



Network Features

Revised: March 19, 2007, OL-5906-14

The Cisco BTS 10200 Softswitch supports network features as described in the following sections:

- [Digit Manipulation](#)
- [Numbering Plans and Dialing Procedures](#)
- [Emergency Services \(911\)](#)
- [Operator Services](#)
- [Network Services](#)

In general, Cisco BTS 10200 Softswitch features delivered via gateway clients behave identically to their public switched telephone network (PSTN) counterparts.



Note

For information on subscriber features, see [Chapter 4, “Subscriber Features.”](#) For information on outgoing call restriction options (Class of Service and Outgoing Call Barring) see [Chapter 5, “Class of Service Restrictions and Outgoing Call Barring.”](#)

Some features can be accessed and controlled by the subscriber using a handset and vertical service codes (VSCs). *VSCs are provisionable by the service provider* (any unique ASCII string up to five characters long), and the customary values are country specific. The VSC values used throughout this chapter are for illustration purposes. For convenience, some VSC values are preprovisioned in the Cisco BTS 10200 Softswitch. (These values are listed in the Vertical Service Code appendix of the *Cisco BTS 10200 Softswitch Command Line Interface Reference Guide*.)

Typically, the system responds to user handset actions by providing an appropriate announcement. However, if an announcement is not provisioned or cannot be played, an alternate tone (for example, reorder tone) is played. Announcements are listed in the *Cisco BTS 10200 Softswitch Provisioning Guide*, and tones are listed in the *Cisco BTS 10200 Softswitch Operations, Maintenance, and Troubleshooting Guide*.

Digit Manipulation

The Digit Manipulation (DIGMAN) feature provides the ability to modify both calling number and called number for both incoming and outgoing calls within the Cisco BTS 10200 Softswitch.

**Note**

The calling party number is also known as ANI (automatic number identification). The called party number is also known as DNIS (dialed number identification service).

In addition to modifying the calling number and the called number, the digit manipulation tables can be used to modify the nature of address (NOA) of ANI and/or DNIS numbers. This feature provides the following benefits in the service provider network:

- Robust dial plans for both North American Numbering Plan (NANP) and ITU-T E.164 numbering plan
- Flexible call processing
- ANI- or DNIS-based routing

For additional standards information, see the following industry sources:

- NANP—See <http://www.nanpa.com>
- ITU-T Recommendation E.164, *The International Public Telecommunication Numbering Plan*

The Cisco BTS 10200 Softswitch performs digit manipulation by matching and replacing digits in the digit string that is being processed. For details on the rules used in this process, see the *Cisco BTS 10200 Softswitch Operations, Maintenance, and Troubleshooting Guide*.

Numbering Plans and Dialing Procedures

The Cisco BTS 10200 Softswitch supports the numbering plans and dialing procedures listed in [Table 3-1](#). These features are described in the sections that follow.

Table 3-1 Support for Numbering Plans and Dialing Procedures

Feature Description	Reference
E.164 Dialing Plan Implementation	ITU-T Recommendation E.164
Casual Dialing (Dial Around)	
Directory Services (411, 555-1212, 0+ Listing Services)	GR-532-CORE FSD-30-17-0000
Easily Recognizable Codes	GR-2892-CORE SR-2275, Sec. 3.3
Information Service Calls (900 and 976)	
n11 support (211, 311, 411, 611, 711, 811)	GR-532-CORE FSD-30-16-0000

E.164 Dialing Plan Implementation

The Cisco BTS 10200 Softswitch implements a dialing plan based on ITU-T Recommendation E.164, *The International Public Telecommunication Numbering Plan*, a standard for numbering and routing. This dialing plan uses a generic numbering scheme for number evaluation. The Cisco BTS 10200 Softswitch performs digit manipulation on ANI data of the calling party, and on DNIS data of the called party.

National Number

In the E.164 numbering scheme, there are three parts to any national number (number that terminates within the country):

- National destination code (NDC)—A region of the country (1 to 6 digits, typically 3)
- Exchange code (EC)—An area served by a single central office (CO) switching facility (1 to 6 digits, typically 4)
- Dialing number (DN)—The specific digits that identify a subscriber line (1 to 4 digits, typically 4)

**Note**

The combination [EC + DN] is called the subscriber number (SN).

The combination [NDC + EC + DN], or [NDC + SN], is called the national number (NN).

**Tip**

[NDC + EC + DN] is interpreted as [NPA + NXX + XXXX] in NANP, where NPA (numbering plan area) = 200 to 999, NXX (office code) = 200 to 999, and XXXX = 0000 to 9999. The Cisco BTS 10200 Softswitch applies the NANP interpretation if the NANP-DIAL-PLAN flag is set to Y (yes) in the DIAL-PLAN-PROFILE table.

A user originates a call by dialing as follows:

- To place a call to a phone in the same EC (served by the same CO), dial the SN. In most cases, this is considered a local call.
- To place a call to a phone in another EC, but within the same region (same NDC), dial the SN. In most cases, this is considered a local toll call.
- To place a call to a phone in another region (different NDC), dial the national (trunk) prefix and the NN. The national prefix varies from country to country. In most cases, this type of call is considered a national toll call.

Examples of national prefixes include:

- 0 in China
- 1 and 0 within NANP
- 9 in Finland and Spain
- 16 in France

International Number

The international number is the number dialed from one country to another to reach a subscriber. Each country is assigned a country code (CC). The international number is the combination [CC + NN], or [CC + NCD + EC + DN]. [Table 3-2](#) lists several examples.

