论文摘要

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基于网络编码的无线局域网多播MAC协议及性能分析

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摘　要：针对现有IEEE 802.11协议无法提供可靠多播服务的缺陷，提出一种基于网络编码的无线局域网多播MAC协议MPNC。该协议对已有的ELBP协议进行了扩展，采用网络编码组传输模型发送多播数据。对于多播源节点，采用随机线性码对多播数据帧进行编码组合发送；对于多播接收节点，在接收的编码帧累积到一定数量后通过解码操作恢复出所需的原始数据。该方案有效减少了多播数据帧的发送次数，从而提高了无线带宽的利用效率。基于终端信道竞争的二维马尔可夫链模型，推导了差错信道下MPNC协议在网络饱和状态下的吞吐量理论表达式。最后，使用NS-2模拟器评估MPNC协议在不同信道误比特率和多播节点数目下的性能。仿真结果表明，MPNC比已有LBP和ELBP协议获得更优的吞吐量性能，并验证了理论分析的正确性。

关键字：MAC协议；多播；吞吐量；随机线性码

A multicast MAC protocol for wireless LAN based on network coding and its performance analysis

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Abstract: In order to conquer the deficiency of the multicast service provided by IEEE 802.11, a multicast MAC protocol called MPNC based on network coding was proposed for the wireless local area network (WLAN). By extending the previous proposed ELBP protocol, MPNC exploited network coding group to transmit multicast data frames. In multicast source node, the data frames were combined with random linear codes to transmit. In received nodes, the data frames were decoded after receiving enough combined frames. The scheme can effectively reduce the number of transmission and improve the throughput efficiency. Based on the 2-dim Markov chain model for the channel contention of terminals, analytic solutions were derived for the saturation throughput of MPNC under the error-prone channels. Finally, NS-2 simulator was used to evaluate the performance of MPNC under the condition of different bit error rates and the number of multicast users. The results show that MPNC can achieve better performance than LBP and ELBP protocols in terms of throughput. Further, the results validate the conclusion of the theory analysis.

Key words:MAC protocol; multicast; throughput; random linear codes