


G.shdsl WAN Interface Card for the Cisco 1700 Series



The Cisco 1700 Series with a single-pair high-bit-rate digital-subscriber-line (G.shdsl) WAN interface card (WIC) is the industry's first multiservice router to deliver business-class broadband service with scalable performance, flexibility, and security for small-medium businesses and small enterprise branch offices. Together with the integrated G.shdsl WIC (WIC-1SHDSL), the Cisco 1700 is the perfect solution for a variety of businesses that require high-speed business-class DSL access on a secure, high-performance modular platform. (See Figure 1.)

Figure 1 Single-Port G.shdsl WIC (WIC-1SHDSL)



Combined with the WIC-1SHDSL, the Cisco 1700 delivers cost-effective, high-speed, symmetrical bandwidth at a lower monthly cost than most traditional WAN circuits. This provides businesses with the necessary bandwidth for such critical traffic as voice and videoconferencing, and allows customers to take advantage of the cost savings of integrating voice and data traffic on the same WAN link. Service providers can benefit by offering differentiated service levels through service-level agreements (SLAs) at a more competitive price.

The G.shdsl standard (ITU G.991.2) represents the first DSL standard accepted worldwide and is the latest in DSL technology. The G.shdsl WIC is based on ITU recommendation G.991.2 and, therefore, allows for better interoperability with third-party vendors. For more information on G.shdsl technology and the Cisco suite of DSL products, see the following URL or contact your local representative:

<http://www.cisco.com/warp/public/779/servpro/solutions/dsl/gshdsl.html>

Feature Summary

The Cisco 1700 combined with the WIC-1SHDSL provides:

- Symmetrical WAN speeds (up to 2.3 Mbps) over a single copper pair
- Multiple G.shdsl WICs per Cisco 1700 chassis
- Support for voice over IP (VoIP) over DSL with IP quality of service (QoS)
- Support for IP QoS map to ATM class of service (CoS)
- Back-to-back operation or operation via DSL access multiplexer (DSLAM)
- Support for up to 23 virtual circuits per WIC

Key Benefits: Business Class DSL

Symmetrical, High-Speed, Cost-Effective Bandwidth

Based on the ITU G.991.2 global industry standard, the Cisco G.shdsl solution delivers symmetrical data rates from 192 kbps up to 2.3 Mbps. Speeds vary, depending on the loop length and line conditions. More traditional WAN links, such as leased-line and ISDN, provide similar service, but often at a much higher monthly cost. The G.shdsl WIC delivers symmetrical connectivity and provides the necessary bandwidth for business applications such as VoIP, videoconferencing, and toll bypass at a lower monthly charge.

The dual WAN ports on the Cisco 1700 Series platforms allow for flexibility in installing WAN access lines. Multiple G.shdsl WICs can be configured per router chassis to provide additional bandwidth through a second WAN link, and supply connectivity to additional sites or service providers. With the broad array of WICs available for the Cisco 1700 platform, flexible configurations, including asymmetric DSL (ADSL), dial, ISDN, E1/T1, and Frame Relay are also possible. Secondary WAN links can, therefore, be used to provide more available bandwidth or redundancy for mission-critical applications.

Business-Class Security

The Cisco 1700 can be optimized for virtual private networks (VPNs). VPNs allow for secure use of any shared network incorporating the same policies and levels of security and performance as a private network. The Cisco 1700 Series provides VPN security through optional hardware-based encrypted tunneling at Triple Digital Encryption Standard (3DES) IP Security (IPSec) speeds of up to wire speed (T1/E1). VPN capability over G.shdsl allows for secure access to corporate networks without the costs and limitations associated with point-to-point links.

In addition, the Cisco 1700 Series incorporates Cisco IOS[®] Firewall Technology (Cisco Secure Integrated Software) supporting stateful firewall and intrusion-detection functionality. With an always-on DSL connection, Internet security is a critical component in protecting corporate resources from malicious attacks.

Integrated Voice and Data over G.shdsl

Service providers increase revenue by building differentiated service options based on premium, standard, or best-effort service classes. This requires a QoS mechanism to differentiate service levels and prioritize traffic accordingly. The Cisco 1700 with G.shdsl WIC provides ATM CoS features that enable service providers to manage their core ATM network infrastructures and deliver scalable, cost-effective services with QoS guarantees to their customers. Permanent-virtual-circuit (PVC) traffic shaping and queuing allow further optimization of the existing bandwidth between customers and various services.