Table 3-2 **Examples of International Numbers**

Country	City	CC	NDC	EC	DN Group	Complete International Number
Belgium	Bruxelles	32	02	123	xxxx	32-02-123-xxxx
China	Chengdu	86	28	8293	xxxx	86-28-8293-xxxx
Germany	Dusseldorf	49	211	12	xxxx	49-211-12-xxxx
Canada	Montreal	1	514	870	xxxx	1-514-870-xxxx
United Kingdom	London	44	71	248	xxxx	44-71-248-xxxx

To place a call to a phone in another country, the caller must dial an international prefix and then the international number. Thus, the complete digit string to dial is [international prefix + CC + NN]. The international prefix varies from country to country. Examples of international prefixes include:

- 00 in China
Example of a call from China to Montreal: 00-1-514-870-xxxx
- 011, 01 in NANP
Example of a call from the United States to Bruxelles: 011-32-02-123-xxxx

In some countries, two or more international prefixes may be used

- To reach different groups of countries
- To reach countries within a group

Casual Dialing (Dial Around)

Casual dialing, also known as dial around, specifies whether the carrier supports 101XXXX calls. The digit map CLI command tokens provide the digit pattern. The digit pattern specifies all possible acceptable patterns. An example of a casual digit pattern is 1010321 or 1010220. The digit map table tells the media gateway (MGW) how to collect and report dialed digits to the Call Agent (CA). Subscribers can prefix their interLATA or international calls with 101XXXX. Casual dialing supports the following casual calls:

- 101XXXX + 0/1 + NPA + NXX-XXXX
- 101XXXX + 0/00
- 101XXXX + 011/01 + CC + NN

Directory Services (411, 555-1212, 0+ Listing Services)

The Cisco BTS 10200 Softswitch supports the directory services access feature as specified in Telcordia document GR-352-CORE, LSSGR: *Interface To Directory Assistance Systems (FSD 30-17-0000)*.

Directory services allows a subscriber to obtain the listed telephone number for a given name and address. The caller dials a specific service number to reach directory services, also referred to as directory assistance (DA). When a subscriber dials one of the following digit patterns, the Cisco BTS 10200 Softswitch routes the call to the applicable directory services in the PSTN:

- 411 or 555-1212 (DA)
- 1+411, 1+555-1212 (toll DA)
- 1-NPA-555-1212 (mostly for out-of-town/state numbers)
- 1-8XX-555-1212 (toll-free numbers)
- 0+ listing services

The service to the caller can be provided manually by a live operator, automated via a voice or dual tone multifrequency (DTMF) recognition system, or by a combination of these. The volume level from an automated voice-response unit, however, should be comparable to that of a live operator. Different network operators can employ different systems in providing directory services.

A typical directory services request requires that the caller first give the name of the town and city. The caller then provides the name of the person or business that the caller wants to call, including the spelling of unusual names. Finally, the caller states if the request is for residence or business. Additional services include handling multiple requests made during the same call and automatic connection to the person (or business) the caller wants to call.

Easily Recognizable Codes

The Cisco BTS 10200 Softswitch supports selected easily recognizable codes (ERCs) as described in document SR-2275, *Telcordia Notes On the Network*, Section 3.3. The supported ERCs are

- 500 personal communications services (PCS)—See the Alliance for Telecommunications Industry Solutions (ATIS) document INC-95-0407-009, *Personal Communication Services N00NXX. Code Assignment Guidelines*, for a PCS description.
- 700 service access calls (SAC)—Range of codes used by interexchange carriers (IXCs) to provide services on the network.
- Toll-free service call features (8XX)—See the [“8XX \(Toll-Free Calling\)” section on page 3-11](#) for a description.
- 900/976 information service calls—See the [“Information Service Calls \(900 and 976\)” section on page 3-5](#) for a description.

Other Telcordia reference documents include:

- SR-2275, *Telcordia Notes On the Network*
- GR-2892-CORE, *Switching and Signaling Generic Requirements for Toll-Free Service Using AIN*

Information Service Calls (900 and 976)

Information service calls (ISCs) provide a variety of announcement-related services on a national or local basis. There are two general categories of this service:

- Public announcement services (PAS)—Weather, sports, horoscope, and so forth
- Media-stimulated calling (MSC)—Telephone voting, radio station call-ins, and so forth

National calls are dialed as 1-900-xxx-xxxx and local calls are dialed as NPA-976-xxxx.

n11 support (211, 311, 411, 611, 711, 811)

**Note**

911 service is covered in the [“Emergency Services \(911\)”](#) section on page 3-8.

This section describes Cisco BTS 10200 Softswitch support for n11 services. The typical relationship between the n11 codes and the nature of dial (NOD) values is as follows. The [NOD values](#) are listed in the *Cisco BTS 10200 Softswitch Command Line Reference Guide*.

n11 Code	NOD Value
211	INFO
311	NON-EMG
411	DA
611	REPAIR
711	RELAY
811	BUSINESS

For additional information on n11 calling, see the following industry documents:

- Telcordia document GR-352-CORE, *LSSGR: Service Codes N11 (FSD 30-16-000)*
- The NANPA web site, http://www.nanpa.com/number_resource_info

Community Information and Referral Services (211)

The 211 service provides access to information from government service agencies and certain public charity groups.

Nonemergency Services (311)

Some city governments offer 311 service to provide nonemergency information to the community. The caller dials 311 and the Call Agent translates this to the closest nonemergency access office.

The Cisco BTS 10200 Softswitch supports nonemergency services (311) for routing calls to a specified route type and identification. Routes for all nonemergencies (311) are allocated through the destination table by defining the call type (“call-type=non-emg”) and the routing information for the dialed digits.

Directory Assistance (411)

The 411 service provides directory assistance. See the [“Directory Services \(411, 555-1212, 0+ Listing Services\)”](#) section on page 3-4.

Repair Service (611)

The 611 service connects to the local telephone repair service (if the service provider offers this service).

Telecommunications Relay Services (711)

The 711 service provides access to telecommunications relay services (TRS).

Local Billing Services (811)

The 811 service connects to the local telephone billing office.

Other n11 Codes

The 511 code (caller access to information about local traffic conditions) is not supported in this release of the Cisco BTS 10200 Softswitch.

Emergency Services (911)

The Cisco BTS 10200 Softswitch supports emergency services (911) as specified in Telcordia document GR-529-CORE, *LSSGR: Basic 911 Emergency Service (FSD 15-01-0000)*.

