Analog Voice Network Interface Modules for Cisco 4000 Series ISRs

NIMs Support Multiple Voice Applications on the Cisco 4000 Series ISRs

Introduction

The Cisco® 4000 Series Integrated Services Routers (ISRs) host the Cisco network interface modules (NIMs), which have evolved from the enhanced high-speed WAN interface card (EHWIC), increasing port density and module capability. Up to three integrated NIM slots on the 4000 Series allow for flexible configurations. The NIMs support online insertion and removal (OIR), reducing the downtime required for new or replacement modules.

The available modules include 2-port and 4-port foreign exchange station (FXS), direct inward dial (DID), foreign exchange office (FXO), a combination of 2-port FXS and 4-port FXO, 4-port ear and mouth (E/M), and 2-port and 4-port basic rate interface (BRI) (Figure 1). The BRI cards support only voice features. The NIMs have a dedicated digital signal processor (DSP) that will be used for time-division multiplexing (TDM) analog voice services. Table 1 lists the available modules.

Note: These NIMs are not supported with the Cisco 2900 and 3900 Series ISRs.

Figure 1. Cisco FXO, FXS, and Combo 2FXS/4FXO NIMs Compatible with the Cisco 4000 Series ISRs

Table 1. Cisco FXO and FXS NIM Types and Feature Comparison

Part Number	Number of Ports	ISR G2 comparison
NIM-2FXO	2	VIC2-2FXO
NIM-4FXO	4	VIC2-4FXO
NIM-2FXS	2	VIC3-2FXS/DID
NIM-4FXS	4	VIC3-4FXS/DID
NIM-2FXS/4FXO	6	VIC2-4FXO and VIC3-2FXS/DID
NIM-4E/M	4	VIC3-2E/M
NIM-2BRI-NT/TE	2	VIC2-2BRI-NT/TE
NIM-4BRI-NT/TE	4	VIC2-2BRI-NT/TE

The FXS, FXO, E/M, and BRI NIMs can be inserted into the NIM slot on the supported Cisco 4000 Series ISRs without powering off the router.

The new generation of Cisco FXO/FXS NIMs add improvements over the previous WAN interface cards (VICs and VIC2s). The FXO, FXS, E/M, and BRI NIMs contain an onboard DSP and don't require the router to have dedicated packet voice DSP module (PVDM) on the motherboard. The DSP on the voice module is necessary for the voice features. It also provides for echo cancellation of up to 128-ms echo-tail length for demanding network conditions.

Since the fourth-generation Cisco NIMs have their own DSP to support voice, there is no need to synchronize the clock to the backplane, and the clock-participate command is not supported in the BRI, FXO/FXS, and E/M NIMs. The NIMs support:

- Caller line ID
- G.711, G.729a, and G.726
- G723 and Internet Speech Audio Codec (iSAC); Internet Low Bit Rate Codec (iLBC) is on the roadmap
- Fax detection, pass-through, and relay (T.38)
- Modem detection and pass-through
- Dual-tone multifrequency (DTMF) detection
- Echo cancellation
- Voice activity detection
- Comfort noise generation
- Real-Time Control Protocol (RTCP)
- Acoustic shock protection
- Noise reduction is on the roadmap
- Real-Time Transport Protocol (RTP)
- RFC 4733 Digit Relay

The FXS features include:

- Capable of supporting either FXS or DID functionality
- Configurable long loop ports
- Message waiting indicator (MWI)
- Cable detection

The FXO features include:

- Supports both ground start and loop start modes
- Provides call detail record (CDR) information
- Support for interworking with Cisco Unified Communications Manager (Skinny Client Control Protocol [SCCP]), H.323, Session Initiation Protocol (SIP) and Media Gateway Control Protocol (MGCP) 1.0
- Cable detection
- Overload protection

The FXO port is used to connect to PBX or key systems, or to provide off-premises connections to the public switched telephone network (PSTN). It supports battery reversal detection and caller ID. This VIC can be software configured to work in all countries. It is also used to connect to analog Centralized Automatic Message Accounting (CAMA) trunks to provide dedicated E-911 service (North America only).

The FXS port is used to connect directly to phones, fax machines, and key systems. It generates battery polarity reversal and caller ID. The FXS NIMs are designated as an Off-Premises Extension Lite product offerings. This means that while the module addresses a subset of the off-premises extension applications, it should be noted that the module is not in full compliance for off-premises use.

The DID port is used to provide off-premises DID connection from central office. It serves only incoming calls from the PSTN. It does not support caller ID in DID mode.

The Cisco 4000 Series ISRs also support a NIM carrier card, which converts the SM-X slot into an equivalent NIM slot and can support either one single-wide NIM or a double-wide NIM. This allows the router to support higher port densities.

Cisco IOS XE Software Release Requirements

The modules are supported on the Cisco 4400 and 4300 Series ISRs and require Cisco IOS XE Software Release 3.13.3. Voice applications require a minimum of the Unified Communications technology package, which is optional. Table 2 lists the Cisco IOS Software releases for the FXO and FXS NIMs.

