WHITE PAPER

CISCO IP COMMUNICATIONS FOR ENTERPRISE BRANCH ARCHITECTURE AND SMALL OFFICES

Leaders have recently come to realize that having a strong, scalable network infrastructure is essential to their organization's overall success. They are discovering the enormous benefits to be gained by integrating services directly into their network components. Cisco® Enterprise Architecture for the small and branch office demonstrates to small, midsized, and large organizations, as well as their service providers, how to build new value into their IP networks through incorporating business-critical services such as telephony, network security, switching, content delivery, and messaging into a single, integrated networking system that can scale and adapt to new environments. By using their IP networks, organizations can increase their return on technology investment, further improve employee productivity and customer satisfaction, reduce their total cost of ownership (TCO), and dramatically simplify network management.

As businesses evolve and grow, the requirements and expectations placed upon their data and communication networks continue to expand. Traditional telephone networks, in particular, are facing increased demands for greater flexibility and integration with data systems and applications—which they are not positioned to meet. With the maturity and continuing industry-wide acceptance of packet voice technology, the delivery of voice services through a converged Cisco IP Communications solution becomes a natural choice when seeking an efficient and flexible voice solution. For example, the Texas-based Cancer Therapy and Research Center (CTRC) offers radiation and medical oncology services to San Antonio's four largest hospitals and maintains major cancer research facilities. According to Mike Luter, chief technology officer, CTRC needed to maintain the highest levels of network availability and reliability as well as improve overall communications across its network. Luter says, "CTRC has eight linear accelerators, two HDR (High Dose Rate radiation brachytherapy) units, and sees more than 200 cancer patients a day—that's one patient every 10 minutes on some systems. These people rely on CTRC for radiation and medical oncology services. They need to be treated according to the schedule that has been developed by their oncologist. To have someone miss or have to reschedule a radiation treatment because of network downtime is simply unacceptable."

CTRC has received positive results since its deployment of an IP network. First, the center has enjoyed superior reliability. "We have created a 'bulletproof' data network with IP telephony built in," Luter says. "The fact that we can now ensure patient treatment, on schedule, is key. Our linear accelerators are able to deliver 200 patient treatments per day, which enables us to perform according to our economic model for the treatment equipment."

Once the choice to move to IP Communications has been made, the next step is to determine how best to deliver packet voice services. This paper will provide some guidance on the different options available. End users have come to expect certain basic features from voice services: call forwarding, call conferencing, auto attendant, and voice mail, to list a few. The actual delivery mechanism for these features is usually of no interest to the end users, but easy access to these features and their administration brings new potential applications for productivity and cost savings. For this reason, a single integrated platform is often the preferred solution in various small-office environments.

The telephony service needs of small or branch offices, regardless of industry type—legal, financial, health care, retail, or municipality—can be categorized into the following three basic classifications:

- IP Communications for the small office—For small offices (fewer than 100 users) that need converged voice and data communications quickly and efficiently, Cisco CallManager Express allows customers to enable feature-rich call processing via their existing or planned access routing platform. In conjunction with Cisco CallManager Express, Cisco Unity™ Express offers integrated voice-mail and auto-attendant capability. Together, they provide a simple, consistent, distributed architecture that can be easily replicated for multiple small branches across an enterprise network. When a customer is ready to grow beyond 100 users or migrate to a centralized call-processing model with Cisco CallManager, only a simple configuration change to the access router is required to enable redundancy at branch locations via the Survivable Remote Site Telephony (SRST) feature at no additional cost. Investments made in IP phones, Cisco Catalyst® switches, analog phones, and fax machines are carried forward with the new solution.
- IP Communications for the branch office—For businesses with multiple remote sites on a quality-of-service (QoS)-enabled WAN, a centralized call-processing architecture provides the needed scalability and support. The remote sites rely on the centralized Cisco CallManager to handle call processing and Cisco Unity software for unified messaging. In the rare event of an IP WAN failure, remote sites can take advantage of the SRST feature integrated into Cisco access routers. This feature provides the IP endpoints at the branch offices with the core call-processing capability for redundancy.
- Small or branch office equipment integration—For businesses looking to integrate with existing equipment such as private branch exchange (PBX), Centrex, or Key systems, Cisco access and voice-only gateways can be easily enabled with voice over IP (VoIP). Ready-to-use modules and cards available on the Cisco 1700, 2600, and 3700 Series routers permit a flexible approach to the many types of interfaces used in the voice market. Gateways used for toll bypass protect investments because they can be reused in an IP telephony solution.