Many customers require IP QoS to differentiate between high- and low-priority traffic. The Cisco 1700 with G.shdsl WIC supports VoIP over DSL with IP QoS map to ATM CoS. These enhanced QoS features enable data and voice traffic to be transmitted on the same virtual circuit, thus allowing for further reduction of monthly recurring WAN charges.

Support for Analog and Digital Voice Interfaces

Cisco 175x (1750 and 1751) routers feature one voice-interface-card (VIC) slot and two WAN/voice-interface-card (WIC/VIC) slots. Cisco 1751 VICs include dual-port foreign exchange station (FXS), foreign exchange office (FXO), ear and mouth (E&M), and direct inward dial (DID), all of which provide the analog voice interface to legacy telephony equipment (phones, fax, private branch exchange [PBX], and key telephone system [KTS]) and the Public Switched Telephone Network (PSTN). It provides users a cost-effective way to migrate toward a packet-based multiservice infrastructure without deeming legacy telephony equipment obsolete. Cisco 1751 supports digital voice with dual-port ISDN Basic Rate Interface (BRI) NT/TE VIC (network and user-side Q.931 BRI). This enables users to easily connect ISDN PBXs and KTSs to a multiservice network with a minimum of configuration changes on the PBX. In addition, users can immediately take full advantage of multiservice capabilities, such as telephony toll-bypass applications and full gateway integration within Cisco AVVID (Architecture for Voice, Video and Integrated Data). The Cisco 1750 does not support digital voice interfaces (BRI) or analog DID, but does support the other voice interfaces referenced in this section.

Standards-Based Voice Technology

The voice functionality of the Cisco 1700 with the G.shdsl WIC, which is based on H.323 standards, enables third parties to develop applications to a standard protocol. This results in an ecosystem of compatible voice applications such as enhanced call control via gatekeepers, service billing, and network management. Such an ecosystem provides a complete solution for rapid deployment of intranet voice services for branch offices and enterprise teleworkers.

DSLAM Interoperability

The G.shdsl is based on the Globespan chipset and operates either back to back or connected to a Cisco 6160 and 6260 DSLAM. Interoperability testing with third-party vendors' DSLAMs is likely to be conducted on an ongoing basis. Additional information on this will be provided when testing is completed.

Customers can deploy G.shdsl WICs in a back-to-back configuration to take advantage of existing copper wiring in a building, campus, or neighborhood where DSLAM aggregation equipment is either not needed or not financially justified. In back-to-back mode, one side of the connection is configured in server mode and provides functionality similar to that of a DSLAM.

Quality of Service

IP QoS

The Cisco 1700 with the G.shdsl WIC supports the integration of voice and data over the same G.shdsl circuit using VoIP, thus allowing for further reduction of monthly recurring WAN charges. Enhanced QoS is offered through mapping of IP QoS to ATM CoS features. Table 1 lists the QoS features and their benefits.

Table 1 Features and Benefits of Cisco 1700 with G.shdsl WIC

Feature	Benefit
Low-Latency Queuing (LLQ), also called Priority Queuing/Class-Based Weighted Fair Queuing (PQ/CBWFQ)	Achieves low latency by classifying and prioritizing voice traffic over data
Differentiated Services	Classifies and marks high-priority traffic so that it receives the assigned QoS across the network
Multilink PPP (MLP) with Link Fragmentation and Interleaving (LFI)	Fragments larger data packets into smaller segments and interleaves voice packets to overcome serialization delays over a multilink interface
Committed Access Rate (CAR)	Provides bandwidth commitments and specifies policies for handling traffic that exceeds this bandwidth commitment
Weighted Random Early Detection (WRED)	Specifies policies for congestion management

