

OrcaWave Communication Platform

Basic Installation Guide

Aug 2018

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Preface

This document describes the various deployment and installation of OrcaWave.

Intended Audience

This guide is intended for experienced system and network administrators. Depending on the functionality to be used, readers should have specific knowledge in the following areas:

- Networking and data communications
- TCP/IP protocols
- General router configuration
- Routing protocols
- Network administration
- Network security
- IP service
- SIP protocol

Chapter 1: OrcaWave GUI Configuration

This section presents the following:

- OrcaWave GUI configuration.(VOIP)
- Special configuration.
- Basic troubleshooting.

Login to the OrcaWave GUI

Open your web browser and enter the IP address of your OrcaWave system, the default IP address is <http://192.168.100.1:8888>

If your OrcaWave is the DNS server you can login using <http://orcawave.cpe:8888>

Click on OrcaWave Administration, enter your username and password, the default username is user and the password is OrcaWave .



Add, delete, and modify phones and extensions

Add extension

From the applications menu click on Extensions



Chose Generic SIP Device from the drop down menu and click Submit



OrcaWave
UNIFIED COMMUNICATIONS

Admin Applications Connectivity Reports Settings User Panel

Add an Extension

Please select your Device below then click Submit

- Device

Device Generic SIP Device

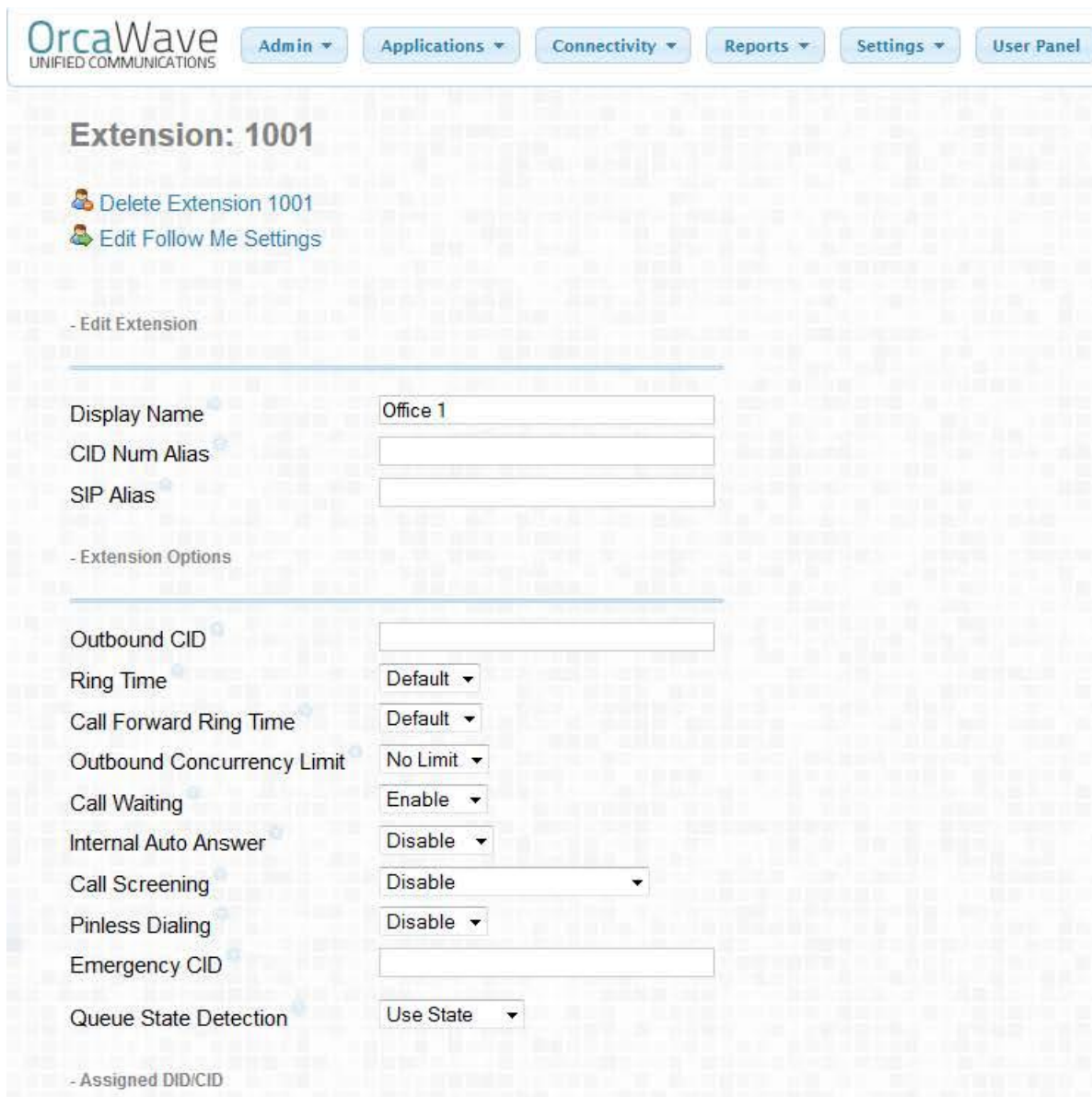
Submit

In the user extension field put your extension number and Display Name then scroll down to device options and put a password in the secret field the password should be at least 6 characters long with 2 numbers and 2 letters (remember this password will be used later to register your IP Phone) then click Submit and apply configuration changes from the red bar at the top.

It's recommended that you don't use a 3 digit extension that begins with 1 in most of the countries. If you did you should exclude the local emergency numbers and info services numbers from your list.

Delete extension


From the Extensions menu you will find all of your extensions on the right, click on the one you want to delete then click on delete extension at the top of the page.




OrcaWave
UNIFIED COMMUNICATIONS

Admin ▾ Applications ▾ Connectivity ▾ Reports ▾ Settings ▾ User Panel

Extension: 1001

 Delete Extension 1001

 Edit Follow Me Settings

- Edit Extension

Display Name

CID Num Alias

SIP Alias

- Extension Options

Outbound CID

Ring Time

Call Forward Ring Time

Outbound Concurrency Limit

Call Waiting

Internal Auto Answer

Call Screening

Pinless Dialing


Emergency CID

Queue State Detection

- Assigned DID/CID



Modify extension

From the Extensions menu, click on the one you want to modify and edit your configuration, submit and apply your configuration changes at the top of the page.



Admin ▾
Applications ▾
Connectivity ▾
Reports ▾
Settings ▾
User Panel
Vyatta
Apply Config

