ATM Software Segmentation and Reassembly

Last Updated: December 4, 2012

Feature History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.2(2)XB</td>
<td>Cisco 2600 Series T1/E1 ATM and Cisco 3660 T1 Inverse Multiplexing over ATM (IMA) ATM Adaption Layer 2 (AAL2) Support was introduced.</td>
</tr>
<tr>
<td>12.2(8)T</td>
<td>This feature was integrated into the Cisco IOS Release 12.2(8)T.</td>
</tr>
</tbody>
</table>

This document describes the ATM Software segmentation and reassembly (SAR) feature and includes the following sections:

- Finding Feature Information, page 1
- Feature Overview, page 2
- Supported Platforms, page 5
- Supported Standards and MIBs and RFCs, page 5
- Prerequisites, page 6
- Configuration Tasks for AAL2 Trunking with CAS, page 6
- Configuration Tasks for AAL2 Trunking with CCS, page 20
- Configuration Tasks for MGCP CAS, page 36
- Configuration Tasks for MGCP PRI Backhaul, page 52
- Monitoring and Maintaining, page 76
- Configuration Examples, page 77
- Command Reference, page 94
- Glossary, page 95

Finding Feature Information

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

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Feature Overview

The ATM Software Segmentation and Reassembly (SAR) feature allows the Cisco 2600 series to carry voice and data traffic over ATM networks using AAL2 and AAL5 and allows the Cisco 3660 to support AAL2 voice traffic.

For the Cisco 2600 series, this feature works in conjunction with the T1/E1 multiflex voice/WAN interface card (VWIC), which is plugged into a WIC slot to provide one ATM WAN interface at a T1/E1 rate supporting up to 24/30 channels of voice.

T1/E1 ATM support is a time-to-market feature that helps service providers take advantage of the inherent quality of service (QoS) features of ATM multiservice applications. FR-ATM (FRF.5 and FRF.8) internetworking is supported on the Cisco 2600 series.

On the Cisco 3660 a T1 IMA network module is used as the IMA interface providing a maximum of one ATM IMA interface that supports up to 48/60 voice channels. Up to eight T1/E1s and multiple IMA groups are permitted, but only the first IMA group supports voice over AAL2 for up to 48/60 voice channels. NM-IMA already supports AAL5 on both the Cisco 2600 series and Cisco 3600 series (not just 3660).

The Cisco 2600 Series T1/E1 ATM portion of this feature provides a shared implementation of the ATM features currently available on the Cisco MC3810 with the Cisco 2600 series.

The figure below illustrates the ATM AAL2 nonswitched trunking feature connecting two private branch exchanges (PBXs) together without the call agent (CA).

**Figure 1**  ATM AAL2 Non-Switched Trunking Solution

The next two figures below illustrate CA solutions. In these solutions, a CA provides business voice services traditionally offered by a circuit-based PBX.
In the figure below, the trunking gateway (the Cisco 3660 platform) requires support of incoming and outgoing multi-frequency signaling for the barge-in and busy-line verify features. The residential gateway (the Cisco uBR924 cable access router) must support the CLASS features and 911 capability.

*Figure 2  Residential Cable Access Solution*

In the figure below, the gateway (the Cisco 2600 platform) requires PBX connectivity to interface with the legacy PBX.

*Figure 3  IP Centrex Solution*

- Benefits, page 3
- Restrictions, page 4
- Related Features and Technologies, page 4
- Related Documents, page 5

**Benefits**

**AAL2 and AAL5 Functionality**

Adds AAL2 and AAL5 functionality to the Cisco 2600 series and AAL2 to the Cisco 3660 on an IMA network module. AAL2 and AAL5 are the most bandwidth-efficient, standards-based trunking methods for transporting compressed voice, voice-band data, and frame-mode data over ATM infrastructures.
Economical ATM SAR Option
Provides robust, low-cost addition of ATM software SAR functionality to the Cisco 2600 series.

Lower Overhead and Better QoS
Enhances continued use of existing ATM infrastructure, providing traditionally high ATM QoS.

Restrictions

Cisco 2600 Series and Cisco 3660
- Analog voice modules are not supported for AAL2 feature. (IP over ATM AAL5 is supported.)

Cisco 2600 Series
- SS7 and bisync protocol cannot be used when this feature is active.
- Only one T1/E1 multiflex VWIC is supported, setting the number of allowable T1/E1 ATM interfaces to one.
- Only the Cisco 2650 and Cisco 2651 support end-to-end, Network Traceable Reference (NTR) clocking. For the NTR clock to work correctly, the T1/E1 multiflex VWIC must be placed in slot zero of the Cisco 2650 and Cisco 2651. In the case where a two-port T1/E1 multiflex VWIC is installed in slot zero, either of the two ports can be configured for support, but only one can be supported.
- The T1/E1 ATM feature requires that the T1/E1 multiflex VWIC be placed in slot zero.

Cisco 3660
- Only one IMA group can support AAL2 voice. If there are multiple IMA groups, then only the first IMA group supports AAL2 voice.
- Two T1/E1s are supported for ATM and 48/60 voice ports for PBX.
- Only the T1/E1 IMA network module supports AAL2 voice. This feature does not support OC3/T3/E3 network modules.
- The T1/E1 IMA network module does not support an NTR clock.

Cisco 2620XM
- When the traffic is sent with rate 100pps (256 bytes size), some cells are lost on the router where VWIC-1MFT-E1 is configured as ATM port. There is no workaround to this limitation. For a detailed description, see Traffic Shaping on Cisco 3810 Routers at the following URL:

Related Features and Technologies
- Media Gateway Control Protocol (MGCP) channel associated signaling (CAS) PBX and AAL2 permanent virtual circuit (PVC) Software
- PRI/Q.931 Signaling Backhaul
- Voice over ATM with AAL2 Trunking
Related Documents

- MGCP CAS PBX and AAL2 PVC
- ATM forum documents for AAL2
  - ATM Trunking Using AAL2 for Narrowband Services (AF-VTOA-0113.000)
- ITU I-series documents located at
  - http://www.itu.int/home/index.html
  - I.363.2, B-ISDN ATM Adaptation Layer Specification: Type 2 AAL
  - I.366.1, Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL Type 2
  - I.366.2, AAL Type 2 Service Specific Convergence Sublayer for Trunking
- Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2
- Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2
- Cisco IOS Interface Command Reference, Release 12.2
- Cisco IOS Interface Configuration Guide, Release 12.2

Supported Platforms

- Cisco 2600 series
- Cisco 3660

Supported Standards and MIBs and RFCs

**Standards**
No new or modified standards are supported by this feature.

**MIBs**
No new or modified MIBs are supported 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:


**RFCs**
- RFC 1577
- RFC 1483
- RFC 2221
Prerequisites

T1/E1 multiflex VWICs on Cisco 2600 series routers must be plugged into slot zero. The Cisco 3660 must be configured with a T1/E1 IMA Network Module. PBX voice requires a Digital T1/E1 Packet Voice Trunk Network Module Interface to be installed in the network module slot in the Cisco 2600 series or Cisco 3660.

You can configure the following four features on the Cisco 2600 series and Cisco 3660 routers:

- AAL2 Trunking with CAS
- AAL2 Trunking with common channel signaling (CCS)
- MGCP CAS
- MGCP Primary Rate Interface (PRI) Backhaul

Configuration Tasks for AAL2 Trunking with CAS

See the following sections for configuration tasks for AAL2 Trunking with CAS on Cisco 2600 series and Cisco 3660:

- Configuring ATM on Cisco 2600 Series, page 6
- Configuring ATM on Cisco 3660, page 9
- Configuring Voice Band Detection Playout Settings, page 13
- Configuring Subcell Multiplexing for AAL2 Voice, page 14
- Configuring End-to-End Clocking, page 14
- Configuring a CAC Master for AAL2 Voice, page 16
- Configuring a CAC Slave for AAL2 Voice, page 16
- Configuring Dial Peers for AAL2 Voice, page 17
- Configuring MGCP POTS Dial Peer, page 19
- Configuring DS-0 group for CAS, page 20

Configuring ATM on Cisco 2600 Series

This section describes the ATM configuration tasks necessary to support Voice over ATM using AAL2 on the Cisco 2600 series.

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 time slots 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 2600 series or Cisco 3660 concentrators at both ends of the ATM link.
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.

To configure a Cisco 2600 series or Cisco 3660 series concentrator to support VoATM on a T1/E1 trunk, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# controller t1 e1 0/0
2. Router(config-controller)# mode atm
3. Router(config-controller)# framing framing type
4. Router(config-controller)# linecode linecode type
5. Router(config-controller)# no shutdown
6. Router(config-controller)# exit
7. Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]]
8. Router(config-if)# pvcword } { vpi/vci | vci
9. Router ( config-if-atm-vc ) # encapsulation aal2
10. Router(config-if-atm-vc)# vbr-rtpeak-rate average-rate ] burst
11. Router(config-if-atm-vc)# oam-pvc manage ] [frequency
12. Router(config-if-atm-vc)# oam retryup-count down-count retry-frequency
13. Router(config-if-atm-vc)# end
14. Router# show atm vc

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# controller t1 e1 0/0</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config-controller)# mode atm</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Router(config-controller)# framing framing type</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Router(config-controller)# linecode linecode type</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Router(config-controller)# no shutdown</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Router(config-controller)# exit</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]]</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>Router(config-if)# pvcword ] { vpi</td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td>Router ( config-if-atm-vc ) # encapsulation aal2</td>
</tr>
</tbody>
</table>
| **Step 10**  | Router(config-if-atm-vc)# vbr-rtpeak-rate average-rate [ burst] | Configures the PVC for variable-bit-rate real-time (VBRrt) (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - 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:  
    - 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 20 byte sample size--max calls x 22  
    - G.729 with 30 byte sample size--max calls x 15  
    - 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.  
    - Burst size--Set the burst size as large as possible, and never less than the minimum burst size.  
  Guidelines are as follows:  
  - The minimum burst size is 4 x the number of voice calls.  
  - The maximum burst size is the maximum allowed by the carrier. You can calculate the value using the calculator at the following URL: http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 11</strong> Router(config-if-atm-vc)# oam-pvc manage [ frequency]</td>
<td>(Optional) Configures transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specifies the number of seconds between loopback cells, and optionally enable operation, administration, and maintenance (OAM) management of the connection. The range for frequency is 0 to 600. The default is 10.</td>
</tr>
</tbody>
</table>
| **Step 12** Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency | (Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.  
• The value of up-count 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 value of down-count 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 value of retry-frequency 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.  
**Note** Enter the oam retry command only once with all the arguments in the order shown. The first number always specifies up-count; the second down-count, and the third retry-frequency. |
| **Step 13** Router(config-if-atm-vc)# end | Exits configuration mode. |
| **Step 14** Router# show atm vc | Verifies the ATM PVC configuration. |

**Configuring ATM on Cisco 3660**

**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.
SUMMARY STEPS

1. Router(config)# interface atm < slot>/ima < grp#> [subinterface-number [multipoint | point-to-point]]
2. Router(config-if)# pvc [name] vpi/vci
3. Router ( config-if-atm-vc ) # encapsulation aal2
4. Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst]
5. Router(config-if-atm-vc)# oam-pvc manage] [ frequency
6. Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency
7. Router(config-if-atm-vc)# end
8. Router# show atm vc
9. Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst ]
10. Router(config-if-atm-vc)# vcci pvc-identifier
11. Router(config-if-atm-vc)# exit
12. Router(config-if)# exit
13. Router(config)# dial-peer voice number pots
14. Router(config-dial-peer)# application MGCPAPP

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** | Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface.  
**Note** To configure an IMA group on each ATM interface, enter the IMA group and group number.  
The default for subinterfaces is **multipoint**.  
**For all Scenarios** : Set up three subinterfaces for point-to-point. |
| Router(config)# interface atm < slot>/ima < grp#> [subinterface-number [multipoint | point-to-point]] | |
| **Step 2** | Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode.  
**Note** AAL2 encap is not supported for ilmi and qsaal PVCs. |
<p>| Router(config-if)# pvc [name] vpi/vci | |
| <strong>Step 3</strong> | Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255. |
| Router ( config-if-atm-vc ) # encapsulation aal2 | |</p>
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 4** | Configures the PVC for VBR-rt (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - **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:  
    - 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  
  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.  
  - **Burst size**—Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
  You can calculate the value using the calculator at the following URL: [http://www-vnt/SPUniv/DSP/Codec_Calc1.asp](http://www-vnt/SPUniv/DSP/Codec_Calc1.asp) |  |
| **Step 5** | (Optional) Configures transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specifies the number of seconds between loopback cells, and optionally enables OAM management of the connection.  
  The range for **frequency** is 0 to 600. The default is 10. |  |
| **Step 6** | (Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.  
  - The value of **up-count** 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 value of **down-count** 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 value of **retry-frequency** 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.  
  **Note** Enter the **oam retry** command only once with all the arguments in the order shown. The first number always specifies **up-count**; the second **down-count**, and the third **retry-frequency**. |  |
<p>| <strong>Step 7</strong> | Exits configuration mode. |  |</p>
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 8</strong> Router# show atm vc</td>
<td>Verifies the ATM PVC configuration.</td>
</tr>
</tbody>
</table>
| **Step 9** Router(config-if-atm-vc)# vbr-rtpeak-rateaverage-rate [burst ] | Configure the PVC for the variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - 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 (max calls) the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps: for VoIP:  
    - G.711 with 40 or 80 byte sample size: max calls x 128K  
    - G.726 with 40 byte sample size: max calls x 85K  
    - G.729a with 10 byte sample size: max calls x 85K  
  for VoAAL2:  
    - G.711 with 40 byte sample size: max calls x 85K  
    - G.726 with 40 byte sample size: max calls x 43K  
    - G.729a with 10 byte sample size: max calls x 43K  
  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.  
  - Burst size-- Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
 You can calculate the value using the calculator at the following URL:  
http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
| **Step 10** Router(config-if-atm-vc)# vcci pvc-identifier | Assigns a unique identifier to the PVC.                                |
| **Step 11** Router(config-if-atm-vc)# exit              | Exits ATM virtual circuit configuration mode.                          |
| **Step 12** Router(config-if)# exit                    | Exits interface configuration mode.                                    |
| **Step 13** Router(config)# dial-peer voice number pots | Enters dial peer configuration mode for the plain old telephone service (POTS) dial peer. |
| **Step 14** Router(config-dial-peer)# application MGCPAPP | Initiates the MGCP protocol for the voice ports.                      |
Configuring Voice Band Detection Playout Settings

To configure voice band detection playout buffer delay on Cisco 2600 series and Cisco 3660 series routers, use the following commands beginning in the voice service configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# vbd-playout-delay maximum time
4. Router(config-voice-service-session)# vbd-playout-delay minimum time
5. Router(config-voice-service-session)# vbd-playout-delay mode {fixed | passthrough}
6. Router(config-voice-service-session)# vbd-playout-delay nominal time
7. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Router(config)# voice service voatm</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Router(config-voice-service)# session protocol aal2</td>
<td>Example:</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Specifies the maximum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers in milliseconds. The time is set in milliseconds. The range is from 40-1700 milliseconds. The default is set to 200 milliseconds.</td>
</tr>
<tr>
<td>Router(config-voice-service-session)# vbd-playout-delay maximum time</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Specifies the minimum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 4-1700 milliseconds. The default is set to 4 milliseconds.</td>
</tr>
<tr>
<td>Router(config-voice-service-session)# vbd-playout-delay minimum time</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Configures voice band detection playout delay adaptation mode on a Cisco router. When the vbd-delay-playout mode is set to fixed, jitter buffer is set at a constant delay in milliseconds. When the vbd-delay-playout mode is set to passthrough, jitter buffer is set to DRAIN_FILL for clock compensation. There is no default.</td>
</tr>
<tr>
<td>Router(config-voice-service-session)# vbd-playout-delay mode {fixed</td>
<td>passthrough}</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Specifies the nominal AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 0-1500 milliseconds. The default is 100 milliseconds.</td>
</tr>
<tr>
<td>Router(config-voice-service-session)# vbd-playout-delay nominal time</td>
<td></td>
</tr>
</tbody>
</table>
### 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 2600 series router or a Cisco 3660 interoperates with a voice interface service module (VISM) in an MGX switch.

To configure the Cisco 2600 series router or the Cisco 3660 to perform subcell multiplexing, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# subcell-mux <number>
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-voice-service-session)# subcell-mux &lt;number&gt;</td>
<td>Enables subcell multiplexing. The number is time in milliseconds. By default, subcell multiplexing is not enabled.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

### Configuring End-to-End Clocking

The following commands can be used to configure the Cisco 3660 only when there is a time-division multiplexing (TDM) switch module on board. For the Cisco 2600 series, these commands are automatically allowed.

