



## Local Number Portability

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This chapter describes local number portability (LNP) and its implementation and operation on the Cisco BTS 10200 Softswitch. This chapter consists of the following sections:

- [Introduction to LNP, page 6-1](#)
- [Cisco BTS 10200 Softswitch LNP Function, page 6-10](#)
- [Provisioning Ported Numbers, page 6-14](#)
- [Local Exchange Routing Guide, page 6-22](#)

### Introduction to LNP



Note

If you are already familiar with Local Number Portability and the operations of the Number Portability Administration Center Service Management System (NPAC SMS), you can proceed directly to the [“Cisco BTS 10200 Softswitch LNP Function”](#) section on page 6-10.

Local number portability (LNP), which is required by the Telecommunications Act of 1996, is defined by the Federal Communications Commission (FCC) as “the ability of [subscribers] to retain, at the same location, existing telecommunications numbers without impairment of quality, reliability, or convenience when switching from one telecommunications carrier to another.”

The North American Numbering Council (NANC) is the Federal Advisory Committee created to advise the FCC on numbering issues. NANC was also charged with the responsibility for selecting the entities to serve as Local Number Portability Administrators (LNPAs). The LNPA Selection Working Group developed the process for selecting LNPA(s) and prescribed the specific duties of the LNPA(s).

Eight regional LNP databases were established in North America, with each of the seven U. S. regions coinciding with the seven original Bell Operating Company (BOC) regions; the eighth region is Canada. Lockheed-Martin Information Management services (now NeuStar, Inc.), was the vendor of choice for all eight regions and is currently the LNPA managing the Number Portability Administration Center Service Management System (NPAC SMS).

The NPAC SMS currently consists of two data centers with the primary data center in Sterling, VA and a backup data center in Charlotte, N.C. To access NPAC services, service providers (SPs) are required to provide an Operating Company Number (OCN), which is assigned by the National Exchange Carrier Association (NECA). NPAC uses the individual service provider's OCN as the Service Provider Identification Number (SPID).

## LNP Implementation

The LNPA Working Group was also given the responsibility for directing the implementation of a nationwide system of regional SMS databases for number portability, and determining possible future SMS needs. *Number Portability Switching Systems* (T1.TRQ.02-2001), a technical requirements document that is available for a fee from the Alliance for Telecommunications Industry Solutions (ATIS) Document Center located at <http://www.atis.org/doccenter.shtml>, defines the switch requirements for Number Portability (NP) between wireline networks using the Location Routing Number (LRN) method. Under the LRN method, a unique 10-digit number is assigned to each central office switch to identify each switch in the network for routing purposes. The LRN serves as a network address.

The type of telephone number portability that local telephone companies must currently provide under the terms of the Telecommunications Act of 1996 and FCC docket 95-116 is called “service provider Portability.” The NANC Functional Requirements Specification (FRS) Release 3.2.1a, which was issued July 28, 2003, defines the functional requirements of the NPAC SMS that enable service provider portability (see <http://www.npac.com/documents.htm#v3.2>).

To provide the Service Provider Portability type of LNP in North America, the Alliance for Telecommunications Industry Solutions (ATIS) T1S1 committee’s LRN database lookup scheme was approved by FCC Order 97-289, 18 August 1997. When customers change service providers, the LRN of the switch to which they transfer is returned in response to all LNP queries generated by calls to the subscriber’s telephone number (TN).

As stated previously, the LRN is a 10-digit number—the network address of the switch that received the subscriber’s telephone number from the previous service provider—that uniquely identifies a switch or point of interconnection (POI). The LRN is used to route all calls to numbers that have been ported. According to the ATIS Industry Numbering Committee’s (INC’s) *Location Routing Number Assignment Practices*, “a unique LRN may be assigned to every LNP-equipped switch. Service providers should select and assign one (1) LRN per Local Access and Transport Area (LATA)—the geographic area over which the Local Exchange Carrier (LEC) may provide toll calls—within their switch coverage area.”

Telephony switches contain a database of the office codes (NPA-NXXs) associated with subscriber numbers that have been ported from or to any switch. This information is available in two different formats from two different locations:

- The database at the NPAC SMS contains the LRNs of all switches (NPA-NXX) that have had at least one telephone number ported in or ported out.
- The [Local Exchange Routing Guide](#) (LERG) designates all switches (NPA-NXX) that are currently open to portability.

When a service provider needs a new exchange number (NXX), it enters the required information into the Routing Database System (RDBS), which is a mechanized database maintained by NeuStar. All NPA/NXX activity in the United States is reported to the RDBS, and the information is used to produce the LERG and the Terminating Point Master (TPM) used for Signaling System 7 (SS7) information.

The LERG information is used by most service providers in the North America Numbering Plan (NANP) to maintain their OSS databases with the information needed for rating and routing. More detailed information on the contents of the LERG is provided at the end of this document.

## Process Flows

The NPAC SMS prescribes the operational and administrative aspects of the intercompany procedures that are required to change a subscriber from one service provider to another. The following sections describe most of the process flows, which indicate how the NPAC SMS procedures are used by service providers in the business processes associated with porting subscriber telephone numbers. The specific requirements generated by these process flows are included in the appropriate sections that follow.

The process flows supported by the NPAC SMS that are described here include:

- [Service Provisioning, page 6-4](#)
- [Service Order Cancellation, page 6-4](#)
- [Service Disconnection, page 6-5](#)
- [Conflict Resolution, page 6-6](#)
- [Audit Requests, page 6-7](#)
- [Report Requests, page 6-8](#)






The NPAC SMS supported work flows that are *not* described here include:

- Service Repair
- Disaster Recovery and Backup
- Data Administration Requests

Refer to the *NANC Functional Requirements Specification (FRS) Release 3.2.1a*, July 28, 2003, for the process flows for these three areas (see <http://www.npac.com/documents.htm#v3.2>).

## Flow Chart Legend

The following flow charting symbols are used in the process flow charts in this document.

-  Rectangular boxes represent Service Provider (SP) procedures external to the NPAC SMS.
-  Boxes with rounded corners represent NPAC SMS sub-process work flows.
-  Diamonds represent decisions - either by the Service Provider or NPAC SMS personnel.
-  Circles represent connections to a process in another flowchart. The text indicates a corresponding connection point in another flowchart.
-  The oval shape represents the termination or end point of a process flow.

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## Service Provisioning

This section defines the service provisioning work flow by which a telephone number is ported to a new service provider. The service provisioning process includes all the steps necessary to complete the porting-in process; however, some situations may preclude the process from being completed (see the “[Service Order Cancellation](#)” section on page 6-4).