Other Telcordia reference documents include

- SR-4163, *E9-1-1 Service Description*
- GR-350-CORE, *E911 Public Safety Answering Point: Interface Between a 1/1A ESS Switch and Customer Premises Equipment*



Note

911 is typically used in the United States; other digit strings are used elsewhere in the world. Depending on the region of the world, the provisionable timers may require different values, or may not be needed, and they can be turned off. The called-party control feature, typically used in the United States, can also be turned off. All other functions of the emergency number are the same as for the 911 feature.

Emergency service is a public safety feature providing emergency call routing to a designated Emergency Service Bureau (ESB), normally called the public safety answering point (PSAP) in the United States. The 3-digit 911 number is assigned for public use in many areas of the United States and Canada for reporting an emergency and requesting emergency assistance. Depending on municipal requirements and procedures, an ESB attendant can transfer the call to the proper agency, collect and relay emergency information to the agency, or dispatch emergency aid directly for one or more participating agencies.

911 calls are location dependent and must be selectively routed to the appropriate PSAP depending on where the call originates. The routing process is part of the Enhanced 911 (E911) feature set and works as follows:

1. In the PSTN, the local serving end office routes the call to the designated E911 tandem for that serving area.
2. The E911 tandem then routes the call to the proper PSAP.

Once the caller is connected to the PSAP attendant, the PSAP system typically displays the caller's directory number to the PSAP attendant. Additional data (such as the subscriber's name, address and closest emergency response units) may also be retrieved from the local carrier automatic location identification (ALI) database and displayed to the PSAP attendant.



Note

The service provider can provision a flag for each subscriber to specify which number to send with emergency calls—the subscriber directory number or the subscriber billing number.

Special emergency functions can be provided via a channel-associated signaling (CAS) trunking gateway (TGW) that supports ESB trunks or emergency service line (ESL) trunks with MF signaling. Examples of special emergency functions include:

- Operator callback—Allows the PSAP to automatically ring back the caller.
- End-to-end called-party hold—The Cisco BTS 10200 Softswitch keeps the connection active even if the caller goes on hook.
- Operator disconnect—Allows the PSAP to terminate the call even though the caller has not gone on hook.

Feature Interactions

The following feature interactions apply to emergency calls (call-type=EMG):

- During a 911 call from a subscriber line, the call waiting (CW) and three-way calling (TWC) features are automatically disabled for the subscriber line.
- There is an interaction when a Centrex subscriber invokes call hold (CHD) and places a call to an emergency number:
 - When the emergency operator answers the call, a two-party call is active between the subscriber and the emergency operator. The on-hold party remains on hold.
 - When the subscriber presses the Flash button or hookswitch, a three-way call is established among the subscriber, the emergency operator, and the previously on-hold party.
 - It is not possible to place the emergency operator on hold.



Note

The emergency service (911) feature can be made available to all subscribers lines connected to a Cisco BTS 10200 Softswitch using the default office service ID. See the [“Default Office Service ID” section on page 4-72](#) for a general description of this provisionable service.

Operator Services

The Cisco BTS 10200 Softswitch supports operator services as specified in Telcordia Requirement FR-271, *Operator Services Systems Generic Requirements (OSSGR)*. This section describes:

- [Subscriber Access to Operator, page 3-9](#)
- [Busy Line Verification \(BLV\) and Operator Interrupt \(OI\) Services, page 3-10](#)

Subscriber Access to Operator

Operator services is a call-processing function whereby callers can access either a live operator or an automated function to complete calls or gain access to information. The service provider can provide this feature or outsource it to a third-party vendor. Some additional functions accomplished by operator services include automatic call distribution, billing detail recording, and information retrieval. The following numbers are commonly used to access operator services:

- 0—Local operator support
- 00—Operator support outside the “local” calling area, using a presubscribed interexchange carrier (PIC)
- 0+ area code and number—Operator support when the destination number is known (that is, for collect calls, calling card calls, person-to-person calls, and so forth, using PIC)
- CAC+0+—Operator services, using a dialed carrier access code (CAC)
- 01+CC+NN—International operator services, using PIC
- CAC+01+CC+NN—International operator services, using a dialed CAC

Operator services provided to callers include:

- Assistance
- General information

- Directory assistance
- Dialing instructions
- Rate information
- Credit recording
- Trouble reporting
- Call completion
- Alternate billing services (ABS)
- Calling card calls
- Collect calls
- Third-number calls
- Handling options
- Person-to-person
- Conference calls
- Call transfer
- Real-time rating
- Rate quotes
- Time and charges
- Notify

Busy Line Verification (BLV) and Operator Interrupt (OI) Services

This section describes busy line verification (BLV) and operator interrupt (OI) services. OI is also referred to as emergency interrupt (EI). BLV and OI services are based on GR-1176 (FSD 80-01-0300), Busy Line Verification, part of Telcordia OSSGR requirements (FR-271).

Description and Operation

BLV service permits the user to obtain operator assistance to determine if a called line is in use. The user dials 0, waits for the operator to pick up the line, and requests BLV service. OI service permits the operator to speak directly with the busy party. The service provider can deny BLV service to any subscriber by setting type=denied for fname=BLV in the subscriber-feature-data table (see the BLV provisioning link listed below). Note that denying BLV also denies OI.

BLV and OI services work as follows:

1. The user calls the operator and requests BLV service regarding a specific called line.
2. The operator provides the BLV service.
3. For OI, the operator interrupts the conversation in progress and relays a message.
4. If the interrupted party at the called line is willing to hang up, they do so.
5. The user can originate a new call to the called DN.

**Note**

At the user's request, the operator has the option to directly connect the user to the called line.

The BLV feature can be made available to all subscribers lines connected to a Cisco BTS 10200 Softswitch using the default office service ID. See the [“Default Office Service ID” section on page 4-72](#) for a general description of this provisionable service.

