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A Multi-Layer Routing Protocol for Mobility Management in Wireless Mesh Networks

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Abstract

In the recent trends, Wireless Mesh networks are proven to be one of the emerging fields in the wireless networks. WMNs comprises of Gateways (GWs), Mesh Clients (MCs) and Mesh Routers (MRs). However, it is challenging job to provide seamless connectivity when MC moves around the network. The recent advances in the field of wireless technology created a chance to overwhelmed the disadvantages of wired and wireless networks. The mobility management in the WMNs motivated the researchers to concentrate. In this paper, we are proposing a model called as multi-layer routing protocol for WMNs. This protocol works with the data link layer and network layer for data frame transmission. The proposed algorithm is implemented with intra domain for experimental evaluation. The experimental results show the effectiveness of the routing protocol.

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Keywords: Mobility Management; Multi Layer Routing Protocol; Packet Latency; Packet Loss Ratio; Wireless Mesh Networks.

1. Introduction

In the recent trends, the wireless networks are gaining popularity over the communications specifically, multi hop networks, such as opportunistic networks (mobile ad hoc networks)[1–3]. WSNs (wireless sensor networks) placed their type of mark by introducing the cognitive radio networks[4–6]. The vehicular sensor networks and vehicular ad hoc networks are proceeding in the research based on the internet of things. The wireless mesh networks received high attention based on the reliability and the extensibility. The WMNs provide low cost, high data rate and reliability over the communication in different type of applications[7,8]. The WMNs are extensively used in military fields, disaster relief and smart grid technologies.

The WMNs uses the IEEE802.11 standard for the connection establishment in wireless broadband services. Figure 1 shows the typical WMNs having the mesh gateways, mesh routers and mesh clients.

Mesh clients are very rich in mobility when compared to the mesh routers. Thus, the static network is composed of mesh routers[9,10]. In conventional mesh networks, the mesh clients itself act as mesh routers, bridges and gateways. The architecture of conventional WMNs is almost similar to the wireless ad-hoc networks. The clients with in the mesh network are in mobile nature which can send and receive the information from the mesh routers. The mesh routers

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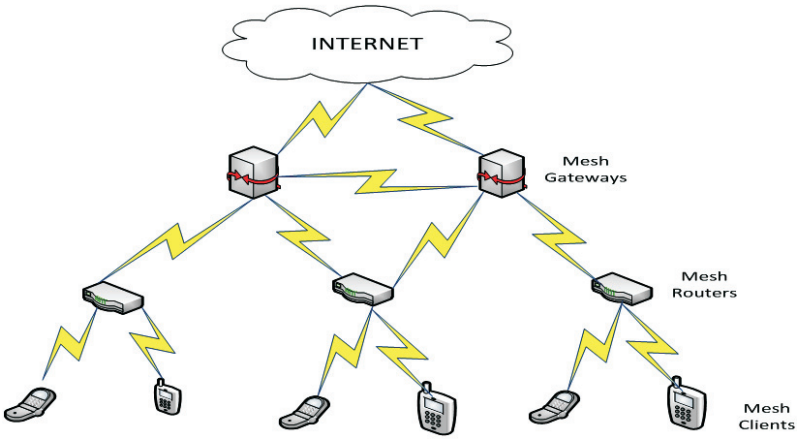

Fig. 1. Wireless Mesh Network.

send the collected information to the mesh gateways which is already connected to the internet. The mesh routers form self-reliable and self-manageable links at the time of communication.

In the recent trends, many routing protocols are proposed for MANETs and WSNs. But, WMNs are different from the remaining networks. The routing protocols available in the WMNs are weighted cumulative ETT (WCETT)[11], Expected Transmission Time (ETT)[12], Expected Transmission Count (ETC)[13], AVAIL[14], and Inference Neighbouring Count (INX)[15]. The above stated protocols achieved results in their state of art. But, the dynamic traffic in the WMNs is not fully absorbed by the above categories. In this paper, we are concentrating on the mobility management scheme for intra domain in the WMNs. The intra domain refers to the mobility of the clients with in the same routers

2. Literature Survey

In WMN, the mobility management contains both handover and location management in the communication. The mobile nodes in the WMNs store their information at the routers, based on that information; the nodes present location can be identified. This information updating process at the router is a continuous process. The handover management is accountable for forming the new link whenever the node is moving to the control of another router. The router in the handover process is belongs to the different domains (inter domain) or same domain (intra domain). In the present system we are dealing with intra domain mobility management.

2.1 Intra domain

There are number of mechanisms proposed for intra domain mobile management in conventional wireless networks. But, the exiting mechanisms are not comfortable for WMNs. In this literature some intra domain mobility management schemes are studied.

Routing mechanisms

In[16], cross layer mobile management scheme was proposed by Navda *et al.* each mesh router contains the routing table to record the information about the mobile clients in the network. Before handover process, every client searches for better router by sending probe request message. The mesh client selects the best router based on the link quality according to its signal strength.

In[17] MAC layer triggered mobility management adopts mobility management scheme. This scheme works with the principle of assigning the IP address to the hash function for finding the mobility of the client.