To provision a subscriber’s ported-in telephone number, complete the following steps:

- 
- Step 1** The new service provider obtains the customer’s authorization to port the subscriber’s telephone numbers and notifies the old service provider according to the internal business processes of the respective service providers.
- The processes for obtaining authorization from the subscriber to port a number are defined solely by the service providers. The NPAC does not obtain or verify customer approval to port a telephone number.
- Step 2** Both the old and new service provider can send notifications of the impending change to the NPAC SMS from their Service Order Administration Systems (SOAs).
- Step 3** The NPAC SMS receives the notifications, performs validation checks, and attempts to match the notification received from the new service provider with a concurring notification that may (or may not) be sent from the old service provider.
- If the NPAC SMS receives a notification from the old service provider, but none from the new service provider, it automatically cancels the request and the subscriber remains with the old service provider.
- Step 4** If both notifications that NPAC receives are valid, NPAC notifies both service providers that they can complete any physical changes required.
- Step 5** Both service providers complete any physical changes that are required, such as moving the subscriber loop.
- Step 6** When the due date for providing service by the new service provider is reached, the new service provider sends an activation notice to the NPAC SMS.
- Step 7** The NPAC SMS broadcasts the update in real time to each of the eight regional SMSs.
- Step 8** Upon receiving the update from the NPAC SMS, all service providers update their network switches with the latest LNP information.

The NPAC SMS records any transmission failures and takes the appropriate action.

End-office switches have a table identifying all office codes (NPA-NXX) that include one or more subscriber numbers that have been ported in or ported out.

The routing of calls to ported numbers *should* be accomplished by the originating switch; however, if a donor switch receives a call for a number that has been ported-out it can send a query to its regional LNP database (NPAC SMS), retrieve the recipient switch’s LRN, and reroute the call to that switch.

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## Service Order Cancellation

Some situations can preclude the service provisioning process from being completed. When these situations occur, the NPAC SMS has some very explicit rules regarding the cancellation of service orders, as illustrated in [Figure 6-1](#).

The following list describes the rules that are applied in different scenarios:

- If a Create Subscription notification is sent by both service providers, either service provider can send a message to the NPAC SMS to cancel the Subscription Version (SV).

If both service providers concur with the cancellation, the NPAC SMS sets the Subscription Version to “canceled” and notifies both service providers that the Subscription Version has been canceled.

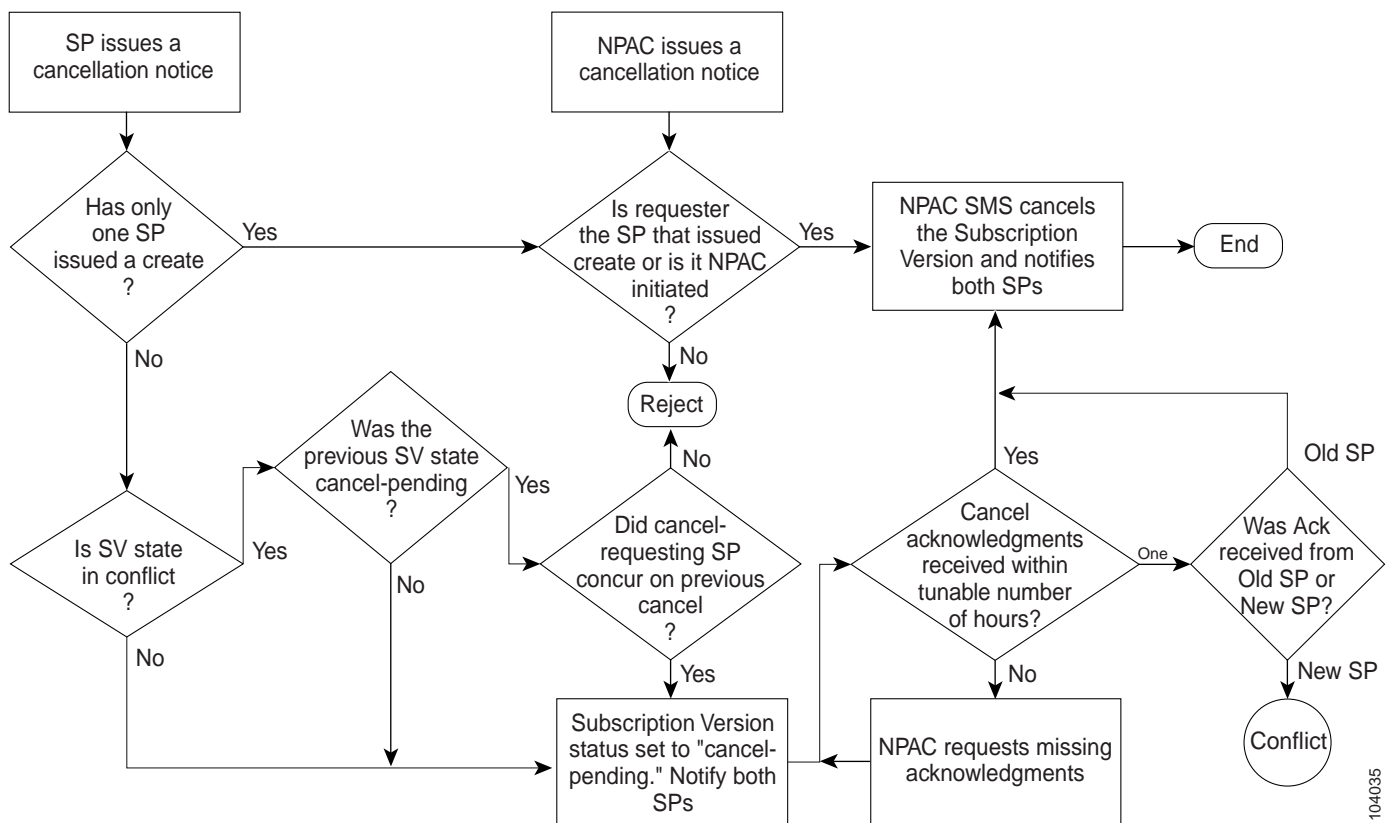
- If a Create Subscription notification is sent by only the new service provider, only the new service provider can send a message to the NPAC SMS to cancel the Subscription Version.

If cancellation concurrence is not provided by the old service provider, the Subscription Version is still set to the “canceled” state by the NPAC SMS.

- If a Create Subscription notification is sent by only the old service provider, only the old service provider can send a message to the NPAC SMS to cancel the Subscription Version.

If cancellation concurrence is not provided by the new service provider, the Subscription Version is placed in the “conflict” state by the NPAC SMS, and the [process for handling conflicts](#) is invoked.

