

>THIS IS **THE WAY**

>THIS IS **NORTEL**

Nortel Multiservice Switch 7400/15000/20000

# Operations: Call Server

---

NN10600-405

Document status: Standard  
Document issue: 7.1S1  
Document date: October 2005  
Product release: PCR7.1 and up  
Job function: Operations  
Type: NTP  
Language type: U.S. English

Copyright © 2005 Nortel.  
All Rights Reserved.

NORTEL, the globemark design, and the NORTEL corporate logo are trademarks of Nortel.



---

# Contents

---

<b>What's new</b>	<b>5</b>
<b>Call server configuration</b>	<b>6</b>
Configuring the call-router source link	8
Configuring a call server in a Multiservice Switch-only frame relay network	10
Migrating from interworking with DPN-100 to Multiservice Switch-only network	11
Migrating from a Multiservice Switch node-only network to interworking with DPN-100	12
Monitoring call server operation	13
<b>Troubleshooting</b>	<b>14</b>
The troubleshooting process	14
Common problems and corrective actions	15
<b>Multiservice Switch call-routing services</b>	<b>17</b>
Call-routing services overview	17
What is a Multiservice Switch subnet?	17
What are the call-routing services?	18
What is a prefix DNA?	18
What are the benefits?	19
How are they deployed?	19
How are they used with the IP interface over Frame Relay?	20
How are they used with Voice Networking?	20
Characteristics and limitations	20
How to use the call server	20
If you are migrating from an interworked DPN-100 and Multiservice Switch network	21
If you are not migrating from an interworked network	21
Provision the call routers	21
Considerations and recommendations for installing and provisioning the call server	21
Address recommendations	22
Memory impacts	22
DNA lengths	22
RID subnet considerations	22



Routing aspects of the call server	24
Multiservice Switch–connection address–resolution system	24
Call-packet routing	25
Prefix DNAs and RID/MID mapping	25
RID retry	26
Typical operation of the call server	27

---

<b>Compliances</b>	<b>35</b>
--------------------	-----------

---

<b>Address plans</b>	<b>36</b>
----------------------	-----------

Address definition	36
X.121 definition	36
E.164 definition	37
Multiservice Switch node-based address translation	37
X.121 and E.164 address translation	38
Addressing plan strategies	39
Address plan example (two-node network)	39

---

<b>Procedure conventions</b>	<b>41</b>
------------------------------	-----------

Operational mode	41
Provisioning mode	42
Activating configuration changes	42



---

## What's new

---

There were no new features added to this document.

---

**Attention:** To ensure that you are using the most current version of an NTP, check the current NTP list in NN10600-000 *Nortel Multiservice Switch 7400/15000/20000 What's New*.

---



---

## Call server configuration

---

Configure Nortel Multiservice Switch call-routing services to translate DNAs to routable addresses.

Nortel Multiservice Switch Call Server supports the following DNA based services:

- Frame Relay
- Internet Protocol (IP) interface over Frame Relay or IPIFR

### Prerequisites to call server configuration

- Familiarity with Nortel Multiservice Switch call server concepts. See [Multiservice Switch call-routing services \(page 17\)](#).
- Base software and call server software installed using the procedures in NN10600-270 *Nortel Multiservice Switch 7400/15000/20000 Software Installation*.
- Completion of basic configuration at the node level (such as port, card, and LP configuration). Use the task flows and procedures in NN10600-550 *Nortel Multiservice Switch 7400/15000/20000 Common Configuration Procedures* if you require supporting information or need to provision or reconfigure any switch or nodal elements.

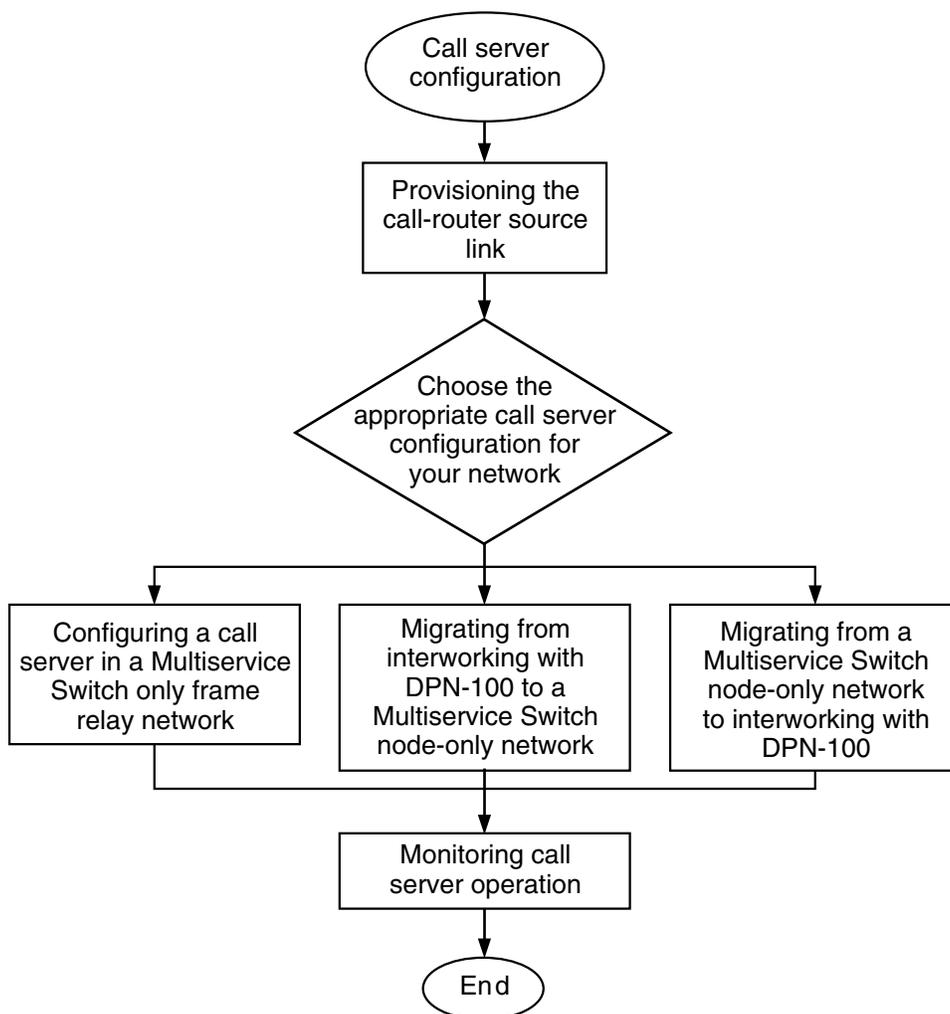
### Call server configuration procedures

This task flow shows you the sequence of procedures you perform to configure the call server. To link to any procedure, go to [Call server configuration procedure navigation \(page 7\)](#).



---

## Call server configuration procedures



MSS 3452 001 AA

### Call server configuration procedure navigation

- [Configuring the call-router source link \(page 8\)](#)
- [Configuring a call server in a Multiservice Switch-only frame relay network \(page 10\)](#)
- [Migrating from interworking with DPN-100 to Multiservice Switch-only network \(page 11\)](#)
- [Migrating from a Multiservice Switch node-only network to interworking with DPN-100 \(page 12\)](#)
- [Monitoring call server operation \(page 13\)](#)



## Configuring the call-router source link

Configure the call-router source link for every Nortel Multiservice Switch node in the network with a *CallRouter (CR)* component. Apply the same provisioning data to every *CR* component in the Multiservice Switch subnet. If a call server resource module (CSRM) is connected to the Multiservice Switch network, the CSRM provides the call routing services and the *CR* component becomes dormant.

### Procedure steps

Step	Action
1	Add a <i>CallRouter</i> component. <b>add CallRouter</b>
2	Add a numbering plan to the <i>CallRouter</i> component. <b>add CR Npi/&lt;num_plan&gt;</b>
3	Add a prefix Data Network Address (DNA) to the numbering plan. <b>add CR Npi/&lt;num_plan&gt; Dna/&lt;prefix_DNA&gt;</b>
4	Set the <i>moduleId</i> attribute value for each DNA. <b>set CR Npi/&lt;num_plan&gt; Dna/&lt;prefix_DNA&gt; moduleId &lt;mod_value&gt;</b>
5	Perform a semantic check to ensure consistency across all components and their data. <b>check prov</b>
6	Save the new view. <b>save prov</b>
7	Use the activate prov command to propagate the editing view throughout the node. <b>activate prov</b>  Using the activate prov command causes the editing view to become the current view.
8	Use the confirm prov command to ensure that connectivity to the operator has been maintained. <b>confirm prov</b>

	<p><b>CAUTION</b> <b>Confirmation of provisioning is mandatory</b> If you do not confirm the provisioning at this point, an automatic rollback will occur. This means the node will restart using the last committed view saved on disk.</p>
---	--



9 Commit the provisioning.

**commit prov**

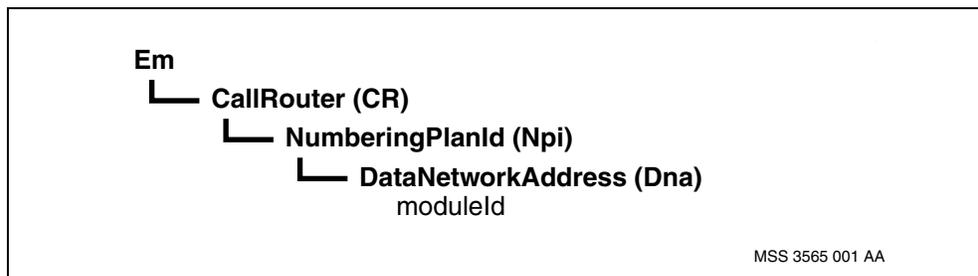
**--End--**

### Variable definitions

Variable	Value
<mod_value>	is the value of the module identifier to which the DNA maps.
<num_plan>	is the numbering plan to the CR. You can add either the X121 or E164 numbering plans to the CR, or both.
<prefix_DNA>	is the instance value of the prefix-DNA in the numbering plan. The value must be 1 to 15 digits, each of which can be a value of 0 through 9, or a wildcard (for example, 3021842300).

