WHITE PAPER

THE NETWORKED COMMUNICATIONS ADVANTAGE
THE ADVANTAGES OF CISCO IP COMMUNICATIONS ON THE CISCO INTELLIGENT INFORMATION NETWORK

INTRODUCTION

Businesses and organizations of all sizes have entered a new phase in the adoption of IP Communications—a category that includes IP telephony; unified messaging and voice mail; customer contact; and audio, Web, and videoconferencing. Until recently, the IP Communications debate focused on whether it was a viable, "ready-for-prime-time" technology, but in the last year the debate has shifted. With more than 50 percent of all private branch exchange (PBX) sales by 2005 expected to be IP-based, according to market researchers InfoTech and Synergy Research, and with more than 14,500 organizations using Cisco® IP Communications solutions, this new technology has gained a strong foothold in the mainstream market. Now the debate is centered around the best architectural approach to implementing an IP Communications system.

Many traditional telephony vendors continue to offer a "hybrid" option that attaches IP telephony to a core time-division multiplexing (TDM) architecture. But most of the market has accepted that an end-to-end IP telephony system is the future. Gartner Group estimates that, by the end of 2007, traditional enterprise telephony-system manufacturers will cease development entirely of traditional systems. Further, many industry analysts now believe that because an end-to-end IP telephony system is inevitable, there is no reason to delay the adoption of an all-IP infrastructure. The more quickly companies embrace a common IP platform for all their communications needs—voice, video, and data—the more quickly they will realize the benefits and dramatic efficiencies of a common, standards-based IP infrastructure.

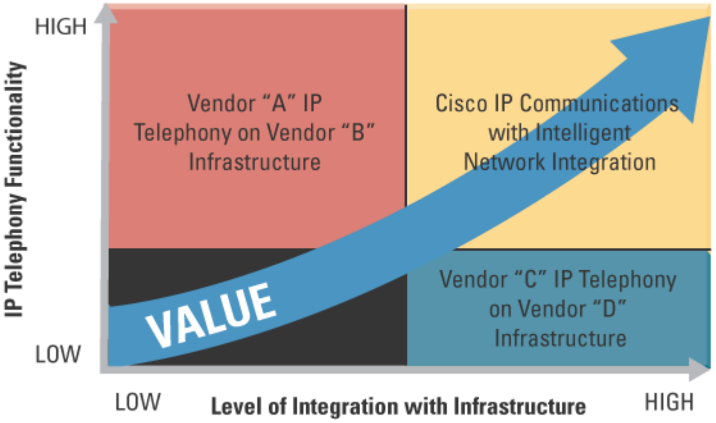
Support for this idea can be seen in the fact that all of the leading traditional TDM voice vendors are now delivering IP PBXs. Cisco Systems® has been delivering an all-IP solution since 1997 with the largest number of IP Communications installations in the industry (more than 15,000 organizations) including more than 40 companies with more than 5000 phones; (Cisco itself uses more than 54,000 IP phones). In fact, no other vendor comes close to Cisco in terms of designing, building, and managing large, scalable IP Communications installations. Cisco also has the largest number of pure IP phones installed in the industry. As of early 2004, Cisco had shipped 3 million IP phones, two to five times as many IP phones as any other telephony vendor.

A Systems Approach

Through years of experience, Cisco has developed and tested a total end-to-end solution that is based on a *systems approach*. This approach combines the strengths of the Cisco data networking infrastructure—routers, switches, firewalls—with security and important applications including IP telephony, customer contact and self-service solutions, voice mail, unified messaging, and audio, Web, and videoconferencing.

The power of a systems approach is that each new application—video, Web, or telephony—is just another media type rather than a different communication medium. Voice and video are woven, along with other types of data, into the fabric of a converged network. Intelligent devices are automatically given rights and priorities and the applications themselves can intelligently communicate with the infrastructure to meet the constantly changing needs of the system as specified by the organization. This unity of infrastructure and applications is what distinguishes Cisco IP Communications solutions from those of its competitors (Figure 1).

Figure 1
The Value of Integration


HIGH
IP Telephony Functionality
LOW
Vendor "A" IP Telephony on Vendor "B" Infrastructure
Cisco IP Communications with Intelligent Network Integration
VALUE
Vendor "C" IP Telephony on Vendor "D" Infrastructure
LOW
Level of Integration with Infrastructure
HIGH

The Value of an IP Telephony System Increases with its Integration with the Infrastructure

This paper will highlight the many special features that customers can gain when they deploy Cisco IP Communications on a Cisco IP networking infrastructure—and it will demonstrate the unique value that this systems approach delivers to customers.

