CHAPTER 3

Operations

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Introduction

This chapter contains recommended operating procedures for the Cisco BTS 10200 Softswitch. In these procedures, the assumption is that all components have been correctly installed, configured, and provisioned in accordance with the instructions provided in the relevant documentation. All components are assumed to have been successfully started, as described in Chapter 1, "Cisco BTS 10200 Softswitch Startup and Shutdown Procedures".

Note Operation of the Cisco BTS 10200 Softswitch should be performed by a system administrator who has been trained in the complexities of the system and has some experience administering the system.

Administering and Monitoring System Components

The Cisco BTS 10200 Softswitch provides a user interface for administering and monitoring the following internal system components:

- Call Agent (CA)
- Feature Server (FS)
- Element Management System (EMS)
- Bulk Data Management System (BDMS)

Using Status and Control States

This section describes the use of status and control states, and includes the following topics:

- Displaying Operational States of Components with the Status Command
- Switching Administrative Service States of Internal Component Pairs with the Control Command
- Showing the State of an Application with the Status Application Command
- Controlling the State of an Application with the Control Application Command
- Determining the Status of a Call Agent with the Status and Control Commands

- Determining the Status of and Controlling the Feature Server
- Reporting and Controlling the EMS Status with the Status and Control Commands
- Determining and Controlling Bulk Data Management System Status with the Status and Control Commands
- Additional BDMS Status and Control Examples

Displaying Operational States of Components with the Status Command

The operational (status) states of the components are displayed using the *status* command. Typical examples of the command are:

```
status element-manager id=EM01;
status element-manager id=BDMS01;
status call-agent id=CA146;
status feature-server=FSPTC235;
status feature-server=FSAIN205;
```

Status states can be in either Normal or Forced mode. Table 3-1 lists status state modes and descriptions.

Table 3-1 Status State Modes

State Mode	Description
STARTUP	During platform startup, the two sides are communicating to determine which side will come up active.
INIT-NORMAL	Primary will be Active, Secondary will be Standby; switchover allowed.
INIT-FORCED	Primary will be forced to Active or Standby, Secondary will be forced to Standby or Active; no switchover allowed.
ACTIVE-NORMAL	Primary is Active, Secondary is Standby; switchover allowed.
ACTIVE-FORCED	Primary or Secondary has been forced to Active; no switchover allowed.
STANDBY-NORMAL	Primary should be Active, Secondary should be Standby; switchover allowed.
STANDBY-FORCED	Primary or Secondary has been forced to Standby; no switchover allowed.
TRANSITION-TO-ACTIVE-NORMAL	Primary is going to Active, Secondary is going to Standby; switchover allowed.
TRANSITION-TO-ACTIVE-FORCED	Primary has been forced to Active or Standby; Secondary has been forced to Standby or Active; no switchover allowed.
TRANSITION-TO-STANDBY-NORMAL	Primary is going to Standby, Secondary is going to Standby; switchover allowed.
TRANSITION-TO-STANDBY-FORCED	Primary has been forced to Active or Standby; Secondary has been forced to Standby or Active; no switchover allowed.

Switching Administrative Service States of Internal Component Pairs with the Control Command

The operator can use the *control* commands to switch the administrative service state (target state, or control state) of each internal component pair—EMS pair, BDMS pair, CA pair and FS pair. Each switching command will take approximately 20 seconds to complete on the system.

Following are typical examples of the command:

```
control call-agent id=CA146; target-state=FORCED-STANDBY-ACTIVE;
Invalid parameter value.
target_state=FORCED_STANDBY_ACTIVE;
```

Enter one of the following values:

- ACTIVE_STANDBY
- STANDBY_ACTIVE

Control states can be in either Normal or Forced mode. Table 3-2 lists control state modes and descriptions.

Table 3-2 Control State Modes

Control State	Description
NORMAL	Primary is active and secondary is standby.
FORCED-ACTIVE-STANDBY	Primary has been forced to active and secondary is standby.
FORCED-STANDBY-ACTIVE	Primary has been forced to standby and secondary is active.

One of the following messages is returned when a control command is successful:

```
Reconfigured Successfully
Already in this configuration
```

One of the following messages is returned when a control command fails:

```
Mate Changeover Timeout
Mate Refused Changeover
If this command is executed it will cause a System Outage
Invalid Configuration
Local Changeover Timeout
Local Changeover Failure
```

Showing the State of an Application with the Status Application Command

The **status application** command shows the state of any Cisco BTS 10200 Softswitch application (CA, FS, EMS, BDMS), including uptime, side indications and additional qualifying reason information.

Tip The **status application** command is a CLI command that provides more detail than the status <element-manager, call-agent, feature-server, or bdms> commands, including, for example, time stamps and restart counters. The **status application** command provides information similar to the nodestat command without using a root command.

Command Types Status

Examples

```
status application id=CA146;
status application id=EM01;
```

Syntax Description

ID	Type of application. VARCHAR(8): 1–8 ASCII characters. Permitted values are: CAnnn (or cannn)—CA EMnn (or emnn)—EMS BDMSnn (or bdms)—BDMS FSPTCnnn (or fsptcnnn)—FSPTC FSAINnnn (or fsainnnn)—FSAIN

Controlling the State of an Application with the Control Application Command

The **control application** command controls the state of an application instance. This command takes the application specified either in service or out of service.