**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.
## SUMMARY STEPS

1. `Router(config)# network-clock-participate {nm | wic} slot`
2. For Cisco 2600 series:
3. `Router(config) network-clock-select priority t1 slot/port`
4. `Router(config) network-clock-select priority t1 slot/port`
5. `Router(config) voice-card slot`

## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1**  
`Router(config)# network-clock-participate {nm | wic} slot` | Enables the Cisco 2600 series router or the Cisco 3660 to receive clock signals from the VWIC by entering the keyword **wic** and the slot number 0 on the router. |
| **Step 2**  
For Cisco 2600 series: | Enables the Cisco 2600 series router or the Cisco 3660 to receive clock signals from the network module by entering the keyword **nm** and the slot number 1 on the router. |
| **Example:**  
`Router(config)# network-clock-participate {nm | wic} slot` | (This will be repeated with different examples for different routers) |
| **Step 3**  
`Router(config) network-clock-select priority t1 slot/port` | Names a source to provide timing for the network clock and to specify the selection **priority** for this clock source. The priority selection is 1 or 2. Use the **no** form of this command to cancel the selection. |
| **Step 4**  
`Router(config) network-clock-select priority t1 slot/port` | Assigns **priority 1** to ATM interface 0/0 and **priority 2** to controller 1/0. |
| **Step 5**  
`Router(config) voice-card slot` | Enters voice-card configuration mode and sets codec complexity. For **slot**, use a value from 0 to 3 that describes the card location in the module. |
Configuring a CAC Master 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 common to the Cisco 2600 series and the Cisco 3660 routers.

You can configure a Cisco 2600 series router or a Cisco 3660 as either a CAC master or a CAC slave. By default, this 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 2600 series router or a Cisco 3660 configured as a master always performs CAC during fax/modem upspeed. A Cisco 2600 series router or a Cisco 3660 configured as a slave sends a request for CAC to the CAC master.

To configure a Cisco 2600 series router or a Cisco 3660 as a CAC master, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# cac master
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1  Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Step 2  Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Step 3  Router(config-voice-service-session)# cac master</td>
<td>Configures this Cisco 2600 series router or a Cisco 3660 as a CAC master.</td>
</tr>
<tr>
<td>Step 4  Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

Configuring a CAC Slave for AAL2 Voice

To return a Cisco 2600 series router or a Cisco 3660 to its default operation as a CAC slave, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# no cac master
4. Router(config-voice-service-session)# end
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 Multiservice Applications Configuration Guide, Release 12.1.

- Configuring Network Dial Peers to Support AAL2, page 17

Configuring Network Dial Peers to Support AAL2

To configure a network dial peer for Voice over ATM (VoATM), specify a unique tag number, an ATM, a virtual circuit number, and a channel identifier (CID).

To configure VoATM dial peers, use the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice tag voatm
2. Router(config-dial-peer)# destination-pattern string
3. Router(config-dial-peer)# session protocol aal2-trunk
4. Router(config-dial-peer)# session target atm 0/0 pvc word | vpi/vci | vci } cid
5. Router(config-dial-peer)# codec aal2 profile itut | custom profile-number codec
6. Router(config-dial-peer)# dtmf-relay
7. Router(config-dial-peer)# signal-type ext-signal transparent
8. Router(config-dial-peer)# no vad
9. Router(config-dial-peer)# exit
10. Repeat Step 1 through Step 9

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# dial-peer voice tag voatm</td>
<td>Defines a VoATM dial peer for VoATM and enters dial-peer configuration mode. The tag identifies the dial peer. Each tag on any one router must be unique.</td>
</tr>
</tbody>
</table>
# Configuring Dial Peers for AAL2 Voice

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 2** | Router(config-dial-peer)# **destination-pattern** *string* Configures the dial peer’s destination pattern. The *string* 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:  
  - 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. |
| **Step 3** | Router(config-dial-peer)# **session** protocol aal2-trunk Configures the session protocol to support AAL2-trunk permanent (private line) trunk calls. |
| **Step 4** | Router(config-dial-peer)# **session** target atm 0/0 [vpi]/vci | pvc *word*  
  | Use *word* to identify the PVC if a word name was assigned when the PVC was created in the Configuring ATM on Cisco 2600 Series, page 6.  
  Use *word* to identify the PVC if a word name was assigned when the PVC was created in the Configuring ATM on Cisco 3660, page 9. |
| **Example:** | (for Cisco 2600 series) |
| **Example:** | For Cisco 3660: |
| **Example:** | router(config-dial-peer)# **session** target atm <slot>/ima | *<group#>* |
| **Step 5** | Router(config-dial-peer)# **codec** aal2 profile **itut** | **custom**  
  | profile-number **codec** Specifies a codec profile for the DSP.  
  Profile options are **itut 1**, **itut 2**, **itut 7**, **custom 100**, and **custom 110**.  
  The default is **itut 1** with codec G.711 u-law.  
  See the "Command Reference" section for the codec options available for each AAL2 profile.  
  **Note** Use this command instead of the **codec** (dial-peer) command for AAL2 trunk applications. |
**Configuring MGCP POTS Dial Peer**

To configure MGCP POTS dial peer on the Cisco 2600 series and Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice number pots
2. Router(config-dial-peer)# application MGCPAPP
3. 
4. Router(config-dial-peer)# exit

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Enters the dial-peer configuration mode for the POTS dial peer.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Initiates the MGCP protocol for the voice ports.</td>
</tr>
</tbody>
</table>
### Command or Action | Purpose
--- | ---
**Step 3** | This command associates the dial peer with a specific logical interface. The value of slot is the router location where the voice port adapter is installed. Valid entries are from 0 to 3. The value of port indicates the voice interface card location. Valid entries are 0 or 1. Each defined DS0 group number is represented on a separate voice port. This allows you to define individual DS0s on the digital T1/E1 card.

**Example:**

```
Router(config-dial-peer)# port slot/port:ds0-group
```

**Step 4** | Exits from the dial-peer configuration mode.

---

### Configuring DS-0 group for CAS

To configure ds0 group for CAS on the Cisco 2600 series and Cisco 3660, complete the following steps:

**SUMMARY STEPS**

1. `Router(config)# controller{t1 | e1} slot/port`
2. `Router(config-controller)# mode cas`
3. `Router(config-controller)# ds0-group channel-number timeslots range type signaling-type`
4. `Router(config-controller)# exit`

**DETAILED STEPS**

| Command or Action | Purpose |
--- | --- |
**Step 1** | For the CAS PBX Scenarios only: Selects the T1/E1 controller 1/0. `Router(config)# controller{t1 | e1} slot/port` |
**Step 2** | For the CAS PBX Scenarios only: Specifies that the controller will support CAS. `Router(config-controller)# mode cas` |
**Step 3** | For the CAS PBX Scenarios only: Configures the T1 time slots for CAS calls. The scenarios use the following three DS0 definitions:
- ds0-group 1 time slots 1-8 type e&m-immediate-start
- ds0-group 2 time slots 9-16 type e&m-wink-start
- ds0-group 3 time slots 17-24 type fxs-ground-start `Router(config-controller)# ds0-group channel-number timeslots range type signaling-type` |
**Step 4** | For the CAS PBX Scenarios only: Exits controller configuration mode. `Router(config-controller)# exit` |

---

### Configuration Tasks for AAL2 Trunking with CCS

See the following sections for configuration tasks for AAL2 Trunking with CCS on Cisco 2600 series and Cisco 3660:

- Configuring ATM on the Cisco 2600 Series, page 21
- Configuring ATM on the Cisco 3660, page 24
Configuring ATM on the Cisco 2600 Series

This section describes the ATM configuration tasks necessary to support Voice over ATM using AAL2 on Cisco 2600 series.

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 time slots 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 2600 series or Cisco 3660 concentrators at both ends of the ATM link.

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.

To configure a Cisco 2600 series or Cisco 3660 series concentrator to support VoATM on a T1/E1 trunk, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# controller t1 e1 0/0
2. Router(config-controller)# mode atm
3. Router(config-controller)# framing framing type
4. Router(config-controller)# linecode linecode type
5. Router(config-controller)# no shutdown
6. Router(config-controller)# exit
7. Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]]
8. Router(config-if)# pvc word ] { vpi/vci | vci
9. Router ( config-if-atm-vc ) # encapsulation aal2
10. Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst
11. Router(config-if-atm-vc)# oam-pvc manage] [ frequency
12. Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency
13. Router(config-if-atm-vc)# end
14. Router# show atm vc
# DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# controller t1 e1 0/0</td>
<td>Selects the T1 or E1 controller 0/0.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-controller)# mode atm</td>
<td>Specifies that the controller will support ATM encapsulation and create ATM interface 0/0.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-controller)# framing framing type</td>
<td>Specifies the T1 framing type as extended super frame or esf. When the controller is set to ATM mode, the Controller framing is automatically set to Extended SuperFrame (esf) on T1 and to crc4 on E1.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-controller)# linecode linecode type</td>
<td>Specifies the T1 linecode type as b8zs. The linecode is automatically set to b8zs on T1 and to hdb3 on E1.</td>
</tr>
<tr>
<td><strong>Step 5</strong> Router(config-controller)# no shutdown</td>
<td>Ensures that the controller is activated.</td>
</tr>
<tr>
<td><strong>Step 6</strong> Router(config-controller)# exit</td>
<td>Exits controller configuration mode.</td>
</tr>
<tr>
<td><strong>Step 7</strong> Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]</td>
<td>Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface. For subinterfaces, the default is multipoint.</td>
</tr>
</tbody>
</table>
| **Step 8** Router(config-if)# pvc word [ vpi/vci | vci | \[
<p>| Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode. vpi= 0 to 255 vci= 1 to 1023 word= optional PVC identifier (letters only); if you assign a PVC identifier, you can use it to specify this PVC when configuring network dial peers |
| <strong>Step 9</strong> Router ( config-if-atm-vc ) # encapsulation aal2 | Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255. |</p>
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 10** Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst] | Configures the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
- **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:  
  - 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 30 byte sample size—max calls x 15  
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.  
- **burst**—Set the burst size as large as possible, and never less than the minimum burst size.  
Guidelines are as follows:  
The minimum burst size is 4 x the number of voice calls.  
The maximum burst size is the maximum allowed by the carrier.  
You can calculate the value using the calculator at the following URL:  
http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
| **Step 11** Router(config-if-atm-vc)# oam-pvc manage] [ frequency] | (Optional) Configures transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specifies the number of seconds between loopback cells, and optionally enables OAM management of the connection.  
The range for *frequency* is 0 to 600. The default is 10. |
| **Step 12** Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency] | (Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.  
- The value of *up-count* 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 value of *down-count* 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 value of *retry-frequency* 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.  
**Note** Enter the *oam retry* command only once with all the arguments in the order shown. The first number always specifies *up-count*; the second *down-count*, and the third *retry-frequency*. |
### Configuring ATM on the Cisco 3660

**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.

### SUMMARY STEPS

1. Router(config)# `interface atm <slot>/ima<grp#> [subinterface-number [multipoint | point-to-point]]`
2. Router(config-if)# `pvc [name] vpi/vci`
3. Router(config-if-vc)# `encapsulation aal2`
4. Router(config-if-vc)# `vbr-rt peak-rate average-rate [burst`  
5. Router(config-if-vc)# `oam-pvc manage [frequency`  
6. Router(config-if-vc)# `oam retry up-count down-count retry-frequency`  
7. Router(config-if-vc)# `end`  
8. Router# `show atm vc`  
9. Router(config-if-vc)# `vbr-rt peak-rate average-rate [burst ]`  
10. Router(config-if-vc)# `vcci pvc-identifier`  
11. Router(config-if-vc)# `exit`  
12. Router(config-if)# `exit`  
13. Router(config)# `dial-peer voice number pots`  
14. Router(config-dial-peer)# `application MGCPAPP`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# `interface atm &lt;slot&gt;/ima&lt;grp#&gt; [subinterface-number [multipoint</td>
<td>point-to-point]]`</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> To configure an IMA group on each ATM interface, enter the IMA group and group number.</td>
</tr>
<tr>
<td></td>
<td>The default for subinterfaces is <strong>multipoint</strong>.</td>
</tr>
<tr>
<td></td>
<td>For all Scenarios: Set up three subinterfaces for point-to-point.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| **Step 2** | Router(config-if)# pvc [name] vpi/vci  
Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode.  
**Note** AAL2 encap is not supported for ilmi and qsaal PVCs. |
| **Step 3** | Router ( config-if-atm-vc ) # encapsulation aal2  
Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255. |
| **Step 4** | Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst]  
Configures the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
- **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:  
  - 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  
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.  
- **burst size**—Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
  The minimum burst size is 4 x the number of voice calls.  
The maximum burst size is the maximum allowed by the carrier.  
You can calculate the value using the calculator at the following URL:  
http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
| **Step 5** | Router(config-if-atm-vc)# oam-pvc manage] [ frequency]  
(Optional) Configures 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.  
The range for frequency is 0 to 600. The default is 10. |
**Command or Action**  
**Step 6**  
Router(config-if-atm-vc)# `oam retry up-count down-count retry-frequency`

(Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.

- The value of `up-count` 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 value of `down-count` 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 value of `retry-frequency` 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.

**Note**  
Enter the `oam retry` command only once with all the arguments in the order shown. The first number always specifies `up-count`; the second `down-count`, and the third `retry-frequency`.

**Step 7**  
Router(config-if-atm-vc)# `end`

Exits configuration mode.

**Step 8**  
Router# `show atm vc`

Verifies the ATM PVC configuration.
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 9** Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst ] | Configures the PVC for the variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - 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 (max calls) the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps:  
    - for VoIP:  
      - G.711 with 40 or 80 byte sample size: max calls x 128K  
      - G.726 with 40 byte sample size: max calls x 85K  
      - G.729a with 10 byte sample size: max calls x 85K  
    - for VoAAL2:  
      - G.711 with 40 byte sample size: max calls x 85K  
      - G.726 with 40 byte sample size: max calls x 43K  
      - G.729a with 10 byte sample size: max calls x 43K  
  - burst--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
    - You can calculate the value using the calculator at the following URL:  

<table>
<thead>
<tr>
<th>Step 10</th>
<th>Router(config-if-atm-vc)# vcci pvc-identifier</th>
<th>Assigns a unique identifier to the PVC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 11</td>
<td>Router(config-if-atm-vc)# exit</td>
<td>Exits ATM virtual circuit configuration mode.</td>
</tr>
<tr>
<td>Step 12</td>
<td>Router(config-if)# exit</td>
<td>Exits interface configuration mode.</td>
</tr>
<tr>
<td>Step 13</td>
<td>Router(config)# dial-peer voice-number pots</td>
<td>Enter dial peer configuration mode for the POTS dial peer.</td>
</tr>
<tr>
<td>Step 14</td>
<td>Router(config-dial-peer)# application MGCPAPP</td>
<td>Initiates the MGCP protocol for the voice ports.</td>
</tr>
</tbody>
</table>

**Configuring Voice Band Detection Playout Settings**

To configure voice band detection playout buffer delay on Cisco 2600 series and Cisco 3600 series routers, use the following commands beginning in the voice service configuration mode:
SUMMARY STEPS

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# vbd-playout-delay maximum time
4. Router(config-voice-service-session)# vbd-playout-delay minimum time
5. Router(config-voice-service-session)# vbd-playout-delay mode {fixed | passthrough}
6. Router(config-voice-service-session)# vbd-playout-delay nominal time
7. Router(config-voice-service-session)# end

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-voice-service-session)# vbd-playout-delay maximum time</td>
<td>Specifies the maximum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers in milliseconds. The time is set in milliseconds. The range is from 40-1700 milliseconds. The default is set to 200 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-voice-service-session)# vbd-playout-delay minimum time</td>
<td>Specifies the minimum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 4-1700 milliseconds. The default is set to 4 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 5</strong> Router(config-voice-service-session)# vbd-playout-delay mode {fixed</td>
<td>passthrough}</td>
</tr>
<tr>
<td><strong>Step 6</strong> Router(config-voice-service-session)# vbd-playout-delay nominal time</td>
<td>Specifies the nominal AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 0-1500 milliseconds. The default is 100 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 7</strong> Router(config-voice-service-session)# end</td>
<td>Exits voice-service-session configuration mode.</td>
</tr>
</tbody>
</table>
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 2600 series router or a Cisco 3660 interoperates with a voice interface service module (VISM) in an MGX switch.

To configure the Cisco 2600 series router or the Cisco 3660 to perform subcell multiplexing, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# subcell-mux <number>
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# voice service voatm</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-voice-service)# session protocol aal2</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-voice-service-session)# subcell-mux &lt;number&gt;</td>
</tr>
<tr>
<td>Step 4</td>
<td>Router(config-voice-service-session)# end</td>
</tr>
</tbody>
</table>

**Configuring End-to-End Clocking**

The following commands can be used to configure the Cisco3660 only when there is a TDM switch module on board. For Cisco 2600 series these commands are automatically allowed.

**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.

**SUMMARY STEPS**

1. Router(config)# network-clock-participate {nm | wic} slot
2. For Cisco 2600 series:
3. Router(config) network-clock-select priority t1 slot/port
4. Router(config) network-clock-select priority t1 slot/port
5. Router(config) voice-card slot
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# network-clock-participate {nm</td>
<td>wic} slot</td>
</tr>
<tr>
<td><strong>Step 2</strong> For Cisco 2600 series:</td>
<td>Enables the Cisco 2600 series router or the Cisco 3660 to receive clock signals from the network module by entering the keyword nm and the slot number 1 on the router.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Example: For Cisco 3660:</td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Step 3 Router(config) network-clock-select priority t1 slot/port</td>
<td>Names a source to provide timing for the network clock and to specify the selection priority for this clock source. The priority selection is 1 or 2. Use the no form of this command to cancel the selection.</td>
</tr>
<tr>
<td>Step 4 Router(config) network-clock-select priority t1 slot/port</td>
<td>Assigns priority 1 to ATM interface 0/0 and priority 2 to controller 1/0</td>
</tr>
<tr>
<td>Step 5 Router(config) voice-card slot</td>
<td>Enters voice-card configuration mode and set codec complexity. For slot use a value from 0 to 3 that describes the card location in the module.</td>
</tr>
</tbody>
</table>

## Configuring a CAC Master 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 common to the Cisco 2600 series and the Cisco 3660.

