Q&A

Cisco Cable High-Speed WAN Interface Cards

Q. **What is the Cisco® cable high-speed WAN interface card (HWIC)?**

A. Designed to be DOCSIS® 2.0 compliant, the Cisco cable HWIC is a high-speed WAN interface card with a single male F-connector. It can be inserted in the HWIC slots of a Cisco 1841 Integrated Services Router (ISR) and Cisco 2800 and 3800 Series Integrated Services Routers or in the WAN interface card (WIC) slot of a Cisco IAD2430 Series Integrated Access Device to provide integrated DOCSIS connectivity in conjunction with advanced services.

Q. **What are the benefits of cable HWICs over standalone cable modems?**

A. The cable HWICs on Cisco Systems® routers provide the following benefits over two-box solutions (one cable modem and one router):

- **Improved quality of service (QoS):** A typical cable modem has significantly higher LAN interface bandwidth than what is available on the cable WAN interface. The LAN peer (for example, a router) cannot effectively enforce an upstream QoS policy because the upstream QoS does not receive any indication when the cable modem's WAN interface is congested. Therefore, to ensure QoS enforcement, the LAN peer must shape the outgoing traffic to the committed access rate (CAR) or risk high-priority traffic being dropped.

  Cisco cable HWIC integrates Cisco IOS® Software QoS and DOCSIS QoS to address this issue. A congestion notification mechanism is implemented so that the cable modem can provide back pressure to Cisco IOS Software when it experiences congestion on the WAN interface. Cisco IOS Software will queue the outgoing primary service flow payloads and apply QoS to manage congestion. Meanwhile, Cisco IOS Software will allow secondary service flow payloads to skip the queue to guarantee service on high-priority traffic. This method results in significantly improved upstream QoS performance and optimized utilization of the upstream available bandwidth.
- **Enhanced failover scheme:** When a router is connected to an external cable modem Ethernet port, the router will not be notified when the cable connection goes down. If the cable modem is a primary connection, this will cause a problem because failover to the backup link might not take place or may take time (depending on Dynamic Host Configuration Protocol [DHCP] lease settings). The cable HWIC sends real-time status to the Cisco router so that the failover will initiate immediately if the cable link goes down.
- **Improved access to advanced services capabilities of the Cisco ISRs:** By integrating the cable HWIC, both cable operators and business customers can use Cisco routers' advanced services capabilities such as voice, video, wireless, security, multicast, and Multiprotocol Label Switching (MPLS).
- **Ease of management:** Integration of the cable interface saves space and makes the deployment, management, and maintenance of equipment much easier. A cable operator can choose just to manage the cable WAN connection or both the cable WAN connection and the host router. Likewise, a business can integrate the cable modem and still choose what level of support and control to have over the host router. It also reduces the probability of opportunistic theft.
- **Improved availability:** In addition to the enhanced failover capability, Cisco ISRs have many high-availability features, including optional redundant power supplies (Cisco 2811 Integrated Services Router and above) and removable fan trays (Cisco 3800 Series only). Additionally, all the components of the ISRs are designed and tested to help ensure they meet true business-class availability requirements and will provide a higher degree of availability than consumer-grade devices.

Q. What are the product numbers for the cable HWIC?

A. There are two product SKUs:

- HWIC-CABLE-D-2
- HWIC-CABLE-E/J-2

Q. What is the difference between HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2?

A. HWIC-CABLE-D-2 is designed to comply with the DOCSIS 2.0 specification and can be used in the United States and Europe. HWIC-CABLE-E/J-2 is designed to meet the European and Japanese DOCSIS 2.0 specification and can be used in Europe and Japan.

Q. What are the downstream/upstream bandwidth and frequency range for DOCSIS, Euro-DOCSIS, and J-DOCSIS?

A. Table 1 shows the downstream/upstream bandwidth and frequency range for DOCSIS, Euro-DOCSIS, and J-DOCSIS.

Table 1. Cable Channel Bandwidth and Frequency Range

	DOCSIS	Euro-DOCSIS	J-DOCSIS
Downstream Bandwidth	6 MHz	8 MHz	6 MHz
Downstream Frequency Range	91–857 MHz (center)	112–858 MHz (center)	75–860 MHz (center) 90–860 MHz implemented
Upstream Bandwidth	TDMA (200, 400, 800, 1600, 3200, and 6400 kHz) S-CDMA (1600, 3200, and 6400 kHz)		
Upstream Frequency Range	5–42 MHz	5–65 MHz	10–55 MHz

Q. Is the cable HWIC compatible with DOCSIS 1.0, 1.1, and 2.0?

A. Yes. The cable HWIC is based on the DOCSIS 2.0 standards and is designed to be backward compatible with DOCSIS 1.1 and 1.0.

