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# CHARACTERISTICS OF TELECOMMUNICATION SERVICES AND TRAFFIC

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The advance of new communication technology and market demands for new services have lead to an ever increasing array of available telecommunication services. The traffic characteristics and performance requirements of these new services vary considerably. Hence the network provider has great difficulty in

1. determining whether the service requirements are compatible with the facilities provided by the transit and end networks;
2. modelling the resultant network traffic pattern, and dimensioning the network for a specified quality-of-service.

To assist with the above problems, services can be classified according to the OSI Reference Model, or according to the requirements and characteristics of the services and the networks supporting them. While these approaches are generally accepted internationally, from the teletraffic engineer's point-of-view, services can be more conveniently divided into data and voice, which have different service requirements and traffic generating characteristics. Data networks are usually separate from voice networks because of their differing performance requirements which include throughput, delay and information integrity. In general, requirements for voice services are less demanding because their performance is assessed subjectively.

The assumptions of Poisson call arrival process and negative exponential call duration are considered to be adequate for voice traffic using a circuit-switched network. For data services, the network traffic pattern is the aggregated result of traffic profiles produced by the users of one or more available services. Three major categories of data transfer can be identified - bulk (e.g. file transfer), interactive (e.g. videotex) and short transfers (e.g. electronic fund transfer). Their general characteristics are :

(a) bulk transfer - high data volume, and connection via high speed line;
(b) interactive transfer - low data volume, long inactive periods, and terminal and remote host may follow a particular response time distribution for a given task;
(c) short transfer - low data volume, short session time, short and generally fixed message length, and a small number of dialog cycles per session.

Although some of the characteristics of the interactive and short transfers are similar, their demand for network resources are quite different. While the interactive transfers are generally more bursty, the short transfers have a more predictable behaviour, and impose greater demands on the signalling and switching functions of the network.

A telecommunication network can be dimensioned to the quality-of-service requirements once the network traffic pattern is characterized. The techniques of modelling the network traffic pattern and dimensioning circuit-switched networks are quite well developed. However similar techniques for packet-switched networks are still under intense investigation. For data networks, the assumptions of Poisson call arrival process, negative exponential call duration and geometrical message length are often used because of their mathematical tractability. These assumptions are generally considered to be valid when the number of users in the network is large and diverse.

Traffic modelling techniques for packet-switched networks are reported in [1] and [2]. A decomposition method is used in [1] where each of the queues in the network is considered individually. Some recent work on queueing theory give analytical results for particular cases of superposition of point processes [2]. The packet arrivals into a node are doubly stochastic, resulting from a superposition of call and packet arrival processes. A tractable approximation - an Interrupted Poisson Process, is used to model the packet arrival process. The first three moments of the packet arrival process are matched to those of the approximating process. The results obtained from the queueing analysis using the approximating process are extremely promising. Further research in this area has the potential of improving the model of traffic generated in a packet-switched network.

## REFERENCES

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