


Cisco 3660 Voice Gateway



A natural extension of Cisco Systems IP networking expertise, the Cisco 3660 Voice Gateway relays high quality voice and fax traffic across an IP Network. When equipped with digital T1/E1 packet voice trunk network modules and voice-enabled Cisco IOS® software, the Cisco 3660 supports carrier-class Voice over IP (VoIP) and fax over IP services.

Cisco IOS software offers a powerful array of quality-of-service (QoS) mechanisms, variable frame sizing, and standards-based H.323 controls, which provide industry-leading voice quality and call control routing to deliver enhanced services.

In addition to being H.323 and NEBS Level 3 compliant, the Cisco 3660 Voice Gateway supports a family of industry-standard voice CODECs and provides echo cancellation and voice activity detection (VAD)/silence suppression. It offers an integrated interactive voice response (IVR) solution that provides voice-prompts and digit collection in order to authenticate the user and identify the call destination. Users can readily interface with Public Switched Telephone Network (PSTN) digital switches or private branch exchanges (PBXs), and existing Remote Access Dial-In User Service (RADIUS) authentication and billing servers.

The Cisco 3660 Voice Gateway's Digital T1/E1 Packet Voice Trunk Network Modules ensure predictable, real-time voice processing. The Cisco 3660 Voice Gateway can accept 6 Digital T1/E1 Packet Voice Trunk Network Modules, allowing it to scale up to 360 voice connections within a single chassis.

Figure 1 The Cisco 3660 Voice Gateway





Cisco 3660 Voice Gateway High-Level Overview

The Cisco 3660 Voice Gateway: a high performance, high-density, feature rich solution for service providers.

Feature	Details
Performance	100-120 Kpps
Chassis Slots	6
Digital Voice Ports	Medium complexity Codecs: 360 (E1)/288 (T1) High-complexity Codecs: 180 (E1)/144 (T1)
Analog Voice Ports	24
Sync Ports	48
LAN Ports (Integrated)	1 or 2 10/100 Ethernet 2 Advanced Integration Module (AIM) slots
High Availability	Dual Power Supplies Hot-swap Network Modules
Optional Uplinks	OC3, DS3, HSSI
Compliance	NEBS Level 3/ETSI
Dimension (WxHxD)	Meets 12 inch / 300 mm depth requirement 8.7 x 17.5 x 11.8 (in) 221 x 445 x 300 (mm)

Cisco Voice Gateway Products Summary

Number of Voice Ports	Recommended Cisco Packet Telephony Gateway-Enabled Product
Up to 2520	Cisco AccessPath VS3 digital T1/E1 interfaces
Up to 360	Cisco 3660 Voice Gateway digital T1/E1 interfaces
Up to 120	Cisco AS5300 digital T1/E1 interfaces

Voice Gateway Solutions and Applications

International Wholesale Long Distance
Long distance phone-to-phone or fax-to-fax calls over a data network instead of the PSTN.

Debit/Prepaid Calling

A high-margin service, often serving alternate markets while allowing the provider to avoid consumer credit risk and increase their value-added service offerings by using these services.

Open Settlement Protocol:

Service providers can employ reliable third parties to handle VoIP call termination while leveraging the bandwidth efficiencies and tariff arbitrage advantages inherent in IP.

Click-to-Dial

Enables online shoppers to immediately access a sales agent during a purchase transaction. The online shopper and the sales agent can view the web page at the same time. Any questions are answered in real time and the purchase is made. Click-to-dial can be marketed by service providers similarly to 800 services, so that PC-to-sales agent calls can be reverse charged to the e-commerce company.

Unified Communication

Enables service providers to offer their customers consolidated voice, fax, and e-mail services on a single IP network, independent of location, time or device. Unlike traditional communications solutions, the Cisco strategy allows service providers to develop and market highly profitable, cost-effective services that build brand identity and increase customer loyalty while reducing churn.

Internet Call Waiting

Enables the use of a single phone line for both voice calls and access. This service offers an effective solution for consumers and businesses with limited lines for dial-up and phone service.

Store-and-Forward Fax

Enables service providers to transmit and receive faxes across packet-based networks without the timeout restrictions imposed by real-time fax transport methods. This enables their customers to be able to send and receive faxes to and from Group 3 fax devices; receive faxes that will be delivered as e-mail attachments; and create and send a standard e-mail message that will be delivered as a fax to a standard Group 3 fax device.



