



Voice over ATM with AAL2 Trunking on Cisco MC3810-V3 Concentrators

This document describes voice telephony over ATM (VTOA) using ATM adaptation layer 2 (AAL2) trunking on the Cisco MC3810-V3 multiservice access concentrators.

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Feature Summary

This feature enables the Cisco MC3810-V3 concentrators to carry voice traffic (for example, telephone calls and faxes) over ATM networks using AAL2. AAL2 is the most bandwidth-efficient standards-based trunking method for transporting compressed voice, voice-band data, circuit-mode data, and frame-mode data over ATM infrastructures.

Benefits

Voice over ATM with AAL2 trunking provides the following improvements to the Cisco MC3810-V3 capabilities:

- Increased quality of service (QoS) capabilities
- Standards-based transport of voice over ATM
- Bandwidth-efficiency
- Robust architecture
- Signaling transparency
- CAS and CCS support

Restrictions

This feature is not supported on Cisco MC3810 series chassis prior to the V3 version.

This feature requires an HCM2 or HCM6 high-performance voice compression module.

The following capabilities are not supported in this release of AAL2 VoATM:

- Data services over AAL2; Nx64K circuit mode; N>=1
- AAL2 switched virtual circuits (SVCs)
- Fax/modem relay; fax demodulation and remodulation
- Idle code detection; idle channel suppression
- Cisco-switched AAL2 trunking
- MIBs

Related Documents

For more information about voice technologies, see the Cisco IOS Release 12.1 *Multiservice Applications Configuration Guide*, and the *Multiservice Applications Command Reference*.

For information about voice port command changes in Cisco IOS Release 12.0(7)XK, see the Cisco IOS 12.0(7)XK online document *Voice Port Enhancements in Cisco 2600, 3600 and 3810 Routers and Concentrators*.

Supported Platform

Cisco MC3810-V3

Supported Standards, MIBs, and RFCs

ATM Forum—af-vtoa-113

ITU—I.363.2

ITU—I.366.2

Prerequisites

Before you can configure your router to use Voice over ATM, you must first:

- Establish a working ATM network. For more information about configuring ATM, refer to the *Wide Area Networking Configuration Guide*.
- Complete your company's dial plan.
- Establish a working telephony network based on your company's dial plan.
 - Integrate your dial plan and telephony network into your existing ATM network topology.
 - Contact your PBX vendor for instructions about how to reconfigure the appropriate PBX interfaces.

After you have analyzed your dial plan and decided how to integrate it into your existing ATM network, you are ready to configure your network devices to support Voice over ATM.

Configuration Tasks

To configure Voice over ATM with AAL2 trunks, complete the following tasks as required:

- Configuring ATM for AAL2 Voice, page 3
- Configuring Call Admission Control for AAL2 Voice, page 6 (optional)
- Configuring Subcell Multiplexing for AAL2 Voice, page 7 (optional)
- Configuring Dial Peers for AAL2 Voice, page 8
- Configuring AAL2-Trunk Permanent Calls, page 10 (optional)



Note

ATM defaults to Interim Local Management Interface (ILMI). If your carrier is using Local Management Interface (LMI), be sure to configure LMI support on the router.

Configuring ATM for AAL2 Voice

This section describes the ATM configuration tasks necessary to support Voice over ATM using AAL2. The commands and procedures in this section are specific to the Cisco MC3810-V3.




Note

If any DS0 groups (CAS groups), channel groups, or clear channels are configured on T1/E1 controller 0, you must remove them before configuring VoATM. Because ATM uses all of the DS0 timeslots on the controller, the ATM configuration cannot take place if any DS0s on controller 0 are used by other applications.


You must perform the VoATM configuration on the Cisco MC3810-V3 concentrators at both ends of the ATM link.

To configure a Cisco MC3810-V3 concentrator to support VoATM on a T1/E1 trunk, complete the following steps beginning in global configuration mode:

Step	Command	Purpose
1.	<code>router(config)# controller {t1 e1} 0</code>	Select the T1 or E1 controller 0. On the Cisco MC3810, ATM is supported only on controller 0.
2.	<code>router(config-controller)# mode atm</code>	Specify that the controller will support ATM encapsulation and create ATM interface 0. When the controller is set to ATM mode, the following takes place: <ul style="list-style-type: none"> • Controller framing is automatically set to Extended SuperFrame (ESF) on T1 and to CRC4 on E1. • The linecode is automatically set to B8ZS on T1 and to HDB3 on E1.
3.	<code>router(config-controller)# no shutdown</code>	Make sure the controller is activated.

Step	Command	Purpose
4.	<code>router(config-controller)# exit</code>	Exit controller configuration mode.
5.	<code>router(config)# interface atm0</code> <code>[subinterface-number [multipoint </code> <code>point-to-point]]</code>	Enter interface configuration mode to configure ATM interface 0 or an ATM subinterface. For subinterfaces, the default is multipoint .
6.	<code>router(config-if)# pvc [word] {vpi/vci vci}</code>	Create an ATM PVC for voice traffic and enter ATM virtual circuit configuration mode. <i>vpi</i> = 0 to 255 <i>vci</i> = 1 to 1023 <i>word</i> = optional PVC identifier (letters only); if you assign a PVC identifier, you can use it to specify this PVC when configuring network dial peers  Note The ilmi and qsaal options are not supported for AAL2.
7.	<code>router(config-if-atm-vc)# encapsulation aal2</code>	Set the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255.

