Cisco PGW 2200 Protocol Gateway

The Cisco® PGW 2200 Protocol Gateway is a multiprotocol, carrier-grade softswitch designed to support media gateway control functions and interworking in next-generation networks (NGNs) for IP-IP, IP-public switched telephone network (PSTN), and PSTN-PSTN connectivity and to connect these networks to both standards-based Session Initiation Protocol (SIP) services and Intelligent Network (IN) services. The Cisco PGW 2200 supports both SIP interworking and border control functions, H.323, and a wealth of PSTN protocols with more than 90 country variants for interconnection across the world. Currently used in more than 600 customer networks, the Cisco PGW 2200 scales cost-effectively from service provider-hosted enterprise networks to very large service provider applications.

Product Overview

The Cisco PGW 2200 supports multiple roles in NGNs. With its flexible database tables, powerful routing control commands, and range of extensive attributes against trunk groups, it can be used as a flexible component in many networks, including H.323 and SIP. The Cisco PGW 2200 can be used in a versatile capacity within distributed architecture networks, such as those conforming either to the specifications of Telecoms and Internet converged Services and Protocols for Advanced Networks (TISPAN), or to the IP Multimedia Subsystem (IMS) framework specifications for both SIP- and non-SIP-oriented networks.

The Cisco PGW 2200 is capable of routing a call based upon analysis of an E164 telephone number or a SIP user and domain name, providing a powerful and generic call routing capability. The analysis and routing can be carried out using the Cisco PGW 2200's own internal analysis databases or by interfacing to route or application servers. When handling SIP traffic, the softswitch is able to work in proxy mode or Back-to-Back User Agent (B2BUA) mode with user-controlled levels of information transparency and topology hiding.

The Cisco PGW 2200 has interworking capabilities for SIP, H.323, SS7 ISDN User Part (ISUP), Primary Rate Interface/Q Interface Signaling Protocol (PRI/QSIG), Digital Private Network Signaling System (DPNSS), Intelligent Network services using SIP and intelligent Network Application Protocol (INAP). The softswitch can autonomously make routing and analysis decisions using its onboard database, making it a single-device solution. The fully 64-bit database also allows it to scale to large service provider deployments. The Cisco PGW 2200 maintains every critical component needed in these networks, such as full hot standby redundancy, standard billing interfaces, and Lawful Intercept capabilities. The softswitch can control media gateways such as the Cisco MGX® Family, Cisco Integrated Services Routers, and Cisco universal gateways such as the Cisco AS5300 and AS5400 Series, and supports services such as interactive voice response (IVR) or IP call centers, interconnecting with Cisco Unified Intelligent Contact Management (ICM) servers.

The Cisco PGW 2200 is capable of extremely high performance in a single 1-unit to 5-unit rack and will scale beyond this capacity across multiple racks for higher capacity, colocated or across geographic regions for additional redundancy. In its smallest configuration, an entire softswitch, media gateway, and time-division multiplexing (TDM) backhaul functionality can fit in less than 9 centimeters (cm) of rack space with no compromise on SIP or PSTN features.

A command line and graphical interface are available to support configuration and manageability, and the industry-standard interfacing allows for easy integration into existing applications.

The Cisco PGW 2200 Release 9.8(1) operates on Sun Microsystems hardware running the Solaris 10 operating system.

Cisco PGW 2200 Applications

Next-Generation Network Communications

The Cisco PGW 2200 allows the creation of SIP-based distributed networks by operating as a core IP Multimedia System (IMS) architecture component; it can also perform multiple roles in the mobile and PSTN arena within the TISPAN framework.