Feature Interactions

The following feature interactions are applicable to the BLV and OI services:

- The BLV feature does not support interaction with features currently invoked by the verified party (terminating subscriber) at the time of verification. If the verified party is engaged in a call and has any features invoked, the operator will receive a busy tone and will not be able to perform an interrupt on the call. In this section, “currently invoked” means that another feature has already been triggered in the call.
- If the verified party (terminating subscriber) has call forwarding unconditional (CFU) activated, the operator will receive a busy tone and will not be able to perform an interrupt on the call.

Network Services

The Cisco BTS 10200 Softswitch supports the network services listed in [Table 3-3](#).

Table 3-3 Support for Network Services

Feature Description	Reference
8XX (Toll-Free Calling)	SR-2275, Sec. 14.6
Calling Party Number Options for Outgoing SETUP Messages	
Dialing Parity (IntraLATA Toll Presubscription)	FSD-20-24-0040 TR-TSY-000693
Lawful Intercept Interface	PKT-SP-EM-I08-040113
Local Number Portability (LNP)	ATIS/T1S1 T1.TRQ-02-2001
Network Loopback Test for NCS/MGCP Subscriber Endpoints	
Split-NPA	INC97-0404-016
T.38 Fax Relay	IETF RFC 2833 ITU-T <i>Recommendation T.38</i>
Trunk Testing	

8XX (Toll-Free Calling)

The purpose of the toll-free feature is to have the called party, rather than the calling party, charged for the call. These calls are prefixed with the 1+8XX service access codes. The seven digits following the 8XX codes are used for routing the call. For an inbound/outbound 8XX call, the Cisco BTS 10200 Softswitch checks the local toll-free database first. If the corresponding DN is not found in the local toll-free database, the system sends a query to the service control point (SCP) to request the corresponding DN.

All aspects of toll-free calling are transparent to the caller. A caller expects to dial 1-8XX-NXX-XXXX to reach the desired destination. The company that translates the number to a specific DN, and the company that routes the call, must appear transparent to callers. Most callers are not aware that their dialed 8XX number is changed into a specific DN. What matters to the callers is that they reach what they perceive to be the called number, and they are not billed for the call.

**Note**

These toll-free (8XX) features can be made available to all subscriber lines connected to a Cisco BTS 10200 Softswitch using the default office service ID, or to all subscribers in a specific POP using the office service ID. See the [“Default Office Service ID”](#) section on page 4-72 for a general description of this provisionable service.

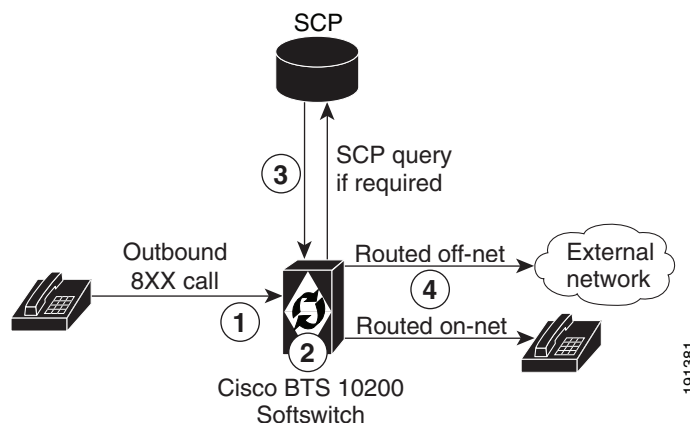
8XX Call Processing

The system processes outbound 8XX calls as follows:

1. The CA signals the AIN FS to perform an 8XX query.
2. The AIN FS performs an internal database query.
3. If an internal record is found for the 8XX number, the AIN FS provides the routing information to the CA and the call is attempted.
4. If no internal record is found, the next action depends on how the NOA token is provisioned in the dial plan table. If NOA is provisioned as NATIONAL (the default value), the AIN FS performs an external service control point (SCP) query. If a route is found, the CA completes the call. Otherwise the call is released.

Figure 3-1 shows the processing of an outbound 8XX call placed by a subscriber.

Figure 3-1 Processing of an Outbound 8XX Call



Notes for Figure 3-1

1. A subscriber dials an 8XX call.
2. The system attempts to translate the 8XX call to a DN in its local database.
3. If there is no record in the local database, the system sends a query to the SCP and receives a translated DN.
4. The system routes the call to the appropriate subscriber (on-net call) or external network (off-net call).

Local Toll-Free Database

This section explains how the system uses information from the local toll-free database.

The Cisco BTS 10200 Softswitch provides the ability to translate inbound/outbound 8XX numbers at the Feature Server (FS) using a local 8XX database. The 8XX service supports the following features:

- Origin-dependent routing
- Time-of-day routing
- Percentage-based routing
- Information digit-based screening
- Black/white list screening

The Cisco BTS 10200 Softswitch also supports optional DNIS service. In an 8XX DNIS service, when a call is terminated to a PBX (call center), 4 digits are outpulsed to the PBX to identify the originally dialed 8XX number. In case of custom DNIS, up to 22 digits can be outpulsed with additional information such as:

- Original 8XX number dialed
- Automatic number identification (ANI)
- Originating line information of the calling party

When a translated number (for an original 8XX call) is received, the Analyzed Info DP triggers the FS. The Cisco BTS 10200 Softswitch looks up the DNIS and TG information for the call. The DNIS information is then outpulsed to the PBX. If an overflow condition is encountered, the call is routed to the overflow trunk. The overflow trunk can be a PSTN trunk.

See SR-2275, *Telcordia Notes on the Network*, Section 14.6 for additional information on toll-free database services.

SCP-Based Toll-Free Services

This section explains how the system uses information from the external toll-free database.

