



Integrated Voice and Data WAN on T1/E1 Interfaces

This chapter describes how to implement the Integrated Voice and Data WAN on T1/E1 Interfaces with the AIM-ATM-VOICE-30 Module feature. This card provides a voice-processing termination solution at a density of 30 VoIP or VoFR voice or fax channels, while not consuming a network-module slot. It provides 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



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.

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

Feature History for Integrated Voice and Data WAN on T1/E1 Interfaces with the AIM-ATM-VOICE-30 Module

Release	Modification
12.2(15)T	This feature was introduced.

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.



Note

For more information about related Cisco IOS voice features, see the following:

- “[Overview of ISDN Voice Interfaces](#)” on page 3
- Entire Cisco IOS Voice Configuration Library—including library preface and glossary, other feature documents, and troubleshooting documentation—at http://www.cisco.com/en/US/products/ps6441/prod_configuration_guide09186a0080565f8a.html.

For a list of references cited in this chapter, see the “[Additional References](#)” section on page 181.

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

- Perform the prerequisites that are listed in the “[Prerequisites for Configuring an ISDN Voice Interface](#)” section on page 15.

Cisco 2600 series and Cisco 2600XM

- Ensure that you have the following:
 - 64-MB RAM and 32-MB flash memory
 - Appropriate voice-interface hardware, as listed in [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#)

Cisco 3660, Cisco 3725, and Cisco 3745

- Ensure that you have the following:
 - 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 [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#)

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

Restrictions are described in the [Restrictions for Configuring ISDN Voice Interfaces, page 4](#). In addition, the following apply.

Cisco 2600 Series Restrictions

- This feature does not support Drop and Insert.
- Voice channels can appear only on a single port of the two T1/E1 interfaces on the VWIC. Data channels can appear on both.

Other Platform Restrictions

- This feature is not supported on the following platforms: Cisco 1700 series, Cisco MC3810, and Cisco AS5x00.

Hardware Restrictions

- This feature is not supported on the AIM-VOICE-30 card or the AIM-ATM card.
- Modem relay is not supported on AIM-ATM-VOICE-30 DSPs.
- Codec GSM-EFR is not supported.
- With a high-complexity image set, an AIM-ATM-VOICE-30 DSP card can process up to only 16 voice channels. The 16 associated time slots must be within a contiguous range. Applications and voice interfaces that can be used with the three types of AIM are listed in [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#).

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

**Note**

General information about ISDN voice interfaces is presented in the [“Information About ISDN Voice Interfaces”](#) section on page 4.

To implement this feature, you should understand the following concepts:

- [AIM-ATM-VOICE-30 Module, page 160](#)
- [Integrated Voice and Data WAN, page 160](#)
- [High-Complexity Voice Compression, page 162](#)
- [Network Clock Source and Participation, page 162](#)

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 supported platform with one of the T1/E1 voice/WAN interface cards (such as VWIC-1T1). The 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 PBX or PSTN signaling protocols.

The module supports VoIP, VoFR, and VoIP over ATM (VoATM) while leaving the router network-module slot open for other functions such as asynchronous or synchronous serial concentration. For additional information, see [AIM-ATM](#), [AIM-VOICE-30](#), and [AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660](#).

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 Frame Relay, high-level data link control (HDLC), and Point-to-Point Protocol (PPP), for example, while the remaining T1 or E1 channels can be used for voice channel-associated signaling (CAS) or PRI.

[Figure 7](#) shows a typical application scenario in which 16 channels of a T1 line are used for voice and 4 channels are used for Frame relay data. Integrating 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 7 Typical Application Scenario