### Procedure job aid

#### Call-router source link component hierarchy





---

## Configuring a call server in a Multiservice Switch-only frame relay network

Configure a call server in a Multiservice Switch-only frame relay network.

### Procedure steps

---

Step	Action
1	Add the call-server feature to the control processor (CP).
2	Add the <i>CallRouter (CR)</i> component to each of the nodes.
3	Configure the <i>NumberingPlanId (Npi)</i> subcomponent of the <i>CR</i> component.
4	For each node, configure the prefix DNAs in the <i>CR</i> component. The provisioned data for the <i>CR</i> component must be the same on every node in the subnet.

---

--End--

---



---

## Migrating from interworking with DPN-100 to Multiservice Switch-only network

Migrate from interworking with DPN-100 to a Multiservice Switch node-only network.

### Prerequisites

- Ensure that IPIFR has been provisioned and is operating on each node.

### Procedure steps

---

Step	Action
1	Add the call-server feature to each Multiservice Switch node.
2	Add the <i>CallRouter (CR)</i> component to each of the Multiservice Switch nodes.
3	Add the <i>Npi</i> subcomponent of the <i>CR</i> component.
4	For each Multiservice Switch node, provision the prefix DNAs in the <i>CR</i> component. The provisioned data for the <i>CR</i> component must be the same on every Multiservice Switch node in the subnet.
5	Disconnect the call server resource module (CSRM) from the Multiservice Switch subnet.

---

--End--

---



---

## Migrating from a Multiservice Switch node-only network to interworking with DPN-100

Migrate from a Multiservice Switch node-only network to interworking with DPN-100.

### Procedure steps

---

Step	Action
1	If you have interconnecting subnets, add prefix DNAs (which map to RID, but not MID) provisioned in the <i>CR</i> component to the source call router (SCR) of the CSRM, replacing the MIDs with the RID of the Multiservice Switch subnet.
2	If you do not have interconnecting subnets, add all the prefix DNAs provisioned in the <i>CR</i> component to the SCR of the CSRM replacing the MIDs with the RID of the Multiservice Switch subnet.
3	Connect the CSRM to the Multiservice Switch-only network.
4	Delete the <i>CR</i> component from each Multiservice Switch node.

---

--End--

---



---

## Monitoring call server operation

Monitor call server operation to determine whether the call server feature is operating within expected parameters.

### Procedure steps

---

Step	Action
1	List all DNAs in the CR in the X.121 numbering plan. <code>list CR Npi/X121</code>
2	Display the provisioned attributes for a DNA in the X.121 numbering plan. <code>display -p CR Npi/X121 dna/&lt;x&gt;</code>
3	Display the CR statistics for the X.121 numbering plan. <code>display CR Npi/X121</code>

---

--End--

---

### Variable definitions

Variable	Value
<x>	is the DNA identifier.



---

# Troubleshooting

---

Troubleshoot any problems that occur after the call server nodes in Nortel Multiservice Switch-only Frame Relay networks are operational.

This section describes common problems, probable causes, and corrective measures. Such problems include:

- failure of call setup
- call server provisioning failure
- problems in adding prefix DNAs
- memory exhaustion

## Navigation

- [The troubleshooting process \(page 14\)](#)
- [Common problems and corrective actions \(page 15\)](#)

## The troubleshooting process

The objective of effective troubleshooting is to identify the problem quickly, isolate the cause, and resolve the fault as quickly as possible in order to avoid disruption in service or loss of data.

The following flowchart lists the three main steps to troubleshooting.

1 Identify the problem.

An alarm will usually indicate which component has failed. Another indicator might be a change in throughput. When the problem has been identified, refer to the procedures described in [Common problems and corrective actions summary table \(page 15\)](#).

2 Determine the cause.

Determine the cause by using the procedures described in [Common problems and corrective actions summary table \(page 15\)](#).



3 Resolve the problem.

Refer to the “Corrective measures” column in the appropriate table described in [Common problems and corrective actions summary table \(page 15\)](#).

Subsequent sections in this chapter identify the most common problems encountered when operating Nortel Multiservice Switch nodes.

### Common problems and corrective actions

[Common problems and corrective actions summary table \(page 15\)](#) provides guidelines on how to respond to problems that may occur when you are using this feature. The first column describes the problem, the second column provides a probable cause for that problem, and the third column explains how to correct the problem.

**Attention:** Problems that occur when your service is up and running may not be confined only to the *CallRouter* component.

#### Common problems and corrective actions summary table

Problems that may occur	Probable causes	Corrective measures
Call fails to set up	The CR is not provisioned on the node of the master end.	Provision the CR.
	There is no prefix DNA that matches the slave (destination) DNA.	Provision a prefix for it on the CR.
	The prefix DNA that matches the destination DNA is not mapped to the correct MID.	Provision a longer prefix for the DNA or check that the FR DNA on the destination side is correct.
Call fails to set up	The CSRM is still connected and does not have your prefix. (Multiservice Switch 7400 nodes only)	<p>If you are not interworking with DPN-100, check first for the <i>CallRouter</i> components on the Multiservice Switch nodes and then disconnect the CSRM.</p> <p>If you are interworking with DPN-100, add the prefixes to SCR of CSRM. (For details, see NTP NN10600-450 <i>Nortel Multiservice Switch 7400: Operations: DPN-100 Interworking</i>.)</p>
(1 of 2)		



**Common problems and corrective actions summary table (continued)**

Problems that may occur	Probable causes	Corrective measures
	You cannot route to the destination.	Use the ping command to see if the destination node is reachable. (For details, see NTP NN10600-050 <i>Nortel Multiservice Switch 7400/15000/20000 Command Reference</i> .) If the node is not reachable, check for congestion or a lack of connection.
Cannot provision the call server	PVC provisioning data is not accurate. (DNAs are not provisioned correctly.)	Check destination DNAs of master end for correct provisioning.
	Networking is not in the list of software available.	Add networking.
	The call server feature not added to CP or added but not activated.	Add the feature, if necessary, and then activate it.
Problems in adding prefix DNAs	You are not using the appropriate version (1.3) of the software.	Upgrade the software version.
	Insufficient memory.	Review memory considerations for this feature and add memory to the CP if necessary. (Refer to <a href="#">Memory impacts (page 22)</a> .) The maximum number of prefixes which you can add depends on how much memory is available.
Problems in adding prefix DNAs	The prefix you are trying to add has already been provisioned by wildcard.	Choose a different prefix to provision.
	You have exceeded the maximum length provisioned in the <i>Mod Vcs</i> component.	Change the maximum length in the mod VCS component or provision a shorter prefix.
Memory exhaustion	The engineering guidelines may not have been followed exactly.	Review the engineering guidelines and make sure that you have followed them exactly as directed. Refer to <a href="#">Considerations and recommendations for installing and provisioning the call server (page 21)</a> .
(2 of 2)		



---

# Multiservice Switch call-routing services

---

This section provides conceptual information about the Nortel Multiservice Switch node call-routing services.

## Navigation

- [Call-routing services overview \(page 17\)](#)
- [How to use the call server \(page 20\)](#)
- [Considerations and recommendations for installing and provisioning the call server \(page 21\)](#)
- [Routing aspects of the call server \(page 24\)](#)

## Call-routing services overview

This overview introduces the call-routing services for nodes in Nortel Multiservice Switch-only networks, defining Multiservice Switch subnets and prefixes for data network addresses (DNA). This section answers the following questions:

- [What is a Multiservice Switch subnet?](#)
- [What is a prefix DNA?](#)
- [What are the call-routing services?](#)
- [What are the benefits?](#)
- [How are they deployed?](#)
- [How are they used with the IP interface over Frame Relay?](#)
- [How are they used with Voice Networking?](#)
- [Characteristics and limitations](#)

### What is a Multiservice Switch subnet?

When a stand-alone Nortel Multiservice Switch network has its own routing identifier (RID) it is referred to as a subnet. Each Multiservice Switch node in the subnet has its own module identifier (MID), which must be unique within



the RID.A Multiservice Switch subnet is defined as a group of interconnecting Multiservice Switch nodes, which share the same RID. You may have multiple subnets interconnecting in the network.

