



# Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

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This document provides configuration enhancements for the AIM-ATM-VOICE-30 digital signaling processor (DSP) card on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, and Cisco 3745. This feature provides a voice processing (termination) solution with AIM-ATM-VOICE-30 at a density of 30 Voice over IP (VoIP) or Voice over Frame Relay (VoFR) voice or fax channels, while not consuming a network module slot.

This feature adds the following benefits:

- Integrated voice and serial data WAN functionality on the same T1/E1 interface or on the second port of the voice/WAN interface cards (VWIC)
- Support for high-complexity codecs

The serial interface supports the following features:

- Point-to-Point Protocol (PPP), Frame Relay (FR), and high-level data link control (HDLC) encapsulations—Up to 120 channels
- FR, HDLC, and PPP encapsulation and voice on the same T1/E1 voice interface available in the following two options:
  - Channel associated signaling (CAS) or Primary Rate Interface (PRI) group, plus the channel group are defined on the same T1/E1 interface in the Cisco 2600 WIC slot.
  - The DS0 or PRI, plus the channel groups are configured across two ports of the same T1/E1 VWIC. For example, you can configure a DS0 group or a PRI group on port 0, and a channel group on the same port or another port.
- HDLC data inversion—Meets the density requirement for T1 links
- Compression support—Software and hardware compression is supported on the Cisco 3660, Cisco 3725, and Cisco 3745



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**Note** There is only one Advanced Integration Module (AIM) slot on Cisco 2600 platforms, so hardware compression is not applicable to the Cisco 2600 series.

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- Multilink PPP
- G.703 (E1 unframed mode)

## Feature Specifications for the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

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### Feature History

Release	Modification
12.2(15)T	This feature was introduced

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### Supported Platforms

For platforms supported in Cisco IOS Release 12.2(15)T, consult Cisco Feature Navigator.

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### Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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## Prerequisites for Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

### Cisco 2600 series and Cisco 2600XM

- 64 MB RAM and 32 MB Flash memory
- Appropriate voice interface hardware, as listed in [Table 1](#) of the [AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#) feature document.

### Cisco 3660, Cisco 3725, and Cisco 3745

- Cisco IOS Release 12.2(15)T IP Plus or a later release
- 128 MB RAM and 32 MB Flash memory
- Multiservice interchange (MIX) module (MIX-3660-64) installed in the time-division multiplexing (TDM) slot on the motherboard on the Cisco 3660 only
- Appropriate voice interface hardware as listed in [Table 1](#) of the [AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#) feature document

## Restrictions

- This feature is not supported on the AIM-VOICE-30 card or the AIM-ATM card.
- This feature is not supported on the Cisco 1700 series, Cisco MC3810, or Cisco AS5x00 platforms.
- This feature does not support Drop and Insert on the Cisco 2600 series.
- Voice channels can appear only on a single port of the two T1/E1 interfaces on the VWIC, while data channels can appear on both (Cisco 2600).
- Codec GSM-EFR is not supported.
- Modem relay is not supported by AIM-ATM-VOICE-30 DSPs.
- When running a high-complexity image set, an AIM-ATM-VOICE-30 DSP card can only process up to 16 voice channels. Those 16 time slots need to be within a contiguous range. Applications and voice interfaces that can be used with the three types of AIM are listed in [Table 1](#) of the *AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660* feature document.

Refer to the following links for information about Cisco IOS software image sets supported in 12.2(15)T.



### Note

You must have an account with Cisco.com to access the following links.

- Cisco IOS Release 12.2.8 T and Cisco IOS Release 12.2.11 T:  
[http://www.cisco.com/warp/customer/cc/pd/rt/2600/prodlit/1675\\_pp.htm](http://www.cisco.com/warp/customer/cc/pd/rt/2600/prodlit/1675_pp.htm)
- Cisco IOS Release 12.2.13 T:  
[http://www.cisco.com/warp/customer/cc/pd/rt/2600/prodlit/1975\\_pp.htm](http://www.cisco.com/warp/customer/cc/pd/rt/2600/prodlit/1975_pp.htm)

## Information About Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

Before you configure the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature, you must first understand the following concepts:

- [AIM-ATM-VOICE-30 Module, page 4](#)
- [Integrated Voice and Data WAN, page 5](#)
- [High-Complexity Voice Compression, page 6](#)
- [Related Features and Technologies, page 7](#)

## AIM-ATM-VOICE-30 Module

The AIM-ATM-VOICE-30 module is an advanced integration module capable of supporting up to 30 voice or fax channels when used in a Cisco 2600 series, Cisco 2600XM, Cisco 2691, Cisco 3660, Cisco 3725, and Cisco 3745 with one of the T1/E1 voice/WAN interface cards (such as VWIC-1T1). The AIM-ATM-VOICE-30 module includes DSPs that are used for a number of voice processing tasks such as voice compression and decompression, voice activity detection or silence suppression, and private branch exchange (PBX) or public switched telephone network (PSTN) signaling protocols.

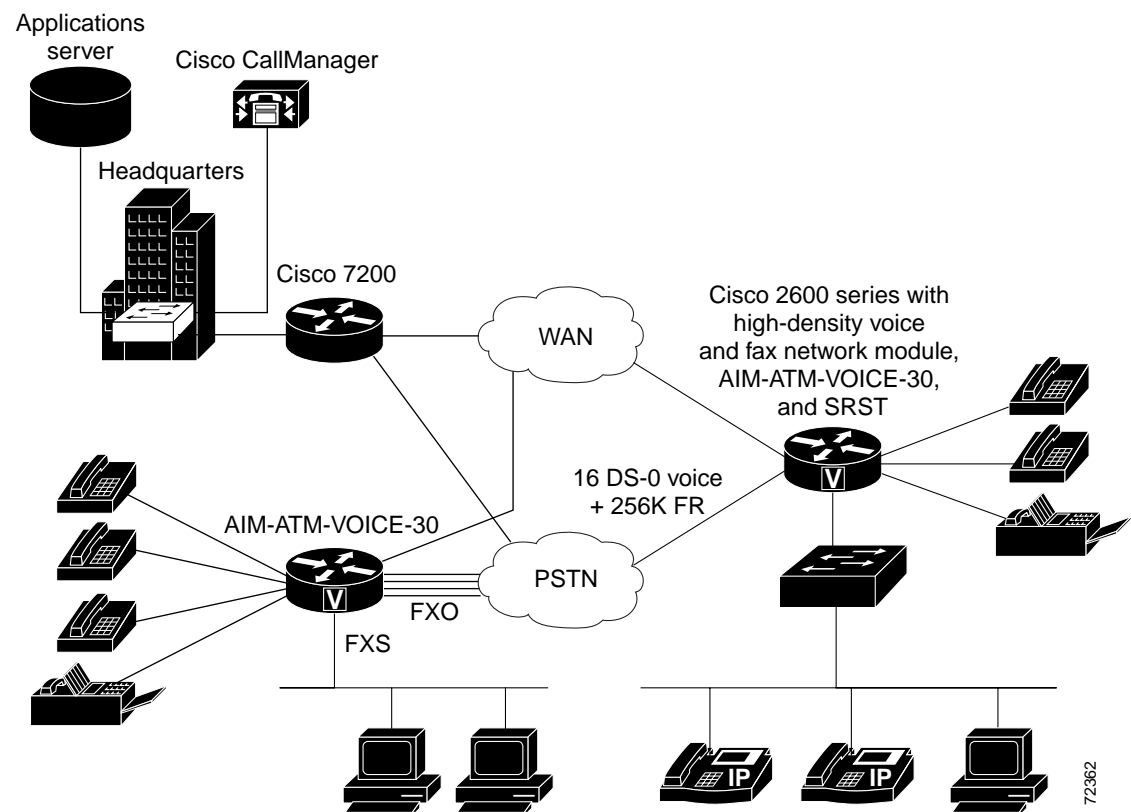
By using the AIM-ATM-VOICE-30, you can support VoIP, VoFR, or VoIP over ATM (VoATM) while leaving the router network module slot open for other functions such as asynchronous or synchronous serial concentration. Refer to the [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#) feature document for more information.

