

短文与研究通讯

一种环境感知的无线Mesh网络自适应QoS路径选择算法

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摘要:

本文针对如何改善无线多跳Mesh网络的服务质量, 满足无线多媒体业务对数据传输的带宽、时延、抖动的要求等问题, 研究了一种基于无线信道状态和链路质量统计的MAC层最大重传次数的自适应调整算法。该算法通过对无线Mesh网络的无线信道环境的动态感知, 利用分层判断法区分无线分组丢失的主要原因是无线差错还是网络拥塞导致, 实时调整MAC层的最佳重传次数, 降低无线网络中的分组冲突概率。基于链路状态信息的统计和最大重传策略, 提出了一种启发式的基于环境感知的QoS路由优化机制HEAOR。该算法通过动态感知底层链路状态信息, 利用灰色关联分析法自适应选择最优路径, 在不增加系统复杂度的基础上, 减少链路误判概率, 提高传输效率。NS2仿真结果表明, HEAOR算法能有效减少重路由次数, 降低链路失效概率, 提高网络的平均吞吐率。本文提出的方法不仅能够优化MAC层的重传, 而且通过发现跨层设计的优化参数实现对路径的优化选择。

关键词: 无线Mesh网络; 环境感知; MAC重传; 链路质量

An Adaptive QoS Path Selection Algorithm based on Environment-Aware for Wireless Mesh Networks

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Abstract:

With the rapid development of the wireless Multi-hop Mesh networks, more and more wireless multimedia services have high demands on bandwidth, delay and jitter to improve overall system performance. In this paper, an adaptive adjustment strategy of the MAC (Media Access Control) layer maximum retransmission count is developed by means of statistical information of wireless channel state and link quality, to reduce wireless link collision probability and improve the packet successful delivery rate of wireless Mesh networks. The adaptive adjustment strategy takes into consideration packet loss property of the MAC layer and PHY (Physical) layer over wireless networks, and distinguishes the causes of packet loss for wireless link (wireless link random error or network congestion/conflict) based on environment information by use of stratified analysis method to predict the best retransmission count of the MAC layer for each packet that should be retransmitted. In the network layer, based on adaptive retransmission strategy of the MAC layer and statistics of path state, a heuristic environment-aware QoS (Quality of Service) dynamic routing optimization algorithm HEAOR (Heuristic Environment-Aware Optimal Routing) for IEEE 802.11 wireless Mesh networks is proposed. The proposed heuristic scheme can adaptively select optimal path based on dynamic aware of bottom layers link information by means of gray correlation analysis method to improve routing efficiency and reduce the probability of packet loss without increasing the routing computational complexity. NS2 simulation results show that the proposed optimal routing selection scheme can reduce rerouting frequency and link failure probability, and is effective in improving throughput and reducing end-to-end delay. The proposed scheme enables us to find optimal the MAC layer retransmissions and select an optimal path over error-prone wireless links.

Keywords: Wireless Mesh networks Environment Aware MAC retransmission; Link quality

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