



WHITE PAPER

IP Voice Network Brokering

Enabling VoIP beyond the Corporate Firewall



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CONTENTS

| | |
|------------------------------------|---|
| + Introduction | 3 |
| + New Service Solutions | 4 |
| + The Role VeriSign Plays | 5 |
| + VeriSign Technology Strategy | 6 |
| Common Signaling | 6 |
| Simplified Service Deployment | 6 |
| Security Services | 6 |
| + How It Works | 7 |
| + Total Cost of Ownership Benefits | 8 |
| + Summary | 9 |



Recent changes in communications technology and services have more enterprises deploying their own IP-based voice systems.

Introduction

This paper will look at the shift in deployment of voice services as a result from the many structural changes in technology and services as outlined below. It will discuss the benefits and the challenges of deploying new Internet Protocol (IP) technologies within the enterprise and present a solution for a trusted voice brokering infrastructure to bridge enterprises and service providers.

- **New telecommunications infrastructure**

The rapid construction of telecommunications infrastructure throughout the latter portion of the 1990s caused a substantial drop in the wholesale and retail cost and pricing structures for voice and data services—changing the economic model of service deployment.

- **Availability of off-the-shelf voice appliances**

Deployment of voice services infrastructure on off-the-shelf computing appliances is replacing single function, proprietary hardware and software—reducing the cost of deploying telecommunication services.

- **Industry standardization on IP**

Progress is being made towards industry standardization of IP-based networks and affiliated standards such as Extensible Markup Language (XML) and Session Initiation Protocol (SIP), enabling a variety of new business models, including the outsourcing of application services to third parties and data networks to privately operated vertical industry extranets and the Internet.

- **New voice technologies**

Developments in alternatives to E.164 addressing and parallel associated voice infrastructures are leading to valuable, innovative services. Growth in the deployment of broadband networks and improvements in quality of service are attracting more businesses to VoIP services.

However, adoption of these new technologies is not without its problems. Voice network deployments have traditionally been complex due to a legacy of proprietary private branch exchanges (PBX) and key systems equipment, as well as closed voice virtual network systems provided by Inter-Exchange Carriers (IXC) like AT&T, MCI and Sprint. The recent advances in IP Centrex, IP PBX, and Hosted IP PBX, have done nothing to solve the underlying complexity: these new platforms are either tied to existing Class 5 switching features or separated and incompatible with existing voice systems, and due to the aforementioned collapse in switched voice services pricing, have questionable cost-of-ownership paybacks for customers after deployment. They also require new Office Support System (OSS), Billing Support System (BSS), and process deployment by the underlying provider. Ultimately, incompatible equipment and new, but closed, services platforms eliminate any direct benefit of deploying new technology for voice services.

New Service Solutions

New IP-based applications offer many benefits, but the enterprise faces significant obstacles to gaining access and fully utilizing these applications.

VoIP stops at the corporate firewall due to the inability to broker secure communications between enterprises and between enterprises and their service providers.

Though there are many challenges, there are bright spots in the deployment of IP-enabled voice infrastructure. Application Service Providers are utilizing IP-controlled media servers to reduce the cost of specialized conference calling applications. The technology enables participation via personal computers and the Internet, rather than through more expensive telephone calls. Outsourced interactive voice response (IVR) operators are reducing the cost of ongoing operation while increasing functionality through eased access to customer databases and Internet standards such as Voice XML (VXML). Companies are reducing the cost of their customer care operations by disaggregating call centers and implementing remote agents over IP telephony. Most importantly for service providers, the cost to deploy softswitching—the underlying signal and media gateways required to interconnect VoIP and time division multiplexing (TDM)-based networks—has reached a level of reliability allowing carriers to confidently deploy IP trunking.

Despite these advances, IVR and conferencing providers are still generally reached via the public switched telephone network (PSTN). For example, even if a customer's phone system is capable of transacting via IP, corporate customers are still unable to bypass the PSTN to reach applications providers because there is no way to securely broker a call from the customer's IP voice infrastructure into the applications provider's network infrastructure. Even though carriers have IP-enabled trunking infrastructure, it is generally deployed on network-network interfaces (NNIs), rather than on user-network interfaces (UNIs), owing to signaling protocol incompatibilities and compression/decompression (CODEC) nuances. Ultimately, without specific and complicated interactions between enterprises and carriers, the IP voice revolution within the enterprise stops at the corporate firewall, where security rules block entry of inbound voice streams, or at the central office, where the traffic is converted upstream to TDM for tandem processing.