Tip The **control application** command is a CLI command that provides functionality similar to the platform stop/start commands without using a root command.

Caution Use this command with extreme caution, because it has a significant affect on operation of the host machine.

Command Types

Control

Examples

```
control application id=CA146; action=star;node=prica06
control application id=CA146; action=stop;node=prica06
control application id=EM01; action=start;node=prica06
control application id=EM01; action=stop;node=prica06
```

Syntax Description

ID	Type of application. VARCHAR(8): 1–8 ASCII characters. Permitted values are: CAnnn (or cannn)—CA EMnn (or emnn)—EMS BDMSnn (or bdms)—BDMS FSnnn (or fsnnn)—FS
ACTION	Activity to perform. Permitted values are: START—Start a CA, EMS, BDMS, or FS. STOP—Stop a CA, EMS, BDMS, or FS.

Determining the Status of a Call Agent with the Status and Control Commands

This section describes the status and control commands for the Cisco BTS 10200 Softswitch Call Agent.

Status Command

The status command reports the status of a Call Agent.

Command Types

Status

Examples

```
status call-agent id=CA146;
```

Reply Example:

```
APPLICATION INSTANCE -> Call Agent [CA146]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

Reply : Success:
```

Control Command

The control command puts the Call Agent into a specific mode (state).

Command Types

Control

Examples

```
control call-agent id=CA146; target-state=standby-active;
control call-agent id=CA146; target-state=active-standby;
```

Reply Example:

```
Request was successful
REPLY=CONFIGURATION COMMAND EXECUTED->Reconfigured successfully.
```

Determining the Status of and Controlling the Feature Server

This section describes the status and control commands for the Cisco BTS 10200 Softswitch Feature Server.

Status Command

The status command reports the status of a Feature Server.

Command Types Status

Examples

```
status feature-server id=FSAIN205.Cisco.com;
```

Reply Example:

```
target-state=active-standby;
```

Control Command

The control command puts a Feature Server into a specific mode (state).

Command Types Control

Examples

```
control feature-server id=FSAIN205.Cisco.com; target-state=standby-active;
```

Reply Example:

```
Request was successful
REPLY=CONFIGURATION COMMAND EXECUTED->control feature-server LOCAL STATUS
```

Reporting and Controlling the EMS Status with the Status and Control Commands

This section describes the status and control commands for the Cisco BTS 10200 Softswitch Element Management System (EMS). These commands are specific to the EMS. For Billing commands, see the "Determining and Controlling Bulk Data Management System Status with the Status and Control Commands" section on page 3-7.

Status Command

The status command reports the status of an EMS.

Command Types Status

Examples

```
status element-manager id=EM01;
```

Reply Example:

```
Reply : Success:

        ELEMENT MANAGER STATUS IS... ->

        APPLICATION INSTANCE -> Element Manager [EM01]
        PRIMARY STATUS -> ACTIVE_NORMAL
        SECONDARY STATUS -> FAULTY

        EMS MYSQL STATUS IS ... -> Daemon is running!

        ORACLE STATUS IS... -> Daemon is running! Control Command
```

Control Command

The control command puts an EMS into a specific mode (state).

Command Types Control

Examples

```
control element-manager id=EM01; target-state=active-standby;
```

Reply Example:

```
Request was successful
REPLY=CONFIGURATION COMMAND EXECUTED->CONTROL EMS LOCAL STATUS
```

Determining and Controlling Bulk Data Management System Status with the Status and Control Commands

This section describes the status and control commands for the Cisco BTS 10200 Softswitch Bulk Data Management System (BDMS).

Status Command

The status command reports the status of the BDMS.

Command Types Status

Examples

```
status bdms id=BDMS01;
```

Reply Example:

```
Reply : Success:
BILLING SERVER STATUS IS... ->

APPLICATION INSTANCE -> Bulk Data Management Server [BDMS01]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

BILLING MYSQL STATUS IS... -> Daemon is running!
```

Control Command

The control command puts the BDMS into a specific state (mode).

Command Types

Control

Examples

control bdms id=BDMS01; target-state=active-standby;

Reply Example:

```
Reply : Success:

APPLICATION INSTANCE -> Bulk Data Management Server [BDMS01]
REASON -> CONFIGURATION COMMAND EXECUTED->CONTROL BDMS LOCAL STATUS System
```

Additional BDMS Status and Control Examples

Use the following steps to verify the status of the BDMS and switch the administrative states.

