Configuration Notes 243

Mediatrix 3000 Digital Gateway
VoIP Trunking with a Legacy PBX

February 15, 2007

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Introduction

This document outlines the configuration steps to set up a Mediatrix® 3000 digital gateway to provide VoIP trunking with a legacy PBX.

Mediatrix 3000 Digital Gateway Overview

These configuration notes apply to the Mediatrix 3000 Series digital gateway products. The Mediatrix 3000 Series digital gateways allow enterprises to lower communications costs over any IP link. The platform supports ISDN E1 and T1 PRI telephony interfaces, as well as ISDN BRI interfaces. They provide an ideal solution for enterprise voice applications or for connecting to a service provider's broadband access.

Mediatrix® 3000 digital gateways are fully scalable in terms of number of ports and functionalities. They currently come in the following models:

Model	Interfaces	VoIP Call Capacity
Mediatrix 3404	5 BRI ports	up to 8
Mediatrix 3408	10 BRI ports	up to 16
Mediatrix 3531	1xT1-PRI interface	up to 23
Mediatrix 3532	2xT1-PRI interface	up to 46
Mediatrix 3631	1xE1-PRI interface	up to 30
Mediatrix 3632	2xE1-PRI interface	up to 60

The Mediatrix digital gateways link any standard ISDN E1/T1 PRI or BRI connection to the IP network and deliver the clarity of toll quality voice for a comprehensive VoIP solution.

T.38 FoIP, fax bypass, and modem bypass capabilities ensure that the Mediatrix digital gateways seamlessly transport voice and data services. The Mediatrix digital gateways offer flexibility and scalability for VoIP network integration and low bandwidth voice.

With configurable NT/TE PRI ports, call-switching and user programmable call routing (including caller/called ID), Mediatrix digital gateways integrate smoothly into existing PBX and PSTN networks.

Key Features:

- Voice Routing.
- Fax over IP support, including T.38.
- Proven voice algorithms implemented on dedicated DSP for enhanced voice quality.
- Up to 60 simultaneous calls.
- SNMPv3 and web management.
- Configuration file encryption.
- Automatic firmware and configuration file download.
- PSTN Bypass feature (BRI models only).

Deployment Scenario

Description

This configuration note is a step-by-step guide to set up one Mediatrix 3632 Series digital gateway to provide VoIP trunking with a legacy PBX. The Mediatrix 3632 is used to connect a branch office's PBX to an existing VoIP network. The configuration starts with the Mediatrix 3632 default configuration but can be easily customized for the 3631, 3531, and 3532, so from now on, the device will be referred to as the *Mediatrix 3000 DG* (Digital Gateway). The following is the network topology to which we will refer in our sample deployment.

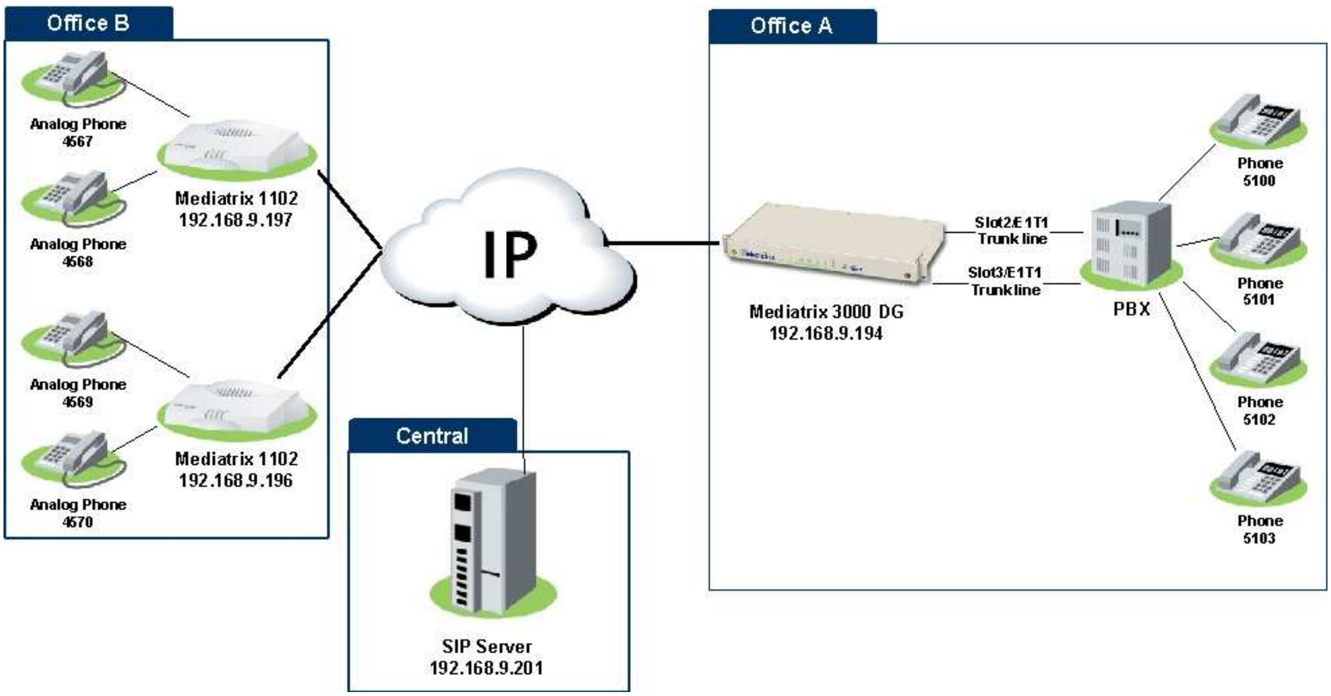


Figure 1 - Network Topology

Note: The network addresses and phone numbers shown above are sample values that will most probably vary in your specific setup. In the following pages, when referring to such a sample value, it will be visually outlined (e.g., ***192.168.9.194***), so whenever you see parameters outlined in that fashion, you should replace them with the values that are appropriate for your specific setup.

Objectives

The steps described in the following pages will show you how to setup the Mediatrix 3000 DG so it can:

A. receive calls from the PBX and route them to a remote branch through the VoIP network. (e.g., from Office A to Office B):
   1. a user from Office A picks up a phone and dials a number.
   2. the PBX uses one of its trunk lines to route the call to the Mediatrix 3000 DG.
   3. the Mediatrix 3000 DG forwards the call to the appropriate Mediatrix 1102.
   4. the Mediatrix 1102 makes the appropriate analog phone ring.
   5. a user in Office B picks up the analog phone and the call is established.

B. receive calls from remote branches through the VoIP network and route them on one of the local branch's PBX lines (e.g., from Office B to Office A):
   1. a user from Office B picks up an analog phone and dials a number.
   2. the appropriate Mediatrix 1102 routes the call to the Mediatrix 3000 DG.

3. the Mediatrix 3000 DG decides to which ISDN PRI interface route this call.
4. the Mediatrix 3000 DG routes the call to the PBX.
5. the PBX makes the appropriate phone ring.
6. a user from Office A picks up the phone and the call is established.

Assumptions

This configuration note focuses on configuring the Mediatrix 3000 DG, and assumes that:

- extension numbers behind the PBX correspond to registered users in the SIP server (without authentication).
- the Mediatrix 3000 DG in Office A is connected to two E1 trunk lines in the PBX.
- the Office B setup is functional, and the SIP users are correctly registered to the SIP server.

Steps

This configuration note will guide you through the following steps:

1. Physical connection of the Mediatrix 3000 DG to the network and PBX.
2. IP address discovery or configuration.
3. Web interface access.
4. SIP configuration.
5. ISDN configuration.
6. Call routing configuration.
7. Basic call establishment.

Configuration of the Mediatrix 3000 DG Digital Gateway

Physical Connection of the Mediatrix 3000 DG to the Network and PBX

Please refer to the Mediatrix 3000 DG Quick Start booklet (packaged with the Mediatrix 3000 DG) for instructions on hardware installation.

The Mediatrix 3000 DG Quick Start booklet can also be found online on the Mediatrix Download Portal at https://support.mediatrix.com/DownloadPlus/Download.asp.

IP Address Discovery or Configuration

The purpose of this section is to be able to contact the Mediatrix 3000 DG's management interface to start with unit configuration.

