

# The Cisco Solution for Managed SIP Trunks

## Introduction and Background

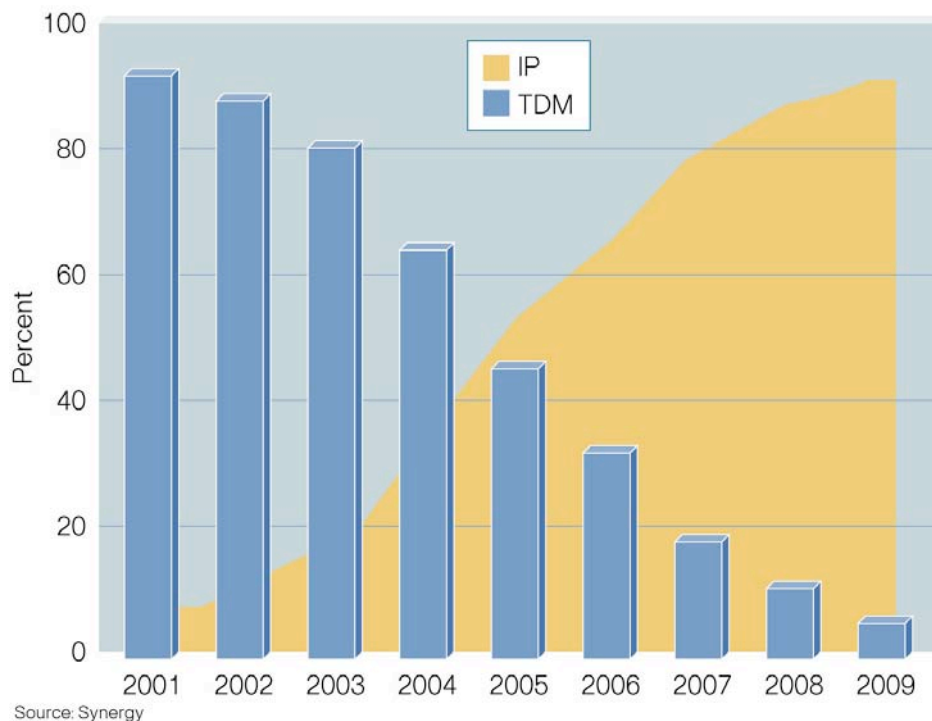
### The Transition to Converged IP Networks

The telecommunications industry is in the midst of an immense transition. Traditional long-established switching and transport technologies are rapidly being replaced by IP-based transport and edge devices. The IP revolution, now widespread in all types of public and private telecommunications networks, has started to have significant commercial impact in enterprise networks, where the move to IP LANs and WANs has enabled companies to run data, voice, and video over a single network instead of over three separate special-purpose networks. Convergence onto a single network, with the intrinsic transport efficiency of IP, is allowing enterprises to realize significant savings in network costs, with payback periods measured, in some cases, in just a few months. At the same time, an even larger-scale transformation is occurring within the core networks of telecommunications carriers, where migration to IP and convergence onto a single network are also taking place to not only address this growing business appetite for network and productivity efficiencies but to optimize the carriers' operational and service-delivery infrastructure as well.

Convergence on the business customer's LAN and WAN environment is also extending to the heart of business voice telephony, namely the traditional public branch exchange (PBX). IP PBXs are now starting to dominate the market<sup>1</sup> for enterprise-scale PBXs and small key systems alike. Figure 1 shows the steady rise of IP in business networks and the corresponding decline in the use of time-division multiplexing (TDM). The crossover point, with investment in IP LAN and WAN technology, occurred in 2005, and the trend is projected to continue, with TDM soon to become a relatively scarce technology.

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<sup>1</sup> Telecom/IT industry research company Dell'Oro Group reported that demand for IP PBXs continued to grow, with a further 10% increase during Q3 2006. Dell'Oro predicts that revenues from IP PBXs will overtake those from traditional PBXs and key systems during 2005. The firm also forecasts that while IP PBX sales will continue to grow, traditional PBX revenues will drop by approximately 31% compound per year through 2010.