DIFFERENTIATORS OF CISCO IP COMMUNICATIONS ON CISCO INFRASTRUCTURE

One of the most compelling advantages of a solution based entirely on Cisco equipment is that customers gain the benefit of an IP telephony architecture designed from the start to take advantage of tight functional integration with the underlying Cisco IP networking infrastructure—primarily switches and routers. Cisco IP phones are able to use the Ethernet switches in the network as the "voice call switch matrix." Calls are managed differently and the inherent time slot and bandwidth limitations of traditional TDM architectures are removed. Switching of a call is done only between the devices required to switch the call—the IP phones and voice gateways—and the Ethernet switches. Calls do not have to be routed back to a traditional TDM switching matrix somewhere in the network to complete the call—increasing complexity of deployment and adding tremendous overhead to the network.

Cisco IP phones are also able to receive call-processing capability directly from the Cisco IOS® Software running on the access router for remote or small office locations—Cisco CallManager Express for localized call processing or Cisco Survivable Remote Site Telephony (SRST) to provide redundant call processing at remote locations in a centralized Cisco CallManager deployment. This tight integration with the IP network infrastructure provides customers the flexibility to design their IP networks to meet their individual voice and data needs.

Beyond network efficiency and scalability, the tight integration of IP telephony and Cisco infrastructure also delivers a range of other benefits. These include:

- Speedier, lower-cost moves, adds, and changes
- Automatically updated E911 System
- Quicker deployment of quality of service (QoS) settings
- Security
- Built-in resiliency
- Power over Ethernet and intelligent power management to reduce power costs
- New planning and management tools deliver voice quality

- A full range of IP Communications solutions
- Video—a simple addition to the IP network
- Revenue-generating and productivity-enhancing Extensible Markup Language (XML) applications

The following section describes each of these benefits in detail.

Speedier, Lower-Cost Moves, Adds, and Changes

The simplicity with which Cisco customers can make phone moves, adds, and changes (MACs) and the resulting administrative cost savings is one example of the power of Cisco IP integration. This ease of MACs is the direct result of two important capabilities that are built into the Cisco data infrastructure and which are optimized when Cisco IP telephony systems are deployed: the Cisco Discovery Protocol and AutoQoS.

Cisco Discovery Protocol is a special protocol that has been a network-management staple of Cisco data infrastructures for many years. It helps enable switches and routers to communicate with one another and to exchange location information to build network topology maps. For IP telephony, Cisco has enhanced Cisco Discovery Protocol by adding new fields that allow an IP phone to automatically retrieve the information it needs to operate from the local switch. These fields include the Voice VLAN ID (VVID), which is an identification number that tells phones when they are plugged into certain ports the correct voice VLAN they should join and assigns QoS. Voice VLANs, like their cousins data VLANs, permit groups of users to be logically segmented for security reasons. Based on the Power over Ethernet standard, Cisco Discovery Protocol also automatically assigns the proper power requirements depending on the needs of the Cisco IP Phone.

When a user plugs a phone into a switch port, a Cisco Discovery Protocol message is exchanged to indicate the port on the access switch is connected to a Cisco IP Phone. After the initial power assignment, Cisco Discovery Protocol automatically refines the power requirements depending on the needs of the Cisco IP Phone, providing a tailored power level that extends the number of devices that can be powered from the switch.

What is unique in this interaction is that Cisco Discovery Protocol operates automatically in response to a device being plugged into a jack. This is because Cisco Discovery Protocol is an integral part of the Cisco infrastructure.

Other vendors offer only the voice components, or partner with infrastructure vendors and, therefore, lack this type of integration. As a result, each time a phone is moved or added to the infrastructure, IT personnel must be notified who then must make manual changes to reconfigure port switches. As phone networks scale, administrative costs increase exponentially.

Cisco Discovery Protocol automation translates into significant IT cost savings at large companies where 25 percent of their personnel move each year (a common industry standard of MACs). The Yankee Group estimates that it costs companies up to US$150 per MAC.