Once the physical connection is complete and the Mediatrix 3000 DG is powered up, the first thing to do is find out the IP address the Mediatrix 3000 DG is using. The Mediatrix 3000 DG's WAN IP address can be set either dynamically or statically. The default behaviour of the Mediatrix 3000 DG is to try to obtain a dynamic IP address through DHCP.

You can also access the Mediatrix 3000 DG through its private LAN interface.

Dynamic WAN IP Address Discovery

Before connecting the Mediatrix 3000 DG to the network, Mediatrix strongly suggests that you reserve an IP address in your DHCP server for the unit you are about to connect. DHCP servers reserve IP addresses for specific devices by using a unique identifier for each device. The Mediatrix 3000 DG's unique identifier is its media access control (MAC) address. The MAC address appears on the label located on the bottom side of the unit.

If you have not reserved an IP address, you can discover which IP address has been assigned to the Mediatrix 3000 DG by either:

- consulting your DHCP server's logs to find out details on the DHCP lease that was given to the Mediatrix 3000 DG.
- using a network packet sniffer (e.g., Ethereal) to examine the DHCP messages exchanged between the Mediatrix 3000 DG and your DHCP server while the Mediatrix 3000 DG boots up.

Default WAN Static IP Address Configuration

If there is no DHCP server in your network, then the WAN IP address can be configured statically. The first thing to do is set the Mediatrix 3000 DG to its known default static IP address. You can do this by using the Mediatrix 3000 DG's partial reset feature (see the section Further Information and Configuration for more details).

1. Once the Mediatrix 3000 DG has finished booting up (the *Power* LED is lit, not blinking), insert a small, unbent paper clip into the RESET/DEFAULT hole located at the rear of the Mediatrix 3000 DG and press the RESET/DEFAULT button. The *Power* LED will start blinking, and after a few seconds, all the LEDS will start blinking. Release the paper clip after all the LEDs start blinking and before they all stop blinking (between 7-11 seconds).

After a partial reset is performed, the Mediatrix 3000 DG's WAN connection uses the default 192.168.0.1 IP address. From now on, you can optionally change the Mediatrix 3000 DG's IP address (see section Further Information and Configuration for more details).

LAN Interface Access

The Mediatrix 3000 DG's default LAN IP address is 192.168.0.10.

Web Interface Access

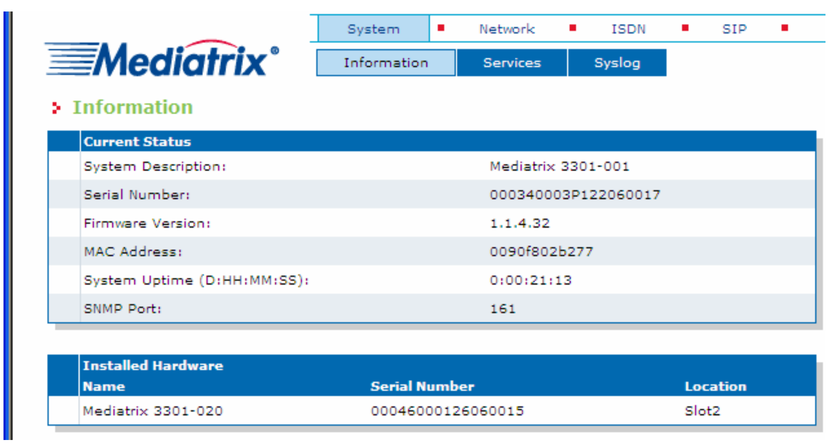
The purpose of this section is to log in to the Mediatrix 3000 DG's web interface.

The Mediatrix 3000 DG's web interface may be used to view the status of the Mediatrix 3000 DG and set its numerous parameters.

1. In your web browser's address field, type ***192.168.9.194*** (or the address of the Mediatrix 3000 DG). The PC you use must be connected to the same subnet as the Mediatrix 3000 DG or to a network where it can reach the Mediatrix 3000 DG's IP address. The following window appears:

2. Enter the user name **public**. Leave the *Password* field empty.

3. Click **Login**.



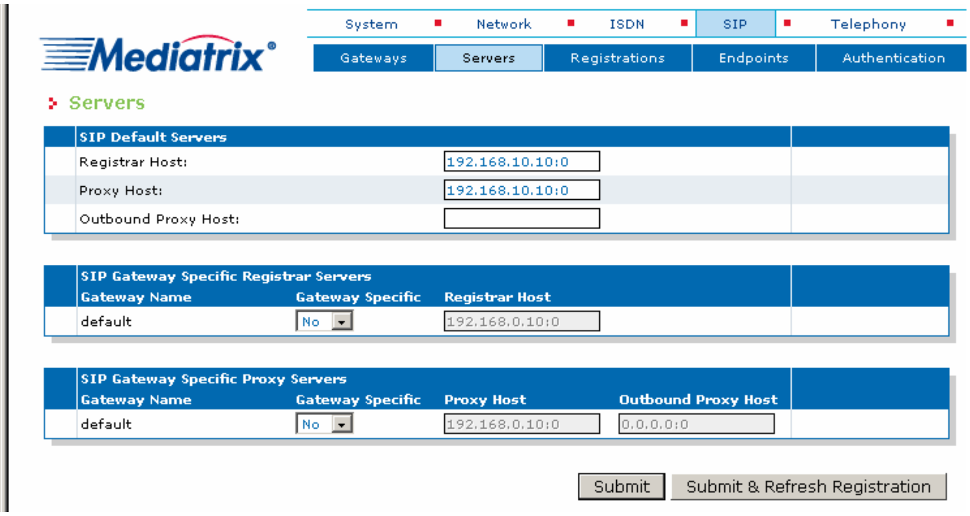
You now have access to the Mediatrix 3000 DG's configuration web interface.

SIP Configuration

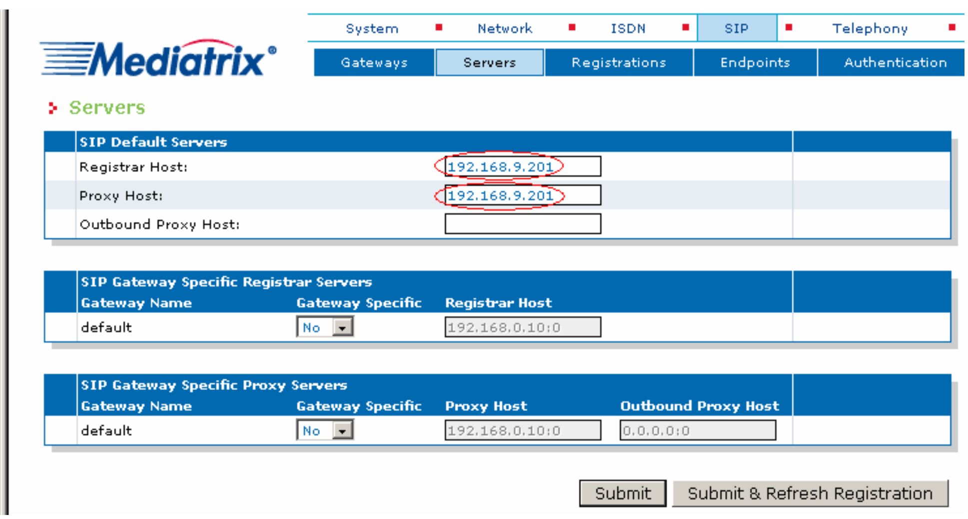
The purpose of this section is to setup the Mediatrix 3000 DG to use your SIP server for registration and call routing, and to tell the Mediatrix 3000 DG to register SIP users for all the phones that are connected to the PBX.

The SIP configuration tells the Mediatrix 3000 DG which SIP servers, parameters, and phone numbers to use. The following steps configure the Mediatrix 3000 DG as illustrated in the sample network topology.

