Nortel Networks

Nortel Networks Multiservice Switch 7400

Operations: Frame Relay Managed Cut-through Switching

NN10600-440

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Publication: NN10600-440
Document status: Standard
Document version: 6.1S1
Document date: August 2004

Printed in Canada

Publication history

August 2004

6.1S1 Standard
General availability. Contains information on Nortel Networks Multiservice Switch 7400 for the PCR6.1 release.

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About this document

This guide describes managed cut-through switching (MCS).

The following topics are discussed in this section:

Who should read this document and why

This guide is for persons who perform the following tasks for MCS:

- planning
- engineering
- installing and configuring
- provisioning
- operating and maintaining
- troubleshooting

What you need to know

This guide assumes that you understand the Nortel Networks Multiservice Switch network architecture. You can learn more about the product by reading NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.

How this document is organized

The NN10600-440 *Nortel Networks Multiservice Switch 7400 Operations: Frame Relay Managed Cut Through Switching*, contains the following information:

- “MCS overview” (page 25) presents an overview of MCS and its applications
- “Frame relay services and MCS” (page 41) describes how MCS is used by frame relay services
- “MCS architecture” (page 57) describes the functional components of the MCS switched path and their provisionable attributes
- “Configuring MCS” (page 81) explains how to configure MCS and MCS switched paths
- “Engineering notes” (page 105) provides engineering information for MCS
- “Troubleshooting MCS” (page 111) provides information you can use in maintaining and troubleshooting MCS switched paths

What’s new in this document

There were no new features added to this document.

Other changes made to this document include the following item:

- 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*.

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 node 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*.

See the following documents for information related to MCS switched paths:

- NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*
- NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*
- NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- NN10600-605 *Passport - MDM Network Security: Operations*
- NN10600-561 *Nortel Networks Multiservice Switch 7400/15000/20000 Data Management*
- NN10600-450 *Nortel Networks Multiservice Switch 7400: Operations: DPN-100 Interworking*
- NN10600-920 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Frame Relay to ATM Interworking*
- NN10600-700 *Nortel Networks Multiservice Switch 7400/15000/20000 ATM Technology Fundamentals*
- NN10600-405 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Call Server*

- 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
MCS task flow overview

MCS configuration is dependent on its supporting Nortel Networks Multiservice Switch nodes being properly installed and configured. This book deals only with the procedures used to configure MCS once the supporting network infrastructure is in place.See “MCS configuration in relation to overall Multiservice Switch configuration” (page 22) for a view of how MCS configuration fits into the overall configuration

For a detailed view of the sequence of tasks you perform to configure MCS on Multiservice Switch, see “MCS configuration task flow” (page 23). Each box in the task flow represents a task that comprises one or more procedures. Each task has a corresponding section in this guide that contains the relevant procedures. To link to any task, go to the list that follows the task flow.

Figure 1
MCS configuration in relation to overall Multiservice Switch configuration

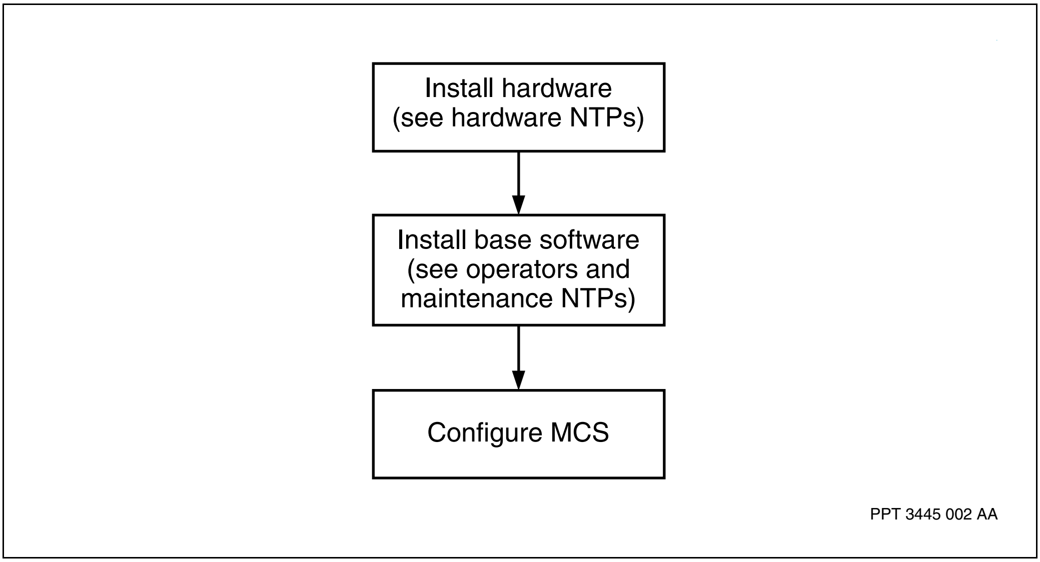
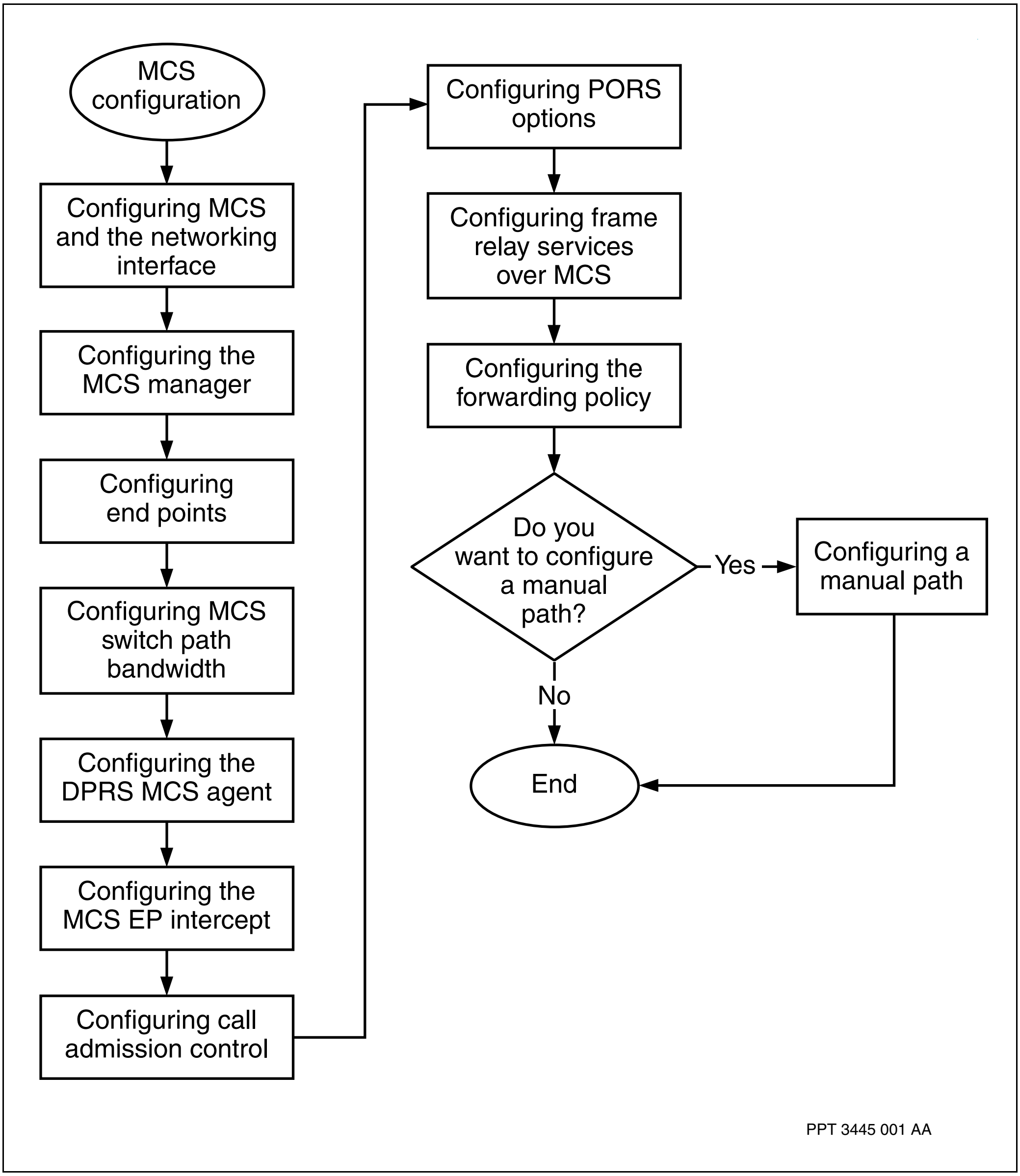


Figure 2
MCS configuration task flow



- “Configuring MCS and the networking interface” (page 83)
- “Configuring the MCS manager” (page 85)
- “Configuring end points” (page 87)
- “Configuring MCS switched path bandwidth” (page 90)
- “Configuring the DPRS MCS agent” (page 91)
- “Configuring the DPRS MCS EP intercept” (page 92)
- “Configuring call admission control” (page 93)
- “Configuring PORS options” (page 96)
- “Configuring frame relay services over MCS” (page 98)
- “Configuring the forwarding policy” (page 99)
- “Configuring a manual path” (page 103)

Chapter 2
MCS overview

This chapter describes the operation of managed cut-through switching (MCS) for frame relay services that use the data packet routing system (DPRS).

For the Frame Relay service that interworks with ATM, refer to NN10600-920 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Frame Relay to ATM Interworking*.

What is MCS?

MCS is a Nortel Networks Multiservice Switch networking infrastructure enhancement introduced to provide superior adaptation for services over large frame/cell or ATM-centric networks. MCS provides bidirectional, point-to-point virtual connections between Multiservice Switch nodes at a specific quality of service (QoS). MCS switched paths are statically provisioned and dynamically routed through the network.

MCS supports the following services:

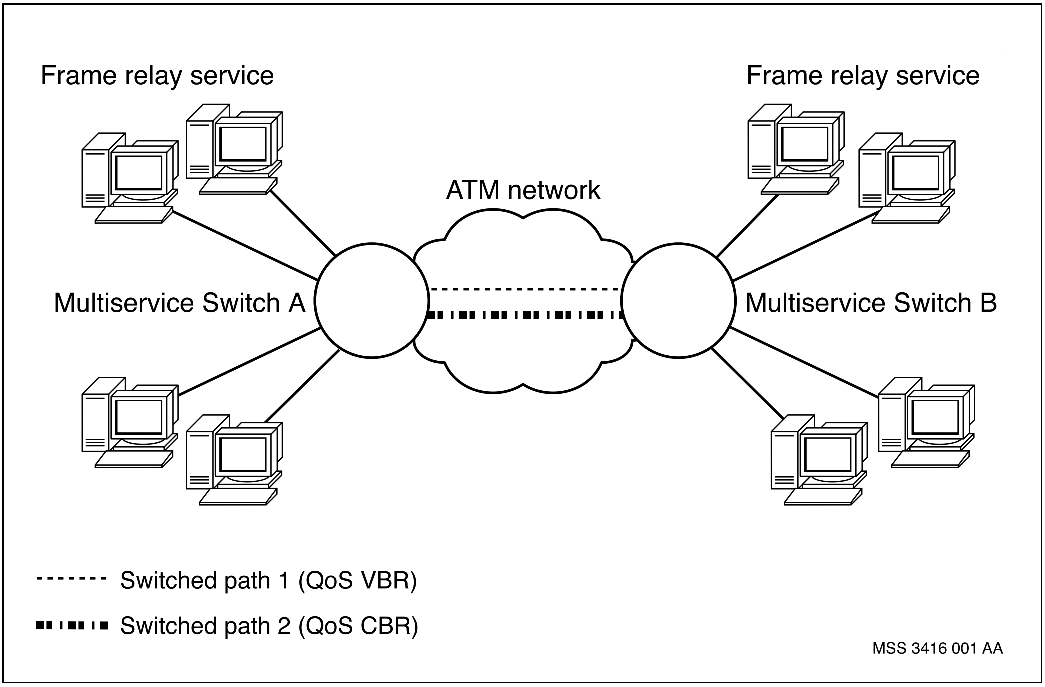
- Multiservice Switch frame relay services that use DPRS
- Frame relay forum FRF.5 services. For information about the operation of MCS for FRF.5 services, see NN10600-920 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Frame Relay to ATM Interworking*.

How does MCS work?

The MCS connection is a switched path that provides many-to-one multiplexing of connections for a data service. Service connections that share the same QoS parameters can be mapped onto a single switched path and transported through the network. MCS takes advantage of the underlying network infrastructure, QoS facilities, and high-performance switching capabilities.

The figure “MCS switched paths” (page 27) shows two Nortel Networks Multiservice Switch nodes connected by a pair of switched paths used for a frame relay service. Each path multiplexes the frame relay service connections for a defined QoS, such as constant bit rate (CBR) or variable bit rate (VBR).

Figure 3
MCS switched paths



Why use MCS?

An organization uses MCS when it needs a high-performance, low-latency method of routing traffic across an ATM or frame-based network. The MCS capability supports frame relay in a connection-oriented, scalable manner.

The MCS concept of cut-throughs eliminates the need for software routing on tandem switches. MCS switched paths are also designed to operate independently of the routing protocols and make direct use of the underlying layer 2 forwarding capabilities.

The following points are the key characteristics of MCS:

- MCS switched paths are switch-based, rather than FP-based. Connections from all points on the switch can be multiplexed on one path if they have the same destination and QoS.

- MCS provides high-performance switching based on QoS.
- MCS provides robust routing through dynamic establishment of the switched path, using connection-oriented routing.
- MCS uses the underlying networking functionality to achieve load-sensitive routing through bandwidth reservation throughout the network.
- MCS works in mixed ATM and frame/cell-based networks.

Which routing system does MCS use?

The path-oriented routing system (PORS) provides routing facilities for MCS transmission.

Which services does MCS support?

MCS supports frame relay user-to-network interface (UNI) and network-to-network interface (NNI) software systems between two Nortel Networks Multiservice Switch nodes, by transporting frame relay traffic throughout the network. PVC, SVC, and SPVC connections can be routed over MCS switched paths.

MCS features

MCS provides functionality that maintains the benefits of the existing Nortel Networks Multiservice Switch DPRS routing. At the same time, MCS offers a connection-oriented approach to forwarding frame relay traffic through the network.

Scalable architecture

The n:1 multiplexing capability of MCS provides a scalable architecture that works well in large networks. A benefit for the network operator is that an MCS switched path is provisioned only at the originating end. The connection through the network is determined dynamically by the routing system. This feature also allows re-routing under failure conditions.

With MCS, it is also possible for networks to evolve easily into large ATM-centric networks. Small non-ATM networks can use MCS over PORS today, and easily migrate to MCS over ATM as ATM facilities are added to the network.

Multiplexing frame relay UNI and NNI connections over a single switched path also reduces the virtual path and virtual circuit resources used in the network. For example, only one VCC is required for multiple frame relay connections.

QoS-based routing

MCS supports multiple QoS values, using frame relay transfer priorities (TP) mapped to ATM service categories. The network operator can provide QoS support for extended service definitions for multiple service classes, accommodating various frame relay applications.

Variable architecture

MCS operates in frame-cell networks and a variety of ATM network architectures. The existing frame relay infrastructure is preserved, while an evolutionary path to FRF.5 is provided for network-to-network interworking.

Improved performance

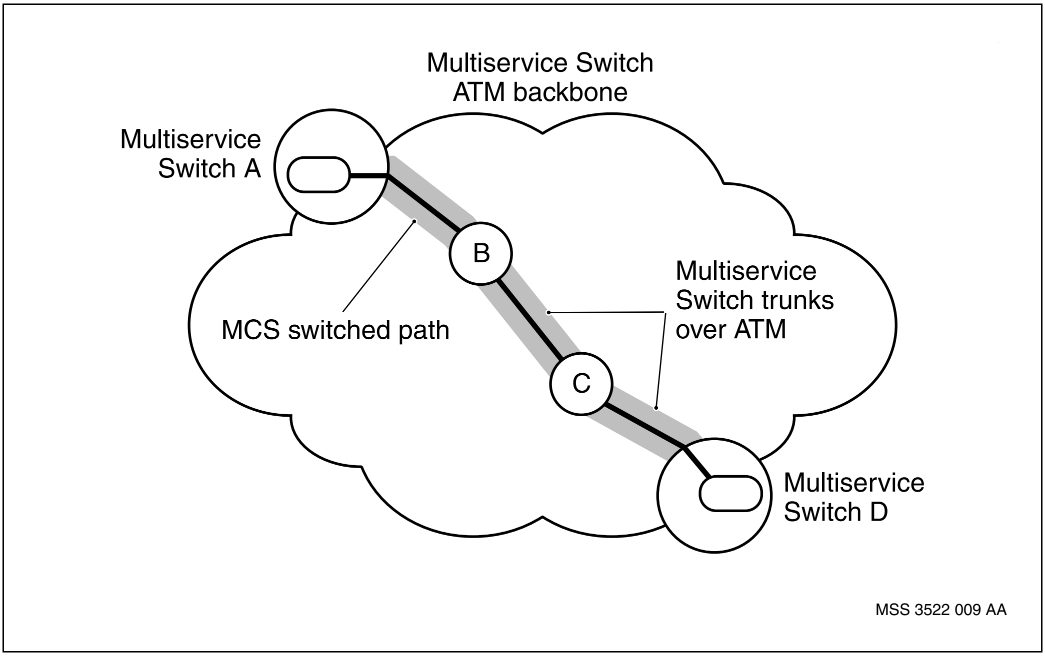
Compared to a traditional frame-cell network using DPRS, MCS provides a 20% increase in traffic forwarding through tandem nodes.

Network scalability

When using Nortel Networks Multiservice Switch trunks over ATM, engineering restrictions limit the meshing of Multiservice Switch networks. The limitation occurs because the extra Multiservice Switch trunks increase the level of CPU and memory utilization for topology calculations. MCS switched paths can be used instead to build a highly-meshed network. Using MCS enables hardware forwarding rates for frame relay services across the entire network.

Figure “Multiservice Switch trunks over ATM and MCS switched paths” (page 30) shows the difference between Multiservice Switch trunks over ATM and MCS switched paths. Using Multiservice Switch trunks over ATM, forwarding decisions are required at nodes A, B, C, and D. Using MCS, Multiservice Switch nodes A and D are connected by an MCS switched path, which is hardware-forwarded from end to end, eliminating the decisions at the tandem nodes B and C.

Figure 4
Multiservice Switch trunks over ATM and MCS switched paths



Investment protection

Investment in existing infrastructure is maintained, as MCS works with the DPRS routing system in a complementary manner. MCS maintains the benefits of DPRS, while providing connection-oriented functionality in situations identified by the network operator.

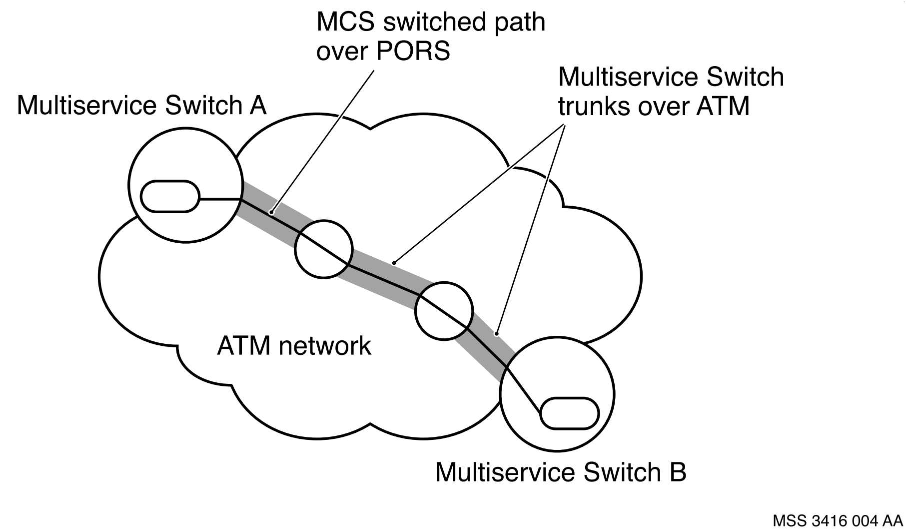
Call admission control

MCS provides a call admission control (CAC) capability for frame relay service connections. This capability allows MCS to reject calls when the bandwidth reservation exceeds specified levels, or simply to monitor the bandwidth. CAC improves the engineering of the frame relay connection. The capability ensures optimal use of network bandwidth by monitoring or controlling reserved bandwidth.