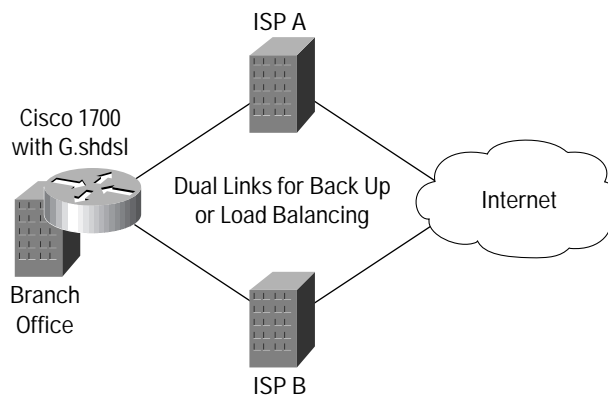
These features are supported on a per-virtual circuit basis (mixing of voice and data traffic) and supported on a virtual-circuit bundle in process/fast/Cisco Express Forwarding (CEF) switching modes for differentiated services (DiffServ) and CAR. MLP using LFI over ATM is supported on a single virtual circuit on the ATM interface, and in process and fast switching modes.

Managed Services/Applications

1. Managed Internet access
2. Managed VPN service
3. Managed VoIP service
4. Back-to-back deployment in a campus environment

Scenario 1—Managed Internet Access

Figure 2 Managed Internet Access with WAN Backup

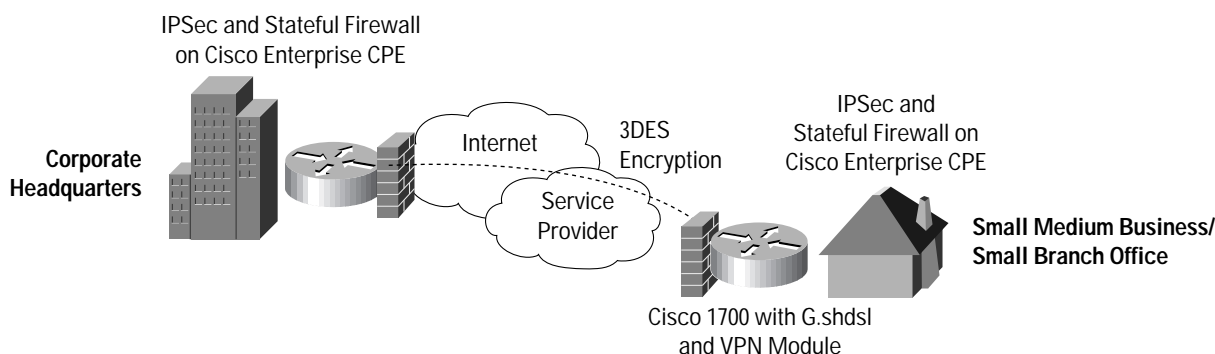


The modularity and flexibility of the Cisco 1700 Series with G.shdsl WIC is highlighted in Figure 2. Service providers can provide the end customer with a managed service using the G.shdsl as the primary WAN access using ISDN as a secondary line for backup. The customer also has the flexibility to select a second G.shdsl line using a different Internet service provider (ISP).