This is not the first time corporations have experienced this problem. Initially, email services were proprietary to a specific enterprise. Mainframe-based corporate email allowed streamlined communication within an enterprise, leading to private interconnections between enterprises on a case-by-case basis. Carriers and service providers stepped into the fray, providing closed infrastructures for inter-enterprise email. Finally, with the adoption of Simple Mail Transfer Protocol (SMTP) and the Internet, corporations had a trusted and easily deployed method by which to communicate between enterprises. Mainframe-based email no longer exist because these new technologies, combined with a low-cost service infrastructure for brokering email transactions, made email easy to deploy and enabled a revolution in corporate communications. What service for brokering email transactions was that? It was VeriSign® Domain Directory Services.

IP voice now sits at the same crossroads email was at a decade ago. Advancements in IP voice technology, such as Session Initiation Protocol (SIP) and low-bandwidth voice encoders/decoders (CODECs) have allowed for convergence of voice and data within the enterprise, but corporations and carriers still lack a native, underlying service by which to broker trusted and secure voice communications between enterprises. Even more importantly, corporations lack a method by which to fully outsource the voice application infrastructure and take advantage of a service provider's economies of scale and expertise.

VeriSign is leveraging experience in securing the Internet and managing Internet lookups to provide a secure method to allow networks to interoperate.

Fortunately, that is where VeriSign can play a key role. With their lightning-speed directory services, secure network infrastructure, and telecommunication signaling know how, it is possible for VeriSign to offer the marketplace a solution: an open-standards-based, trusted voice brokering infrastructure to bridge enterprises and service providers. That solution is VeriSign® PBX IP Connect Service.

The Role VeriSign Plays

VeriSign operates intelligent infrastructure services that enable businesses and individuals to find, connect, secure, and transact across today's complex global networks. Every day, VeriSign enables 14 billion Internet transactions through the operation of the Internet's *.com* and *.net* registries and it enables 3 billion telephony interactions through its Communications Services division. Through its Security Services group VeriSign protects users of the Internet from financial fraud, and brokers trusted electronic transactions.

Through this unique melding of fast transactional lookup ability, its expertise in telecommunications signaling, and a reputation for secure and trusted data network infrastructure, VeriSign is in a unique position to facilitate an emerging market in IP media services—with VoIP, video, instant messaging, and peer-to-peer services.

The VeriSign approach to this market concentrates on providing IP-based signaling services to replace existing private voice networks and applications, rather than building individual private signaling systems or relying on service control point (SCP)-based carrier voice private networking services. Initial customers for this service are concentrated in the Fortune 1000, particularly those in common communities of interest (such as automotive manufacturers and their suppliers) and those deploying a combination of voice strategies premise-based Hosted IP PBX, multi-vendor IP PBX, and IP Centrex.

In addition, VeriSign enables next-generation, converged service providers to participate in this infrastructure. Service providers can now offer their services directly to end-user customers through the use of less-expensive IP media servers. They can also provide toll, local, and E911 gateway infrastructure services—through a single IP pipe, rather than separate IP and PSTN trunks to public networks. By partnering with best-of-breed ecosystem partners, this service will streamline the implementation of outsourced media applications, such as:

- Unified Messaging
- Unified Communication
- Conferencing
- Collaboration
- IP Remote Agent roaming
- Media and quality-of-service assurance services
- Communication Assistance for Law Enforcement Act of 1994 (CALEA) services
- Media stream recording
- Local/long distance/international and E911 trunking

Enterprise-wide integration of IP telephony services requires protocol normalization, management of addressing data (E.164 telephone number), and security of interconnection points and control of who has access to the network and services.

VeriSign Technology Strategy

To accomplish this sweeping goal, VeriSign has built a massively scalable directory and redirection service (VeriSign® Network Routing Directory), complete with filtering and security technology for access control at the core of the service network. The three pillars of this schema are outlined below.

+ Common Signaling

The core of the PBX IP Connect Service is based on SIP, a convergence protocol developed at Columbia University in conjunction with the Internet Engineering Task Force (IETF). It is generally accepted as the future of multimedia signaling over IP.

Most “standards-compliant” voice systems are only compliant with their own interpretation of those standards. Thus, even if PBX systems of different manufacturers speak the same signaling protocol (e.g., SIP, H.323), they generally cannot contact one another over IP. Their only layer of compatibility is via a local exchange carrier or inter-exchange carrier. Even if systems speaking the same protocol could communicate, there are many systems that still require backward compatibility with H.323, or forward compatibility with SIP.

