NORTEL NETWORKS

Nortel Networks Multiservice Switch 7400

Operations: DCME Voice Service

NN10600-760

Nortel Networks Multiservice Switch 7400

Operations: DCME Voice Service

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General availability. Contains information on Nortel Networks Multiservice Switch 7400 for the PCR6.1 release.

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About this document

This document describes the digital circuit multiplication equipment (DCME) voice service of Nortel Networks Multiservice Switch 7400, including the features and characteristics of the DCME voice service, how to provision and maintain the DCME voice service on a Multiservice Switch 7400 node, and how to monitor and troubleshoot the DCME voice service

The following topics are discussed in this section:

Who should read this document and why

The NN10600-760 *Nortel Networks Multiservice Switch 7400 Operations: DCME Voice Service* document is for persons who perform the following tasks related to the DCME voice service:

- planning
- engineering
- provisioning

- operating
- monitoring and maintaining
- troubleshooting

What you need to know

The NN10600-760 *Nortel Networks Multiservice Switch 7400 Operations: DCME Voice Service* assumes you are familiar with the voice transport service on Nortel Networks Multiservice Switch nodes, the path-oriented routing system (PORS), Multiservice Switch software architecture (the relationship between components and attributes), and command-line provisioning.

How this document is organized

The NN10600-760 *Nortel Networks Multiservice Switch 7400 Operations: DCME Voice Service* contains the following sections:

- "DCME voice service fundamentals" (page 35) provides you with an overview and details of the specific features of Nortel Networks Multiservice Switch 7400 DCME voice service.
- "DCME voice service configuration" (page 17) provides prerequisites and specific procedures that allow you to provision Multiservice Switch 7400 DCME voice service.
- "Monitoring and maintaining the DCME voice service" (page 57) provides you with operational information on how to monitor and maintain Multiservice Switch 7400 DCME voice service.
- "Troubleshooting the DCME voice service" (page 67) provides you with information on how to deal with Multiservice Switch 7400 DCME voice service alarms.
- "Compliance with standards" (page 73) provides you with specific details about the ITU-T standards governing the development of Multiservice Switch 7400 DCME voice service.

What's new in this document

There were no new features added to this document.

Other changes made to this document include the following:

- The terms Passport and PVG have been rebranded in conjunction with the new Nortel Networks' brand simplified naming format. Passport is now referred to as the Nortel Networks Multiservice Switch, and PVG is now Media Gateway 7480/15000. For more information on the product rebranding, refer to NN10600-000 *Nortel Networks Multiservice Switch 7400/15000/20000 What's New in PCR6.1*.
- "Structural changes" (page 13)
- Updated this document to remove references to these MVP FPs which are support discontinued (SDed):
  - 1-port DS1 MVP with cardtype 1pDS1MVP and PEC NTFN62
  - 1-port DS1Voice with cardtype 1pDS1V and PEC NTFP41
  - 1-port E1 MVP with cardtype 1pE1MVP and PEC NTFN20
  - 1-port E1Voice with cardtype 1pE1V and PEC NTFP43
  - 1-port J2MV with cardtype J2MV and PEC NTBP96
  - 1-port TTC2M MVP with cardtype 1pTTC2mMVP and PEC NTFN64

Structural changes

This document was restructured into a modular, task-based format to improve the usability of the information. The following changes were made to this document.:

- Procedures were grouped into higher-level tasks.
- Task flow charts were added to improve navigation through tasks and procedures, to set tasks and procedures in context, and to provide a visual representation of prerequisites and configuration paths.
- Procedures were restructured into a modular format.
- Purpose statements were added to tasks and procedures to provide context.
- Prerequisites were divided into those applicable to an entire task. those applicable only to a specific procedure, and those applicable only to a specific procedure step. Prerequisites applicable to an entire task were

placed in the appropriate task-level prerequisite section, prerequisites applicable only to a specific procedure were placed in the perquisites section of the procedure, and prerequisites applicable only to a specific step were placed in the step.

- 'Where' statements were removed from procedures and the content placed in the 'Variable values' table following the procedure.
- A 'Procedure Job Aid' section was added to procedures where appropriate. This consists of information that supports the procedure, such as a component hierarchy figure, a checklist, or a diagram.
- Conceptual and reference information were removed from procedures, placed in the appropriate conceptual or reference section, and cross-referenced from the procedure where appropriate.

Text conventions

This document uses the following text conventions:

- `nonproportional spaced plain type`

  Nonproportional spaced plain type represents system generated text or text that appears on your screen.

- **`nonproportional spaced bold type`**

  Nonproportional spaced bold type represents words that you should type or that you should select on the screen.

- *italics*

  Statements that appear in italics in a procedure explain the results of a particular step and appear immediately following the step.

  Words that appear in italics in text are for naming.

- [`optional_parameter`]

  Words in square brackets represent optional parameters. The command can be entered with or without the words in the square brackets.

- `<general_term>`

  Words in angle brackets represent variables which are to be replaced with specific values.

- UPPERCASE, lowercase

  Nortel Networks Multiservice Switch commands are not case-sensitive and do not have to match commands and parameters exactly as shown in this document, with the exception of string options values (for example, file and directory names) and string attribute values.

- |

  This symbol separates items from which you may select one; for example, ON|OFF indicates that you may specify ON or OFF. If you do not make a choice, a default ON is assumed.

- ...

  Three dots in a command indicate that the parameter may be repeated more than once in succession.

The term absolute pathname refers to the full specification of a path starting from the root directory. Absolute pathnames always begin with the slash (/) symbol. A relative pathname takes the current directory as its starting point, and starts with any alphanumeric character (other than /).

Related documents

For the complete list of documents contained in the Nortel Networks Multiservice Switch documentation library, see NN10600-001 *Nortel Networks Multiservice Switch 7400/15000/20000 Basics: Customer Documentation*. Specifically, see the following documents for more information to help you implement, operate, and monitor the DCME voice service:

- NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- NN10600-050 *Nortel Networks Multiservice Switch 7400/15000/20000 Command Reference*

- NN10600-750 *Nortel Networks Multiservice Switch 7400 Operations: Voice Transport*
- NN10600-405 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Call Server*
- NN10600-420 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Trunking*
- NN10600-425 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Dynamic Packet Routing System*
- NN10600-450 *Nortel Networks Multiservice Switch 7400: Operations: DPN-100 Interworking*
- NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System*
- NN10600-060 *Nortel Networks Multiservice Switch 7400/15000/20000 Component Reference*
- NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/ 20000 Alarms Reference*

How to get more help

For information on training, problem reporting, and technical support, see the "Nortel Networks support services" section in the product overview document.

Chapter 1
DCME voice service configuration

Configure the Nortel Networks Multiservice Switch 7400 digital circuit multiplication equipment (DCME) voice service to concentrate a number of input trunk channels on a reduced number of transmission channels.

- "Prerequisites to DCME voice service configuration" (page 17)
- "DCME voice service configuration task" (page 18)

Prerequisites to DCME voice service configuration

- You require NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*, NN10600-060 *Nortel Networks Multiservice Switch 7400/15000/20000 Component Reference*, and *Nortel Networks Multiservice Switch Engineering Notes and Guidelines*. In particular, NN10600-060 *Nortel Networks Multiservice Switch 7400/15000/20000 Component Reference* provides detailed descriptions of provisionable and operational DCME components and attributes. Included with the descriptions of provisionable attributes are the default and available values you can use to set them.
- Nortel Networks Multiservice Switch 7400 DCME voice service operates only on the E1 multipurpose voice platform enhanced echo cancellation (MVP-E) function processor (FP). See the following Multiservice Switch documents for information on installing, configuring, and maintaining the E1 MVP-E FPs:
  - NN10600-175 *Nortel Networks Multiservice Switch 7400 Hardware Installation, Maintenance, and Upgrade*

— NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*

- Use the procedures in NN10600-270 *Nortel Networks Multiservice Switch 7400/15000/20000 Software Installation* to install DCME software. The DCME software is named dcmeSystem.
- The DCME feature—dcme—cannot coexist on an E1 MVP-E FP with other voice or transparent data service Multiservice Switch software features, specifically vtds and voiceNetworking. You can, however, provision the DCME voice service feature and other voice or transparent data service features on separate FPs on the same Multiservice Switch shelf.
- The path-oriented routing system (PORS) and the dynamic packet routing system (DPRS) enable the DCME voice service's connections between nodes. These systems must be installed and activated in your network. Ensure that your version of PORS and DPRS are compatible with the version of DCME software you plan to deploy.

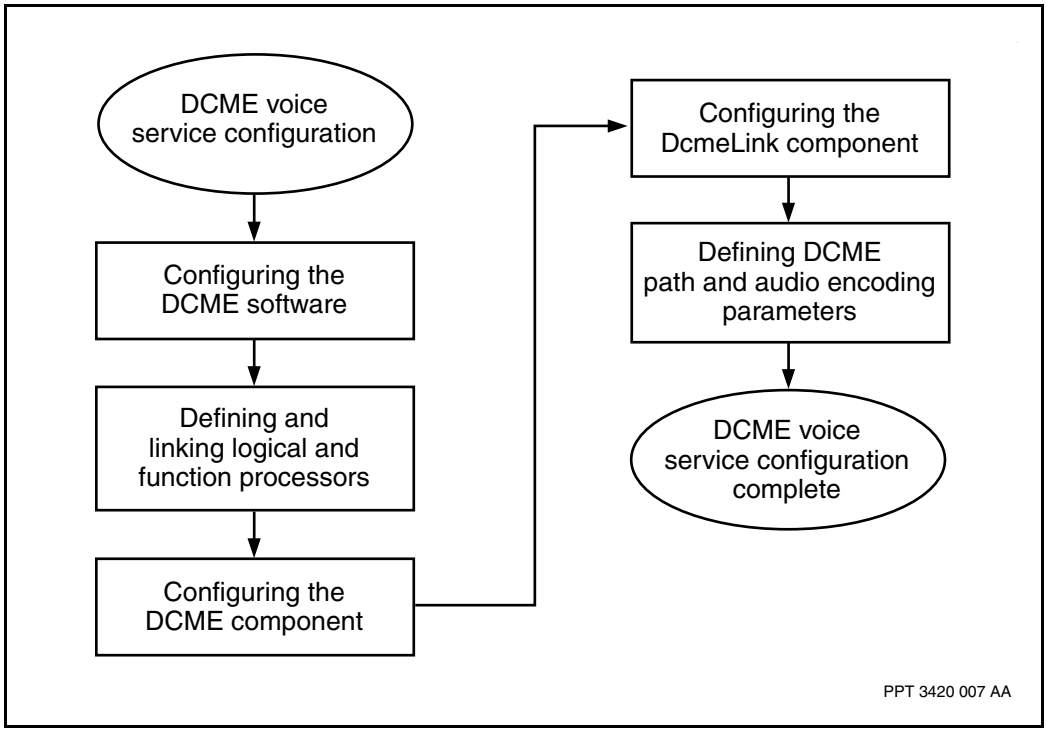
  For information on configuring PORS, see NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System* and NN10600-420 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Trunking*.