MCS using PORS routing

The figure “MCS using PORS” (page 31) shows an MCS switched path in a frame-cell network using the PORS routing system. Each frame-cell trunk in the illustration represents either a frame-cell trunk or a Nortel Networks Multiservice Switch trunk over ATM. The switched path becomes an overlay on the physical link. The services are multiplexed onto a single switched path to be transported to the remote node.

Figure 5
MCS using PORS



In PORS terminology, the MCS switched path is a permanent logical connection (PLC). The PORS PLC connection is established dynamically.

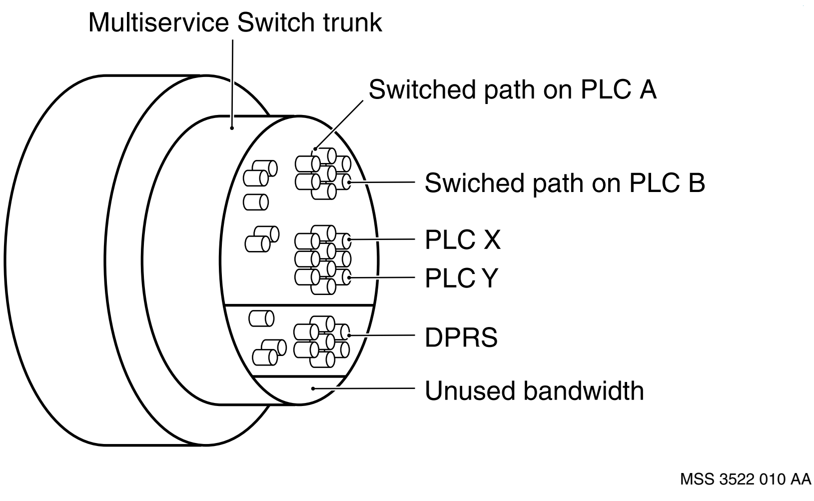
Like any other PLC, the switched path benefits from the PORS value-added features, such as bandwidth reservation, auto-reroute, path optimization, and manual path creation.

Figure “MCS switched path over PORS PLC” (page 32) shows how MCS switched paths are transported over the PORS routing system on a Multiservice Switch trunk. The PORS bandwidth reservation scheme is used to determine the available bandwidth for PORS connections. The switched paths then share the available PORS bandwidth with any other PORS traffic that exists.

When the Multiservice Switch trunk is over ATM, the PORS connection shares the same VCC with the DPRS traffic. When the PORS connections are in map mode, there is one VCC for each connection, as in MCS over ATM links (see figure).

For more information on the PORS routing system, see NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System*.

Figure 6
MCS switched path over PORS PLC



DPRS MCS switched path establishment

To establish an MCS switched path, the PORS routing system is used to create a connection between two Nortel Networks Multiservice Switch nodes.

Switched path end points

The MCS switched path has two end points, each residing on a Nortel Networks Multiservice Switch module. The originating, or source, end point is provisioned. The terminating, or destination, end point is created dynamically when a call setup request is received from an originating end point. An end point group is created to contain all the end points with a common destination Multiservice Switch node.

Establishing a switched path

Figure "Switched path establishment" (page 34) shows the establishment of a generic PORS-based MCS connection. Nortel Networks Multiservice Switch A contains switched path end point (Ep) 6, which the network operator has provisioned as part of end point group (EpG) 12.

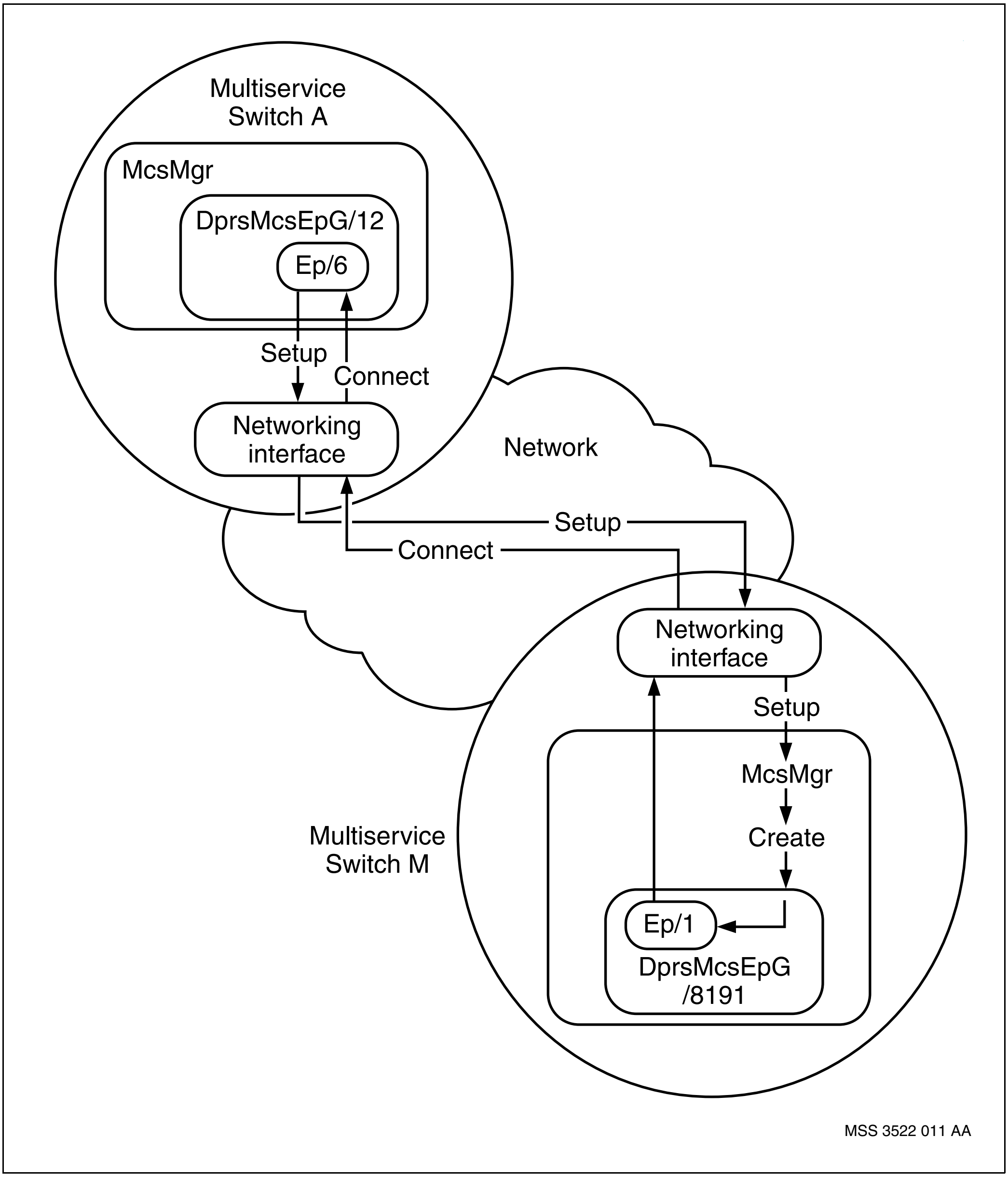
When the end point is activated, it originates an MCS call setup request to the networking interface. The networking interface is the networking software that provides the interface between the MCS switched path and the routing system. The interface hides the underlying PORS layer.

The routing system establishes the connection through the network based on the provisioned characteristics of the switched path. The networking interface of Multiservice Switch B receives the setup request and forwards it to the MCS manager.

If there is a dynamic end point group in the destination Multiservice Switch node that corresponds to the originating Multiservice Switch node, the MCS manager forwards the request to that group. If there is no corresponding dynamic group, the MCS manager creates it. Then the MCS manager creates the new end point.

The end point at the destination then returns a connect message through the networking interface to the originating end point. The EPs exchange staging information (node identifiers), and are then able to transfer data. Frame relay data is forwarded over the switched path as soon as the call setup is complete and the switched path is available.

Figure 7
Switched path establishment



If the networking interface at the destination does not accept the setup request, it returns a release to the originating end point. A call can be released for any of the following reasons:

- no resources are available
- the terminating Multiservice Switch node is not ready to accept setup requests
- there is no suitable path through the network

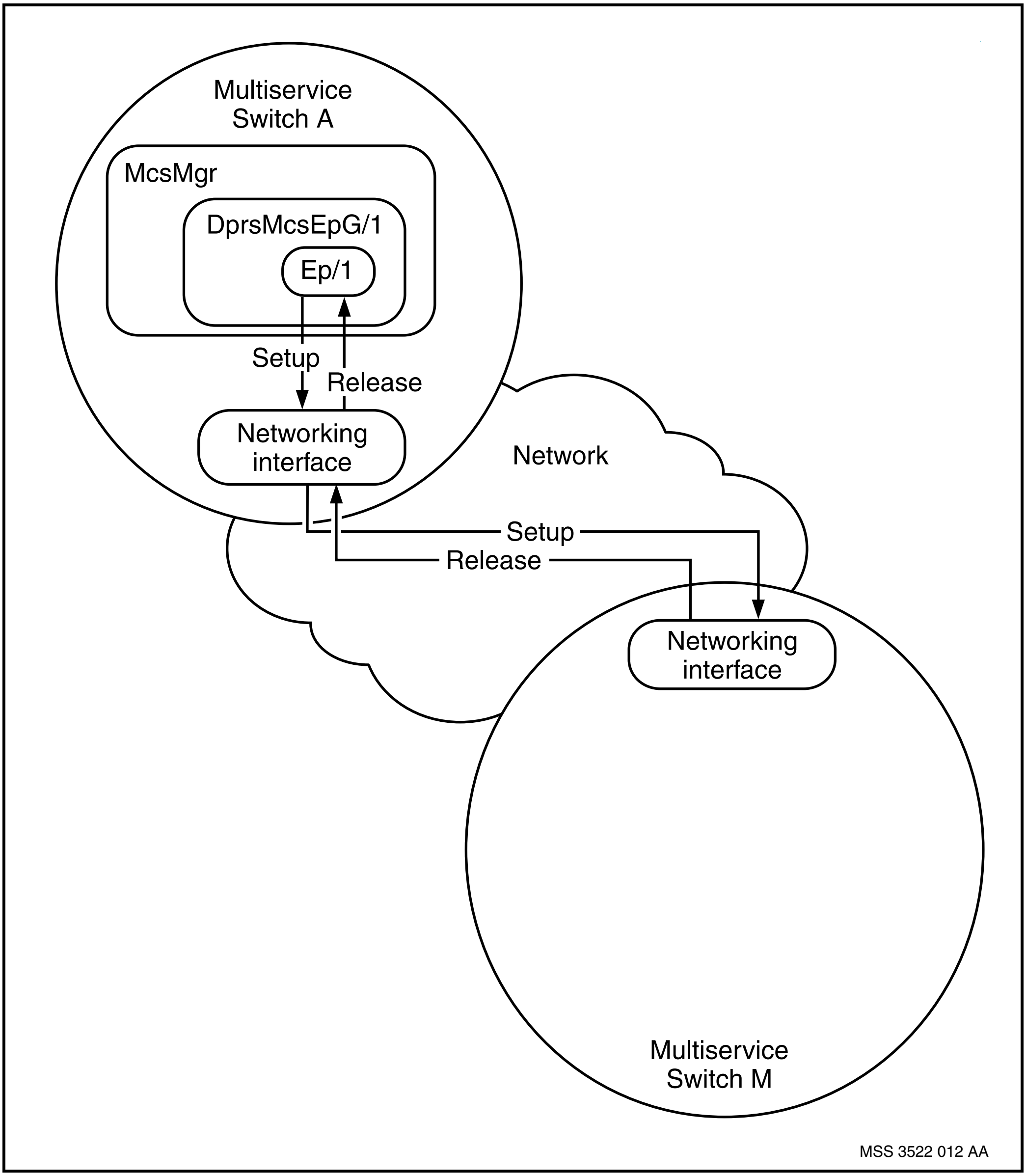
For more information, see “Troubleshooting” (page 118).

The MCS manager can release a connection

- if no local resources are available
- if the security option prevents the call from establishing
- if provisioned engineering limits are reached

Figure “Unsuccessful switched path establishment attempt” (page 36) shows an unsuccessful attempt at MCS switched path establishment. If switched path establishment is unsuccessful, the originating end point re-sends the setup request (after a hold-off period) until the connection is established. The frame relay service cannot begin data transfer until the switched path is established.

Figure 8
Unsuccessful switched path establishment attempt



Releasing a switched path

Some possible reasons for releasing an established switched path are

- provisioning changes
- network failure
- locked end point

Figure “Release due to provisioning change” (page 38) shows a release due to a provisioning change. In this example, an established switched path is released when the network operator deletes the existing end point on Nortel Networks Multiservice Switch A. Multiservice Switch A sends a release message through the networking interface to the terminating end point on Multiservice Switch B, and the connection is released. If the dynamic end point on Multiservice Switch B is the last end point in the group, the group is also deleted.

Figure 9
Release due to provisioning change

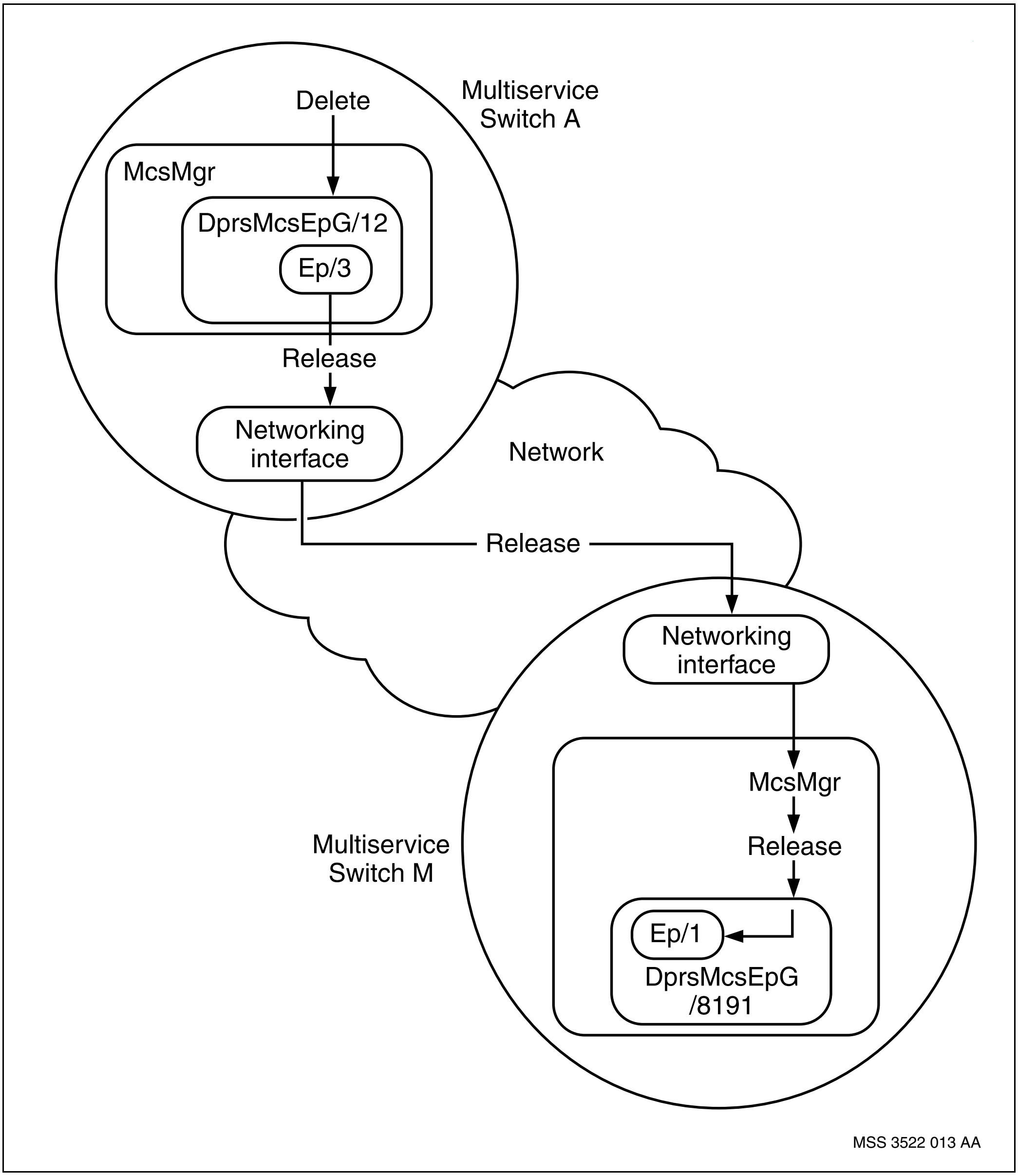


Figure “Release due to network failure” (page 40) shows a release due to a network failure. In this example, an established switched path is released due to a connection failure somewhere in the network.

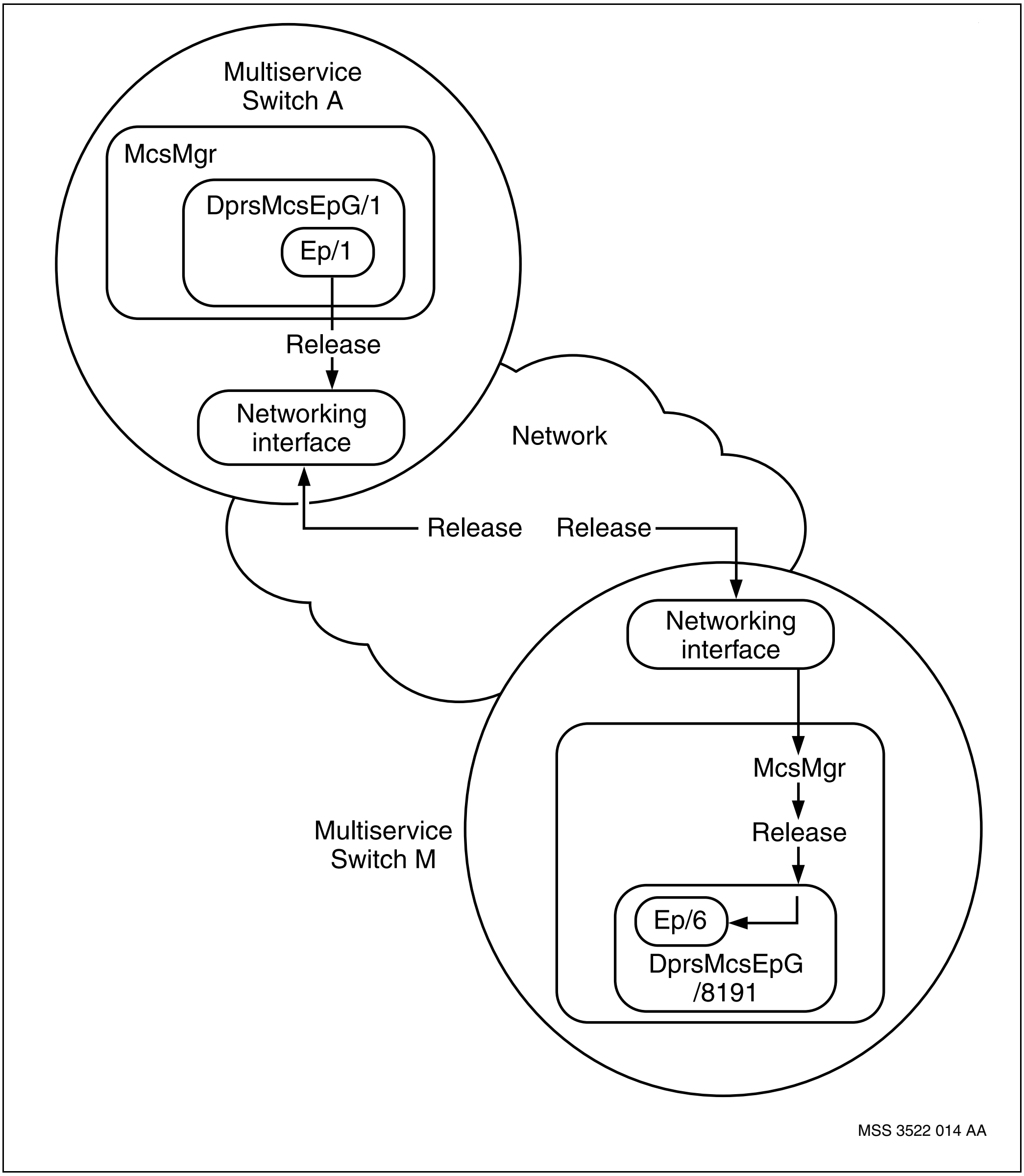
Both the originating and terminating ends of the switched path receive a release message. The terminating end point is deleted, and the originating end point launches another setup request.

