# Cisco Cable High-Speed WAN Interface Cards

The Cisco® integrated Cable high-speed WAN interface cards (HWICs) provide lower total cost of ownership, advanced quality-of-service (QoS) enforcement, and advanced monitoring and load-balancing capabilities for customers by optionally integrating a DOCSIS 2.0-based cable modem within a Cisco Integrated Services Router (ISR) or Cisco IAD2430 Series Integrated Access Device.

Additionally, the new Cisco Cable HWICs greatly expand the portfolio of managed business-class cable services cable operators can offer to their small and medium sized business (SMB) and enterprise customers. The Cisco ISRs and Cisco IAD2430 Series can be coupled with the cable HWIC to provide a range of services, including security, IP Communications, switching, wireless LAN management and connectivity, WAN optimization, and much more.

## Overview

The new Cable HWICs (HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2) are designed to comply with DOCSIS 2.0, Euro-DOCSIS 2.0, and J-DOCSIS 2.0 specifications and provide single-port cable modem connectivity for the Cisco modular integrated services routers and the Cisco IAD2430 series routers to the cable operator WAN. These cable HWICs (Figure 1), combined with the Cisco 2800 and 3800 Series Integrated Services Routers; Cisco 1841 and 1941 Integrated Services Routers and Cisco IAD2430 Series provide high-speed digital data transmission between customer premises equipment (CPE) and a central office. This enables cable 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.

**Figure 1.** Single-Port DOCSIS 2.0 and Euro/J-DOCSIS 2.0-Based Cable HWICs (HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2)

Both the 1-port DOCSIS-based cable HWIC and the one-port Euro/J-DOCSIS-based cable HWIC cards provide a single F-connector for broadband connectivity. The cable HWICs are supported starting with Cisco IOS Software Release 12.4(11)T. Cable operators can use the Cisco ISRs and Cisco IAD2430 Series when combined with the cable HWICs to provide a vast array of business services, including voice, video, data, security, wireless, switching, and content caching over the DOCSIS network.

The cable HWICs embedded in the Cisco IOS Software routers provide an integrated solution for a cost-effective alternative to leased lines, ISDN, or xDSL services for critical primary WAN links or backup solutions. Cable service providers and enterprise customers can also benefit from ease of deployment and management by deploying an

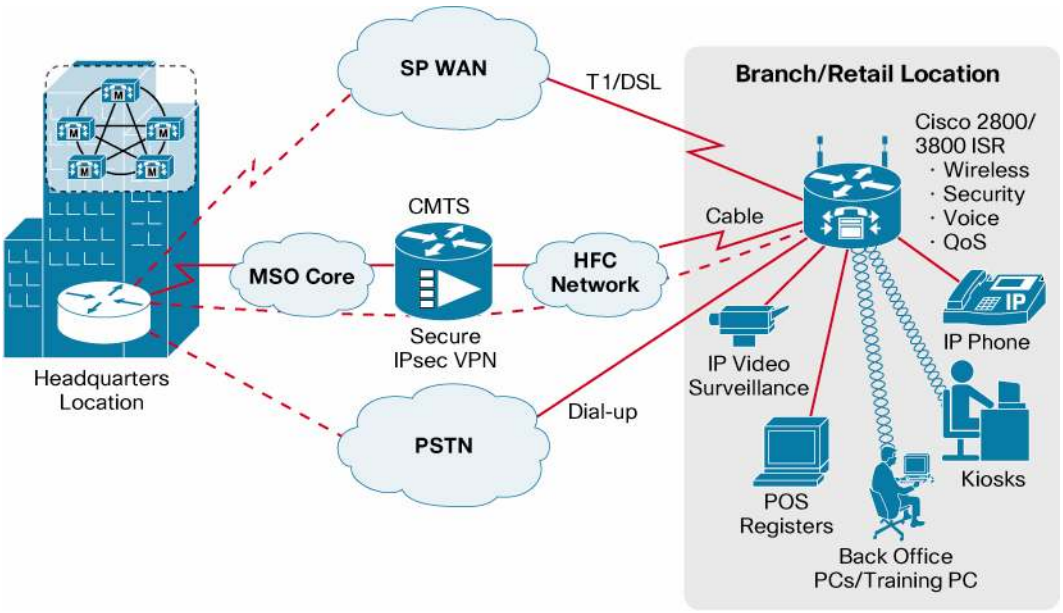
integrated cable solution. Additional benefits of an integrated cable solution over a standalone cable modem plus a router include improved QoS enforcement, enhanced WAN failover capabilities, and improved availability.