Scenario 2—Managed VPN Service over G.shdsl

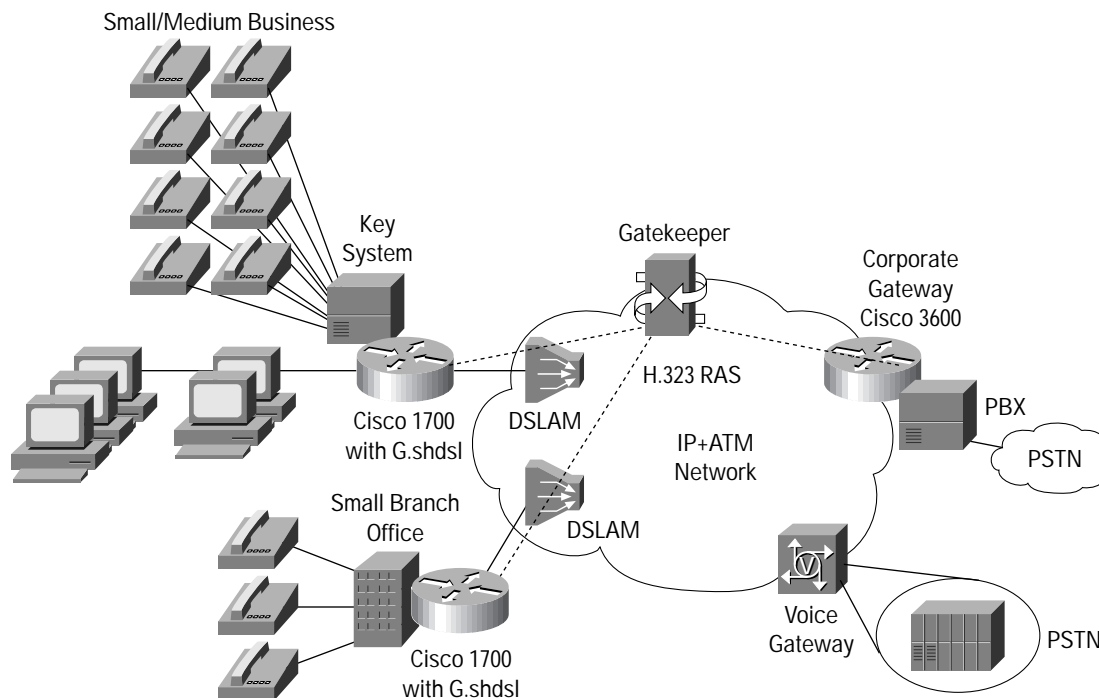
Figure 3 Secure VPN through the Internet over G.shdsl



Service providers can deliver a managed VPN service for business customers that takes advantage of the huge cost-saving opportunities of VPN technology by deploying VPNs over G.shdsl. Symmetrical bandwidth and high bit rates allow customers to deploy mission-critical applications to remote sites at an affordable cost without the fear of compromising data security. The Cisco 1700 G.shdsl solution, along with an optional hardware encryption module, can deliver hardware-encrypted data at wire speeds (T1/E1). VPN technology with IPSec 3DES combined with integrated Cisco IOS Firewall technology gives branch offices the added security needed for an “always-on” connection to the Internet.

Scenario 3—Managed VoIP Service

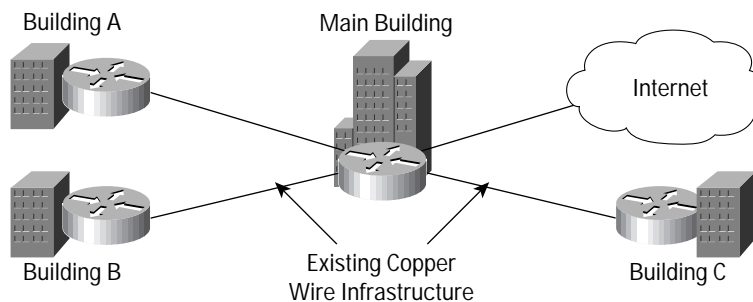
Figure 4 Intranet Toll-Quality Voice



Service providers can deliver a managed VoIP service to their customers by taking advantage of the Cisco 1700 combined with the WIC-1SHDSL. This solution enables interoffice voice calls to be sent across the DSL network and thus avoid the long-distance toll charges incurred from a long-distance carrier, local exchange carrier (LEC), or Post, Telephone, and Telegraph (PTT). Customers lease an ATM virtual circuit between one or multiple sites and use VoIP over DSL to pass intranet voice traffic between sites.

Scenario 4—Back-to-Back Deployment in a Campus Environment

Figure 5 Back-to-Back G.shdsl Deployment in a Campus Environment



Many businesses today require data and voice connectivity between multiple buildings in a campus environment. Often copper wire is the only means to interconnect each facility to the campus main building. G.shdsl technology allows customers to link up two Cisco 1700s with WIC-1SHDSL cards back to back over standard 26 AWG telephone wire and provide up to 2.3-Mbps WAN connectivity between the two facilities. This setup allows for the deployment of data, voice, and video over the existing copper wire infrastructure without a costly infrastructure upgrade. Multiple WIC-1SHDSL pairs can be used to allow for additional bandwidth between each facility.

