

Cisco IGX 8400 Universal Router Module



The Cisco IGX 8400 Universal Router Module (URM) provides native support for a full suite of IP services, including VoIP, on the Cisco IGX™ 8400 Series.

Worldwide ATM WAN Enterprise customers planning to support voice and data branch to core integration can use the Cisco IGX 8400 Universal Router Module for end-to-end operability with any Cisco IOS®-based platform and expanded reach of voice switched networks.

With the Cisco IGX 8400 URM, the IGX 8400 can be peered with other Cisco IOS-based platforms and provide unprecedented IP + ATM hardware integration.

By integrating IOS technology, the Cisco IGX 8400 URM helps deliver a seamless migration path towards New World technologies, such as VoIP and MPLS, for Cisco IGX 8400 customers.

The addition of a Cisco IGX 8400 URM to an IGX allows scaling of multi-service over IP and IP routing applications, and enables the user to provision branch integration services such as voice over IP (VoIP) as well as implement voice network switching with technologies such as H.323.

The Cisco IGX Universal Router Module is available with 2 Voice-enabled Back Card BC-URI-2FE2V-T1, or BC-URI-2FE2V-E1. Each back card features 2 CAS/CCS voice ports (T1 or E1) and 2 Fast Ethernet ports.

Features and Benefits of Cisco IGX 8400 Universal Router Module

Scalability

- Merges ATM switching with IP routing in one box, reduces cost of network equipment and simplifies the network (no need to maintain separate networks)
- Interoperable with Cisco multi-service voice and data products (such as 1750, MC3810, 2600, 3600, 7200, 7500, 5300, 5800, Cisco IP Phones, IP-PBX and Catalyst Switches)
- Voice switching through Cisco IOS Technology moves from point-to-point traffic to switched voice traffic, reduces the amount of required private branch exchange (PBX) equipment, simplifies dial plans and expands the reach of voice switched networks.



- Enables the administration of large dial plans via H.323 v2/v1 gateway and gatekeeper interoperability and support
- Up to 60 voice channels per URM module, up to 30 modules per Cisco IGX platform or up to a total of **1,800** voice channels per Cisco IGX platform.

Flexibility

- End-to-end operability with any Cisco IOS platform: common operating system and common feature set.
- Through its Cisco IOS integration, the Cisco IGX 8400 URM supports requirements such as routing, firewall and VPN
- Dual connections to PBXs, public switched telephone networks (PSTNs) or both using E1 or T1 interfaces via a dual port E1 or T1 MultiFlex Voice/WAN interface card (VWIC) with integrated T1 CSU/DSU or E1 DSU.
- Programmable digital signal processors support G.711, G.723, G.726, G.728, G.729 and G.729a/b for customized solutions to meet the need for high voice quality and bandwidth efficiency

Performance

- A high-performance RISC architecture provides up to 85 Kpps of fast switching capability or up to 8.5 Kpps of process switching capabilities.
- Support is included for one AIM slot, which can be used to provide hardware acceleration and additional processing power for emerging applications as network needs evolve.
- Support for up to 155Mbps total throughput to Cisco IGX backplane
- Branch office to regional office connectivity, enabling support for emerging applications.

Cisco IOS Software

Full support for Cisco IOS software allows customers to deploy many features across a variety of applications. These include:

- *Asynchronous Transfer Mode (ATM)*—ATM Forum standard ATM adaptation Layer 5 (AAL5) with support for the following ATM QoS Traffic Classes: Unspecified Bit Rate (UBR), UBR+, Variable Bit Rate (VBR-rt, VBR-nrt), Available Bit Rate (ABR), and Constant Bit Rate (CBR). VoIP and H.323 over ATM are also supported.
- *IP Quality of service (QoS)*—Features such as the resource reservation protocol (RSVP), protocol independent multicast (PIM), generic traffic shaping, committed access rate (CAR), custom and priority queuing, and weighted fair queuing (WFQ) ensure a consistent QoS for new applications such as teleconferencing over the WAN.
- *Security*—Cisco IOS software firewall feature set, IPSEC with data encryption standard (DES), and 3DES data encryption, tunneling, extended access lists, violation logging, Remote Access Dial-In User Service (RADIUS), Kerberos V, and TACACS+ with authentication, authorization, and accounting (AAA) are supported. Future Hardware-based Encryption support through AIM expansion.
- *Voice signaling*—Cisco IOS software offers a robust set of signaling features for packet telephony applications with ISDN Primary Rate Interface (PRI) and other common channel signaling variants planned for the future.