### **What are the call-routing services?**

The initial release of Nortel Multiservice Switch networks required call-routing and network features from designated DPN-100 resource modules (RM). Specific RMs were designated as the call server resource modules (CSRM) for Multiservice Switch subnets and provisioned accordingly. (See NN10600-450 *Nortel Multiservice Switch 7400: Operations: DPN-100 Interworking* for details.)

Now, the basic call-routing services in a Multiservice Switch node-only network remove the need for an attached CSRM. As a result, you need to manage only one node, the Multiservice Switch node, instead of two. You do not have to manage a DPN-100 module. Multiservice Switch node's call-routing services translate the DNA to a routable address.

Two advanced services related to call routing are call redirection and hunt groups.

A call redirection server (CRS) provides call redirection for DPRS services, such as frame relay, in Multiservice Switch node-only networks. Call redirection servers direct failed call attempts to alternative destinations. A CRS improves the frame relay service's availability by redirecting a call attempt that would otherwise fail when the destination cannot be reached. The RID redirection capability of the CRS can be used for splitting a large RID subnet into smaller RID subnets. For more information on call redirection, see NN10600-410 *Nortel Multiservice Switch 7400/15000/20000 Operations: Call Redirection Server*.

A hunt group is a single data network address (DNA) that represents a group of service DNAs. When users call the DNA assigned to the hunt group, the server forwards the call to one of the hunt group members. For more information on hunt groups, see NN10600-415 *Nortel Multiservice Switch 7400/15000/20000 Operations: Hunt Group Server*.

Multiservice Switch node call-routing services do not provide call-routing services for any DPN-100 module that is connected to the Multiservice Switch network.

### **What is a prefix DNA?**

A data network address (DNA) is made up of many digits. The total length of the DNA depends on the address plan selected and the provisioning of the maximum length in the module-wide virtual-circuit system (*Mod Vcs*) component.



The prefix DNA is a set of digits. The prefix represents all DNAs with first digits exactly matching that set of digits. A prefix DNA can contain a wildcard character (?) in any position. A wildcard represents any digit ranging from 0 to 9. The length of the prefix DNA cannot exceed the maximum permissible DNA length provisioned.

### What are the benefits?

With these call-routing services, you can configure Nortel Multiservice Switch nodes as a stand-alone network and eliminate the need for managing a DPN-100 CSR. No CSR is connected to the Multiservice Switch subnet, therefore fewer control packets are sent.

No CSR is connected to the Multiservice Switch subnet, therefore fewer control packets are sent.

### How are they deployed?

Deploy the call-routing services for Nortel Multiservice Switch-only networks as follows:

- 1 Provision the call servers and IPIFR for each Multiservice Switch in the network.

Detailed provisioning instructions for the call servers is in [Call server configuration \(page 6\)](#). Refer to NN10600-271 *Nortel Multiservice Switch 7400/15000/20000 Network Management Connectivity* for procedures to provision the IPIFR.

- 2 Provision all Multiservice Switches with a call router (CR).

You can interwork these call-routing services with configurations involving DPN-100 equipment such as CSRs, access modules (AM), and RMs. Both can exist together, but the CSR services will be used when the CSR is directly connected to a Multiservice Switch subnet. That is, the CSR will override the call server when the CSR is provisioned to support the RID of the connected subnet. The CSR is only available with Nortel Multiservice Switch 7400 nodes.

However, you can migrate

- a Multiservice Switch-only network to a mixed network with DPN-100 modules and Multiservice Switches
- a mixed DPN-100 and Multiservice Switch network to a Multiservice Switch node-only network

For migration details, see [Call server configuration \(page 6\)](#).



### How are they used with the IP interface over Frame Relay?

To configure a Nortel Multiservice Switch node-only network, you also require the *IpiFr* component. This component allows a direct connection from Preside Multiservice Data Manager to the node and establishes transmission control protocol and internet protocol (TCP/IP) connections over permanent virtual circuits. (For more information, see NN10600-271 *Nortel Multiservice Switch 7400/15000/20000 Network Management Connectivity*.)

### How are they used with Voice Networking?

Each Nortel Multiservice Switch node in a network that supports Voice Networking calls must be provisioned with a Call Router (CR). Alternately, if a CSRМ is available through a DPN Gateway, the CSRМ will service all nodes which are in the same RID. You can determine if a CSRМ is visible to the node by using the following command:

```
display rtg dpn
```

Whichever method you use—CR or CSRМ—the NPI (E.164 or X.121) and the DNA must be provisioned in the CR or CSRМ to allow routing between nodes in the network. (See NN10600-755 *Nortel Multiservice Switch 7400 Operations: Voice Networking* for details on how to use DNAs to route Voice Networking calls.)

### Characteristics and limitations

The characteristics of this feature are as follows:

- Each Nortel Multiservice Switch node can support only one *CallRouter* component.
- The call router resides on the control processor (CP). Note that the call router cannot be provisioned on a function processor (FP).

The limitations of this feature are as follows:

- Every Multiservice Switch node in the Multiservice Switch node-only network must be provisioned with a *CallRouter* component.
- The Multiservice Switch nodes that are not provisioned with a *CallRouter* component will not be able to establish intermodule outgoing calls.
- The provisioning data for all call-routing systems must be identical within the Multiservice Switch subnet.
- If a CSRМ (Nortel Multiservice Switch 7400 nodes only) is connected to the Multiservice Switch subnet, the CSRМ provides the call-routing services and the *CallRouter* component on the node becomes dormant.

### How to use the call server

This feature is used only with Nortel Multiservice Switch node-only subnets. These subnets are not directly connected to a DPN-100 call-server resource module (CSRМ).



The information in this section only applies to Multiservice Switch 7400 series nodes.

### **If you are migrating from an interworked DPN-100 and Multiservice Switch network**

Provision IP interface over Frame Relay (IPIFR). IPIFR allows Preside Multiservice Data Manager workstations to connect directly to a Nortel Multiservice Switch node-only Frame Relay network. For more information on how to provision IPIFR, see NN10600-271 *Nortel Multiservice Switch 7400/15000/20000 Network Management Connectivity*.

For Preside Multiservice Data Manager workstation control, use the call servers in conjunction with IPIFR. If you are migrating from an interworked DPN-100 and Multiservice Switch network to a Multiservice Switch node-only network, you must change your Preside Multiservice Data Manager connection from IP interface over virtual circuits (IPIVC) to IPIFR.

Refer to the following procedures:

- [Migrating from interworking with DPN-100 to Multiservice Switch-only network \(page 11\)](#)
- [Configuring a call server in a Multiservice Switch-only frame relay network \(page 10\)](#)

### **If you are not migrating from an interworked network**

The IPIFR is likely already provisioned for you. See NN10600-271 *Nortel Multiservice Switch 7400/15000/20000 Network Management Connectivity*, for details.

For more information on the start-up program, see NN10600-271 *Nortel Multiservice Switch 7400/15000/20000 Network Management Connectivity*.

### **Provision the call routers**

Provision the call routers (CR) on every node in each Nortel Multiservice Switch subnet. Each subnet should have its own prefixes. Nodes within a particular subnet should have the same call-router provisioning data.

## **Considerations and recommendations for installing and provisioning the call server**

Consider the following matters before you provision this feature:

- [Address recommendations \(page 22\)](#)
- [Memory impacts \(page 22\)](#)
- [DNA lengths \(page 22\)](#)
- [RID subnet considerations \(page 22\)](#)



### Address recommendations

This feature supports two types of address plans: X.121 and E.164. For more information, see [Address plans \(page 36\)](#).

You can have many DNAs on a single Nortel Multiservice Switch node. It is important to group the DNAs to simplify the task of managing them. Group the DNAs so that you have a few prefixes shared by the DNAs within a single node.

### Memory impacts

Follow these guidelines to minimize memory consumption in the control processor (CP). The call router uses CP memory. When you provision, group the DNAs so that

- FR DNAs within a Nortel Multiservice Switch node use the same group of prefixes, especially if you are planning to use interconnecting subnets
- nodes within a subnet all use a small group of prefixes
- the full set of DNAs is not duplicated
- memory is conserved

### DNA lengths

The module-wide virtual-circuit system (*Mod Vcs*) component provisions the maximum length for X.121 and E164. The default maximum is 15 but you can change it. For more information on this component, see NN10600-060 *Nortel Multiservice Switch 7400/15000/20000 Component Reference*.

The length of the prefix DNAs is checked against the maximum length provisioned in the *Mod Vcs* component. Their length cannot exceed this maximum.