Cisco 3660 Voice Gateway Features and Benefits

Feature	Benefit
Digital Interfaces (T1/E1 PRI)	This feature enables higher port densities for increased scalability.
H.323 Compatibility	The Cisco 3660 Voice Gateway interoperates with H.323-compliant voice and videoconferencing applications such as Microsoft NetMeeting, as well as third-party H.323-compliant gateways and gatekeepers.
High-Performance Digital Signal Processors (DSPs)	High-performance (100 mips) DSPs have plenty of horsepower to support the full range of available high-compression/low-delay CODECs, including G.711, G.729, G.729a, and G.723.1. The DSPs fully support integrated echo cancellation, voice activity detection, silences suppression, jitter buffering, and comfort noise generation to ensure uniform, high-quality voice conversations. Full coverage for all voice channels is provided.
Low-Latency Design	The Cisco 3660 Voice Gateway is designed for minimal latency, which is essential for high-quality voice and fax traffic.
Multiclass, Multilink Point-to-Point Protocol (PPP) Fragmentation and Interleaving	This feature reduces large data packets into small packets, prevents voice packets from being stuck behind large packets, and reduces latency.
Cisco Voice Manager (CVM)	CVM is a configuration, monitoring, and reporting application for packet telephony gateway networks. It provides call history reports, call volume reports, and quality of voice exception reports using the ITU-T G.113 specification for voice quality. This Java application runs on Windows NT or Solaris.
High Performance Co-Processor Design	This is a highly integrated single-device solution that minimizes packet latency, essential for high-quality voice. PC-based solutions using loosely coupled components cannot achieve the same performance characteristics.
Modular Architecture	The system provides flexibility and investment protection. The Cisco 3660 Voice Gateway's modular design allows for scaling from 24 to 360 voice channels.
Compatible with Existing Phones, Faxes, PBXs, and Key Systems	This feature provides a standard interface to your existing telephony equipment. Users continue to use familiar equipment, with no special adaptation or retraining.
Real-Time CODEC Selection	This sophisticated DSP architecture supports simultaneous H.323 capability negotiation on all channels. The Cisco 3660 Voice Gateway's digital T1/E1 packet voice trunk network modules load the appropriate voice or fax CODEC on the fly for all channels, simultaneously if necessary.
E.165 Echo Cancellation	This feature provides echo cancellation into the circuit-switched network with a tail of up to 32 mbps, more than adequate to support carrier quality.
Adaptive Jitter Buffering	Adaptive jitter buffer intelligently balances delay and packet loss through the gateway for maximum call clarity and quality.
Voice Activity Detection (silence suppression)	Bandwidth on the packet network is used only when someone is speaking. During silent periods of a phone call (up to 50 percent of the time), bandwidth is available for data traffic.
Front-End Clipping (Time Before Speech Activity is Detected After a Period of Silence)	0 mbps
Hang-Over Time (Maximum Time Before Silence is Recognized After a Period of Speech)	200 mbps



Cisco 3660 Voice Gateway Features and Benefits (Continued)

Feature	Benefit
Comfort Noise Regeneration	To better simulate phone calls over voice networks, this feature reassures the phone user that the connection is being maintained, even when no voice conversation is in progress.
Voice Quality Statistics	Call parameters used for the ITU-T G.113 recommendation for voice quality impairment calculations are supplied. These include CODEC type, bandwidth used, end-to-end delay, circuit noise, loudness, echo, packet loss, and other statistics.
ITU Standard CODECs G.711, G.729, G.729a, and G.723.1	These standards-based compression technologies allow for high-quality voice and compression as low as 53 kbps to minimize bandwidth required to transmit packet telephony.
Dial Plan Mapping	This feature entails mapping of dialed phone numbers to IP addresses. Mapping can be programmed directly in the Cisco 3660 Voice Gateway or alternately maintained in H.323 gatekeepers that communicate to multiple gateways via H.323 registration, admission, and status (RAS) messages.
Number Expansion	This feature enables speed dialing and simplifies dial plan configuration. It expands all numbers matching a defined pattern, so you need to configure and dial only the last few significant digits of the number.
Direct Inward Dial	Direct Inward dial allows direct dialing of each user sitting behind a PBX; there is no need to dial the main number and then dial an extension. This feature is also useful in service provider applications with a VCO/4K used as a service node.
Secondary Dial Tone	This feature allows explicit access to a VoIP network for two-stage calling implementation. The first dial tone is generated by the local phone company and the second dial tone, or prompt, is generated by the VoIP carrier.
Call Progress and Tone Generation	This feature generates call progress tones, including dial, busy, ring-back, and congestion tones, with local country variants.
Dual Tone Multifrequency (DTMF) Transport	This feature enables the use of touch tones for voice-mail applications and IVR systems; it also supports out-of-band DTMF relay when high-compression CODECs such as G.723.1 are used, which may corrupt inband DTMF tones.
Fax Autodetect	Any port can accept a fax relay call; the port is automatically reconfigured when an incoming fax call is detected. A scalable design gives the Cisco 3660 Voice Gateway the unique ability to reload all fax algorithms simultaneously, meeting the stringent timing requirements of legacy fax machines.
-law and A-law Encoding on Any Channel	This feature facilitates international calling by transparently transcoding between -law encoding (used in T1 countries) and a-law (used in E1 countries).
Music on Hold Threshold	This feature offers intelligent music on hold handling.



