Configuring Hardware Echo Cancellation on T1/E1 Multiflex Voice WAN Interface Cards

The multiflex trunk (MFT) dedicated echo cancellation modules (dedicated ECAN modules) are daughter cards that attach to the second generation multiflex voice/WAN interface cards (MFT VWIC2 family). The dedicated ECAN modules are available in 32-channel and 64-channel configurations (EC-MFT-32 and EC-MFT-64), which match the requirements of the 1- and 2-port T1/E1 MFT VWIC2s, respectively. This chapter describes the configuration to enable additional echo cancellation effectiveness:

- Control of the echo canceller provided through the size of the echo cancellation buffer, ranging from 24 milliseconds (ms) to 128 ms
- Processing and memory resources to ensure robust echo canceller coverage independent from the configuration of the echo canceller or the demand placed on the general voice DSP resources

### Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.
Prerequisites for Hardware Echo Cancellation

Cisco IOS Image

To run hardware echo cancellation on T1/E1 interfaces, you must install an IP Plus or IP Voice image (minimum) of Cisco IOS Release 12.3(14)T or a later release.

Baseboard and Daughter Card Configuration

Hardware echo cancellation is restricted to the same baseboard voice/WAN interface card (VWIC) on which the daughter card (EC-MFT-32 and EC-MFT-64) is installed and cannot be shared by other T1/E1 controllers.

Restrictions for Hardware Echo Cancellation

Hardware Echo Cancellation Tail Length

If you are using hardware echo cancellation, the value for tail length is set to 128 ms. This is not configurable and cannot be changed.

Accurate TDM ERL Readings for Echo Cancellation

To ensure accurate statistics for network monitoring and troubleshooting, an estimate of the quality of the TDM connection and the ECAN's ability to discern and cancel out echo might be necessary. To ensure accurate readings, you must configure software-based echo cancellation by entering the `echo-cancel enable type software` command (Step 6 in the procedure in How to Configure Hardware Echo Cancellation, on page 4). If you accept the default (hardware echo cancellation) or enter the `echo-cancel enable type hardware` command, the output for the `show voice call` command always displays “TDM ERL Level(dBm0): +6.0.” If you enter the `echo-cancel enable type software` command to enable software-based echo cancellation, the `show voice call` command output displays accurate real-time TDM ERL measurements. The sample output examples provided in the following sections demonstrate the difference:

Sample Output of the show voice call command

The following is sample output of software-enabled echo cancellation--hardware echo cancellation is disabled. Note the different values for the TDM ERL levels.

```
Router# show voice call 0/0/0:23.1
0/0/0:23 1
    vtsp level 0 state = S_CONNECT
callid 0x0001 00 1 state S_TSP_CONNECT cld 9011204 cllg 9011200
Router# ***DSP VOICE TX STATISTICS***
Tx Vox/Fax Pkts: 3563, Tx Sig Pkts: 0, Tx Comfort Pkts: 4
Tx Dur(ms): 80150, Tx Vox Dur(ms): 71200, Tx Fax Dur(ms): 0
```
***DSP LEVELS***
TDM Bus Levels (dBm0): Rx -12.5 from PBX/Phone, Tx -16.4 to PBX/Phone
TDM ACOM Levels (dBm0): +27.0, TDM ERL Level (dBm0): +27.0
TDM Bgd Levels (dBm0): -84.4, with activity being silence

***DSP VOICE ERROR STATISTICS***
Rx Pkt Drops (Invalid Header): 0, Tx Pkt Drops (HPI SAM Overflow): 0

Router# show voice call 0/0/0:23.2
0/0/0:23 2
vtsp level 0 state = S_CONNECT
callid 0x0002 B02 state S_TSP_CONNECT clld 9011202 cllg 9011205

***DSP VOICE TX STATISTICS***
Tx Vox/Fax Pkts: 1800, Tx Sig Pkts: 0, Tx Comfort Pkts: 0
Tx Dur (ms): 36000, Tx Vox Dur (ms): 36000, Tx Fax Dur (ms): 0

The following is sample output showing hardware echo cancellation—note that the TDM ERL level is +6.0 in both cases.