Feature Summary

Table 1 Cisco IGX 8400 Universal Router Module Feature Summary

Feature	Benefits
Advanced Voice Busyout (AVBO)	AVBO provides a way to busy out a voice port or DS0 group (timeslot) based on monitored network congestion to remote IP destinations. Service Assurance Agent (SAA) probes are sent periodically to IP destinations, and if the returned values exceed the configured thresholds, the voice interface can be busy out.
Any Call to Any Call with end-to-end Interoperability	Interoperates with Cisco IP phones, analog phones, fax machine connections, and PBX connections to and from any other Cisco voice enabled product.
Authentication, Authorization, and Accounting (AAA)	Supports debit and credit card (prepaid and post-paid calling card) applications.
AVVID Interoperable	Interoperable within the Cisco AVVID architecture.
Call Admission Control using RSVP	Uses Resource ReserVation Protocol (RSVP) to determine end-to-end. Resource availability before establishing a call across an IP infrastructure.
Circuit Switched Leased Line Replacement	Businesses incur significant recurring monthly costs for leased lines purely for the interconnection of telecom PBXs and switches. This product gives these enterprises the ability to remove these costly rigid-bandwidth leased lines and replace them with flexible bandwidth lines, which will be used to carry data, voice, and video. The ability to support proprietary PBX signaling types exists by using connection trunking and transparent CCS.
Comfort Noise Generation	While using VAD, the DSP at the destination emulates background noise from the source side, preventing the perception that a call is disconnected.
Connection Trunk	Creates a tie-line replacement structure while only consuming bandwidth during a call (digital-to-digital or digital-to-analog).
DTMF Relay	Carries DTMF tones/information out-of-band for clearer transmission and detection.
Extensive E1 support	E1 version supports both balanced and unbalanced modes. E1 G.703 unframed for utilizing the full 2.048 Mbps is also supported.
Fax Support	Transmit Group III fax over any voice channel without sacrificing voice processing resources regardless of compression type.
Gateway for IP phones to PSTN or classic PBXs	Enables a connection for incoming and outgoing calls to and from the PSTN or classical PBXs using Cisco IP phones.
Gateway for legacy PBXs, Phones, Fax Machines, and Key Communication Systems to PSTN	Enables a connection for incoming and outgoing calls to and from the PSTN originating from and destined for legacy PBXs, phones, fax machines, and key communication systems connected to a data, voice, and video infrastructure.
H.323 version 1 and 2 Support	Uses industry-standard signaling protocols for call setup between gateways, gatekeepers, and H.323 end points (such as Intel Internet Phone or Microsoft Netmeeting).
Integrated Data WAN Support	Connect one or two T1 or E1 interfaces on this network module as a WAN interface either as one or multiple groups of DS0s or as an entire T1 or E1 frame while still providing packet voice support for connections to PBXs and the PSTN.
Integrated IOS	Enterprises and Service Providers can use a single box for ATM-based multi-service switching and IP routing applications.
Interactive Voice Response Support (IVR)	Utilizes IVR to provide automated-attendant, voice-mail support, and call routing based on desired service.
Off-premise Extension (OPX)	Extends the capability of legacy PBX to off-premise phones.
Open Settlement Protocol Support (OSP)	Provides the ability to settle account billing between service providers who are sharing resources to expand geographical coverage using third-party tools and standards-based OSP.
Private Line Automatic Ringdown (PLAR)	Provides a direct connection to another digital or analog voice port by lifting a telephone handset on one end.
Scalable from 60 to 1,800 Voice Channels	Up to 30 URM modules are supported in one Cisco IGX.
Standards-based Compression Algorithm Support	Users can choose to either transmit voice across their networks as uncompressed PCM (G.711, u-law and A-law) or compressed from 5.3 kbps to 32 kbps using standards-based compression algorithms (G.729, G.729a/b, G.723.1, G.726, G.728).
Standards-Based PCM Encoding	Standards-based ITU-T G.711 PCM encoding provides 64 kbps analog to digital conversion using u-law or A-law.
Toll Bypass	Reduce or eliminate toll charges assessed by long distance and local carriers by transporting voice and fax traffic across the enterprise intranet, LAN, metropolitan-area network (MAN), or WAN.