## Applications

### Business-Class Cable Broadband Connectivity

The Cisco 3800 and 2800 Series ISRs, Cisco 1841 and 1941 ISR offer multiple WAN slots to support the broadest range of WAN connectivity. These routers can be configured with the Cisco cable HWIC for primary WAN access, offering high-speed cable broadband connection to the Internet or to enterprise offices. The advanced QoS enforcement minimizes latency for high-priority data and voice traffic. The status and quality of the link can be monitored with Cisco IOS Software using advanced management instrumentation. The cable HWIC coupled with the breadth of WAN access technologies available for the ISR offers enterprise and SMB customers the maximum WAN flexibility and choice for branch office connections (Figure 2).

**Figure 2.** Cable Solution for Branch/Retail Office with Security, Voice, Wireless




### Secondary WAN Connectivity

In addition to being an excellent primary WAN link, the cable HWICs are well suited for used as a secondary WAN link for businesses of all sizes. This secondary link can be used to offload Web traffic directly to the Internet, provide a redundant option for a primary link in case of failure, or provide load balancing with a xDSL or other type of WAN link.

Increasingly, Internet connectivity is crucial to a branch or small business employee's productivity. However, as more streaming media and rich content is placed on the Web, the WAN bandwidth requirements to provide this connectivity continue to grow. In the case of a branch office, as shown in Figure 2, using Policy-Based Routing, all HTTP (Port 80) traffic can be diverted from a primary low-bandwidth link to the DOCSIS link to minimize the amount of traffic being routed back to corporate headquarters. The ISRs can optionally provide end-to-end security with advanced firewall, intrusion prevention, and URL filtering capabilities to help ensure security and proper usage of the Internet.

As more business applications are centralized, connectivity to the central or regional office becomes crucial to the growing population of workers distributed among branch offices around the world. Cable broadband provides an excellent backup to traditional public switched telephone network (PSTN)-based WAN links because it uses a

separate network infrastructure. This separation helps reduce the probability that if the primary PSTN-based WAN link goes down, the backup link, which would often otherwise reside in the same binder as the primary link, will simultaneously go down as well. The ISRs can create IP Security (IPsec) tunnels back to the central site to secure any mission-critical communications until the primary link is restored. Additionally, the high performance capability of the cable HWIC makes it an excellent backup option for newer high-speed technologies such as ADSL2+ and Ethernet WAN services.

**Business-Class Security**

The Cisco ISRs with the cable HWICs can be optimized for Internet security with the Cisco IOS Firewall supporting stateful inspection firewall and intrusion prevention system (IPS) features (Figure 2). With an always-on cable connection, Internet security is vital to protect corporate resources from malicious network attacks. These features can be enabled on the modular routers by deploying the optional Cisco IOS Software with the Advanced Security or higher feature set.

These platforms can also be utilized for VPN IPsec and Multiprotocol Label Switching (MPLS) connectivity, which allow secure use of the Internet for communications with the same policies and levels of security and performance as a private network. IPsec-based VPNs provide security through encryption tunneling, and the Cisco ISRs support hardware-based Triple Data Encryption Standard (3DES) IPsec and Advanced Encryption Standard (AES) support. Encryption features can be enabled on the routers by deploying the optional Cisco IOS Software Advanced Security feature set.