Step	Command	Purpose
8.	<pre>router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst]</pre>	<p>Configure the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:</p> <ul style="list-style-type: none"> • Peak rate: If it does not exceed your carrier's allowable rate, set to the line rate (for example, 1536 kbps for T1-ATM). • Average rate: Calculate according to the maximum number of calls the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps: <ul style="list-style-type: none"> G.711 with 40 or 80 byte sample size—max calls x 85 G.726 with 40 or 80 byte sample size—max calls x 43 G.729 with 30 byte sample size—max calls x 15 G.729 with 20 byte sample size—max calls x 22 G.729 with 10 byte sample size—max calls x 43 <p>If voice activity detection (VAD) is enabled, the bandwidth usage is reduced by as much as 12 percent with the maximum number of calls in progress. With fewer calls in progress, bandwidth savings are less.</p> <ul style="list-style-type: none"> • Burst size: Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows: <ul style="list-style-type: none"> The minimum burst size is 4 x the number of voice calls. The maximum burst size is the maximum allowed by the carrier.
9.	<pre>router(config-if-atm-vc)# oam-pvc [manage] [frequency]</pre>	<p>(Optional) Configure transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specify the number of seconds between loopback cells, and optionally enable OAM management of the connection.</p> <p>The range for <i>frequency</i> is 0 to 600. The default is 10.</p>

Step	Command	Purpose
10.	<code>router(config-if-atm-vc)# oam retry up-count down-count retry-frequency</code>	<p>(Optional) Specify OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.</p> <ul style="list-style-type: none"> The <i>up-count</i> is the number of OAM loopback cell responses received to change the PVC connection to up. The range is 1 to 600; the default is 3. The <i>down-count</i> is the number of OAM loopback cell responses not received to change the PVC connection to down. The range is 1 to 600; the default is 5. The <i>retry-frequency</i> is the number of seconds between loopback cells sent to verify the down state of a PVC. The range is 1 to 1000; the default is 1. <p> Note Enter the oam retry command only once with all of the arguments in the order shown. The first number always specifies <i>up-count</i>; the second <i>down-count</i>, and the third <i>retry-frequency</i>.</p>
11.	<code>router(config-if-atm-vc)# end</code>	Exit configuration mode.
12.	<code>router# show atm vc</code>	Verify the ATM PVC configuration.



Note When verifying your ATM PVC connectivity, note that you cannot enter the **ping** command over a voice PVC because the command applies to data only. If you have data and voice PVCs set to the same destination, you can enter the **ping** command over the data PVC.

Configuring Call Admission Control for AAL2 Voice

This section describes the configuration tasks necessary to configure call admission control (CAC) for AAL2 voice. The commands and procedures in this section are specific to the Cisco MC3810-V3. CAC is an optional feature.

You can configure a Cisco MC3810-V3 as either a CAC master or a CAC slave. By default, a Cisco MC3810-V3 is a CAC slave. You typically configure a CAC master at one end of an ATM trunk and a CAC slave at the opposite end. A Cisco MC3810-V3 configured as a master always performs CAC during fax/modem upspeed. A Cisco MC3810-V3 configured as a slave sends a request for CAC to the CAC master.

To configure a Cisco MC3810-V3 as a CAC master, complete the following steps beginning in global configuration mode:

Step	Command	Purpose
1.	<code>router(config)# voice service voatm</code>	Enters voice-service configuration mode.
2.	<code>router(config-voice-service)# session protocol aal2</code>	Enters voice-service-session configuration mode and specifies AAL2 trunking.

Step	Command	Purpose
3.	<code>router(config-voice-service-session)# cac master</code>	Configures this Cisco MC3810-V3 as a CAC master. By default, a Cisco MC3810-V3 is a CAC slave.
4.	<code>router(config-voice-service-session)# end</code>	Exits configuration mode.

To return a Cisco MC3810-V3 to its default operation as a CAC slave, complete the following steps beginning in global configuration mode:

Step	Command	Purpose
1.	<code>router(config)# voice service voatm</code>	Enters voice-service configuration mode.
2.	<code>router(config-voice-service)# session protocol aal2</code>	Enters voice-service-session configuration mode and specifies AAL2 trunking.
3.	<code>router(config-voice-service-session)# no cac master</code>	Configures this Cisco MC3810-V3 as a CAC slave.
4.	<code>router(config-voice-service-session)# end</code>	Exits configuration mode.

Configuring Subcell Multiplexing for AAL2 Voice

This section describes the configuration tasks necessary to enable AAL2 common part sublayer (CPS) subcell multiplexing when the Cisco MC3810-V3 interoperates with a voice interface service module (VISM) in an MGX switch. The commands and procedures in this section are specific to the Cisco MC3810-V3.

To configure the Cisco MC3810-V3 to perform subcell multiplexing, complete the following steps beginning in global configuration mode:

Step	Command	Purpose
1.	<code>router(config)# voice service voatm</code>	Enters voice-service configuration mode.
2.	<code>router(config-voice-service)# session protocol aal2</code>	Enters voice-service-session configuration mode and specifies AAL2 trunking.
3.	<code>router(config-voice-service-session)# subcell-mux</code>	Enables subcell multiplexing. By default, subcell multiplexing is not enabled.
4.	<code>router(config-voice-service-session)# end</code>	Exits configuration mode.

Configuring Dial Peers for AAL2 Voice


For more information on dial peers and dial-peer configuration, see the “Configuring Voice over ATM” chapter in the Cisco IOS Release 12.1 *Multiservice Applications Configuration Guide*.

Configuring Network Dial Peers to Support AAL2

To configure a network dial peer for VoATM, specify a unique tag number, an outgoing serial port, and a virtual circuit number.