You can configure a Cisco 2600 series router or a Cisco 3660 as either a CAC master or a CAC slave. By default, this 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 2600 series router or a Cisco 3660 configured as a master always performs CAC during fax/modem upspeed. A Cisco 2600 series router or a Cisco 3660 configured as a slave sends a request for CAC to the CAC master.
To configure a Cisco 2600 series router or a Cisco 3660 as a CAC master, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# cac master
4. Router(config-voice-service-session)# end

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Step 2 Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Step 3 Router(config-voice-service-session)# cac master</td>
<td>Configures this Cisco 2600 series router or a Cisco 3660 as a CAC master.</td>
</tr>
<tr>
<td>Step 4 Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

**Configuring a CAC Slave for AAL2 Voice**

To return a Cisco 2600 series router or a Cisco 3660 to its default operation as a CAC slave, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# no cac master
4. Router(config-voice-service-session)# end

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Step 2 Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Step 3 Router(config-voice-service-session)# no cac master</td>
<td>Configures this Cisco 2600 series router or a Cisco 3660 as a CAC slave.</td>
</tr>
<tr>
<td>Step 4 Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>
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 Multiservice Applications Configuration Guide, Release 12.1.

- Configuring Network Dial Peers to Support AAL2, page 32

Configuring Network Dial Peers to Support AAL2

To configure a network dial peer for Voice over ATM (VoATM), specify a unique tag number, an atm, a virtual circuit number, and channel identifier (CID).

To configure VoATM dial peers, use the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice tag voatm
2. Router(config-dial-peer)# destination-pattern string
3. Router(config-dial-peer)# session protocol aal2-trunk
4. Router(config-dial-peer)# session target atm 0/0 pvc word | vpi/vci | vci } cid
5. Router(config-dial-peer)# codec aal2 profile itut | custom profile-number codec
6. Router(config-dial-peer)# dtmf-relay
7. Router(config-dial-peer)# signal-type ext-signal transparent
8. Router(config-dial-peer)# no vad
9. Router(config-dial-peer)# exit
10. Repeat Step 1 through Step 9

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# dial-peer voice tag voatm</td>
<td>Defines a VoATM dial peer for VoATM and enter dial-peer configuration mode. The <code>tag</code> identifies the dial peer. Each <code>tag</code> on any one router must be unique.</td>
</tr>
</tbody>
</table>
| **Step 2** Router(config-dial-peer)# destination-pattern string | Configures the dial peer’s destination pattern. The `string` 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:  
- 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. |
<table>
<thead>
<tr>
<th><strong>Command or Action</strong></th>
<th><strong>Purpose</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong> Router(config-dial-peer)# session protocol aal2-trunk</td>
<td>Configures the session protocol to support AAL2-trunk permanent (private line) trunk calls.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-dial-peer)# session target atm 0/0 pvc word vpi/vci vci cid</td>
<td>Configures the ATM session target for the dial peer. Be sure to specify atm 0/0 as the interface for the PVC. Use word to identify the PVC if a word name was assigned when the PVC was created in Configuring ATM on Cisco 2600 Series, page 6. Use word to identify the PVC if a word name was assigned when the PVC was created in Configuring ATM on Cisco 3660, page 9.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>(for Cisco 2600 series)</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>For Cisco 3660:</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>router(config-dial-peer)# session target atm &lt;slot&gt;/ima &lt;group#&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> Router(config-dial-peer)# codec aal2 profile itut</td>
<td>custom profile-number codec</td>
</tr>
<tr>
<td><strong>Step 6</strong> Router(config-dial-peer)# dtmf-relay</td>
<td>(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. DTMF relay is disabled by default.</td>
</tr>
<tr>
<td><strong>Step 7</strong> Router(config-dial-peer)# signal-type ext-signal transparent</td>
<td>(Optional) Defines 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. Enter ext-signal for common channel signaling (CCS). ABCD signaling packets are not sent. Enter transparent for nonswitched trunks using channel associated signaling (CAS). ABCD signaling bits are passed transparently to the ATM network.</td>
</tr>
<tr>
<td><strong>Step 8</strong> Router(config-dial-peer)# no vad</td>
<td>(Optional) Disables voice activity detection (VAD) on the dial peer. VAD is enabled by default.</td>
</tr>
</tbody>
</table>
Command or Action | Purpose
--- | ---
**Step 9** Router(config-dial-peer)# exit | Exits from the dial-peer configuration mode.
**Step 10** Repeat Step 1 through Step 9 | Configures additional VoATM dial peers.

## Configuring MGCP POTS Dial Peer

To configure MGCP POTS dial peer on the Cisco 2600 series and the Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice number pots
2. Router(config-dial-peer)# application MGCPAPP
3. 
4. Router(config-dial-peer)# exit

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# dial-peer voice number pots</td>
<td>Enters the dial-peer configuration mode for the POTS dial-peer.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-dial-peer)# application MGCPAPP</td>
<td>Initiates the MGCP protocol for the voice ports.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Example: Router(config-dial-peer)# port slot/port:ds0-group</td>
<td>This command associates the dial peer with a specific logical interface. The value of slot is the router location where the voice port adapter is installed. Valid entries are from 0 to 3. The value of port indicates the voice interface card location. Valid entries are 0 or 1. Each defined DS0 group number is represented on a separate voice port. This allows you to define individual DS0s on the digital T1/E1 card.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-dial-peer)# exit</td>
<td>Exits from the dial-peer configuration mode.</td>
</tr>
</tbody>
</table>

## Configuring DS-0 Group and Channel Group for CCS

To configure a DS-0 group and the channel group for CCS on the Cisco 2600 series and the Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# controller {T1 | E1} slot/port
2. Router(config-controller)# mode ccs frame-forwarding
3. Router(config-controller)# channel-group number timeslots range speed{48|56|64}]
4. Router(config-controller)# ds0-group channel-number timeslots range type signaling-type
5. Router(config-controller)# exit
**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# controller {T1</td>
<td>E1} slot/port</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-controller)# mode ccs frame-forwarding</td>
<td>Configures the controller to support CCS transparent signaling.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-controller)# channel-group number timeslots range speed{48</td>
<td>56</td>
</tr>
<tr>
<td>• number--channel-group number. 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 a values from 0 to 30.</td>
<td></td>
</tr>
<tr>
<td>• range--time slot or range of time slots belonging to the channel group. The first timeslot is numbered 1. Pick one timeslot from the timeslot range. For a T1 controller, the timeslot range is from 1 to 24. For an E1 controller, the timeslot range is from 1 to 31.</td>
<td></td>
</tr>
<tr>
<td>• speed {48</td>
<td>56</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-controller)# ds0-group channel-number timeslots range type signaling-type</td>
<td>For the CCS PBX Scenarios only : Configures the T1 time slots for CCS calls. The signaling type is external signaling.</td>
</tr>
<tr>
<td><strong>Step 5</strong> Router(config-controller)# exit</td>
<td>For the CCS PBX Scenarios only : Exits controller configuration mode.</td>
</tr>
</tbody>
</table>

### Configuring T-CCS Frame Forwarding

To configure T-CCS frame-forwarding on the Cisco 2600 series and the Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# interface serial 1:channelnumber
2. Router(config-if)# ccs encap atm
3. Router(config-if)# ccs connect {serial |atm} slot/number [dlci dlci | pvc vci | pvc vcd | pvc vpi/vci | pvc string]
4. Router(config-if)# exit
**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# interface serial 1:channelnumber</td>
<td>Enters interface configuration mode. This procedure maps the D channel from the digital T1/E1 packet voice trunk network module to the specified interface. The channel number argument specifies the channel number. For T1, enter the channel number as 23. For E1, enter 15.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-if)# ccs encap atm</td>
<td>(ATM only) Configures the CCS encapsulation to use the ATM packet format.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-if)# ccs connect {serial</td>
<td>atm} slot/number [dlci dlci</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-if)# exit</td>
<td>Exits the interface mode.</td>
</tr>
</tbody>
</table>

---

**Configuration Tasks for MGCP CAS**

See the following sections for configuration tasks for MGCP CAS on Cisco 2600 series and Cisco 3660 routers. Each task in this list is identified as either required or optional:

- Configuring MGCP CAS PBX on the Cisco 2600 Series and Cisco 3660, page 36
- Configuring ATM on the Cisco 2600 Series, page 39
- Configuring ATM on the Cisco 3660, page 43
- Configuring Voice Band Detection Playout Settings, page 46
- Configuring Subcell Multiplexing for AAL2 Voice, page 48
- Verifying the MGCP CAS PBX and AAL2 PVC Configurations, page 48
- Configuring End-to-End Clocking, page 49
- Configuring a CAC Master for AAL2 Voice, page 50
- Configuring a CAC Slave for AAL2 Voice, page 50
- Configuring MGCP POTS Dial Peer, page 51
- Troubleshooting Tips, page 52

---

**Configuring MGCP CAS PBX on the Cisco 2600 Series and Cisco 3660**

Use the following commands for configuring the Media Gateway Control Protocol (MGCP) CAS PBX on Cisco 2600 series and Cisco 3660 routers:
### SUMMARY STEPS

1. Router(config)# mgcp
2. Router(config)# mgcp call-agent ipaddr hostname [port] [service-type type] version version-number
3. Router(config-if)# mgcp sgcp restart notify
4. Router(config-if)# mgcp modem passthrough [cisco ca nse]
5. Router(config)# mgcp tse payloadtype
6. Router(config)# no mgcp timer receive-rtcp
7. Router(config)# mgcp timer rtp-nsetimer
8. Router(config)# mgcp quarantine mode process
9. Router(config)# controller {t1 | e1} slot/port
10. Router(config-controller)# mode cas
11. Router(config-controller)# ds0-group channel-number timeslots range type signaling-type tone type addr info service service-type
12. Router(config-controller)# exit
13. Router(config-if-atm-vc)# vbr-rtpeak-rateaverage-rate [burst ]
14. Router(config-if-atm-vc)# vcci pvc-identifier
15. Router(config-if-atm-vc)# exit
16. Router(config-if)# exit
17. Router(config)# dial-peer voicenumberpots
18. Router(config-dial-peer)# application MGCPAPP

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# mgcp</td>
<td>Starts the MGCP daemon.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config)# mgcp call-agent ipaddr hostname [port] [service-type type] version version-number</td>
<td>Configures the MGCP call agent and service type.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-if)# mgcp sgcp restart notify</td>
<td>Causes MGCP to send and process simple gateway control protocol (SGCP) restart in progress (RSIP) messages.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-if)# mgcp modem passthrough [cisco ca nse]</td>
<td>Enables the router to process fax or modem messages. VoAAL2 does not support cisco.</td>
</tr>
<tr>
<td><strong>Step 5</strong> Router(config)# mgcp tse payloadtype</td>
<td>Enables the telephony signaling events (TSE) payload for fax and modem messages.</td>
</tr>
<tr>
<td><strong>Step 6</strong> Router(config)# no mgcp timer receive-rtcp</td>
<td>Turns off the real-time transport protocol (RTP) RTP control protocol (RTCP) transmission interval at the gateway.</td>
</tr>
<tr>
<td><strong>Step 7</strong> Router(config)# mgcp timer rtp-nsetimer</td>
<td>Turns on the RTP named signaling events (NSE) timeout interval at the gateway.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 8</strong> Router(config)# mgcp quarantine mode process</td>
<td>(Optional) Turns on processing for MGCP quarantine mode.</td>
</tr>
<tr>
<td><strong>Step 9</strong> Router(config)# controller {t1</td>
<td>e1 } slot/port</td>
</tr>
<tr>
<td><strong>Step 10</strong> Router(config-controller)# mode cas</td>
<td>For the CAS PBX scenarios only: Specifies that the controller will support CAS.</td>
</tr>
</tbody>
</table>
| **Step 11** Router(config-controller)# ds0-group channel-number timeslots range type signaling-type tone type addr info service service-type | For the CAS PBX scenarios only: Configures the T1 time slots for CAS calls. The scenarios use the following three digital signal level 0 (DS-0) definitions:  
  - ds0-group 1 time slots 1-8 type e&m-immediate-start  
  - ds0-group 2 time slots 9-16 type e&m-wink-start  
  - ds0-group 3 time slots 17-24 type fxs-ground-start |
| **Step 12** Router(config-controller)# exit | For the CAS PBX scenarios only: Exits controller configuration mode. |
**Command or Action**  
---  
**Step 13**  
Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst ]  
Configure the PVC for the variable-bit-rate real-time (voice) traffic.  
Guidelines for setting the peak rate, average rate, and burst size are as follows:  
• 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:  
  
  For VoIP:  
  G.711 with 169 or 80 byte sample size: max calls x 128K  
  G.726 with 40 byte sample size: max calls x 85K  
  G.729a with 10 byte sample size: max calls x 85K  
  For VoAAL2:  
  G.711 with 40 byte sample size: max calls x 85K  
  G.726 with 40 byte sample size: max calls x 43K  
  G.729a with 30 byte sample size: max calls x 15K  
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.  
• burst-- Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
  
  The minimum burst size is 4 times the number of voice calls.  
  The maximum burst size is the maximum allowed by the carrier.  
  You can calculate the value using the calculator at the following URL:  
  http://www-vnt/SPUniv/DSP/Codec_Calc1.asp

**Step 14**  
Router(config-if-atm-vc)# vcci pvc-identifier  
Assigns a unique identifier to the PVC.

**Step 15**  
Router(config-if-atm-vc)# exit  
Exits ATM virtual circuit configuration mode.

**Step 16**  
Router(config-if)# exit  
Exits interface configuration mode.

**Step 17**  
Router(config)# dial-peer voice number pots  
Enters dial-peer configuration mode for the POTS dial peer.

**Step 18**  
Router(config-dial-peer)# application MGCPAPP  
Initiates MGCP for the voice ports.  
You can enter the MGCPAPP keyword in either uppercase or lowercase.

---

**Configuring ATM on the Cisco 2600 Series**

This section describes the ATM configuration tasks necessary to support Voice over ATM using AAL2 on Cisco 2600 series.
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 the DS-0 time slots 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 2600 series or Cisco 3660 concentrators at both ends of the ATM link.

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.

To configure a Cisco 2600 series or Cisco 3660 series concentrator to support VoATM on a T1/E1 trunk, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# controller t1 e1 0/0
2. Router(config-controller)# mode atm
3. Router(config-controller)# framing framing type
4. Router(config-controller)# linecode linecode type
5. Router(config-controller)# no shutdown
6. Router(config-controller)# exit
7. Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]
8. Router(config-if)# pvcword ] { vpi/vci | vci
9. Router ( config-if-atm-vc ) # encapsulation aal2
10. Router(config-if-atm-vc)# vbr-rtpeak-rate average-rate [ burst
11. Router(config-if-atm-vc)# oam-pvc manage] [ frequency
12. Router(config-if-atm-vc)# oam retryup-count down-count retry-frequency
13. Router(config-if-atm-vc)# end
14. Router# show atm vc

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# controller t1 e1 0/0</td>
<td>Selects the T1 or E1 controller 0/0.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# mode atm</td>
<td>Specifies that the controller will support ATM encapsulation and create ATM interface 0/0.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Router(config-controller)#framing framing type</td>
</tr>
<tr>
<td>Specifies the T1 framing type as extended super frame or <strong>esf</strong>.</td>
<td></td>
</tr>
<tr>
<td>When the controller is set to ATM mode, the Controller framing is automatically set to Extended SuperFrame (esf) on T1 and to crc4 on E1.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Router(config-controller)#linecode linecode type</td>
</tr>
<tr>
<td>Specifies the T1 linecode type as <strong>b8zs</strong>.</td>
<td></td>
</tr>
<tr>
<td>The linecode is automatically set to b8zs on T1 and to hdb3 on E1.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Router(config-controller)#no shutdown</td>
</tr>
<tr>
<td>Ensures that the controller is activated.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Router(config-controller)#exit</td>
</tr>
<tr>
<td>Exits controller configuration mode.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Router(config)#interface atm slot/port subinterface-number multipoint [point-to-point]</td>
</tr>
<tr>
<td>Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface.</td>
<td></td>
</tr>
<tr>
<td>For subinterfaces, the default is <strong>multipoint</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>Router(config-if)# pvcword</td>
</tr>
<tr>
<td>Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode.</td>
<td></td>
</tr>
<tr>
<td><strong>word=</strong> optional PVC identifier (letters only); if you assign a PVC identifier, you can use it to specify this PVC when configuring network dial peers</td>
<td></td>
</tr>
<tr>
<td><strong>Note</strong> AAL2 encap is not supported for ilmi and qsaal PVCs.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td>Router(config-if-atm-vc)#encapsulation aal2</td>
</tr>
<tr>
<td>Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255.</td>
<td></td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| **Step 10** Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst] | Configures the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  • 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:  
    - 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 30 byte sample size--max calls x 15  
  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.  
  • burst--Set the burst size as large as possible, and never less than the minimum burst size.  
  Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
  You can calculate the value using the calculator at the following URL: http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
| **Step 11** Router(config-if-atm-vc)# oam-pvc manage] [ frequency] | (Optional) Configures transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specifies the number of seconds between loopback cells, and optionally enables OAM management of the connection.  
  The range for frequency is 0 to 600. The default is 10. |
| **Step 12** Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency | (Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.  
  • The value of up-count 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 value of down-count 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 value of retry-frequency 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.  
  **Note** Enter the oam retry command only once with all the arguments in the order shown. The first number always specifies up-count ; the second down-count , and the third retry-frequency . |
### Configuring ATM on the Cisco 3660

#### SUMMARY STEPS

1. `Router(config)# interface atm <slot>/ima<grp#> [subinterface-number [multipoint | point-to-point]]`  
   - Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface.  
   - Note To configure an IMA group on each ATM interface, enter the IMA group and group number.  
   - The default for subinterfaces is multipoint.  
   - *For all Scenarios*: Set up three subinterfaces for point-to-point.