Using cable HWICs with Cisco ISRs, cable operators can increase their average revenue per subscriber (ARPU) and decrease the potential for subscriber churn by offering business-class security services as a managed service to customers.

**Converged Data and Voice over IP Services**

The Cisco IAD2430, 2800, and 3800 Series ISRs combined with the cable HWIC can meet the IP Communications needs of SMBs and enterprise branch offices while concurrently delivering an industry-leading level of security within a single routing platform. Cisco CallManager Express (CME) is an optional solution embedded in Cisco IOS Software that provides call processing for Cisco IP phones, including wired and wireless LAN phones. Cisco IAD2430, 2800, and 3800 Series platforms together with the cable HWIC provide advanced QoS enforcement to help ensure high levels of quality for IP Communications (Figure 2). The Cisco CallManager Express solution offers a core set of phone features that customers require for their everyday business needs and uses the wide array of voice capabilities embedded in the Cisco modular ISRs running Cisco IOS Software.

The Cisco ISRs and Cisco IAD2430 Series with the cable HWIC provide an integrated data and voice services platform for cable service providers to cost-effectively accelerate the migration from traditional time-division multiplexing (TDM) to voice over IP (VoIP) for business customers. In this application, a business customer would connect (or would already have connected) its private branch exchange (PBX) or key system to a VoIP-enabled Cisco ISR. The router would packetize the voice traffic and send the packets over the HFC network. At the headend, the call manager or the H.323 gatekeeper would then decide which packets get sent on to the PSTN and which would stay on the IP network. For a business, the advantages of using VoIP services include toll bypass, remote PBX presence over a WAN, and unified voice/data trunking.

## Features and Benefits

**Architecture Feature and Benefits**

The new Cisco cable HWICs help ensure maximum availability, high performance, ease of upgrade, and expandability. The modules have their own processor, firmware, and memory that run independently of the host

router resources, helping to ensure maximum performance and upgradability and facilitating ongoing DOCSIS compliance. Table 1 lists some of the features and benefits of this advanced architecture.

**Table 1.** Cisco Cable HWIC Module Architecture Features and Benefits

| Feature | Benefit |
|---|---|
| **Standards Based** | • The Cable HWICs are designed to comply with DOCSIS 2.0 standards and integrate transparently within existing cable operator networks.<br>• HWIC-CABLE-D-2 is designed to comply with DOCSIS 2.0.<br>• HWIC-CABLE-E/J-2 is designed to comply with the J-DOCSIS and Euro-DOCSIS 2.0 standards. (Note: J-DOCSIS downstream center frequency is limited to 90-860MHz.)<br>• The Cable HWIC is designed to work in PacketCable™ Multimedia networks and supports up to 15 secondary service flows. |
| **Independent Software Image** | The Cisco Cable HWIC runs its own firmware image and can be upgraded independently of the host router's Cisco IOS Software by the cable modem termination system (CMTS). |
| **Protected Cable Modem Configuration** | The Cisco Cable HWIC configuration can only be changed by the cable operator using a CMTS. |
| **Maximum Availability** | • The Cisco Cable HWIC can be restarted independently of Cisco IOS Software by the CMTS or by the end user.<br>• The Cisco router with the integrated cable modem can monitor the cable modem state and automatically reroute traffic to an alternate interface in the case of a WAN failure.<br>• Replaces the external RJ-45 cable when using an external cable modem with a highly available internal connection.<br>• Integration limits the opportunity/potential for opportunistic theft of the cable modem or accidental disconnection. |

### Cisco IOS Software Support

Cisco IOS Software features integrate the power and flexibility of the infrastructure to provide a complete set of network services. Cisco IOS Software provides a common architecture for the creation of network services, which provides many advantages to Cisco customers. Cisco IOS Software provides business-class networking in important areas such as routing, security, IP Communications, high availability, and manageability, as described in Table 2.