### RID subnet considerations

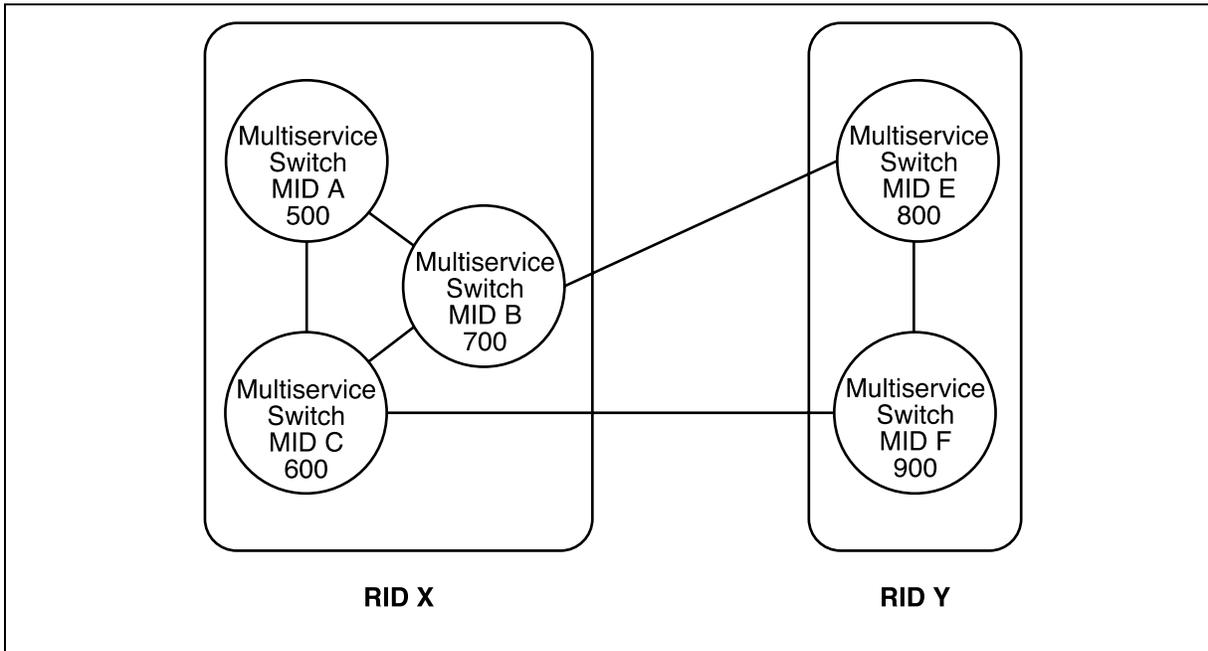
The provisioned data for the *CallRouter* component must be the same for every Nortel Multiservice Switch node in the subnet, and consistent for Multiservice Switch nodes between subnets.

The provisioning data in the *CR* component between subnets should not be the same.

You may want to create and use Preside Multiservice Data Manager templates to simplify provisioning for every module in every subnet. For more information, see 241-6001-023 *Nortel Multiservice Data Manager Configuration Tools*.



**Example of interconnecting RID subnets**



Using the example in [Example of interconnecting RID subnets \(page 23\)](#), the following is an example of the DNAs, RIDs, and MIDs for each subnet:

**RID Y examples**

DNA	RID	MID
3021500	0	A
3021600	0	B
3021700	0	C
3021800	Y	0
3021900	Y	0

**RID X examples**

DNA	RID	MID
3021500	X	0
3021600	X	0
3021700	X	0



### RID X examples

DNA	RID	MID
3021800	0	E
3021900	0	F

#### Without the interconnecting RID subnet feature

If you do not plan to use the interconnecting RID subnet feature, group the prefixes for the node for the MIDs, but not the RIDs.

#### For evolving to the interconnecting RID subnet feature

If you plan to use the interconnecting RID subnet feature eventually, but not immediately, have the nodes within the RID subnet use the same set of prefix DNAs.

## Routing aspects of the call server

This chapter describes the routing aspects of the call server for Nortel Multiservice Switch node-only networks, including:

- Multiservice Switch-connection address-resolution system
- Call-packet routing
- Prefix data network addresses (DNA), routing identifier (RID), and module identifier (MID) mapping (impacts)
- RID retry
- How the call server typically operates, and how it operates when used with the interconnecting RID subnets feature

### Multiservice Switch-connection address-resolution system

Nortel Multiservice Switch-connection address-resolution system performs the call routing for this feature. This system consists of two components, the *CallRouter (CR)* component and the *NumberingPlanId (Npi)* component, which are both under the root component. The component hierarchy is described in NN10600-060 *Nortel Multiservice Switch 7400/15000/20000 Component Reference*

The *CR* component is a database containing prefix DNAs mapped to a Multiservice Switch node MID or RID. The prefix DNA is mapped to a MID for Multiservice Switch nodes within the subnet, and to a RID for nodes outside the subnet. The call router translates a called DNA to a node MID or RID, according to the best match, not necessarily the first match.

The *Npi* component is also a database containing all DNAs provisioned in the node and mappings to the component that owns each DNA. The NPI on the destination Multiservice Switch node translates the DNA to an application.



Multiservice Switch node call-address resolution system supports two types of address plans: X.121 and E.164. Detailed descriptions of these address plans are in [Address plans \(page 36\)](#).

### Call-packet routing

The call router routes the virtual circuit (VC) call-request packets.

The call-request packet arrives at the call router on the originating Nortel Multiservice Switch node. The call router examines the called address digit by digit, starting with the first digits of the international address until the destination switch is determined. Thus an arbitrary number of digits up to a full address may participate in determining the destination switch. Generally, if fewer digits are needed to determine the destination switch, the translation is faster, and the database uses less memory.

If the DNA in the call-request packet translates to a Multiservice Switch node MID, the packet is forwarded to the *Npi* component on the destination node identified by the MID. If the *Npi* component translates the DNA to an application, the packet is forwarded to the application on the node. If any one of the two translations is unsuccessful, an abort with the reason “address not found” is sent back to the originator.

If the DNA in the call-request packet translates to a Multiservice Switch node RID, the packet is forwarded to the closest call router in the Multiservice Switch subnet of the mapped RID. The call router will then map it to a Multiservice Switch node MID. The packet is then forwarded to the NPI on the destination node identified by the MID. If NPI translates the DNA to an application, then the packet is forwarded to the application on the node.

If a CSR (Nortel Multiservice Switch 7400 nodes only) is connected to the Multiservice Switch subnet that has the call router provisioned, then the CSR provides all the call routing services. The call router becomes dormant. Once the CSR is disconnected from the subnet, the call router provides the basic call routing services.

Optionally, a Multiservice Switch node-only network can include call redirection servers. Call redirection servers (CRS) direct failed call attempts to alternative destinations. A CRS has a database of primary addresses mapped to alternative addresses or RID/MID locations. When a destination cannot be reached, the CRS redirects the call to an alternative location. For more information on call redirection servers, see NN10600-410 *Nortel Multiservice Switch 7400/15000/20000 Operations: Call Redirection Server*.

### Prefix DNAs and RID/MID mapping

The *CallRouter* component represents a provisioned database of prefix DNAs to Nortel Multiservice Switch node MIDs and RIDs to map called DNAs to a Multiservice Switch node’s MID (within the subnet) or otherwise to RIDs. If



there are interconnecting Multiservice Switch subnets, the prefix DNAs in another subnet will map to the subnet's RID. The *CallRouter* component resides on the CP for every Multiservice Switch node in the subnet.

### **RID retry**

RID retry can be used to simplify call routing when different regional networks are interconnected by trunks. The simplification is achieved by designating a core RID in each regional network as the interconnecting RID. Other regional networks always map the prefix DNA of this regional network to the designated interconnecting RID. (You must ensure that there is no duplication of RID values in the resulting interconnected network.)

To minimize CR table size and maintenance throughout the interconnected network, you can implement the two-phase RID retry scheme that uses interconnecting RIDs amongst the regional networks.