Table 2. Cisco FXO and FXS NIM IOS Releases

Product Number	Cisco IOS Release
NIM-2FXO	XE3.13.4, XE3.14.3, XE3.15.1, XE3.16 and above
NIM-4FXO	XE3.13.4, XE3.14.3, XE3.15.1, XE3.16 and above
NIM-2FXS	XE3.13.4, XE3.14.3, XE3.15.1, XE3.16 and above
NIM-4FXS	XE3.13.4, XE3.14.3, XE3.15.1, XE3.16 and above
NIM-2FXS/4FXO	XE3.14.3, XE3.15.1, XE3.16 and above
NIM-4E/M	XE3.14.3, XE3.15.1, XE3.16 and above
NIM-2BRI-NT/TE	XE3.14.3, XE3.15.1, XE3.16 and above
NIM-4BRI-NT/TE	XE3.14.3, XE3.15.1, XE3.16 and above

Network Interface Specifications

Table 3 lists the weight of each NIM, and Table 4 describes the network management features.

Table 3. Weight

All values are +/-0.01 lb (+/- 5 g).

Product Number	Weight
NIM-2FXO	0.42 lb (191 g)
NIM-4FXO	0.44 lb (200 g)
NIM-2FXS	0.42 lb (191 g)
NIM-4FXS	0.44 lb (200 g)
NIM-2FXS/4FXO	0.52 lb (236 g)
NIM-4E/M	0.44 lb (200 g)
NIM-2BRI-NT/TE	0.42 lb (191 g)
NIM-4BRI-NT/TE	0.44 lb (200 g)

Table 4. Network Management Features

Management Feature	
Telnet or console	Remote and local configuration, monitoring, and troubleshooting from Cisco IOS XE Software command-line interface.
Simple Network Management Protocol (SNMP)	• Router and data service unit (DSU)/channel service unit (CSU) managed by single SNMP agent; router, DSU, and CSU appear as a single network entity to user • Standard MIB (MIB II) • Cisco Integrated DSU/CSU MIB • RFC 1406 T1 MIB, including Alarm Detection and Reporting
SNMP traps	Generated in response to alarms

Cabling

Unlike some old VIC analog FXO modules, there are no jumpers to set on the NIM analog modules.

- For NIM FXO and FXS port connections, connect with a straight-through 2-wire cable.
- For NIM E/M port cabling, refer to the following link: http://www.cisco.com/c/en/us/td/docs/wireless/lmr/design/guide/lmrsrnd_1/lmrifrad.html
- For NIM BRI port cabling, refer to the following link: http://www.cisco.com/public/scc/compass/pdfs/0000_i_isdn_bri_pinouts.pdf

Homologation

Table 5 lists the standards the cards have been tested to.

Table 5. Standards

NIM-FXO	NIM-FXS	NIM-BRI	NIM-E/M
TIA-968-B (USA) CS-03 (Canada) AS/CA S002 (Australia) AS/CA S003 (Australia) PTC220 (New Zealand) TBR 21 (CE countries)	TIA-968-B (USA) CS-03 (Canada) AS/CA S003 (Australia) PTC220 (New Zealand)	TIA-968-B (USA) CS-03 (Canada) AS/ACIF S031 (Australia) PTC220 (New Zealand) TBR 3 (CE countries) ITU-T I.430	TIA-968-B (USA) CS-03 (Canada) AS/CA S003 (Australia)

Compliance

Table 6 lists the standards with which the NIMs comply.

Table 6. Compliance Standards

Emission	Immunity
47 CFR Part 15 CISPR22: Edition 6.0: 2008 CNS13438: 2006 EN 300 386 V1.6.1 EN 55022:2010 EN61000-3-2: 2006 [Inc amd 1 '&' 2] EN61000-3-3: 2008 ICES-003 Issue 5: 2012 KN 22: 2009 TCVN 7189: 2009 VCCI: V-3/2013.04	CISPR24: 2010 EN 300 386 V1.6.1 EN55024: 2010 KN24: 2011 TCVN 7317: 2003

Ordering Information

Table 7 will help you understand all the components or parts you need to purchase in order to install and use the product. It also provides a direct link to the Cisco Ordering Tool and lists part numbers for customer convenience.

To place an order, visit the Cisco Ordering Home Page. To download software, visit the Cisco Software Center.

Table 7. Ordering Information

Product ID	Product Description
NIM-2FXO	2-port Network Interface Module - FXO (Universal)
NIM-4FXO	4-port Network Interface Module - FXO (Universal)
NIM-2FXS	2-Port Network Interface Module - FXS, FXS-E and DID
NIM-4FXS	4-Port Network Interface Module - FXS, FXS-E and DID
NIM-2FXS/4FXO	2-Port FXS/FXS-E/DID and 4-Port FXO Network Interface Module
NIM-4E/M	4-Port E/M Network Interface Module
NIM-2BRI-NT/TE	2-Port BRI Network Interface Module
NIM-4BRI-NT/TE	4-Port BRI Network Interface Module

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