The Windows™ Telephony Application Programming Interface

Combining the Power of the Computer With the Functionality of the Telephone

Backgrounder

Initially, the desktop computer was a personal productivity tool — first through the use of spreadsheets and word processing programs — and later with additional tools such as databases, project managers, presentation packages and personal information managers. Then local area networks (LANs) connected desktop computers within workgroups and departments, allowing people to share information and resources. In addition, LANs allowed people within a workgroup to communicate electronically, further expanding the role of desktop computers to communicate business information.

The next step in the evolution of the desktop computer is to combine it with one of the most basic business tools — the telephone. Intel Corporation and Microsoft Corporation, in cooperation with many major telecommunications, PC and software companies, have created a standard interface — the Windows™ Telephony Application Programming Interface (API) — for the integration of telephones and personal computers running the Microsoft® Windows™ operating system.

The API brings the utility and reach of the telephone to the desktop computer. In fact, with the availability of cellular telephone technology, the capabilities are not even limited to the desktop.

Enabling a Broad Range of Applications

The possibilities are exciting for users of both telephones and computers. Products based on the Windows Telephony API will improve existing capabilities, such as:

> **Visual Interface to Telephone Features.** Users can easily access telephone features through the Windows graphical user interface. Telephone providers have been adding features to telephones at a quick pace — call forwarding, call parking, speed dialing, and conference calling. Unfortunately, most people typically use only one or two of the most basic features simply because they can't remember the more sophisticated features — let alone how to use them. Through computer software applications, users will be able to access even the most complex features with ease. For example, setting up a conference call may be as easy as "clicking" on the names of the conferees.
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> **Personal Communication Management.** With a graphical user interface, people can have their PCs handle incoming telephone calls, automatically controlling which calls reach them. For example, people will be able to ensure that they receive important calls by requesting that certain calls be forwarded automatically to locations at which they expect to be working.
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> **Voice Input/Output.** With a telephone connected to the computer, the familiar and ubiquitous telephone handset can be used as a voice input/output device. Users will be able to add voice annotation to a report or listen to a voice-annotated graph as it is viewed on the PC monitor.
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> **Telephone Network Access.** Connecting existing applications directly to the telephone network will greatly expand the usefulness of these applications and increase users' productivity. For example, a personal information manager can be used not only to look up telephone number, but also to actually place calls to those numbers.

Additionally, several interesting new applications will be enabled by combining computers and telephones:

> **Integrated Messaging**. With direct connection to the telephone, integrated messaging becomes a reality. Today, when people arrive at the office, they must check three separate "in-boxes": voice mail, electronic mail and the fax machine. With the desktop computer connected to the phone network, users can combine these three forms of messaging into a single in-box. They can review and manage all of their messages — electronic mail, fax and voice mail — from a single place. In addition, voice-mail messages can be accessed randomly, which is far more efficient than the serial access provided on most telephone-based voice-mail systems.
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> **Integrated Meetings.** One of the most attractive capabilities of the computer is that it can store, communicate and present information that spans the entire spectrum of media — text, data, graphics, voice and video — in any combination. By itself, the telephone can communicate and present voice information only. By combining the functions of the computer and the telephone, people in geographically separate locations can participate in interactive meetings and share visual as well as audio information. That means they can hold meetings over the telephone network that are nearly as rich in information content as in-person meetings.
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> For example, two or more engineers can "meet" over a telephone connection to discuss a new printed circuit board design. All can view a schematic drawing of the board, displayed simultaneously on each PC screen. Anyone can make markings on the schematic to illustrate particular points. Each person's markings appear simultaneously on all screens, perhaps in different colors to identify which individual made the marks. In addition, the engineers maintain full voice communication while they are interacting visually. With higher-bandwidth telephone networks, it may be possible to transmit full or partial motion video as well. For example, one of the engineers may demonstrate the insertion of the new printed circuit board into a computer using a clip of motion video.
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> These two applications merely scratch the surface of possibilities presented by the integration of the personal computer and the telephone. More will emerge as products are developed on the Windows Telephony API specification.