  For information on configuring DPRS and the call server, see NN10600-425 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Dynamic Packet Routing System* and NN10600-450 *Nortel Networks Multiservice Switch 7400: Operations: DPN-100 Interworking*, and NN10600-405 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Call Server*, respectively.

DCME voice service configuration task

"DCME voice service configuration task flow" (page 19) shows you the sequence of tasks and procedures you perform to configure the DCME voice service. To link to any task or procedure, go to "Task navigation" (page 19).

Figure 1
DCME voice service configuration task flow



Task navigation

- "Configuring the DCME software" (page 20)
- "Defining and linking logical and function processors" (page 22)
- "Configuring the DCME component" (page 25)
- "Configuring the DcmeLink component" (page 27)
- "Defining DCME path and audio encoding parameters" (page 31)

Configuring the DCME software

Configure DCME software on the two Nortel Networks Multiservice Switch nodes (each of which connects to an ISC exchange) that will run the DCME voice service.

Prerequisites

- The DCME voice service uses data network address (DNA)-based routing which requires you to configure a call server. Ensure that the callServer feature is present under the *featureList* attribute for Lpt/CP.

Procedure steps

1. Specify the DCME software you want to configure.

   ```
   set sw avList dcmeSystem_<av_number>
   ```

2. Add a *LogicalProcessorType* (*Lpt*) component instance for the DCME voice service and set its *featureList* attribute.

   ```
   add sw lpt/<name>
   ```

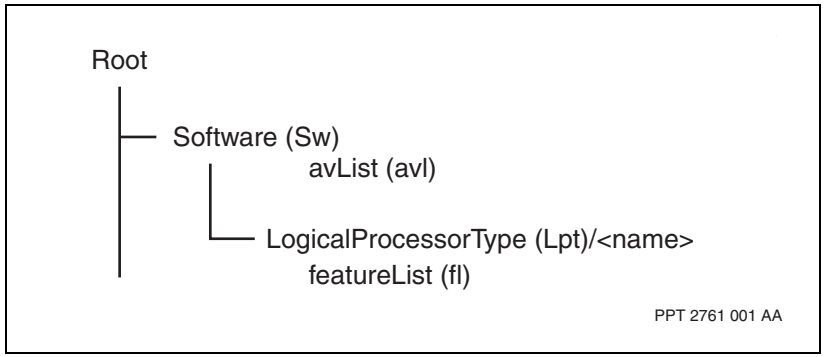
3. Repeat step 1 and step 2 to configure DCME software on the remote end node.

Variable definitions

Variable	Definition
<av_number>	The software application version number. The value used for the *avList* attribute must correspond exactly to the value found under the operational component *Sw ApplicationVersion* (*Av*).
<name>	Up to 25 ASCII characters. To help simplify provisioning, use a descriptive word when naming an *Lpt* component, such as DCME.

Procedure job aid

Figure 2
Software component hierarchy



Defining and linking logical and function processors

Define logical processors (LP) and link them to the configured DCME software, and specify the type of port and channels (including the signaling channel) for each LP. For each function processor (FP), you define its type and specify its position on the Nortel Networks Multiservice Switch shelf. You then link the LPs to the FPs. Each LP and FP combination represents one E1 physical interface to the ISC exchange.

Prerequisites

- To help simplify provisioning, follow the same naming and numbering conventions for DCME components and attributes on each Nortel Networks Multiservice Switch node.

Procedure steps

1. Add logical processors.

   add lp/<lp_number>

2. Link the LPs to the configured DCME software.

   set lp/<lp_number> logicalProcessorType sw lpt/DCME

3. For each FP, define its slot number.

   add shelf card/<card_number>

4. For each FP, define its card type.

   set shelf card/<card_number> cardType <FP>

5. Link each LP to an FP.

   set lp/<lp_number> mainCard shelf card/<card_number>

6. Perform a semantic check of your changes.

   check prov

7. Add an E1 port to each LP.

   add lp/<lp_number> e1/0

8. Specify the channel associated signaling (CAS) framing format for each E1 port.

   set lp/<lp_number> e1/0 linetype cas

9 Specify the clocking source to use for each E1 CAS port.

```
set lp/<lp_number> e1/0 clockingSource module
```

10 Optionally, delete channel 0 before you add channel and timeslot pairs to allow you to align channel and timeslot numbers with those on the connected PBX, simplifying the configuration and monitoring processes.

```
del lp/<lp_number> e1/0 chan/0
```

11 Add channels and timeslots to each E1 port. An E1 port supports up to 31 channels.

```
add lp/<lp_number> e1/0 chan/<signaling_channel>
```

```
set lp/<lp_number> e1/0 chan/<signaling_channel>
timeslots <timeslot_number>
```

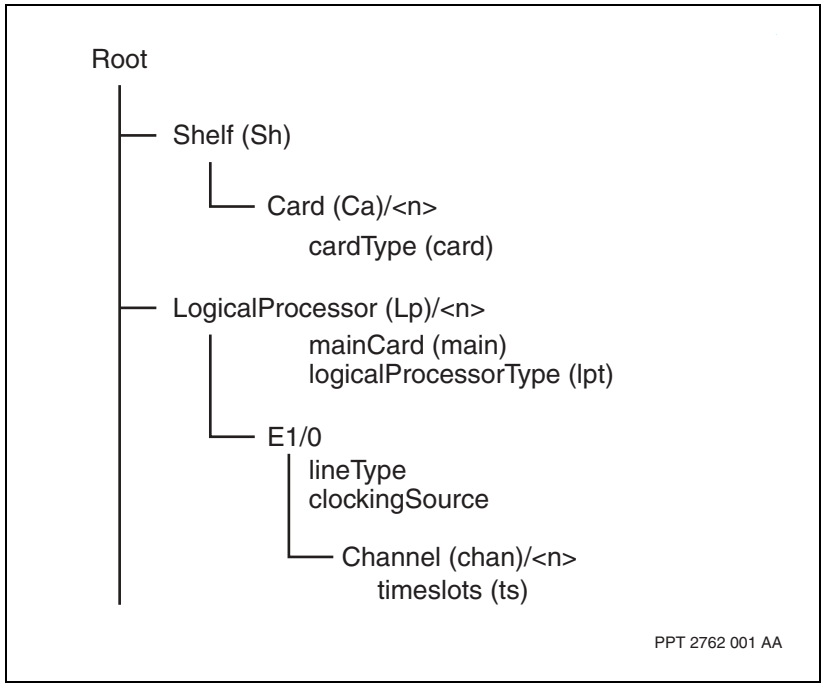
12 Perform step 1 to step 11 on the remote end node configured with DCME software.

Variable definitions

Variable	Definition
<card_number>	The slot number of the FP.
<FP>	1pE1Mvpe The DCME voice service supports up to 14 E1 MVP-E FPs.
<lp_number>	The instance number of the LP. The DCME voice service supports up to 14 LPs (lp/1 up to lp/14). You must reserve lp/0 for the control processor (CP), which you link to the *Shelf Card/0* component instance. You can link Lp/15 to a spare CP or, for example, a trunking FP.
<signaling_channel>	The channel you assign to carry signaling information. Timeslot 16 on an E1 link carries signaling information. Typically, you assign timeslot 16 to channel 16, as most PBXs define channels 1 to 15 and 17 to 31 to carry traffic.
<timeslot_number>	The timeslot number.

Procedure job aid

Figure 3
Shelf and LogicalProcessor component hierarchy



Configuring the DCME component

Add a DCME component and review its default settings to ensure they meet your requirements.

Procedure steps

1. Add a *Dcme* component.

   `add Dcme/<dcme_number>`

2. Display the default settings of the *Dcme* component's provisionable attributes.

   `display -p Dcme/<dcme_number>`

3. Review the default settings to ensure they meet your requirements, and change them if necessary.

4. Perform a semantic check of your provisioning.

   `check prov`

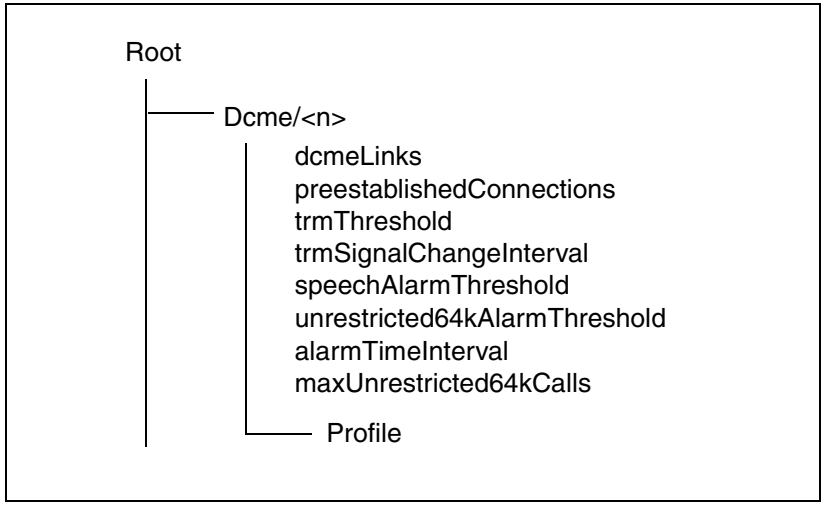
5. Perform step 1 to step 3 on the remote end node.

Variable definitions

Variable	Definition
<dcme_number>	The instance number of the Dcme component. You can provision up to 14 *Dcme* components: Dcme/1 to Dcme/14.

Procedure job aid

Figure 4
Dcme component hierarchy



Configuring the DcmeLink component

Add DcmeLink components and configure them for your network.

Prerequisites

- When provisioning the remoteDNA attribute, keep in mind that for call setup, the DCME voice service gives higher priority to numerically higher DNAs. That is, DNAs have a master (higher DNA number) and slave (lower DNA number) relationship.