## Integrated Voice and Data WAN

This feature adds integrated voice and serial data WAN service on the same T1 or E1 interface or VWIC on AIM-ATM-VOICE-30 DSP cards. This enhancement enables you to use some DS0 channels for serial data FR, HDLC, and PPP, for example, while the remaining T1 or E1 channels can be used for voice CAS or PRI.

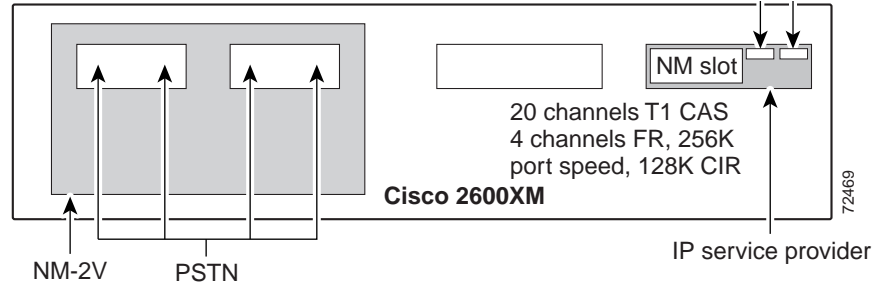
[Figure 1](#) shows a typical application scenario. Your ability to integrate voice and serial data on the same T1 or E1 line minimizes the recurring cost of providing PSTN and data WAN access. In particular, integrated access provides a number of voice DS0s (for PSTN access) and a Frame Relay link on the same T1.

**Figure 1** Typical Application Scenario



[Figure 2](#) shows a typical deployment scenario in which port 0 of the VWIC-MFT module is connected to a service provider with 20 channels. These 20 channels are used for voice (running CAS or PRI), while the remaining four channels are used for serial data (running Frame Relay). Using this type of configuration, you can take advantage of the integrated service offered by a service provider and minimize the cost of leasing and supporting T1 or E1 lines.

Figure 2 Typical Feature Deployment



## High-Complexity Voice Compression

This feature adds high-complexity G.723 and GSM-FR codec support to the AIM-ATM-VOICE-30 card so that the DSP can support both medium- and high-complexity codecs running separately. Each DSP core can process a maximum of two voice channels, so each AIM-ATM-VOICE-30 module can support up to 16 voice channels when running a high-complexity DSP firmware image.

The following high-complexity codecs are supported:

- G.723.1 5.3K
- G.723.1 6.3K
- G.723 1A 5.3K
- G.723 1A 6.3K
- G.729
- G.729B
- GSM-FR

The following medium-complexity codecs are supported in high-complexity mode:

- G.711ulaw
- G.711alaw
- G.726
- G.729A
- G.729 AB
- Clear-channel codec
- Fax relay



### Note

Neither modem-relay nor GSM-EFR is supported.

## Related Features and Technologies

The following technologies are related to the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature. See the “[Related Documents](#)” section on [page 28](#) for related documents.

- [Enhanced ITU-T Echo Cancellation](#)
- Inverse Multiplexing over ATM
- Voice over ATM
- Voice over Frame Relay
- Voice over IP

## How to Configure Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

See the following sections for configuration tasks. Each task in the list indicates if the task is required or optional.



Note

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For detailed configuration tasks for the AIM-ATM, AIM-VOICE-30, refer to the [AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#) feature document.

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- [Configuring Network Clock Source and Participation, page 7](#)
- [Configuring the AIM-ATM-VOICE-30 Card for High-Complexity Codecs and Time Slots, page 15 \(Optional\)](#)
- [Configuring Serial Data WAN, page 18 \(Optional\)](#)

## Configuring Network Clock Source and Participation



Note

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You must configure network clock source and participation to use the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature.

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Packet voice and video are sensitive to time delays. To prevent mismatches and data slips, you must synchronize data flows to a single clock source, known as the *network clock*. When a network clock is configured on a gateway, the router is externally clocked by one T1 or E1 port and passes that clock signal across the backplane to another T1 or E1 port on another WIC or network module slot. Use of a network clock on a gateway is configured by naming the network modules and interface cards that are participating in network clocking, and then selecting a port to act as the source of timing for the network clock.

The network clock provides timing from the source, through the port to the AIM, and then out to all participating router slots. The Cisco 2600 series and Cisco 2600XM support one internal AIM slot, and the Cisco 3660, Cisco 3725, and Cisco 3745 support two internal AIM slots.

## Network Clocking Commands

Three commands configure network clocking: **network-clock-participate**, **network-clock-select**, and **clock source** (digital ports only).

The **network-clock-participate** command configures the specified router slot to take its clock from the network clock; that is, this command identifies the slots that get their timing from the AIM.

The **network-clock-select** command is used if the clock is from an external source. This command configures a port in one of the participating slots to be a source for the network clock, and assigns it a priority level. This command is repeated for each port that you want to act as a primary or backup source for the network clock. The highest priority level indicates the port that you want to be the primary source of timing for the network clock. If the highest-priority port becomes unavailable, the second highest priority level takes over automatically as the network clock, and so forth for the lower-priority levels. The clocking is provided to the AIM, which then provides it to participating slots in the router.

## Network Clocking Prerequisites

The network clock source must be derived from an external source, for example, PSTN, PBX, or an ATM network. For digital voice ports, the **clock source** command in controller configuration mode configures the type of timing (internal or from the line) for each port that you designate as a primary source or backup for the network clock.

These commands allow maximum flexibility. For example, on a router with a multiflex trunk VWIC connected to an ATM network and a digital T1/E1 packet voice trunk network module connected to a PBX, you could set up network clocking in any of three ways:

- The multiflex trunk VWIC provides clocking to the AIM, which provides it to the digital T1/E1 packet voice trunk network module (that is, to the PBX).
- The digital T1/E1 packet voice trunk network module provides clocking to the AIM, which provides it to the multiflex trunk VWIC.
- The ATM network and the PBX run their own clocks, which are not necessarily synchronized. However, this scenario could result in poor voice quality.

For a detailed discussion of clock sources on individual ports, see “Clock Sources on Digital T1/E1 Voice Ports” section in the “[Configuring Voice Ports](#)” chapter in the *Cisco IOS Voice, Video, and Fax Configuration Guide*, Release 12.2.



### Note

You must configure the controller for PRI or DS0 groups and for ATM AIM or CAS before configuring network clock participate parameters.

To configure network clock timing and priority for ATM and digital voice ports on the specified platform, complete these steps.