The Windows Telephony API Approach

One of the major problems in connecting the computer to the telephone is the enormous complexity and diversity found in the underlying telephone network. There is a wide variety of telephone services and equipment, and many incompatible protocols. The analog Public Service Telephone Network (PSTN), proprietary PBXs, key systems, cellular systems, and Integrated Service Digital Network (ISDN) facilities vary across service networks and switches. The Windows Telephony API provides a standard application programming interface that allows users and application developers to take advantage of the many capabilities and services of the telephone. At the same time, it isolates users and application developers from the complexity and variability of the underlying telephone network.

The Windows Telephony API will allow application programs to control telephony functions. This includes such basic functions as establishing, answering and terminating a call. It also includes supplementary functions, such as hold, transfer, conference and call park found in PBXs and other phone systems. The API also provides access to features that are specific to certain service

providers, with built-in extensibility to accommodate future telephony features and networks as they become available.

The Windows Telephony API operates independently of the underlying telephone network and equipment. It isolates the application from the network complexity, greatly simplifying the application development task. In addition, the API is independent of the method of connection between the computer and the telephone. This gives maximum flexibility to integrate the PC with the telephone system. For example, the PC can be connected to the telephone network as shown in Figure 1. The PC can be connected through a telephone as shown in Figure 2. Multiple PCs can share telephone resources through a voice server, as shown in Figure 3. Or a server can be connected through a switch-to-host link, as shown in Figure 4. Different connection models offer different capabilities to applications. For example, conferencing applications require a connection as shown in either Figure 1 or Figure 3, in order for the PC to get access to the information transmitted over the phone line.

