



Network Side ISDN PRI Signaling, Trunking, and Switching

Feature History

Release	Modification
12.1(3)T	This feature was introduced.
12.2(2)XB1	This feature was implemented on the Cisco AS5850 platform. Note The Trunk Group Resource Manager (TGRM) feature is not supported on the Cisco AS5850 in the 12.2(2)XB1 release.
12.2(11)T	This feature was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

This feature module describes the Network Side ISDN PRI Signaling, Trunking, and Switching feature. It includes information on the benefits of the new feature, supported platforms, related documents, and so forth.

This document includes the following sections:

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Feature Overview

The Network Side ISDN PRI Signaling, Trunking, and Switching feature enables Cisco IOS software to replicate the public switched network interface to a PBX that is compatible with the National ISDN (NI) switch types and European Telecommunications Standards Institute (ETSI) Net5 switch types.

Routers and PBXs are both traditionally CPE devices with respect to the public switched network interfaces. However, for Voice over IP (VoIP) applications, it is desirable to interface access servers to PBXs with the access server representing the public switched network.

Enterprise organizations use the current VoIP features with Cisco products as a method to reduce costs for long distance phone calls within and outside their organizations. However, there are times that a call cannot go over VoIP and the call needs to be placed using the Public Switched Telephone Network (PSTN). The customer then must have two devices connected to a PBX to allow some calls to be placed using VoIP and some calls to be placed over the PSTN. In contrast, this feature allows Cisco access servers to connect directly to user-side CPE devices such as PBXs and allows voice calls and data calls to be placed without requiring two different devices to be connected to the PBXs.

The ISDN Network Side ISDN PRI Signaling, Trunking, and Switching feature allows Cisco ISDN-enabled access servers to switch calls across interfaces as legacy phone switches do today and to mimic the behavior of the legacy phone switches.

This feature provides the capabilities described in the following sections:

- [Network Side ISDN PRI](#)
- [Call Switching Using Dial Peers](#)
- [Trunk Group Resource Manager](#)
- [Class of Restrictions](#)

Network Side ISDN PRI

Network Side ISDN PRI enables the access server to provide a standard ISDN PRI network-side interface to the PBXs and to mimic the behavior of legacy phone switches. To a PBX, the access server functions as a NI PRI switch or an ETSI PRI Net5 switch. No change in PBX capability or behavior is required.

Call Switching Using Dial Peers

Call switching using dial peers enables Cisco VoIP gateways to switch both voice and data calls between different interfaces based on the dial peer matching. An incoming call is matched against configured dial peers, and based on the configured called number, the outgoing interface is selected. Any call that arrives from an ISDN PRI network side on a supported platform is either terminated on the access server, switched to an IP network, or switched to the PSTN, depending on the configuration.

**Note**

An incoming call will be switched or processed as a voice call only if it matches a dial peer.

A dial peer is an addressable call endpoint identified, for example, by a phone number or a port number. In VoIP, there are two kinds of dial peers: plain old telephone service (POTS) and VoIP. Dial peers are defined from the perspective of the access server and are used for both inbound and outbound call legs. An *inbound* call leg originates outside the access server. An *outbound* call leg originates from the access server.

For inbound call legs, a dial peer might be associated with the calling number or the port designation. Outbound call legs always have a dial peer associated with them. The destination pattern (a defined initial part of a phone number) is used to identify the outbound dial peer. The call is associated with the outbound dial peer at setup time.

POTS dial peers associate a telephone number with a particular voice port so that incoming calls for that telephone number can be received and outgoing calls can be placed.

Trunk Group Resource Manager

The Trunk Group Resource Manager (TGRM) supports the logical grouping, configuration, and joint management of one or more PRI interfaces. The TGRM is used to store configuration information and to accept or select an interface from a trunk group when requested. A trunk group is provisioned as the target of a dial peer, and the TGRM transparently selects the specific PRI interface and channels to use for incoming or outgoing calls. Trunks are selected based on usage: The trunk that is least used is selected.

Using trunk groups simplifies the task of configuring dial peers and PRI interfaces, and also enables the dynamic selection of PRI interfaces as needed in the access server.

A trunk group can include any number of PRI interfaces, but all the interfaces in a trunk group must use the same type of signaling.

Class of Restrictions

The Class of Restrictions (COR) functionality provides the ability to deny certain call attempts based on the incoming and outgoing class of restrictions provisioned on the dial peers. This functionality provides flexibility in network design, allows users to block calls (for example, to 900 numbers), and applies different restrictions to call attempts from different originators.

COR is used to specify which incoming dial peer can use which outgoing dial peer to make a call. Each dial peer can be provisioned with an incoming and an outgoing COR list. The incoming COR list indicates the capability of the dial peer to initiate certain classes of calls. The outgoing COR list indicates the capability required for an incoming dial peer to deliver a call via this outgoing dial peer. If the capabilities of the incoming dial peer are not the same or a superset of the capabilities required by the outgoing dial peer, the call cannot be completed using this outgoing dial peer.

Benefits

The Network Side ISDN PRI Signaling, Trunking, and Switching feature provides the following benefits:

- Allows you to bypass PSTN tariffed services such as trunking and administration, thus extending the cost savings of VoIP.
- Allows your PBXs to be connected directly to a Cisco access server, so PBX station calls can be routed automatically to the IP network without the need for special IP telephones.

- Provides flexibility in network design.
- Enables you to block calls selectively based on the called number or the calling number.