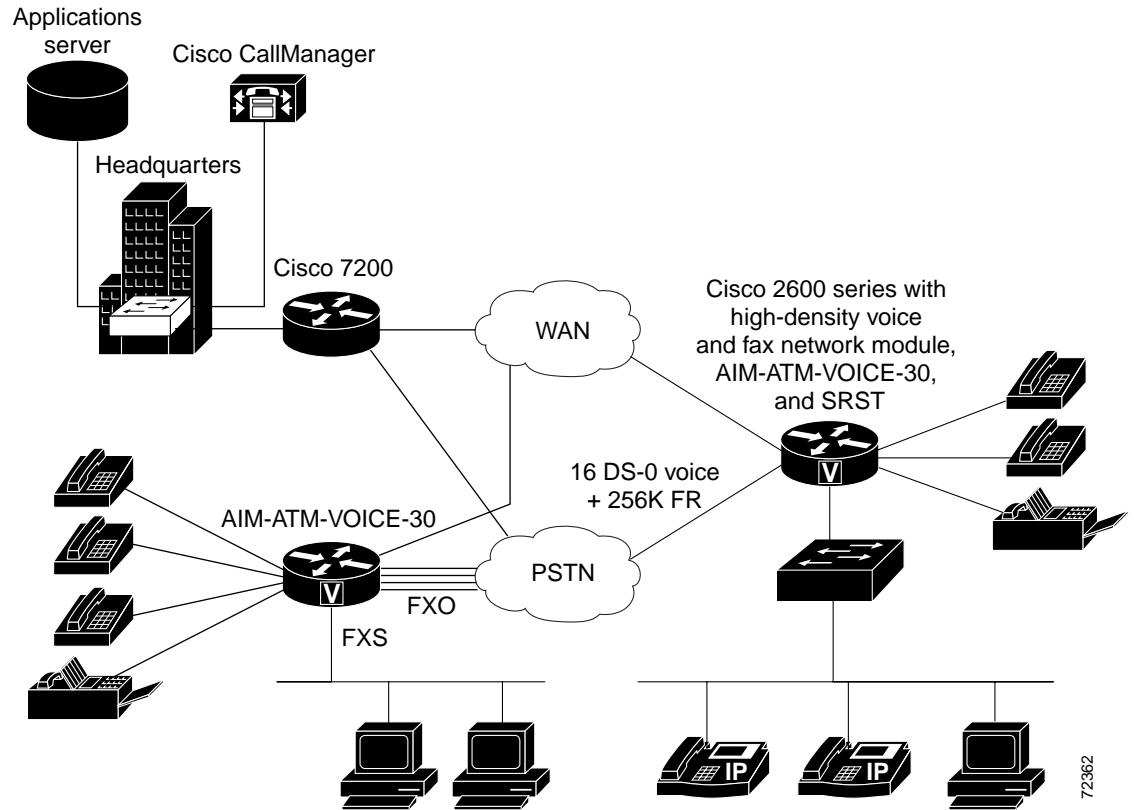
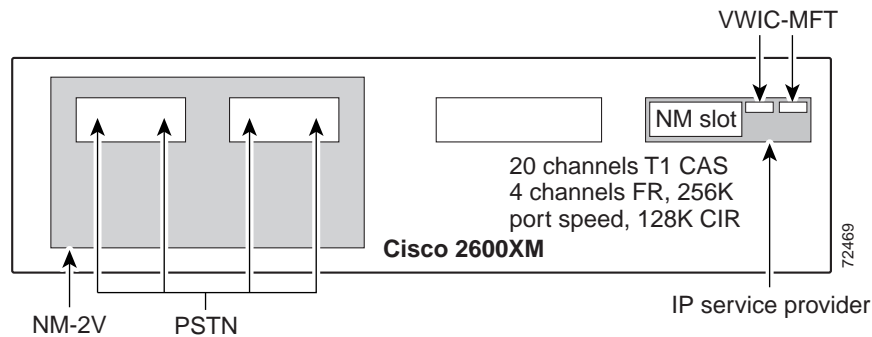


Figure 8 shows a typical deployment scenario in which port 0 of the VWIC-MFT module is connected to an integrated voice and data service provider with 20 channels. These 20 channels are used for voice (running CAS or PRI); the remaining four channels are used for serial data (running Frame Relay). Using 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 8 Typical Feature Deployment



High-Complexity Voice Compression

This feature adds high-complexity G.723, G.728, and GSM-FR codec support to the AIM-ATM-VOICE-30 module so that the DSP can support both medium- and high-complexity codecs running separately. Each DSP core can process up to two voice channels, so each 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.728
- G.729
- G.729B
- GSM-FR

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

- G.711 mu-law
- G.711 a-law
- G.726
- G.729A
- G.729 AB
- Clear-channel codec
- Fax relay



Note

Neither modem-relay nor GSM-EFR is supported.

