ABSTRACT

The mobile phone is the prevailing mode of communication in today’s world. The unprecedented growth of mobile subscribers in recent decade and an expected exponential growth in near feature are major concerns in mobile networks. Moreover, to maintain quality of service on top of increasing demand of value added services by subscribes requires a lot of effort in planning and designing of mobile network. In such high demand mobile network, service providers incur huge runtime cost in operation and maintenance of mobile access network. Thus a primary challenge forced by mobile service providers is to design, maintain and operate cost optimized mobile access network. Although, lot of research work concentrates on cost optimization in mobile network, little work focused on cost optimization in mobile access network. Next challenge, in mobile access network is providing survivability mechanism to handle failure scenarios. As mobile access network is critical part of mobile network, and is vulnerable to failures due to its hierarchical structure. Hence, this research work targets on cost optimization along with survivability in mobile access network. So a comparative study of cost optimization with and without fault tolerance in mobile access network is very much needed.

This dissertation presents a novel and effective way of cost optimization technique in mobile access network. This work considers two types of mobile access network namely basic non-hierarchical and advanced hierarchical mobile access networks. Cost optimization in basic non-hierarchical mobile access network is considered at first. It, presents a mathematical formulation of cost optimization using mixed integer programming. Further, to solve this problem, an efficient heuristic algorithm has been proposed. Experimental results show that the proposed heuristic algorithm performs cost optimization in effective way compared to other existing solutions.

Next, cost optimization in hierarchical advanced mobile access network is considered. Mathematical formulation using mixed integer programming for cost optimization in hierarchical mobile access network is presented and a solution to this problem, using an extended evolutionary heuristic algorithm has been advanced. The experimental results and comparative analysis show that the proposed algorithm outperforms in terms of computation time and
memory requirements for hierarchical mobile access network as compared to many existing algorithms.

Secondly, this dissertation presents integration of fault tolerance mechanism into the above described cost optimization method in mobile access network. The mixed integer programming is extended to formulate cost optimization along with fault tolerance. This work presents cost effective fault tolerance heuristic algorithm to find solution to this problem. The experimental results and comparative study demonstrates that proposed algorithm provides cost optimization at lesser computation time and memory consumption for various sizes of mobile access network.