Restrictions

In Cisco IOS Release 12.1(3)T, the trunking and COR parts of this feature are available only on the Cisco AS5800 access server. In addition, call hairpinning without the need of a Voice Feature Card (and its digital signal processor) is available only on the Cisco AS5800 and Cisco AS5400. The remainder of the feature is platform-independent.

The Cisco AS5800 and Cisco AS5400 switch both voice and data calls. The Cisco AS5300 switches only data calls.

On the Cisco AS5800, direct-inward-dial (DID) switched calls can work without a Voice Feature Card, if the appropriate modem is present. Refer to the AS5800 hardware and software installation manuals for more information.

On the Cisco AS5400, direct-inward-dial (DID) switched calls can work with only Trunk Feature Cards present. No Voice Feature Card or Modem Feature card are required.

An interface that is a member of a Non-Facility Associated Signaling (NFAS) group cannot belong to a trunk group.

The Cisco AS5400 supports Network Side ISDN PRI Signaling and Calling Switching Using Dial Peers. It does not support Trunk Group Resource Manager, and Class of Restrictions.

Network side Non-Facility Associated Signaling (NFAS) is not supported.

Related Features and Technologies

This feature uses the dial peers feature, which was made available in Cisco IOS Release 12.1.

Related Documents

Refer to the “Voice over IP for the Cisco AS5800” document for a description of VoIP capabilities and the broader configuration context on the Cisco AS5800.

Supported Platforms

- Cisco AS5800
- Cisco AS5850

The entire Network Side ISDN PRI Signaling, Trunking, and Switching feature is supported only on the Cisco AS5800 platform.

See “[Restrictions](#)” earlier in this document for more specific information about the feature parts that are supported only on the Cisco AS5800. The remaining parts of the feature are platform independent.

Table 1 Cisco IOS Release and Platform Support for this Feature

Platform	12.1(3)T	12.2(2)XB1	12.2(11)T
Cisco AS5800	X	Not supported	X
Cisco AS5850	Not supported	X	X

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, 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.

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

The Network Side ISDN PRI part of this feature runs on any ISDN-capable platform with PRI interfaces. In Cisco IOS Release 12.1(3)T, the trunking and class of restrictions parts of this feature require the Cisco AS5800.

Before you begin to configure this feature, ensure that the selected access server is in the following condition:

- The T1 or E1 controllers are operational and configured for ISDN PRI.
- The D-channel interfaces are operational and configured for ISDN PRI.
- Each D-channel interface is configured with the **isdn incoming-voice modem** command.

For example, the selected PRI interfaces might have a configuration similar to the following:

```
interface Serial1/0/0:23
no ip address
no ip directed-broadcast
isdn switch-type primary-ni
isdn protocol-emulate network
isdn incoming-voice modem
no cdp enable
```

Configuration Tasks

See the following sections for configuration tasks for the Network Side ISDN PRI Signaling, Trunking, and Switching feature. Each task is identified as optional or required.

- [Configuring Network Side ISDN PRI](#) (Required)
- [Configuring Global or Interface Trunk Groups](#) (Optional)
- [Configuring Classes of Restrictions](#) (Optional)
- [Verifying Network Side ISDN PRI Signaling, Trunking, and Switching](#) (Optional)

Configuring Network Side ISDN PRI

You can configure the access server for Network Side ISDN PRI for NI or Net5 switches. In either case, you can configure the switch type globally (using the one-command version of Step 1) or you can configure the switch type on selected PRI interfaces (using the two-command version of Step 1).

To configure Network Side ISDN PRI, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# isdn switch-type type	Sets the global ISDN switch type. Two types are supported: <ul style="list-style-type: none"> • primary-ni for NI on a T1 line • primary-net5 for ETSI Net5 on an E1 line
	or	

Command	Purpose
Router(config-if)# interface serial0/0/n	Specifies the D-channel interface. For <i>n</i> , the D-channel number, use: <ul style="list-style-type: none"> • 0:23 on a T1 PRI • 0:15 on an E1 PRI
and Router(config-if)# isdn switch-type {primary-ni primary-net5}	Sets the switch type on the interface.
Step 2 Router(config-if)# isdn protocol-emulate network	Enables network-side support on the PRI interface.

If you choose to configure Network Side ISDN PRI on individual interfaces in Step 1, repeat the configuration on the additional PRI interfaces.

Configuring Global or Interface Trunk Groups

You can create trunk groups globally (using the one-command version of Step 1) or on each interface (using the two-command version of Step 1). To configure trunk groups, use the following commands beginning in global configuration mode:

Command	Purpose
Step 1 Router(config)# trunk group group-number or Router(config-if)# interface serial0/0/n and Router(config-if)# trunk-group group-number	Defines the trunk group globally. Specifies the PRI D-channel. For <i>n</i> , the D-channel number, use: <ul style="list-style-type: none"> • 0:23 on a T1 PRI • 0:15 on an E1 PRI Adds the interface to a trunk group. If the trunk group has not been defined globally, it will be created now.
Step 2 Router(config-if)# max-calls {voice data any} number [direction in out]	Applies a maximum number of calls restriction to the trunk group. This command can be repeated to apply a maximum number to different types of calls and, optionally, to specify whether the maximum applies to incoming or outgoing calls. Note Repeat Step 1 and Step 2 to create additional trunk groups and specify their restrictions, as needed for your traffic.
Step 3 Router(config)# dial-peer voice tag pots	Enters dial-peer configuration mode and defines a remote dial peer.
Step 4 Router(config-dial-peer)# trunkgroup group-number	Specifies the trunk group to be used for outgoing calls to the destination phone number.

