



White Paper

Cisco Service Exchange Solution for IP Multimedia Subsystem (IMS)

Enabling Next-Generation Multimedia Communication Services

Service providers are looking to increase their revenue and lower their costs by transitioning to next-generation networks that support voice, video, and data services across multiple types of network access—including wireless, wireline, and cable. The Cisco Service Exchange Solution for IP Multimedia Subsystem (IMS) helps service providers deploy a complete array of real-time, personalized business and consumer multimedia services over any access network.

THE CHANGING LANDSCAPE OF COMMUNICATIONS

Consumers and businesses today enjoy a wide range of choice for communications, entertainment, and online services, which they can access in many different ways. Many can buy their broadcast video and video on demand from a cable operator, a satellite TV provider, or even a DSL provider offering IPTV. High-speed data (HSD) is available from cable, DSL, and Wi-Fi providers. Cable operators and “best-effort” voice-over-broadband service providers are entering the telephone services market, and mobile virtual network operators (MVNOs) are pursuing both consumer and enterprise mobile wireless markets.

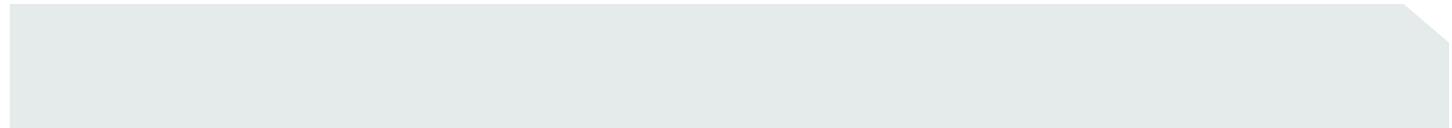
With so many services and so many different choices for delivery, competition is fierce. Service providers try to offer as many services as possible to reduce customer turnover and increase revenue, because their market penetration for any particular service may be relatively low. To reduce risk or cost of entry, some service providers are forming new relationships to deliver new services to new customers. For example, voice carriers are partnering with content providers to enter the multimedia services market. Around the world, wireline service providers are investing in mobile operators, cable operators, or each other to reach new markets and fuel growth.

Service providers are also evolving their networks into next-generation delivery platforms that can easily introduce new services. Real-time multimedia services deployed on IP-based networks enable service providers to take advantage of their network investment over the greatest number of services. However, next-generation network architectures must deliver many simultaneous applications to many endpoints, scale to support subscriber growth, support quality of service (QoS) capabilities, and be able to take advantage of endpoint device enhancements over time. Providers want to deliver a wide range of user-personalized multimedia services to many users, regardless of their location—for as little as possible.

The market for real-time, interactive multimedia services is promising, if the explosive forecasts for voice-over-broadband services are any indication. Ovum forecasts the worldwide consumer Voice-over-IP (VoIP) market will be 6 percent of the overall consumer voice market in 2008, representing \$15 billion in service revenue and 197 million users, with half using soft clients. Other new multimedia services, such as video telephony and video instant messaging services, are gaining considerable popularity, bringing visual communications into the mainstream for both home and office users. Because today’s softphones, Wi-Fi phones, smart phones, and personal-digital-assistant (PDA) communicators can support voice, data, and video, they are creating new service opportunities for service providers.

Cisco IP Next Generation Networks

To help service providers make a successful transition to these new opportunities, Cisco Systems® has developed an architecture called the Cisco IP Next-Generation Network (IP NGN). Cisco IP NGN helps service providers develop and plan their organizations, their specific network architectures, and business models for the future. It delivers both sustainable competitive advantages and profits.



The Cisco IP NGN architecture is focused around three primary areas of convergence: an application layer that interfaces with the customer; a secure network layer that creates and delivers the services; and in between, a service control layer that orchestrates the delivery, operations, features, and billing of the service itself. Intelligent Networking connects all three layers, making interlayer communications efficient and productive.

Within the service control layer of the Cisco IP NGN architecture, Cisco has developed the Service Exchange Framework (SEF), a set of enabling technologies that allow service providers to deliver today's voice, video, and data services efficiently while also creating a foundation for new rich multimedia services.

