

## ADSL2 and ADSL2 High-Speed WAN Interface Cards

Cisco® Integrated Services Routers offer a wide variety of WAN connectivity modules to accommodate the range of application needs in customer networks. The Cisco ADSL2 and ADSL2+ high-speed WAN interface cards (HWICs) deliver business-class asymmetric DSL (ADSL) services for customers ranging from small-to-medium sized businesses to enterprise branch offices. Both, 1-port and 2-port HWIC cards are available. While the 1-port HWIC card has an ADSL port, the 2-port HWIC card has an ISDN BRI backup port in addition to the ADSL port.

### Overview

The ADSL HWICs provide 1-port ADSL (Figure 1) connectivity to a WAN. These HWICs, combined with the Cisco 1941 Integrated Services Router (ISR), Cisco 1861 Integrated Services Router, the Cisco 2900 series Integrated Services Routers, 3900 series Integrated Services Routers (ISRs), 1841 ISR, 2800 and 3800 ISRs provide high-speed digital data transmission between customer premises equipment (CPE) and a central office. This enables service providers and resellers to offer additional services by supporting features for business-class security, voice integration, differentiated classes of service (CoS), and managed network access with Cisco IOS® Software. These value-added features, along with the manageability and reliability of Cisco IOS Software technology, provide the mission-critical networking that businesses require.

Both the 1-port and 2-port HWIC cards are supported on the Cisco 1841, 1861, 2801, 2811, 2821, 2851, 3825, 3845, 1941, 2901, 2911, 2921, 2951, 3925 and 3945 ISRs. The 1-port HWICs are supported starting with Cisco IOS Software Release 12.4(4)T and the 2-port HWICs are supported starting with Cisco IOS Software Release 12.4(6)T on the Cisco 1841, 1861, 2801, 2811, 2821, 2851, 3825, 3845 ISRs. The 1-port and 2-port HWICs are supported starting with Cisco IOS Software Release 15.0(1)M for 1941, 2901, 2911, 2921, 2951, 3925 and 3945 ISRs.

**Figure 1.** Single-Port HWIC Provides ADSL Port for Connectivity



**Figure 2.** Dual-Port HWIC with ADSL Port for Connectivity and ISDN BRI Port for Backup



**Figure 3.** Single-Port HWIC with Annex M (HWIC-1ADSL-M)



The ITU accepted the ADSL2 standard in July 2002 and the ADSL2+ standard in January 2003. The ADSL2 standard (ITU G.992.3) adds new features and functions targeted at improving ADSL performance and interoperability. In addition, the standard adds support for new applications, services, and deployment scenarios. Among the changes are improvements in data rate and reach performance, rate adaptation, improved diagnostics, and power enhancements. The conventional ADSL standard (ITU G.992.1) provides downstream data rates of up to 8 Mbps and upstream data rates of up to 0.8 Mbps, and ADSL2 provides higher downstream rates of up to 12 Mbps and upstream data rates of up to 1 Mbps. The ADSL2+ standard (ITU G.992.5) doubles the bandwidth used for downstream data transmission, effectively doubling the maximum downstream data rates, and achieving downstream data rates of up to 24 Mbps and upstream data rates of up to 1.5 Mbps. The exact data rates vary depending on the distance from the DSL access multiplexer (DSLAM), DSLAM type, line card and chipset, and firmware, noise profile, quality of copper, etc. The reach-extended ADSL2 standard (G.992.3) Annex L increases performance on loop lengths greater than 16,000 feet from the Central Office. The Annex M for G.992.3 (ADSL2) and G.992.5 (ADSL2+) was consented on October 2003. The Annex M for G.992.3 (ADSL2) and G.992.5 (ADSL2+) contains PSD Masks for new ADSL2 service over POTS that increases the upstream data rates by doubling the number of US tones to 64. As a result, Annex M provides higher upload speeds for users by doubling the upstream data rate (when compared to Annex A) under certain loop and noise conditions.