Figure 6-1 Service Order Cancellation Work Flow



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## Service Disconnection

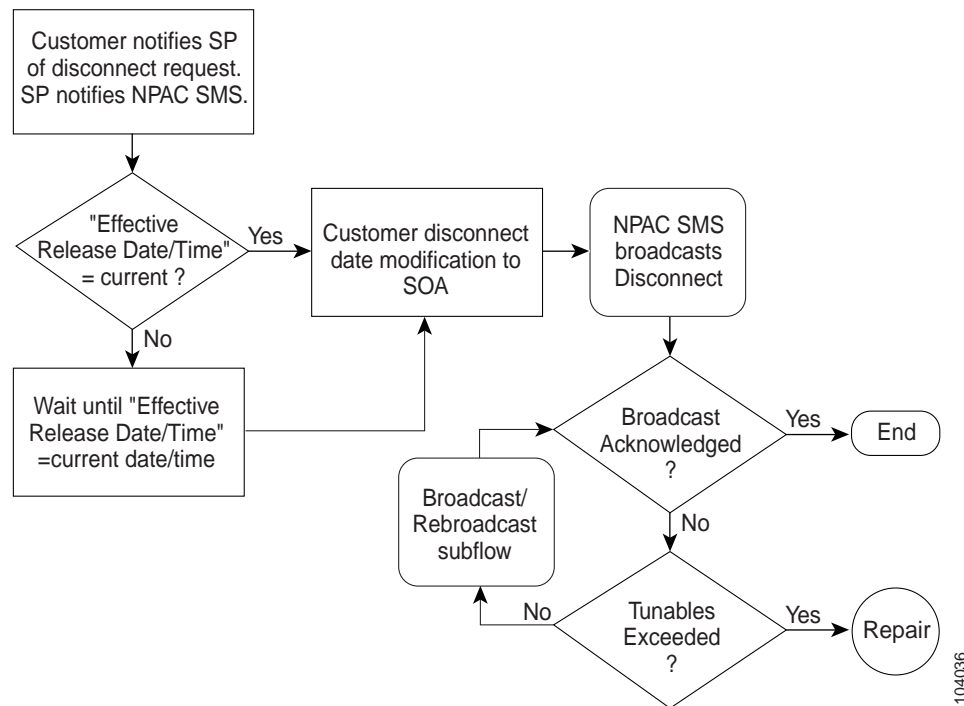
Disconnecting a subscriber who has a ported telephone number also requires interaction with the NPAC SMS, as illustrated in [Figure 6-2](#).

To disconnect a subscriber who has a ported telephone number, complete the following steps:

- Step 1** The subscriber and service provider agree on a disconnect effective date and time.
- Step 2** The current service provider sends an update indicating the disconnect to the appropriate NPAC SMS.
- Step 3** NPAC SMS broadcasts the update to all service providers based on the disconnect effective date.

- Step 4** On the effective date, NPAC SMS removes the ported telephone number from its database of ported numbers.
- If the service provider needs to change the Customer Disconnect Date (CDD) or Effective Release Date (ERD) of the disconnect, the service provider sends a modify request to the NPAC SMS.
- Step 5** Upon receiving an update, all service providers remove the telephone number from their LNP databases. NPAC SMS logs the update in a history file, and calls to the telephone number are routed as if it were a non-porting number.

**Figure 6-2** Disconnect Ported Number Work Flow



## Conflict Resolution

Some conflicts can arise in the LNP processes. [Figure 6-3](#) illustrates the causes of conflicts and the procedures that the NPAC SMS uses to resolve them.

If either the old or new service provider did not send a notification to the NPAC SMS, the NPAC SMS notifies the service provider from which it did not receive a notification that it is expecting a notification. If the NPAC SMS receives the missing notification, and both notifications indicate agreement among the service providers, the process proceeds as normal.

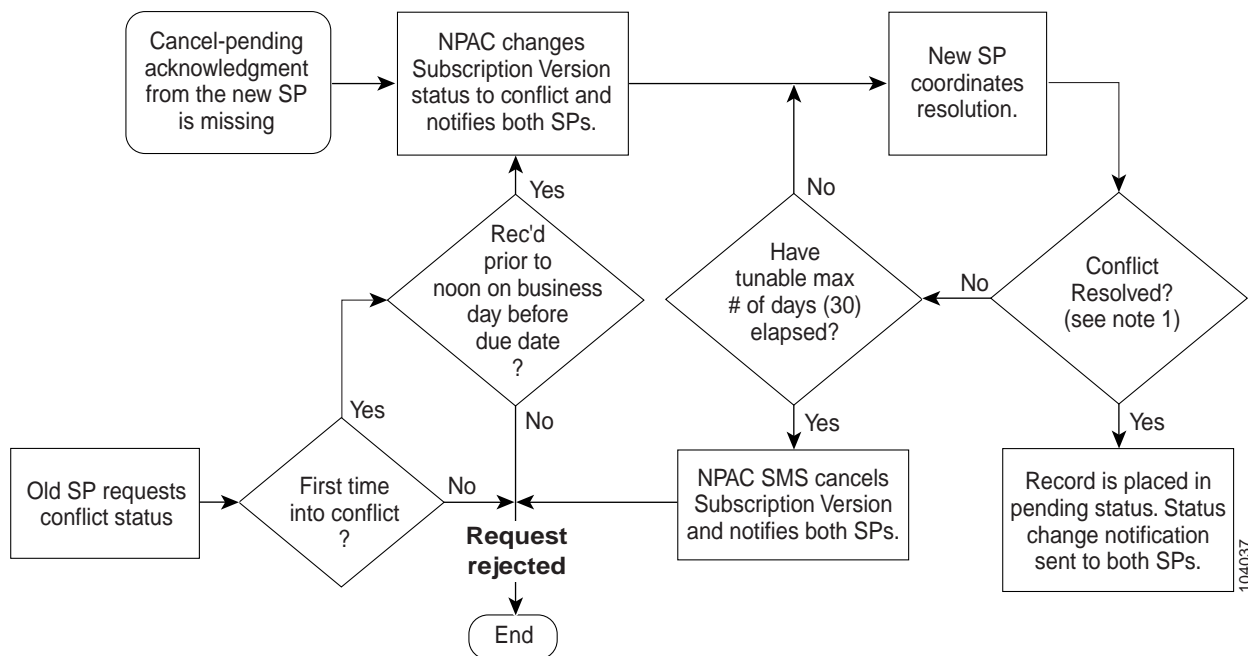
The following list describes the actions that the NPAC SMS takes in different situations:

- If the NPAC SMS does *not* receive a concurring notification from the *old* service provider, the NPAC SMS logs the failure to respond and allows the new service provider to proceed with activation when the new service provider due date is reached.
- If the NPAC SMS does *not* receive a concurring notification from the *new* service provider, the NPAC SMS logs the failure to respond, cancels the request, and notifies both service providers of the cancellation.

- If the service providers disagree as to who will provide service for the telephone number, the NPAC SMS places the request in the “conflict” state and notifies both service providers of the conflict status and the Status Change Cause Code.
  - The service providers then determine between them who will serve the customer using their internal business processes.
  - When a resolution is reached, the NPAC SMS is notified by the new service provider and removes the request from the conflict state.

Within the first 6 hours, only the old service provider can initiate “conflict off.” After 6 hours, either service provider can remove the conflict status. The new service provider can alternatively request cancellation of the Subscription Version.

Figure 6-3 Conflict Resolution Work Flow



## Audit Requests

An audit function is necessary for troubleshooting customer problems and as a maintenance process to ensure Subscription Version data integrity across the entire LNP network. Audits are concerned with the process of comparing the NPAC SMS view of the LNP network's Subscription Version data with one or more of the service provider's views of its network.

