Switched 56K Digital Dial-in Over Channelized T1 and Robbed Bit Signaling

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Feature Summary

Internet Service Providers can provide switched 56 kbps access to their customers using a Cisco AS5300 or Cisco AS5200. This document describes how to enable switched 56 kbps services over channelized T1 (CT1) robbed bit signaling (RBS) connections.

Switched 56K digital dial-in enables many services for ISPs. When using traditional ISDN PRI, the access server uses the bearer capability to determine the type of service. However when providing switched 56K over a CT1 RBS connection, the DS0s in the access server can be configured to provide either modem or 56 kbps data service. The dial-in user can access a 56 kbps data connection using either an ISDN BRI connection or a 2- or 4-wire switched 56 kbps connection. The telco to which the access server connects must configure its switches to route 56 kbps data calls and voice (modem) calls to the appropriate DS0.

Likewise, an enterprise can provide switched 56 kbps digital dial-in services to its full time telecommuters or small remote offices using ISDN PRI or a CT1 RBS connection.

For more information about how this feature works and some solutions samples, see the "Functional Description" section on page 3 later in this document.

Benefits

- Enables ISDN BRI clients to connect to a Cisco AS5300 or Cisco AS5200 over switched 56K and T1 CAS.
- Provides switched 56K dial-in services over T1 CAS to remote clients that do not have access to ISDN BRI. For example, a remote PC making digital calls over a 2- or 4-wire switched 56 kbps connection and a CSU.

List of Terms

Channelized T1 (CT1)—Access link operating at 1.544 Mbps, which is subdivided into 24 channels (also known as timeslots) of 64 kbps each. The individual channels or groups of channels connect to different destinations. A CT1 line interfaces with a T1 controller, which is a logical device inside the access server that defines parameters such as line coding and framing. The controller is configured with CAS (also known as robbed bit signaling), which is issued with the **cas-group (controller t1)** command.

CSU/DSU—Channel Service Unit/Data Service Unit (CSU/DSU). The CSU is a device that performs protective and diagnostic functions for a telecommunications line. The DSU is a device that converts digital data into analog signals that can be sent over a dedicated telephone line. Typically, the two devices are packaged as a single unit. You can think of it as a very high-powered and expensive modem. Such a device is required for both ends of a T-1 or T-3 connection, and the units at both ends must be from the same manufacturer.

Switched 56K—A two- or four wire 56 Kbps digital connection that is commonly used for dial-in remote access. In addition to offering the flexibility of access on demand, switched 56K applications include video conferencing, access to Frame Relay networks, file transfer, and LAN interconnection.

Restrictions

- Only switched 56K over T1 is supported. Switched 56K over E1 is not supported.
- If you do not want to dedicate all the DS0s or timeslots on a single T1 to switched 56K services, be sure to negotiate with the telco about which DS0s will support switched 56K and which DS0s will not. Analog modem calls are not supported over DS0s that are provisioned for switched 56K. For an example configuration, see the section “Switched 56K and Analog Modem Calls Over Separate T1 CAS Lines” on page 9.
- Dialing out with switched 56K is not supported at this time. A Cisco AS5300 or Cisco AS5200 only supports incoming switched 56K calls.
- The telco must configure its side of the T1 connection to deliver 56 kbps data calls to the correct range of DS0s.
- Certain types of T1 lines might not support this service (for example, Loop Start and Ground Start). Some telcos might not offer this service.

Note A CSU is built into the Cisco AS5300 and Cisco AS5200.

Platforms

This feature is supported on the following platforms:

- Cisco AS5300
- Cisco AS5200
- For 2- and 4-wire switched services, the remote end point must be compatible with the telco's service. For BRI end points, the remote device can be any BRI device the supports 56 kbps.

Prerequisites

- The remote device could be an ISDN BRI end point such as a terminal adapter or BRI router. In this scenario, the CSU/DSU is irrelevant. For 2- or 4-wire switched 56K remote clients, the remote end point must be compatible with the carrier's service. Different carriers may implement different versions switched 56K end points.
- A CSU/DSU must be present at the remote client side of the connection. Otherwise, switched 56K connections are not possible. The Cisco AS5300 and Cisco AS5200 access servers have built-in CSU/DSUs.
- Cisco IOS Release 11.3(2)T or later must be running on the access server.