2. `Router(config-if)# pvc [name] vpi/vci`  
3. `Router ( config-if-atm-vc ) # encapsulation aal2`  
4. `Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst ]`  
5. `Router(config-if-atm-vc)# oam-pvc manage [ frequency ]`  
6. `Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency`  
7. `Router(config-if-atm-vc)# end`  
8. `Router(config-if-atm-vc) vcci pvc-identifier`  
9. `Router(config-if-atm-vc)# exit`  
10. `Router(config-if)# exit`  
11. `Router(config)# dial-peer voice number pots`  
12. `Router(config-dial-peer)# application MGCPAPP`

#### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface.</td>
</tr>
</tbody>
</table>
| `Router(config)# interface atm <slot>/ima<grp#> [subinterface-number [multipoint | point-to-point]]` | *Note* To configure an IMA group on each ATM interface, enter the IMA group and group number.  
   - The default for subinterfaces is multipoint.  
   - *For all Scenarios*: Set up three subinterfaces for point-to-point. |

**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.
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2</strong> Router(config-if)# pvc [name] vpi/vci</td>
<td>Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode. <strong>Note</strong> AAL2 encapsulation is not supported for ilmi and qsaal PVCs.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router (config-if-atm-vc) # encapsulation aal2</td>
<td>Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255.</td>
</tr>
</tbody>
</table>
| **Step 4** Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst] | Configures the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - 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:  
    - 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  
  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.  
  - burst size--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
    - You can calculate the value using the calculator at the following URL: http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
| **Step 5** Router(config-if-atm-vc)# oam-pvc manage] [ frequency] | (Optional) Configures 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.  
  The range for frequency is 0 to 600. The default is 10. |
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 6</strong></td>
<td>Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Router(config-if-atm-vc)# end</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>Router# show atm vc</td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step 9</th>
<th>Router(config-if-atm-vc)# vbr-rtpeak-rateaverage-rate [burst ]</th>
</tr>
</thead>
</table>
| Purpose | Configures the PVC for the variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
|         | • 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 (max calls) the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps:  
|         | For VoIP:  
|         | G.711 with 40 or 80 byte sample size: max calls x 128K  
|         | G.726 with 40 byte sample size: max calls x 85K  
|         | G.729a with 10 byte sample size: max calls x 85K  
|         | For VoAAL2:  
|         | G.711 with 40 byte sample size: max calls x 85K  
|         | G.726 with 40 byte sample size: max calls x 43K  
|         | G.729a with 10 byte sample size: max calls x 43K  
|         | 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.  
|         | • burst--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
|         | The minimum burst size is 4 x the number of voice calls.  
|         | The maximum burst size is the maximum allowed by the carrier.  
|         | You can calculate the value using the calculator at the following URL:  
|         | http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |

| Step 10 | Router(config-if-atm-vc)# vcci pvc-identifier |
| Purpose | Assigns a unique identifier to the PVC. |

| Step 11 | Router(config-if-atm-vc)# exit |
| Purpose | Exits ATM virtual circuit configuration mode. |

| Step 12 | Router(config-if)# exit |
| Purpose | Exits interface configuration mode. |

| Step 13 | Router(config)# dial-peer voice number pots |
| Purpose | Enter dial peer configuration mode for the POTS dial peer. |

| Step 14 | Router(config-dial-peer)# application MGCPAPP |
| Purpose | Initiates the MGCP protocol for the voice ports. |

### Configuring Voice Band Detection Playout Settings

To configure voice band detection playout buffer delay on Cisco 2600 series and Cisco 3600 series routers, use the following commands beginning in the voice service configuration mode:
### SUMMARY STEPS

1. `Router(config)# voice service voatm`
2. `Router(config-voice-service)# session protocol aal2`
3. `Router(config-voice-service-session)# vbd-playout-delay maximum time`
4. `Router(config-voice-service-session)# vbd-playout-delay minimum time`
5. `Router(config-voice-service-session)# vbd-playout-delay mode {fixed | passthrough}`
6. `Router(config-voice-service-session)# vbd-playout-delay nominal time`
7. `Router(config-voice-service-session)# end`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** | Router(config)# voice service voatm  
Enters voice-service configuration mode. |
| **Step 2** | Router(config-voice-service)# session protocol aal2  
Enters voice-service-session configuration mode and specifies AAL2 trunking. |
| **Example:** |  
| **Step 3** | Router(config-voice-service-session)# vbd-playout-delay maximum time  
Specifies the maximum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers in milliseconds.  
The time is set in milliseconds. The range is from 40-1700 milliseconds. The default is set to 200 milliseconds. |
| **Step 4** | Router(config-voice-service-session)# vbd-playout-delay minimum time  
Specifies the minimum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers.  
The time is set in milliseconds. The range is from 4-1700 milliseconds. The default is set to 4 milliseconds. |
| **Step 5** | Router(config-voice-service-session)# vbd-playout-delay mode {fixed | passthrough}  
Configures voice band detection playout delay adaptation mode on a Cisco router.  
When the vbd-delay-playout mode is set to fixed, jitter buffer is set at a constant delay in milliseconds.  
When the vbd-delay-playout mode is set to passthrough, jitter buffer is set to DRAIN_FILL for clock compensation. There is no default. |
| **Step 6** | Router(config-voice-service-session)# vbd-playout-delay nominal time  
Specifies the nominal AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers.  
The time is set in milliseconds. The range is from 0-1500 milliseconds. The default is 100 milliseconds. |
| **Step 7** | Router(config-voice-service-session)# end  
Exits voice-service-session 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 2600 series router or a Cisco 3660 interoperates with a voice interface service module (VISM) in an MGX switch.

To configure the Cisco 2600 series router or the Cisco 3660 to perform subcell multiplexing, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1.  Router(config)# voice service voatm
2.  Router(config-voice-service)# session protocol aal2
3.  Router(config-voice-service-session)# subcell-mux number
4.  Router(config-voice-service-session)# end

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Step 2 Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Step 3 Router(config-voice-service-session)# subcell-mux number</td>
<td>Enables subcell multiplexing. The number is time in milliseconds. By default, subcell multiplexing is not enabled.</td>
</tr>
<tr>
<td>Step 4 Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

Verifying the MGCP CAS PBX and AAL2 PVC Configurations

Use these commands to verify the configuration settings:

**SUMMARY STEPS**

1.  Router# show dial-peer voice sum
2.  Router# show run

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router# show dial-peer voice sum</td>
<td>Displays the status of the dial peer. The dial peer should be active. If it is not, enter the command:</td>
</tr>
<tr>
<td></td>
<td>Router(config-dial-peer)# no shut</td>
</tr>
<tr>
<td>Step 2 Router# show run</td>
<td>Displays the current configuration settings.</td>
</tr>
</tbody>
</table>
Configuring End-to-End Clocking

The following commands can be used to configure the Cisco 3660 only when there is a TDM switch module on board. For the Cisco 2600 series routers, these commands are automatically allowed.

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.

SUMMARY STEPS

1. Router(config)# network-clock-participate {nm | wic} slot
2. for Cisco 2600 series:
3. Router(config)# network-clock-select priority t1 slot/port
4. Router(config)# network-clock-select priority t1 slot/port
5. Router(config)# voice-card slot

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enables the Cisco 2600 series router or the Cisco 3660 to receive clock signals from the VWIC by entering the keyword wic and the slot number 0 on the router.</td>
</tr>
<tr>
<td><strong>Step 2</strong> for Cisco 2600 series:</td>
<td>Enables the Cisco 2600 series router or the Cisco 3660 to receive clock signals from the network module by entering the keyword nm and the slot number 1 on the router.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# network-clock-participate {nm</td>
<td>wic} slot</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>for Cisco 3660:</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>for Cisco 3660:</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Names a source to provide timing for the network clock and to specify the selection priority for this clock source. The priority selection is 1 or 2. Use the no form of this command to cancel the selection.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# network-clock-select priority t1 slot/port</td>
<td></td>
</tr>
</tbody>
</table>
Configuring a CAC Master 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 common to the Cisco 2600 series and the Cisco 3660 routers.

You can configure a Cisco 2600 series router or a Cisco 3660 as either a CAC master or a CAC slave. By default, this 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 2600 series router or a Cisco 3660 configured as a master always performs CAC during fax/modem upspeed. A Cisco 2600 series router or a Cisco 3660 configured as a slave sends a request for CAC to the CAC master.

To configure a Cisco 2600 series router or a Cisco 3660 as a CAC master, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# cac master
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-voice-service-session)# cac master</td>
<td>Configures this Cisco 2600 series router or a Cisco 3660 as a CAC master.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

Configuring a CAC Slave for AAL2 Voice

To return a Cisco 2600 series router or a Cisco 3660 to its default operation as a CAC slave, complete the following steps beginning in global configuration mode:
**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# no cac master
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# voice service voatm</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config-voice-service)# session protocol aal2</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Router(config-voice-service-session)# no cac master</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Router(config-voice-service-session)# end</td>
</tr>
</tbody>
</table>

**Configuring MGCP POTS Dial Peer**

To configure MGCP POTS dial peer on the Cisco 2600 series and Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice number pots
2. Router(config-dial-peer)# application MGCPAPP
3. 
4. Router(config-dial-peer)# exit

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# dial-peer voice number pots</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config-dial-peer)# application MGCPAPP</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Example: Router(config-dial-peer)# port slot/port:ds0-group</td>
</tr>
</tbody>
</table>
Command or Action | Purpose
--- | ---
Step 4 Router(config-dial-peer)# exit | Exits from the dial-peer configuration mode.

Troubleshooting Tips

- For a good voice quality and to be able to make fax calls, make sure that you configure end-to-end clocking properly, that is, make sure that the T1 controllers participating in this configuration do not have any errors.
- Make sure that you do not configure bisync tunnelling protocol (BSTUN) and ATM on the Cisco 2650 router simultaneously.

Configuration Tasks for MGCP PRI Backhaul

See the following sections for configuration tasks for MGCP PRI Backhaul for Cisco 2600 series and Cisco 3660 routers:

- Configuring MGCP CAS PBX on the Cisco 2600 Series and Cisco 3660, page 52
- Configuring ATM on the Cisco 2600 Series, page 55
- Configuring ATM on the Cisco 3660, page 58
- Configuring Voice Band Detection Playout Settings, page 61
- Configuring Subcell Multiplexing for AAL2 Voice, page 63
- Verifying the MGCP CAS PBX and AAL2 PVC Configurations, page 63
- Configuring End-to-End Clocking, page 64
- Configuring a CAC Master for AAL2 Voice, page 65
- Configuring a CAC Slave for AAL2 Voice, page 65
- Configuring Backhaul Session Manager, page 66
- Configuring ISDN Signaling Backhaul, page 69
- Configuring Fast Ethernet for Signaling Backhaul Compatibility, page 69
- Configuring the Cisco VSC3000, page 70
- Configuring MGCP POTS Dial Peer, page 76

Configuring MGCP CAS PBX on the Cisco 2600 Series and Cisco 3660

Use the following commands for configuring the Media Gateway Control Protocol (MGCP) CAS PBX on the Cisco 2600 series and the Cisco 3660 routers:
SUMMARY STEPS

1. Router(config)# mgcp
2. Router(config)# mgcp call-agent ipaddr | hostname [port] [service-type type] version version-number
3. Router(config-if)# mgcp sgcp restart notify
4. Router(config-if)# mgcp modem passthrough [cisco | ca | nse]
5. Router(config)# mgcp tse payloadtype
6. Router(config)# no mgcp timer receive-rtcp
7. Router(config)# mgcp timer rtp-nsetimer
8. Router(config)# mgcp quarantine mode process
9. Router(config)# controller{t1 | e1} slot/port
10. Router(config-controller)# mode cas
11. Router(config-controller)# ds0-group channel-number timeslots range type signaling-type tone type addr info service service-type
12. Router(config-controller)# exit
13. Router(config-if-atm-vc)# vbr-rtpeak-rateaverage-rate [burst ]
14. Router(config-if-atm-vc)# vccpipe-identifier
15. Router(config-if-atm-vc)# exit
16. Router(config-if)# exit
17. Router(config)# dial-peer voicenumberpots
18. Router(config-dial-peer)# application MGCPAPP

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# mgcp</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config)# mgcp call-agent ipaddr</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# mgcp sgcp restart notify</td>
</tr>
<tr>
<td>Step 4</td>
<td>Router(config-if)# mgcp modem passthrough [cisco</td>
</tr>
<tr>
<td>Step 5</td>
<td>Router(config)# mgcp tse payloadtype</td>
</tr>
<tr>
<td>Step 6</td>
<td>Router(config)# no mgcp timer receive-rtcp</td>
</tr>
<tr>
<td>Step 7</td>
<td>Router(config)# mgcp timer rtp-nsetimer</td>
</tr>
<tr>
<td>Step 8</td>
<td>Router(config)# mgcp quarantine mode process</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 9</strong> Router(config)# **controller(t1</td>
<td>e1) slot/port**</td>
</tr>
<tr>
<td><strong>Step 10</strong> Router(config-controller)# <strong>mode cas</strong></td>
<td><em>For the CAS PBX scenarios only</em>: Specifies that the controller will support CAS.</td>
</tr>
</tbody>
</table>
| **Step 11** Router(config-controller)# **ds0-group channel-number timeslots range type signaling-type tone type addr info service service-type** | *For the CAS PBX scenarios only*: Configures the T1 time slots for CAS calls. The scenarios use the following three digital signal level 0 (DS-0) definitions:  
  - ds0-group 1 time slots 1-8 type e&m-immediate-start  
  - ds0-group 2 time slots 9-16 type e&m-wink-start  
  - ds0-group 3 time slots 17-24 type fxs-ground-start |
| **Step 12** Router(config-controller)# **exit** | *For the CAS PBX scenarios only*: Exits controller configuration mode. |
| **Step 13** Router(config-if-atm-vc)# **vbr-rt peak-rate average-rate [burst]** | Configures the PVC for the variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:  
  - 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 (max calls) the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps:  
    - For VoIP:  
      - G.711 with 40 or 80 byte sample size: max calls x 128K  
      - G.726 with 40 byte sample size: max calls x 85K  
      - G.729a with 10 byte sample size: max calls x 85K  
    - For VoAAL2:  
      - G.711 with 40 byte sample size: max calls x 85K  
      - G.726 with 40 byte sample size: max calls x 43K  
      - G.729a with 10 byte sample size: max calls x 43K  
  - burst--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:  
    - The minimum burst size is 4 x the number of voice calls.  
    - The maximum burst size is the maximum allowed by the carrier.  
  You can calculate the value using the calculator at the following URL: http://www-vnt/SPUniv/DSP/Codec_Calc1.asp |
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 14</strong> Router(config-if-atm-vc)# vcci pvc-identifier</td>
<td>Assigns a unique identifier to the PVC.</td>
</tr>
<tr>
<td><strong>Step 15</strong> Router(config-if-atm-vc)# exit</td>
<td>Exits ATM virtual circuit configuration mode.</td>
</tr>
<tr>
<td><strong>Step 16</strong> Router(config-if)# exit</td>
<td>Exits interface configuration mode.</td>
</tr>
<tr>
<td><strong>Step 17</strong> Router(config)# dial-peer voice number pots</td>
<td>Enters dial-peer configuration mode for the POTS dial peer.</td>
</tr>
<tr>
<td><strong>Step 18</strong> Router(config-dial-peer)# application MGCPAPP</td>
<td>Initiates MGCP for the voice ports. You can enter the MGCPAPP keyword in either uppercase or lowercase.</td>
</tr>
</tbody>
</table>

**Configuring ATM on the Cisco 2600 Series**

This section describes the ATM configuration tasks necessary to support Voice over ATM using AAL2 on Cisco 2600 series.

---

**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 time slots 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 2600 series or Cisco 3660 concentrators at both ends of the ATM link.