Step 1 Verify the status of the BDMS. Enter the following command:

status bdms; id=BDMS01;

Reply Example:

```
BILLING SERVER STATUS IS... ->

APPLICATION INSTANCE -> Bulk Data Management Server [BDMS01]
PRIMARY STATUS -> ACTIVE_NORMAL
SECONDARY STATUS -> FAULTY

BILLING ORACLE STATUS IS... -> Daemon is running!

Reply : Success:
```

Step 2 Modify the status of the BDMS. Enter the following command:

control bdms id=BDMS01; target-state=FORCED_ACTIVE_STANDBY

Reply Example:

```
Success:

APPLICATION INSTANCE -> Bulk Data Management Server [BDMS01]
REASON -> Application instance reconfigured successfully
```

Step 3 Verify the status of the BDMS. Enter the following command:

status bdms; id=BDMS01;

Reply Example:

```
Success:

REPLY=CONFIGURATION COMMAND EXECUTED -> status billing_server
PRIMARY STATUS -> ACTIVE_FORCED
SECONDARY STATUS -> STANDBY_FORCED
```

Step 4 Modify the status of the BDMS. Enter the following command:

```
control bdms id=BDMS01; target-state=FORCED_STANDBY_ACTIVE
```

Reply Example:

```
Request was successful.

REPLY=CONFIGURATION COMMAND EXECUTED -> Reconfigured Successfully
```

Step 5 Verify the status of the BDMS. Enter the following command:

```
status bdms id=BDMS01;
```

Reply Example:

```
Request was successful.

REPLY=CONFIGURATION COMMAND EXECUTED -> status billing_server
PRIMARY STATUS -> STANDBY_FORCED
SECONDARY STATUS -> ACTIVE_FORCED
```

Step 6 Modify the status of the BDMS. Enter the following command:

```
control bdms id=BDMS01; target-state=FORCED-ACTIVE-STANDBY;
```

Reply Example:

```
Request was successful.

REPLY=CONFIGURATION COMMAND EXECUTED -> Reconfigured Successfully
```

Determining System Status with the Status Command

The status system command returns the status of all applicable components of the system.

Command Types

Status

Examples

```
status system;
```

Reply Example:

```
  Checking Call Agent status ...
  Checking Feature Server status ......
  Checking Billing Server status ...
  Checking Billing Oracle status ...
  Checking Element Manager status ...
  Checking EMS MySQL status ...
  Checking ORACLE status ...


  CALL AGENT STATUS IS... ->

  APPLICATION INSTANCE -> Call Agent [CA146]
  PRIMARY STATUS -> ACTIVE
  SECONDARY STATUS -> STANDBY

  FEATURE SERVER STATUS IS... ->
```

```
APPLICATION INSTANCE -> Feature Server [FSPTC235]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

FEATURE SERVER STATUS IS... ->

APPLICATION INSTANCE -> Feature Server [FSAIN205]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

BILLING SERVER STATUS IS... ->

APPLICATION INSTANCE -> Bulk Data Management Server [BDMS01]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

BILLING ORACLE STATUS IS... -> Daemon is running!

ELEMENT MANAGER STATUS IS... ->

APPLICATION INSTANCE -> Element Manager [EM01]
PRIMARY STATUS -> ACTIVE
SECONDARY STATUS -> STANDBY

EMS MYSQL STATUS IS ... -> Daemon is running!

ORACLE STATUS IS... -> Daemon is running!

Reply : Success:
```

Activating a Media Gateway

The **control** command is used to change the state of the media gateway 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. Enter the following command:

```
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. Enter the following command:

```
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.

Archiving Your Database

Step 1 Login as **root**.

Step 2 Switch from user **root** to user **oracle**:

```
su - oracle
```

Step 3 Verify the Oracle replication queue is empty:

```
dbadm -r dbadm -r get_unpushed_trans
```

You should see the following:

```
================================================
Transaction statements (calls) not been pushed
================================================
no rows selected
```

If the output shows unpushed transactions, wait a few seconds and repeat this step until the queue is empty.

Step 4 Switch from user **oracle** to user **root** by exiting:

```
exit
```

Step 5 Stop all platforms. If this is a primary node, use the CLI command to control the standby forced active.

Step 6 Verify that “/var/yp” exists. Enter:

```
ls -l /var/yp
```

If the result is “no such file or directory”, enter:

```
mkdir -p /var/yp
```

Step 7 Mount the NFS server. Enter:

```
mount <nfsserver hostname/ip>:/<share directory> /mnt
```

Example:

```
mount 10.89.183.253:/opt/archive /mnt
```

Step 8 Back up all interfaces. Enter:

```
tar -cvf  /mnt/<local_hostname>.tar host*
```

Example:

```
<hostname>#tar -cvf bts-prica.tar host.*
```

Step 9 Restore the Solaris “**date**” command to create the system Flash Archive. Enter:

```
mv /bin/date /bin/date.orig
mv /bin/.date /bin/date
```

Step 10 Create the archive. Enter:

```
<hostname>#flarcreate -n <archive name> -x /opt -S -c /mnt/<file name>
```

Note Example archive name: flarcreate -n **CCPU-EMS** -x /opt -S -c /mnt/secems04.archive

Step 11 Back up the **/opt** directory. Enter:

```
tar -cvf - /opt/* |gzip -c >/opt/<hostname_release>.tar.gz
```

Step 12 Restore the original configuration. Enter:

```
mv /bin/date /bin/.date
mv /bin/date.orig /bin/date
```

Step 13 Unmount the NFS server. Enter:

```
umount /mnt
```

Show and Change Database Usage Commands

This section describes the following:

- **show** command paging capability for batch data retrieval
- **show** command for database usage
- **change db-usage** command

Retrieving Batch Data with the Show Command Paging Capability

The **show** command paging capability is used for retrieving subscriber related records (such as SUBSCRIBERS, TERMINATIONS, SUBSCRIBER_SERVICE_PROFILES) in batches.