Procedure steps

1. Add *DcmeLink* components.

   add DcmeLink/<dcmeLink_number>

2. Link the *DcmeLink* components to the *Dcme* parent component.

   set DcmeLink/<dcmeLink_number> dcme Dcme/<dcme_number>

3. Specify a data network address (DNA) for each *DcmeLink* component.

   set DcmeLink/<dcmeLink_number> Dna dataNetworkAddress <dna>

4. Specify the numbering plan indicator (NPI) of each *DcmeLink* component's DNA.

   set DcmeLink/<dcmeLink_number> Dna numberingPlanIndicator <npi>

5. Specify the DNA of the remote *DcmeLink* component to identify the *DcmeLink* component on the far end to which the DCME voice service establishes a connection.

   set DcmeLink/<dcmeLink_number> remoteDna <dna>

6. Specify the NPI of the remote *DcmeLink* component's DNA.

   set DcmeLink/<dcmeLink_number> remoteNpi <npi>

7. Specify the idle pattern that corresponds to the one generated by the connected ISC exchange to indicate that a channel is idle and allow each *DcmeLink* component to determine which channels are available for incoming calls.

   set DcmeLink/<dcmeLink_number> idlePattern <idlePattern number>

8 If the connected ISC exchange performs compander law conversion (A-to-Mu or Mu-to-A law), then you must also set the *alternateIdlePattern* attribute.

```
set DcmeLink/<dcmeLink_number> alternateIdlePattern
<alternateIdlePattern_number>
```

9 Add a *Vs* component for each channel provisioned under the *E1* component of each *Lp* component instance.

```
add DcmeLink/<dcmeLink_number> VoiceService/
<voiceService_number>
```

10 If your network requires a permanent channel to transport inter-ISC exchange call-related signaling information across the Nortel Networks Multiservice Switch subnet, set the *VoiceService* component's *vsType* attribute to permanent64kVs. (The default value of the *vsType* attribute, dynamicVs, specifies that the *Vs* component be used for processing DCME voice service calls.)

```
set DcmeLink/<dcmeLink_number> VoiceService/
<voiceService_number> vsType permanent64kVs
```

11 Link each *Vs* component instance to a channel. To simplify provisioning, associate like-numbered components.

```
set DcmeLink/<dcmeLink_number> Vs/
<voiceService_number> Framer interfaceName lp/
<lp_number> E1/0 chan/<signaling_channel>
```

12 Assign a signaling channel for each *DcmeLink* component instance.

```
set DcmeLink/<dcmeLink_number> Framer interfaceName
lp/<lp_number> E1/0 chan/<signaling_channel>
```

13 Perform a semantic check of your provisioning.

```
check prov
```

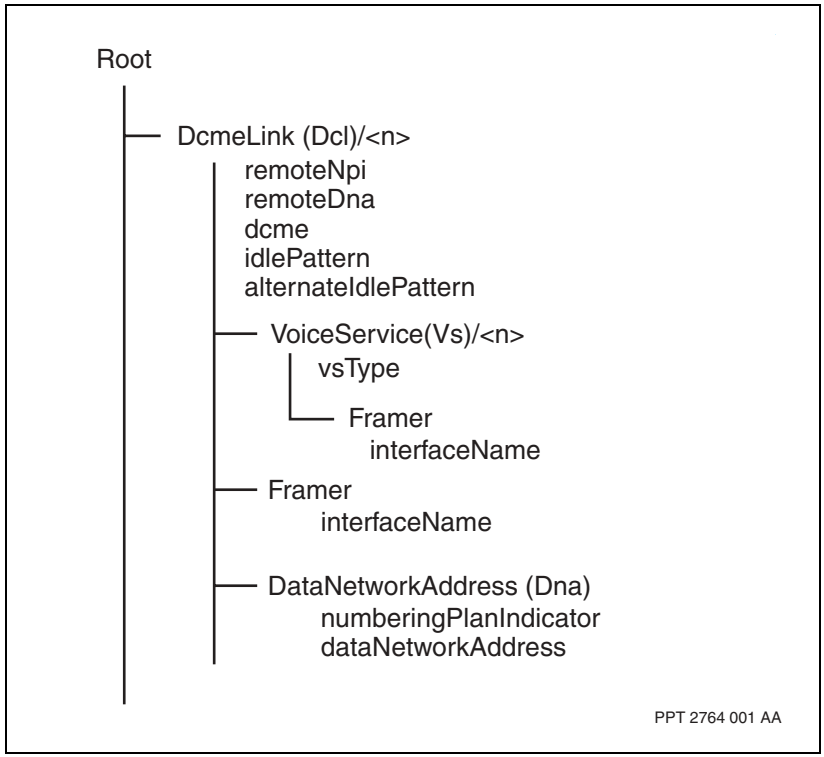
14 Perform step 1 to step 13 on the remote end node to establish the DCME voice service's connections.

Variable definitions

Variable	Definition
<alternateIdlePattern_number>	Any hexadecimal number between 00 and FF. The default value is D5 Hex. To ensure that idle pattern recognition operates properly when the connected ISC exchange performs compander law conversion, the value of the *alternateIdlePattern* attribute must be different from the one you specify for the *idlePattern* attribute.
<dcmeLink_number>	The instance number of the DcmeLink component. You can provision up to 14 *DcmeLink* components.
<dcme_number>	The instance number of the DCME parent component. You can provision up to 14 DCME parent components. However, each *DcmeLink* component can only belong to one *Dcme* component instance.
<dna>	A binary coded decimal number with a maximum length of 15 digits.
<idlePattern_number>	Any hexadecimal number between 00 and FF. The default value is D5 Hex.
<lp_number>	The instance number of the LP.
<npi>	Either e164 or x121.
<signaling_channel>	The channel you assign to carry signaling information.
<voiceService_number>	A number from 1 through 15 and 17 through 31 (use these numbers to simplify the provisioning process and associate like-numbered *VoiceService* and *Channel* component instances). You can provision up to 30 *Vs* components. Do not provision Vs/16 because channel 16 carries all signaling information for each *DcmeLink* component instance.

Procedure job aid

Figure 5
DcmeLink component hierarchy



Defining DCME path and audio encoding parameters

Define path and audio encoding parameters for all audio traffic on DCME links interfacing to the same *Dcme* parent component. The provisioning of attributes under the *Profile* component impacts how the DCME voice service encodes and then transmits audio traffic across the subnet. You define path parameters by provisioning the PORS attributes under the *Profile* component's *LogicalConnectionOptions* group. You define how the DCME voice service encodes and handles audio data by provisioning the attributes under the *Profile* component's *FramerOptions* group.

Prerequisites

- The values you specify for encoding and path attributes must be identical on both the local and remote Nortel Networks Multiservice Switch nodes. That is, for a group of *DcmeLink* components connecting to a peer group of *DcmeLink* components, you must provision each group's *Dcme Profile* component in the same way.
- The table "Profile component provisioning information and guidelines for the E1 /MVP-E FP" (page 44) contains information to assist you in setting certain *Profile* component provisionable attributes.
- For more information on configuring the PORS-related attributes under the *LogicalConnectionOptions* group, see NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System*, NN10600-420 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Trunking*, and NN10600-060 *Nortel Networks Multiservice Switch 7400/15000/20000 Component Reference*.

Procedure steps

1 Display the default settings of the attributes under the *Profile* component's *LogicalConnectionOptions* group and change attribute settings as required.

```
display -p dcme/<dcme_number> Profile
LogicalConnectionOptions
```

2 Display the default settings of the attributes under the *Profile* component's *FramerOptions* group and change attribute settings as required. The E1 MVP-E FPs support specific values for certain attributes in the *FramerOptions* group.

```
display -p dcme/<dcme_number> Profile FramerOptions
```

3 Perform step 1 and step 2 on the remote end node running the DCME voice service.

Variable definitions

Variable	Definition
<dcme_number>	The instance number of the Dcme component.

Procedure job aid

Figure 6
Profile component hierarchy

Chapter 2
DCME voice service fundamentals

See the following sections for a description of the Nortel Networks Multiservice Switch 7400 digital circuit multiplication equipment (DCME) service:

- "What is the DCME voice service?" (page 35)
- "How does the DCME voice service work?" (page 47)

"How does the DCME voice service work?" (page 47) also contains detailed information about the DCME voice service's key characteristics and features.

What is the DCME voice service?

Digital circuit multiplication equipment (DCME) is a general class of equipment that permits the concentration of a number of input trunk channels on a reduced number of transmission channels. DCME is used by international switching centers (ISC)—the high-capacity exchanges at the end of international circuits that switch calls destined to or originating from another country—to process calls. Typically, time division multiplexing (TDM) equipment provides DCME functionality. An ISC exchange can be, for example, a DMS-250 or -300.

A typical configuration involves two ISC exchanges and two TDM switches with DCME functionality. Each ISC, one at either end of a network, connects to a TDM switch. The TDM switches connect together by means of a trunk. The TDM switches facilitate the flow of calls across the network between the two ISC exchanges.

The Nortel Networks Multiservice Switch 7400 DCME voice service allows two interconnected Multiservice Switch 7400 nodes—one node at each end of a network, each node connecting to an ISC exchange—to emulate DCME. Specifically, the DCME voice service

- communicates to ISC exchanges the availability of transmission channels and bandwidth for a range of call types
- maintains a pool of pre-established logical connections (LC) to manage bursts of calls from ISCs
- reduces the bandwidth necessary to transmit pulse code modulation (PCM) encoded audio traffic by using high-compression encoding algorithms

Multiservice Switch 7400 provides DCME functionality primarily through support of ITU-T Recommendation Q.50 and through software applications on the control and function processors.

See the following sections for details of what the DCME voice service comprises:

- "DCME voice service traffic information" (page 36)
- "DCME voice service signaling" (page 39)
- "DCME voice service components" (page 41)
- "DCME voice service hardware" (page 46)

DCME voice service traffic information

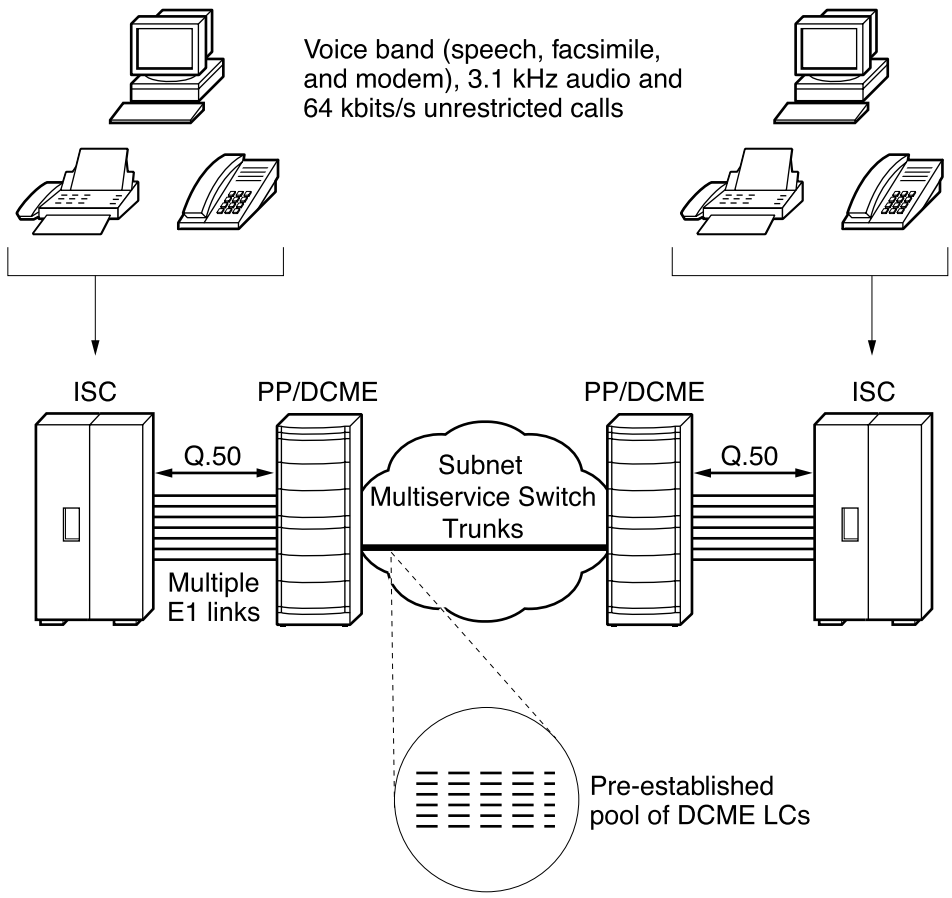
The DCME voice service supports the following call types:

- voice band, which include speech, facsimile, and modem
- 3.1 kHz audio (a type of call that allows data on a voice channel when a modem or the equivalent of a modem is used)
- 64 kbit/s unrestricted

The DCME voice service allows you, through the use of provisionable attributes, to encode and compress audio traffic before transmitting it across the subnet. (The DCME voice service sends 64 kbit/s unrestricted calls clear channel through the subnet.) Along with specifying how to encode audio

traffic, you can assign other quality of service parameters (such as different setup and discard priorities for certain types of traffic) using the path-oriented routing system (PORS). The DCME voice service also allows you to provision the amount of transmission bandwidth you want to reserve or pre-establish for DCME traffic. You can also share bandwidth on the transmission facilities with other types of traffic (for example, frame relay). The figure "Multiservice Switch 7400 DCME voice service connections and traffic types" (page 38) provides a high-level illustration of the service's basic configuration.

Figure 7
Multiservice Switch 7400 DCME voice service connections and traffic types



PP/DCME	Multiservice Switch node running DCME software
ISC	International switching centre
LCs	Logical connections
Q.50	TRM and AB-bit signaling between PP/DCME and ISC

MSS 2624 001 AA

DCME voice service signaling

The DCME voice service and ISCs communicate traffic management information and transmission bandwidth availability by means of Q.50 signaling and idle pattern recognition.

Q.50 signaling, as defined in ITU-T Q.50, includes two types of signaling: transmission resource management (TRM) signaling and AB-bit line signaling. TRM and AB-bit line signaling involve changes in the value of specific bits carried in timeslot 16 to indicate state changes. E1 interfaces use timeslot 16 to carry signaling information. AB-bit line signaling uses the first two E1 channel associated signaling (CAS) bits from individual channels, known as the A and B signal bits. TRM signaling uses three spare bits—5, 7, and 8—from frame 0 of an E1 CAS multi-frame.

Idle pattern recognition allows the DCME voice service to monitor channel activity. The E1 multipurpose voice platform enhanced echo cancellation (MVP-E) function processor (FP) provides idle pattern recognition functionality.

TRM and AB-bit line signaling and idle pattern recognition are interdependent. For example, the DCME voice service permits an ISC to seize a channel to set up a new speech call using idle pattern recognition. The ISC can seize the channel as long as the TRM signal from the DCME voice service indicates that transmission capacity is available to transmit the new call across the subnet.

See the following sections for more information about DCME voice service signaling:

- “TRM signaling” (page 40)
- “AB-bit line signaling” (page 40)
- “Idle pattern recognition” (page 40)

TRM signaling

TRM signaling between the DCME voice service and ISCs includes a series of notification signals concerning transmission capacity and load control status. Specifically, TRM signaling

- allows the DCME voice service to communicate to ISCs the availability of transmission channels or bandwidth, or both, for voice band (speech, facsimile, and modem), 3.1 kHz audio and 64 kbit/s unrestricted calls. If no transmission bandwidth or channels are available, the DCME voice service alerts the ISCs. ISCs can then reroute traffic through an alternate transmission facility.
- allows ISCs to communicate their traffic load status to the DCME voice service

The DCME voice service and ISCs also send maintenance signals using the same spare bits—5,7, and 8—that TRM signaling uses. For more information on maintenance signals, see “Maintaining the DCME voice service” (page 62).

AB-bit line signaling

AB-bit line signaling allows the DCME voice service to exchange call setup request and release information with ISCs and to monitor the status of its connections to ISCs. Specifically, AB-bit line signaling

- allows the DCME voice service to acknowledge and process 3.1 kHz audio and 64 kbit/s unrestricted call requests from ISCs on an on-demand basis
- allows the DCME voice service to communicate to ISCs its current status and channel availability information

Idle pattern recognition

Idle pattern recognition applies only to voice band (speech, modem, and facsimile) calls. Idle pattern frames indicate that a channel is inactive and available for a new call. Idle pattern recognition allows the DCME voice service to dynamically detect channel activity for new voice band calls by recognizing the removal of the idle pattern when an ISC seizes an idle channel. The idle pattern recognition feature is provisionable which allows the DCME voice service to connect with a variety of ISCs.

DCME voice service components

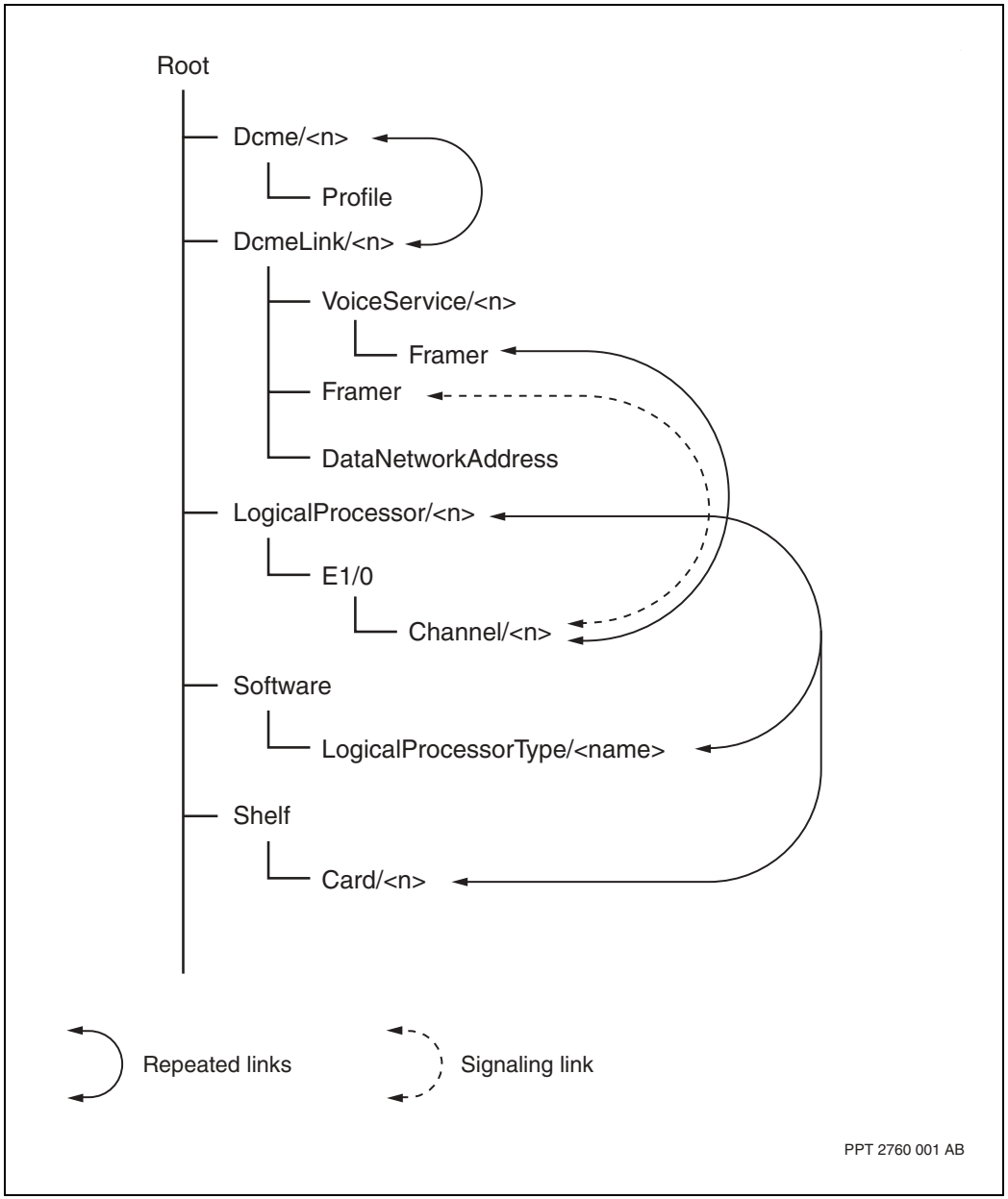
You configure the DCME voice service's connections by defining and grouping together DCME links (*DcmeLink* components) under a *Dcme* parent component. The *Dcme* parent component handles all transmission resource management (TRM) signaling and logical connection parameters for the 1 to 14 *DcmeLink* components it controls. Each DCME link represents an FP and LP pair connected to an ISC exchange by means of an E1 interface. Each E1 interface consists of 30, 64 kbit/s channels carrying PCM-encoded audio traffic. You can provision multiple *Dcme* component instances—up to a total of 14—and associate groups of DCME links under specific instances. The provisioning of multiple *Dcme* components, and the association of groups of DCME links under each instance, allows you to configure the DCME voice service differently for each customer.

Note: The *Profile* component also resides under the *Dcme* parent component. For information on how to provision the *Profile* component, see "DCME path and audio encoding parameters" (page 43).

Note: The *dcmeLinks* attribute remains blank until you create *DcmeLink* components and link them to the *Dcme* component.

The figure "DCME and DCME voice service-related provisionable components" (page 42) illustrates the relationship between DCME and DCME voice service-related provisionable components. The solid-line arrows indicate repeated links between components. The dotted-line arrows indicate the signaling channel link, for channel and timeslot pair number 16, on an E1 port.