1. Click the **SIP** menu, then the **Servers** sub-menu. The following window appears:

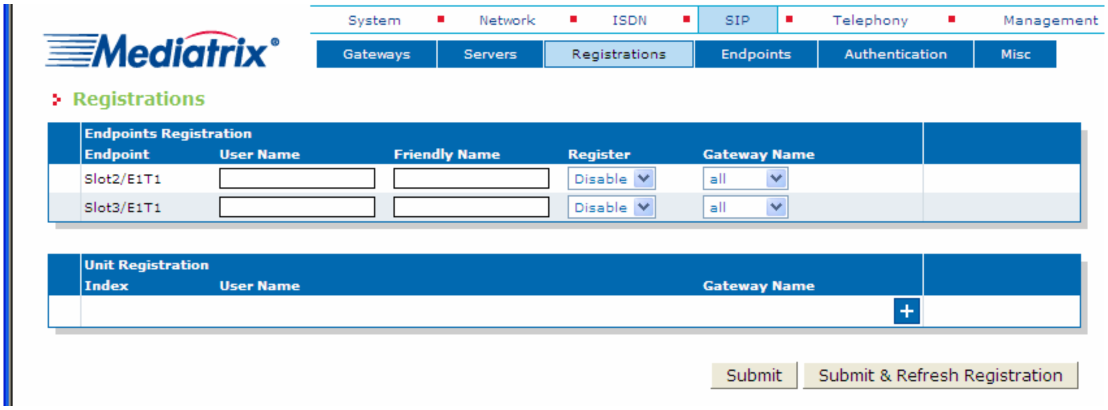


2. Set the *Registrar Host* field to the address of the central SIP Server ***192.168.9.201***.
3. Set the *Proxy Host* field to the address of the central SIP Server ***192.168.9.201***.



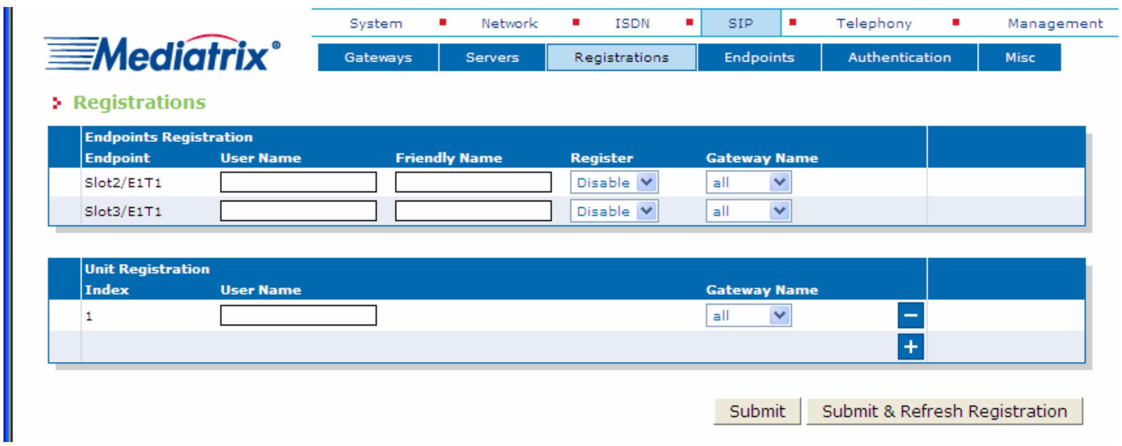
4. Click **Submit** to save the configuration changes. The Mediatrix 3000 DG is now configured to use your SIP server.

5. Click the **Registrations** sub-menu. The following window appears:

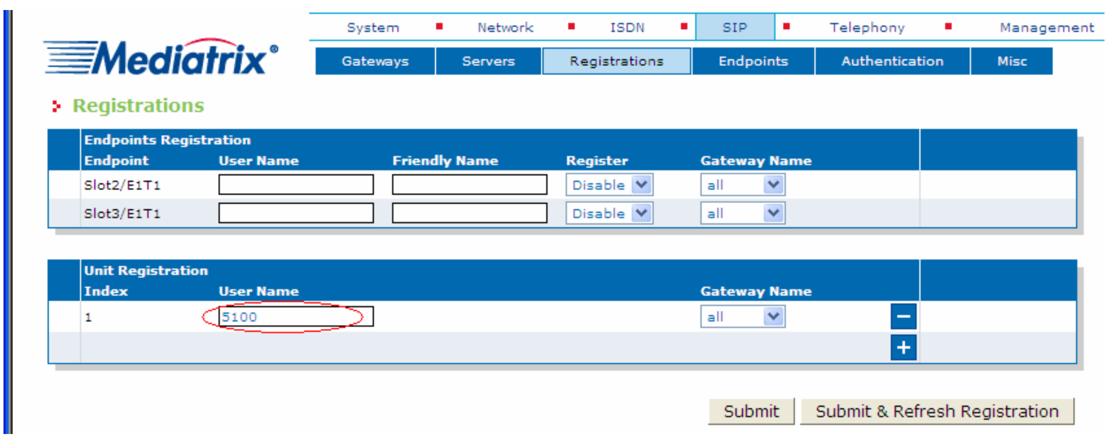


In this window, you can enter the extension numbers from the PBX to be registered in the SIP server.

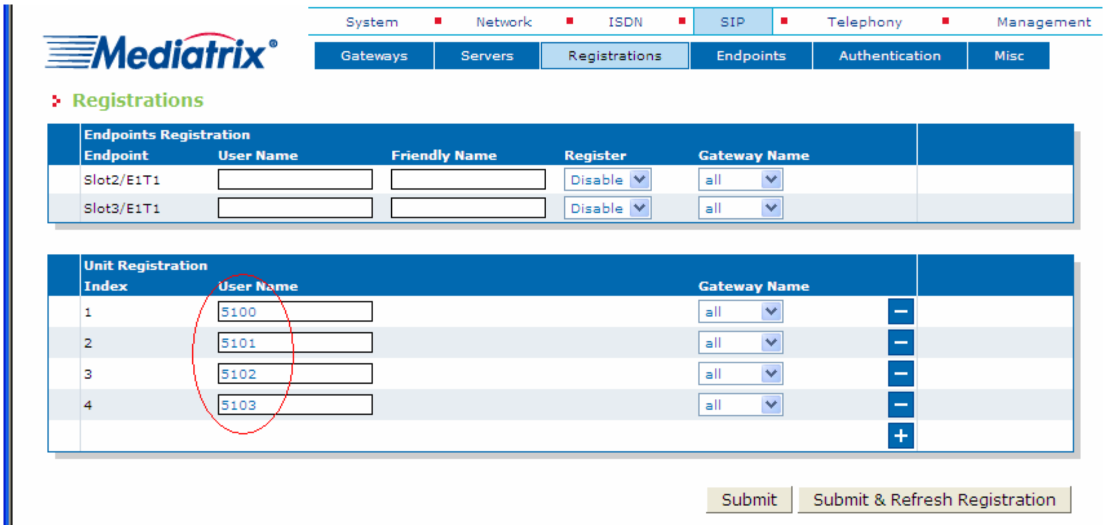
6. Click the button at the bottom right of the *Unit Registration*, section. An empty entry appears in the section.



7. Enter the phone number of the first phone from Office A of the sample network topology (Figure 1) in the *User Name* field (***5100*** in our example).



8. Repeat steps 6 and 7 for all of the phones from Office A of the sample network topology ([Figure 1](#)). At the end of the process, the *Unit Registration* section looks like the following:



9. Click **Submit & Refresh Registrations**. This saves the configuration in the Mediatrix 3000 DG and causes it to send the appropriate SIP REGISTER messages to the SIP server so each phone has a registered SIP user associated with it.

10. OPTIONAL STEP: if your SIP server requires SIP authentication, further configuration steps are necessary so the Mediatrix 3000 DG has all the needed information to authenticate to the server (see the section [Further Information and Configuration](#) for more details).

ISDN Configuration

The purpose of this section is to configure the Mediatrix 3000 DG's ISDN PRI interfaces in Network mode (NT) for an E1 line type. This requires that the PBX be configured in Terminal Equipment (TE). If your setup differs, please refer to the section [Further Information and Configuration](#) for more details.

The ISDN configuration tells the Mediatrix 3000 DG how its ISDN PRI interfaces should behave. You must configure the ISDN parameters of the Mediatrix 3000 DG digital gateways for each interface you intend to use.