The following parameters apply to all show commands that operate on provisioning data. These parameters are particularly useful when displaying tables containing large amounts of data such as SUBSCRIBERS and TERMINATIONS.

- **limit** specifies the page size for the maximum number of rows (or lines) returned in response to the query.
- **start_row** specifies the location in the data set where to start the page to be displayed. (The data set is the entire set of data that can be displayed as a result of the **show** command.)

Note The default value for **start_row** is **1** (or the first row of data).

- **display** shows only the columns of data requested. The display is a comma-separated list of the desired columns.
- **order** provides a key for ordering or sorting the data. More than one item can be specified for the sort.

Example: Controlling the Volume and Format of Data

In the following example, the **show** command parameters are used to control the volume and format of data to be displayed:

```
show subscriber limit=1000; start_row=<next page value>;
```

Where:

- **subscriber limit=1000** specifies the page size as 10 rows. The first page contains the total size of the display (such as 12,000 rows).
- **start_row=<next page value>** specifies the location in the data set where to start the page to be displayed.

Example: Ordering and Displaying Specific Data

In the following example, the **show** command parameters are used to order and display only the desired data:

```
show subscriber limit=1000; start_row=<next page value>; display=id,sub_service_profile;
order=id;
```

Where:

- **subscriber limit=1000** indicates that 1000 is the maximum number of rows in a page. The first page contains the total size of the display (such as 12,000 rows).
- **start_row=<next page value>** specifies the location in the data set where to start the page to be displayed.
- **display=id,sub_service_profile** indicates that the data is sorted by **id** column. The subscribers can be alphabetized by sorting according to the **name** or another parameter. The **display** parameter is a comma-separated list of parameters used to sort the returned data. In this example, only the **id** and **sub_profile_id** columns of data are displayed from the subscriber table.
- **order=id** means that the data is sorted by **id** column.

Show Database Usage Command

The **show db-usage** command returns and modifies the maximum number of records allowed, as well as the number of licensed and current database records. Records can be shown and changed but cannot be deleted.

The EMS updates the *current number of records* field in real time. The db-usage command also uses the Database Threshold (db-thresholds) table, which contains default alarm threshold parameters that are provisioned during installation. Parameters can be changed and shown. The default threshold parameters are:

- 80 percent minor
- 85 percent major
- 90 percent critical

Note Do not use a hyphen (-) in the actual name of a table when using this command. Use the underscore (_). For example, dial_plan is correct; dial-plan is not correct.

Use the following command example to show db-usage statistics:

```
show db-usage table-name=dial_plan;
```

Change db-usage

Use the following command example to change db-usage tokens and values:

```
change db-usage table-name=dial-plan; minor-threshold=70;major-threshold=80;
critical-threshold=95;
```

Viewing and Manipulating Transactions

This section describes the commands and tables for viewing and manipulating transactions.

Transaction Queue Command

The transaction-queue command allows users to view and delete entries in a transaction queue, if any exist.

The Transaction Queue table tracks updates into the database, as well as into the shared memory of the Call Agent and Feature Servers. Entries should never remain in the transaction queue for more than a few seconds, unless an Element Management System (EMS), Call Agent, or Feature Server is in an error state. In case of an error state, the transaction queue continues to store entries for later updates.

Note Transaction queue entries can be deleted but not changed.

Showing Entries with the Show Transaction Queue Command

Use the following command example to show any entries in a transaction queue:

```
show transaction-queue target=CA146
```

Deleting Entries with the Delete Transaction Queue Command

Use the following command example to delete any entries in a transaction queue.

```
delete transaction-queue target=CA146
```

Caution The ***delete transaction-queue*** command causes a database inconsistency. Call the Cisco Systems Technical Assistance Center (Cisco TAC) to determine the necessity of using this command.

Blocking Provisioning

Prevent BTS provisioning during an upgrade or maintenance windowfrom the following interfaces:

- CLI
- FTP
- CORBA
- SNMP

Note The software will support blocking HTTP interfaces in a future release.

If you block provisioning before performing an SMG restart or EMS reboot, blocking is still enforced when these applications return to in-service state.

There are two levels of blocking:

- PROVISION—prevents all provisioning commands from executing
- COMPLETE—prevents all commands from executing

Who Can Block?

Only terminal type “MNT” users can use these blocking and unblocking commands. “MNT” users are never blocked. “MNT” users issue these commands from either Active or Standby EMS.

Who Can Be Blocked?

A blocking command applies to all non-“MNT” users on terminals on either Active or Standby EMS. Commands do not execute for:

- logged-in users
- users who login after the block command

Commands are not queued for execution after unblock. The CLI user prompt changes when blocked, notifiying the user their commands will not execute.

Using Block and Unblock Commands

Step 1 Select operation mode:

- MAINTENANCE—(default) for regular maintenance
- UPGRADE—for upgrades

Step 2 Use block/unblock commands.

