

## Cisco Multimode G.SHDSL with EFM and ATM Mode for Cisco Integrated Services Routers Generation 2

- Q.** What is the Cisco Multimode Symmetric High-Bit-Rate DSL High-Speed WAN Interface Card?
- A.** This Enhanced high-speed WAN interface card (EHWIC) is a single-port, 4-pair WAN interface card offering G.SHDSL-based WAN connectivity using the 802.3ah Ethernet in the First Mile (EFM)-compliant extended-rate SHDSL EFM (2BASE-TL) technology and ATM mode for modular routers deployed in small to medium-sized businesses (SMBs) and enterprise branch offices. The symmetric DSL, G.SHDSL is an accepted worldwide technology standard based on ITU recommendation G.991.2. The G.SHDSL Enhanced (EHWIC) is designed to transport rate-adaptive symmetrical data across a single copper pair and EFM bonding with Annexes A, B, F, and G up to 4 x 5.696 Mbps. Please note that EHWIC-4SHDSL-EA is double wide EHWIC module. Please refer to [http://www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/oview\\_ic.html](http://www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/oview_ic.html) to get an overview of Cisco Interface Cards for Cisco Access Routers.
- Q.** What is the Cisco 888EA Integrated Services Router?
- A.** This Cisco Integrated Services Routers Generation 2 (ISR G2) fixed platform has an Multimode G.SHDSL port, 4 pair with EFM and ATM mode with the same G.SHDSL feature parity as the Cisco Multimode Symmetric High-Bit-Rate DSL High-Speed WAN Interface Card for the ISR G2 modular platforms.
- Q.** What is Ethernet in the First Mile?
- A.** EFM, also known as IEEE 802.3ah, is a collection of protocols specified in [IEEE 802.3](#) that define [Ethernet in access networks](#); that is, [first or last mile](#).
- Q.** What is EFM bonding?
- A.** EFM bonding based on IEEE 802.3ah is the method for bonding multiple DSL pairs for Ethernet transport to achieve higher data rates.
- Q.** What annexes do the EHWIC cards (EHWIC-4SHDSL-EA) and Cisco 880 Series Data Routers (C888EA-K9) support?
- A.** The G.991.2 standard has the following annexes:
- Annex A: This annex describes those specifications that are unique to SHDSL systems operating under conditions such as those typically encountered within the North American network. The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body.
  - Annex B: This annex describes those specifications that are unique to SHDSL systems operating under conditions such as those typically encountered within European networks. The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body.
  - Annex F: The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body and Annex A for payload data rates up to 5696 kbps.

- Annex G: The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body and Annex B for payload data rates up to 5696 kbps.

**Q.** What are the feature differences between the Cisco One-Port 4-Pair EFM HWIC-4SHDSL, Cisco One-Port 4-Pair ATM HWIC-4SHDSL, and Cisco Multimode One-Port 4-Pair EFM and ATM EHWIC-4SHDSL (HWIC-4SHDSL-E, HWIC-4SHDSL, and EHWIC-4SHDSL-EA, respectively)?

**A.** Tables 1 and 2 list the differences.

**Table 1.** Differences Between G.SHDSL EFM/ATM and Multimode G.SHDSL WAN Interface Cards

Features	One-Port 4-Pair EFM HWIC-4SHDSL	One-Port 4-Pair ATM HWIC-4SHDSL	One-Port Multimode 4 Pair EHWIC-4SHDSL
Packet Transfer Mode (PTM)	Yes	No	Yes
ATM	No	Yes	Yes
EFM	Yes	No	Yes
Inverse Multiplexing over ATM (IMA)	No	Yes	Yes
Annexes A and B	Yes	Yes	Yes
Annexes F and G	Yes	Yes	Yes
M-pair bonding with Annexes F and G	No	Yes	Yes
EFM bonding	Yes	No	Yes
Connector	RJ-45	RJ-45	RJ-45
Dying Gasp	Yes	No	Yes
Wetting current	Yes	Yes	Yes
Line coding	16-TCPAM and 32-TCPAM	16-TCPAM and 32-TCPAM	16-TCPAM and 32-TCPAM-64
Rate adaptive	Yes	Yes	Yes
Auto-detection of pairs	No	Yes	Yes (Not supported in IMA mode)
Auto-detection with IMA (Annexes F & G)	No	No	Yes