"With Cisco IP telephony, the cost and time involved is greatly reduced", according to Ann Farquhar, Director of Civilian Operations and Communications for the City of Southfield, Michigan. "If I needed to move somebody from one building or office to another, I had to call a vendor and have them come in and change the line," says Farquhar. "It took a lot of time, often two or three days. Now it only takes five minutes. An employee can just pick up her phone and plug it in at the new location."

Cisco Discovery Protocol also plays an important part in the *IP phone mobility* feature of Cisco IP telephony—the capability that allows users to move their IP phone anywhere on the network, plug in their phone, and immediately have all of their phone's settings, including phone number, speed dial, and messaging features. This is possible through automatic communication between Cisco Discovery Protocol, the Cisco IP phones, and Cisco CallManager in a centralized call-processing deployment. This mobility means employees can move virtually anywhere and simply plug their phones into the network and all calls will be automatically routed to their new location.

The Cisco IP Phone mobility feature offers great value to companies where employees move or travel frequently. NFL Films, for example, creator of the legendary Super Bowl highlights, uses this feature each year when it moves half of its company to the Super Bowl site for about a month to film the annual event. Employees simply plug their IP phones into the temporary data network and all of their phone settings, phone numbers, and directory information are automatically reset on the phone—saving significant administrative costs. This feature allowed NFL Films to "go live" at the 2003 Super Bowl in half the time than at previous Super Bowl events.

Automatically Updated E911 System

Administrative costs are also lowered (and worker safety enhanced) with another unique feature of the Cisco IP Communications solution—Enhanced 911, an application that is available with Cisco Emergency Responder.

The challenge with any E911 system is how to maintain an up-to-date list of phones and their locations so that emergency personnel can be dispatched quickly to the correct location. This can be a challenge because large companies on average move almost 25 percent of their employees each year. Cisco provided an industry-unique solution to this problem for IP Communications systems years in advance of any other company, and in advance of the standard as well.

The advantage of a Cisco solution based on a systems approach is that, just as Cisco Discovery Protocol automatically notes when Cisco IP phones are moved and delivers the required voice VLAN identifier, it also identifies the port location. Cisco Emergency Responder software performs a similar function. It automatically notes when an IP phone is moved or added to the network and maintains a database that matches the IP phone's MAC address (the hardware identifying number) with the physical address of the Ethernet switch with which it is currently registered. All this is accomplished through a systems approach where the Cisco infrastructure tracks the presence of the user for the E911 solution.

Quicker Deployment of QoS Settings

Another feature of the Cisco infrastructure that is optimized with a Cisco telephony system is Cisco AutoQoS. This potent feature of Cisco IOS Software allows companies to quickly and automatically deploy QoS settings for hundreds and even thousands of phones with few commands. Cisco specifically developed this capability as a result of years of in-the-field feedback from customers as they scaled their IP telephony deployments—an example of the value customers receive from the long experience Cisco has with IP telephony.

As mentioned earlier, before Cisco Discovery Protocol is able to deliver the correct QoS settings to IP phones, ports on access switches must be configured initially to recognize the IP phones and deliver the correct QoS voice settings. To apply QoS, however, involves many steps, including the following:

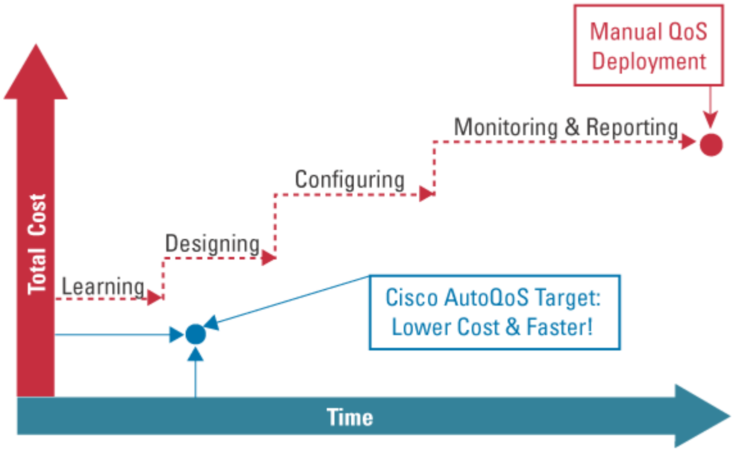
- Classifying applications—Identifying and categorizing the network traffic generated by each application.
- Generating policies—Determining which policy a company follows to balance QoS policy variables, including bandwidth, delay, jitter, and packet loss.
- Configuring the proper QoS—Because QoS is rich in features, the task of programming network devices with the right set of features and parameters can be time-consuming.