**ADSL over Basic Telephone Service (HWIC-1ADSL and HWIC-ADSL-B/ST)****Key Features**

- Supports ADSL over basic telephone service with Annex A ITU G. 992.1 (ADSL), G.992.3 (ADSL2), and G.992.5 (ADSL2+)
- Supports reach-extended ADSL2 standard (G.992.3) Annex L
- Complies with ANSI T1.413 issue 2
- Supports ATM Adaptation Layer 5 (AAL5) services
- Supports ATM CoS features constant bit rate (CBR), non-real-time variable bit rate (VBR-nrt), real-time variable bit rate (VBR-rt), and unspecified bit rate (UBR)
- Supports up to 23 virtual circuits per HWIC
- Supports IP quality of service (QoS)
- Supports Dying Gasp function
- Has one RJ-11 ADSL interface
- Interoperates with third-party DSLAMs (See Tables 1 and 2)
- The 2-port HWIC has the backup ISDN BRI port
- ADSL over ISDN (HWIC-1ADSLI and HWIC-ADSLI-B/ST)

**Key Features**

- Supports ADSL over ISDN with Annex B G.992.1 (ADSL), G.992.3 (ADSL2), and G.992.5 (ADSL2+)
- Supports reach-extended ADSL2 standard (G.992.3) Annex L
- Complies with ANSI T1.413 issue 2
- Supports AAL5
- Supports ATM CoS features CBR, VBR-nrt, VBR-rt, and UBR
- Supports up to 23 virtual circuits per HWIC
- Supports IP QoS
- Supports Dying Gasp function
- One RJ-11 ADSL interface
- Interoperates with third-party DSLAMs (See Tables 1 and 2)
- The 2-port HWIC has the backup ISDN BRI port

**ADSL over Basic Telephone Service—Annex M (HWIC-1ADSL-M)**

- Supports ADSL over basic telephone service with Annex A ITU G. 992.1 (ADSL), G.992.3 (ADSL2), and G.992.5 (ADSL2+)
- Supports reach-extended ADSL2 standard (G.992.3) Annex L
- Supports Annex M (except UK Mask); Optimized for PSD mask M9, EU-64
- Complies with ANSI T1.413 issue 2
- Supports ATM Adaptation Layer 5 (AAL5) services
- Supports ATM CoS features constant bit rate (CBR), non-real-time variable bit rate (VBR-nrt), real-time variable bit rate (VBR-rt), and unspecified bit rate (UBR)
- Supports up to 23 virtual circuits per HWIC
- Supports IP quality of service (QoS)

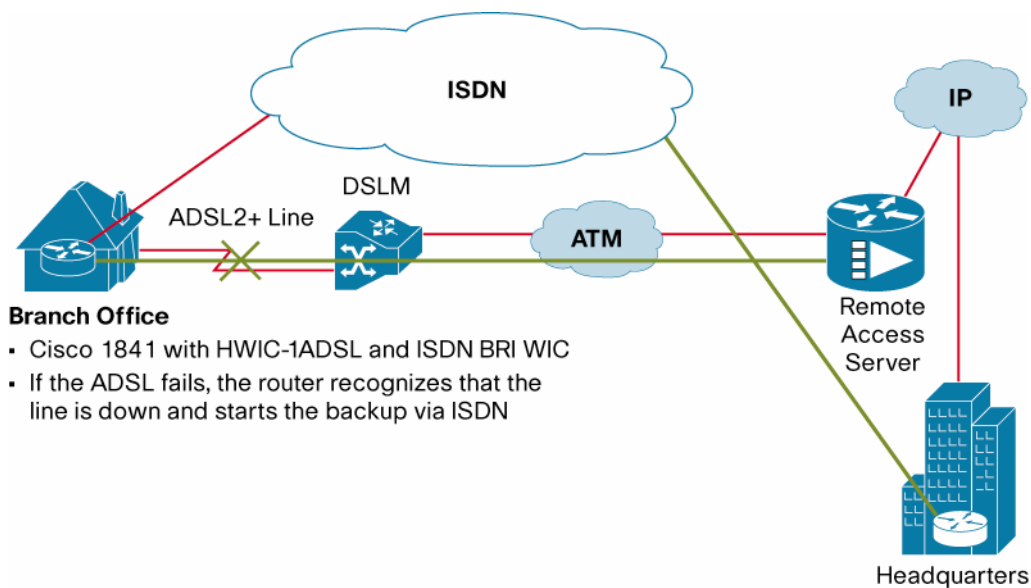
- Supports Dying Gasp function
- Has one RJ-11 ADSL interface
- Interoperates with third-party DSLAMs (See Tables 1 and 2)