Figure 1. Cisco IP Communications for the Small Office (Single Site)

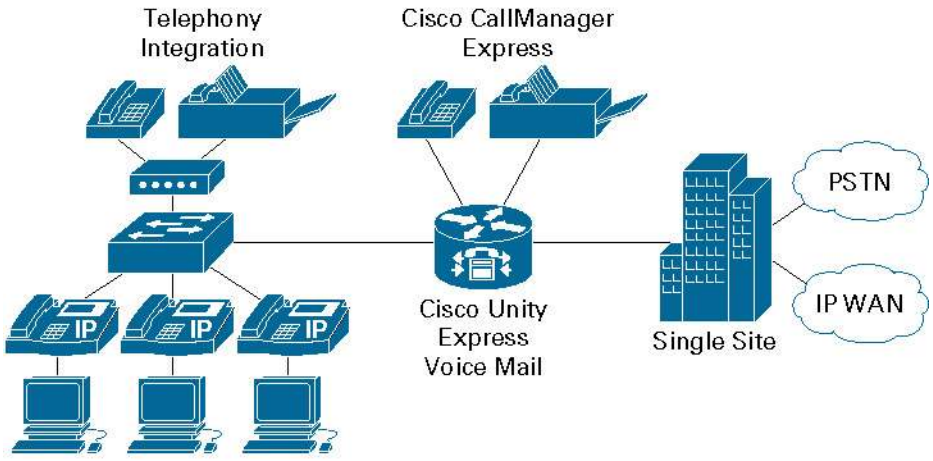
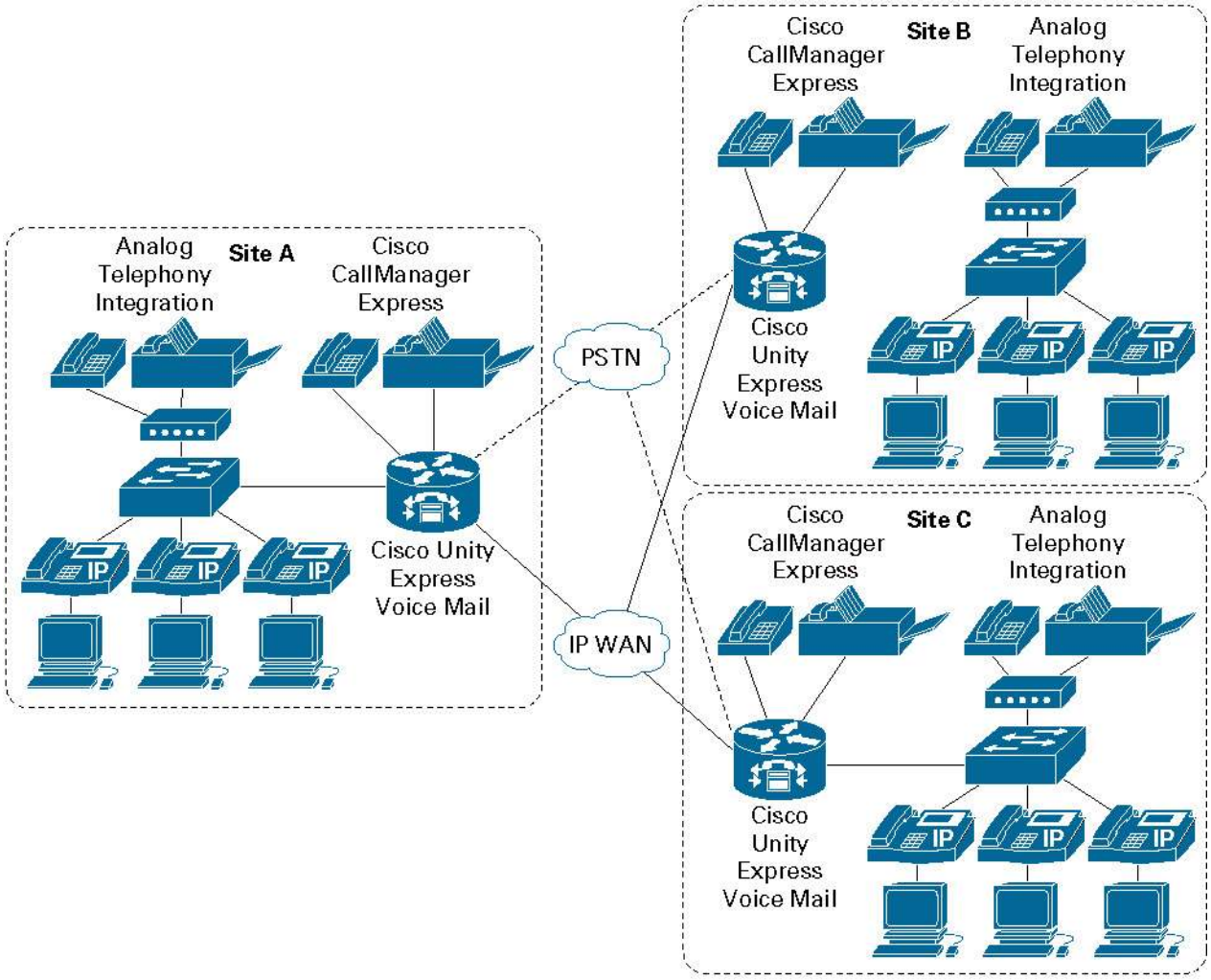