**Figure 1.** IP Versus TDM Investments

However, until recently there was a significant gap in this evolving all-IP picture. The majority of PBXs, including IP PBXs, access the public switched telephone network (PSTN) through traditional PSTN technology in the form of a TDM trunk delivered over a T1 or higher-level service, or for smaller businesses, as individual analog lines over copper loops.<sup>2</sup> Using TDM or analog trunks requires an IP PBX to talk to the PSTN through a media gateway that converts IP-based voice traffic into a form compatible with the traditional PSTN, and in some situations this can result in many successive translations between the IP domain and the TDM domain. For example, the IP traffic from the IP PBX will have to be converted to TDM to reach the service provider's central office. The calls may have to be subsequently converted to IP for transport over the service provider's core network, back to TDM for further switching or interconnection (which can happen more than once), and finally, converted to TDM for delivery to the endpoint where it will likely be converted back to IP through another media gateway for handling by another IP PBX.

All these IP-TDM-IP conversions add cost to service providers in the form of additional maintenance of the TDM-based equipment in their core network and on the customer premises and to the business customer in the form of diminished service quality from added latency and reduced voice quality.

In the early days of IP telephony when the population of IP PBXs and other IP endpoints was low, it made economic and architectural sense for IP voice traffic to drop into the traditional PSTN for switching. However, in today's telecommunications world, TDM PBXs are steadily being replaced by IP PBXs using one of several protocols for session initiation and management, the most

<sup>2</sup> Larger businesses requiring multiple traditional PSTN lines at a single location use PCM-based TDM trunks delivered over T1/E1 or higher-capacity circuits. Smaller businesses may use integrated access devices that deliver Internet access and a discrete number of PSTN lines over a T1 or E1 circuit; those lines would typically be presented as discrete analog lines. Smaller businesses with less than, say, six lines would generally receive an analog service delivered over individual copper pairs.

prominent and promising of which is Session Initiation Protocol<sup>3</sup> (SIP). As the proportion of IP endpoints increases, it is more efficient to route IP traffic throughout the entire network at the IP level wherever possible, converting to traditional PSTN only when really necessary. Soon there will be no value, and significant downside, in using traditional telephony to connect customer equipment to the network.

### A Short History of SIP

Just as traditional telephony needed signaling and transmission standards to facilitate the interconnection of calls from a wide range of different endpoints, so too does IP communications. The standard that has emerged as the clear leader in this market is SIP. SIP trunks are the IP equivalent of PSTN trunk service, but delivered over a broadband IP access line, using SIP.

SIP was designed from the outset as a multimedia protocol to handle video sessions and text messaging in addition to voice. SIP can also handle conference sessions and broadcasts, as well as one-to-one sessions. The protocol is script-based and compact and has already been implemented in a wide range of terminal devices: IP PBXs, media gateways, wired and wireless handsets, and softphones. Its ease of use and extensibility make it attractive for all stakeholders: application developers, service providers, and end users alike.

Cisco® has and continues to play a leadership role in the industry organizations responsible for standardization of SIP and its associated applications. Specifically, Cisco is an active participant in:

- The Internet Engineering Task Force (IETF), the global industry forum responsible for determining and documenting the technical specifications of SIP
- The SIP Forum, which is accountable for ensuring the practical functionality of SIP: the interoperability of the products and services that use SIP

The potential for SIP to transform and improve the way that people (and devices) communicate is enormous. SIP-aware technology at the edge and embedded in the network can work together to create features and functionality that would simply not have been technically or economically possible in the old PSTN world. One SIP enthusiast, Vint Cerf (often referred to as one of the “founding fathers” of the Internet) has stated:<sup>4</sup> *“It is my honest opinion that we have barely scratched the surface of the various applications to which SIP may be adapted. If we have seen 1% of the applications of SIP so far, then there are still 99% waiting to be invented, developed or deployed. The generality of SIP will make it a major workhorse of the Internet of this century.”*

### SIP and PBX Trunks

PBX trunks are telecommunications connections that have performed one of two related functions:

