Total Network Data System:

Introduction

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Since the earliest days of telephony telephone traffic measurements have been needed to determine the proper quantities of circuits, operators, and switching systems. In this context "proper" is defined as the efficient and effective utilization of operating factors that provide good service to customers at the lowest possible cost.

The Total Network Data System (TNDS), comprising thirteen different operations systems, is a very large, complex, coordinated set of computer systems developed by Bell Laboratories and now used throughout the Bell Operating Companies. The systems that comprise the Total Network Data System collect, validate, process, archive, and retrieve the traffic data required to fill the entire spectrum of user needs, from near-real-time network management and performance monitoring, through weekly/monthly provisioning and administration, to long-range engineering and planning. The TNDS maintains interfaces with the many telecommunications systems, as well as with operations systems such as the Central Office Equipment Engineering System (COEES), which depend on traffic data.

As the size and complexity of the telephone network expanded, a need evolved for larger quantities of more accurate and timely traffic

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data. Early measurements of busy equipment were made manually (switch counts, peg counts, etc.) and processed with the aid of desk calculators. The mechanical registers of the 1940s and 1950s evolved into camera register recorders and traffic usage recorders, which partially automated the process. In the mid-1960s, data were being keypunched and then summarized and processed on the large billing computers already in use by comptrollers' organizations. In the early 1970s the advent of the minicomputer facilitated on-line data collection and real-time processing to support such functions as network management. By the mid-1970s, a variety of computer systems collected and processed traffic data to support trunk and switching engineering, administration, and network management. These systems have evolved into a tightly coupled family of operations systems, TNDS, which have been implemented and updated in all the Bell Operating Companies. The systems operate on dedicated minicomputers and large general-purpose computers. The TNDS collects, processes, and utilizes traffic data to provide excellent, efficient, economical telephone service.

The TNDS was developed, used, and enhanced during the thirteen years from 1969 to the present. It has become an indispensable element of Bell operating activity. Without the extensive mechanization provided by the TNDS, it is inconceivable that we could have accommodated the explosive network growth, reconfiguration, and churning. Without the TNDS, operating and investment costs would have risen and service would have been degraded.

This special issue of the *Journal* addresses the TNDS from many points of view. The first two articles describe the TNDS environment and objectives and outline the system plan. The third article describes the conceptual framework and theory upon which the TNDS is built. The eight succeeding, more detailed, articles describe the functions performed by the TNDS and the component operations systems that have been developed to support these functions. The final article, prepared by an employee of Southern Bell, describes the TNDS from an operating telephone company perspective.

As we contemplate the future, we envision continued evolution in two areas: Modifications will be required to keep pace with new services and new technology, to provide interfaces with new telecommunications equipment, and to facilitate new network requirements (such as Dynamic Non-Hierarchical Network Routing); and enhancements will be needed to improve efficiency and make the systems user-friendly. These enhancements will include simplified architecture and new computing facilities, enhanced data communications among the TNDS elements, interactive update features, consolidation of record bases, and on-line user documentation.

This special issue of *The Bell System Technical Journal* appears at an appropriate time—the end of an era. The individual articles reflect the way in which business was conducted prior to 1982. As a result of divestiture, responsibility for much of the TNDS will be transferred to the Central Services Organization, which will be owned and operated by the seven regional Bell Operating Companies. However, the TNDS will continue to provide the independent regional companies with primary traffic data in the future, as it has to the Bell System in the past, without, we hope, missing a beat during the transition.

AUTHOR

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