Cognitive Network Layer
in MANETs Mobility Aware Routing Protocol

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Abstract. It is intended to add cognition to make cognitive network layer in order to design and develop Quality of Service (QoS) aware adaptive routing protocol in Mobile Adhoc Networks (MANETs). QoS-aware routing is challenging as nodes in the network are free to move, the topology will be changing dynamically. Performance of AODV will be less when nodes in the network are highly mobile. In this paper, Mobility Aware Routing Protocol (MARP) model is proposed to extract a core part in MANET that is stable in terms of mobility of the nodes. This core part is a subset of MANET mobile nodes through which transmission will be done. Here selection of paths through this extracted core can ensure more QoS in time. The MARP model not only provides a better way to discover a QoS but it considers an efficient route maintenance scheme by selecting the route which has more stability as source is having knowledge about other available paths. Since MARP is multipath routing protocol, route maintenance is easy and it robust. By simulation MARP show better performance over existing AODV-on demand routing protocol.

Keywords: AODV, Load, MANETs, Mobility, QoS.

1   Introduction

Mobile Adhoc Networks (MANETs) has been recognized as an area of research in its own rights, but their practical implementation in real world has been limited so far. Due to dynamic topology, and lack of central coordination in MANETs, the provision of Quality of Service (QoS) is much more challenging than in wired networks. The difficulties in the provision of such guarantees have limited the usefulness of MANETs. As a result research focus has been shifted from best effort services to the provision of higher and better defined QoS in MANETs. QoS Routing protocols play an important role in a QoS mechanism, since their task to find which nodes, if any, can serve an applications requirements. The link among nodes through which transmission will take place may live for longer period, as nodes in range move out. Control packet overhead is more here since it allows single path, once it breaks route discovery process will be started again. The QoS routing algorithm for wired networks cant be applied directly to adhoc networks.

The performance of most of the wireless routing algorithm relies on the availability of the precise state information [1]. However, the dynamic nature of adhoc network makes the available state information inherently imprecise. Second, nodes may join, leave and rejoin an adhoc network at any time, any location. Existing links may disappear and, new links may be found as the nodes move. With the increase in demand for QoS in evolving applications, it is necessary to support this QoS in MANETs. The characteristics of these networks make QoS support a very complex process.

Due to the fact that Mobile Nodes (MNs) change their physical location by moving around, the network topology may unpredictably change [2]. This causes changes in link status between each MN and its neighbors. Thus, MNs which join and/or leave the communication range of a given MN in the network will certainly change its relationship with its neighbors by detecting new link breakages and/or link additions. This can produce a large number of updates in the routing table of each MN in MANET. Furthermore, this topology change makes an overhead traffic in the process of path maintenance assured by the implemented routing protocol in MANET. Hence, the performance of a MANET is closely related to the capability of the routing protocol to adapt itself to topology changes. It is more judicious that the QoS-aware routing takes in to consideration the mobility of MNs in the network. Our approach to evaluate and quantify this mobility of MNs is based on the link changes of each MN with its neighboring MNs. Consequently, MNs with low mobility composing path of required QoS are more reliable amongst each other. Otherwise, the QoS provided by QoS-aware routing can be assured and guaranteed in time.

1.1   Issues for QoS-Aware Routing in MANETs

Providing QoS-aware routing in MANETs is really challenging task and it is an active research area. MANETs have certain unique characteristics that pose several issues and difficulties in provisioning QoS-aware routing. These issues include features of the MANET environment like predictable link properties, node mobility and route maintenance. These issues are summarized as follows [2].

a. Link properties: Wireless media is very unpredictable. Packet collision is intrinsic to wireless network. Signal propagation faces difficulties such as signal fading, interference, and multi-path cancellation. All these properties make measures such as bandwidth and delay of a wireless link unpredictable.
b. Mobility: Mobility of the MNs creates a dynamic network topology. Links will be dynamically formed when two MNs come into the transmission range of each other and are torn down when they move out of range.
c. Route maintenance: The dynamic nature of the network topology and the changing behavior of the communication medium make precise maintenance of network state information very difficult. Thus, the QoS-aware routing in MANETs have to operate with inherently imprecise information. Furthermore, in MANET environments, MNs can join or leave at any time. The