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Using NDN in Improving Energy Efficiency of MANET



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Abstract This paper seeks to extol the virtues of named data networking (NDN), as an alternative to host-centric networking (HCN), for its prominent features that can be taken advantage of to significantly reduce energy consumption demands in a mobile

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ad hoc network (MANET) implementation. Therefore, a NDN-based content routing mechanism was compared with two types of HCN routing protocol implementations in this study: OLSR and Batman-adv. The experimental results obtained from this research provide early evidence that NDN can increase the energy efficiency of MANET compared to the use of HCN primarily TCP/IP on the network stack solution for MANET. Of particular note would be NDN-based content routing's viability as a solution for energy consumption issues that plague wireless multi-hop ad hoc networks. Last but not least, this paper also provides the future research direction that could be undertaken on the subject.

Keywords Mobile ad hoc network · MANET testbed · Named data networking · NDN · Energy efficiency · Host-centric · HCN · OLSR and Batman-adv

1 Introduction

Energy is a limited resource on any mobile nodes in mobile ad hoc network (MANET) because the energy source only comes from the battery which only store limited amount of energy supply, just to enable the mobile devices to be used even if it is not connected to a fixed power supply such as a mesh router in a wireless mesh network. Furthermore, the mobile device in the MANET not only serves as a consumer, but also a router or relay to network traffic from other mobile devices to form a multi-hop wireless network [1, 2]. Because of that, energy conservation issue in MANET is one of the critical issues and needs to be addressed effectively, given that the lifespan of a mobile device in a MANET must be maximized as good as possible. This is because the lifespan of mobile devices in MANET influenced directly the lifespan of the network itself [3–6].

Until now, after several decades host-centric MANET exists, and there is still no evidence indicating that the increase in energy efficiency of the host-centric MANET can be done effectively. The approach used in the host-centric MANET to tackle dynamic network topology with additional mechanisms is still less efficient even though various new better methods have been proposed [7–10].

Circa 2000 a new paradigm appeared to replace host-centric, known as NDN. NDN has vast potential to improve the network energy efficiency of future Internet applications [11, 12].

This paper has been divided into six main sections as follows: Sect. 1 provides the introduction to the paper including the background information and problem addressed. Section 2 critically evaluates the related work carried out in this field. Section 3 discusses the advantages of NDN architecture that makes NDN more suitable to be used as a network stack solution in MANET compared to HCN, e.g., TCP/IP. Section 4 describes the research methodology used in this study. Section 5 provides a preliminary result obtained from real-world testbed-based experiment conducted in this research. And finally, Sect. 6 concludes the paper and presents our future work.