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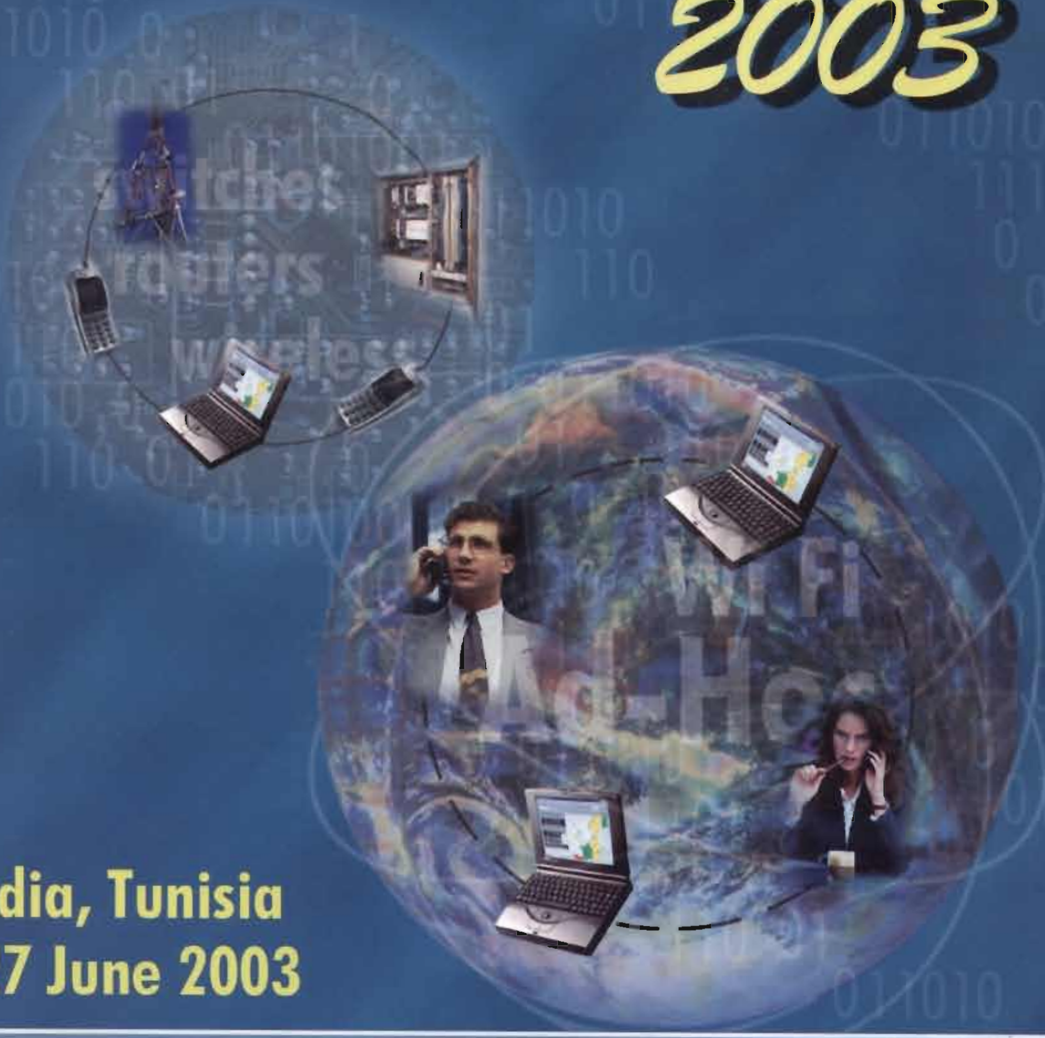