- Monitoring and reporting—QoS parameters must be fine-tuned and adjusted based on real network operations. But how can customers sort through the mountains of data that deluge them about network and application performance? For instance, how does an IT manager find out "who" (that is, which user or IP address) is causing congestion or creating abnormal loads on a link?
- Consistency—Customers are faced with managing QoS policies consistently across multiple kinds of devices in the network, including IP phones, switches, and routers.

Figure 2 shows figuratively how Auto QoS reduces time and costs over manual QoS deployment.

Figure 2

The QoS Challenge: Reducing the Cost and Time to Deploy QoS



Automation is critical to reducing the cost and time to deploy QoS as large numbers of IP phones are added to the network.

For each of these major categories, Cisco AutoQoS provides automation to help speed and simplify QoS across many devices. It identifies the voice over IP (VoIP) bearer and control traffic and uses intelligent classification on the routers to provide deep and stateful packet inspection. It evaluates the network environment and generates an initial policy. Based on this finding, it determines WAN settings for fragmentation, compression, encapsulation, and Frame Relay-ATM interworking. After policy has been determined, *with only one command* Cisco AutoQoS configures the port on an access switch to prioritize voice traffic without affecting other network traffic, while still offering the flexibility to adjust QoS settings for unique network requirements. It will also automatically monitor and report by providing visibility into the classes of service deployed via system logging and Simple Network Management Protocol (SNMP) traps, with notification of abnormal events.

While Cisco AutoQos enhances the operation of voice and video traffic from any source, it has been specifically optimized and tested only on a Cisco end-to-end infrastructure. Cisco has completed extensive benchmarking encompassing thousands of hours to deliver the highest compatibility of Cisco AutoQos across Cisco switches, routers, and IP phones.

The results from the development of AutoQoS were so successful that Cisco created Smart Ports, modeled after the AutoQoS capability. Smart Ports are a series of macros and templates that provide simple commands to automate and simplify the deployment of other Cisco devices.

Security

The security and reliability of an organization's voice systems is critical. When evaluating the security requirements of the IP telephony system, it is important to remember that many of the security issues that have confronted voice systems for years also carry over into the world of IP telephony. These threats range from theft of service, to loss of privacy (eavesdropping or impersonation), to denial of service. The addition of IP technology with its open and published nature introduces new challenges and requires new methods of protection. However, a properly configured IP telephony system can be as secure, or more secure, than a traditional TDM-based system.

To provide the most secure and cost-effective solution, Cisco IP telephony security is based on an integrated, systems approach—unlike some competitors that focus either on securing only the voice components or on securing the infrastructure itself. Cisco takes a systems-level approach that uses the intelligence of the network while weaving together features and capability in the endpoints, call-processing infrastructure, and the applications to deliver a comprehensive, intelligent approach to security.

Cisco applies three critical components—secure connectivity, trust and identity, and threat defense—to each of the four layers of an IP telephony system: infrastructure, call processing, endpoints, and applications, as follows (for more in-depth details, see www.cisco.com/go/ipcsecurity):

- Secure connectivity—To help ensure that communications over both the WAN and LAN are secure and private, Cisco offers technologies such as VLAN segmentation and Voice and Video Enabled VPN (V3PN). Additional capabilities serve to protect the stability and availability of the network infrastructure to deliver reliable connectivity. Encryption tools in the call-processing system and endpoints protect the signaling and media streams used by voice applications.
- Trust and identity—To contextually identify users and establish trust, many standards-based authentication mechanisms have to work together. Cisco offers support for traditional authentication, authorization, and accounting (AAA) services in the infrastructure, as well as more advanced capabilities elsewhere through the use of such tools as Extensible Authentication Protocol (EAP) and digital certificates.
- Threat defense—Many techniques protect against aggressive threats. Firewalls, either integrated or standalone, and intrusion-protection systems defend the infrastructure. A hardened OS and integrated host intrusion prevention in the form of Cisco Security Agent protect the call-processing components. And there are features in the Cisco IP phones that can help defend against "man-in-the-middle" attacks.

Cisco is the only vendor that provides all three critical components of secure connectivity, trust and identity, and threat defense and integrates these technologies deep into the fabric of the network.