Router# show voice call 0/0/0:23.1
0/0/0:23 1
vtsp level 0 state = S_CONNECT
callid 0x0002 B01 state S_TSP_CONNECT clld 9011204 cllg 9011200

***HARDWARE ECHO CANCELLER STATISTICS***
Echo Canceller: On  Tail-length: 128ms
H-Register: Update  Modem tone disable: Ignore 2100Hz tone
Worst ERL : 6dB  Residual Control: Comfort noise
High level compensation: Off
Tx Power = 0.0dB  Tx Avg Power = 0.0dB
Rx Power = 0.0dB  Rx Avg Power = 0.0dB
ERL = 27.0dB  ACOM = 0.0
3 Reflectors (Tails) = (1, 0, 0)Ms, Max Reflector = 1Ms
Ecan Status words 0x7C, 0x1001
EC Lib version: 9183.890

***DSP LEVELS***
TDM Bus Levels (dBm0): Rx -23.5 from PBX/Phone, Tx -36.5 to PBX/Phone
TDM ACOM Levels (dBm0): +6.0, TDM ERL Level (dBm0): +6.0
TDM Bgd Levels (dBm0): -84.0, with activity being silence

***DSP VOICE ERROR STATISTICS***
Rx Pkt Drops (Invalid Header): 0, Tx Pkt Drops (HPI SAM Overflow): 0

Router# show voice call 0/0/0:23.2
0/0/0:23 2
vtsp level 0 state = S_CONNECT
callid 0x0004 B02 state S_TSP_CONNECT clld 9011202 cllg 9011205

***HARDWARE ECHO CANCELLER STATISTICS***
Echo Canceller: On  Tail-length: 128ms
H-Register: Update  Modem tone disable: Ignore 2100Hz tone
Worst ERL : 6dB  Residual Control: Comfort noise
High level compensation: Off
Tx Power = 0.0dB  Tx Avg Power = 0.0dB
Rx Power = 0.0dB  Rx Avg Power = 0.0dB
ERL = 6.0dB  ACOM = 0.0
3 Reflectors (Tails) = (4, 0, 0)Ms, Max Reflector = 4Ms
Ecan Status words 0x7C, 0x1001
EC Lib version: 9183.890
How to Configure Hardware Echo Cancellation

To configure hardware echo cancellation on T1/E1 multiflex voice/WAN interface cards, complete the following tasks.

**SUMMARY STEPS**

1. enable
2. configure terminal
3. card type {e1 | t1} slot subslot
4. voice-card slot
5. voice-port {slot-number / subunit-number / port | slot / port : ds0-group-number}
6. echo-cancel enable type [hardware | software]
7. echo-cancel coverage {24|32|48|64|80|96|112|128}
8. exit
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** | enable | Enables privileged EXEC mode.  
- Enter your password if prompted. |
| **Step 2** | configure terminal | Enters global configuration mode. |
| **Step 3** | card type \{e1 | t1\} slot slot | Sets or changes the card type to E1 or T1.  
- slot --Specifies the slot number. Range can be 0 to 6, depending on the platform.  
- subslot --Specifies the VWIC slot number. Range can be 0 to 3, depending on the host module or platform.  
- When the command is used for the first time, the configuration takes effect immediately.  
- A subsequent change in the card type will not take effect unless you enter the `reload` command or reboot the router.  
--- Note ---  
When you are using the `card type` command to change the configuration of an installed card, you must enter the `no card type e1 | t1` `slot subslot` command first. Then enter the `card type e1 | t1` `slot subslot` command for the new configuration information. |
| **Step 4** | voice-card slot | Enters voice card configuration mode.  
- Specify the slot location using a value from 0 to 5. |
| **Step 5** | voice-port \{slot-number / subunit-number / port | slot / port : ds0-group-number\} | Enters voice port configuration mode and specifies the voice port.  
- The `slot-number` argument identifies the slot where the voice interface card (VIC) is installed. Valid entries are from 0 to 3, depending on the slot in which it has been installed.  
- The `subunit-number` identifies the subunit on the VIC where the voice port is located. Valid entries are 0 or 1.  
- The `port` argument identifies the voice port number. Valid entries are 0 and 1.  
or  
- The `slot` argument is the slot in which the voice port adapter is installed. Valid entries are from 0 to 3. |
### Examples