**Table 2.** Differences Between G.SHDSL WAN Port in the Fixed Platforms

Features	Cisco 888E	Cisco 888	Cisco 888EA
PTM	Yes	No	Yes
Number of pairs	4	2	4
ATM	No	Yes	Yes
EFM	Yes	No	Yes
IMA	No	No	Yes
Annexes A and B	Yes	Yes	Yes
Annexes F and G	Yes	Yes	Yes
M-pair bonding with Annexes F and G	No	No	Yes
EFM bonding	Yes	No	Yes
Connector	RJ-45	RJ-11	RJ-45
Dying Gasp	Yes	No	Yes
Wetting current	Yes	Yes	Yes
Line coding	16-TCPAM and 32-TCPAM	16-TCPAM and 32-TCPAM	16-TCPAM and 32-TCPAM-64
Rate adaptive	Yes	Yes	Yes
Auto-detection of pairs	No	No	Yes
Auto-detection with IMA (Annex F and G)	No	No	Yes

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**Q.** What are the key features of the Multimode G.SHDSL EFM and ATM port. (EHWIC-4SHDSL-EA and C888EA-K9, respectively)?

**A.** A summary of the features follows:

**Feature Summary**

- Offer standards compliance based on ITU-T Recommendation G.991.2
- Support G.SHDSL Annex A (U.S. signaling) and Annex B (European signaling)
- Support Annexes F and G
- Offer symmetrical WAN speeds up to 1 x 2304 kbps over a 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.992.1 Annexes A and B
- Offer symmetrical WAN speeds up to 1 x 5696 kbps over a 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 5696 kbps over four copper pairs using ITU-T G.992.1 Annexes F and G
- Support EFM bonding: Up to four SHDSL pairs bonding are supported
- Symmetrical WAN speeds of 2.304 Mbps per pair up to 9.2 Mbps over four pairs on the 4-pair G.SHDSL WAN interface card by bonding with IMA
- M-pair bonding on the 4-pair G.SHDSL WAN interface card using Annexes F and G with symmetrical WAN
- Support Dying Gasp
- Support point-to-point configuration
- Support 802.1Q, QinQ, trunk, and VLAN tagging
- Support IP quality-of-service (QoS) features, 802.1P, and differentiated services code point (DSCP)
- Support 64- and 65-octet encapsulation
- Support 802.1ag Draft 8.1 Connectivity Fault Management (CFM)
- Support EFM (IEEE 802.3ah) operations, administration, and maintenance (OAM)
- Support Ethernet Link Management Interface (LMI)
- Support Ethernet OAM features:
  - Discovery
  - Remote failure indication
  - Link monitoring
  - Remote loopback (intrusive loopback)
- Support Bidirectional Forwarding Detection (BFD)
- Support maximum-transmission-unit (MTU) size of 1940 bytes
- Support Point-to-Point Protocol (PPP) over Ethernet over Dot1q (PPPoEoDot1q)
- Offer ability to configure multiple G.SHDSL EFM HWICs per Cisco 1921, 1941, 2900, 3900, and 3900E
- Provide single RJ-45 connector