Supported MIBs and RFCs

The POP_MIB is supported

Functional Description

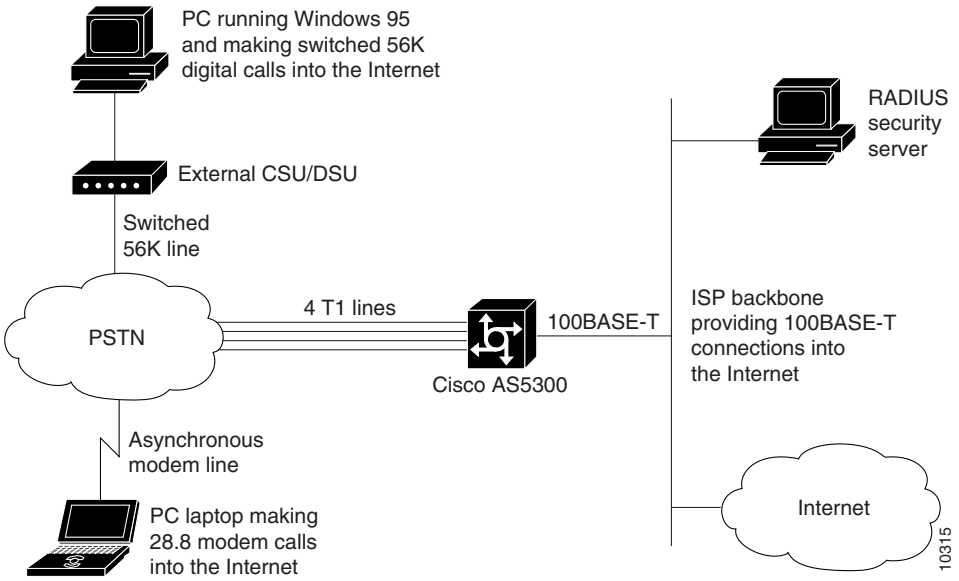
The following scenario descriptions are provided, which show multiple applications for supporting switched 56K over T1 CAS:

- Switched 56K and Analog Modem Calls into T1 CAS
- Basic Call Processing Components
- ISDN BRI Calls into T1 CAS

Switched 56K and Analog Modem Calls into T1 CAS

Figure 1 shows a sample network scenario using switched 56K. Two remote PCs are dialing in to the same Cisco AS5300 to get access to the Internet. The desktop PC is making switched 56K digital calls through an external CSU/DSU. The laptop PC is making analog modem calls through a 28.8 kbps modem. The Cisco AS5300 dynamically assigns IP addresses to each node and forwards data packets off to the switched 56K channels and onboard modems respectively.

Figure 1 PCs Making Switched 56K and Analog Modem Calls into a Cisco AS5300



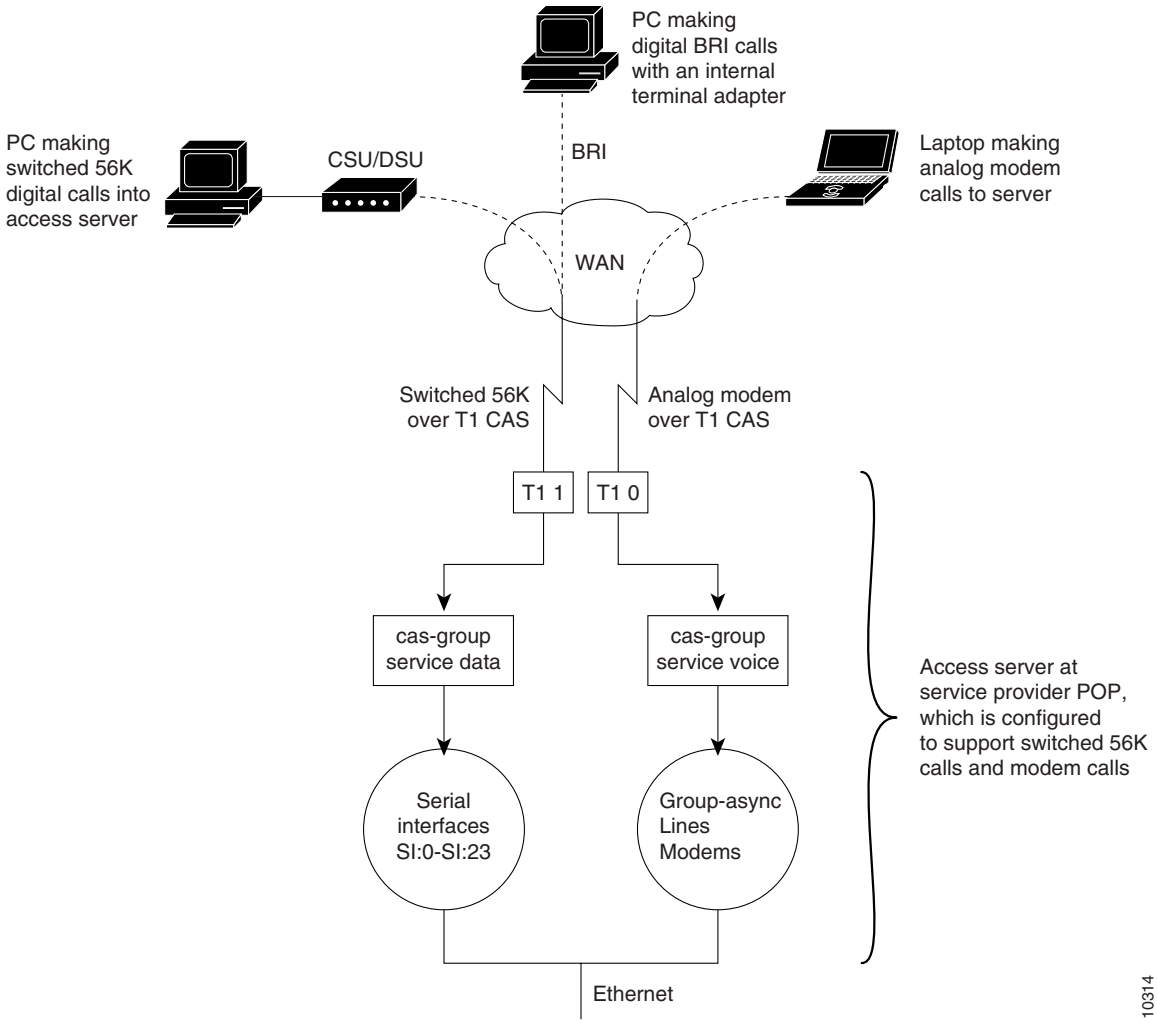
For the startup running configuration on the Cisco AS5300 shown in Figure 1, see the section "Comprehensive Switched 56K Startup Configuration Example" on page 9.