Digital Certificates

A digital certificate is a type of electronic credential, issued by a trusted third party, and signed and protected against tampering using advanced encryption technology. At the time of this document's publishing, Cisco is the only IP telephony vendor to support digital certificates. The use of digital certificates by Cisco provides a trust and identity foundation upon which several important security solutions can be built. These industry-standard (X.509 v3) digital certificates are supported by Cisco CallManager and several models of Cisco IP phones.

Digital certificates are set up and managed by a Certificate Authority, a trusted organization or entity that issues and manages certificates at the request of another organization or entity. The Certificate Authority uses a secure private key to "sign" the certificate, proving its validity. For ease of deployment Cisco offers a Certificate Authority product that can issue digital certificates, or a customer might select a Certificate Authority from another vendor such as Microsoft or RSA.

With a digital certificate embedded in a phone and within Cisco CallManager, the Cisco CallManager can "sign" configuration files that it sends down the wire to the phones. When the phone receives an update, it looks at the digital certificate and uses a known public key to determine if the file is from a trusted Cisco CallManager platform or if it has been modified in transit. This helps ensure that the configuration can be trusted and that no one has tampered with the data being sent.

In addition, the signed key information held within the digital certificates can be used to quickly establish private, encrypted communication between nodes. For example, Cisco CallManager and Cisco IP phones can protect the privacy of signaling in the telephony infrastructure, either using a secure hashing algorithm to validate signaling messages, or transport-layer security (the follow-on to Secure Sockets Layer [SSL]) to encrypt the signaling data. To provide an additional layer of voice privacy, some Cisco IP phones can use Advanced Encryption Standard (AES) 128-bit encryption to protect the actual voice-communication stream.

While other companies provide encryption, they do not rely on a public Certificate Authority that automates this process. Instead, they must do authentication manually, which is a time-consuming and fallible process. And, because the digital certificates that Cisco IP telephony systems use are standards-based, the cost of implementing the necessary trust and identity infrastructure can be shared with other applications that also use digital certificates, such as VPN and user authentication.

Cisco Discovery Protocol Protects Against "Open" Ports

Cisco Discovery Protocol, discussed earlier in this paper in regards to administrative cost savings and mobility, also brings unique security capabilities to an all-Cisco IP telephony network. This is because Cisco Discovery Protocol is able to distinguish automatically between a Cisco IP Phone and a PC whenever a user plugs a device into a Cisco switch port. This ability to distinguish an IP phone from a PC helps ensure that a switch does not provide a PC with the voice VLAN identification code and give it the QoS reserved for phones.

Without Cisco Discovery Protocol, a port must be set manually, leaving open the possibility that a PC could be connected to a voice port and use its existing voice settings and QoS allocated to that jack. The PC could then generate large amounts of traffic, quickly congesting the LAN and disrupting voice service to the other IP phones. Cisco Discovery Protocol, used in concert with other tools such as dynamic Address Resolution Protocol (ARP) inspection and gratuitous ARP denial, can also help protect against Voice over Misconfigured IP Telephony, an eavesdropping technique where a PC user employs packet-sniffing to capture and reassemble voice streams.

On competing telephony systems that lack the integration with Cisco Discovery Protocol, each time users move their phones, Ethernet jacks become potential points of increased vulnerability. IT personnel must manually reconfigure those jacks or they remain security holes. The urgency to track these security holes and the time required to be extra vigilant in closing them add to the administrative costs of competing IP telephony systems on Cisco infrastructures.

Cisco takes an innovative approach to security, protecting IP telephony systems like no other vendor can. The integrated, systems-level approach ties all of the components of the solution together to provide secure connectivity, trust and identity, and threat defense at multiple layers, and offers all the future benefits of an intelligent, self-defending network. Recent independent testing by Miercom on IP Telephony Security resulted in Cisco receiving the only "Secure" rating.

Built-in Resiliency

Because Cisco designed its IP Communications system from the very beginning for packet networks, Cisco CallManager call processors, Cisco IP phones, Cisco Unity™ voice-mail and unified messaging servers, and Cisco customer contact software are all liberated from specific physical locations. Customers can design their networks by placing Cisco CallManager and other servers in clusters and deploying them in multiple locations anywhere in the network. When Cisco CallManager and other servers are distributed across an IP network in this type of cluster design, resiliency is built into the infrastructure and can take full advantage of the routeability and inherent resilience of IP packet networks. If one Cisco CallManager on a network segment were to malfunction, for instance, all IP phones either on that segment or on other segments that rely on that Cisco CallManager can register to a backup Cisco CallManager automatically, regardless of where it is located on the network.