Quality of Service

Service providers are deploying worldwide toll-quality VoIP networks. Cisco voice technology maintains carrier-quality communications in the face of most adverse network conditions, including packet delay and packet loss. Both packet loss and packet delay can have a significant adverse impact on speech quality.

The high-performance voice coprocessor design of Cisco voice gateways minimizes delay and packet loss during the voice encoding and packetization process. Cisco QoS

features—including IP Precedence, Resource Reservation Protocol (RSVP), Weighted Fair Queuing (WFQ), Weighted Random Early Detection (WRED), and Multiclass Multilink PPP (MP) fragmentation and interleaving—implemented on both the voice gateways and backbone routing infrastructure, can provide a low-latency, high-reliability path for sensitive voice traffic through today's networks.

Cisco IOS Software and Quality of Service Features and Benefits Summary

Feature	Benefit
IP Precedence	The Type of Service (ToS) field in an IP header provides three settable precedence bits. Voice traffic should be configured with IP precedence of 5. This capability allows the network to prioritize voice packets above other traffic, thereby assuring highest voice quality over congested network.
Queuing Mechanisms	Queuing mechanisms include WFQ, priority queuing and custom queuing. These are configurable Cisco IOS software capabilities that reserve appropriate bandwidth and prioritize voice and fax traffic to ensure transparent delivery of toll-quality voice and fax.
Committed Access Rate (CAR)	The CAR feature performs both packet classification and bandwidth management functionality. The packet classification features let users partition network traffic into multiple priority levels or classes of service (CoSs). The network operator can define up to six CoSs using the three precedence bits in the ToS field in the IP header. The operator can then use the other QoS features to assign appropriate traffic-handling policies, including congestion management, bandwidth allocation, and delay bounds for each traffic class.
Weighted Random Early Detection (WRED)	WRED features provide network operators with powerful congestion-control capabilities designed to provide preferential treatment for premium-class traffic under congestion situations while concurrently maximizing network throughput and capacity utilization and minimizing packet loss and delay.
Resource Reservation Protocol (RSVP)	RSVP allows Cisco voice gateway to request/ reserve required bandwidth for a call.



Cisco 3660 Voice Gateway Specifications

Feature	Specifications
Processor Type	225-MHz RISC QED RM5271
Flash Memory	16 MB, upgradable to 64MB
System Memory	32 MB SDRAM, upgradable to 64, 128, or 256 MB SDRAM
Network Module Slots	Six slots
Advanced Integration Module Slots	Two slots
Onboard LAN Ports	Two autosensing 10/100 Mbps ports
Power	250W power supplies with dual DC, dual AC, or single DC/single AC configuration
Performance	100 to 120-Kpps fast switching and 10 to 12 Kpps process switching
Console and Auxiliary Ports (up to 115.2 kbps)	Yes
Rack-Mounting	Yes, 19 in. and 23 in. widths, center mount
Dual Type II PCMCIA Card Slots	Yes
Dimensions	8.7 x 17.5 x 11.8 in. (221 x 445 x 300 mm)
Weight	32 LB (14.55 kg) (min.) 43 LB (19.55 kg) (max.)

Power Requirements

Output	250W max. per power supply
AC Input Voltage	100 to 240
Frequency	50 to 60 Hz
AC Input Current	4A at 100V or 2A at 200V
DC Input Voltage	-38V to -75V
DC Input Current	8A at -48V

Environmental Specifications

Operating Temperature	32 to 104 F (0 to 40 C)
Non-operating Temperature	-13 to 158 F (-25 to 70 C)
Relative Humidity	5 to 95 percent
Noise Level	(Maximum) 48 dbA
Regulatory Compliance	The Cisco 3660 Voice Gateway conforms to a number of different safety, EMI, immunity and network homologation standards. Details of the regulatory specifications can be found at http://www.cisco.com/public/Support_root.shtml .