## Applications

### Business-Class DSL with WAN Backup

The modular Cisco ISRs ( Cisco 1841 ISR , Cisco 2800 Series ISR, Cisco 3800 Series ISR, Cisco 1900 Series ISR, Cisco 2900 and Cisco 3900 Series ISRs) offer multiple WAN slots. These routers are configured with ADSL2+ HWICs for primary WAN access and an ISDN WIC for WAN backup. This scenario provides redundancy for mission-critical applications (Figure 2). In addition, the WAN flexibility in these platforms enables the customers to swap out the ADSL2+ HWIC with any other WIC or HWIC depending on their business need.

**Figure 4.** ADSL2+ WAN Access with ISDN Backup



### Banking Application

In this scenario (refer to Figure 3), a bank branch is able to use the Cisco 2811 ISR with an ADSL2+ HWIC and ISDN Basic Rate Interface (BRI) WIC to provide primary and backup WAN access. In addition, the 8-port asynchronous/synchronous HWIC (HWIC-8A/S) is used as an interface to ATM machines. This scenario further highlights the versatility of the Cisco 2811 because it enables the banking databases to update any ATM transactions that take place while continuing to provide WAN access and redundancy for mission-critical applications.

**ATM Machines**

**Bank Branch**

- Cisco 2811 with HWIC-1ADSL, ISDN BRI WIC, and HWIC-8A/S
- ADSL2+ Access, WAN Backup through ISDN BRI WIC; High-Density Asynchronous/Synchronous Interface to ATM Terminals in Ban

**Bank Headquarters**

**ISN**

**ATM**

**Remote Access Server**

**IP**

**ADSL Line**

**DSL**

The modular Cisco ISRs with the ADSL2+ HWICs can be optimized for Internet security with the Cisco IOS Firewall supporting stateful inspection firewall and intrusion prevention system features. With an always-on DSL connection, Internet security is vital to protect corporate resources from malicious network attacks. These features can be enabled on the modular routers by purchasing the optional Cisco IOS Software with the Advanced Security or higher feature set.

These platforms can also be optimized for VPNs, which allow 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) and Advanced Encryption Standard (AES) support. Encryption features can be enabled on the routers by purchasing the optional Cisco Advanced Security IOS Software.

The modular Cisco ISRs with the ADSL2+ HWIC help service providers offer differentiated service options based on premium, standard, or best-effort service classes. The routers employ QoS features such as application-aware networking with IP QoS features and traffic management with ATM CoS features.

Using Cisco QoS features including Class-Based Weighted Fair Queuing (CBWFQ), low-latency queuing (LLQ), Weighted Random Early Detection (WRED), etc., the modular Cisco ISRs with ADSL2+ HWICs help service providers and resellers offer services that can differentiate bandwidth based on a specific application or a specific user. For example, an order entry department's traffic can be given priority over that of a marketing department.

## Traffic Management Using ATM CoS

In addition to IP QoS features, the modular Cisco ISRs with the ADSL2+ HWIC map IP QoS to ATM CoS features, including support for CBR, VBR-nrt, VBR-rt, and UBR. These features help service providers manage their core ATM network infrastructures to deliver scalable, cost-effective services with QoS guarantees to their customers. Per-virtual-circuit traffic shaping and queuing allows further optimization of the existing bandwidth between customers and various services.

## DSLAM Interoperability

Tables 1 and 2 list the DSLAMs supported by the new ADSL/ADSL2+ HWICs at first customer shipment (FCS) of Cisco IOS Software Release 12.4(4)T with firmware 2.5.27, and 12.4(6)T with firmware 2.5.42. The DSLAMs listed in Table 1 provide interoperability for the ADSL standard (G.992.1); those listed in Table 2 provide interoperability for ADSL2 and ADSL2+ standards (G.992.3 and G.992.5). These tables will be updated as more DSLAMs are tested and supported.