The Standard for Next-Generation Networks—The IP Multimedia Subsystem

Within the NGN arena, a new set of standards is gaining momentum. The IP Multimedia Subsystem (IMS) is an open, standardized architecture that aims to merge multimedia services across the cellular world and IP networks, using the same standard protocols for both mobile and fixed IP services. Based on Session Initiation Protocol (SIP), IMS defines standard control plane interfaces for creating new applications. Industry experts expect IMS to open up the telecommunications service development process to a growing base of application developers, accelerating new service creation to an Internet-like pace.

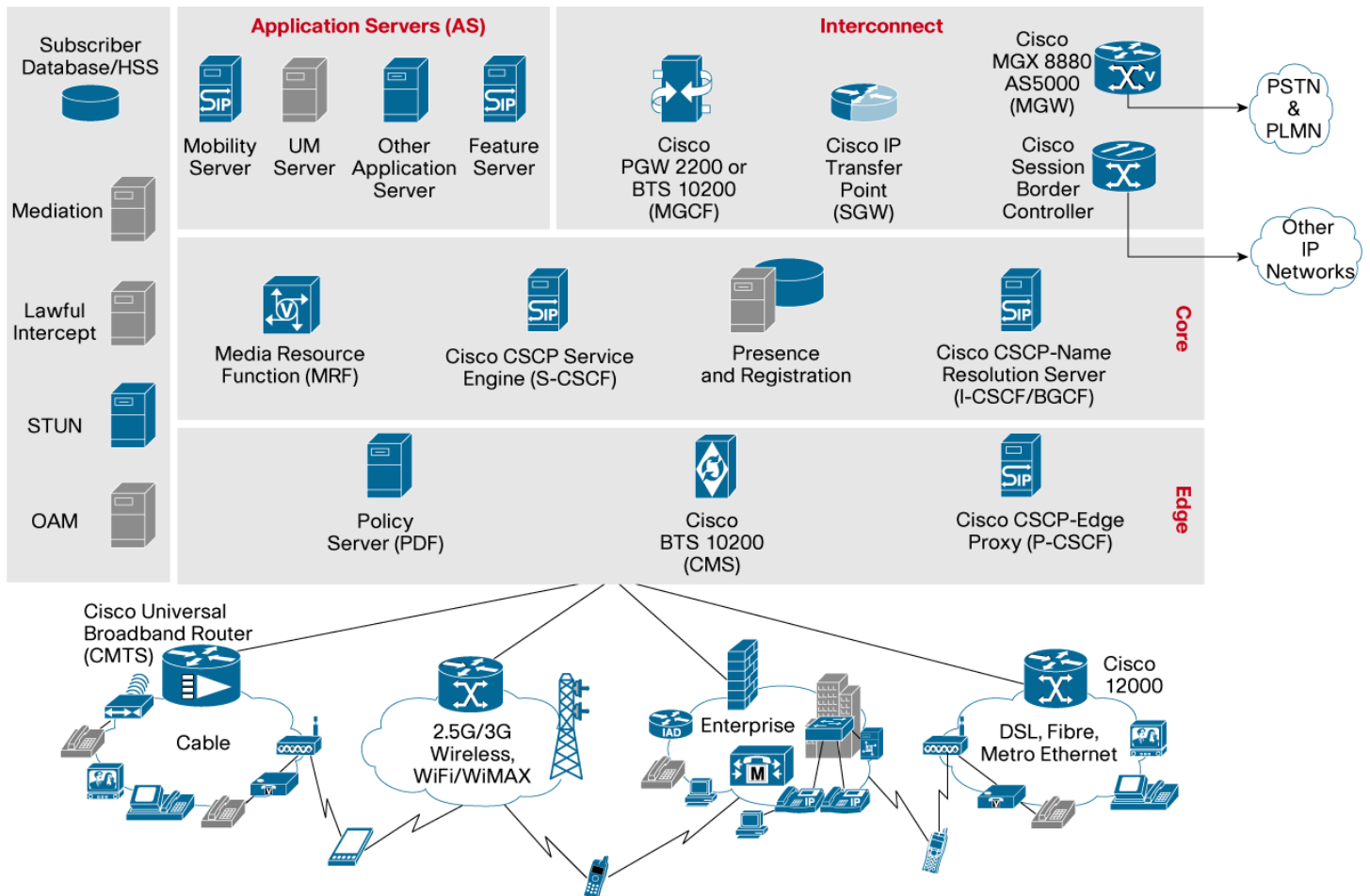
IMS was initially developed by the Third Generation Partnership Project (3GPP) to meet the requirements of GSM operators seeking to deploy IP applications over their 3G wireless networks. Standards bodies for CDMA wireless as well as wireline networks have since adopted specifications based on IMS. CableLabs®, the standards-setting organization for the North American cable industry, has also adopted the signaling core of the IMS specification for PacketCable™ 2.0, which specifies requirements for real-time, interactive, multimedia services over cable DOCSIS® access networks.