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The <em>port</em> argument is the voice interface card location. Valid entries are 0 to 3.</td>
</tr>
<tr>
<td></td>
<td>• The <em>ds0-group-number</em> argument indicates the defined DS0 group number. Each defined DS0 group number is represented on a separate voice port. This allows you to define individual DS0s on the digital T1/E1 card.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> The commands, keywords, and arguments that you are able to use may differ slightly from those presented here, based on your platform, Cisco IOS release, and configuration. When in doubt, use Cisco IOS command help to determine the syntax choices that are available.</td>
</tr>
<tr>
<td>Step 6 echo-cancel enable type [hardware</td>
<td>Ensures hardware echo cancellation.</td>
</tr>
<tr>
<td></td>
<td>software]</td>
</tr>
<tr>
<td></td>
<td>• The <strong>hardware keyword</strong> is the default. Echo cancel coverage is hardcoded for 128 ms.</td>
</tr>
<tr>
<td></td>
<td>• This command is needed only to configure the <strong>software keyword</strong> to effect software-based (DSP) echo cancellation or to restore the <strong>hardware</strong> default.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> The <strong>hardware</strong> and <strong>software</strong> keywords are available only when the optional hardware echo cancellation module (EC-MFT-32 or EC-MFT-64) is installed on the multiflex VWIC.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> If you need to obtain accurate, real-time readings for the quality of the TDM connection and the echo canceller's ability to discern and cancel out echo, you should enter the <strong>echo-cancel enable type software</strong> command. See the <strong>Restrictions for Hardware Echo Cancellation</strong>, on page 2 for more information.</td>
</tr>
<tr>
<td>Step 7 echo-cancel coverage {24</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>• These coverage options are applicable only if you configured the <strong>echo-cancel enable type software</strong> command in the previous step.</td>
</tr>
<tr>
<td></td>
<td>• If you configured the <strong>echo-cancel enable type hardware</strong> command in the previous step, this value is set to 128 ms.</td>
</tr>
<tr>
<td></td>
<td>• Beginning with Release 12.4(20)T, the default for software echo cancellation is 128 ms. Prior to Release 12.4(20)T, the default is 64 ms.</td>
</tr>
<tr>
<td>Step 8 exit</td>
<td>Exits controller configuration mode and returns the router to privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td>Router (config-voiceport) # exit</td>
</tr>
</tbody>
</table>

### Examples

This section provides the following examples for verifying echo cancellation:
show echo-cancel hardware status Example

The output in this section shows that hardware echo cancellation is enabled on slot 1.

Router_3725# show echo-cancel hardware status 1

VWIC HWECAN 1/0 is UP.
Software version:4.4.803 , Date:Feb 6 16:58:57 2004
Tail length:128 Tone disabler type:G.165 Fax notify: Off
Device:VWIC 8MBPS 1TIEC TL128 MS 1P Max Channels:32
Only Port0 have Local HWECAN Connectivity.

<table>
<thead>
<tr>
<th>ECAN CH</th>
<th>ASSIGNED</th>
<th>DSP ID</th>
<th>VOICEPORT</th>
<th>EC</th>
<th>NLP</th>
<th>COV</th>
<th>LAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>yes</td>
<td>1/1</td>
<td>1/0:1.1</td>
<td>on</td>
<td>off</td>
<td>on</td>
<td>u-Law</td>
</tr>
</tbody>
</table>

Total assigned channel(s):1
Total device(s) in the slot 1

show call active voice echo-canceller summary Example

The output in this section shows summary information for the hardware echo cancellation.

Router_3725# show call active voice echo-canceller summary

<table>
<thead>
<tr>
<th>Call ID</th>
<th>Port</th>
<th>DSP/Ch</th>
<th>Codec</th>
<th>Ecan-type</th>
<th>Tail</th>
<th>Called</th>
<th>Dial-peers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0xE71</td>
<td>1/0:1.1</td>
<td>1/1</td>
<td>g729r8</td>
<td>HW</td>
<td>128ms</td>
<td>1000</td>
<td>1/10</td>
</tr>
</tbody>
</table>

1 active call found
number of hardware ecan channels:1
number of software ecan channels:0

show call active voice echo-canceller CallID Example

The output in this section shows hardware echo canceller information for an active voice call.

Router# show call active voice echo-canceller E71

Device:VWIC HWECAN 1/0 Channel Id - 1 Tail - 128Ms
Software version:4.4.803 , Date:Feb 6 16:58:57 2004
Echo Canceller:On Tail-length:128ms
H-Register:Update Modem tone disable:Ignore 2100Hz tone
Worst ERL :6dB Residual Control:Cancel only
High level compensation:off
Tx Power = 0.0dB Tx Avg Power = 0.0dB
Rx Power = 0.0 dB  Rx Avg Power = 0.0 dB
ERL = 1.0 dB   ACOM = 0.0
3 Reflectors(Tails) = (90, 0, 0) Ms, Max Reflector = 90 Ms
Ecan Status words 0x1C, 0x00
EC Lib version: 9155

More detailed syntax information about the commands used in this chapter is documented in the Cisco IOS Voice Command Reference.