With the 9.8(1) release, the current softswitch capabilities are expanded and the ability to operate as a Signaling Border Element (SBE) within a distributed Session Border Controller (SBC) is introduced. SBC functions can be divided into two logical sub-elements, signaling path border element or SBE and data path border element or DBE. The SBE provides signaling functions such as protocol interworking (for example, H.323 to SIP), identity and topology hiding where the DBE provides media-related functions such as deep packet inspection and modification, and media relay under SBE control. To date, the SBE and DBE logical elements have generally been realized within a single, physical SBC device referred to as a unified SBC. However these can be decoupled for ease of management and scalability using standards-based H.248 interface between SBE and DBE. In its SBE capacity the Cisco PGW 2200 is able to do the protocol interworking, provide centralized analysis and routing as well as carrier-class billing capability, and enable simultaneous support of both a VoIP network and SS7/PSTN networks worldwide.

Taking everything into account, within an IMS or TISPAN architecture, the Cisco PGW 2200 can be fitted into the roles of Media Gateway Control Function (MGCF), Breakout Gateway Control Function (BGCF), and Interfacing Border Control Function (IBCF).

Service Provider-Hosted Call Center Applications

The Cisco PGW 2200 can interwork with third-party products and Cisco products such as Cisco Unified Contact Center (also known as Cisco IPCC, IP Contact Center), Cisco Unified Communications Manager, and Cisco Unified Communications , allowing for the deployment of a range of customer-care solutions that tightly integrate web-based customer and attendant portals with a diverse range of network services such as consultative transfer and location-based routing for optimizing customer management and the customer experience.

Business Voice and Hosted Unified Communications

Through SIP or H.323, service providers can offer multisite voice and data, and voicemail and messaging using applications such as Cisco Unity® Unified Messaging. The Cisco PGW 2200 can transparently interwork services from the enterprise network into the service provider network. Service providers can also offer services such as TDM private branch exchange (PBX) interconnection using the protocols available on the Cisco PGW 2200, and can interwork both new and existing services with Cisco Unified Communications Manager by using the Cisco PGW 2200 for full feature transparency across the network.

The Cisco PGW 2200 supports H.323 Annex M.1, allowing the smooth migration from TDM to IP PBXs in hosted communications scenarios without loss of any supplementary service.

A web portal allows operators to monitor and configure the entire business voice solution with flexibility. The alarm and management subsystems include Simple Network Management Protocol (SNMP) and configuration through text and graphical interfaces.

SIP Trunking

With Release 9.8(1), the Cisco PGW 2200 supports SIP trunking and will interwork over a SIP trunk to the Cisco Unified Communications Manager.

Fixed Mobile Convergence

The proven interoperability between the Cisco PGW 2200 and a diverse range of networks, media gateways, and application servers allows its use as a component to support a variety of applications, such as Fixed Mobile Convergence, where the softswitch can be used with the application server for functions such as “forking” of calls to fixed and mobile destinations for higher call-completion rates, call reattempt, and call rerouting. The industry-standard capabilities can accelerate deployment of services by helping ensure interoperability with third-party products.

National and International Transit

Carriers can take advantage of the PSTN interconnection capability of the Cisco PGW 2200 and transport traffic via IP over optimal routes using Time-of-Day Routing and Least Cost Routing capabilities. Pre- and post-paid services can be enabled, and Intelligent Network AIN or INAP functions for services such as 800 and 900 numbers. The onboard database infrastructure allows for a proven local number portability (LNP) capability of an extremely large number of subscribers today. The Cisco PGW 2200 provides revenue assurance through fault-tolerant billing and network security testing against all its interfaces, and regulatory compliance including Lawful Intercept capability.

Cisco PGW 2200 Release 9.8(1)

Release 9.8(1) Overview

Major highlights of Cisco PGW 2200 Release 9.8(1) include further database improvements for greater capacity and infrastructure changes resulting in increased performance. The Cisco PGW 2200 already provided Media Gateway Control for TDM using MGCP or H.248 protocols; this capability is now strengthened with full H.248 Version 2 implementation supporting control of gateways in an IP-IP call capacity, controlling and anchoring the media stream and performing Network Address Port Translation (NAPT). In a distributed architecture, the Cisco PGW 2200 can now be placed in a signaling border element or controller (SBE/SBC) role controlling at the edge one or more data border elements (DBEs). If a Cisco MGX Family gateway is controlled it is now also possible to do transcoding. Other DBEs can include the Cisco 7600 or XR 12000 Series Routers.