G.shdsl WIC Business Class DSL Features and Benefits

Table 2 Features and Benefits Summary

Feature	Benefits
Flexibility	
Cisco IOS Software Support	<ul style="list-style-type: none"> Required (base IP/DSL image [‘y7’ image]); all Plus images also support DSL; a Plus image must be used for IP QoS map to ATM CoS features (enhanced QoS features) <p>Provides the industry’s most robust, scalable, and feature-rich internetworking software support using the accepted standard networking software for the Internet and private WANs. Is part of the Cisco end-to-end network solution (including multiprotocol routing [IP, Internetwork Packet Exchange (IPX), AppleTalk, IBM/ Systems Network Architecture (SNA)] and bridging).</p>
Integrated Voice and Data Networking	
Voice and Data Integration	<ul style="list-style-type: none"> Reduces long-distance toll charges by allowing the data network to carry interoffice voice and fax traffic Works with existing handsets, key units, and PBXs, eliminating the need for a costly phone-equipment upgrade Supports ATM CoS features Supports IP QoS features
Advanced QoS Features	<ul style="list-style-type: none"> Offers mapping of IP QoS to ATM CoS features Supports LLQ (PQ/CBWFQ), DiffServ, MLPPP with LFI, CAR, and WRED
Digital Voice Interfaces	<ul style="list-style-type: none"> Provide toll-quality, award-winning derived VoIP



Feature	Benefits
Standards-Based H.323 Signaling	<ul style="list-style-type: none">• Allows an ecosystem of third-party vendors to develop applications for a complete solution• Allows rapid low-cost deployment of VoIP
Digital Signal Processors (DSPs) and Voice-Compression Coders/Decoders (Codecs) G.711, G.729, G.729b, G.723.1, G.726	<ul style="list-style-type: none">• Provide hardware-based compressed voice to fit significantly more voice lines over a single copper pair without breaking the end-to-end delay budget
Modular Architecture	
Multiple WAN Slots	<ul style="list-style-type: none">• Supports flexible configurations, including WICs that support G.shdsl, ADSL, dial, ISDN, E1/T1, and Frame Relay
Support for VIC Slots	<ul style="list-style-type: none">• Offers added flexibility and investment protection
Multiple Platform Support	<ul style="list-style-type: none">• Supports G.shdsl WIC on Cisco 1720, 1750, and 1751 at FCS• Reduces cost of maintaining inventory• Lowers training costs for support personnel• Protects investments through reuse on various platforms
Security with VPN and Integrated Firewall	
IPSec 3DES Hardware-Based Encryption	<ul style="list-style-type: none">• Enables creation of VPNs by providing industry-standard data privacy, integrity, and authenticity as data traverses the Internet or a shared public network• Hardware-based VPN encryption performance at wire speed (T1/E1)
3DES IPSec, Generic Routing Encapsulation (GRE), Layer 2 Tunneling Protocol (L2TP), Layer 2 Forwarding (L2F)	<ul style="list-style-type: none">• Offers choice of standards-based tunneling methods to create VPNs for IP and non-IP traffic• Is fully interoperable with public certificate authorities and IPSec standards-based products• Is part of the scalable Cisco end-to-end VPN solution portfolio
Cisco Unity Client Support	<ul style="list-style-type: none">• Cisco 1700 Series Routers can terminate VPN tunnels initiated by the Unity Client
Cisco IOS Firewall Feature Set	<ul style="list-style-type: none">• (Cisco Secure Integrated Software) Includes context-based access control for dynamic firewall filtering, denial-of-service detection and prevention, Java blocking, and real-time alerts• Allows internal users to access the Internet with secure, per-application-based, dynamic access control while preventing unauthorized Internet users from accessing the internal LAN
Network/Port Address Translation (NAT/PAT)	<ul style="list-style-type: none">• Hides internal IP addresses from external networks• Prevents certain denial-of-service attacks from outside networks on internal hosts• Allows multiple users access via a single IP address
Password/Challenge Handshake Authentication Protocol (PAP/CHAP), MS-CHAP, Remote Access Dial-In User Service (RADIUS), TACACS+	<ul style="list-style-type: none">• Supports all leading user identity-verification schemes
Route and Router Authentication	<ul style="list-style-type: none">• Accepts routing-table updates from only known routers, ensuring that no corrupt information from unknown sources is received
Internet Key Exchange (IKE), X.509v3 Digital Certification	<ul style="list-style-type: none">• Ensures proper identity and authenticity of devices and data• Enables scalability to very large IPSec networks through automated key management• Offers support for Certificate Enrollment Protocol (CEP) with certification authorities (CAs) such as Verisign and Entrust
ATM Features	
ATM Traffic Unspecified Bit Rate (UBR), Non-Real Time Variable Bit Rate (VBRnrt), Real-Time VBR (VBRrt), and Constant Bit Rate (CBR) with Traffic Shaping	<ul style="list-style-type: none">• Ensures CoS guarantees for real-time traffic, with ability to send traffic over the appropriate virtual circuit to provide ATM-level shaping and ensure that no head-of-line blocking can happen between circuits of different or equal traffic classes