Table 1 Cisco IGX 8400 Universal Router Module Feature Summary (Continued)

Feature	Benefits
Voice Activity Detection (VAD)	Consume bandwidth during a call only when there is voice traffic to send (silence suppression).
Voice over ATM	Transport voice directly over ATM networks using AAL 5 encapsulation. VoIP is also transported over ATM.
Voice over IP	Transmits data, voice, and video end-to-end with IP, and interworks with other Cisco IOS-based voice-enabled platforms.

Features Highlights of Cisco IGX 8400 Universal Router Module

Voice Channel Support

- Up to 60 channels per URM of low- or medium- complexity voice or fax-relay (G729, G729a/b, G726, G.711, Group 3 FAX up to 14.4K)
- Up to 30 channels per URM of high-complexity voice or fax-relay (G723.1, G728)

Voice Feature Support

- Advanced Voice Busyout (AVBO)
- Answer-address, incoming-called-number on dial-peers
- Break-out/Break-in (BOBI) (CCS protocol interworking)
- Called party number restrictions
- CAS + CAS/CCS interworking
- CDR Records
- Comfort noise generation
- Configurable cause codes
- Connection trunk
- D-channel compression
- Echo cancellation (up to 32 ms configurable)
- Hard-coded cause codes
- Hunt groups across cards
- Integrated add/drop multiplexer (drop and insert)
- LED indicators for voice processing resources and port status
- Multiple service areas (H.323 zones)
- PBX tie-line replacement
- Private line automatic ring-down (PLAR)
- Silence suppression, voice activity detection (VAD)
- Transparent CCS (PRI Backhaul)
- Wildcard addressing and routing
- Wildcard in translation rules

Telephony Interface Signaling Support

- E1 Me1CAS

- E1 R2 CAS
- Inbound signaling (such as DTMF, MF support)
- T1 and E1 CAS
- T1 and E1 Transparent CCS (with Multi-D channel)
- CCS Signaling Protocol Support:
 - AT&T 4ESS, Technical reference 41459
 - QSIG (ETSI) - ETS 300 239
 - Euro-ISDN (ETSI) - ETS 300 120
 - Q.931A, Japanese ISDN

Standards Support

- H.323 version 1 and 2 feature support
- H.323 CODEC-negotiation
- H.323 gateway RAS support (version 1/version 2)
- Supports ITU Standard Compression Algorithms (G.729, G.723.1, G.729a/b, G.711, G.728, G.726)

Traditional Circuit Switched PBX Support

- Qualified PBX interoperability for Lucent Definity series, Nortel Meridian, and ROLM/Siemens HICOM, NEC NEAX 2400,
- Toshiba Strada DK424, Mitel 2000SX, Ericsson, Nortel SL-1 (other PBXs continue to be certified)

ATM Support

- Multiprotocol encapsulation with support for Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) encapsulation and VC multiplexing (Internet Engineering Task Force [IETF] RFC 1483)