Extension: 1001

 Delete Extension 1001
 Edit Follow Me Settings

- Edit Extension

Display Name

CID Num Alias

SIP Alias

- Extension Options

Outbound CID

Ring Time

Default ▾

Call Forward Ring Time

Default ▾

Outbound Concurrency Limit

No Limit ▾

Call Waiting

Enable ▾

Internal Auto Answer

Disable ▾

Call Screening

Disable ▾

Pinless Dialing

Disable ▾

Emergency CID

Queue State Detection

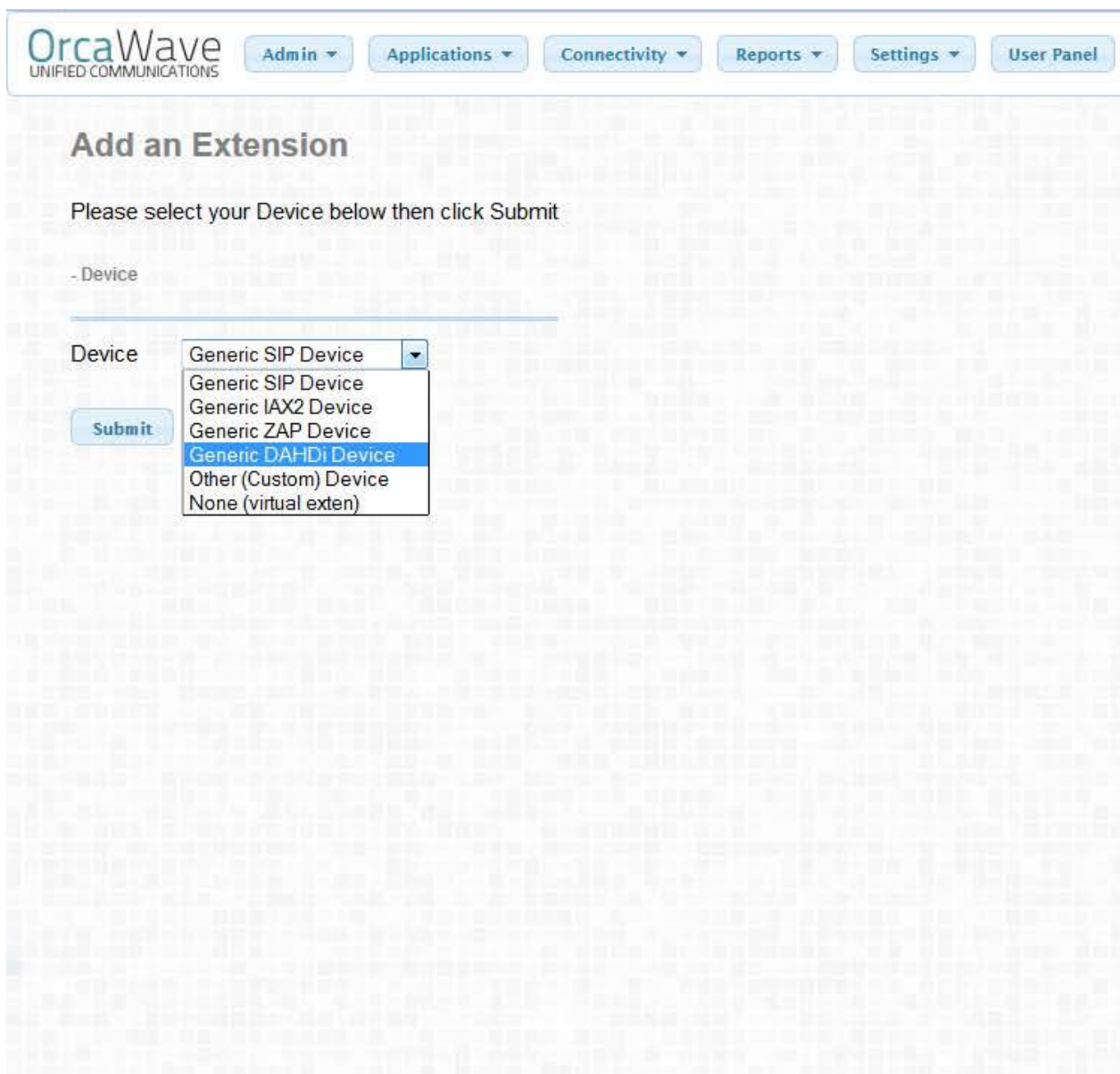
Use State ▾

- Assigned DID/CID

Analog phone

Go extensions Device select Generic DAHDI Device

This phone will be connected directly to the PBX on the left port with green light.



OrcaWave
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Admin Applications Connectivity Reports Settings User Panel

Add an Extension

Please select your Device below then click Submit

- Device

Device

- Generic SIP Device
- Generic SIP Device
- Generic IAX2 Device
- Generic ZAP Device
- Generic DAHDI Device**
- Other (Custom) Device
- None (virtual exten)

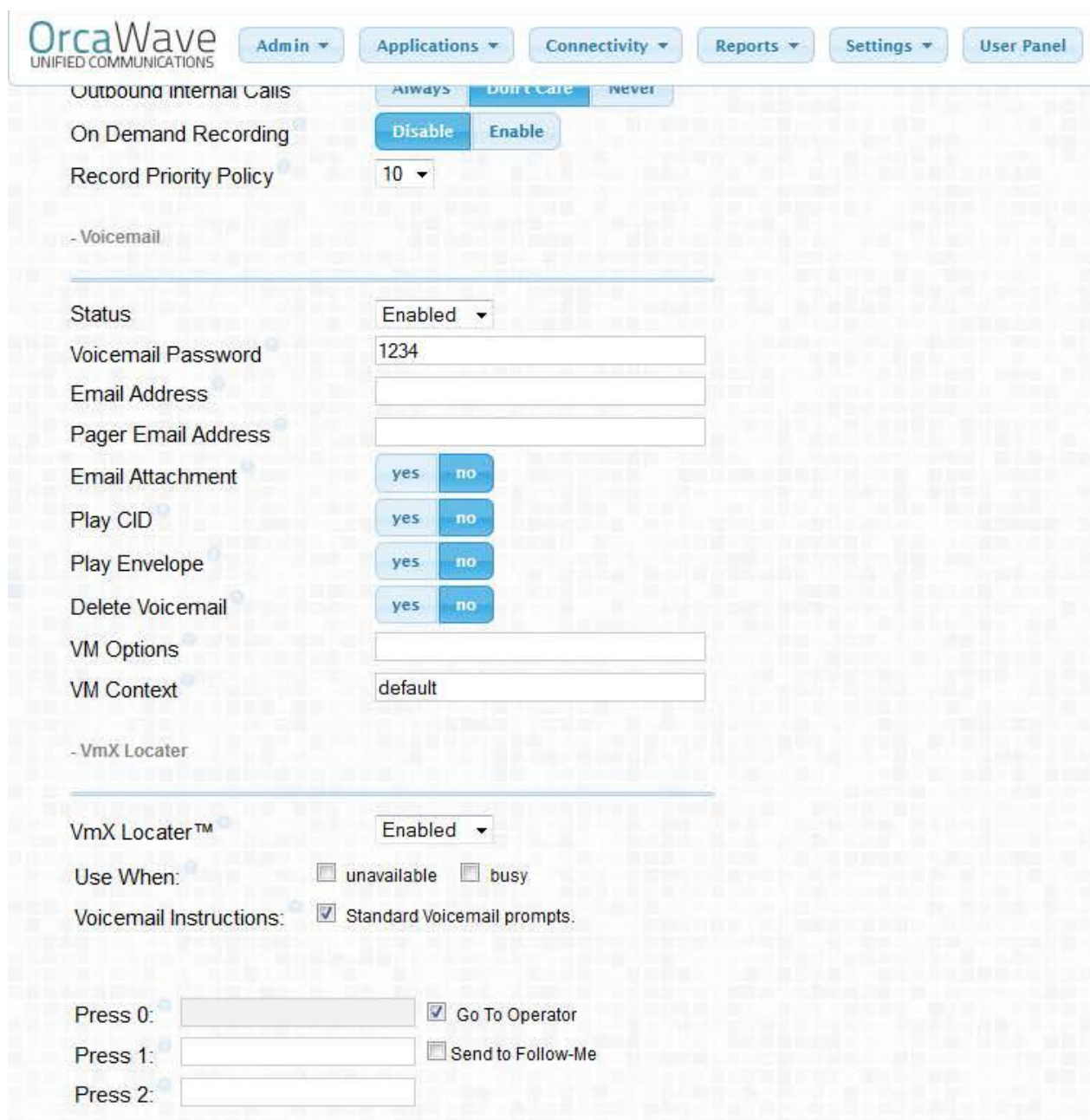
Submit

Fill in User Extension and Display Name then scroll down to the Device Options.

In the channel field type 5.

Voice Mail

From the extension configuration scroll down to the voicemail settings , change the status to enabled , set the password , and enter your email address



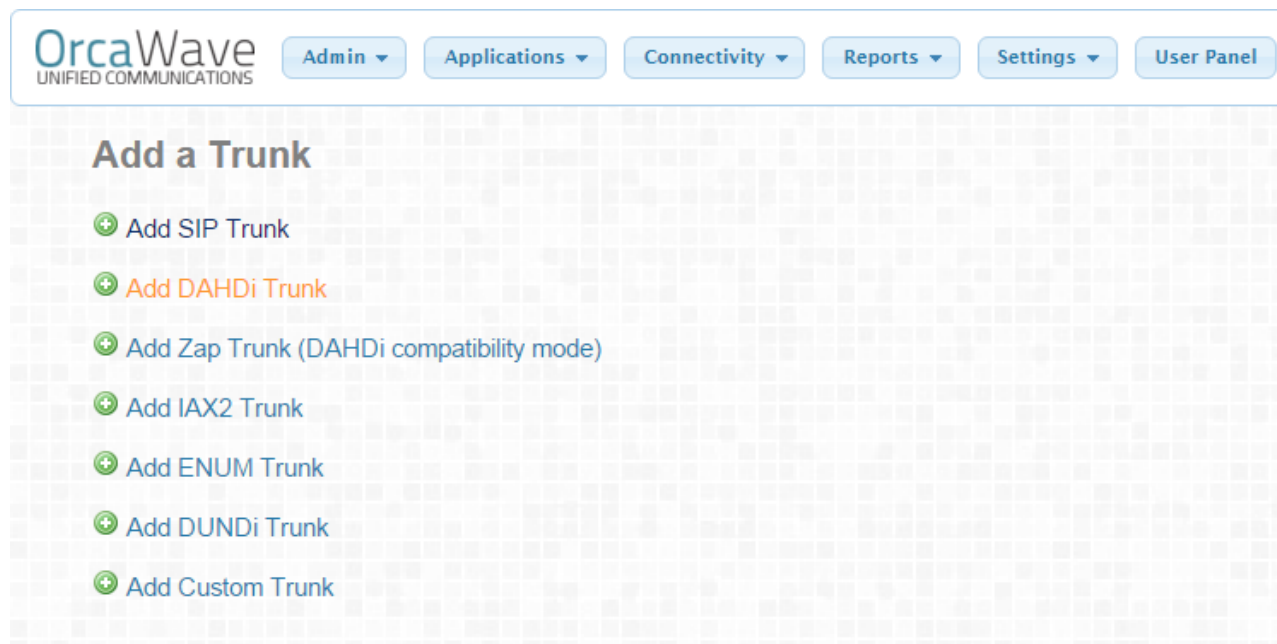
The screenshot shows the OrcaWave Unified Communications settings interface. At the top, there are navigation tabs: Admin, Applications, Connectivity, Reports, Settings, and User Panel. Below these are several configuration sections:

- Outbound Internal Calls:** Radio buttons for Always, Don't Care (selected), and Never.
- On Demand Recording:** Disable and Enable buttons.
- Record Priority Policy:** A dropdown menu set to 10.
- Voicemail:** A section header for the voicemail configuration.
- Status:** A dropdown menu set to Enabled.
- Voicemail Password:** A text input field containing 1234.
- Email Address:** An empty text input field.
- Pager Email Address:** An empty text input field.
- Email Attachment:** Radio buttons for yes and no (no is selected).
- Play CID:** Radio buttons for yes and no (no is selected).
- Play Envelope:** Radio buttons for yes and no (no is selected).
- Delete Voicemail:** Radio buttons for yes and no (no is selected).
- VM Options:** An empty text input field.
- VM Context:** A text input field containing default.
- VmX Locator:** A section header for VmX Locator settings.
- VmX Locator™:** A dropdown menu set to Enabled.
- Use When:** Checkboxes for unavailable and busy (both are unchecked).
- Voicemail Instructions:** A checked checkbox for Standard Voicemail prompts.
- Press 0:** A text input field with a checked checkbox for Go To Operator.
- Press 1:** A text input field with an unchecked checkbox for Send to Follow-Me.
- Press 2:** An empty text input field.

