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System 75:

Introduction and Overview

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(Manuscript received July 11, 1984)

In 1980, a group of system designers at AT&T Information Systems Laboratories (then a part of AT&T Bell Laboratories) was asked to produce a new communications system for the intermediate-size business office (40 to 400 users), to complement a larger system already under development—System 85. The new system was named the System 75 office communication system. Its purpose was to meet the competitive challenge for a high-function digital communication system whose integrated technology could address the evolving needs in office communications and automation. The proposal developed by our designers was based on an all-new hardware and software architecture.

In this intermediate-size range, the existing Feature Package 15 of the *Dimension*[®] PBX already had provided a challenging standard. Its more than 150 PBX features would have to be included in any new AT&T offering. Like the larger System 85, it would also provide integrated data switching capabilities, including 64-kb/s transparent switching; and simultaneous voice/data transmission using the Digital Communications Protocol (DCP)[†] that supports two 64-kb/s voice

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[†] Acronyms and abbreviations used in the text are defined at the back of the *Journal*.

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and data channels and one 8-kb/s signaling channel at a single interface. With a significant fraction of customers requiring efficient multilocation service, it was recognized that the System 75 switch should also support multilocation networking services available in the current-generation *Dimension* systems and in System 85. These include Distributed Communication System (DCS) operation—permitting significant feature transparency between locations, a DS1 Interface to T1 facilities, Electronic Tandem Network support, and Centralized Attendant Service (CAS). AT&T Information Systems Architecture provided standards with regard to customer-system interactions, terminals, adjuncts and interfaces.

In mid-1983, an internal prototype with partial feature content underwent trials at AT&T Information Systems Laboratories. The first commercial customer received service early in 1984 and the product was publicly announced on April 26, 1984. The system's initial features are listed in the Appendix A to this introduction.

Customer systems have come of age insofar as complexity and sophistication are concerned. Based on the technologies of microprocessors, modern software engineering, and VLSI, products such as System 85 and System 75 have a range and extent similar to the much larger switching systems designed for central office use. Since we felt that there was much of interest to be reported on their design, development, and project methodologies, early in 1984 we decided to produce this special issue of the *AT&T Technical Journal* on System 75. This collection of papers was therefore assembled to serve as an example of modern design in customer communication systems.

There are four major groupings of papers in this issue. The first two papers deal with the switch and control architecture—realized in hardware and firmware—and the physical architecture of the overall product. The next group of four papers describes those functional components realized in software: switch services (a generalization of what is traditionally known as “call processing”); system management, including database aspects and user interface; maintenance for all hardware and software elements; and the real-time operating system. The third group of three papers treats project methodology and software tools upon which the methodology and firmware/software development rests. The first of these papers provides a project management overview and explains how designs from each development community are coordinated and integrated. The tools paper focuses on the software development methodology and tools environment. The test tool is described in a separate paper. Testing was a critical aspect of system development requiring a unique computer-based capability. The final topic deals with bringing the product to the people it serves—customers, and sales and service personnel—those who ultimately judge

the acceptability of the product. The paper describes how the product is introduced to these users, how their reaction is measured, and how corrective measures are taken where necessary.

An important theme throughout these papers is the degree of overall design and development unity and coordination that was required and achieved. Tools, for example, were specified jointly by tools builders and end-user developers. Although an early version of the operating system had been built to support some exploratory call processing development prior to the start of this project, its evolution and optimizations reflected the needs discovered by those developing services for System 75. All maintenance design required significant support in hardware and device design, firmware (on port boards and in the common control) and, of course, in the software. Specification, design, integration, and testing spanned all project areas. System test, performed by a separate test group, depended on an intimate knowledge of software and software-firmware interfaces, and on quick turnaround from developers for fixes to permit testing to progress beyond the current trouble area. These are but a few examples of intra-project development coordination. The last paper of this issue illustrates the same broad coordination tasks involving all of AT&T Information Systems and its customers.

ACKNOWLEDGMENTS

Only a few of the many people contributing to the design and development of System 75 are authors in this issue. To the other creative and dedicated individuals who had a part in its successful development, we are most thankful and appreciative. Although this group of papers stresses the development aspects of System 75, centered in one organization, the project received outstanding support and product contributions from other AT&T Information Systems and AT&T Bell Laboratories organizations. Specific individuals and the areas in which they led are: D. A. Keller and R. S. Breen (Systems Engineering); D. B. James (architectural consultant); R. S. Berryman (selected software tools); and C. O. Riddleberger (AT&T Bell Laboratories Power Systems).

APPENDIX A

System 75 Features

Standard System Features

Advanced private line termination
Automatic route selection
Code calling access
Direct department calling
Direct inward dialing

Restrictions
Code restriction
Inward restriction
Manual originating line
Manual terminating line