## Configuring Clock Source Internal

If you are configuring a clock with an internal source, follow these steps.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **controller t1** *slot/port*
4. **clock source** {**line** [**primary**] | **internal**}
5. **exit**
6. **network-clock-participate** [**slot** *slot* | **wic** *wic-slot* / **aim** *aim-slot-number*]
7. **exit**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables higher privilege levels, such as privileged EXEC mode.  <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>controller t1</b> <i>slot/port</i>  <b>Example:</b> Router(config)# controller t1 1/0	Enters controller configuration mode on the T1 or E1 controller on the selected slot and port.
Step 4	<b>clock source</b> { <b>line</b> [ <b>primary</b> ]   <b>internal</b> }	Specifies the source from which the PLL on this port derives its clocking, and if the source is from the <b>line</b> , whether this port is the primary source. The default is <b>line</b> .  <ul style="list-style-type: none"> <li>• The <b>primary</b> keyword specifies that the PLL on this port derives its clocking from the external source to which the port is connected. This option also puts a second port, which is generally connected to the private branch exchange (PBX), into looped-time mode. Both ports are configured with <b>line</b>, but only the port connected to the external source is configured with <b>primary</b>.</li> <li>• The <b>internal</b> keyword specifies that the clock is generated from the T1 or E1 controller internal PLL.</li> </ul> <p><b>Note</b> If you accept the default, the clock source configuration does not appear in the <b>show running-config</b> command output. Use the <b>show controller</b> command to display the current clock source for a port.</p>

Command or Action	Purpose
<p><b>Step 5</b></p> <pre>mode atm [aim aim-slot-number]</pre> <p><b>Example:</b> Router(config-controller)# mode atm aim aim-slot-number </p>	<p>Specifies that the configuration on this controller is for ATM, using the AIM in the specified slot for ATM processing, and creates ATM interface 0.</p> <ul style="list-style-type: none"> <li>The <i>aim-slot</i> argument is the AIM slot number on the router chassis: <ul style="list-style-type: none"> <li>Cisco 2600 series—0</li> <li>Cisco 3660 and Cisco 3700 series—0 or 1</li> </ul> </li> </ul> <p><b>Note</b> The <b>mode atm</b> command without the <b>aim</b> keyword uses software to perform ATM SAR rather than the AIM. This is supported on Cisco 2600 series WIC slots only and is not supported on network module slots.</p>
<p><b>Step 6</b></p> <pre>exit</pre> <p><b>Example:</b> Router(config-controller)# exit </p>	<p>Returns to global configuration mode.</p>
<p><b>Step 7</b></p> <pre>network-clock-participate [slot slot-number   wic wic-slot   aim aim-slot-number]</pre> <p><b>Example:</b> Router(config)# network-clock-participate wic 0</p> <p><b>Example:</b> Router(config)# network-clock-participate slot 5</p> <p><b>Example:</b> Router(config)# network-clock-participate wic 0</p> <p><b>Example:</b> Router(config)# network-clock-participate aim 0</p>	<p>Allows the network module or VWIC in the specified slot to use the network clock for its timing.</p> <ul style="list-style-type: none"> <li>The keywords you select depend on the platform you are using. See the examples in the <a href="#">network-clock-participate</a> command reference for more information.</li> </ul>
<p><b>Step 8</b></p> <pre>exit</pre> <p><b>Example:</b> Router(config)# exit </p>	<p>Exits global configuration mode and completes the network clock source and participation configuration.</p>

## Configuring Clock Source Line

If you are configuring a clock with a line source, follow these steps.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller t1** *slot/port*
4. **clock source** {**line** [**primary**] | **internal**}
5. **mode atm aim**  
Or  
**mode cas**  
Or  
**ds0-group** *ds0-group* **timeslots** *timeslot-list* **type** {**e&m-immediate** | **e&m-delay** | **e&m-wink** | **fxs-ground-start** | **fxs-loop-start** | **fxo-ground-start** | **fxo-loop-start**}
- Or  
**pri-group** *timeslots timeslot-list*
6. **exit**
7. **network-clock-participate** [**slot** *slot* | **wic** *wic-slot* / **aim** *aim-slot-number*]
8. **network-clock-select** **priority** {**t1** | **e1**} *slot/port*
9. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>controller t1</b> <i>slot/port</i>  <b>Example:</b> Router(config)# controller t1 1/0	Enters controller configuration mode on the T1 or E1 controller on the selected slot and port.

Command or Action	Purpose
<p>Step 4 <code>clock source {line [primary]   internal}</code></p> <p><b>Example:</b>  Router(config-controller)# clock source line</p>	<p>Specifies the source from which the PLL on this port derives its clocking, and if the source is from the <b>line</b>, whether this port is the primary source. The default is <b>line</b>.</p> <ul style="list-style-type: none"> <li>• The <b>primary</b> keyword specifies that the PLL on this port derives its clocking from the external source to which the port is connected. This option also puts a second port, which is generally connected to the private branch exchange (PBX), into looped-time mode. Both ports are configured with <b>line</b>, but only the port connected to the external source is configured with <b>primary</b>.</li> <li>• The <b>internal</b> keyword specifies that the clock is generated from the T1 or E1 controller internal PLL.</li> </ul> <p><b>Note</b> If you accept the default, the clock source configuration does not appear in the <b>show running-config</b> command output. Use the <b>show controller</b> command to display the current clock source for a port.</p>

	Command or Action	Purpose
Step 5	<pre>mode atm [aim aim-slot-number]</pre> <p>Or</p> <pre>mode cas</pre> <p>Or</p> <pre>ds0-group ds0-group timeslots timeslot-list type {e&amp;m-immediate   e&amp;m-delay   e&amp;m-wink   fxs-ground-start   fxs-loop-start   fxo-ground-start   fxo-loop-start}</pre> <p>Or</p> <pre>pri-group timeslots timeslot-list</pre> <p><b>Example:</b> Router(config-controller)# mode atm aim aim-slot-number</p> <p><b>Example:</b> Router(config-controller)# mode cas</p> <p><b>Example:</b> Router(config-controller)# ds0-group ds0-group timeslots timeslot-list type fxs-loop-start</p> <p><b>Example:</b> Router(config-controller)# pri-group timeslots timeslot-list</p>	<p>Specifies that the configuration on this controller is for ATM, using the AIM in the specified slot for ATM processing, and creates ATM interface 0.</p> <ul style="list-style-type: none"> <li>The <i>aim-slot</i> argument is the AIM slot number on the router chassis: <ul style="list-style-type: none"> <li>Cisco 2600 series—0</li> <li>Cisco 3660 and Cisco 3700 series—0 or 1</li> </ul> </li> </ul> <p><b>Note</b> The <b>mode atm</b> command without the <b>aim</b> keyword uses software to perform ATM SAR rather than the AIM. This is supported on Cisco 2600 series WIC slots only and is not supported on network module slots.</p> <ul style="list-style-type: none"> <li>If you are configuring CAS for PRI rather than ATM, use the <b>mode cas</b> command, which specifies CAS mode for software images before Cisco IOS Release 12.2(15)T. <ul style="list-style-type: none"> <li>Required only for Cisco 2600 series routers when configuring the <b>ds0-group</b> command and using WIC slots; not used on the Cisco 3660 or on Cisco 2600 series routers using network modules.</li> </ul> </li> <li>If you are configuring DS0 groups, use the <b>ds0-group</b> command, which defines the T1 or E1 channels for use by compressed voice calls and the signaling method that the router uses to connect to the private branch exchange (PBX) or central office (CO).</li> <li>If you are configuring PRI groups instead of DS0 groups, use the <b>pri-group</b> command, which specifies an ISDN PRI on a channelized T1 or E1 controller.</li> </ul> <p><b>Note</b> When configuring PRI groups, you must also configure the <b>isdn switch-type</b> command. Also, only one PRI group can be configured on a controller.</p>
Step 6	<pre>exit</pre> <p><b>Example:</b> Router(config-controller)# exit</p>	<p>Exits controller configuration mode.</p>
Step 7	<pre>network-clock-participate [slot slot-number   wic wic-slot   aim aim-slot-number]</pre> <p><b>Example:</b> Router(config)# network-clock-participate wic 0</p> <p><b>Example:</b> Router(config)# network-clock-participate slot 5</p>	<p>Allows the network module or VWIC in the specified slot to use the network clock for its timing.</p> <ul style="list-style-type: none"> <li>The keywords you select depend on the platform you are using. See the <a href="#">network-clock-participate</a> command reference for more information.</li> </ul>