Basic Call Processing Components

Figure 2 shows the basic components that process switched 56K calls and analog modem calls on board a Cisco AS5300 and AS5200. Switched 56K and modem calls are signaling using robbed bit signaling. Digital switched 56K calls utilize logical serial interfaces just like in ISDN PRI. Modem calls utilize asynchronous interfaces, lines, and modems.

Note The BRI terminal must originate its calls with a bearer capability of 56 kbps.

Figure 2 Processing Components for Switched 56K Calls Versus Analog Modem Calls



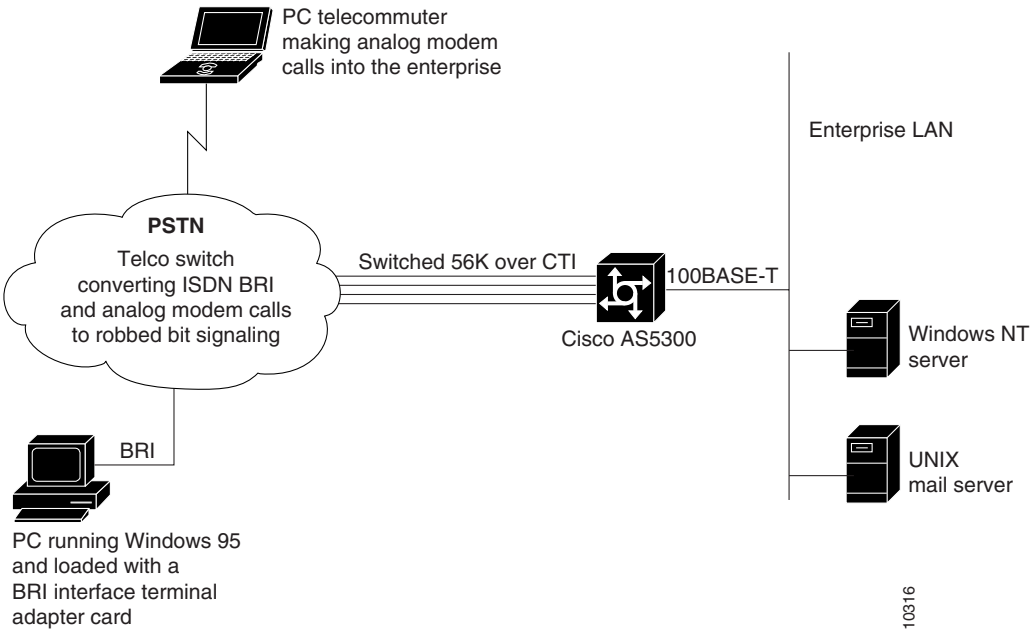
Note The Cisco IOS software does enable you to configure one T1 controller to support both switched 56K digital calls and analog modem calls. In this scenario, Figure 2 would show all calls coming into the access server through one T1 line and controller. However, if you do this, be sure to negotiate with the Telco about which DS0s will support switched 56K services and which DS0s will not. On the access server, analog modem calls are not supported over DS0s that are provisioned for switched 56K. For an example software configuration, see the section "Mixture of Switched 56K and Modem Calls Over CT1 CAS" on page 8.

ISDN BRI Calls into T1 CAS

Figure 3 shows how switched 56K functionality can be used to forward ISDN BRI network traffic to a Cisco AS5300, which is configured for switched 56K robbed bit signaling over CT1.

Note The BRI terminal must originate its calls with a bearer capability of 56 kbps.

Figure 3 Remote PC Making BRI Digital Calls via Switched 56K to a Cisco AS5300



For the startup running configuration on the Cisco AS5300 shown in Figure 3, see the section "Comprehensive Switched 56K Startup Configuration Example" on page 9.

Configuration Tasks

This section describes how to configure switched 56K services on an access server. After the **cas-group** command is enabled for switched 56K services, a logical serial interface is automatically created for each 56K channel, which must also be configured.

