在AS5400网关上语音和数据呼叫TDM交换的配置示例

目录

简介

本文详细介绍Cisco AS5400平台上时分复用(TDM)交换的理论和配置。

先决条件

要求

假设读者对ISDN呼叫信令和TDM网络上同步时钟源的分布有基本的了解。本文档提供了一些有关TDM时钟的背景信息。熟悉Cisco IOS®配置和调试命令也很有帮助。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- Cisco AS5400、AS5350和AS5850平台
- 带IP Plus功能集的思科IOS软件版本12.2.2XB5

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

背景信息

TDM交换的基础是所有已配置接口共享的同步时钟源。如果不同端口的时钟参考不同，接入服务器会注册时钟滑移，这在语音呼叫中可能不明显，但几乎肯定会导致传真或调制解调器呼叫失败。因此，与之同步的外部设备(PBX或中心局(CO)交换机)接入服务器接口与通用主时钟参考是至关重要的。大多数电信或服务提供商订用或发起第1层时钟参考，并在其网络中传播此参考。因此，在大多数情况下，时钟即使在不同的服务提供商之间也能保持同步。如果接入服务器上所有已配置的T1/E1接口保持同步，则接口出错的可能性很小。

TDM交换基于来电的拨号号码识别服务(DNIS)来路由呼叫。一旦接入服务器收到传入ISDN Q.931设置消息，它便可确定呼叫的发送位置，在传出接口上选择适当的承载信道，并发送ISDN Q.931设置消息以向下游设备发出新呼叫的存在信号。终端设备发送ISDN Q.931连接消息后，接入服务器会交叉连接背板上的脉冲码调制(PCM)流。如前段所述，两个相连网络必须具有相同的时钟同步，以确保PCM音频流或数字数据从一个接口无错地切换到另一个接口。网络图显示了根据在已配置的普通老式电话服务(POTS)拨号对等体上进行的匹配，在特定PRI接口上传入并通过其他接口交换出去的ISDN呼叫的一般概念。如有必要，可使用IOS转换规则来操纵被叫/主叫号码。

配置

AS5400平台通常安装为拨入数据、语音、传真或调制解调器接入服务器。要终止语音类型呼叫（语音、传真或调制解调器），接入服务器需要安装适当的任何服务、任何端口(ASAP)数字信号处理器(DSP)资源。

如果调制解调器、传真或语音呼叫实际上不需要在接入服务器上终止，但出于某种原因需要切换回备用端口，则可以将AS5400配置为在纯TDM应用中工作，在该应用中，语音呼叫交换通过ISDN D信道信令控制。数据或语音呼叫可以根据DNIS（被叫号码）切换到另一个接口。实际上，接入服务器成为TDM语音/数据交换机。此功能通常称为TDM交换，但其他名称（如发夹、长号或拨号修饰）也应用于该技术。通常，术语是可互换的，对于本文档，术语是TDM交换。没有与ISDN一起传递的双音多频(DTMF)或多频(MF)信令音。呼叫控制通过高级数据链路控制(HDLC)封装的D通道消息完成。因此，在TDM操作模式下，无需语音呼叫的DSP资源。

接入服务器使用传入DNIS（被叫号码）匹配传出POTS拨号对等体目标模式，并将呼叫路由到适当的端口。也可以使用IOS转换规则来控制呼叫路由决策的被叫号码和主叫号码。