Command or Action	Purpose
<p><b>Step 8</b></p> <pre>network-clock-select priority {t1   e1} slot/port</pre> <p><b>Example:</b> Router(config)# network-clock-select 1 e1 0/1</p>	<p>Specifies a port to be used as a timing source for the network clock and the priority level for the use of that port. The source that is given the highest priority is used first; if it becomes unavailable, the source with the second-highest priority is used, and so forth.</p> <ul style="list-style-type: none"> <li>• This command is required if the clock source is from the line</li> <li>• The <i>priority</i> argument selects the priority for the clock source (1 is highest priority).</li> <li>• The <b>t1</b> and <b>e1</b> keywords specify the T1 or E1 ports.</li> <li>• The <i>slot</i> argument represents the slot number that identifies the controller clock source. <ul style="list-style-type: none"> <li>– Cisco 2600 series and Cisco 2600XM—0 (built-in WIC slot) or 1 (network module slot).</li> <li>– Cisco 3660—1 to 6</li> <li>– Cisco 3725 and Cisco 3745—1 to 4.</li> </ul> </li> <li>• The <i>port</i> argument represents the port number that identifies the controller clock source. The range is from 0 to 3.</li> </ul>
<p><b>Step 9</b></p> <pre>exit</pre> <p><b>Example:</b> Router(config)# exit</p>	<p>Exits global configuration mode and completes the network clock source and participation configuration.</p>

## Configuring the AIM-ATM-VOICE-30 Card for High-Complexity Codecs and Time Slots

To configure the AIM-ATM-VOICE-30 card for high-complexity codecs and time slot, use the following commands.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice-card** *slot-value*
4. **codec complexity** {**high** | **medium**}
5. **dspfarm**
6. **exit**
7. **controller e1** *slot/port*
8. **ds0-group 0 timeslot 1-16**
9. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables higher privilege levels, such as privileged EXEC mode.  • Enter your password if prompted.
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>voice-card</b> <i>slot-value</i>  <b>Example:</b> Router(config)# voice-card 0	Enters voice-card configuration mode to configure DSP resources on the specified card.  • The <i>slot</i> value is the AIM slot number on the router chassis: <ul style="list-style-type: none"> <li>– Cisco 2600 series and Cites 2600XM—0</li> <li>– Cisco 3660—7 is AIM slot 0, and 8 is AIM slot 1</li> <li>– Cisco 3725—3 is AIM slot 0, and 4 is AIM slot 1</li> <li>– Cisco 3745—5 is AIM slot 0, and 6 is AIM slot 1</li> </ul>

Command or Action	Purpose
<p><b>Step 4</b></p> <pre>codec complexity {high   medium}</pre> <p><b>Example:</b> Router(voice-card)# codec complexity high</p>	<p>Changes the codec complexity to high or medium and matches the DSP complexity packaging to the supported codecs.</p> <ul style="list-style-type: none"> <li>Using the <b>high</b> keyword changes codec complexity to high. Using the <b>medium</b> keyword changes the codec complexity configuration back to medium (the default complexity).</li> <li>When the codec complexity configuration changes, the system prompts you to remove all existing DS0 or PRI groups using the following voice cards: <ul style="list-style-type: none"> <li>0 (Cisco 2600 series and Cisco 2600XM)</li> <li>7 or 8 (Cisco 3660).</li> <li>3 or 4 (Cisco 3725)</li> <li>5 or 6 (Cisco 3745)</li> </ul> </li> </ul> <p>Then all DSPs are reset, loaded with the specified firmware image, and released.</p> <p><b>Note</b> For switched calls, you can configure a high-complexity codec even when the DSPs are loaded with medium-complexity firmware. However, an error message is displayed on the console during the call setup when a high-complexity codec is detected.</p> <ul style="list-style-type: none"> <li>This command affects all the DSPs on this voice card. You cannot specify the DSP firmware type based on the DSP chip type.</li> </ul>
<p><b>Step 5</b></p> <pre>dspfarm</pre> <p><b>Example:</b> Router(config-voicecard)# dspfarm</p>	<p>(Optional) Enters the DSP resources on the AIM specified in the <b>voice-card</b> command into the DSP resource pool.</p>
<p><b>Step 6</b></p> <pre>exit</pre> <p><b>Example:</b> Router(config-voicecard)# exit</p>	<p>Exits voice-card configuration mode.</p>
<p><b>Step 7</b></p> <pre>controller e1 slot/port</pre> <p><b>Example:</b> Router(config)# controller e1 1/0</p>	<p>Enters controller configuration mode on the E1 controller on the selected slot and port.</p>

	Command or Action	Purpose
Step 8	<pre>ds0-group 0 timeslots 1-16</pre> <p><b>Example:</b>  <pre>Router(config-controller)# ds0-group 0 timeslots 1-16</pre></p>	<p>Adds DS0 groups on the T1/E1 controller and configures high-complexity time slots.</p> <ul style="list-style-type: none"> <li>• The <i>ds0-group-number</i> argument specifies the DS0 time slots that make up a logical voice port on a T1 or E1 controller.</li> <li>• The <b>timeslots</b> <i>timeslot-list</i> keyword and argument signify a single time-slot number, a single range of numbers, or multiple ranges of numbers separated by commas. <ul style="list-style-type: none"> <li>– For T1, allowable values are from 1 to 24.</li> <li>– For E1, allowable values are from 1 to 31</li> </ul> </li> <li>• When running high-complexity codecs with the AIM-ATM-VOICE-30 module, up to 16 voice channels can be processed.</li> </ul>
Step 9	<pre>exit</pre> <p><b>Example:</b>  <pre>Router(config-controller)# exit</pre></p>	<p>Exits controller configuration mode and completes the configuration.</p>

## Configuring Serial Data WAN

To configure serial data WAN, use the following commands.



Note

You can configure either Step 6 or Step 7, but not both.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller e1 slot/port**
4. **clock source { line [primary] | internal }**
5. **channel-group channel-group-number timeslots range [speed bit-rate] aim [aim-slot-number]**
6. **ds0-group ds0-group-number timeslots timeslot-list type e&m-immediate-start**  
Or
7. **pri-group timeslots timeslot-range | d-channel timeslot | rlm-timeslot timeslot number**
8. **no shutdown**
9. **end**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables higher privilege levels, such as privileged EXEC mode.  • Enter your password if prompted.
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>controller e1 slot/port</b>  <b>Example:</b> Router(config)# controller e1 0/1	Enters controller configuration mode on the E1 controller on the selected slot and port.  • In this example, a VWIC E1 card is installed in WIC slot 0.

	Command or Action	Purpose
Step 4	<pre>clock source {line [primary]   internal}</pre> <p><b>Example:</b> Router(config-controller)# clock source internal</p>	<p>Specifies the source from which the phase-locked loop (PLL) on this port derives its clocking, and if the source is from the <b>line</b> or whether this port is the primary source. The default is <b>line</b>.</p> <ul style="list-style-type: none"> <li>The <b>primary</b> keyword specifies that the PLL on this port derives its clocking from the external source to which the port is connected. This option also puts a second port, which is generally connected to the private branch exchange (PBX), into looped-time mode. Both ports are configured with <b>line</b>, but only the port connected to the external source is configured with <b>primary</b>.</li> <li>The <b>internal</b> keyword specifies that the clock is generated from the T1 or E1 controller internal PLL.</li> </ul> <p><b>Note</b> If you accept the default, the clock source configuration does not appear in the <b>show running-config</b> command output. Use the <b>show controller</b> command to display the current clock source for a port.</p>
Step 5	<pre>channel-group channel-group-number timeslots timeslot-range [speed bit-rate] aim aim-slot-number</pre> <p><b>Example:</b> Router(config-controller)# channel-group 1 timeslots 1-5 aim 0</p>	<p>Directs HDLC traffic from the T1/E1 interface to the AIM-ATM-VOICE-30 digital signaling processor (DSP) card.</p>