Trunks

Configure DAHDI trunk (LOCAL)

From the Connectivity menu click on trunks then add DAHDI trunk



For the normal trunk, in the Trunk Name and Outbound CallerID just type your telephone land line number (i.e. 25XXXXXX) and scroll down to the DAHDI Identifier and type g0. Submit and apply changes.

Configure DAHDI trunk (for 2 separate lines)

Let's say you have two land lines and on the telephone set, you also have two lines and you want the phone to be configured in a way that if someone called the land line number one, the phone rings in line number one and vice versa .

on the other hand if you initiate a call from line one, you want the call to go out through line one.

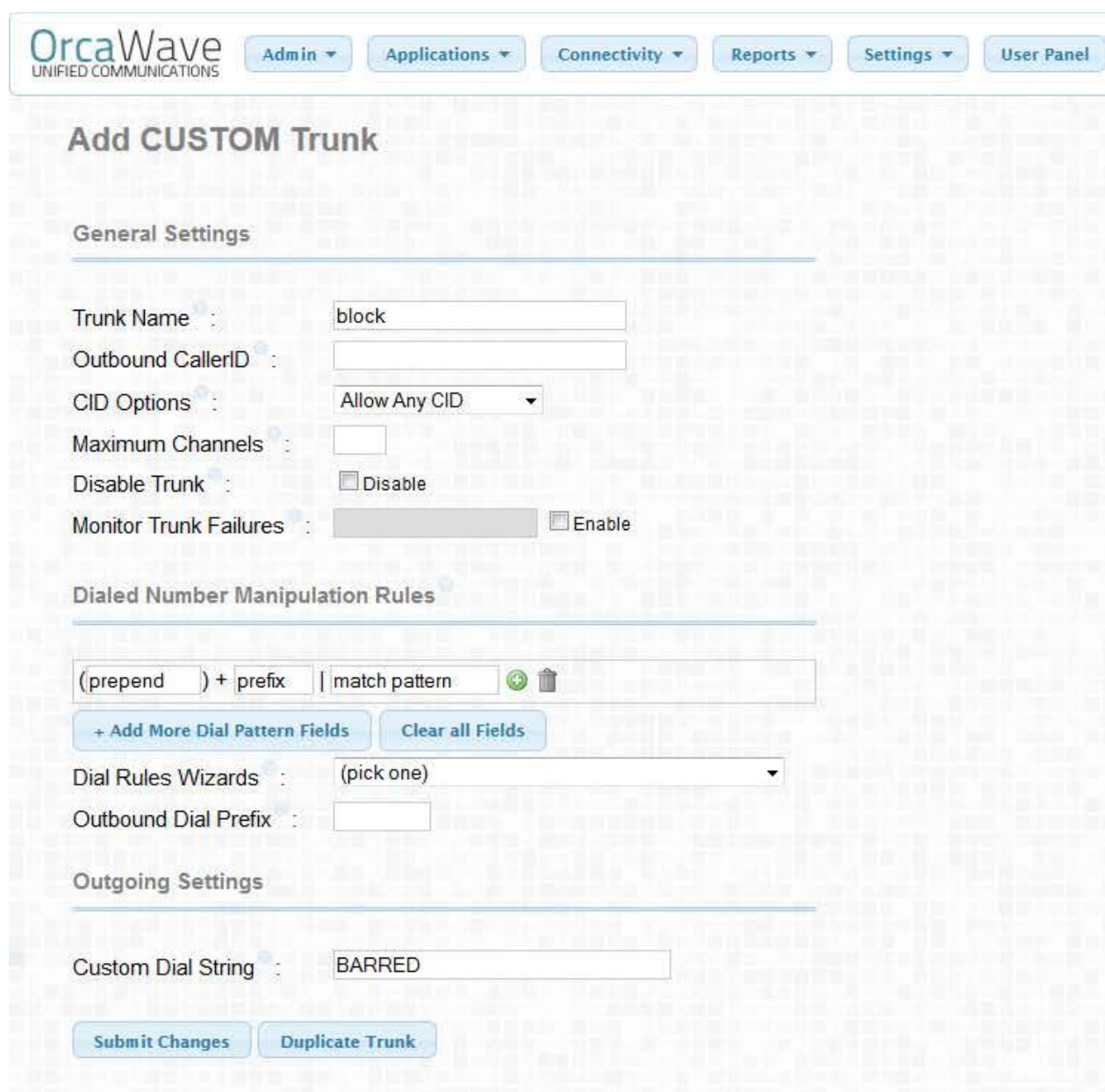
Here you have to do the following configuration:
First you have to create two DAHDI Trunks, one for each line But in the DAHDI Identifier field you put 1 for line one and 3 for line two.



Trunk to Block calls

For example this trunk can be used to block international calls on some Extensions.

Go to trunk, add custom trunk, name it then in the Custom Dial String: type **BARRED**



OrcaWave UNIFIED COMMUNICATIONS

Admin Applications Connectivity Reports Settings User Panel

Add CUSTOM Trunk

General Settings

Trunk Name : block

Outbound CallerID :

CID Options : Allow Any CID

Maximum Channels :

Disable Trunk : Disable

Monitor Trunk Failures : Enable

Dial Number Manipulation Rules

(prepend) + prefix | match pattern

+ Add More Dial Pattern Fields Clear all Fields

Dial Rules Wizards : (pick one)

Outbound Dial Prefix :

Outgoing Settings

Custom Dial String : BARRED

Submit Changes Duplicate Trunk

Outbound Routes

Configure outbound route to block:

From the basic setup menu click on outbound route then click on add route Fill in the Route Name put the Match pattern and caller ID if you want then from the trunk sequence select the custom trunk you created for blocking and from the route position make sure that this outbound route is on top.

Configure outbound route for local calls:

From the basic setup menu click on outbound route then click on add route Fill in the Route Name in the Match pattern type NXXXXXXX or . to match any dialed digits then from the trunk sequence select the trunk you made for local calls.