To configure Voice over ATM dial peers, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1.	<code>router(config)# dial-peer voice tag voatm</code>	Define a Voice over ATM dial peer for Voice over ATM and enter dial-peer configuration mode. The <i>tag</i> identifies the dial peer. Each <i>tag</i> on any one router must be unique.
2.	<code>router(config-dial-peer)# destination-pattern string</code>	Configure the dial peer’s destination pattern. The <i>string</i> is a series of digits that specify the E.164 or private dialing plan telephone number. Valid entries are the digits 0 through 9 and the letters A through D. The following special characters can be entered in the string: <ul style="list-style-type: none"> • The star (*) and the pound sign (#) can be used in a dial string, but not as leading characters (for example *650 is not permitted). • The period (.) can be entered as a wildcard digit. Network dial peers typically use wildcards to represent a range of destination telephone numbers (for example 1408555.... for all numbers in area code 408 with the 555 prefix). • The comma (,) can be used only in prefixes, and is used to insert a 1-second pause. • The timer (T) character can be used to configure variable-length dial plans.
3.	<code>router(config-dial-peer)# session protocol aal2-trunk</code>	Configure the session protocol to support AAL2-trunk permanent (private line) trunk calls.
4.	<code>router(config-dial-peer)# session target atm 0 pvc {word vpi/vci vci} cid</code>	Configure the ATM session target for the dial peer. Be sure to specify atm 0 as the interface for the PVC. Use <i>word</i> to identify the PVC if a word name was assigned when the PVC was created in step 6. of the “Configuring ATM for AAL2 Voice” section on page 3.

Step	Command	Purpose
5.	<code>router(config-dial-peer)# codec aal2 profile {itut custom} profile-number codec</code>	<p>Specify a codec profile for the DSP.</p> <p>Profile options are itut 1, itut 2, itut 7, custom 100, and custom 110.</p> <p>The default is itut 1 with codec G.711ulaw.</p> <p>See the command reference for the codec options available for each AAL2 profile.</p> <p> Note Use this command instead of the codec (dial-peer) command for AAL2 trunk applications.</p>
6.	<code>router(config-dial-peer)# dtmf-relay</code>	<p>(Optional) If the codec type is a low bit-rate codec such as g729 or g723, specify support for DTMF relay to improve end-to-end transport of DTMF tones. DTMF tones do not always propagate reliably with low bit-rate codecs.</p> <p>DTMF relay is disabled by default.</p>
7.	<code>router(config-dial-peer)# signal-type {ext-signal transparent}</code>	<p>(Optional) Define the type of ABCD signaling packets that are generated by the voice port and sent over the ATM network. The signal type must be configured to the same setting at both ends of the PVC.</p> <p>Enter ext-signal for common channel signaling (CCS). ABCD signaling packets are not sent.</p> <p>Enter transparent for nonswitched trunks using channel associated signaling (CAS). ABCD signaling bits are passed transparently to the ATM network.</p>
8.	<code>router(config-dial-peer)# no vad</code>	<p>(Optional) Disable voice activity detection (VAD) on the dial peer. VAD is enabled by default.</p>

To configure additional Voice over ATM dial peers, exit dial-peer configuration mode by entering **exit**, and repeat the previous steps.

Configuring AAL2-Trunk Permanent Calls

To configure AAL2-trunk permanent calls on a Cisco MC3810-V3 concentrator, complete the following commands beginning in global configuration mode:

Step	Command	Purpose
1.	For Cisco MC3810-V3 analog voice ports: <code>router(config)# voice port slot/port</code> For Cisco MC3810-V3 digital voice ports: <code>router(config)# voice port slot:ds0-group</code>	Enter voice port configuration mode.
2.	<code>router(config-voiceport)# connection trunk destination-string [answer-mode]</code>	Configure the trunk connection, specifying the telephone number in the <i>destination-string</i> . For AAL2-trunk permanent calls, the voice port at one end must be the call initiator (master) and the voice port at the other end is normally the call answerer (slave). By default, voice ports operate in master mode. Enter the answer-mode keyword to specify that a voice port should operate in slave mode.
3.	<code>router(config-voiceport)# shutdown</code>	Shut down the voice port.
4.	<code>router(config-voiceport)# no shutdown</code>	Reactivate the voice port to enable the trunk connection to take effect.



Note

Every time you enter the **connection trunk** or **no connection trunk** command, or make any changes to VoATM dial peers, you must toggle the corresponding voice port (by entering **shutdown**, then **no shutdown**) to activate the changes.

Validation Tips

You can check the validity of your dial-peer and voice-port configuration by performing the following tasks:

- If you have relatively few dial peers configured, you can use the **show dial-peer voice** command to verify that the data configured is correct.
- To show the status of the voice ports, use the **show voice port** command.
- To show the trunk status for all trunks, use the **show voice call summary** command.
- To show the current status of all DSP voice channels, use the **show voice dsp** command.
- Enter the **show atm pvc vpi/vci** command; this should display cid-level statistics.

Troubleshooting Tips

If you are having trouble connecting a call and you suspect the problem is associated with the dial-peer configuration, you can try to resolve the problem by performing the following tasks:

- Use the **show dial-peer voice** command on the local and remote concentrators to verify that the data is configured correctly on both.
- Use the **show interface** command to verify that the ATM interface is up.
- Make sure the voice port and/or controller T1 0 is set to **no shutdown**.

Voice over ATM Configuration Example

The following is a sample configuration for Voice over ATM on Cisco MC3810-V3 concentrators at opposite ends of an AAL2 trunk:

Cisco MC3810-V3 Configuration at End A

```

version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname aal2-faxtest1
!
!
!
!
!
!
network-clock base-rate 64k
ip subnet-zero
!
isdn voice-call-failure 0
!
!
voice-card 0
!
!
controller T1 0
mode atm
framing esf
linecode b8zs
!
controller T1 1
mode cas
framing esf
linecode b8zs
interface Ethernet0
ip address 1.7.78.1 255.255.0.0
!
interface Serial0
no ip address
!
interface Serial1
no ip address
shutdown
interface ATM0
no ip address

```

```

ip mroute-cache
no atm ilmi-keepalive
pvc 99/99
  vbr-rt 1536 1536 1000
  encapsulation aal2
!
voice-port 1:1
  no echo-cancel enable
timeouts wait-release 3
  connection trunk 1001
!
dial-peer voice 1001 voatm
  destination-pattern 1001
  called-number 2001
session protocol aal2-trunk
  session target ATM0 pvc 99/99 21
  dtmf-relay
  signal-type trans
  codec aal2-profile custom 100 g711ulaw
  no vad
!
dial-peer voice 201 pots
  destination-pattern 2001
port 1:1
!end

