THE BELL SYSTEM TECHNICAL JOURNAL
Vol. 57, No. 10, December 1978
Printed in U.S.A.

THE BELL SYSTEM TECHNICAL JOURNAL

DEVOTED TO THE SCIENTIFIC AND ENGINEERING ASPECTS OF ELECTRICAL COMMUNICATION

Volume 57 December 1978 Number 10

Transaction Network, Telephones, and Terminals:

Overview

By J. W. FITZWILLIAM and R. L. WAGNER

(Manuscript received June 6, 1978)

Short inquiry and response messages, called transactions, are becoming increasingly important in the conduct of business affairs. These messages are moved electronically through data communications networks. To meet the need, a family of Transaction telephones, terminals, and associated networks, adjuncts, and arrangements has been developed.

I. INTRODUCTION

Data communications began to gain momentum around 1962 with data transmission channels provided over the voice network using both switched and private line facilities. Many uses for data channels were developed, including widespread use of switched network channels for very short data messages.

Such short messages are termed "transactions" in this issue of the B.S.T.J. A transaction consists of an *inquiry* message followed by a *re-*

sponse message, each of which is typically less than 100 characters long (less than two lines of a typed page). Such transactions may be used in a variety of applications—for example, in verifying the credit of a customer in the course of a purchase or in actually moving funds from the buyer's bank to the seller's bank. This second example is from the world of electronic funds transfer, which has been generating much interest among members of government, the banking industry, and their customers.

II. CURRENT SYSTEMS

Transactions typically involve computerized data bases (customer service centers), which may have the credit standing and current balances for all holders of a particular credit card in a given region, or they may be the computerized record of all checking accounts in a bank. There are many such possibilities. An individual making a credit card purchase, as an example, frequently experiences a salesperson making a telephone call and giving the card number and the amount of purchase. The purchaser never hears what comes back, but if the purchase is then completed, which is the usual situation, she or he may assume that it was an approval. The purchaser is frequently aware of a considerable wait, perhaps several minutes, while this transaction is under way.

Figure 1 shows what usually happens during this time interval. The salesperson has called a clerk seated at a cathode ray terminal (CRT). The information, received verbally, is entered into the CRT by means of a keyboard. From there it proceeds to the service center's computer, which contains the credit records. After a short time (usually a very few seconds), the computer has processed this particular inquiry and re-

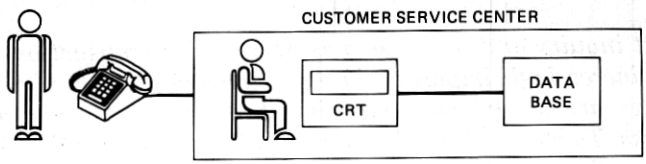

Fig. 1—Existing public switched network service.

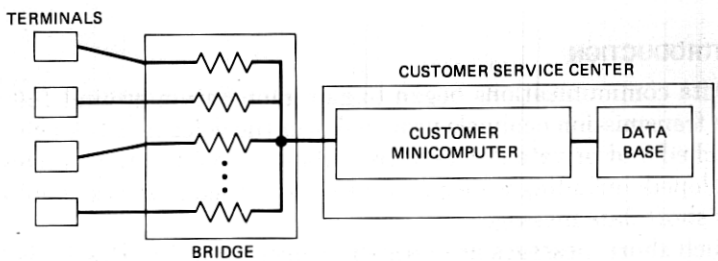

Fig. 2—Existing private line service.

sponds to the CRT, which displays the information. The clerk reads the computer's response to the salesperson waiting on the far end of the telephone connection. The clerk, one of many handling inquiries to the computer, then terminates the call and is ready to receive another. If there is a problem, the salesperson may be referred to another individual for its resolution.

Figure 2 shows an alternative way of reaching the service center's data base. In this situation, the salesperson has a special terminal connected directly to the computer via multipoint (bridged) access lines. Sometimes the terminal has a means for automatically reading the characters on the customer's plastic card. The dollar amount of the transaction is entered manually on a small keyboard (sometimes called a "pad" when only numerals are involved). The terminal also has means for displaying the response, including some cryptic explanation if it is a denial. Private line systems as depicted in Fig. 2 are particularly attractive to entrepreneurs who provide service involving high-volume sales positions. Such systems can be economical and have superior response time, since they eliminate setting up a public switched network call and verbal exchanges between the salesperson and the clerk at the CRT. A disadvantage is the need to handle referrals by a completely separate telephone call.

III. PROBLEMS WITH CURRENT SYSTEMS

Neither of the two systems depicted in Figs. 1 and 2 is entirely satisfactory. The reasons are different, however, The dial-in system of Fig. 1 may be slow, with call setup time approaching the duration of the message. Also, the presence of the intermediate person at the terminal represents unnecessary cost. Finally, concentration of a high volume of short holding-time calls at the customer service center may necessitate special engineering of the switching facilities serving that location so as to avoid traffic congestion problems adversely affecting other users.

The private line systems depicted in Fig. 2 solve the response-time problems and eliminate the need for the individual at the computer terminal. They suffer mainly from the infirmities of conference circuits (multipoint connections), which bridge many subscribers on a common channel going to the computer. Such circuits are effective in moderation, but as more terminals (and drops) are added to the network to make its operation economical, the reliability and difficulty of tracing problems become very troublesome.