If the switched path fails, frame relay traffic no longer arrives on the datapath. The frame relay connection responds by sending idle probes over the switched path. If the probes are not acknowledged, the frame relay call is taken down.

In a PORS network, the situation shown in figure “Release due to network failure” (page 40) is different. If there is a connection failure, PORS tries to re-establish the connection before sending the release to the originating end point.

When the network operator locks an originating end point, the call is cleared. It is re-established when the end point is unlocked. If a dynamic end point is locked, the end point is deleted, and the call is cleared. In this case, the originating end point then attempts to re-establish the call.

Figure 10
Release due to network failure



Chapter 3
Frame relay services and MCS

This chapter describes how managed cut-through switching (MCS) is used by frame relay services, and includes the following topics:

Networking scenarios

Figure "Frame relay UNI-to-UNI" (page 42) shows how MCS switched paths are used to connect frame relay UNI services. When FR UNIs are provisioned to use MCS, many frame relay DLCIs are multiplexed to a single MCS switched path. The multiplexing is done according to the destination and transfer priority of the connection.

Each MCS switched path is defined with supported transfer priorities and a connection transfer priority. The supported transfer priorities specify that only DLCIs with these transfer priorities can be carried on the switched path. The connection transfer priority is used to define the transfer priority at which the switched path operates. This value is mapped to an ATM service category, which actually defines the QoS of the path.

In the example, Path 1 supports TP6 and TP9 traffic, and Path 2 supports TP0 traffic. The connection TP of these paths is independent of their supported TP. At the far end, the traffic is demultiplexed at the transport FPs and forwarded to the FR UNI services. The MCS switched path supports full FR UNI functionality, and is transparent to the service user.

Figure 11
Frame relay UNI-to-UNI

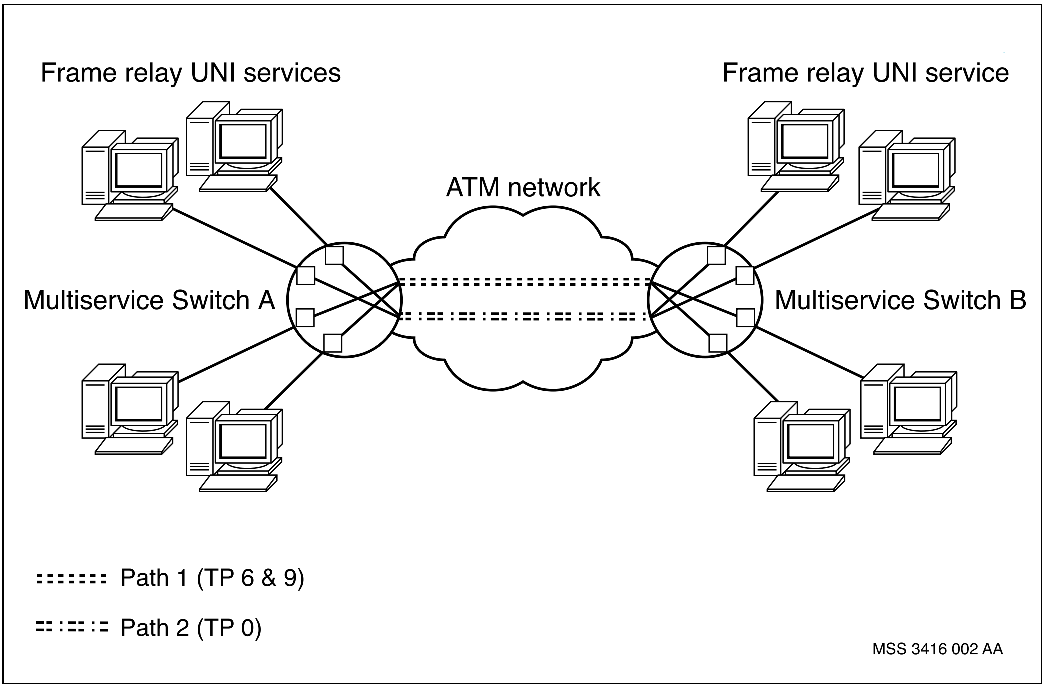
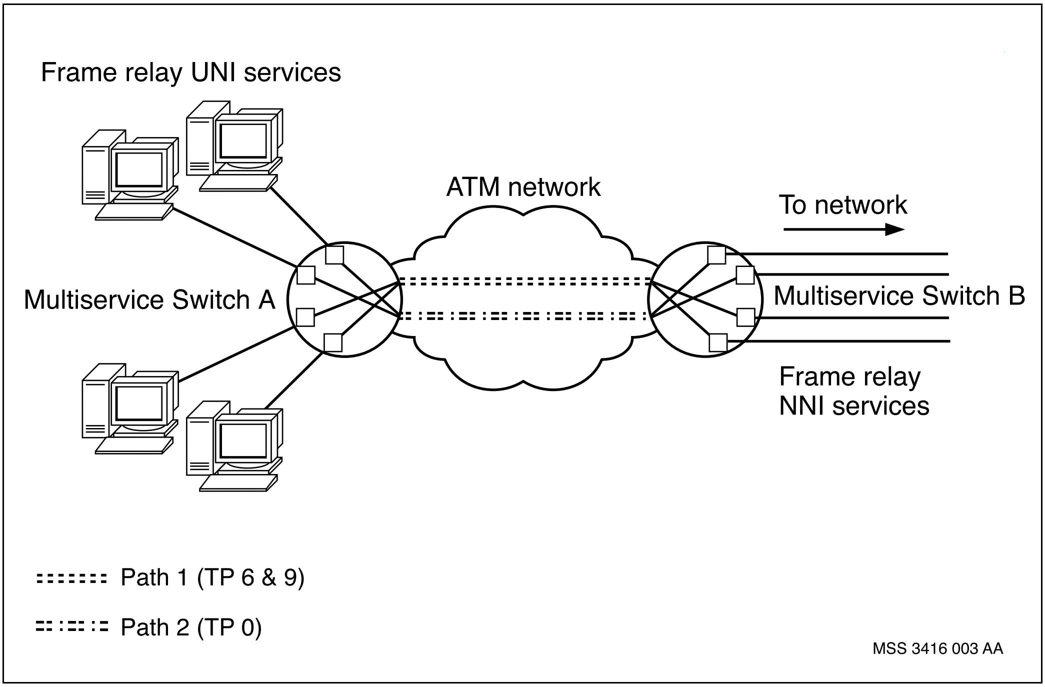


Figure “Frame relay UNI-to-NNI” (page 43) shows how MCS switched paths are used by frame relay services to connect UNI and NNI services. The switched path operates the same way as it does for FR UNI-to-UNI connections, except that the traffic is forwarded to FR NNI access services at the far end.

Figure 12
Frame relay UNI-to-NNI



MCS switched paths in the network

Figure “MCS connections in a sample network” (page 46) shows a sample network illustrating the MCS concepts. The network shows nine frame relay service UNIs in three Nortel Networks Multiservice Switch nodes that are connected by four MCS switched paths. The four switched paths are differentiated by the QoS of the traffic and the routing system used to transport the data.

The QoS of each switched path is derived from the mapping between the connection TP value and the ATM service category. The connection TP at the originating end is used to establish the switched path. To share a common switched path

- the frame relay connections must have the same destination

- the connection TPs must be on the supported TP list of the switched path

ATM service categories provide a mapping to the Multiservice Switch multiple priority system (MPS) priorities. For information on MPS, see NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.

Table “Sample TP-to-service category mappings” (page 44) shows the mappings between the TPs and ATM service categories used in the sample network in figure “MCS connections in a sample network” (page 46).

Table 1
Sample TP-to-service category mappings

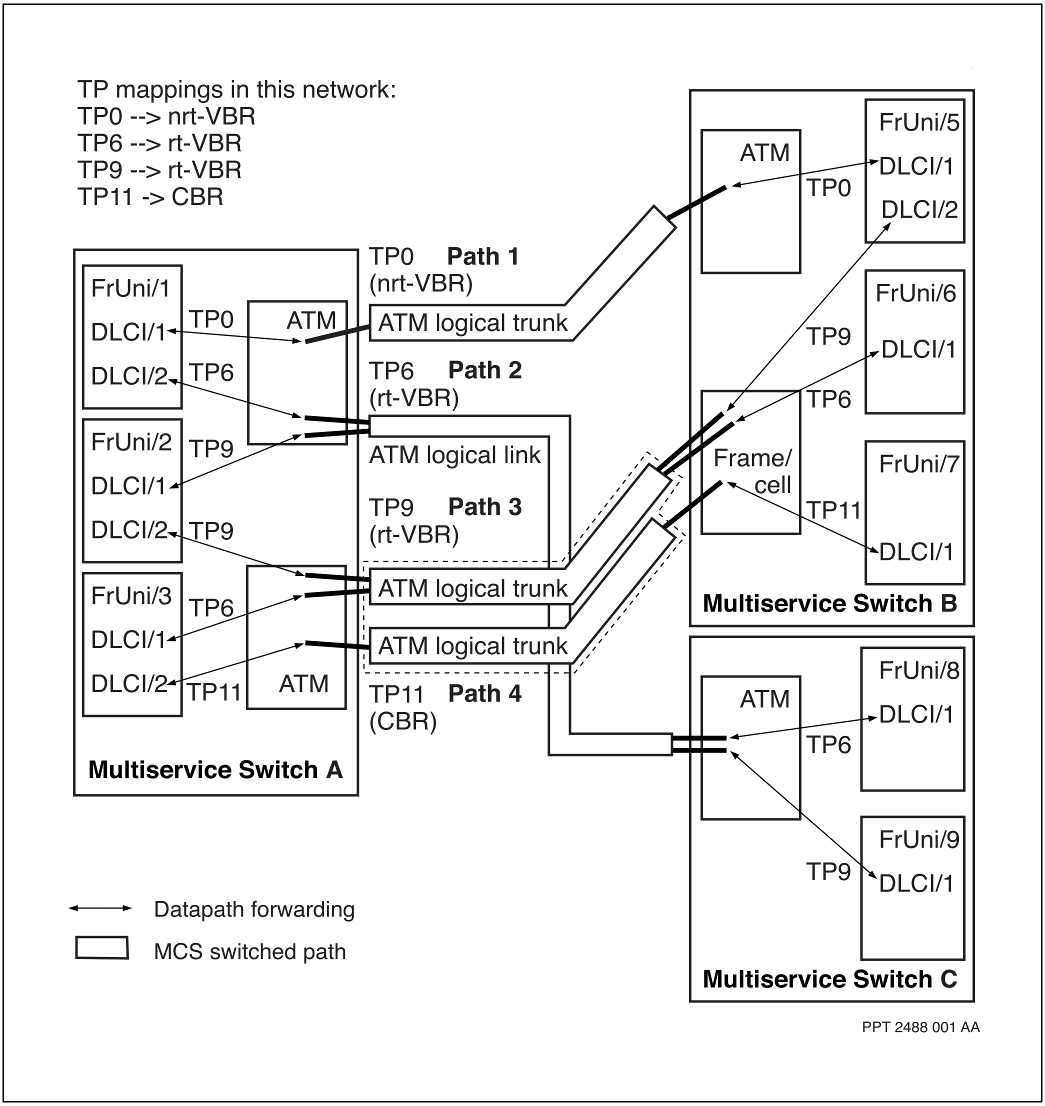
Connection transfer priority	ATM service category
TP0	nrt-VBR
TP6	rt-VBR
TP9	rt-VBR
TP11	CBR

In the sample network, the four MCS connections have the following characteristics:

- Path 1 connects Multiservice Switch A and Multiservice Switch B, using PORS over Multiservice Switch trunks over ATM. The ATM service category defined for the switched path is non real-time variable bit rate (nrt-VBR), as specified by the connection transfer priority mapping. The supported transfer priority for Path 1 is TP0.
- Path 2 connects Multiservice Switch A and Multiservice Switch C over an ATM link using the ATM routing system. The ATM service category for Path 2 is real-time VBR (rt-VBR), as specified by the connection transfer priority mapping. The supported transfer priorities for Path 2 are TP6 and TP9, so it multiplexes traffic for TP6 and TP9 data. Frame relay connections from two different interfaces are multiplexed to Path 2. The frame relay connections are de-multiplexed at Multiservice Switch C.

- Path 3 connects Multiservice Switch A and Multiservice Switch B using PORS over a frame-cell trunk. Path 3 also has an ATM service category of rt-VBR, as specified by the connection transfer priority mapping. The supported transfer priorities for Path 3 are TP6 and TP9, so it multiplexes TP6 and TP9 data.
- Path 4 also connects Multiservice Switch A and Multiservice Switch B, using the same physical link as Path 3. Path 4 is assigned service category CBR, according to the connection transfer priority mapping. The supported transfer priority for Path 4 is TP11.

Figure 13
MCS connections in a sample network



Call setup

Data traffic from frame relay services is transported over MCS switched paths, but the call setup traffic for these services uses DPRS. Figure "Call setup in a Multiservice Switch node-only network" (page 47) shows call setup routing in a Nortel Networks Multiservice Switch node-only network. The call request is sent to the far-end node through the Multiservice Switch call router. The data traffic is then forwarded from Multiservice Switch A to Multiservice Switch B through the switched path. The call accept message is also returned to the originating end through DPRS.

Figure 14
Call setup in a Multiservice Switch node-only network

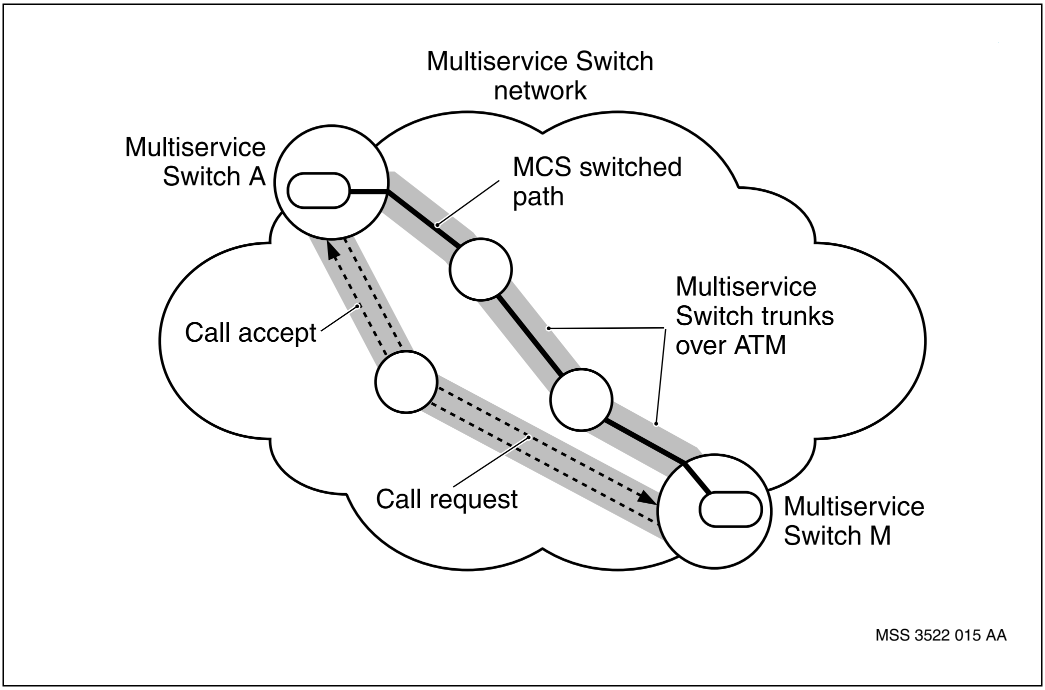
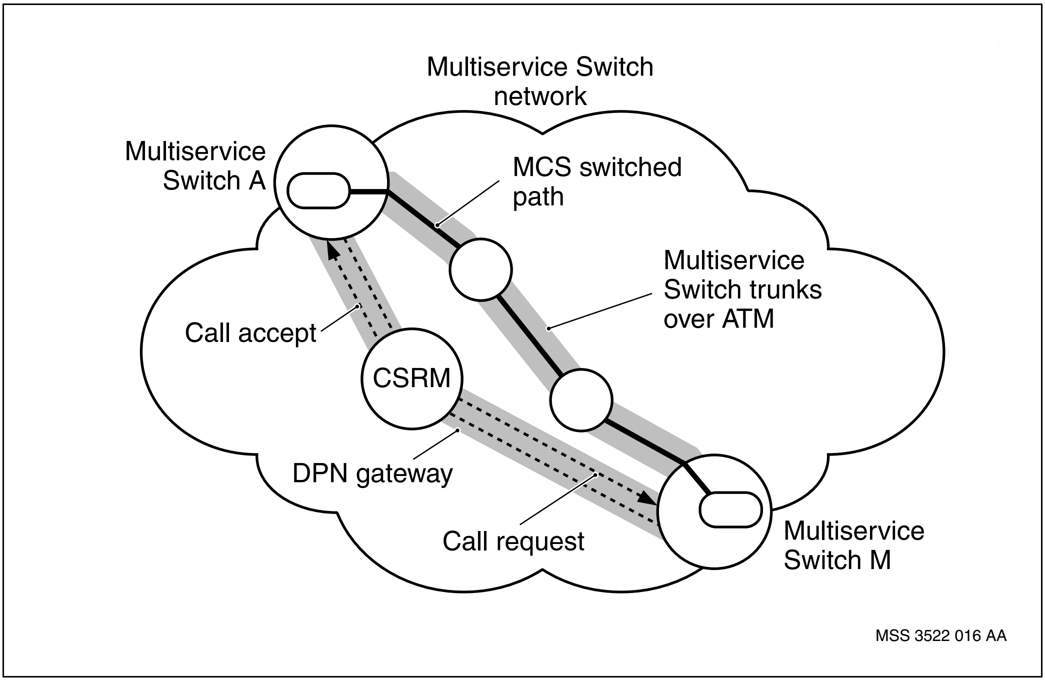


Figure “Call setup in a Multiservice Switch and DPN network” (page 48) shows call setup traffic routing in a mixed network. In this case, the call request is sent to the far-end node through the DPRS call server resource module (CSRM).

The CSRM connection to the Multiservice Switch network shown in figure “Call setup in a Multiservice Switch and DPN network” (page 48) applies to Multiservice Switch 7400 series nodes only.

Figure 15
Call setup in a Multiservice Switch and DPN network



Frame forwarding

The network operator forwards traffic for each DLCI over MCS switched paths only (dprsMcsOnly).

Call admission control

Call admission control (CAC) allows you to control and monitor the amount of bandwidth reserved for a frame relay connection on an MCS switched path. By controlling the amount of bandwidth reservation permitted, you can keep the level of subscription to the switched path at an appropriate level by rejecting frame relay service connections that exceed reservation levels. By monitoring the bandwidth, you can examine the frame relay service connections using the switched path, and adjust the network engineering accordingly.

CAC characteristics

The CAC capability allows you to provision

- the CAC policy, either enforced or monitored
- the type of CAC, either CIR-based or EIR-based
- oversubscription
- a maximum SVC or PVC bandwidth
- alarm thresholds for bandwidth usage

CAC allows a maximum of 512 connections to run over a switched path.

CAC policy

You can set the CAC policy to either enforced or monitored. In the enforced CAC mode, MCS does not allow bandwidth reservation for a switched path to exceed the effective bandwidth of the switched path. The effective bandwidth of a switched path is defined as

```
effectiveBandwidth = bandwidth*overSubscriptionFactor
```

In enforced mode, MCS rejects any frame relay service connection that causes the bandwidth reservation to exceed the effective bandwidth of the switched path.