Figure 2. Cisco IP Communications for the Small Office (Multisite)



In general, resources within small offices are scarce and must be carefully allocated to provide the highest return. Services and infrastructure should be efficient, flexible, scalable, and cost effective. When implementing an IP telephony solution, an organization must determine certain elemental components of any deployment. To provide guidance in this area, these components have been divided into six groups: telephony endpoints, LAN connectivity, telephony service, Internet connectivity, management, and additional service requirements.

TELEPHONY ENDPOINTS

Cisco Systems® offers a broad range of IP phones with options and features to meet the needs of any size business. The Cisco IP Phone 7902 provides basic telephony services. Other entry-level phones include the Cisco IP Phone 7905 and Cisco IP Phone 7912, which provide enhanced call functions and Extensible Markup Language (XML) application interaction. The Cisco IP Phone 7940 and Cisco IP Phone 7960 offer high-quality speakerphone capability and a large pixel-based display for easy feature navigation and application access. The Cisco IP Conference Station 7935 uses world-class acoustics to suit the needs of multiparty use. Mobile IP telephony is available through the use of the Cisco Wireless IP Phone 7920.

The majority of these IP telephony endpoints also provide Ethernet connectivity to the PC or desktop computer. Drawing inline power from the LAN connection reduces the amount of cabling required at the desktop. These telephony endpoints are far more capable than traditional analog and digital telephones. With available XML application processing, the telephony endpoint becomes an information terminal, which could be used to access inventory control systems and data services in instances where a desktop terminal or browser is not readily available. These "terminals" benefit retail or manufacturing environments, for example, where it is not cost effective to widely deploy desktop terminals.

LAN CONNECTIVITY

LAN switches are the foundation of delivering LAN connectivity. Cisco Catalyst switches provide intelligent services, such as advanced QoS, security and availability as well as Cisco-based inline power and IEEE standard power over Ethernet. As well, Cisco offers a network switch module for multiservice access devices.

Customers that expect to deploy IP telephony need to prepare effectively with LAN switches that can meet increased requirements, such as being able to treat time-sensitive traffic with the appropriate priority and ensure that the network can recover immediately from any network convergence or power failure.

Cisco Catalyst switches have a broad set of standards-based and advanced QoS and high-availability features to prepare networks to run applications that merge voice, video, and data traffic. Integrated inline power from Cisco is important for IP telephony deployments. It makes IP telephony deployments easier and more cost effective to deploy because the switch can automatically detect the type of IP device on each port, such as an IP phone, and because customers don't need to have an uninterruptible power supply (UPS) or individual wall power for each IP phone.

