Cisco Multimode G.SHDSL Enhanced High-Speed WAN Interface Card for Cisco Integrated Services Routers Generation 2 with EFM/ATM Mode

Cisco® Integrated Services Routers Generation 2 (ISR G2) offer a wide variety of WAN connectivity modules to accommodate the range of application needs in customer networks. The single-port Cisco Multimode Four-Pair G.SHDSL Double Wide Enhanced High-Speed WAN Interface Card (EHWIC-4SHDSL-EA) offers G.SHDSL-based WAN connectivity using both 802.3ah Ethernet in the First Mile (EFM) and ATM modes on a single enhanced high-speed WAN interface card (EHWIC). Both modes are not supported simultaneously. This EHWIC will be used in modular routers that are deployed in small to medium-sized businesses (SMBs) and enterprise branch offices (Figure 1).

Overview

Designed to deliver high-speed Ethernet services over SHDSL access, the multimode G.SHDSL EHWIC offers symmetric data rates over one to four pairs of copper wire and supports both EFM and ATM modes. In order to achieve higher bandwidths, bonding of multiple pairs (4-wire, m-pair, Inverse Multiplexing over ATM [IMA], and EFM bonding) is supported.

In EFM mode, the multimode G.SHDSL EHWIC allows bonding as defined by IEEE 802.3ah, and it is typically used in scenarios where individual links are aggregated using the 802.3ah loop aggregation. Depending on the amount of wire pairs in service, the data rates can be 1 x 5.7 Mbps up to 4 x 5.7 Mbps with Annexes F and G. The EHWIC complies with the 2BASE-TL standard, which is based on the IEEE 802.3ah EFM standard. The 2BASE-TL standard uses the technology standard based on ITU recommendation G.991.2 bis.

In ATM mode, the multimode G.SHDSL EHWIC allows bonding of multiple pairs up to 4 pairs (8-wire) with increased bandwidth by using IMA or data interleaving with m-pair mode. In both IMA and m-pair modes, the multimode four-pair G.SHDSL EHWIC offer data rates up to 5.696 Mbps per pair and up to 22.784 Mbps over four pairs. Refer to Table 2 for the data rates supported by the multimode four-pair G.SHDSL EHWIC (EHWIC-4SHDSL-EA) under different modes.

The multimode four-pair G.SHDSL EHWIC cost-effectively allows service providers and enterprise customers to deliver Ethernet services to sites with no access to fiber by using bonded copper pairs with symmetrical bandwidth at rates up to 4 x 5.696 Mbps. These rates cover applications traditionally served by high-data-rate DSL (HDSL), single-line DSL (SDSL), T1, E1, and services beyond E1.

The multimode four-pair G.SHDSL EHWIC together with the Cisco ISR G2 router provides businesses the necessary bandwidth for critical traffic such as voice and videoconferencing, and enables customers to save money by integrating voice and data traffic on the same WAN link. Service providers can increase subscriber revenue by bundling services and offering differentiated service levels through service-level agreements (SLAs).

Figure 1. Cisco Multimode Four-Pair G.SHDSL EHWIC (EHWIC-4SHDSL-EA)

Feature Summary

- Complies with standard based on ITU Recommendation G.991.2
- Supports G.SHDSL Annexes A (U.S. signaling) and B (European signaling)
- Supports Annexes F and G
- Offers symmetrical WAN speeds up to 1 x 2304 kbps over single copper pair, up to 2 x 2304 kbps over two copper pairs, up to 3 x 2304 kbps over three copper pairs, and up to 4 x 2304 kbps over four copper pairs using ITU-T G.991.2 Annexes A and B
- Offers symmetrical WAN speeds up to 1 x 5696 kbps over single copper pair, up to 2 x 5696 kbps over two copper pairs, up to 3 x 5696 kbps over three copper pairs, and up to 4 x 56964 kbps over four copper pairs using ITU-T G.991.2 Annexes F and G
- Supports EFM bonding; supports up to four SHDSL pairs bonding
- In ATM mode, supports maximum of eight permanent virtual circuits (PVCs)
- Supports dying gasp and wetting current
- Supports point-to-point configuration
- Supports 802.1Q, QinQ, trunk, and VLAN tagging
- Supports ATM class-of-service (CoS) and IP quality-of-service (QoS) features, 802.1P, and differentiated services code point (DSCP)
- Supports EFM (IEEE 802.3ah) operation, administration, and maintenance (OA&M)
- Offers ability to configure multiple G.SHDSL EFM EHWICs per Cisco 1921, 1941, and 2900 and 3900 Series Routers
- Provides single RJ-45 connector system requirements