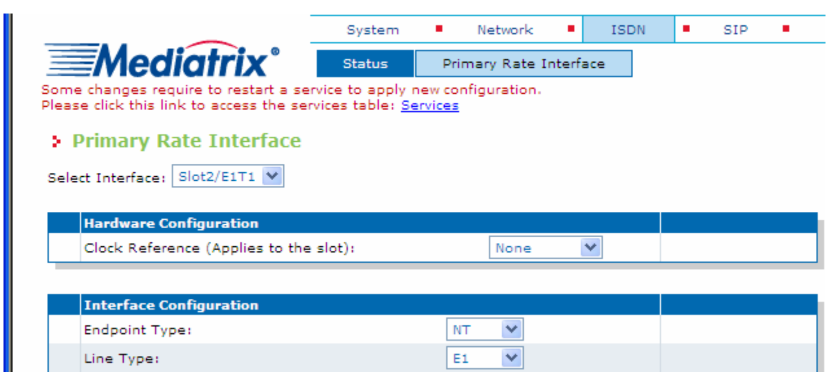
1. Click the **ISDN** menu, then the **Primary Rate Interface** sub-menu. The following window appears:

2. Select the interface for which you want to apply the changes in the *Select Interface* drop-down menu. Depending on the model of Mediatrix 3000 DG you are using, you may have 1 or 2 interfaces available in the drop-down menu.

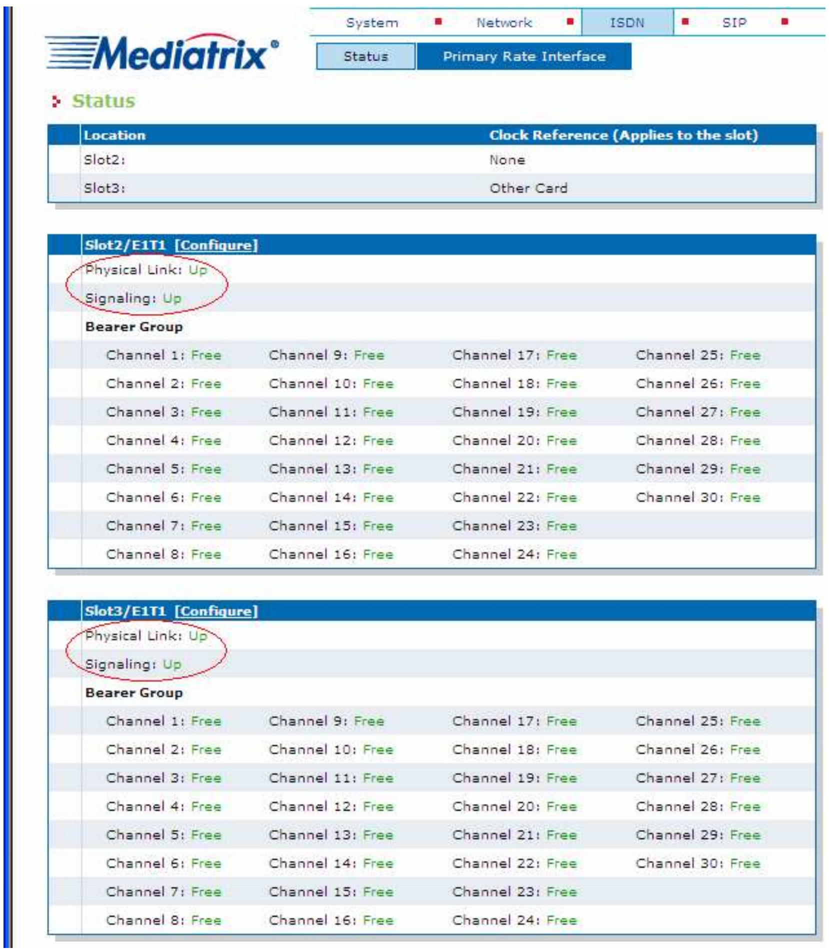
3. In the *Interface Configuration* section, set the *Endpoint Type* field to **NT**. Leave all other parameters to their default values.

   NOTE: The *Line Coding*, *Line Framing,* and *Signaling Protocol* fields are left to common default values here. However, they must be compatible with your setup. If your setup differs, please refer to the section Further Information and Configuration for more details.

4. Click **Submit** to apply the configuration changes made to this interface.



5. The parameters that have just been configured require a restart of the ISDN service. A service is a logical grouping of features. Restarting a service is a required mechanism for certain elements in the configuration. However, you can finish with the ISDN configuration steps before doing that. Once the ISDN configuration is over, follow the instructions from Appendix A - Restarting a Service to restart the ISDN service as required.
6. Repeat steps 2-3-4 for all of the ISDN PRI interfaces listed in the *Select Interface* field.
7. Restart the ISDN service as described in Appendix A - Restarting a Service.
8. To confirm that the ISDN configuration is completed and compatible with the rest of your setup, click the **Status** sub-menu. The following window appears:



The *Physical Link* and *Signaling* status fields of each of the ISDN PRI interfaces configured should be **Up**. If they are not, please review the configuration steps from this section of the document and make sure they have been applied correctly and are compatible with your setup. Please refer to the section **Error! Reference source not found.** for more details.

Call Routing Configuration

The purpose of this section is to configure the Mediatrix 3000 DG's call router so it can route calls to/from the VoIP network and the PBX as described in the Deployment Scenario section.

You must configure the call router parameters of the Mediatrix 3000 DG digital gateway so that the calls can properly terminate. Remember that the purpose of this configuration note is to achieve the sample deployment scenario shown in Figure 1. Your specific setup may vary.

Planning the Call Router

The goal of planning the Call router configuration is to summarize the rules incoming calls will follow when passing through the Mediatrix 3000 DG.

This is:

- Call sources and destinations.
- Calls allowed and rejected.
- Call properties manipulations.
- All routing possibilities.

Before going further with the configuration steps, you should refer back to the two types of calls described in the **Error! Reference source not found.** section.

The most basic call scenario implies at least configuring *Routes*. In the current deployment scenario, you will also configure a *Hunt Group* to support step 3 of call scenario B defined in the ***Error! Reference source not found.*** section (see Further Information and Configuration for more details).

- A Route is a virtual connection made inside the Mediatrix 3000 DG between call sources and destinations. Routes are part of the Mediatrix 3000 DG's Route table. When a call comes in, the Mediatrix 3000 DG uses its Route table to decide to which destination route the call.
- A Hunt Group is a virtual entity that regroups different call destinations in one group. This entity can then be used as a call destination in a Route. When an incoming call is routed to a Hunt, the Hunt uses an algorithm to decide which one of its internal destinations the call is effectively routed to.