**Table 1.** DSLAM Interoperability for ADSL

| Product Number and Standard                    | HWIC ADSL Firmware | DSLAM Part Number      | DSLAM Line Card/Chipset  | DSLAM Firmware                           |
|------------------------------------------------|--------------------|------------------------|--------------------------|------------------------------------------|
| <b>Annex A-HWIC-1ADSL and HWIC-ADSL-B/ST</b>   | 2.5.42-12.4(6)T*   | Alcatel ASAM 7300      | ADLT-J (12-port)/Alcatel | GFD5AA42.030                             |
|                                                |                    | Alcatel ASAM 7300      | ADLT-J (12-port)/Alcatel | GFD5AA42.030                             |
|                                                |                    | Alcatel ASAM 7300      | ADLT-L (24-port)/Alcatel | LBTEAA43.033                             |
|                                                |                    | Lucent Stinger         | Stngr-72-gs/Globespan    | 9.7.1 and 9.7.1e64                       |
|                                                |                    | Lucent Stinger         | Stngr-72-ct/Centillium   | 0278                                     |
|                                                |                    | Cisco 6260             | atuc-8-dmt/Globespan     |                                          |
|                                                |                    | Cisco 6260             | atuc-4-flexi/Globespan   |                                          |
| <b>Annex B-HWIC-1ADSLI and HWIC-ADSLI-B/ST</b> | 2.5.42-12.4(6)T    | Alcatel ASAM 7300      | ADLT-N (24-port)/Alcatel | LBTEAA43.033                             |
|                                                |                    | ECI SAM 240            | ECI16/ADI 930            | xa5.11                                   |
|                                                |                    | ECI SAM 240            | ECI16A/ADI Anaconda      | xc5.11                                   |
|                                                |                    | Siemens Xpresslink 2.1 | SUADSL: 32I/TI           | Item No: S50010-M1208-A101, Version: 985 |
|                                                |                    | Siemens Xpresslink 2.0 | SUADSL: 16I/TI           | Item No: S50010-M1067-A101, Version: 985 |

\* HWIC-1ADSL and HWIC-1ADSLI were first supported in 12.4(4)T with 2.5.27

**Table 2.** DSLAM Interoperability for ADSL2 and ADSL2+

| Product Number and Standard                                       | HWIC Firmware   | DSLAM Part Number | DSLAM Line Card/Chipset    | DSLAM Firmware             |
|-------------------------------------------------------------------|-----------------|-------------------|----------------------------|----------------------------|
| <b>Annex A-HWIC-1ADSL and HWIC-ADSL-B/ST</b><br>2.5.42-12.4(6)T** |                 | Alcatel ASAM 7300 | ADLT-D (24-port)/BRCM      | L7D6AA47.020               |
|                                                                   |                 | Lucent Stinger    | stngr-72-gs-adsl-card/GSPN | 9.7.1e64                   |
|                                                                   |                 | Huawei MA5300     | EADB/GSPN                  | V100R006B02D100-May 8 2007 |
|                                                                   |                 | Huawei MA5600     | ADGE/GSPN                  | 322(2007-9-29)             |
| <b>Annex B-HWIC-1ADSLI and HWIC-ADSLI-B/ST</b>                    | 2.5.42-12.4(6)T | Alcatel ASAM 7300 | ADLT-F (24-port)/BRCM      | L7D6AA47.020               |

\*\* HWIC-1ADSL and HWIC-1ADSLI were first supported in 12.4(4)T with 2.5.27

**Table 3.** DSLAM Interoperability for Annex M (except UK Mask)

| Product Number and Standard | HWIC ADSL Firmware | DSLAM Part Number | DSLAM Line Card/Chipset        | DSLAM Firmware     |
|-----------------------------|--------------------|-------------------|--------------------------------|--------------------|
| <b>HWIC-1ADSL-M</b>         | 3.0.14-12.4(15)T   | Alcatel 7300      | ABLT-D (24-port) / Broadcom    | L7D6AA47.174       |
|                             |                    | Lucent Stinger    | stngr-72-gs-adsl-card/Conexant | 9.9.1 (E.67.1.36)  |
|                             |                    | ECI SAM480        | ATUC-32/Infineon               | A4_9.00.56         |
|                             |                    | Ericsson EDA2.1   | EDN312xp/Broadcom              | CXC 132 7380 R2C09 |



## Performance

ADSL performance varies according to a variety of factors, including DSLAM line-card type, DSLAM software version, training rate, line noise, and loop length.