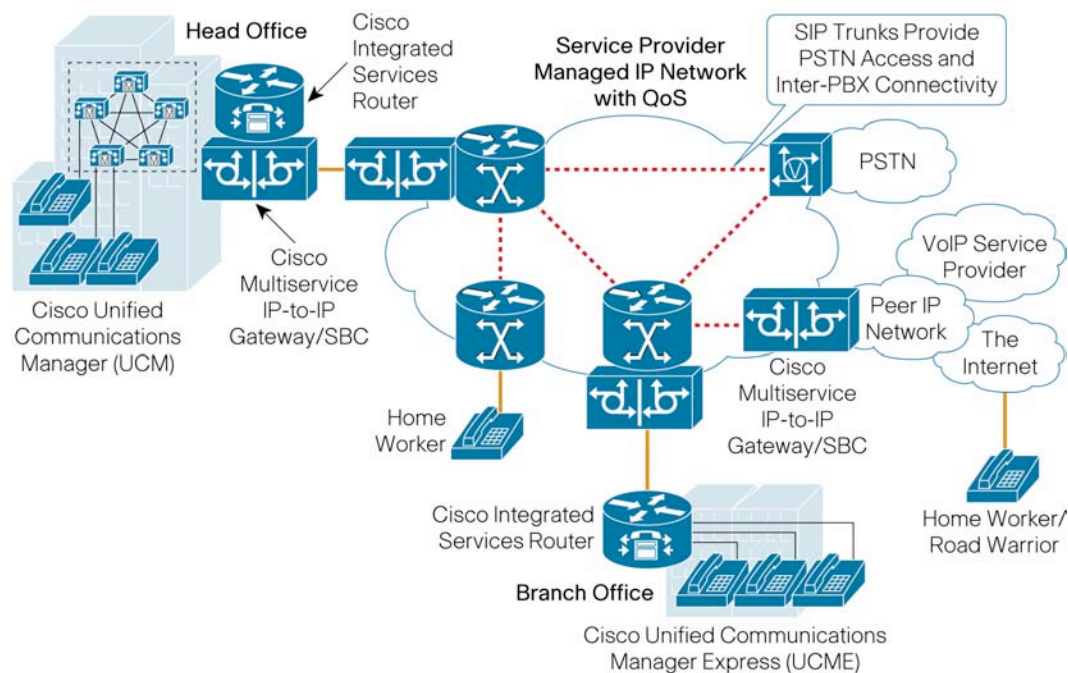
- Connecting the PBX to the global PSTN, so that PBX users can connect with phone users throughout the world
- Connecting the PBX to other PBXs so that calls between those offices can bypass the PSTN and incur reduced toll call charges

<sup>3</sup> The ITU-T standard H.323 was in use before SIP and is still in widespread use worldwide. Like SIP, H.323 is a multimedia protocol (not just voice) and provides session management and control for multimedia sessions delivered using the IETF Real-Time Transport Protocol (RTP) and Real-Time Control Protocol (RTCP) for transport. H.323 and SIP each have their advantages and advocates. While SIP appears to have more traction across the industry at present, H.323 will continue to be used. Cisco technologies support both SIP and H.323, as well as SIP/H.323 protocol conversion so that service provider and enterprise/SMB investments in either technology can be protected.

<sup>4</sup> Foreword by Vinton G Serf to “SIP Beyond VoIP: The Next Step in the IP Communications Revolution” by Henry Sinnreich, Alan B. Johnston, Robert J. Sparks (VON Publishing, October 2005).

Traditionally, the prevalent PBX technology was based on TDM switching, and consequently, PBX trunks for either purpose used either TDM channels or (for small networks) individual analog lines. With the move to all-IP networks and end devices, and the gradual rise of SIP for call session initiation and management, it became technically possible to replace those traditional-technology trunks with new-generation SIP trunks over service provider IP networks.

**Figure 2.** Network Topology Overview



A SIP trunk is not a physical circuit (unlike a TDM trunk) but a path over the IP network to a predefined destination that is created as and when needed to carry traffic. To create SIP trunks used to provide access to the PSTN, it is necessary to configure both the service provider's softswitch/SIP proxy and the customer's IP PBX to recognize each other, interpret each other's SIP signaling appropriately, and pass traffic. Creating a PBX-to-PBX SIP trunk over an IP network is similarly a matter of configuring each PBX to send or receive traffic for certain destinations (as defined in routing rules) directly to or from a specific address on the IP network. On the surface, this appears to be all that is needed to establish the ability to communicate over a SIP trunk.