Digital Packet Voice Network Modules

Module	Description	Minimum IOS Release
NM-HDV-1T1-24	Single-port, 24-channel T1 voice/fax Network Module (supports 24 channels of medium complexity VoCoders: G.729a/b, G.726, G.711 and fax or 12 channels of G.726, G.729, G.723.1, G.728, G.729a/b, G.711 and fax)	12.(2)XH and 12.1(3)T
NM-HDV-1T1-24E	Single-port, enhanced 24-channel T1 voice/fax Network Module (supports 24 channels of high and medium complexity VoCoders: G.729a/b, G.726, G.729, G.728, G.723.1, G.711 and fax)	12.(2)XH and 12.1(3)T
NM-HDV-2T1-48	Dual-port, 48-channel T1 voice/fax Network Module (supports 48 channels of medium complexity VoCoders: G.729a/b, G.726, G.711 and fax or 24 channels of G726, G729, G723.1, G.728, G729a/b, G711 and fax) Supports add/drop multiplexing (drop and insert)	12.(2)XH and 12.1(3)T
NM-HDV-1E1-30	Single-port, 30-channel E1 voice/fax Network Module (supports 30 channels of medium complexity VoCoders: G.729a/b, G.726, G.711 and fax or 12 channels of G.726, G.729, G.723.1, G.728, G.729a/b, G.711 and fax)	12.(2)XH and 12.1(3)T
NM-HDV-1E1-30E	Single-port, enhanced 30-channel E1 voice/fax Network Module (supports 30 channels of high and medium complexity VoCoders: G.729a/b, G.726, G.729, G.728, G.723.1, G.711 and fax)	12.(2)XH and 12.1(3)T
NM-HDV-2E1-60	Dual-port, 60-channel E1 voice/fax Network Module (supports 60 channels of medium complexity VoCoders: G.729a/b, G.726, G.711 and fax or 30 channels of G726, G729, G723.1, G.728, G729a/b, G711 and fax) Supports add/drop multiplexing (drop and insert)	12.(2)XH and 12.1(3)T

Fax Trunk Network Modules

Module	Description	Minimum IOS Release
NM-HDV=	High-density voice/fax Network Module spare	12.(2)XH and 12.1(3)T

Analog Packet Voice and Fax Trunk Network Modules

Module	Description	Minimum IOS Release
NM-2V	2-slot voice and fax network module	12.(2)XH and 12.1(3)T

Voice Interface Cards

Card	Description	Minimum IOS Release
VIC-2FXO	2-port voice interface card—FXO	12.(2)XH and 12.1(3)T
VIC-2E/M	2-port voice interface card—E&M	12.(2)XH and 12.1(3)T
VIC-2FXO-M3	2-port voice interface card—FXO (for Australia)	12.(2)XH and 12.1(3)T
VIC-2FXO-EU	2-port voice interface card—FXO (for Europe)	12.(2)XH and 12.1(3)T
VIC-2BRI-S/T-TE	2-port voice interface card—BRI (terminal)	12.(2)XH and 12.1(3)T

Ordering/Configuration Details

A typical configuration of a 3660 with 192/240 voice ports:

Quantity	Product
1	Cisco3661-AC (1 E/FE) or Cisco3662-AC (2 E/FE)
4*	NM-HDV-1E1-30E (60 voice ports) or NM-HDV-1T1-24E (48 voice ports)
1	8 to 32 MB Flash Memory Upgrade
1	32 to 256 MB DRAM upgrade
1	IP PLUS IOS Image

Note: *The 3660 can accommodate up to 6 NM-HDV-2E1-48 or NM-HDV-2E1-60s (with some additional memory requirements), which would result in 12 T1/E1s of voice port density using G.729a. Using G.729a (medium complexity) vs. G.729 (high complexity) provides twice the voice density with very similar Mean Opinion Scores (MOS), and G.729a and G.729 Codec-interworking is seamless.

Regulatory Compliance

The Cisco voice gateway conforms to a number of different safety, EMI, immunity, and network homologation standards.



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 Europe
11, Rue Camille Desmoulins
92782 Issy-les-Moulineaux
Cedex 9
France
www.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

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 Australia, Pty., Ltd
Level 9, 80 Pacific Highway
P.O. Box 469
North Sydney
NSW 2060 Australia
www.cisco.com
Tel: +61 2 8448 7100
Fax: +61 2 9957 4350

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