Cisco 4000 Series Integrated Services Router Packet Voice Digital Signal Processor Modules (PVDMs) for Cisco Unified Communications Solutions Data Sheet

Product Overview

The Cisco[®] Packet Voice Digital Signal Processor Modules (PVDMs) enable Cisco 4000 Series Integrated Services Routers (ISRs) to provide rich-media capabilities such as high-density voice connectivity, conferencing, transcoding, media optimization, transrating, and secure voice for Cisco Unified Communications solutions. These new modules support unprecedented scale while allowing for a smaller solution footprint than ever before.

Figure 1.   On-Board Motherboard PVDM (PVDM4) Top View

Figure 2.   PVDM Enhanced Services Module (SM-X-PVDM)

Features and Benefits

The PVDMs support digital voice connections, conferencing, universal transcoding, and media optimization services:

- **T1/E1 voice:** One of the primary uses of PVDMs is to packetize digital voice into IP packets to enable time-division multiplexing (TDM) digital voice applications.
- **Conferencing:** PVDM modules support ad hoc and meet-me conferencing with various codecs in conjunction with Cisco Unified Communications Manager and Cisco Unified Communications Manager Express.
- **Universal transcoding:** In conjunction with Cisco IOS® Software, the PVDMs support universal transcoding, which allows conversion from any supported codec to any other supported codec.
- **Transrating:** The PVDMs support transrating, in which the same codec is repacketized in order to connect dissimilar networks that have different codec packetization periods.
- **Voice-quality management:** The PVDMs perform compression, voice-activity detection, jitter management, and echo cancellation. The echo cancellation offered in the PVDMs has a tail length of 128 milliseconds and complies with ITU-T G.168.
- **Energy savings:** The motherboard PVDMs (PVDM4s) offer multiple power-saving modes, including a power-saver mode when the module is not in use. In power-saver mode, each PVDM4 can save up to 5 watts of power.

The analog voice modules (FXS, FXO, and E/M) and Basic Rate Interface (BRI) digital voice modules for the 4000 Series ISRs contain built-in, nonconfigurable digital signal processors (DSPs) and do not require any additional PVDMs for voice packetization.

Refer to the PVDM Q&A for commonly asked questions.

Form Factor and Options

Cisco 4000 Series PVDMs are available in two form factors with four supported densities in each form factor:

- Motherboard PVDMs (PVDM4) for densities up to 256 channels (Figure 1)
- PVDM enhanced services modules (SM-X-PVDM) for densities up to 3080 channels (Figure 2)

The motherboard PVDMs are supported on all Cisco 4000 Series ISRs. They can be plugged directly into the single slot on the router motherboard or into the network interface module (NIM) that supports T1/E1 ports. A PVDM4 module plugged into the motherboard delivers IP-based voice services such as conferencing, media optimization, and transcoding only.

A PVDM4 module plugged into the T1/E1 NIM would be used for voice T1/E1 connectivity. Any excess channels can be reused toward other IP-based services supported on the motherboard slot. Enhanced DSP architecture accommodates a new packet-processing engine optimized for rich-media voice applications, while concurrently supporting the TDM-IP voice framework.

The PVDM enhanced services modules are supported on ISRs that contain an SM-X slot - namely the Cisco 4331, 4351, and 4451 ISRs. The SM-X modules support only IP-based voice services and cannot be used for TDM applications.

Table 1 lists the various PVDM options along with their slot requirements.

Table 1. Cisco 4000 Series ISR PVDM Part Numbers and Slot Requirements

Part Number	Slot	Description
PVDM4-32(=)	On-board motherboard or T1/E1 module slot	32-channel high-density voice DSP module, or spare
PVDM4-64(=)	On-board motherboard or T1/E1 module slot	64-channel high-density voice DSP module, or spare
PVDM4-128(=)	On-board motherboard or T1/E1 module slot	128-channel high-density voice DSP module, or spare
PVDM4-256(=)	On-board motherboard or T1/E1 module slot	256-channel high-density voice DSP module, or spare
SM-X-PVDM-500(=)	Enhanced services module slot	768-channel high-density voice DSP module, or spare
SM-X-PVDM-1000(=)	Enhanced services module slot	1024-channel high-density voice DSP module, or spare
SM-X-PVDM-2000(=)	Enhanced services module slot	2048-channel high-density voice DSP module, or spare
SM-X-PVDM-3000(=)	Enhanced services module slot	3080-channel high-density voice DSP module, or spare