The Cisco IP NGN architecture and SEF support the IMS specification and supply a comprehensive foundation for the deployment of IMS-based multimedia services, such as push-to-talk (PTT) and fixed-mobile convergence (FMC), as well as many other IP-based services such as multicasting, IPTV, e-commerce and business IP virtual private networks (VPNs).

CISCO ENABLES CARRIER-GRADE NEXT-GENERATION MULTIMEDIA COMMUNICATIONS SERVICES

The Cisco Service Exchange Solution for IMS delivers the broad range of services capabilities outlined in IMS-based standards emerging from the wireless, wireline, and cable industries (refer to Figure 1). The solution helps service providers generate revenue by offering their subscribers ubiquitous access over any network to a complete array of real-time, multimedia business and consumer services, such as “triple-play,” push-to-talk, presence-based services, video telephony, and FMC. Service providers can allow subscribers to easily personalize and select their own multimedia services, while retaining control of billing and usage options.

Figure 1. Cisco Service Exchange Solution for IMS



Services developed on the Cisco Service Exchange Solution for IMS can scale to millions of subscribers per service, and take advantage of the service delivery intelligence of the underlying Cisco IP NGN architecture, which enables applications, subscribers, and access networks to be aware of intelligent IP network attributes. The solution delivers the following core capabilities:

- **Access Independence**—Services can take advantage of access network features, such as QoS, while not being dependent on any particular access network.
- **Endpoint Independence**—Services work to the greatest possible extent across multiple endpoint devices, including analog phones, IP phones, softphone clients, Wi-Fi phones, PDA communicators, video communication devices, and more.
- **Rich Client Support**—Services can incorporate rich client features such as multimedia capabilities, buddy lists and IM, and integration with Web and other client applications.
- **Service Mobility**—Subscribers can connect their endpoint devices to different wireline and wireless broadband access networks at different times to receive services transparently.
- **Application Independence**—Applications from different vendors, running on different platforms, can communicate using standard SIP-based interfaces and integrate with existing Operational Support Systems (OSS) with minimal effort.
- **Presence Support**—Presence is a core network capability that collects and distributes real-time subscriber state information to many applications on the network.

At the heart of the Cisco Service Exchange Solution for IMS are the call and session control platforms, which establish, maintain, route, integrate, and terminate real-time voice and multimedia sessions. These platforms also serve as the interface to enhanced voice, video, and data applications such as voicemail, unified messaging, mobility services, and more. Furthermore, these core platforms interconnect voice and multimedia services between traditional time-division multiplexing (TDM) and IP packet networks. The platforms that provide these call and session control services are the Cisco Call Session Control Platform (CSCP), the Cisco BTS 10200 Softswitch, and the Cisco PGW 2200 Media Gateway Controller.

Cisco Call Session Control Platform

The Cisco CSCP provides broadband wireline, cable, and wireless service providers with a carrier-grade, distributed, intelligent SIP-based services environment for delivering multimedia applications and services over their IP-based networks. It acts as the 3GPP-defined Call Session Control Function (CSCF) in the IMS reference architecture. The Cisco CSCP resolves the tasks common to all applications just once, dramatically simplifying application development. It also allows the provider to retain much more customer control than in a traditional applications environment: the subscriber database, profile information, presence and location, and other information that binds a subscriber to a particular service are all managed and controlled through a single mechanism.