---

**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.

---

To configure a Cisco 2600 series or Cisco 3660 series concentrator to support VoATM on a T1/E1 trunk, complete the following steps beginning in global configuration mode:
### SUMMARY STEPS

1. `Router(config)# controller t1 e1 0/0`
2. `Router(config-controller)# mode atm`
3. `Router(config-controller)# framing framing type`
4. `Router(config-controller)# linecode linecode type`
5. `Router(config-controller)# no shutdown`
6. `Router(config-controller)# exit`
7. `Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]]`
8. `Router(config-if)# pvcword ] { vpi/vci | vci`
9. `Router ( config-if-atm-vc ) # encapsulation aal2`
10. `Router(config-if-atm-vc)# vbr-rtpeak-rate average-rate [ burst`
11. `Router(config-if-atm-vc)# oam-pvc manage] [ frequency`
12. `Router(config-if-atm-vc)# oam retryup-count down-count retry-frequency`
13. `Router(config-if-atm-vc)# end`
14. `Router# show atm vc`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# controller t1 e1 0/0</td>
<td>Selects the T1 or E1 controller 0/0.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# mode atm</td>
<td>Specifies that the controller will support ATM encapsulation and create ATM interface 0/0.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# framing framing type</td>
<td>Specifies the T1 framing type as Extended SuperFrame (esf).</td>
</tr>
<tr>
<td>When the controller is set to ATM mode, the Controller framing is automatically set to Extended SuperFrame (esf) on T1 and to crc4 on E1.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# linecode linecode type</td>
<td>Specifies the T1 linecode type as b8zs.</td>
</tr>
<tr>
<td>The linecode is automatically set to b8zs on T1 and to hdb3 on E1.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# no shutdown</td>
<td>Ensures that the controller is activated.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-controller)# exit</td>
<td>Exits controller configuration mode.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# interface atm slot/port subinterface-number multipoint [point-to-point]]</td>
<td>Enters interface configuration mode to configure ATM interface 0/0 or an ATM subinterface.</td>
</tr>
<tr>
<td>For subinterfaces, the default is multipoint.</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step 8</th>
<th>Router(config-if)# pvc [vpi vci]</th>
<th></th>
</tr>
</thead>
</table>
| **Purpose** | Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode. vpi= 0 to 255 vci= 1 to 1023 word= 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** AAL2 encap is not supported for ilmi and qsaal PVCs.

<table>
<thead>
<tr>
<th>Step 9</th>
<th>Router(config-if-atm-vc)# encapsulation aal2</th>
<th></th>
</tr>
</thead>
</table>
| **Purpose** | Sets the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255.

<table>
<thead>
<tr>
<th>Step 10</th>
<th>Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst]</th>
<th></th>
</tr>
</thead>
</table>
| **Purpose** | Configures the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:

- **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:
  - 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 30 byte sample size--max calls x 15

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.

- **burst**--Set the burst size as large as possible, and never less than the minimum burst size.

Guidelines are as follows:

- The minimum burst size is 4 x the number of voice calls.
- The maximum burst size is the maximum allowed by the carrier.

You can calculate the value using the calculator at the following URL:
http://www-vnt/SPUniv/DSP/Codec_Calc1.asp

<table>
<thead>
<tr>
<th>Step 11</th>
<th>Router(config-if-atm-vc)# oam-pvc manage [frequency]</th>
<th></th>
</tr>
</thead>
</table>
| **Purpose** | (Optional) Configures transmission of end-to-end F5 OAM loopback cells on a PVC, optionally specifies the number of seconds between loopback cells, and optionally enables OAM management of the connection.

The range for **frequency** is 0 to 600. The default is 10.
<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Step 12 Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency | (Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.  
- The value of up-count 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 value of down-count 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 value of retry-frequency 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.  
**Note** Enter the `oam retry` command only once with all the arguments in the order shown. The first number always specifies `up-count`; the second `down-count`, and the third `retry-frequency`. |
| Step 13 Router(config-if-atm-vc)# end | Exits configuration mode. |
| Step 14 Router# show atm vc | Verifies the ATM PVC configuration. |

### Configuring ATM on the Cisco 3660

**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.

**SUMMARY STEPS**

1. Router(config)# interface atm slot/ima gp# [subinterface-number] [multipoint | point-to-point]  
2. Router(config-if)# pvc [name] vpi/vci  
3. Router ( config-if-atm-vc ) # encapsulation aal2  
4. Router(config-if-atm-vc)# vbr-rtpeak-rate average-rate [ burst  
5. Router(config-if-atm-vc)# oam-pvc manage] [ frequency  
6. Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency  
7. Router(config-if-atm-vc)# end  
8. Router# show atm vc  
9. Router(config-if-atm-vc)# vbr-rtpeak-rateaverage-rate [ burst ]  
10. Router(config-if-atm-vc)# vcci[pvc-identifier  
11. Router(config-if-atm-vc)# exit  
12. Router(config-if)# exit  
13. Router(config)# dial-peer voice number pots  
14. Router(config-dial-peer)# application MGCPAPP
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><strong>Enter</strong> interface configuration mode to configure ATM interface 0/0 or an ATM subinterface. <strong>Note</strong> To configure an IMA group on each ATM interface, enter the IMA group and group number. The default for subinterfaces is <strong>multipoint</strong>. <strong>For all Scenarios</strong> : Set up three subinterfaces for point-to-point.</td>
</tr>
<tr>
<td>Router(config)# interface atm slot/ima grp# [subinterface-number [multipoint</td>
<td>point-to-point]]</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Creates an ATM PVC for voice traffic and enters ATM virtual circuit configuration mode. <strong>Note</strong> AAL2 encap is not supported for ilmi and qsaal PVCs.</td>
</tr>
<tr>
<td>Router(config-if)# pvc [name] vpi/vci</td>
<td><strong>Sets</strong> the encapsulation of the PVC to support AAL2 voice traffic. This automatically creates channel identifiers (CIDs) 1 through 255.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td><strong>Configures</strong> the PVC for variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:</td>
</tr>
<tr>
<td>Router (config-if-atm-vc ) # encapsulation aal2</td>
<td><strong>peak rate</strong>--If it does not exceed your carrier’s allowable rate, set to the line rate (for example, 1536 kbps for T1-ATM). <strong>average rate</strong>--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:</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>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. <strong>burst size</strong>--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows: The minimum burst size is 4 x the number of voice calls. The maximum burst size is the maximum allowed by the carrier. You can calculate the value using the calculator at the following URL: <a href="http://www-vnt/SPUniv/DSP/Codec_Calc1.asp">http://www-vnt/SPUniv/DSP/Codec_Calc1.asp</a></td>
</tr>
<tr>
<td>Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [ burst ]</td>
<td><strong>Configures</strong> 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. <strong>The range for frequency</strong> is 0 to 600. The default is 10.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td><strong>OAM</strong>-pvc manage[ ] [ frequency ]</td>
</tr>
</tbody>
</table>
### Command or Action

**Step 6**  
Router(config-if-atm-vc)# oam retry up-count down-count retry-frequency

(Optional) Specifies OAM management parameters for verifying connectivity of a PVC connection. This command is supported only if OAM management is enabled.

- The value of **up-count** 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 value of **down-count** 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 value of **retry-frequency** 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.

**Note**  
Enter the `oam retry` command only once with all the arguments in the order shown. The first number always specifies `up-count`; the second `down-count`, and the third `retry-frequency`.

**Step 7**  
Router(config-if-atm-vc)# end

Exits configuration mode.

**Step 8**  
Router# show atm vc

Verifies the ATM PVC configuration.
### Command or Action

<table>
<thead>
<tr>
<th>Step 9</th>
<th>Router(config-if-atm-vc)# vbr-rt peak-rate average-rate [burst]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Configures the PVC for the variable-bit-rate real-time (voice) traffic. Guidelines for setting the peak rate, average rate, and burst size are as follows:</td>
</tr>
<tr>
<td></td>
<td>• peak rate--If it does not exceed your carrier’s allowable rate, set to the line rate (for example, 1536 kbps for T1-ATM).</td>
</tr>
<tr>
<td></td>
<td>• average rate--Calculate according to the maximum number of calls (max calls) the PVC will carry times the bandwidth per call. The following formulas give you the average rate in kbps:</td>
</tr>
<tr>
<td></td>
<td>for VoIP:</td>
</tr>
<tr>
<td></td>
<td>G.711 with 40 or 80 byte sample size: max calls x 128K</td>
</tr>
<tr>
<td></td>
<td>G.726 with 40 byte sample size: max calls x 85K</td>
</tr>
<tr>
<td></td>
<td>G.729a with 10 byte sample size: max calls x 85K</td>
</tr>
<tr>
<td></td>
<td>for VoAAL2:</td>
</tr>
<tr>
<td></td>
<td>G.711 with 40 byte sample size: max calls x 85K</td>
</tr>
<tr>
<td></td>
<td>G.726 with 40 byte sample size: max calls x 43K</td>
</tr>
<tr>
<td></td>
<td>G.729a with 10 byte sample size: max calls x 43K</td>
</tr>
<tr>
<td></td>
<td>If voice activity detection (VAD) is enabled, the bandwidth usage is reduced by a much as 12 percent with the maximum number of calls in progress. With fewer calls in progress, bandwidth savings are less.</td>
</tr>
<tr>
<td></td>
<td>• burst--Set the burst size as large as possible, and never less than the minimum burst size. Guidelines are as follows:</td>
</tr>
<tr>
<td></td>
<td>The minimum burst size is 4 x the number of voice calls.</td>
</tr>
<tr>
<td></td>
<td>The maximum burst size is the maximum allowed by the carrier.</td>
</tr>
<tr>
<td></td>
<td>You can calculate the value using the calculator at the following URL:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www-vnt/SPUniv/DSP/Codec_Calc1.asp">http://www-vnt/SPUniv/DSP/Codec_Calc1.asp</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 10</th>
<th>Router(config-if-atm-vc)# vcci pvc-identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assigns a unique identifier to the PVC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 11</th>
<th>Router(config-if-atm-vc)# exit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exits ATM virtual circuit configuration mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 12</th>
<th>Router(config-if)# exit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exits interface configuration mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 13</th>
<th>Router(config)# dial-peer voice number pots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enter dial peer configuration mode for the POTS dial peer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 14</th>
<th>Router(config-dial-peer)# application MGCPAPP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initiates the MGCP protocol for the voice ports.</td>
</tr>
</tbody>
</table>

### Configuring Voice Band Detection Playout Settings

To configure voice band detection playout buffer delay on Cisco 2600 series and Cisco 3600 series routers, use the following commands beginning in the voice service configuration mode:
SUMMARY STEPS

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# vbd-playout-delay maximum time
4. Router(config-voice-service-session)# vbd-playout-delay minimum time
5. Router(config-voice-service-session)# vbd-playout-delay mode {fixed | passthrough}
6. Router(config-voice-service-session)# vbd-playout-delay nominal time
7. Router(config-voice-service-session)# end

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Specifies the maximum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers in milliseconds. The time is set in milliseconds. The range is from 40-1700 milliseconds. The default is set to 200 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Specifies the minimum AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 4-1700 milliseconds. The default is set to 4 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Configures voice band detection playout delay adaptation mode on a Cisco router. When the vbd-delay-playout mode is set to fixed, jitter buffer is set at a constant delay in milliseconds. When the vbd-delay-playout mode is set to passthrough, jitter buffer is set to DRAIN_FILL for clock compensation. There is no default.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Specifies the nominal AAL2 voice band detection playout delay buffer on Cisco 2600 series and Cisco 3660 routers. The time is set in milliseconds. The range is from 0-1500 milliseconds. The default is 100 milliseconds.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Exits voice-service-session configuration mode.</td>
</tr>
</tbody>
</table>
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 2600 series router or a Cisco 3660 interoperates with a voice interface service module (VISM) in an MGX switch.

To configure the Cisco 2600 series router or the Cisco 3660 to perform subcell multiplexing, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# subcell-mux number
4. Router(config-voice-service-session)# end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>2</td>
<td>Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>3</td>
<td>Router(config-voice-service-session)# subcell-mux number</td>
<td>Enables subcell multiplexing. The number is time in milliseconds. By default, subcell multiplexing is not enabled.</td>
</tr>
<tr>
<td>4</td>
<td>Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

**Verifying the MGCP CAS PBX and AAL2 PVC Configurations**

Use these commands to verify the configuration settings:

**SUMMARY STEPS**

1. Router# show dial-peer voice sum
2. Router# show run

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Router# show dial-peer voice sum</td>
<td>Displays the status of the dial peer. The dial peer should be active. If it is not, enter the command:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Router(config-dial-peer)# no shut</td>
</tr>
<tr>
<td>2</td>
<td>Router# show run</td>
<td>Displays the current configuration settings.</td>
</tr>
</tbody>
</table>
Configuring End-to-End Clocking

The following commands can be used to configure the Cisco 3660 only when there is a TDM switch module on board. For the Cisco 2600 series these commands are automatically allowed.

**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.

**SUMMARY STEPS**

1. Router(config)# `network-clock-participate {nm | wic} slot`
2. for Cisco 2600 series:
3. Router(config)# `network-clock-select priority t1 slot/port`
4. Router(config)# `network-clock-select priority t1 slot/port`
5. Router(config)# `voice-card slot`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Route(config)# `network-clock-participate {nm</td>
<td>wic} slot`</td>
</tr>
<tr>
<td><strong>Step 2</strong> Route(config)# `network-clock-participate {nm</td>
<td>wic} slot`</td>
</tr>
<tr>
<td><strong>Example:</strong> Route(config)# `network-clock-participate {nm</td>
<td>wic} slot`</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config)# <code>network-clock-select priority t1 slot/port</code></td>
<td>Names a source to provide timing for the network clock and to specify the selection <code>priority</code> for this clock source. The priority selection is 1 or 2. Use the <code>no</code> form of this command to cancel the selection.</td>
</tr>
</tbody>
</table>
### Configuring a CAC Master 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 common to the Cisco 2600 series and Cisco 3660.

You can configure a Cisco 2600 series router or a Cisco 3660 as either a CAC master or a CAC slave. By default, this 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 2600 series router or a Cisco 3660 configured as a master always performs CAC during fax/modem upspeed. A Cisco 2600 series router or a Cisco 3660 configured as a slave sends a request for CAC to the CAC master.

To configure a Cisco 2600 series router or a Cisco 3660 as a CAC master, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. `Router(config)# voice service voatm`
2. `Router(config-voice-service)# session protocol aal2`
3. `Router(config-voice-service-session)# cac master`
4. `Router(config-voice-service-session)# end`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# voice service voatm</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config-voice-service)# session protocol aal2</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Router(config-voice-service-session)# cac master</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Router(config-voice-service-session)# end</td>
</tr>
</tbody>
</table>

### Configuring a CAC Slave for AAL2 Voice

To return a Cisco 2600 series router or a Cisco 3660 to its default operation as a CAC slave, complete the following steps beginning in global configuration mode:

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 4</strong></td>
<td>Router(config)# network-clock-select priority t1 slot/port</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Router(config)# voice-card slot</td>
</tr>
</tbody>
</table>
SUMMARY STEPS

1. Router(config)# voice service voatm
2. Router(config-voice-service)# session protocol aal2
3. Router(config-voice-service-session)# no cac master
4. Router(config-voice-service-session)# end

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# voice service voatm</td>
<td>Enters voice-service configuration mode.</td>
</tr>
<tr>
<td>Step 2 Router(config-voice-service)# session protocol aal2</td>
<td>Enters voice-service-session configuration mode and specifies AAL2 trunking.</td>
</tr>
<tr>
<td>Step 3 Router(config-voice-service-session)# no cac master</td>
<td>Configures this Cisco 2600 series router or a Cisco 3660 as a CAC slave.</td>
</tr>
<tr>
<td>Step 4 Router(config-voice-service-session)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

Configuring Backhaul Session Manager

The backhaul session manager operates on the media gateway and enables signaling applications to backhaul signaling information to a remote or local virtual switch controller (VSC), and also provides redundancy and transparent management of transport paths.

To configure the backhaul session manager, log on to the media gateway and complete the following tasks as required for your application:

- Creating Session Sets and Groups and Sessions, page 66
- Changing Default Values of Session-Group Parameters, page 67

Creating Session Sets and Groups and Sessions

To create session sets, session groups, and sessions on the Cisco media gateway, complete the following steps starting in global configuration mode:

SUMMARY STEPS

1. Router(config)# backhaul-session-manager
2. Router(config-bsm)# set set-name client ft nft
3. Router(config-bsm)# group group-name set set-name
4. Router(config-bsm)# session group group-name remote_ip remote_port local_ip local_port priority

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# backhaul-session-manager</td>
<td>Enters backhaul session manager configuration mode.</td>
</tr>
</tbody>
</table>
### Configuring Backhaul Session Manager

**Command or Action**

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Router(config-bsm)# set set-name client ft nft</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Creates a session set and specifies its parameters:</td>
</tr>
<tr>
<td></td>
<td>• <strong>set-name</strong> --A word you select to identify the session-set</td>
</tr>
<tr>
<td></td>
<td>• <strong>client</strong> --Required for PRI backhaul; specifies that the session set function as a client</td>
</tr>
<tr>
<td></td>
<td>• Fault-tolerance option:</td>
</tr>
<tr>
<td></td>
<td>◦ <strong>ft</strong> = fault-tolerant</td>
</tr>
<tr>
<td></td>
<td>◦ <strong>nft</strong> = non-fault-tolerant</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>For fault-tolerant operation, you must configure more than one group in this session set. If only one group will be configured in this session-set, you must specify nft.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>If you configure the session set for non-fault-tolerant operation, you should also configure the Cisco VSC3000 for non-fault-tolerant operation. See the Configuring the Cisco VSC3000, page 70.</td>
</tr>
</tbody>
</table>

**Step 3**

| Router(config-bsm)# group group-name set set-name |
|-------------------------------------------------
| **Purpose** | Adds a new session group to a specified session set. |
| | • **group-name** --A word you select to identify the new session group |
| | • **set-name** --The session-set to which you are adding the new session group |
| Repeat this step to add additional session groups to a session set. |

**Step 4**

<table>
<thead>
<tr>
<th>Router(config-bsm)# session group group-name remote_ip remote_port local_ip local_port priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Note</strong></td>
</tr>
<tr>
<td>Repeat this step to create additional sessions in a session group.</td>
</tr>
</tbody>
</table>

---

**Changing Default Values of Session-Group Parameters**

If you need to change the default values of session-group parameters, complete the following commands as required, in backhaul-session-manager configuration mode:
Do not change the session-group parameters unless instructed to do so by Cisco technical support. Sessions might fail if the relationships among parameters are not set correctly.