## Software Support

The 1-port HWICs are supported starting the 12.4(4)T and 2-port HWICs are supported starting the 12.4(6)T. The Annex-M HWIC is supported starting 12.4(11)XW. All HWICs are supported on the Cisco 1841, 1861 ISRs and the Cisco 2800 series ISR, Cisco 3800 series ISR, Cisco 1941, Cisco 2900 and Cisco 3900 series ISRs. The 1-port and 2-port HWICs are supported starting with Cisco IOS Software Release 15.0(1)M for 1941, 2901, 2911, 2921, 2951, 3925 and 3945 ISRs.

The ADSL2 and ADSL2+ features are supported in the IP Base image for the Cisco 1841 ISR and the Cisco 2800 and 3800 series ISRs. The default Cisco IOS Software for the Cisco 1841 ADSL2+ bundles is the Cisco IOS Software IP Broadband image. In addition to all the features of the IP Base image, the IP Broadband image also has the Service Assurance Agent feature. The default Cisco IOS Software image for the Cisco 2800 Series ADSL bundles is the Cisco IOS Software SP Services image.

The ADSL2 and ADSL2+ features are supported with the IP Base technology package license for the Cisco 1941 ISR, Cisco 2900 and 3900 series ISR.

## Platform Support

All the ADSL2+ HWICs are supported only in the onboard HWIC slots of the modular ISRs. Table 3 provides platform support details.

**Table 4.** Platform Support Details and Maximum Number of HWICs per Platform

| HWIC-1ADSL, HWIC-1ADSLI, HWIC-ADSL-B/ST, HWIC-ADSL-IB/ST, HWIC-1ADSL-M | Maximum Number of HWICs |
|------------------------------------------------------------------------|-------------------------|
| Cisco 1861                                                             | 1                       |
| Cisco 1841,1941,2801 and 2901                                          | 2                       |
| Cisco 2811, 2911,2821,2921, 2851,2951 3825,3925,3845 and 3945          | 4                       |

## Product Number and Ordering Information

ADSL over basic telephone service (Annex A) product numbers are listed in Table 4 and ADSL over ISDN (Annex B) part numbers are listed in Table 5.

**Table 5.** ADSL over Basic Telephone Service (Annex A) Product Numbers

| Product Number     | Description                                                              |
|--------------------|--------------------------------------------------------------------------|
| HWIC-1ADSL         | 1-port ADSL over basic telephone service HWIC (system)                   |
| HWIC-1ADSL=        | 1-port ADSL over basic telephone service HWIC (spare)                    |
| HWIC-ADSL-B/ST     | HWIC with ADSL over POTS and ISDN BRI ports (system)                     |
| HWIC-ADSL-B/ST=    | HWIC with ADSL over POTS and ISDN BRI ports (spare)                      |
| CISCO1841-ADSL2    | Cisco 1841 bundle, HWIC-ADSL, IP Broadband, 32 MB Flash/128 MB DRAM      |
| CISCO1841-ADSL2-B  | Cisco 1841 bundle, HWIC-ADSL-B/ST, IP Broadband, 32 MB Flash/128 MB DRAM |
| CISCO2801-ADSL2/K9 | Cisco 2801 bundle, HWIC-ADSL, SP Services, 64 MB Flash/192 MB DRAM       |
| CISCO2811-ADSL2/K9 | Cisco 2811 bundle, HWIC-ADSL, SP Services, 64 MB Flash/256 MB DRAM       |