TDM交换的应用可以包括充当小型ISDN数据/语音交换（使用ISDN网络侧协议仿真）的接入服务器，或通过备用运营商进行呼叫重路由（最低成本）。

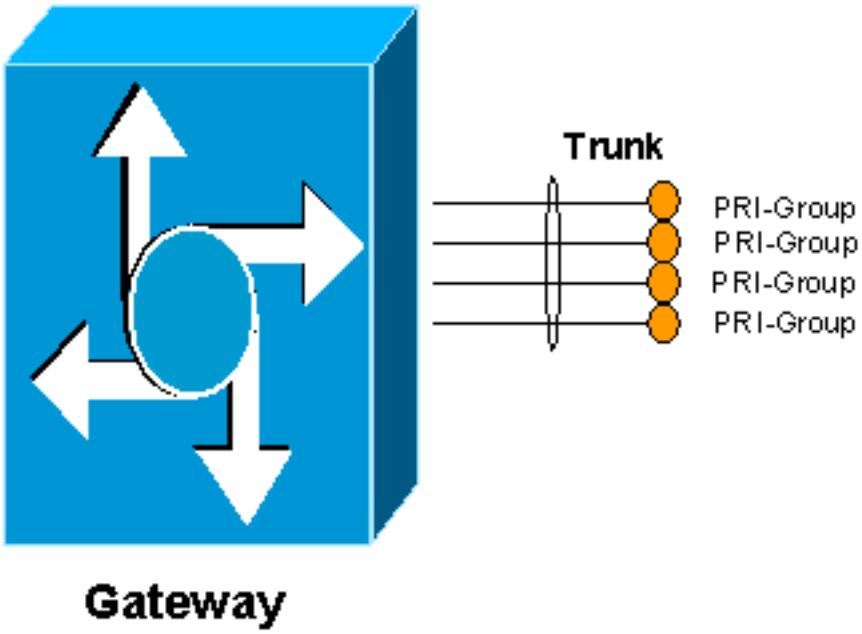
本文档介绍如何配置AS5400以对语音和数据呼叫执行TDM交换。根据在DNIS上为传入呼叫（在ISDN Q.931设置消息中提供）所做的匹配，呼叫从一个接口切换到备用接口。该技术还适用于使用TDM背板（如AS5350和AS5850）的其他平台。

本部分提供有关如何配置本文档所述功能的信息。

注意：使用命令查找工具(仅限注册客户)可查找有关本文档中使用的命令的详细信息。

网络图

本文档使用以下网络设置：



配置

为了允许接入服务器执行TDM交换，必须启用资源池并将可用的承载信道资源放入池中。然后，此承载信道池与DNIS组关联，这允许特定资源池与特定传入被叫号码或任何传入被叫号码相关联。此输出显示了一个示例：

AS5400

```
!
resource-pool enable
!
resource-pool group resource TDM_Voice
range limit 124
!--- Up to 124 speech channels can be switched. !
resource-pool group resource TDM_Data range limit 124 !-
-- Up to 124 data channels can be switched. ! !
resource-pool profile customer TDM_Switching limit base-
size all limit overflow-size 0 resource TDM_Voice speech
!--- Resources for speech calls. ! resource TDM_Data
digital ! resources for data calls ! dnis group default
!--- Default DNIS group matches all called numbers. !
```

必须启用资源池功能，才能允许TDM交换。定义了名为TDM_Voice的资源组，允许最多124个可用于语音呼叫的信道。另一个名为TDM_Data的资源组允许最多124个信道进行数据呼叫。这些数字源自系统上E1或T1端口的最大数量。例如，8端口E1卡有30个承载信道，每个接口（31个信道）有1个信令信道，用于8个端口。总数为248（31乘8）。 此处分配一半用于数据，一半用于语音呼叫。

然后，资源组TDM_Voice被放置到名为TDM_Switching的配置文件中，呼叫类型被定义为语音，而资源组TDM_Data被定义为数字。这有效地允许具有语音和数据承载能力的呼叫通过接入服务器。dnis group **default命令**允许匹配所有传入的被叫号码。可以定义与更具体被叫号码匹配的DNIS组。有关详细信息，请参阅适用于语音和数据服务的通用端口资源池配置指南。

如果需要，可以操纵被叫号码，以在呼叫进入特定端口时预置接入代码。例如：

AS5400

```
!
translation-rule 1
Rule 1 ^.% 555
!--- Match on any string, prepend with 555. ! voice-port
6/0:D translate called 1 !--- Apply translation rule 1
to port 6/0 so any !--- incoming call is prepended with
555. compand-type a-law ! voice-port 6/3:D compand-type
a-law !--- The translated called number is matched on
POTS dial-peers !--- to determine where it should be
routed. dial-peer voice 1 pots description - enable DID
(single stage dialing) on port 6/0 incoming called-
number . direct-inward-dial port 6/0:D ! dial-peer voice
2 pots description - reroute calls from 6/0 to 6/3
destination-pattern 55598842304 port 6/3:D prefix
0401890165 !
```

当呼叫进入端口6/0时，其前缀为555。如果原始被叫号码为98842304，则转换后的号码变为55598842304，并与拨号对等体2匹配。呼叫随后在端口6/3上发出。由于它是显式匹配，因此原始被叫号码将被删除，而prefix命令将其替换为0401890165。