Command or Action	Purpose
<p><b>Step 6</b></p> <pre>ds0-group ds0-group-number timeslots timeslot-list type e&amp;m-immediate-start</pre> <p><b>Example:</b> Router(config-controller)# ds0-group 2 timeslots 6-12 type e&amp;m-immediate-start</p>	<p>Adds DS0 groups on the T1/E1 controller and configures high-complexity time slots.</p> <p><b>Note</b> If you are adding PRI groups instead of DS0 groups, skip this step and proceed to Step 7.</p> <ul style="list-style-type: none"> <li>The <i>ds0-group-number</i> argument specifies the DS0 time slots that make up a logical voice port on a T1 or E1 controller.</li> <li>The <b>timeslots timeslot-list</b> keyword and argument signify a single time-slot number, a single range of numbers, or multiple ranges of numbers separated by commas. <ul style="list-style-type: none"> <li>For T1, allowable values are from 1 to 24.</li> <li>For E1, allowable values are from 1 to 31</li> </ul> </li> <li>When running high-complexity codecs with the AIM-ATM-VOICE-30 module, up to 16 voice channels can be processed.</li> <li>The <b>type</b> keyword specifies the signaling type by which the router communicates with the PBX or public switched telephone network (PSTN).</li> <li>The signaling method selection for the <b>type</b> keyword depends on the connection that you are making. The recEive and transMit or ear and mouth (E&amp;M) interface allows connection for PBX trunk lines (tie lines) and telephone equipment. The <b>e&amp;m-immediate-start</b> keyword is one of the <b>type</b> keyword choices and is listed on the <b>ds0-group</b> command reference page in the <a href="#">Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2 T</a>.</li> </ul>
<p><b>Step 7</b></p> <pre>pri-group timeslots timeslot-range   d-channel timeslot   rlm-timeslot timeslot number]</pre> <p><b>Example:</b> Router(config-controller)# pri-group timeslots 6-23</p>	<p>Adds PRI groups on the T1/E1 controller.</p> <ul style="list-style-type: none"> <li>The <b>timeslots timeslot-range</b> keyword and argument represent a single range of values. T1 range is from 1 to 23. E1 range is from 1 to 15.</li> </ul> <p><b>Note</b> Only one PRI group can be configured on a controller.</p>
<p><b>Step 8</b></p> <pre>exit</pre> <p><b>Example:</b> Router(config-controller)# exit</p>	<p>Exits controller configuration mode and completes the process for configuring serial data WAN.</p>

## Configuration Examples for Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

This section provides the following configuration examples:

- [Serial Data WAN Example, page 21](#)
- [High-Complexity Codecs Configuration Example, page 24](#)

## Serial Data WAN Example

The following examples verifies a single serial data WAN configuration using the show running config command in privileged EXEC mode:

```
Router# show running config

Building configuration...

Current configuration : 1356 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname "buckskin-hc"
!
network-clock-participate wic 0
network-clock-participate aim 0
network-clock-select 1 E1 0/0
voice-card 5
 dspfarm
!
ip subnet-zero
!!
isdn switch-type primary-qsig
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
!
controller E1 0/0
 channel-group 1 timeslots 1-11 aim 0
 pri-group timeslots 12-31
!
controller E1 0/1
!
controller E1 0/3
controller E1 0/2
!
interface FastEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0:1
 ip address 175.0.0.1 255.0.0.0
 encapsulation ppp
!
interface Serial0/0:15
 no ip address
 no logging event link-status
 isdn switch-type primary-qsig
 isdn incoming-voice voice
 no cdp enable
!
```

```

interface FastEthernet0/1
 ip address 1.10.10.1 255.0.0.0
 speed 100
 full-duplex
 !
 ip http server

 ip classless
 !
 call rsvp-sync
 !
 voice-port 0/0:15
 !
 mgcp profile default
 !
 dial-peer cor custom
 !
 dial-peer voice 40 pots
 destination-pattern 427....
 direct-inward-dial
 port 0/0:15
 prefix 427
 !
 dial-peer voice 400 voip
 destination-pattern 525....
 session target ipv4:1.10.10.2
 !
 line con 0
 exec-timeout 0 0
 line aux 0
 line vty 0 4
 login
 !
 end

```

The following example verifies a multiple serial data WAN configuration using the show running config command in privileged EXEC mode:

```

Router# show running config

Building configuration...
Current configuration : 1492 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname "buckskin-hc"
!
network-clock-participate wic 0
network-clock-participate aim 0
network-clock-select 1 E1 0/0
voice-card 5
 dspfarm
 !
 ip subnet-zero
 !
 isdn switch-type primary-qsig
 !
 no voice hpi capture buffer
 no voice hpi capture destination
 !
 mta receive maximum-recipients 0

```

```
!  
controller E1 0/0  
  channel-group 1 timeslots 1-11 aim 0  
  pri-group timeslots 12-31  
!  
controller E1 0/1  
  channel-group 1 timeslots 1-31 aim 0  
!  
controller E1 0/3  
!  
controller E1 0/2  
!  
interface FastEthernet0/0  
  no ip address  
  shutdown  
  duplex auto  
  speed auto  
!  
interface Serial0/0:1  
  ip address 172.0.0.1 255.0.0.0  
  encapsulation ppp  
!  
interface Serial0/0:15  
  no ip address  
  no logging event link-status  
  isdn switch-type primary-qsig  
  isdn incoming-voice voice  
  no cdp enable  
!  
interface FastEthernet0/1  
  ip address 10.10.10.1 255.0.0.0  
  speed 100  
  full-duplex  
!  
interface Serial0/1:1  
  ip address 175.5.0.1 255.0.0.0  
  encapsulation frame-relay  
!  
ip http server  
ip classless  
!  
call rsvp-sync  
!  
voice-port 0/0:15  
!  
mgcp profile default  
!  
dial-peer cor custom  
!  
dial-peer voice 40 pots  
  destination-pattern 427....  
  direct-inward-dial  
  port 0/0:15  
  prefix 427  
!  
dial-peer voice 400 voip  
  destination-pattern 525....  
  session target ipv4:10.10.10.2  
!  
line con 0  
  exec-timeout 0 0  
line aux 0  
line vty 0 4  
  login
```

```
!
end
```

## High-Complexity Codecs Configuration Example

To check that high-complexity codecs have been configured, use the **show running config** command in privileged EXEC mode:

```
Router# show running-config

Building configuration...
Current configuration : 1276 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname "router-hc"
!
network-clock-participate wic 0
network-clock-participate aim 0
network-clock-select 1 E1 0/0
voice-card 5
  codec complexity high
  dspfarm
!
ip subnet-zero
!
isdn switch-type primary-qsig
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
!
controller E1 0/0
  pri-group timeslots 1-16
!
controller E1 0/1
!
controller E1 0/3
!
controller E1 0/2
!
interface FastEthernet0/0
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface Serial0/0:15
  no ip address
  no logging event link-status
  isdn switch-type primary-qsig
  isdn incoming-voice voice
  no cdp enable
!
interface FastEthernet0/1
  ip address 1.10.10.1 255.0.0.0
  speed 100
  full-duplex
!
```

```

ip http server
ip classless
!
call rsvp-sync
!
voice-port 0/0:15
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 40 pots
destination-pattern 427....
direct-inward-dial
port 0/0:15
prefix 427
!
dial-peer voice 400 voip
destination-pattern 525....
session target ipv4:0.10.10.2
!
line con 0
exec-timeout 0 0
line aux 0
line vty 0 4
login
!
end

```

## Verifying Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module

The following sections contain examples that you can use to verify your configuration.