Network administrators can ensure that power outages don't affect a building's telephony connections by implementing the Centralized Power Provisioning system, which consists of a Cisco Catalyst inline power switch, a Cisco Redundant Power Supply (RPS), and a UPS system to back it up in secured wiring closets.

TELEPHONY SERVICE

A call-control device or some form of call processing is required to establish connections between intranetwork calls and out to the public switched telephone network (PSTN). An access routing platform, such as the Cisco 2651XM, Cisco 2691 or Cisco 3725 and 3745 access router, in conjunction with Cisco CallManager Express embedded in Cisco IOS® Software, is recommended to provide these call-control services in small offices where data connectivity is also required.

When fitted with a traditional telephony interface, the Cisco access platform can also provide PSTN access for both inbound and outbound calls to and from the IP telephony endpoints. The addition of a Cisco Unity Express network module to the access platform enables local voice-mail and auto-attendant services. If required, existing telephony endpoints such as traditional analog phones or fax machines can also be connected to the access device. All control and call features are easily managed through a graphical Web interface on the access device.

INTERNET CONNECTIVITY

Most offices today have some form of Internet connection in place. One option is a DSL line, in which case a DSL WAN interface card (WIC) may be installed in the access device. Another option is a Frame Relay or T1 leased line, in which case a serial or T1 WIC may be configured for the Cisco access platform.

MANAGEMENT

Deploying a single platform based on Cisco IOS Software greatly simplifies the management of office services. Users familiar with the Cisco IOS Software command-line interface (CLI) can make configuration changes and monitor their systems with ease. Those who do not wish to use the CLI may use the Web-based GUI to provision and manage the telephony services. For a more sophisticated range of management options, the CiscoWorks Small Network Management Solution can be deployed to manage inventory, configuration, changes, and syslog activities.

ADDITIONAL SERVICES

With the prevalence of viruses and network intruders today, any connection to the public Internet is incomplete without network security. The Cisco IOS Firewall feature set, embedded within the access device, can be enabled to help protect the LAN from unauthorized access. (For more information, see the Network Security section.)

The power of a network is the ease with which information can be shared and communication can be improved. Offices may wish to establish bilateral communications with each other through the Internet, deploying Cisco IOS Firewall features to maintain network integrity. Alternatively, the offices could subscribe to a VPN service provided by a service provider, to allow them to communicate efficiently and effectively without having to build out a significant network infrastructure. A Cisco access platform such as the Cisco 2600 or Cisco 3700 Series router is the ideal solution to deliver local service and provide external connectivity.

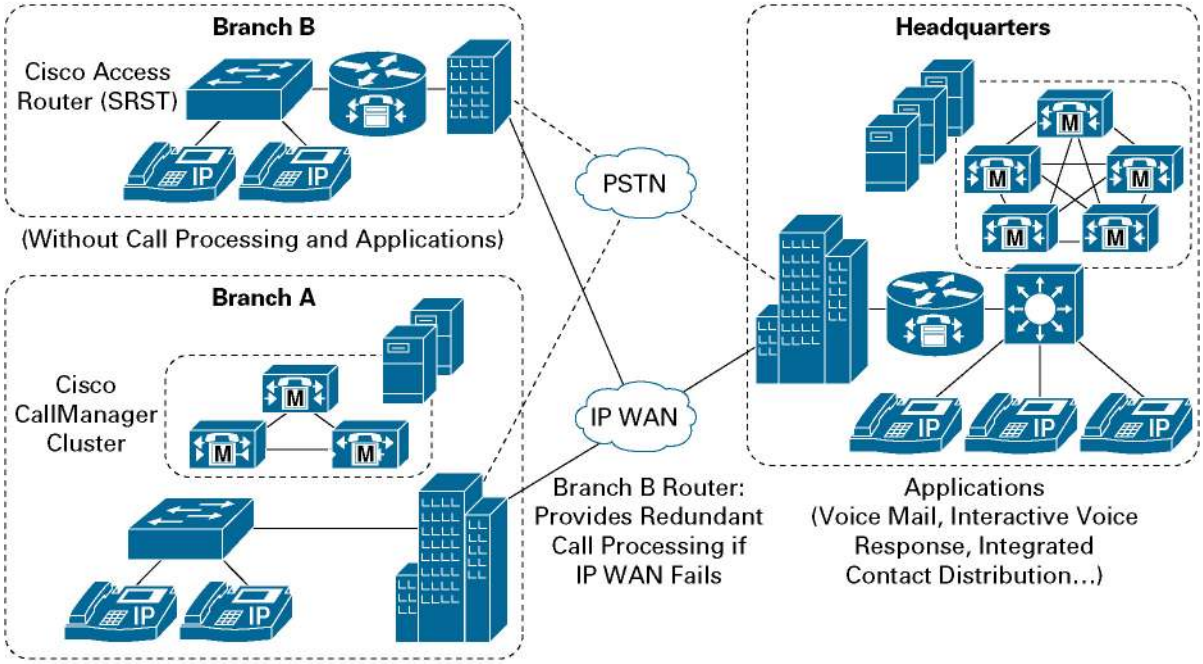
If small offices are to be interconnected, and voice calls are to be passed between autonomous offices, careful consideration must be paid to the Internet or intranet connectivity so that call quality is suitable for end users. With VPN services, the negotiation of service-level agreements (SLAs) is prudent to help ensure that IP voice communication is given the required attention.