Figure 8
DCME and DCME voice service-related provisionable components



Recommended DCME component settings

- Ensure that the values for the *preestablishedConnections* and *trmThreshold* attributes are adequate enough to handle the typical burst of calls received from an ISC to one DCME link.
- To avoid overloading the ISC exchange, provision the *trmSignalChangeInterval* attribute with a value that allows enough time between TRM signal changes—from congestion (no bandwidth available) to congestion cleared (normal service available). The possible values are between 10 and 300 seconds.
- Ensure that a relationship exists between the *alarmTimeInterval* attribute and the *speechAlarmThreshold*, *audio3kHzAlarmThreshold* and *unrestricted64kAlarmThreshold* attributes.

  The three alarm threshold attributes allow you to set the maximum number (from 0 to 1000) of failed voice band (speech, modem, and facsimile), 3.1kHz audio, and 64 kbit/s unrestricted calls, respectively, that can occur on one DCME link. The DCME voice service generates an alarm when, for a particular call type the number of failed calls exceeds the value you set under the corresponding alarm threshold attribute, and the number of failed calls occurs within the amount of time you specified under the *alarmTimeInterval* attribute. The default setting of 0 for the three alarm threshold attributes means that the DCME voice service does not monitor failed calls.

DCME path and audio encoding parameters

A DCME voice service's connection can be in one of three possible modes or states: voice (for speech calls), modem/fax (for modem or facsimile calls), or fax (for facsimile calls). The DCME voice service initially handles all audio traffic according to the value you specify under the voiceEncoding attribute. A 2100 Hz inband tone identifies modem and facsimile traffic and a switch from voice mode to modem/fax mode. A fax preamble signals a switch from modem/fax to fax mode.

In modem/fax and fax mode, the DCME voice service handles audio traffic according to the value provisioned under the modemFaxEncoding attribute. If you set the *modemFaxEncoding* attribute to faxRelayOnly, the DCME voice service handles traffic according to the maximum possible rate for fax relay encoding immediately upon detecting a 2100 Hz tone (in this case, the

DCME voice service does not support modem calls). If you set the *modemFaxEncoding* attribute to useVoiceEncoding, then the DCME voice service handles all audio traffic as speech calls (according to the value provisioned under the *voiceEncoding* attribute). However, if the *voiceEncoding* attribute contains the value g728at16 or g729at8, the DCME voice service ignores modem and facsimile calls.

All of the provisionable attributes under the *Profile* component have default settings. You can change certain default values to, for example, compress DCME audio traffic so that it consumes less bandwidth on the trunk connecting the two Nortel Networks Multiservice Switch nodes. For more guidelines, see "Profile component provisioning information and guidelines for the E1 /MVP-E FP" (page 44).

Table 1
Profile component provisioning information and guidelines for the E1 /MVP-E FP

Attribute name	Provisioning guidelines
dtmfRegeneration	When set to on, DTMF tones received from an incoming PBX are converted to a digit at the ingress node, transported across the subnet, and regenerated as the appropriate DTMF tone by the egress node. Both the ingress and egress MVP-E FPs must have the *dtmfRegeneration* attribute set to on for DTMF regeneration to be performed. The value on is the recommended setting for all voice applications that use ITU-T G.728 or G.729/ encoding. When set to off (the default setting), DTMF tones are transported transparently across the subnet. The *dtmfRegeneration* attribute only affects DTMF tones generated after voice call establishment (for example, when pressing digits to access voice mail).
faxIdleSuppressionG711-G726	To support the suppression of idle periods during facsimile transmissions and conserve bandwidth, set the *faxIdleSuppressionG711G726* attribute to on. The *modemFaxEncoding* attribute must also be set to g711G726 for fax idle suppression to operate.
insertedOutputDelay	To avoid cell loss, set the *insertedOutputDelay* attribute higher if high cell delay variations occur in your network.
(Sheet 1 of 3)	

Table 1 (continued)
Profile component provisioning information and guidelines for the E1 /MVP-E FP

Attribute name	Provisioning guidelines
modemFaxEncoding	For the modem/fax encoding values g711G726 and faxRelayG711G726, the E1 MVP-E FPs support the following rates: 32 and 64 kbit/s. When you set the *modemFaxEncoding* attribute to faxRelayOnly, the DCME voice service uses the maximum possible fax relay rate, according to the algorithm negotiated by the fax machines, and does not support modem calls. The actual rate used for a given call depends on line quality and the rates supported by the sending fax machine. When you set the *modemFaxEncoding* attribute to useVoiceEncoding, the DCME voice service handles all audio traffic as voice traffic. That is, according to the value provisioned under the *voiceEncoding* attribute. For faxRelayG711G726 encoding, the actual rate used depends on the state or mode of the call. Upon detecting a fax preamble, the DCME voice service uses the maximum possible fax relay rate. If you set the *modemFaxEncoding* attribute to either faxRelayOnly or useVoiceEncoding, then the values provisioned under the *minModemFaxG711G726Rate* and *maxModemFaxG711G726Rate* attributes do not apply. To enable dynamic up- and down-speeding of modem/fax and fax traffic, you set the *modemFaxEncoding* attribute to g711G726 and the *minModemFaxG711G726Rate* attribute to 32 and the *maxModemFaxG711G726Rate* attribute to 64 (the default value).
modemFaxSpeechDiscrim	You set the *modemFaxSpeechDiscrim* attribute to allows the DCME voice service to differentiate between voice and modem/fax traffic. When set to on, the *modemFaxSpeechDiscrim* attribute allows the DCME voice service to recover from a switch to a modem/fax encoding algorithm from a voice encoding algorithm. If *modemFaxSpeechDiscrim* is set to off, a 2100 Hz tone from a facsimile machine in the background of a voice conversation can trigger the switching of encoding algorithms.
(Sheet 2 of 3)	

Table 1 (continued)
Profile component provisioning information and guidelines for the E1 /MVP-E FP

Attribute name	Provisioning guidelines
silenceSuppression	To set the level of background or comfort noise generated at the egress node when silence suppression is operational, adjust the value provisioned under the *comfortNoiseCap* attribute. The default value -40 dBm0 is the maximum available level of comfort noise.
speechHangoverTime	To prevent clipping, you set the *speechHangoverTime* attribute to specify the amount of time that must elapse after the end of a speech burst before applying silence suppression. The *silenceSuppression* attribute must be set to on for the setting of the *speechHangoverTime* attribute to take effect.
v17EncodedAsG711G726	The default value no specifies that fax relay supports calls from V.17 fax machines. The DCME voice service instructs V.17 fax machines to down-speed from 14.4 kbit/s to 9.6 kbit/s.
voiceEncoding	To enable dynamic up- and down-speeding of voice traffic, you set the *voiceEncoding* attribute to g711G726 and the *minVoiceG711G726Rate* attribute to 24 or 32 and the *maxVoiceG711G726Rate* attribute to 32 (if the *minVoiceG711G726Rate* attribute is set to 24) or 64 (the default value).
(Sheet 3 of 3)	

DCME voice service hardware

The software applications that comprise the DCME voice service operate on the one-port E1 MVP-E FPs and on the control processor (CP). Each ISC's E1 link interfaces to an E1 MVP-E FP by means of E1 CAS. The DCME voice service supports up to 14 E1 connections. Each E1 link consists of 30, 64 kbit/s channels (plus one channel for signaling). Each E1 link constitutes one ISC input trunk. (For more information on the E1 MVP-E FPs, see NN10600-170 *Nortel Networks Multiservice Switch 7400 Hardware Description*.)

How does the DCME voice service work?

The DCME voice service establishes voice band (speech, modem, and facsimile), 3.1 kHz audio and 64 kbit/s unrestricted calls between ISCs. The DCME voice service establishes calls over a Nortel Networks Multiservice Switch network containing path-oriented routing system (PORS) logical connections (LCs).

See the following sections for more information on how the DCME voice service operates:

- "Incoming call processing" (page 47)
- "Determination of transmission bandwidth and channel availability for incoming calls" (page 50)
- "Call routing" (page 56)
- "Audio traffic encoding and handling" (page 56)

Incoming call processing

The DCME voice service processes an incoming call from an ISC according to its call type—voice band (speech, modem, or facsimile), 3.1 kHz audio or 64 kbit/s unrestricted. Incoming 3.1 kHz audio and 64 kbit/s unrestricted calls require AB-bit line signaling to request a connection, while an incoming voice band call does not. The table "AB-bit line signaling values and descriptions" (page 48) contains the valid and invalid AB-bit line signaling combinations used by the DCME voice service and ISCs, and descriptions of each combination. The AB-bit line signaling values determine whether an incoming call gets set up successfully. AB-bit line signaling values and descriptions are also important when you monitor the DCME voice service. For more information on monitoring the DCME voice service, see "Monitoring and maintaining the DCME voice service" (page 57).

See the following sections for more information on how the DCME voice service processes calls:

- "Successful call setup" (page 48)
- "Unsuccessful call setup" (page 49)

Table 2
AB-bit line signaling values and descriptions

From ISC to DCME		From DCME to ISC	
AB bit values	**Description of signal**	**AB bit values**	**Description of signal**
00	Invalid	00	Invalid
01	Normal service available	01	Normal service available
10	3.1 kHz request	10	Special service acknowledge
11	64 kbit/s call request	11	Channel out of service/ unavailable

Successful call setup

For a voice band call to be successfully processed, the ISC and DCME voice service must be transmitting the normal service available signal (AB = 01) on the particular channel. While the ISC and DCME voice service transmit the normal service available signal, the ISC seizes the idle channel to process the call. The DCME voice service dynamically detects the new call by recognizing the removal of the idle pattern on that channel.

To successfully process 3.1 kHz audio and 64 kbit/s unrestricted calls, the ISC requires that the DCME voice service

- transmit the normal service available signal (AB = 01)
- recognize, for each call type, the incoming call request signal (AB = 10 and AB = 11, respectively)
- acknowledge the call request signal (AB =10)

The table “AB-bit line signaling for successful call setup” (page 49) summarizes for each call type the signaling sequence between the DCME voice service and the ISC for successful call setup.

Table 3
AB-bit line signaling for successful call setup

Call type	AB-bit signaling sequence and direction			Comments
	(1) From DCME to ISC	(2) From ISC to DCME	(3) From DCME to ISC	
Voice band (speech, modem, or facsimile)	AB = 01	AB = 01	AB = 01	When the voice band call terminates, the ISC sends its idle pattern sequence.
3.1 kHz audio	AB = 01	AB = 10	AB = 10	When the 3.1 kHz connection terminates, AB-bit line signaling between the ISC and DCME voice service reverts to normal service available.
64 kbit/s unrestricted	AB = 01	AB = 11	AB = 10	When the 64 kbit/s call terminates, AB-bit line signaling between the ISC and DCME voice service reverts to normal service available.