**Table 2.** Cisco IOS Feature Support

| Feature | Benefit |
|---|---|
| **Advanced Routing** | • Provides robust, scalable, and feature-rich internetworking software support using the accepted standard networking software for Internet and private WANs.<br>• Cisco IOS Software feature sets support IP routing and standards such as Network Address Translation (NAT), Open Shortest Path First (OSPF), Routing Information Protocol (RIPv1 and RIPv2), Border Gateway Protocol (BGP), Enhanced Interior Gateway Protocol (EIGRP), Next Hop Resolution Protocol (NHRP), and more. |
| **Advanced Security** | With the Cisco IOS Software Advanced Security feature set, the Cisco ISRs can provide end-to-end security, adaptive threat defense, and protection for network infrastructure through security features such as a Cisco IOS Firewall, intrusion prevention, IPsec VPN, advanced application inspection and control, Secure Shell (SSH) Protocol Version 2.0, and Simple Network Management Protocol (SNMPv3) in one secure solution set. |
| **IP Communications** | • Cisco CallManager Express is an optional solution that provides call processing for Cisco IP phones and delivers telephony features similar to those that are commonly used by business users to meet the requirements of SMBs.<br>• With Survivable Remote Site Telephony (SRST), branch offices can use centralized call control while cost-effectively providing local branch backup using SRST redundancy for IP telephony.<br>• Conferencing and transcoding across a broad set of Cisco access platforms provide substantial scalability and also enable Cisco customers to reduce network costs.<br>• Designed to meet enterprise and service provider Session Border Controller (SBC) needs, the Cisco Multiservice IP-to-IP Gateway is an integrated application within Cisco IOS software that runs on Cisco 2800, and 3800 Series ISRs for integrated voice, video, and data services. |
| **Traffic Monitoring and Advanced Management** | Consistent Cisco IOS Software-based interface and instrumentation across portfolio, service-level agreement (SLA) enforcement with IP SLA, role-based access for split control, NetFlow for advanced traffic monitoring, Embedded Event Manager for advanced scripting. |

### Advanced QoS Support

By integrating the cable modem functionality into a Cisco router, advanced functionality such as expanded QoS enforcement (Table 3) can be enabled. In a two-box solution (that is, a standalone cable modem plus a standalone router) the cable modem is usually connected to the router using an Ethernet or USB port. In this scenario, the router

has no ability to sense congestion at the cable modem. If the router continues to send packets, the cable modem will be forced to make decisions regarding the processing and dropping of packets without proper knowledge or understanding of the appropriate prioritization of the packets, which can result in poor performance for latency-sensitive traffic such voice, video, and mission-critical data. The Cisco Cable HWIC overcomes this limitation by using its integration within Cisco routers to constantly communicate its status and ability to handle additional packets.

**Table 3.** Advanced QoS Features and Benefits

| Feature | Benefit |
|---|---|
| **Cable interface Congestion Management for the Primary Service Flow** | Cisco IOS Software can detect upstream congestion on the Cable HWIC primary service flow and prioritize packets to help ensure latency-sensitive and mission-critical traffic receives the highest priority. |
| **Dynamic ACLs for Secondary Service Flows** | Cisco IOS Software uses a propriety protocol to install dynamic ACLs to bypass the router's normal forwarding queue and pass latency-sensitive packets directly to high-priority secondary service flows. |
| **Cisco IOS Software-Based QoS** | Cisco IOS Software supports a broad array of QoS features, including Low Latency Queuing (LLQ), Weighted Fair Queuing (WFQ), Class-Based Weighted Fair Queuing (CBWFQ), and Weighted Random Early Detection (WRED), allowing a customer to maximize the control of the WAN interface. |
| **Enhanced Failover and Load Balancing** | When the cable interface is being used as a secondary or backup interface and the primary link fails, latency-sensitive and mission-critical traffic can be prioritized on the cable interface over Web and lower priority data. |
| **Secondary Service Flow Support for up to 15 Flows** | Secondary service flows are optionally used by cable operators to provide advanced levels of QoS throughout the cable operator's network to help ensure latency-sensitive and mission-critical traffic is prioritized throughout the cable operator's network. |