**Table 6.** ADSL over ISDN (Annex B) Product Numbers

| Product Number          | Description                                          |
|-------------------------|------------------------------------------------------|
| <b>HWIC-1ADSLI</b>      | 1-port ADSL over ISDN HWIC (system)                  |
| <b>HWIC-1ADSLI=</b>     | 1-port ADSL over ISDN HWIC (spare)                   |
| <b>HWIC-ADSLI-B/ST</b>  | HWIC with ADSL over ISDN and ISDN BRI ports (system) |
| <b>HWIC-ADSLI-B/ST=</b> | HWIC with ADSL over ISDN and ISDN BRI ports (spare)  |

**Table 7.** ADSL over Basic Telephone Service (Annex M) Product Numbers

| Product Number           | Description                                                                    |
|--------------------------|--------------------------------------------------------------------------------|
| <b>HWIC-1ADSL-M</b>      | 1-port ADSL over basic telephone service HWIC (system)                         |
| <b>HWIC-1ADSL-M=</b>     | 1-port ADSL over basic telephone service HWIC (spare)                          |
| <b>CISCO1841-ADSL2-M</b> | Cisco 1841 ADSL2 Annex M bundle, HWIC-1ADSL-M, IP Base, 64MB Flash/128 MB DRAM |
| <b>C2801-ADSL2-M/K9</b>  | Cisco 2801 Annex M bundle, HWIC-1ADSL-M, SP Services, 64 MB Flash/192 MB DRAM  |
| <b>C2811-ADSL2-M/K9</b>  | Cisco 2811 bundle, HWIC-1ADSL-M, SP Services, 64 MB Flash/256 MB DRAM          |

### Cable Information

The straight-through cable is the default cable and is included in the HWIC packaging. Customers who have an external splitter require the crossover cable. The crossover cable can be ordered as a spare (part number CAB-ADSL-RJ11X=).

### Cisco 1800, 1900, 2800, 2900, 3800 and 3900 Series Regulatory Approvals

When installed in the Cisco 1800,1900, 2800, 1900, 3800 and 3900 series Integrated Services Routers, the ADSL2 and ADSL2+ HWIC does not change the router standards (regulatory compliance, safety, EMC, telecom).

Refer to the platform-specific links for their regulatory compliance, safety, EMC, and telecom standards.

- **For Cisco 1841 and 1861 Integrated Services Router:**

<http://www.cisco.com/go/1800>

- **For Cisco 2800 Series Integrated Services Routers:**

<http://www.cisco.com/go/2800>

- **For Cisco 3800 Series Integrated Services Routers:**

<http://www.cisco.com/go/3800>

- **For Cisco 1941 Series Integrated Services Routers:**

<http://www.cisco.com/go/1900>

- **For Cisco 2900 Series Integrated Services Routers:**

<http://www.cisco.com/go/2900>

- **For Cisco 3900 Series Integrated Services Routers:**

<http://www.cisco.com/go/3900>

### ADSL2+ Chipset Specifications

- **HWIC-1ADSL, HWIC-ADSL-B/ST** (ADSL over basic telephone service)-STMicroelectronics STM20190
- **HWIC-1ADSLI, HWIC-ADSLI-B/ST** (ADSL over ISDN)-STMicroelectronics STM20190
- **HWIC-1ADSL-M** (ADSL over basic telephone service, Annex M), STMicroelectronics STM20196P



**Table 8.** ADSL HWIC Dimensions and Weight

|               | HWIC-1ADSL/HWIC-1ADSLI | HWIC-ADSL-B/ST and HWIC-ADSLI-B/ST                                |
|---------------|------------------------|-------------------------------------------------------------------|
| <b>Width</b>  | 3.08 in. (7.82 cm)     | 3.08 in. (7.82 cm)                                                |
| <b>Height</b> | 0.76 in. (1.92 cm)     | 0.76 in. (1.92 cm)                                                |
| <b>Depth</b>  | 4.74 in. (12.04 cm)    | 4.74 in. (12.04 cm)                                               |
| <b>Weight</b> | 0.19 lb (90 g)         | HWIC-ADSL-B/ST: 0.23 lb (109 g); HWIC-ADSLI-B/ST: 0.22 lb (105 g) |

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