数据呼叫交换的工作方式相同。POTS拨号对等体匹配被叫号码，并将其转发到其他端口。例如，如果呼入的端口6/4的被叫号码为5551000，则使用新的被叫号码5552000将呼出端口6/7。同样，如果呼入的端口6/7的被叫号码为5552000，则使用新的被叫号码5551000将呼出的端口6/4切出。

AS5400

```
!
dial-peer voice 3 pots
description - enable DID on port 6/4
incoming called-number
direct-inward-dial
port 6/4:D
!
dial-peer voice 4 pots
description - enable DID on port 6/7
incoming called-number
direct-inward-dial
port 6/7:D
!
dial-peer voice 12 pots
description - reroute calls from 6/4 to 6/7
destination-pattern 5551000
port 6/7:D
prefix 5552000
!
dial-peer voice 13 pots
description - reroute calls from 6/7 to 6/4
destination-pattern 5552000
port 6/4:D
prefix 5551000
!
```

验证

使用本部分可确认配置能否正常运行。

命令输出解释程序（仅限注册用户）(OIT) 支持某些 show 命令。使用 OIT 可查看对 show 命令输出的分析。

- **show run** — 显示作为TDM交换机运行的接入服务器的完整配置。

```
multi-5-19#show run
Building configuration...

Current configuration : 3110 bytes
!
! Last configuration change at 13:18:39 UTC Wed Jun 19 2002
! NVRAM config last updated at 20:45:12 UTC Sat Jan 8 2000
!
version 12.2
service timestamps debug datetime msec localtime
service timestamps log uptime
no service password-encryption
!
hostname multi-5-19
!
enable password cisco
!
!
!
resource-pool enable
!
resource-pool group resource TDM_Voice
range limit 124
!
resource-pool group resource TDM_Data
range limit 124
!
resource-pool profile customer TDM_Switching
limit base-size all
limit overflow-size 0
resource TDM_Data digital
resource TDM_Voice speech
dnis group default
dial-tdm-clock priority 1 6/0
!
!
!
!
ip subnet-zero
ip cef
!
isdn switch-type primary-net5
!
!
!
!
!
!
!
fax interface-type fax-mail
mta receive maximum-recipients 0
!
controller E1 6/0
pri-group timeslots 1-31
!
controller E1 6/1
!
```

```
controller E1 6/2
!
controller E1 6/3
pri-group timeslots 1-31
!
controller E1 6/4
pri-group timeslots 1-31
!
controller E1 6/5
!
controller E1 6/6
!
controller E1 6/7
pri-group timeslots 1-31
!
translation-rule 1
Rule 1 ^.% 555
!
translation-rule 2
Rule 2 ^.% 666
!
!
!
interface FastEthernet0/0
no ip address
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
!
interface Serial0/0
no ip address
shutdown
clockrate 2000000
!
interface Serial0/1
no ip address
shutdown
clockrate 2000000
!
interface Serial6/0:15
no ip address
isdn switch-type primary-net5
isdn incoming-voice modem
no cdp enable
!
interface Serial6/3:15
no ip address
isdn switch-type primary-net5
isdn incoming-voice modem
no cdp enable
!
interface Serial6/4:15
no ip address
isdn switch-type primary-net5
isdn protocol-emulate network
no cdp enable
!
interface Serial6/7:15
no ip address
isdn switch-type primary-net5
```

```
isdn protocol-emulate network
no cdp enable
!
interface Group-Async0
physical-layer async
no ip address
!
ip classless
!
no ip http server
!
!
!
call rsvp-sync
!
voice-port 6/0:D
translate called 1
compand-type a-law
!
voice-port 6/3:D
translate called 2
compand-type a-law
!
voice-port 6/4:D
compand-type a-law
!
voice-port 6/7:D
compand-type a-law
!
!
mgcp profile default
!
dial-peer cor custom
!
!
!
dial-peer voice 1 pots
incoming called-number
direct-inward-dial
port 6/0:D
!
dial-peer voice 2 pots
incoming called-number
direct-inward-dial
port 6/3:D
!
dial-peer voice 10 pots
destination-pattern 55598842304
port 6/3:D
prefix 94344600
!
dial-peer voice 11 pots
destination-pattern 66698842305
port 6/0:D
prefix 94344600
!
dial-peer voice 3 pots
incoming called-number
direct-inward-dial
port 6/4:D
!
dial-peer voice 4 pots
incoming called-number
direct-inward-dial
```

```
port 6/7:D
!
dial-peer voice 12 pots
destination-pattern 5551000
port 6/7:D
prefix 5552000
!
dial-peer voice 13 pots
destination-pattern 5552000
port 6/4:D
prefix 5551000
!
!
line con 0
line aux 0
line vty 0 4
password cisco
login
!
scheduler allocate 10000 400
ntp master
end

multi-5-19#
```