In practice however, establishing working SIP trunks is more complicated because of the challenges of handling different interpretations and implementations of SIP by equipment vendors, delivering security (authentication and encryption), managing quality of service (QoS), enabling Network Address Translation (NAT) and firewall traversal, and ensuring carrier-grade reliability and continuity of service. In other words, SIP trunks depend not just on intelligent network-aware edge devices but on a well-engineered transport network that is designed to deliver the levels of security, availability, performance, interoperability, and overall service quality that business customers have come to expect from the communications systems that support their everyday business. The need to engineer edge devices and the network to operate seamlessly together requires a world-class integrated suite of network and customer premises equipment (CPE), and the expertise to design, install, and run it 24 hours a day, all year.

## Managed SIP Trunking: The Service Provider Perspective

There is an emerging consensus in the service provider community that the near future will include:

- IP-based services as the standard method of delivering connectivity to customers
- A continued increase in the use of SIP for carrier-grade telecom services

However, the transition is still in its early stages. Some service providers are being cautious about deploying and selling SIP trunks aggressively, expressing concern about quality of service and management issues, and some service providers may also be concerned about customer acceptance of this (relatively) new but decidedly different (from the business customer's perspective) technological approach.

Cisco recognized the potential of SIP many years ago and started to implement SIP capability in network products as early as 2001.<sup>5</sup> In the years since then, SIP has evolved and matured, and Cisco products now establish SIP firmly as a stable and secure technology. While market-leading equipment companies such as Cisco have been building standards-based SIP capability into their enterprise and network products for some time, many CPE vendors still have not incorporated SIP functionality into their products. Some will not do so until they see that the use of SIP trunks has become the standard for PSTN service delivery. However, as mentioned in the introduction, this reluctance is fast disappearing. PBX and call system vendors now recognize that compatibility with SIP trunks is essential if they are to stay in the market. Customers have moved quickly from skepticism to acceptance, and the pressure is now on service providers to meet the expected demand.

While everyone accepts that the move to SIP trunks as a universal delivery method will happen eventually, there is an understandable wish to manage the pace of change in order to assure quality and to allow the impact on traditional operational and financial models to be absorbed with as little disruption as possible. As with so many other technology innovations in the past, timing is all-important. Service providers will adopt a range of rollout strategies, depending on their geographical coverage, customer base, and competitive positioning.

## The Customer Value Proposition: Why Business Customers Want SIP Trunks

There are many good reasons for large enterprises and small and medium-sized businesses (SMBs) to consider the possibility of using a managed SIP trunking service. While the real long-term value of managed SIP trunks will become even more apparent to business customers as their use spreads, early adopters are already aware that managed SIP trunking can offer the following benefits, compared to traditional TDM trunks.

- *Quick and easy deployment.* As described earlier, given compatible network equipment and CPE, establishing SIP trunks over a properly engineered and managed IP network is largely a matter of configuring the devices correctly. Service providers with a managed SIP trunking service can largely automate the process of enabling SIP trunks for their customers, and so in practice, a new SIP trunk can be made available and be in use in a timeframe significantly shorter than that required for a TDM trunk. This translates into a successful IP "upgrade" of the business customer's communications services with minimized business interruption.

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<sup>5</sup> More information at:

[www.cisco.com/application/pdf/en/us/guest/tech/tk701/c1482/ccmigration\\_09186a00800b3f21.pdf](http://www.cisco.com/application/pdf/en/us/guest/tech/tk701/c1482/ccmigration_09186a00800b3f21.pdf).