Configuring Classes of Restrictions

To configure classes of restrictions for dial peers, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# dial-peer cor custom	Specifies that named classes of restrictions apply to dial peers.
Step 2	Router(config-cor)# name class-name	Provides a name for a custom class of restrictions. Note Repeat this step for additional class names, as needed. These class names are used in various combinations to define the lists in Step 3 and Step 4.
Step 3	Router(config)# dial-peer cor list list-name	Provides a name for a list of restrictions.
Step 4	Router(config-cor)# member class-name	Adds a COR class to this list of restrictions. The member is a class named in Step 2. Note Repeat Step 3 and Step 4 to define another list and its membership, as needed.
Step 5	Router(config)# dial-peer voice tag pots	Enters dial-peer configuration mode and defines a remote dial peer.
Step 6	Router(config-dial-peer)# corlist incoming cor-list-name	Specifies the COR list to be used when this is the incoming dial peer.
Step 7	Router(config-dial-peer)# corlist outgoing cor-list-name	Specifies the COR list to be used when this is the outgoing dial peer. Note Repeat Step 5 through Step 7 for additional dial peers, as needed.

Verifying Network Side ISDN PRI Signaling, Trunking, and Switching

To learn whether the Network Side ISDN PRI Signaling, Trunking, and Switching feature is configured successfully, perform the following steps:

- Step 1** Enter the **show isdn status** command to learn whether an appropriate switch type is specified either globally or on the D-channel interface:

```
Router# show isdn status serial 0:15

Global ISDN Switchtype = primary-net5
ISDN Serial0:15 interface
***** Network side configuration *****
dsl 0, interface ISDN Switchtype = primary-net5
```

- Step 2** Enter the **show dial-peer voice** command to learn whether the trunk group COR list and permission fields are set as desired on a dial peer:

```
Router# show dial-peer voice

VoiceEncapPeer210
  information type = voice,
  tag = 210, destination-pattern = `221',
```

```

answer-address = '', preference=0,
numbering Type = 'unknown'
group = 210, Admin state is up, Operation state is up,
incoming called-number = '221', connections/maximum = 4/unlimited,
DTMF Relay = disabled,
Modem = system passthrough ,
huntstop = disabled,
application associated:
permission :both
incoming COR list:maximum capability
outgoing COR list:minimum requirement
type = pots, prefix = '221',
forward-digits default
session-target = '', voice-port = '1/0/8:D',
direct-inward-dial = enabled,
digit_strip = enabled,

```

- Step 3** Enter the **show dial-peer cor** command to display the COR names and lists you defined. For example, if you configured COR as shown in the following sample display, the **show dial-peer cor** command output reflects that configuration.

Sample Configuration

```

dial-peer cor custom
  name 900block
  name 800_call
  name Catchall
!
dial-peer cor list list1
  member 900block
  member 800_call
!
dial-peer cor list list2
  member 900block
!
dial-peer cor list list3
  member 900block
  member 800_call
  member Catchall

```

Verification

```
Router# show dial-peer cor
```

```

Class of Restriction
  name:900block
  name:800_call
  name:Catchall

```

```

COR list <list1>
  member:900block
  member:800_call

```

```

COR list <list2>
  member:900block

```

```

COR list <list3>
  member:900block
  member:800_call
  member:Catchall

```

- Step 4** Enter the **show tgrm** command to verify the trunk group configuration. For example, if you configured trunk groups as shown in the following sample display, the **show tgrm** command output reflects that configuration.

Sample Configuration

```
interface Serial1/0/8:15
no ip address
ip mroute-cache
no keepalive
isdn switch-type primary-net5
isdn protocol-emulate network
isdn incoming-voice modem
trunk-group 2
no cdp enable
```

Verification

Router# **show tgrm**

```
Trunk   Any in Vce in   Data in
Group # Any out Vce out   Data out

      2      65535  65535  65535
          65535  65535  65535
          0 Retries
          Interface Se1/0/1:15   Data = 0, Voice = 0, Free = 30
          Interface Se1/0/8:15   Data = 2, Voice = 0, Free = 28

Total calls for trunk group:Data = 2, Voice = 0, Free = 58
Selected Voice Interface :Se1/0/1:15
Selected Data Interface  :Se1/0/1:15
```

- Step 5** Enter the **show isdn status** command to display the status of both Network Side ISDN PRI and call switching:

Router# **show isdn status**

```
Global ISDN Switchtype = primary-net5
ISDN Serial1/0/0:15 interface
***** Network side configuration *****
dsl 0, interface ISDN Switchtype = primary-net5
Layer 1 Status:
ACTIVE
Layer 2 Status:
TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
Layer 3 Status:
2 Active Layer 3 Call(s)
Activated dsl 0 CCBs = 2
CCB:callid=3C71, sapi=0, ces=0, B-chan=31, calltype=data
CCB:callid=3C72, sapi=0, ces=0, B-chan=30, calltype=data
The Free Channel Mask: 0x9FFF7FFF
ISDN Serial1/0/1:15 interface
/1/0/8
filtering...
ISDN Serial1/0/8:15 interface
***** Network side configuration *****
dsl 8, interface ISDN Switchtype = primary-net5
Layer 1 Status:
ACTIVE
Layer 2 Status:
TEI = 0, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
Layer 3 Status:
```

```

2 Active Layer 3 Call(s)
Activated dsl 8 CCBS = 2
  CCB:callid=BB40, sapi=0, ces=0, B-chan=1, calltype=DATA
  CCB:callid=BB41, sapi=0, ces=0, B-chan=2, calltype=DATA
The Free Channel Mask: 0xFFFF7FFC

```

Monitoring and Maintaining Network Side ISDN PRI Signaling, Trunking, and Switching

Command	Purpose
Router# show tgrm	Displays TGRM information for debugging purposes.