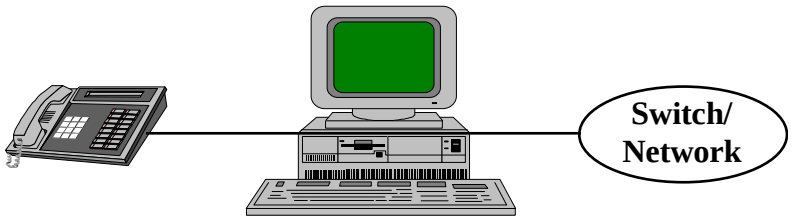

Figure 1. Connect PC to Network

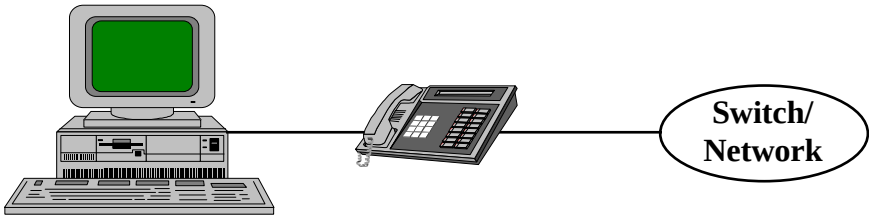

Figure 2. Connect PC to Telephone

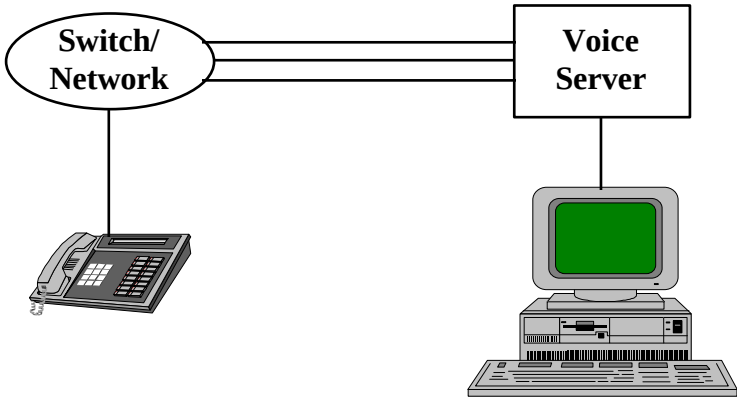

Figure 3. Connect PC to Voice Server

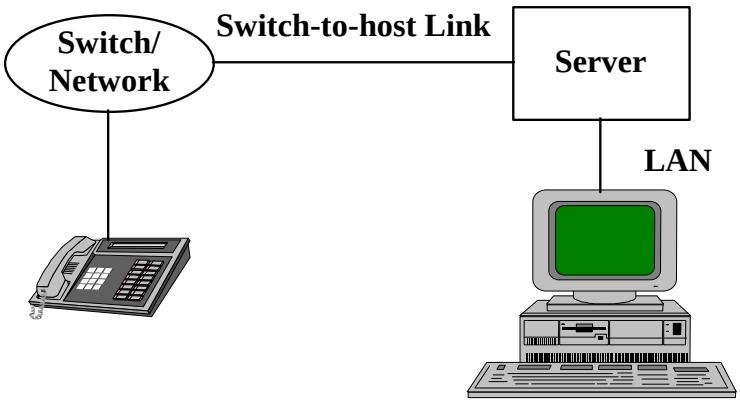

Figure 4. Connect PC via Switch-to-host Link

The Windows Telephony API is part of the Microsoft *Windows* Open Services Architecture (WOSA), which provides a single set of open-ended interfaces to enterprise computing services. WOSA encompasses a number of APIs, providing applications and corporate developers with an open set of interfaces to which applications can be written and accessed. WOSA also includes services for data access, messaging, software licensing, connectivity and financial services.

WOSA services such as the Windows Telephony API consist of two interfaces. Developers write to an applications programming interface (API). The other interface, referred to as the service provider interface (SPI), is used to establish the connection to the specific telephone network. This model is similar to the computer industry model whereby printer manufacturers provide printer drivers for Windows-based applications. Figure 5 shows the relationship between the "front-end" Windows Telephony API and the "back-end" Windows Telephony SPI.

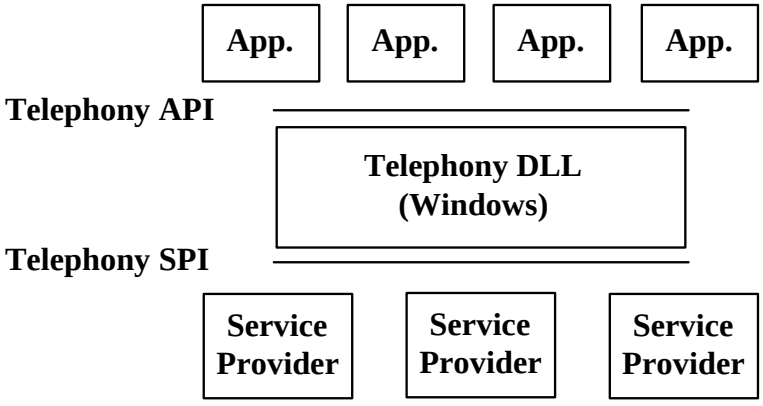

Figure 5. Windows Seamlessly Integrates Applications and Telephone Networks

Applications can combine the Windows Telephony API with other capabilities of Windows to provide a combination of services. For example, an application can use the Windows Telephony API to establish a connection and then use the Windows audio functionality to record and play back voice information over the connection.

Summary

The Windows Telephony API brings a whole new range of functionality to business users by enabling the integration of the desktop computer with the telephone. Because the API isolates applications from the complexity of the underlying network, application developers can generate network-independent applications. Also, the API is independent of the type of PC-to-telephone connection, giving application developers and users configuration flexibility. Removing these barriers is critical to the development of PC applications that exploit the telephone network.

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