

## Network Design Based on Network and Traffic Characteristics

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**Abstract:** Telecommunication is undergoing a transformation from a system based on telephony to one that encompasses a wide range of applications and services involving different media. This transformation is accompanied by a dramatic change in the characteristics of traffic. The telecommunication service market itself is also changing greatly. To adapt to these changes, it is necessary to dimension and operate economical network facilities. To meet this need for the coming age, this paper first identifies the issues and required solutions related to traffic engineering for network facilities. In addition, we have proposed a method of estimating the required processing capacity by selecting factors that affect the processing capacity and applying multiple regression analysis to them. By applying this method and comparing the results with the values measured in an actual network, we have confirmed that our method is sufficiently accurate for actual traffic engineering purposes. For the estimation of the required bandwidths, we have analyzed actual traffic and developed a design flow using a queuing model of M/H2/1/K.

**Keywords:** traffic engineering, performance evaluation, traffic model

### 1. Introduction

Telecommunication is undergoing a transformation from a system based on telephony to one that encompasses a wide range of applications and services involving text, still images, video and music. These applications and services are giving rise to an explosive growth in traffic and are also accompanied by dramatic changes the characteristics of traffic. The network that carries this changing traffic is also changing from a centrally planned and centrally managed telephone network to the Internet where network management is distributed.

The traffic theory based on stochastic process analysis proposed by A. K. Erlang at the start of the 20th century has long been used for the design and evaluation of the telephone network, which traditionally carried only voice traffic. The theory has allowed the forecasting of traffic and well-planned network engineering. Each time a new application emerged, Erlang's model was modified or extended to allow network engineering and evaluation for that application.

Since the beginning of the 1990s, the Internet has become more and more widely used and the design and evaluation of the Internet have become important research topics. Since a



