This distributed design also provides customers with much greater flexibility in where and how they deploy solutions such as Cisco Unity Unified Messaging or Cisco customer contact software because these platforms do not have to reside physically close to the call processors.

Most competing IP telephony systems still run off a centralized TDM-based system. All calls must be hauled back to this central point, eliminating any geographic redundancy between sites. To create redundancy, customers must install much additional hard-wired, centralized PBX systems that are much more costly than Cisco CallManager implementations.

Resiliency at Remote Sites

Business resiliency is also provided at remote branch offices through the use of Cisco Survivable Remote Site Telephony (SRST), a unique, industry-first capability embedded in the Cisco IOS Software running on Cisco access routers. In a centralized call-processing model, the Cisco SRST access router inherits its configuration from Cisco CallManager, facilitating automatic failover so that local calls and calls using a local gateway do not drop if the WAN link goes down, with no configuration or intervention required. If the WAN link to a remote office fails and connection to the Cisco CallManager for the domain is lost, the phones in that branch office automatically redirect to the Cisco SRST access router. The Cisco SRST router automatically takes over by offering a subset of the functions provided by Cisco CallManager—primarily the setting up and breaking down calls. After the disrupted WAN link is restored, the phones automatically reregister with the original Cisco CallManager—again, no manual intervention is required. Cisco SRST is all accomplished through this integrated system with no additional hardware components.

Power over Ethernet and Intelligent Power Management Reduce Power Costs

IP Communications devices such as IP phones require power to operate, but getting power from a wall socket is not a viable option, especially when phones scale into the thousands. In 2000, Cisco was the first company to introduce inline power (now called Power over Ethernet [PoE], an 802.3af standard) that allowed the LAN switching infrastructure to provide power over a copper Ethernet cable to an endpoint (powered device). IP telephones, like desktop PBX phones, need power for their operation and PoE helps enable scalable and manageable power delivery and simplifies deployments of IP telephony. As wireless networking emerged, PoE was also used to power wireless devices to allow for deployments in locations where local power access did not exist. While IP telephones and wireless access points are the most intuitive uses for PoE, the advent of 802.3af standardization of PoE opens the door to a new generation of networked-attached devices. These include video cameras, point-of-sale devices, security access control (card scanners), building automation, and industrial automation, just to name a few.

Cisco now offers IP phones and LAN switches that support both the 802.3af standard for power and additional levels of control with Cisco intelligent power management. Like other unique features available with Cisco IP Communications on a Cisco infrastructure, Cisco PoE provides customers with significant power-consumption savings to each and every category of end device.

Whereas the IEEE standard specifies that 802.3af power should be provisioned in large increments of wattage such as 9 watts or 15 watts of power to each end device regardless of power need, the Cisco power-detection and management technology allows for the provisioning of power based on exactly what power the end device actually needs, down to individual tenths of watts needed. This is possible through the communication between Cisco Discovery Protocol, discussed earlier, and the Cisco IP phones. The intelligent power-management feature can provide tremendous savings in terms of power-consumption requirements, backup UPS and battery power systems, and electrical costs for enterprise customers.

Is the Network Ready? New Planning and Management Tools Deliver Voice Quality

Perhaps no greater need arises when deploying IP Communications than that of network readiness: Can the network handle the expected VoIP or video traffic? Does it have the needed bandwidth and QoS to enable latency-sensitive traffic to operate smoothly?

Just as it does in ways previously discussed in this paper, Cisco integration provides multiple advantages when managing Cisco IP telephony on a Cisco IP infrastructure. CiscoWorks IP Telephony Monitor 2.0 provides IP telephony managers specific tools and information to instill high confidence that Cisco technology-based IP telephony environments are functioning at peak efficiency.

The CiscoWorks IP Telephony Monitor suite, for example, integrates with Cisco Service Assurance Agent (SAA) and allows planners to carefully assess the network's readiness for IP Communications. Working with Cisco SAA, the planning tool injects traffic into the network and can assess the delay and jitter of the traffic. This can then be compared with a baseline to see if the performance falls within the guidelines for IP telephony.