System Requirements

- The multimode four-pair G.SHDSL EHWICs are supported on all modular Cisco ISR G2 routers:

  Cisco, 1921, 1941, 2901, 2911, 2921, 2951, 3925, 3945, 3925e, and 3945e.
- The multimode four-pair G.SHDSL EHWICs are supported in all Cisco IOS® Software feature sets.
- The routers listed previously need to run Cisco IOS Software Release 15.2(2)T or later.
- The system requires no additional flash or DRAM memory other than the specified minimum memory for the previously mentioned Cisco IOS Software releases.
- The multimode four-pair G.SHDSL EHWICs can be inserted into any EHWIC slot in any ISR G2 router.

Cisco Integrated Services Router with/multimode G.SHDSL EFM EHWIC Applications

Business-Class DSL with Backup WAN

The Cisco ISR and ISR G2 routers with the 4-pair G.SHDSL EFM EHWIC provide a business-class DSL solution for WAN access along with the option of a backup WAN interface (asymmetric DSL [ADSL] and ADSL2+, very-high-data-rate DSL 2 [VDSL2], ISDN Basic Rate Interface [BRI], T1/E1, analog modem, cable modem, third- and fourth-generation [3G and 4G, respectively], etc.) for mission-critical applications. The bonding feature offered on the G.SHDSL EFM EHWIC allows service providers to bond two or more pairs of G.SHDSL links to offer differentiated bandwidth based on SLAs.

Business-Class Security

The Cisco ISR G2 routers with the multimode G.SHDSL EFM EHWICs can be optimized for Internet security with the Cisco IOS Firewall supporting stateful-inspection-firewall and intrusion-prevention-system features. These platforms can also be optimized for VPNs to allow for secure use of the Internet for communications with the same policies and levels of security and performance as a private network. VPNs provide security through encryption tunneling, and the Cisco routers support hardware-based Triple Data Encryption Standard (3DES) IP Security (IPsec), Advanced Encryption Standard (AES), and Secure Sockets Layer VPN (SSL VPN). Encryption features can be enabled on the routers with the Advanced Security or any later feature set of the Cisco IOS Software. Further, Cisco ISR G2 Web Security with Cisco ScanSafe enables branch offices to intelligently redirect web traffic to the cloud to enforce granular security and control policy over dynamic Web 2.0 content, protecting branch-office users from threats such as Trojan horses, back doors, rogue scanners, viruses, and worms.

Differentiated Service Offerings through IP

Using Cisco QoS features, including Class-Based Weighted Fair Queuing (CBWFQ), Low-Latency Queuing (LLQ), Weighted Random Early Detection (WRED), etc., the Cisco Integrated Services Routers Generation 2 with the G.SHDSL EHWIC help service providers and resellers offer services that can differentiate bandwidth based on a specific application or a specific user.

Metro Ethernet

Service providers could also run Layer 2 Ethernet Services and provide Transparent LAN Services over a Metro Ethernet infrastructure. Service providers could take advantage of ISR G2 support for Xconnect on over Multiprotocol Label Switching (SVIEoMPLS) over generic routing encapsulation (GRE) with Static Pseudowire Provisioning and L2PT on Layer 2 ports, Dot1Q tunnel mode support on Layer 2 ports, customizable L2PT tunneling MAC address etc., and provide these Layer 2 Ethernet services.

Converged Platform for SMB and Enterprise Branch-Office Applications

The Cisco 1921,1941, 2900, and 3900 Integrated Services Router platforms with the multimode G.SHDSL EFM EHWICs offer you a choice of converged platforms that offer best-of-class data, security, WAN access, and voice services in a single system. The Cisco 2900 and 3900 Series Routers embed voice functions directly inside the router, enabling you to deploy voice services by installing Cisco High-Density Packet/Voice Digital Signal Processor (DSP) Modules (PVDM3) and Cisco Integrated Services Modules (ISMs) for IP telephony conferencing, voice gateways, and Cisco Unity® Express voicemail and Automated Attendant. For call processing, you can enable the Cisco Unified Communications Manager Express solution as part of Cisco IOS Software and reconfigure the same software to support Cisco Survivable Remote Site Telephony (SRST) for centralized call processing with Cisco Unified Communications Manager.

