Chapter 12

Optimal Route Selection Algorithm for Multi-Homed Mobile Network

Sulata Mitra
Bengal Engineering and Science University, India

ABSTRACT

This chapter develops the concept of route optimization in a multi-homed mobile network. In a future wireless network a user may have multiple mobile devices, each having multiple network interfaces and needing interconnection with each other as well as with other networks to form a mobile network. Such mobile networks may be multi-homed i.e. having multiple points of attachment to the Internet. It forwards packets of mobile network nodes inside it to Internet using suitable routes. But there may be multiple routes in a mobile network for forwarding packets of mobile network node. Moreover, the mobile network nodes inside a mobile network may have packets of different service types. So the optimal route selection inside a mobile network depending upon the service type of mobile network node is an important research issue. Two different route optimization schemes to create point to point network among mobile network nodes are elaborated in this chapter. This chapter is aimed at the researchers and the policy makers making them aware of the different means of efficient route selection in a multi-homed mobile network as well as understanding the problem areas that need further vigorous research.

INTRODUCTION

The users’ in future wireless networks expect to be connected to the Internet from “anywhere” at “anytime,” in fixed wireless locations or while on the move. A user may roam over a series of networks during his global travel. Internet browsing “on-the-move,” video conferencing and file transfer are some of the new expected services in near future. In future wireless network a user may have more than one mobile devices say a mobile phone, a laptop, and a personal digital assistant. Each of these devices is likely to have multiple network interfaces that enable them to interconnect with each other as well as with other networks. These devices moving with the user
together are an example of a small scale mobile network (MN). The access networks deployed on public transportations such as ships, trains, buses and aircrafts are examples of MNs at a larger scale. The introduction of security and privacy enhancing mechanism in future wireless networks is required without which antisocial and criminal behaviour jeopardizes the benefit of the system deployment. The hosts are identified with an IP address in such an environment. The Internetwork assures that the IP packets are indeed sent to and received from the authentic hosts. So it is required to verify the authentication of a host’s identity by the routing infrastructure implicitly. A host in this environment claims to own an address that some other node is currently using, with the intention of launching a masquerade, man-in-the-middle or denial-of-service attack against the owner of the given address. Figure 1 shows the architecture of an MN. The mobile routers (MRs) in a MN act as a gateway between the entire MN and the rest of the Internet. A number of mobile network nodes (MNNs) are attached behind a MR as shown in Figure 1. The MRs which are directly connected to the Internet are the root MRs, and the MRs which are directly connected to MNNs are the leaf MRs. For example, MN1 in Figure 1 has MR1, MR3, MR5 as root MRs and MR2, MR4, MR6 as leaf MRs. A MN may change its point of attachment to the Internet. Such a MN is identified within the Internet topology by mobile network prefix (MNP) which is a bit string that consists of some number of initial bits of an IP address. The network to which a MN is usually connected is called its home network. The home agent (HA) in the home network keeps track of the location of MN. When the MN moves out of its home network and enters into a foreign network, it maintains its connectivity with its home agent through an MR-HA tunnel. The home agent tunnels all subsequent packets for MN to MR using this tunnel. So MNNs in different MNs or in the same MN create a point-to-point network among them through MR-HA tunnel. For example, MNN1 in MN1 creates a point-to-point network with MNN4 in MN2 through MR-HA tunnel as shown by firm arrow in Figure 1. MNN2 in MN1 creates a point to point network with MNN3 in MN1 through MR-HA tunnel as shown by the dotted line in Figure 1.

Each MR has one or more egress interface and one or more ingress interface. The packets forwarded from the MN to the rest of the Internet are transmitted through one of the MR’s egress interfaces and packets forwarded to the MN are transmitted through one of the MR’s ingress in-

Figure 1. Architecture of MN