

CISCO MULTIFLEX TRUNK DEDICATED ECHO CANCELLATION MODULES

Cisco® Multiflex Trunk Dedicated Echo Cancellation (MFT ECAN) Modules are dedicated resources for the Cisco Enhanced ITU-T G.168 ECAN feature, providing robust echo cancellation performance for demanding network environments. The modules are daughter cards that attach to Cisco Second-generation Multiflex Trunk Voice/WAN Interface Cards (MFT VWIC2 cards). The dedicated ECAN modules are available in 32- and 64-channel configurations, which match the requirements of the 1- and 2-port T1/E1 MFT VWIC2s, respectively. The 64-channel MFT ECAN Module is shown in Figure 1. Figure 2 shows the module attached to a 2 port T1/E1 MFT VWIC2.

Figure 1. Cisco 64 Channel Multiflex Trunk Dedicated Echo Cancellation Module



Figure 2. Cisco 2-Port T1/E1 MFT VWIC2 with 64-Channel MFT Dedicated ECAN Module



The Cisco Enhanced ITU-T G.168 ECAN feature can be run either on the dedicated ECAN modules or the general voice resources that reside on the platform, network module, or advanced integration module. For example, Cisco 2800 Series and 3800 Series integrated services routers can use either the packet voice DSP modules (PVDM2s) mounted in the router chassis or the digital signal processor (DSP) resources on network modules to run the G.168 ECAN feature. When the G.168 ECAN feature is run on general voice resources, processing and memory constraints limit it to having at most 64-ms echo tail coverage. Although this is adequate in most network conditions, a larger echo tail coverage is sometimes required. In these situations, the dedicated ECAN modules, attached to the appropriate MFT VWIC2, can be used. The processing and memory resources of the dedicated ECAN modules enable the echo canceller to be configured with predefined settings and an extended 128-ms echo tail buffer, providing robust echo cancellation performance in these more demanding network environments.

BENEFITS

Benefits of the Cisco enhanced ITU-T G.168 ECAN feature using either Cisco dedicated ECAN modules or general voice resources include:

- Investment protection through a state-of-the-art echo cancellation feature
 - Enhanced ITU-T G.168 ECAN feature complies with and exceeds the performance requirements specified in the ITU-T Recommendation G.168 Digital Network Echo Cancellers (2000) standard
 - Provides future echo cancellation enhancement capability through Cisco IOS® Software upgrades
- Increased echo cancellation effectiveness by providing capabilities and controls
 - Provides control of the echo canceller coverage through the size of the echo cancellation buffer, ranging from 8 to 64 ms (128 ms of echo cancellation coverage requires dedicated ECAN module)
 - Configures the worst-case echo return loss (ERL), ranging from 0 to 6 dB
 - Provides control over echo cancellation convergence, enabling faster convergence for multiple echo reflectors and improved double-talk detection
 - Provides control for enabling and disabling the nonlinear processor (NLP), which replaces the residual echo at the output of the echo canceller with comfort noise based on the actual background noise of the voice path
- Improved network manageability by providing various echo cancellation performance metrics and testing capabilities
 - Reports various metrics, including combined echo return loss (ACOM), ERL, and worst-case echo return loss
 - Reports statistics for location of the largest reflector (tail) and the internal state of the G.168 ECAN feature
 - Provides test-mode support for manually freezing, thawing, and clearing the echo canceller registers

Additional benefits of the Cisco enhanced ITU-T G.168 ECAN feature when used with the Cisco dedicated ECAN modules include:

- Additional echo cancellation effectiveness through extended capabilities and features
 - Control of the echo canceller is provided through the size of the echo cancellation buffer, ranging from 8 to 128 ms
 - Additional processing and memory resources help ensure robust echo canceller coverage independent from the echo canceller configuration or the demand placed on the general voice DSP resources

APPLICATIONS

Packet Voice Solutions: Echo Cancellation for Demanding Network Conditions

In a voice telephone call, an echo is the audible leak-through of your own voice from the transmit path into your own receive (return) path. Leak-through happens only in analog circuits; digital voice traffic does not leak. Analog signals can leak either electrically from one wire to another (call cross-talk), or acoustically through the air from a loudspeaker to a microphone. Analog signals are often leaked from the send path to the receive path through a hybrid transformer, which converts 4-wire analog to or from 2-wire analog.

Two characteristics of echo are loudness and delay. The louder the echo or the longer the round-trip delay, the more annoying it is for the users. Cisco MFT dedicated ECAN modules are designed to help reduce echo in networks where long delays are present in the sections of the networks that create the echo problems.

An echo canceller is a component of a voice gateway that faces the public-switched-telephone network (PSTN) side of the gateway and reduces the level of echoes that have leaked from the transmit (Tx) path into the receive (Rx) path. The portion of the network connected to the PSTN side of the gateway, including all switches, multiplexers, private branch exchanges (PBXs), other IP networks, and analog or IP phones, is called the tail circuit. The analog component of the tail circuit, known as the analog tail circuit, is the source of all potential echoes on this side of the network. An echo canceller removes the echo portion of the signal coming out of the tail circuit and heading back into the WAN. Many voice-over-IP (VoIP) networks have two PSTN or basic-telephone-service (POTS) components. In these cases, another gateway facing the tail circuit on the other end of the network will be responsible for canceling the echo coming from that direction.