IP COMMUNICATIONS FOR THE BRANCH OFFICE

Centralized Telephony Services

In a centralized telephony services environment (Figure 3), an established enterprise may have already deployed IP telephony at a central or headquarters site(s). When the enterprise chooses to add a new branch, or to provide an existing branch access to core services, the branch should have as much access to those central resources as possible to avoid duplication of operational and capital costs. A multiservice access platform provides a wide range of services with minimal additional investment, and can elevate the branch to the same level of productivity as the headquarters—enabling Enterprise Architecture for branch and small offices.

Figure 3. Centralized Telephony Services



When implementing an Cisco IP Communications solution for a branch office, the same components must be considered as for a small autonomous office.

TELEPHONY ENDPOINTS

Most large enterprises have already discovered some of the benefits in deploying IP telephony endpoints, and wish to extend those benefits to remote branch sites. The ability to search companywide online directories, or run vertical market applications on the phones, often influences the move to IP telephony. IP phones are physically mobile and can be managed remotely, removing the need for a local telephony support staff. With the browsing and XML application capabilities available on the IP telephony endpoints themselves, an enterprise can provide a companywide interface to its telephony services, and can use the phones as another communication vehicle for distributing information to every employee with an IP phone.

LAN CONNECTIVITY

An established enterprise should typically have some familiarity with LAN infrastructures and experience in deploying and managing switches. Even though the branch office may not require the same scale of connectivity as the central office, the same basic switched LAN technology should be deployed either through smaller Cisco Catalyst switches, or switched network modules installed in a multiservice access routing platform. Either method of LAN connectivity makes use of in-line power facilities, reducing cabling and power distribution requirements in the branch office.

TELEPHONY SERVICE

The delivery of telephony service in an established enterprise differs from that in an autonomous office. A larger organization is likely to have already deployed IP telephony in the form of a Cisco CallManager, along with associated voice services such as voice mail, conferencing and directory services. The primary requirement for the branch office is to gain access to those centralized services, and to maintain local calling services in the event of an intranet failure. A Cisco access platform can enable both access as well as the required redundancy. Should the branch lose connectivity to the central site, the Cisco SRST feature, embedded in Cisco IOS Software, will take control of the local IP telephony endpoints and maintain local calling services, switching traffic to the local PSTN so the office's telephony services continue to operate.

INTERNET AND INTRANET CONNECTIVITY

Depending on the enterprise's policy and procedures, the remote branch may be part of an intranet carrying all voice and data traffic back to the central site. In this scenario, WAN interfaces provided in the access platform become an important component for the Enterprise branch architectures and small offices. Traffic management through that WAN interface, and any alternative paths or backup facilities, assumes a higher degree of importance to the branch. Cisco access platforms provide a range of traffic-shaping and traffic-management features embedded within Cisco IOS Software to reroute traffic around points of failure. Multiple WAN interface options are available, allowing the enterprise to make use of backup facilities through ISDN or another on-demand services, to quickly restore connectivity with the central sites and continue full-service operation.