- *Improved utilization of network capacity:* Converged data, voice, and video traffic over IP pipes improves utilization efficiency on Internet access and over the IP WAN. IP is intrinsically more efficient for a given fixed data rate; and while TDM pre-assigns fixed amounts of bandwidth to speech channels whether they are actually in use or not, IP allocates bandwidth dynamically for each call session or data stream, and QoS engineering ensures that that voice quality is maintained. This translates into improved value to the business customer through optimized use of its investment in network capacity.
- *Potential for consolidating and lowering telephony costs:* Compared with traditional communications delivery, there are fewer geographical constraints on the delivery of SIP trunks. In the past a business with branches in many locations might have to source trunks from multiple service providers. A multilocation business may now potentially single-source its managed SIP trunks from one service provider. Businesses that make use of managed SIP trunks, therefore, are able to select from a larger number of services providers and may have the opportunity to negotiate more favorable terms by placing all company business with a single service provider.<sup>6</sup>
- *Economical direct inward dialing (DID):* SIP also enables economical DID services; the dynamic nature of a managed SIP trunk means that the processing overhead for DID working (for both the service provider and the IP PBX) is almost eliminated. With managed SIP trunks, every PBX extension can be given a DID.
- *Business continuity:* In the event of a disastrous failure to equipment resulting from an accident or disaster, re-establishing communications to the service provider's network is easier for an IP-connected IP PBX than for a traditional TDM-connected PBX. The IP PBX only needs to be connected to a broadband IP access pipe. Even if connections have to be temporarily established over the Internet instead of over a service provider's managed IP network, acceptable standards of service in the face of an accident or disaster can be achieved both for PSTN access and inter-PBX working.

Although early implementation of a managed SIP trunking service is often a straight replacement for TDM or analog voice access services, the technology offers much more. Voice is just the start: the future is about multimedia communication throughout the enterprise. When a managed SIP trunk links the customer equipment and the carrier network, it presents opportunities for text messaging and video calls, as well as presence-based services; applications that interact with SIP can be used to also provide new features and sophisticated call management and reporting capabilities.

### **Making the Leap: Customer Triggers**

There are a number of trigger factors that will stimulate customer demand for service providers to deliver communications services over managed SIP trunks. The most obvious trigger point is when the enterprise or small business customer makes a decision to upgrade its PBX to cope with growth, optimize an office move, obtain new features, or reduce maintenance costs.

A further trigger point occurs whenever a company starts to look seriously at its networking costs – and this often follows the realization that increasing traffic volumes could require extra capacity or that an increase in branch offices and a distributed work force would increase network complexity. By upgrading today to managed SIP trunks for PSTN access and PBX-PBX trunks, companies can handle converged traffic in the same size IP pipes, with the service provider optimizing the connection based upon network planning.

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<sup>6</sup> However, the company may still need to buy access pipes from different vendors depending on locality.

Finally, and not to be underestimated, is the desire of businesses, especially those who are themselves in the technology business, not to be left behind with traditional services based on traditional PSTN technologies, while others are embracing the business benefits of moving wholeheartedly into next-generation multimedia IP communications. The pressure will increase even more as the world of business starts to learn more about, and actually experience, the advantages of multimedia telecommunications services and the way these services can bring increased productivity, improved collaboration, and opportunities for introducing more flexible and more effective working methods.

### **Target Customers for Managed SIP Trunking**

Whereas the traditional market for TDM trunks was mainly large enterprises, the dramatically changed economics of IP and the changing nature of business methods supported by IT and advanced communications mean that the market for managed SIP trunks extends from the largest multinational enterprise down to small businesses. The SMB sector has increasingly been able to gain access to features and services that were formerly available only to large businesses, thanks to successive generations of cost-effective, scalable, and innovative technology such as: LAN switches and routers, e-commerce, hosted applications, and virtual private networking. Now, SIP-enabled multimedia communications can be added to this list.

Among the larger enterprises, the prime targets today are those enterprises that have already moved, or are planning to move, to converged IP LAN and WAN environments, especially those that have implemented VoIP or IP PBX technology to any extent and those that are being forced to handle a more distributed office infrastructure. Approximately 75 percent of enterprises make use of VoIP across their enterprise networks<sup>7</sup> and this proportion continues to steadily increase. Such companies will want to achieve full convergence in order to optimize their networks and applications and make the most of their existing investment in IP networking and VoIP components.

With the transformation of business communications by the convergence of voice and data, PSTN access and inter-PBX connections using managed SIP trunks will eventually be demanded by any business with any significant telecommunications needs. The primary selling points may vary from business to business, but regardless of these variances, this technology will become the standard way of connecting PBXs to PBXs and PBXs to service providers. The target market for managed SIP trunks is, therefore, wide, and varied – and bigger than the traditional market for TDM trunks.