With the Cisco CSCP, service providers can mix and match their applications to offer their customers compelling new services packages. A mobile carrier might, for example, build a contact list application that simply shows which users are online. Although this list may initially be used to support an instant messaging service, the carrier can make the same list available for a PTT or a “find me” service (allowing a subscriber to locate all the members of the predefined group at once). By aggregating the capabilities of individual applications, the Cisco CSCP makes such applications surprisingly simple to develop—in sharp contrast to the cumbersome process found in a traditional mobile applications environment.

The Cisco CSCP comprises three closely integrated components:

- **The Cisco CSCP-Service Engine (CSCP-SE)** provides several critical functions, including: service integration and interaction; SIP message routing; user registration; authorization of service requests; and management of service and subscriber data. The CSCP-SE maps to the Serving CSCF (S-CSCF) in the 3GPP IMS specification. The IMS Service Control (ISC) interface of the CSCP-SE enables IMS-compliant applications to take advantage of the powerful session routing capabilities of the CSCP.
- **The Cisco CSCP-Edge Proxy (CSCP-EP)** provides the edge adaptation of SIP signaling for diverse access networks, enabling seamless interoperability between multiple access locations and core network services and resources. The CSCP-EP provides user authentication, signaling compression, QoS signaling for access networks, security, STUN for Network Address Translation (NAT)/Firewall traversal and other adaptation functions. The CSCP-EP maps to the Proxy CSCF (P-CSCF) in the 3GPP IMS specification.
- **The Cisco CSCP-Name Resolution Server (CSCP-NRS)** is a high-performance SIP server for intercarrier and on-net/off-net routing. The CSCP-NRS can be deployed as a cluster of servers for high availability, and can be shared by multiple Points of Presence (POPs). It handles the routing of calls/sessions between carriers as well as between on-net and off-net subscribers. It handles requests from any server in the network that does not have name resolution capability. The CSCP-NRS forwards SIP requests to other sites, whether they are other POPs within the provider's network, to another SIP network through a Session Border Controller (SBC), or to the public switched telephone network (PSTN) via a media gateway controllers such as the Cisco PGW 2200. The CSCP-NRS is the Cisco implementation of the Interrogating CSCF (I-CSCF) and Border Gateway Control Function (BGCF) in the 3GPP IMS specification.

Cisco BTS 10200 Softswitch

The Cisco BTS 10200 Softswitch lets service providers transition gracefully from circuit-switched to packet-based infrastructures. The Cisco BTS 10200 has a comprehensive feature set that allows service providers to offer local voice services over any broadband access with carrier-grade reliability, service flexibility, and scalability to millions of subscribers. In addition, service providers can optimize their operational efficiencies and investment during their evolution to packet networks. The Cisco BTS 10200 Softswitch enables IP connections to the PSTN using Signaling System 7 (SS7), H.323, and SIP. It is deployed globally by competitive carriers, cable MSOs, DSL and MetroE providers, who are offering residential voice services over broadband, and/or converged voice and data services to small-and-medium businesses.

For multimedia services, the Cisco BTS 10200 interworks with the Cisco CSCP for the integration of new multimedia services. In the future, the Cisco BTS 10200 will evolve to further support IMS and PacketCable 2.0, and provide the following additional capabilities:

- Deployable as physically separate Call Management Server (CMS) or Media Gateway Controller (MGC)
- Act as Application Server to the Cisco CSCP-SE
- Support call triggers via SIP for enhanced services (e.g., “Digital DialTone”)
- Support the ISC Interface to interwork with IMS Application Servers (AS)
- Provide efficient on-net routing between geographically distributed BTS 10200 softswitches via a SIP route proxy (Cisco CSCP-NRS).