Step 3 Exit the blocked mode using the “unblock session” command.

Viewing a Call Trace Summary

The Call Trace Summary command reports the information gathered when a customer activates a trace by pressing *57 on the telephone. This command logs information pertaining only to the most recently received call. Report is the only command type. Using the command without any tokens returns all entries in the table.

Use the following command example to report call trace information:

```
report call-trace-summary
```

Note Table information is logged from the switch. If the system cannot decipher the information from the switch, it returns the value UNKNOWN in the applicable field.

The report appears on the screen. No HTML report is generated.

Using the Command Scheduler to Schedule Command Executions

The Command Scheduler allows you to schedule a command to execute daily, weekly, or monthly at a specific time. Once a command is scheduled, the Scheduler allows you to remove a command from the schedule. Regardless of whether the command previously executed, the command can be removed at any time. If the command is scheduled to recur and is currently executing within the Element Management System (EMS), the command completes in a normal fashion but is removed from the list from that point forward.

It is often necessary to schedule commands to occur during periods of least system activity. Using the start-time and recurrence command tokens, you can schedule commands at any time and at any frequency. The recurrence token schedules a command daily, weekly, or monthly. Scheduling a command without the recurrence token causes the Command Scheduler to execute the command only once.

The characteristics of a scheduled command are read once at execution time. During execution, the characteristics can be changed but do not affect the command that is running.

Showing a Scheduled Command

Use the following command example to show a particular scheduled command:

Note A command must be added before it can be shown.

```
show scheduled-command id=1234;
```

Adding a Scheduled Command

Use the following command example to add a scheduled command:

```
add scheduled-command start-time=2001-10-01 12:22:22; noun=database; verb=audit;
```

Changing a Scheduled Command

Use the following command example to change a scheduled command:

```
change scheduled-command id=1234; start-time=2001-10-02 20:00:00;
```

Deleting a Scheduled Command

Use the following command example to delete a scheduled command:

```
delete scheduled-command id=1234;
```

Controlling the Subsystem Group In or Out of Service

The Subsystem Group table has a status associated with it. The operator can control a subsystem group in or out of service. Controlling the subsystem group out of service has the same affect as controlling all the subsystems in the subsystem group out of service. Controlling the subsystem group in service puts all subsystems in the group in service.

The following CLI command controls both subsystem/OPC combinations out of service:

```
control subsystem_grp id=CNAM; mode=forced; target_state=UOS;

SUBSYSTEM GRP ID -> CNAM

INITIAL STATE -> User in service

RESULT STATE -> User out of service

REQUEST STATE -> User out of service

FAIL REASON -> ADM found no failure

REASON -> ADM executed successfully

RESULT -> ADM configure result in success

Reply : Success: CLI change successfully
```

Note If a subsystem/OPC combination is taken out of service individually, the state of the subsystem group may be in service while some members of the group are out of service.

Requesting the Status of a Subsystem Group

The operator may request the status of the subsystem group table. The following example CLI command requests status:

```
status subsystem_grp id=CNAM

SUBSYSTEM GRP ID -> CNAM
```

```
REASON -> ADM executed successfully

RESULT -> ADM configure result in success

ADMIN STATE -> User in service

OPER STATE -> Subsystem Group allowed

Reply : Success:
```

Monitoring the Host Operating System Time

The Solaris Operating System (OS) obtains the system time automatically through network time protocol (NTP) services.

Caution Users should never attempt to modify the system date or time in their Cisco BTS 10200 Softswitch host machines while system components (CA, FS, EMS, and BDMS) are running. This could cause the system to have serious problems. Allow the Solaris OS to obtain the time automatically through NTP services.

Performing Local Number Portability Functions

This section describes local number portability (LNP) operation on the Cisco BTS 10200 Softswitch in the following subsections:

