT]

Table 2, is assume structure of AODV route table. AODV uses traditional routing tables, one entry per destination.

Path
A-D-E-F
D-C-D-E
A-B-D
A-B-F-D
A-C-D-E
B-F-E
A-C-D
A-B-F-E-D

Table 2: Route Table

With this traditional routing table (Table 2) we have added one more Fast Route Table (FRT) in AODV protocol. The entire path whose weightage factor is greater than or equal to threshold value is inserted into Fast Route Table (FRT). If a source A wish to send a message to D by using AODV protocol and in case of sequential search first path is A-B-D; probability of successful communication via this path is 20.9%. This leads 79.1% probability of communication failure. Weightage factor of path A-C-D is 0.44. Probability of successful communication via this path is double than path A-B-D. So it is better to go with path A-C-D according weightage factor but number of search requires is 7.
Now according Fast Routing Table (FRT) it will search only that path which has weightage factor equal or greater than 0.4. It ignores rest of available path with weightage factor less than 0.4. So number of search require in case of FRT is 2.

No. of search require in Table-2 : 7
No. of search require in Table-1 : 2

There are more than three time reductions in searching time by using weightage factor AODV protocol. There are following advantage of this AODV protocol:

a) It will reduce the searching time in a considerable amount of time.
b) Provides more than 50% chances of successful communication.
c) Act as a static router for other node. As most of the time these nodes are in neighboring position.
d) Better signal strength
e) Conservation of battery back up as no need to take extra efforts of searching neighboring node.

5. CONCLUSION AND FUTURE WORK:

All possible paths that are available for same source to destination are a nature of Ad-Hoc network. But searching

these entire paths brings an extra overhead. We have shown that the AODV algorithm yields great no. of searching time during phase 1, and then proposed a improved AODV algorithm with the goal of reducing route searching time. This is done by first assigning the weightage factor of path and insert those paths in a Fast Routing Table (FRT) if weightage factor is greater or equal to threshold value i.e. 0.4.

Currently simulation of these two algorithms is in progress to test this scheme under different traffic and mobility scenario.

References:

[1] Dr. Mustapha Guezouri and Abdelaziz OUAMARI "Optimizing Routes Quality and Scattering in the AODV Routing protocol" October 2007, JCS &T Vol. 7 No.3.

[2] J. Macker and S. Corson, "Mobile Ad Hoc Networks (MANET)," IETF WG Charter., http://www.ietf.org/html.charters/manet-charter.html, 1997.

[3] Geetam S. Tomar, Manish Dixit & Shekhar Verma, et.al. " AODV Routing Protocol with Selective Flooding" 2009 International Conference of Soft Computing and Pattern Recognition, pp. 682-686.

[4] Charles E. Perkins, Nokia Research Center Elizabeth M. Royer, University of California Samir R. Das and Mahesh K. Marina, University of Cincinnati "Performance Comparison of Two On-Demand Routing Protocols for Ad Hoc Networks" IEEE Personal Communications February 2001, pp. 16-28.

[5] C. E. Perkins, E. M. Belding-Royer, and S. Das. Ad hoc On-Demand Distance Vector (AODV) Routing. RFC 3561, July 2003.

[6] C. E. Perkins and E. M. Royer. The Ad hoc On-Demand Distance Vector Protocol. In C. E. Perkins, editor, Ad hocNetworking, pages 173.219. Addison-Wesley, 2000.

[7] Chai-Keong Toh, "A novel distributed routing protocol to support Ad hoc mobile computing" Proc. 1996 IEEE 15th Annual Int'l. PhoenixConf. Comp. and Commun., Mar. 1996, pp. 480-86.

[8] C.-K.Toh, "Long-lived Ad-Hoc Routing based on the concept of Associativity" March 1999 IETF Draft, 8 pages.

[9] [9] R. Dube et al., "Signal Stability based adaptive routing for Ad Hoc Mobile Networks", IEEE Pers. Comm., Feb. 1997, pp. 36-45.