Mobility Impact on Mobile Ad hoc Routing Protocols

Nadjib Badache,
Basic software laboratory, CERIST, 3 Aissou brothers road, Ben-aknoun, Algiers, Algeria
badache@wissal.dz

Djamel Djenouri
Basic software laboratory, CERIST, 3 Aissou brothers road, Ben-aknoun, Algiers, Algeria
ddjenouri@mail.cerist.dz

Abdelouahid Derhab,
Basic software laboratory, CERIST, 3 Aissou brothers road, Ben-aknoun, Algiers, Algeria
aderhab@mail.cerist.dz

Abstract
An ad hoc network is a set of mobile units connected by wireless technologies, making an infrastructureless temporary network. without turning to a central administration. The network topology is unpredictable, dynamic, it may change any time. These topology changes make ad hoc networks challenging to implement routing protocols. In this paper, we study mobility effects on the performance of several mobile ad hoc routing protocols.

Keywords
Ad Hoc mobile networks, wireless networks, routing protocols, simulation, GloMoSim.

1 INTRODUCTION

Ad hoc mobile networks are dynamically formed by a set of mobile nodes connected by wireless links without any predefined infrastructure or centralised administration. It can be used in different applications such as: emergency search and rescue operations, communication between soldiers on a battlefield, sharing information in conference, and data acquisition operations in inhospitable terrains.
In such networks, a pair of nodes communicates by sending messages either over a direct wireless link, or over a sequence of wireless links including one or more intermediate nodes (hops). A wireless link is established only if two nodes are within a certain transmission radius called power range.
In order to provide communication within the networks, a routing protocol is used to discover routes between nodes. An ad hoc network routing protocol must deal with many limitations, which include frequent topology changes, low battery lives , low bandwidth, and high error rates. Implementing routing protocol that establishes an efficient route between a pair of nodes in such environment is one of the challenges facing ad hoc mobile networks.
Ad hoc network routing protocols can be divided in two categories: the *proactive protocols* and the *reactive protocols*.
The proactive protocols maintain permanently for each node, routes to every other nodes in the network. This approach is costly in terms of resources such as bandwidth, battery power and CPU.
The reactive protocols create routes only if needed by the source node; the disadvantage with this approach is that the delay to obtain routes may be high.
In this paper we present some parameters and metrics that we have added to Glomosim, and we study mobility effects on the performance of six protocols, four reactive (ABR, AODV, DSR, LAR) and two proactive (FSR, WRP) by measuring different quantitative metrics at different mobility levels.
The remainder of the paper is organised as follows: Section 2 presents an overview of the routing protocols simulated. Section 3 presents metrics and parameters added to the simulator. Section 4 contains the results of our simulation experiments. Finally, a conclusion is presented in Section 5.

2 PROTOCOLS OVERVIEW

2.1 WPR (Wireless Routing Protocol) [6]

WRP is based on a vector distance algorithm. To avoid counting to infinity problem, WRP introduces the shortest way predecessor node for each destination. Each node maintains 4 tables : distance table, routing table, link cost table and Message Retransmission List (MRL).
When a node either detects a neighbour link state change, or receives an update message from its neighbours, it sends another update message. Nodes included in response list of the update message (formed using MRL), have to acquit the message reception. If there is no routing table change compared with the last update, node has to send a hello message to ensure the connection. At the time of update message reception, node modifies its distance and seeks best routes basing on the received information. MRL list, must be updated after each ACK reception.

2.2 FSR (Fisheye State Routing) [7]

FSR is based on the fisheye technique [3], in order to reduce topological information size. Intuitively, this technique gives a great precisions at a focal point, then this precision regarding a given node decreases when distance between this node and the focal one increases.
FSR protocol is similar to the LS (Link State) approach, as each node saves the whole topology. The main difference is the manner in which routing information are exchanged between nodes. In FSR

0-7803-7983-7/03/$17.00 ©2003 IEEE