Configuration Examples

This section provides the following configuration examples:

- [Call Switching and Dial Peers Configuration on T1/T3 Example](#)
- [Trunk Group Configuration Example](#)
- [COR for Dial Peer Configuration Example](#)
- [COR Based on Outgoing Dial Peers Example](#)
- [Dial Peers and Trunk Groups for Special Numbers Example](#)

Call Switching and Dial Peers Configuration on T1/T3 Example

The following example enables Network Side ISDN PRI, call switching, and dial peers:

```

isdn switch-type primary-ni
!
controller T1 1/0/0
  framing esf
  linecode b8zs
  pri-group timeslots 1-24
!
interface Serial1/0/0:23
  no ip address
  no ip directed-broadcast
  isdn switch-type primary-ni
  isdn protocol-emulate network
  isdn incoming-voice modem
  no cdp enable
!
dial-peer voice 11 pots
  incoming called-number 222
  destination-pattern 222
  direct-inward-dial
  port 1/0/0:D

```

```
prefix 555
```

Trunk Group Configuration Example

The following trunk group allows only voice calls:

```
trunk group 1
  max-calls data 0
!
```

The following trunk group allows a maximum of 20 outgoing voice calls:

```
trunk group 2
  max-calls voice 20 direction out
!
```

The following trunk group allows a maximum of 50 incoming calls:

```
trunk group 3
  max-calls any 50 direction in
!
```

The following trunk group allows a maximum of 100 calls, 30 of which can be voice (incoming or outgoing), and 60 of which can be incoming data (the remaining 10 will be unused):

```
trunk group 4
  max-calls any 100
  max-calls voice 30
  max-calls data 60 direction in
```

COR for Dial Peer Configuration Example

The following example defines trunk group 101, establishes Network Side ISDN PRI on two PRI interfaces, and assigns both interfaces to trunk group 101. In addition, it establishes three COR lists, and specifies which incoming dial peers can make calls to 800 and which can make calls to 900 area codes. This example adopts a useful mnemonic pattern: the **dial-peer voice** tags for incoming calls correspond to the answer address (the phone number being called) and the **dial-peer voice** tags for outgoing calls correspond to the destination pattern.

```
trunk group 101
!
interface Serial1/0/0:23
  no ip address
  no ip directed-broadcast
  isdn switch-type primary-ni
  isdn protocol-emulate network
  isdn incoming-voice modem
  no cdp enable
  trunk-group 101
!
interface Serial1/0/1:23
  no ip address
  no ip directed-broadcast
  isdn switch-type primary-ni
  isdn protocol-emulate network
  isdn incoming-voice modem
  no cdp enable
```

```

trunk-group 101
!
dial-peer cor custom
  name 900_call
  name 800_call
!
dial-peer cor list list1
  member 900_call
!
dial-peer cor list list2
  member 800_call
!
dial-peer cor list list3
  member 900_csll
  member 800_call
!
dial-peer voice 525 pots
  answer-address 408525....
  corlist incoming list3
  direct-inward-dial
!
dial-peer voice 526 pots
  answer-address 408526....
  corlist incoming list2
  direct-inward-dial
!
dial-peer voice 900 pots
  destination-pattern 1900.....
  direct-inward-dial
  trunkgroup 101
  prefix 333
  corlist outgoing list1
!
dial-peer voice 12345 pots
  destination-pattern .T
  direct-inward-dial
  trunkgroup 202
!

```

COR Based on Outgoing Dial Peers Example

A typical application of COR is to define a COR name for the number that an outgoing dial peer serves, then define a list that contains only that COR name, and assign that list as **corlist outgoing** for this outgoing dial peer. For example, dial peer with destination pattern 5x can have a **corlist outgoing** that contains COR 5x.

The next step, in the typical application, is to determine how many call permission groups are needed, and define a COR list for each group. For example, group A is allowed to call 5x and 6x, and group B is allowed to call 5x, 6x, and 1900x. Then, for each incoming dial peer, we can assign a group for it, which defines what number an incoming dial peer can call. Assigning a group means assigning a **corlist incoming** to this incoming dial peer.

```

config terminal
dial-peer cor custom
  name 5x
  name 6x
  name 1900x
!
dial-peer cor list listA
  member 5x
  member 6x

```

```

!
dial-peer cor list listB
  member 5x
  member 6x
  member 1900x
!
dial-peer cor list list5x
  member 5x
!
dial-peer cor list list6x
  member 6x
!
dial-peer cor list list1900x
  member 1900x

! outgoing dialpeer 100, 200, 300
dial-peer voice 100 pots
  destination-pattern 5T
  corlist outgoing list5x
dial-peer voice 200 pots
  destination-pattern 6T
  corlist outgoing list6x
dial-peer voice 300 pots
  destination-pattern 1900T
  corlist outgoing list1900x
!
! incoming dialpeer 400, 500
dial-peer voice 400 pots
  answer-address 525...
  corlist incoming listA
dial-peer voice 500 pots
  answer-address 526
  corlist incoming listB

```

In this example, calls from 525xxxx are not able to use dial peer 300, which means they will not be able to make 1900 calls (long distance calls to the 900 area code). But calls from 526xxxx can make 1900 calls.