When RID retry is not implemented, a call-request packet is routed in three phases:

- the CR maps the prefix DNA to a RID
- the CR at the destination RID subnet maps the prefix DNA to a MID
- the NPI at the destination node maps the prefix DNA to the application PID

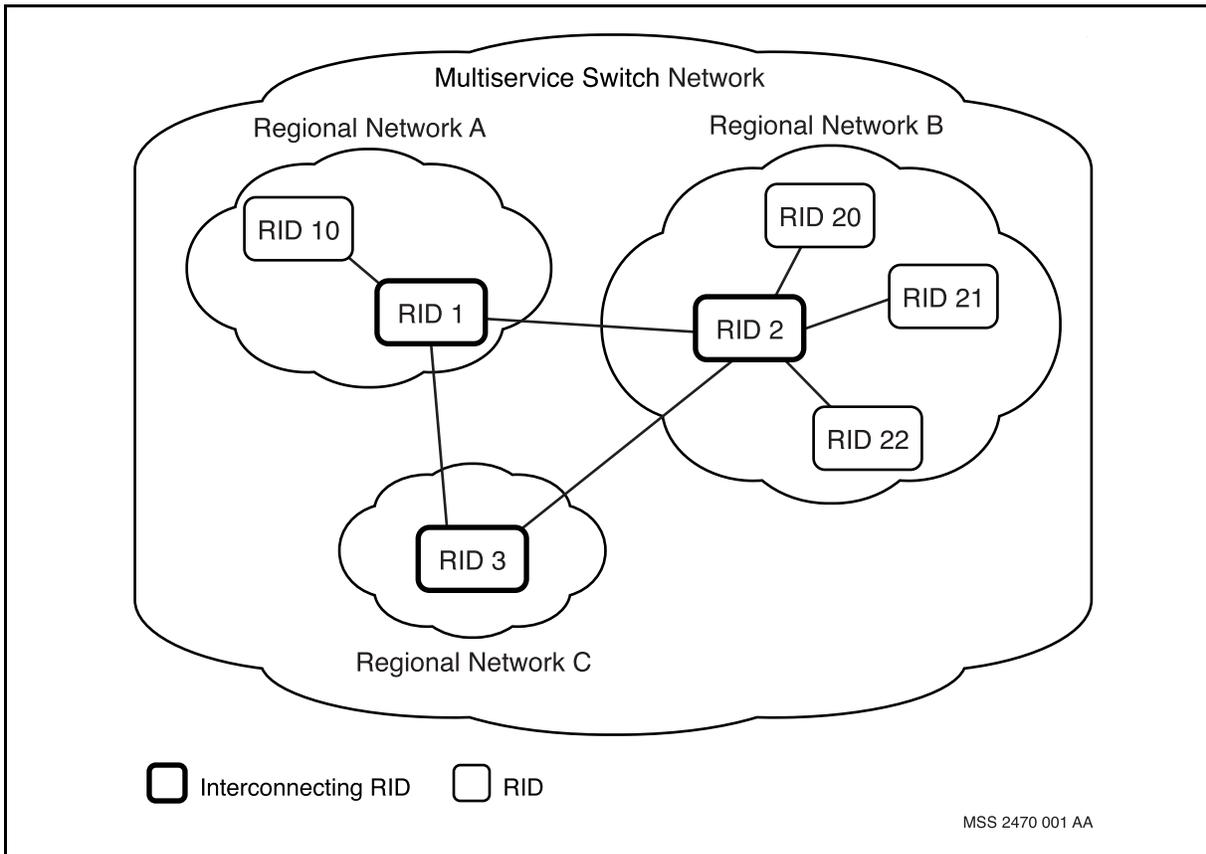
The RID retry feature allows the CR to re-map the prefix DNA to a RID. The CR table already contains mapping information of prefix DNA to either RID or MID. The RID re-mapping operation can be attempted twice along the call path. On the third attempt, the call request packet is redirected.

### **Two-phase RID retry**

When two or more regional networks are interconnected over trunks, the CR tables in each network must be updated so that calls can be routed from one regional network to another. Each regional network maintains CR entries for the regional network, and an entry for the prefix address of every other regional network. For instance, the prefix address may be represented by a four-digit data network identification code (DNIC). Each DNIC is mapped to the interconnecting RID for the regional network. The interconnecting RID is the RID that is designated to receive call requests from other regional networks. [Interconnecting RIDs between regional networks](#) shows three regional networks merged together using interconnecting RIDs to route calls between the regional networks.



### Interconnecting RIDS between regional networks



#### Interconnecting RIDs

Calls are sent from the CR on the originating regional network to the CR of the interconnecting RID on the destination network. The CR on the interconnecting RID routes calls destined to DNAs that are MID-mapped directly to the node that supports the DNA. The CR on the interconnecting RID also forwards calls destined to other DNAs that are RID-mapped to the other RIDs, presumably within the same destination regional network. Calls that cannot be MID-mapped or RID-mapped are redirected.

Two-phase RID retry allows you to interconnect regional networks over trunks, and allows regional networks to manage local resources without updating CR tables throughout all the interconnected regional networks.

#### Typical operation of the call server

The call-server (call router) feature provides call routing in a Nortel Multiservice Switch node-only Frame Relay network and removes the need for the Multiservice Switch subnet to be connected to a CSRM. To enable a Multiservice Switch node-only network to be configured, this feature also requires a Preside Multiservice Data Manager connection through IPIFR, which provides provisioning and network monitoring access.



If you are using interconnecting RID subnets, each RID should have its own provisioned database of prefix DNAs. The *CR* component must be provisioned on every Multiservice Switch node. Each node within a subnet must have the same provisioning.

If a CSRM is connected to the Multiservice Switch subnet, the call services function is provided by the CSRM, even if the *CallRouter* components have been provisioned for each node on the Multiservice Switch node-only network.

A direct CSRM connection is only supported on Multiservice Switch 7400 series nodes.

The figure [Example of call-routing services from the CSRM \(page 29\)](#) illustrates the behavior of a Multiservice Switch subnet when its call-routing services are provided by a CSRM, as follows:

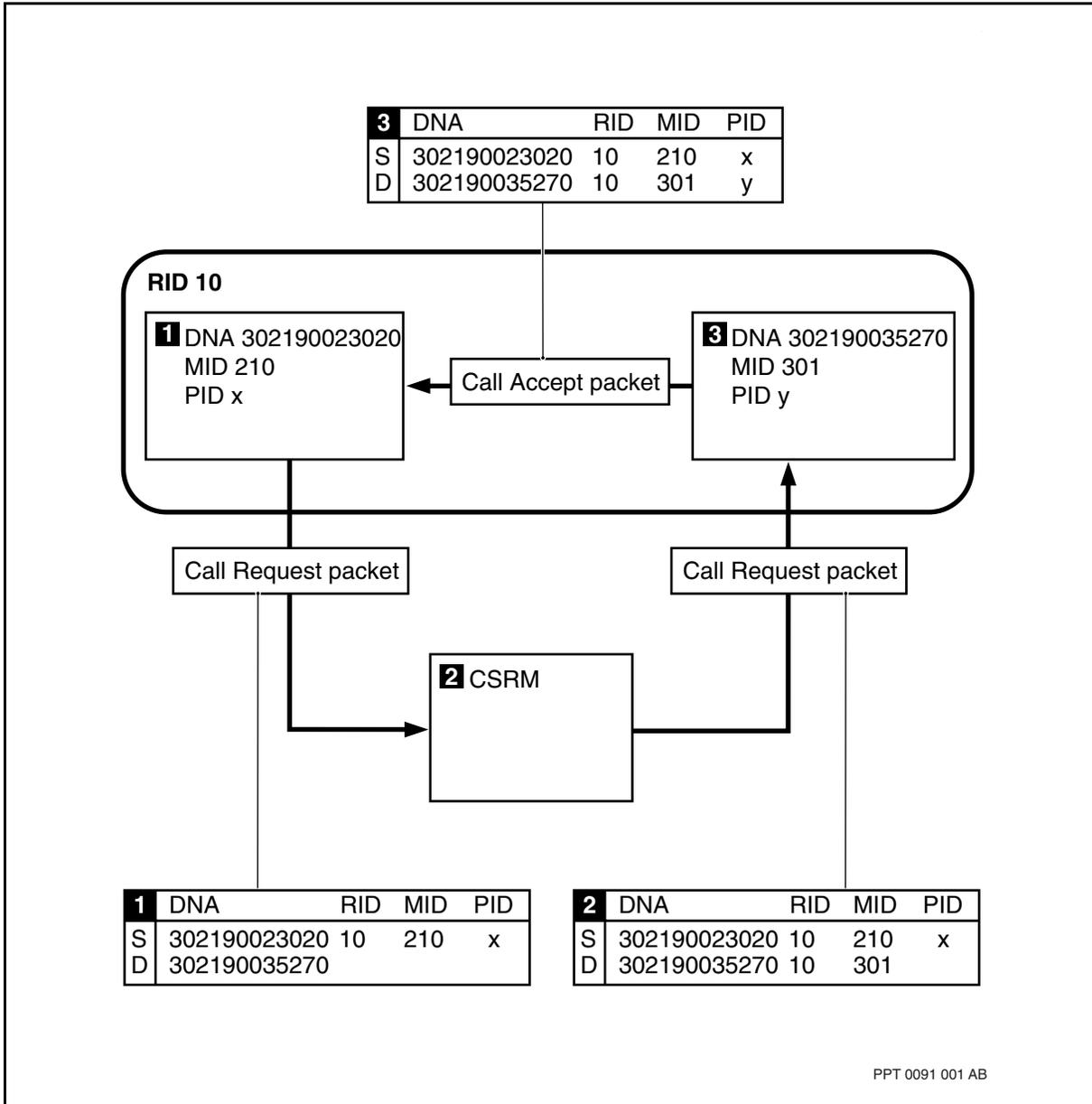
- 1 Multiservice Switch node's virtual circuit process creates a call request packet and sends it to the closest CSRM. The call request packet includes the DNA, RID, MID, and process identifier (PID) of the source, and the DNA of the destination.