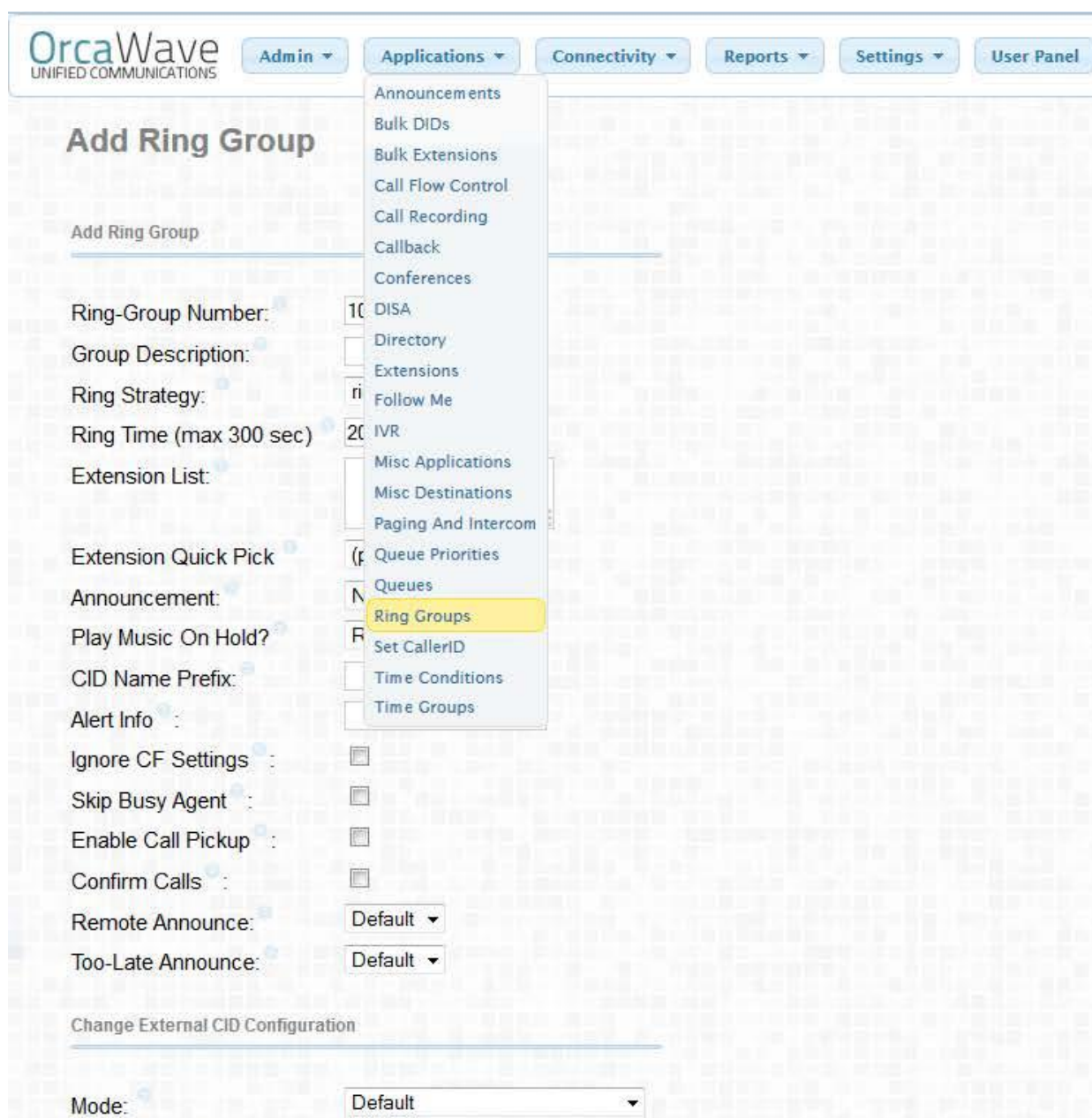
Configure outbound route for international calls:

From the basic setup menu click on outbound route then click on add route Fill in the Route Name in the Match pattern type 0. (if you want only one extension to be able to use this route in the caller ID type that extension number) then from the trunk sequence select the trunk you made for local calls.

Inbound Call Control

Ring Group

From the Application menu click on Ring Groups and fill the Extension List then apply config.



The screenshot displays the OrcaWave Unified Communications Admin interface. At the top, there are navigation tabs: Admin, Applications, Connectivity, Reports, Settings, and User Panel. The 'Applications' menu is open, showing a list of options including Announcements, Bulk DIDs, Bulk Extensions, Call Flow Control, Call Recording, Callback, Conferences, DISA, Directory, Extensions, Follow Me, IVR, Misc Applications, Misc Destinations, Paging And Intercom, Queue Priorities, Queues, Ring Groups (highlighted in yellow), Set CallerID, Time Conditions, and Time Groups.

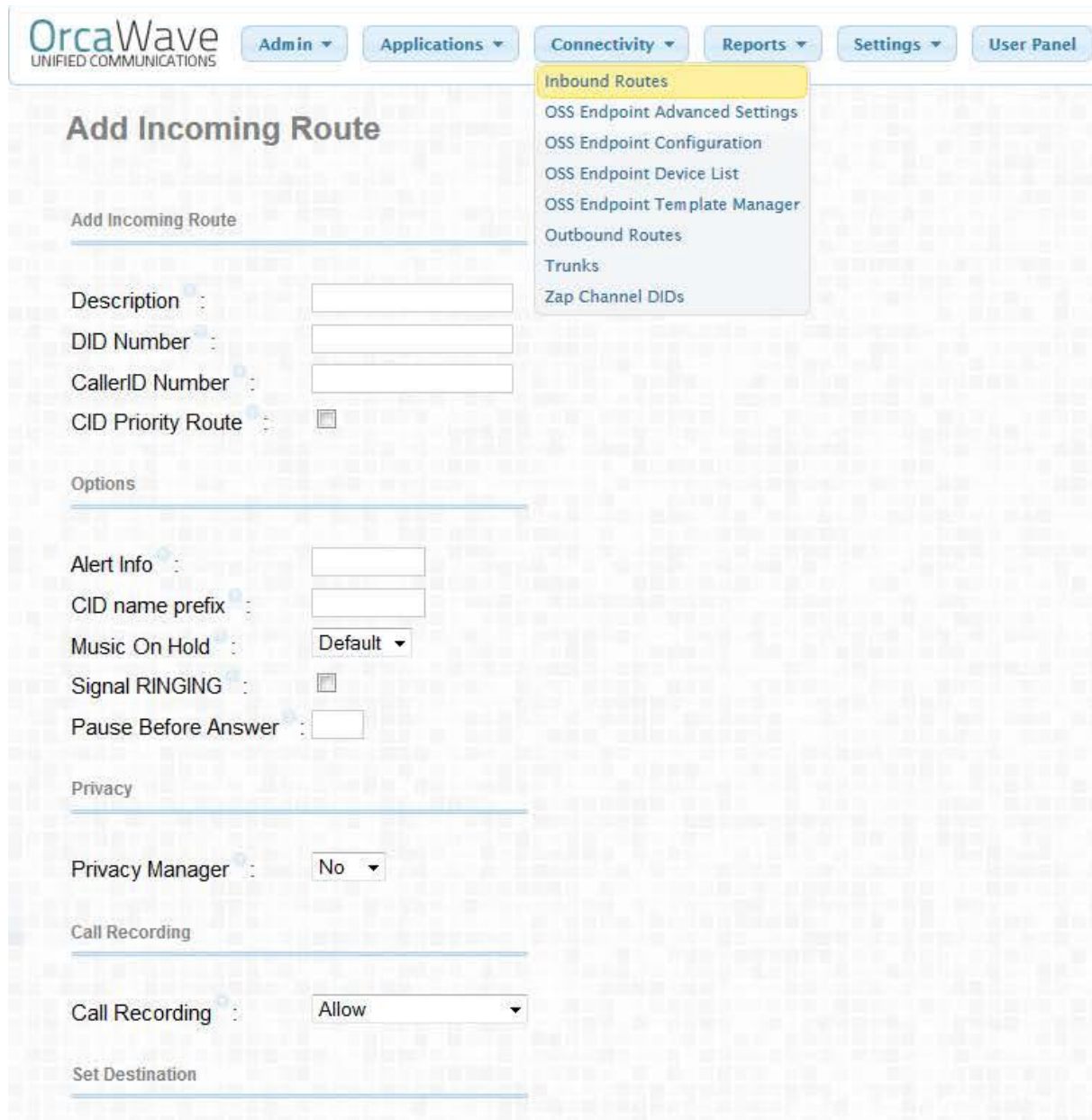
The main content area is titled 'Add Ring Group' and contains the following configuration fields:

- Ring-Group Number: 10
- Group Description:
- Ring Strategy: ri
- Ring Time (max 300 sec): 20
- Extension List:
- Extension Quick Pick: (f
- Announcement: N
- Play Music On Hold?: R
- CID Name Prefix:
- Alert Info :
- Ignore CF Settings :
- Skip Busy Agent :
- Enable Call Pickup :
- Confirm Calls :
- Remote Announce: Default ▾
- Too-Late Announce: Default ▾

At the bottom, there is a section for 'Change External CID Configuration' with a 'Mode:' dropdown menu set to 'Default'.

Inbound Routes

From the Connectivity menu click on Inbound Routes fill in the description and DID Number with your land line number



OrcaWave
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Admin Applications Connectivity Reports Settings User Panel

Add Incoming Route

Add Incoming Route

Description :

DID Number :

CallerID Number :

CID Priority Route :

Options

Alert Info :

CID name prefix :

Music On Hold : Default ▾

Signal RINGING :

Pause Before Answer :