To configure an access server to support switched 56K digital calls, complete the following tasks beginning in Privileged EXEC mode:

Task		Command
Step 1	Enter global configuration mode.	**configure terminal**
Step 2	Specify a T1 controller.	**controller t1** *number*
Step 3	Set the framing.	**framing** {**sf** | **esf**}
Step 4	Define the line code.	**linecode** {**ami** | **b8zs**}
Step 5	Specify the clocking.	**clock source** {**line** {**primary** | **secondary**} | **internal**}
Step 6	Configure robbed bit signaling for a range of timeslots. After this command is entered, a logical serial interface is automatically created for each switched 56K channel.[1]	**cas-group** *channel* **timeslots** *range* **type** *signal* **service data**
Step 7	Exit controller configuration mode.	**exit**
Step 8	Specify logical serial interface, which was dynamically created when the **cas-group** command was issued.	**interface serial** *number***:***number*
Step 9	Configure the core protocol characteristics for the serial interface.[2]	

1. See the **cas-group (controller t1)** command reference page later in this document for configuration options.
2. For step-by-step configuration information, see the *Configuration Fundamentals Configuration Guide* for Cisco IOS Release 11.3.

Configuration Examples

The following examples are provided:

- Switched 56K T1 Controller Example
- Mixture of Switched 56K and Modem Calls Over CT1 CAS
- Switched 56K and Analog Modem Calls Over Separate T1 CAS Lines
- Comprehensive Switched 56K Startup Configuration Example

Switched 56K T1 Controller Example

The following shows how to configure one T1 controller on a Cisco AS5300 to support switched 56K digital calls. The Cisco AS5300 has four controllers, which are numbered 0 to 3. If you want all four T1s to support switched 56K calls, then repeat this procedure on each T1 controller.

Note Use this same procedure for configuring a Cisco AS5200.

Step 1 Enter global configuration mode using the **configure terminal** command:

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
```

Step 2 Specify a T1 controller with the **controller t1** *number* command. Replace the *number* variable with a controller number between 0 and 3.

```
router(config)# controller t1 1
```

Step 3 Configure robbed bit signaling on a range of timeslots then specify switched 56K digital services using the **cas-group** command. In this example, all calls coming into controller T1 1 are expected to be switched 56K data calls, not analog modem calls.

```
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service data
```

Note Be sure your signaling type matches the signaling type specified by the central office or telco on the other end. For a list of supported signaling types and how to collect DNIS, see the **cas-group (controller t1)** command reference page later in this document.

Step 4 Set the framing for your network environment. You can choose extended superframe (enter **framing esf**) or superframe (enter **framing sf**).

```
router(config-controller)# framing esf
```

Step 5 Set the line code type for your network environment. You can choose AMI encoding (enter **linecode ami**) or B8ZS encoding (enter **linecode b8zs**).

```
router(config-controller)# linecode b8zs
```

Mixture of Switched 56K and Modem Calls Over CT1 CAS

The following example configures one T1 controller to accept incoming switched 56K digital calls and analog modem calls over the same T1 CAS line. Timeslots 1 through 10 are provisioned by the telco to support switched 56K digital calls. Timeslots 11 through 24 are provisioned to support analog modem calls. Due to the DS0s provisioning, it is impossible for analog modems calls to transmit over the DS0s that map to timeslots 1 through 10.

```
router(config)# controller T1 0
router(config-controller)# cas-group 1 timeslots 1-10 type e&m-fgb service data
router(config-controller)# cas-group 1 timeslots 11-24 type e&m-fgb service voice
router(config-controller)# framing esf
router(config-controller)# clock source line primary
router(config-controller)# linecode b8zs
router(config-controller)# exit
```

Switched 56K and Analog Modem Calls Over Separate T1 CAS Lines

The following example configures one Cisco AS5300 to accept 50 percent switched 56K digital calls and 50 percent analog modem calls. The controllers T1 0 and T1 1 are configured to support the switched 56K digital calls using the **cas-group 1 timeslots 1-24 type e&m-fgb service digital** command. The controllers T1 2 and T1 3 are configured to support analog modem calls.

```
router(config)# controller T1 0
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service data
router(config-controller)# framing esf
router(config-controller)# clock source line primary
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# controller T1 1
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service data
router(config-controller)# framing esf
router(config-controller)# clock source line secondary
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# controller T1 2
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service voice
router(config-controller)# framing esf
router(config-controller)# clock source internal
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# controller T1 3
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service voice
router(config-controller)# framing esf
router(config-controller)# clock source internal
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# copy running-config startup-config
```

Comprehensive Switched 56K Startup Configuration Example

The startup configuration in this section runs on the Cisco AS5300 in Figure 1. This configuration is for an IP dial-in scenario with a mix of switched 56K calls and modem calls. Switched 56K digital calls come into controllers T1 0 and T1 1. Analog modem calls come into controllers T1 2 and T1 3.

In this example, the switched 56K clients are single end points in a remote node configuration. If each switched 56K client were instead a router with a LAN behind it without port address translation (PAT) turned on, then a static address, subnet mask, and route must be configured for each remote end point. This is best done through RADIUS.

After a T1 timeslot is configured with robbed bit signaling using the **cas-group** command with the **service data** option, a logical serial interface is instantly created for each switched 56K channel. For example, signaling configured on all 24 timeslots of controller T1 1 dynamically creates serial interfaces S0:0 through S0:23. You must then configure protocol support on each serial interface. No interface group command exists for serial interfaces, unlike asynchronous interfaces via the **interface group-async** command. Each serial interface must be individually configured. In most cases, the serial configurations will be identical. To streamline or shorten this configuration task, you might consider using a dialer interface as shown in the example.

Note In this example, only analog modem calls encounter the group asynchronous and line interfaces. Switched 56K calls encounter the logical serial interfaces and dialer interface.