It can also be applied to different sections of the network at different times. For example, perhaps a company runs a financial application at the end of each month to reconcile the books. What effect will this have on the IP telephony performance? These issues are no longer based on conjecture, but can actually be tested on the network.

Beyond planning, CiscoWorks IP Telephony Monitor also tracks the health of IP telephony environments by proactively monitoring Cisco voice elements in the network to alert operations personnel to potential problems and to help minimize IP telephony service downtime. It also captures performance and capacity-management data for analysis.

A further advantage is that the integration of CiscoWorks IP Telephony Monitor with Cisco CallManager means full integration with Cisco IP Communications endpoints. A company with a competitor's IP telephony system on a Cisco infrastructure, for example, could use CiscoWorks IP Telephony Monitor to look at the routers and switches, but it would not be able to see the IP phones. Help desk people would have to struggle to determine if a reported problem was with the other vendor's IP telephony systems or with a Cisco router or switch. Considering that many companies already face challenges getting the network operations team to work with the telephony team, an integrated toolset goes a long way to breaking down unnecessary barriers.

Full Range of IP Communications Applications

In addition to IP telephony and video, Cisco IP Communications solutions include a range of other applications, such as Cisco Unity Unified Messaging, Cisco Unity Express, Cisco Contact Center, Cisco MeetingPlace, and Cisco IP/VC Software, that are tightly integrated with Cisco CallManager and Cisco IP phones to deliver robust, feature-rich communications.

Cisco Unity Unified Messaging allows users to listen to their e-mail over the telephone, check voice messages from within their e-mail inbox, and (when integrated with a supported third-party fax server) forward faxes to any local fax machine—increasing organizational productivity while improving customer service and responsiveness.

Cisco Unity Express provides localized voice-mail and automated-attendant services specifically designed for the small and midsized branch-office environment. With Cisco Unity Express, users can easily and conveniently manage their voice messages and greetings with intuitive telephone prompts and a straightforward GUI that allows simple administration.

Cisco contact center solutions optimize the effectiveness of every customer interaction regardless of contact channel, media type, or network. These intelligent, integrated solutions provide customer-contact representatives with the information and speed they need to significantly improve agent productivity and service which, in turn, solidifies customer loyalty and retention.

Cisco MeetingPlace is a fully integrated voice and Web conferencing solution that improves communications and productivity by allowing employees, partners, and customers to simply meet anytime, anywhere. Deployed “on-net,” behind the corporate firewall, Cisco MeetingPlace integrates simply and directly with an organization’s private networks and enterprise applications for the utmost in security and cost savings and a highly natural user experience.

The Cisco IP/VC product family facilitates videoconferencing over IP networks and is designed for organizations that want a reliable, easy-to-manage, cost-effective network infrastructure for videoconferencing. Cisco IP/VC videoconferencing solutions significantly enhance the effectiveness of corporate training and meetings by giving interactions a human touch.

Video: A Simple Addition to the Converged Cisco IP Network

After customers have deployed a Cisco converged IP Communications solution with Cisco CallManager and other call-processing components, enabling video simply calls for adding another application to the network. It does not require the building of a completely distinct and separate network. Today, Cisco is shipping Cisco VT Advantage, a video-telephony solution that integrates with Cisco CallManager and enables video at the desktop with the ease of audio. When registered to Cisco CallManager, the Cisco VT Advantage-enabled IP phone has the features and capability of a full-featured IP videophone. System administrators can provision a Cisco IP Phone with Cisco VT Advantage as they would any other Cisco IP Phone, greatly simplifying deployment and management.

The simplicity of easily adding applications to the existing infrastructure means that the dial plans for video and telephony are also integrated. Just as a user would dial a 5-digit number to join an audio conference, the user would dial the same 5-digit number to join the videoconference. The features are integrated into the software so the user simply dials the number and a screen popup alerts the user as to whether the called party has video availability.

From an IT perspective, management is dramatically simplified as call detail records (CDRs) are also integrated into and managed by Cisco CallManager. IT managers no longer must download CDRs from two separate systems—the phone and the video. Instead, all records are located in one place.

Cisco video telephony also preserves all investments in existing traditional video equipment because this equipment can interoperate with Cisco CallManager.

