

An Artisoft White Paper

## **The Software PBX**

**How Open-Systems Computing  
is Transforming Business  
Phone Systems**



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## About Artisoft

Artisoft is a leading provider of open systems IP-PBX and call center products that deliver unprecedented communications capabilities to medium-size businesses, branch offices, and call centers. Artisoft's innovative software products have consistently garnered industry recognition, winning more than 35 awards for technical excellence. The company distributes its products and services worldwide through a dedicated and growing channel of authorized resellers. For more information, please visit Artisoft's website at [www.artisoft.com](http://www.artisoft.com) or call 800-914-9985.

The shift from proprietary to open systems that transformed the computer industry is now taking place in telecommunications, giving businesses dramatically more choice and functionality in their phone systems.

Voice-data convergence—the integration of telephone and computer systems—has evolved to the point where companies can now select software-based telephone switching (PBX) systems that run on industry standard hardware platforms. Software PBXs offer a greater set of features, lower the cost of ownership, and make it easier to expand a system while preserving the initial investment.

## History Repeats Itself

The open systems market that exists in the computer industry gives customers the freedom to mix and match technologies and provides purchasing power that could not have been imagined years ago. Previously, customers had to purchase a complete system—computer, peripherals and software—from a single vendor. Once the purchase was made, the customer was locked into a proprietary system with little flexibility. The technology was limited to whatever the single vendor could provide. Because of this arrangement, the vendor could charge high prices for add-ons, expansions, upgrades, and support. This made the cost of owning a computer system extremely expensive.

Now, businesses take for granted that they can purchase computer software and hardware products manufactured by multiple vendors and that these products will all work together as an integrated solution. For example, a business may purchase an e-mail system developed by Vendor A, a sales-automation software application developed by Vendor B, a PC server manufactured by Vendor C, an extra disk drive produced by Vendor D, and some additional memory created by Vendor E. Over time, that business may upgrade one of these components without having to replace any of the others.

Looking back, it's clear that the shift toward open systems has brought dramatic benefits to the computer industry. It has increased competition in almost every area, resulting in the rapid introduction of new technologies and steadily falling prices. The advent of open systems also changed the face of the industry, with new companies emerging as leaders over more established, proprietary system vendors.

## The Shift to Open Systems in Telecommunications

Driven by customer's requirements for additional flexibility and affordability, the phone industry is now undergoing a similar shift toward open systems. The benefits for businesses are even more dramatic.

Historically, companies had no choice but to purchase a proprietary phone system, where all the components—switch (PBX), handsets, peripherals, and applications—came from a single vendor. Because of this arrangement, a business was forced to rely on a single supplier to meet its technology needs and was forced to abandon its telephone system as it expanded. As a consequence, growth was often interrupted or slowed.

In addition, the need for phone systems to be integrated with other information technology (IT) systems has become increasingly important. When a business interacts with its customers and suppliers, its IT systems shape those interactions. Transactions that occur via a company's phone system often involve accessing the company's Web server, e-mail, customer relationship management software (CRM), and accounting software. More and more, companies want these transactions to involve some level of computerized automation and application integration. Some examples include allowing customers to retrieve account information by entering in PIN codes, automatically routing callers to the most appropriate sales agent, or presenting customer service reps with customer information for incoming callers.

Today, PBXs are part of the fabric of the way a company operates, and this requires flexibility in hardware and software interfaces. Internet connections change and get faster. Web servers have to be upgraded to accommodate exploding demand. Storage subsystems increase in sophistication and can take Web-oriented applications up into capacity ranges that were once exclusive to mainframes. Desktop PCs have a limited life span because of constant improvements in technology. In this fluid environment, a company cannot afford to be locked into an inflexible PBX environment.

## The Software PBX

Fortunately, the telecommunications industry is embracing open systems. Because of this, customers are enjoying significantly better products at greatly reduced cost.