Cisco PGW 2200 Media Gateway Controller

The Cisco PGW 2200 Media Gateway Controller (MGC) supports the interworking requirements of Cisco’s Service Exchange Solution for IMS in allowing service providers to seamlessly route calls between the PSTN and IMS-based networks. The Cisco PGW 2200 supports interoperability between TDM interfaces and IP signaling protocols, including SS7, Primary Rate Interface (PRI), Digital Private Network Signaling System (DPNSS), ITU QSIG, Media Gateway Control Protocol (MGCP), SIP, and H.323. With an extensive library of worldwide PSTN protocol variants, the Cisco PGW 2200 has become one of the most widely deployed PSTN interconnect platforms for IP-based networks in use today, with deployments in more than 75 countries. The Cisco PGW 2200 is a field-proven, carrier-class platform, designed to provide maximum interoperability, reliability, and scalability.

The Cisco PGW 2200 provides SS7 interconnect for Cisco AS5000 universal gateways and Cisco MGX® 8000 Series media gateways, offloading PSTN voice and dial traffic to IP networks. The Cisco PGW 2200 also provides number modification, normalization, and screening to supplement the full-feature richness and strong routing capabilities of Cisco IOS® Software. Deployed in conjunction with Cisco media gateways, the Cisco PGW 2200 supports applications such as VoIP transit, managed business voice, voice VPNs, tandem private branch exchange (PBX), and SS7 interconnect for Cisco IP contact centers.

SERVICES ENABLED BY CISCO SERVICE EXCHANGE SOLUTION FOR IMS

IMS COMPONENT MAPPING

The Cisco Service Exchange Solution for IMS consists of Cisco and partner products which map to the IMS specification as indicated in Table 1 below.

Table 1. Cisco Service Exchange Solution for IMS

IMS Component	Cisco Product
Proxy CSCF (P-CSCF)	Cisco CSCP-Edge Proxy
Serving CSCF (S-CSCF)	Cisco CSCP-Service Engine
Interrogating CSCF (I-CSCF)	Cisco CSCP-Name Resolution Server

Breakout Gateway Control Function (BGCF)	Cisco CSCP-Name Resolution Server
SIP Application Server (AS)	Partner product; Cisco Feature Server
Media Gateway Control Function (MGCF)	Cisco PGW 2200; Cisco BTS 10200
Media Gateway (MGW)	Cisco MGX® 8000 Series, with Cisco Voice Interworking Services Module (VISM-PR) and Cisco Voice Switch Services Module (VXSM); AS5000 Series
Home Subscriber Server (HSS)	Partner product
Home Location Registrar (HLR)	Partner product
Policy Decision Function (PDF)	Partner product

The Cisco Service Exchange Solution for IMS helps service providers deploy real-time, interactive multimedia services over the same access-independent infrastructure. Although the possible services are many, the next section highlights some of the market-leading multimedia services already deployed using the Cisco solution.

Voice-over-Broadband Services

The Cisco Service Exchange Solution for IMS has both the scalable infrastructure and wide range of telephony features required to support the dramatic growth of voice-over-broadband services. By enabling cable, DSL, Metro Ethernet, and T1/E1 broadband service providers to build IP telephony environments on secure, scalable, and transparent foundations, the Cisco solution provides a clear roadmap for deployment of real-time VoIP communications services for SIP endpoints. The solution also solves the technical challenges of delivering voice over a shared access medium, such as security, QoS, billing, and lawful intercept.

Cable Multimedia Communications Services

Bundling voice, video, and high-speed Internet access—the triple play—is convenient and affordable for consumers, and it increases revenue and reduces subscriber turnover for service providers. A Parks Associates report (January 2004) showed that 77 percent of broadband households interested in VoIP services would switch to a triple-play service provider to gain just a \$10 monthly savings over a non-bundled set of similar services. When triple-play customers are acquired, they are far less likely to cancel services or switch to another service provider. Kagan Research reports that adding voice services to an offering of video and HSD services can reduce overall customer turnover by 50 percent.

By accelerating their delivery of VoIP offerings, cable operators have led the way in offering triple-play services. Major cable MSOs in North America and numerous leading European cable operators have already deployed the Cisco Cable Multimedia Communications Solution to provide VoIP services over their cable broadband infrastructure. Cable MSOs are now using DOCSIS, PacketCable, and need to spell this out: PacketCable™ Multimedia standards from CableLabs to introduce QoS to cable networks, allowing them to go beyond triple play to offer interactive gaming, video communications, and other multimedia services on their HSD networks. Additionally, cable operators are now looking to deploy SIP infrastructures that allow them to offer other services such as presence, instant messaging, buddy lists displayed on the TV, geographic location data, support for SIP endpoints, and others.