MCS never rejects a connection when the monitored CAC policy is provisioned (unless there are already 512 connections). In the monitored mode, MCS issues an alarm when the effective bandwidth is exceeded (if alarms are enabled). The monitored CAC policy allows you to track bandwidth reservation at each end of the switched path, without preventing any connections from being established.

CAC type

You can provision CAC to operate on either the committed information rate (CIR) or the excess information rate (EIR) signalled by the frame relay connection. The CAC type determines if the effective bandwidth of a switched path is treated as CIR or EIR. If you provision the CAC type as CIR, MCS does not do CAC on the EIR value for the connection. The reverse also applies.

You can define the type of CAC independently for the originating and terminating ends of the switched path.

Oversubscription

The oversubscription factor allows you to define the level of oversubscription on a switched path as a multiple of the forward or reverse bandwidth. The CAC calculation process uses this factor in determining the effective bandwidth of the switched path. The oversubscription factor can range from 0.00 to 100.00. A value of less than 1 indicates undersubscription. The default value is 1, or no oversubscription.

Maximum SVC or PVC bandwidth

When the CAC policy is enforced, you can provision the CAC capability with a maximum bandwidth that an SVC or PVC can reserve on the switched path. The CAC fails if an SVC or PVC exceeds this bandwidth. If the SVC or PVC reservation is below this limit, the regular CAC calculation process continues.

You can also use this capability to prevent any PVC or SVC (using either CIR or EIR) from establishing by setting the maximum bandwidth to 0.

The oversubscription factor does not apply to these attributes. CAC operates strictly on the provisioned values for maximum SVC and PVC bandwidth.

Alarm thresholds

You can provision alarm thresholds for bandwidth usage. By default, alarms are disabled. (the alarm threshold is set to 0). You can set alarm thresholds between 1 and 100% in the forward and reverse directions of a switched path. When alarms are enabled, they are generated when the bandwidth reservation rises above the specified threshold, and cleared when the reservation level falls 10% below the provisioned value. You can define separate minor, major, and critical alarm thresholds.

CAC on switched paths

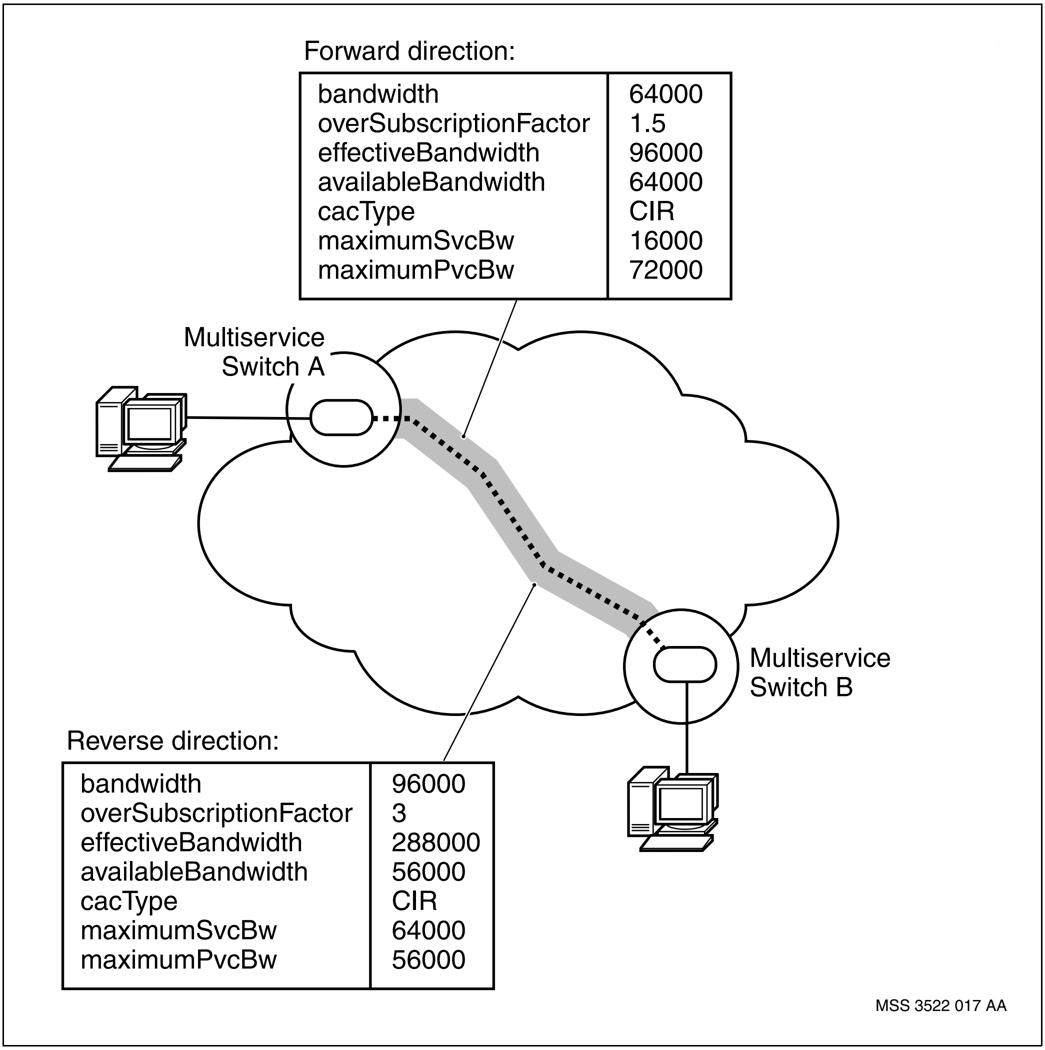
Figure “CAC on switched paths” (page 52) shows a simple example of a switched path between two Nortel Networks Multiservice Switch nodes. In the example, there is only one bidirectional connection running over the switched path. The tables in the illustration show the bandwidth and CAC characteristics of the switched path in both directions.

In CAC terminology, forward and reverse directions are relative to the direction of the frame relay service connection. For a frame relay service connection originating on Multiservice Switch A in the example, forward direction indicates the bandwidth reserved or available for the frame relay service from Multiservice Switch A to Multiservice Switch B. Reverse direction indicates the bandwidth from Multiservice Switch B to Multiservice Switch A.

In the example, the difference between the effective bandwidth and available bandwidth shows that there is 32000 bits/s of bandwidth reserved in the forward direction and 232000 bits/s in the reverse direction. This leaves 64000 bits/s available bandwidth in the forward direction, and 56000 bits/s in the reverse direction.

How the CAC operates on this switched path depends on the provisioned CAC parameters, particularly on whether the CAC policy is enforced or monitored.

Figure 16
CAC on switched paths



Enforced CAC

If there is a frame relay service connection on Multiservice Switch A destined for Multiservice Switch B, with a forwarding policy of MCS only, it would use the switched path shown in figure “CAC on switched paths” (page 52). Before this connection could use the switched path, MCS would perform CAC.

If the connection is a PVC, CAC would pass if the bandwidth needed in the forward direction for CIR traffic is 64000 bits/s or less. If the PVC exceeds this size, it would not be able to reserve the bandwidth needed. The CAC would fail because the CAC policy is set to enforced.

If the connection is an SVC, the CAC will fail if the connection attempts to reserve more that 16000 bits/s. This failure occurs because of the maximum SVC bandwidth value, regardless of how much effective bandwidth is available.

In the reverse direction, reserved CIR bandwidth must be 56000 bits/s or less for a PVC. If the CIR needed for the connection exceeds this amount, the connection will be cleared because the CAC policy is set to enforced. If the connection is an SVC, the bandwidth needed must be 32000 bits/s or less, as specified by the reverse maximum SVC bandwidth parameter.

Monitored CAC

When the CAC policy is defined as monitored, the connection is always established because monitored CAC never fails a CAC request. If the new connection’s CIR reservation in figure “CAC on switched paths” (page 52) causes the bandwidth to exceed 64000 bits/s in the forward direction, CAC would raise an alarm (if alarms are enabled). Similarly, if the reserved CIR bandwidth of 56000 bit/s is exceeded in the reverse direction, CAC would raise an alarm.

Changing CAC parameters

Table “CAC parameters” (page 54) explains how provisioning changes in the CAC parameters affect switched path connections.

Table 2
CAC parameters

Parameter	Change from	Change to	Behavior
CAC	not provisioned	provisioned	All currently-established connections remain unaffected.
CAC policy	monitored	enforced	All currently-established connections remain unaffected. The actual bandwidth used may be greater than the effective bandwidth. There may be SVCs and PVCs that have reserved more bandwidth than specified by the maximum. Connections are reevaluated when they go down and come back up.
	enforced	monitored	Calls that could not be established previously due to insufficient effective bandwidth or maximum PVC or SVC bandwidth are allowed to establish connections.
CAC type	EIR	CIR	All currently-established connections remain unaffected. The EP has an accurate count of the CIR bandwidth reserved by existing connections, but bandwidth reservation may exceed effective bandwidth. There may be connections that have bandwidth reserved at a level greater than that specified as the maximum SVC or PVC allowed. CAC starts tracking all new incoming calls against CIR bandwidth. Connections are reevaluated when they go down and come back up.
(Sheet 1 of 3)			

**Table 2 (continued)
CAC parameters**

Parameter	Change from	Change to	Behavior
	CIR	EIR	All currently-established connections remain unaffected. The EP has an accurate count of the EIR bandwidth reserved by existing connections but bandwidth reservation may exceed effective bandwidth. There may be connections that have bandwidth reserved at a level greater than that specified as the maximum SVC or PVC allowed. CAC starts tracking all new incoming calls against EIR bandwidth. Connections are reevaluated when they go down and come back up.
Bandwidth	lower bandwidth	higher bandwidth	The effective bandwidth increases. Calls that previously could not be established may be able to come up.
	higher bandwidth	lower bandwidth	Effective bandwidth decreases. All currently-established connections remain unaffected. The level of bandwidth reservation may exceed the amount of effective bandwidth. Alarms may be generated. Connections are reevaluated when they go down and come back up.
Oversubscription factor	lower factor	higher factor	The effective bandwidth increases. Calls that previously could not be established may be able to come up
	higher factor	lower factor	Effective bandwidth decreases. All currently-established connections remain unaffected. The level of bandwidth reservation may exceed the amount of effective bandwidth. Alarms may be generated. Connections are reevaluated when they go down and come back up.
(Sheet 2 of 3)			

Table 2 (continued)
CAC parameters

Parameter	Change from	Change to	Behavior
Maximum SVC bandwidth	higher bandwidth	lower bandwidth	SVCs that have been rejected previously may be able to come up.
	lower bandwidth	higher bandwidth	All currently-established connections remain unaffected. There may be SVC connections established with more reserved bandwidth than this new value. Connections are reevaluated when they go down and come back up.
Maximum PVC bandwidth	higher bandwidth	lower bandwidth	PVCs that have been rejected previously may be able to come up.
	lower bandwidth	higher bandwidth	All currently-established connections remain unaffected. There may be PVC connections established with more reserved bandwidth than this new value. Connections are reevaluated when they go down and come back up.
Alarm thresholds	lower threshold	higher threshold	A clear alarm is generated if the bandwidth reservation level is 10% below the new threshold value.
	higher threshold	lower threshold	An alarm is generated if the bandwidth reservation level exceeds the new threshold value.
(Sheet 3 of 3)			

MCS discards

Nortel Networks Multiservice Switch routing common headers contain congestion, discard priority (DP), and emission priority (EP) indicators from the frame relay service. MCS preserves the congestion indication and DP and EP settings for the frame relay traffic. MCS passes these indicators on to the frame relay service FP at the remote end. However, the service discard priority value is not used during data transmission. Instead, MCS takes the discard priority associated with the connection's ATM service category. When there is congestion on the service FP at the remote end, the ingress transport FP may discard packets according to the MCS discard priority.

Chapter 4
MCS architecture

This chapter describes the functional components of managed cut-through switching (MCS) and their provisionable attributes, and includes the following topics:

For more details on specific components, see NN10600-060 *Nortel Networks Multiservice Switch 7400/15000/20000 Component Reference*.

Functional breakdown

The functional elements of the MCS switched path are

- the MCS manager (McsMgr)
- the end point group (DprsMcsEpG)
- the switched path end point (Ep)
- the DPRS MCS agent
- the DPRS MCS CAC agent
- the DPRS MCS intercept

MCS manager

The MCS manager creates and removes switched path end points on the Nortel Networks Multiservice Switch nodes.

The network operator creates switched paths by provisioning source end points. When the provisioning is activated, the MCS manager creates all the provisioned end points. The MCS manager also responds to setup requests from remote nodes by creating terminating end points.

The MCS manager interacts with the networking interface, which provides the interface to the PORS routing system.

An MCS manager process is created on an LP when the dprsMcsEp feature is provisioned on that LP. It is recommended that you provision two or more MCS managers on different LPs in the Multiservice Switch node. The MCS manager will be current (active) on only one of the LPs. If that LP fails, an MCS manager on another LP will become the current MCS manager. The current MCS manager process manages all of the end points provisioned on the Multiservice Switch node. The other MCS manager processes on separate LPs ensure redundancy if the LP with the current MCS manager fails.

End point group

The end point group consists of the end points within a common destination Nortel Networks Multiservice Switch node, or NSAP address. The MCS manager creates a group

- due to provisioning
- dynamically (in the dynamic range) when a setup request is received for a remote NSAP address that does not yet have a group

When an end point group is deleted, all the end points in the group are deleted.

End point

The end point is responsible for all setup, connect, and release messages that are needed to bring up or release a switched path. Once the connection has been established, module information is exchanged between the end points. Then the switched path becomes available to the subscribing frame relay services.

The MCS manager creates an end point in each of two situations:

- when the network operator provisions an end point on the module
- when a request for an MCS switched path is accepted from a remote Nortel Networks Multiservice Switch node

The end point also handles CAC requests from the CAC agent, passing or failing the request based on the provisioned characteristics.

DPRS MCS agent

The DPRS MCS agent forwards packets over the MCS switched paths. The agent must be provisioned on each LP on which a frame relay service is provisioned to run over MCS. A master agent process on the current LP of the MCS manager interfaces with all the end points to obtain the required forwarding information. The information is then distributed to all the other agents on the Nortel Networks Multiservice Switch node. You need to provision the DPRS MCS agent only on LPs that do not have the dprsMcsEp feature. If the dprsMcsEp feature (and therefore the MCS manager) is provisioned on the same LP as the frame relay service, you do not need to provision the DPRS MCS agent.

DPRS MCS CAC agent

The MCS CAC agent, which is part of the DPRS MCS agent, resides on the frame relay service FP. The CAC software responds to the CAC request from the frame relay VC with a CAC pass or fail message. To determine this response, the CAC agent forwards the CAC request to the end point. The end point accepts or rejects the CAC request based on the provisioned CAC characteristics.

DPRS MCS EP intercept

The DPRS EP MCS intercept forwards data from the transport service to the access service interface and maintains throughput statistics. A DPRS MCS EP intercept must be provisioned on all transport service FPs used to terminate a switched path. Failure to do so will prevent switched paths from establishing.

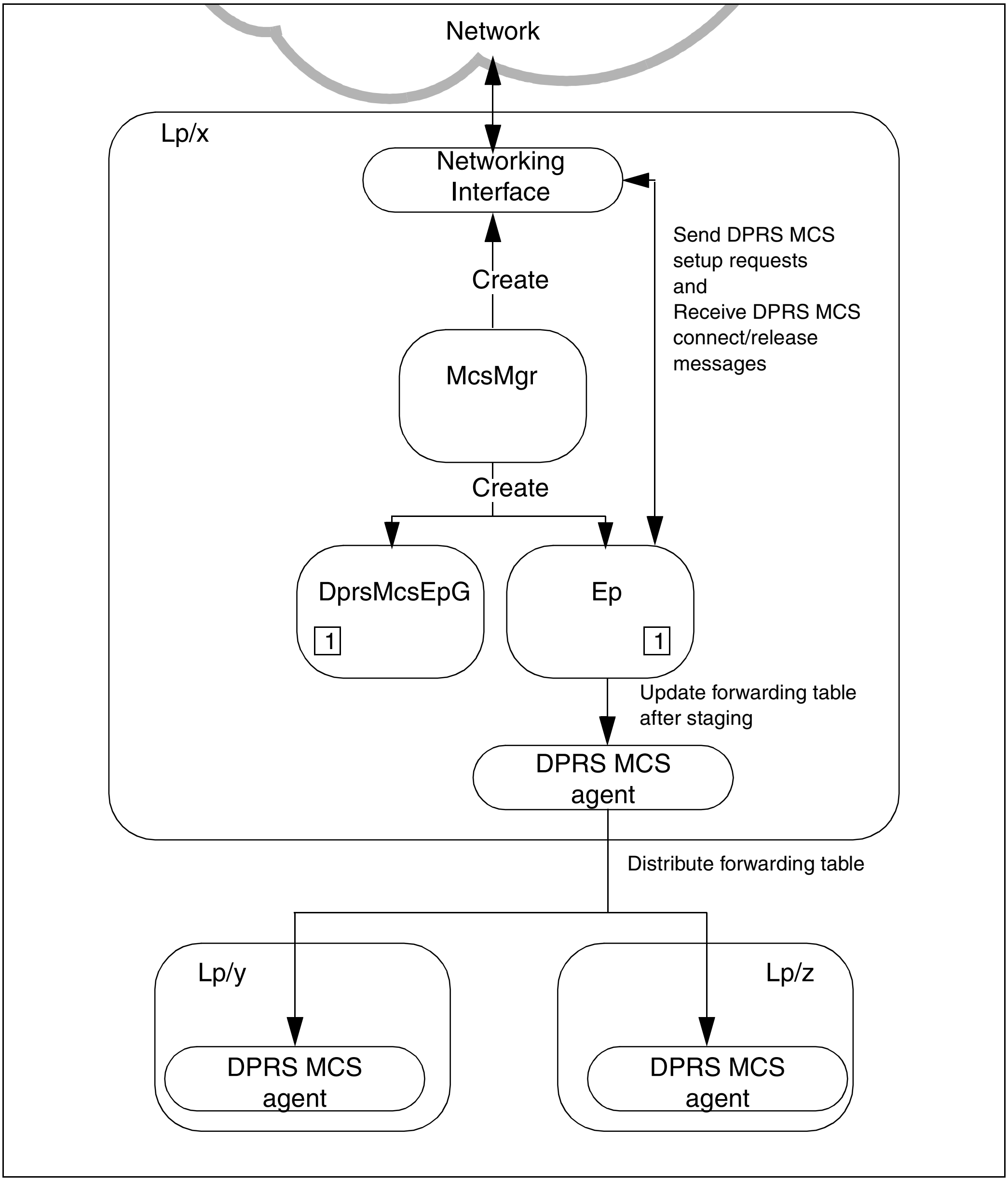
Functional relationships

The functional elements of MCS interact with each other during call setup and data transport.

Creating an originating end point

Figure “Creating an originating Ep” (page 61) shows the creation and call setup of a provisioned originating end point. The network operator creates an originating end point through provisioning. When the provisioning is activated, the MCS manager is created. The MCS manager creates the networking interface, the provisioned end point group, and the related end points. The end point launches a setup request through the networking interface and then waits for a connect or release message. If it receives a release message, the end point waits for a hold-off period and then tries the setup request again. If it receives a connect message, the end point stages (exchanges node identifiers) with the remote end point on the destination module, and updates the DPRS MCS agent with the forwarding information. The DPRS MCS agent distributes the forwarding information to all other DPRS MCS agents.