The following methods help ensure data integrity across the LNP network:

- On-demand audits can be initiated by any service provider who believes a problem may exist in another service provider's network. These audits are executed through queries to the appropriate service provider's network, and corrected by means of downloads to those same networks.
- Local service providers are also responsible for comparing database extracts of Subscription data written to an FTP site by the NPAC SMS with their own versions of the same Subscription data.
- The NPAC SMS selects a random sample of active Subscription Versions from its own database, then compares those samples to the representation of that same data in the various local SMS databases.

## Report Requests

The NPAC SMS supports report generation for predefined and ad hoc reports. The report generation function creates output report files according to specified format definitions, and distributes reports to output devices as requested. The report distribution service supports distribution to electronic files, to local or remote printers, to e-mail addresses, and to fax machines.

## Data Management

The NPAC SMS supports functionality to manage network, service provider, and Subscription Version data.

### NPAC Network Data

The NPAC SMS database contains data that defines configuration of the LNP service and the network. This includes such data as:

- Participating service providers
- NPA-NXXs that are portable
- LRNs associated with each service provider

An NPAC SMS database can reside in a service control point (SCP), or it can be combined with signal transfer point (STP) equipment in the SS7 network. When the database returns the LRN of a subscriber's new switch, the call is redirected to the LRN and the original called number is included as additional data. When the recipient switch receives a call to its LRN, the original called number is extracted and the incoming call is routed to that number.

### Service Provider Data

Service provider data indicates who the LNP service providers are and includes location, contact name, security, routing, and network interface information.

### Subscription Version Data

The Subscription Version data indicates how local number portability should operate to meet subscribers needs.

## Troubleshooting LNP Problems

Problems can arise when porting a subscriber's telephone number from one service provider to another. The Network Interconnection Interoperability Forum (NIIF), a part of the ATIS organization, has published a document (ATIS/NIIF-0017) that includes detailed steps that service providers should follow when LNP problems are encountered. The document is titled *Guidelines for Reporting Local Number Portability Troubles in a Multiple Service Provider Environment*, and it is available at <http://www.atis.org/atis/clc/NIIF/niifdocs.htm>.

The NIIF also maintains the National LNP Contact Directory, a protected document that provides telephone numbers of 24x7 LNP-qualified contacts for each service provider. The directory is located at the URL given above. You can download and submit an application for a password at the same URL.

# Cisco BTS 10200 Softswitch LNP Function

This section describes how to provision the local number portability (LNP) functionality on a Cisco BTS 10200 Softswitch to support both ported-in and ported-out subscriber telephone numbers.

## Establishing a Session

Using the Cisco BTS 10200 Softswitch command line interface (CLI), you can initiate an interactive CLI session using the Secure Shell (SSH) to build and send CLI commands by typing them in. You can also install a GUI tool, such as the Extensible Provisioning Object Manager (EPOM), or you can build and send CLI commands using predefined scripts, depending on the extent of the operations you want to do.

The following sections specify how you can create the CLI commands, and where you can obtain the values of the CLI command parameters. Command parameters that are hard coded are shown in the commands as they would be generated: for example, **port-start=1**. Command parameters that must be obtained elsewhere are shown in traditional variable brackets in italics *<parameter>*: for example,

```
tsap-addr=<network_address_of_MTA>
```

Provisioning commands can be successfully executed only on the Cisco BTS 10200 Softswitch Element Management System (EMS) that is in an active status. Therefore, at the beginning of each session you must determine which EMS is the active EMS. Using the IP addresses and identifiers of the primary and secondary EMSs, query each to determine which EMS is active, as described in the following sections.

## Logging in Using Secure Shell

Secure Shell (SSH) is the method used to access the Cisco BTS 10200 Softswitch CLI prompt and login to the primary EMS. SSH provides encrypted communication between a remote machine and the EMS or Call Agent for executing CLI or MAINT commands. SSH servers run on both EMSs and CAs of the softswitch. To connect, the client and server sides must both be running the secure shell daemon (SSHD).

You can get IP addresses and identifiers for the primary and secondary EMSs from the SOFTSW\_INFO table by using the subscriber's TN (the TN\_INFO table contains the SOFTSW\_ID as a foreign key).

To establish an SSH session and log in to the primary EMS, complete the following steps:

- 
- Step 1** To log in from the client side, use an SSH client program or enter the following at a console:

```
ssh <username>@<IPaddress>
```

On the first SSH log in from the client side, you might see a message similar to the following:

```
The authenticity of host [hostname] can't be established.
Key fingerprint is 1024 5f:a0:0b:65:d3:82:df:ab:42:62:6d:98:9c:fe:e9:52.
```

```
Are you sure you want to continue connecting (yes/no)?
```

- Step 2** If a message similar to one above is displayed, enter **yes** to continue.  
The default password prompt appears. From this point on, all communications are encrypted.
- Step 3** Enter the default password.

With SSH enabled, new users are prompted to enter a new password and you must reenter that password during your first log in. From that point on, you are prompted only once at the beginning of each session for your password.

**Step 4** At the log in prompt, enter your CLI username.

The password prompt appears.

**Step 5** Enter your password.

- If the EMS you attempt to log in to is the *primary* EMS, a message similar to the following is displayed:

```
Last login: Thu Apr 15 10:24:15 2004 from 64.101.149.247
Sun Microsystems Inc. SunOS 5.8 Generic Patch October 2001
CLI>
```

If the system responds with a CLI> prompt, you are ready to send commands to the EMS. Proceed to [Step 6](#).

- If the EMS you attempt to log in to is the *secondary* EMS, a message similar to the following is displayed:

```
Last login: Thu Apr 15 10:24:15 2004 from 64.101.149.247
Sun Microsystems Inc. SunOS 5.8 Generic Patch October 2001
Unable to initialize the Session
      ERROR reply from Session Manager -->
No login allowed on the STANDBY EM01 application.
CLI will terminate in 30 seconds
```

The system will log you off. Determine the the IP address and identifier of the other EMS and repeat [Step 1](#) through [Step 5](#).

If you cannot establish an SSH session with, or log in to the primary EMS, you can attempt to log in to the secondary EMS, as described in the next section.

**Step 6** Use the following command to show user activity on the EMS:

```
CLI>show ems
```

You should receive a response similar to the following:

```
Reply : Success: Current EMS logical IP assignment.
```

```
IP_ALIAS=Not-defined-yet
INTERFACE=hme0
```

```
CLI>
```

**Step 7** Enter any other desired commands.

**Step 8** To log off and terminate the SSH session, enter **exit** at the CLI> prompt.

---

## Logging in to the Secondary EMS (Optional)

You can optionally attempt to log in to the secondary (standby) EMS in the same manner described in the previous section by using the IP address of the secondary EMS. If a login to the secondary EMS fails, the system returns an error message.

If you cannot log in to either the primary (active) EMS or the secondary (standby) EMS, consult your Cisco BTS 10200 administrator or contact Cisco TAC for assistance.