Unsuccessful call setup

For all call types, unsuccessful call setup results from a lack of transmission bandwidth, indicated by a particular AB-bit line signal and a specific TRM signal. (For details on TRM signaling, see “Determination of transmission bandwidth and channel availability for incoming calls” (page 50).) For a voice band call, unsuccessful call setup results from a channel out of service AB-bit line signal (AB = 11) being sent from the DCME to the ISC. For both 3.1 kHz audio and 64 kbit/s unrestricted calls, unsuccessful call setup results in the DCME responding to each call type’s call request signal (AB = 10 and AB = 11, respectively) with a normal service available signal (AB = 01), ignoring the call setup requests. The table “AB-bit line signaling for unsuccessful call setup” (page 50) summarizes for each call type the signaling sequence between the DCME voice service and ISCs for unsuccessful call setup.

Table 4
AB-bit line signaling for unsuccessful call setup

Call type	AB-bit signaling sequence and direction			Comments
	(1) From DCME to ISC	(2) From ISC to DCME	(3) From DCME to ISC	
Voice band (speech, modem, or facsimile)	AB = 01	AB = 01	AB = 11	The ISC waits for the DCME voice service to send the normal service available signal.
3.1 kHz audio	AB = 01	AB = 10	AB = 01	There is no acknowledgment by the DCME voice service of the 3.1 kHz call request from the ISC.
64 kbit/s unrestricted	AB = 01	AB = 11	AB = 01	There is no acknowledgment by the DCME voice service of the 64 kbit/s unrestricted call request from the ISC. As a result, the DCME voice service transmits a TRM signal.

Determination of transmission bandwidth and channel availability for incoming calls

The DCME voice service manages transmission bandwidth and channel availability by means of TRM signaling. TRM signaling allows the DCME voice service to notify ISCs in advance about congestion or a lack of transmission resources. TRM signaling prevents ISCs from seizing an idle channel to set up a call when the DCME voice service has no transmission resources available to process the call.

Note: TRM signaling does not provide advanced notification to ISCs of the unavailability of transmission bandwidth for 64 kbit/s unrestricted calls. The TRM signal sent from the DCME voice service to ISCs indicates only that new 64 kbit/s call requests cannot be established. The DCME voice service must first fail to process a call setup request for a 64 kbit/s call before it sends the TRM signal.

The table “TRM signaling values and descriptions” (page 52) contains the valid and invalid TRM signals sent by the DCME voice service and ISCs, including the actual bit values and signal descriptions. See “Maintaining the DCME voice service” (page 62) for information on the TRM signals sent by the DCME voice service and ISC during maintenance procedures. TRM signaling values and descriptions are also important when you monitor the DCME voice service. For more information on monitoring the DCME voice service, see “Monitoring and maintaining the DCME voice service” (page 57).

See the following sections for more information on how the DCME voice service determines transmission bandwidth and channel availability:

- “Pool of pre-established logical connections” (page 52)
- “Pool management” (page 53)
- “Call and logical processor handling during a control processor switchover” (page 55)

Table 5
TRM signaling values and descriptions

TRM signals from DCME to ISC		
TRM signal (bits 5, 7, 8)	**Signal description**	**Comments**
011	No channel(s) available for 3.1 kHz	The DCME voice service never uses this signal. This signal exists for backwards compatibility reasons only. The DCME voice service uses the no capacity available (111) TRM signal.
100	Dcme normal	Transmission resources are available.
101	No 64 kbit/s capacity	The DCME voice service transmits this signal when it can no longer handle new 64 kbit/s unrestricted call requests.
111	No capacity available	No trunk(s) or transmission channels available for all call types.
TRM signals from ISC to DCME		
TRM signal (bits 5, 7, 8)	**Signal description**	**Comments**
101	Switching center normal	The ISC's traffic load status is normal.
001, 010, 011, 100	Invalid	The DCME voice service considers these TRM signals to be invalid.

Pool of pre-established logical connections

For transmission purposes and to help minimize delay for establishing voice band calls, the DCME voice service maintains a pool of pre-established PORS logical connections (LC).

Note 1: The DCME voice service also uses LCs from the pre-established pool to transmit 3.1 kHz audio calls. The DCME voice service only recognizes 3.1 kHz audio calls as being different from voice band calls during call setup signaling.

Note 2: When you activate the DCME voice service, one logical connection (LC) comes up automatically. The DCME voice service uses this LC for control signals between the two Nortel Networks Multiservice Switch nodes.

As long as transmission bandwidth is available (represented by the Dcme normal signal, TRM = 100), the DCME voice service sends voice band and 3.1 kHz audio calls across the subnet by using LCs from the pre-established pool. (The DCME voice service dynamically establishes other LCs to process 64 kbit/s unrestricted call requests.) The pre-established LCs reserve bandwidth for the DCME voice service's connection-oriented traffic. The number of pre-established LCs in the pool is provisionable by setting the preestablishedConnections attribute. The number you specify for pre-established LCs applies to all DCME links. The number you choose depends on the nature of traffic in your network—the number of calls in a typical burst from an ISC—and the quality of service you want to provide. The sum of the pre-established LCs equals the total transmission bandwidth reserved for DCME voice service traffic.

Pool management

The DCME voice service constantly works to maintain the number of pre-established LCs you specify. When a new call uses a pre-established LC, the DCME link immediately attempts to establish another LC to replenish the pool. When a DCME link cannot obtain the necessary bandwidth to replenish its pool, another DCME link can release one of its pre-established LCs (not currently being used by a call), allowing for a sharing of transmission bandwidth among the DCME links. When a call clears, the DCME voice service releases the LC and makes it available to other DCME links.

You also provision, using the trmThreshold attribute, a threshold for the number of LCs in the pool below which the DCME voice service transmits the no capacity available TRM signal (TRM = 111). A DCME link can approach its threshold number as new calls continue to come in from the ISC when

- a DCME link is unable to replenish its pool of pre-established LCs (for example, when traffic is heavy or congested in the subnet)

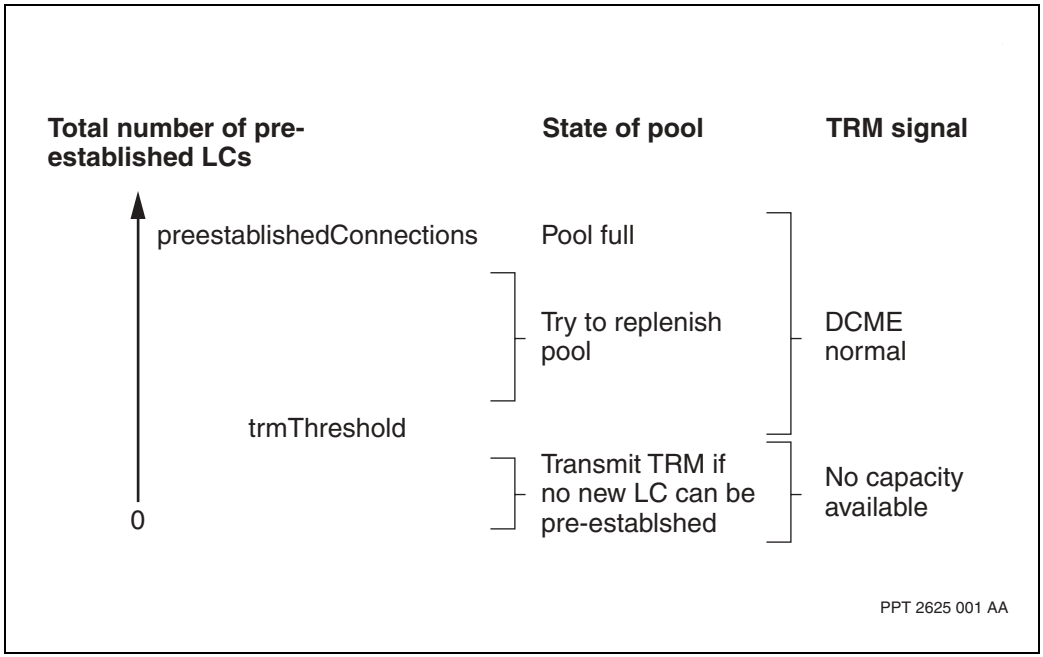
- other DCME links cannot release any of their LCs. A DCME link can only release a pre-established LC to another DCME link if the number of remaining LCs in its pool is one more than the value specified under the trmThreshold attribute.

The figure "DCME pool management" (page 55) illustrates the relationship between the preestablishedConnections and trmThreshold attributes.

As long as the number of pre-established LCs in a DCME link's pool is equal to or greater than the threshold number, the DCME voice service continues to transmit the Dcme normal TRM signal. When the number of pre-established LCs for a given DCME link falls below the threshold number, and the other DCME links cannot release one of their LCs without dropping below the trmThreshold level, the DCME voice service immediately issues a no capacity available TRM signal (TRM = 111) to the ISC. The ISC attempts to reroute traffic through alternate facilities, allowing the DCME voice service time for the DCME link to restore the number of pre-established LCs in its pool to an acceptable level. (The number halfway between the values provisioned under the preestablishedConnections and trmThreshold attributes determines what the acceptable level is.) Once the DCME link's number of pre-established LCs returns to an acceptable level, the DCME voice service transmits the Dcme normal TRM signal to the ISC.

Note: You can set the amount of time between consecutive TRM signal changes sent to an ISC. The amount of time you specify applies to the change from either the no capacity available or no 64 kbit/s capacity to Dcme normal TRM signals. To avoid overloading the ISC's circuits, make sure signal changes do not happen more than once every 10-20 seconds. You can set the time from 10 seconds up to five minutes.

Figure 9
DCME pool management



Call and logical processor handling during a control processor switchover

A control processor (CP) switchover (a switchover happens when a main processor fails and the standby or spare processor initializes and takes over) does not disrupt the DCME voice service's existing established calls. However, the DCME voice service cannot allocate new LCs while a CP switchover is in progress. As well, it is possible for calls that are in the call setup phase not to get established when a CP switchover occurs.

Upon detecting a CP switchover, each DCME link transmits to ISCs a channel out of service/unavailable (AB = 11) signal on all idle channels and does not accept new calls. Channels carrying calls during a CP switchover will also transmit a channel out of service/unavailable signal when the calls terminate. Upon completion of a CP switchover, the DCME links transmit AB-bit line signals on all their channels according to the state the channels were in prior to the CP switchover.

Call routing

The DCME voice service routes calls from a local DCME link to a remote DCME link over logical connections (LC) using data network addresses (DNA). DNAs are provisionable and uniquely identify each DCME link. DNAs share a master and slave relationship which helps to reduce the possibility of PORS glare or call collision from occurring. (Call collision happens when two DCME links try simultaneously to seize the same logical connection.) To prevent two DCME links from seizing the same logical connection, calls on the DCME link with the numerically higher DNA are set up first.