```
!
version 11.3
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
no service udp-small-servers
no service tcp-small-servers
!
hostname 5300
!
aaa new-model
aaa authentication login default local
aaa authentication login console enable
aaa authentication login vty local
aaa authentication login dialin radius
aaa authentication ppp default local
aaa authentication ppp dialin if-needed radius
aaa authorization exec local radius
aaa authorization network radius
aaa accounting network start-stop radius
aaa accounting exec start-stop radius
!
enable secret cisco
!
username admin password cisco
async-bootp dns-server 10.1.3.1 10.1.3.2
!
!
!Switched 56k calls come into controllers T1 0 and T1 1. Take note of the keywords
!"service data" in the cas-group command.
!
controller T1 0
 framing esf
 clock source line primary
 linecode b8zs
 cas-group 0 timeslots 1-24 type e&m-fgb service data
!
controller T1 1
 framing esf
 clock source line secondary
 linecode b8zs
 cas-group 1 timeslots 1-24 type e&m-fgb service data
!
!Analog modem calls come into controllers T1 2 and T1 3.
!
controller T1 2
 framing esf
 clock source line internal
 linecode b8zs
 cas-group 2 timeslots 1-24 type e&m-fgb
!
controller T1 3
 framing esf
 clock source line internal
 linecode b8zs
 cas-group 3 timeslots 1-24 type e&m-fgb
!
interface loopback0
 ip address 10.1.2.62 255.255.255.192
```

```
!
interface Ethernet0
 no ip address
 shutdown
!
interface FastEthernet0
 ip address 10.1.1.11 255.255.255.0
 ip summary address eigrp 10.10.1.2.0 255.255.255.192
!
! Interface serial0:0 maps to the first switched 56k channel. The dialer pool-member
! command connects ! this channel to dialer interface 1.
!
interface Serial0:0
 dialer rotary-group 1
!
interface Serial0:1
 dialer rotary-group 1
!
interface Serial0:2
 dialer rotary-group 1
!
interface Serial0:3
 dialer rotary-group 1
!
interface Serial0:4
 dialer rotary-group 1
!
interface Serial0:5
 dialer rotary-group 1
!
interface Serial0:6
 dialer rotary-group 1
!
interface Serial0:7
 dialer rotary-group 1
!
interface Serial0:8
 dialer rotary-group 1
!
interface Serial0:9
 dialer rotary-group 1
!
interface Serial0:10
 dialer rotary-group 1
!
interface Serial0:11
 dialer rotary-group 1
!
interface Serial0:12
 dialer rotary-group 1
!
interface Serial0:13
 dialer rotary-group 1
!
interface Serial0:14
 dialer rotary-group 1
!
interface Serial0:15
 dialer rotary-group 1
!
interface Serial0:16
 dialer rotary-group 1
!
interface Serial0:17
 dialer rotary-group 1
```

```
!
interface Serial0:18
 dialer rotary-group 1
!
interface Serial0:19
 dialer rotary-group 1
!
interface Serial0:20
 dialer rotary-group 1
!
interface Serial0:21
 dialer rotary-group 1
!
interface Serial0:22
 dialer rotary-group 1
!
!Interface serial 0:23 is the last switched 56k channel for controller T1 0.
!
interface Serial0:23
 dialer rotary-group 1
!
!The switched 56k channels for controller T1 1 begin with interface serial 1:0 and end
!with interface serial 1:23.
!
interface Serial1:0
 dialer rotary-group 1
!
interface Serial1:1
 dialer rotary-group 1
!
interface Serial1:2
 dialer rotary-group 1
!
interface Serial1:3
 dialer rotary-group 1
!
interface Serial1:4
 dialer rotary-group 1
!
interface Serial1:5
 dialer rotary-group 1
!
interface Serial1:6
 dialer rotary-group 1
!
interface Serial1:7
 dialer rotary-group 1
!
interface Serial1:8
 dialer rotary-group 1
!
interface Serial1:9
 dialer rotary-group 1
!
interface Serial1:10
 dialer rotary-group 1
!
interface Serial1:11
 dialer rotary-group 1
!
interface Serial1:12
 dialer rotary-group 1
!
interface Serial1:13
 dialer rotary-group 1
```

