Chapter XIV
FSR Evaluation Using the Suboptimal Operational Values

Osama H S Khader
The Islamic University of Gaza, Palestine

ABSTRACT

In mobile ad hoc networks, routing protocols are becoming more complicated and problematic. Routing in mobile ad hoc networks is multi-hop because of the limited communication range of wireless radios. Since nodes in the network can move freely and randomly, an efficient routing protocol is needed in order for such networks to be able to perform well in such an environment. In this environment the routing strategy is applied such that it is flexible enough to handle large populations and mobility and be able to minimize the use of the battery. Also it should be designed to achieve maximum packet delivery ratio. Further more, the routing protocol must perform well in terms of fast convergence, low routing delay, and low control overhead traffic. In this paper an improved implementation of the Fisheye State Routing (FSR) protocols is presented, where a new selection routing criteria that utilizes a minimum number of hops is a selection metric. The results obtained from simulation indicate that the fewer number of hops used the better and more efficient the output for packet delivery ratio was generated.

INTRODUCTION

A mobile ad-hoc network is a collection of mobile nodes with no pre-established infrastructure. Each of the nodes has a wireless interface and communicates with others over radio frequency (RF). Laptop computers and personal digital assistants that communicate directly with each other are some examples of nodes in an ad-hoc network. Nodes in the ad-hoc network are often mobile but also can consist of stationary nodes. An ad-hoc network uses no centralized administration. This ensures that the network will not cease functioning just because one of the mobile
nodes should be able to enter and leave the network as they wish. Ad hoc networks are often characterized by a dynamic topology, due to the fact that nodes change their physical location by moving around. Another characteristic is that a node has limited central processing unit (CPU) capacity, storage capacity, battery power, and bandwidth. This means that power usage must be limited, leading to a limited transmitter range. Every node in an ad hoc network must be willing to forward packets for other nodes. Thus every node acts both as a host and as a router. The topology of ad-hoc networks varies with time as nodes move, join, or leave the network. This topological instability requires a routing protocol to run on each node to create and maintain routes among the nodes.

The rest of the article is organized as follows. A survey of most existing wireless routing protocols is given in the MANET Routing Protocols section. The next section describes the FSR protocol. This followed by the performance results section. The last two sections are the conclusion and future work.

**MANET ROUTING PROTOCOLS**

Existing wireless routing schemes can be classified into four categories: (a) distance vector based, (b) link state (LS) based, (c) on-demand based, and (d) location based. Historically, the first type of routing scheme used in early packet networks, such as the ARPANET, was the distance vector type. The main advantages of the distance vector approach are simplicity and computation efficiency. However, this approach suffers from slow convergence and a tendency to create routing loops. While several approaches were proposed that solve the looping problem (Murthy & Garcia-Luna Aceves, 1996; Bhagwat, 1994). None of them overcome the problem of slow convergence. The solutions to both convergence and looping come in the form of the LS approach. LS is the preferred scheme for wired nets. In LS, global network topology information is maintained in all routers by the periodic flooding of LS updates by each node. Any link change triggers an immediate update. As a result, the time required for a router to converge to the new topology is much less than in the distance vector approach. Due to global topology knowledge, preventing a routing loop is also easier.

Unfortunately, as LS relies on flooding to disseminate the update information, excessive control overhead may be generated, especially when mobility is high and frequent updates are triggered. In addition, the small update packets make for inefficient use of the wireless medium access control (MAC) layer. When mobile ad hoc network (MANET) size and mobility increase (beyond certain thresholds), current proactive routing schemes (i.e., the distance vector and LS) become infeasible, since they will consume a large part of network capacity and node processing power to transmit update control messages just to keep up with the topology changes. The most recent addition to the family are the on-demand routing schemes. These have been specifically introduced in order to overcome some limitations of the proactive protocols in mobile environments. Examples include ad hoc on-demand distance vector by Perkins and Royer (1999), temporally ordered routing algorithm by Park and Corson (1997), and dynamic source routing by Zhong and Yuan (2003). The basic idea behind these reactive protocols is that a node discovers a route in an “on demand.” It computes a route only when needed. In on-demand schemes, query/response packets are used to discover (possibly more than) one route to a given destination. These control packets are usually smaller than the control packets used for routing table updates in proactive schemes, causing less overhead. However, since a route has to be entirely discovered prior to the actual data packet transmission, the initial search latency may degrade the performance of interactive applications (e.g., distributed database queries).
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