Figure 17
Creating an originating Ep

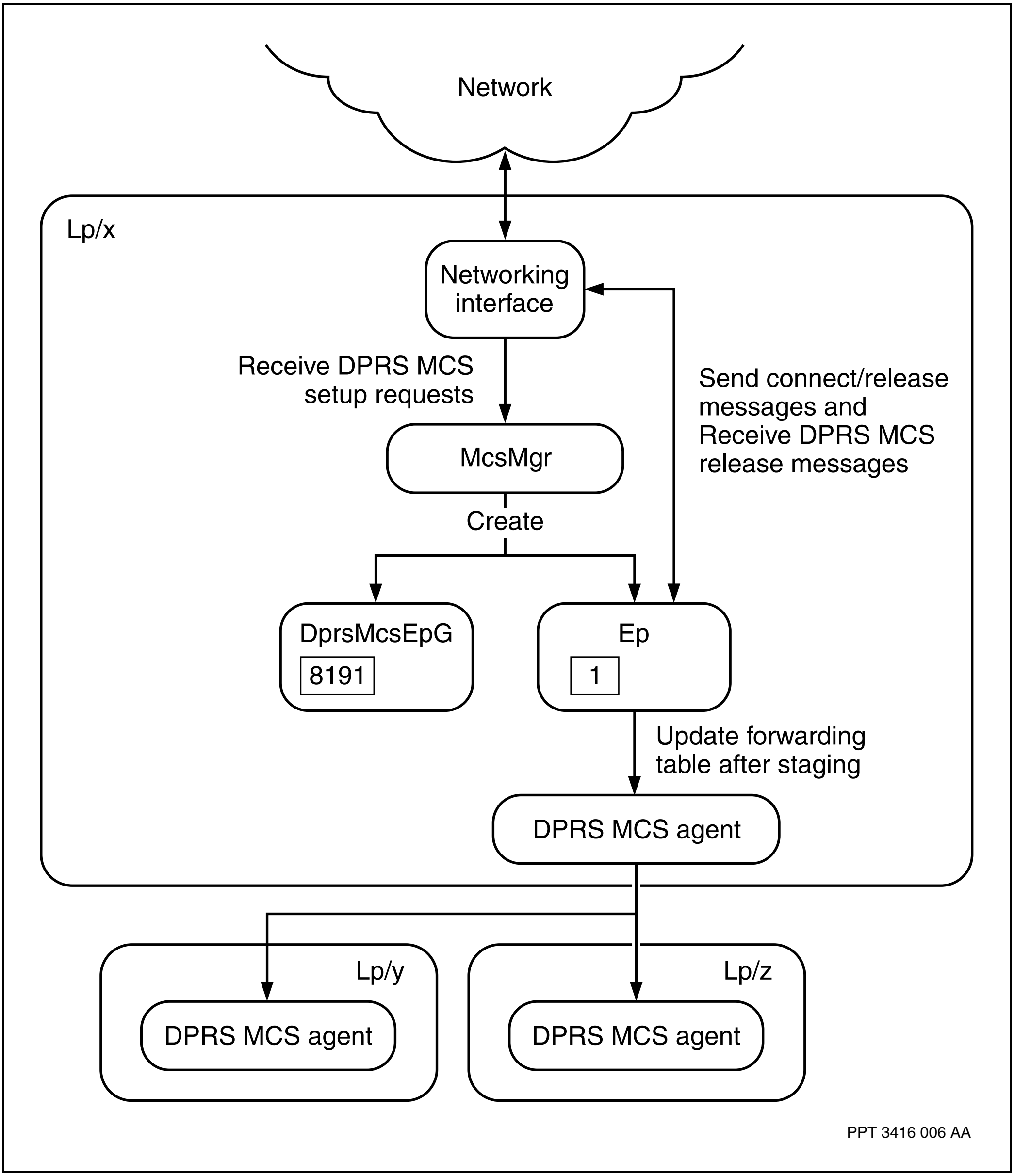


Creating a dynamic end point

Figure “Creating a dynamic Ep” (page 63) shows the creation and call setup of a dynamic end point. The current MCS manager receives a call setup request from the networking interface. If security requirements are not met or there are insufficient local resources, the MCS manager releases the call. Otherwise, the MCS manager accepts the call request and creates a dynamic group (in the range 4096 to 8191) and an end point. At this point, the control of the call setup is passed to the end point. If it can accept the call, the end point sends a connect message to the originating end and updates the DPRS MCS agent after staging. If not, the end point sends a release message and deletes itself.

The MCS manager can control call setup through the security option. This option allows the network operator to specify which destination NSAP addresses can establish connections to the node. If the security option is enabled, the MCS manager rejects any call for which there is no matching locally-provisioned end point group.

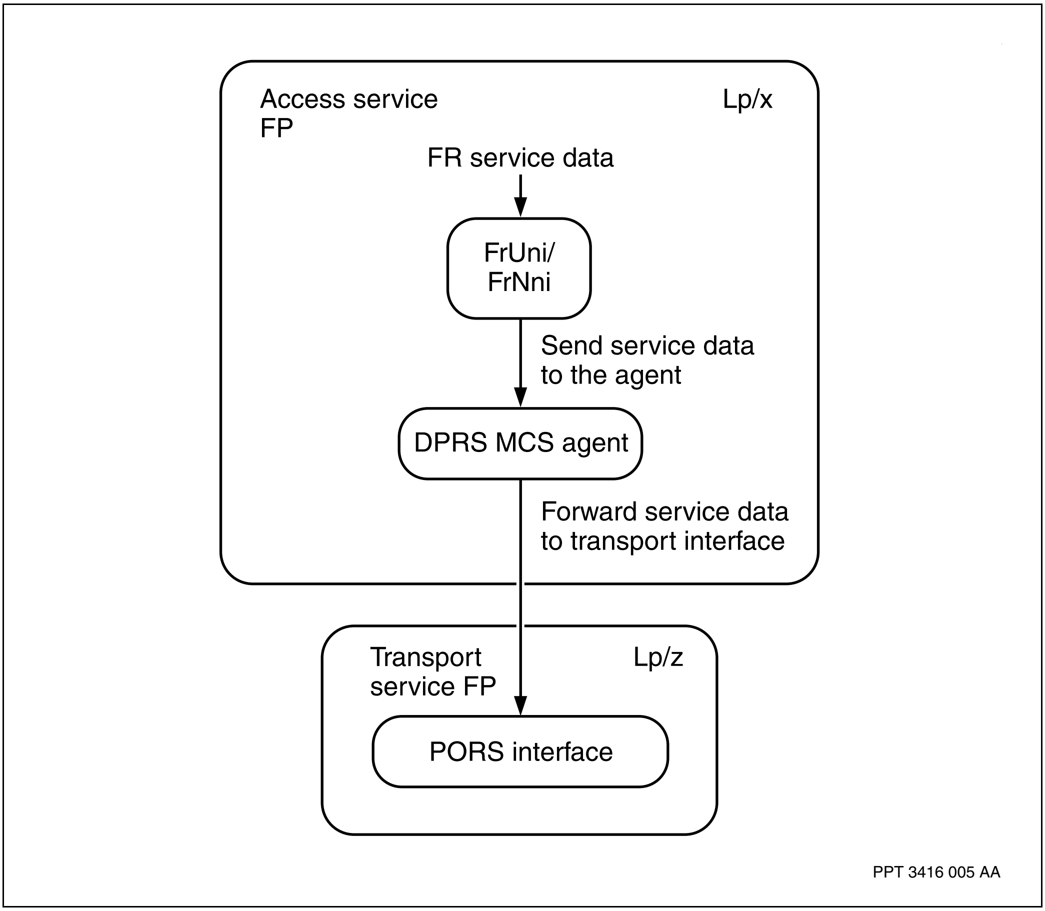
Figure 18
Creating a dynamic Ep



Sending data to the transport service

Figure “Sending data to the transport service” (page 64) shows how data travels from the access service through the DPRS MCS agent and then to its destination through the transport interface. The frame relay data is sent to the DPRS MCS agent, which forwards it to the transport FP.

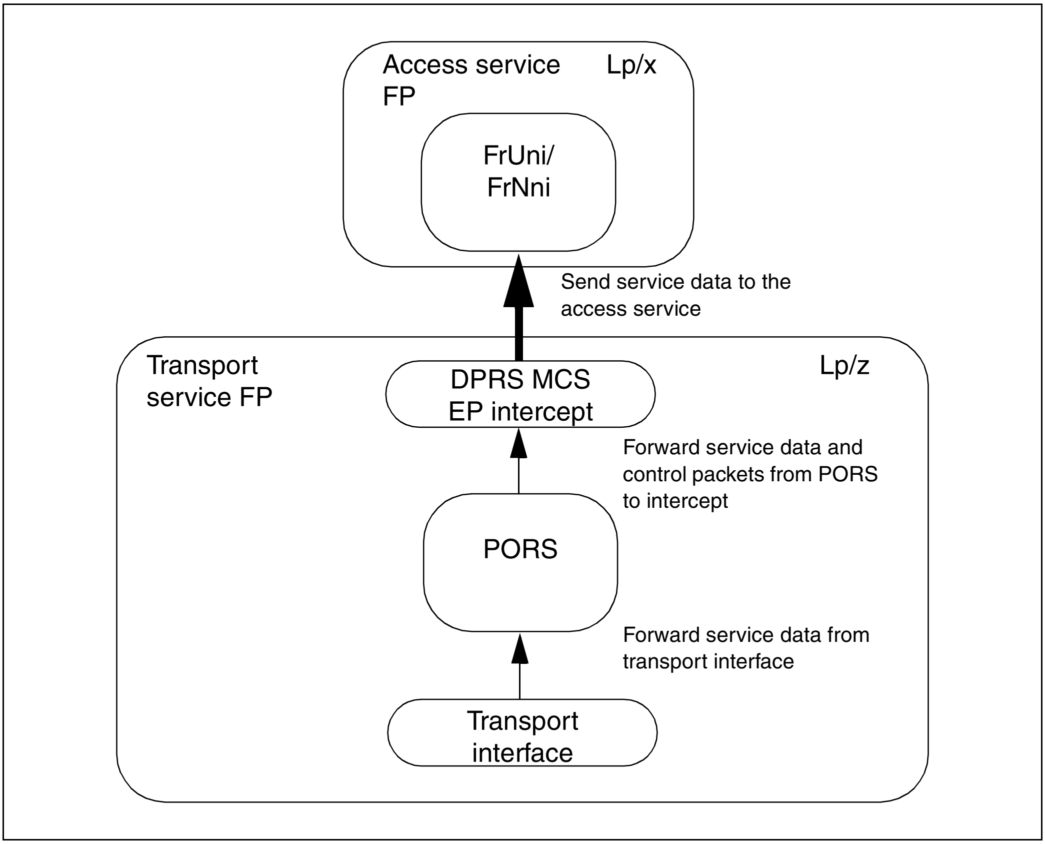
Figure 19
Sending data to the transport service



Sending data to the access service

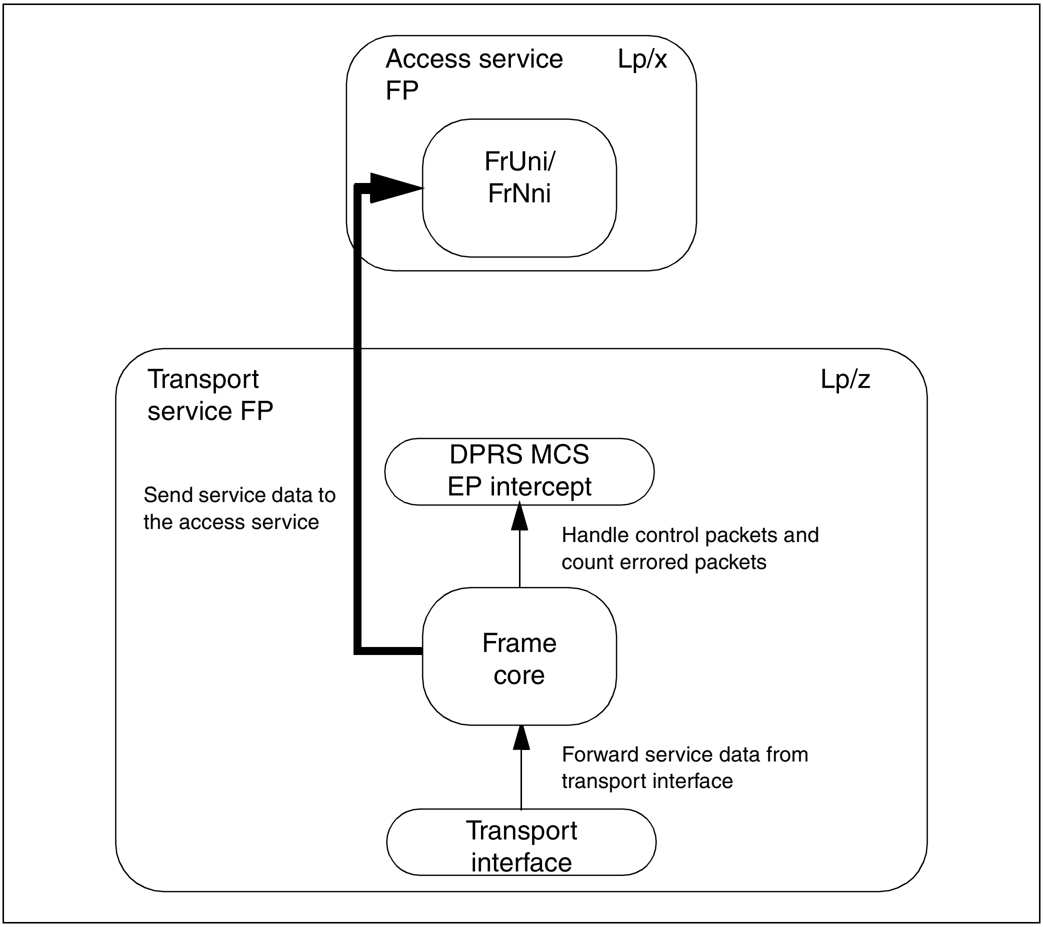
Figure “Sending PORS data to the access service” (page 66) and figure “Sending ATM data to the access service” (page 67) show how data is received from the transport interface and forwarded to the access service. If the data is identified as PORS traffic (figure “Sending PORS data to the access service” (page 66)), it is sent to the PORS software, which processes the data. When it determines that the traffic is DPRS MCS data, PORS forwards it to the DPRS MCS EP intercept. There must be an intercept on each transport FP that can possibly terminate a switched path. The intercept forwards the data to the access service. This process applies to both PORS on Nortel Networks Multiservice Switch trunks, and PORS on Multiservice Switch trunks over ATM.

Figure 20
Sending PORS data to the access service



If the data is identified as ATM traffic (figure "Sending ATM data to the access service" (page 67)), it is sent to the Frame Core software. When it determines that the traffic is DPRS MCS data, the Frame Core sends the data directly to the access service.

Figure 21
Sending ATM data to the access service



Handling call admission control

Figure “Handling a CAC request” (page 69) shows a successful call admission control (CAC) process. The process begins when the frame relay service launches (or creates) a VC and continues with the following steps:

1 The VC sends a setup message to the remote frame relay interface, which makes a call to the VC (or creates it).

2 The VC sends a CAC request to the CAC agent, which forwards it to the end point.

3 The end point evaluates the request, and returns a CAC OK to the VC if the CAC parameters have been satisfied.

4 The VC returns a call indication to the frame relay connection.

5 The frame relay connection signals an Raccept message to the originating VC and signals the connection.

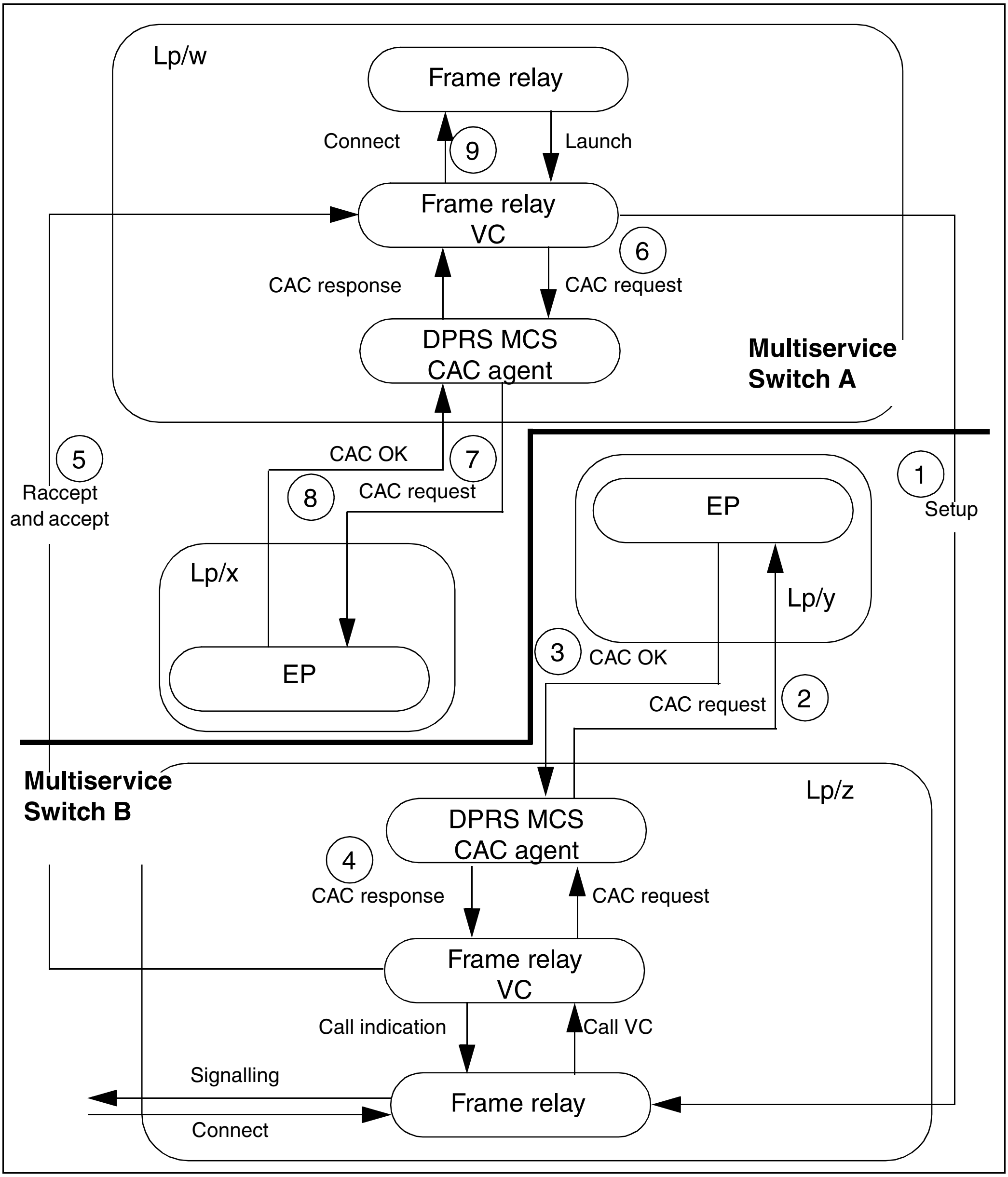
6 The originating VC then launches a CAC request.

7 The end point evaluates and passes the request.

8 The CAC agent returns a CAC OK to the VC.

9 The remote frame relay interface signals a connect message to the VC, which forwards the accept message to the originating VC. The originating VC signals a connect message to the originating frame relay interface.

Figure 22
Handling a CAC request



MCS components and attributes

Figure “McsMgr and related components” (page 71) shows the *McsManager* (*McsMgr*) component and its subcomponents and related components.

The *McsMgr* component may have

- up to 8191 *DprsMcsEpG* components (up to 4096 of these components can be provisioned, and the remainder can be dynamically created)
- up to 256 *DprsMcsEpG EndPoint* (*Ep*) components per group

  Note: Although these are the maximum limits that can be achieved, practical engineering limits may prevent this number of components from being provisioned.

The *Ep* component has a PORS *LogicalConnection* (*LCo*) dynamic component. The networking interface dynamically creates this component when a successful connection has been established.