Privacy

Privacy Manager : No ▾

Call Recording

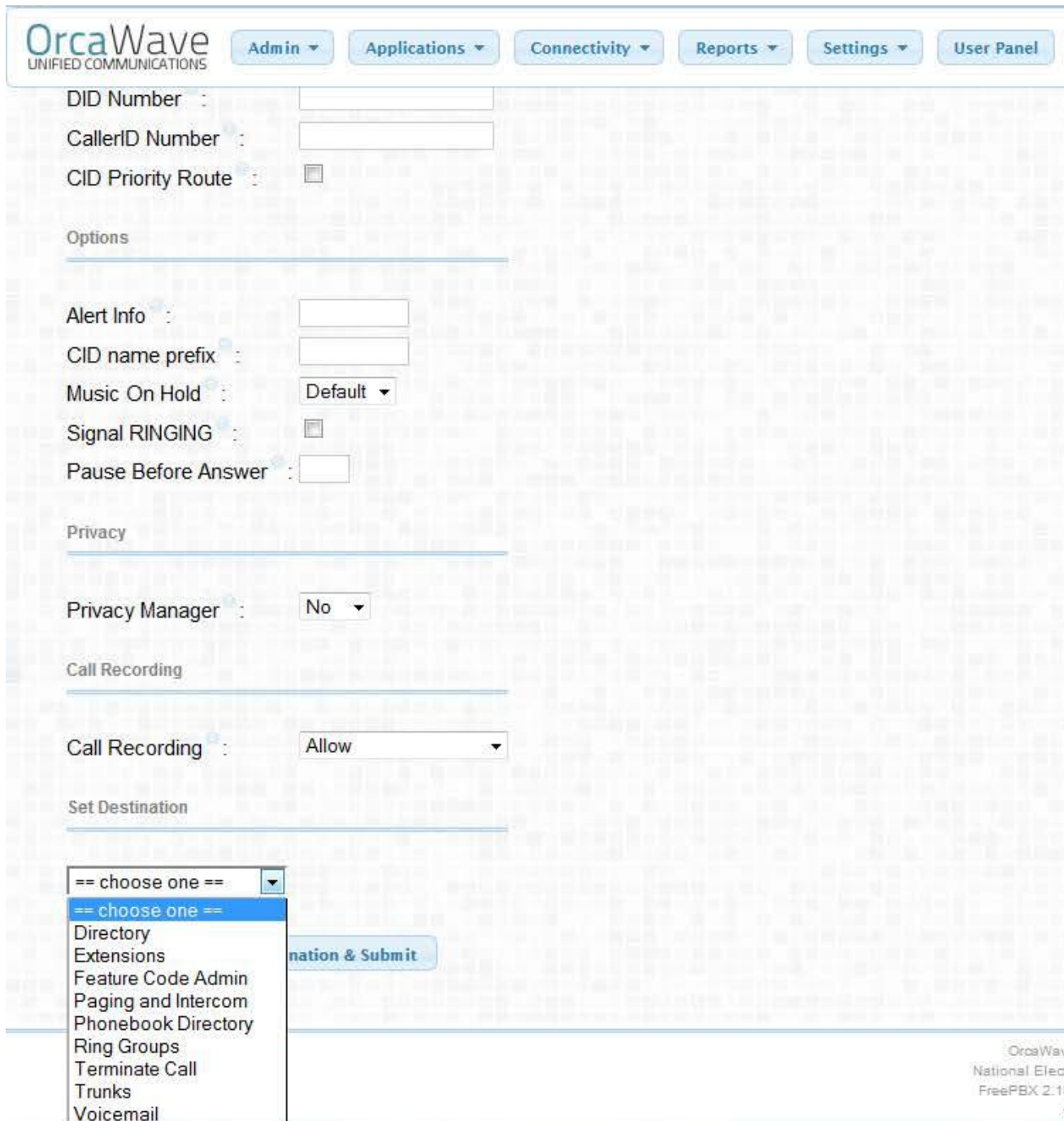
Call Recording : Allow ▾

Set Destination

Inbound Routes

- OSS Endpoint Advanced Settings
- OSS Endpoint Configuration
- OSS Endpoint Device List
- OSS Endpoint Template Manager
- Outbound Routes
- Trunks
- Zap Channel DIDs

At the bottom of the page you can set the destination to the ring group you just created. If you want to point it to the IVR you have to create one first.



The screenshot shows the OrcaWave Unified Communications administration interface. At the top, there is a navigation bar with the OrcaWave logo and several menu items: Admin, Applications, Connectivity, Reports, Settings, and User Panel. Below the navigation bar, the main configuration area is divided into several sections:

- Basic Information:** Includes fields for DID Number, CallerID Number, and a checkbox for CID Priority Route.
- Options:** A section header followed by a horizontal line.
- Alert Info:** Includes fields for Alert Info, CID name prefix, Music On Hold (set to Default), Signal RINGING (checkbox), and Pause Before Answer.
- Privacy:** A section header followed by a horizontal line.
- Privacy Manager:** A dropdown menu set to No.
- Call Recording:** A section header followed by a horizontal line.
- Call Recording:** A dropdown menu set to Allow.
- Set Destination:** A section header followed by a horizontal line.

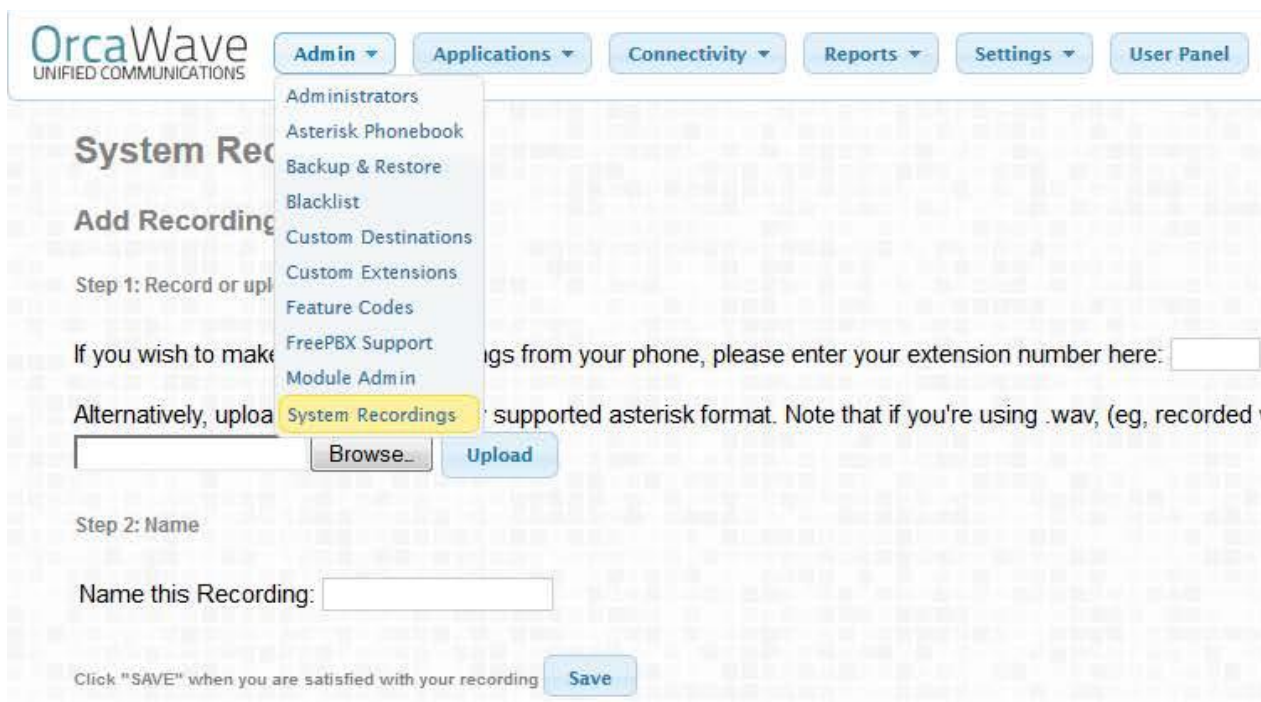
In the Set Destination section, a dropdown menu is open, showing the following options:

- == choose one ==
- Directory
- Extensions
- Feature Code Admin
- Paging and Intercom
- Phonebook Directory
- Ring Groups
- Terminate Call
- Trunks
- Voicemail

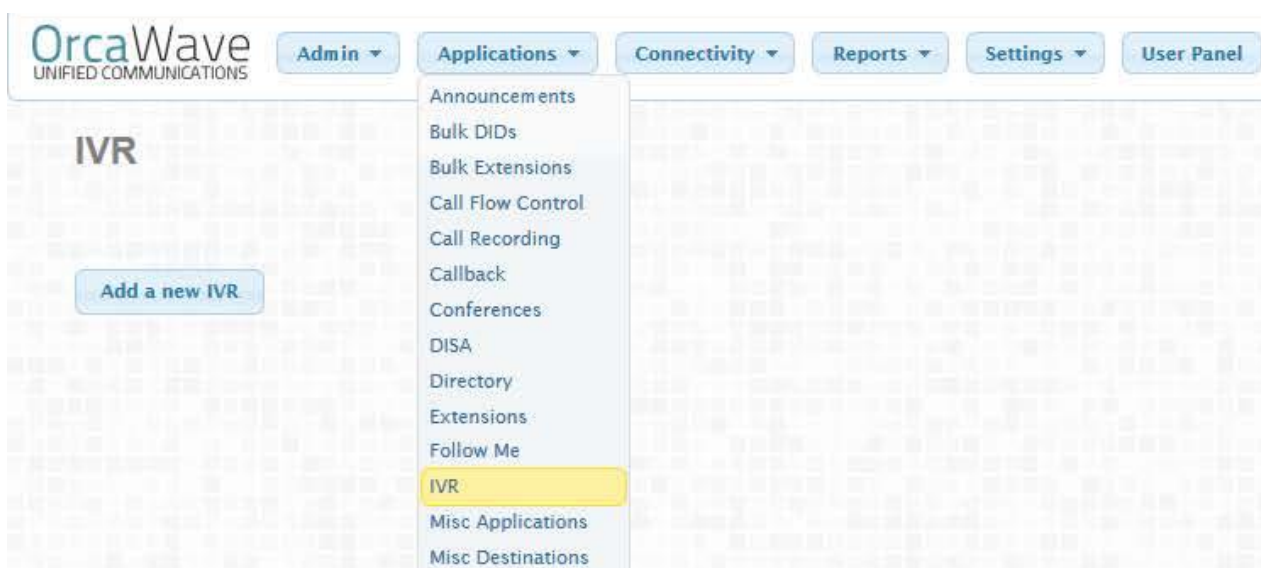
Below the dropdown menu, there is a button labeled "Save & Submit". In the bottom right corner, there is a small text area that reads "OrcaWave National Elec FreePBX 2.1".