Revenue-Generating XML Productivity Applications

Organizations worldwide are using the XML programming language to develop highly innovative, profit-generating applications—and many of these applications are being developed for Cisco CallManager and Cisco CallManager Express to be displayed on Cisco IP Phones.

Sports Soccer, for example, a leading sports retail chain in the United Kingdom and Belgium, has used XML to develop a pioneering application that enables its clerks at checkout counters to use their Cisco IP phones to quickly locate inventory items for customers. With Cisco IP phones as part of a Cisco converged network, clerks no longer need to spend time calling different stores in the area to locate specific items. Instead, they use an always-convenient IP phone to search for the item using the collaborative voice-data inventory application. This application does a SKU inventory lookup of all stores in the area. When it discovers the item, it automatically initiates a call to that store and delivers a screen popup of the requested inventory item at the same time as a clerk in the store answers the IP phone. Within seconds, the clerk understands the request while viewing the information. An ensuing voice conversation then completes the details regarding whether the item should be shipped to the store or held for customer pickup.

XML applications displayed on IP phones are being used to overcome a limitation not widely recognized—that more than 40 percent of U.S. workers do not have access to PCs, according to a September, 2001 U.S. Department of Labor report.

Cisco IP Communications has a distinct advantage in the XML space over competing systems because of the robustness of the Cisco XML developer ecosystem. Because Cisco has the largest installed base of IP phones of any competitor and holds the largest share of the market, more than 100 XML developers are actively developing applications. This is due also, in part, to Cisco's long-term commitment to maintaining XML as an open standard and its development of an open interface. Cisco has also created a wealth of resources such as programming guides, FAQ libraries and discussion forums, software development kits, and a robust developer support program. All of these efforts have made it easier for XML developers to build XML applications for Cisco CallManager and Cisco CallManager Express, which provide customers with many more off-the-shelf applications than are available with any other competitor.

CISCO AND PARTNERS DELIVERING A NETWORKED SYSTEMS APPROACH

From its beginnings, when Cisco introduced the first multiprotocol router to the market in the early 1980s, Cisco has been the leader in IP networking innovation. As Cisco technology has become the foundation of most enterprise networks and the Internet itself, Cisco has continued to build on its vision: an all-IP network that unifies communications through the integration of voice, video, and data.

This experience and early commitment to IP voice and video is unparalleled in the industry. While traditional vendors only first entered the IP telephony market in 2000, Cisco entered the market in 1997 with the release of the Cisco AVVID (Architecture for Voice, Video and Integrated Data) network blueprint. It has used that blueprint to lead innovations in the IP telephony industry, including:

- First to put XML applications on the phone
- First to provide inline power
- First to provide Survivable Remote Site Telephony (SRST)
- First to provide integrated call-processing capability directly into the router
- First to provide automated E911 administration for IP telephony
- First to provide AutoQoS
- First to provide clustering for scalability and geographic redundancy
- First to provide voice and data VLANs
- First to scale IP telephony to large enterprise implementations
- First to provide digital certificates in IP phones

But what distinguishes Cisco today is not only its early commitment to this technology, but the fact that Cisco IP networking was designed from the start with a systems approach. Over the years, Cisco has designed an awareness of voice, video, and data media types into every component and layer of the Cisco infrastructure. The intelligent infrastructure constantly looks at all modes of communications including e-mail, telephony, voice mail, videoconferencing, and many others and recognizes their unique requirements and interdependencies. The infrastructure then adjusts to meet the specific needs of the organization. This systems approach helps ensure that Cisco delivers the most competitive and secure IP Communications solution to customers.

In addition, with a fully integrated communications system from Cisco, (where the IP phones, access switches, routers, Cisco IOS Software and other components are from Cisco), customers have one point of contact to receive speedy implementation and problem resolution. Problems are quickly resolved by Cisco; customers don't have to first determine whether the problem is with the data vendor or with the telephony vendor. Further, as new features are developed, especially those that are based on primary functions of the Cisco infrastructure such as Cisco Discovery Protocol, Cisco customers can be confident that they will be among the first to deploy them—and to do so with confidence of complete compatibility between the telephony and the infrastructure elements.

Ultimately, the many years of experience Cisco has both with IP Communications and with the IP networks means that customers can be confident that they have the strongest ally in their efforts to implement a successful, secure, and powerful IP Communications solution.

For more information, visit www.cisco.com/go/ipc or contact your local Cisco representative.

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