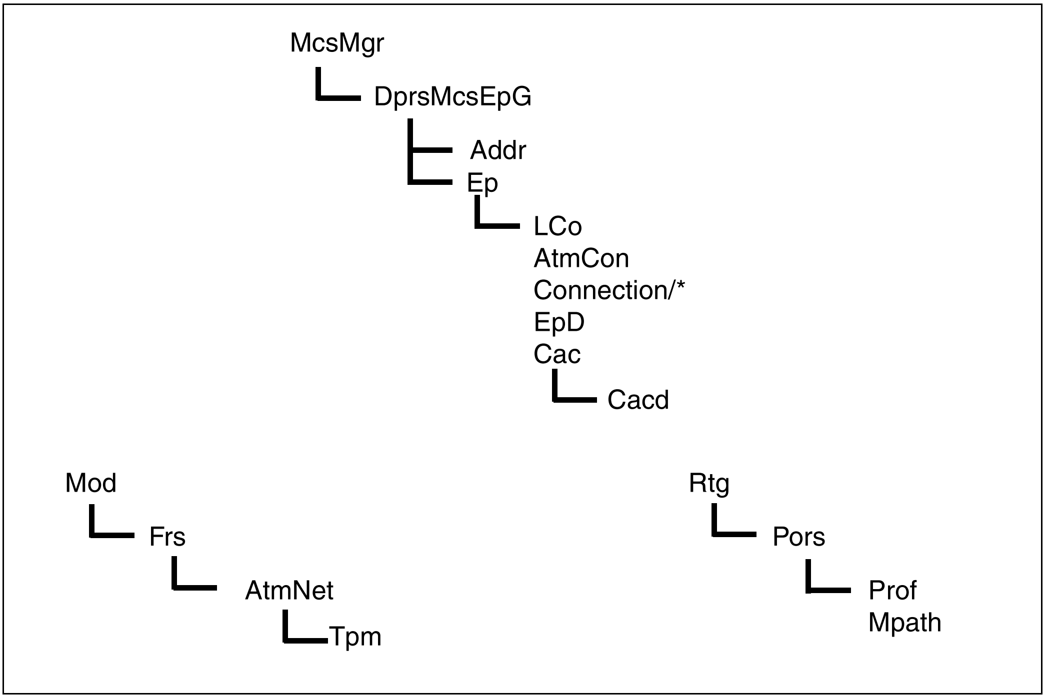
Another dynamic component, *Connection/**, displays the connections established on a switched path.The operational attributes of the *Connection/** component provide the component names and the bandwidths of the service connections using the switched path. Up to 512 connections are allowed on a switched path when the CAC feature is provisioned. If this limit is exceeded, alarms are raised.

The *Ep* component may also have an associated *callAdmissionControl* (*Cac*) component. The *Cac* component is an dynamic, optional component. *Cac* is created when an EP is provisioned with CAC. The *CallAdmissionControlDescriptor* (*Cacd*) subcomponent contains the provisioned CAC characteristics for the EP.

The *Ep* component has optional, provisionable links to the *Rtg Pors Profile* (*Prof*) and *ManualPath* (*Mpath*) components. The *Prof* component may contain PORS routing characteristics for the switched path. The *Mpath* component contains the PORS route for a manually-defined path.

There is also a relationship with the *ModuleData* (*Mod*) *FrameRelaySystem* (*Frs*) *AtmNetworking* (*AtmNet*) *TransferPriorityMapping* (*Tpm*) component, as it is used to map the connection TP to an ATM service category.

Figure 23
McsMgr and related components



McsMgr component

Table “McsMgr attributes” (page 72) shows the provisionable attributes of the *McsMgr* component.

Table 3
McsMgr attributes

Attribute	Description
maxEps (mEps)	The maximum number of end points on the module. When the number of end points (originating and terminating) exceeds this value, all new remote connections are rejected. The default value is 512.
epAlarmThreshold (epThresh)	When the number of end points (originating and terminating) crosses this threshold, an alarm is issued. The default value is 128.
security (sec)	This attribute is set to on or off. When it is on, only switched paths that already have an end point group provisioned at the remote end can be set up. The default value is off.
overrideNsapAddress (oNsap)	The network operator can specify an override NSAP address if the default address generated by the *McsMgr* component is not appropriate. (The default address is the node prefix assigned to the node, followed by the MCS suffix, which is 20 4800 200 100.) The default value is no address.

DprsMcsEpG component

The *DprsMcsEpG* component has two sub-components:

- the *Address (Addr)* subcomponent defines the remote NSAP address to be used by Eps in the group
- the *Ep* subcomponent defines the connection information for the end point

Table “DprsMcsEpG Addr attributes” (page 73) lists the provisionable attributes for the *Addr* subcomponent.

Table 4
DprsMcsEpG Addr attributes

Attribute	Description
remoteAddress (rAddr)	The NSAP address of the *McsMgr* component at the destination module. This address is used by the end points provisioned under this *DprsMcsEpG* component to establish a switched path. The default value is no address.
commentText	Any additional textual information. Typically, this attribute is used to specify the destination module name. The default value is no comment.

Ep component

The characteristics of the *Ep* component are provisioned on the *EndPointDescriptor* (*EpD*) component. Table "Ep Epd attributes" (page 74) shows the provisionable attributes of the *EpD*.

Table 5
Ep Epd attributes

Attribute	Description

forwardBandwidth (fBw)	The bandwidth at which the transport connection agrees to transfer information in the forward (originating to terminating) direction, specified in bits per second.
	
	For ATM-routed connections, this value is converted to peak cell rate (PCR) for the setup PDU used to request a connection. The conversion formula is
	
	`PCR = bandwidth bit/s /`
	`(48 bytes * 8 bit/byte)`
	
	The default value is 512000 bit/s.

reverseBandwidth (rBw)	The bandwidth at which the transport connection agrees to transfer information in the reverse (terminating to originating) direction, specified in bits per second.
	
	For ATM-routed connections, this value is converted to peak cell rate (PCR) for the setup PDU used to request a connection. The conversion formula is
	
	`PCR = bandwidth bit/s /`
	`(48 bytes * 8 bit/byte)`
	
	The default value is sameAsForward.

connectionTransferPriority (connTp)	The transfer priority characteristics of the connection. This attribute value is used in the *Mod Frs AtmNet* component TP mapping that determines the ATM service category for the transport connection. (See table “Frame relay AtmNet Tpm attribute” (page 80).) The default value is 0.
(Sheet 1 of 3)	

Table 5 (continued)
Ep Epd attributes

Attribute	Description
transportConnection Preference (transConPref)	The preferred routing system to be used in setting up the transport connection: • if porsOnly is selected, the *Ep* component attempts switched path establishment using PORS network facilities, and fails if they are not available The default value is porsOnly.
profile (prof)	The optional PORS profile to be used for the transport connection when it is set up using PORS. (It is ignored if the ATM routing system is in use.) The default value is the default PORS profile.
(Sheet 2 of 3)	

Table 5 (continued)
Ep Epd attributes

Attribute	Description
manualPath (mpath)	The optional manual path to be used for the transport connection when it is set up using PORS. This attribute is linked to the manual path that specifies the sequence of trunks to use for the PORS route. (It is ignored if the ATM routing system is in use.) The default value is the default PORS manual path.
supportedTransferPriorities (supTps)	The frame relay transfer priorities that are supported through the transport connection. This attribute is used to determine which *Ep* component in a *DprsMcsEpG* component should be used to multiplex a particular frame relay DLCI. The default value is 0. ***Note:*** A transfer priority can be supported in only one *Ep* component per group. It is not possible for two end points to support the same TP. If two such end points are provisioned (one at each node), only one is activated. In that case, the module with the highest numerical NSAP prefix is activated, and the other is released. However, you can provision two end points with the same characteristics, as long as the TP value is different.
(Sheet 3 of 3)	

Cac component

The characteristics of the *Cac* component are provisioned on the *Cacd* component. Table “Cac Cacd attributes” (page 77) shows the provisionable attributes of the *Cacd* component.

Table 6
Cac Cacd attributes

Attribute	Description
forwardCacPolicy (fCacP)	The CAC policy for the EP in the forward direction is either enforced or monitored. The default value is monitored.
forwardCacType (fCacT)	The type of CAC for the EP in the forward direction is either cir (based on CIR) or eir (based on EIR). The default is cir.
forwardOverSubFactor (fOsFactor)	The oversubscription factor to be used when determining the available bandwidth in the forward direction, in the range 0.00 to 100.00. The default is 1.
forwardMaxSvcBw (fMaxSvcBw)	The maximum SVC size that will be allowed on this switched path in the forward direction when the CAC policy is enforced. The default is no maximum.
forwardMaxPvcBw (fMaxPvcBw)	The maximum PVC size that will be allowed on this switched path in the forward direction when the CAC policy is enforced. The default is no maximum.
forwardAlarmThreshold (fAlarmThresh)	The forward-direction bandwidth thresholds for minor, major, and critical alarms used when the CAC policy is monitored. Each value will generate an alarm when the bandwidth reservation in the forward direction exceeds it. The range is 0 to 100%. The default value is 0 (disabled).
reverseCacPolicy (rCacPolicy)	The CAC policy for the EP in the reverse direction is either enforced or monitored. The default value is sameAsForward.
reverseCacType (rCacType)	The type of CAC for the EP in the reverse direction is either cir (based on CIR) or eir (based on EIR). The default is sameAsForward.
(Sheet 1 of 2)	

Table 6 (continued)
Cac Cacd attributes

Attribute	Description
reverseCacOverSubFactor (rOsFactor)	The oversubscription factor to be used when determining the available bandwidth in the reverse direction, in the range 0 to 100.The default is sameAsForward.
reverseMaxSvcBw (rMaxSvcBw)	The maximum SVC size that will be allowed on this switched path in the reverse direction when the CAC policy is enforced. The default is sameAsForward.
reverseMaxPvcBw (rMaxPvcBw)	The maximum PVC size that will be allowed on this switched path in the reverse direction when the CAC policy is enforced. The default is sameAsForward.
reverseAlarmThresholds (rAlarmThresh)	The reverse-direction bandwidth thresholds for minor, major, and critical alarms used when the CAC policy is monitored. Each value will generate an alarm when the bandwidth reservation in the reverse direction exceeds it. The range is 0 to 100%. The default value is 0 (disabled).
(Sheet 2 of 2)	

Associated components

Two frame relay components are associated with MCS provisioning:

- the *FrameRelayUni* (*FrUni*) or *FrameRelayNni* (*FrNni*) *DataLinkConnectionIdentifier* (*Dlci*) *DirectCall* (*Dc*) or *DataNetworkAddress* (*Dna*) component, which contains the *dataPath* attribute that defines the forwarding policy for the switched path
- the *Mod Frs AtmNet* component, which contains the TP-to-ATM service category mapping for the switched path

Another associated component is the *atmRouting* component, which manages NSAP addressing for the node. The *atmRouting* component must be added during the provisioning process, but there are no *atmRouting* attributes related to MCS provisioning.

Dlci Dc or Dna component

To support MCS packet forwarding for a DLCI, the *dataPath* attribute must be provisioned for the PVC or SVC.

For a PVC, the *FrUni* or *FrNni Dlci Dc* component contains the *dataPath* attribute.

For an SVC, the *FrUni* or *FrNni Dna* component contains the *dataPath* attribute.

For an SPVC, the *FrUni* or *FrNni Dna* component contains the *dataPath* attribute.

Table “Frame relay Dlci Dc or Dna attribute” (page 79) shows the provisionable attribute of the *Dc* or *Dna* component.

Table 7
Frame relay Dlci Dc or Dna attribute

Attribute	Description
dataPath (dPa)	By selecting dprsMcsOnly, the data for this DLCI is forwarded over MCS only.

AtmNetworking Tpm component

The *Mod Frs AtmNet Tpm* component is used to map the connection TP to an ATM service category. The service category is used in the setup PDU that the *Ep* component sends to the networking interface to request a connection.

> ***Note:*** If you are provisioning both the *Mod Frs AtmNet* and *Mod Frs DprsNet* components, make sure the information under these components is consistent. If these component values are not consistent, incorrect engineering of the network can result. For more information on the *Mod Frs DprsNet* component, see NN10600-900 *Nortel Networks Multiservice Switch 7400/15000/20000 Frame Relay Technology Fundamentals*.

For information on the mapping of ATM service categories to MPS priorities, see NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.

Table “Frame relay AtmNet Tpm attribute” (page 80) shows the MCS-related provisionable attribute of the *Tpm* component.

> ***Note:*** For DPRS MCS switched paths, only the *atmServiceCategory* attribute is applicable.

Table 8
Frame relay AtmNet Tpm attribute

Attribute	Description
atmServiceCategory (sc)	The ATM class of service mapping for a TP: • cbr for constant bit rate • rtVbr for real-time variable bit rate • nrtVbr for non real-time variable bit rate • ubr for unspecified bit rate

Chapter 5
Configuring MCS

Note: MCS can only be configured on Nortel Networks Multiservice Switch 7400.

Install and provision managed cut-through switching (MCS) to enhance your Nortel Networks Multiservice Switch networking infrastructure.

Prerequisites to configuring MCS

- Install MCS software.

- For Nortel Networks Multiservice Switch 7400 series nodes only: To ensure that fast memory is acquired for the forwarding software on PM1 FPs, the DPRS MCS agent must be the first feature provisioned on the feature list of the software LPT. (This factor does not affect PM2 FPs.) When you add this feature to an FP for the first time, you must reset the FP to obtain fast memory.
- Install trunks, frameRelay, and atmNetworking software

Configuring MCS and the networking interface

Configure MCS and the networking interface to take full advantage of the multiplexing that MCS offers for service connections sharing the same QoS.

Procedure steps

1 Create one or more software LPTs for the dprsMcsEp feature using one of the following sub-steps:

a. Create a software LPT with the dprsMcsEp feature and a networking interface.

```
set sw lpt/<lpt_name> fl! dprsMcsEp <networking_if>
```

b. Create a software LPT with a feature combination and a networking interface.

```
set sw lpt/<lpt_name> fl! dprsMcsEp
<feature_combination> <networking_if>
```

Some examples of creating the software LPT are:

```
set sw lpt/dprsMcs fl! dprsMcsEp porsApi
set sw lpt/dprsMcsFruniPors fl! dprsMcsEp
frameRelayUni porsApi
```

2 Link the LPT to an LP.

```
set lp/<n> lpt sw lpt/<lpt_name>
```

Variable definitions

Variable	Definition
<feature_combination>	Any supported combination of features from the left of table “Feature combinations” (page 84).
<lpt_name>	Name of the logical processor type. For example, dprsMcs, dprsMcsFruniAtm, or dprsMcsFruniPors.
(Sheet 1 of 2)	

Variable	Definition
<n>	Instance value of the logical processor being provisioned.
<networking_if>	*porsApi*. One of the networking interface values from the right column of table “Feature combinations” (page 84) associated with the feature combination you selected for <feature_combination>.
(Sheet 2 of 2)	

Procedure job aid

Figure 24
Configuring MCS and the networking interface component hierarchy

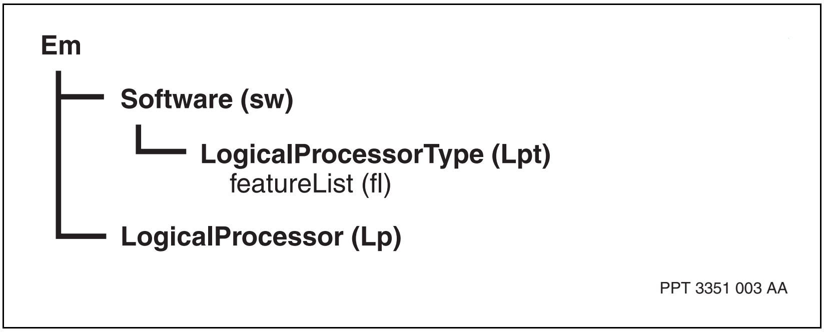


Table 9
Feature combinations

Supported feature combination	Networking interface
atmCore	porsApi
porsTrunks dprsMcsEpIntercept	porsApi

Configuring the MCS manager

Configure the MCS manager in order to create and provision endpoints.

Procedure steps

1. Add the *ARtg* component.

   `add aRtg`

2. Add the *McsMgr* component.

   `add mcsMgr`

3. Optionally, set the maximum number of end points on the module.

   `set mcsMgr mEps <max_eps>`

4. Optionally, set the alarm threshold.

   `set mcsMgr epThresh <threshold>`

5. Optionally, set an override NSAP address.

   `set mcsMgr oNsap <addr>`

6. Optionally, set the security option.

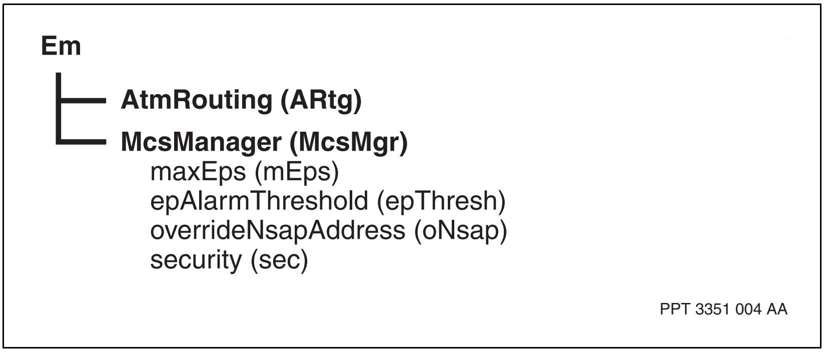
   `set mcsMgr sec on|off`

Variable definitions

Variable	Definition
<addr>	Any valid NSAP address.
<max_eps>	A value between 1 and 16384.
<threshold>	A value between 1 and 16384.

Procedure job aid

Figure 25
Configuring the MCS manager component hierarchy



The MCS manager process is created on each LP on which you provision the dprsMcsEp feature. To provision candidate managers for redundancy, you can do either of the following:

- create one software LPT according to “Configuring MCS and the networking interface” (page 83), and link it to more than one LP
- create two or more software LPTs, and link them to more than one LP

When you provision redundant MCS manager processes, you must ensure that the LPs of the current and candidate managers are similar. For example, they should be similar in terms of memory, CPU utilization, and throughput levels. This practice ensures that a newly-current MCS manager has sufficient resources on the LP to re-establish all the MCS switched paths.

Configuring end points

Configure end points to setup, connect, and release messages that are necessary in either bringing up or releasing a switched path.

Prerequisites

- Configure an MCS manager. See “Configuring the MCS manager” (page 85).
- Determine the bandwidth value of a switched path. For more information, see “Configuring MCS switched path bandwidth” (page 90).

Procedure steps

1. Add a new end point group.

   add mcsMgr dprsMcsEpG/<n>

2. Set the remote address.

   set mcsMgr dprsMcsEpG/<n> addr rAddr <addr>

   Note: For more information on NSAP addressing, see NN10600-702 *Nortel Networks Multiservice Switch 7400/15000/20000 ATM Routing and Signalling Fundamentals*.

3. Add the *Ep* component under the group.

   add mcsMgr dprsMcsEpG/<n> ep/<m>

4. Set the bandwidth for the forward direction (originating to terminating) of the switched path.

   set mcsMgr dprsMcsEpG/<n> ep/<m> EpD fBw <bw>

5. Set the bandwidth for the reverse direction (terminating to originating) of the switched path.

   set mcsMgr dprsMcsEpG/<n> ep/<m> EpD rBw <bw>

6. Set the connection transfer priority.

   set mcsMgr dprsMcsEpG/<n> ep/<m> EpD connTp <tp>

7. Set the transport connection preference.

   set mcsMgr dprsMcsEpG/<n> ep/<m> EpD transConPref <preference>

8 Set the supported transfer priorities.

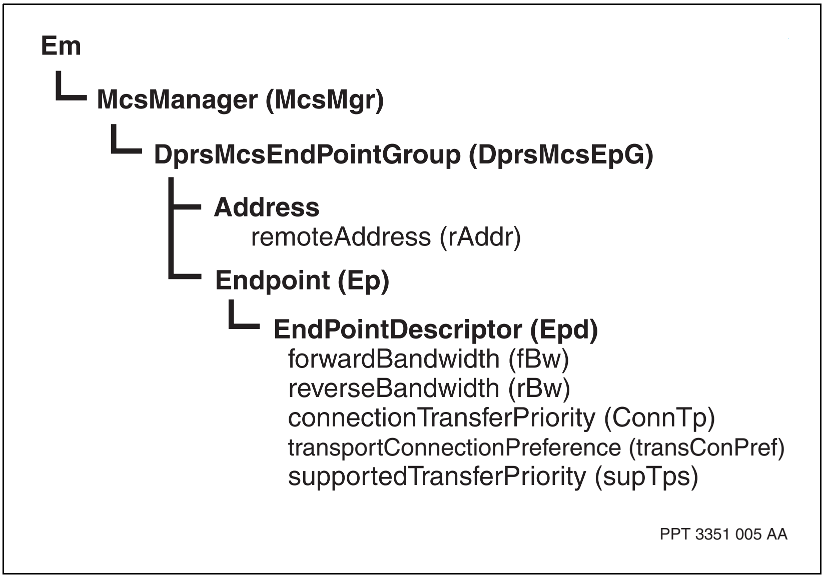
```
set mcsMgr dprsMcsEpG/<n> ep/<m> EpD supTps <tp_list>
```

Variable definitions

Variable	Definition
<addr>	The NSAP address of the remote *McsMgr*. You can determine this NSAP address by looking at the operational NSAP address of the *McsManager* on the destination node.
<bw>	Specified in bits per second in the range of 5600 to 50 000 000 (the default is sameAsForward).
<m>	The endpoint identifier in the range of 1 to 256.
<n>	The group identifier in the range of 1 to 4096.
<preference>	porsOnly
<tp>	The transfer priority in the range of 0 to 15.
<tp_list>	The list of transfer priorities in the range of 0 to 15.