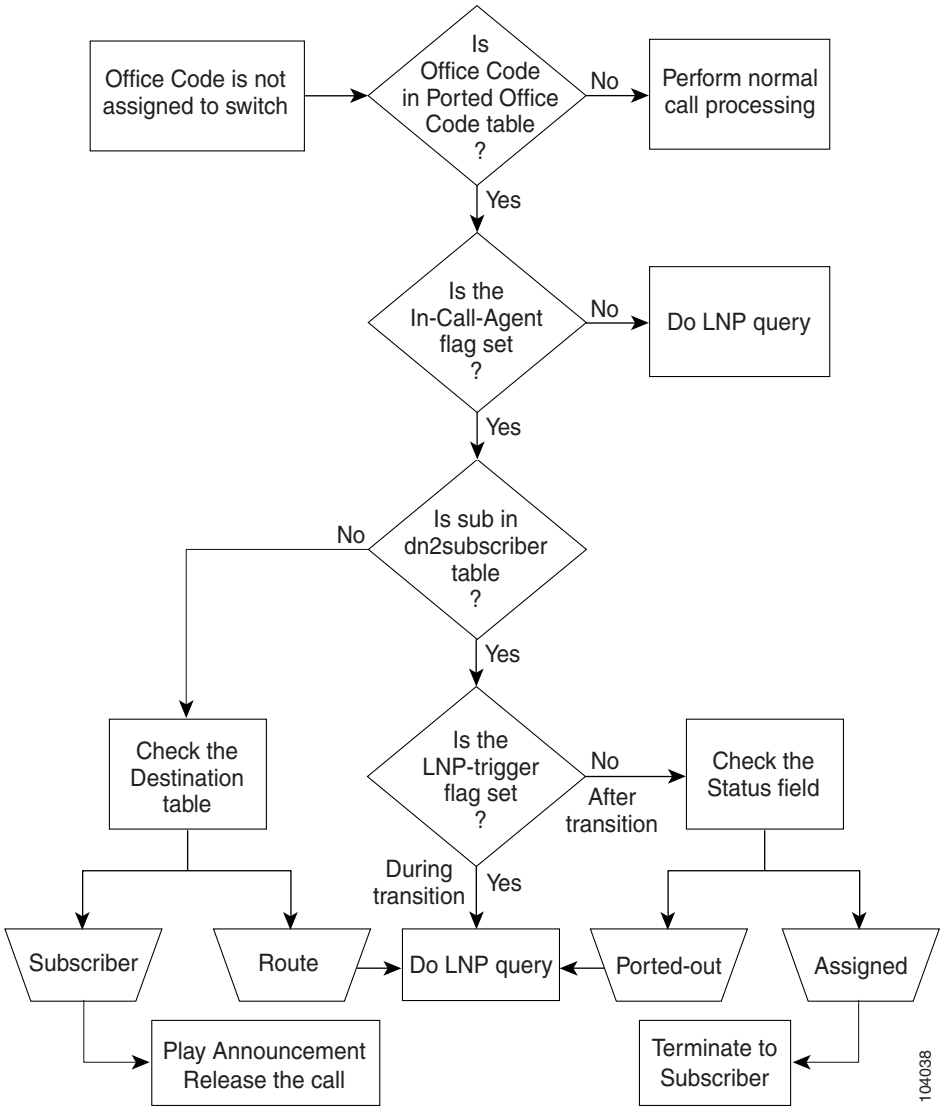
- LNP Call Flow, page 3-18
- Disconnecting Service to a Subscriber with a Ported Telephone Number, page 3-23

To perform LNP functions, start with establishing a CLI session. See Logging into the EMS Using CLI, page 2-2 for information.

LNP Call Flow

Figure 3-1 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 3-1 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 DN2**SUBSCRIBER** 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 "Logging into the EMS Using CLI" section on page 2-2, and enter the CLI commands as described in the following sections:

- Changing lnp-trigger to Y (Yes), page 3-21
- Changing DN Status to Ported-Out, page 3-22
- Deactivating a Customer's Service, page 3-22

Activating a Subscriber

Use the **control** command to change 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 Enter the following command, using the transaction-id of the command that added the subscriber:

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

Text similar to the following is displayed:

```
Success: Database is void of entries.
```

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

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

The data elements specified in this command are described as follows:

subscriber-termination id	The 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 (No)

After the activation for a ported-in number is complete, the Cisco BTS 10200 Softswitch must 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. To accomplish this, reset the **lnp-trigger** flag to N.

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

Step 1 Retrieve the office-code-index by entering 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;
```

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

Changing lnp-trigger to Y (Yes)

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 a Customer's Service

To deactivate a 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;
```

The 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.

Disconnecting Service to a Subscriber with a Ported Telephone Number

Disconnecting service to a subscriber who has a ported telephone number requires interaction with the NPAC SMS, as illustrated in Figure 3-2.

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

Step 1 As the service provider, set a time and date with the subscriber to disconnect service.

Step 2 Send an update indicating the service disconnection to the appropriate NPAC SMS. The following events occur:

a. When the service disconnection notification is received, NPAC SMS broadcasts the update to all service providers.

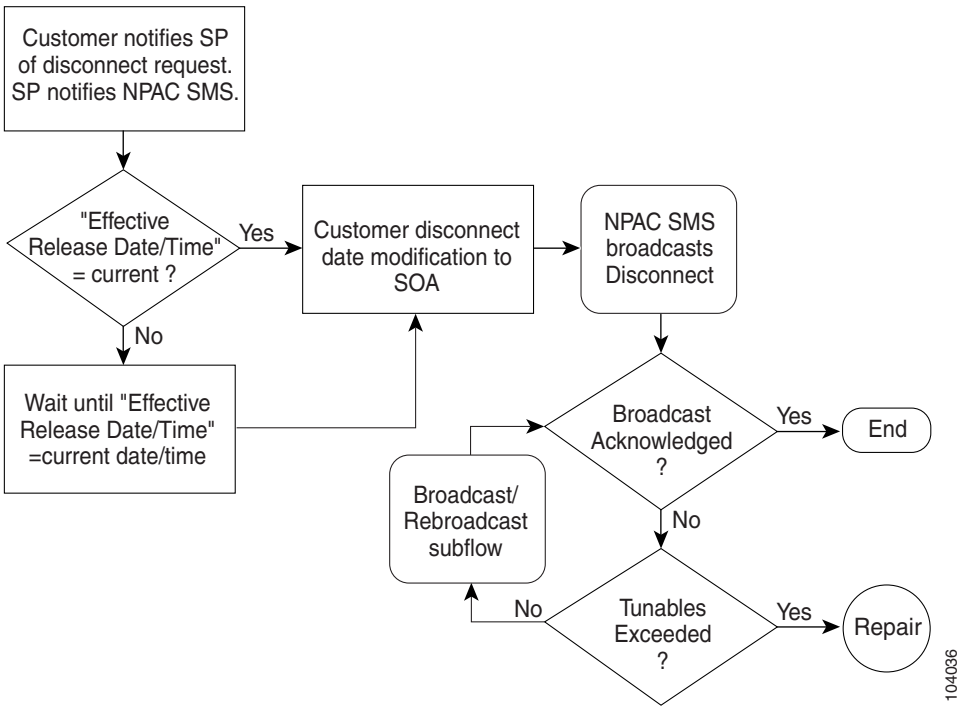
b. On the effective date, NPAC SMS removes the ported telephone number from its database of ported numbers.