故障排除

使用本部分可排除配置故障。

故障排除命令

命令输出解释程序（仅限注册用户）(OIT) 支持某些 show 命令。使用 OIT 可查看对 show 命令输出的分析。

排除ISDN中继故障时，可以使B信道忙。在CAS中继的控制器配置模式下发出**ds0 busyout X命令。**

```
Router(config-controller)#ds0 busyout X
```

要占线CCS或PRI ISDN中继，请在接口配**置模式下使用isdn service b_channel X state 2**命令。

对于T1:

```
Router(config)#interface serial 0:23
```

对于E1:

```
Router(config)#interface serial 0:15

Router(config-if)#isdn service b_channel X state 2
```

有效状态为0=Inservice、1=Maint、2=Outofservice,X是CCS和CAS配置中的B通道编号。

show isdn service命令可用于查找每个B信道的状态。

注意：在使用debug命令之前，请参阅有关Debug命**令的**重要信息。

正常的ISDN和IOS转换规则调试可用于排除TDM交换故障。

- **debug translation detailed** — 显示有关IOS转换规则操作的信息，以便监控被叫号码或主叫号码的数字操作。
- **debug isdn q931** — 显示有关本地路由器（用户端）和网络之间ISDN网络连接（第3层）的呼叫建立和拆卸的信息。

