ITC 11, Minoru Akiyama (Editor)
Elsevier Science Publishers B. V. (North-Holland)

ESSENTIAL SERVICE PROTECTION UNDER TRAFFIC OVERLOADS

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ABSTRACT

One of the more sensitive issues in telephone administration is the provisioning of good service to vital lines during periods of traffic overload. Essential lines have usually been informally defined by local practice, but frequently include phones in fire and police departments, hospital operating rooms, telephone switching centers, some coin phones, etc. It is highly desirable that these phones receive essentially unimpaired service during traffic overloads, which may well be coincident with circumstances such as earthquakes, hurricanes, or other local catastrophes.

A novel strategy has been devised to protect the service to "essential" lines during traffic overloads, which, at the same time, avoids any significant impact on the total call-carrying capacity of stored-program-controlled switching systems. Other desirable attributes of a design for service protection for essential lines are that it responds rapidly and automatically to overloads, that it not place a significant overhead on the system, that it not unnecessarily degrade service to other lines, and that the controls be automatically reduced as the overload diminishes.

The Essential Service Protection (ESP) Feature implemented in the AT&T 1A ESS™ and 5ESS™ Switching Systems provides all of the above-mentioned attributes. In modern electronic switching systems, lines initiating a service request are first placed in a queue to wait to be served by the common control equipment. A very effective overload control strategy, the Improved Overload Strategy (IOS), to administer the flow of requests through this line service request queue, was first implemented in the 1ESS™ Switching System.[1] Building upon this IOS feature, ESP has been implemented using a network of queues and timing strategies. Simulation models have been used to predict the performance of the IOS/ESP strategy and to estimate parameters defined in its implementation. The generic software containing the ESP feature was introduced to operating 1A ESS Switches in early 1983. Difficult-to-obtain data on the performance of ESP in a large switching system under overload was, by chance, obtained during a minor earthquake on May 2, 1983, in California. An analysis of this system performance will be discussed.

The ESP strategy has also been adapted for implementation in the distributed architecture of the 5ESS Switching System. The distributed architecture allows effective control of partial or focused overloads near the periphery of the 5ESS Switch. A key element of the IOS overload control is the application of a Last-In-First-Out (LIFO) service discipline to the line origination queue. This discipline is very effective in controlling the impact of customer behavior on the switch.[1,2] However, it is possible for a service request to suffer an arbitrarily long waiting time in a LIFO queue. Thus, the LIFO queue is periodically searched for essential lines, and those found are moved to a second high-priority queue. If nonempty, this second queue is exhaustively served before the LIFO queue is served. A simulation of this ESP/IOS control strategy, under normal and overload conditions, has yielded expected queue length and delay distributions; these and other system performance results will be presented. This ESP/IOS strategy is now also in service in the 5ESS Switching System.

REFERENCE

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