IVR

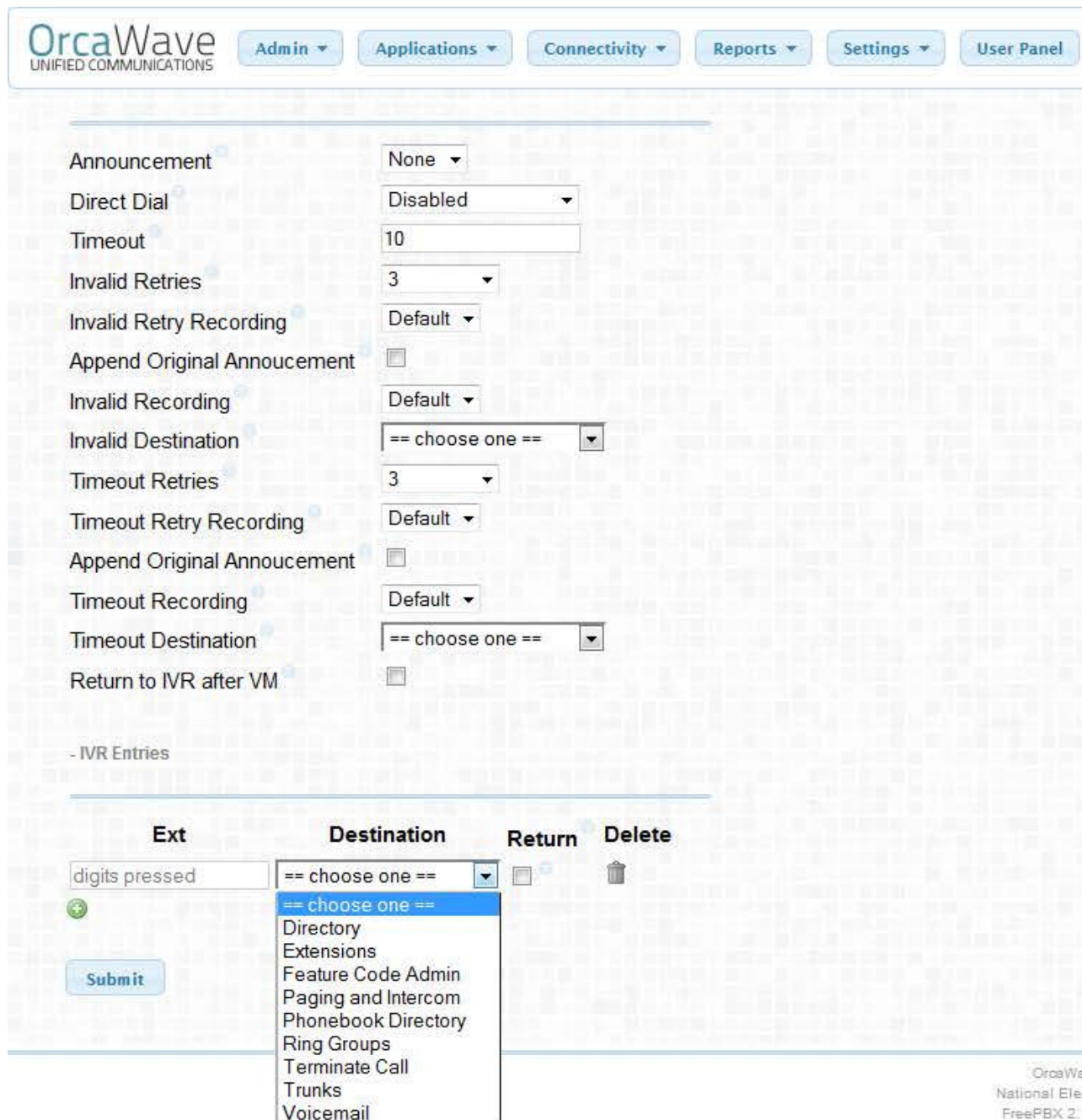
Create you recordings first click on the Admin menu the System Recordings on the bottom then follow the instructions on that page and save your recordings



Then from the Application menu click on IVR then Add a new IVR



Type the IVR name and description and choose your recordings from the Announcement drop down menu. Change the Direct Dial to Extensions to provide the option for callers to direct dial an extension during the IVR . For the Invalid Destination and Timeout Destination choose Extensions and point it to your receptionist's extension. Fill the IVR Entries then submit and apply config.



The screenshot shows the OrcaWave Unified Communications interface. At the top, there are navigation tabs: Admin, Applications, Connectivity, Reports, Settings, and User Panel. The main content area is divided into two sections: configuration settings and IVR Entries.

Configuration Settings:

- Announcement: None
- Direct Dial: Disabled
- Timeout: 10
- Invalid Retries: 3
- Invalid Retry Recording: Default
- Append Original Announcement:
- Invalid Recording: Default
- Invalid Destination: == choose one ==
- Timeout Retries: 3
- Timeout Retry Recording: Default
- Append Original Announcement:
- Timeout Recording: Default
- Timeout Destination: == choose one ==
- Return to IVR after VM:

IVR Entries:

Ext	Destination	Return	Delete
digits pressed	== choose one ==	<input type="checkbox"/>	
<input type="text"/>	<ul style="list-style-type: none"> == choose one == Directory Extensions Feature Code Admin Paging and Intercom Phonebook Directory Ring Groups Terminate Call Trunks Voicemail 	<input type="checkbox"/>	

At the bottom right of the page, there is a footer: OrcaWave National Elec FreePBX 2.1

Now you can set the destination of your Inbound Route to the IVR as mentioned earlier.

Chapter 2: OrcaWave CLI Configuration

This section presents the following:

- OrcaWave CLI configuration.
- Special configuration.
- Basic troubleshooting.

OrcaWave CLI Login

You can SSH to OrcaWave using PuTTY on port 2212

Download link: <http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe>

Insert the IP address of OrcaWave and login with:

Username: orca

Password: OrcaW@ve

PPPOE Authentication

Login to OrcaWave ssh 192.168.100.1 port 2212

```
vyatta@OrcaWave:~$ configure
```

```
vyatta@OrcaWave# run show interfaces
```

```
Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down
Interface      IP Address      S/L  Description
-----
eth0           192.168.100.1/24  u/u  LAN
eth1           192.168.100.1/24  u/u  WAN
lo             127.0.0.1/8      u/u
              ::1/128
w1g1          -                u/u
[edit]
```

Interface eth1 is facing the Internet

```
vyatta@OrcaWave# set interfaces ethernet eth1 pppoe 1 user-id usernamefromISP
```

```
vyatta@OrcaWave# set interfaces ethernet eth1 pppoe 1 password passwordfromISP
```

```
vyatta@OrcaWave# set interfaces ethernet eth1 pppoe 1 default-route auto
```

```
vyatta@OrcaWave# commit
```

```
vyatta@OrcaWave# save
```

When authentication is successful you will find an IP address assigned to ppp0 interface from the ISP.

```
vyatta@OrcaWave# run show interfaces
```

```
Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down
Interface      IP Address      S/L  Description
-----
eth0           192.168.100.1/24  u/u  LAN
eth1           u/u             WAN
lo             127.0.0.1/8     u/u
              ::1/128
w1g1           -               u/u
[edit]
```

NAT Configuration

Now let's setup the Network Address Translation (NAT).

```
vyatta@OrcaWave# set nat source rule 10 outbound-interface ppp0
vyatta@OrcaWave# set nat source rule 10 translation address masquerade
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

Configuring Access to a Name Server

In order to be able to translate host names (such as `www.cnn.com`) to IP addresses (such as `69.58.157.123`), the system must be able to access a DNS server.

[Example 1-1](#) configures a static IP address for the DNS server at address `12.34.56.78`. To configure the OrcaWave in this way, perform the following steps.

Example 1-1 Configuring static access to a DNS name server

Step	Command
Specify the IP address of the DNS server.	vyatta@OrcaWave# set system name-server 12.34.56.78 [edit]

Configuring DNS Forwarding

There are two main steps to configuring the OrcaWave for DNS forwarding:

- Specifying the DNS name servers to forward to
- Specifying the interfaces on which to listen for DNS requests

Specifying the Listening Interfaces

The listening interfaces are the interfaces to which internal clients will forward DNS requests. The DNS forwarding service listens for these requests and forwards them to the name server.

To set the listening interface, use the **set service dns forwarding listen-on** command.

You can specify more than one interface by issuing this command multiple times.

Enabling the DHCP Server

OrcaWave DHCP server is enabled by default on eth0.

