ABSTRACT

The Cross-layer or interlayer networking can be considered as one in which different layers of the network protocol stack inter-communicate the useful information so as to collectively achieve the desired vertical optimization goal. The development of cross layer design is considered for wireless networks such as ad hoc networks, sensor networks and mesh networks.

Research focuses on designing a cross-layer interaction system that consists of rate adaptation and congestion aware and network parameters optimizations to improve the overall performance in terms of throughput, packet delivery, latency and also overhead of the packets. Rate adaptation is the process of dynamically changing data transmission rate based on the channel quality estimation. Rate selection is sensitive to accuracy and delay incurring in the feedback of the channel quality estimates. If the channel is changing faster then, it can be estimated and fed back to the transmitter, adaptive techniques will perform poorly. The experiments are conducted to assess the performance improvements by simulating different cross-layer implementations for wireless networks. Efficient Cross Layer Design Adaptive Routing Protocol (ECLAP) which is designed to adopt cross-layer strategy that takes three layers such as network, MAC and physical layer together into consideration for Wireless Sensor Networks. The simulation results show that ECLAP is an efficient approach which yields good results and achieves significant improvement in terms of performance. Research work involves the use of layer information in MAC, routing protocols and transport layer. The performance of S-MAC protocol and Cross Layer MAC is analyzed with varying traffic load and network density. The result shows that Cross MAC result in significant energy savings compared

with an S-MAC without sleeping. The source node with cross layer MAC consumes less energy than S-MAC for different traffic loads.

A reactive protocol Cross Layer Based Temporally Ordered Routing Protocol (CL-TORA) is developed to measure the performance of the Wireless Mesh Networks by using a newly adopted routing metric NCLRM. The developed CL-TORA protocol not only improves the network throughput to a greater extent but also reduces the end to end delay while achieving the load balance route results.

The performance of low power low rate IEEE 802.15.4 standard is analyzed in different network scenarios in heterogeneous simulation environment. Wireless Personal Area Networks are formed using tiny sensor devices which have several resource constraints. A new standard IEEE 802.15.4 was uniquely designed to suit personal wireless networks requirement consuming low power, provides low data rate and low cost. Finally, the performance analysis of popular routing protocols for wireless ad hoc networks using Rician fading propagation model is carried out. A variety of popular routing protocols for ad-hoc Networks have been used for simulations. They can be classified mainly into proactive routing protocols and reactive routing protocols. Minimal configuration and quick deployment make ad-hoc network suitable for emergency situations. It is observed that proactive protocols perform better than reactive with respect to average end-to-end delays and packet delivery fraction especially at higher data rates. Reactive routing protocols perform better in causing less routing load and better performance at lower data rates. The experimental set ups are built and carried out on Network Simulator 2 (NS-2).