这些命令输出是**调试转**换详细（IOS转换规则调试）的跟踪，**以及**为交换到端口6/3的端口6/0上的语音呼叫启用的调试isdn q931。

```
multi-5-19#debug translation detailed
*Jan 1 00:20:53.215: ISDN Se6/0:15: RX <- SETUP pd = 8 callref = 0x1D79
*Jan 1 00:20:53.215: Bearer Capability i = 0x8090A3
*Jan 1 00:20:53.215: Channel ID i = 0xA18395
*Jan 1 00:20:53.215: Called Party Number i = 0x80, '98842304',
Plan:Unknown, Type:Unknown
 !--- Receive a setup message on interface 6/0:15 for a !--- speech call with a called number of
98842304. !--- Speech call is indicated by the bearer capability of 0x8090A3 : !--- 64 Kbps A-
law PCM audio/speech. !--- IOS Translation rule number 1 prepends '555' to the original !---
called number when it passes through port 6/0. *Jan 1 00:20:53.219: xrule_checking *Jan 1
00:20:53.219: xrule_checking calling , called 98842304 *Jan 1 00:20:53.219: xrule_checking
peer_tag 0, direction 1, protocol 6 *Jan 1 00:20:53.219: xrule_translation *Jan 1 00:20:53.219:
xrule_translation callednumber 98842304, strlen 8 *Jan 1 00:20:53.219: xrule_translation
callednumber 98842304 xruleCalledTag=1 *Jan 1 00:20:53.219: xrule_translation called Callparms
Numpertype 0x80, match_type 0x0 *Jan 1 00:20:53.219: xrule_translation Xrule index 1, Numpertype
0x9 *Jan 1 00:20:53.219: dpMatchString, target_number 98842304, match_number ^.% *Jan 1
00:20:53.219: dpMatchString match_tmp , match_len 0 *Jan 1 00:20:53.219: dpMatchString
beginning_replace 0, match_tmp ,target 98842304 *Jan 1 00:20:53.219: dpMatchString 1. target
98842304,match_tmp *Jan 1 00:20:53.219: dpMatchString 1.1 compare_len 0, target 98842304,
match_tmp *Jan 1 00:20:53.219: dpMatchString 5. match_len=compare_len 0, target 98842304 *Jan 1
00:20:53.219: replace_string *Jan 1 00:20:53.219: replace_string match ^.%, replace 555 *Jan 1
00:20:53.219: translation_format replace_rule ^.%, strip_proceeding 0 *Jan 1 00:20:53.219:
replace_string match_tmp ^.%, strip_proceeding 0 *Jan 1 00:20:53.219: replace_string match_tmp
*Jan 1 00:20:53.219: replace_string direction 1, callparty 2 *Jan 1 00:20:53.219: replace_string
direction 1, callparty 2, target 98842304 *Jan 1 00:20:53.219: replace_string match_tmp ,replace
555 *Jan 1 00:20:53.219: replace_string2.replace1,target98842304,current98842304,match_tmp *Jan
1 00:20:53.219: replace_string2.1 compare_len 0,match_len 0 *Jan 1 00:20:53.219: replace_string
3. replace1 , compare_len 0 *Jan 1 00:20:53.219: replace_string 4. replace1 5,compare_len -
1,replace 55 *Jan 1 00:20:53.219: replace_string 4. replace1 55,compare_len -2,replace 5 *Jan 1
00:20:53.219: replace_string 4. replace1 555,compare_len -3,replace *Jan 1 00:20:53.219:
replace_string 5.replace1 555, compare_len -3,match_len 0 *Jan 1 00:20:53.219: replace_string 6.
replace1 555,compare_len -3,current 98842304 *Jan 1 00:20:53.219: replace_string 7. replace1
5559 *Jan 1 00:20:53.219: replace_string 7. replace1 55598 *Jan 1 00:20:53.219: replace_string
7. replace1 555988 *Jan 1 00:20:53.219: replace_string 7. replace1 5559884 *Jan 1 00:20:53.219:
replace_string 7. replace1 55598842 *Jan 1 00:20:53.219: replace_string 7. replace1 555988423
*Jan 1 00:20:53.219: replace_string 7. replace1 5559884230 *Jan 1 00:20:53.219: replace_string
7. replace1 55598842304 *Jan 1 00:20:53.219: replace_string buffer 55598842304 *Jan 1
00:20:53.219: xrule_translation index 1,xrule_number 55598842304, callparty 2 *Jan 1
00:20:53.219: xrule_translation Return rc = 0 *Jan 1 00:20:53.219: xrule_checking Return rc = 0
*Jan 1 00:20:53.223: ISDN Se6/0:15: TX -> CALL_PROC pd = 8 callref = 0x9D79 *Jan 1 00:20:53.223:
Channel ID i = 0xA98395 !--- Send a call proceeding back to the ISDN. *Jan 1 00:20:53.227: ISDN
Se6/3:15: TX -> SETUP pd = 8 callref = 0x0005 *Jan 1 00:20:53.227: Bearer Capability i =
0x8090A3 *Jan 1 00:20:53.227: Channel ID i = 0xA9839F *Jan 1 00:20:53.227: Called Party Number i
= 0x80, '0401890165', Plan:Unknown, Type:Unknown !--- Match has been made on outgoing POTS dial-
peer !--- and a new call is sent out on 6/3:15. *Jan 1 00:20:53.371: ISDN Se6/3:15: RX <-
CALL_PROC pd = 8 callref = 0x8005 *Jan 1 00:20:53.371: Channel ID i = 0xA1839F *Jan 1
00:20:53.371: ISDN Se6/3:15: RX <- ALERTING pd = 8 callref = 0x8005 !--- Receive alerting on the
second (outgoing) call leg. *Jan 1 00:20:53.375: ISDN Se6/0:15: TX -> ALERTING pd = 8 callref =
```

```
0x9D79 *Jan 1 00:20:53.375: Progress Ind i = 0x8188 - In-band info or appropriate now available
!--- Send alerting on the first (incoming) call leg. *Jan 1 00:21:00.095: ISDN Se6/3:15: RX <-
CONNECT pd = 8 callref = 0x8005 *Jan 1 00:21:00.095: ISDN Se6/3:15: TX -> CONNECT_ACK pd = 8
callref = 0x0005 *Jan 1 00:21:00.099: ISDN Se6/0:15: TX -> CONNECT pd = 8 callref = 0x9D79 *Jan
1 00:21:00.247: ISDN Se6/0:15: RX <- CONNECT_ACK pd = 8 callref = 0x1D79 !--- Both calls
connect. *Jan 1 00:21:00.247: ISDN Se6/0:15: CALL_PROGRESS:CALL_CONNECTED call id 0x5, bchan 20,
dsl0 *Jan 1 00:21:37.591: ISDN Se6/0:15: RX <- DISCONNECT pd = 8 callref = 0x1D79 *Jan 1
00:21:37.591: Cause i = 0x8290 - Normal call clearing !--- Receive a disconnect on incoming call
leg. *Jan 1 00:21:37.595: ISDN Se6/0:15: TX -> RELEASE pd = 8 callref = 0x9D79 *Jan 1
00:21:37.599: ISDN Se6/3:15: TX -> DISCONNECT pd = 8 callref = 0x0005 *Jan 1 00:21:37.599: Cause
i = 0x8090 - Normal call clearing !--- Send a disconnect on the outgoing call leg. *Jan 1
00:21:37.631: ISDN Se6/0:15: RX <- RELEASE_COMP pd = 8 callref = 0x1D79 *Jan 1 00:21:37.723:
ISDN Se6/3:15: RX <- RELEASE pd = 8 callref = 0x8005 *Jan 1 00:21:37.723: Cause i = 0x8290 -
Normal call clearing *Jan 1 00:21:37.723: ISDN Se6/3:15: TX -> RELEASE_COMP pd = 8 callref =
0x0005 !--- Both calls have cleared.
```

