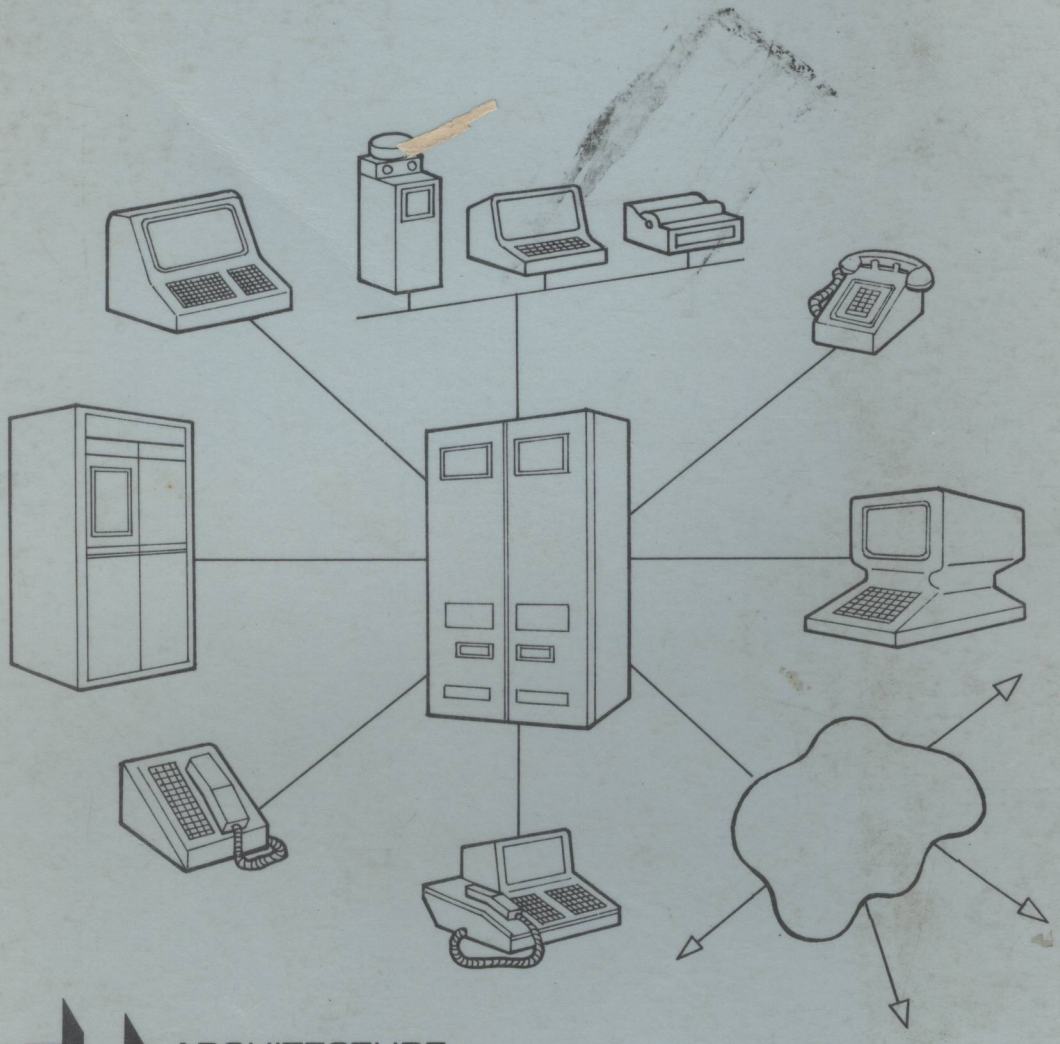
Integrated Voice/Data PBXs

3rd Edition



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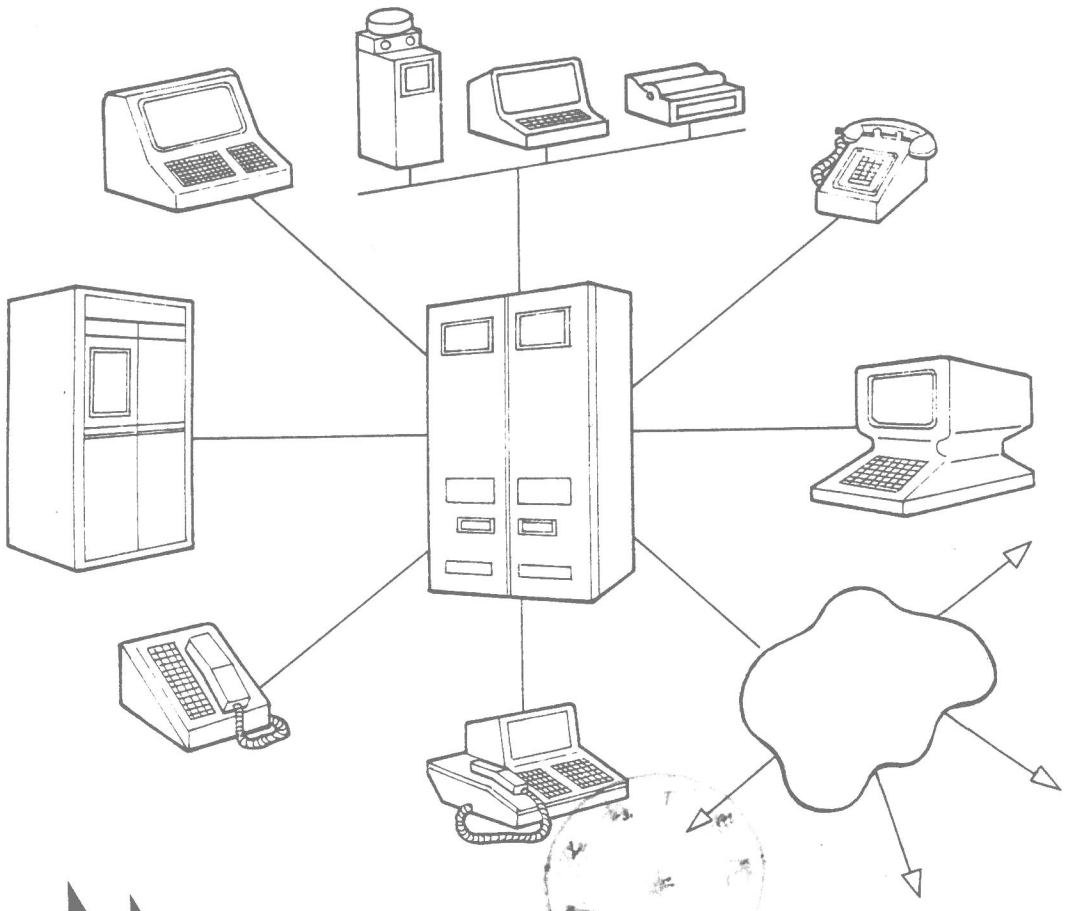

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Foreword

With recent advances in the electronics industry, the telecommunications industry is also moving forward to establish itself as a major player in the office automation market. In an effort to upgrade their systems, the PBX manufacturers are learning and designing simultaneously. Since the divestiture of AT&T, competition is the main incentive to accelerate such efforts. The manufacturers who plan for product enhancements as they design new systems are the ones which will survive in this competitive environment.

As new technological breakthroughs are achieved, improvements should adequately fit into the PBX products without major redesign and slipping production schedules. Some of the manufacturers are taking the time to design an upgradeable system accurately the first time. Others have released what they feel is an adequate solution. Still, the more conservative companies are still in the "wait-and-see" mode. Manufacturers who move now to learn about the future may find that it will be a profitable future.

This report is designed to explain and illustrate the basic operation of the integrated voice/data PBX -- what it is actually capable of, and how it accomplishes its task. It also describes and evaluates the systems that are available on the market today, or that are scheduled for release in the near future. Comments on IBM's Token-Ring-Rolm CBX connection, the setbacks at Ztel, and AT&T Information System's future are included as part of the conclusions and projections of future trends.