Feature	Benefits
Up to 23 Virtual Circuits per WIC	<ul style="list-style-type: none"> Enables more sessions at a time; relevant for small and medium-sized businesses and small branch offices with 50–200 employees
Point-to-Point Protocol (PPP) over ATM	<ul style="list-style-type: none"> Ensures compatibility with existing network
PPP over Ethernet Client	<ul style="list-style-type: none"> Meets service-provider requirements and eliminates the need for additional network software on LAN-connected client PCs
RFC 1483	<ul style="list-style-type: none"> Supports RFC 1483
Device Integration	
Integrated Router, Voice Gateway, Firewall, Encryption, VPN Tunnel Server, Data/Channel Service Unit (DSU/CSU), and NT1 in a single device	<ul style="list-style-type: none"> Reduces costs and simplifies management

G.shdsl WIC Business Class DSL Feature Highlights

Scalable Bandwidth

- Delivers from 192 kbps to 2.3 Mbps bandwidth (symmetrical)
- Rate adaptable using G.hs (handshake)—automatically selects optimal speed setting

Longer Reach Than Other DSL Technologies

- Provides 2.3 Mbps at up to 11,000 feet on 26 AWG (subject to line conditions)
- Operates at distances up to 22,000 feet
- Repeatable for even greater distances
- Spectral “friendly” technology gives less interference with other transmission technologies

Voice Support

- Support for VoIP over DSL with QoS using H.323 signaling

Cisco IOS Software and Platform Support

- First supported in Cisco IOS Software Release 12.2(4)XL
- Supported on Cisco 1720, 1750, 1751 at FCS
- Functions in built-in VIC/WIC slots

Country Support

- Complies with ITU G.991.2 standard
- Worldwide-accepted technology

See the following URL or contact your local Cisco representative for country-specific approval status:

http://www.cisco.com/cgi-bin/compliance/approvals_search.pl

Memory and Software Requirements (Recommendation for 12.2(4)XL)

A base IP/DSL image can be used to run the G.shdsl WIC on the Cisco 1700 platforms at a minimum. In addition to the base IP/DSL image, the DSL feature (‘y7’ image) is also available in all Plus images. In order to run the enhanced QoS features, a Plus image is required.