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SCALABLE MODEL FOR THE SIMULATION OF OLSR AND FAST-OLSR PROTOCOLS

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ABSTRACT

Technological advances and rapid development of the IEEE 802.11 standard have facilitated the growth of wireless local area networks (WLAN) and mobile computing in public domains. So, the routing protocols must support a very large and fast mobility of nodes over a very large ad-hoc network. In this paper, we present a scalable simulation model and results for the Optimized Link State protocol (OLSR) and the Fast-OLSR extension. OLSR is a proactive protocol, thus it periodically sends control packets to build and update the topology. Fast-OLSR extension is designed to meet the need for fast mobility in Mobile Ad-hoc NETworks (MANETs). The aim of this article is to evaluate the performance of Fast-OLSR in a very large ad-hoc networks by applying an extensible simulation model close to a real ad-hoc network. The simulation results were obtained with an IEEE 802.11 medium access control and physical layer model. Results show that the loss rate can be minimized for the Ad-hoc network of nodes with fast mobility by implementing OLSR and Fast-OLSR protocols.

I. INTRODUCTION

Growing interest has been given to the area of Mobile ad-hoc networking since the apparition of powerful radio devices allowing the connection of mobile nodes. A mobile ad-hoc network (MANET) [1] is a collection of nodes, which are able to connect on a wireless medium forming an arbitrary and dynamic network with *wireless links*. Implicit in this definition of a network is the fact that links, due to node mobility and other factors, may appear and disappear at any time. This in a MANET implies that the topology may be dynamic and that routing of traffic through a multi-hop path is necessary if all nodes are to be able to communicate.

A key issue in MANET is the necessity that the routing protocols have to respond rapidly to topological changes in the networks. At the same time, due to the limited bandwidth available through mobile radio interfaces, it is imperative that the amount of control traffic, generated by the routing protocols is kept at a minimum. Different routing protocols are proposed in the MANET divided into the following categories: proactive, ractive and hybride protocols.

OLSR [2, 3] is a proactive, link-state routing protocol, employing periodic message exchange to update topological information in each node in the network. Topological information is flooded to all nodes, providing routes immediately available when needed. However, when a node is moving fast, its neighbors are not stable and change quickly. The OLSR protocol cannot detect the broken links quickly. So, the packets transmitted on an invalid link are lost. In order to minimize packet loss, an extension of the Optimized Link State Routing protocol (OLSR), denoted Fast-OLSR [4] is proposed. The nodes in a moving fast mode activate the fast moving mode by applying Fast-OLSR protocol. In this paper, we evaluate the performance of a large Ad-hoc network of nodes implementing OLSR and Fast-OLSR protocols.

This paper is organized as follows: in section II, we provide a brief overview of the IEEE 802.11 access technique and briefly describe the simulation model. In section III, we describe the three families of routing protocols (i.e., reactive, proactive and hybrid protocols) discussed in the MANET working group. In section IV, we briefly present OLSR, a proactive protocol suitable for dense and large mobile ad hoc networks. In section V, we show the Fast-OLSR extension that takes into account fast mobility. In section VI, we evaluate the performance of the Fast-OLSR extension on the basis of the simulation results. We present the simulation model that we have developed to represent a mobile network.

II. THE IEEE 802.11 STANDARD AND THE SIMULATION MODEL

A. IEEE 802.11 physical layer

We use the IEEE 802.11 [5] direct sequence (DS) system. The physical layer can offer a throughput of 1 or 2 $Mbps$, which takes into account the exact protocol overhead. We have used the following assumption: the broadcast packets and the point to point packets are sent at 1 Mbps. Our simulation model takes into account the exact overhead caused by the physical layer of IEEE 802.11 standard. For further detail refer to [5,6].

B. The IEEE 802.11 MAC scheme

With radio signals, it is not possible to directly detect collisions in a radio network. Indeed, it is not possible to listen to alien transmission while actually transmitting. Packet collisions must therefore be detected by another means. The IEEE 802.11 standard uses an acknowledgement for a point-to-point packet, broadcast packets are not acknowledged. The receiver sends this acknowledgement packet just after reception of the packet. The MAC scheme of the IEEE 802.11 is primarily based on a CSMA (Carrier Sense Multiple Access) scheme. The main principle of this access technique is a preventive listening of