The introduction of SIP profiles on the Cisco PGW 2200 enables the system user to have powerful configuration control of the transparency of information when working in a SIP-SIP B2BUA mode by taking trust issues fully into account and providing a robust SIP interconnection capability. In addition, when handling SIP calls, the Cisco PGW 2200 can now dynamically select the underlying transport type as either UDP or TCP and can interwork the two on a call, allowing greater resilience for service provider networks.

To meet the increasing demand for interworking with SIP networks, support for SIP-I (profile C of ITU Q1912.5) is introduced on the Cisco PGW 2200, supporting an initial set of protocol types and allowing interconnections via SIP carrying ISUP information transparently.

As already briefly mentioned, the Cisco PGW 2200 can now also analyze according to SIP user and domain information and offers the possibility to configure screening against sources. It is also possible to translate destinations either in non-E.164 or E.164 format and to translate from one format to the other.

In summary, within an NGN IMS or TISPAN architecture, the Cisco PGW 2200 can be fitted into the roles of MGCF, BGCF, or IBCF and offers Service Policy Decision Function (SPDF) functionality.

Product Evolution

The strong feature set of the Cisco PGW 2200 has allowed for a wealth of applications for voice networks. The Cisco PGW 2200 can be used for transit services, and large-scale network-access-server (NAS) farms for dialup Internet access. The proven H.323 capabilities of the Cisco PGW 2200 help service providers allow direct voice-over-IP (VoIP) interconnection to enterprise customers. In addition, a rich level of SIP functions is present in the Cisco PGW 2200 for service provider interconnection. For service provider-hosted IP telephony solutions, the Cisco PGW 2200 allows for direct IP connections to voice gateways and IP PBXs such as the Cisco Unified Communications Manager with phones communicating through Skinny Client Control Protocol (SCCP) and SIP. As service providers realize their ambition to carefully migrate to an all-IP architecture, the Cisco PGW 2200 provides a unique, proven platform capable of TDM and PSTN interoperability and ready to be repositioned and move forward as part of an NGN IMS or TISPAN distributed network architecture.

Cisco PGW 2200 Summary

Cisco's industry-leading support for comprehensive SIP, PSTN, PBX, H.323, and Intelligent Network protocols, and its patented universal call model, have resulted in a world-class design with a rich feature set to enable creation of next-generation networks and services. The unique capabilities, proven interoperability, and strong record of performance of the Cisco PGW 2200, as well as Cisco's VoIP expertise and strong support infrastructure, are critical strengths to help ensure that Cisco PGW 2200 deployments can provide an excellent softswitch solution.

Technical Summary

Tables 1 through 4 give features and technical information about the Cisco PGW 2200 Protocol Gateway.