```
vyatta@OrcaWave# show service dhcp-server
disabled false
shared-network-name OrcaWave {
  authoritative disable
  subnet 192.168.100.0/24 {
    default-router 192.168.100.1
    dns-server 192.168.100.1
    lease 86400
    ntp-server 192.168.100.1
    start 192.168.100.10 {
      stop 192.168.100.200
    }
    tftp-server-name 192.168.100.1
    time-server 192.168.100.1
  }
}
[edit]
vyatta@OrcaWave#
```

Chapter 3: OrcaWave Scenario

This section presents the following:

- OrcaWave standalone scenario.
- OrcaWave router scenario

OrcaWave installation with PSTN lines

Figure 3-1 shows an example of OrcaWave standalone installation with PSTN trunk configuration.

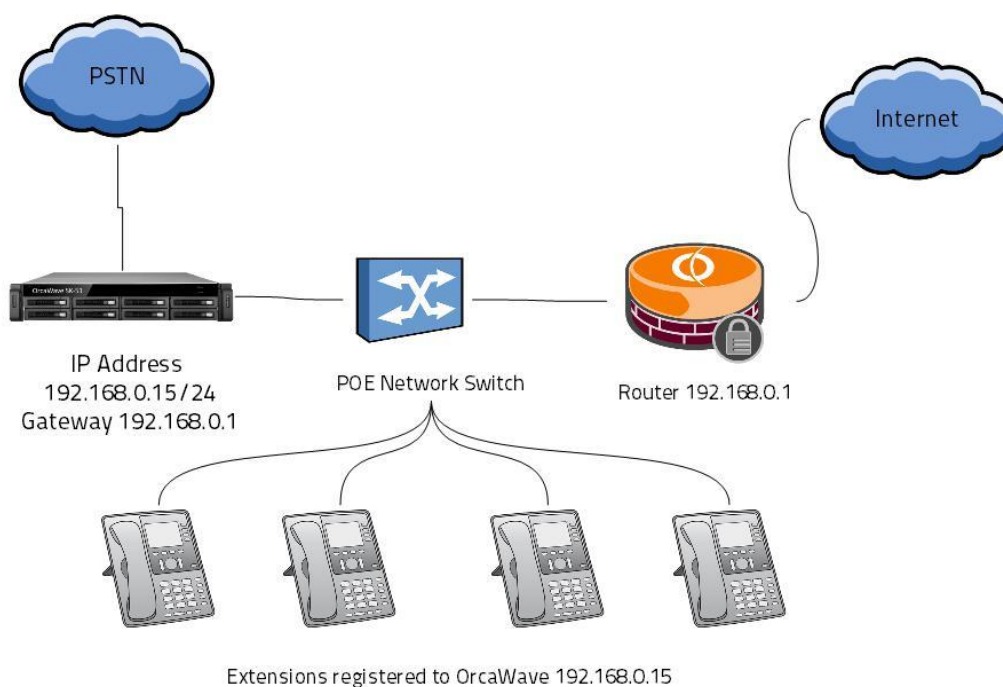


Figure 3-1

Setting up Static IP Address

First we delete the DHCP address from eth1.

```
vyatta@OrcaWave# delete interfaces ethernet eth1 address dhcp
vyatta@OrcaWave# set interfaces ethernet eth1 address 192.168.0.15/24
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

Setting up Default Route

Set default route to the internet router

```
vyatta@OrcaWave# set protocols static route 0.0.0.0/0 next-hop 192.168.0.1
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

Firewall

We have to delete the firewall configuration on eth1 so the phones can register to it.

```
vyatta@OrcaWave# delete interfaces ethernet eth1 firewall
vyatta@OrcaWave# set firewall all-ping enable
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