- Classical IP and Address Resolution Protocol (ARP) over ATM; client and ARP server (IETF RFC 1577; IETF RFC 1755; IETF RFC 1626)
- Multiprotocol routing over ATM (MPOA) for IP, Novell IPX, DECnet IV and V, AppleTalk Phases 1 and 2, Connectionless Network Service (CLNS), Xerox Network Systems (XNS), and Banyan VINES via IETF RFC 1483
- IETF PPP over ATM
- ATM Forum ILMI for address prefix acquisition and ATM service address registration with UNI-compliant switches throughout the ATM network
- ATM network service access point (NSAP) E.164 address support
- F4 (virtual path) and F5 (virtual connection) OAM cell segment and end-to-end flows, remote deflect identification (RDI), and alarm indication signal (AIS)
- Layer 2 per-VC queuing
- Up to 1024 simultaneous Virtual Circuits (VCs)
- AAL5 ATM adaptation layer
- ATM Service classes: UBR, UBR+, VBR-rt, VBR-nrt, ABR, and CBR (data only)
- Permanent virtual paths (PVPs)
- ATM bandwidth (resource) manager
- NHRP (Next Hop Resolution Protocol)
- Interim Local Management Interface (ILMI)

Physical Interfaces

- 2 Digital CAS/CCS Channelized Voice Ports (T1 or E1)
- 2 Fast Ethernet Ports
- Up to 155 Mbps connectivity to Cisco IGX 8400 Backplane
- One Console Port
- One advanced integration module (AIM) slot for hardware acceleration and increased processing power

On-board DSU/CSU

- Selectable DSX-1 cable length in increments from 0 to 655 feet in DSU mode)
- Selectable DS1 CSU line build-out: 0, -7.5, -15, and -22.5 dB
- Selectable DS1 CSU receiver gain: 26 or 36 dB

T1/E1 Diagnostics

- ANSI T1.403 Annex B/V.54 loopup/down code recognition, network loopback, and user initiated loopbacks, network payload loopback, local data terminal equipment (DTE) loopback, remote line (codes: V.54, loop up, and loop down)
- BERT patterns all 0s, all 1s, 1:2, 1:8, 3:24, QRW, QRSS, 63, 511, 2047 and V.54/T1.403 annex B bit patterns, two user-programmable 24-bit patterns
- Alarm detection: alarm indication signal (AIS), time slot 16 AIS, remote alarm, far-end block error (FEBE), out of frame (OOF), cyclic redundancy check (CRC) multiframe OOF, signaling multiframe OOF, frame errors, cycle redundancy checks (CRC) errors, Loss of network signal (red alarm), loss of network frame, receive (blue alarm) (AIS) from network, receive (yellow) from network Performance Reports / Error Counters CRC, errored seconds, burst errored seconds, severely errored seconds, Ft and Fs framing errors for SF framing, FPS framing errors for ESF framing, 24-hour history stored in 15-minute increments
- Onboard processor for real-time facility data link (FDL) messaging, in-band code detection and insertion, alarm integration, and performance monitoring
- Full FDL support and FDL performance monitoring, according to configurable standard: ANSI T1.403 or AT&T TR 54016

Cisco IOS and Platform Support

- Fully supported via IOS CLI including device configuration, monitoring, link status, security, Layer 2 and 3 protocol configuration and management, and call history



Network Management Support

- SNMP protocol compliant
- Manageable via a MIB browser
- CiscoView interface for configuration
- Support for CiscoWorks, CiscoWorks2000, and CiscoView allows simplified management of all integrated components on the Cisco IGX-URM and provides consistent network management along with other Cisco devices in the network.
- Enhanced setup feature, which provides context-sensitive questions, guiding the user through the configuration process and allowing faster deployment.
- Support for the Cisco Discovery Protocol (CDP), which enables a CiscoWorks network management station to automatically discover URM in a network topology.
- ATM Management Information Base (MIBs):
 - MIB II
 - AToM MIB
 - ATM ILMI MIB
 - RFC 1406, 1595, 1695, and 2233