The Cisco BTS 10200 Softswitch communicates with an SCP-based database called the toll-free database service, which contains information for routing the call. The database service provides information about the network service provider selected to complete the call, and information for translating the toll-free number to a specific 10-digit directory number (DN). The routing of the call can vary depending on the arrangements made between the toll-free subscriber and the network service provider. These arrangements can include selective routing based on the time of day, day of week, and location from which the call originates.

Provisioning Commands

To provision this feature, see the [8XX \(Toll-Free Calling\) provisioning procedure](#) in the *Cisco BTS 10200 Softswitch Provisioning Guide*.

Calling Party Number Options for Outgoing SETUP Messages

This feature allows the service provider to control the calling party number (CPN) data sent in the outbound SETUP message on redirected calls outbound from the Cisco BTS 10200 Softswitch to the PSTN.

The CPN option is provisionable (via CLI commands) using the SEND-RDN-AS-CPN token in the TRUNK-GRP table:

- If this token is set to Y (yes), the system overwrites the existing CPN with the redirecting number (RDN) and includes the new value in the outbound SETUP message.
- If this token is set to N (no), the system does not change the existing CPN data.
N is the default value.

This feature is applicable to the following scenarios:

- Redirection by a subscriber phone
- Redirection of a basic or Tandem call

Figure 3-2 shows an example of the networks and phones involved in redirection by a subscriber phone. Table 3-4 explains how to provision the SEND-RDN-AS-CPN token for various call-redirection scenarios and results.

Figure 3-2 General Network View for Redirection by a Subscriber Phone

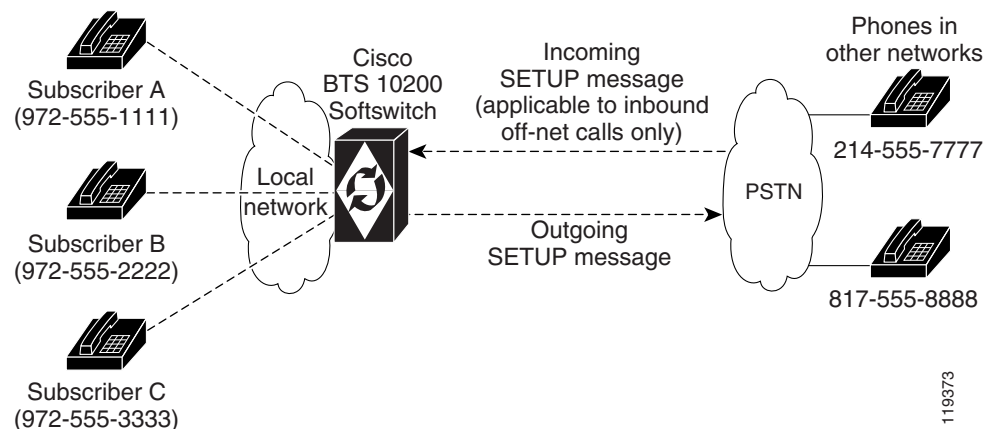


Table 3-4 Provisioning SEND-RDN-AS-CPN Token in TRUNK-GRP Table for Redirection by a Subscriber Phone

Scenario (See Figure 3-2)	Existing CPN and RDN Data (Example)	Value Provisioned for SEND-RDN-AS-CPN	Effect On Outbound SETUP Message	Content of Outbound SETUP Data (Example)
On-net to off-net call (either of the following): A -> B -> fwd -> C -> fwd -> off-net A -> C -> fwd -> off-net	CPN= 972-555-1111 RDN= 972-555-3333	Y	Overwrite CPN with RDN	CPN= 972-555-3333 RDN= 972-555-3333
		N	Do not change CPN	CPN= 972-555-1111 RDN= 972-555-3333
Off-net to on-net to off-net call: Inbound off-net call -> B -> fwd -> off-net Note In this example, the existing RDN (from the incoming SETUP message) is 817-555-8888. The new RDN is the DN of the forwarding phone, Subscriber B—972-555-2222.	CPN= 214-555-7777 RDN= 817-555-8888 (from incoming SETUP message)	Y	Overwrite CPN with RDN	CPN= 972-555-2222 RDN= 972-555-2222
		N	Do not change CPN	CPN= 214-555-7777 RDN= 972-555-2222

[Figure 3-3](#) shows an example of the networks and phones involved in redirection of a basic or Tandem call. [Table 3-5](#) explains how to provision the SEND-RDN-AS-CPN token for call-redirection scenarios and results. Note that the content of the outbound SETUP message depends on whether the RDN is available in the incoming SETUP message.

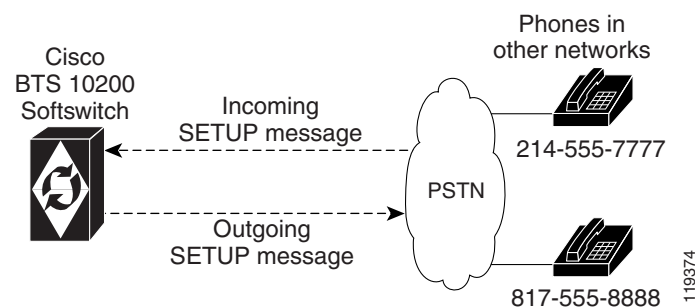
Figure 3-3 General Network View for Redirection of Basic or Tandem Call

Table 3-5 Provisioning SEND-RDN-AS-CPN Token in TRUNK-GRP Table for Redirection of Basic or Tandem Call

Scenario (See Figure 3-3)	Existing CPN and RDN Data (Example)	Value Provisioned for SEND-RDN-AS-CPN	Effect On Outbound SETUP Message	Content of Outbound SETUP Data (Example)
Off-net to off-net call (basic or Tandem) with RDN available in the incoming SETUP message: off-net call -> Cisco BTS 10200 Softswitch -> off-net	CPN= 214-555-7777 RDN= 817-555-8888	Y	Overwrite CPN with RDN	CPN= 817-555-8888 RDN= 817-555-8888
	(from incoming SETUP message)	N	Do not change CPN	CPN= 214-555-7777 RDN= 817-555-8888
Off-net to off-net call (basic or Tandem) with RDN <i>not available</i> in the incoming SETUP message: off-net call -> Cisco BTS 10200 Softswitch -> off-net	CPN= 214-555-7777 <i>RDN not available</i>	Y	Do not change CPN	CPN= 214-555-7777 RDN not available
	(from incoming SETUP message)	N	Do not change CPN	CPN= 214-555-7777 RDN not available

**Tip**

To view all the tokens in this table, see the [Trunk Group Table](#) information in the *Cisco BTS 10200 Softswitch Command Line Interface Reference Guide*.