Table 1. Key Features

Feature	Description	Benefits
Enhanced SIP support	An extensive SIP feature set includes B2BUA mode, either transparent in a trusted environment or Full with Topology hiding in a non-trusted environment. Midcall services are fully integrated between SIP and other protocols, performance and network congestion handling (for example, reconfigurable transmissions), and enhanced SIP services interworking to all protocols, including H.323. For SIP interconnections SIP-I is available along with the ability to choose the transport UDP/TCP dynamically, for greater resilience. Support for either Strict or Loose routing is provided.	This support offers interoperability with a range of SIP endpoints and other SIP entities in SIP and mixed networks.
All-IP architecture	All hardware can be geographically distributed and is fully redundant.	This architecture offers redundancy and graceful scalability across sites.
Multiprotocol support	Call handling and supplementary services are supported for any-to-any protocol, not limited to SIP-SIP.	Features can interwork across different networks and can be migrated easily as the network evolves.
Interconnection capability	The Cisco PGW 2200 offers immediate interconnection to public and private, circuit, and packet networks worldwide, according to ITU-T, ETSI, ANSI, IETF, TISPAN, and Third-Generation Partnership Project (3GPP) specifications.	A wealth of knowledge and interconnection history allows the Cisco PGW 2200 to operate in many countries.
Advanced routing and analysis	The Cisco PGW 2200 offers an extensive feature list, available from Cisco. Examples include service and policy creation based on Time-of-Day Routing for network usage optimization, call limiting for class of service to carriers, decision making based on Calling Party Number (CGPN) or SIP Source user and domain/Called Party Number (CDPN) or SIP Destination user and domain, release cause code and other parameters, digit and parameter modification such as Nature of Address (NOA), codec preferred routing, overload and congestion procedures, and digit buffering for international gateways. Full number translations based on longest match provide for rapidly modifying CGPN/CDPN or redirecting numbers. Trunk-group properties can be configured in Extensible Markup Language (XML) format for ease of maintenance.	The wide feature set allows for flexibility in many critical areas of operation. Features can be configured within the real-time database, allowing changes to be updated and deployed rapidly.

Feature	Description	Benefits
Onboard, real-time database	Many tables, such as a number portability table, are possible to support analysis functionality. Current maximum number of entries is 70 million.	Allows the Cisco PGW 2200 to be a single-device solution offering all forms of call screening and routing.
Distributed Session Border Controller (SBC) functionality	The Cisco PGW 2200 can operate as a Signaling Border Element (SBE) within a distributed SBC architecture.	The Cisco PGW 2200 supports protocol interworking and provides centralized analysis and routing as well as carrier-class billing capability. It can be placed neatly within an IMS/TISPAN architecture supporting both PSTN and VoIP traffic simultaneously.
Enterprise and call center capability	A range of features such as blind and consultative call take-back and transfer are provided.	The Cisco PGW 2200 can be used for multitenant hosted services. In the small configuration the Cisco PGW 2200 is also suitable for enterprise-managed applications.
Application-layer integration	The Cisco PGW 2200 supports the following protocols: SIP, Signaling System 7 (SS7) INAP, ANSI AIN, and Domain Name System (DNS). E.164 Number Mapping (ENUM) is a planned item.	The IP and PSTN capabilities allow for comprehensive compatibility when deploying services.
Midcall triggering	This feature supports extensive events, for example SIP REFER, dual-tone multifrequency (DTMF), and QSIG Facility support.	Services can be active and benefit from user and network input during the call.
Video call support	The Cisco PGW 2200 supports video codecs to enable video call handling in addition to audio call handling	Enables Cisco PGW 2200 to inter-operate and support TelePresence solutions as well as other voice/video solutions. This feature becomes available June 2009.
Network management	Cisco MGC Node Manager (MNM) monitors multiple Cisco PGW 2200 nodes and allows for graphical configuration, monitoring, and generating reports and displays. Command-line interface (CLI) support is also available, in addition to support for SNMP and RADIUS. Database modifications require no downtime.	The Cisco PGW 2200 provides for simple integration into existing management tools and portals as well as ready-to-use text and graphical interfaces.
Billing	The Cisco PGW 2200 collects and stores CDR information. For offline processing and interrogation of this data, the Cisco Billing and Measurements Server can be used in conjunction with the Cisco PGW 2200. The server collects, formats, and stores billing and measurements data from the Cisco PGW 2200. The formatted data can then be processed by a billing system and other measurement collection and reporting systems.	Comprehensive billing and measurements information is collected on the Cisco PGW 2200 and there is an option to use the billing and measurements server to save and allow management of this data.
Lawful Intercept	The Cisco PGW 2200 has been tested with mediation devices from multiple vendors, using the Cisco Service Independent Intercept (SII) architecture.	The mediation devices allow for immediate Lawful Intercept connection between the Cisco PGW 2200 and many country-specific mediation interfaces worldwide.