Dial Peers and Trunk Groups for Special Numbers Example

The following partial examples show setups for handling special numbers such as the 911 emergency number, the 0 local operator number, the 00 long-distance operator number, and so forth. “T” in these examples stands for the “interdigital timeout.” Calls to emergency numbers should not wait for this timeout, so 911 is used as the destination pattern, not 911T.

This partial example sets up a trunk group to handle calls going to the operator (0):

```

dial-peer voice 100 pots
  destination-pattern 0T
  trunkgroup 203
!

```

The following partial example sets up a trunk group to handle calls to the long distance operator (00):

```

dial-peer voice 200 pots
  destination-pattern 00T
  trunkgroup 205
!

```

The following partial example sets up a trunk group to handle calls to the international direct dial (011):

```

dial-peer voice 300 pots
  destination-pattern 011T
  trunkgroup 207

```

!

The following partial example sets up a trunk group to handle street line calls (calls that get a dial tone for an outside line):

```
dial-peer voice 400 pots
 destination-pattern 9T
 trunkgroup 209
```

The following partial example sets up a trunk group to handle calls for directory assistance:

```
dial-peer voice 500 pots
 destination-pattern 411
 trunkgroup 211
```

The following partial example sets up a trunk group to handle calls to the 911 emergency number. Emergency calls will not require a wait for the interdigital timeout to expire. They will be completed immediately.

```
dial-peer voice 600 pots
 destination pattern 911
 trunkgroup 333
```

Command Reference

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

- [corlist incoming](#)
- [corlist outgoing](#)
- [dial-peer cor custom](#)
- [dial-peer cor list](#)
- [member \(dial peer cor list\)](#)
- [name \(dial peer cor custom\)](#)
- [permission \(dial peer voice\)](#)
- [show tgrm](#)
- [trunk group \(global\)](#)
- [trunk-group \(interface\)](#)
- [trunkgroup \(dial-peer\)](#)

corlist incoming

To specify the class of restrictions (COR) list to be used when a specified dial peer acts as the incoming dial peer, use the **corlist incoming** dial-peer configuration command. To clear the previously defined incoming COR list in preparation for redefining the incoming COR list, use the **no** form of this command.

corlist incoming *cor-list-name*

no corlist incoming *cor-list-name*

Syntax Description	<i>cor-list-name</i>	Name of the dial peer COR list that defines the capabilities the specified dial peer has when it is used as an incoming dial peer.
---------------------------	----------------------	--

Defaults	None
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Command Modes	Dial-peer configuration
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Command History	Release	Modification
	12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.	
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.	

Usage Guidelines	The dial-peer cor list and member commands define a set of capabilities (a COR list). These lists are used in dial peers to indicate the capability set that a dial peer has when it is used as an incoming dial peer (the corlist incoming command), or to indicate the capability set that is required for an incoming dial peer to make an outgoing call through the dial peer (the corlist outgoing command). For example, if dial peer 100 is the incoming dial peer, and its corlist incoming is list_100, dial peer 200 has list_200 as corlist outgoing . If list_100 does not include all the members of list_200 (that is, if list_100 is not a superset of list_200), it is not possible to have a call from dial peer 100 that uses dial peer 200 as the outgoing dial peer.
-------------------------	--

Examples	In the following example, incoming calls from 526.... are blocked from being switched to outgoing calls to 1900.... because the COR list for the incoming dial peer (list2) is not a superset of the COR list for the outgoing dial peer (list1):
-----------------	---

```
dial-peer list list1
  member 900_call

dial-peer list list2
  member 800_call
  member other_call
```

■ corlist incoming

```

dial-peer voice 526 pots
  answer-address 408526...
  corlist incoming list2
  direct-inward-dial

dial-peer voice 900 pots
  destination pattern 1900.....
  direct-inward-dial
  trunkgroup 101
  prefix 333
  corlist outgoing list1
!
```

Related Commands

Command	Description
corlist outgoing	Specifies the COR list to be used by outgoing dial peers.
dial-peer cor list	Defines a COR list name.
member	Adds a member to a dial peer COR list.

corlist outgoing

To specify the class of restrictions (COR) list to be used by outgoing dial peers, use the **corlist outgoing** dial-peer configuration command. To clear the previously defined outgoing COR list in preparation for redefining the outgoing COR list, use the **no** form of this command.

corlist outgoing *cor-list-name*

no corlist outgoing *cor-list-name*

Syntax Description	<i>cor-list-name</i>	Name of the dial peer COR list required for outgoing calls to the configured number using this dial peer.
---------------------------	----------------------	---

Defaults	None
-----------------	------

Command Modes	Dial-peer configuration
----------------------	-------------------------

Command History	Release	Modification
	12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.	
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.	