Audio traffic encoding and handling

By setting the values of the Profile component's provisionable attributes, you define the encoding and path parameters of the DCME voice service's audio traffic prior to transmitting it across the subnet. The E1 MVP-E FPs support voice encoding algorithms with compression rates of 16 and 8 kbit/s. The E1 MVP-E FPs also support a fax modulation and demodulation feature known as fax relay. The E1 MVP-E FPs support echo cancellation, which the DCME voice service applies to voice band calls. To help with network loss planning, you can apply a gain or a loss—in 1 dB increments—to audio signals when they enter or leave the network, or both.

The PORS-based LCs between DCME links handle the DCME voice service's audio traffic. When you use the Profile component's provisionable attributes, you can define, for example, the setup and emission priorities for DCME audio traffic. (See the NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System* and NN10600-420 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Trunking* for more information on configuring PORS in your network.)

Chapter 3
Monitoring and maintaining the DCME voice service

See the following sections for information on how to monitor and maintain the DCME voice service:

- "Monitoring the DCME voice service" (page 57)
- "Maintaining the DCME voice service" (page 62)

Use the information in this section to optimize the capabilities of the DCME voice service.

Monitoring the DCME voice service

You can monitor the performance of the DCME voice service by viewing its operational data. Operational data can include the following:

- the status and location of certain components
- statistical information, such as the number of failed calls
- real-time performance information, such as the current voice encoding rate being used by a particular call

You can use the information in the DCME voice service's operational data to isolate problems or evaluate performance. For an illustration of how to analyze DCME voice service operational data, see "Example of a DCME voice service operational scenario" (page 61). For information on DCME voice service problems, see "Troubleshooting the DCME voice service" (page 67).

The following sections contain information on how to monitor the DCME voice service:

- "DCME voice service operational and statistical attributes" (page 58)
- "Viewing DCME voice service operational data" (page 60)
- "Example of a DCME voice service operational scenario" (page 61)

DCME voice service operational and statistical attributes

The following figures describe the operational and statistical attributes of the DCME voice service's components:

- "Dcme component operational and statistical attributes" (page 58)
- "DcmeLink component operational and statistical attributes" (page 59)
- "VoiceService component operational and statistical attributes" (page 60)

Figure 10
Dcme component operational and statistical attributes

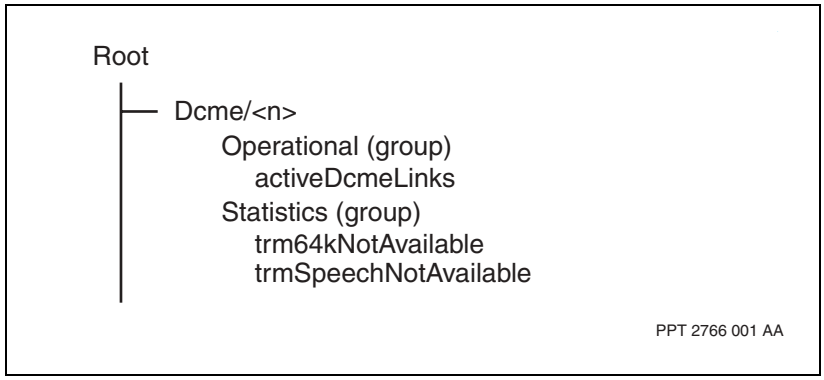


Figure 11
DcmeLink component operational and statistical attributes

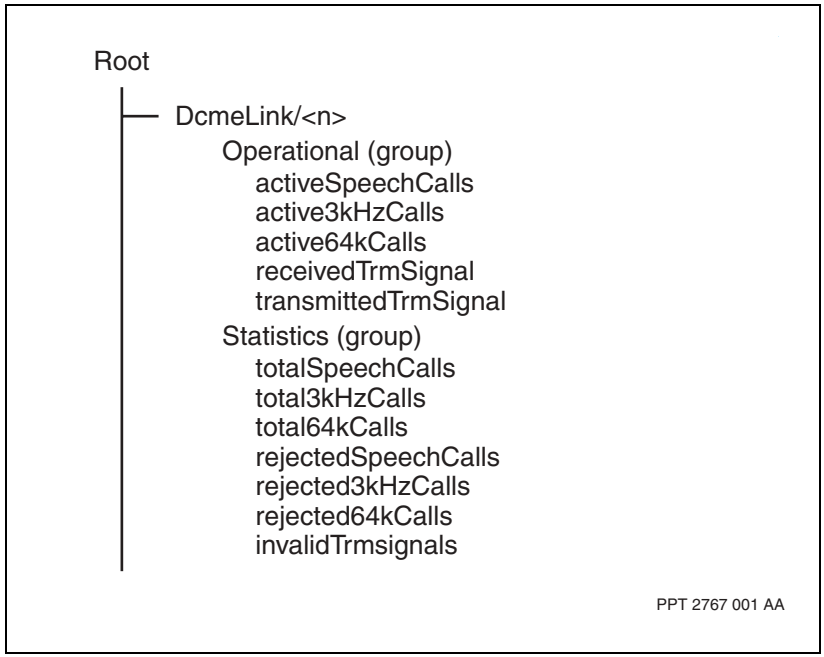
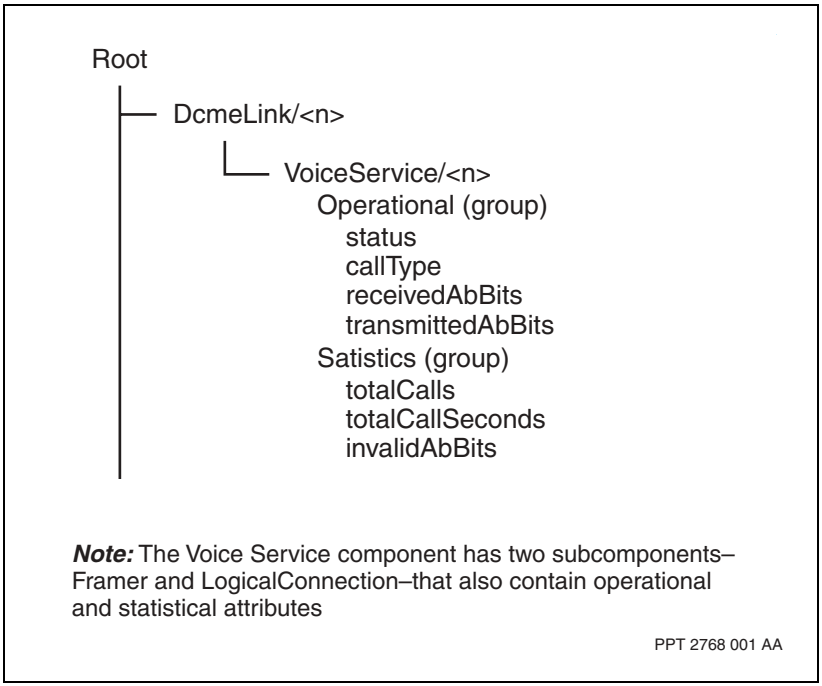


Figure 12
VoiceService component operational and statistical attributes



Viewing DCME voice service operational data

To view the DCME voice service's operational data, you use two basic Nortel Networks Multiservice Switch commands: list and display. (For more information on node commands, see NN10600-050 *Nortel Networks Multiservice Switch 7400/15000/20000 Command Reference*.) The following are examples of how to view specific DCME operational data (the examples assume you are in operational mode).

Example 1

To view all instances of the Dcme component on your node, enter the following command:

```
list Dcme/*
```

Example 2

To view all instances of the *DcmeLink* component on your node, enter the following command:

```
list DcmeLink/*
```

Example 3

To display all of the statistical and operational attributes for a particular instance of a *DcmeLink* component, enter the following command:

```
display DcmeLink/<n>
```

In this example, if you want to know how many failed speech calls DcmeLink/<n> recorded, look for the number indicated by the *rejectedSpeechCalls* operational attribute under the *Statistics* group.

Example 4

To determine which channels are currently processing calls, enter the following command:

```
display DcmeLink/<n> Vs/*
```

In this example, the *status* operational attribute indicates whether a channel is currently processing a call—the value shown is seized—or is currently inactive—the value shown is idle.

Example 5

To display the real-time encoding algorithm being used to compress audio traffic on a particular channel, enter the following command:

```
display DcmeLink/<n> Vs/<n> Framer
```

In this example, the operational attribute *currentEncoding* indicates the specific encoding algorithm currently being used.

Example of a DCME voice service operational scenario

The DCME voice service receives both TRM and AB-bit line signals from an ISC. The DCME voice service recognizes the values of specific TRM and AB bit combinations as being either valid or invalid. The DCME voice service considers invalid bit combinations to be Q.50 signaling protocol errors. Protocol errors do not disrupt the DCME voice service. Rather, the *invalidTrmSignals* and *invalidAbBits* operational attributes under each *DcmeLink* component increments each time the DCME voice service receives invalid TRM and AB-bit line signals from an ISC.

Maintaining the DCME voice service

All networks and software applications require regular, scheduled maintenance. You can shut down the DCME voice service to perform maintenance tasks with minimal disruptions to both currently running and incoming calls. The DCME voice service allows you to shut down each *Dcme* parent component (including shutting down all *DcmeLink* components it controls) or each *DcmeLink* component. You can perform maintenance tasks on the local or remote Nortel Networks Multiservice Switch node running the DCME voice service, or both.

See the following sections for information on how to prepare DCME voice service for maintenance procedures:

- "Entering maintenance mode" (page 63)
- "Exiting maintenance mode" (page 65)

Note: To perform maintenance procedures on the DCME voice service, you must be familiar with how to lock and unlock components. You must also be able to verify the valid Open Systems Interconnection (OSI) operational states for the *Dcme*, *DcmeLink*, and *DcmeLink VoiceService* (*Vs*) components. For more information on the DCME voice service's OSI states, see "DCME voice service OSI states" (page 68).

The table "Maintenance-related TRM signaling values and descriptions" (page 63) contains the TRM signals sent by the DCME voice service and the ISC before entering and during maintenance mode.

Table 6
Maintenance-related TRM signaling values and descriptions

Maintenance-related TRM signals from DCME to ISC		
TRM signal (bits 5, 7, 8)	**Signal description**	**Comments**
110	Maintenance release request	Signal sent when DCME voice service enters maintenance mode.
Maintenance-related TRM signals from ISC to DCME		
TRM signal (bits 5, 7, 8)	**Signal description**	**Comments**
110	Maintenance release ack	ISC acknowledges maintenance release request from DCME voice service.
111	DCME clear of traffic	Signal sent by ISC to DCME (after acknowledgment of maintenance release request) which indicates that all circuits are clear of traffic.
001, 010, 011, 100	Invalid	The DCME voice service considers these TRM signal bits sent from an ISC to be invalid.