Such an integrated solution rapidly enables service deployment, increases efficiency of network operations, and provides opportunities to protect, grow, and optimize your business.

Multimode G.SHDSL EHWIC Feature

Table 1 lists the features of the G.SHDSL EHWIC.

Table 1. Multimode Four-Pair G.SHDSL EHWIC Features

Features	Description
Annexes A and B	Yes
Annexes F and G	Yes
Support for 2-, 4-, and 8-wire modes	Yes
Support for IMA	Yes
Support for M-pair bonding with Annex F and Annex G	Yes
EFM bonding	Yes
Connecter	RJ-45
Dying gasp	Yes
Wetting current	Yes
Line coding	16- and 32-TCPAM (Trellis Coded Pulse Amplitude Modulation) 64-TCPAM (Lantiq extension rates - supported if DSL access multiplexer [DSLAM] supports it as well)
Rate adaption	Yes
Termination	Customer premises equipment (CPE)
Data rate	192-5696 kbps per pair Up to 10 Mbps per pair (Lantiq extension rates - supported if DSLAM supports it as well)
G.SHDSL chipset	Socrates-4e from Lantiq

Data Rates Supported with Four-Pair G.SHDSL EFM/ATM EHWIC

Table 2 gives data rates for the 4-pair G.SHDSL EHWIC in the two modes (EFM and ATM). **Note:** Actual data rates depend upon factors such as loop length, line conditions, DSLAM line card and chipset, and data rates provisioned by the service provider.

Table 2. EFM and ATM Bonding

Configuration Mode	Options	EHWIC-4SHDSL-EA
EFM/ATM	2-wire (1 pair) Annexes A and B	From 192 to 2304 kbps
	4-wire (2 pair bonding) Annexes A and B	From 2 x 192 to 2 x 2304 kbps
	6-wire (3 pair bonding) Annexes A and B	From 3 x 192 to 3 x 2304 kbps
	8-wire (4-pair bonding) Annexes A and B	From 4 x 192 to 4 x 2304 kbps
	2-wire (1 pair) Annexes F and G	From 768 to 5696 kbps
	4-wire (2 pair bonding) Annexes F and G	From 2 x 768 to 2 x 5696 kbps
	6-wire (3 pair bonding) Annexes F and G	From 3 x 768 to 3 x 5696 kbps
	8-wire (4 pair bonding) Annexes F and G	From 4 x 768 to 4 x 5696 kbps

Interoperability

The multimode G.SHDSL EHWIC is based on the Lantiq chipset, and it operates when connected to a DSLAM. Table 3 lists the DSLAMs that have been tested and are supported for interoperability. This table will be updated as more DSLAMs, line cards, and firmware versions are tested and supported in the future.

Table 3. DSLAM Interoperability EFM

Sr.No	Mode	DSLAM	DSLAM Chassis	Controller Card	Line Card	Firmware
1	ATM	Alcatel ASAM 7300	7300	SANT-F	SMLT-A	LDP7AA46.030
					SMLT-C	LPR9AA46.029
2	ATM	Huawei MA5603	5603	SCUB	SHEB	1.4.13
3	ATM	Lucent Stringer			LIM-SL-72	9.7.4 e21
					LIM-SL-48	9.7.4 e21
4	ATM	ECI 480	480		STUC-16A	S3_8.10.16
					STUC-32A	S3_8.10.16
5	ATM	Alcaltel ISAM_7330_FTTN	7330	NANT-A	NSLT-A	1.4.1
					SMLT-J	1.2.42
7	EFM	Alclatel ISAM_7330_FTTN	7330	NANT-A	NSLT-A	1.4.1
8	EFM	Huawei_5603	5603	SCUB	SHEB	1.4.13
9	EFM	Huawei_5600	5600		SHEB	1.4.18
10	EFM	Hatteras HN4000	HN4000			7.1.2
11	EFM	Actelis ML698	ML 698			SW: 7.10/35

Platform Support

Table 4 gives platform support details for the multimode G.SHDSL EHWICs.