## Provisioning Ported Office Codes

The Local Exchange Routing Guide (LERG) designates all switches (NPA-NXX) that are currently open to portability. The assigned NPA-NXXs are managed by the Cisco BTS 10200 Softswitch in the PORTED-OFFICE-CODE table. The ranges of portable office codes are listed in NPA-NXX, NPA-NXX-X, NPA-NXX-XX, NPA-NXX-XXX, or NPA-NXX-XXXX formats depending on how wide a range of numbers is needed (10,000, 1,000, 100, 10, or 1 respectively).

If the Cisco BTS 10200 Softswitch has office codes that have been ported-in, the **in-call-agent** flag associated with those office codes in the PORTED-OFFICE-CODE table is set to Y (Yes).

- If the **in-call-agent** flag for an office code is set to Y (Yes), the Cisco BTS 10200 Softswitch performs an internal DB lookup in the DN2SUBSCRIBER table.
  - If the directory number (DN) is found, the call is terminated locally within the switch.
  - If the directory number (DN) is not found, an LNP query is made to determine how to route the call.
- If the **in-call-agent** flag for an office code is set to N (No), an LNP query is made to determine how to route the call.

To set up a ported-office-code in the Cisco BTS 10200 Softswitch, complete the following steps:

- 
- Step 1** Log in to the Cisco BTS 10200 Softswitch and display the CLI prompt.
- Step 2** Enter a command similar to the following:
- ```
add ported-office-code digit-string=469-255;
```
- Reply: Success: CLI add successful  
Transaction 106634552016805 was processed.
- Step 3** Verify the office code you entered by entering the following command:
- ```
show ported-office-code;
```
- ```
DIGIT_STRING=469255
IN_CALL_AGENT=N
```
- Reply: Success: Entry 1 of 1 returned.
- Step 4** Set the **in-call-agent** flag to Y by entering a command similar to the following:
- ```
change ported-office-code; digit-string=469-255; in-call-agent=y;
```
- Reply: Success: CLI change successful  
Transaction 106641008260905 was processed.
- Step 5** Verify the setting of the **in-call-agent** flag by entering the following command:
- ```
show ported-office-code;
```
- ```
DIGIT_STRING=469255
IN_CALL_AGENT=Y
```
- Reply: Success: Entry 1 of 1 returned.
-

## Provisioning the Unconditional LNP Trigger

Unconditional LNP triggers are assigned on a per-DN basis. The Cisco BTS 10200 manages it in the DN2SUBSCRIBER table by setting the **lnp-trigger** flag to Y (Yes).

- If the **lnp-trigger** flag for a number in the DN2SUBSCRIBER table is set to Y (Yes), an unconditional LNP query of the NPAC SMS database is initiated to determine where to route the call.
- If the **lnp-trigger** flag for a number in the DN2SUBSCRIBER table is set to N (No), the call is terminated locally within the Cisco BTS 10200 without generating an LNP query.

To provision an unconditional LNP trigger, complete the following steps:

---

**Step 1** Log in to the Cisco BTS 10200 Softswitch and display the CLI prompt.

**Step 2** Enter a command similar to the following:

```
show dn2subscriber office-code-index=6; dn=1112;
```

```
OFFICE_CODE_INDEX=6
DN=1112
STATUS=ASSIGNED
RING_TYPE=1
LNP_TRIGGER=N
NP_RESERVED=N
SUB_ID=yoda
```

Reply: Success: Entry 1 of 1 returned.

**Step 3** Set the **lnp-trigger** flag to Y by entering a command similar to the following:

```
change dn2subscriber office-code-index=6; dn=1112; lnp-trigger=y;
```

Reply: Success: Transaction 106641047028705 was processed.

**Step 4** Verify that the **lnp-trigger** flag has been set to Y by entering the following command:

```
show dn2subscriber office-code-index=6; dn=1112;
```

```
OFFICE_CODE_INDEX=6
DN=1112
STATUS=ASSIGNED
RING_TYPE=1
LNP_TRIGGER=Y
NP_RESERVED=N
SUB_ID=yoda
```

Reply: Success: Entry 1 of 1 returned.

---

# Provisioning Ported Numbers

The Cisco BTS 10200 Softswitch can accommodate the following two LNP situations:

- A new subscriber moves to the switch from another service provider's switch and requests LNP service (ported-in).
- An existing subscriber moves to another service provider and requests LNP service (ported-out). See the [“Porting-out a Subscriber”](#) section on page 6-20.

## Porting-in a Subscriber

To port-in a subscriber requesting LNP service, you must complete the following procedures:

- [Provisioning Ported-in Numbers](#), page 6-14
- [Transition Period](#), page 6-16
- [Changing lnp-trigger to Y](#), page 6-17
- [Activating a Media Gateway](#), page 6-17
- [Activating a Subscriber](#), page 6-18
- [Changing lnp-trigger to N](#), page 6-18

## Provisioning Ported-in Numbers

To provision the Cisco BTS 10200 Softswitch for ported-in numbers, perform the following steps:

- 
- Step 1** Log in to the Cisco BTS 10200 Softswitch and display the CLI prompt.
- Step 2** If you have been notified that a subscriber number (or numbers) are to be ported in to your switch, but the physical move has not been completed, enter a command similar to the following:
- ```
add ported-office-code digit-string=469-255; in-call-agent=y;
```
- This command sets up a 6-digit office code (469-255) in the PORTED-OFFICE-CODE table with the **in-call-agent** flag set to Y (Yes), which indicates that a subset of the numbers from 469-255-0000 through 469-255-9999 within that office code are portable, and are serviced by this switch.
- Step 3** Before a DN can be assigned to a ported-in subscriber, the subscriber's office code also has to be defined in the OFFICE-CODE table. To define an office code (NDC), enter a command similar to the following:
- ```
add ndc digit-string=469;
```
- Reply: Success: CLI add successful  
Transaction 106641195944405 was processed.
- Step 4** To define an exchange code, enter a command similar to the following
- ```
add exchange-code ndc=469; ec=255;
```
- Reply: Success: CLI add successful  
Transaction 106641197355705 was processed.
- Step 5** To assign the office code to a Call Agent, enter a command similar to the following:
- ```
add office-code ndc=469; ec=255; call-agent-id=CA146; dn-group=xxxx;
```
- Reply: Success: CLI add successful  
Transaction 106641200723005 was processed.

**Step 6** Verify that the office code has been entered by entering the following command:

```
show office-code ndc=469; ec=255;
```

```
DIGIT_STRING=469255
OFFICE_CODE_INDEX=11
DID=N
CALL_AGENT_ID=CA146
DIALABLE=Y
NDC=469
EC=255
DN_GROUP=xxxx
```

Reply: Success: Entry 1 of 1 returned.