IV. THE RESPONSE

The papers in this issue of the B.S.T.J. describe a multidimensional response to the problems and the opportunities outlined above. A family of products and serving arrangements has resulted, giving customers a choice.

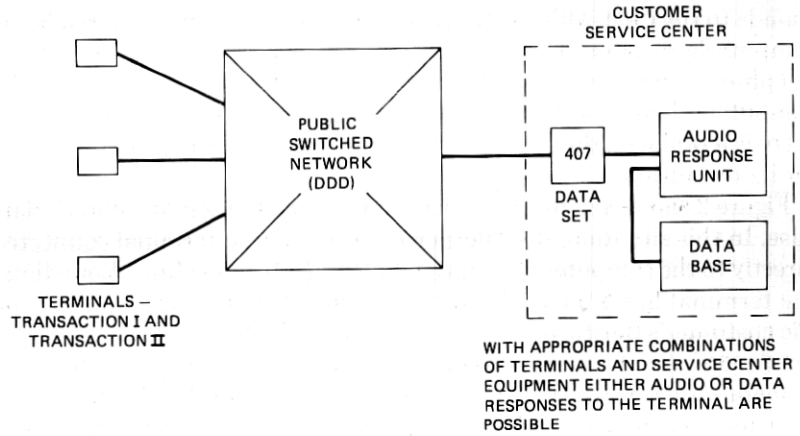

Fig. 3—One type of serving arrangement for transaction traffic.

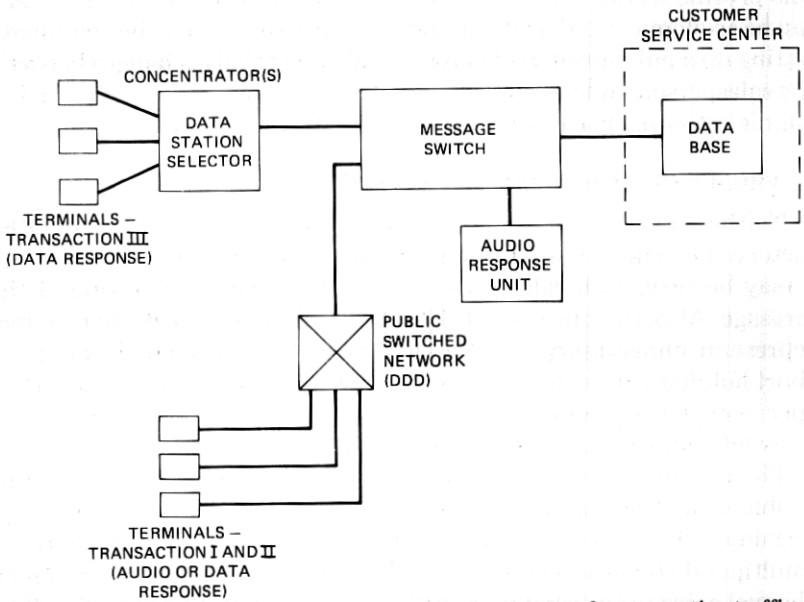

Fig. 4—Transaction network—another serving arrangement for transaction traffic.

One type of serving arrangement depends entirely on the public switched network. It is supported by Transaction telephones and data sets (type 407) tailored to this special use. A second type of serving arrangement, called the Transaction Network, introduces a message switching network to achieve better response time, reliability, sharing, and functionality tailored to transaction-oriented applications. These two arrangements are shown in simplified schematic form in Figs. 3 and 4, respectively.

Transaction telephones and terminals serve both of these networks and have wide applicability for other innovative uses. They provide simple, convenient data entry and data reception capabilities that are well matched to short data transactions. These telephones and terminals can all read the magnetically encoded stripe on the standard credit card. Transaction I and II telephones both operate on the switched network and double as ordinary telephones. The Transaction I telephone is the simpler, lower-cost terminal that receives audible response; the Transaction II telephone provides the additional capability of data output on a numeric (LED) display. The Transaction III terminal has no voice capability and was designed expressly for the Transaction Network, where it provides higher-speed performance. Transaction II and Transaction III are compatible with the Transaction printer for issuing receipts, verifying checks, or providing other hard copy as an alternative output of the Transaction terminals.

For the serving arrangements of Figs. 3 and 4, the connection is between the salesperson at the Transaction terminal and the computer, where either data or voice responses are composed. In both cases, recorded or synthetic speech is used when responding to the salesperson in the "voice response" mode. However, in Fig. 3 the customer service center provides the response from a dedicated unit, whereas in Fig. 4 voice responses are prepared with a shared-use unit at the message switch.

This brief explanation is intended to develop the context for the papers that follow. There are important subsystems, adjuncts, and arrangements that have not been mentioned here.

V. THE CHALLENGE

There is an evolving use of computers and associated communications systems to improve the quality of life. The technical advances described in this issue of the B.S.T.J. are a part of this larger view. Although each advance brings with it new problems and frustrations, the prevailing view of the futurists is that there is more change ahead involving computers, communications, and "us." What appears radical today in terms of dependence on computers, we are told, will be commonplace and comfortable tomorrow.