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This research work deal with the MAC layer protocols which may be said to be the 'heart' of wireless communication. Wireless communication is a broad topic involving a number of thrust areas for researchers, specially the medium access techniques, techniques for increasing data rates, data security etc; and also involving various network technologies which are to be optimized. Medium access is required for all types of wireless networks such as Wireless WANs, Wireless LANs, Mobile Ad-hoc networks, and sensor networks. The present century is witnessing worldwide exponential growth of wireless technology and networking. Wireless Local Networking has become extremely popular for internet connectivity in offices, homes, colleges and university campuses.

The IEEE 802 working group has approved different network standards for Medium Access Layer and Physical Layer specifications. These standards are designed for various Metropolitan Area Networks, Local Area Networks and Personal Area Networks. IEEE 802.11 working group has approved Physical layer and Medium Access Layer Protocols for Wireless LANs. IEEE working groups have constantly refined the 802.11 Medium Access Control (MAC) to improve various performance matrices for better support of higher layer Applications.

MAC layer plays an important role in better utilization of physical communication resources. Wireless networks have several issues due to wireless access, mainly in Ad-hoc networks. In Ad-hoc network the performance may be degraded due to variable data-rate links, limited communication bandwidth, higher retransmission probability due to transmission error etc. In the

last two decades, MAC layer protocols of Ad-hoc networks have eitnessed significant research activity. Reliable data delivery in ad-hoc networks is highly dependent on the MAC layer protocols.

IEEE802 working group has selected the carrier sense protocol CSMA/CA for wireless LANs. However, CSMA/CA gives rise to several issues such as large packet overheads, the hidden node problem and the exposed node problem etc. CSMA/CA based MAC layer has difficulty in delivering high data rates because of higher interference, high rate of collision and retransmission, and also random delays due to the wireless channel. It does not provide any guarantee to successfully deliver a packet at first transmission.

In view of the above, the objective of this research work is MAC layer protocol analysis and upgradation for performance enhancement of wireless LANs, particularly for Ad-hoc networks. This research work has three parts. The first part presents existing IEEE802.11 MAC protocols. The protocols have been simulated and analyzed under several traffic conditions. We have tried to optimize the performance of the MAC protocol within the constraints of the standards.

The second part of this work introduces a novel hybrid MAC layer scheme for wireless LAN standards. Hybrid MAC protocol uses the combined strength of the standard MAC protocol and TDMA. This hybrid MAC protocol has been designed to enhance the performance of a fixed Ad-hoc wireless LAN. Simulation and tests have confirmed a reduced packets-loss rate, improved packets-delivery ratio, and lower power consumption.

Finally, this research work seeks attention towards cooperative MAC layer protocols for Mobile Wireless Ad-hoc Network (MANET). The proposed novel scheme minimizes the link failure due to mobility of nodes, minimizes packets-drop probability, improves the coverage area and enhances packets-delivery ratio with the help of intermediate nodes.

In this research work, the various protocols have been simulated and analyzed by using the Network Simulator (NS-2).