By default, CSRM routing on Multiservice Switch 7400 nodes is set to closest. You can provision CSRM routing as shared so that each subsequent call request packet alternates between two CSRMs. For more information, see NN10600-450 *Nortel Multiservice Switch 7400: Operations: DPN-100 Interworking*.

- 2 The CSRM interprets the DNA and determines the RID and MID of the destination Multiservice Switch node. This information is inserted in the call request packet and sent to the destination node.
- 3 The call request packet arrives at the destination Multiservice Switch node. The node's local call routing system determines the PID for the destination. It is placed in the call accept packet along with the information in the call request packet and sent back to the source.



**Example of call-routing services from the CSR**



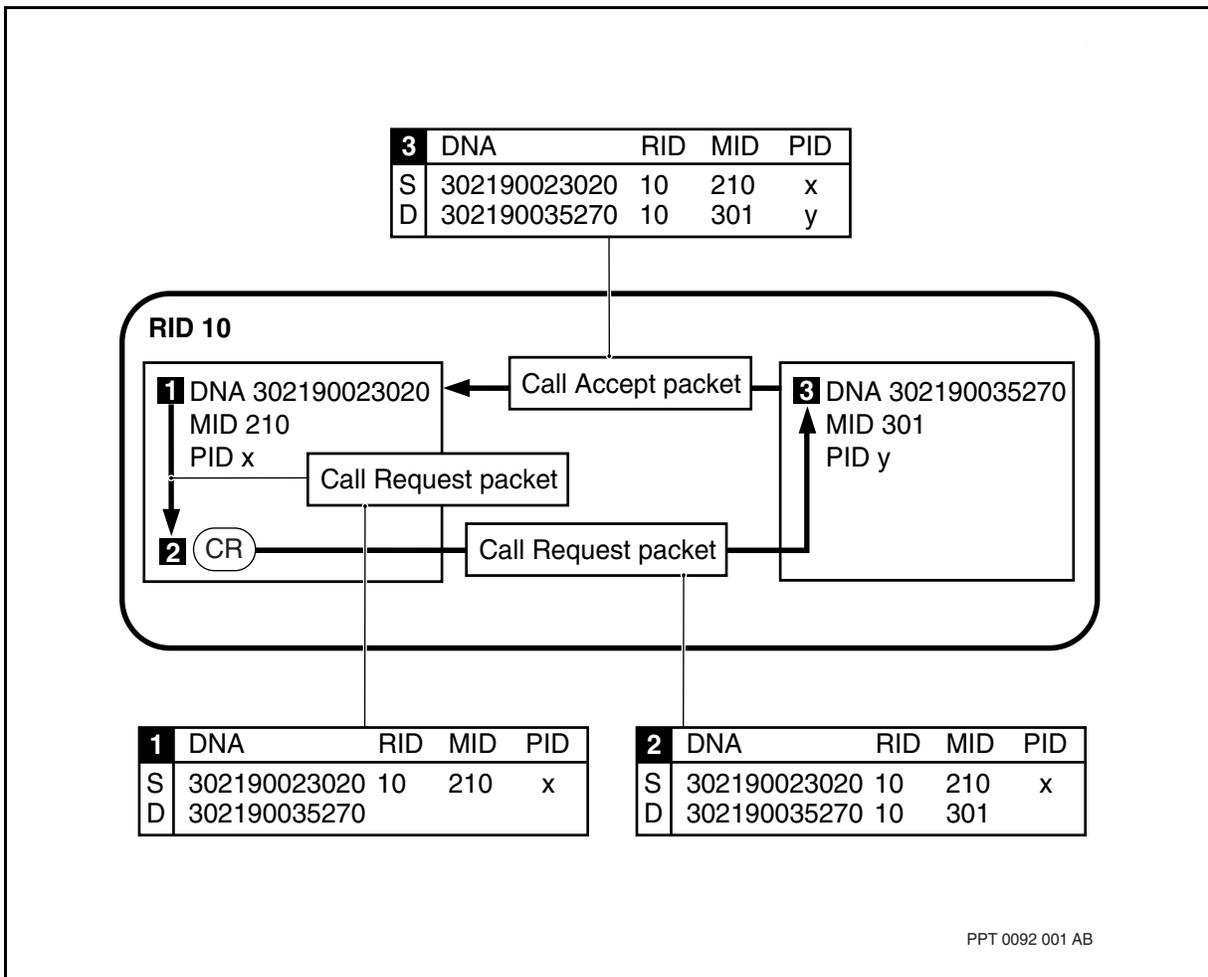
Example of the CallRouter (CR) component in a single RID subnet shows an example of the call-server feature deployed in a single-RID subnet.

- 1 Nortel Multiservice Switch node's virtual circuit process creates a call request packet and sends it to the call router. The call request packet includes the DNA, RID, MID, and PID of the source, and the DNA of the destination.



- 2 The defined prefix-DNA maps the DNA of the destination to either a MID or a RID. If it maps to a MID, the MID of the destination is put in the call request packet. In this case the call router also knows that the destination Multiservice Switch node is in the same RID subnet as the source node, and therefore can also put the destination RID in the call request packet. The call request packet is then sent to the destination node.
- 3 The call request packet arrives at the destination Multiservice Switch node. The node local call routing system determines the PID for the destination. It is placed in the call accept packet along with the information in the call request packet and sent back to the source.

**Example of the CallRouter (CR) component in a single RID subnet**



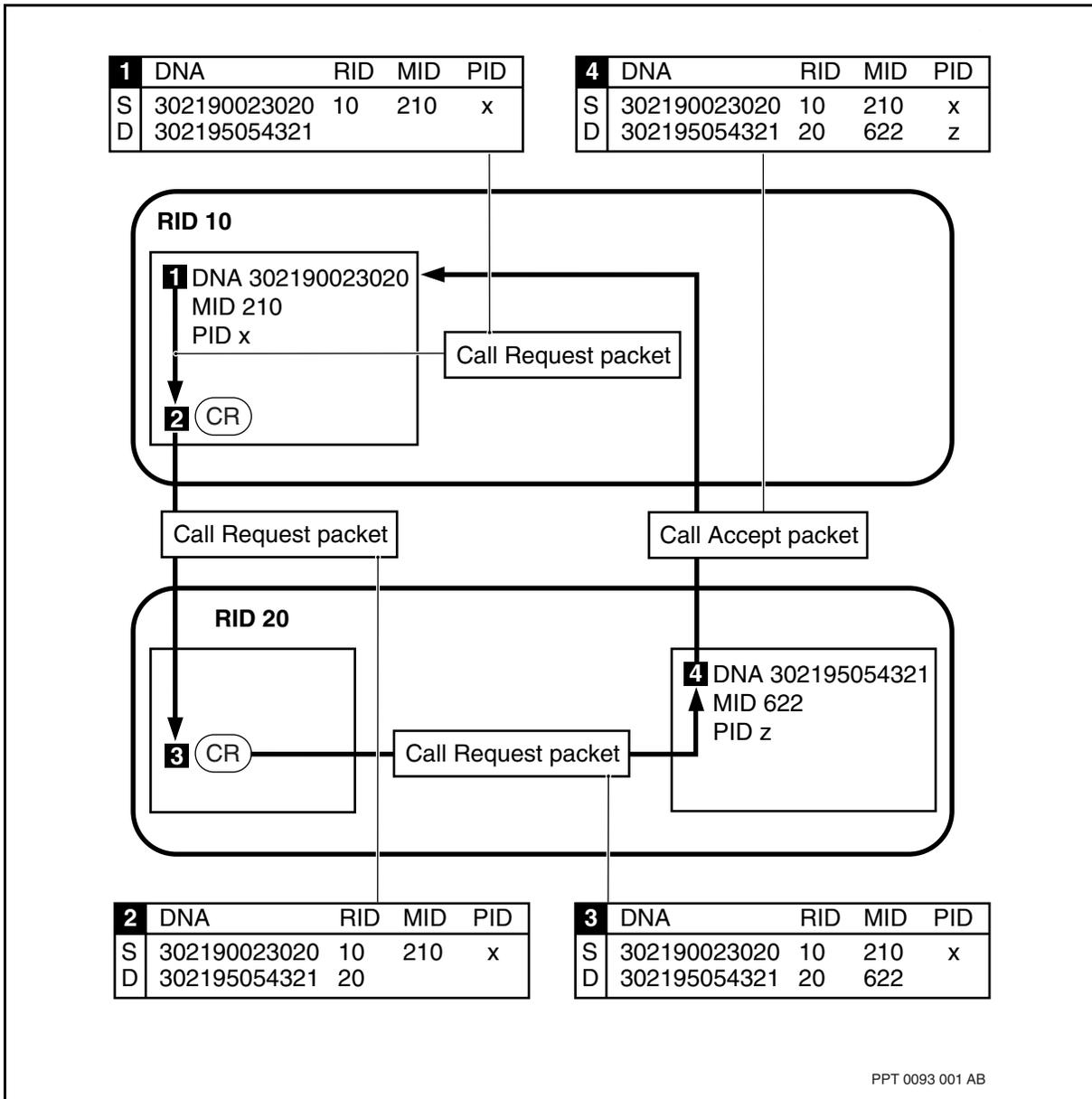


Example of the CallRouter (CR) component used with multiple RID subnets shows an example of the call-server feature deployed in multiple-RID subnets.