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router(config-bsm)# group group-name auto-reset number-of-auto-resets</td>
<td>Specifies the maximum number of auto resets before the connection is considered failed. The range is 0 to 255. The default is 5.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name cumulative-ack number-of-segments</td>
<td>Specifies the maximum number of (RUDP) segments that will be received before sending an acknowledgement. The range is 0 to 255. The default is 3.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name out-of-sequence number-of-segments</td>
<td>Specifies the maximum number of out-of-sequence segments that will be received before an acknowledgement is sent. The range is 0 to 255. The default is 3.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name receive window-size</td>
<td>Specifies the maximum window size for the receiver. The range is 1 to 65. The default is 32.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name retrans resend-attempts</td>
<td>Specifies the maximum number of times reliable user data protocol (RUDP) attempts to resend a segment before declaring the connection broken. The range is 0 to 255. The default is 2.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name timer cumulative-ack milliseconds</td>
<td>Specifies the maximum number of milliseconds RUDP delays before sending an acknowledgement for a received segment. The range is 100 to 65535. The default is 300.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name timer keepalive milliseconds</td>
<td>Specifies the number of milliseconds RUDP waits before sending a keepalive segment. The range is 0 to 65535. The default is 200.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name timer retransmit milliseconds</td>
<td>Specifies the number of milliseconds RUDP waits to receive an acknowledgement for a segment. The range is 100 to 65535. The default is 600.</td>
</tr>
<tr>
<td>Router(config-bsm)# group group-name timer transfer-state milliseconds</td>
<td>Specifies the number of milliseconds RUDP waits to receive a selection of a new session from the application during a transfer state. The range is 0 to 65535. The default is 600.</td>
</tr>
<tr>
<td>Router(config-bsm)# exit</td>
<td></td>
</tr>
</tbody>
</table>
Configuring ISDN Signaling Backhaul

To configure the ISDN Q.931 signaling backhaul parameters, log on to the media gateway and complete the following steps starting in global configuration mode. Repeat this procedure for each T1 interface on the media gateway that will use backhaul.

**SUMMARY STEPS**

1. `Router(config)# controller{t1 | e1}controller-number`
2. `Router(config-control)# pri-group timeslots 1-24 service mgcp`
3. `Router(config-control)# exit`
4. `Router(config)# interface serialcontroller-number:23`
5. `Router(config-if)# isdn switch-typeswitch-type`
6. `Router(config-if)# isdn bind-L3 backhaul set-name`
7. `Router(config-if)# exit`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters controller configuration mode and specifies a controller for the PRI interface. Controller numbers are: 0/0, 0/1, 1/0, 1/1, 2/0, 2/1, 3/0, 3/1, 4/0, 4/1, 5/0, 5/1.</td>
</tr>
</tbody>
</table>
| **Step 2**        | Creates a serial D-channel interface for signaling backhaul and specifies control protocol MGCP for signaling backhaul.  
• The controller time slots cannot be shared between backhaul and other Layer 3 protocols. |
| **Step 3**        | Exits from controller configuration mode. |
| **Step 4**        | Enters interface configuration mode for the D-channel signaling backhaul interface. Enter a controller number that matches the controller number specified in Step 1. |
| **Step 5**        | Configures the D-channel interface to match the ISDN switch type. Examples of ISDN switch types include primary-4ess, primary-5ess, primary-nec5.  
• This can be done in either global or interface configuration mode. |
| **Step 6**        | Configures ISDN to backhaul Q.931 to the Cisco VSC3000.  
• You must use the set name of a session set that was defined in Step 2 of the Creating Session Sets and Groups and Sessions, page 66.  
• In the example, "L" is shown for clarity. You can enter lower-case "l". |
| **Step 7**        | Exits the interface configuration mode. |

**Configuring Fast Ethernet for Signaling Backhaul Compatibility**

If your media gateway has 10/100 BASE-T Fast Ethernet capability, configure the Fast Ethernet interface not to use auto negotiation.
When the Fast Ethernet interface is configured for auto-negotiation, it can take up to 2 seconds for this interface to be enabled when the interface has to initialize. Two examples where the interface initializes are execution of the no shut command and disconnection or reconnection of the Ethernet cable. Auto-negotiation affects the traffic flow on the Ethernet interface and can, therefore, interrupt the traffic flow on existing RUDP connections, causing them to fail. To avoid these problems, the Fast Ethernet interface should not be configured for auto-negotiation. Instead, set the duplex and speed parameters according to the requirements of the network.

To reconfigure the Fast Ethernet interface for specified duplex and speed operation, complete the following steps beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# intEthernet-port-number
2. Router(config-if)# duplex full half
3. Router(config-if)# speed 10 100
4. Router(config-if)# exit

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Router(config)# intEthernet-port-number</td>
<td>Enters Ethernet interface configuration mode for the specified Ethernet port.</td>
</tr>
<tr>
<td>Step 2 Router(config-if)# duplex full half</td>
<td>Configures the Ethernet port for full-duplex or half-duplex operation.</td>
</tr>
<tr>
<td>Step 3 Router(config-if)# speed 10 100</td>
<td>Configures the Ethernet port to operate at 10 Mbps or 100 Mbps.</td>
</tr>
<tr>
<td>Step 4 Router(config-if)# exit</td>
<td>Exits from interface configuration mode.</td>
</tr>
</tbody>
</table>

**Configuring the Cisco VSC3000**

The Cisco VSC3000 is the signaling controller software that provides call control and runs on a UNIX server such as a Sun Netra 1800. Man Machine Language (MML) is the user interface into the signaling controller software. You use this interface to configure parameters of your signaling controller software and to display information about the current settings.

If the Cisco VSC3000 is set up for fault-tolerant operation, configure the backhaul session manager also for fault-tolerant operation. For more information, refer to the Cisco MGC Software Release 7 Provisioning Guide.

To configure the Cisco VSC3000 to perform signaling backhaul, log on to the UNIX server and complete the MGCP service provisioning procedure as follows:
SUMMARY STEPS

1. `mml> prov-add:extnode:name=media-gateway-name`,
   - Assigns a name to the media gateway (the external node) at the far end of a backhaul link.
2. `desc=media-gateway-name`
   - Provides a description of the media gateway (MG).
3. `mml> prov-add:ipfaspath:name=ipfaspath-name`,
4. `extnode=media-gateway-name`,
5. `mdo=ISDN-variant`,
6. `custgrpId=customer-group-ID`,
7. `side=equipment-location`,
8. `desc=description`
9. `mml> prov-add:iplnk:name=iplink-name`,
10. `if=enif interface-number`,
11. `ipaddr=IP_Addr number`,
12. `port=port-number`,
13. `pri=priority-number`,
14. `peeraddr=IP-address`,
15. `peerport=port-number`,
16. `sigslot=slot-number`,
17. `sigport=port-number`,
18. `svc=ipfaspath-name`,
19. `desc=description`
20. `mml> prov-add:mgcppath:name=MGCP-path-name`,
21. `extnode=ipfaspath-name`,
22. `desc=description`
23. `mml> prov-add:iplnk:name=clink6`,
24. `if=enif1`,
25. `ipaddr=IP_Addr number`,
26. `port=2427`,
27. `peeraddr=IP-address`,
28. `peerport=2427`,
29. `svc=mgcp-service-name`,
30. `pri=1`,
31. `desc=description`

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> mml&gt; prov-add:extnode:name=media-gateway-name</td>
<td>Assigns a name to the media gateway (the external node) at the far end of a backhaul link.</td>
</tr>
<tr>
<td><strong>Step 2</strong> desc=media-gateway-name</td>
<td>Provides a description of the media gateway (MG).</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Step 3</strong> mml&gt; prov-</td>
<td>Adds an IP path for D-channel transport (ipfaspath) from the Cisco VSC3000 to a</td>
</tr>
<tr>
<td>add:ipfaspath:name=</td>
<td>media gateway and assigns it a path name.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> extnode=</td>
<td>Specifies the media gateway (external node) at the opposite end of the IP</td>
</tr>
<tr>
<td>media-gateway-name,</td>
<td>path; the name must match the media gateway name assigned in Step 1.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> mdo= ISDN-variant,</td>
<td>Specifies the ISDN variant. Options include:</td>
</tr>
<tr>
<td></td>
<td>• ETSI_300_102</td>
</tr>
<tr>
<td></td>
<td>• ETSIS_300_102_C1</td>
</tr>
<tr>
<td></td>
<td>• ATT_41459</td>
</tr>
<tr>
<td></td>
<td>• ATT_41459_C2</td>
</tr>
<tr>
<td></td>
<td>• BELL_1268</td>
</tr>
<tr>
<td></td>
<td>• ETSI_300_172</td>
</tr>
<tr>
<td></td>
<td>• BELL_1268_C3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> custgrpid=</td>
<td>Assigns a customer group ID (the dial plan to use for this connection).</td>
</tr>
<tr>
<td>customer-group-ID,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong> side=</td>
<td>Defines the Cisco VSC3000 as network side or user side. The Cisco VSC3000 is normally network side, opposite to the PBX, which is normally the user side. Enter network, or user,.</td>
</tr>
<tr>
<td>equipment-location,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 8</strong> desc=</td>
<td>Describes the function of this IP path (backhaul service to a specified media gateway, for example Backhaul service to 3660-6).</td>
</tr>
<tr>
<td>description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 9</strong> mml&gt; prov-add:iplnk:name=</td>
<td>Adds an IP link for the PRI D-channel and assigns it a name.</td>
</tr>
<tr>
<td>iplink-name</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 10</strong> if=enif</td>
<td>The Ethernet interface name for the Cisco VSC3000 Ethernet card (typically enif1).</td>
</tr>
<tr>
<td>interface-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 11</strong> ipaddr=</td>
<td>The IP address of the Cisco VSC3000 Ethernet port as defined in ../etc/</td>
</tr>
<tr>
<td>IP_Addr number</td>
<td>XECfgParm.dat (for example, IP_Addr1).</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 12</strong> port=</td>
<td>The port number on the Cisco VSC3000.</td>
</tr>
<tr>
<td>port-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 13</strong> pri=</td>
<td>The selection priority of this IP link. (1, 2 and so on; this should match the selection priority specified on the media gateway for this IP link.)</td>
</tr>
<tr>
<td>priority-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 14</strong> peeraddr=</td>
<td>The IP address of the media gateway.</td>
</tr>
<tr>
<td>IP-address,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 15</strong> peerport=</td>
<td>The port number on the media gateway; does not have to match the Cisco VSC3000 port</td>
</tr>
<tr>
<td>port-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 16</strong> sigslot=</td>
<td>The physical card slot in the media gateway.</td>
</tr>
<tr>
<td>slot-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 17</strong> sigport=</td>
<td>The PRI port number in the media gateway (= the T1/E1 controller number).</td>
</tr>
<tr>
<td>port-number,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 18</strong> svc=</td>
<td>The IP path that this IP link is assigned to, which matches the ipfaspath-name assigned in Step 2.</td>
</tr>
<tr>
<td>ipfaspath-name,</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action | Purpose
--- | ---
Step 19 **desc** = *description* | Optional description of this IP link. For example, **IP link-backhaul svc 3660-6** could describe an IP link for backhaul service to media gateway 3660-6.

Step 20 **mml > prov-add:mgcppath:name** = **MGCP-path-name**, | Defines an MGCP control path. For example, mgcp36606 could define an MGCP path to media gateway 3660-6.

Step 21 **extnode** = *ipfaspath-name*, | Associates the MGCP control path with an IP path for D-channel transport. The *ipfaspath-name* must match the *ipfaspath-name* specified inStep 2.

Step 22 **desc** = *description* | Optional description of this MGCP control path. For example, MGCP service to 3660-6 could describe the function of this MGCP control path.

Step 23 **mml > prov-add:iplnk:name** = *clink6*, | Adds an IP link for the MGCP control path.

Step 24 **if** = *enif1*, | The Ethernet interface name for the Cisco VSC3000 Ethernet card (typically enif1).

Step 25 **ipaddr** = *IP_Addr number*, | The IP address of the Cisco VSC3000 Ethernet port as defined in ../etc/XECfgParm.dat (for example, IP_Addr1).

Step 26 **port** = 2427, | The port used by the IP link for the MGCP control path on the Cisco VSC3000 (2427 is pre-defined for MGCP use).

Step 27 **peeraddr** = *IP-address*, | The IP address of the media gateway connected to this IP link.

Step 28 **peerport** = 2427, | The IP port at the media gateway for this IP link (2427 is pre-defined for MGCP use).

Step 29 **svc** = *mgcp-service-name*, | A name of the MGCP signaling service supported by this IP link. For example, mgcp36606 could be the name for MGCP signaling service to 3660-6).

Step 30 **pri** = 1, | Selection priority for this IP link (1, 2, and so on).

Step 31 **desc** = *description* | Optional description of the IP link for the MGCP control path. For example, MGCP link to 3660-6 could describe the IP link for the MGCP path to 3660-6.

---

- **Verifying the Configuration**, page 73

### Verifying the Configuration

#### SUMMARY STEPS

1. Enter the **show isdn status** command to verify successful ISDN configuration for backhaul. The following output shows that Layers 1, 2, 3 are enabled and active. Layer 3 shows the number of active ISDN calls.

2. Enter the **show backhaul-session-manager set all** command to display all session sets. This set contains one group called grp1, and it is configured in fault-tolerant mode.

3. Enter the **show backhaul-session-manager group status all** command to display the status of all session-groups.

4. Enter the **show backhaul-session-manager session all** command to display all sessions.
DETAILED STEPS

Step 1  Enter the `show isdn status` command to verify successful ISDN configuration for backhaul. The following output shows that Layers 1, 2, 3 are enabled and active. Layer 3 shows the number of active ISDN calls.

In the example below, notice that the Layer 2 protocol is Q.921, and the Layer 3 protocol is BACKHAUL. This verifies that it is configured to backhaul ISDN. Also, if you are connected to a live line, you should see that Layer 1 status is ACTIVE and that layer 2 state is MULTIPLE_FRAME_ESTABLISHED. This means that the ISDN line is up and active.

Example:

```
Router# show isdn status
*00:03:34.423 UTC Sat Jan 1 2000
Global ISDN Switchtype = primary-net5
ISDN Serial1:23 interface
dsl 0, interface ISDN Switchtype = primary-net5
L2 Protocol = Q.921  L3 Protocol(s) = BACKHAUL
Layer 1 Status: ACTIVE  Layer 2 Status:
              TEI = 0, Ces = 1, SAFI = 0, State = MULTIPLE_FRAME_ESTABLISHED
Layer 3 Status:
NLCB:callid=0x0, callref=0x0, state=31, ces=0 event=0x0
NLCB:callid=0x0, callref=0x0, state=0, ces=1 event=0x0
0 Active Layer 3 Call(s)
Activated dsl 0 CCBs = 0
Number of active calls = 0
Number of available B-channels = 23
Total Allocated ISDN CCBs = 0
```

Step 2  Enter the `show backhaul-session-manager set all` command to display all session sets. This set contains one group called grp1, and it is configured in fault-tolerant mode.

Example:

```
Router# show backhaul-session-manager set all
Session-Set
   Name  :set1
   State :BSM_SET_OOS
       Mode  :Fault-Tolerant (FT)
       Option :Option-Client
       Groups :1
           statistics
               Successful switchovers:0
               Switchover Failures:0
               Set Down Count 0
               Group:grp1
```

Possible states are:

SESS_SET_IDLE--A session set has been created.

SESS_SET_OOS--A session has been added to session group. No ACTIVE notification has been received from the Cisco VSC3000.

SESS_SET_ACTIVE_IS--An ACTIVE notification has been received over one in-service session group. STANDBY notification has not been received on any available session group(s).

SESS_SET_STANDBY_IS--A STANDBY notification is received, but no in-service active session group available.
SESS_SET_FULL_IS--A session group in-service that has ACTIVE notification, and at least one session group in-service has STANDBY notification.

SESS_SET_SWITCH_OVER--An ACTIVE notification is received on session group in-service, that had received STANDBY notification.

**Step 3**
Enter the `show backhaul-session-manager group status all` command to display the status of all session-groups. The status is either Group-OutOfService (no session in the group has been established) or Group-Inservice (at least one session in the group has been established).

The Status (use) is either Group-Standby (the Cisco VSC3000 connected to the other end of this group will go into standby mode), Group-Active (the Cisco VSC3000 connected to the other end of this group will be the active Cisco VSC3000), or Group-None (the Cisco VSC3000 has not declared its intent yet).