Usage Guidelines	If the COR list for the incoming dial peer is not a superset of the COR list for the outgoing dial peer, calls from the incoming dial peer cannot use that outgoing dial peer.
-------------------------	--

Examples	In the following example, incoming calls from 526.... are blocked from being switched to outgoing calls to 1900.... because the COR list for the incoming dial peer (list2) is not a superset of the COR list for the outgoing dial peer (list1):
-----------------	---

```
dial-peer list list1
member 900_call

dial-peer list list2
member 800_call
member other_call

dial-peer voice 526 pots
answer-address 408526....
corlist incoming list2
direct-inward-dial

dial-peer voice 900 pots
destination pattern 1900.....
direct-inward-dial
```

■ **corlist outgoing**

```
trunk group 101
prefix 333
corlist outgoing list1
```

Related Commands

Command	Description
corlist incoming	Specifies the COR list to be used by incoming dial peers.
dial-peer cor list	Defines a COR list name.
member	Adds a member to a dial peer COR list.

dial-peer cor custom

To specify that named classes of restrictions (COR) apply to dial peers, use the **dial-peer cor custom** global configuration command.

dial-peer cor custom

Syntax Description This command has no arguments or keywords.

Defaults None

Command Modes Global configuration

Command History	Release	Modification
	12.1(3)T	This command was introduced.
	12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
	12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines You must use this command and the **name** command to define the names of capabilities before you can specify COR rules and apply them to specific dial peers.

Examples of possible names might include the following: call1900, call527, call9, or call911.



Note You can define as many as 64 COR names.

Examples The following example defines two COR names:

```
dial-peer cor custom
 name 900blackhole
 name CatchAll
```

Related Commands	Command	Description
	name	Provides a name for a custom COR.

dial-peer cor list

To define a class of restrictions (COR) list name, use the **dial-peer cor list** global configuration command. To remove a previously defined COR list name, use the **no** form of this command.

dial-peer cor list *list-name*

no dial-peer cor list *list-name*

Syntax Description

<i>list-name</i>	Name of a list to be applied to incoming or outgoing calls to specific numbers or exchanges.
------------------	--

Defaults

None

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines

A COR list defines a capability set that is used in the COR checking between incoming and outgoing dial peers.

Examples

The following example adds two members to the COR list named list1:

```
dial-peer cor list list1
  member 900block
  member 800_call
```

Related Commands

Command	Description
dial-peer cor custom	Specifies that named CORs apply to dial peers.
member (dial peer cor list)	Adds a member to a dial peer COR list.
name	Provides a name for a custom COR.

member (dial peer cor list)

To add a member to a dial peer class of restrictions (COR) list, use the **member** dial peer cor list configuration command. To remove a member from a list, use the **no** form of this command.

member *class-name*

no member *class-name*

Syntax Description	<i>class-name</i>	Class name previously defined in dial peer cor custom configuration mode by use of the name command.
---------------------------	-------------------	---

Defaults	None
-----------------	------

Command Modes	Dial peer cor list configuration
----------------------	----------------------------------

Command History	Release	Modification
	12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.	
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.	

Examples The following example adds three members to the COR list named list3:

```
dial-peer cor list list3
member 900_call
member 800_call
member catchall
```

Related Commands	Command	Description
	dial-peer cor list	Defines a COR list name.

name (dial peer cor custom)

To provide a name for a custom Class of Restrictions (COR), use the **name** dial peer cor custom configuration command. To remove a previously named custom COR, use the **no** form of this command.

name *class-name*

no name *class-name*

Syntax Description	<i>class-name</i>	A name that describes the specific class of restriction.
--------------------	-------------------	--

Defaults	None
----------	------

Command Modes	Dial peer cor custom configuration
---------------	------------------------------------

Command History	Release	Modification
	12.1(3)T	This command was introduced.
	12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
	12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines	The dial-peer cor custom and name commands define the names of capabilities to apply COR operation on. Examples of possible names might include the following: call1900, call527, call9, or call 911. You must define the capabilities before you specify the COR rules.
------------------	--

You can define as many as 64 COR names.

Examples	The following example defines three COR names:
----------	--

```
dial-peer cor custom
name 900_call
name 800_call
name catchall
```

Related Commands	Command	Description
	dial-peer cor custom	Specifies that named CORs apply to dial peers.

permission (dial peer voice)

To specify whether incoming or outgoing calls are permitted on the defined dial peer, use the **permission** dial peer voice configuration command. To remove the specified permission, use the **no** form of this command.

permission { **orig** | **term** | **both** | **none** }

no permission { **orig** | **term** | **both** | **none** }

Syntax Description

orig	This dial peer is permitted to originate calls. Thus the access server can accept incoming calls from the dial peer.
term	This dial peer is permitted to terminate calls. Thus, the access server can send outgoing calls to the dial peer.
both	This dial peer is permitted to originate and terminate calls. Both incoming and outgoing calls are permitted.
none	No incoming or outgoing calls can be made to or from this dial peer.

Defaults

both

Command Modes

Dial peer voice configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines

After a dial peer is associated with an incoming call, the permission is checked to determine whether incoming calls are permitted on the dial peer. If permission is not set to **orig** or **both**, the incoming call is blocked.

After a dial peer is matched for an outgoing call, the permission is checked to determine whether outgoing calls are permitted on the dial peer. If permission is not set to **term** or **both**, the outgoing call using this dial peer fails.



Note

The call may “rotary” to the next dial peer if the current dial peer does not have the **huntstop** command set.