这是debug isdn q931命令**的命令输**出。这些跟踪显示从端口6/4到端口6/7的ISDN数据呼叫。

```
Jun 19 13:36:02.091: ISDN Se6/4:15: RX <- SETUP pd = 8 callref = 0x0005
Jun 19 13:36:02.091: Bearer Capability i = 0x8890
Jun 19 13:36:02.091: Channel ID i = 0xA9839F
Jun 19 13:36:02.095: Called Party Number i = 0x81, '5551000', Plan:ISDN, Type:Unknown
 !--- Call comes in on port 6/4 for 5551000. Bearer Capability !--- is 0x8890, which indicates
64 K data call. Jun 19 13:36:02.095: ISDN Se6/4:15: TX -> CALL_PROC pd = 8 callref = 0x8005 Jun
19 13:36:02.095: Channel ID i = 0xA9839F Jun 19 13:36:02.099: ISDN Se6/7:15: TX -> SETUP pd = 8
callref = 0x0085 Jun 19 13:36:02.099: Bearer Capability i = 0x8890 Jun 19 13:36:02.099: Channel
ID i = 0xA98381 Jun 19 13:36:02.099: Called Party Number i = 0x81, '5552000', Plan:ISDN,
Type:Unknown !--- Redirect the call out on port 6/7, (new) called !--- number is 5552000 with
data bearer capability. Jun 19 13:36:02.155: ISDN Se6/7:15: RX <- CALL_PROC pd = 8 callref =
0x8085 Jun 19 13:36:02.155: Channel ID i = 0xA98381 Jun 19 13:36:02.159: ISDN Se6/7:15: RX <-
CONNECT pd = 8 callref = 0x8085 Jun 19 13:36:02.159: Channel ID i = 0xA98381 !--- Second call
leg connects. Jun 19 13:36:02.159: ISDN Se6/7:15: TX -> CONNECT_ACK pd = 8 callref = 0x0085 Jun
19 13:36:02.163: ISDN Se6/4:15: CALL_PROGRESS:CALL_CONNECTED call id 0x7,bchan 30, dsl 2 Jun 19
13:36:02.163: ISDN Se6/4:15: TX -> CONNECT pd = 8 callref = 0x8005 !--- First call leg connects.
Jun 19 13:36:02.215: ISDN Se6/4:15: RX <- CONNECT_ACK pd = 8 callref = 0x0005 Jun 19
13:38:12.783: ISDN Se6/4:15: RX <- DISCONNECT pd = 8 callref = 0x0005 Jun 19 13:38:12.783: Cause
i = 0x8090 - Normal call clearing !--- Remote device drops the call, first call leg disconnects.
Jun 19 13:38:12.787: ISDN Se6/4:15: TX -> RELEASE pd = 8 callref = 0x8005 Jun 19 13:38:12.787:
ISDN Se6/7:15: TX -> DISCONNECT pd = 8 callref = 0x0085 Jun 19 13:38:12.787: Cause i = 0x8290 -
Normal call clearing !--- Second call leg is dropped. Jun 19 13:38:12.807: ISDN Se6/7:15: RX <-
RELEASE pd = 8 callref = 0x8085 Jun 19 13:38:12.851: ISDN Se6/4:15: RX <- RELEASE_COMP pd = 8
callref = 0x0005 !--- Both calls have cleared.
```

相关信息

- 用于语音和数据服务的通用端口资源池
- 语音技术支持
- 语音和统一通信产品支持
- Cisco IP 电话故障排除
- 技术支持和文档 - Cisco Systems