Echo cancellers work by saving the voice signal sent to the transmit (Tx) path in a buffer and then canceling out the echoed signals from the receive (Rx) path. The echo canceller coverage (also known as tail coverage or tail length) specifies the length of time the echo canceller stores its approximation of the echo (voice signal) in the echo cancellation buffer (memory). The echo canceller coverage needs to be large enough to account for the delays in the tail circuit component on one side of the network. In most situations, 64 ms of echo canceller coverage is adequate and can be covered by the Cisco enhanced ITU-T G.168 ECAN feature running on general voice DSPs. In networks with many PSTN hops, multiple digital/analog conversions, multiple PBXs, or other IP networks (with poor or disabled echo cancellation capabilities), the total delay in the tail circuit may exceed 64 ms. In these situations, the Cisco MFT dedicated ECAN modules, running the enhanced ITU-T G.168 ECAN feature, can provide an echo cancellation solution with echo canceller coverage of up to 128 ms.

It is important to stress that the echo canceller faces into a tail circuit---it eliminates echoes in its own tail circuit that would be experienced by the caller on the other end of the network. Echo cancellers are not aware of the rest of the network; therefore, tail circuit delay has nothing to do with the WAN or the total end-to-end round-trip delay. For example, the total end-to-end round-trip delay in a network may be 200 ms, while the tail circuit delay at one end of the network may be only 50 ms. In this case, 64 ms of echo canceller coverage will suffice.

Delays in the tail circuit, especially on the service provider side of the network, will vary depending on the telephone number that is called. Long tail circuit delays often occur when calls are routed through cellular, satellite, or other IP networks. In these situations, it is recommended that the echo canceller be set to its maximum echo canceller coverage---the MFT dedicated ECAN modules should always have the echo canceller coverage set to 128 ms for maximum coverage.

It is not economical to eliminate echoes for every call. As long as analog networks exist, there will be cases where the echo tail circuit may exceed 128 ms, such as a long-distance call from Paris to a research station in Antarctica, passing through other IP networks, multiple digital/analog conversions, a satellite link, and possibly a PBX. In such cases, it is not economical for the remote side of the network (Paris) to provide the echo cancellation. It is more effective for the echo to be dealt with at the local site---at the satellite link, remote IP network, or in the analog component of the remote PBX (Antarctica). This type of approach will help ensure higher quality calls for all satellite customers or remote users.

SPECIFICATIONS

Tables 1 and 2 provide part numbers for Cisco dedicated ECAN modules and MFT VWIC2s.

Table 1. Cisco MFT Dedicated ECAN Module Part Numbers

Product Number	Description
EC-MFT-32	32-Channel Multiflex Trunk Dedicated ECAN Module
EC-MFT-64	64-Channel Multiflex Trunk Dedicated ECAN Module

Note: Dedicated Echo Cancellation module is not supported on MFT VWIC2 when MFT VWIC2 is used on the Cisco 1751 or 1760.

Table 2. Cisco Second-Generation MFT VWIC2s with Slots for MFT Dedicated ECAN Modules

Product Number	Product Description	Recommended ECAN Module
VWIC2-1MFT-T1/E1	1-Port T1/E1 Multiflex Trunk Voice/WAN Interface Card	EC-MFT-32
VWIC2-2MFT-T1/E1	2-Port T1/E1 Multiflex Trunk Voice/WAN Interface Card	EC-MFT-64
VWIC2-1MFT-G703	1-Port G.703 Multiflex Trunk Voice/WAN Interface Card	EC-MFT-32
VWIC2-2MFT-G703	2-Port G.703 Multiflex Trunk Voice/WAN Interface Card	EC-MFT-64

Note:

- It is possible to install a Cisco 32-Channel MFT Dedicated ECAN Module on a 2-port MFT VWIC2. However, not all voice channels will be able to concurrently use the echo cancellation feature.
- It is possible to install a Cisco 64-Channel MFT Dedicated ECAN Module on a 1-port MFT VWIC2. However, the extra echo cancellation channels will not be used. The only ports on the MFT VWIC2 that can use the module resources are the ports directly attached to the module.

Cisco IOS Software Release and Feature Set License Requirements

The MFT dedicated ECAN modules running the Cisco enhanced ITU-T G.168 ECAN feature are supported beginning with Cisco IOS Software Release 12.3(14)T, and will be first available in the 12.4(1) mainline release. Data applications require at minimum the IP Base feature set license; voice applications require at minimum the IP Voice feature set license.

The Cisco enhanced ITU-T G.168 ECAN feature was originally introduced in Cisco IOS Software Release 12.2(13)T on several platforms, including Cisco 2600 Series and 3600 Series multiservice access routers. Subsequent features extended support to additional platforms, network modules, and advanced integration modules.

Dimensions and Weight (H x W x D)

0.44 in. x 2.37 in. x 1.62 in. (1.1 x 6.0 x 4.1 cm)

Weight

- 0.4 oz (11 g) (EC-MFT-32)
- 0.4 oz (12 g) (EC-MFT-64)

Environmental

- Operating temperature: 0 to 40°C (32 to 104°F)
- Storage temperature: -25 to 70°C (-13 to 158°F)
- Relative humidity: 5 to 85% noncondensing operating; 5 to 95% noncondensing, nonoperating

Regulatory, T1, and E1 Compliance

All regulatory, T1, and E1 compliance for Cisco dedicated ECAN modules is covered through the second-generation MFT VWIC2s.

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