Note If you (the service provider) need to change the Customer Disconnect Date (CDD) or Effective Release Date (ERD) of the disconnect, the you must send a modify request to the NPAC SMS.

Step 3 When an update is received, all service providers must 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-ported number.

Figure 3-2 Disconnect Ported Number Work Flow



Changing Subscriber DN

The change number feature enables you to change the directory number of a subscriber. The following procedures enable you to change a directory number of a subscriber and to remove the old directory number announcement.

Changing a Subscribers Directory Number

To change the directory number of a subscriber, do the following:

Step 1 Change the subscriber DN to the new DN.

```
change sub id=<id>; dn1=<new-DN>;
```

Example:

```
change sub id=sub1; dn1=206-222-1841;
```

Step 2 Use the show subscriber command to verify the new DN.

```
show sub id=<id>
```

Example:

```
show sub id=sub1;

Dn1 indicates 206-222-1841
```

Step 3 Verify that the changed number (old DN) of the subscriber is being tracked in the changed-number table.

```
show changed-number old-dn=<old-dn>
```

Example:

```
show changed-number OLD-DN=206-222-2345
```

Step 4 Use the dn2subscriber table to verify that the old DN is in the changed number (CN) state and new DN is in assigned state. Check if the status of the old DN is CN.

```
show dn2subscriber FDN=<old-DN>;
```

Example:

```
show dn2subscriber FDN=206-222-2345;
```

Check if the status of the new DN is assigned.

```
show dn2subscriber FDN=<new-DN>;
```

Example:

```
show dn2subscriber FDN=206-222-1841;
```

Step 5 Place an incoming call to the new DN and verify the call is setup successfully.

Step 6 Place an incoming call to the old DN and verify that the announcement played is "<old DN> has been changed to <new DN>."

If an announcement is not played, do the following:

- Verify if the release cause id maps to annc-id=118.

  ```
  show release-cause id=22;
  ```

- Verify if the announcement id maps to announcement-number 301.

  ```
  show annc id=118;
  ```

Old Directory Number Announcement Removal

If you do not want to play an announcement for the old DN anymore, do the following:

Step 1 Delete the changed-number entry.

```
delete changed-number old-DN=<old-DN>;
```

Step 2 Change the status of the old DN to DISC in the dn2subscriber table.

```
change dn2subscriber DN=<old-DN>; status=DISC;
```

Troubleshooting LNP Problems

See the *Cisco BTS 10200 Troubleshooting Guide* for details on 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.

Managing Billing Interface and Billing Records

See the *Cisco BTS 10200 Softswitch Billing Interface Guide for details on managing the billing interface and billing records.*

The billing subsystem on the EMS gathers all billing related call events from call processing, formats them into a standard format, and transmits them to an external collection device. The interface to the billing mediation device can vary from carrier to carrier, thus this subsystem supports a flexible profiling system.

The billing subsystem includes the following functions:

- Provides SFTP transfer of call data records to a remote billing server
- Supports batch record transmission via FTP
- Issues events and alarms as appropriate including potential billing data overwrites
- Saves billing data according to available disk space in Oracle
- Support for user-provisionable billing subsystem tokens
- Support for on-demand Call Detail Block (CDB) queries based on ranges of timestamps, ranges of sequence numbers, a calling number, a called number, or last record written

Record Retention Mechanisms in the EMS

A "worst case number of records required" is determined, based on predicted call capacities and call type mixtures. Once this number of records has been reached, the next entry rolls over to the first record in the database and starts overwriting from this record onwards.

The following sample calculation is used to predict the number of records needed to store 48 hours of records:

100 calls/second in busy hour yields an average daily mean of **45 calls/second X 60 seconds/ minute X 60 minutes/hour X 48 hours = 7,776,600 records.**

Billing Alarm Tracking Mechanisms

The billing manager process in the EMS tracks the total number of records the billing database can store, the number of unacknowledged records, and the current percentage of the database that is occupied by unacknowledged records. This information is then compared against the threshold levels set in the billing

alarm database. If the current amount of billing data exceeds thresholds in the database, then the billing manager issues alarms. The billing manager resets the alarms as the storage levels drop below the thresholds.

