

Abstract

Project Code : PDF4380032

Project Title : Virtual Path Layout and Logical Capacity Design of Highly Reliable Backbone Networks *and* A Distributed Topology Adjustment Algorithm for Wireless Networks with Mobile Base Stations

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Virtual Path Layout and Logical Capacity Design of Highly Reliable Backbone Networks

Objective (ATM Design): To design and evaluate low-cost backbone networks with high network-survivability against network failures.

Methods (ATM Design): This research proposes a traffic classification scheme and its logical capacity design scheme, based on traffic's reliability requirements. The scheme classifies traffic into 4 classes with different cost and reliability requirements. The heuristic approach is used to design the logical capacity due to its complexity in design criteria. Computer simulations are used to evaluate the proposed schemes.

Results (ATM Design): Based on some simulations and numerical experiments, the proposed survivable backbone networks with 4 traffic reliability classes, i.e., TPC-VP(Top Priority), HPC-VP(High Priority), MPC-VP(Medium Priority) and LPC-VP(Low Priority), can be designed with much lower cost (30%-55%) than that of conventional backbone network. In addition, the network can achieve very high survivability (near 100% restoration ratio at severe failures) and much faster (500%) restoration speed for high-end TPC-VP traffic, and still maintains reasonable degradation of reliability for low-end LPC-VP traffic. However, the tradeoff between the degradation of LPC-VP reliability and the cost of network is adjustable by the proposed design scheme.

Conclusion (ATM Design): By the proposed traffic classification and its design scheme, backbone networks can be designed with reasonable cost and still achieves high survivability for their high-end traffic and realizes quite low cost for their low-end traffic.

Future Research Suggestion (ATM Design): Since the ATM backbone network is likely to be bypassed in the future, the exploration whether the proposed idea can apply to the future IP backbone network is interesting.

Keyword (ATM Design): *Survivable Network, Reliability, ATM network*

A Distributed Topology Adjustment Algorithm for Wireless Networks with Mobile Base Stations

Objective (Wireless Design): To design an automatic topology adjustment algorithm for mobile base stations operating in fully wireless networks, based on the distribution of subscribers' population.

Methods (Wireless Design): This research proposes to track subscriber's population by moving mobile base stations toward the center of their nearby groups of subscribers. At the same time, mobile base stations are also drawn outward their neighboring base stations in order to solve the "oversupply base station" problem. The balance between 2 movement forces determines the proper position of mobile base stations. Computer simulations are used to evaluate the proposed schemes.

Results (Wireless Design): Based on some simulations and numerical experiments, the proposed algorithm outperforms the existing one, especially in the case of overload capacity. In addition, it still performs well, even in rapidly changes of subscribers' population or in the presence of failure of base stations. Moreover, the proposed algorithm can be used in the migration period from the fixed base stations to the full mobile base stations since it is designed as the distributed algorithm in which each mobile base station uses only information acquired by itself.

Conclusion (Wireless Design): By the proposed algorithm, mobile base stations can be moved accordingly to the movement of subscribers' population. Therefore, network resources can be used more efficiently and may not be over provisioned. Thus, service cost for subscribers can become cheaper.

Future Research Suggestion (Wireless Design): Further investigation will be done on applying this algorithm to multi-hop cellular network with mobile base station in which the last mile of base stations can be extended by the localized ad hoc networks dynamically.

Keyword (Wireless Design): *Wireless cellular network, mobile base station, topology adjustment*