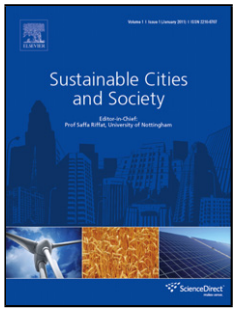

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A Clustering Based Routing Algorithm in IoT Aware Wireless Mesh Networks

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Highlights:

- Our system achieve optimal network throughput.
- In IoT over WMN environment, a Load Balancing and Interference Delay Aware rout ing algorithm is used to avoid network traffic jam.
- The proposed scheme efficiently utilizes the available mesh station queue informatio n and the number of mesh nodes that suffers from channel interference in the availabl e path. This increases the network energy efficiency by managing the interference del ay.

Abstract

The Internet of Things (IoT) notion enables embedded devices to connect and share data through IP or the web. Interference routing metric and adaptive load balancing have gained much attention as the key challenges to overcome in IoT based wireless mesh networks (WMN) with the increase in wireless service performance. Moreover, IoT over WMN severely affected by network traffic caused by enormous data generation by a large number of users. Hence, we have proposed a clustering based routing algorithm considering an interference and load balancing routing metric that focuses on minimizing the existing issues of networks. In this study, we propose a scheme that reduces the end-to-end delay but also gives full consideration to both the quality on the entire route to the destination and to the expected lifetime of nodes with bottlenecks from heaped traffic in IoT. Simultaneously, it utilizes mesh station channel interference and queue information appropriately to address the identified challenges. The simulations results show that the proposed scheme performed superior to the existing routing metrics present in the current literature for similar purposes.

Keywords: Interference Delay Aware, Load Balancing, Wireless Mesh Networks, Routing Metrics, Internet Protocol, Internet of Things.

1 Introduction

The fundamental idea of Wireless Mesh Network (WMN) is a collection of heterogeneous devices that are uniquely addressable, which are capable of identifying and sharing information to support ubiquitous computing [1]. With the extensive attention, WMN has rapidly approached various fields of interests i.e. smart home, smart healthcare, smart city, smart transportation, and much more. However, a considerable amount of modifications are demanded in each area of interest, in order to ensure WMN service provision. For example, Wireless HART and Bluetooth require a gateway to translate information, since they do not offer native compatibility for IP network functionalities [2]. Wireless Mesh Network (WMN) has become the buzzword in the modern era owing to its ability in providing faster connectivity among devices that are connected to the internet [3]. Hence, it is crucial to consider the selection of the best link, routing data among mesh stations (MSTA), etc. in order to use WMN services in IoT. WMN provides a layered wireless architecture that consists of two layers. Mesh routers in the first layer create the self-configured ad-hoc wireless network. The gateways are selected among the mesh routers. In the second layer, MSTAs are attached to the ad-hoc network of the first layer. Cost-effective deployment, efficient communication, and ability to self-heal are considered as the main advantages of WMN. Another important characteristic is that communication with mesh network does not lead to an excessive energy consumption of MSTAs. The throughput of WMN is significantly leveraged by ubiquitous communication [4]. Facilitating network access in areas where the wired network is unavailable is another key advantage of WMNs. Furthermore, various advantages of WMNs are taken into consideration in many research areas i.e. house networking, community networking, healthcare systems, etc. Even though WMN is extensively studied during the recent past, various challenges still exist in the context of architecture. Especially, scheduling transmissions at the medium access control (MAC) layer are challenging, since WMN generally consists of a large number of nodes. In fact, an optimal scheduling technique is essential to improve the throughput of WMN. A similar scenario is expected in IoT environment as well, where innumerable IoT nodes communicate with each other as shown in Figure 1. Hence, a larger number of nodes are susceptible to overloading and interference in WMN links [5].