- [Checking Clock Resources, page 25](#)
- [Checking Voice DSP Configuration, page 26](#)
- [Checking the Serial Interface, page 26](#)

### Checking Clock Resources

To display the current chosen clock and the list of all sources of network clocks according to their priority, use the **show network-clocks** command in privileged EXEC mode:

```
Router# show network-clocks
```

```
Network Clock Configuration
```

```
-----
```

Priority	Clock Source	Clock State	Clock Type
3	E1 6/2	GOOD	E1
5	T1 2/0	GOOD	T1
9	Backplane	Good	PLL

```
Current Primary Clock Source
```

```
-----
```

Priority	Clock Source	Clock State	Clock Type
----------	--------------	-------------	------------

```

3                               E1 6/2                               GOOD                               E1

```

## Checking Voice DSP Configuration

To check the voice DSP configuration, use the **show voice dsp** command in privileged EXEC mode. This example shows one DSP channel allocated from this voice card.

```

DSP  DSP                DSPWARE CURR  BOOT                PAK    TX/RX
TYPE NUM CH CODEC      VERSION STATE STATE      RST AI VOICEPORT TS ABORT  PACK COUNT
==== == == =====
C5421000 00 {high}    3.6.14 IDLE idle      0 0 0/0:0    01    0    5313/1516

```

## Checking the Serial Interface

Use the **show interface serial** command in privileged EXEC mode to check configuration on the serial interface. The following example uses serial slot 0, port 0, and channel 3:

```

Router# show interface serial 0/0:3

Serial0/0:3 is up, line protocol is up
  Hardware is ATM AIM SERIAL
  Internet address is 20.0.0.1/16
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set
  LCP Open
  Open:IPCP, CDPCP
  Last input 00:00:09, output 00:00:09, output hang never
  Last clearing of "show interface" counters 18:36:25
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:weighted fair
  Output queue:0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 48 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    6696 packets input, 446400 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    6697 packets output, 460924 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
  Timeslot(s) Used:4, Transmitter delay is 0 flags

```

You can also use the **show controller serial** command in privileged EXEC mode to check configuration on the serial interface. The following example uses serial slot 0, port 0, and channel 3:

```

Router# show controller serial 0/0:3

Interface Serial0/0:3 is up
  Hardware is ATM AIM SERIAL
  hwidb=0x82C1B768, sardb=0x826404A4
  slot 0, unit 0, subunit 0
  Current (mxt5100_t)sardb:
    Ind_Q(0x3D53580), Ind_Q_idx(695), Ind_Q_size(30000)
    Cmd_Q(0x3D4E720), Cmd_Q_idx(359), Cmd_Q_size(20000)
    Inpool(0x3B9E1A0), Inpool_size(4096)

```

```
Outpool(0x3D1B080), Outpool_size(4096)
Localpool(0x3D20000), Localpool_size(256)
StorBlk(0x3BA7000), host_blk(0x3BA4840), em_blk(0x3BA4900)
tx_buf_desc(0x3D476A0), tx_free_desc_idx(1023)
num_fallback(0)
MXT5100 Port Info:
  Port Number (4), Port ID (0xE05)
  Interface Number (0), Interface ID (0xF5E0)
  Port Type 2, Port Open Status SUCCESS
HDLc channels opened(1)
  Port counters:Tx Packets:50686, Rx Packets:42864
  Tx Bytes:0, Rx Bytes:0
  Discards:No Resource:0, Protocol Errors 4
MXT5100 Channel Info:
  HDLC Channel Info (0):
    Chan_ID (0xF25), Open Status SUCCESS
  tx_limited=0(8)
```

## Where to Go Next

For more information about the AIM-ATM-VOICE-30 card, refer to the [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#) feature document on Cisco.com.

## Additional References

The following sections provide additional references related to the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature:

- [Related Documents](#), page 28
- [Standards](#), page 29
- [MIBs](#), page 29
- [RFCs](#), page 30
- [Technical Assistance](#), page 30

## Related Documents

Related Topic	Document Title
How to configure AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 series and the Cisco 3660	<a href="#">AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660</a>
ATM and IMA for the Cisco 2600 series and the Cisco 3660	<a href="#">ATM Software Segmentation and Reassembly (SAR), Cisco IOS Release 12.2(2)XB</a>
Cisco 2600 series	<a href="#">Cisco 2600 series routers documentation index on Cisco.com</a>
Cisco 3600 series	<a href="#">Cisco 3600 series routers documentation index on Cisco.com</a>
Cisco 3700 series	<a href="#">Cisco 3700 Series Routers documentation index on Cisco.com</a>
How to configure your Cisco router or access server to support voice, video, and fax applications.	<a href="#">Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2 T</a>
How to use Cisco IOS commands to support voice, video, and fax applications.	<a href="#">Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2 T</a>
Cisco IOS WAN commands and reference material	<a href="#">Cisco IOS Wide-Area Networking Command Reference, Release 12.2 T</a>
Clock sources on individual ports	<a href="#">Clock Sources on Digital T1/E1 Voice Ports</a> ” section in the “Configuring Voice Ports” chapter of the <i>Cisco IOS Voice, Video, and Fax Configuration Guide</i> , Release 12.2
Cisco IOS software configuration	<a href="#">Configuration guide and command reference indexes, Cisco IOS Release 12.2 and 12.2 T</a>
How to configure VoATM with AAL2 or AAL5 encapsulation	<a href="#">Configuring AAL2 and AAL5 for the High-Performance Advanced Integration Module on the Cisco 2600 Series</a> , Cisco IOS Release 12.2(2)XA
How to configure Inverse Multiplexing over ATM (IMA)	<a href="#">Configuring ATM</a> ” chapter in the <i>Cisco IOS Wide-Area Networking Configuration Guide</i> , Release 12.2
How to configure ISDN.	<a href="#">Configuring ISDN Interfaces for Voice</a> ” chapter in the <i>Cisco IOS Voice, Video, and Fax Configuration Guide</i> , Release 12.2.
How to configure the G.168 extended echo canceller	<a href="#">Enhanced ITU-T Echo Cancellation</a>
How to install AIM modules	<a href="#">Installing the High Performance ATM Advanced Integration Module in Cisco 2600 Series Routers</a>
How to configure the MIX module on the Cisco 3660	<a href="#">Multiservice Interchange (MIX) for Cisco 2600 and 3600 Series Multiservice Platforms</a> , Release 12.2(4)T.
Cisco IOS Release 12.2	<a href="#">Release notes index, Cisco IOS Release 12.2T on Cisco.com</a>
How to configure VoIP on Cisco 2600 and Cisco 3600 series	<a href="#">Voice over IP for the Cisco 2600 and Cisco 3600 series routers documentation index on Cisco.com</a>

## Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

## MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:  <a href="http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a>

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

## RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

# Command Reference

This section documents a modified command. All other commands used with this feature are documented in the Cisco IOS Release 12.2 T command reference publications.

- [channel-group](#)
- [network-clock-participate](#)

# channel-group

To configure serial WAN on a T1 or E1 interface, use the **channel-group** command in controller configuration mode. To unassign a channel group, use the **no** form of this command.



## Note

Neither the Cisco AS5x00 NAS nor the Cisco MC3810 is supported with the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature.

Cisco 2600 Series, Cisco 3660, Cisco 3725, and Cisco 3745

**channel-group** *channel-group-number* **timeslots** *range* [**speed** *bit-rate*] **aim** [*aim-slot-number*]

**no channel-group** *channel-group-number*

Cisco 2611 (Cisco Signaling Link Terminal or SLT)

**channel-group** *channel-number*

**no channel-group** *channel-number*

Cisco AS5350 and Cisco AS5400 Series

**channel-group** *channel-group-number*

**no channel-group** *channel-group-number*

Cisco MC3810

**channel-group** *channel-number* **timeslots** *range* [**speed** *bit-rate*]

**no channel-group** [*channel-number* **timeslots** *range*]

## Syntax Description

<i>channel-group-number</i>	Channel-group number on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, and Cisco 3745 routers. When configuring a T1 data line, channel-group numbers can be values from 0 to 23. When configuring an E1 data line, channel-group numbers can be values from 0 to 30. Valid values can be 0 or 1 on the Cisco AS5350 and Cisco AS5400.
<b>timeslots</b> <i>range</i>	One or more time slots or ranges of time slots belonging to the channel group. The first time slot is numbered 1. For a T1 controller, the time slot range is from 1 to 24. For an E1 controller, the time slot range is from 1 to 31.