Entering maintenance mode

You enter maintenance mode by locking a *Dcme* component or individual *DcmeLink* components on the local or remote DCME voice service, or both. The locking of a component does not disrupt any currently running calls. However, no new calls can be established. The locking of a component is not complete until all calls currently in progress run to completion.

To lock a *Dcme* component, issue the following command:

```
lock Dcme/<n>
```

To lock a *DcmeLink* component, issue the following command:

```
lock DcmeLink/<n>
```

where:
<n> represents the instance number—1 to 14—of each component

When you lock a *Dcme* component, the DCME voice service sends a maintenance release request (110) TRM signal to ISCs on all DCME links associated with this particular *Dcme* component. If you lock individual *DcmeLink* components, the DCME voice service sends a maintenance release request (110) TRM signal to ISCs only on each DCME link you lock. Before you proceed with maintenance tasks, you must wait for the following to occur:

1 The ISCs send a maintenance release ack (110) TRM signal which indicates acknowledgment and acceptance of the DCME voice service's maintenance release request (110) TRM signal. While the ISCs and DCME voice service send and acknowledge maintenance-related TRM signals, it is possible for calls received from a remote DCME link to be processed.

2 The DCME voice service sends a channel out of service/unavailable (11) AB-bit signal on channels with no currently running calls indicating that no new calls can be established. That is, no new calls can be established on those channels associated with the DCME link(s) you are locking.

Note: It is preferable to lock DCME voice service components—that is, enter maintenance mode—on both the local and remote nodes. The locking of components on both the remote and local nodes transmits maintenance release request signals, which are service status signals, to the connected ISCs and prevents the transmission of the channel out of service signal, which indicates channel failure.

3 All currently running calls run to completion.

4 The ISC sends a Dcme clear of traffic (111) TRM signal which indicates that all channels are idle.

5 There is an on-screen notification, by means of an alarm, of the completion of the lock command. You can check the status of a locked component at any time using the display command.

If the network is busy when you attempt to lock the local DCME voice service's component(s), the remote DCME voice service does not always receive notification of the maintenance request. If the remote *Dcme* component does not receive notification, the possibility of failing new calls and generating TRM signals on the remote DCME voice service arises.

If a CP switchover occurs after the DCME voice service transmits a maintenance release request (110) TRM signal, the maintenance release request signal is lost. The DCME voice service reacts to a CP switchover as if the entire Nortel Networks Multiservice Switch shelf rebooted. The DCME voice service reverts to operational mode and transmits the Dcme normal (100) TRM signal. Also, if you reset an E1 MVP-E FP, the DCME voice service's components come up in unlocked state.

Exiting maintenance mode

You exit maintenance mode and return the DCME voice service to operational mode by unlocking the *Dcme* or individual *DcmeLink* component(s) that you locked. As the DCME voice service comes back up, transmission bandwidth is once again reserved, the remote *DcmeLink* components mark the channels as idle, and the local *DcmeLink* components notify the ISC that the DCME voice service is back to normal.

To unlock a *Dcme* component, issue the following command:

```
unlock Dcme/<n>
```

To unlock a *DcmeLink* component, issue the following command:

```
unlock DcmeLink/<n>
```

where:
<n> represents the instance number—1 to 14—of each component

When you unlock a component, the following occurs:

1 The DCME voice service attempts to replenish the pool of pre-established LCs according to the value specified under the Dcme component's *preestablishedConnections* attribute.

2 Once the DCME voice service replenishes the pool up to the value specified under the *trmThreshold* attribute, the local and remote *DcmeLink* components (if you locked components on both the local and remote nodes) send the Dcme normal (100) TRM signal on all channels.

3 There is an on-screen notification, by means of an alarm, of the completion of the unlock command.

Chapter 4
Troubleshooting the DCME voice service

See “Getting DCME voice service troubleshooting information” (page 67) for information on how to troubleshoot DCME voice service problems.

Getting DCME voice service troubleshooting information

The following information can help you to identify and isolate DCME voice service problems:

- “DCME voice service alarm data” (page 67)
- “DCME voice service OSI states” (page 68)

DCME voice service alarm data

The DCME voice service has three alarms. These alarms indicate when the number of failed or rejected voice band (speech, modem, and facsimile), 3.1 kHz audio, and 64 kbit/s unrestricted calls exceeds the number or threshold you provisioned (*speechAlarmThreshold*, *audio3kHzAlarmThreshold*, and *unrestricted64kAlarmThreshold* attributes, respectively). You also provision the interval of time (*alarmTimeInterval* attribute) within which the number of rejected calls must be exceeded in order to generate one of these alarms.

The number of each alarm and the type of call each applies to is as follows:

- 7057 0001 applies to rejected speech calls
- 7057 0002 applies to rejected 3.1 kHz audio calls
- 7057 0003 applies to rejected 64 kbit/s unrestricted calls

The text of each alarm contains the reason for the alarm and possible remedial actions you can take to solve the problem. In general, failed calls result from a lack of transmission resources or congestion in the subnet, or both. Once congestion clears or the pool of pre-established DCME LCs replenishes itself, the alarm clears. If the alarm persists, the value you specified under the *preestablishedConnections* attribute is not adequate enough to process the number of calls received from the ISC.

For all three call types, you can configure the DCME voice service to not monitor failed calls and, therefore, to not generate these failed call alarms. You do this by setting each call type's alarm threshold attribute and the *alarmTimeInterval* attribute to 0.

For more information about DCME voice service and Nortel Networks Multiservice Switch alarms, see NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*.

DCME voice service OSI states

The DCME voice service uses component state definitions according to the Open Systems Interconnection (OSI) standards. Each DCME voice service component has three high-level state variables, an operational state, a usage state, and an administrative state. These states are the primary factors affecting the management state of a component and are described in detail in NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*. You use the display command in operational mode to view the DCME voice service's component state information.

The following tables contain the valid OSI states for the *Dcme*, *DcmeLink*, and *DcmeLink VoiceService* components:

- "Dcme component state combination" (page 69)
- "DcmeLink component state combination" (page 70)
- "DcmeLink VoiceService (Vs) component state combination" (page 71)

Use the information in these tables to assist you in isolating DCME voice service problems.

Table 7
Dcme component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	Not applicable to the *Dcme* component.
Unlocked, Enabled, Idle	The *Dcme* component is up and running but there is no *DcmeLink* component capable of handling new calls (no *DcmeLink* component is unlocked/enabled).
Unlocked, Enabled, Active	The *Dcme* component is up and running, and has at least one *DcmeLink* component capable of handling new calls (at least one *DcmeLink* component is unlocked/enabled).
Unlocked, Enabled, Busy	Not applicable to the *Dcme* component.
Shutting Down, Enabled, Active	The *Dcme* component is being locked and is waiting for all the *DcmeLink* components to become disabled before going to the locked state.
Shutting Down, Enabled, Busy	Not applicable to the *Dcme* component.
Locked, Disabled, Idle	Not applicable to the *Dcme* component.
Locked, Enabled, Idle	The *Dcme* component is administratively prohibited from accepting any new call, and there is no call in progress on any of the *DcmeLink* components.

Table 8
DcmeLink component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *DcmeLink* component does not have any call in progress, nor can it establish new ones. This state can be due to • The *DcmeLink* component is not yet initialized. • The *Dcme* component is locked. • All channels to the ISC are disabled or unable to reach the remote *DcmeLink* component through the subnet. • The remote *DcmeLink* component is in maintenance mode.
Unlocked, Enabled, Idle	The *DcmeLink* component is capable of establishing new calls, but no call is in progress.
Unlocked, Enabled, Active	The *DcmeLink* component is capable of establishing new calls and some calls are in progress.
Unlocked, Enabled, Busy	The *DcmeLink* component has calls in progress, but either does not have any more bandwidth to establish new calls or all the channels have a call in progress.
Shutting Down, Enabled, Active	The *DcmeLink* component is in this state while you are putting it in maintenance mode and it is waiting for existing calls to complete before going to the locked state.
Shutting Down, Enabled, Busy	The *DcmeLink* component is in this state while you are putting it in maintenance mode and it is waiting for existing calls to complete before going to the locked state.
Locked, Disabled, Idle	The *DcmeLink* component is in maintenance mode. No call is in progress. The *DcmeLink* component is unable to establish a new call due to no available LC, no enabled channel to the ISC, or the *Dcme* component is locked.
Locked, Enabled, Idle	The *DcmeLink* component is in maintenance mode. No call is in progress. The *DcmeLink* component is immediately capable of establishing new calls if it is unlocked.

Table 9
DcmeLink VoiceService (Vs) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *Vs* component is unable to handle a call for its corresponding channel. This state can be due to the *Dcme* or *DcmeLink* components being locked, the *DcmeLink* component being disabled, or the corresponding channel being disabled. This state can also be due to the corresponding remote *Vs* component being disabled.
Unlocked, Enabled, Idle	The *Vs* component is capable of handling a call, but there is no call in progress.
Unlocked, Enabled, Active	Not applicable to the *Vs* component.
Unlocked, Enabled, Busy	The *Vs* component is presently handling a call. Each *Vs* component can handle only one call at a time and cannot handle additional calls.
Shutting Down, Enabled, Active	Not applicable to the *Vs* component.
Shutting Down, Enabled, Busy	Not applicable to the *Vs* component.
Locked, Disabled, Idle	The *Vs* component has been locked and is unable to handle a call for its corresponding channel.
Locked, Enabled, Idle	The *Vs* component has been locked and has not yet disabled the corresponding channel. This state is transient, since when a *Vs* component is locked, it also eventually disables the channel. (The operational state becomes disabled.)

Appendix
Compliance with standards

The Nortel Networks Multiservice Switch 7400 DCME voice service complies with certain sections of the following International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) standards:

- G.165 echo cancellation
- G.711 pulse code modulation (PCM) audio encoding at 64 kbit/s
- G.726 adaptive differential pulse code modulation (ADPCM) voice encoding at 24 and 32 kbit/s and modem/facsimile encoding at 32 kbit/s
- G.728 low delay-code excited linear prediction (LD-CELP) voice encoding at 16 kbit/s
- G.729/G.729A conjugate structured-algebraic code excited linear prediction (CS-ACELP) voice encoding at 8 kbit/s
- G.763 digital circuit multiplication equipment (DCME)
- Q.50, Annex A, June 1997 (for TRM and AB-bit line signaling) and November 1988 (for backwards compatibility support of 3.1 kHz audio connections)
- T.30, V.17, V.21, V.27, and V.29 encoding of facsimile traffic (for fax relay), with supported rates from 2.4 kbit/s up to 14.4 kbit/s
- V.34 and earlier for modem calls

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