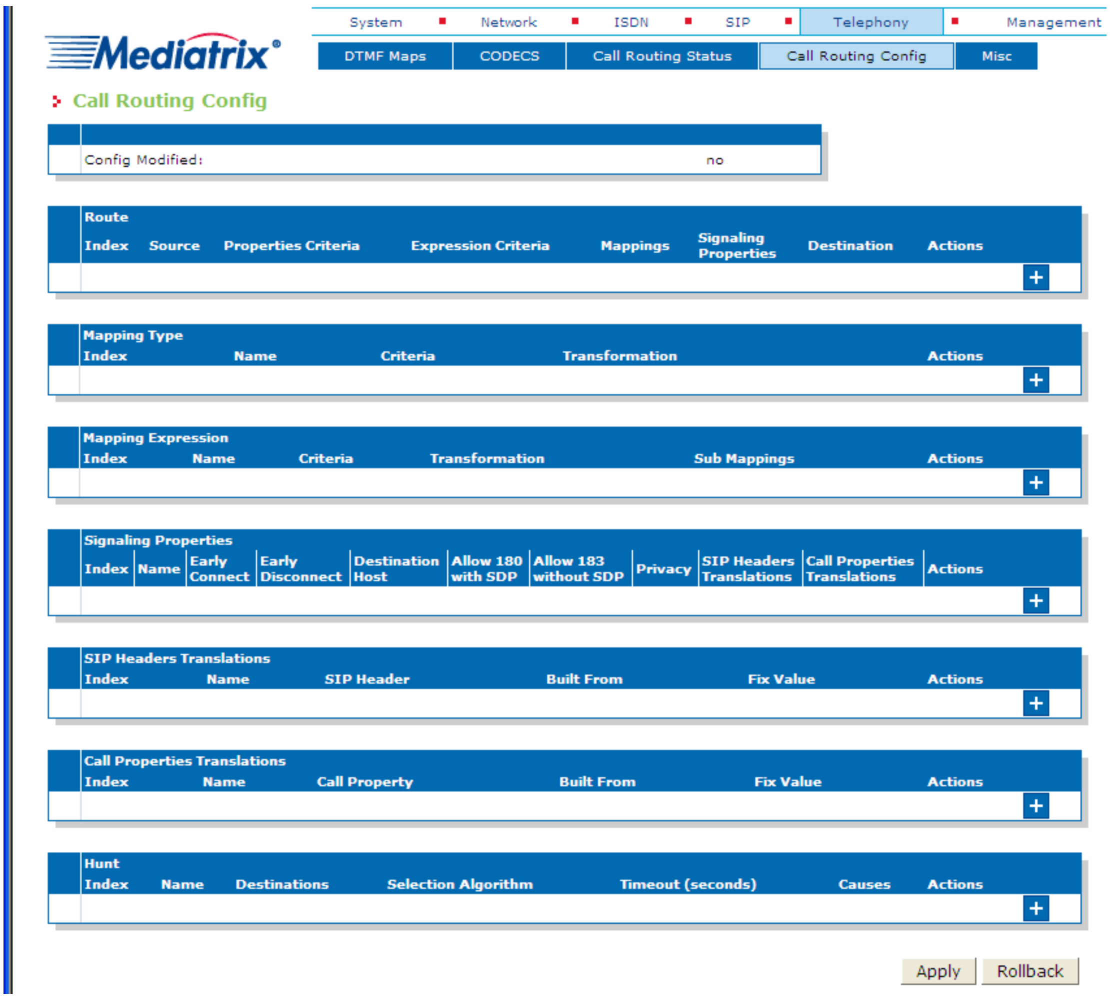
Configuring the Call Router

Hunt Group

The purpose of this subsection is to configure a Hunt Group in the Mediatrix 3000 DG, so it can be later used as a route's destination.

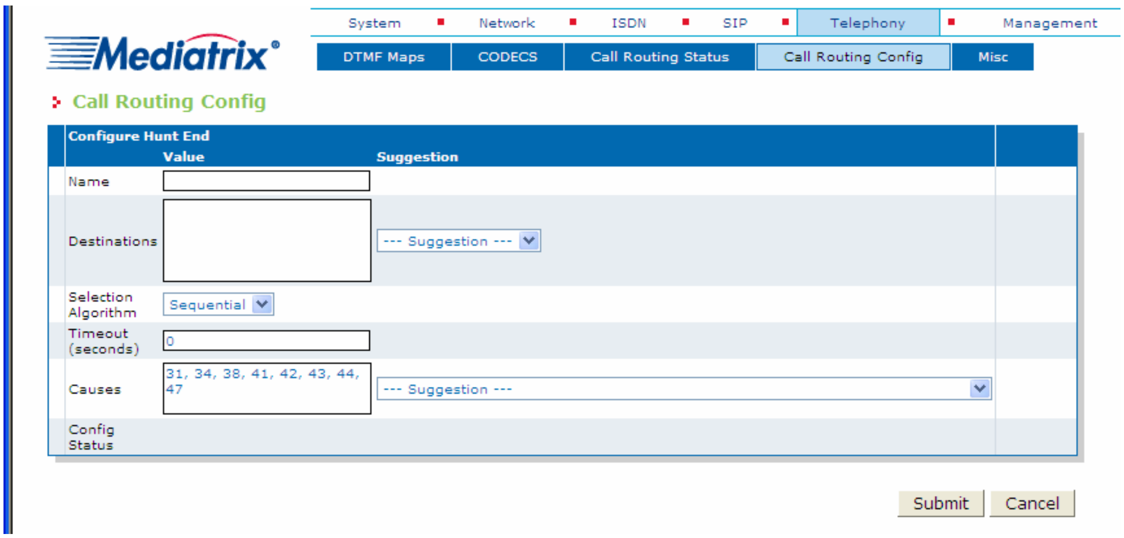
In the current scenario, you will use a Hunt Group to group both of the Mediatrix 3632's ISDN PRI interfaces as one virtual call destination.

1. Click the **Telephony** menu, then the **Call Routing Config** sub-menu. The following window appears.



2. Locate the *Hunt* section at the bottom of the window.

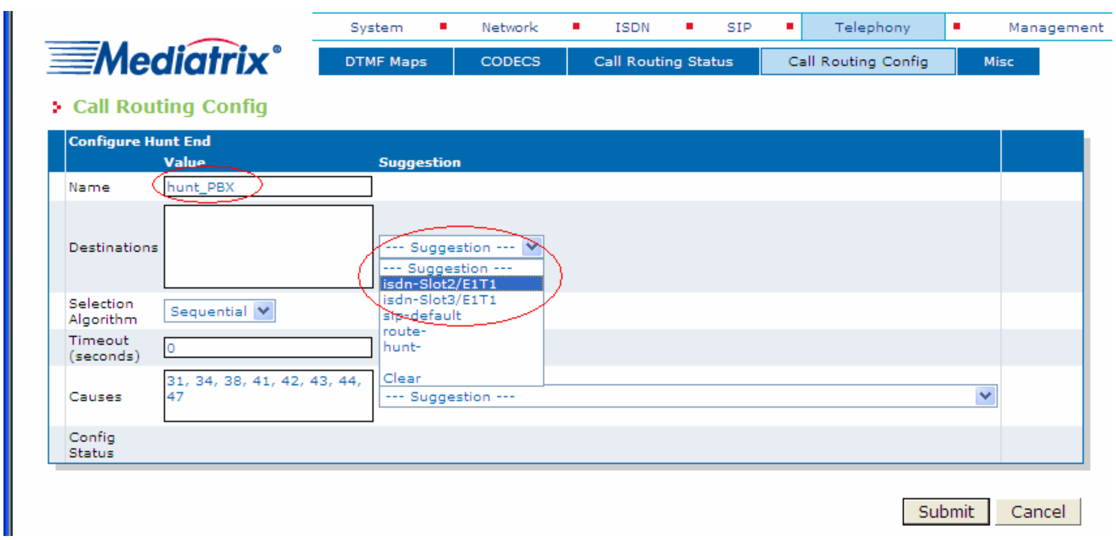
3. Click the + button at the bottom right of the *Hunt* section. The following window appears.



To create a Hunt Group:

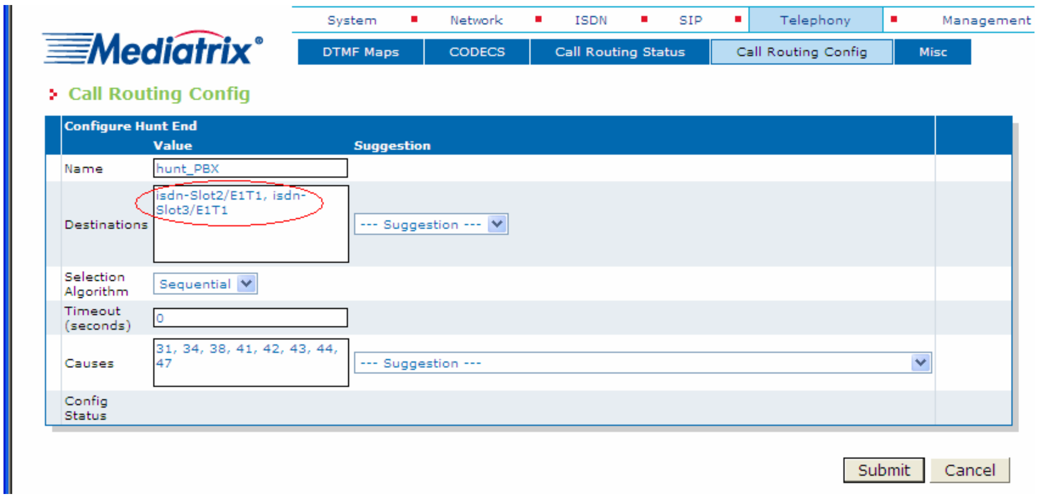
4. Set the *Name* field to ***hunt_PBX***.

5. Use the *Suggestion* drop-down list to select and add the possible destinations that will be part of the Hunt Group.



6. Following the Deployment Scenario, select one by one both of the Mediatrix 3000 DG's ISDN PRI interfaces (**isdn-Slot2/E1T1**, which corresponds to port E1/T1 on SLOT 2 and **isdn-Slot3/E1T1**, which corresponds to port E1/T1 on SLOT 3). The interfaces will be automatically added as destinations for that Hunt Group.