The software PBX is the key technology enabling the phone industry to move to open systems. A software PBX requires no proprietary hardware; instead, it uses industry-standard interfaces and runs on commercial, off-the-shelf hardware. With a software PBX, the phone system becomes another set of software applications (i.e., call manager, voice mail, auto attendant, automatic call distributor) and another set of peripherals (i.e., handsets, headsets, IP devices) running off a standard computer server or network appliance. The software PBX is the result of an evolution that has occurred over the last 10 years, driven by an important trend—the convergence of voice and data technologies.

## The Convergence of Phone and Computer Systems

Historically, businesses that required a phone system chose from several proprietary PBXs. These systems combined purpose-built hardware with closed and proprietary software that had little or no outside interface other than network-communications protocols for incoming and outgoing PSTN (analog) calls. Vendors continue to sell these systems today because they are lucrative and lock a customer into a single source of hardware for the long term.

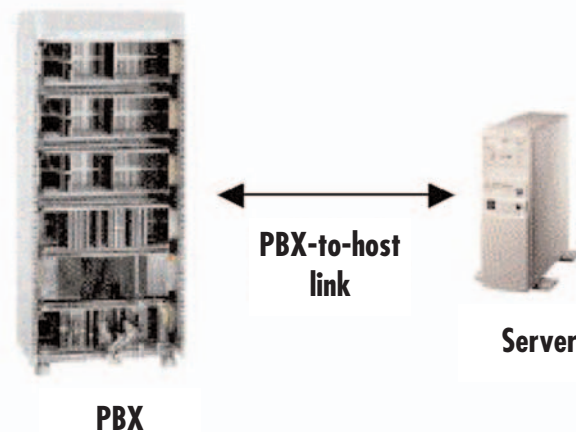
Some telecommunications manufacturers began to recognize the underlying need for openness and began developing and manufacturing products that attempted to uncouple the software from the hardware while taking advantage of computer-system standards. The convergence of phone systems and computer systems has evolved over four phases:

- Computer Telephony Integration (CTI)
- Proprietary PC PBX
- Proprietary Internet Protocol (IP) PBX
- Software PBX

## Computer Telephony Integration (CTI)

Over 20 years ago, the first standards-based connections to PBX systems were introduced. Computer telephony integration (CTI) brought standard control interfaces (such as the ECMA PBX-to-host link) to proprietary PBXs, mostly for the purpose of interfacing voice processing systems such as voice mail and interactive voice response (IVR). At this phase of evolution, PC-based voice processing systems worked alongside legacy switching hardware.

Even though a wide variety of standards were implemented, the early CTI systems had some advantages—PBXs no longer sat isolated and interfaces were no longer controlled by a single vendor. But the cost of adding CTI interfaces to legacy PBXs was, and remains, high. Customers still had the expense and limitations of the proprietary PBXs, and acquired the additional integration and maintenance issues associated with the new server. Further, the relatively narrow and inflexible CTI interfaces—typically low-speed serial links—were often insufficient for new tasks beyond the limited feature set, such as basic transfers of calls.



**FIGURE 1** | Serial connections and simple standard protocols enabled call-center software and voice-mail systems to communicate with PBXs.

## PC PBXs

About seven years ago, the first PC PBXs started to appear. In these systems, PCs that had previously just handled voice processing, handled some call switching as well. This had some advantages:

- Because PC operating systems are always increasing in power and capability, PC PBXs could inherit some of these advantages.
- PC PBXs could run application software in the same box as the switching hardware. This eliminated some of the restrictions inherent in CTI interfaces with proprietary PBXs. PC PBXs sometimes came with an applications suite that provided messaging and other features only found in expensive legacy PBX/voice-mail combinations.
- PC PBXs interfaced with standard analog handsets, allowing customers to mix and match among multiple vendors.

As development continued, it became apparent that the PC PBXs on the market had one large deficiency—they still relied on proprietary hardware. While they were able to use off-the-shelf computer servers, underneath the covers these systems had many of the same problems as proprietary PBXs. Once again, customers were locked into a single vendor for both the underlying switching hardware and all of the application software. Their choices were limited to what a single vendor could provide, and they lost all of their negotiating leverage after they made their initial purchase.