<b>speed</b> <i>bit-rate</i>	<p>(Optional) Speed of the underlying DS0s in kilobits per second. Valid values are 48, 56, and 64.</p> <p>The default line speed when configuring a T1 controller is 56 kbps on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, Cisco 3745, and the Cisco MC3810.</p> <p>The default line speed when configuring an E1 controller is 64 kbps on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, Cisco 3745, and the Cisco MC3810.</p> <p>The <i>bit-rate</i> argument controls real-time (VBR-RT) traffic shaping, and the maximum burst size (MBS) is 255 cells.</p>
<b>aim</b> <i>aim-slot-number</i>	<p>Directs HDLC traffic from the T1/E1 interface to the AIM-ATM-VOICE-30 card on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, and Cisco 3745.</p> <p>The <i>aim-slot-number</i> values are 0 for the Cisco 2600 series and Cisco 2600XM, 0 or 1 for the Cisco 3660, and 0 or 1 for the Cisco 3725 and Cisco 3745.</p>
<i>channel-number</i>	Valid values can be 1 or 31 on the Cisco SLT (Cisco 2611).

## Defaults

The T1/E1 line is connected to the motherboard or network module (NM) serial communication controller (SCC) by default on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, and Cisco 3745 routers.

The serial interface object encapsulation is set to HDLC on a Cisco AS5350 or Cisco AS5400 network access server (NAS).

## Command History

Release	Modification
11.3 MA	This command was introduced on the Cisco MC3810.
12.0	This command was integrated into Cisco IOS Release 12.0 on the Cisco MC3810.
12.0(7)XE	This command was implemented on the Catalyst 6000 family switches.
12.1(1)E	This command was supported on the E train.
12.1(1)T	This command was modified to accommodate two channel groups on a port on 1- and 2-port T1/E1 Multiflex VWICs on the Cisco 2600 series and Cisco 3600 series.
12.2(11)T	This command was modified for use on the Cisco AS5350 and Cisco AS5400.
12.2(15)T	The <b>aim</b> keyword was added for use on the Cisco 2600 series, Cisco 2600XM, Cisco 2691, Cisco 3660, Cisco 3725, and Cisco 3745.

## Usage Guidelines

A channel group is created using Advanced Integration Module (AIM) HDLC resources when a **channel-group** command with the **aim** keyword is parsed during system initialization or when the command is entered during configuration. You must specify the **aim** keyword under a T1/E1 controller port to direct HDLC traffic from the T1/E1 interface to the AIM-ATM-VOICE-30 card on the Cisco 2600 series, Cisco 2600XM, Cisco 3660, Cisco 3725, and Cisco 3745.

If previous **channel-group** commands are configured with the **aim** keyword, subsequent **channel-group** commands without the **aim** keyword are rejected. Similarly, if a regular **channel-group** command is followed by another **channel-group** command with the **aim** keyword implemented, the second command is rejected on the Cisco 2600 and Cisco 2600XM.

A channel group using AIM HDLC resources is deleted only when a **no channel-group** command is entered.

When using the Integrated Voice and Data WAN on T1/E1 Interfaces Using the AIM-ATM-VOICE-30 Module feature, by default, the **channel-group** command on a NAS sets the serial interface object encapsulation to HDLC. You can override the default with the **encapsulation ppp** or **frame relay** commands for that serial interface object.

When using the Integrated Signaling Link Terminal feature, by default, the **channel-group** command on a NAS sets the serial interface object encapsulation to HDLC. You must override the default by entering the **encapsulation ss7** command for that serial interface object. Once this is done, encapsulation cannot be changed again for that object. The SS7 encapsulation option is new to the *Integrated Signaling Link Terminal* feature and is only available for interface serial objects created by the **channel-group** command. The Integrated Signaling Link Terminal feature added SLT functionality on Cisco AS5350 and Cisco AS5400 platforms.

A digital SS7 link can be deleted by entering the **no channel-group channel-group-number** command on the associated T1/E1 controller. The link must first be stopped using the **no shutdown** command. It is not necessary to remove the channel ID association first.

Use the **channel-group** command in configurations where the router or access server must communicate with a T1 or E1 fractional data line. The channel group number may be arbitrarily assigned and must be unique for the controller. The time slot range must match the time slots assigned to the channel group. The service provider defines the time slots that comprise a channel group.



#### Note

Channel groups, CAS voice groups, and TDM groups all use group numbers. All group numbers configured for channel groups, CAS voice groups, and TDM groups must be unique on the local Cisco MC3810 concentrator. For example, you cannot use the same group number for a channel group and for a TDM group. Furthermore, on the Cisco MC3810, only one channel group can be configured on a controller.

Valid values for the *bit-rate* argument have changed. If you specify 56 kbps, the channel group is limited to 14 channels on the Cisco MC3810 MultiFlex Trunk (MFT). Because the **56** keyword is the default, specify the **64** keyword when you need more than 14 channels.

The channel group number can be 0 or 1 on the Cisco SLT (Cisco 2611).

The **channel-group** command also applies to Voice over Frame Relay, Voice over ATM, and Voice over HDLC on the Cisco MC3810.

#### Examples

The following example explicitly sets the encapsulation type to PPP to override the HDLC default:

```
Router# configure terminal
Router(config)# controller t1 6/0
Router(config-controller)# channel-group 2 timeslots 3 aim 0
Router(config-controller)# exit
Router(config)# interface serial 6/0:2
Router(config-if)# encapsulation ppp
Router(config-if)# ip address 12.0.0.1 255.0.0.0
Router(config-if)# no shutdown
Router(config-if)# end
```

The following example defines three channel groups using the Integrated Signaling Link Terminal feature. Channel group 0 consists of a single time slot, channel group 8 consists of seven time slots and runs at a speed of 64 kbps per time slot, and channel group 12 consists of a single time slot.

```
Router(config-controller)# channel-group 0 timeslots 1 aim 0
Router(config-controller)# channel-group 8 timeslots 5,7,12-15,20 aim 0 speed 64
Router(config-controller)# channel-group 12 timeslots 2 aim 0
```

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**Related Commands**

Command	Description
<b>invert data</b>	Enables channel inversion.
<b>voice-card</b>	Configures a card with voice processing resources and enters voice card configuration mode.

# network-clock-participate

To allow ports on a specified network module or voice/WAN interface card (VWIC) to use the network clock for timing, use the **network-clock-participate** command in global configuration mode. To restrict the device to use only its own clock signals, use the **no** form of this command.

**network-clock-participate** [*slot slot-number* | **wic** *wic-slot* / **aim** *aim-slot-number*]

**no network-clock-participate** [*slot slot-number* | **wic** *wic-slot* / **aim** *aim-slot-number*]

## Syntax Description

<b>slot</b> <i>slot-number</i>	Network module slot number on the router chassis. The following are valid values: <ul style="list-style-type: none"> <li>• Cisco 2600 series—1</li> <li>• Cisco 3660—1 to 6</li> <li>• Cisco 3700 series—1 to 4</li> </ul>
<b>wic</b> <i>wic-slot</i>	<ul style="list-style-type: none"> <li>• Configures the WAN interface card (WIC) slot number on the router chassis. The following are valid values: <ul style="list-style-type: none"> <li>– Cisco 2600 series—0 and 1</li> <li>– Cisco 3700 series—0 to 2</li> </ul> </li> </ul>
<b>aim</b> <i>aim-slot-number</i>	Configures the Advanced Integration Module (AIM) in the specified slot. The following are valid values: are 0 for the Cisco 2600 series and Cisco 2600 XM, 0 or 1 for the Cisco 3660, and 0 or 1 for the Cisco 3725, and Cisco 3745.