MANAGEMENT

A larger enterprise will already have some established tools and methods to manage their network infrastructure based on Cisco IOS Software. Available options include the CiscoWorks suite of management tools, or other Simple Network Management Protocol (SNMP) or Web-based tools. By deploying a Cisco access platform at the remote branch, full management of the branch services is easily achieved through inclusion of that platform within the existing management topology. The Web-based GUI for the telephony features also allows local branch users to customize their individual telephony service.

ADDITIONAL SERVICES

The remote branch may require local Internet access, depending on the policy of the enterprise. It is important to understand that although this branch is remote, it still has access to the core services of the enterprise, so any intrusion from the Internet into the branch network is also an intrusion into the core network. For this reason it is advisable to apply network security controls into the Cisco access platform, using the Cisco firewall features embedded within the Cisco IOS Software in the platform. Employment of further network security measures such as intrusion detection systems is also recommended to help ensure the integrity of the network.

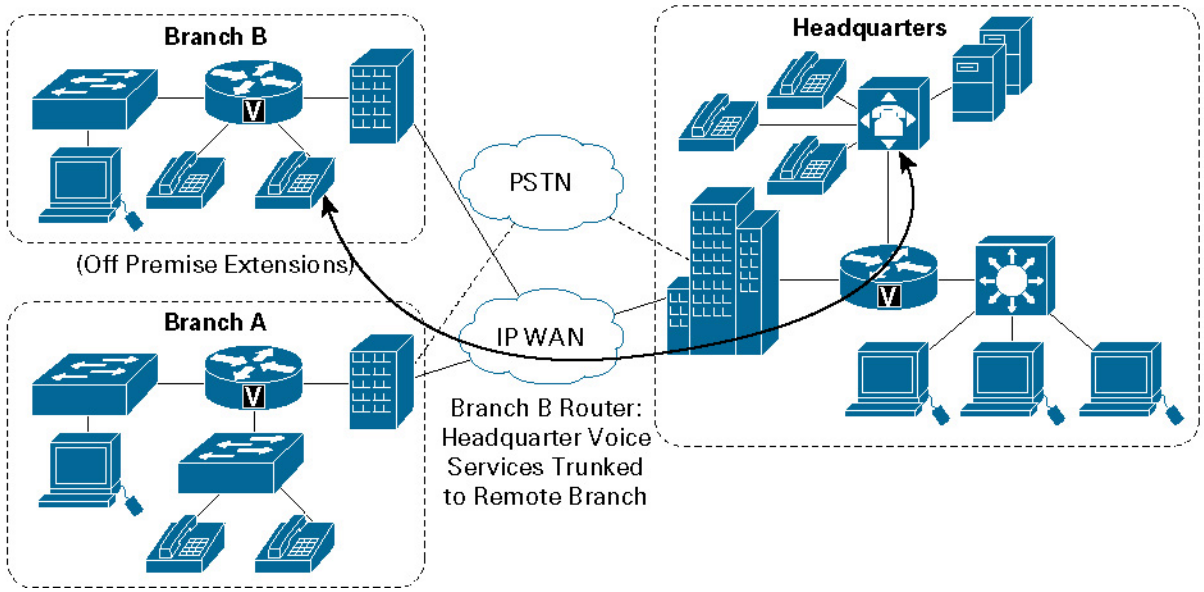
If the enterprise makes extensive use of Web broadcast and electronic media for information distribution, deployment of the content-distribution network module within the Cisco access platform is recommended to provide the required content and caching services local to the users. Adding content to the existing list of services deployed on the Cisco access platform truly makes the remote office an Enterprise Branch Architecture.