**Step 7** To add the ported-in subscriber, enter a command similar to the following:

```
add subscriber ID=<subscriber ID>; category=INDIVIDUAL; name=<subscriber name>;
status=ACTIVE; address1=<address line 1 from billing system>; city=<city from billing
system>; state=<state from billing system>; zipcode=<zip code from billing system, no
hyphens>; billing-dn=<TN to be used in CDR's>; dn1=<TN to be associated with this
subscriber>; privacy=<privacy option>; ring-type-dn1=1; term-id=aaln/1; mgw-id=<mgw-id>;
pic1=<carrier for interlata calls>; pic2=<carrier for intralata toll calls>; pic3=<carrier
for international calls>; grp=N; usage-sens=Y; sub-profile-id=mototampa;
cos-restrict-id=INTL; term-type=TERM;
```

This command creates a new subscriber in the switch, specifying information about the subscriber, their VoIP telephone number, the MTA MAC address, and several service characteristics. This command also loads the subscriber's VoIP TN into the DN2SUBSCRIBER table in the Cisco BTS 10200 Softswitch, provided that the NPA-NXX has been loaded into the OFFICE-CODE table. If the NPA-NXX has not been loaded in the OFFICE-CODE table by this time, this command will generate an error message.

Data elements specified in this command are:

- **subscriber ID**—Unique identifier of the subscriber's VoIP service, formed by concatenating the subscriber's identifier from the division billing system and the number of the voice port used for the service on the MTA (for example, 8223130012388228\_01).
- **category**—Set to INDIVIDUAL for all subscribers.
- **name**—This field is used for the Calling Party Name Delivery (CNAM) feature if the local CNAM option is set in the POP table.
- **status**—Set to ACTIVE for all subscribers.
- **Address fields**—Taken from values used by the division billing system.
- **billing-dn**—The telephone number that will be used when creating call detail records for this subscriber.
- **DN1**—The first telephone number that will be routed to this service. Initially, there will only be one telephone number per VoIP subscriber.
- **privacy**—Can be set to NONE (display name and number), FULL (display neither name nor number), or NAME (display number, but not name).
- **ring-type-dn1**—Set to 1 for every subscriber.
- **term-id**—Set to aaln/1 for every subscriber.
- **mgw-id**—The unique identifier of the subscriber's MTA, which is created by taking the MTA MAC address and stripping out all the hyphens.

- **pic1, pic2, pic3**—Parameters that are used by the Cisco BTS 10200 Softswitch to route calls from the subscriber:
  - pic1 is the preferred interLATA carrier.
  - pic2 is the preferred intraLATA carrier.
  - pic3 is the preferred international carrier.

However, if the only gateway to an LD carrier is through a competitive local exchange carrier (CLEC) partner (that is, no direct trunks exist from our media gateway to the LD carrier), then pic1 should be the CIC code of the CLEC partner, not the LD carrier, because the CLEC partner would have to carry LD calls from the subscriber to their preferred LD carrier.

- **grp**—Indicates if the subscriber is an individual or a group. Default value is N.
  - **usage-sens**—Specifies if usage-sensitive features are active for this subscriber. Default value is Y.
  - **sub-profile-id**—Identifies the subscriber profile assigned to the subscriber.
  - **cos-restrict-id**—Identifies the class of service (CoS) restriction profile assigned to the subscriber.
  - **term-type**—Identifies the termination type for the subscriber.
- 

## Transition Period

During the transition period when a subscriber telephone number is in the process of being ported out or ported in, the subscriber loop move may not be completed.

The process of porting a number out of a donor switch and porting it into the recipient switch requires some amount of time to complete the physical move plus the administrative changes that are necessary. Special call processing might be required during this brief transition period between the time that the subscriber requests that its numbers be ported, the physical move is coordinated, the subscriber's LNP activation in the national LNP databases is completed, and the updated LNP information is disseminated to all of the switches within the NANP. During this brief period of time, the LNP databases at the NPAC SMS are the ultimate authority on how calls to the ported telephone number are to be routed.

In the Cisco BTS 10200 LNP implementation, the subscriber's 10-digit DN and an unconditional trigger are used during the transition period. When the unconditional trigger is assigned to a 10-digit DN, all calls to that subscriber's number generate an LNP query regardless of whether the call originates on-net or off-net. Based on the response to the LNP query, the call may terminate on the old service provider's switch or it might be routed to the new service provider's switch based on the LRN that is returned.

The DN2SUBSCRIBER table is checked for the dialed number as follows:

- If the subscriber's number is present in the DN2SUBSCRIBER table, the setting of the **lnp-trigger** flag is checked to determine whether an LNP query is to be issued.
  - If the **lnp-trigger** flag is set to Y (Yes), an LNP query is issued to determine the correct LRN (switch) to which to route the call.
  - If the **lnp-trigger** flag is set to N (No), the call is terminated locally, if possible.
- If the subscriber's number is *not* present in the DN2SUBSCRIBER table, an LNP query is issued to determine the correct LRN (switch) to which to route the call.

## Changing Inp-trigger to Y

If the LNP transaction has not yet been activated in the national LNP databases, calls to this telephone number are routed to the current VoIP service provider's switch. Any calls originating outside the Cisco BTS 10200 Softswitch will perform an LNP lookup, get the LRN of the current service provider's switch, and route the call. However, calls originating on the Cisco BTS 10200 Softswitch will see the DN in the DN2SUBSCRIBER table, which has the **inp-trigger** for this DN in the DN2SUBSCRIBER table set to N (No) by default.

For the Cisco BTS 10200 Softswitch to perform an unconditional LNP query, the **inp-trigger** flag in the DN2SUBSCRIBER table must be set to Y (Yes). Changing **inp-trigger** settings requires execution of a **change** transaction in the DN2SUBSCRIBER table, which is indexed by the OFFICE-CODE-INDEX.

To change the **inp-trigger** flag to Y (Yes), complete the following steps:

- 
- Step 1** To retrieve the office-code-index, enter the following command:

```
show office-code digit-string=<NPA-NXX of the ported TN>;
```

The Cisco BTS 10200 Softswitch returns the office-code-index.

- Step 2** Using the captured office-code-index, change the **inp-trigger** for the ported-in subscriber's DN by entering a command similar to the following:

```
change dn2subscriber office-code-index=11; dn=1234; inp-trigger=y;
```

This command sets the **inp-trigger** to Y, which generates an unconditional LNP query.

---

## Activating a Media Gateway

The **control** command is used to change the state of the MTA to "in service." You should monitor the Cisco BTS 10200 Softswitch transaction queue to verify that the media gateway has been successfully added before trying to activate the media gateway.

To verify that the media gateway has been added and to activate the media gateway, complete the following steps:

- 
- Step 1** Execute the following command, using the transaction-id of the command that added the media gateway:

```
show transaction-queue transaction-id=1029944382523
```

Reply: Success: Database is void of entries.

- Step 2** If the above response is received, you can execute the **control** command to activate the media gateway:

```
control mgw id=<mgw-id>; target-state=ins; mode=forced;
```

Data elements specified in this command are:

- **mgw id**—The unique identifier of the voice port on the subscriber's MTA, which is created by taking the voice port's MAC address and stripping out all the hyphens.
  - **target-state**—Use "ins" to indicate "in service" for all activations.
  - **mode**—Use "forced" for all activations.
-

## Activating a Subscriber

This **control** command changes the state of the subscriber to “in service.” Monitor the Cisco BTS 10200 Softswitch transaction queue to verify that the subscriber has been successfully added before trying to activate the subscriber.