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1. Introduction

The PBX market has slowed its phenomenal rate of acceleration. Due to the large installed base of PBXs, it is expected that the PBX vendors will enter into a two-to-three period of essentially flat growth. Add-ons and attachments will now form the basis for continued sales by these vendors.

With office automation upon us and a computer on every desk, the telephone is a natural companion because it has been a major asset in business communications since 1920. The telephone wiring already is in place; companies such as IBM and AT&T have introduced local network products that can operate on this in-place wire, and if extensive data transmission is necessary -- with large data transfers or high speed communication -- an integrated voice/data PBX tied into a baseband or broadband local network, can be the key communications element in our offices.

1.1. Common Terms and Basic Components

The PBX performs three basic functions. It must detect a request from any station at any time, such as a phone coming off-hook. It must make a connection by processing a dialed number. The connection must be maintained until it is no longer needed, usually indicated by either party returning to an on-hook condition.

The main components of a PBX include the switching matrix, the access lines, the user stations, the trunks, and the signaling equipment. These will be defined in more detail below.

Switching matrix. The switching matrix provides the basic switching mechanisms within the PBX. In the Mitel SX-2000 integrated voice/data system, this matrix consists of up to four cards containing digital crosspoint (DX) chips arranged as a switching array, having a maximum array of 64 input links and 64 output links. United Technologies Communications Company's UTX-1001 system takes a different approach for reliability and performance; two separate matrices, one for voice and one for data, switch the signals from the incoming trunk to the appropriate locations.

Control complex. The control complex provides the functions for the PBX such as call processing, timing, and call recording. Some systems incorporate an entire management station to perform control while others have software-controlled systems with updates made by loading a new tape.

Northern Telecom uses a central station for systems management on the Electronic Switched Network (ESN) called the Communications Management Center (ESN/CMC). System changes can be made through this console.

The United Technologies system accomplishes all updates by reloading system tapes or disks.

Access lines. The switch must be connected to the users. The lines used to connect all users and computer ports to the switch are access lines. Some systems have uniform wiring in which the same two-pair wiring is extended into every office, providing power and ground with each station plugging into an outlet.

AT&T Information Systems' System 85 allows a multiplexed stream of digitized voice and high-speed data to be transmitted over normal telephone wiring to the digital switch. Simultaneous voice and data communications are possible through a single terminal, via a common wire into a single port on the communications processor. The architecture also allows rearrangement of both voice and data terminals with a common wall plug.

User stations. The user stations provide the main user interface for invoking PBX functions. Some proprietary electronic station sets rival the key system telephone sets for the amount of features and convenience. Training is provided for personnel to learn to use these features.

Trunks. The switch must be connected to the local central office to communicate with external sources. This connection to the CO is made over trunks. The number of trunks connected to a particular switch is dependent upon the telephone usage within the company. These trunks may be incoming only, outgoing only, or both. If the traffic analysis to determine the number of trunks is inaccurate, the company may be paying for trunk capacity not being used, or not getting the required amount of throughput for the people needing to make calls.

Signaling equipment. Common signaling functions include dial pulse address signaling which is accomplished by a rotary dial, dual tone multi-frequency (DTMF) address signaling, and audible signaling for precise tones and audio supervision.

In dial pulse signaling, the outgoing signal is determined by 10 or 20 pulses/second, a 60% break interval, and 1 second inter-digital time (minimum). The incoming signal is characterized by 8 or 12 pulses/second, 42-84% break interval, and a 0.3 second inter-digital time (minimum).

The dual tone multi-frequency address signaling is more popularly known as Touch Tone signaling as referred to by Ma Bell. Its outgoing signals are characterized by a 100 ms tone time, a 100 ms inter-tone time, a 0.5% frequency range, and 4 ms tone rise time. The incoming signal has a 40 ms tone time, a 40 ms inter-tone time, and a 1.8% frequency range.

Some signaling equipment conforms to the North American