Procedure job aid

Figure 26
Configuring endpoints component hierarchy



Configuring MCS switched path bandwidth

Determine the appropriate amount of bandwidth for the MCS switched path.

Procedure steps

1. Identify the bandwidth needed for each frame relay service connection on the Nortel Networks Multiservice Switch node that will use the MCS switched paths.
2. Group these frame node and TP.
3. Map each of these groups to a provisioned MCS switched path. Sum up the committed information rate (CIR) for each group, taking into account possible over-subscription and future growth. This is the value that you should provision as the bandwidth for the Ep.
4. Repeat these steps for each destination Multiservice Switch node and TP grouping.

Configuring the DPRS MCS agent

Configure a logical processor with a DPRS MCS agent if the frame relay service is not on the same LP as the dprsMcsEp feature (and therefore the MCS manager) and the DLCIs on the LP have a forwarding policy of dprsMcsOnly.

Procedure steps

1 Provision the agent.

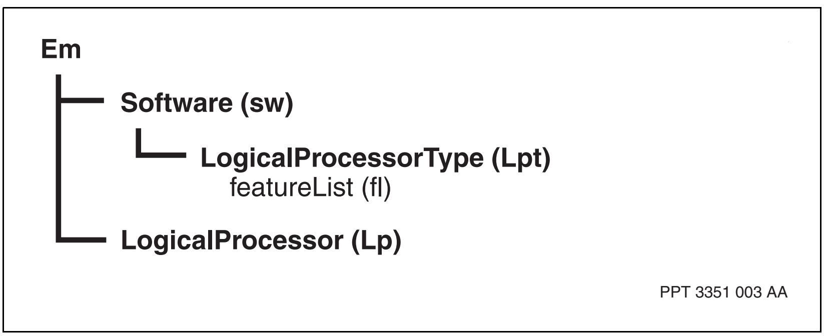
```
set lp/10 lpt sw lpt/<lpt_name> fl! dprsMcsAgent
<fr_feature>
```

Variable definitions

Variable	Definition
<fr_feature>	The frameRelayUni or frameRelayNni.
<lpt_name>	A name of your choice (for example, fruniWithDprsMcsAgent or frnniWithDprsMcsAgent).

Procedure job aid

Figure 27
Configuring the DPRS MCS agent component hierarchy



Configuring the DPRS MCS EP intercept

Configure the DPRS MCS EP intercept on any transport service FP used to terminate a switched path.

Procedure steps

1 Provision the intercept.

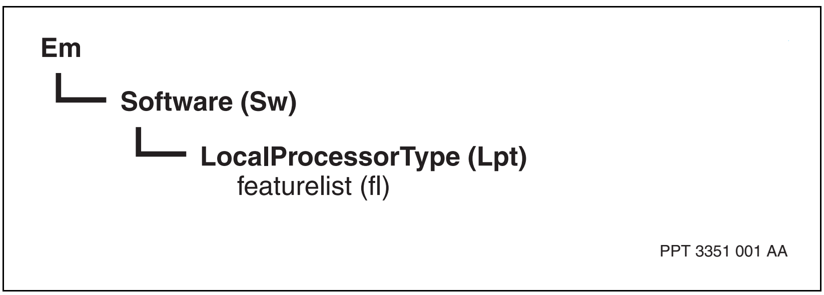
```
set sw lpt/<lpt_name> fl! dprsMcsEpIntercept
<trunk_feature_list>
```

Variable definitions

Variable	Definition
<lpt_name>	Any name of your choice (for example, porsWithIntercept or atmWithIntercept).
<trunk_feature_list>	A list containing the porsTrunks trunking feature.

Procedure job aid

Figure 28
Configuring the DPRS MCS EP intercept component hierarchy



Configuring call admission control

Configure call admission control (CAC) to reject calls when bandwidth reservation exceeds specified levels, or to simply monitor bandwidth.

Procedure steps

1 Add the *Cac* component.

```
add mcsMgr dprsMcsEpG/<n> ep/<m> Cac
```

2 Set the CAC policy for the EP in the forward direction.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fCacP
enforced|monitored
```

3 Set the CAC type for the forward direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fCacT cir|eir
```

4 Set the oversubscription factor for the forward direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fOsFactor
<factor>
```

5 Set the maximum SVC bandwidth for the forward direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fMaxSvcBw
<bw>
```

6 Set the maximum PVC bandwidth for the forward direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fMaxPvcBw
<bw>
```

7 Set the forward-direction alarm thresholds.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd fAlarmThresh
minor|major|critical <threshold>
```

8 Set the CAC policy for the EP in the reverse direction.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rCacPolicy
enforced|monitored
```

9 Set the CAC type for the reverse direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rCacType
cir|eir
```

10 Set the oversubscription factor for the reverse direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rOsFactor
<factor>
```

11 Set the maximum SVC bandwidth for the reverse direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rMaxSvcBw
<bw>
```

12 Set the maximum PVC bandwidth for the reverse direction of the switched path.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rMaxPvcBw
<bw>
```

13 Set the reverse-direction alarm thresholds.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> Cac Cacd rAlarmThresh
minor|major|critical <threshold>
```

Variable definitions

Variable	Definition
<bw>	The bandwidth, specified in bits per second, in the range of 5600 to 50 000 000 (the default is sameAsForward).
<factor>	A decimal value between 0.00 and 100.00 (the default is 1, or no oversubscription, and a value of less than 1 indicates undersubscription).
<m>	The endpoint identifier in the range of 1 to 256.
<n>	The group identifier in the range of 1 to 4096.
<threshold>	The decimal value between 1 and 100 (the default is 0, or disabled).

Procedure job aid

Figure 29
Configuring CAC component hierarchy

- **Em**
  - **McsManager (McsMgr)**
    - **DprsMcsEndPointGroup (DprsMcsEpG)**
      - **EndPoint (Ep)**
        - **CallAdmissionControl (Cac)**
          - **CallAdmissionControlDescriptor (Cacd)**
            forwardCacPolicy (fCacP)
            forwardCacType (fCact)
            forwardOversubFactor (fOsFactor)
            forwardMaximumSvcBw (fMaxSvcBw)
            forwardMaximumPvcBw (fMaxPvcBw)
            forwardAlarmThresholds (fAlarmThresh)
            reverseCacType (rCacType)
            reverseCacOverSub (rOsFactor)
            reverseMaxSvcBw (rMaxSvcBw)
            reverseAlarmThresholds (rAlarmThresh)

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Configuring PORS options

If you set the *transConPref* attribute for the *Ep* component to porsOnly, you can provision the following PORS options:

- PORS profile
- manual path

PORS profile

Since the networking interface uses a standard signaling protocol, the proprietary PORS call setup parameters cannot be signaled through the Setup PDU.

To preserve some of the key PORS features, you can use a PORS profile. A PORS profile specifies call routing options that are applicable to PORS connections. The PORS profile is represented by a provisioned component (*Rtg Pors Profile*). The profile includes many of the attributes usually found in the *Plc* component, such as

- setup and holding priority
- transmit and receive bandwidth
- trunk and traffic types
- cost and delay values

When you provision an MCS connection to use PORS, you should create a profile to suit the connection, and link it to the EP. For information on creating a PORS profile, see NN10600-435 *Nortel Networks Multiservice Switch 7400/15000/20000 Operations: Path-Oriented Routing System*. To link a profile to an MCS connection, see “Configuring a manual path” (page 103).

If you provision MCS over PORS and do not link the EP to a specific profile, the EP is automatically assigned the following default values:

```
setupPriority = 2
holdingPriority = 2
bumpPreference = bumpWhenNecessary
requiredTxBandwidth = 0 bit/s
requiredRxBandwidth = 0 bit/s
requiredTrafficType = data
permittedTrunkTypes = terrestrial satellite tt1 tt2
```

```
tt3 ~tt4 ~tt5 ~tt6
requiredSecurity = 4
requiredCustomerParm = 4
pathAttributeToMinimize = cost
maximumAcceptableCost = 1280
maximumAcceptableDelay = 100000 msec
emissionPriority = sameAsMcsEndPoint
discardPriority = sameAsMcsEndPoint
pathFailureAction = reRoutePath
optimization = enabled
```

Note: Because you have not actually created a profile, it is not possible to display these default values.

Configuring frame relay services over MCS

Provisioning frame relay services over MCS is described in the following topics:

- “Configuring the forwarding policy” (page 99)
- “Configuring ATM class of service” (page 101)

For more information on frame relay, see NN10600-900 *Nortel Networks Multiservice Switch 7400/15000/20000 Frame Relay Technology Fundamentals*.

Configuring the forwarding policy

Configure the forwarding policy to specify the datapath as either DPRS or MCS.

> ***Note:*** If both *Dc* and *Dna* components are provisioned, the value provisioned for *Dc* takes precedence. For more information on the *Dc* and *Dna* components, see NN10600-900 *Nortel Networks Multiservice Switch 7400/15000/20000 Frame Relay Technology Fundamentals*.

Procedure steps

1 Provision the forwarding policy for a frame relay connection:

```
set FrUni|FrNni/<n> dlci/<m> Dc|Dna dPa <forwarding>
```

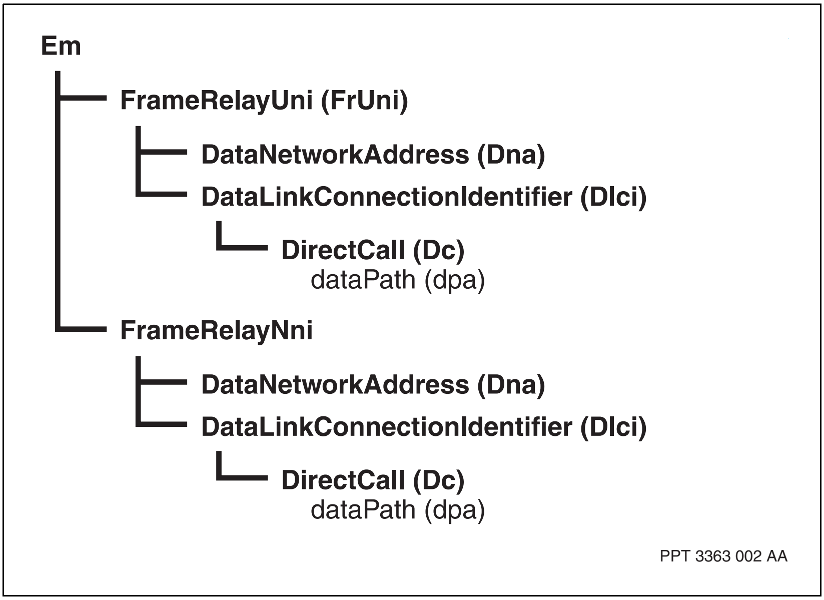
> ***Note:*** If there is a different *dataPath* attribute value provisioned at each end of the switched path, the frame relay call cannot be set up.

Variable definitions

Variable	Definition
<forwarding>	Indicates the forwarding policy as dprsMcsOnly. In order for the frame relay DLCI to use an MCS switched path, dprsMcsOnly must be specified.
<m>	The identifier of the DLCI.
<n>	The identifier of the frame relay interface.

Procedure job aid

Figure 30
Configuring the forwarding policy component hierarchy



Configuring ATM class of service

Configure the ATM class of service to determine the QoS for the MCS switched path. (For information about the mapping of ATM service categories to MPS priorities, see NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.)

The networking interface used to set up MCS connections is based on an ATM model. For this reason, you must specify an ATM service category even when you select the *porsOnly* routing mode. ATM values are according to standard, but PORS values can be changed through the PORS profile.

To provision the mapping, you must:

- add the *Mod Frs AtmNet* component for the TP defined in the *EpD* subcomponent for the *Ep* component
- set the appropriate service category

This procedure shows how to map a TP to an ATM service category.

Procedure steps

1 Add the component.

add mod frs atmNet

The process of adding the component automatically adds the sixteen TP subcomponents.

2 Set the service category for the appropriate TP.

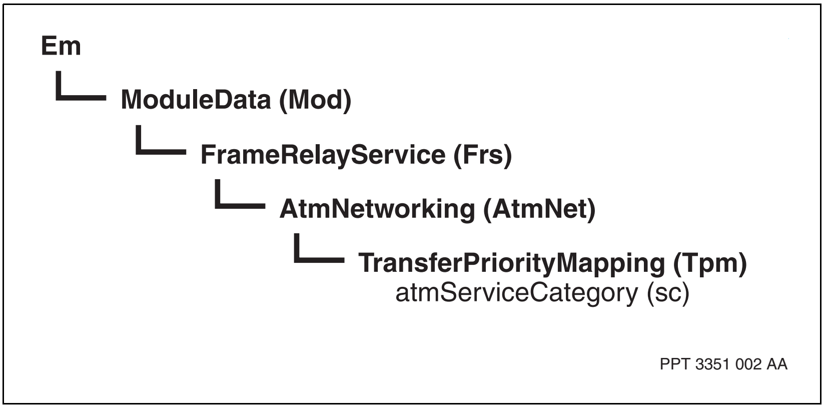
set mod frs atmNet tpm/<tpm> sc <category>

Variable definitions

Variable	Definition
<category>	The cbr, rtvbr, nrtvbr, or ubr.
<tpm>	Value between 0 and 15.

Procedure job aid

Figure 31
Configuring ATM class of service component hierarchy



Configuring a manual path

You may need to provision a manual path under the following conditions:

- when you need to control the path the MCS connection takes through the network
- when the MCS switched path is traversing topology region boundaries

The *ManualPath* component is a provisioned component that contains the specification of the route. This procedure shows how to provision a manual path for the MCS connection. For information on how to create a PORS manual path, see NN10600-435 *Nortel Networks Multiservice Switch 7400/ 15000/20000 Operations: Path-Oriented Routing System*.

Procedure steps

1 Set the PORS profile to be associated with the *Ep*.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> EpD prof rtg pors
porsProfile/<prof>
```

2 Set the manual path for the *Ep* component.

```
set mcsMgr dprsMcsEpG/<n> ep/<m> EpD mpath rtg pors
manualPath/<mp>
```

Variable definitions

Variable	Definition
<m>	The endpoint identifier in the range of 1 to 256.
<mp>	The number of the manual path associated with the endpoint.
<n>	The group identifier in the range of 1 to 4096.
<prof>	The number of the PORS profile associated with the endpoint.

Procedure job aid

Figure 32
Configuring a manual path component hierarchy

- **Em**
  - **McsManager (McsMgr)**
    - **DprsMcsEndPointGroup (DprsMcsEpG)**
      - **EndPoint (Ep)**
        - **EndPointDescriptor (EpD)**
          profile (prof)
          porsManualPath (mpath)

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Chapter 6
Engineering notes

This section provides engineering information for managed cut-through switching (MCS), and includes the following topics:

Engineering considerations

The following considerations may affect the engineering of MCS switched paths:

- Provisioning the DPRS MCS agent on an LP with a frame relay service reduces the supported DLCI limit by 100 for that LP.
- Up to 16 MCS switched paths, one per TP, can be provisioned between two Nortel Networks Multiservice Switch nodes.
- When DPRS MCS CAC is enabled on the FP, 512 frame relay connections are supported on each switched path.
- In a configuration using MCS switched paths, PM2 FPs are recommended for flexibility, extra processing ability, and more flexible memory engineering. The DPRS MCS CAC feature is not recommended for use on a PM1 FP.

- Since a DPRS MCS switched path does not support the same type of routing as DPRS, high reliability does not apply to frame relay connections using a switched path. If the *FrUni* or *FrNni Dna outDefaultPathReliability* attribute is set to *high*, the *FrUni* or *FrNni Dlci vc pathReliability* operational attribute will specify the following value under the following conditions:
  - — if the *FrUni* or *FrNni Dlci Dc dataPath* attribute is set to dprsMcsOnly, the *pathReliability* attribute is always normal
- The FR DLCI ping command does not give accurate results over DPRS MCS. This is because MCS uses the PORS routing system to determine the path and round trip delay, whereas frame relay uses DPRS.
- The MCS manager can be provisioned to run on an LP with no other features. In this configuration, known as a server configuration, network operators can provision up to 512 switched paths on a PM2 FP or 128 switched paths on a PM1 FP. For information on restrictions for the server configuration, see table "Engineering considerations for the server configuration" (page 107). A server configuration, is typically provisioned when
  - — a large number of end points are provisioned, competing for resources (such as memory, CPU, message blocks). Competition with other access or transport services adversely affects the other services.
  - — a spare slot is available.
- To reduce memory utilization on ATM transport FPs, you can specify the expected number of MCS switched paths using the FP. To do this, provision the LP *AtmResourceControl InnConnectionPoolCapacity* attribute to the required number. This attribute controls the number of resources available for switched paths using the LP. The default value for the attribute is 128, and the maximum is 512. For information on feature combinations on FPs, see table "Engineering considerations for feature combinations" (page 108).
- If the *dataPath* attribute for an intranode frame relay PVC or SVC connection is specified as dprsMcsOnly, the connection will not stage.

- The MCS manager can support up to 128 Endpoints with 2000 DLCIs when provisioned on a PM2 Premium or Standard card. However, the MCS manager can only support 32 endpoints with 2000 DLCIs when provisioned (as candidate LP) on an ATM card.
- The PM2 Premium FP supports up to 5000 FrAtm DLCIs (SPVCs). However, if a gateway configuration is used where the FrAtm and FrNni components reside on the same PM2 Premium FP, the limit is 3000 DLCIs.
- The PM1 FP supports up to 60 virtual framer instances and the PM2 FP (standard or premium) supports up to 140 virtual framers on a single card. For example, up to 70 FrNni virtual framers connected to up to 70 FrAtm virtual framer components is supported on a single PM2 Premium FP (70 virtual framers for the FrNni components and 70 virtual framers for the FrAtm components, totalling 140 virtual framers).
- The PQC cards support up to 256 virtual framers on a single FP.

Table “Engineering considerations for the server configuration” (page 107) indicates the engineering restrictions associated with the DprsMcsEp feature provisioned in the server configuration.

Table 10
Engineering considerations for the server configuration

Features on software LPT	Network interface	Processor type	Number of Eps
dprsMcsEp	porsApi	PM1	128
dprsMcsEp	porsApi	PM2	512

Table “Engineering considerations for feature combinations” (page 108) indicates the engineering restrictions associated with provisioning the dprsMcsEp feature with various feature combinations.

Table 11
Engineering considerations for feature combinations

Feature combination	Network interface	Number of Eps	Restriction
frameRelayNni	atmApi	128	100 DLCIs
frameRelayUni	atmApi	128	100 DLCIs
atmCore	porsApi	128	500 VCCs
unack Trunks + porsTrunks	atmApi	128	4 PORS trunks
unackTrunks + porsTrunks + dprsMcsEpIntercept	porsApi	32	4 PORS trunks

Network infrastructure

This section explains the network infrastructure needed to support MCS, and the effect of MCS on existing PORS networks.

Infrastructure for MCS

The ATM and PORS infrastructure must be properly engineered to support the MCS services that will be using their facilities. You must ensure that:

- there are sufficient facilities for the PORS routing system to support all the service categories
- there is sufficient bandwidth available between each source and destination Nortel Networks Multiservice Switch node to support all the MCS switched paths between them

Infrastructure for control and signaling information

To use MCS, all Nortel Networks Multiservice Switch nodes in the network must have at least one Nortel Networks Multiservice Switch trunk to the Multiservice Switch network. This trunk is needed for call setup requests and control traffic. Frame relay services need

- DPRS routing facilities to send control traffic from one module to another in the network
- Multiservice Switch call routers or CSRMs to establish calls

Effects on PORS networks

Using MCS affects PORS networks in the following ways:

- PORS routes traffic using delay and cost parameters, whereas DPRS routing is based on throughput and delay.
- You may need to consider the increase in PORS bandwidth and adjust the *maxReserveableBw* attributes on each Nortel Networks Multiservice Switch trunk accordingly.

Quality of service

To determine the QoS for the MCS switched path, you must map the frame relay transfer priority to the ATM service category. Table "ATM service categories" (page 109) shows the correlation between ATM service categories and the MPS emission priority and discard priority values.

Table 12
ATM service categories

ATM service category	MPS	
	Emission priority	Discard priority
CBR	0	1
rt-VBR	1	1
nrt-VBR	2	2
UBR	2	3

For more information about MPS, see NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.

Chapter 7
Troubleshooting MCS

Maintain and troubleshoot frame relay managed cut-through switching (MCS) to pinpoint the source of any connection problems that may arise after configuring MCS.

The following procedures are included in this chapter:

Displaying connections and reserved bandwidth

Display connections to determine which connections are using a switched path and the bandwidth they reserved.

Procedure steps

1 Display an endpoint connection.

