CHAPTER 6

CONCLUSION

This chapter concludes this dissertation with a summary of research contributions, and discusses the merits of mobility prediction schemes in wireless networks. It throws open problems for further research in this area.

Most of the previously investigated research works related to CAC, mobility and resource management has been proposed and discussed separately adopting either uniform or non-uniform traffic conditions. In this research work, a integrated framework of user mobility prediction based resource reservation and flexible admission control schemes has been developed and implemented which has the capacity to adapt to changing mobility patterns and makes use of prediction models to attain high utilization of the network resources.

This dissertation began with an introduction to wireless cellular networks; channel allocation; call admission strategies and highlighted the need for user mobility prediction in resource reservation.

6.1 CONCLUSION

A new bandwidth management strategy has been proposed which uses a call admission control and its associated bandwidth allocation mechanism together to provide a flexible call admission control in cellular networks. The bandwidth allocation algorithm has used a call admission algorithm to decide if a call can be supported by the system and reallocates the bandwidth of ongoing calls. In order to assess the effectiveness of the proposed scheme with respect to both the handover drop probability and to improve the network utilization, a multimedia call model and mobility model have been introduced. This scheme permit priority component calls to use the reserved bandwidth for the handoff call. The simulation results of this scheme for multimedia call show that, it will
improve the degradation of communication quality due to handoffs in mobile multimedia networks, because the proposed scheme considers the characteristics of multimedia component calls and their priorities for its QoS.

A flexible channel allocation strategy with Wiener prediction method has been proposed for mobile multimedia networks. It is a new class of dynamic resource prediction and reservation method that overcomes some of the critical limitations of existing methods by modeling the instantaneous amount of resource demands directly and suits well for multi class multimedia networks. The simulation results of the proposed bandwidth allocation scheme indicate that, it will reduce the degradation of communication quality due to handoffs failure in mobile multimedia networks. The performance evaluation with simulation of Wiener prediction method shows that the proposed scheme can reduce the call dropping probability of handoff calls and call blocking probability of new calls compared with existing collaborative method in the multimedia mobile environment.

A novel integrated framework of flexible channel assignment strategy and mobility prediction technique based bandwidth reservation scheme by incorporating road information has been suggested, which utilizes real-time mobile positioning information to maintain a better tradeoff between $P_{FT}$ and $P_{CB}$ and for better accuracy. Assuming that the BSs are equipped with road-map information and that the mobile terminals are equipped with global positioning systems devices, the proposed mobility prediction based bandwidth-reservation scheme makes use of a mobile user's moving speed, direction, and the road information stored in the BSs to predict the handoff probabilities to neighboring cells. The amount of reserved bandwidth is dynamically adjusted according to the handoff probability and the traffic load in each cell. To show the effectiveness of the prediction scheme and flexible channel assignment scheme, this work has performed simulation of other channel assignment strategies viz., fixed and dynamic channel assignment strategy with and without incorporating the prediction based on road topology information.
A new combined framework of sectorized mobility prediction mechanism and adaptive bandwidth-management algorithms that is suitable for multimedia cellular networks has been discussed. A region partition and cell numbering scheme has been introduced to add an additional level of location description to differentiate varying future locations of a mobile user depending on its moving direction, thus reducing computation overhead. Adaptive bandwidth allocation algorithm has the ability hence is able to respond to the changing network conditions quickly and effectively, and it also is shown to maintain the relative priorities and fairness among traffic classes by taking the user QoS profile and real traffic conditions into account. The simulation results show that the bandwidth utilization in improved, lower call dropping and blocking probabilities are obtained under uniform and non-uniform traffic load distributions in the mobile cellular network.

Finally, due to the multi-dimensionality of the problem together with the non-linearity introduced by the QoS requirements, performance analysis of the implemented algorithms is this research work is bound to be largely intractable. Further, user movements considered in this work are of regular, random and a combination of both the mobility patterns. On a related note, the algorithms developed here could be adapted with very minor changes to other kinds of wireless networks such as ad-hoc wireless networks, mixed wireless-wired networks and wireless local loop networks.

6.2 **SCOPE FOR FUTURE WORK**

As we move towards the next generation mobile systems, the need for improving coverage, system capacity, and service quality becomes more and more important. Moreover, QoS provisioning must be end-to-end (i.e. from service to terminal). It is expected that cellular communications will play a major role in public communication services, and wireless LANs will play a major role in private area communications. Short-range wireless systems will also be used to configure personal area networks. When many types of networks can be used, users may wish to access each system according to the time, location, or other conditions. Therefore, interconnection between
wireless access networks, and capability of handoff between wireless access networks will be of paramount importance. This would require intra/inter-domain handovers and service reconfiguration procedures to be accomplished within minimum latency. Mobility prediction has been identified as a key abettor to this goal.

Research on resource management may also be extended to interconnected wireless and wireline systems, and to satisfy the end-to-end performance of interconnected wireline and wireless networks.

- QoS provisioning in the end-to-end environment:
  An end-to-end connection may include hybrid wireless and wireline links. Effective and efficient QoS guarantee in the interconnected networks require much more complexity than the QoS provisioning in wireless access networks.

- Access control and admission control in the end-to-end environment:
  QoS provisioning serves the basis for the access control and admission control research. When considering access control and admission control in the end-to-end connections not only the wireless access link should be taken into consideration, but also all the links in the connections.

- Mobility and handoff for interconnected wireless and wireline networks:
  In the inter-connected networks, when a mobile user moves between the areas of different MSCs, it may affect the end-to-end connections, e.g. how to re-establish an end-to-end connection and guarantee the required QoS during and after handoff. Location management may become more important especially when the mobile users roam among different networks with different air interfaces.