## Internet Protocol (IP) PBXs

As Voice-Over-IP technologies improved, several vendors introduced IP PBX products that managed all communications over a business IP network. Because IP standards were still evolving, each vendor interpreted them differently or ignored them completely, creating telephones and routers that were incompatible with those of competing vendors. This resulted in proprietary and sometimes very expensive telephones, routers and hubs. In addition, the vendors provided only very basic application sets and their proprietary architectures provided little incentive for 3rd-party developers to create add-on applications. Essentially, the IP PBX merely replicated the limited features and high cost of ownership of traditional proprietary PBXs within a data-centric environment.

## Software PBXs

The software PBX was introduced several years ago after many experiments in combining computers, networks, and PBXs, including CTI, PC PBXs, and IP PBXs. A software PBX takes advantage of a comprehensive set of standards that enables software to control switching and voice-processing hardware without becoming entangled in the implementation details of the hardware. This allows underlying hardware, signal processing, and communications links to be changed without forcing users to discard the software part of the system that defines the way voice communication works at their companies. Since the software is compatible with industry-standard telephony hardware and computing platforms, it provides plug-and-play compatibility among software, hardware and all peripherals, allowing greater flexibility in implementation.

## Advantages of Software PBXs

**A software PBX will not become obsolete.** When a company purchases a software PBX, it is investing in a product that will continue to increase in value over time. Since the functionality of the system is contained in the software applications, customers will continuously have access to new features through inexpensive software upgrades. They can also upgrade the underlying hardware without having to change any of the software.

**A software PBX provides infrastructure flexibility.** Each company has a unique and ever changing variety of business requirements, and to be effective, the company's infrastructure must provide a high degree of flexibility. By enabling hardware independence, a software PBX provides the maximum flexibility. For example, a software PBX can operate as either a traditional PBX, as an IP-PBX, or as a combination of both, allowing customers to adopt IP telephony at their own pace.

**A software PBX lowers the cost of ownership of communications systems.** Once a business installs a software PBX, future capacity upgrades will be straightforward and inexpensive. Competition between manufacturers will result in price reductions, and simpler upgrades will lead to lower service fees. Because the company is no longer dependent on a single PBX vendor, the IT buyer does not have to manage supplier risk and achieves greater bargaining power among multiple vendors, resulting in a lower cost of ownership over time.

**A software PBX allows a company to embrace new technologies quickly as they become proven in the marketplace.** With a software PBX, upgrades to capacity, availability, connections, and storage are all as transparent to the users—the people whose productivity the system is meant to enhance—as upgrades to the underlying platforms for other enterprise applications. The phone system can become integrated with new systems that a business acquires, such as e-mail, order-processing, IVR, and Web-based customer care applications.

**A software PBX provides more choice in features and applications, and a more customizable system.** The software PBX can integrate with voice and data applications using standard system API interfaces. Customers can also develop applications that are customized to the unique requirements of the business. For example, unique CRM applications with screen pops, paging applications, and call center applications are easy to implement and modify as the requirements of the business evolve.

## Artisoft's TeleVantage Software PBX

Artisoft's TeleVantage is the leading software PBX available today. TeleVantage is designed to take advantage of open systems standards, and to provide business customers with maximum infrastructure and applications flexibility.