### **Selling Points**

Different businesses will be influenced by different factors and to varying extents. Broadly, the selling points can be grouped into financial factors, risk minimization, and business-performance improvement.

#### **Financial Factors**

For all businesses, large and small, financial issues are likely to dominate, or at least prompt an interest in SIP trunks as a managed service.

- Lower total cost of ownership (TCO): TCO discussions must take into account potential operational savings available from using a converged managed service
- Reduction in ongoing operational expenses (OpEx)

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<sup>7</sup> "SIP Trunking: A Single Pipe to the Cloud", Christian Stegh, January 2006

- Predictable costs arising from long-term, stable contracts with managed service providers, making it easier to plan communications budgets
- Low up-front-costs, enabled by service provider deals that allow initial costs to be deferred – and recovered from recurring payments over a period of time

### **Minimizing Risk**

Also, all businesses are interested in removing risk and uncertainty; so while many companies will look for financial savings first, they are also likely to be influenced by the need for predictability and dependability. Companies that wish to minimize risk will be interested in:

- Underpinning services with SLAs that instill confidence that the managed SIP trunks will be available with a high degree of reliability
- 24-hour monitoring and surveillance from a service provider
- Knowing that a service provider will monitor future technology developments and may make them available as part of a service upgrade
- Being reassured that because the managed SIP trunks service is based upon industry standards, it will be interoperable with existing and future IP PBX technology that is also built to those standards
- Handing over the burden of coping with communications convergence (data, voice, and video) and IT/communications convergence to a third party

### **Achieving Business-Performance Improvement**

The introduction of managed SIP trunks into the working environment can potentially transform the way work is done. For example:

- The intimate integration of IT applications and communications applications will enable increasingly sophisticated forms of automated workflow management and collaboration tools.
- Person-to-person video communication and real-time sharing of information, especially across multiple offices, will improve collaboration and productivity.
- High-quality video multicasting, with interaction, will cease to be exotic and will become economically possible for the majority of companies.

## **The Cisco Solution for SIP Trunks as a Managed Service**

### **Overview**

Maintaining end-to-end SIP-managed IP transport for all multimedia sessions provides a consistent foundation for the evolution of network-based managed services that further enhance the communications environment of business customers. This is the promise of the IP Next-Generation Network (IP NGN), the Cisco vision for service providers (Figure 3).

**Figure 3.** Cisco and the IP Next-Generation Network

The migration of all business communications services from traditional access technologies to managed SIP trunks is a logical next step in the evolution of IP NGNs, and the Cisco solution for managed SIP trunking gives service providers and VARs the architectural framework and supporting programs to access this new market with confidence.

The Cisco solution for SIP trunking as a managed service is an industry standards-based approach to quickly and reliably connect SIP-enabled IP PBXs and service provider networks for a quality IP communications service. The service is based upon SIPConnect<sup>8</sup> recommendations and is available to service providers with SIPConnect-compliant SIP proxies. The solution includes:

- Technology, including Cisco integrated services routers, Cisco Multiservice IP-to-IP Gateway (IOS Session Border Controller), Cisco Unified Communications Manager (formerly Cisco Unified CallManager), Cisco Unified Communications Manager Express (formerly Cisco Unified CallManager Express), plus a rich set of configuration tools such as the Quick Configuration Tool (QCT)
- The Cisco Powered Program and the forthcoming Cisco SIP Trunking certification/designation, which is designed to qualify service provider offerings, provide go-to-market program assistance to program members, offer technical benefits such as service provider SIP signaling templates preloaded into QCT for quick activation, and identify these service providers to VARs and partners interested in a joint offer
- Cisco Professional Services

The Cisco solution for managed SIP trunks is intrinsic to and consistent with Cisco's vision for the service provider market: *"to provide intelligent, efficient, and flexible solutions that connect customers with services, services with networks, and networks with each other."*

Because Cisco has adopted an integrated approach to the development of network and CPE components, a service provider's investment in the technology can generate multiple revenue opportunities. A Cisco integrated services router not only hosts Cisco Unified Communications Manager Express with SIP capability but provides a platform for a wide range of other managed services such as managed VPN and security.