Network Clock Source and Participation



Note

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.

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 number of supported AIM slots is as follows:

- The Cisco 2600 series and Cisco 2600XM support one internal AIM slot.
- The Cisco 3660, Cisco 3725, and Cisco 3745 support two internal AIM slots.

The network clock source must be derived from an external source—for example, PSTN, PBX, or ATM network. For digital voice ports, the **clock source** command 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.

This command allows 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 can 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.

**Note**

For a detailed discussion of clock sources on individual ports, see the information about clock sources on digital T1/E1 voice ports in the chapter on configuring voice ports in the *Cisco IOS Voice, Video, and Fax Configuration Guide*.

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

This section contains the following procedures:

- [Configuring Network Clock Source and Participation, page 163](#)
- [Configuring the AIM-ATM-VOICE-30 Card for High-Complexity Codecs and Time Slots, page 170 \(optional\)](#)
- [Configuring Integrated Voice and Serial Data WAN, page 172 \(optional\)](#)
- [Verifying Integrated Voice and Serial Data WAN, page 174 \(optional\)](#)

**Note**

For detailed configuration tasks for the AIM-ATM, AIM-VOICE-30, see *AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660*.

Configuring Network Clock Source and Participation

**Note**

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.

Configuring Clock Source Internal

To configure a clock with an internal source, perform the following steps.

Prerequisites

- Configure the controller for PRI or DS0 groups and for ATM AIM or CAS before configuring network-clock participation parameters.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller**
4. **clock source**
5. **mode atm**
6. **exit**
7. **network-clock-participate**
8. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enters privileged EXEC mode. Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters configuration mode.
Step 3	controller {t1 e1} slot/port Example: Router(config)# controller t1 1/0	Enters controller configuration mode on the T1 or E1 controller on the selected slot/port.

	Command or Action	Purpose
Step 4	<pre>clock source {line [primary] internal}</pre> <p>Example: 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 line, whether this port is the primary source. Arguments and keywords are as follows:</p> <ul style="list-style-type: none"> • line—Clock recovered from the line's receive data stream. This is the default. • primary—External source to which the port is connected. This option also puts a second port, which is generally connected to the PBX, into looped-time mode. Both ports are configured with line, but only the port connected to the external source is configured with primary. • internal—T1 or E1 controller internal PLL. <p>Note With the default, the clock source does not appear in the show running-config command output. Use the show controllers command to display the current source for a port.</p>
Step 5	<pre>mode atm [aim aim-slot-number]</pre> <p>Example: Router(config-controller)# mode atm aim 0</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. Use when you connect the T1 line to an ATM network. The argument is as follows:</p> <ul style="list-style-type: none"> • <i>aim-slot-number</i>—AIM slot number on the router chassis: <ul style="list-style-type: none"> – Cisco 2600 series: 0 – Cisco 3660 and Cisco 3700 series: 0 or 1 <p>Note This command without the aim keyword uses software rather than the AIM to perform ATM SAR. This is supported on Cisco 2600 series WIC slots only and not on network module slots.</p>
Step 6	<pre>exit</pre> <p>Example: Router(config-controller)# exit</p>	<p>Exits the current mode.</p>

	Command or Action	Purpose
Step 7	<p>network-clock-participate [<i>slot slot-number</i> <i>wic wic-slot</i> <i>aim aim-slot-number</i>]</p> <p>Example: Router(config)# network-clock-participate slot 5</p> <p>Example: Router(config)# network-clock-participate wic 0</p> <p>Example: Router(config)# network-clock-participate aim 0</p>	Allows the network module or VWIC in the specified slot to use the network clock for its timing. Keywords depend on platform.
Step 8	<p>exit</p> <p>Example: Router(config)# exit</p>	Exits the current mode.