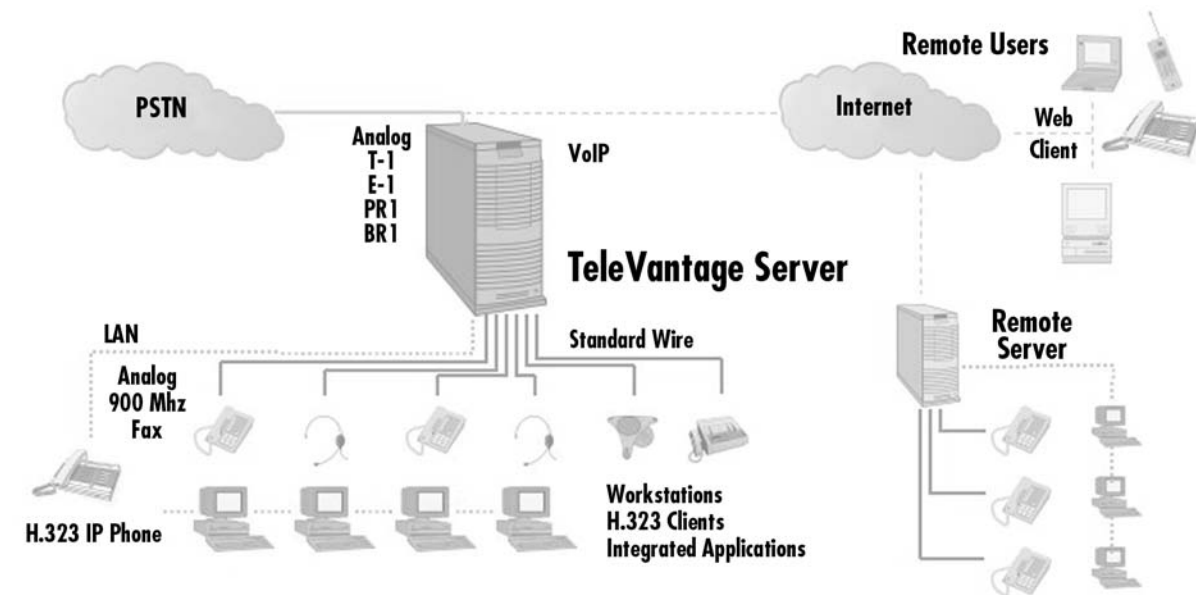
With TeleVantage, no proprietary hardware is required. TeleVantage runs on industry-standard Intel® voice-processing components, standard Windows® servers, and standard phones. Built using industry-standard interfaces, TeleVantage can function as either an IP PBX or traditional PBX, providing the best of all possible worlds.

Layer	Description	Benefits
H.323	Protocol standard for packet telephony on IP networks	H.323 enables TeleVantage to connect to IP telephones and PCs running NetMeeting® conferencing and other H.323 software to act like telephones. It also enables TeleVantage servers to connect to public packet telephony gateways, and for multiple TeleVantage servers to be linked in large virtual systems.
TAPI API	Windows API for telephony	Applications that adhere to Microsoft's TAPI standard such as Goldmine®, Act!™ And Outlook® will work with TeleVantage without modifications.
MAPI	Windows messaging API	Using MAPI, TeleVantage is compatible with the widest possible range of e-mail servers and e-mail client software. For those companies who do not own a MAPI e-mail server, they can use freely available MAPI clients to communicate to SMTP compatible servers.
ODBC	Windows database API	Using ODBC, TeleVantage integrates with Microsoft SQL Server or Microsoft Data Engine (MSDE) for logging and other internal databases.
COM	Component Object Model (COM)	The TeleVantage COM interface provides a very powerful yet high-level and object-oriented interface to TeleVantage internals. This interface is appropriate for interfacing TeleVantage with other enterprise software systems such as accounting software or Web applications. An example is TeleVantage IVR Plug-in interface for developing tightly integrated IVR or voice mail applications.
H.100	Hardware interface for voice-processing cards	H.100 enables multiple manufacturers' voice-processing cards to plug into the same chassis and connect to each other. This enables TeleVantage to offer a very wide range of telephone and network connections and a high degree of scalability as hardware increases in capacity.

By adhering to industry standards and eliminating the need for proprietary hardware, TeleVantage provides customers with maximum flexibility. TeleVantage interfaces with 3rd-party applications using standard telephony APIs and supports networked communication through the standard COM interface.