Dialing Parity (IntraLATA Toll Presubscription)

The Cisco BTS 10200 Softswitch supports this feature in accordance with Telcordia document GR-693-CORE, LSSGR: *Presubscription Indication (FSD 20-24-0000)*.

Dialing parity—also known as intraLATA toll presubscription—allows subscribers to select a telecommunications company for intraLATA calls (local toll calls) in the same way they select a long-distance provider. With dialing parity, subscribers are able to dial the number they want and have a preselected carrier—a competitive local exchange carrier (CLEC), incumbent local exchange carrier (ILEC), or a long-distance carrier—automatically handle the call if it is a local (intraLATA) toll call. Preselecting a local toll carrier eliminates the need for dial-around service for local toll calls (101XXXX numbers). Prior to implementation of dialing parity, long-distance carriers provided intraLATA service by dialing around an ILEC or CLEC via 101XXXX numbers (carrier access codes—CACs).

Local access and transport areas (LATAs) were created after the breakup of the AT&T system. LATAs are also known as called service areas or local toll calling areas. CLECs and ILECs provide two types of calls to their subscribers within the LATA:

- Local calls
- Local toll calls

Local toll calls are typically calls to places more than 16 miles from the subscriber location in urban areas and more than 13 miles in rural areas. Local toll calls do not qualify as either local or long distance—they are between the two and are subject to different rates.

Lawful Intercept Interface

This section describes the lawful intercept interface supported by the Cisco BTS 10200 Softswitch.

General Description of Lawful Intercept Implementation

The Cisco BTS 10200 Softswitch supports the call data interface and call content function for lawful intercept, along with the provisioning interface required to configure a wiretap. The Cisco BTS 10200 Softswitch provides support for lawful intercept using two different, industry-developed architectures: PacketCable and the Cisco Service Independent Intercept (SII). Depending on their network type, service providers may choose to configure their networks consistent with either of these architectures in their effort to meet their obligations related to lawful intercept. Given the constantly evolving nature of industry-developed standards, service providers must recognize that the features and functionality of the Cisco BTS 10200 Softswitch described below may also be subject to change over time.

**Note**

Each country controls its own laws applicable to lawful intercept. For example, in the United States, one of the applicable laws is referred to as the Communications Assistance for Law Enforcement Act (CALEA).

Lawful Intercept Provisioning Interface

The Cisco BTS 10200 Softswitch supports a secure provisioning interface to process wiretap requests from law enforcement agencies through a mediation device. The service provider can limit viewing and provisioning of these parameters to selected authorized personnel. The applicable parameters (entered via CLI) include the DN, tap type, and call data channel for data transmission. The tap type specifies whether the tap order is a pen register (outgoing call information), a trap and trace (incoming call information), a pen and trace (incoming and outgoing call information), or an intercept (bidirectional plus the call content).

Lawful Intercept Call Data Interface

The Cisco BTS 10200 Softswitch provides the PacketCable EMS/RADIUS interface for the transmission of call identifying information to the lawful intercept delivery function (DF) server as required by Appendix A, PCES Support, in PKT-SP-EM-I08-040113, *PacketCable Event Messages Specification (EMS)*, January 13, 2004.

Full call-identifying information (call data) is shipped to a DF server from the Cisco BTS 10200 Softswitch for the subject under surveillance for various call types (for example, basic call and call forwarding).

Lawful Intercept Call Content Function

The call content function provides for capturing voice in a replicated Real-Time Transport Protocol (RTP) stream. The Cisco BTS 10200 Softswitch can be configured to operate with simultaneous support for PacketCable intercept and Cisco SII, or with Cisco SII only.

Simultaneous support for PacketCable intercept and Cisco SII is achieved as follows: During the call-setup phase, the Cisco BTS 10200 Softswitch searches for a PacketCable-compliant call-content intercept access point (IAP) in the call path. If the Cisco BTS 10200 Softswitch determines that there is no such IAP available in the call path, it falls back to Cisco SII.

**Note**

An intercept access point (IAP) is a point within a communication system where some of the communications or call identifying information of an intercept subject's equipment, facilities, and services are accessed.

Additional information about each type of intercept is provided below:

- **PacketCable intercept**—In PacketCable intercept, a replicated RTP stream is sent to the DF server by an aggregation router or a trunking gateway upon request from the Cisco BTS 10200 Softswitch. The Cisco BTS 10200 Softswitch requests the relevant IAP (aggregation router or trunking gateway) to duplicate and transport the RTP stream to a predefined IP address and port number.

The Cisco BTS 10200 Softswitch uses Common Open Policy Service (COPS) protocol when sending the above request to an aggregation router, and Media Gateway Control Protocol (MGCP) when sending the request to a trunking gateway.

- **Cisco Service Independent Intercept**—In Cisco SII, a replicated RTP stream is sent to the DF server by an aggregation router or a trunking gateway upon request from the DF server. The DF server uses SNMPv3 as the control protocol to send the intercept request to the appropriate IAP.

Local Number Portability (LNP)

The Cisco BTS 10200 Softswitch supports the local number portability (LNP) feature. For further information, see *Number Portability Switching Systems*, T1.TRQ-02-2001, which provides unofficial agreement within T1S1. T1S1 is the ATIS accredited body for signaling. This document is available at <http://www.atis.org>.