Configuring the Clock-Source Line

To configure the clock-source line, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller**
4. **clock source**
5. **mode atm**
or
mode cas
or
ds0-group timeslots
or
pri-group timeslots
6. **exit**
7. **network-clock-participate**
8. **network-clock-select priority**
9. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<pre>enable</pre> <p>Example: Router> enable</p>	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	<pre>configure terminal</pre> <p>Example: Router# configure terminal</p>	Enters global configuration mode.
Step 3	<pre>controller {t1 e1} slot/port</pre> <p>Example: Router(config)# controller t1 1/0</p>	Enters controller configuration mode on the T1 or E1 controller on the specified slot/port.
Step 4	<pre>clock source {line [primary] internal}</pre> <p>Example: Router(config-controller)# clock source line</p>	<p>Specifies the source from which the phase-locked loop (PLL) on this port derives its clocking and, if the source is line, whether this port is the primary source. Keywords are as follows:</p> <ul style="list-style-type: none"> • line—Clock recovered from the line's receive data stream. This is the default. • primary—External source to which the port is connected. This option also puts a second port, which is generally connected to the PBX, into looped-time mode. Both ports are configured with line, but only the port connected to the external source is configured with primary. • internal—T1 or E1 controller internal PLL. <p>Note With the default, the clock source does not appear in the show running-config command output. Use the show controllers command to display the current source for a port.</p>

Command or Action	Purpose
<p>Step 5</p> <pre>mode atm [aim aim-slot] or mode cas or ds0-group group-number timeslots timeslot-range type type or pri-group timeslots timeslot-range</pre> <p>Example: Router(config-controller)# mode atm aim 0</p> <p>or</p> <p>Example: Router(config-controller)# mode cas</p> <p>or</p> <p>Example: Router(config-controller)# ds0-group 0 timeslots 1-4,8-23 type fxs-loop-start</p> <p>or</p> <p>Example: Router(config-controller)# pri-group timeslots 1-4,8-23</p>	<p>(mode atm command) Sets the controller to ATM mode and creates ATM interface ATM 0. Use for Cisco 2600 series, Cisco 3660, and Cisco 3700 series that use an AIM for ATM processing. Do not use on routers that use an AIM only for DSP resources.</p> <p>Note This command without the aim keyword uses software (rather than AIM) to perform ATM segmentation and reassembly. This is supported on Cisco 2600 series WIC slots only and is not supported on network module slots.</p> <p>or</p> <p>(mode cas command) Sets the controller to CAS mode (for software images earlier than Cisco IOS Release 12.2(15)T). Use for Cisco 2600 series with WIC slots.</p> <p>or</p> <p>(ds0-group timeslots command) Creates a DS0 group that makes up a logical voice port on a T1/E1 controller and specifies the signaling type by which the router connects to the PBX or CO.</p> <p>or</p> <p>(pri-group timeslots command) Creates a PRI group that makes up a logical voice port on a channelized T1 or E1 controller.</p>
<p>Step 6</p> <pre>exit</pre> <p>Example: Router(config-controller)# exit</p>	<p>Exits the current mode.</p>
<p>Step 7</p> <pre>network-clock-participate [slot slot-number wic wic-slot aim aim-slot-number]</pre> <p>Example: Router(config)# network-clock-participate wic 0</p> <p>Example: 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. Keywords depend on platform.</p>

	Command or Action	Purpose
Step 8	<pre>network-clock-select priority {t1 e1} slot/port</pre> <p>Example: Router(config)# network-clock-select 1 e1 0/1</p>	<p>Specifies a slot/port to be used as a timing source for the network clock and the priority level for that port. The source that is given the highest priority is designated the primary source and is used first; if it becomes unavailable, the source with the second-highest priority is used, and so forth. This command is required if the clock source is from the line. The clocking is provided to the AIM, which then provides it to participating slots in the router. Keywords and arguments are as follows:</p> <ul style="list-style-type: none"> • <i>priority</i>—Priority for the clock source (1 is highest priority) • t1 or e1—T1 or E1 ports • <i>slot/port</i>—Slot and port for the controller clock source. Slots are as follows: <ul style="list-style-type: none"> – Cisco 2600 series and Cisco 2600XM—0 (built-in WIC slot) or 1 (network module slot) – Cisco 3660—1 to 6 – Cisco 3725 and Cisco 3745—1 to 4
Step 9	<pre>exit</pre> <p>Example: Router(config)# exit</p>	<p>Exits the current mode.</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 slots, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice-card**
4. **codec complexity**
5. **dspfarm**
6. **exit**
7. **controller**
8. **ds0-group timeslot**
9. **exit**