Table 3 Memory and Software Image Requirements

Product Number	Image Name	Software Image	Flash	DRAM
S17C-12204XL	c1700-y-mz	Cisco 1700 IOS IP	8 MB	32 MB
S17C7-12204XL	c1700-y7-mz	Cisco 1700 IOS IP/DSL	8 MB	32 MB
S17C7P-12204XL	c1700-sy7-mz	Cisco 1700 IOS IP/DSL Plus	8 MB	32 MB
S17C7K8-12204XL	c1700-k8sy7-mz	Cisco 1700 IOS IP/DSL Plus IPsec 56	8 MB	32 MB
S17C7K9-12204XL	c1700-k9sy7-mz	Cisco 1700 IOS IP/DSL Plus IPsec 3DES	16 MB	48 MB
S17CH-12204XL	c1700-o3y-mz	Cisco 1700 IOS IP/FW/IDS	8 MB	32 MB
S17C7HK8-12204XL	c1700-k8o3sy7-mz	Cisco 1700 IOS IP/DSL/FW/IDS Plus IPsec 56	8 MB	32 MB
S17B-12204XL	c1700-ny-mz	Cisco 1700 IOS IP/IPX	8 MB	32 MB
S17B7HP-12204XL	c1700-no3sy7-mz	Cisco 1700 IOS IP/DSL/IPX/FW/IDS Plus	16 MB	48 MB
S17Q-12204XL	c1700-bnr2y-mz	Cisco 1700 IOS IP/IPX/AT/IBM	8 MB	32 MB
S17Q7P-12204XL	c1700-bnr2sy7-mz	Cisco 1700 IOS IP/DSL/IPX/AT/IBM Plus	16 MB	48 MB
S17Q7HK8-12204XL	c1700-bk8no3r2sy7-mz	Cisco 1700 IOS IP/DSL/IPX/AT/IBM/FW/IDS Plus IPsec 56	16 MB	48 MB
S17Q7HK9-12204XL	c1700-bk9no3r2sy7-mz	Cisco 1700 IOS IP/DSL/IPX/AT/IBM/FW/IDS Plus IPsec 3DES	16 MB	48 MB
S17C7HK9-12204XL	c1700-k9o3sy7-mz	Cisco 1700 IOS IP/DSL/FW/IDS Plus IPsec 3DES	16 MB	48 MB
S17CVP-12204XL	c1700-sv3y-mz	Cisco 1700 IOS IP/Voice Plus	16 MB	48 MB
S17C7VP-12204XL	c1700-sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice Plus	16 MB	48 MB
S17C7HV-12204XL	c1700-o3sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice/FW/IDS Plus	16 MB	48 MB
S17B7HPV-12204XL	c1700-no3sv3y7-mz	Cisco 1700 IOS IP/DSL/IPX/Voice/FW/IDS Plus	16 MB	48 MB
S17C7VK8-12204XL	c1700-k8sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice Plus IPsec 56	16 MB	48 MB
S17C7VK9-12204XL	c1700-k9sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice Plus IPsec 3DES	16 MB	48 MB
S17C7HVK8-12204XL	c1700-k8o3sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice/FW/IDS Plus IPsec 56	16 MB	48 MB
S17C7HVK9-12204XL	c1700-k9o3sv3y7-mz	Cisco 1700 IOS IP/DSL/Voice/FW/IDS Plus IPsec 3DES	16 MB	48 MB
S17Q7HVK8-12204XL	c1700-bk8no3r2sv3y7-mz	Cisco 1700 IOS IP/DSL/IPX/AT/IBM/Voice/FW/IDS Plus IPsec 56	32 MB	64 MB
S17Q7HVK9-12204XL	c1700-bk9no3r2sv3y7-mz	Cisco 1700 IOS IP/DSL/IPX/AT/IBM/Voice/FW/IDS Plus IPsec 3DES	32 MB	64 MB

Product Number and Ordering Information

Table 4 Cisco Product Numbers and Descriptions

Product Number	Description
CISCO1720-SHDSL	Cisco 1720 bundle with G.shdsl WIC, IP/DSL image, 8-MB Flash, 32-MB DRAM
WIC-1SHDSL=	One-port G.shdsl WIC

The Cisco 1750 and 1751 can be configured with the G.shdsl WIC.

Hardware Specifications

Table 5 Hardware Specifications

G.shdsl Chipset	Globespan Chipset
Dimensions (H x W x D)	0.75 x 3.08 x 4.38 in. (1.91 x 6.93 x 9.86 cm)
Weight	2.4 oz (68 gram)
LEDs	CD (Carrier Detect) LP (Loopback) OK (DLSAR download complete)
Ports	Single RJ-11 connector
Cabbling	RJ-11 line cord (included)

Cisco 1700 Platform-Specific Technical Specifications

Refer to the Cisco 1700 data sheets for additional information on mechanical, environmental, and agency certifications. See the following URLs for Cisco 1700 data sheets:

For the Cisco 1720 data sheet and technical specifications, refer to the following URL:

http://www.cisco.com/warp/public/cc/pd/rt/1700/prodlit/1720_ds.htm

For the Cisco 1750 data sheet and technical specifications, refer to the following URL:

http://www.cisco.com/warp/public/cc/pd/rt/1700/prodlit/1750_ds.htm

For the Cisco 1751 data sheet and technical specifications, refer to the following URL:

http://www.cisco.com/warp/public/cc/pd/rt/1700/prodlit/c1751_ds.htm



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