Table 2. Protocol Support

Protocol Family	Description	Benefits
SIP	• SIP, RFCs 2543 and 3261 • RFC 3261 Strict and Loose Routing • SIP-GTD (Generic Type Descriptor, 98-percent compatible with ITU-T Q.1980.1, Narrowband Signaling Syntax) • RFC 3204, MIME media types for ISUP (SIP-T) • RFC 2782 DNS SRV • RFC 2976 SIP INFO • RFC 3262 Reliability of provisional responses • RFC 3311, SIP UPDATE • RFC 3323, SIP Privacy: id • Q.1912.5, SIP P-Asserted-Identity • draft-ietf-sip-privacy-04 Remote Party ID • Q.1912.5 ITU ISUP SIP/SIP-I interworking • RFC 3455, P-Headers (for 3GPP IMS) • RFC 3515, SIP REFER • RFC 3892 SIP Referred by mechanism • draft-levy-sip-diversion-08 SIP Diversion header • SDP RFCs 2327, 3264, and 4566 • RFC 4028 Session timing • SIP-I: Q.1912.5 (03/2004), “Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control Protocol (BICC) or ISDN User Part (ISUP) (doesn’t support BICC) • RFC 2915 & 3263 DNS NAPTR • RFC3326, SIP Reason Header Field • RFC-3265, SIP telephone Event Notification (In-dialog SUBSCRIBE) • draft-Mahy-sip-signaled-digits-00 (for application/dtmf-relay)	Allows for the creation of industry-standard SIP networks and enables a high level of compatibility interfacing into SIP networks from multiple vendors
H.323	• H.323 Versions 2 and 4 (H.225 and H.245) • H.323 Annex M.1 • H.246 Annex C • H.323 encoding of G.726 Annex B • Non RAS Mode	ITU standards-based VoIP communications with proven interoperability with a large range of H.323 endpoints and strong interworking capabilities to SIP and PSTN networks; Annex M.1 can allow for complete interworking of services between TDM PBXs and IP communications, such as Cisco Unified Communications Manager
Gateway control	• IETF MGCP (RFC 3435) • H.248.1 Version 2 available in Q3 2007, including H.248.4, 8, 10, 14, and 37	Standards-based communication to gateways for media connection and border control functions
Enterprise	• ITU-T Q.931 Digital Subscriber Signaling System Number 1 (DSS1) • AT&T 41459 ISDN PRI • ETSI ISDN PRI ETS 300 102 • ETSI/ECMA QSIG EN 300 172 and related supplementary services • BTNR 188 DPNSS 1 and ND1301:2001/03	Protocol and service interworking support for connection to corporate voice networks worldwide
SS7	• ITU-T ISUP Q.761-764, Q.767, ETSI ISUP V1-V2-V3, BTNR TUP/IUP, and ANSI ISUP (90+ country variants) • ITU-T TUP Q.721 • ITU-T INAP CS-1 and Q.121X • ITU-T TCAP Q.771-774 • ITU-T SCCP Q.711-714 • ANSI AIN 0.1 (T1.667), Transactional Capabilities Application Part (TCAP), and SCCP	World-class SS7 support, including feature interworking to any protocol, IP, and PSTN

Protocol Family	Description	Benefits
Signaling backhaul	• Backhaul Session Management (BSM) over Reliable User Datagram Protocol (RUDP) (draft-ietf-sigtran-reliable-udp-00.txt) for DSS1 or QSIG Facility/Non-Facility Associated Signaling (FAS/NFAS) • Extended ISDN User Part (EISUP) over RUDP (inter-PGW) • SIGTRAN MTP3 User Adaptation (M3UA) (RFC 3332) over Stream Control Transmission Protocol (SCTP) (RFC 2960) (ISUP) • SIGTRAN M3UA (RFC 3332) over SCTP over IP (TCAP/SCCP) • SIGTRAN SUA (RFC 3868) over SCTP (TCAP/SCCP) • SIGTRAN IUA (RFC 3057) over SCTP (DSS1 or QSIG)	Cisco pioneered, reliable, fully redundant carrier-grade signaling backhaul using standards-based protocols
Other IP interfaces	• DNS • Secure File Transfer Protocol (SFTP) • Secure Shell (SSH) Protocol • SNMP • RADIUS • HTTP	Standard interfaces for compatibility, hardened and tested for vulnerability prevention