- 1 Nortel Multiservice Switch node's virtual circuit process creates a call request packet and sends it to the call router. The call request packet includes the DNA, RID, MID, and PID of the source, and the DNA of the destination.
- 2 The defined prefix-DNA maps the DNA of the destination to either a MID or a RID. If it maps to a RID, the RID of the destination is put in the call request packet. In this case, the call router also knows that the destination Multiservice Switch node is in a different RID subnet than the source node. The call request packet is then sent to the closest node in the destination RID subnet.
- 3 The call request packet is delivered to the call router in the Multiservice Switch node in the destination RID subnet. This call router uses its defined prefix DNAs to map the DNA to the MID of the destination node. The call request packet is then sent to the destination node.
- 4 The call request packet arrives at the destination Multiservice Switch node. The node's local call routing system determines the PID of the destination. It is placed in the call accept packet along with the information in the call request packet and sent back to the source.



**Example of the CallRouter (CR) component used with multiple RID subnets**



**Example of RID retry in a merged network environment** shows an example of the RID retry feature deployed in a merged network environment.

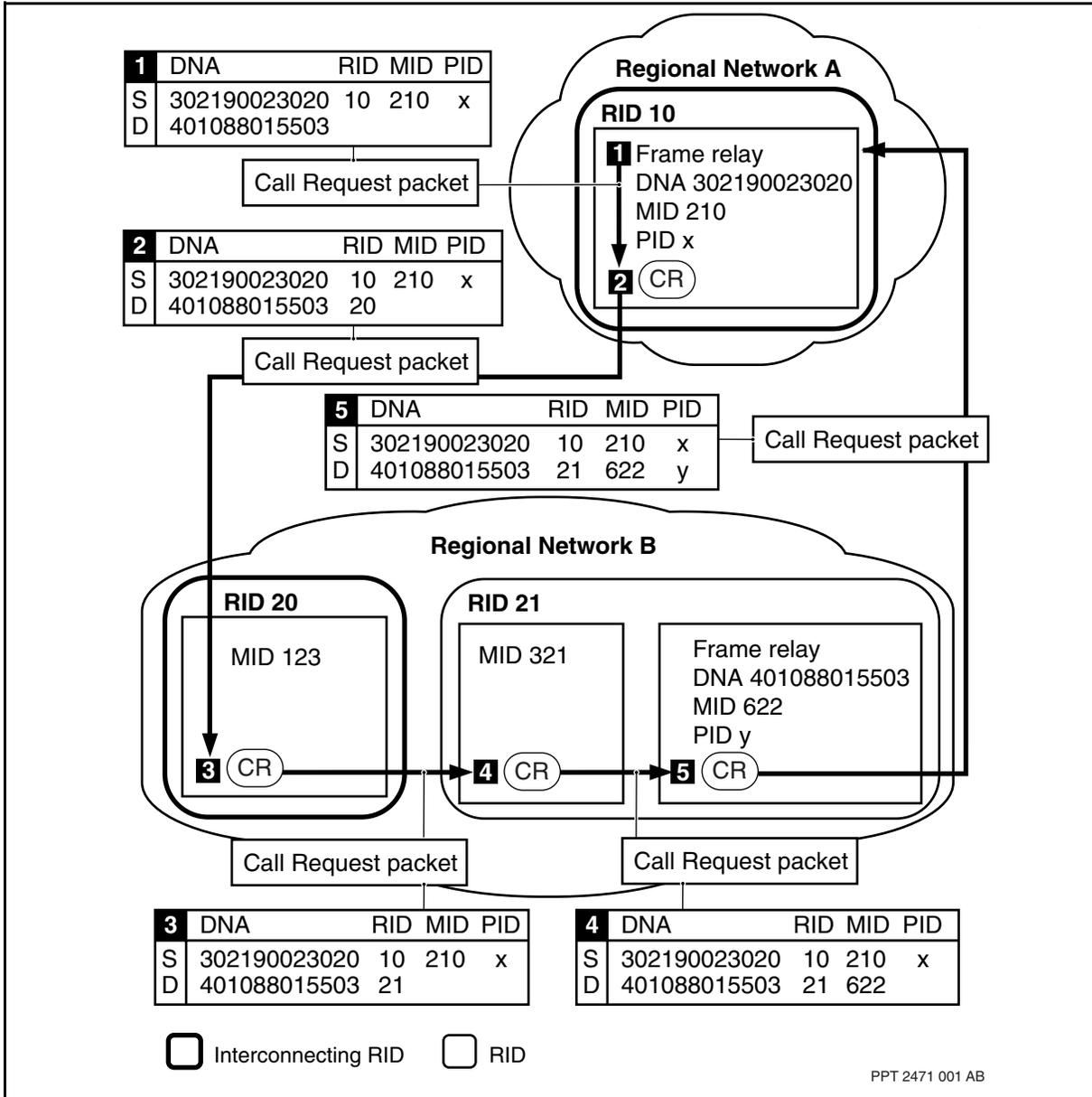
- 1 Nortel Multiservice Switch node's virtual circuit process creates a call request packet and sends it to the call router. The call request packet includes the DNA, RID, MID, and PID of the source, and the DNA of the destination.



- 2 The defined prefix-DNA maps the DNA of the destination to either a MID or a RID. If it maps to a RID, the RID of the destination is put in the call request packet. In this case, the call router knows that the destination Multiservice Switch node is in a different RID subnet from the source node. The call request packet is then sent to the closest node in the destination RID subnet (of another regional network).
- 3 The call request packet is delivered to the call router in the interconnecting RID subnet of the destination regional network. This call router uses its defined prefix-DNA to map the DNA. However, the mapping result is to another RID within the destination regional network. The call request packet is then sent to the closest Multiservice Switch node in the destination RID subnet (within the same destination regional network).
- 4 The call request packet is delivered to the call router in the destination RID subnet of the destination regional network. This call router uses its defined prefix-DNA to map the DNA to the MID of the destination Multiservice Switch node. The call request packet is then sent to the destination node.
- 5 The call request packet arrives at the destination Multiservice Switch node. The node's local call routing system determines the PID of the destination. The PID is placed with the other information in the call request packet and sent back to the source.



Example of RID retry in a merged network environment





---

## Compliances

---

This feature complies with the following address-plan standards:

- CCITT Recommendation X.121, International Numbering Plan for Public Data Networks (Geneva, March 1988)
- CCITT Recommendation E.164, Numbering Plan for the ISDN Era (Geneva, March 1988)



---

# Address plans

---

This section describes the X.121 and E1.64 address plans.

## Navigation

- [Address definition \(page 36\)](#)
- [Multiservice Switch node-based address translation \(page 37\)](#)
- [X.121 and E.164 address translation \(page 38\)](#)
- [Addressing plan strategies \(page 39\)](#)
- [Address plan example \(two-node network\) \(page 39\)](#)

## Address definition

This feature supports two address plans: X.121 and E1.64.

### X.121 definition

X.121 is defined as the CCITT numbering plan standard for public switched packet data networks (PSPDN).

For X.121, Nortel Multiservice Switch networks implement the following formats in accordance with CCITT recommendations:

- The full X.121 international address must be less than or equal to 14 digits in length.
- An international address is made up of one of the following components:
  - a data country code (DCC) of exactly three digits (see [DNIC format \(page 37\)](#)), and a nationally defined national number (NN) of up to 11 digits
  - a DNIC of exactly four digits (see [DNIC format \(page 37\)](#)), and a nationally defined network terminal number (NTN) of up to ten digits



**DNIC format**

DNIC:	Y	X	X	X
	- -	+ - -		- - - Network digit
		- - - - - - - -		DCC
				X = a digit from 0 to 9
				Y = a digit from 2 to 7

**Note 1:** The 1988 version of CCITT X.121 Recommendation (Tables 1 and 2) specifies that the initial digits 9 and 0 of an International format X.121 address, indicate respectively, escape to E.164 (analogue access) and escape to E.164 (digital access). As a result, the use of a Pseudo-DNIC with an initial digit of 9 or 0 in DPN-100 networks is not advisable. The network envelope X.32 Enable option is used to control whether a network treats an initial digit of 9/0 as an X.121 Pseudo-DNIC (option OFF) or as an escape code to E.164 (option ON). Some existing DPN-100 networks are known to use Pseudo-DNIC with initial digit (or 0). It should be noted that it will not be possible for these networks to support interworking with another network that uses E.164 addresses for e.g. ISDN or X.32 services.