NAT

Delete the NAT configuration as well as we don't need it in this scenario.

```
vyatta@OrcaWave# delete nat
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

Network Test

Now you can test the network connectivity to OrcaWave

From your network try to ping 192.168.0.15.

Trunk Configuration and Extension is mention earlier in Chapter 1 [here](#)

OrcaWave Installation with SIP over Data Link

Figure 3-2 shows an example of OrcaWave installation with SIP trunks over Data connection

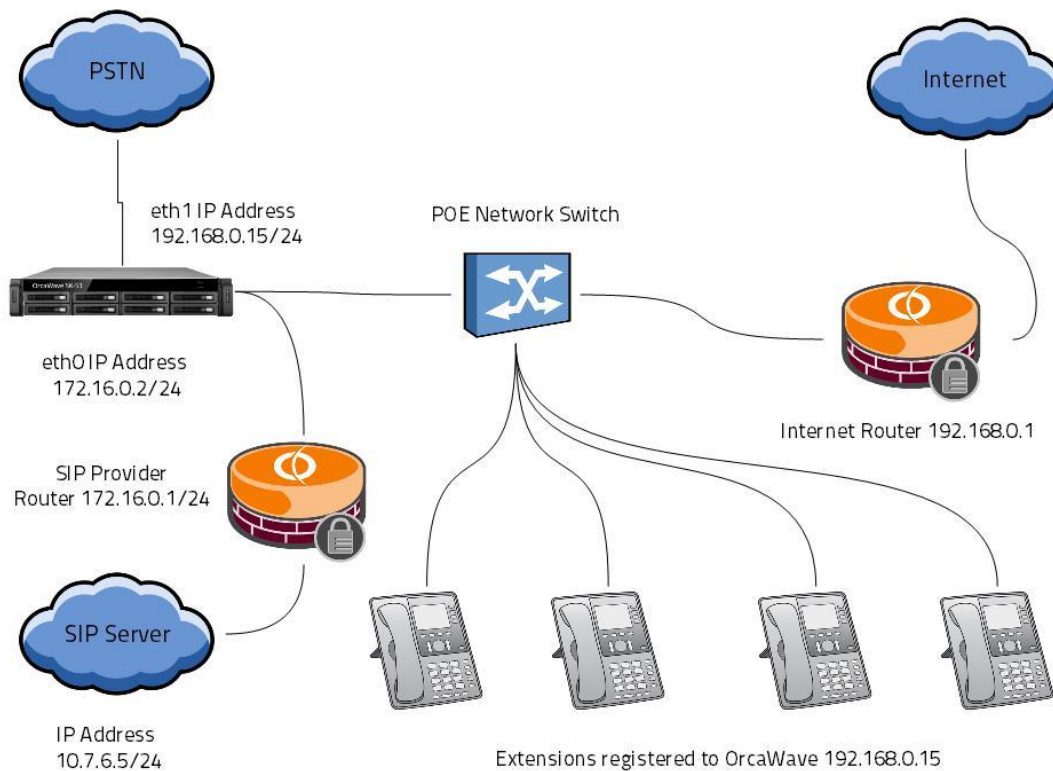


Figure 3-2

Setting up Special Route

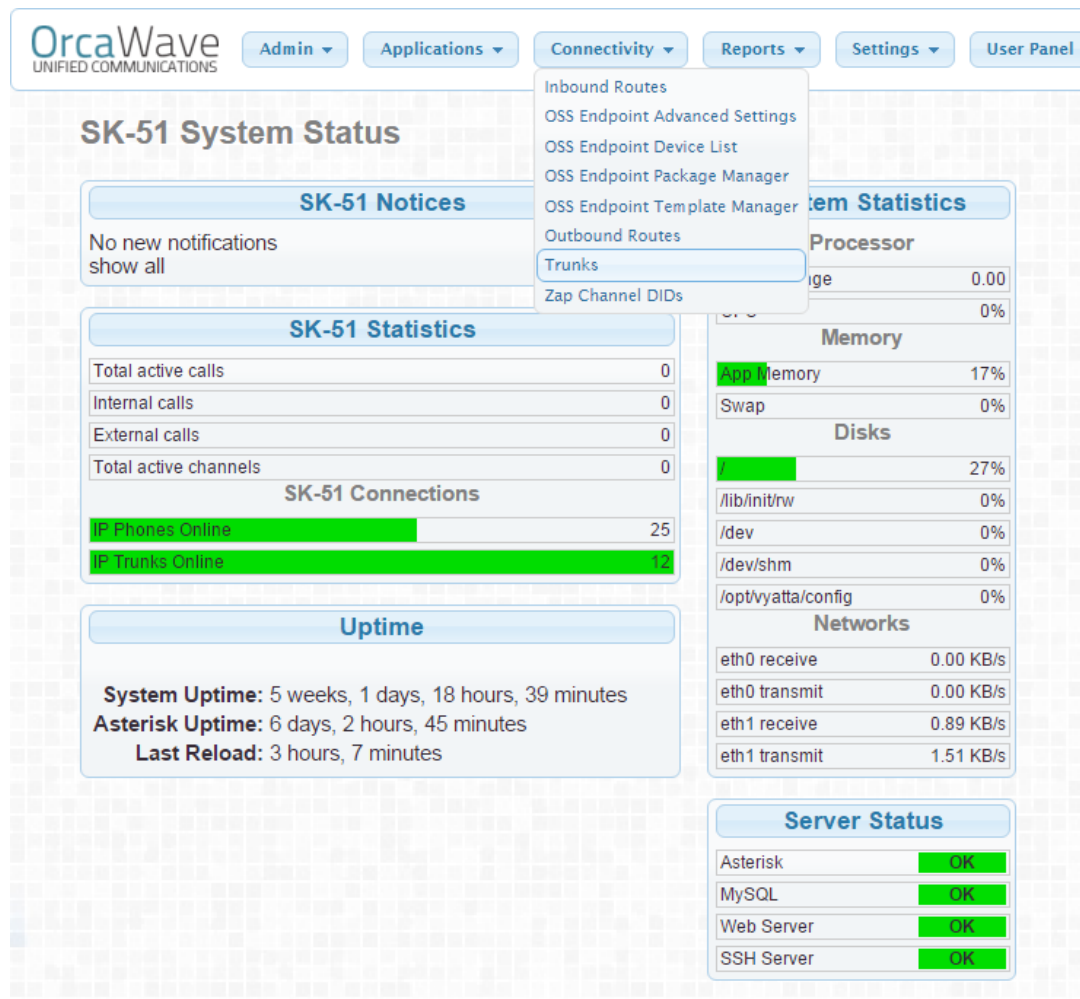
```
vyatta@OrcaWave# set protocols static route 10.7.6.0/24 next-hop 172.16.0.1
vyatta@OrcaWave# commit
vyatta@OrcaWave# save
```

Now ping 10.7.6.5 to check the connectivity.

SIP Trunk

Now we are going to configure the SIP trunk.

Login to OrcaWave and go to Connectivity – Trunks – Add SIP Trunk



The screenshot shows the OrcaWave Unified Communications dashboard. At the top, there is a navigation bar with the OrcaWave logo and several menu items: Admin, Applications, Connectivity, Reports, Settings, and User Panel. The 'Connectivity' menu is expanded, showing options like Inbound Routes, OSS Endpoint Advanced Settings, OSS Endpoint Device List, OSS Endpoint Package Manager, OSS Endpoint Template Manager, Outbound Routes, Trunks (highlighted), and Zap Channel DIDs.

The main content area is titled 'SK-51 System Status' and contains several widgets:

- SK-51 Notices:** A box indicating 'No new notifications show all'.
- SK-51 Statistics:** A table showing call and channel counts:

Total active calls	0
Internal calls	0
External calls	0
Total active channels	0
- SK-51 Connections:** A table showing online status:

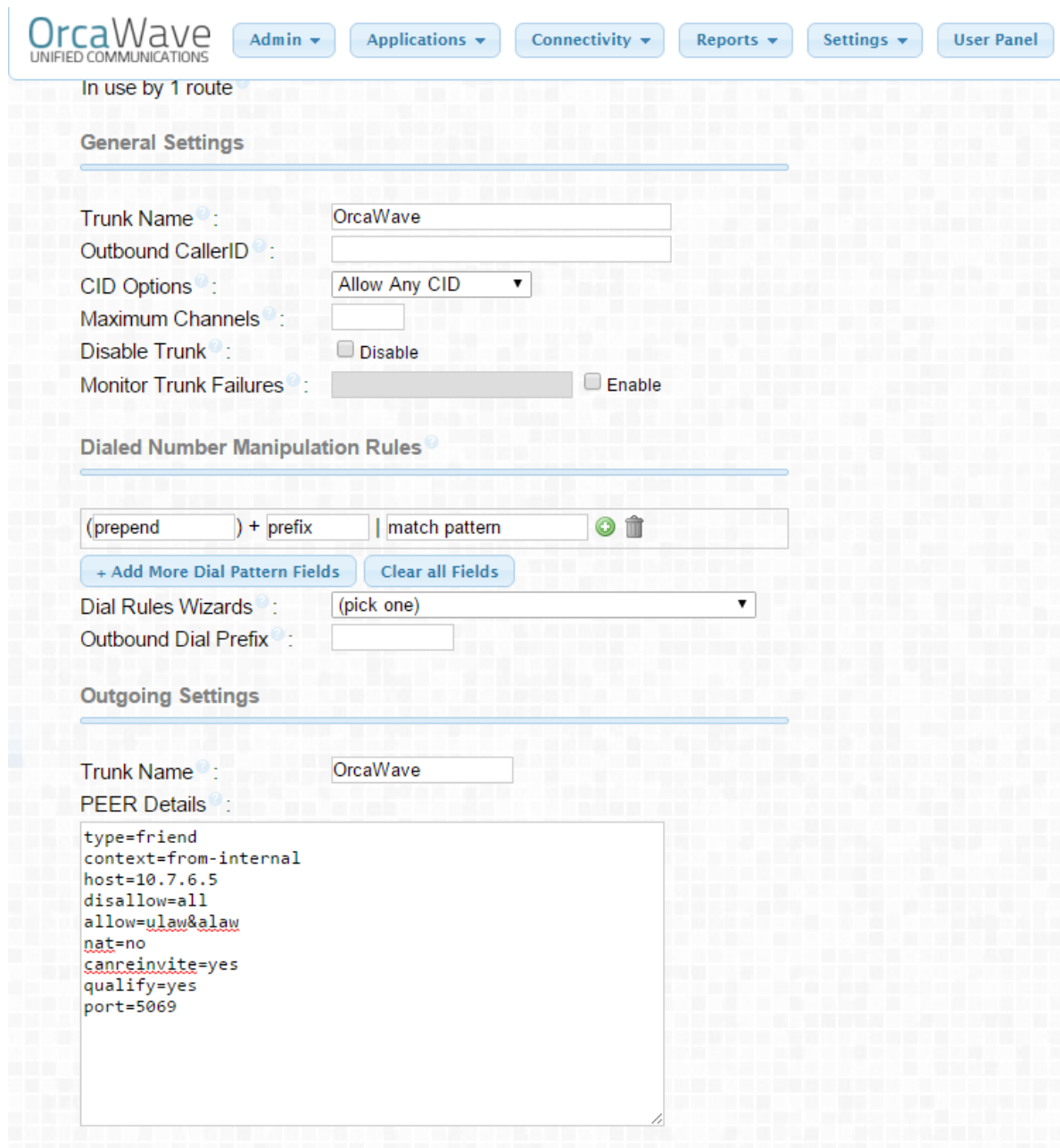
IP Phones Online	25
IP Trunks Online	12
- Uptime:** A box showing system and Asterisk uptime, and the last reload time:

System Uptime: 5 weeks, 1 days, 18 hours, 39 minutes
Asterisk Uptime: 6 days, 2 hours, 45 minutes
Last Reload: 3 hours, 7 minutes
- System Statistics:** A section on the right showing system health metrics:

System Statistics	
Processor	
Usage	0.00
Load	0%
Memory	
App Memory	17%
Swap	0%
Disks	
Usage	27%
/lib/init/rw	0%
/dev	0%
/dev/shm	0%
/opt/vyatta/config	0%
Networks	
eth0 receive	0.00 KB/s
eth0 transmit	0.00 KB/s
eth1 receive	0.89 KB/s
eth1 transmit	1.51 KB/s
- Server Status:** A table showing the status of various services:

Asterisk	OK
MySQL	OK
Web Server	OK
SSH Server	OK

Fill in the information under SIP trunk configuration
 (Mainly these configuration are provided to you by your SIP Provider)



The screenshot shows the OrcaWave Unified Communications interface for configuring a SIP trunk. The page has a navigation bar with 'Admin', 'Applications', 'Connectivity', 'Reports', 'Settings', and 'User Panel' menus. Below the navigation bar, it indicates 'In use by 1 route'. The configuration is divided into three sections: General Settings, Dialed Number Manipulation Rules, and Outgoing Settings.

General Settings

- Trunk Name: OrcaWave
- Outbound CallerID: [Empty field]
- CID Options: Allow Any CID (dropdown)
- Maximum Channels: [Empty field]
- Disable Trunk: Disable
- Monitor Trunk Failures: [Greyed out field] Enable

Dialed Number Manipulation Rules

- Rule configuration: (prepend) + prefix | match pattern (with add and delete icons)
- + Add More Dial Pattern Fields (button)
- Clear all Fields (button)
- Dial Rules Wizards: (pick one) (dropdown)
- Outbound Dial Prefix: [Empty field]

Outgoing Settings

- Trunk Name: OrcaWave
- PEER Details:


```

type=friend
context=from-internal
host=10.7.6.5
disallow=all
allow=ulaw&alaw
nat=no
canreinvite=yes
qualify=yes
port=5069
      
```

Submit and Apply config.

You can check your SIP trunk from reports – Asterisk Info – SIP info.

Inbound and Outbound

[Inbound](#) and [outbound](#) configuration is mentioned earlier in Chapter-1.

Glossary

ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	Dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point

DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP security
IPv4	IP Version 4
IPv6	IP Version 6
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol

LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
MIB	Management Information Base
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
ND	Neighbor Discovery
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
P2P	peer-to-peer
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol

PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
Rx	receive
S3	Amazon Simple Storage Service
SIP	Session Initiation Protocol
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SSH	Secure Shell
SSID	Service Set Identifier
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
Tx	transmit
UDP	User Datagram Protocol
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	Virtual Private Network

VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access