

**A Decision Support System
for
Optimal Network Design and Performance Prediction**

In Jun Choi, Chi-Hyuck Jun, Soo Young Chang,
Moon Su Choi, Young Sin Ahn, Sang Yeob Kang

Pohang Institute of Science and Technology
Department of Industrial Engineering
P.O. Box 125, Pohang, 790-600, Korea

Abstract

We describe a decision support system for optimal communication network design and performance prediction. The properties of a target network are that the total communication line length is minimal and every possible node pair must have at least two distinct paths (the second property is known as 2-connectivity). The system takes as input all the nodes of a network and lengths between two nodes that can be connected, determines a topology that satisfies the above properties, and assesses system reliability and maximum communication traffic between any two nodes. It provides a convenient graphical environment to enter the candidate network topology and relevant data including arc reliability and automatically generates and solves mathematical models for design and communication traffic prediction, and calculates the reliability of a target network using Flow Augmenting Path System (FAPS) algorithm we developed. FAPS algorithm is as fast as the best reliability evaluation algorithm known to date. However, it can calculate the approximated reliability of a target network significantly faster. Since the accurate assessment of network reliability is not possible during design phase, FAPS algorithm is considered to be a very effective tool for reliability prediction. The system, called NLSS (Network Life-cycle Support System), is part of our on-going effort to provide effective and efficient aids for decision problems that could occur during planning, design, implementation, and operation of a communication network.

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