**Q.** What is the Multimode G.SHDSL chipset?

**A.** The G.SHDSL chipset is based on the Socrates-4e chipset from Lantiq.

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- Q.** What type of lightening surge protection is supported?
- A.** The card is designed and tested to meet GR-1089 lightening surge type 1/3.
- Q.** What Cisco IOS® Software release is required?
- A.** For the supported Cisco IOS Software release, please refer to the product data sheet:  
[http://www.cisco.com/en/US/products/ps5949/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps5949/products_data_sheets_list.html).
- Q.** How many Multimode G.SHDSL HWICS can be installed in the Cisco 1921, 1941, 2900, or 3900 Integrated Services Routers?
- A.** Please refer to the product data sheet:  
[http://www.cisco.com/en/US/products/ps5949/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps5949/products_data_sheets_list.html).
- Q.** What data rates does the G.SHDSL support?
- A.** Please refer to the product data sheet:  
[http://www.cisco.com/en/US/products/ps5949/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps5949/products_data_sheets_list.html).
- Q.** Which DSL access multiplexers (DSLAMs) interoperate with the Multimode G.SHDSL?
- A.** Please refer to the product data sheet:  
[http://www.cisco.com/en/US/products/ps5949/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps5949/products_data_sheets_list.html).
- Q.** Do the Multimode G.SHDSL EHWICs and G.SHDSL fixed ISR G2 router (C888EA-K9) work in central-office mode (back-to-back connection without a DSLAM)?
- A.** Not in Cisco IOS Software Release 15.2(2)T. It will be supported in the later releases.
- Q.** What Ethernet-over-Coaxial (EoC) messages are supported?
- A.** The Multimode G.SHDSL EFM and ATM mode comply with ITU-T specification G.991.2 to provide proper responses to DSLAM EoC requests.
- Q.** Is the firmware upgradable independently of Cisco IOS Software?
- A.** Yes. Please rename the firmware file to "shdsl\_ea\_fw.bin", put it in the flash memory, and reload the router. When the Cisco IOS Software image comes up, it will check if "shdsl\_ea\_fw.bin" is present in the flash memory. If present, this firmware will be loaded to the chipset; otherwise the firmware embedded in the Cisco IOS Software will be used.
- Q.** What is the mean time between failure (MTBF) for this HWIC?
- A.** MTBF for the Multimode G.SHDSL EFM and ATM mode (EHWIC-4SHDSL-EA) is 2,000,000 hours; for the Multimode G.SHDSL WAN port in the fixed platform (C888EA-K9), it is 200,000 hours; and for only the WAN card on this router, it is 1 million hours.
- Q.** What MIBs are supported?
- A.** The following MIBs are supported:
- Entity MIB
  - Chassis MIB
  - Interface MIB
  - HDSL2-SHDSL-LINE-MIB (per the latest RFC 4319)

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- Q.** Are new commands available to configure the G.SHDSL HWICs?
- A.** Yes, there are new commands to configure the G.SHDSL EFM HWICs. Please refer to the configuration manual for the EHWICs for specific commands.
- [http://www.cisco.com/en/US/docs/routers/access/interfaces/software/feature/guide/GSHDSL\\_EFM\\_ATM\\_HWI\\_CS.html](http://www.cisco.com/en/US/docs/routers/access/interfaces/software/feature/guide/GSHDSL_EFM_ATM_HWI_CS.html).

<http://www.cisco.com/en/US/docs/routers/access/800/860-880-890/software/configuration/guide/SCG880-860.html>.

- Q.** What is the supported MTU size?
- A.** It is 1940 bytes.
- Q.** What type of cable should I use when installing the G.SHDSL HWICs?
- A.** Cisco recommends you use the cable supplied with the HWIC. Part numbers are indicated in Table 3.

**Table 3.** Part Numbers of the HWIC Spare Cables

Spare Cable for	Part Number
HWIC-4SHDSL-EA	CAB-RJ45-2RJ11



Americas Headquarters  
Cisco Systems, Inc.  
San Jose, CA

Asia Pacific Headquarters  
Cisco Systems (USA) Pte. Ltd.  
Singapore

Europe Headquarters  
Cisco Systems International BV Amsterdam,  
The Netherlands

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