DETAILED STEPS

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

	Command or Action	Purpose
Step 4	<pre>codec complexity {high medium}</pre> <p>Example: <pre>Router(config-voice-card)# codec complexity high</pre></p>	<p>Changes the codec complexity to high or medium and matches the DSP complexity packaging to the supported codecs.</p> <p>When codec complexity changes, the system prompts you to remove all existing DS0 or PRI groups. Then all DSPs are reset, loaded with the specified firmware image, and released.</p> <p>For switched calls, you can configure a high-complexity codec even when the DSPs are loaded with medium-complexity firmware. However, an error message displays during call setup when a high-complexity codec is detected.</p> <p>This command affects all DSPs on this voice card. You cannot specify the DSP firmware type based on the DSP chip type.</p>
Step 5	<pre>dspfarm</pre> <p>Example: <pre>Router(config-voicecard)# dspfarm</pre></p>	<p>(Optional) Enters the DSP resources on the AIM specified in the voice-card command into the DSP resource pool.</p>
Step 6	<pre>exit</pre> <p>Example: <pre>Router(config-voicecard)# exit</pre></p>	<p>Exits the current mode.</p>
Step 7	<pre>controller {t1 e1} slot/port</pre> <p>Example: <pre>Router(config)# controller e1 1/0</pre></p>	<p>Enters controller configuration mode on the T1 or E1 controller on the selected slot/port.</p>
Step 8	<pre>ds0-group group-number timeslots timeslot-range type type</pre> <p>Example: <pre>Router(config-controller)# ds0-group 0 timeslots 1-16</pre></p>	<p>Creates a DS0 group that makes up a logical voice port on a T1/E1 controller. The keyword and argument are as follows:</p> <ul style="list-style-type: none"> timeslots <i>timeslot-range</i>—Number, range of numbers, or multiple ranges of numbers separated by commas. T1 range: 1 to 24. E1 range: 1 to 31. type <i>type</i>—Signaling type by which the router communicates with the PBX or PSTN. <p>Note High-complexity codecs with the AIM-ATM-VOICE-30 module can process up to 16 voice channels.</p>
Step 9	<pre>exit</pre> <p>Example: <pre>Router(config-controller)# exit</pre></p>	<p>Exits the current mode.</p>

Configuring Integrated Voice and Serial Data WAN

To configure integrated voice and serial data WAN, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller**
4. **clock source**
5. **channel-group timeslots**
6. **ds0-group timeslots type**
or
pri-group timeslots
7. **no shutdown**
8. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enters privileged EXEC mode. Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	controller {t1 e1} slot/port Example: Router(config)# controller e1 0/1	Enters controller configuration mode on the T1 or E1 controller on the specified slot/port. The example shows a VWIC E1 card installed in WIC slot 0.

	Command or Action	Purpose
Step 4	<pre>clock source {line [primary] internal}</pre> <p>Example: 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 line, whether this port is the primary source. Arguments and keywords are as follows:</p> <ul style="list-style-type: none"> • line—Clock recovered from the line's receive data stream. This is the default. • primary—External source to which the port is connected. This option also puts a second port, which is generally connected to the PBX, into looped-time mode. Both ports are configured with line, but only the port connected to the external source is configured with primary. • internal—T1 or E1 controller internal PLL. <p>Note With the default, the clock source does not appear in the show running-config command output. To display the current source for a port, use the show controllers command.</p>
Step 5	<pre>channel-group channel-group-number timeslots timeslot-range [speed bit-rate] aim aim-slot-number</pre> <p>Example: 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. Use to specify T1/E1 timeslots to be used for HDLC/PPP/Frame-relay encapsulated data.</p>
Step 6	<pre>ds0-group ds0-group-number timeslots timeslot-range type type</pre> <p>or</p> <pre>pri-group timeslots timeslot-range d-channel timeslot rlm-timeslot timeslot number]</pre> <p>Example: Router(config-controller)# ds0-group 2 timeslots 6-12 type e&m-immediate-start</p> <p>or</p> <p>Example: Router(config-controller)# pri-group timeslots 6-23</p>	<p>(DS0 groups) Creates a DS0 group that makes up a logical voice port on a T1/E1 controller. Keywords and arguments are as follows:</p> <ul style="list-style-type: none"> • timeslot timeslot-range—Number, range of numbers, or multiple ranges of numbers separated by commas. T1 range: 1 to 24. E1 range: 1 to 31. • type type—Signaling type by which the router communicates with the PBX or PSTN. <p>Note High-complexity codecs with the AIM-ATM-VOICE-30 module can process up to 16 voice channels.</p> <p>or</p> <p>(PRI groups) Creates a PRI group that makes up a logical voice port on a channelized T1 or E1 controller. The keyword and argument are as follows:</p> <ul style="list-style-type: none"> • timeslot timeslot-range—Range of numbers. T1 range: 1 to 23. E1 range: 1 to 15. <p>Note Only one PRI group can be configured on a controller.</p>