**Note 2:** The DNICs of the form "111X" as defined in CCITT Recommendation X.121 are also supported.

**E.164 definition**

E.164 is defined as the CCITT numbering plan standard for ISDN packet and circuit mode terminals.

**Multiservice Switch node-based address translation**

Translation of both numbering plans is based on what is known as a prefix DNA, which is the first "n" digits of the full international address (DNIC+NTN or CC+NSN) where "n" can range from 1 to 15 digits. See [Sample DNA mappings \(page 39\)](#).



On Nortel Multiservice Switch nodes, the node examines the called address digit-by-digit starting with the first digit of the international address until the destination switch is determined. Thus, an arbitrary number of digits up to a full address can participate in determining the destination switch. Generally, if fewer digits need to be used to determine the destination switch, the translation is faster and the CP memory usage is less.

When defining prefix DNAs, “wild” digits can be used so that the digit position specified by the wild digit is ignored when making a routing decision. This will reduce the number of prefix DNAs needed to properly route the calls.

Also, prefix DNAs of prefix DNAs can be defined. For example, if it is desired that all X.121 DNAs beginning with 30211123 go to one MID while all other X.121 DNAs beginning with 3021112 go to another MID, then only the two X.121 prefix DNAs (302311123 and 3021112) need to be entered in the service data. This can also reduce the amount of data entry and storage required to support the numbering plan.

## X.121 and E.164 address translation

The following prefix DNA mappings are possible for X.121 and E.164:

- prefix DNA maps to RID
- prefix DNA maps to MID

If a DNA is translated to an RID, the call is sent to the call-routing system of the Nortel Multiservice Switch subnet containing the destination node in the network.

If a DNA is translated to a MID, the call is sent to the call-routing system on the destination switch.

Each Multiservice Switch node has a local DNA database (*Npi* component off Root), which is responsible for the final stage of call routing: that of getting the call to its final destination (for example, usually an access port). Thus, it must “translate” the address it receives from the *CR* component to a purely internal entity identifying that destination. Both numbering plans are handled in the same way.

---

**Attention:** If a node becomes isolated (the node becomes unavailable due to network link failures), calls can still be set up to and from addresses that exist on the particular module. This is true for both numbering plans.

---



## Addressing plan strategies

Designing an addressing plan for long-term network flexibility is an important exercise. A scalable addressing plan retains its structure even with significant network growth and change. Addressing plan strategies include the following points:

- do not include RIDs, MIDs, or other topology information in the DNA structure
- divide the DNA into geographical area: DNIC, area or region code, site code, city or node detail, and Fruni or line code

### Sample DNA mappings

3021	901	23	12345	
DNIC	area code	module code	line code or Fruni code	
3021	99	01	22	1401
DNIC	region code	site code	module code	line code or Fruni code

### Address plan example (two-node network)

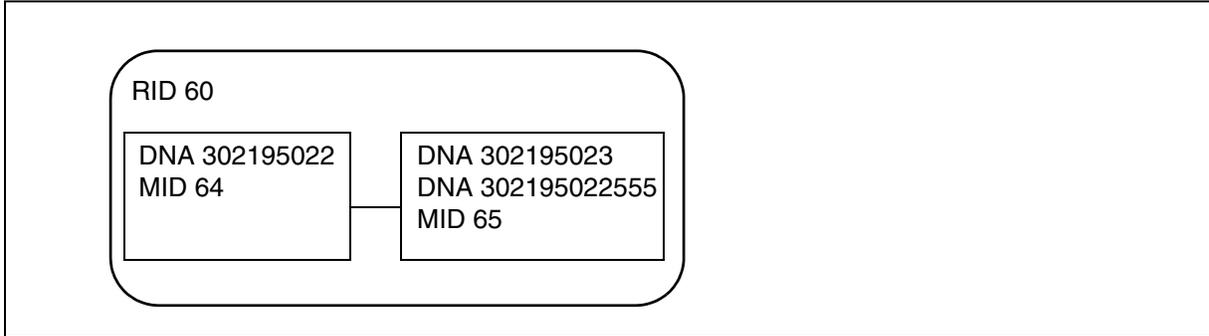
In the example shown in [Example of a two-node network \(page 40\)](#), a simple two-node network is shown with its corresponding RID and MID values. With this example in mind, some general guidelines can be established for using prefix-DNAs. To reduce memory consumption when provisioning, it is recommended that as few prefix-DNAs as possible be mapped to a single Nortel Multiservice Switch module.

The ideal is, of course, one prefix-DNA per Multiservice Switch module. It is also best to avoid the worst case in which there is no grouping of DNAs on a single module basis. This would result in having to provision every DNA in the subnet into every CR in each module, thereby resulting in higher memory consumption. Since the CR finds the best possible match, exceptions can be provisioned.



For example, in [Example of a two-node network \(page 40\)](#), if it is now desired for MID 65 to also contain all DNAs that begin with the digits 302195022555. For CR provisioning data for both modules, see the table [Address plan example DNAs](#)

**Example of a two-node network**



**Address plan example DNAs**

prefix-DNA	RID	MID
302195022	60	64
302195023	60	65
301295022555	60	65



---

## Procedure conventions

---

This document uses the following procedure conventions:

- You can enter commands using full component and attribute names, or you can abbreviate them. The commands used in the procedures contain the full component and attribute names in the first instance. In the second instance, the component and attribute names are abbreviated. For more information on abbreviating component and attribute names, see NN10600-060 *Nortel Multiservice Switch 7400/15000/20000 Component Reference*. All component and attribute names are formatted in italics.
- The introduction of every procedure states whether you must perform the procedure in operational mode or provisioning mode. For more information on these modes, see [Operational mode \(page 41\)](#) or [Provisioning mode \(page 42\)](#).
- When you complete a procedure, you can verify your changes and then activate them as the new node configuration. For more information on completing configuration changes and exiting provisioning mode, see [Activating configuration changes \(page 42\)](#).

### Operational mode

Procedures contained within this document can either be performed in operational mode or provisioning mode. When you initially log into a node, you are in operational mode. Nortel Multiservice Switch systems use the following command prompt when you are in operational mode:

```
#>
```

where:

# is the current command number

In operational mode, you work with operational components and attributes. In operational mode, you can

- list operational components and display operational attributes to determine the current operating parameters for the node
- control the state of parts of the node by locking and unlocking components



- set certain operational attributes and enter commands to perform diagnostic tests

## Provisioning mode

To change from operational mode to provisioning mode, type the following command at the operator prompt:

```
start Prov
```

Only one user can be in provisioning mode at a time. Nortel Multiservice Switch systems use the following command prompt whenever you are in provisioning mode:

```
PROV #>
```

where:

# is the current command number

In provisioning mode, you work with the provisionable components and attributes that contain the current and future configurations of the node. You can add and delete components, and display and set provisionable attributes. For information on completing the configuration changes, exiting provisioning mode, and returning to operational mode see [Activating configuration changes \(page 42\)](#).

For information on operational and provisionable attributes, see NN10600-060 *Nortel Multiservice Switch 7400/15000/20000 Component Reference*.

## Activating configuration changes

Several procedures in this document ask that you complete the configuration changes. When you complete the configuration changes, you are activating the configuration changes, confirming that you want to activate them, and saving the changes. You are instructed to complete the configuration changes only at the end of procedures that you perform in provisioning mode.

	<p><b>CAUTION</b> <b>Activating a provisioning view can affect service</b> Activating a provisioning view can result in a CP reload or restart, causing all services on the node to fail. See NN10600-050 <i>Nortel Multiservice Switch 7400/15000/20000 Command Reference</i>, for more information.</p>
--	---



**CAUTION**

**Risk of service failure**

When you activate the provisioning changes (see [step 3](#)), you have 20 minutes to confirm these changes. If you do not confirm these changes within 20 minutes, the shelf resets and all services on the node fail.

- 1 Verify that the provisioning changes you have made are acceptable.

**check Prov**

Correct any errors and then verify the provisioning changes again.

- 2 If you want to store the provisioning changes in a file, save the provisioning view.

**save -f(<filename>) Prov**

- 3 If you want these changes as well as other changes made in the edit view to take effect immediately, activate, confirm, and commit the provisioning changes.

**activate Prov**

**confirm Prov**

**commit Prov**

- 4 End the provisioning session.

**end Prov**



Nortel Multiservice Switch 7400/15000/20000

## Operations: Call Server

Copyright © 2005 Nortel.  
All Rights Reserved.

Publication: NN10600-405  
Document status: Standard  
Document issue: 7.1S1  
Document date: October 2005  
Product release: PCR7.1 and up  
Job function: Operations  
Type: NTP  
Language type: U.S. English

NORTEL, the globemark design, and the NORTEL corporate logo are trademarks of Nortel.