Codec Support and Capacity

The PVDM4 modules support a wide range of codecs of different complexities. They support all codecs supported by the Cisco 2800/3800 High-Density PVDMs (PVDM3s). Table 2 lists the codecs supported on the PVDM4 and SM-X-PVDM modules, and Table 3 gives the channel densities of the PVDM4 and SM-X-PVDM modules. Table 4 lists the media-enhancement features.

Table 2. Voice, Fax, and Modem Codec Support on PVDMs

Low-Complexity Codecs	Complexity	Motherboard PVDMs (PVDM4s)	PVDM Enhanced Services Modules (SM-X-PVDMs)
Clear channel	Low	Supported	Not applicable
G.711	Low	Supported	Supported
Fax and modem pass-through	Low	Supported	Not supported
G.722	Medium	Supported	Supported
G.726	Medium	Supported	Not supported
G.728	High	Supported	Not supported
G.729	High	Supported	Supported (mapped to G.729a)
G.729a	Medium	Supported	Supported
G.729b	High	Supported	Supported (mapped to G.729ab)
G.729ab	Medium	Supported	Supported
Fax Relay	Medium	Supported	Not supported
iLBC (Internet low bit rate codec)	High	Supported	Supported
iSAC (Internet speech audio codec)	High	Transcoding only	Transcoding only
AMR-WB	High	Supported	Not supported
Modem relay	High	Supported	Not supported

Table 3. Channel Densities of PVDM4 and SM-X-PVDM Modules

Name	Number of Channels		
	Low Complexity	Medium Complexity	High Complexity
PVDM4-32	32	24	16
PVDM4-64	64	48	32
PVDM4-128	128	96	64
PVDM4-256	256	192	128

Name	Number of Channels		
	Low Complexity	Medium Complexity	High Complexity
SM-X-PVDM-500	768	384	192
SM-X-PVDM-1000	1024	512	256
SM-X-PVDM-2000	2048	1024	512
SM-X-PVDM-3000	3080	1400	770

Table 4.   Media-Enhancement Features

Feature	Motherboard PVDMs (PVDM4s)	PVDM Enhanced Services Modules (SM-X-PVDMs)
Echo cancellation	Yes	No
Tone detection	Yes	Yes
Noise reduction	Yes	Yes
Acoustic shock prevention	Yes	Yes
Gain control	Yes	Yes

Cisco Platform Availability and Performance

The PVDM4 modules are supported on all Cisco 4000 Series ISRs. The platform motherboard has one slot for the PVDM4 module. You can plug any additional PVDM4 modules into the T1/E1 NIMs.

The SM-X-PVDM modules are supported on Cisco 4000 Series ISRs with an SM-X slot. Table 5 provides details on the platform support. Tables 6 and 7 give information on platform performance for transcoding and conferencing, respectively.

Table 5.   Platform Availability for SM-X-PVDM Modules

4000 Series Platform	SM-X-PVDM-500 (maximum channels)	SM-X-PVDM-1000 (maximum channels)	SM-X-PVDM-2000 (maximum channels)	SM-X-PVDM-3000 (maximum channels)
4321	Not supported	Not supported	Not supported	Not supported
4331	1 (500)	1 (1000)	Not supported	Not supported
4351	2 (1000)	1 (1000)	Not supported	Not supported
4431	Not supported	Not supported	Not supported	Not supported
4451	2 (1000)	2 (2000)	1 (2000)	1 (3000)
4461	3(1500)	3(3000)	2(4000)	2(4000)

All SM-X-PVDM modules require minimum of 8GB RAM

Table 6.   Platform Performance for Transcoding

4000 Series Platform	Low Complexity to Low Complexity	Low Complexity to Medium Complexity	Low Complexity to High Complexity
4331	750	380	190
4351	1000	510	255
4451	3050	1400	765

Table 7.   Platform Performance for Conferencing

4000 Series Platform	Low Complexity (8-party)	High Complexity (8-party)
4331	190	48
4351	255	63
4451	700	210

Note that the 4000 Series ISRs do not support the PVDM3 modules, and the 2900 and 3900 Series ISRs do not support the PVDM4 and SM-X-PVDM modules.