```
!
interface Serial1:14
 dialer rotary-group 1
!
interface Serial1:15
 dialer rotary-group 1
!
interface Serial1:16
 dialer rotary-group 1
!
interface Serial1:17
 dialer rotary-group 1
!
interface Serial1:18
 dialer rotary-group 1
!
interface Serial1:19
 dialer rotary-group 1
!
interface Serial1:20
 dialer rotary-group 1
!
interface Serial1:21
 dialer rotary-group 1
!
interface Serial1:22
 dialer rotary-group 1
!
interface Serial1:23
 dialer rotary-group 1
!
interface Group-Async1
 ip unnumbered Loopback0
 encapsulation ppp
 async mode interactive
 peer default ip address pool dialin_pool
 no cdp enable
 ppp authentication chap pap dialin
 group-range 1 96
!
interface Dialer1
 ip unnumbered Loopback0
 no ip mroute-cache
 encapsulation ppp
 peer default ip address pool dialin_pool
 no fair-queue
 no cdp enable
 ppp authentication chap pap dialin
!
router eigrp 10
 network 10.0.0.0
 passive-interface Dialer0
 no auto-summary
!
ip local pool dialin_pool 10.1.2.1 10.1.2.96
ip default-gateway 10.1.1.1
ip classless
!
dialer-list 1 protocol ip permit
radius-server host 10.1.1.23 auth-port 1645 acct-port 1646
radius-server host 10.1.1.24 auth-port 1645 acct-port 1646
radius-server key cisco
!
line con 0
 login authentication console
```

```
line 1 96
 autoselect ppp
 autoselect during-login
 login authentication dialin
 modem DialIn
line aux 0
 login authentication console
line vty 0 4
 login authentication vty
 transport input telnet rlogin
!
end
```

Command Reference

The following command was modified to show support for switched 56K connections over channelized T1:

- **cas-group (controller t1)**

The following commands are new:

- **show controllers t1 call-counters**
- **show controllers t1 cas-data**

Note All other commands used with this feature are documented in the Cisco IOS Release 11.3 command references.

cas-group (controller t1)

To configure channelized T1 timeslots with robbed bit signaling, use the **cas-group** controller configuration command. Use the **no** form of this command to disable robbed bit signaling for one or more timeslots.

cas-group *channel* **timeslots** *range* **type** *signal*
no cas-group *channel* **timeslots** *range* **type** *signal*

Syntax Description

channel — Specifies a single channel group number, which can be between 0 and 23.

timeslots *range* — Specifies a range of timeslots, which are from 1 to 24. Timeslots can be specified by ranges or groups. For example, 1-24 or 1-15 and 17-24.

type *signal* — Specifies a type of robbed bit signaling. Replace the *signal* variable with one of the following signal types. The keywords **service**, **data**, and **voice** are used for switched 56K configuration. These keywords are described at the end of this syntax description table.

- **e&m-fgb** [**dtmf** [**dnis**] | [**service** {**data** | **voice**}]] | [**service** {**data** | **voice**}] | [**mf** [**dnis**] | [**service** {**data** | **voice**}]]—Specifies ear and mouth channel signaling with feature group B support, which includes the wink start protocol. Use the options **dtmf** [**dnis**] to configure DTMF tone signaling with optional DNIS provisioning. Use the options **mf** [**dnis**] to configure MF tone signaling with optional DNIS provisioning. Use the options **service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information about these switched 56K keywords.)
- **e&m-fgd** [**service** {**data** | **voice**}]—Specifies ear and mouth channel signaling with feature group D support, which includes the wink start protocol. Use the options **service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information.)
- **e&m-immediate-start** [**service** {**data** | **voice**}]—Specifies ear and mouth channel signaling with immediate start support. Use the options **service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information.)
- **fxs-ground-start** [**service** {**data** | **voice**}]—Specifies Foreign Exchange Station ground start signaling support. Use the options [**service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information.)
- **fxs-loop-start** [**service** {**data** | **voice**}]— Specifies Foreign Exchange Station loopstart signaling support. Use the options **service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information.)
- **sas-ground-start** [**service** {**data** | **voice**}]—Specifies Special Access Station ground start signaling support. Use the options **service** {**data** | **voice**} for switched 56K configurations. (See the end of this syntax description table for more information.)

- **sas-loop-start** [**service** {**data** | **voice**}]—Specifies Special Access Station loopstart signaling support. Use the options **service** {**data** | **voice**} for switched 56K configurations.
- **service**—(Optional) Specifies the type of services provided for scenarios involving switched 56K connections. Do not include this option in the **cas-group** command statement if you are not using the access server to provide switched 56K connections.
- **data**—Enables switched 56K digital data services on the specified range of timeslots. The data is directly read from the timeslot or channel. Timeslots configured with this option will not accept analog modem calls.
- **voice**—Enables analog modem services on the specified range of timeslots. The call is forwarded to the modems for demodulation. Timeslots configured with this option will not accept switched 56K digital calls.

Default

All incoming calls are forward to modems unless otherwise specified (such as using the keywords **service data** for switched 56K digital calls). The default signaling type is **e&m-fgb**.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.2.

Use the **cas-group** command to configure T1 controllers with different types of robbed bit signaling, such as on-hook and off-hook for E&M feature group B (**e&m-fgb**).

If you want to collect DNIS information on a T1 controller, you must manually configure it on the access server. DNIS collection is performed only for E&M-fgb. To collect DTMF DNIS for E&M-fgb under a controller T1 configuration, issue the **cas-group 0 timeslots 1-24 type e&m-fgb dtmf dnis** command. To collect MF DNIS for E&M-fgb, issue the **cas-group 0 timeslots 1-24 type e&m-fgb mf dnis** command.

Examples

The following example configures all 24 channels with ear and mouth robbed bit signaling with feature group B support:

