ABSTRACT

The significant expansion of mobile communications over the last few years allows the users to communicate ubiquitously without geographical coverage limitations of individual wireless network. Mobility is the major motivation for the extensive development and deployment of mobile wireless networks. In order to provide global connectivity to mobile users with reliable communication channels and to meet the requirement of seamless handover for real time and multimedia applications, mobility management deserves careful attention. The research work presented in this thesis focuses on cross layer trigger based handover schemes in wireless networks to improve handover performance. The handover initiation algorithm is designed based on signal strength and residual time to reach the boundary of current cell which supports the execution of handover near the boundary area. The threshold parameters are estimated to optimize handover performance in terms of handover rate and position of first handover. The handover rate and probability of call interruption are reduced by 30% and 80% respectively, when compared with conventional signal strength based handover algorithm. To avoid service disruption along with maximum utilization of network resources during the change of access networks, three methods of handover trigger time selection termed as Biased method, Neutral method and Prediction based method, are proposed. Simulation results demonstrate that the probability of unnecessary handovers, handover failure probability, and probability of false handover initiation have been reduced by 55%, 70% and 25% respectively as compared to contemporary approach. We also use cross layer information to take a dynamic decision about the requirement of handover and selection of target network when subjected to varying environments and mobility conditions. The handover requirement is determined using fuzzy values of signal to interference ratio, quality of service and time to reach the boundary of the current cell. The target network is selected by combining TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) and fuzzy AHP (Analytical Hierarchical Process) method. It assigns priorities to the factors responsible for handover according to the type of service and end user context. The proposed scheme is able to maintain quality of service in diverse conditions as compared to fixed weight assignment methods. The data rate, delay and security have shown an improvement of 43%, 35% and 17% respectively as compared to single criteria algorithms. The cross layer triggers used in handover execution phase, are able to reduce
handover delay by 37%. The proposed algorithm provides a mechanism to accomplish the functions of link layer and network layer in overlapping mode, minimizing layer 3 delay and handover latency to the significant extent. In addition, the cross layer triggers give information about the link events so that the exchange of successive messages can be accomplished promptly. The cross layer trigger based handover scheme proposed in this thesis contributes significantly towards the overall performance improvement of the mobile wireless networks.