Table 4. List of supported ISRG2 platforms

Platforms	Multimode Four-Pair G.SHDSL EHWIC
Platforms supported	Cisco 1921, 1941, 2901, 2911, 2921, 2951, 3925, 3945, 3945E, and 3925E
Onboard EHWIC slots on all platforms	Yes

Table 5 gives the maximum number of multimode G.SHDSL EHWICs per platform

Table 5. Number of supported multimode G.SHDSL Double Wide EHWICs per ISR G2 Platform

Platform	Maximum
1921	1
1941	1
3925E	1
3945E	1
2901	2
2911	2
2921	2
2951	2
3925	2
3945	2

Software Requirements

The minimum Cisco IOS Software Release required for the multimode G.SHDSL EHWIC (EHWIC-4SHDSL-EA) on the Cisco 1921,1941, 2900, and 3900 Integrated Services Routers is listed in Table 6. The recommended T-train Cisco IOS Software Release is 15.2(2)T. The four-pair multimode G.SHDSL EFM/ATM EHWIC is supported in all Cisco IOS Software feature sets.

Table 6. Minimum Cisco IOS Software Release

Platforms	Minimum Cisco IOS Software Release	Recommended Cisco IOS Software Release	Cisco IOS Software Release Feature Set
1921, 1941, 2901, 2911, 2921, 2951, 3925, 3945, 3925E, and 3945E	15.2(2)T	15.2(2)T or later	IP Base and later

Product Number and Ordering Information

Table 7 gives product ordering information, and Table 8 gives product hardware specifications.

Table 7. Product Ordering Information

Product Number	Description
EHWIC-4SHDSL-EA	4-pair G.SHDSL EFM/ATM EHWIC

Table 8. Hardware Specifications

Specification	Cisco Multimode Four-Pair G.SHDSL EHWIC	
Chipset	Socrates-4e from Lantiq	
Dimensions (H x W x D)	6.25 x 5.63 x 1.75 in. (15.88 x 14,30 x 4.45 cm)	
Firmware version	IDC Firmware version: V1.7.2.0 DFE Firmware version: V-1.1.7.10_2 10	
Weight	3 Lbs	
LEDs	EN/LP	Status of the system: Green: Operating system is running Amber: Indicates loopback mode
	EFM	Green: Indicates EFM mode
	ATM	Green: Indicates ATM mode
	L0, L1, L2, L3, L4, L5, L6, L7	Status of link: Green on: Link is active Off: Link is inactive or not configured Amber: Link alarm Blinking green: Link is training. Slow blinking indicates IMA link training Fast blinking indicates non-IMA link Is training Amber and green blinking Simultaneously: Loopback mode EN/LP is also amber
Ports	RJ-45 connector	
Cable	RJ-45	
Network Equipment Building Standards (NEBS) compliance	No	

Safety, EMC, Telecom, Network Homologation, Power, and Environmental Requirements

When installed in a Cisco 1921,1941, 2900, or 3900 router, the multimode four-pair G.SHDSL EHWIC (EHWIC-4SHDSL-EA) does not change the standards (safety, EMC, telecom, network homologation, power, environmental requirements, and regulatory approvals) of the router itself. Refer to the Cisco 1921,1941, 2900, and 3900 data sheets for additional information about mechanical, environmental, and agency certifications.

- For Cisco 1900 Series: http://www.cisco.com/en/US/prod/collateral/routers/ps10538/data_sheet_c78_556319.html.
- For Cisco 2900 Series: http://www.cisco.com/en/US/prod/collateral/routers/ps10537/data_sheet_c78_553896.html.
- For Cisco 3900 Series: http://www.cisco.com/en/US/prod/collateral/routers/ps10536/data_sheet_c78_553924.html.

Country Support

- This worldwide-accepted technology is based on ITU Recommendation 991.2.
- Refer to the following URL or contact your local Cisco representative for country-specific approval status: http://tools.cisco.com/cse/prdapp/jsp/externalsearch.do?action=externalsearch&page=EXTERNAL_SEARCH.

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