7. Leave the other fields with their default value.



8. Verify if the ISDN interfaces have been successfully added to the configuration by checking the *Destinations* field, then click **Submit** to apply changes and save the new Hunt Group.

9. Your are brought back to the **Call Routing Config** sub-menu, and you can see the *Hunt Group* you have just created in the *Hunt* section.

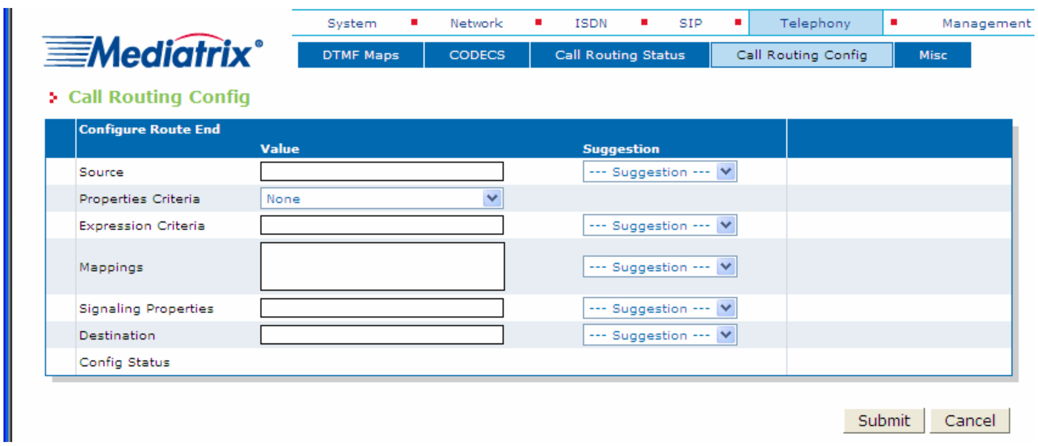
   You can also see a yellow *Yes* that warns you that the configuration has been modified but not applied (i.e., the **Call Routing Status** differs from the **Call Routing Config**). The *Call Routing Config* sub-menu is a working area where you build up a Call Router configuration. While you work in this area, the configured parameters are saved but not applied (i.e., they are not used to process incoming calls). The yellow *Yes* flag warns you that the configuration has been modified but is not applied. You will apply the configuration later when it is complete.

Route

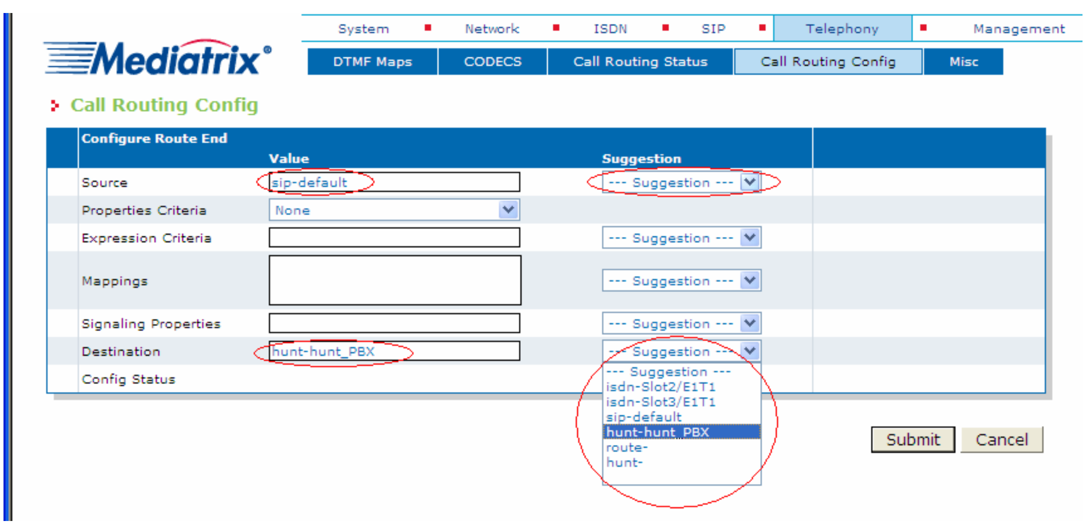
The purpose of this subsection is to configure the Mediatrix 3000 DG so it makes virtual "connections" between call sources and destinations.

1. Locate the *Route* section at the top of the window.

2. Click the **+** button at the bottom right of the *Route* section. The following window appears.



3. To create a route from SIP (**sip-default**) to ISDN (***hunt_PBX***), set the *Source* field to **sip-default** and the *Destination* field to ***hunt-hunt_PBX***. You can use both fields' associated *Suggestion* drop-down list to help you fill them. This route will satisfy call scenario B described in section Deployment Scenario, where SIP users from Office B call phones from Office A.



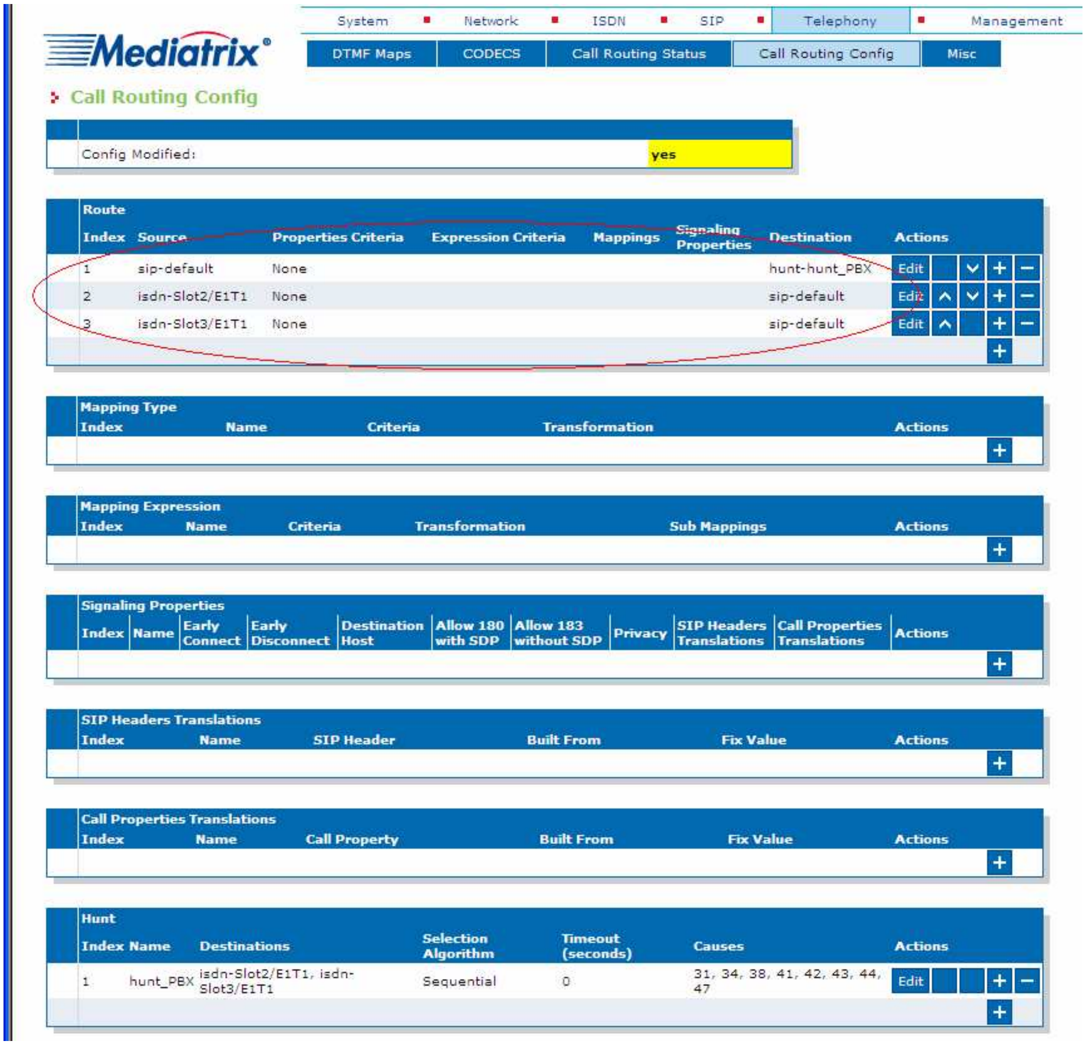
4. Click **Submit** to apply changes and save the new route.