```
l mcsMgr dprsMcsEpG/<n> Ep/<m> con/*
```

2 Display the frame relay DLCI on an endpoint connection and the bandwidth it has reserved.

```
d mcsMgr dprsMcsEpG/<n> Ep/<m> con/*
```

Variable definitions

Variable	Definition
<m>	The endpoint identifier in the range of 1 to 256.
<n>	The group identifier in the range of 1 to 4096.

Procedure job aid

The following command displays the frame relay DLCI on connection 1 and the bandwidth it has reserved:

```
d mcsMgr dprsMcsEpG/1120 Ep/6 con/1
```

```
McsMgr DprsMcsEpG/1120 Ep/6 Con/1
frameRelayDlci = FrUni/1105 Dlci/101
reservedBandwidth = 64000 bit/s
```

Verifying MCS connections

You can use the ping command to check end-to-end connectivity of the MCS control path. The ping command provides a ping between a specified end point and its remote counterpart. For example, the following command checks the connection for Ep3 in group 1:

```
ping mcsMgr dprsMcsEpG/1 ep/3
```

```
Transport Connection to EM/NODER14 McsMgr DprsMcsEpG/
8191 Ep/1 is up.
```

Note: This ping command differs from the DPRS ping command. In the DPRS ping, you specify the destination RID/MID. In the MCS ping, you specify the source end point.

Displaying CAC parameters

The following example shows the operational attributes of the *Cac* component for Ep1 in group 1120:

`d mcsMgr dprsMcsEpG/1120 Ep/1 Cac`

```
McsMgr DprsMcsEpG/1120 Ep/1 Cac
effectiveBandwidth = 512000 bit/s
effectiveBandwidthAvailable = 0 bit/s
overSubscriptionFactor = 1.00
numberOfCallsActive = 20
cacPolicy = monitored
cacType = cir
maximumSvcBandwidth = noMaximum
maximumPvcBandwidth = noMaximum
numberOfCacFailures = 0
lastFailedFrDlci =
lastFailedReason = none
alarmThreshold = minor : 0
                 major : 0
                 critical : 0
```

Verifying round trip delay over PORS

The following example obtains round trip delay on an MCS switched path routed over PORS:

`d mcsMgr dprsMcsEpG/1 ep/1 lco`

```
state = pathUp
path = "EM/NODERD Trk/30 LCh/6","EM/NODER14 McsMgr
DprsMcsEpG/8191 Ep/1"
overrideRemoteName =
end = calling
costMetric = 128
delayMetric = 0 msec
roundTripDelay = 1 msec
setupPriority = 2
bumpPreference = bumpWhenNecessary
holdingPriority = 2
```

```
requiredTxBandwidth = 55680 bit/s
requiredRxBandwidth = 55680 bit/s
requiredTrafficType = data
permittedTrunkTypes = terrestrial satellite tt1 tt2
tt3 ~tt4 ~tt5 ~tt6
requiredSecurity = 4
requiredCustomerParameter = 4
emissionPriority = 1
discardPriority = 1
pathType = normalRetryCount  = 1
pathFailureCount = 0
reasonForNoRoute = one
lastTearDownReason = none
pathFailureAction = reRoutePath
optimization = enabled
pathUpDateTime = 1980-04-17 18:15:39.69 pktsToNetwork
= 2
bytesToNetwork = 55
pktsFromNetwork = 2
bytesFromNetwork = 55
```

Locking an end point

Lock an endpoint to clear the switched path.

Procedure steps

1 Lock an endpoint.

```
lock mcsMgr dprsMcsEpG/<n> ep/<m>
```

If you lock the terminating end point, the end point is deleted and the originating end point will re-establish the call. If you lock the originating end point, the call is released. In this case, the call will be re-established only when the end point is unlocked with the unlock command.

> ***Note:*** Locking the terminating end point can bring the connection up and down so quickly that it appears that the lock operation has not worked. Verify that the setup attempts on the originating side are increasing.

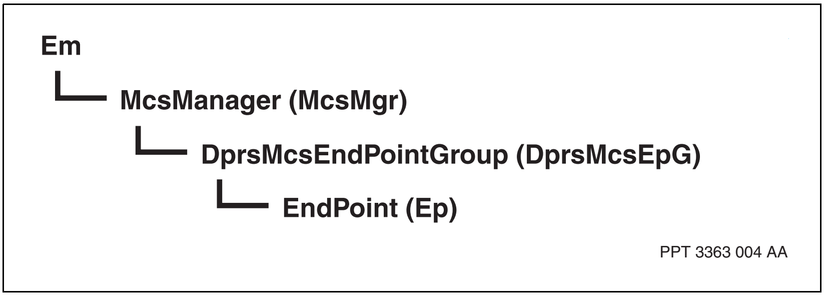
If the two switched paths in a group are provisioned with the same supported TP, only one path (the one with the highest numerical NSAP prefix) is activated. If you lock the activated switched path, the other switched path with that TP will be activated.

Variable definitions

Variable	Definition
<m>	The endpoint identifier in the range of 1 to 256.
<n>	The group identifier in the range of 1 to 4096.

Procedure job aid

Figure 33
Locking an endpoint component hierarchy



Statistics

MCS provides receive statistics for traffic arriving on the Nortel Networks Multiservice Switch node through the switched path. Table “Receive statistics” (page 116) describes these statistics.

Table 13
Receive statistics

Statistic	Description
Packets from MCS	The number of packets received on the switched path for each level of service discard priority (DP0, DP1, DP2, DP3).
Octets from MCS	The number of octets received on the switched path for each level of service discard priority (DP0, DP1, DP2, DP3).
Packets discarded	The number of packets that have been discarded at the transport FP due to congestion at the access FP. This value is also reported by level of service discard priority (DP0, DP1, DP2, DP3).
Errored packets discarded	The number of errored frames (per switched path) that could not be forwarded.

Redundancy and failure

This section describes the redundancy and failure-handling aspects of MCS.

MCS manager redundancy

It is recommended that you provision redundancy for MCS managers. You should have at least two MCS managers, or ensure that there is FP sparing for the LP that is provisioned with the MCS manager. See “Configuring the MCS manager” (page 85)).

FP or CP failure

The effect of processor failure on an MCS switched path depends on which processor is involved. Table “CP or FP failure” (page 117) describes the actions that occur when a CP or FP fails.

Table 14
CP or FP failure

Failed processor	Action
CP	MCS has full support for CP switchover. It is not affected by a CP failure. No new call setup attempts can be made while the CP is unavailable.
Service FP	If the frame relay service FP fails, there is no effect on any MCS switched path.
Transport FP	If there is a failure on an MCS transport FP, all switched paths using that FP are released. The MCS manager then dynamically re-establishes each switched path.
McsMgr FP	If the FP containing the current MCS manager fails, all switched paths are released. One of the candidate MCS manager becomes active and begins re-establishing the switched paths.

Link failure in the network

When there is a network failure, such as a failed Nortel Networks Multiservice Switch node or trunk, the affected MCS switched paths are released. The MCS manager then attempts to re-establish the switched path dynamically for each originating end point.

Alarms

Alarms are the messages used to indicate faults or failure conditions on the node. They contain a large amount of information, which assists you in monitoring the network.

Causes of alarms

For MCS, the causes of alarms include

- incorrect provisioning of MCS
- lack of MCS resources
- MCS manager failure with no alternative MCS manager
- exceeding the maximum number of end points specified, or exceeding the end point alarm threshold

MCS alarms

The alarms associated with MCS are

- 7053 0000, 7053 0002, 7053 0007, 7053 0008, and MCS manager alarms
- 7053 0003 to 7053 0005, end point alarms
- 7053 0300 to 7053 0302, MCS agent alarms
- 7053 0402 to 7053 0406, CAC alarms

For more information on individual alarms, see NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*.

Troubleshooting

Table “Troubleshooting” (page 119) provides guidelines on how to respond to problems that may occur when you are using MCS. The table lists the problem, the probable cause (if applicable), and the corrective action to take.

Table 15
Troubleshooting

Problem	Probable cause	Corrective action
MCS manager problems:		
I cannot add the *McsMgr* component.	The dprsMcsEp feature may not be provisioned on one or more LPTs that have been assigned to an LP.	Ensure that the feature is provisioned and that provisioning has been activated.
The *McsMgr* component remains in the unlocked, disabled, idle, depend state.	The LPs on which the dprsMcsEp feature has been provisioned are disabled.	Ensure that the LPs are in the unlocked, enabled, active state.
End point problems:		

How do I know that the DPRS MCS switched path is up?		Verify that a display on the *Ep* component shows that it is in the unlocked, enabled, busy state. For example:
		`display mcs dprsMcsEpG/x ep/y`
		Do a ping operation on the switched path using the following command:
		`ping mcs dprsMcsEpG/x ep/y`

Using DPRS MCS over ATM, how do I get a switched path to use a new, better route that has become available?		Lock and unlock the *Ep* component to force it to re-establish the connection. For example:
		`lock mcs dprsMcsEpG/x ep/y`
		`unlock mcs dprsMcsEpG/x ep/y`
		Note: These commands will interrupt data traffic using the switched path.

(Sheet 1 of 7)		

Table 15 (continued)
Troubleshooting

<table>
<tr><th>Problem</th><th>Probable cause</th><th>Corrective action</th></tr>
<tr><td>I have changed the ATM service category under the Mod Frs AtmNet Tpm component, but the Ep component does not reflect the new service category.</td><td>The new service category is not picked up until the Ep component re-establishes the connection.</td><td>To force the Ep component to use the new service category, issue a lock and unlock sequence. For example:
<code>lock mcs dprsMcsEpG/x ep/y</code>
<code>unlock mcs dprsMcsEpG/x ep/y</code>

Note: These commands will interrupt data traffic using the switched path.</td></tr>
<tr><td>A provisioned Ep component is not coming up.</td><td>There are two possible causes:
a collision condition, in which a dynamic Ep component already exists at the remote node for this transfer priority
the transport resources for the call are not available</td><td>To determine whether a collision condition exists, issue a display command on the containing provisioned group and check the associatedEpGroupName attribute to determine if there is an associated dynamic group. If there is, display the individual end points in the dynamic group to determine whether there is a supported transfer priority overlap. If so, the provisioned Ep component has a lower node calling address, and will not come up until the other switched path is disabled. The disabled Ep component will continue to attempt to set up the call at intervals of one minute.

To determine whether resources are available
check that the DPRS MCS EP intercept feature has been provisioned on all the transport cards at the source and destination nodes
check that a transport path exists between the source and destination nodes
check that the transport connection (trunk of AtmIf component) has enough bandwidth to accommodate the call</td></tr>
<tr><td colspan="3">(Sheet 2 of 7)</td></tr>
</table>

Table 15 (continued)
Troubleshooting

Problem	Probable cause	Corrective action
None of the end points in a *DprsMcsEpG* component are coming up.	There are three possible causes: • the provisioned remote NSAP address may be invalid, or the address may have changed at the remote end • the transport resources for the call are not available • there is a transmission problem	To determine whether the address is the cause • verify that the remote NSAP address specified under the address subcomponent of the group is the valid NSAP address of an *McsMgr* component on the destination node • check whether an override NSAP address has been added, changed, or removed for the remote *McsMgr* component To check transport resources • verify that the transport resources are available from end to end (there may be resource contention on this node or in the network that leads to race conditions when set requests are attempted) • check whether this node or another node in the network now has added functionality that has increased contention for resources To check for a transmission problem, verify the last *transportConnectionClearCause* attribute. Table “Clear causes and reasons” (page 126) lists the clear causes and the possible reasons for them.
(Sheet 3 of 7)		

Table 15 (continued)
Troubleshooting

Problem	Probable cause	Corrective action
Switched path connections over PORS are not coming up.	There are three possible causes: • the porsApi is not provisioned on the current *McsMgr* LP • there are insufficient PORS resources to support all the PORS connections • the default PORS profile has some values that must be changed	Provision the porsApi on the LP of the current *McsMgr* component. Ensure that there are enough resources for the PORS connections. Ensure that the values in the PORS profile or the default PORS profile (when you are not specifying a profile) are valid in your environment. (See “PORS profile” (page 96).) For example, the traffic type in the default profile is data. Ensure that the data traffic type is supported on the links or that you provide a profile with the appropriate traffic type.
(Sheet 4 of 7)		

Table 15 (continued)
Troubleshooting

Problem	Probable cause	Corrective action
Frame relay and DPRS MCS agent problems:		

How do I know if the frame relay traffic is going over the switched path?		Display the VC of the DLCI and check the *dataPath* attribute for dprsMcsOnly. For example:
		`d fruni/x dlci/y vc`
		
		Display the VC of the DLCI and check the *Ep* component attribute. If the *dataPath* attribute is dprsMcsOnly and the MCS switched path is up, this command will display an *Ep* component name.
		
		Check the statistics:
		
		Display the remote *Ep* component statistics to determine whether traffic is being received on the switched path. For example:
		`d mcs d/n e/n statistics`
		
		For PORS connections, determine the trunk logical channel that the switched path is using by displaying the *LCo* subcomponent. For example:
		`d mcs d/n e/n lco`
		
		For an ATM trunk, display the *Trk* logical channel and check the *localConnection* attribute to determine the ATM VCC. You can display the ATM VCC statistics for the source and destination nodes.

The frame relay connection is provisioned to use dprsMcsOnly, but the VC indicates that the DPRS routing system is being used.	Unless both ends of the frame relay connection match (both set to dprsMcsOnly), the default behavior is to fall back to DPRS forwarding.	Ensure that the frame relay *dataPath* attributes are the same at both ends of the connection. See “Configuring frame relay services over MCS” (page 98). If the VC is not in data transfer mode, the connection always indicates DPRS forwarding. After the VC becomes active, the connection shows MCS forwarding.
(Sheet 5 of 7)		

Table 15 (continued)
Troubleshooting

Problem	Probable cause	Corrective action
The frame relay connection is going down about every minute.	The switched path is going up and down, causing the frame relay probes to fail. This process in turn causes the frame relay connection to go down.	There is a problem somewhere in the network causing this reaction. You need to determine what the network problem is.
The *Ep* component is established but the data is not getting through.		Verify that the frame relay DLCI DC is in data transfer mode and stays that way for more than one minute without going down. Ensure that the frame relay VC *dataPath* attribute is set to dprsMcsOnly. Ensure that the DPRS MCS agent is provisioned on every LP that has connections using DPRS MCS.
Traffic is being discarded, but the end point does not indicate any discards.	Discards can occur in three places: • during the send operation from the service FP to the transport FP • during transmission through the network • during transmission from the transport FP to the service FP at the destination	Statistics are only kept at the destination transport FP. So discards that occur at the originating side or through the network are not reflected in these statistics. In this case, the third possibility is not the answer, as the statistics are not being incremented. To check for the first possibility, verify the shared message block and bus congestion levels on the transport FP on the originating node. To check for the second possibility, verify the congestion levels of the path through the network.
Why is the frame relay ping command giving me the wrong information?	The frame relay connection uses the DPRS routing system to determine the path and round trip delay, whereas MCS uses the PORS routing system.	Use the MCS ping command or the display command to determine the information. (See “Verifying MCS connections” (page 112) and “Verifying round trip delay over PORS” (page 113).)
(Sheet 6 of 7)		

Table 15 (continued)
Troubleshooting

Problem	Probable cause	Corrective action
I have provisioned CAC and my DLCI does not come up.	CAC policy is set to enforced and some of the CAC attributes are not being met.	Check the *lastFailedReason* under the CAC subcomponent. The CAC may fail due to any of the following reasons: • there is no more bandwidth available in either the forward or reverse direction of the frame relay connection. In this case, increase the available bandwidth by increasing the bandwidth of the EP or the oversubscription factor. • the frame relay connection may be requesting more bandwidth than allowed for the specific type of connection. In this case, increase the maximumSvcBandwidth or maximumPvcBandwidth attribute. • There may be more than the maximum of 512 connections on the EP. An alternative solution is to set the CAC policy to monitored so that no CAC requests are rejected.
(Sheet 7 of 7)		

Table "Clear causes and reasons" (page 126) lists the clear causes associated with failures to establish an MCS connection. The causes are stored in the last *transportConnectionClearCause* attribute.

> ***Note:*** The causes listed in Table "Clear causes and reasons" (page 126) are those causes returned by the MCS software. Other causes may be returned by the networking layer (PORS). For information about ATM related cause codes not listed in this table, see NN10600-715 *Nortel Networks Multiservice Switch 7400/15000/20000 ATM Fault and Performance Management*

Table 16
Clear causes and reasons

Cause	Cause value	Possible reasons
3	No route to destination	• there is no trunk or route available to the destination • there is not enough bandwidth on the PORS trunk to accommodate the call • the PORS profile attributes are not met by the existing PORS trunks • there is an error on creating the intercept on the transport FP for PORS connections • the provisioned NSAP address does not match the NSAP address of the remote *McsMgr*
16	Normal call clear	The remote *Ep* component is locked.
17	User busy	This cause indicates a software error condition, as it appears that a connection for the source and destination *Ep* pair already exists. Contact your next level of support.
21	Call rejected	• the *security* option is on and the remote node does not have a locally-provisioned group with the NSAP address of the originating node • the remote node is at or above the maximum number of end points specified for the *McsMgr* component, and is not accepting new calls
(Sheet 1 of 3)		

Table 16 (continued)
Clear causes and reasons

Cause	Cause value	Possible reasons
37	Cell rate unavailable	There is not enough bandwidth at the ATM interface to accommodate nrt-VBR, rt-VBR, and CBR calls.
41	Temporary failure	• the *McsMgr* component at the remote end is not ready to receive a setup request
47	Resources unavailable	• there are no free dynamic group numbers at the remote end • there is no room for any more end points under the dynamic group at the remote end • there are insufficient resources to add this dynamic end point at the remote end • the intercept feature is not provisioned on the transport FP at the source or destination node • the porsApi feature is not provisioned on the *McsMgr* component FP at the source node • PORS cannot find the manual path specified in the *Rtg Pors Mpath* component associated with the MCS end point
73	Traffic parameters unsupported	This cause indicates a software error condition. The combination of traffic parameters specified in the IEs is not valid.
96	IE missing	The IE is not properly formatted. Contact your next level of support.
(Sheet 2 of 3)		

Table 16 (continued)
Clear causes and reasons

Cause	Cause value	Possible reasons
97	Message type not implemented	The IE is not properly formatted. Contact your next level of support.
102	Timer recovery	• the porsApi feature is not provisioned on the *McsMgr* component LP at the remote node, and the source *Ep* component specifies a *transConPref* attribute of porsOnly
(1000)	Cause not provided	The underlying network interface has not provided a cause for the connection clearance.
(Sheet 3 of 3)		

Nortel Networks Multiservice Switch 7400

Operations: Frame Relay Managed Cut-through Switching

Release Release 6.1

Publication: NN10600-440
Document status: Standard
Document version: 6.1S1
Document date: August 2004
Printed in Canada

NORTEL NETWORKS