```
router(config)# controller T1 0
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb
router(config-controller)#
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 1 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 2 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 3 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 4 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 5 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 6 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 7 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 8 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 9 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 10 is up
```

```
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 11 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 12 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 13 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 14 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 15 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 16 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 17 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 18 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 19 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 20 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 21 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 22 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 23 is up
%DSX0-5-RBSLINEUP: RBS of controller 1 timeslot 24 is up
```

The following example configures the required signaling to support modem pooling and the digital number identification service (DNIS) over channelized T1 lines on a Cisco AS5300. The only supported signaling and tone types for modem pooling over CT1 RBS are E&M feature group B, DTMF tones, and MF tones. By configuring DNIS as part of the **cas-group** command, the system can collect DNIS digits for incoming calls, which can be redirected to specific modem pools setup for different customers or services. Additionally, you must be running MICA modems in the system and have at least 10% of your total modems in the default modem pool. Free modems are needed in the default pool to detect the incoming called number or DNIS before handing the call off to the appropriate modem pool. Therefore, a two modems are actually needed to handle each incoming call.

Note Make sure that your switch provides inband address information for incoming analog calls before you enable this feature.

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
router(config)# controller t1 0
router(config-controller)# cas-group 0 timeslots 1-24 type e&m-fgb dtmf dnis
router(config-controller)# exit
router(config)#
router(config)# modem-pool accounts1
router(config-modem-pool)# pool-range 30-50
router(config-modem-pool)# called-number 2000 max-conn 21
router(config-modem-pool)# exit
router(config)#
```

The next example configures a Cisco AS5200 to accept switched 56K digital calls on both of its T1 controllers:

```
router(config)# controller T1 0
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service data
router(config-controller)# framing esf
router(config-controller)# clock source line secondary
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# controller T1 1
router(config-controller)# cas-group 1 timeslots 1-24 type e&m-fgb service data
router(config-controller)# framing esf
router(config-controller)# clock source line primary
router(config-controller)# linecode b8zs
router(config-controller)# exit
router(config)# copy running-config startup-config
```

The next example configures switched 56K digital services and analog modem services on one controller. Each service is assigned its own range of timeslots. Switched 56K calls are assigned to timeslots 1 through 15. Analog modem calls are assigned to timeslots 16 through 24. However, you must use different channel group numbers in each **cas-group** command entry.

```
router(config)# controller T1 0
router(config-controller)# cas-group 0 timeslots 1-15 type e&m-fgb service data
router(config-controller)# cas-group 1 timeslots 16-24 type e&m-fgb service voice
router(config-controller)# framing esf
router(config-controller)# clock source line secondary
router(config-controller)# linecode b8zs
router(config-controller)# exit
```

show controllers t1 call-counters

To view the total number of calls and call durations on a T1 controller, use the **show controllers t1 call-counters** Privileged EXEC command.

show controllers t1 *number* **call-counters**

Syntax Description

number	Controller number (for example 0, 1, 2, or 3).

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 T.

This command displays the T1 controller status as calls, such as switched 56K digital calls, pass through the hardware.

Examples

The following is sample display output for the **show controller t1 1 call-counters** command.

```
router# show controller t1 1 call-counters
T1 1:
  DS0's Active: 0
  DS0's Active High Water Mark: 0
  TimeSlot   Type   TotalCalls   TotalDuration
      1       cas           0       00:00:00
      2       cas           0       00:00:00
      3       cas           0       00:00:00
      4       cas           0       00:00:00
      5       cas           0       00:00:00
      6       cas           0       00:00:00
      7       cas           0       00:00:00
      8       cas           0       00:00:00
      9       cas           0       00:00:00
     10       cas           0       00:00:00
     11       cas           0       00:00:00
     12       cas           0       00:00:00
     13       cas           0       00:00:00
     14       cas           0       00:00:00
     15       cas           0       00:00:00
     16       cas           0       00:00:00
     17       cas           0       00:00:00
     18       cas           0       00:00:00
     19       cas           0       00:00:00
     20       cas           0       00:00:00
     21       cas           0       00:00:00
     22       cas           0       00:00:00
     23       cas           0       00:00:00
     24       cas           0       00:00:00

Total DS0's Active High Water Mark: 7
```

Table 1 describes the sample display output for the **show controller t1 1 call-counters** command.