**Example:**

```
Router# show backhaul-session-manager group status all
Session-Group
Group Name : grp1
  Set Name : set1
  Status : Group-OutOfService
  Status (use) : Group-None
```

**Step 4**
Enter the `show backhaul-session-manager session all` command to display all sessions.
The State is OPEN (the connection is established), OPEN_WAIT (the connection is awaiting establishment), OPEN_XFER (session failover is in progress for this session, which is a transient state), or CLOSE (this session is down, also a transient state). The session moves to OPEN_WAIT after waiting a fixed amount of time.

The Use-status field indicates whether PRI signaling traffic is being transported over this session. The field will be either OOS (this session is not being used to transport signaling traffic) or IS (this session is being used currently to transport all PRI signaling traffic). The User-status field indicates the connection status.

**Example:**

```
Router# show backhaul-session-manager session all
Session information --
Session-id:35
  Group:grp1
  Configuration:
    Local:10.1.2.15      , port:8303
    Remote:10.5.0.3       , port:8303
    Priority:2
    RUDP Option:Client, Conn Id:0x2
  State:
    Status:OPEN_WAIT, Use-status:OOS
  Statistics:
    # of resets:0
    # of auto_resets 0
    # of unexpected RUDP transitions (total) 0
    # of unexpected RUDP transitions (since last reset) 0
    Receive pkts - Total:0 , Since Last Reset:0
    Transmit pkts - Total:0 , Since Last Reset:0
    Transmit Failures (PDU Only)
      Due to Blocking (Not an Error) - Total:0, Since Last Reset:0
      Due to causes other than Blocking - Total:0, Since Last
```
Configuring MGCP POTS Dial Peer

To configure MGCP POTS dial peer on the Cisco 2600 series and Cisco 3660, complete the following commands beginning in global configuration mode:

**SUMMARY STEPS**

1. Router(config)# dial-peer voice number pots
2. Router(config-dial-peer)# application MGCPAPP
3. Router(config-dial-peer)# port slot/port:ds0-group
4. Router(config-dial-peer)# exit

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# dial-peer voice number pots</td>
<td>Enters the dial-peer configuration mode for the POTS dial peer.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-dial-peer)# application MGCPAPP</td>
<td>Initiates MGCP for the voice ports.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-dial-peer)# port slot/port:ds0-group</td>
<td>Associates the dial peer with a specific logical interface.</td>
</tr>
<tr>
<td>Example:</td>
<td>The value of slot is the router location where the voice port adapter is installed. Valid entries are from 0 to 3.</td>
</tr>
<tr>
<td></td>
<td>The value of port indicates the voice interface card location. Valid entries are 0 or 1.</td>
</tr>
<tr>
<td></td>
<td>Each defined DS0 group number is represented on a separate voice port. This allows you to define individual DS0s on the digital T1/E1 card.</td>
</tr>
<tr>
<td><strong>Step 4</strong> Router(config-dial-peer)# exit</td>
<td>Exits dial-peer configuration mode.</td>
</tr>
</tbody>
</table>

**Monitoring and Maintaining**

- Monitoring MGCP CAS PBX and AAL2 PVC Configurations, page 77
- Monitoring and Maintaining Signaling Backhaul, page 77
Monitoring MGCP CAS PBX and AAL2 PVC Configurations

Use these commands at any time to monitor the MGCP configuration:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router# show mgcp connection endpoint statistics</td>
<td>Displays all active MGCP connections on the router.</td>
</tr>
<tr>
<td>Router# debug mgcp [all</td>
<td>errors</td>
</tr>
<tr>
<td>Router# clear mgcp statistics</td>
<td>Resets the MGCP statistical counters.</td>
</tr>
</tbody>
</table>

Monitoring and Maintaining Signaling Backhaul

Use the following commands as required to monitor and maintain the signaling backhaul sessions and the connection to the Cisco VSC3000:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router# clear backhaul-session-manager group</td>
<td>Resets the statistics for all available session groups or a specified session group.</td>
</tr>
<tr>
<td>Router# show backhaul-session-manager set</td>
<td>Displays status, statistics, or configuration of all available session sets.</td>
</tr>
<tr>
<td>Router# show backhaul-session-manager group</td>
<td>Displays status, statistics, or configuration of all available session groups.</td>
</tr>
<tr>
<td>Router# show backhaul-session-manager session</td>
<td>Displays status, statistics, or configuration of all available sessions.</td>
</tr>
<tr>
<td>Router# show isdn status</td>
<td>Displays status of ISDN backhaul. If the connection to the Cisco VSC3000 is lost, the router shuts down Layer 2 so that it cannot receive more calls. When the Cisco VSC3000 connection is back up, you may use this to verify that Layer 2 was also brought back up correctly.</td>
</tr>
</tbody>
</table>

Configuration Examples

- Cisco 2600 Series, page 78
- Cisco 3660, page 84
MGCP CAS Voice FAX Call Examples

- Originating Gateway Configuration Example, page 78
- Terminating Gateway Configuration Example, page 79

Originating Gateway Configuration Example

```
2650-org# show run
Building configuration...
Current configuration:
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 2650-org
!
enable password lab
!
!
memory-size iomem 10
voice-card 1
no ip subnet-zero
no ip domain-lookup
ip dhcp smart-relay
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
mgcp sdp simple
mgcp default-package dt-package
no mgcp timer receive-rtcp
!
controller T1 0/0
  mode atm
  framing esf
  clock source internal
  linecode b8zs
!
controller T1 0/1
!
controller T1 1/0
  framing esf
  linecode b8zs
ds0-group 1 timeslots 1 type esm-immediate-start
ds0-group 2 timeslots 2 type esm-immediate-start
!
controller T1 1/1
!
interface Ethernet0/0
  ip address 1.9.46.170 255.255.0.0
  no cdp enable
!
interface Ethernet0/1
  no ip address
  shutdown
```
no cdp enable
!
interface ATM0/0
no ip address
ip mroute-cache
atm idle-cell-format itu
atm uni-version 4.0
atm voice aal2 aggregate-svc bandwidth 1500
atm voice aal2 aggregate-svc traffic-parameters 1500 1500 65000
atm voice aal2 aggregate-svc upspeed-number 100
atm voice aesa 1111111111.01 application aal2xgcp
atm ilmi-keepalive
pvc 0/5 qsaal
!
pvc 0/16 ilmi
!
ip default-gateway 1.9.0.1
ip kerberos source-interface any
ip classless
no ip http server
!
no cdp run
!
snmp-server engineID local 00000009020000505474780
no snmp-server ifindex persist
snmp-server forwarder
snmp-server manager
!
voice-port 1/0:1
!
voice-port 1/0:2
!
dial-peer cor custom
!
!
dial-peer voice 1 pots
application mgcppapp
port 1/0:1
forward-digits all
!
dial-peer voice 2 pots
application mgcppapp
port 1/0:2
forward-digits all
!
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
password lab
login
!
end
2650-org#

Terminating Gateway Configuration Example

2650-trm# show run
Building configuration...
Current configuration:
!
version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 2650-trm
! boot system flash
! memory-size iomem 20
voice-card 1
  ip subnet-zero
  no ip domain-lookup
  ip host dirt 223.255.254.254
  ip dhcp smart-relay
mgcp
  mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
  mgcp modem passthrough voa12 mode nse
  mgcp sd p simple
  mgcp default-package dt-package
  no mgcp timer receive-rtcp

! controller T1 0/0
  mode atm
    framing esf
    clock source internal
    linecode b8zs

controller T1 1/0
  framing esf
  linecode b8zs
ds0-group 1 timeslots 1 type e&m-immediate-start
ds0-group 2 timeslots 2 type e&m-immediate-start
ds0 busyout 24

! interface FastEthernet0/0
  ip address 1.9.46.150 255.255.0.0
  duplex auto
  speed auto

interface FastEthernet0/1
  no ip address
  shutdown
  duplex auto
  speed auto

interface ATM0/0
  no ip address
  ip mroute-cache
  atm idle-cell-format itu
  atm uni-version 4.0
  atm voice aal2 aggregate-svc bandwidth 1500
  atm voice aal2 aggregate-svc traffic-parameters 1500 1500 65000
  atm voice aal2 aggregate-svc upspeed-number 100
  atm voice aesa 222222222222.01 application aal2xgp
  atm ilmi-keepalive
  pvc 0/5 qsaal
  pvc 0/16 ilmi

! ip default-gateway 1.9.0.1
  ip kerberos source-interface any
  ip classless
  ip route 0.0.0.0 0.0.0.0 1.9.0.1
  no ip http server

! snmp-server engineID local 00000009020000024B1345A0
  no snmp-server ifindex persist
  snmp-server forwarder
  snmp-server manager
! voice-port 1/0:1
! voice-port 1/0:2
! dial-peer cor custom
!
! dial-peer voice 1 pots
  application mgcpapp
  port 1/0:1
  forward-digits all
!
! dial-peer voice 2 pots
  application mgcpapp
  port 1/0:2
  forward-digits all
!
! line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
login
!
end
2650-trm#

MGCP PRI Backhaul Configuration Examples

- Originating Gateway Configuration Example, page 81
- Terminating Gateway Configuration Example, page 83

Originating Gateway Configuration Example

2650-org# show run
Building configuration...
Current configuration:
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 2650-org
!
enable password lab
!
!
memory-size iomem 10
voice-card 1
no ip subnet-zero
no ip domain-lookup
ip dhcp smart-relay
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
mgcp sdp simple
mgcp default-package dt-package
no mgcp timer receive-rtcp
backhaul-session-manager
set vsc2_set client nft
group vsc2_grp set vsc2_set
    session group vsc2_grp 1.9.64.23 8004 1.9.46.170 8004 1
isdn switch-type primary-5ess
call rsvp-sync
!
!
caller T1 0/0
mode atm
framing esf
clock source internal
linecode b8zs
!
caller T1 0/1
!
caller T1 1/0
framing esf
linecode b8zs
pri-group timeslots 1-24 service mgcp
!
caller T1 1/1
!
!
interface Ethernet0/0
ip address 1.9.46.170 255.255.0.0
no cdp enable
!
interface Ethernet0/1
no ip address
shutdown
no cdp enable
!
interface ATM0/0
no ip address
ip mroute-cache
atm idle-cell-format itu
atm uni-version 4.0
atm voice aal2 aggregate-svc bandwidth 1500
atm voice aal2 aggregate-svc traffic-parameters 1500 1500 65000
atm voice aal2 aggregate-svc upspeed-number 100
atm voice aesa 111111111111.01 application aal2xgcp
atm ilmi-keepalive
pvc 0/5 qsaal
!
pvc 0/16 ilmi
!
interface Serial1/0:23
no ip address
ip mroute-cache
no logging event link-status
isdn switch-type primary-5ess
isdn incoming-voice voice
isdn bind-l3 backhaul vsc2_set
no cdp enable
!
ip default-gateway 1.9.0.1
ip kerberos source-interface any
ip classless
no ip http server
!
no cdp run
!
-snmp-server engineID local 000000090200005054747880
no snmp-server ifindex persist
snmp-server forwarder
snmp-server manager
!
dial-peer cor custom
!

Terminating Gateway Configuration Example

```
! 
! line con 0 
  exec-timeout 0 0 
  transport input none 
line aux 0 
line vty 0 4 
  password lab 
  login 
! 
no scheduler allocate 
end

Terminating Gateway Configuration Example

2650-trm# show run 
Building configuration... 
Current configuration: 
! 
version 12.1 
no service pad 
service timestamps debug uptime 
service timestamps log uptime 
no service password-encryption 
! 
hostname 2650-trm 
! 
boot system flash 
! 
! 
memory-size iomem 20 
voice-card 1 
  ip subnet-zero 
  no ip domain-lookup 
  ip host dirt 223.255.254.254 
  ip dhcp smart-relay 
! 
mgcp 
  mgcp call-agent 1.9.64.23 service-type mgcp version 0.1 
  mgcp modem passthrough voaal2 mode nse 
  mgcp adp simple 
  mgcp default-package dt-package 
  no mgcp timer receive-rtcp 
  backhaul-session-manager 
  set vscl_set client nft 
  group vsclgrp set vscl_set 
  session group vsclgrp 1.9.64.23 8000 1.9.46.150 8000 1 
  isdn switch-type primary-5ess 
  call rsvp-sync 
  srcp 5555 
  ! 
  ! 
  controller T1 0/0 
    mode atm 
    framing esf 
    clock source internal 
    linecode b8zs 
  ! 
  controller T1 1/0 
    framing esf 
    linecode b8zs 
    pri-group timeslots 1-24 service mgcp 
  ! 
  ! 
  interface FastEthernet0/0
```
ip address 1.9.46.150 255.255.0.0
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface ATM0/0
no ip address
ip mroute-cache
atm idle-cell-format itu
atm uni-version 4.0
atm voice aal2 aggregate-svc bandwidth 1500
atm voice aal2 aggregate-svc traffic-parameters 1500 1500 65000
atm voice aal2 aggregate-svc upspeed-number 100
atm voice aesa 222222222222.01 application aal2xgcp
atm ilmi-keepalive
pvc 0/5 qsaal
pvc 0/16 ilmi
!

interface Serial1/0:23
no ip address
ip mroute-cache
no logging event link-status
isdn switch-type primary-5ess
isdn incoming-voice voice
isdn bind-l3 backhaul vscl_set
no cdp enable
!
ip default-gateway 1.9.0.1
ip kerberos source-interface any
ip classless
ip route 0.0.0.0 0.0.0.0 1.9.0.1
no ip http server
!
!
snmp-server engineID local 00000009020000024B1345A0
no snmp-server ifindex persist
snmp-server forwarder
snmp-server manager
!
voice-port 1/0:23
!
dial-peer cor custom
!
!
!
!
line con 0
exec-timeout 0 0
transport input none
line aux 0
line vty 0 4
login
!
!
!
no scheduler allocate
end
2650-trm#

Cisco 3660

- MGCP CAS Call Examples, page 85
- VoATM with AAL2 Trunking CAS Call Examples, page 86
- VoATM with AAL2 Trunking CCS Call Examples, page 88
MGCP CAS Call Examples

- Originating Gateway Configuration Example, page 85
- Terminating Gateway Configuration Example, page 85

**Originating Gateway Configuration Example**

```
3660-org# show run
!
ccontroller T1 3/0
  framing esf
clock source internal
dlinecode b8zs
ds0-group 1 timeslots 1 type e&m-immediate-start
!
interface ATM2/0
tima-group 0
!
interface ATM2/1
tima-group 0
!
interface ATM2/2
tima-group 0
!
interface ATM2/3
tima-group 0
!
interface ATM2/IMA0
  mtu 17998
  ip address 2.2.2.2 255.255.255.0
  pvc 65/100
    protocol ip 2.2.2.1 broadcast
    encapsulation aal5snap
 !
  ip address 2.2.2.1 255.255.255.0
  pvc 65/101
    vbr-rt 1400 1400 60000
    vcci 2
    encapsulation aal2
  
  voice-port 3/0:1
  
  dial-peer voice 1 pots
    application mgcpapp
    port 3/0:1
  
end
```

**Terminating Gateway Configuration Example**

```
3660-trm# show run
memory-size iomem 30
mgcp
  mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
  no mgcp timer receive-rtcp
  isdn voice-call-failure 0
  call rsvp-sync
!
ccontroller T1 1/0
  framing esf
  clock source internal
```
VoATM with AAL2 Trunking CAS Call Examples

- Originating Gateway Configuration Example, page 86
- Terminating Gateway Configuration Example, page 87

**Originating Gateway Configuration Example**

```
3660-org# show run
!
controller T1 3/0
  framing esf
clock source internal
  linemode b8zs
ds0-group 1 timeslots 1 type e&m-immediate-start
ds0-group 2 timeslots 2 type e&m-immediate-start
!
interface ATM2/0
  ima-group 0
!
interface ATM2/1
  ima-group 0
  no scrambling-payload
!
interface ATM2/2
  ima-group 0
!
interface ATM2/3
  ima-group 0
!
interface ATM2/IMA0
  mtu 17998
  ip address 2.2.2.2 255.255.255.0
  vcci 2
  encapsulation aal2
!
voice-port 1/0:1
!
dial-peer voice 1 pots
  application mgcpapp
  port 1/0:1
!
end
```
pvc 65/100
   protocol ip 2.2.2.1 broadcast
   encapsulation aal5snap
!
pvc 65/101
   vbr-rt 1400 1400 60000
   vcci 2
   encapsulation aal2
!
! voice-port 3/0:1
   connection trunk 7200000
!
! voice-port 3/0:2
   connection trunk 7200002
!
dial-peer voice 20 pots
   destination-pattern 7100000
   port 3/0:1
!
dial-peer voice 21 voatm
   destination-pattern 7200000
   session protocol aal2-trunk
   session target ATM2/IMA0 pvc 65/101 101
   signal-type trans
   codec aal2-profile ITUT 1 g711ulaw
   no vad
!
dial-peer voice 22 pots
   destination-pattern 7100002
   port 3/0:2
!
dial-peer voice 2003 voatm
   destination-pattern 7200002
   session protocol aal2-trunk
   session target ATM2/IMA0 pvc 65/101 102
   signal-type trans
   codec aal2-profile ITUT 1 g711ulaw
   no vad
!
end