Examples

The following example configures a dial peer and sets its permission to both:

```
dial-peer voice 526 pots
  answer-address 408526...
  corlist incoming list2
  direct-inward-dial
  permission both
```

Related Commands

Command	Description
dial-peer voice	Enters dial-peer configuration mode and defines a remote VoIP dial peer.

show tgrm

To display information for debugging purposes about defined trunk groups and interfaces that have been assigned to the trunk groups, use the **show tgrm** EXEC command.

show tgrm

Syntax Description This command has no arguments or keywords.

Defaults None

Command Modes EXEC

Command History	Release	Modification
	12.1(3)T	This command was introduced.
	12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
	12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Examples The following is sample output from the **show tgrm** command:

```
Router# show tgrm

      Trunk   Any in   Vce in   Data in
Group #   Any out Vce out   Data out

      2      65535   65535   65535
          65535   65535   65535
          0 Retries
          Interface Se1/0/1:15   Data = 0, Voice = 0, Free = 30
          Interface Se1/0/8:15   Data = 2, Voice = 0, Free = 28

          Total calls for trunk group:Data = 2, Voice = 0, Free = 58
          Selected Voice Interface :Se1/0/1:15
          Selected Data Interface  :Se1/0/1:15
```

[Table 2](#) describes the fields in the **show tgrm** command sample output.

Table 2 *show tgrm Field Descriptions*

Field	Description
Trunk Group #	Number of a defined trunk group.
Any in, Vce In, Data In, Any out, Vce out, Data out	Trunk group settings specifying whether incoming and outgoing voice and data traffic are allowed. The nonconfigured number 65535 indicates that max-calls values have not been configured in the global trunk group command.
Retries	Defined maximum number of retries.
Interface	Specified interface, and the number of channels currently used for voice, for data, and the number of free channels.
Total calls for trunk group	Number of calls to and from the trunk group, followed by the number of channels used for voice and for data, and the number of free channels.
Selected Voice Interface	Interface or trunk to be used next for a voice call.
Selected Data Interface	Interface or trunk to be used next for a data call.

trunk group (global)

To define a trunk group, use the **trunk group** global configuration command. To disable the specified trunk group, use the **no** form of this command.

```
trunk group group-number [max-calls any | voice | data number] | [direction in | out]
[max-retries retries]
```

```
no trunk group group-number
```

Syntax Description

<i>group-number</i>	Identifier for this trunk group, in the range 1 to 1000.
max-calls any voice data <i>number</i>	(Optional) Specifies the maximum number of voice or data calls allowed on this trunk group or the maximum number of any type of calls allowed on this trunk group, in the range 1 to 1000.
direction in out	(Optional) Specifies whether the trunk group is restricted to incoming or to outgoing calls.
max-retries <i>retries</i>	(Optional) Specifies the maximum number of outgoing call attempts when a glare situation is encountered, in the range 1 to 5. The default value is 1.

Defaults

No trunk group is defined.

If the **max-calls** keyword is not specified, the trunk group allows all calls, both incoming and outgoing.

The default maximum number of retries is 1.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
	Note The trunk group (global) command is not supported on the Cisco AS5850 in the 12.2(2)XB1 release.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines

Use this command to define the trunk group. Then if you decide to configure an interface for the Network Side ISDN PRI feature, use a **trunk-group** interface configuration command to assign the interface to a defined trunk group.

However, a trunk group need not be defined globally before being configured on an interface. If it has not been defined, it will be created.

The **max-calls** keyword set can be repeated to allow you to specify the maximum number of voice calls, the maximum number of data calls, and the maximum number of any calls.

Examples

The following example defines trunk group 101 but does not specify a maximum number of calls:

```
trunk group 101
```

The following example specifies multiple maximums. In the first version of the example, the maximums are shown on separate lines for readability, but in reality they are part of a single command:

```
trunk group 101
  max-calls any 100
  max-calls voice 30
  max-calls data 60 direction in
```

In the second version of the example, the same command is shown in a single run-on line:

```
trunk group 101 max-calls any 100 max-calls voice 30 max-calls data 60 direction in
```

Related Commands

Command	Description
trunk-group (interface)	Assigns the specified interface to the defined trunk group.

trunk-group (interface)

To assign a specified PRI interface to a defined trunk group, use the **trunk-group** interface configuration command. To remove the specified interface from the defined trunk group, use the **no** form of this command.

trunk-group *group-number*

no trunk-group *group-number*

Syntax Description

<i>group-number</i>	The defined trunk group to which this PRI interface is assigned.
---------------------	--

Defaults

An interface is not assigned to any trunk group.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform. Note The trunk-group (interface) command is not supported on the Cisco AS5850 in the 12.2(2)XB1 release.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines

A trunk group need not be defined globally before being configured on an interface. If it has not been defined, it will be created.

A PRI interface can belong to only one trunk group, and a trunk group can include only interfaces of the same signaling type (all ISDN or all channel-associated signaling). An interface that is a member of a Non-Facility Associated Signaling (NFAS) group cannot belong to a trunk group.