### Ease of Management and Deployment

Cisco Cable HWICs are highly manageable devices that offer many ease of management advantages (Table 4). For instance, the cable HWICs can be monitored using the host router command-line interface (CLI), providing one point of monitoring and management for the cable modem and host router. Additionally, the Cisco Cable HWIC can be managed using an advanced Cisco GUI software suite such as the Cisco Router and Security Device Manager (SDM) or CiscoWorks. These easy-to-use Web-based management interfaces can be accessed through a standard Web browser.

**Table 4.** Management Features and Benefits

| Feature | Benefit |
|---|---|
| **Single, Static MAC Address** | MAC address of the cable HWIC is assigned at the factory and does not change, allowing for ease of management by cable operators. |
| **Clear Demarcation Point** | The cable HWIC configuration can only be modified using the cable operator's CMTS and cannot be changed using Cisco IOS Software in compliance with the DOCSIS, Euro-DOCSIS, and J-DOCSIS standards. |
| **Real-time Status and Statistics Using Cisco IOS Software** | The cable HWIC provides Cisco IOS Software with real-time status and statistics updates, which can be monitored remotely or onsite using Cisco IOS Software. |
| **Cisco IOS Software IP SLA** | End-to-end service-level measurement assures IP service levels, proactively verifies network operation, and accurately measures network performance. |
| **Cisco IOS Software Embedded Event Manager (EEM)** | EEM harnesses network intelligence through event detectors and takes action according to predefined policies, resulting in increased manageability, control, and resiliency. |
| **Ease of deployment** | Single box to manage for managed services. New features and services can be enabled using Cisco IOS Software without the introduction of a second device or a truck roll. |
| **Cisco Router and Security Device Manager (SDM)** | Provides an easy-to-use, Web-based management interface through a standard Web browser to configure the Cisco IOS Software router and control the router's interaction with the cable HWIC. |
| **Cisco CNS 2100 Series Intelligence Engine support** | Secure networking product supports the activation, upgrading, and configuration of CPE through centralized template-based configuration management. |
| **Future CiscoWorks support (planned for 2007)** | CiscoWorks network management software provides management capabilities on a per-port and per-switch basis, providing a common management interface for Cisco routers and switches. |

## Summary/Conclusion

Bandwidth requirements continue to rise at businesses of all sizes, and convergence of data, voice, and video on these single pipes requires more intelligent solutions. As companies strive to lower the costs of running their networks and to increase the productivity of their end users with network applications, broadband connectivity is increasingly a core requirement for businesses of every size. The Cisco Cable HWICs enable a higher level of physical and logical security, provide advanced QoS for IP Communications, easy expandability, higher availability, and simplified management for SMBs and enterprise branch offices. By integrating the Cable HWIC into existing or new Cisco IOS Software-based routers, the Cisco Cable HWICs can help businesses of all sizes avoid expensive private circuit upgrades and allow cable operators to reach a broader set of customers and provide increasing levels of advanced managed services in a cost-effective manner.

### Software Support

**Table 5.** Software support

| Platforms | Minimum Cisco IOS Sotware Release | Minimum Cisco IOS Sotware Feature Set or License |
|---|---|---|
| **Cisco 1800, 2800, and 3800 Series Integrated Services Routers and IAD2430** | 12.4(11)T | IP Base |
| **Cisco 1900,Series Integrated Services Routers** | 15.0(1)M | IP Base |

### Platform Support

The cable HWICs are supported in the onboard HWIC slots of the modular Cisco 1841 ISR, Cisco 1941 ISR, Cisco 2800 and 3800 Series ISRs and in the WIC slot of the Cisco IAD2430 Series. Table 6 provides platform support details.