```

Cisco MC3810-V3 Configuration at End B

```

Current configuration:
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname aal2-faxtest2
!
!
!
!
!
network-clock base-rate 64k
ip subnet-zero
!
isdn voice-call-failure 0
!
!
voice-card 0
!
controller T1 0
  mode atm
  framing esf
  clock source internal
  linecode b8zs
!
controller T1 1
  mode cas
  framing esf
  linecode b8zs
  ds0-group 1 timeslots 1 type e&m-immediate-start

interface Ethernet0

```

```
    ip address 1.7.78.4 255.255.0.0
    !
interface Serial0
    shutdown
    !
interface Serial1
    no ip address
    shutdown
    !
interface ATM0
    ip address 223.223.226.3 255.255.255.0
    ip mroute-cache
    no atm ilmi-keepalive
    pvc 99/99
        vbr-rt 1536 1536 1000
        encapsulation aal2
    !
    !
voice-port 1:1
    timeouts wait-release 3
    connection trunk 2001
    !
dial-peer voice 201 pots
    destination-pattern 1001
    port 1:1
    !
dial-peer voice 1001 voatm
    destination-pattern 2001
    called-number 1001
    session protocol aal2-trunk
    session target ATM0 pvc 99/99 21
    dtmf-relay
    signal-type trans
    codec aal2-profile custom 100 g711ulaw
    no vad
line con 0
    exec-timeout 0 0
    transport input none
line aux 0
line 2 3
line vty 0 4
    login
    !
end
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

New and modified **debug** commands can be found in the “Debug Commands” section on page 27.

The following new and modified commands are described in this section (modified commands are marked by an asterisk):

- **cac master**
- **codec aal2-profile**
- **encapsulation***
- **session protocol**
- **session protocol aal2***
- **session target***
- **show aal2 profile**
- **subcell-mux**
- **voice service**

cac master

To configure the call admission control (CAC) operation of a Cisco MC3810-V3 as master, enter the **cac master** voice-service configuration command. The **no** form of the command restores the default value.

cac master

no cac master

Syntax Description This command has no arguments or keywords.

Defaults The Cisco MC3810-V3 is enabled as a CAC slave.

Command Modes Voice-service configuration

Command History	Release	Modification
	12.1(1)XA	The command was introduced for the Cisco MC3810-V3.

Usage Guidelines You should configure the Cisco MC3810-V3 concentrators at opposite ends of an AAL2 trunk for the opposite CAC operation—master at one end and slave at the other end.

A Cisco MC3810-V3 configured as a master always performs CAC during fax/modem upspeed. A Cisco MC3810-V3 configured as a slave sends a request for CAC to the CAC master.

Examples The following example configures the CAC operation of a Cisco MC3810-V3 as master:

```
router(config)# voice service voatm
router(config-voice-service)# session protocol aal2
router(config-voice-service-session)# cac master
```

The following example returns the CAC operation of a Cisco MC3810-V3 to slave:

```
router(config)# voice service voatm
router(config-voice-service)# session protocol aal2
router(config-voice-service-session)# no cac master
```

codec aal2-profile

To set the codec profile for a DSP on a per-call basis, enter the **codec aal2-profile** dial-peer configuration command. The **no** form of the command restores the default value.

codec aal2-profile { **itut** | **atmf** | **custom** } *profile-number* *codec*

no codec aal2-profile

Syntax Description	itut	Specifies the <i>profile-number</i> as an ITU-T type.
	atmf	Specifies the <i>profile-number</i> as an ATMF type.
	custom	Specifies the <i>profile-number</i> as a custom type.
	<i>profile-number</i>	The available <i>profile-number</i> selections depend on the profile type. For ITU-T: <ul style="list-style-type: none"> • 1 = G.711ulaw • 2 = G.711ulaw with silence insertion descriptor (sid) • 7 = G.711ulaw and G.729ar8 For ATMF: None. ATMF is not supported. For custom: <ul style="list-style-type: none"> • 100 = G.711ulaw and G.726r32 • 110 = G.711ulaw, G.726r32, and G.729ar8
	<i>codec</i>	Enter one codec for the DSP. The possible <i>codec</i> entries depend on the <i>profile-number</i> . The valid entries are as follows: <ul style="list-style-type: none"> • For ITU 1—g711ulaw • For ITU 2—g711ulaw • For ITU 7—g711ulaw or g729ar8 • For custom 100—g711ulaw or g726r32 • For custom 110—g711ulaw or g726r32 or g729ar8

Defaults The default is ITU profile 1 (G.711ulaw).

Command Modes Dial-peer configuration

Command History	Release	Modification
	12.1(1)XA	The command was introduced for the Cisco MC3810-V3.

Usage Guidelines Use this command to configure the DSP to operate with specified a profile type and codec(s).
You must enter the **session protocol aal2-trunk** command before configuring the codec AAL2 profile.

This command is used instead of the **codec (dial-peer)** command for AAL2 trunk applications.

Examples

The following example sets the codec AAL2 profile type to ITU and configures a profile-number of 7, enabling codec G.729ar8:

```
router(config)# dial-peer voice 100 voatm
router(config-dial-peer)# session protocol aal2-trunk
router(config-dial-peer)# codec aal2-profile itu 7 g729ar8
```

The following example sets the codec AAL2 profile type to custom and configures a profile-number of 100, enabling codec G.726r32:

```
router(config)# dial-peer voice 200 voatm
router(config-dial-peer)# session protocol aal2-trunk
router(config-dial-peer)# codec aal2-profile custom 100 g726r32
```

Related Commands

Command	Description
session protocol (dial-peer)	Establishes a session protocol for calls between the local and remote routers via the packet network.

encapsulation

To configure the ATM adaptation layer (AAL) and encapsulation type for an ATM PVC, use the **encapsulation** command in the appropriate command mode. Use the **no** form of this command to remove an encapsulation from a PVC.

encapsulation *aal-encap*

no encapsulation *aal-encap*



Note

This document only describes encapsulation settings for AAL2 Voice over ATM on the Cisco MC3810-V3. For the full syntax of the **encapsulation** command, refer to the *Cisco IOS Wide Area Networking Command Reference*.

Syntax Description

<i>aal-encap</i>	ATM adaptation layer (AAL) and encapsulation type. For AAL2 Voice over ATM the value for <i>aal-encap</i> is aal2 .
------------------	--

Defaults

The global default encapsulation is aal5snap.

Command Modes

Virtual circuit (vc) configuration

Command History

Release	Modification
11.3 T	This command was first introduced.
12.0	This command superseded the encapsulation atm command for the Cisco MC3810, and the aal5mux frame and aal5mux voice suboptions appeared.
12.0(7)XK	Support for the aal5mux voice option was added to the Cisco 3600 series routers.
12.1(1)XA	Support for the aal2 option was added to the Cisco MC3810-V3 concentrators.

Usage Guidelines

Use **aal2** encapsulation to dedicate the specified PVC to AAL2 Voice over ATM.

If you specify virtual template parameters after the ATM PVC is configured, you should issue a **shutdown** command followed by a **no shutdown** command on the ATM subinterface to restart the interface, causing the newly configured parameters (such as an IP address) to take effect.

Examples

The following example configures a PVC to support AAL2 encapsulation for Voice over ATM on a Cisco MC3810-V3 concentrator:

```
router(config-interface-atm)# pvc 20/20
router(config-interface-atm-vc)# encapsulation aal2
```

session protocol

To specify a session protocol for calls between the local and remote routers via the packet network, use the **session protocol** dial-peer configuration command. Use the **no** form of this command to reset the default value for this command.

```
session protocol { aal2-trunk | cisco }
```

```
no session protocol
```

Syntax Description

aal2-trunk	AAL2 nonswitched trunk session protocol.
cisco	Cisco session protocol.

Defaults

VoATM trunks use Cisco session protocol.

Command Modes

Dial-peer configuration

Command History

Release	Modification
11.3(1)T	This command was introduced for Cisco 3600 series VoIP peers with the keyword cisco .
12.0(3)XG	The cisco-switched and frf11-trunk keywords were added for VoFR dial peers.
12.1(1)XA	Support was added for VoATM dial peers on the Cisco MC3810-V3 with the aal2-trunk keyword.

Usage Guidelines

The keyword **cisco** is only applicable to VoIP on the Cisco 3600 series.

The keyword **aal2-trunk** is only applicable to VoATM on the Cisco MC3810-V3.

Examples

The following example selects AAL2 trunking as the session protocol on a Cisco MC3810-V3 concentrator:

```
router(config)# dial-peer voice 10 voatm
router(config-dialpeer)# session protocol aal2-trunk
```

The following example selects Cisco Session Protocol as the session protocol on a Cisco 3600 series router:

```
router(config)# dial-peer voice 20 voip
router(config-dialpeer)# session protocol cisco
```

Related Commands

Command	Description
session target	Configures a network-specific address for a dial peer.

session protocol aal2

To enter the voice-service-session configuration mode and specify AAL2 trunking on a Cisco MC3810-V3, use the **session protocol aal2** voice-service configuration command.

session protocol aal2

Syntax Description This command has no keywords or arguments.

Defaults There is no default setting for this command.

Command Modes Voice-service configuration

Release	Modification
12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines This command applies to VoATM on the MC3810-V3. In the voice-service-session configuration mode for AAL2, you can configure only AAL2 features, such as call admission control and subcell multiplexing.

Examples The following example shows how to access the voice-service-session configuration mode, beginning in global configuration mode:

```
router(config)# voice service voatm
router(config-voice-service)# session protocol aal2
router(config-voice-service-session)#
```

session target

To configure a network-specific address for a dial peer, use the **session target** dial-peer configuration command. Use the **no** form of this command to delete the network-specific address for a dial peer.

```
session target {serial | atm} interface-number pvc {word | vpi/vci | vci} cid
```

```
no session target
```

Syntax Description	
serial	A serial interface for the dial-peer address.
atm	An ATM interface for the dial-peer address.
<i>interface-number</i>	The interface number for the dial-peer address.
pvc	The specific ATM permanent virtual circuit (PVC) for this dial peer.
<i>word</i>	(Optional) A name to identify the PVC. You can use <i>word</i> to identify the PVC if a word identifier was assigned when the PVC was created.
<i>vpi/vci</i>	ATM network virtual path identifier (VPI) and virtual channel identifier (VCI) of this PVC. On the Cisco MC3810 the valid range is: for <i>vpi</i> 0 to 255 and for <i>vci</i> 1 to 1023.
<i>vci</i>	ATM network virtual channel identifier (VCI) of this PVC. On the Cisco MC3810 the valid range is 1 to 1023.
<i>cid</i>	ATM network channel identifier (CID) of this PVC. The valid range is 8 to 255.

Defaults No network specific address is specified.

Command Modes Dial-peer configuration

Command History	Release	Modification
	11.3(1) T	This command was first introduced.
	11.3(1) MA	Support was added for VoFR, VoATM, and VoHDLC dial peers on the Cisco MC3810.
	12.0(3) XG and 12.0(4)T	The <i>cid</i> option was added. Support was added for VoFR dial peers on the Cisco 2600 and Cisco 3600 series routers.
	12.0(7)XK	Support was added for VoATM dial peers on the Cisco 3600 series routers. Support was added for VoIP dial peers on the Cisco MC3810. Support for VoHDLC on the Cisco MC3810 was removed.
	12.1(1)XA	Support was added for VoATM dial peers on the Cisco MC3810.

Usage Guidelines

Use the **session target** command to specify a network-specific address or domain name for a dial peer. Whether you select a network-specific address or a domain name depends on the session protocol you select.

You must enter the **session protocol aal2-trunk** dial-peer configuration command before you can specify a cid for a dial peer.

Examples

The following example configures a session target for Voice over ATM on a Cisco MC3810-V3. The session target is sent to ATM interface 0, and is for a PVC with a VPI/VCI of 1/100.