Cable MSOs can most effectively deliver such advanced services by deploying SIP platforms to connect disparate networks together, as demonstrated by CableLabs' adoption of the IMS SIP-based signaling core for the PacketCable 2.0 specification. The Cisco Service Exchange Solution for IMS will enable cable MSOs to support multiple applications on a common, standard infrastructure that supports both SIP and PacketCable, while protecting their investment as these standards continue to evolve. The Cisco solution eliminates dependence on a single application vendor. Cable providers can reuse solution components across multiple applications and access networks, allowing MSOs to provide their subscribers with FMC for voice, video, and data services.

Push-to-Talk Services for Wireless

Push-to-Talk (PTT) is emerging as a popular voice service over wireless networks. Combining aspects of cellular mobile communications, subscriber presence detection, and walkie-talkie style instant communications, PTT enables subscribers to quickly initiate and engage in brief, burst-oriented style conversations and voice conferencing. Many leading mobile operators have already introduced versions of PTT services, targeted at both business and consumer markets. The PTT cellular market is expected to reach \$10.1 billion in services revenue and 340 million subscribers worldwide by 2008 (Wintergreen Research, 2004).

The Cisco Service Exchange Solution for IMS helps wireless operators offer PTT services by supporting SIP-based VoIP connections between two or more endpoints. Service providers can take advantage of underlying IP-based networks and the inherent bandwidth efficiency of PTT to offer a new service at incremental cost. With the Cisco solution, service providers can bundle PTT services with other “Push-to-X” services such as video, multimedia messaging, content sharing, presence, and conferencing.

Fixed-Mobile Convergence (FMC) Services for Consumer and Enterprise

Service providers are looking for new ways to boost revenue, reduce costs, and increase customer loyalty. Both business and consumer subscribers struggle with managing multiple phones, phone numbers, voicemail boxes, Internet access devices, and communications bills. In the near future these will begin to converge.

FMC represents the convergence of wireless and wireline devices, services, and ultimately networks. For businesses and consumers, FMC offers flexibility, simplicity, and economy. The Cisco Service Exchange Solution for IMS allows service providers to flexibly develop highly scalable multimedia communications services that span both fixed and mobile networks. For broadband and wireless carriers targeting the consumer market, Cisco is already delivering both FMC-capable network infrastructure and Linksys® endpoints. For enterprise markets, Cisco is delivering FMC between enterprise IP telephony and cellular networks, with dual-mode IP Phones able to roam between Cisco CallManager sites and public wireless networks. The Cisco Service Exchange Solution for IMS will enable operators to deliver FMC for any subscriber service and type of content, from voice to enhanced communications services, video programming content, and personal media such as photos, music, and data services—any service, anywhere, and anytime.

WHY CISCO

With its global commitment to service providers, massive investment in innovation, extensive IP expertise, and comprehensive approach to both the network and business needs of its customers, Cisco is focused on helping service providers make their transition to IP NGN as quickly, smoothly, and profitably as possible. The Cisco Service Exchange Solution for IMS allows service providers to deliver consumer and business multimedia services over broadband wireline, and wireless infrastructures. With an industry-leading portfolio of carrier-grade IP solutions and a successful track record for deploying highly available solutions, Cisco gives service providers the opportunity to offer reliable, scalable voice and multimedia communications services to their customers.

The Cisco IP NGN architecture has been extended to enable services providers to deploy standards-compliant, IMS-based foundations for the delivery of converged, real-time multimedia communications applications. Based on these powerful Cisco solutions, service providers can offer ubiquitous converged IP multimedia services that combine voice, video, and data applications in differentiated and personalized ways.

NEXT STEPS

For more information about the Cisco Service Exchange Solution for IMS, visit <http://www.cisco.com/go/sp>.

**Corporate 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: 408 526-4100

European Headquarters

Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
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

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