5. You are brought back to the **Call Routing Config** sub-menu, and you can see the route you just created in the *Route* section. You can also see the yellow *Yes* that warns you that the configuration has been modified but not applied (i.e., the **Call Routing Status** differs from the **Call Routing Config**).

6. Repeat steps 2 to 5 twice to create two additional routes. These new routes will satisfy call scenario A described in ***Error! Reference source not found.***, where phones from Office A call SIP users from Office B:

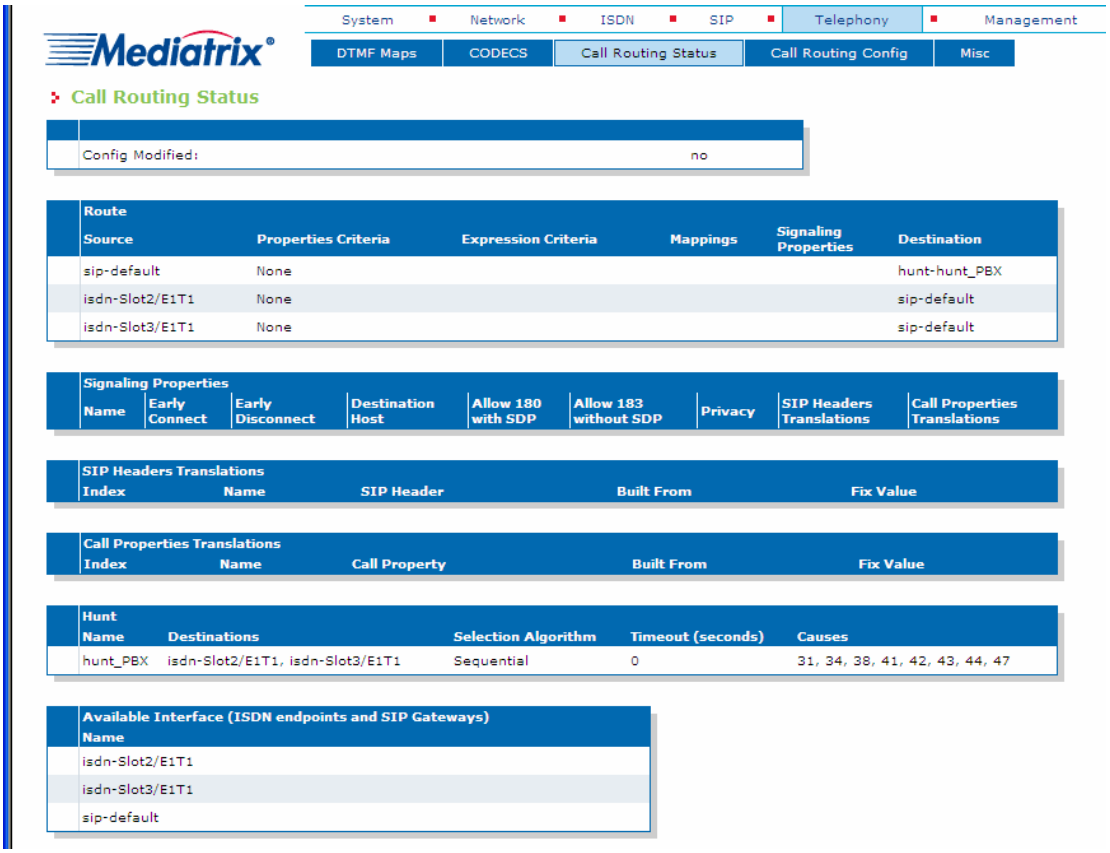
   - one from *Source* **isdn-Slot2/E1T1** to *Destination* **sip-default**, and
   - one from *Source* **isdn-Slot3/E1T1** to *Destination* **sip-default**.

7. After completing all the route configuration steps, you will see your three routes.



8. Click **Apply**. This applies all the parameters from **Call Routing Config** to the system. You can also see that the yellow *Config Modified* **yes** flag is cleared.

9. The call routing parameters can be seen in the **Call Routing Status** window.



Config Modified:	no

Route					
Source	Properties Criteria	Expression Criteria	Mappings	Signaling Properties	Destination
sip-default	None				hunt-hunt_PBX
isdn-Slot2/E1T1	None				sip-default
isdn-Slot3/E1T1	None				sip-default

Signaling Properties								
Name	Early Connect	Early Disconnect	Destination Host	Allow 180 with SDP	Allow 183 without SDP	Privacy	SIP Headers Translations	Call Properties Translations

SIP Headers Translations				
Index	Name	SIP Header	Built From	Fix Value

Call Properties Translations				
Index	Name	Call Property	Built From	Fix Value

Hunt				
Name	Destinations	Selection Algorithm	Timeout (seconds)	Causes
hunt_PBX	isdn-Slot2/E1T1, isdn-Slot3/E1T1	Sequential	0	31, 34, 38, 41, 42, 43, 44, 47

Available Interface (ISDN endpoints and SIP Gateways)
Name
isdn-Slot2/E1T1
isdn-Slot3/E1T1
sip-default

The configuration note has prepared the system to perform calls in both directions.

Basic Call Establishment

Once this configuration procedure is completed, you are ready to start making basic calls through your new Mediatrix 3000 DG, considering that the rest of your network's setup is configured properly.

Perform Basic Call (Scenario A)

- Pickup the phone that has the phone number ***5100***.
- Dial ***4567***.
- The analog phone number ***4567*** rings.
- Pick up the analog phone number ***4567***.
- The call is established.
- Hang up both phones to end the call.

Perform Basic Call (Scenario B)

- Pick up the analog phone number ***4567***.
- Dial ***5100***.
- The phone number ***5100*** rings.
- Pickup the phone number ***5100***.

- The call is established.
- Hang up both phones to end the call.

Further Information and Configuration

You can refer to the following documents/sections for further information on configuration parameters and features used in this configuration note.

All documents are available online on the Mediatrix Download Portal at https://support.mediatrix.com/DownloadPlus/Download.asp.

1- For more information on the Partial Reset feature, and on what to do after performing a Partial Reset to recover a unit with which you had lost contact, refer to the *Partial Reset* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

2- For more information on configuring level 2 network links, level 3 network interfaces and IP addresses, refer to the *Interfaces Configuration* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

3- For more information on configuring the Mediatrix 3000 DG's ISDN PRI interfaces in TE or NT mode and additional parameters, refer to the *ISDN Configuration* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

4- For more information on configuring the Mediatrix 3000 DG to work with SIP servers that require SIP authentication, refer to the *SIP Authentication* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

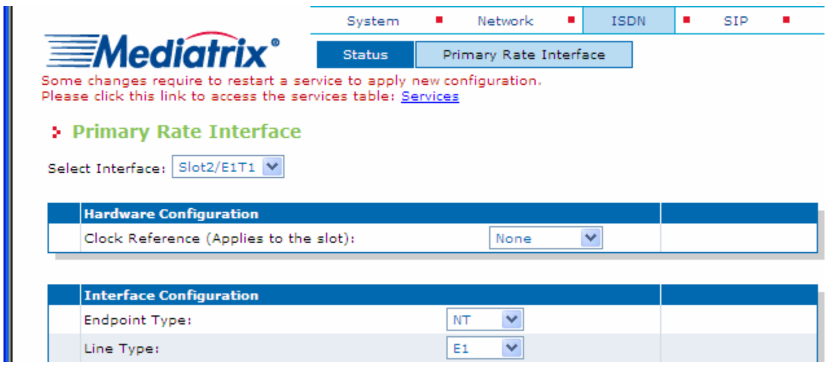
5- For information on how to configure the Mediatrix 3000 DG so it processes dialed DTMFs according to specific dialing plans, refer to the *DTMF Maps Configuration* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

6- For more information on call routing including routes, mappings, signaling properties, and hunts, refer to the *Call Router Configuration* section of the *Mediatrix 3000 Series Digital Gateway Software Configuration Guide*.