## TeleVantage Infrastructure Flexibility

Because Artisoft's TeleVantage has been developed using industry-standard interfaces, it affords maximum flexibility in connecting telephones, phone lines, data networks, network service providers, and the distributed parts of an enterprise at distant locations. Figure 3 shows how TeleVantage provides a very broad set of connectivity options:



**FIGURE 2** | Standards make connectivity choices possible.

In Figure 2, a wide range of connectivity choices are illustrated:

- Digital and analog trunk connections to the public-switched telephone network (PSTN), including analog, T1, E1, Primary Rate ISDN (PRI-ISDN), and Basic Rate ISDN (BRI-ISDN)
- Voice over IP (VoIP)
- Remote connection to off-premises extensions (OPXs)
- Remote connections to Web clients
- Connections to remote servers to create large virtual systems
- Local connections to a variety of conventional telephones including conference speakerphones, wireless phones, and call-center-oriented headset-equipped phones
- Local connections to IP phones over existing data network
- Local connections to PCs running H.323-based conferencing software such as NetMeeting

Future connectivity options will provide additional choices for IT managers and never require a decision to replace a whole system.

## TeleVantage Applications Flexibility

TeleVantage provides a robust turnkey set of telephony applications, including PBX functionality, automated attendants, call center options, and voice mail, all integrated as a single software solution. The following examples are elements of the Artisoft TeleVantage applications suite:

- **A call-control view** provides a graphical user interface that puts powerful operations such as call transfer and conference calling at a PC user's fingertips. Multiple calls can be easily manipulated with an on-screen interface.
- **Call center queues** provide a full-featured call distribution system, enabling you to customize your callers' hold experience, play single or repeating prompts, prompt callers to enter data, configure call priority, and set up multi-level supervisor permissions. You can use the TeleVantage Call Center Reporter to run a variety of reports on call center activity.
- **IP gateways** bring your teams together while saving on long distance fees. Transparently route calls over the Internet to other remote TeleVantage servers, so that users at all locations appear as if they are running on one phone system. Callers dial a regular extension to call users at remote offices with no special access codes or extra digits required. You can even route long-distance calls over the Internet using the remote servers to treat the calls as local calls.
- **A visual interface to voice mail** provides fast PC-based access to voice messages. Voice messages can be treated like e-mail — they can be organized, prioritized, and referred to over time for tremendous productivity improvements.
- **Call and message screening** allows employees to prioritize everyday voice transactions. Call handling can be personalized so that employees can be reached at office, home, and mobile phones, according to the user's preference. On the basis of caller-ID information, different callers can be handled accordingly with custom greetings and call routing.
- **Logging and reporting** make it easy to see what phone usage has occurred in a TeleVantage system. Hold time and call volume information is particularly useful for call center managers.
- **Remote users** can take advantage of productivity improvements when not at their desktop. For example, a remote user can use the Web interface and a cell phone to create a conference call.
- **Extensible programming interfaces** makes integrating TeleVantage with e-commerce Web sites straightforward because TeleVantage has been built using Microsoft COM interfaces.

## The End Game for Voice-Data Conversion

The final stage of the evolution in voice-data convergence is an open systems PBX that runs on a standard computer server with *no additional required hardware*. Intel has recently announced a new technology called NetStructure™ Host Media Processing (HMP) that leverages the Pentium® chip to deliver standard telephony functions and capabilities. Since the Pentium will be able to handle tasks currently done by telephony hardware, all the equipment required to be a phone system will soon come with a standard Windows server. This will cause a dramatic reduction in costs, rendering proprietary PBXs and IP PBXs obsolete.

Through its strategic relationship with Intel, Artisoft has already begun working with this new technology and is well positioned to be at the forefront of delivering an HMP-based software PBX.

## Summary

Acquiring a software PBX is a prudent decision that unchains voice communications from hardware platforms. Underlying switching hardware, network connections, and computing platforms can be changed or upgraded in cost-effective ways that are transparent to business operations.

Web sites, call centers, and back-office software systems have become ever more integrated as companies pursue greater efficiency, global reach, and new capabilities through e-commerce. Voice communications are part of the e-commerce environment and they should be well integrated. A software PBX provides maximum flexibility in integrating with a company's existing and future infrastructure.

A software PBX has a powerful set of features that can be customized to meet the needs of today's dynamic businesses. It provides more value than a proprietary PBX because it spans conventional and IP telephony while incorporating features such as ACD and extensive reporting that would be costly options or separate products in other systems.

Software PBXs provide a better value today and a technology-independent investment for the future.



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