To verify that the subscriber has been added and to activate the subscriber, complete the following steps:

---

**Step 1** Execute the following command, using the transaction-id of the command that added the subscriber:

```
show transaction-queue transaction-id=1029944382524
```

Reply: Success: Database is void of entries.

**Step 2** If the above response is received, execute the **control** command to activate the subscriber:

```
control subscriber-termination id=<subscriber id>; target-state=INS;
mode=FORCED;
```

Data elements specified in this command are:

- **subscriber-termination id**—Unique identifier of the subscriber’s VoIP service, formed by concatenating the subscriber’s identifier from the division billing system and the number of the voice port used for the service on the MTA (for example, 8223130012388228\_01).
  - **target-state**—Use “ins” to indicate in service for all activations.
  - **mode**—Use “forced” for all activations.
- 

## Changing lnp-trigger to N

After activation for a ported-in number is complete, the Cisco BTS 10200 Softswitch needs to be updated so that calls to this number from MTAs on this switch are routed directly to the subscriber’s MTA, instead of having the switch perform an LNP query and route the call to the CLEC switch, only to have it route the call back to the Cisco BTS 10200. This is accomplished by resetting the **lnp-trigger** flag to N.

To reset the **lnp-trigger** flag to N, complete the following steps:

---

**Step 1** To retrieve the office-code-index, enter the following command:

```
show office-code digit-string=<NPA-NXX of the ported TN>;
```

The Cisco BTS 10200 Softswitch returns the office-code-index.

**Step 2** Change the **lnp-trigger** flag to N by entering the following command:

```
change dn2subscriber office-code-index=
  <office-code-index of ported TN’s NPA-NXX>;
dn=<XXXX of the ported TN>; lnp-trigger=N;
```

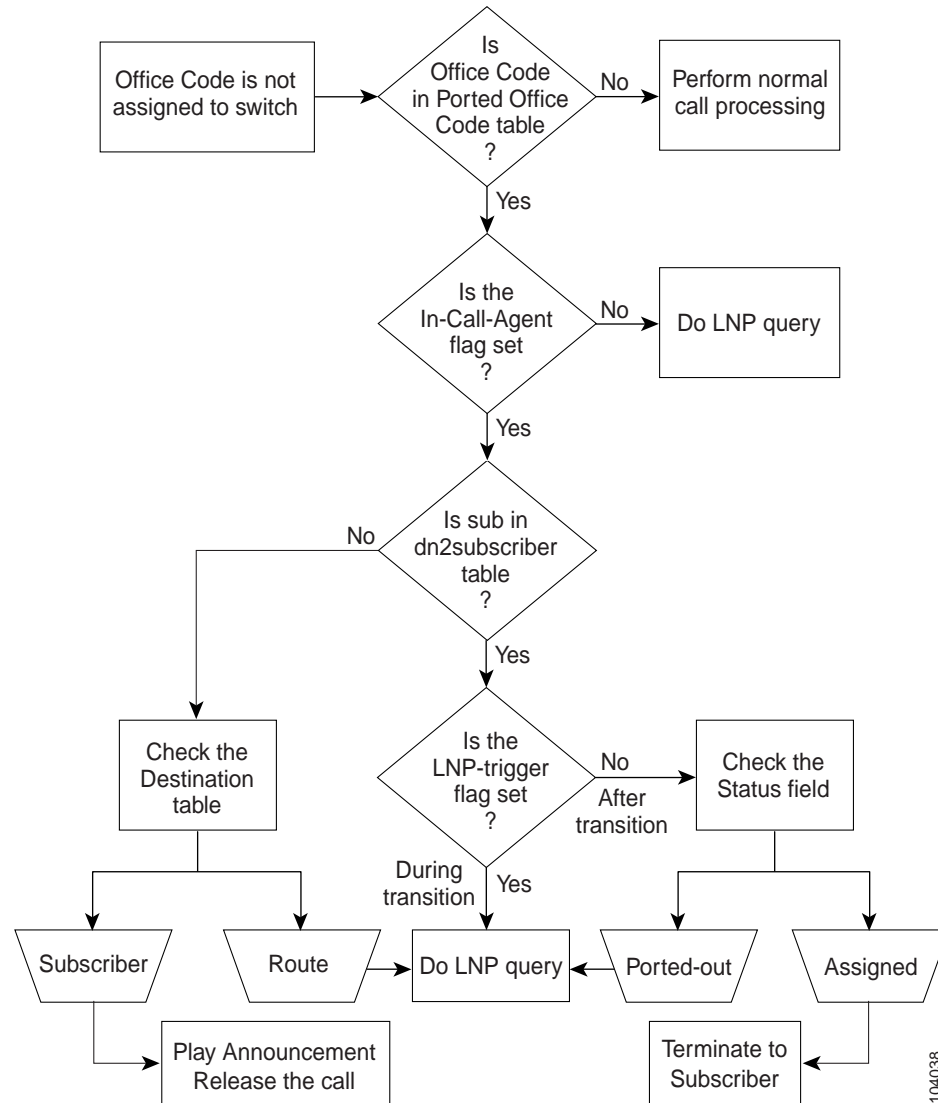
Setting the **lnp-trigger** flag to N (No) prevents the initiation of unconditional LNP queries.

---

## LNP Call Flow

Figure 6-4 shows the processing of a call in which the office code is not one that is normally assigned to the switch. This chart points out the various parameters and flags that must be set to ensure that calls are processed correctly before, during, and after a subscriber's number is ported-in or ported-out of a switch.

Figure 6-4 Ported-in Call Processing for Originating Calls



The porting-in process is complete when:

- The subscriber's line is physically connected to the switch.
- The subscriber's office code is added to the OFFICE-CODE table.
- The subscriber's number is added to the DN2SUBSCRIBER table.
- The **in-call-agent** flag is set to Y (ported-in) in the PORTED-OFFICE-CODE table.
- The **lnp-trigger** flag is set to N in the DN2SUBSCRIBER table.

## Porting-out a Subscriber

In some cases, subscribers will want to discontinue their service, but take their telephone number with them to their new service provider. This is similar to the port-in case described previously, where the **lnp-trigger** is set to Y at the beginning of the porting process to ensure that all calls are routed according to the national LNP databases. This is necessary because the national LNP database has authority on when and where to route calls to a ported number, although the number may still exist in the local DN2SUBSCRIBER table.

When subscribers want to move their service to another service provider and request LNP service, log in to the Cisco BTS 10200 Softswitch as described in the “[Establishing a Session](#)” section on page 6-10, and enter the CLI commands as described in the following sections:

- [Changing lnp-trigger to Y, page 6-20](#)
- [Changing DN Status to Ported-Out, page 6-20](#)
- [Deactivating Service, page 6-21](#)

### Changing lnp-trigger to Y

When a service order to port out a number has been issued, change the **lnp-trigger** to Y (Yes) to ensure the routing of calls to the number is done according to the NPAC SMS national LNP databases.

