

On Avoiding Large Interference Range Collisions for Wireless Ad Hoc Networks

Resolving hidden terminal problem is one of the major responsibilities in designing MAC protocols for wireless ad hoc networks. IEEE 802.11 DCF, currently the most popular used MAC protocol, adopts four-way handshake to prevent hidden terminal problem. However, it has been pointed out that four-way handshake cannot completely prevent hidden terminal problem because the STAs which are out of the transmission ranges of both the transmitter and the receiver may still interfere with the receiver. As a result, the paper proposes a fragmentationbased MAC protocol with power control, named F-RCRC MAC protocol, to avoid the LIRC (Large Interference Range Collision) problem, a kind of hidden terminal problem, for wireless ad hoc networks. F-RCRC designs a new interframe space, named FIFS, to reduce the overhead caused by the fragmentation scheme. With the fragmentation, the design of FIFS can effectively avoid the hidden STAs interfering with the receivers'receiving. Moreover, a dynamic transmission power scheme is devised to actively and timely warn the hidden STAs such that the possible collision is avoided. Thus, the LIRC problem can be solved and the network throughput is increased accordingly. In addition, F-RCRC can reduce the energy consumption and increase the spatial reuse due to the controlled transmission power. It is further shown that FRCRC can also solve the POINT problem and work correctly in multi-rate environments. Simulation results show that F-RCRC performs much better than the related work in terms of network throughput as well as the power throughput.