LNP permits subscribers who change their local phone company to keep their existing telephone numbers. An FCC order requires this feature in the 100 top metropolitan service areas in the United States. LNP permits calls to be routed to the subscriber's new local switch without any particular per-call action required of either the calling or called party. Each switch contains a database of the office codes (NPA-NXXs) associated with subscriber numbers that have been ported in and ported out.

**Note**

The LNP feature can be made available to all subscribers lines connected to a Cisco BTS 10200 Softswitch using the default office service ID. See the [“Default Office Service ID” section on page 4-72](#) for a general description of this provisionable service.

**Note**

For a complete description of the LNP feature and the applicable provisioning procedures, see the *Local Number Portability* feature module in the Cisco BTS 10200 Softswitch documentation set.

The Cisco BTS 10200 Softswitch supports the LNP function as follows:

- Ranges/blocks of ported numbers are provisionable in the Cisco BTS 10200 Softswitch, with block size granularity from 100 to 10,000 DNs per block.

- During the call processing, if the dialed digits/destined digits match 3 to 10 contiguous digits of a ported NPA-NXX-XXXX at the Info_Analyzed/ Collected_Info trigger detection point (TDP), a query is initiated to an external database using the AIN Info_Analyzed message. This LNP trigger is also known as the public office dialing plan (PODP) trigger.
- The Cisco BTS 10200 Softswitch processes the received response (Analyze_Route) from the TCAP query and determines whether the dialed digits have been translated to a location routing number (LRN):
 - If the CalledPartyID received from the Analyze_Route differs from the dialed digits (that is, the LRN comes back), the call is routed based on the received CalledPartyID as the ISUP IAM CalledPartyNumber and sets the ForwardCallIndicator parameter to “Number translated”. The ISUP IAM also includes the ISUP GenericAddress Parameter (GAP) set to the dialed digits.
 - If the CalledPartyID received from the Analyze_Route is the same as the dialed digits (that is, no LRN comes back), the call is routed based on the received CalledPartyID as the ISUP IAM CalledPartyNumber and sets the ISUP ForwardCallIndicator (FCI) parameter to “Number translated”.
 - When the LNP query results in an error, the call is routed based on the dialed digits/destination digits, and does not include the ISUP GAP, and the FCI is set to “Number not translated”.

Network Loopback Test for NCS/MGCP Subscriber Endpoints

This feature allows support for a network loopback test on any MGCP/NCS subscriber endpoints controlled by the Cisco BTS 10200 Softswitch. With Release 4.4.x, the system supports line-side testing only. The procedure for setting up the test includes configuring the test lines as subscriber terminations and provisioning the MGW parameters. The procedure is described in the *Release Notes* document.

The following limitations apply:

- The testing and tested devices must be configured on same Call Agent.
- The system does not support loopback testing across a SIP or H.323 network.

Split-NPA

When DNs are exhausted within an NPA, an additional NPA is assigned to the region. The new NPA may be allocated as an overlay over the existing NPA, in which case there is no major impact to the Cisco BTS 10200 Softswitch. However, when the new NPA is assigned based on a geographical split of the region, there are significant impacts. The assignment of the new NPA based on a geographical split is referred to as split-NPA.

The split-NPA feature impacts both provisioning (EMS) and call processing subsystems in the Cisco BTS 10200 Softswitch. Several provisioning tasks must be performed to introduce a new NPA into a region, including:

- Duplicate records (tasks to be performed before permissive period)
- Update ANI records (tasks to be performed during permissive period)
- Cleanup (tasks to be performed after permissive period)



Note

Permissive period is the time frame where both old NPA and the new NPA can be dialed to reach the subscribers affected due to the split-NPA feature.

Before the permissive period begins, subscribers affected due to the split-NPA can be reached only via the old NPA. Duplicate records for both old and new NPA are created before the permissive period begins.

During the permissive period, both old and new NPA can be dialed (10-digit dialing is required to reach a subscriber in the affected NPA). The subscriber (ANI) and subscriber feature data records are updated to the new NPA during the permissive period.

Once the permissive period ends, subscribers affected due to the split-NPA can be reached only via the new NPA. This is referred to as the mandatory dialing period for the new NPA. The duplicate records created before the permissive period are cleaned up after the mandatory period begins.

For additional information on split-NPA, see the ATIS document INC97-0404-016, *NPA Code Relief Planning & Notification Guidelines*.

T.38 Fax Relay

The Cisco BTS 10200 Softswitch communicates with MGWs to permit faxes to be transported across the IP network in the MGCP and H.323 control environments. The process is based on the following standards documents:

- IETF document *RFC 2833, RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*
- ITU-T Recommendation *T.38 (06/98) - Procedures for Real-Time Group 3 Facsimile Communication Over IP Networks*

The system supports three fax modes:

- T.38 CA-controlled mode—This mode can be used for either of the following fax scenarios:
 - Faxes transmitted between a Cisco IOS MGCP-based MGW and an H.323 gateway (GW)
 - Faxes transmitted between two MGCP-based MGWs

In T.38 CA-controlled mode, the CA instructs the gateway to switch to T.38 fax mode in real time. The CA receives a signal (Request mode for H.323 and Notify(fax) for MGCP) when fax signaling starts and stops. The CA maps the fax messages according to the protocol (MGCP or H.323) used for the originating and terminating messages. Billing records are generated in the CA based on fax start and stop signals. For information, see industry standards documents on H.323 Annex D version 2 (also incorporated into H.323 version 4) and MGCP FXR package.

- T.38 MGW-controlled mode—This mode can be used only for faxes transmitted between two Cisco IOS MGCP-based MGWs. In this mode, the CA passes the Session Description Protocol (SDP) information between the MGWs as in a normal voice call, and the CA is unaware that SDP extensions are being used by the MGWs for T.38 fax relay. After the SDP is exchanged, and if the MGW detects the fax call, it negotiates the codec to invoke the T.38 fax procedure automatically without CA involvement. The MGWs communicate with each other by using the RTP name signaling event (NSE) mechanism to exchange information.
- Inband Mode—This mode can be used for fax transmissions between two H.323 GWs, or between two MGCP MGWs. In this mode, the fax tones exchange is done directly over voice codec (G.711 or G.726 only). The CA treats this as it would any voice call.