To change the **lnp-trigger** to Y (Yes), perform the following steps:

---

**Step 1** To retrieve the office-code-index, enter the following command:

```
show office-code digit-string=<NPA-NXX of the ported TN>;
```

The Cisco BTS 10200 returns the office-code-index.

**Step 2** Change the **lnp-trigger** to Y (Yes) by entering the following command:

```
change dn2subscriber office-code-index=
  <office-code-index of ported TN's NPA-NXX>;
dn=<XXXX of the ported TN>; lnp-trigger=y;
```

Changing the **lnp-trigger** to Y (Yes) results in calls to this DN initiating an unconditional LNP query. Leave the status of the DN=ASSIGNED in the DN2SUBSCRIBER table, because initially calls to the DN may have to be routed to the porting-out subscriber's MTA, based on the results of the LNP queries. Wait until the CLEC reports a Completed state for the transfer before changing the status of the DN.

---

### Changing DN Status to Ported-Out

After the CLEC reports a Completed state, change the status of the number in the DN2SUBSCRIBER table to “ported-out” by completing the following steps:

---

**Step 1** To retrieve the office-code-index, enter the following command:

```
show office-code digit-string=<NPA-NXX of the porting TN>;
```

The Cisco BTS 10200 Softswitch returns the office-code-index.

**Step 2** Change the status of the DN to ported-out by entering a command similar to the following:

```
change dn2subscriber office-code-index=
  <office-code-index of porting TN's NPA-NXX>;
dn=<XXXX of the porting TN>; status=ported-out; sub-id=null;
```

---

## Deactivating Service

To deactivate the customer's service, complete the following steps:

- 
- Step 1** To change the status of the subscriber's termination to out of service, enter the **control** command:
- ```
control subscriber-termination target-state=oos; mode=forced; id=<subscriber id>;
```
- Data elements specified in this command are:
- **target-state**—Use “oos” to indicate out of service for all deactivations.
  - **mode**—Use “forced” for all deactivations.
  - **subscriber id** —Unique identifier of the subscriber's VoIP service.
- Step 2** To deactivate the subscriber's MTA (media gateway), enter the **control** command:

```
control mgw id=<mgw-id>; target-state=oos; mode=forced;
```

Data elements specified in this command are:

  - **mgw id**—The unique identifier of the voice port on the subscriber's MTA, which is created by taking the voice port's MAC address and stripping out all the hyphens.
  - **target-state**—Use “oos” to indicate out of service for all deactivations.
  - **mode**—Use “forced” for all deactivations.

**Step 3** To remove the association between the subscriber and the VoIP service ID, enter the **delete** command:

```
delete subscriber-service-profile sub-id=<subscriber id>; service-id=1;
```

Data elements specified in this command are:

  - **subscriber id**—Unique identifier of the subscriber's VoIP service.
  - **service-id**—Identifies the “bundle” of CLASS features enabled for the subscriber.

**Step 4** To remove the subscriber from the Cisco BTS 10200 Softswitch database, enter the **delete** command:

```
delete subscriber id=<subscriber-id>;
```

The only data element specified in this command is:

  - **subscriber id**—Unique identifier of the subscriber's VoIP service.

**Step 5** To remove the VoIP service from the MTA (media gateway), enter the **delete** command:

```
delete termination prefix=aaln/; port-start=1; port-end=2; mgw_id=<mgw-id>;
```

Data elements specified by this command are:

  - **termination prefix**—Use “aaln/” for all subscribers, indicating “analog line”.
  - **port-start**—Use 1 for all subscribers. Ensure that this is consistent with MTA configuration files.
  - **port-end**—Use 2 for all subscribers. Ensure that this is consistent with MTA configuration files.
  - **mgw-id**—The unique identifier of the voice port on the subscriber's MTA, which is created by taking the voice port's MAC address and stripping out all the hyphens.

**Step 6** To remove the subscriber's MTA from the Cisco BTS 10200 database, enter the **delete** command:

```
delete mgw id=<mgw-id>;
```

The only data element specified by this command is:

  - **mgw-id**—The unique identifier of the voice port on the subscriber's MTA, which is created by taking the voice port's MAC address and stripping out all the hyphens.

---

# Local Exchange Routing Guide

Table 6-1 provides more detailed information on the contents of the different LERG sections.

**Table 6-1 Local Exchange Routing Guide Contents**

| LERG Section | Description                                                                                                                                                                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LERG1:       | Operating Company Names (OCN) and Numbers.                                                                                                                                                                                                                                                              |
| LERG2:       | Operating Company Contact List.                                                                                                                                                                                                                                                                         |
| LERG3:       | NPA Activity (Relief, splits, overlays).                                                                                                                                                                                                                                                                |
| LERG4:       | NPAs and Location.                                                                                                                                                                                                                                                                                      |
| LERG5:       | LATAs and associated NPAs. Lists RBOC region, LATA, and NPAs within LATA.                                                                                                                                                                                                                               |
| LERG6:       | NPA/NXX information.<br>Lists NPA/NXX, dates of changes, COC type, OCN, LATA, Home switch CLLI, Ported Indicator, Access Tandem information, Associated Rate Center, Locality Name and State/Province, Line Range.<br>Useful for constructing, maintaining DN database, Local Calling Areas, Reporting. |
| LERG6 ATC:   | NPA/NXX—Access Tandem Code.                                                                                                                                                                                                                                                                             |
| LERG6 INS:   | NPA/NXX—Activity.                                                                                                                                                                                                                                                                                       |
| LERG7:       | Switching Entity.<br>Switch CLLI, dates of changes, LATA, Equipment type, OCN, City/State/Zip, Int'l Dialing Indicator, Point Code Flag, V&H, Feature Group Tandems, SAC (800,500) serving switches, Serving Office flags.<br>Useful for setting up and maintaining switch tables for routing.          |
| LERG7 INS:   | Switching Entity Activity.                                                                                                                                                                                                                                                                              |
| LERG8:       | Rate Centers.<br>Lists Rate Center Identifiers, Type, dates of changes, LATA, V&H (major and minor), NPAs, Localities served. Also establishes limits to boundaries for limited geographic LNP as stated in the RFP.<br>Useful for setting up and maintaining switch rating tables.                     |
| LERG9:       | Tandem Homing Arrangements.                                                                                                                                                                                                                                                                             |
| LERG9 ATC:   | Tandem Homing Arrangements—Access Tandem Code.                                                                                                                                                                                                                                                          |
| LERG10:      | Operator services by NPA/NXX.<br>Lists NPA/NXX, dates of changes, location info, Operator service Codes for each NPA/NXX.<br>Multiple uses, very helpful in planning for network changes.                                                                                                               |
| LERG11:      | Operator services by location.<br>Similar to LERG10, organized a little differently.                                                                                                                                                                                                                    |
| LERG12:      | Location Routing Numbers (LRN).<br>Lists LRN, LRN type, Switch CLLI, dates of changes, LATA, OCN.<br>Useful for setting up and maintaining SS7 information on STPs/SCPs.                                                                                                                                |