**Table 6.** Platform Support Details

| HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2 | Maximum Number of HWICs |
|---|---|
| **Cisco 1841 ISR** | 2 |
| **Cisco 1941 ISR** | 2 |
| **Cisco 2801 ISR** | 2 |
| **Cisco 2811, 2821, and 2851 ISR** | 4 |
| **Cisco 3825 and 3845 ISR** | 4 |
| **Cisco IAD2431 and IAD2432 Integrated Access Devices** | 1 |

## Hardware Specifications

Hardware specifications of the cable HWICs are described in Table 7.

**Table 7.** Specifications for the HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2

| Specification | Data |
|---|---|
| **Hardware/Platform Compatibility** | Cisco 1841, 1941, 2800, and 3800 Series, and IAD2430 Series |
| **Network Module Support** | Cable HWICs are supported by the following NM carrier modules: NM-2W, NM-1FE1R2W, NM-1FE2W-V2, NM-2FE2W-V2 |
| **Ports** | Single F-type standard coax interface for HFC network |
| **Cabling Required** | Standard coax cabling |
| **LEDs** | Power, link status indicators, downstream (DS) and upstream (US) activities, and online indicator |
| **Cable Certification** | HWIC-CABLE-D-2 is CableLabs® certified (CW45). Pending certification at T-Com Labs for HWIC-CABLE-E/J-2. |

| Specification | Data |
|---|---|
| **DOCSIS Standards Based** | • HWIC-CABLE-D-2: based on DOCSIS 1.0, 1.1, 2.0<br>• HWIC-CABLE-E/J-2: based on Euro-DOCSIS 2.0, J-DOCSIS 2.0 |
| **Dimensions** | • Width 3.08 in. (6.93 cm)<br>• Height .75 in. (1.91 cm)<br>• Depth 4.38 in. (9.86 cm) |
| **Weight** | 2.4 oz (68 g) |

### Product Number and Ordering Information

The cable HWIC product numbers are listed in Table 8.

**Table 8.** Cisco Cable HWIC Product Numbers

| Product Number | Description |
|---|---|
| **HWIC-CABLE-D-2** | 1-port DOCSIS 2.0-based cable HWIC (system) |
| **HWIC-CABLE-D-2=** | 1-port DOCSIS 2.0-based cable HWIC (spare) |
| **HWIC-CABLE-E/J-2** | 1-port Euro/J-DOCSIS 2.0-based cable HWIC (system) |
| **HWIC-CABLE-E/J-2=** | 1-port Euro/J-DOCSIS 2.0-based cable HWIC (spare) |

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

When installed in the Cisco 1800, 1900, 2800, and 3800 Series ISRs, the cable HWICs do not change the router standards (regulatory compliance, safety, EMC, telecom).

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

- For Cisco 1841 Integrated Services Router: http://www.cisco.com/en/US/products/ps5853/products_data_sheet0900aecd8016a59b.html
- For Cisco 2800 Series Integrated Services Routers: http://www.cisco.com/en/US/products/ps5854/products_data_sheet0900aecd8016fa68.html
- For Cisco 3800 Series Integrated Services Routers: http://www.cisco.com/en/US/products/ps5855/products_data_sheet0900aecd8016a8e8.html
- For Cisco IAD2430 Integrated Access Devices: http://www.cisco.com/en/US/products/hw/gatecont/ps887/products_data_sheet09186a008019aded.html
- Cisco 1900 Integrated Services Router (modular): http://www.cisco.com/en/US/products/ps10538/index.html

## Country Availability

For the latest information regarding per-country approval for the HWIC-CABLE-D-2 and HWIC-CABLE-E/J-2, contact your local Cisco representative.

## Environmental Operating Ranges

- **Operating temperature:** 32 to 104ºF (0 to 40ºC)
- **Nonoperating temperature:** 4 to 149ºF (-20 to 65ºC)
- **Relative humidity:** 10 to 85 percent noncondensing operating; 5 to 95 percent noncondensing, nonoperating safety

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