```
router(config)# dial-peer voice 12 voatm
router(config-dialpeer)# destination-pattern 1310222....
router(config-dialpeer)# session protocol aal2-trunk
router(config-dialpeer)# session target atm 0 pvc 1/100 10
```

Related Commands

Command	Description
codec (dial-peer)	Specifies the voice coder rate of speech for a dial peer.
destination-pattern	Specifies either the prefix or the full E.164 telephone number to be used for a dial peer.
dtmf-relay	Enables the DSP to generate FRF.11 Annex A frames for a dial peer.
session protocol (dial-peer)	Establishes a session protocol for calls between the local and the remote routers via the packet network.
signal-type	Sets the signaling type to be used when connecting to a dial peer.

show aal2 profile

To display the AAL2 profiles configured on the system, use the **show aal2 profile** EXEC command.

```
show aal2 profile all | {itut profile-number | custom profile-number | atm profile-number}
```

Syntax Description	
atmf	Displays ATMF profiles configured on the system.
itut	Displays ATU-T profiles configured on the system.
all	Displays ATU-T, ATMF, and custom AAL2 profiles configured on the system.
custom	Displays custom profiles configured on the system.
<i>profile-number</i>	Specifies the profile number of the AAL2 profile to display. The available choices are as follows: For ITU-T: <ul style="list-style-type: none"> • 1 = G.711ulaw • 2 = G.711ulaw with silence insertion descriptor (sid) • 7 = G.711ulaw and G.729ar8 For ATMF: None. ATMF is not supported. For custom: <ul style="list-style-type: none"> • 100 = G.711ulaw and G.726r32 • 110 = G.711ulaw, G.726r32, and G.729ar8

Command Modes User EXEC

Command History	Release	Modification
	12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines This command applies to AAL2 VoATM applications on the Cisco MC3810-V3. Use the **show aal2 profile** EXEC command to display the AAL2 profiles configured in the system.

Examples

The following is sample output from the **show aal2 profile** command for displaying all of the configured profiles in the system:

```
router# show aal2 profile all
Printing all the Profiles in the system

Profile Type: ITUT Profile Number: 1 SID Support: 0
Red enable: 1 Num entries: 1
Coding type: g711ulaw Packet length: 40 UUI min: 0 UUI max: 15

Profile Type: ITUT Profile Number: 2 SID Support: 1
Red enable: 1 Num entries: 1
Coding type: g711ulaw Packet length: 40 UUI min: 0 UUI max: 15

Profile Type: custom Profile Number: 100 SID Support: 1
Red enable: 1 Num entries: 2
Coding type: g711ulaw Packet length: 40 UUI min: 0 UUI max: 7
Coding type: g726r32 Packet length: 40 UUI min: 8 UUI max: 15

Profile Type: ITUT Profile Number: 7 SID Support: 1
Red enable: 1 Num entries: 2
Coding type: g711ulaw Packet length: 40 UUI min: 0 UUI max: 15
Coding type: g729ar8 Packet length: 10 UUI min: 0 UUI max: 15

Profile Type: custom Profile Number: 110 SID Support: 1
Red enable: 1 Num entries: 3
Coding type: g711ulaw Packet length: 40 UUI min: 0 UUI max: 7
Coding type: g726r32 Packet length: 40 UUI min: 8 UUI max: 15
Coding type: g729ar8 Packet length: 30 UUI min: 8 UUI max: 15
```

Table 1 provides an alphabetical listing of the fields in this output and a description of each field.

Table 1 *Field Descriptions for show aal2 profile Command*

Field	Description
Coding type	Voice compression algorithm
ITUT Profile Number	Predefined combination of one or more codec types configured for a DSP
Num entries	Number of profile elements
Packet length	Sample size
Profile Type	Category of codec types configured on DSP. Possible types are ITU-T, ATMF, and custom.
Red enable	Redundancy for type3 packets
SID Support	Silence Insertion Descriptor
UUI max	Maximum sequence number on the voice packets
UUI min	Minimum sequence number on the voice packets.

Related Commands

Command	Description
codec aal2-profile	Sets the codec profile for a DSP on a per-call basis.

subcell-mux

To enable subcell multiplexing on a Cisco MC3810-V3, enter the **subcell-mux** voice-service configuration command. The **no** form of the command restores the default value.

subcell-mux

no subcell-mux

Syntax Description This command has no arguments or keywords.

Defaults Subcell multiplexing is not enabled.

Command Modes Voice-service configuration

Command History	Release	Modification
	12.1(1)XA	The command was introduced for the Cisco MC3810-V3.

Usage Guidelines Use this command to enable AAL2 common part sublayer (CPS) subcell multiplexing when the Cisco MC3810-V3 interoperates with other equipment that uses subcell multiplexing.

Examples The following example enables AAL2 CPS subcell multiplexing on a Cisco MC3810-V3:

```
router(config)# voice service voatm
router(config-voice-service)# session protocol aal2
router(config-voice-service-session)# subcell-mux
```

voice service

To enter the voice service configuration mode and specify the voice encapsulation type, use the **voice service** global configuration command.

voice service { pots | voatm | vofr | voip }

Syntax Description	Command	Description
	pots	Specifies telephony voice service (not supported)
	voatm	Specifies Voice over ATM encapsulation
	vofr	Specifies Voice over Frame Relay encapsulation (not supported)
	voip	Specifies Voice over Internet Protocol encapsulation (not supported)

Defaults There is no default setting for this command.

Command Modes Global configuration

Command History	Release	Modification
	12.1(1)XA	This command was introduced on the Cisco MC3810.

Usage Guidelines Use the **voice service** command to switch to the voice-service configuration mode from the global configuration mode and to specify a voice encapsulation type. Use the **exit** command to exit the voice-service configuration mode and return to the global configuration mode.

Examples The following example shows how to access the voice-service configuration mode and specify VoATM voice encapsulation, beginning in global configuration mode:

```
router(config)# voice service voatm
router(config-voice-service)#
```

Debug Commands

This section provides information on new and modified VoATM AAL2 debug commands for the Cisco MC3810-V3.

All other debug commands used with Voice over ATM are documented in the Cisco IOS Release 12.0 command references.

The following new commands are described in this section:

- **debug ccaal2 session**
- **debug vpm voaal2 all**
- **debug vpm voaal2 type1**
- **debug vpm voaal2 type3**

debug ccaal2 session

To display the ccaal2 function calls during call setup and teardown, use the **debug ccaal2 session** privileged EXEC command. Use the **no** form of this command to turn off the debug function.

debug ccaal2 session

no debug ccaal2 session

Syntax Description This command has no arguments or keywords.

Defaults Debugging for AAL2 sessions is not enabled.

Command History	Release	Modification
	12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines Use this command when troubleshooting an AAL2 trunk setup or teardown problem.

Examples The following example shows sample output from the **debug ccaal2 session** command for a forced shutdown of a voice port:

```

router# debug ccaal2 session
router(config)# voice-port 1/1
router(config-voiceport)# shutdown
router(config-voiceport)#
3d21h:%Voice port in use. Force shutdown.
3d21h:%Voice-port 1/1 is down.
3d21h:ccaal2_call_disconnect:peer tag 0
3d21h:ccaal2_evhandle_call_disconnect:Entered
3d21h:ccaal2_call_cleanup:freeccb 1, call_disconnected 1ccaal2_receive:xmitFunc is NULL
ccaal2_receive:xmitFunc is NULL

3d21h:starting incoming timer:Setting accept_incoming to FALSE and
3d21h:timer 2:(0x126AD48)starts - delay (70000)
3d21h:ccaal2_call_cleanup:Generating Call record
3d21h:cause=81 tcause=81 cause_text=unspecified
3d21h:ccaal2_call_cleanup:ccb 0x1506A84, vdbPtr 0x15ACFD0
freeccb_flag=1, call_disconnected_flag=1
3d21h:%LINK-3-UPDOWN:Interface FXS 1/1, changed state to Administrative Shutdown

```

The following example shows sample output from the **debug ccaal2 session** command for a trunk setup on a voice port:

```

router(config-voiceport)# no shutdown
router(config-voiceport)#
3d21h:%Voice-port 1/1 is up.
3d21h:%LINK-3-UPDOWN:Interface FXS 1/1, changed state to up
3d21h:ccaal2_call_setup_request:Entered
3d21h:ccaal2_evhandle_call_setup_request:Entered
3d21h:ccaal2_initialize_ccb:preferred_codec set(-1)(0)
3d21h:ccaal2_evhandle_call_setup_request:preferred_codec set(5)(40). VAD is 0
3d21h:ccaal2_call_setup_trunk:subchannel linking successful

3d21h:ccaal2_caps_ind:PeerTag = 2007
3d21h:      codec(preferred) = 1, fax_rate = 2, vad = 1
3d21h:      cid = 25, config_bitmask = 0, codec_bytes = 40, signal_type=8
3d21h:encap VOAAL2
3d21h:%HTSP-5-UPDOWN:Trunk port(channel) [1/1] is up

```

Related Commands

Command	Description
show debug	Shows which debug commands are enabled.

debug vpm voaal2 all

To display type 1 (voice) and type 3 (control) AAL2 packets sent to and received from the DSP, use the **debug vpm voaal2 all** privileged EXEC command. Use the **no** form of this command to turn off the debug function.

```
debug vpm voaal2 all {all_dsp | from_dsp | to_dsp}
```

```
no debug vpm voaal2 all
```

Syntax Description

all_dsp	Display messages to and from the DSP.
from_dsp	Display messages from the DSP.
to_dsp	Display messages to the DSP.

Defaults

Debugging for display of AAL2 packets is not enabled.

Command History

Release	Modification
12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines

Do not enter this debug command on a system carrying live traffic. Continuous display of AAL2 type 1 (voice) packets results in high CPU utilization and loss of console access to the system. Calls will be dropped and trunks may go down. For AAL2 debugging, use the **debug vpm voaal2 type3** debug command and identify a specific type 3 (control) packet type.

Examples

The following example shows a sample output from the **debug vpm voaal2 all** command, where the example selection is to display CAS packets sent to and from the DSP:

```
router# debug vpm voaal2 all all_dsp
```

```
Aal2 trace is on
```

```
TYPE 1, len = 43, cid = 25, uui = 14- 19 9D C5 FE FF FF FF FF FF 7E FF 7F
FE FF 7E FF FE FF FF FF FE FE FF 7F FE FF FF 7E FF FE FF FF FF 7F FF FF FF
7D FD FC FF FF FF -
```

```
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

```
TYPE 1, len = 43, cid = 25, uui = 4- 19 9C 82 FD FF 7E FF FF FE FD FF 7E
FF FF FF FF FF FE FF FF FF FF FE FF FF FE FF FF 7E FE FF FF FF FE FF
FF FF FF FF FF -
```

```
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

```
TYPE 1, len = 43, cid = 25, uui = 12- 19 9D 8F FF FF 7E FF FE 7E FF FF FF
FF FE FF FF FE FE FF FF FF FF FE FF FF FF 7E FF FF FF FF FD FF FF
FE 7E FF FF FE FF -
```

```
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

```
TYPE 1, len = 43, cid = 25, uui = 4- 19 9C 82 FF FF FF FF FF FE FF FF
FF FF FF 7E FF FF FF FE 7E FF FE FF FF FF 7E FE FC FE 7E 7E FF FF FF
FF FF 7E FF FF FF -
```

```
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

```
TYPE 1, len = 43, cid = 25, uui = 10- 19 9D 51 FE FF 7E FF FF FF FE 7E FF
FE FF FF FF 7E FF 7E 7E FF FF FF FF FF FF FF 7E FD FF FF FE FF FE
FF FE FE 7E FF FF -
```