Q. What is DOCSIS 2.0?

A. DOCSIS is the Data Over Cable Service Interface Specification defined by CableLabs®, a non-profit research and development consortium that is dedicated to pursuing and helping bring to market new cable technologies. DOCSIS 2.0 is the latest standard from CableLabs and provides significant improvements in upstream throughput for cable modem connectivity. DOCSIS 2.0 is backward compatible to DOCSIS 1.1, which provided improved operational flexibility, security, and QoS features that enable real-time services, and DOCSIS 1.0, which was the first specification for cable modems. More information is available at http://www.cablemodem.com/primer.

Q. Are both Advanced Time Division Multiplex Access (ATDMA) and Synchronous Code Division Multiple Access (SCDMA) supported?

A. Yes.

Q. Have the cable HWICs been certified?

A. HWIC-CABLE-D-2 passed CableLabs certificate wave 45 (CW45) in August 2006. For a complete list of CableLabs certified and qualified products, go to http://www.cablelabs.com/certqual/lists/. HWIC-CABLE-E/J-2 is planned to be submitted to T-Com Labs certificate wave 24 (CW24) with target completion date in September 2006.

Q. With which cable modem termination systems (CMTSs) will the Cisco cable HWIC have interoperability?

A. The Cisco cable HWIC should interoperate with any DOCSIS compliant CMTSs, including Cisco uBR7100 Series Universal Broadband Routers, the Cisco uBR7246VXR Universal Broadband Router, and the Cisco uBR10012 Universal Broadband Router. The complete list of qualified CMTSs is available at the following web sites.

- CableLabs: http://www.cablelabs.com/certqual/lists
- T-Com Labs: http://www.tcomlabs.com/testing_eurocablelabs_certifiedproducts.php

Q. Does the cable HWIC support PacketCable™ MultiMedia?

A. Yes. The cable HWIC design is based on the DOCSIS 2.0 specification. Thus it supports PacketCable MultiMedia (PCMM), which defines QoS and accounting capabilities over DOCSIS 1.1 or 2.0 networks.

Q. Does the cable HWIC support PacketCable 1.0 or 1.5?

A. No. Only PacketCable MultiMedia is supported.

Q. Does or will the cable HWIC support DOCSIS 2.0B or DOCSIS 3.0?

A. No, the cable HWIC only supports one upstream and one downstream channel and cannot be upgraded in the future to support channel bonding, as planned in DOCSIS 2.0B and 3.0.

Q. How many upstream service flows does the cable HWIC support?

A. The cable HWIC supports one primary upstream service flow and 15 secondary upstream service flows.

Q. Which Cisco IOS Software release supports the cable HWIC?

A. The cable HWIC will be first introduced on Cisco IOS Software Release 12.4(6)XE. It is expected to be supported on the next T train release in November 2006.

Q. What Cisco IOS Software images support the cable HWIC?

A. The cable HWIC will be supported by all Cisco IOS Software images on ISR platforms and access platforms. For the Cisco IAD2431 and IAD2432 Integrated Access Devices, the cable HWIC is supported on the images listed in Table 2.

Table 2. Supported images for IAD2431 and IAD2432 routers

Feature Set	Image Name
IP Plus	c2430-is-mz
IP/FW/IDS Plus IPsec 3DES	c2430-ik9o3s-mz
IP Subset/Voice	C2430-i6s-mz
IP Subset/IPSec 64bit/FW/Voice	C2430-i6k9o3s-mz

Q. Can I put multiple cable HWICs in one chassis?

A. Yes. The maximum number of cable HWICs supported in one chassis is limited by the number of HWIC or WIC slots available on the platform. In the case of deploying multiple cable HWICs in a router, each cable HWIC must be on a different subnet unless Point-to-Point Protocol over Ethernet (PPPoE) is used to bundle the cable links. Special configuration is also required at the CMTS device.

Q. Is the cable HWIC supported in a WIC slot? Is there any limitation to the cable HWIC's operation when it is in a WIC slot?

A. Yes, the Cisco cable HWIC is supported in the WIC slots of Cisco IAD2431 and IAD2432 Integrated Access Devices only. The cable HWIC is also supported in the WIC slots on the following network modules:

- NM-2W
- NM-1FE1R2W
- NM-1FE2W-V2
- NM-2FE2W-V2

The cable HWIC will be fully functional in a WIC slot. However, the throughput of the cable HWIC will be limited to 8 Mbps by the WIC internal bus architecture.

Q. Is the cable HWIC supported in a voice/WAN interface card (VWIC) slot or a voice interface card (VIC) slot?

A. No.

Q. Is the cable HWIC supported in the VWIC/WIC/VIC slot on a Cisco 2801?

A. No. The cable HWIC is supported in the HWIC slots (slot 1 and slot 3) on the Cisco 2801. It is not supported in VWIC/WIC/VIC slot (slot 2) or VIC slot (slot 0) on the Cisco 2801.

