

Reactive Routing Protocols in Mobile Ad hoc Networks: A Survey

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Abstract. *A mobile ad hoc network (MANET) is a dynamic wireless network that consists of mobile nodes communicating in the routing without any infrastructure. Routing is one of the interesting areas in MANETs. Routing in the MANET is a challenging task and selecting one routing protocol with all suitable features is difficult. A growing attention in MANETs is providing stable routes with long route lifetime, low control overhead, low end to end delay and high packet delivery ratio and etc. In this paper, we provide an overview and comparison of different reactive routing protocols for MANETs*

Keywords: Mobile ad hoc network, Reactive routing, Mobile node, route discovery, route maintenance

1. Introduction

A mobile ad hoc network (MANET) is a network consisting of a set of mobile nodes with no centralized administration like base stations or mobile switching center. These networks can be deployed without any fixed infrastructure. MANETs are more unstable than wire networks because of the lack of a centralized entity and transmission channel [1,2,3]. Ad hoc networks have no stable routers; all nodes are capable of movement, thus network topology changes frequently. Usually, these nodes operate not only as a host but also as a router and forwarding data packets for other nodes. In order to see these peculiar schemes and design constraints, an efficient routing protocol is essential for MANET in which Designing an efficient routing protocol for MANETs is a very challenging task [4,5]. Many routing protocols have been proposed and these protocols can be classified as proactive and reactive and hybrid. In proactive routing protocols, each mobile node keeps its routing information in a routing table. These tables are periodically updated by transmitting routing information among mobile nodes. Since periodically routing information transmitted, a proactive routing protocol raises a large number of control messages in the network. Due to excessive network traffic and computation overhead of proactive routing protocols, reactive routing protocols have been preferred for MANETs. In reactive routing protocols, a source requires to discovery and maintenance a route between itself and destination before sending data. Nodes using reactive routing protocols, delay the route discover until a demand for a route is made [6,7,8]. Reactive routing protocols consist of two main mechanisms: (a) route discovery and (b) route maintenance. The route discovery mechanism uses flooding mechanism to find all the available paths to a destination. Hence, the destination node selected one path among all feasible paths to be the main routing path. Also, in MANETs links usually breaks due to the mobility of the nodes. Hence there must be route maintenance mechanism to repair routes when links break [5,9]. As a result, the reactive routing protocol needs more time for discovers a route than the proactive protocol.

In this paper our motivation is to provide survey and comparison of seven typical reactive routing protocols such as dynamic source routing (DSR), ad hoc on-demand distance vector (AODV), location-aided routing (LAR), stable weight-based on-demand routing protocol (SWORP), on-demand geographic path routing protocol (OGPR), reliable on-demand routing protocol (RORP), Dynamic backup routes routing protocol (DBR²P) for mobile ad hoc networks.

The remainder of this paper is organized as follows. In section 2 present the preliminaries to the system. In section 3, we briefly review the seven routing protocols and detailed operational description of the routing protocols will be discussed. Section 4, provides a guideline for choosing a routing protocol. Finally, we

conclude this paper in Section 5.

2. Preliminaries

In this section, we first introduce the expected region and the request region. Then we describe the duration of time.

2.1 Expected region and request region

We will introduce some notations and terminologies that are used in location-aided routing (LAR). LAR uses location information for mobile nodes to flood a request packet for destination in a request region. We first need to find an expected region. If the source node S wants to find a path to the destination node D , we assume that node S knows that node D was at location $D(X_d, Y_d)$ at time t . Let t_1 be the current time. Because node S knows that the information of node D includes average velocity (v), node S may assume that the expected region is a circular region of radius $\sqrt{(t_1 - t)}$. An example of an expected region is shown in Fig.1.

We determine the request region after we determine the expected region. As shown in Fig.1. We assume that node S knows the average speed $\sqrt{v}$ of node D . Node S can plan the expected region. We define the request region as a rectangular area that include the current location of node S . The request region is the rectangle whose corners are S , P , Q and R . When the source node S want to search a path to the destination node D , node S sends a route request (RREQ) packet to its neighboring nodes. Let node N receives a RREQ packet, because node N is located in the rectangular request region, this node will forward the packet to its neighbors. Otherwise, if the node i receives a RREQ packet, node i discards the packet because node i is not located in the request region [3,10].

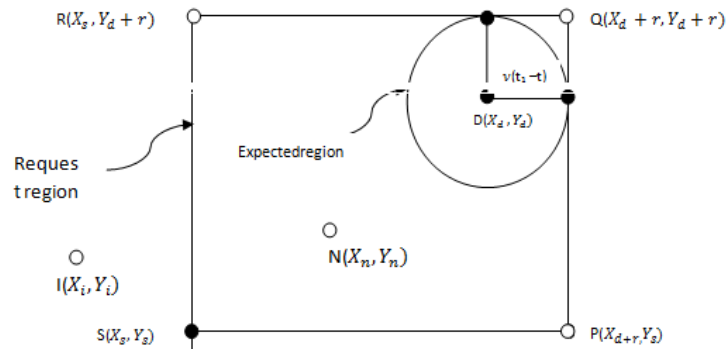


Fig1-Expected and request region

2.2 Duration of time

Because the two neighbors obtain each other motion values, such as position, velocity, and transmission range, the duration of link between these nodes can be determined based on their location information provided by GPS, velocities of movement and radio range. If we know the motion parameters of two nodes, we can calculate the duration of time these two nodes remained connected and provide stable routes.

We assume that two nodes A and B are in the same transmission range (r). We let (x_1, y_1) be the position of mobile node A and (x_2, y_2) be the position of mobile node B . We let $\sqrt{v_1}$ and $\sqrt{v_2}$ be speeds of movement and θ_1 and θ_2 ($0 \leq \theta_1, \theta_2 < 2\pi$) be the moving directions. We can obtain the duration of time between A and B by using the following equation:

$$D_t = \frac{-(ab+cd) + \sqrt{(a^2+c^2)r^2 - (ad-bc)^2}}{a^2+c^2} \quad (1)$$

Note that $a = v_1 \cos \theta_1 - v_2 \cos \theta_2$, $b = x_1 - x_2$, $c = v_1 \sin \theta_1 - v_2 \sin \theta_2$, $d = y_1 - y_2$

When a source node sends a request route packet, the packet adds its location, direction, and speed. The next hop of the source node receives the RREQ packet to predict the duration of time between it and the source node [3,11].

3. Reactive routing protocols

Techniques, such as DSR and AODV [12], attempt to reduce network traffic by initiating a route request on-demand. This type of routing protocols establishes communication links by flooding the network to find a route to the destination node. This strategy is simple and robust; however, it is not energy efficient and can cause severe media congestion.