	Command or Action	Purpose
Step 7	<code>no shutdown</code> Example: Router(config-controller)# no shutdown	Reinstates the controller.
Step 8	<code>exit</code> Example: Router(config-controller)# exit	Exits the current mode.

Verifying Integrated Voice and Serial Data WAN

To verify integrated voice and serial data WAN, perform the following steps (listed alphabetically).

SUMMARY STEPS

1. **show controllers serial**
2. **show interface serial**
3. **show isdn status**
4. **show network-clocks**
5. **show running-config**
6. **show voice dsp**

DETAILED STEPS

Step 1 **show controllers serial**

Use this command to display the configuration on the serial interface

```
Router# show controllers 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)

```

Step 2 show interface serial

Use this command to display the configuration on the serial interface.

```

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

```

Step 3 show isdn status

Use this command to display the status of all ISDN interfaces, including active layers, timer information, and switch-type settings.

Step 4 show network-clocks

Use this command to display the current chosen clock and the list of all sources of network clocks according to their priority.

```

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

```

Step 5 show running-config

Use this command to display the basic router configuration.

Step 6 show voice dsp

Use this command to display the voice DSP configuration.

```
Router# show voice dsp
```

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

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

This section contains the following configuration examples:

- [Single-Serial-Data WAN: Example, page 176](#)
- [Multiple-Serial-Data WAN: Example, page 178](#)
- [High-Complexity Codecs and Network Clock: Example, page 179](#)

Single-Serial-Data WAN: Example

This example shows the configuration of a router whose E1 (0/0) controller is used for integrated voice and serial data. Note that E1 timeslots 1 to 11 are configured for serial data and E1 timeslots 12 to 31 are configured for PRI voice. Also note that interface Serial0/0:1 is the logical interface for E1 timeslots 1 to 11 and interface Serial0/0:15 is the logical interface for E1 timeslots 12 to 31.

```
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 "buick-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
```

Multiple-Serial-Data WAN: Example

This example shows the configuration of a router whose E1 (0/0) controller is used voice and serial data traffic and whose E1 (0/1) controller is used completely for data traffic.

```
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 "buick-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 and Network Clock: Example

This example shows the configuration of a router in which the WIC at slot 0 and AIM at slot 0 are configured to received clock from the network (see the lines `network-clock-participate`). Also note that E1 0/0 controller is the source of the network clock (see the line `network-clock-select`). This example also shows that the voice card in slot 5 uses a high-complexity codec.

```

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

```

Additional References

General ISDN References

- “[ISDN Features Roadmap](#)” on page 1—Describes how to access Cisco Feature Navigator; also lists and describes, by Cisco IOS release, ISDN features for that release
- “[Overview of ISDN Voice Interfaces](#)” on page 3—Describes relevant underlying technology; lists related documents, standards, MIBs, and RFCs; and describes how to obtain technical assistance
- “[Additional References](#)” section on page 64—Lists additional ISDN references

References Mentioned in This Chapter

- *AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30 on the Cisco 2600 Series and Cisco 3660* at http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122t/122t8/ft_04gin.htm
- *Cisco IOS Voice, Video, and Fax Command Reference* at <http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/>