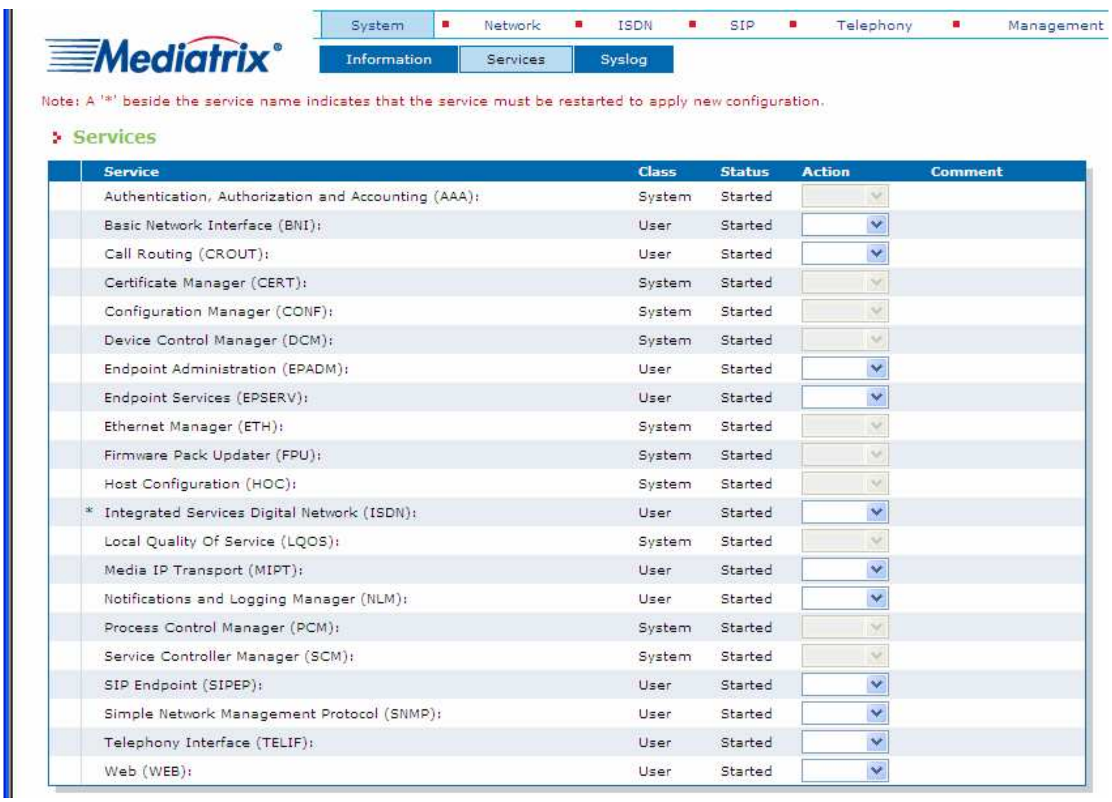
Appendix A - Restarting a Service

The Mediatrix 3000 DG's features are divided in logical entities called *Services.* Some parameters in the Mediatrix 3000 DG require that the service to which they belong be restarted when they are configured in order for their new configuration value to be correctly applied. When this happens (usually after you click a **Submit** button), a message and a **Services** link are displayed at the top of the window stating that a service must be restarted.

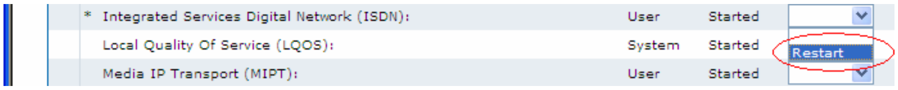
In this example, a parameter of the ISDN services requires that this service be restarted.



1. Click the **Services** link, which brings you to the **Services** page. In this page, each service that requires to be restarted has a "*" besides its name, as illustrated in the following window.

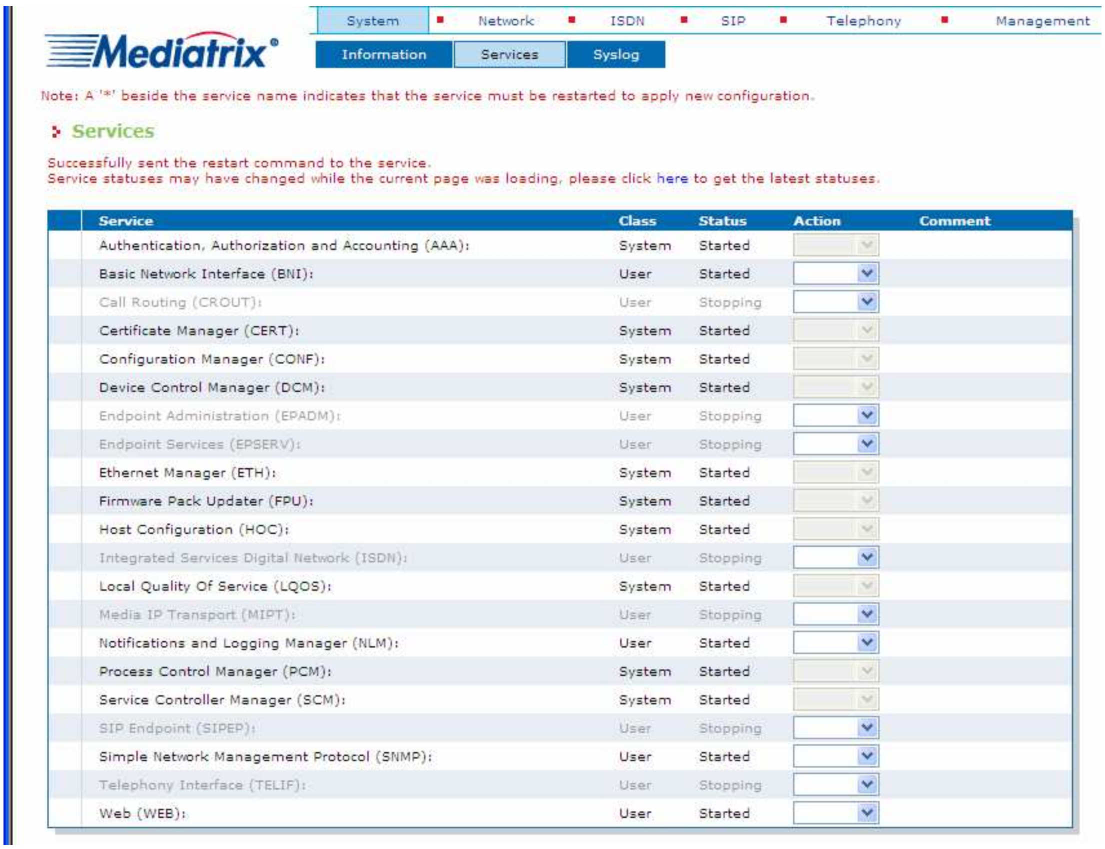


2. Restart each service that has a "*" besides its name by clicking the **Restart** action so it correctly applies its new configuration.



* Integrated Services Digital Network (ISDN):	User	Started	
Local Quality Of Service (LQOS):	System	Started	Restart
Media IP Transport (MIPT):	User	Started	

3. Restarting a service may require other services to be restarted. This is why you would see a few services go from the stopping to starting to started states, even if you only restarted one service. The displayed status may be refreshed at any time by clicking the **Services** submenu or the **here** link.



Service	Class	Status	Action	Comment
Authentication, Authorization and Accounting (AAA):	System	Started		
Basic Network Interface (BNI):	User	Started		
Call Routing (CROUT):	User	Stopping		
Certificate Manager (CERT):	System	Started		
Configuration Manager (CONF):	System	Started		
Device Control Manager (DCM):	System	Started		
Endpoint Administration (EPADM):	User	Stopping		
Endpoint Services (EPSERV):	User	Stopping		
Ethernet Manager (ETH):	System	Started		
Firmware Pack Updater (FPU):	System	Started		
Host Configuration (HOC):	System	Started		
Integrated Services Digital Network (ISDN):	User	Stopping		
Local Quality Of Service (LQOS):	System	Started		
Media IP Transport (MIPT):	User	Stopping		
Notifications and Logging Manager (NLM):	User	Started		
Process Control Manager (PCM):	System	Started		
Service Controller Manager (SCM):	System	Started		
SIP Endpoint (SIPEP):	User	Stopping		
Simple Network Management Protocol (SNMP):	User	Started		
Telephony Interface (TELIF):	User	Stopping		
Web (WEB):	User	Started		

Thank you for using Mediatrix solutions!