Integration of Computer Networks and Telephony Systems—Computer Telephony Integration

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ABSTRACT: By the maturity of the economy and the increase of competition among enterprises, various customer channels, the quality of services, customer satisfaction, and productivity in offices are becoming increasingly important. Telephones and facsimiles are real-time communication devices which provide users with an interface point to their customers. A PC LAN (personal computer local area network) is an important business tool for users to build and share a customer database or information management system. This computer telephony integration (CTI) technology is rapidly attracting attention. Consequently, the following two platforms have been developed: the CX-CTI/CallCenter which operates in a call center, and the CTNET-Server for office use. The CX-CTI/CallCenter improves customer satisfaction and productivity by utilizing PBX (private branch exchange) and telephones, while the CTNET-Server, based on Windows NT,\(^1\) improves office productivity.

INTRODUCTION
TODAY, when the maturity of the economy has coupled with the increase in competition among enterprises, various customer channels, quality of customer services, customer satisfaction and productivity have become a critical matter for companies. Telephones and facsimiles are devices which provide users with an interface point to their customers, while PC-operated information processing systems are used to analyze market needs and trends. Computer telephony integration (CTI) technology, which is rapidly attracting attention, combines PC LANs (personal computer local area networks) with telephony devices, such as those mentioned above. Indeed, several CTI applications, including various call center and office systems, have been developed. Recently, the adoption of the de facto standard application programming interface (API) has accelerated those activities. Hitachi, Ltd. have developed two platforms, the CX-CTI/CallCenter and the CTNET-Server based on these standards. In this paper, the business targets and features of these systems are described.

HITACHI’S CTI BUSINESS TARGETS
The major targets for Hitachi’s CTI application systems are as follows:

• A highly qualitative and reliable professional CTI system, designed specifically for use in call centers.
• An office system which supports unified messaging and groupware.

The CX-CTI/CallCenter, based on Hitachi’s PBXs (private branch exchanges) for medium- to large-sized systems, and the CTI components, which assist the

\(^{1}\) Registered trademark of Microsoft Corp.
SOHO (small office home office), have been developed for the former target. The CTNET-Server, based on PC server for SOHO, has been developed for the latter target.

These two major platforms, the CX-CTI/CallCenter and the CTNET-Server, are described in the next section.

**CTI PLATFORM**

**CX-CTI/CallCenter for Medium- to Large-Sized Systems**

The platform CX-CTI/CallCenter was developed in order to support various customer services, such as order taking, consultations, inquiries, complaints, all conducted over the telephone. With changes in business styles and needs, customers now request 24-hour services, as well as various, accurate, and homogeneous responses. Improvement in productivity and a reduction in reception time are two essential elements which call center operators must adhere to, such that sufficient and precise responses to customer inquiries can be met.

Fig. 1 shows an example of a system configuration which uses the CX-CTI/CallCenter platform. It consists of a Hitachi CX series PBX, a voice response unit (VRU), a telephony server which integrates the PBX and intranet (LAN), series of telephones. This system allows customers to place a call to a customer service center concerning their queries, etc. The call is first connected to a VRU which prompts the customer to input information using the telephone dial pad. The telephony server then transfers the call to an appropriate operator with that information. A management information system (MIS) retrieves the customer’s profile from a database and sends it to the operator’s PC. The operator can then talk with the customer.
while referring to the displayed customer profile.

PBX is a very reliable voice and data switching system, which can realize highly qualitative and reliable data connection with the MIS via the telephony server. This server is compliant with TSAPI (telephony services applications programming interface) which is the standard for CTI technology. All TSAPI-based applications are executable in this system. The next generation system, with a call center function connected to the World Wide Web, are currently being developed.

CTI Components for Small Scale Systems

There are many small-scale telemarketing centers which require CTI. These particular systems require a telephony system called “Intelligent Multi-Functional Telephony System” and a wiring system which integrates telephone cables and LAN cables.

The telephony system consists of a proprietary telephone with a TAPI\(^\text{12}\) compliant PC adapter and related utility software. The TAPI makes it easy to link with PC-based application programs. Consequently, many telephone functions such as electronic phone directories, caller ID indication (obtained from the carrier’s dialed number identification service) as well as other specified applications can be realized. These functions are also useful in telemarketing, particulary for the SOHO system. In a call center, these functions enable operators to dial customers automatically by utilizing the electronic phone directories, and also be able to record the conversation.

The wiring system connects LAN and telephones functionally using just two wires. This unified cabling

\(^{12}\) TAPI: Telephony Application Programming Interface, the name of interface for the Windows Telephony Application, developed by Microsoft Corp. and Intel Corp.
system reduces the wiring time considerably. It realizes a rate of data transmission of 10 Mbit/s, where its interface is based on the IEEE802.3 10BASE-T.

Office-Use Platform: CTNET-Server
Two examples of office CTI applications, unified messaging and a customer service system are shown in Fig. 2. Conventionally, a real-time voice/facsimile communication is based on a PBX-centered system. A CTI server integrates this conventional communication system with electronic mail, and also helps customer services and group works.

The CTNET-Server, which accommodates a circuit board with a voice reply/guidance function, deals with telephone calls over the LAN. The board either compresses and packetizes the voice data in real-time, or simply decompresses it. This board transmits or receives voice data through LAN by an Internet protocol (IP) packet format. With these features, the CTNET-Server can integrate telephony communication with electronic mail.

The major applications in offices include fields such as technical support for corporate information system users, acquisition of facsimile and memorandums from outside, management of group members’ schedules, message communication, etc. Since office LANs require PCs (based on Windows NT server), it is useful to introduce a CTI system not only in medium-sized systems, as shown in Fig. 2, but also in smaller member’s sections of SOHOs.

Furthermore as a gateway to Internet telephony applications, many server-based functions can now be expanded.

Various service functions such as unified messaging, mobile access, on-screen dialing, are anticipated. With these services, various subjects and issues in offices, such as distribution of telephone calls, transfer of message memos, confirmation of electronic or voice mail from outside offices, acknowledgment of facsimiles, can be reduced.

CONCLUSIONS
Two CTI platforms, Hitachi’s PBX-based system, and a second, based on a PC server, have been developed in order to combine computer and voice communication networks. In this paper, the service functions and features of these two platforms are described. For future steps, the development of a CTI system integrated with an intranet is anticipated. In addition, as part of the efforts to maintain various channels and offer high-quality services to customers, this integration will be spread to Internet telephony and electronic commerce applications.

REFERENCE

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