Q. What is the difference between HWIC interfaces and WIC interfaces?

A. The HWIC standard is a superset of the WIC standard. The enhancement of HWIC over WIC includes:

- An 8-bit transmit, 8-bit receive dial-on-demand routing (DDR) interface capable of up to 400-Mbps transfer
- Supports interface cards with higher power requirements (5W)
- A double-wide form factor option that supports up to 10W of power

Q. Which Cisco platforms support the cable HWIC?

A. The cable HWIC is supported on Cisco IAD2431 and IAD2432 Integrated Access Devices; the modular ISR platforms (Cisco 1841, 2801, 2811, 2821, 2851, 3825, and 3845 Integrated Services Routers); and network modules (NM-2W, NM-1FE1R2W, NM-1FE2W-V2, NM-2FE2W-V2). (See Table 3.)

Table 3. Supported Platforms

Platforms	Number of HWIC Slots	Number of WIC Slots	Supported on Cisco IOS Software Release 12.4(6)XE
Cisco IAD2431, IAD2432	1	–	Yes
Cisco 1841	2	–	Yes
Cisco 2801	2	–	Yes
Cisco 2811, 2821, 2851	4	–	Yes
Cisco 3825, 3845	4	–	Yes
NM-2W, NM-1FE1R2W	–	2	Yes
NM-1FE2W-V2, NM-2FE2W-V2	–	2	Yes

Q. Is the MAC address on the cable HWIC statically set?

A. Yes, the MAC address of the cable HWIC is statically set at the factory and does not change. There is a label on the faceplate of the cable HWIC with the MAC address printed per the DOCSIS specification.

Q. How are upgrades to cable modem firmware performed on the cable HWIC?

A. The cable HWIC firmware upgrades are triggered by a CMTS. Users cannot upgrade the cable HWIC firmware from the router command-line interface (CLI). When a firmware upgrade is needed, the cable service provider will set a flag and specify the new firmware release ID in the cable modem configuration file on the CMTS. The cable modem gets the new configuration file and compares the firmware release ID with the current firmware version. If they are different, the cable modem will retrieve the new firmware from the CMTS.

Q. How can I find out the cable HWIC firmware version?

A. The cable HWIC firmware version can be shown by issuing the show controllers Cable-Modem <port> status command on the router CLI. Here is a sample screen output of the show command:

```
Cable Modem Information:
   Software version           2.103.1013
   Software Hidden version    2.103.1013c
   Hardware version
   Cable IP address           10.0.0.102/24
```



```
DOCSIS mode               2 (1_1)
BPI status                1 (DISABLED)
Uptime (seconds)          3172
Current state             16 (OPERATIONAL)
Cable MAC address         00d0.59e1.201d
Internal MAC address      00d0.59e1.201e
Internal IP address       192.168.100.1/24
Downstream buffers free   256
Downstream buffers used   0
Upstream buffers free     254
Upstream buffers used     0
MAC SDRAM free (Kbytes)   20576944
MAC SDRAM used (Kbytes)   7321072
MAC Flash free (Kbytes)   1811540
MAC Flash used (Kbytes)   2349996
```

Q. What are the provisioning and management capabilities of the cable HWIC for business customers?

A. End users of the cable HWIC can manage services related to Cisco IOS Software on the cable modem interface by configuring services such as IP service-level agreements (SLAs), Embedded Event Manager (EEM), Network-Based Application Recognition (NBAR), NetFlow, AutoQoS, AutoSecure, and so on.

Q. What are the provisioning and management capabilities of the cable HWIC for service providers?

A. Cable service providers can push the DOCSIS configuration file from the CMTS to the cable HWIC to manage parameters such as maximum rate, burst rate, class of service, baseline privacy, and so on. The cable HWIC firmware upgrade is also managed by the DOCSIS configuration file using a cable interface.

Q. Why can the IP address not be configured on the cable modem interface of the cable HWIC?

A. DOCSIS standards mandate that a cable modem interface must use DHCP to acquire an IP address.

Q. What is the configuration process for the cable HWIC?

A. The cable HWIC requires both the DOCSIS configuration from the CMTS and the Cisco IOS Software configuration from Cisco IOS Software CLI to work properly.

The cable HWIC obtains the DOCSIS configuration from the CMTS to specify the communication between the cable HWIC and the CMTS. Per the DOCSIS specification, this configuration cannot be altered by the Cisco router and can only be driven from the cable operator/CMTS.

DOCSIS configuration file is a binary file containing the parameters for cable modems to come online in accordance to what the ISP is provisioning. Parameters in a DOCSIS configuration file include maximum downstream and upstream rates, maximum upstream burst rate, class of service or baseline privacy, MIBs, and many other parameters. Several tools are available too build this file. Cisco Broadband Configurator, previously called DOCSIS CPE Configurator, is a Java-based tool that greatly simplifies the creation and maintenance of the DOCSIS configuration file.

The cable HWIC interface must be configured from the Cisco IOS Software CLI to specify services related to Cisco IOS Software such as IP address, ACL, Network Address Translation (NAT), QoS, and so on. A Cisco IOS Software configuration file is an ASCII file.

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