Product Specifications

Table 8 gives the specifications for the PVDM4 and SM-X-PVDM modules.

Table 8.   Module Specifications

Feature	Motherboard PVDMs (PVDM4s)	PVDM Enhanced Services Modules (SM-X-PVDMs)
Components		
DSP	Multicore DSP technology	Multicore CPU technology
Interface	Integrated Services Card (ISC) slot on motherboard or T1/E1 NIM	Enhanced services module (SM-X)
Features		
Operating temperature	32° to 122°F (0° to 50°C)	32° to 104°F (0° to 40°C)
Voltage	3.3V	12V
Current	1.47A	4.17A
Power	4.85W	50W
Weight	0.08 lb (36 g)	1.78 lb (808 g)
Dimensions (H x W x D)	0.67 x 2.50 x 2.62 in. (1.7 x 5.1 x 6.7 cm)	1.58 x 8.55 x 8.10 in. (4.0 x 21.7 x 20.6 cm)
Regulatory and Compliance		
Safety	Complies with: ● IEC 60950 (worldwide) ● AS/NZS 60950-1 (Australia and New Zealand) ● CAN/CSA-C22.2 No. 60950-1, 1st and 2nd Ed. (Canada) ● GB4943-95 (People's Republic of China) ● EN60950-1, 1st and 2nd Ed. (CENELEC; includes EU and EFTA) ● NOM-019-SCFI-1998 (Mexico) ● UL 60950-1, 1st and 2nd Ed. (United States)	Complies with: ● IEC 60950 (worldwide) + A1 and A2 ● AS/NZS 60950-1 (Australia and New Zealand) ● CAN/CSA-C22.2 No. 60950-1, 2nd Ed. (Canada) ● GB4943-95 (People's Republic of China) ● EN60950-1, 2nd Ed. (CENELEC; includes EU and EFTA) plus Am1 and Am2 ● NOM-019-SCFI-1998 (Mexico) ● UL 60950-1, 2nd Ed. (United States)
Homologation	Platform dependent	Platform dependent
Mean time between failures (MTBF)	System dependent	System dependent
EMC		
Emissions	● CISPR22, Class B ● EN55022, Class B, CFR47, Part 15, Subpart B, Class B	● CISPR22, Class A ● EN55022, Class A, CFR47, Part 15, Subpart B, Class B
Harmonics	EN61000-3-2	EN61000-3-2
Flicker	EN61000-3-3	EN61000-3-3
Immunity	● CISPR24 ● EN 55024 ● EN50082-1	● CISPR24 ● EN 55024 ● EN50082-1

Feature	Motherboard PVDMs (PVDM4s)	PVDM Enhanced Services Modules (SM-X-PVDMs)
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61000-4-2
RF fields	EN 61000-4-3	EN 61000-4-3
EFT	EN 61000-4-4	EN 61000-4-4
Surge	EN 61000-4-5	EN 61000-4-5
Conducted RF	EN 61000-4-6	EN 61000-4-6
Power-frequency magnetic fields	EN 6100-4-8	EN 6100-4-8
Voltage dips, sags, and interruptions	EN 61000-4-11	EN 61000-4-11

Ordering Information

To place an order, visit the Cisco Ordering Home Page and refer to Table 1. To download software, visit the Cisco Software Center.

Cisco and Partner Services for the Branch Office

Services from Cisco and our certified partners can help you transform the branch-office experience and accelerate business innovation and growth. We have the depth and breadth of expertise to create a clear, replicable, optimized branch-office footprint across technologies. Planning and design services align technology with business goals and can increase the accuracy, speed, and efficiency of deployment. Technical services help improve operational efficiency, save money, and mitigate risk. Optimization services are designed to continuously improve performance and help your team succeed with new technologies.

Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.

C78-728307-03   07/19