Call Detail Block Correlation and Format

CDBs are produced from the current information sent from the billing generator in the CA to the billing manager in the EMS. An indication that the call has completed all signaling activities can be detected and used as a marker that all billing for the given call is now complete. Each of the billing event messages (BEM) that are portions of a call in progress, are stored in a staging area in the billing generator, waiting for call completion. Once the complete call content is present, the CDB is constructed from the individual BEMs and sent to the billing manager in the EMS.

Northbound Billing Data Transport

Billing data is transported to the customer's OSS network via FTP of batch files containing the Call Detail Blocks.

Note Contact Cisco TAC for billing questions for your specific softswitch system.

Displaying Active Call Information

Active Call Information Display displays the call information of a currently active call.

Query Command

The operator uses a CLI command (**query call-trace**) and enters the subscriber phone number or other suitable input to retrieve information about a subscriber call in progress based on an input parameter, then views the call information from the output. It applies either to originating or terminating calls.

- **Input parameter** means any subscriber-specific information such as DN or FQDN. Global parameters such as NPA-NXX-**** or aaln/*@* or 135.25.156.* are acceptable.
- **Call processing information** that is displayed includes the following:
  - Originating number
  - Terminating number
  - Media gateway(s)
  - SDP IP addresses involved
  - Trunk group number
  - CIC (such as off-net calling).
  - Other information pertaining to the call made by the subject.

The list of input parameters and the list of displayed output fields are both documented in the "Query" section of the *Cisco BTS 10200 Softswitch Command Line Reference Guide*.

Error Message

A query is rejected with an error message in the following cases:

- If there is no match for the DN in the DN2SUBSCRIBER table.
- If the subscriber's TERM-TYPE is not TERM, H323 or SIP.
- If it is an error based on the subscriber status.

Displaying Information on Forwarded Calls

Forwarded calls are handled as shown in the following scenario:

- A calls B and the call is forwarded to C (CFU/CFB/CFNA/CFC).
- If the query is made on A, the output will show that A is connected to C and provide C's information.
- Similarly, if the query is made on C, the output will show that C is connected to A and provide A's information.
- However, if the query is made on B, the output will show that A is calling C and the call is forwarded through B.

Note Note that even when the call is forwarded through B, B could also be originating another call. It is also possible that multiple calls are being forwarded through B.

Displaying Information on Three-Way Call and Call Waiting

If a caller is involved in more than one call at the same time, such as a three-way call or a call-waiting scenario, the output gives the details of both calls.

Display of Query Results

Following are examples of displays from call-trace queries for a POTS subscriber (brief mode selected):

CALL-STATE=CONNECTED (CLG):POTS-SUB 469-555-1234 (CLD):POTS-SUB 469-255-4567

CALL-STATE=CALL-SETUP (CLG):POTS-SUB 469-555-1234 (CLD):SIP-SUB 469-255-4568

CALL-STATE=ALERTING (CLG):POTS-SUB 469-555-1234 (CLD):H323-SUB 469-255-4569

CALL-STATE=CONNECTED (CLG):POTS-SUB 469-555-1234 (CLD):POTS-MLHG
MLHG-ID=mlhg1 TERMINAL=23

CALL-STATE=CALL_SETUP (CLG):POTS-SUB 469-555-1234 (CLD):POTS-CTXG
CTXG-ID=ctxg1 EXT=1234

CALL-STATE=ALERTING (CLG):POTS-SUB 469-555-1234 (CLD):SS7 TGN-ID=123
TRUNK-ID=456

CALL-STATE=CONNECTED (CLG):POTS-SUB 469-555-1234 (CLD):ISDN TGN-ID=123 TRUNK-ID=456

CALL-STATE=CALL-SETUP (CLG):POTS-SUB 469-555-1234 (CLD):CAS TGN-ID=123 TRUNK-ID=456

CALL-STATE=ALERTING (CLG):POTS-SUB 469-555-1234 (CLD):SIP_TG SIP-CALL-ID=<sip-call-id>

CALL-STATE=CONNECTED (CLG):POTS-SUB 469-555-1234 (CLD):H323-TG H323-CALL-ID=<h323-call-id>

Assigning Three-Digit Vertical Service Codes (VSC)

To assign three-digit VSCs:

Step 1 Replace ***xx** in the applicable digit map to ***[4-9]x|*[2-3]xx**.

Note Make sure that the "REFRESH_DIGIT_MAP" flag is set to "Y" in the mgw-profile table for the media gateway to which the subscriber is associated.

Step 2 Add the three-digit access codes to the VSC table.

Step 3 Add the three-digit access codes to the CDP table.

Changing NTP or DNS Server

To change either the NTP or DNS server:

Step 1 Execute a platform stop on the standby side.

Step 2 Make the changes to the NTP or DNS server setting on the standby side and verify.

Step 3 Shutdown and restart the standby side.

Step 4 Platform a start on the standby side if it is not already started.

Step 5 Perform a manual switchover.

Step 6 Repeat Step 1 through Step 4 on the new standby side.

Step 7 Perform a manual switchover to normalize the system