Terminating Gateway Configuration Example

3660-trm# show run
memory-size iomem 30
!
controller T1 1/0
   framing esf
   clock source internal
   linecode b8zs
   ds0-group 1 timeslots 1 type e&m-immediate-start
   ds0-group 2 timeslots 2 type e&m-immediate-start
!
interface ATM3/0
   ima-group 0
!
interface ATM3/1
   ima-group 0
!
interface ATM3/2
   ima-group 0
!
interface ATM3/3
   ima-group 0
!
interface ATM3/IMA0
   mtu 17998
   ip address 2.2.2.1 255.255.255.0
   pvc 65/100
   protocol ip 2.2.2.2 broadcast
encapsulation aal5snap  
!  
pvc 65/101  
vbr-rt 1400 1400 60000  
vcci 2  
encapsulation aal2  
!  
voice-port 1/0:1  
  connection trunk 7200000  
voice-port 1/0:2  
  connection trunk 7200002  
dial-peer voice 20 pots  
  destination-pattern 7100000  
  port 1/0:1  
dial-peer voice 21 voatm  
  destination-pattern 7200000  
  session protocol aal2-trunk  
  session target ATM3/IMA0 pvc 65/101 101  
  signal-type trans  
  codec aal2-profile ITUT 1 g711ulaw  
  no vad  

dial-peer voice 22 pots  
  destination-pattern 7100002  
  port 1/0:2  

dial-peer voice 2002 voatm  
  destination-pattern 7200002  
  session protocol aal2-trunk  
  session target ATM3/IMA0 pvc 65/101 102  
  signal-type trans  
  codec aal2-profile ITUT 1 g711ulaw  
  no vad  
!  
end

VoATM with AAL2 Trunking CCS Call Examples

- Originating Gateway Configuration Example, page 88
- Terminating Gateway Configuration Example, page 89

Originating Gateway Configuration Example

3660-org# show run  
!  
controller T1 3/0  
  mode ccs frame-forwarding  
  framing esf  
  clock source internal  
  linecode b8zs  
  channel-group 23 timeslots 24 speed 64  
  ds0-group 0 timeslots 1 type ext-sig  
!  
interface ATM2/1  
  ima-group 0  
!  
interface ATM2/2  
  ima-group 0  
!  
interface ATM2/3  
  ima-group 0  
!  
interface ATM2/4  
  ima-group 0
! interface ATM2/IMA0
  mtu 17998
  ip address 2.2.2.1 255.255.255.0
  no atm ilmi-keepalive
  atm voice aal2 aggregate-svc upspeed-number 0
  pvc 65/100
    protocol ip 2.2.2.2 broadcast
    encapsulation aal5snap
  !
  pvc 65/101
    vbr-rt 500 500 500
    encapsulation aal2
  !
  pvc 65/102
    vbr-rt 500 500 500
    encapsulation aal5mux voice
  !
  interface Serial3/0:23
    no ip address
    no keepalive
    ccs encap atm
    ccs connect ATM2/IMA0 pvc 65/102
  !
  voice-port 3/0:0
    connection trunk 2000
  !
  dial-peer cor custom
  !
  dial-peer voice 1000 pots
    destination-pattern 1000
    port 3/0:0
  !
  dial-peer voice 2000 voatm
    destination-pattern 2000
    called-number 1000
    session protocol aal2-trunk
    session target ATM2/IMA0 pvc 65/101 100
    signal-type ext-signal
    codec aal2-profile ITUT 1 g711ulaw
    no vad
  !
end

Terminating Gateway Configuration Example

3660-trm# show run
!
controller T1 1/0
  mode ccs frame-forwarding
  framing esf
  clock source internal
  linecode b8zs
  channel-group 23 timeslots 24 speed 64
  ds0-group 0 timeslots 1 type ext-sig
  !
  interface Serial1/0:23
    no ip address
    no keepalive
    ccs encap atm
    ccs connect ATM3/IMA0 pvc 65/102
  !
  interface ATM3/0
    ima-group 0
  !
  interface ATM3/IMA0
    mtu 17998
    ip address 2.2.2.2 255.255.255.0
no atm iimi-keepalive
atm voice aal2 aggregate-svc upspeed-number 0
pvc 65/100
  protocol ip 2.2.2.1 broadcast
  encapsulation aal5snap
!
pvc 65/101
  vbr-rt 500 500 500
  encapsulation aal2
!
pvc 65/102
  vbr-rt 500 500 500
  encapsulation aal5mux voice
!
!
voice-port 1/0:0
  connection trunk 2000
!
dial-peer voice 1000 pots
  destination-pattern 1000
  port 1/0:0
!
dial-peer voice 2000 voatm
  destination-pattern 2000
  called-number 1000
  session protocol aal2-trunk
  session target ATM3/IMA0 pvc 65/101 100
  signal-type ext-signal
  codec aal2-profile ITUT 1 g711ulaw
  no vad
!
end

PRI Q.931 Signaling Backhaul Examples

- Originating Gateway Configuration Example, page 90
- Terminating Gateway Configuration Example, page 91

Originating Gateway Configuration Example

3660-org# show run
memory-size iomem 30
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
mgcp sdv simple
mgcp default-package dt-package
no mgcp timer receive-rtcp
backhaul-session-manager
  set vscl_set client nft
  group vscl_grp set vscl_set
  session group vscl_grp 1.9.64.23 8004 1.9.47.55 8004 1
isdn switch-type primary-5ess
isdn voice-call-failure 0
call rsvp-sync
!
voice class codec 1
!
controller T1 1/0
framing esf
linecode b8zs
pri-group timeslots 1-24 service mgcp
!
interface Serial1/0:23
 no ip address
 ip mroute-cache
 no logging event link-status
 isdn switch-type primary-5ess
 isdn incoming-voice voice
 isdn bind-l13 backhaul vscl_set
 no cdp enable

! interface ATM2/0
 ima-group 0
 ! interface ATM2/1
 ima-group 0
 ! interface ATM2/2
 ima-group 0
 ! interface ATM2/3
 ima-group 0
 ! interface ATM2/IMA0
 mtu 17998
 ip address 2.2.2.2 255.255.255.0
 no atm ilmi-keepalive
 atm voice aal2 aggregate-svc bandwidth 1536
 atm voice aal2 aggregate-svc traffic-parameters 1536 1536 65536
 atm voice aal2 aggregate-svc upspeed-number 100
 atm voice aesa AAAAAAAAAA.01 application aal2xgcp
 pvc 0/5 qsaal
 !
 pvc 0/16 ilmi
 !
 pvc 65/100
 protocol ip 2.2.2.1 broadcast
 encapsulation aal5snap
 !
 pvc 65/101
 vbr-rt 1400 1400 60000
 vcci 2
 encapsulation aal2
 !
 !
 voice-port 1/0:23
 !
 dial-peer voice 1 pots
 application mgcpapp
 forward-digits all
 !
 !
 gatekeeper
 shutdown
 !
 line con 0
 exec-timeout 0 0
 privilege level 15
 transport input none
 line aux 0
 line vty 0 4
 login
 !
 scheduler allocate 5000 3000
 end

Terminating Gateway Configuration Example

3660-trm# show run
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
mgcp sdp simple
mgcp default-package dt-package
going no mgcp timer receive-rtcp
backhaul-session-manager
set vscl_set client nft
group vscl_grp set vscl_set
session group vscl_grp 1.9.64.23 8000 1.9.48.41 8000
isdn switch-type primary-5ess
isdn voice-call-failure 0
call rsvp-sync
!
!
!
!
controller T1 1/0
framing esf
clock source internal
linecode b8zs
pri-group timeslots 1-24 service mgcp
interface Serial1/0:23
isdn switch-type primary-5ess
isdn incoming-voice voice
isdn bind-l13 backhaul vscl_set
interface ATM3/0
ima-group 0
!
interface ATM3/1
ima-group 0
!
interface ATM3/2
ima-group 0
!
interface ATM3/3
ima-group 0
!
interface ATM3/IMA0
mtu 17998
ip address 2.2.2.1 255.255.255.0
no atm ilmi-keepalive
atm voice aa12 aggregate-svc bandwidth 1536
atm voice aa12 aggregate-svc traffic-parameters 1536 1536 65536
atm voice aa12 aggregate-svc upspeed-number 100
atm voice aesa 999999999999.01 application aa12xgcp
pvc 0/5 qsaal
!
pvc 0/16 ilmi
!
pvc 65/100
protocol ip 2.2.2.2 broadcast
encapsulation aal5snap
!
pvc 65/101
vbr-rt 1400 1400 60000
vccl 2
encapsulation aal2
!
voice-port 1/0:23
!
dial-peer voice 1 pots
application mgcpapp
!
end

PRI Q.931 Signaling Backhaul CAS Call Examples
Originating Gateway Configuration Example

3660-org# show run
memory-size iomem 30
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
no mgcp timer receive-rtcp
call rsvp-sync
!
voice class codec 1
!
!
!
!
!
!
controller T1 3/0
framing esf
clock source internal
linecode b8zs
ds0-group 1 timeslots 1 type e&m-immediate-start
!
interface ATM2/0
ima-group 0
!
interface ATM2/1
ima-group 0
!
interface ATM2/2
ima-group 0
!
interface ATM2/3
ima-group 0
!
interface ATM2/IMA0
mtu 17998
ip address 2.2.2.2 255.255.255.0
no atm ilmi-keepalive
atm voice aal2 aggregate-svc bandwidth 1536
atm voice aal2 aggregate-svc traffic-parameters 1536 1536 65536
atm voice aal2 aggregate-svc upspeed-number 100
atm voice aesa AAAAAAAAAAAA.01 application aal2xgcp
pvc 0/5 qsaai
!
pvc 0/16 ilmi
!
pvc 65/100
protocol ip 2.2.2.1 broadcast
encapsulation aal5snap
!
voice-port 3/0:1
!
dial-peer voice 1 pots
application mgcpapp
port 3/0:1
forward-digits all
!
end
Terminating Gateway Configuration Example

3660-trm# show run
!
mgcp
mgcp call-agent 1.9.64.23 service-type mgcp version 0.1
mgcp modem passthrough voaal2 mode nse
no mgcp timer receive-rtcp
isdn voice-call-failure 0
call rsvp-sync
!
controller T1 1/0
framing esf
clock source internal
linecode b8zs
ds0-group 1 timeslots 1 type e&m-immediate-start
!
interface ATM3/0
  ima-group 0
!
interface ATM3/1
  ima-group 0
!
interface ATM3/2
  ima-group 0
!
interface ATM3/3
  ima-group 0
!
interface ATM3/IMA0
mtu 17998
ip address 2.2.2.1 255.255.255.0
no atm ilmi-keepalive
atm voice aal2 aggregate-svc bandwidth 1536
atm voice aal2 aggregate-svc traffic-parameters 1536 1536 65536
atm voice aal2 aggregate-svc upspeed-number 100
atm voice aesa 999999999999.01 application aal2xgcp
  pvc 0/5 qsaal
 !
  pvc 0/16 ilmi
!
  pvc 65/100
  protocol ip 2.2.2.2 broadcast
  encapsulation aal5snap
!
  voice-port 1/0:1
!
dial-peer voice 1 pots
  application mgcpapp
  port 1/0:1
!
end

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the Cisco IOS Asynchronous Transfer Mode Command Reference. For information about all Cisco IOS commands, go to the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or to the Cisco IOS Master Commands List.

- vbd-playout-delay maximum
- vbd-playout-delay minimum
- vbd-playout-delay mode
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: CS and SAR. AALs differ on the basis of the source-destination timing used, whether they use CBR or 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.

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.

Backhaul -- A scheme where telephony signaling is reliably transported from a gateway to a Media Gateway Controller across a packet switched network.

BGW -- see Business Gateway

Business Gateway -- An xGCP media gateway which is a business customer premises equipment that has connection(s) to the VoIP network as well as connection(s) to the user’s telephony equipment (typically a PBX, a corporate LAN or WAN). Such gateways are used to eliminate or reduce the need for individual medium (voice, data, and so forth) connectivity.

CA -- see Call Agent

Call Agent -- An intelligent entity in an IP telephony network which handles call control in an MGCP model Voice over IP network.

CAS -- channel associated signaling. A form of signaling that the circuit state is indicated by one or more bits of signaling status sent repetitively and associated with that specific circuit. CAS is used on a T1 line. With CAS, a signaling element is dedicated to each channel in the T1 frame. This type of signaling is sometimes called Robbed Bit Signaling (RBS) because a bit is taken out (or robbed) from the user's data stream to provide signaling information to and from the switch.

CBR-- constant bit rate. QoS class defined by the ATM Forum for ATM networks. CBR is used for connections that depend on precise clocking to ensure undistorted delivery.

CCS -- common channel signaling. A signaling system used in telephone networks that separates signaling information from user data. A specified channel is exclusively designated to carry signaling information for all other channels in the system.

CID -- channel identifier

CLASS -- Custom Local Area Subscriber Services, usually referred to as "Custom Calling" features

Codec -- Coder-decoder. Device that typically uses pulse code modulation to transform analog signals into a digital bit stream and digital signals back into analog signals. In Voice over ATM, it specifies the voice coder rate of speech for a dial peer.

Dial peer -- An addressable call endpoint. In Voice over ATM, there are two kinds of dial peers: POTS and VoATM.
**DS-0**—digital signal level 0. Framing specification used in transmitting digital signals over a single channel at 64-kbps on a T1 facility. A 64-K B-channel on an E1 or T1 WAN interface.

**DTMF**—dual tone multifrequency. A type of signaling that combines two distinct frequencies to generate a tone for each digit or character dialed. Sometimes referred to as Touchtone. This analog dial signaling uses two distinct tones to represent dialing digits.

**E&M**—Stands for 2-wire or 4-wire interfaces with separate signaling paths (from "Ear and Mouth", also "recEive and transMit"). E&M is a trunking arrangement generally used for two-way switch-to-switch or switch-to-network connections. Cisco’s analog E&M interface is an RJ-48 connector that allows connections to PBX trunk lines (tie lines). E&M connections are also available on E1 and T1 digital interfaces.

**Fault Tolerance**—The level of ability within a system to operate properly even if errors occur.

**FXO**—Foreign Exchange Office. An FXO interface connects to the PSTN’s central office and is the interface offered on a standard telephone. Cisco’s FXO interface is an RJ-11 connector that allows an analog connection to be directed at the PSTN’s central office. This interface is of value for off-premise extension applications.

**FXS**—Foreign Exchange Station. An FXS interface connects directly to a standard telephone and supplies ring, voltage, and dial tone. Cisco’s FXS interface is an RJ-11 connector that allows connections to basic telephone service equipment, keysets, and PBXs.

**Layer 1**—This describes the Physical Layer of the OSI Reference Model defined in ITU X.200. It is responsible for the electric signal being sent and received. This can be viewed as a bit stream coming in, and going out, of the system. Scope must be considered when using this term. For example, Layer 1 on a T1 is 1.544 Mbps but Layer 1 on a DS-0 timeslot in the T1 is 64 kbps.

**Layer 2**—This describes the Datalink Layer of the OSI Reference Model defined in ITU X.200. It is responsible for point-to-point delivery of a PDU. Layer 2 protocols have two basic classes: reliable (meaning delivery is guaranteed or an error is reported) and unreliable (meaning delivery may not occur with no indication to the upper layers).

**Layer 3**—This describes the Network Layer of the OSI Reference Model defined in ITU X.200. It is responsible for the network routing and delivery of a message. Examples of Layer 3 protocols include X.25 Packet Layer Protocol and the Internet Protocol. Q.931 is not considered a Layer 3 protocol because it is not concerned with routing and delivery of a message but rather the message body itself.

**Media Gateway**—Equipment that connects the PSTN or a PBX with the VoIP network. It is controlled by a Call Agent via MGCP. A Media Gateway terminates facilities (trunks), packetizes the PCM stream into IP/ATM and/or forwards packets into the IP/ATM network. It performs these functions in reverse order for media streams flowing from the packet network to the PSTN.

**MG**—see Media Gateway.

**MGC**—Media Gateway Controller. A Media Gateway Controller provides call control capability to handle signaling traffic from a variety of sources. It also manages connections and resources of its Media Gateways. Can also be called a Call Agent.

**MGCP**—Media Gateway Control Protocol

**Package**—A set of parameter values that define a type of voice endpoint or connection. Examples include line-package, trunk-package, dtmf-package, and atm-package.

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

**PCM**—pulse code modulation. Technique of encoding analog voice into a 64-kbit data stream by sampling with eight-bit resolution at a rate of 8000 times per second.

**PDU**—protocol data unit. OSI term for packet.
PLAR --private line, automatic ringdown. Leased voice circuit that connects two single endpoints together. When either telephone handset is taken off-hook, the remote telephone automatically rings.

POTS --plain old telephone service. Basic telephone service supplying standard single line telephones, telephone lines, and access to the PSTN.

POTS dial peer --Dial peer connected via a traditional telephony network. POTS peers point to a particular voice port on a voice network device.

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 POTS.

RSIP--ReStart In Progress. MGCP command used to indicate that a span (or collection of spans) has come into service, has gone out of service, or is about to go out of service.

SPVC --soft permanent virtual circuit. A generic term for any communications medium that is permanently provisioned at the end points, but switched in the middle. In ATM, there are two kind of SPVCs: smart permanent virtual path connections (SPVPCs) and Smart permanent virtual channel connections (SPVCC).