Examples

The following example uses the **trunk group** global configuration command to define trunk group 101, and then uses the **trunk-group** interface configuration command to assign a PRI interface to trunk group 101:

```
!
trunk group 101
!
interface Serial1/0/0:23
 no ip address
 no ip directed-broadcast
 isdn switch-type primary-ni
 isdn protocol-emulate network
 isdn incoming-voice modem
 no cdp enable
```

■ **trunk-group (interface)**

```
trunk-group 101
```

Related Commands

Command	Description
trunk group (global)	Defines a trunk group globally.
trunkgroup (dial-peer)	Specifies the trunk group for the configured dial peer to use.

trunkgroup (dial-peer)

To specify the trunk group for the configured dial peer to use, use the **trunkgroup** dial-peer configuration command. To remove the configured dial peer from the trunk group, use the **no** form of this command.

trunkgroup *group-number*

no trunkgroup *group-number*

Syntax Description	<i>group-number</i>	The trunk group to which this dial peer belongs.
---------------------------	---------------------	--

Defaults	None
-----------------	------

Command Modes	Dial-peer configuration
----------------------	-------------------------

Command History	Release	Modification
	12.1(3)T	This command was introduced.
	12.2(2)XB1	This command was implemented on the Cisco AS5850 platform. Note The trunkgroup (dial-peer) command is not supported on the Cisco AS5850 in the 12.2(2)XB1 release.
	12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Usage Guidelines	Either port or trunk group can be specified in a dial peer, but not both. The trunk group specified here acts the same role as that of a voice port. For outgoing calls, a member of the trunk group will be used to deliver the call.
-------------------------	--

Examples	The following example defines the dial peers to be used for outgoing calls to three different destination patterns and the trunk groups to use for the calls:
-----------------	---

```
dial-peer voice pots
 destination pattern 911
 trunkgroup 1
!
dial-peer voice pots
 destination pattern 0T
 trunkgroup 2
!
dial-peer voice pots
 destination pattern 00T
 trunkgroup 3
```

■ **trunkgroup (dial-peer)****Related Commands**

Command	Description
trunk group (global)	Defines a trunk group.
trunk-group (interface)	Assigns a specified interface to a defined trunk group.

Debug Commands

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

debug tgrm

To display debug messages for all trunk groups, use the **debug tgrm** EXEC command. To end the display of debug messages, use the **no** form of this command.

debug tgrm

no debug tgrm

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes EXEC

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(2)XB1	This command was implemented on the Cisco AS5850 platform.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5850 platform.

Examples

The following examples show output of the **debug tgrm** command.

This message indicates which interface was selected for the outgoing voice call:

```
TGRM:tgrm_select_interface() - Interface Serial0:23 selected
```

This message indicates that the outgoing voice call was denied because of trunk group configuration (*Allowed* shows the **max-calls** value):

```
TGRM:tgrm_select_interface() - Outgoing voice call denied. Allowed = 5, Current = 6
```

This message indicates that the trunk group has no interfaces belonging to it:

```
TGRM:tgrm_select_interface() - Trunk group 3 has no members
```

This message indicates that the outgoing voice or modem call was denied because of trunk group configuration (*Allowed* shows the **max-calls** value). For a data call, the message is “Outgoing data call denied.”

```
TGRM:Serial0:23:tgrm_accept_call() - Outgoing voice call denied. Allowed = > 5, Current = 6
```

This message indicates that the incoming data call was denied because of trunk group configuration (*Allowed* shows the **max-calls** value). For a voice call, the message is “Incoming voice call denied.”

```
TGRM:Serial0:23:tgrm_accept_call() - Incoming data call denied. Allowed = 5, Current = 6
```

Related Commands

Command	Description
debug cdapi events	Displays information about the CDAPI.
debug isdn events	Displays ISDN events occurring on the user side (on the router) of the ISDN interface.
debug isdn q931	Displays information about call setup and teardown of ISDN network connections (Layer 3) between the local router (user side) and the network.
trunk group (global)	Defines a trunk group globally.
trunk-group (interface)	Assigns a specified interface to a defined trunk group.

Glossary

COR—Class of Restrictions.

dial peer—An addressable call endpoint. A dial peer might be identified, for example, by a phone number or a port number. In Voice over IP, there are two kinds of dial peers: POTS and VoIP.

E1—Wide-area digital transmission scheme used in Europe. The E1 clock rate (2.048 MHz) allows for 32 64-kbps channels, which include one channel for framing and one channel for D-channel signaling information.

ETSI—European Telecommunications Standards Institute. ETSI is the European counterpart to the American National Standards Institute (ANSI).

hairpin—To switch the incoming leg of a call from one trunk or interface to the outgoing leg of the call on the same or a different trunk or interface.

ISDN—Integrated Services Digital Network. ISDN is a communications protocol offered by telephone companies that permits telephone networks to carry data, voice, and other traffic.

NFAS—Non-Facility Associated Signaling. Allows a single D channel to control multiple PRI interfaces. Use of a single D channel to control multiple PRI interfaces can free one B channel on each interface to carry other traffic.

NI—National ISDN. A set of standards for a standard national implementation of ISDN.

PBX—Private branch exchange. Privately owned central switching office.

PRI—Primary Rate Interface. Primary rate access consists of a single 64-kbps D channel plus 23 T1 or 30 E1 B channels for voice or data.

POTS—Plain old telephone service. Basic telephone service supplying standard single-line telephones, telephone lines, and access to the Public Switched Telephone Network.

PSTN—Public Switched Telephone Network. PSTN refers to the local telephone company.

T1—Digital WAN carrier facility used in North America. T1 sends DS1 formatted data at 1.544 Mbps through the telephone-switching network, using AMI or B8ZS coding.

TGRM—Trunk Group Resource Manager.

VoIP—Voice over IP.