```
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

```
TYPE 1, len = 43, cid = 25, uui = 2- 19 9C 5C FF FF FE FF FF FF FF FF
FF FF FF FF FF FF FF FF FF 7E FF FD FF 7E FF FF FE FE FF FE FF FF
7E FF FF FF FE FE -
```

```
.
```

Command	Description
debug vpm voaal2 type1	Displays type 1 (voice) AAL2 packets sent to and received from the DSP.
debug vpm voaal2 type3	Displays type 3 (control) AAL2 packets sent to and received from the DSP.
show debug	Shows which debug commands are enabled.

debug vpm voaal2 type1

To display type 1 (voice) AAL2 packets sent to and received from the DSP, use the **debug vpm voaal2 type1** privileged EXEC command. Use the **no** form of this command to turn off the debug function.

debug vpm voaal2 type1 { **all_dsp** | **from_dsp** | **to_dsp** }

no debug vpm voaal2 type1

Syntax Description	all_dsp	Display messages to and from the DSP.
	from_dsp	Display messages from the DSP.
	to_dsp	Display messages to the DSP.

Defaults Debugging for display of AAL2 packets is not enabled.

Command History	Release	Modification
	12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines Do not enter this debug command on a system carrying live traffic. Continuous display of AAL2 type 1 (voice) packets results in high CPU utilization and loss of console access to the system. Calls will be dropped and trunks may go down. For AAL2 debugging, use the **debug vpm voaal2 type3** debug command and identify a specific type 3 (control) packet type.

Examples The following example shows a sample output from the **debug vpm voaal2 type1** command:



Note

The display of voice packets on a live system will continue indefinitely. The debugging output cannot be interrupted, because console access will be lost.

```
router# debug vpm voaal2 type1 to_dsp
Aal2 trace is on

TYPE 1, len = 43, cid = 25, uui = 14- 19 9D C5 FE FF FF FF FF FF 7E FF 7F
FE FF 7E FF FE FF FF FF FE FE FF 7F FE FF FF 7E FF FE FF FF FF 7F FF FF FF
7D FD FC FF FF FF -

TYPE 1, len = 43, cid = 25, uui = 4- 19 9C 82 FD FF 7E FF FF FE FD FF 7E
FF FF FF FF FF FE FF FF FF FF FF FE FF FF FE FF 7E FE FF FF FF FE FF
FF FF FF FF FF FF -

TYPE 1, len = 43, cid = 25, uui = 12- 19 9D 8F FF FF 7E FF FE 7E FF FF FF
FF FE FF FF FE FE FF FF FF FF FE FF FF FF 7E FF FF FF FF FF FD FF FF
FE 7E FF FF FE FF -

TYPE 1, len = 43, cid = 25, uui = 4- 19 9C 82 FF FF FF FF FF FE FF FF
FF FF FF FF 7E FF FF FE 7E FF FE FF FF FF 7E FE FC FE 7E 7E FF FF FF
FF FF 7E FF FF FF -
```

```

TYPE 1, len = 43, cid = 25, uui = 10- 19 9D 51 FE FF 7E FF FF FF FE 7E FF
FE FF FF FF FF 7E FF 7E 7E FF FF FF FF FF FF FF FF FF 7E FD FF FF FE FF FE
FF FE FE 7E FF FF -

```

```

TYPE 1, len = 43, cid = 25, uui = 2- 19 9C 5C FF FF FE FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF 7E FF FD FF 7E FF FF FE FE FF FE FF FF
7E FF FF FF FE FE -

```

Related Commands

Command	Description
debug vpm all	Enables all vpm debugging.
debug vpm voaal2 all	Displays type 1 (voice) and type 3 (control) AAL2 packets sent to and received from the DSP.
debug vpm voaal2 type3	Displays type 3 (control) AAL2 packets sent to and received from the DSP.
show debug	Shows which debug commands are enabled.

debug vpm voaal2 type3

To display type 3 (control) AAL2 packets sent to and received from the DSP, use the **debug vpm voaal2 type3** privileged EXEC command. Use the **no** form of this command to turn off the debug function.

```
debug vpm voaal2 type3 {alarms / alltype3 | cas | dialed | faxrelay | state} {all_dsp / from_dsp
| to_dsp}
```

```
no debug vpm voaal2 type3
```

Syntax Description

alarms	Display type 3 alarm packets.
alltype3	Display all type 3 packets.
cas	Display type 3 CAS signaling packets.
dialed	Display type 3 dialed digit packets.
faxrelay	(Not supported) Display type 3 fax relay packets.
state	Display type 3 user state packets.
all_dsp	Display messages to and from the DSP.
from_dsp	Display messages from the DSP.
to_dsp	Display messages to the DSP.

Defaults

Debugging for display of AAL2 packets is not enabled.

Command History

Release	Modification
12.1(1)XA	This command was introduced on the Cisco MC3810-V3.

Usage Guidelines

This is the preferred debug command for displaying specific types of control packets. It is usually preferable to specify a particular type of control packet rather than **alltype3**, to avoid excessive output display and CPU utilization.

Examples

The following example shows a sample output from the **debug vpm voaal2 type3** command, where the example selection is to display type 3 CAS packets sent from the DSP:

```
router# debug vpm voaal2 type3 cas from_dsp
Aal2 trace is on
router#
3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -

3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -

3d21h:TYPE 3, len = 8, cid = 25, uui = 24
3d21h:CAS
  redundancy = 3, timestamp = 4, signal = 5
- 19 13 8 C0 4 5 F 68 -
```

Related Commands

Command	Description
debug vpm voaal2 type1	Displays type 1 (voice) AAL2 packets sent to and received from the DSP.
debug vpm voaal2 type3	Displays type 3 (control) AAL2 packets sent to and received from the DSP.
show debug	Shows which debug commands are enabled.

