

ABSTRACT

A heterogeneous network is a combination of a fixed network, a base station and Mobile Ad hoc NETWORK (MANET). This new generation of network provides scope for better utilization of spectrum.

A review of literature reveals the importance of maintenance of Quality of Service (QoS) in heterogeneous networks. The main goal of this research work is to design and develop mathematical, simulation and emulation model for three different Quality of Service (QoS) multipath routing protocols in heterogeneous network. Major issues in single path routing include delay, bandwidth, jitter and throughput. Multipath routing strategies ease congestion by splitting the traffic among several paths. Benefits of multipath routing include fault tolerance, increased bandwidth, reduced congestion and node failures. The QoS metrics considered in the research work includes delay, energy and link stability.

The proposed delay optimized AOMDV routing (QAOMDV), Energy Efficient Ad hoc On-demand Multipath Distance Vector routing (EEAOMDV) and Energy Efficient Link Stability routing (EELSRP) protocols use delay, energy and link stability metric to find the route with higher transmission rate, less latency, better energy efficiency and stability.

The major conclusions arrived from the research work include:

- Experimental analysis of different mobility models including Random Waypoint, Reference Point Group Mobility (RPGM), Tactical Indoor Mobility Model (TIMM), Manhattan and Self similar Least Action Walk model (SLAW) on proposed

heterogeneous protocols indicate that Manhattan model is best suited for the heterogeneous environment.

- The proposed models (QAOMDV, EEAOMDV and EELSRP) yield better results when compared to the AOMDV protocol on the wireless side and Multipath Dijkstra Transverse (MDT) protocol on the wired side,
 - i) The packet delivery ratio of QAOMDV, EEAOMDV and EELSRP on the wireless side and MDT on wired side was increased by 3.3%, 6.9% and 8.1% in comparison with AOMDV protocol. Energy consumption was reduced by 3.5%, 9.7% and 11.6% and end-to-end delay was reduced by 10.6%, 22.4% and 26.1% respectively,
 - ii) The packet delivery ratio of EELSRP in emulation was 2.8% higher than that of simulation. Energy consumption was reduced by 11.5% in emulated EELSRP. Normalized routing overhead was increased by 24.5% in emulated EELSRP, and
 - iii) The packet delivery ratio and throughput of real time EELSRP was increased by 1.8% and 24.7% when compared to simulated EELSRP. End-to-end delay and energy consumption were reduced by 57.2% and 13.3% in real time EELSRP when compared to simulated EELSRP.
- Emulation testbed for heterogeneous wired-cum-wireless network (HETEROTB) dynamically adapts to varying network topology. By monitoring the quality of each path from the source to the destination an optimal path is chosen for data transmission. The emulated heterogeneous testbed results for the proposed protocol proved that packet delivery

ratio was increased by 2.8% and energy consumption was reduced by 11.5%, and

- Finally, heterogeneous network with EELSRP has been implemented and tested for remote healthcare centre application.

Experimental results proved the efficiency of the performance of proposed protocols in emulation and simulation environments.