Table 1 Show Controllers T1 Call-Counters Field Descriptions

Field	Description
T1 *number*:	Number of the T1 controller.
DS0's Active:	Displays the number of DS0s channels that are currently active.
DS0's Active High Water Mark:	Number of active DS0s that are approaching the threshold ceiling of the system.
TimeSlot	Timeslot number used on the controller for the specified DS0.
Type	Type of call occupying the timeslot. This entry is usually CAS or ISDN PRI.
TotalCalls	How many calls came in on this timeslot or DS0.
TotalDuration	How long the last call lasted.
Total DS0's Active High Water Mark:	Total number of active DS0s that are approaching the threshold ceiling of the system.

Related Commands

show controllers t1 cas-data
cas-group (controller t1)

show controllers t1 cas-data

To display internal call switching module information about the switched 56k data channels, use the **show controllers t1 cas-data** Privileged EXEC command.

show controllers t1 *number* **cas-data**

Syntax Description

number	Controller number (for example 0, 1, 2, or 3).

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 T.

Examples

The following is sample display output for the **show controller t1 1 cas-data** command.

```
router# show controller t1 1 cas-data
Device Pool: Dev-SW56-pool
Number of SW56 vdev in pool: 48
Number of active connections: 0
No free SW56 device in pool: 0
SW56 max allocated messages: 96

T1 1:
 SW56(slot/subcont/bchan)=0/1/0, hwidb=0x00867348
  csm_state(0x00000100)=CSM_IDLE_STATE, csm_event_proc=0x0006CCC2
  total_call_duration=00:00:00
  invalid_event_count=0, wdt_timeout_count=0
  ic_failure=0, ic_complete=0, remote_link_disc=0
  csm_status(0): VDEV_STATUS_UNLOCKED
  wdt_timestamp_started is not activated
 SW56(slot/subcont/bchan)=0/1/1, hwidb=0x0086EC58
  csm_state(0x00000100)=CSM_IDLE_STATE, csm_event_proc=0x0006CCC2
  total_call_duration=00:00:00
  invalid_event_count=0, wdt_timeout_count=0
  ic_failure=0, ic_complete=0, remote_link_disc=0
  csm_status(0): VDEV_STATUS_UNLOCKED
  wdt_timestamp_started is not activated
 SW56(slot/subcont/bchan)=0/1/2, hwidb=0x00876568
  csm_state(0x00000100)=CSM_IDLE_STATE, csm_event_proc=0x0006CCC2
  total_call_duration=00:00:00
  invalid_event_count=0, wdt_timeout_count=0
  ic_failure=0, ic_complete=0, remote_link_disc=0
  csm_status(0): VDEV_STATUS_UNLOCKED
  wdt_timestamp_started is not activated
 SW56(slot/subcont/bchan)=0/1/3, hwidb=0x0087DE78
  csm_state(0x00000100)=CSM_IDLE_STATE, csm_event_proc=0x0006CCC2
  total_call_duration=00:00:00
  invalid_event_count=0, wdt_timeout_count=0
  ic_failure=0, ic_complete=0, remote_link_disc=0
  csm_status(0): VDEV_STATUS_UNLOCKED
  wdt_timestamp_started is not activated
```

```
SW56(slot/subcont/bchan)=0/1/4, hwidb=0x00885788
 csm_state(0x00000100)=CSM_IDLE_STATE, csm_event_proc=0x0006CCC2
 total_call_duration=00:00:00
 invalid_event_count=0, wdt_timeout_count=0
 ic_failure=0, ic_complete=0, remote_link_disc=0
 csm_status(0): VDEV_STATUS_UNLOCKED
 wdt_timestamp_started is not activated
```

Table 2 describes the sample display output for the **show controller t1 1 cas-data** command.

Table 2 Show Controllers T1 Cas-Data Field Descriptions

Field	Description
Device Pool:	Type of pool in service, which is a logical grouping used to achieve a specific service.
Number of SW56 vdev in pool:	Number of serial devices used in the pool.
Number of active connections:	Number of active switched 56K active connections.
No free SW56 device in pool:	Number of switched 56K channels are available to accept calls.
SW56 max allocated messages:	Number of messages that are allocated to switched 56K services.
T1 *number*:	Number of the controller T1.
SW56(slot/subcont/bchan)=	Specified DS0 or timeslot used for the switched 56K service.
csm_state(0x00000100)=	Call state machine register.
total_call_duration=	How long the call lasted.
invalid_event_count=	Number of invalid event counters for the specified channel.
ic_failure=	Number of incoming call failures.
csm_status(0):	Call state machine register.
wdt_timestamp_started is not activated	Watch dog timer.

Related Commands

show controllers t1 call-counters
cas-group (controller t1)

Debug Commands

The **debug sw56** command is new.

debug sw56

Use the debug sw56 EXEC command to display debug information for switched 56K services.

[**no**] **debug sw56**

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 T.

Figure 4 Sample Debug Output

Figure 4 shows sample debug output for the **debug sw56** EXEC command.

```
router# debug sw56
```

What to Do Next

For information on how to configure serial interfaces, refer to the *Configuration Fundamentals Configuration Guide* for Cisco IOS Release 11.3.

Refer to the following publications for software configurations specific to your chassis:

- *Cisco AS5300 Universal Access Server Software Configuration Guide*
- *Cisco AS5200 Universal Access Server Software Configuration Guide*