VeriSign PBX IP Connect Service will affect protocol repair and protocol translation in the enterprise, allowing disparate systems and deployments of voice technologies to coexist—from TDM to IP—through edge-managed protocol repair and translation. In addition, the high-speed, SIP-based core is designed to support SIP-based video conferencing services, SIP for Instant Messaging and Presence Leveraging Extensions (SIMPLE)-based Instant Messaging services, and any other future peer-to-peer information service designed to run in conjunction with SIP. Thus, the deployment of the service is future proofed.

+ Simplified Service Deployment

Currently, enterprises are responsible for validating and maintaining E.164 telephone number translation data, as well as the means by which this addressing data translates into a service—be that service another telephony user, an IVR system, or an audio conferencing system. VeriSign provides a means by which to manage this internal addressing space and ensure service interconnection—not only within an enterprise’s virtual voice network, but also (at the enterprise’s discretion) to business partners and the public. At minimum, this basic infrastructure enables protected toll bypass within an enterprise. In its more advanced form, it allows private voice ecosystem deployment between enterprises. In the larger sense, managing service providers, on behalf of their enterprise customers, could choose to populate the service with public SIP signaling information to manage Internet- and extranet-based interconnection in conjunction with the security services inherent in the platform.

+ Security Services

Security is the final barrier to enterprise-wide integration of IP telephony services. The deployment of network-edge-based session border controllers requires a level of trust and security that cannot typically be provided over the public Internet: currently deployed methods of voice interconnection require a filtered-port approach similar to email. Since voice communications are real time and cannot be queued for processing like email can, service providers must establish both entry/exit criteria (such as access control lists, white/black lists, stateful inspection, and other rules) and trust (participation in the network requires adoption and deployment of a standard platform as well as contractual standards for interconnection). By participating in a community of IP voice users with such standards and rules, enterprises can more comfortably open voice infrastructure to the public network.

VeriSign PBX IP Connect Service resolves the issues of interoperability, address resolution, and security—operating on a platform built upon the same infrastructure that manages billions of daily transactions for the Internet .com and .net domains—massive scalability, unmatched reliability.

As an additional layer of security, an encrypted, certificate-based Virtual Private Network (VPN) secures all extra-enterprise transactions between the customer premise and VeriSign core signaling applications. This method prevents non-VeriSign customers from accessing the signaling infrastructure and provides an impenetrable line of defense against IP-based signaling structures, such as distributed denial of service (DDoS). Once these trusted relationships between the VeriSign Customer Premise Equipment (CPE) and the enterprise's firewalls are established, it allows co-processing in the security perimeter of the enterprise—permitting ad-hoc firewall pinholing and voice call transversal.

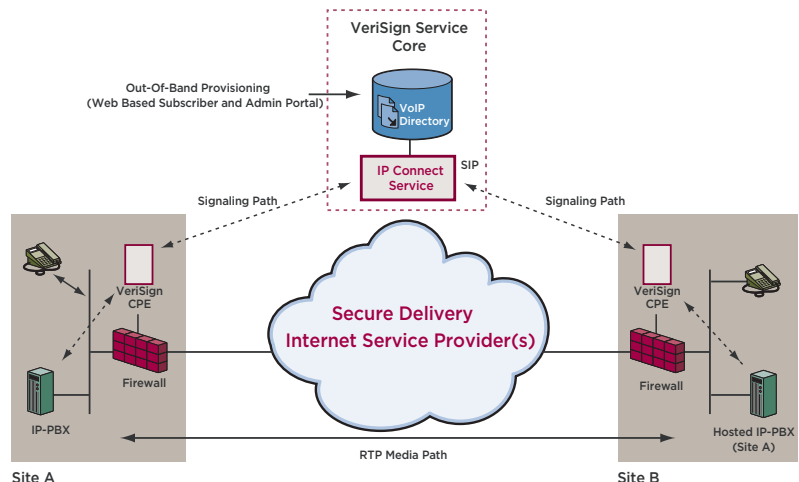
How It Works

VeriSign PBX IP Connect Service works by deploying two service cores—one at the edge of the enterprise network, providing edge-based protocol translation and repair and network perimeter transversal—and one in the public Internet cloud, providing inter-enterprise routing, service brokering, network access control, and auditing, over an encrypted IP VPN.

At the edge, registered IP-enabled PBX, IP PBX, and, in the case of carrier network deployments, IP Centrex and Hosted IP PBX, communicate with the service in their native IP interconnection protocol by forwarding upstream signaling information into an edge-based CPE operated by VeriSign. At this point, VeriSign translates various dialects of H.323 and SIP into standards-based SIP signaling streams for transversal of the public network or customers' intranets and extranets.