Technical Specifications

Table 2 Cisco IGX 8400 Universal Router Module Technical Specifications

Specification		
Processor Type	225 MHz RISC QED RM5271	
Flash Memory	32 MB	
System Memory	128 MB SDRAM (upgradable to 256 with MEM3660-128D=)	
Performance	Up to 85 Kpps fast switching and up to 8.5 Kpps process switching (at 80% processor utilization)	
Maximum Simultaneous Voice Call Setup	60 Calls per URM	
Advanced Integration Module (AIM) Slots	1 slot	
Onboard LAN Ports	Two autosensing 10/100 Mbps Ethernet ports	
Console Port	Located on URM Back Card	
Onboard Voice ports	2 x T1 (with BC-URI-2FE2V-T1 Back Card) 2 x E1 (with BC-URI-2FE2V-E1 Back Card)	
T-1 Interface	Transmit Bit Rate	1.544 Mbps +/- 50 bps/32 PPM
	Receive Bit Rate	1.544 Mbps +/- 50 bps/32 PPM
	Line Code	AMI, B8ZS
	AMI Ones Density	Enforced for N x 56 Kbps channels
	Framing Format	D4 (SF) and ESF
	Output level (LBO)	0, -7.5, or -15 dB
	Input Level	+1dB0 down to -24 dB0
	DTE Interface (data mode)	Fractional Service
	DTE Interface (voice mode)	G.704/structured
	DCE Interface	G.704/structured
E1 Interface	Transmit Bit Rate	2.048 Mbps +/- 100 bps/50 PPM
	Receive Bit Rate	2.048 Mbps +/- 100 bps/50 PPM
	Data Rate	1.984 Mbps (framed mode) Per E1 Port
	Clocking	Internal and Loop (recovered from network)
	E1 National Bits	Software-configurable
	Encoding	HDB3
	DTE Interface (data mode)	Fractional Service
	DTE Interface (voice mode)	G.704/structured
	DCE Interface	G.704/structured



Table 2 Cisco IGX 8400 Universal Router Module Technical Specifications (Continued)

Specification	
T1/E1 Interface Type	RJ48 Connector
T1/E1 Physical Interface Standards	T1 ANSI, ATT T1.1, ANSI T1.403
IP Quality of Service (QoS) Standards	IETF: RSVP, WFQ, WRED, CRTP, PQ, and other IOS capabilities
Signaling Standards	ITU-T: H.323 v1 and v2 T1/E1 CAS T1/E1 CCS: <ul style="list-style-type: none"> • AT&T 4ESS, Technical reference 41459 • QSIG (ETSI) - ETS 300 239 • Euro-ISDN (ETSI) - ETS 300 120 • Q.931A, Japanese ISDN
Clock Support	Pull-in range +/-64 PPM, Pass-through +/-32 PPM
Telco Standards	AT&T Accunet (62411) ATT 54016
Diagnostic Loopback Support	ANSI T1.403 Annex B/V.54 loopup/down code recognition, network loopback, and user initiated loopbacks, network payload loopback, local DTE loopback, remote line (codes: V.541, loop up, and loop down)
Alarm Detection	Alarm indication signal (AIS), remote alarm, far-end block error (FEBE), out of frame (OOF), cyclic redundancy check (CRC) multiframe OOF, signaling multiframe OOF, frame errors, CRC errors, Loss of network signal (red alarm), loss of network frame, receive (blue alarm) (AIS) from network, receive (yellow) from network Performance Reports / Error Counters CRC, errored seconds, burst errored seconds, severely errored seconds, Ft and Fs framing errors for SF framing, FPS framing errors for ESF framing, 24-hour history stored in 15-minute increments
LED Indicators	Data carrier detect (CD) Loopback (LP) Alarm (AL) Voice DSP processing status
DSU/CSU	Selectable DSX-1 cable length in increments from 0 to 655 feet in DSU mode Selectable DS1 CSU line build-out: 0, -7.5, -15, and -22.5 dB Selectable DS1 CSU receiver gain: 26 or 36 dB

Physical/Electrical Specifications

Table 3 Cisco IGX 8400 Universal Router Module Physical/Electrical Specifications

