Chapter 1
Moving From Topology–Dependent to Opportunistic Routing Protocols in Dynamic Wireless Ad Hoc Networks:
Challenges and Future Directions

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ABSTRACT

Mobile ad hoc networks (MANETs) are a collection of wireless devices like mobile phones and laptops that can spontaneously form self-sustained temporary networks without the assistance of any pre-existing infrastructure or centralized control. These unique features have enabled MANETs to be used for communication in challenging environments like earthquake-affected areas, underground mines, etc. Mobility and speed of devices in MANETs have become highly unpredictable and is increasing day by day. Major challenge in these highly dynamic networks is to efficiently deliver data packets from source to destination. Over these years a number of protocols have been proposed for this purpose. This chapter examines the working of popular protocols proposed for efficient data delivery in MANETs: starting from the traditional topology-based protocols to the latest opportunistic protocols. The performances of these protocols are analyzed using simulations in ns-2. Finally, challenges and future research directions in this area are presented.

INTRODUCTION

Recent advances in wireless technology have led to the exponential growth and usage of wireless mobile devices worldwide. Today billions of wireless devices are connected with the help of infrastructure like access points and base stations. These infrastructure supported wireless networks provide an increasing number of wireless local area network (LAN) hot spots, allowing travelers and users with portable laptops and mobile phones to surf the Internet from hotels, airports, railway stations, coffee shops and other public locations. However, these infrastructure supported wireless network comes with a number of limitations. They consume plenty of time and money for installation and maintenance; have constraints in flexibility, suffer from low utilization of local wireless resources and are particularly vulnerable to natural disasters and unpredicted failures. To overcome these limitations, self-sustained, infrastructure-less and decentralized wireless networks have been proposed, known as mobile ad hoc networks (Giordano and Lu, 2001; Chlamtac et al., 2003; Menon & Prathap, 2016).

Mobile ad hoc networks (MANETs) are a collection of wireless devices like mobile phones, laptops, PC's and iPads that can form instantaneous temporary networks without the support of any pre-existing network infrastructure or centralized control. It works as an autonomous system of mobile hosts connected by wireless communication links. The network is configured in a way that all the devices can dynamically join or quit the network at any time without disrupting communication between other devices. Every device in the network plays the dual role of a router and a host, cooperates and coordinates with each other to make routing decisions in the network. Data is transmitted in the network in a store and forward manner from the source node to the destination node via the intermediate nodes. Ease of deployment, speed of deployment and the ability to self-organize and self-adapt without the help of any underlying infrastructure has contributed to the growing popularity of MANETs in research as well as in industry. Today MANETs are used for communication and resource sharing in numerous challenging environments like earthquake and volcano affected areas (Mase, 2011; Menon et al., 2016), underground mines, battlefields etc. Figure 1 shows an example MANET used in disaster recovery operations

Figure 1. MANETs in disaster recovery operations
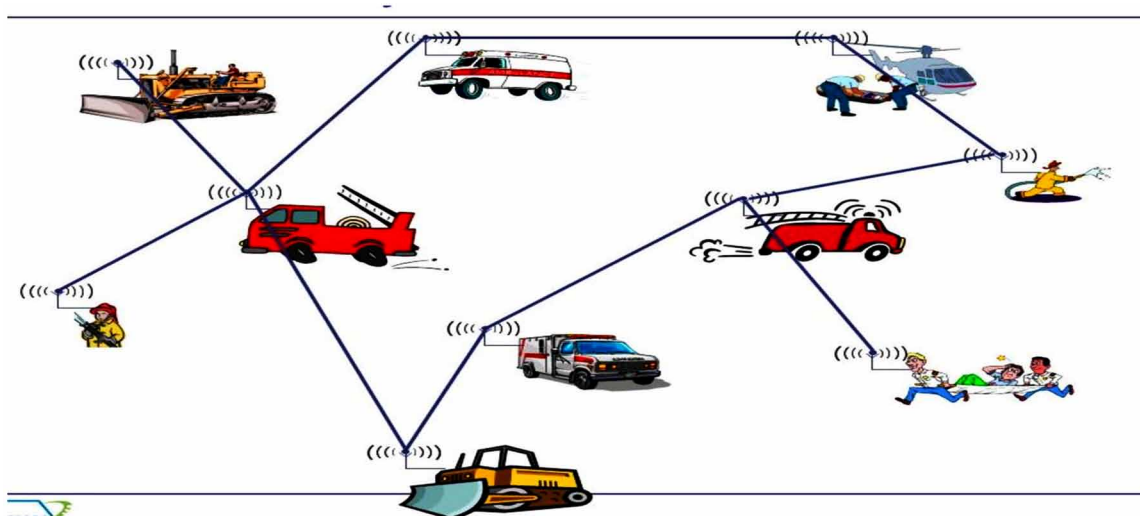
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