

多接口多信道 WMNs 负载感知多播路由与信道分配

摘 要

近几十年，通信技术的发展突飞猛进，无数的新兴技术涌现，无线 Mesh 网络以其多种优秀的特点，如高可靠性、高带宽、低成本等，成为通信技术发展中的一条明路，成为大多数通信问题的主要解决方案。经过十几年的发展，无线 Mesh 网络的应用技术也逐渐成熟，由单播发展为多播，由单接口发展为多接口多信道，由正交信道发展为部分重叠信道。这些技术的发展在发挥无线 Mesh 网络优点的同时，也带来了一些问题，如信道多播传输时网络干扰的增加、信道容量的下降等等。这种情况下，无线 Mesh 网络的信道分配和路由选择，便成为了当下的研究热点。

本文研究的是基于部分重叠信道技术的多接口多信道无线 Mesh 网络中的信道分配和路由度量问题。现有文献大多注重干扰感知，未考虑负载感知或对负载感知不够重视。而负载感知在网络通信的过程中，对利用网络资源和最大化用户数都有着重要的帮助。本毕业设计构建了带有约束的整数线性规划，用于获得理论最大用户数，可以用于对比评估其他方案的性能。同时，本文提出了一种启发式负载感知多播路由和信道分配方案，该方案同时考虑了节点负载、兄弟链路约束和信道容量约束条件，迭代搜索多播路由路径和信道分配，可以保证树链路之间的负载感知干扰最小。仿真结果表明，该方案可以显著提高网络性能，同时降低实现复杂度。

关键词：无线 Mesh 网络，多播，负载感知，信道分配

ABSTRACT

In recent decades, the development of communication technology has progressed by leaps and bounds, and countless technological changes have alternated. Wireless mesh network has many excellent characteristics, such as high reliability, high bandwidth and low cost. It becomes a clear road in the development of communication technology, and it also becomes the main solution to most communication problems. After more than ten years of development, the application of wireless mesh networks have gradually matured, from unicast to multicast, from orthogonal channels to partially overlapping channels, from single interface to multi-interface multi-channel technology. At the same time, the development of these technologies not only takes the advantages of wireless mesh network, but also brings in some problems, such as increase of network interference, decrease of channel capacity and so on. As a result, channel allocation and routing of wireless mesh networks have become a hot topic.

Channel allocation and routing metrics in multi-interface multi-channel wireless mesh networks based on partially overlapping channel technology are studied in this paper. Most of the current literatures focus on interference perception, and consider nothing about load awareness or do not pay enough attention to load perception. In the process of network communication, load awareness is helpful in utilizing networks resources and maximizing the number of users. In this paper, an integer linear programming is formulated, which can obtain the maximum number of users theoretically, and it can be used to evaluate the performance of other schemes. Considering node load, sibling link constraint and channel capacity constraint conditions, iterative search for multicast routing paths and channel assignment can ensure minimal load-aware interference between tree links. Simulation results show that the scheme can significantly improve networks performance while reducing complexity.

Keywords: Wireless mesh networks; Multicast; Load-aware; Channel assignment

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