ABSTRACT

Recent advancements in mobile technology and the demand for seamless services by various applications and users, lead to the exploration of inter-networking among infrastructure and infrastructureless mobile networks. Effective forwarding of the message with limited knowledge of the participating nodes in MANET and utilization of resources by monitoring network radio conditions in heterogeneous mobile networks is a challenging task.

The QoS provisioning with ensured security was not extensively considered in the many existing opportunistic communication scenarios. Also, the decision for optimal utilization of network resources namely energy and bandwidth based on traffic classes in heterogeneous networks environment is not focused. Hence, the proposed research work focuses on high degree of internetworking among mobile devices in intermittently connected networks for providing ubiquitous content dissemination. The message delivery relies highly on efficient opportunistic routing which is based on the parameters such as Trustworthiness, Mobility pattern and Energy level (TME index) of the participating nodes in MANET. Further, various vertical handover decision models are proposed to reduce the handover failures, avoids ping pong effect and minimizes energy utilization in heterogeneous networks.
The proposed Opportunistic Communication framework consists of MANET and heterogeneous networks with support of various accessing technologies such as WLAN, UMTS and WiMAX. In MANET environment, a node is designated as link node with Store-Carry-Forward paradigm which acts a gateway to forward a message to heterogeneous network.

In order to find the efficient path in MANET, an Enhanced TME based Adhoc Routing (ETAR) algorithm is proposed. This routing protocol uses the TME index as a metric to compute the best path for packet delivery within the MANET. The ETAR protocol improves the average residual energy and decreases end to end delay over the existing routing protocols. Moreover, the proposed ETAR shows the improvement in QoS metrics namely control overhead and packet delivery ratios with varying the simulation parameters such as speed, traffic sources and terrain dimensions.

Another contribution of the thesis is the implementation of various Vertical Handover Decision (VHD) schemes that satisfies user expectations and thereby minimizes handover failures, unnecessary handovers and connection breakdown in heterogeneous mobile networks. The various VHD schemes namely RSS prediction based VHO, Energy efficient VHO, Service history based VHO and Multi attribute decision making based VHO are deployed and validated.
In the heterogeneous environment, the proposed efficient vertical handover schemes were compared under different scenarios. Among these, RSS prediction based VHO initiates handover well in advance, considering the channel conditions and thereby enhancing the seamless connectivity. When node energy is low, the service history based VHO handover is triggered from WiMAX network to WiFi network. In addition, the SAW and TOPSIS algorithms evaluate the priorities based on application category for choosing the best among the available access technologies namely GPRS, UMTS, WLAN and WiMAX networks. Finally, the simulated results show that for voice related application, WLAN is the better choice than other. For streaming and background categories, UMTS performs well and for the interactive applications, WiMAX is well suited when compared to other accessing technologies.