<sup>8</sup> <http://www.sipforum.org/sipconnect>

### Initial Deployment

For most service providers, initial deployment of managed SIP trunks will be primarily for basic managed voice services, namely a replacement for TDM voice services. The degree of management can of course vary depending on customer needs, service provider capabilities, and market-penetration strategies. However, the opportunity exists for service providers to provide more sophisticated layers of management, especially when offered along with managed Ethernet, managed firewall, and other managed services.

When combined with Cisco CPE, solution features include:

- **Clear demarcation point:** Allows service providers to offer SLAs with Cisco integrated access devices or Cisco Multiservice IP-to-IP Gateway (IOS Session Border Controller)
- **Improved time to market:** Eliminates need to develop operations down to the desktop; provides easy-to-configure templates for both sides, and normalization of all traffic at the edge.
- **Security:** Protects from rogue customer attacks and prevents possible customer-to-customer attacks.
- **Leading-edge technology:** Cisco CPE uses the same voice gateway features developed for Cisco Unified Communications Manager and Manager Express deployments, allowing consistent and simple integration with a service provider's network.
- **New market and revenue opportunities:** Providers can easily reach all Cisco Unified Communications Manager and Unified Communications Manager Express installed base, whether service provider- or VAR/partner-managed.
- **Media normalization:** CPE provides normalization at the network edge; specifically transcoding, fax/DTMF interoperability issues, Call Admission Control (CAC), and QoS schemes.

### Further Enhancements

When a managed SIP trunking service offering is in place, the technology foundation enables the service provider to deliver additional simple, cost-effective, and scalable IP communications and rich media value-added services to its customers.

The wide range of additional functionality and features could include:

- Text messages and video calling
- Conferencing
- Interactive broadcasts
- Presence-based services
- Advanced call management through application interaction

### More than Technology

Cisco gives service providers industry-leading managed services solutions that are comprised of programs, services, and other benefits to complement Cisco's leading portfolio of innovative products and solutions.

- Cisco Powered Program benefits include launch support in the following areas: access to market intelligence, pricing strategy, revenue projections, cost analysis, and launch planning.

- The Cisco Powered Program's SIP trunking CPN certification/designation demonstrates to business customers that a service provider is delivering a managed service that is independently validated in terms of quality and reliability, network intelligence, flexibility, and scalability.
- Cisco provides unparalleled go-to-market support to service providers who build their service offerings on an end-to-end Cisco network, including service creation resources, joint marketing and co-branding opportunities, implementation support, and ongoing technical support.
- Cisco Professional Services offers the support of teams of specialists in service provider networks and operations. Specialists can be deployed when there is a need for additional services, such as support in developing innovative services or in deploying new networks.
- The Cisco managed SIP trunking solution includes QCT, the Quick Configuration Tool, to enable service installation teams to implement configuration and activation tasks quickly and with predictable results.

## Conclusion

The trajectory of the telecommunications industry is clear. Service providers – and forward-thinking business customers – have embraced the concept of next-generation networks for many good reasons: cost, value, operational benefits and, above all, access to exciting new services and features. Cisco IP Next-Generation Networks are all about IP everywhere, information and communications convergence, multimedia, and services convergence onto unified networks. A primary component in this evolution is the emergence of SIP as an underpinning technology for multimedia communication. SIP provides the capability to meet the communications needs of today, and also establishes a foundation for new services in the future.

Today service providers have an opportunity to deliver SIP-based managed services to their business customers that will immediately provide real economic and operational benefits both to customers and to service providers themselves. But there is certainly more to come. By establishing capability, credibility, and market presence now, service providers will be well positioned to support those customers as they demand new SIP-based services and features. Cisco provides the technologies, services, support, industry expertise, and vision that will help service providers and partners enter this market with confidence, and succeed.

For more information on the Cisco solution for a managed SIP trunking service, visit:

<http://www.cisco.com/go/mgdsiptrunk>.



Americas Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883

Asia Pacific Headquarters  
Cisco Systems, Inc.  
168 Robinson Road  
#28-01 Capital Tower  
Singapore 068912  
www.cisco.com  
Tel: +65 6317 7777  
Fax: +65 6317 7799

Europe Headquarters  
Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
www-europe.cisco.com  
Tel: +31 0 800 020 0791  
Fax: +31 0 20 357 1100

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