Dimensions	Front card 15.25 x 16.25 in.; back card 6.5 x 16.25 in.
Weight	4 lbs (Front Card) 1.7 lbs (Back Card)
Input Power	-48 VDC
Power Consumption	64.7 W
Electrical and Safety Standards	UL 1950 3rd. edition CSA 950, 1995 version IEC 950 EN 60950 AS/NZS: 3260 with amendment 134



Part Numbers

Table 4 Cisco IGX 8400 Universal Router Module Part Number

Part Number	Description
IGX-URM	Universal Router Module Front Card. A Back card is required for operation.
BC-URI-2FE2V-T1	Includes: <ul style="list-style-type: none"> • 2 T1 ports: 48 channel T1 voice/fax network module (supports 48 channels of medium complexity VoCoders: G.729a/b, G.729, G.726, G.711, and fax or 24 channels of G.728, G.723.1 and fax) • 2 Fast Ethernet ports • Console port
BC-URI-2FE2V-E1	Includes: <ul style="list-style-type: none"> • 2 E1 ports: 60 channel E1 voice/fax network module (supports 60 channels of medium complexity VoCoders: G.729a/b, G.729, G.726, G.711, and fax or 30 channels of G.728, G.723.1 and fax). • 2 Fast Ethernet Ports • Console port
SURMCP-12105T	Cisco URM Series IOS IP PLUS

Voice Port Cables

Table 5 Cisco IGX 8400 Universal Router Module Cable Part Numbers

	Description	Part #	Length	Connectors
T1	RJ-45-RJ-45	CAB-T1-RJ-45	10 ft	RJ-45 Male
E1	E1 Cable RJ45 to Dual BNC (Unbalanced)	CAB-E1-RJ45BNC	—	RJ-45 - Dual BNC
	E1 Cable RJ45 to Twinax (Balanced)	CAB-E1-RJ45TWIN	—	RJ-45 - Twinax

Country Approval

Table 6 Cisco URM Digital T1 Interface Country Approval

Country	Specification
US	ANSI T1.403 ATT 54016 Bellcore—AT&T Accunet (62411) FCC Part 68 FCC Part 15 Class A, T1 UL 1950, T1
Canada	CS-03 CSA 950, T1 CSA C108.8 Class A, T1
Japan	VCCI class 1 (or class A) VCCI-V-3/97.04, T1 JATE green book, IEC950
UK	CE (CTR-12 and CTR-13) EN41003 EN60950



Table 7 Cisco URM Digital E1 Interface Country Approval

Country	Specification
Austria (CE) Belgium (CE) Denmark (CE) Finland (CE) France (CE) Germany (CE) Gibraltar (accepts CE) Greece (CE) Ireland (CE) Italy (CE) Liechtenstein (accepts CE) Luxembourg (accepts CE) Malta (accepts CE) Monaco (accepts CE) Netherlands (CE) Norway (CE) Portugal (CE) Spain (CE) Sweden (CE) Switzerland (CE) U.K. (CE)	EMC EN55022/EN50082/ EN61000 Safety EN60950 Telecom CTR13/CTR12/ TUV GS
New Zealand	EMC AS/NZS 3548 Safety AS/NZS 3260 Telecom TNA 117
China	EMC CISPR22 Safety EN60950
Singapore	EMC EN55022/CISPR22 Safety EN60950 Telecom DLCN1/DLCN2
Poland	EMC EN55022/EN50082/EN61000 Safety EN60950 Telecom CTR13/CTR12
Australia	EMC AS/NZS 3548 Safety AS/NZS 3260 Telecom TS016

E1 Compliance (Partial List—continued)

- Germany (VDE 0878 part 3 and 30)
- France (NFC98020, EN60950, EN41003)
- Sweden (SS447-2-22, SS636334, EN60950)
- UK (NTR4)
- Europe (EN55022 Class A, EN55102-1, EN55102-2, CTR12, EN60950, EN50082-1:1992, EN55022:1994 [Amendment 1 + 2])
- CCITT/ITU G.704, I.431
- ETSI NET5, ETS300156
- CTR4 (PRI ISDN)
- CTR-13
- ETS 300011
- ITU I.431



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