SMALL- OR BRANCH-OFFICE LEGACY EQUIPMENT INTEGRATION

Toll Bypass

Despite the widespread acceptance of IP telephony, many branch-office decision makers wish to retain their traditional telephony equipment until its value has sufficiently depreciated. However, that decision does not preclude deployment of IP telephony. With the range of telephony interfaces and voice-traffic-management tools available within Cisco IOS Software, branch-office users can access traditional telephony services using their Cisco access routing platform, thus obtaining an entry point into packet telephony while maintaining their investment in existing equipment. Toll bypass and voice trunking provide excellent examples as depicted by the pink line showing traditional voice traffic from a PBX system being routed over the converged (voice and data) IP WAN and by passing the PSTN in Figure 4 below.

Figure 4. Toll Bypass Deployment



Once again, the same primary components must be considered when deploying an IP telephony solution.

TELEPHONY ENDPOINTS

A branch office that is not ready to deploy IP telephony endpoints can begin to implement the foundations for IP telephony. For example, analog endpoint devices such as phones and fax machines can be connected to the network via analog voice interface cards installed within the Cisco access routing platform. The platform can provide basic voice services, or if preferred, the endpoints can be operated as off-premises extensions, with all voice signaling being passed directly via IP to the main PBX at the central site. This kind of deployment allows remote users to access many of the central PBX features from their local handsets, without the company having to deploy a local PBX or migrate to a complete IP telephony solution.

LAN CONNECTIVITY

Although a branch office may not deploy IP telephony initially, it is still likely to have desktop computing devices that need to be networked together. This is an ideal time to deploy standalone in-line power LAN switches or switch network modules within the Cisco access routing platform. When IP telephony endpoints are deployed in the future, the LAN infrastructure is ready to accommodate them with no significant changes required.

In a Toll Bypass or voice trunking deployment, the majority of the voice services are provided by a central PBX. The Cisco access routing platform provides the delivery mechanism for those services, using IP as the transport instead of circuit-switched trunks. This allows the branch office to reduce its circuit operational costs, while still maintaining access to central voice services such as conference calling, call forwarding, and voice mail. Using a Cisco access routing platform as the voice carrier allows the branch to take the first step in IP telephony deployment without having to discard the existing telephony equipment. As the existing equipment depreciates and the branch becomes ready to migrate to IP telephony endpoints, the platform currently delivering voice trunking can now be used to deliver IP telephony service as well. This is one way the Cisco access routing platform protects investments.

INTERNET AND INTRANET CONNECTIVITY

A branch office that is considering a Toll Bypass or voice trunking deployment likely has some form of intranet connectivity to a central site, and is anticipating some circuit cost reduction by converging its traffic into fewer circuits. The wide offering of WAN interfaces available on the Cisco access routing platform make it an ideal platform for convergence. The added value is in the traffic shaping, traffic management, and voice call-admission-control features that are embedded within the Cisco IOS Software on the platform. Because of the flexible nature of packet voice, it is important to understand the traffic patterns and requirements to maintain expected voice quality across converged networks. The Cisco IOS Software voice traffic features have evolved along with packet voice technology, maturing to the point where high-quality packet voice can be delivered alongside the regular data services that are expected from an access platform.

TELEWORKER/SOHO SMB SMALL BRANCH ENTERPRISE BRANCH OFFICE

To provide some guidance during the selection process, voice service blueprints are available from Cisco for each of the three deployment models discussed in this paper. In each case, the network module options, along with their features and caveats, have been evaluated and guidance provided as to their suitability for deployment. Where multiple feature sets are deployed to build up an Enterprise Branch Architecture environment, those feature sets have been verified as to their compatibility, platform suitability, and any caveats that may pertain to their deployment.

Due to the flexible nature of the Cisco access routing platforms operating with Cisco IOS Software, many customers have deployed the platforms in applications and manners that were not obvious at the time the platforms were released. In addition to the voice blueprints, case studies on some of the more esoteric applications, such as video surveillance and voice paging systems, have been published and are available for review.

IP COMMUNICATIONS TECHNOLOGY AT-A-GLANCE

http://www.cisco.com/application/pdf/en/us/guest/netsol/ns383/c714/ccmigration_09186a00801c60db.pdf

CUSTOMER PROFILES

- BloodSource
  http://www.cisco.com/en/US/products/sw/voicesw/ps4625/products_case_study09186a00801c6326.shtml

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