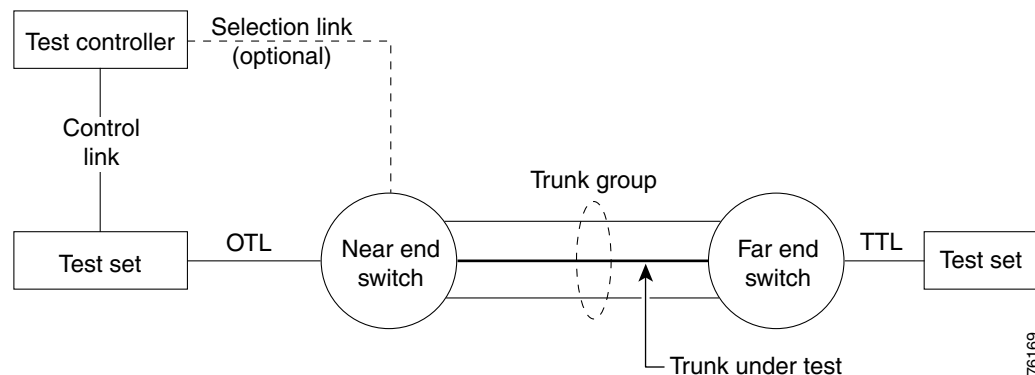
Trunk Testing

Trunk testing is used to evaluate the transmission quality of the shared trunks that interconnect switching systems. Trunk testing is extremely important in monitoring system health, because it is the only practical way to objectively evaluate the performance of individual trunks.

Trunk testing requires the following equipment and test lines. (Some additional types of equipment and lines may also be used.) A basic system setup is shown in [Figure 3-4](#).

- Test controller
- Test set(s)
- Originating test line (OTL)
- Terminating test line (TTL)

Figure 3-4 Trunk Testing Setup



Near End Test Origination Test Calls

The Cisco BTS 10200 Softswitch supports calls used to test individual trunks that connect a local gateway with a gateway or PSTN switch at a remote office. The Cisco BTS 10200 Softswitch supports OTL and TTL capability. User-provided test equipment and, optionally, test controllers may be connected to the test lines. Proper selection of test equipment and test functions helps to ensure interoperability between different carriers.



Note

The processes described in this section are applicable to the Cisco BTS 10200 Softswitch. The processes may work differently on other switches.

The process for testing a Cisco BTS 10200 Softswitch OTL is as follows:

1. The user verifies that the remote CO has the desired 1xx test line available.
2. The user sets up a test device on a CAS TGW that is connected to the local Cisco BTS 10200 Softswitch.
3. The user provisions the CAS-TG-PROFILE table, setting TEST-LINE = YES. (Provisioning commands are described in the *Cisco BTS 10200 Softswitch Command Line Interface Reference Guide*.)
4. On the test device at the CAS TGW side, the user enters digits representing the circuit to be tested and the test to be performed:

- TG, for example 0003
- Trunk number, for example 0018

The complete trunk address in this example is 00030018.

- Test type (10x), for example 104

The technician dials KP-00030018-104-ST.

5. The Cisco BTS 10200 Softswitch automatically inserts either 9581 or 9591 in front of the test type digits to create a dialing string.

The complete test string in this example is PREFIX | 00030018 | 9581104 | END.



Note

Alternatively, with the Cisco BTS 10200 Softswitch, the user can dial the test type with the 9581 or 9591 included: *KP-00030018-9581104-ST.*

6. The Cisco BTS 10200 Softswitch selects the trunk to be tested based on the user-defined trunk address.
7. The TGW outpulses the digits to the remote switch over the designated trunk.

1xx Test Line Support

When the Cisco BTS 10200 Softswitch is the near-end switch, the following process takes place at the remote switch:

1. The remote switch recognizes the trunk test prefix (9581 or 9591) on the incoming signal, and the test type is used to route the test to the appropriate test line.
2. The appropriate tests are performed on the test set.
3. Additional test processes may occur, depending on the specific test configuration.

When the Cisco BTS 10200 Softswitch is supporting the TTL capability (test call originated at another switch), the process is as follows. The Cisco BTS 10200 Softswitch receives the 958 or 959 call, recognizes the 958 or 959 type, and routes the test to the appropriate test line.

T108 Test Line Support

The T108 test line feature determines the performance of trunks connecting digital exchange switches, including voice over packet (VoP) softswitches. Cisco BTS 10200 Softswitch incoming trunks requesting other 1xx-type test lines are routed to shared test lines for the requested tests, regardless of which gateway terminates the trunk or which gateway/IAD terminates the test line. The T108 test line feature requests a test to be performed within the same gateway where the trunk under test (TUT) is terminated, and provides a digital loopback within the gateway. The T108 test line feature supports manual and automated testing.

The T108 test line sequence is as follows:

1. The near-end switch originates the test sequence by placing a test call, identifying the trunk to be selected, and the test line number. A digital test pattern generator is used in the test setup shown in [Figure 3-4](#).
2. The near-end switch uses the trunk identifier to override normal call processing and select only the requested trunk.
3. The far-end switch responds to the destination number and connects to the T108 test line. The T108 test line enables a digital loopback.

4. When the near-end switch receives answer supervision, it conducts digital test sequences to ascertain trunk performance.
5. Once the test sequences are completed, the near-end switch releases the test call and both switches release the trunk connection.
6. The far-end switch can detect if the test connection exceeds a preset time, and releases the test connection if the preset time is exceeded.

**Note**

The T108 test line is also used for trunk redirection (wholesale dial) for Internet services where the carrier modem termination is integrated into the trunk gateway. In this case, the integral digital stored program (DSP) normally supports modem-only transmissions.
