A Contact-based Hybrid Routing Protocol for Mobile Ad Hoc Networks

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In this paper, we propose a routing protocol for mobile ad hoc networks called Contact-based Hybrid Routing (CHR) protocol where each node maintains potential routes to the nodes which it encountered. Only one route request message is forwarded along the potential route maintained by the source to the destination. In forwarding the route request message, if an intermediate node find that the potential route is broken, the node uses the potential route maintained by itself to the next node. Based on this idea, our goal is to reduce the number of route request messages by maintaining small amount of information at nodes. The experimental results in the random way point mobility and the disaster evacuation mobility have shown that CHR could reduce the number of messages while keeping reasonable reachability to the destinations.

1. Introduction

Mobile ad hoc networks (MANETs) will be one of key infrastructures to make our life more affluent. One practical application of MANETs is extension of coverage area of wireless infrastructure by forming ad hoc networks among neighboring mobile clients. Particularly, such application can be implemented in vehicular ad hoc networks (VANETs) as shown in Fig. 1(a). Each vehicle like A1 or B4 which wishes to access through a base station (BS) to the global network is assisted by VANET to establish a route to BS. MANETs are also useful as a substitution for cellular networks, which will be damaged and disabled in large-scale disaster area. In such a case, a rescue team in the refuge may need to communicate with the cellular phones of disaster victims to know their serious situations and make plans for rescue (Fig. 1(b)). This is done by ad hoc facility of brand-new cellular phones which are equipped with wireless LANs. We may compose an ad hoc network among the evacuees to communicate from the refuge to victims who cannot move due to injury or other reasons. Moreover, requirement for real-time communication between a station and mobile clients in parks, museums or malls is plausible; information terminals are lent at an information center, and people who got the terminals can take benefit of on-line navigation and location-aware information service over MANETs (Fig. 1(c)).

In all the scenarios above, one communication end point is a Base Station (BS in short) which is stationary and may or may not be connected to global networks, and another is one of some Mobile Clients (MCs in short). Also many other Mobile Terminals (MT), which may kindly become constitutes of MANETs, move toward BS or leave from BS. Considering this fact, it is natural (i) to maintain routes between the BS and MCs that are going away from BS, and (ii) to provide routes to BS for MCs that are going toward BS by the assistance of MTs, in order to mitigate message overhead of finding routes in on-demand routing protocols.

Motivated by this observation, in this paper, we propose a routing strategy for MANETs and design a corresponding protocol called Contact-based Hybrid Routing protocol (CHR). The primary goal of our design is to alleviate the overhead caused by Route REQuest (RREQ in short) message flood in reactive routing approaches, without relying on any context information such as location information nor special hardware. Also we target mobile environment, thus we would like to avoid route management cost in proactive routing approaches. To balance these two contradictory requirements, we take a hybrid approach. We just use connectivity information between neighbors, so we need only periodical messages exchanges between neighbors.

The main idea to establish a route lies in the following process. Using the connectivity information between neighbors and the same information sent from their (further) neighbors, each node (say node S) knows its two-hop neighbors.