Table 3. Hardware Support

Device Type	Supported Hardware	Benefits
Signaling gateways	• Cisco IP Transfer Point (ITP) implemented on the Cisco 2811 IP Transfer Point LinkExtender (ITP-L). Cisco 7204, 7206, 7301, and 7600 Series. Also available on the Cisco 2651XM Series (end of sale), and the Cisco 7500 Series (end of sale) • Cisco Signaling Link Terminal (SLT) on the Cisco 2611XM (2 link) and Cisco 2651XM (4 link) (both end-of-sale products) • Cisco Integrated SLT on Cisco AS5350 (end of sale), and Cisco AS5350XM, AS5400HPX (end of sale), and AS5400XM	To support the widest range of requirements, a large family of signaling backhaul support is available, from integrated functions within the media gateway to the equally cost-effective ITP-L and the higher-performance Cisco ITP.
Media gateways	• Cisco AS5350, AS5350XM, AS5400HPX, and AS5400XM Universal Gateways • Cisco MGX 8880 (Media Gateway Control Protocol [MGCP] and Trunking Gateway Control Protocol [TGCP]); H.248 support for voice interworking services module (VISM-PR) and voice switch services module (VXSM) • Cisco 1700, 2600, 2700, and 3700 Series access routers • Cisco 2800 and 3800 Series Integrated Services Routers	The Cisco universal gateways or integrated services routers can be used for many networks, including hosted solutions, and the larger Cisco MGX Family gateways can be used for high-density TDM and VoIP traffic. A single Cisco PGW 2200 can support 1000 gateways for expansion.
DBE gateways	• Cisco 7600, ASR 1000 Series and MGX VXSM	These are the gateway DBEs that have been validated with the Cisco PGW 2200 as SBEs so far. Note that the MGX VXSM will be used where transcoding is required.
Cisco PGW 2200 hardware platforms	• Sun Netra X4200M2 • Sun Fire X4600M2 • Sun Netra 210, Netra 240, Netra 440, and Sun Fire V120 and V210 (all end of sale)	The highly cost-effective carrier-grade Sun Netra X4200 is ideal for many networks. The Sun Netra 440 and X4600 are capable of higher throughput.

Table 4. Configuration Metrics

Device Type	Sizing Information per Cisco PGW 2200	Benefits
Signaling gateways	Up to 96 signaling gateways (M3UA), 8 through SCCP User Adaptation (SUA); up to 1536 M3UA signaling paths	Graceful scaling of signaling interfaces
Media gateways	Up to 1000 media gateways (MGCP), 150 (ISDN/QSIG) or 256 (NAS for dialup access)	Graceful scaling of VoIP and PSTN network size
SS7 point codes	Up to 1536 destination point codes (DPCs), 6 originating point codes (OPCs), and 8 capability point codes per OPC	Large number of OPCs and DPCs possible, for the greatest flexibility in PSTN interconnection

Product Migration Options

The recommended Cisco PGW 2200 release for existing deployments and all new networks is Release 9.8(1), which is now available. Release 9.8(1) is compatible with earlier releases.

For More Information

For more information about the Cisco PGW 2200, visit http://www.cisco.com/en/US/products/hw/vcallcon/ps2027/index.html or contact your local Cisco account representative.

For more information about the Cisco End-of-Life Policy, go to: http://www.cisco.com/en/US/products/prod_end_of_life.html

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