## Defaults

No network clocking is enabled, and interfaces are restricted to using the clocking generated on their own modules.

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(5)XM	This command was introduced on the Cisco 3660.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(2)XB	This command was implemented on the Cisco 2600 series. The <b>slot</b> keyword was replaced by the <b>nm</b> keyword and the <b>wic</b> keyword and the <i>wic-slot</i> argument were added.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.2(15)T	This command was implemented on the Cisco 2600XM, Cisco 2691, Cisco 3725, and Cisco 3745. The <b>aim</b> keyword was added. The <b>nm</b> keyword was replaced by the <b>slot</b> keyword.

**Usage Guidelines**

This command is used on the Cisco 2600 series or Cisco 2600XM with an AIM for ATM segmentation. This command is used on the Cisco 3660, Cisco 3725, and Cisco 3745 with reassembly or digital signal processing.

On the Cisco 3700 series, you must use the **network-clock-participate** command and either the **wic wic-slot** keyword and argument or the **slot slot-number** keyword and argument.

This command applies to any network module with T1/E1 controllers to provide clocks from a central source (AIM for the Cisco 2600 or MIX module for the Cisco 3660) to the network module and to the port on the network module. That port can be selected as the clock source with the **network-clock-select** command to supply clock resources to other ports or network modules that choose to participate in network clocking with the **network-clock-participate** command. This command synchronizes the clocks for two ports.

**Note**

If the AIM takes its clock signals from a T1 or E1 controller, it is mandatory to use the **network-clock-select** and **network-clock-participate** commands for ATM. The clocks for the ATM and voice interfaces do not need to be synchronous, but improved voice quality may result if they are.

**Note**

The only VWICs that can participate in network clocking are those found in Cisco 2600 series WIC slots, digital T1/E1 packet voice trunk network modules (NM-HDV), and Fast Ethernet network modules (NM-2W, NM-1FE, and NM-2FE).

**Note**

The **wic wic-slot** value is only available on the Cisco 2600 series, Cisco 2600XM, and Cisco 3700 series.

For the Cisco 2610, you must configure the WIC number; for the Cisco 3660, you must configure the slot number; and for the Cisco 2691, Cisco 3725, and Cisco 3745, you must configure the WIC and the AIM number.

**Examples**

The following example configures the network module in slot 5 to participate in network clocking on a Cisco 3660 with a MIX module:

```
network-clock-participate slot 5
network-clock-select 1 e1
```

The following example specifies that the AIM participates in network clocking and selects port E1 0/1 to provide the clock signals on a Cisco 3700 series router:

```
Router(config)# network-clock-participate wic 0
Router(config)# network-clock-participate aim 0
Router(config)# network-clock-select 2 E1 0/1
```

The following example specifies the slot number that participates in network clocking and selects port E1 5/0 on a Cisco 3660:

```
Router(config)# network-clock-participate slot 5
Router(config)# network-clock-select 1 E1 5/0
```

The following example specifies the WIC number that participates in network clocking and selects port E1 0/0 on a Cisco 2600 series router:

```
Router(config)# network-clock-participate wic 0
Router(config)# network-clock-select 1 E1 0/0
```

**network-clock-participate**

Related Commands	Command	Description
	<b>network-clock-select</b>	Specifies selection priority for the clock sources.
	<b>network-clock-source</b>	Selects the port to be the clock source to supply clock resources to other ports or network modules.

# Glossary

**AAL**—ATM adaptation layer. Service-dependent sublayer of the data link layer. The AAL accepts data from different applications and presents it to the ATM layer in the form of 48-byte ATM payload segments. AALs consist of two sublayers: the convergence sublayer (CS) and the segmentation and reassembly sublayer (SAR). AALs differ on the basis of the source-destination timing used, whether they use constant bit rate (CBR) or variable bit rate (VBR), and whether they are used for connection-oriented or connectionless mode data transfer. At present, the four types of AAL recommended by the ITU-T are AAL1, AAL2, AAL3/4, and AAL5.

**AAL2**—ATM adaptation layer 2. One of four AALs recommended by the ITU-T. AAL2 is used for connection-oriented services that support a variable bit rate, such as some isochronous video and voice traffic.

**AAL5**—ATM adaptation layer 5. One of four AALs recommended by the ITU-T. AAL5 is used for connection-oriented services that support a variable bit rate, such as some isochronous video and voice traffic.

**AIM**—Advanced Integration Module. Hardware with components that provide specialized processing.

**ATM**—Asynchronous Transfer Mode. International standard for cell relay in which multiple service types (such as voice, video, or data) are conveyed in fixed-length (53-byte) cells. Fixed-length cells allow cell processing to occur in hardware, thereby reducing transit delays. ATM is designed to take advantage of high-speed transmission media such as E3, SONET, and T3.

**CAS**—channel associated signaling. The transmission of signaling information within the voice channel. CAS signaling often is referred to as robbed-bit signaling because user bandwidth is being robbed by the network for other purposes.

**CRC**—cyclic redundancy check. Error-checking technique in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending node.

**DS0**—digital service-zero (0). Single time slot on a DS1 (also known as T1) digital interface; that is, a 64-kbps, synchronous, full-duplex data channel, typically used for a single voice connection on a PBX. See also DS1 and PBX.

**DSP**—digital signal processor. A DSP segments the voice signal into frames and stores them in voice packets.

**DSP resource pool**—A collection of DSP resources available to a network module or VWIC on the router. These resources are found on another network module or on an AIM.

**DTMF**—dual tone multifrequency.

**E&M**—recEive and transMit (or ear and mouth).

**FCS**—frame check sequence.

**FPGA**—Field-Programmable Gate Array. A programmable memory device.

**HCMs**—high-performance voice compression modules.

**HDLC**—high-level data link control. Bit-oriented synchronous data link layer protocol developed by ISO. Derived from SDLC, HDLC specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

**IMA**—inverse multiplexing over ATM, a standard defined by the ATM Forum. IMA provides economical, high-bandwidth ATM WAN access by enabling multiple T1 or E1 ATM links to be combined and to appear as one physical link to higher layers.

**MGC**—Media Gateway Controller.

**MF**—multifrequency tones.

**MIX**—multiservice interchange. Feature that allows TDM connections between MIX-enabled ports.

**PBX**—private branch exchange. Privately owned central switching office.

**PDU**—protocol data unit. Another name for packet.

**PLL**—phase-locked loop. An electronic circuit that synchronizes itself to an external reference signal. It locks itself onto the phase or onto the average frequency of the incoming signal, dynamically tracks it, and outputs a related but more useful version. Among the typical applications of a PLL in digital circuits are synchronizing a system to a single clock source and jitter filtering (removing phase noise).

**PPP**—Point-to-Point Protocol.

**PRI**—Primary Rate Interface. ISDN interface to primary rate access. Primary rate access consists of a single 64-kbps D channel plus 23 (T1) or 30 (E1) B channels for voice or data.

**PSTN**—public switched telephone network. General term referring to the variety of telephone networks and services in place worldwide. Sometimes called plain old telephone service (POTS).

**SAR**—segmentation and reassembly. In ATM, the processes of dividing PDUs into 48-byte pieces of payload data at the source for transport, and then reassembling them into a stream at the destination.

**VIC**—voice interface card. Provides voice-specific ports, including foreign exchange station (FXS), foreign exchange office (FXO), ear and mouth (E&M), and basic rate interchange (BRI).

**VWIC**—A card that can operate as a VIC or as a WIC, providing physical connection to WAN or voice networks.

**VoIP**—Voice over IP. The ability to carry normal telephony-style voice over an IP-based Internet with circuit-based telephone-like functionality, reliability, and voice quality. VoIP is a blanket term that generally refers to the Cisco standards-based (H.323, and so forth) approach to IP voice traffic.

**WIC**—wide-area network interface card.

**Note**

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Refer to the [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

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