After edge processing is complete, VeriSign forwards the signaling stream through the firewall over an IP VPN to its service core, operating at multiple interconnection points across the public Internet and extranet partners' networks. At this point, a high-speed SIP processing engine implements access control rules, audits and logs signaling requests, handles incremental transactional billing data, and forwards signaling information to trusted CPEs in other enterprises or IP voice application service providers for termination of voice streams.

Figure 1: Enterprise PBX Interoperability



*Sites may or may not belong to the same enterprise.

To realize the value of their investment in IP voice systems, the enterprise must be able to extend VoIP between enterprises and access more cost-effective IP applications.

Finally, terminating traffic reenters the network via the VeriSign CPE, where it is reconverted into vendor-specific H.323 or SIP implementations for call signaling termination on either another PBX- or IP-based customer- or carrier-operated voice service.

After the signaling origination function completes, the VeriSign CPE opens a pinhole to communicate Rapid Transport Protocol (RTP)-structured voice streams between the originating and terminating call agents, completing the interconnection. When the call completes, the network recognizes this and closes the RTP pinhole and the signaling stream.

Total Cost of Ownership Benefits

Currently, VoIP deployments are sold on Total Cost of Ownership (TCO) benefits, but most enterprises do not recognize the full benefit for multiple reasons.

First, most enterprises, either via policy or as a product of merger and acquisition, do not operate homogenous telecommunications infrastructures. This, in the traditional PBX market, was bridged by a common signaling and interconnection network that resolved incompatibilities and addressing in the network—in this case, the PSTN or a long distance company's virtual network long distance service. With the advent of VoIP, equipment vendors' interpretations of signaling protocols, as well as their proprietary routing and address management systems, prevent most vendors' equipment from communicating with each other.

Second, the emergence of hybrid IP PBX, which converts the service core to IP while retaining some or all of the handsets in a proprietary structure, is slowing the adoption of pure IP PBX in the enterprise. These platforms allow for deployment of VoIP in places where it adds tangible benefit, and they leave depreciated digital and analog handsets where it does not. Though these systems provide capital-cost avoidance strategies to an enterprise, they also perpetuate multiple vendor strategies in the enterprise.

Third, voice services are still generally deployed in conjunction with the PBX, mainly due to the fact that the same incompatibilities that plague inter-vendor PBX interconnection also plague service deployments such as Unified Messaging and Communications. Even if internal enterprise service deployment issues were resolved via a single-vendor implementation, the lack of security and trust over public networks prohibits a direct IP interconnection between enterprises and voice application service providers. Thus, IP PBX users must go to the PSTN for voice services such as conferencing and collaboration, which now run on native, VoIP-based media servers.

Finally, and most important to service providers building hosted IP telephony solutions, the service provides a method to cleanly integrate IP Centrex and Hosted IP PBX solutions into existing corporate voice networks—even if the enterprise uses multiple, existing vendors in disparate service areas.

VeriSign PBX IP Connect Service helps to recapture the TCO benefits of VoIP deployment by providing a suite of management tools to enable VoIP within and between enterprises and their service partners. By resolving incompatibilities between PBXs and building trust between enterprises, PBX IP Connect provides a means by which to enable basic

VeriSign's robust, flexible, and scalable platform enables enterprises and service providers to more efficiently manage their IP infrastructures and realize the benefits IP telephony.

services—such as toll bypass and access cost avoidance—and enhanced, next-generation services such as native IP collaboration and Unified Messaging, without constantly re-organizing and re-optimizing edge network interconnections. Also, as the service grows, the opportunity for outsourcing services grows as well, as do the number of traditional voice calls bypassing the PSTN. This results in even greater TCO benefits for the subscribing enterprise, and higher customer retention levels for the service provider.

A TCO analysis performed by VeriSign showed substantial savings for an enterprise implementing the service. The 875-user enterprise recaptured \$851,689.14 over a five-year period, including the additional costs of deploying the IP Connect Service. If the enterprise accounts for gains associated with the reduction of a single, fully loaded IP telephony engineer headcount made redundant by the service, the total benefit increases to \$1.32 million over that same five-year period.

Summary

The integration of next-generation voice platforms and services have unique needs—building service management tools to scale IP telephony, while maintaining compatibility across all platforms is a difficult task, and meeting Enterprise IP telephony integration requirements requires a flexible, scalable, and open means of interconnection.

VeriSign is in a unique position in the deployment of next-generation, IP-based media services. By melding its reputation for security and trust with its expertise in managing and operating massively scaled signaling and directory services, it is well positioned to solve technical and business challenges in the deployment of Voice over IP and other IP-originated media services.

Visit us at www.VeriSign.com for more information.