

**Expanding Possibilities...**

# **BUILDING YOUR OWN FREE HOME PHONE SYSTEM WITH MIKROTIK**

**By**

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**MUM Egypt, Cairo, 29<sup>th</sup> January, 2019**

# OVERVIEW



1. **Hardware & Software Used In This Presentation.**
2. **What Is MetaROUTER?**
3. **How To Install MetaROUTER In Mikrotik RouterBOARD?**
4. **How To Install Asterisk 1.8 With GUI?**
5. **Basic Asterisk Server Configuration:**
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  - b. **Register Your PC / Android Mobile Phone With Asterisk.**
  - c. **Register Analog Telephone Adapter (ATA) With Asterisk.**
6. **What Is Next?**
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  - b. **Connecting Two Asterisk Servers Together Via SIP Trunk.**
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  - d. **Can We Use A Broadband USB Modem For Internet Connection?**
  - e. **Why Not Integrate Your Asterisk Server With Your Existing Business Telecommunication Systems?!**
  - f. **Can We Make Outbound Calls To PSTN Using Our Asterisk Server?**

# 1. HARDWARE & SOFTWARE USED IN THIS PRESENTATION

## RB951Ui-2HnD

<b>Architecture</b>	MIPSBE
<b>CPU</b>	AR9344
<b>CPU core count</b>	1
<b>CPU nominal frequency</b>	600 MHz
<b>Operating System</b>	RouterOS (version = 6.43.2)
<b>Size of RAM</b>	128 MB
<b>Storage size</b>	128 MB
<b>Storage type</b>	NAND



# 1. HARDWARE & SOFTWARE USED IN THIS PRESENTATION

## (CONTINUED...)

### VoIP Gateways with 2 FXS ports (SIP)

PC

(for initial setup of FXS VoIP Gateway)

RB951Ui-2HnD

FXS-02A



-  Ethernet Cable
-  Telephone Cable
-  Serial Cable



# 1. HARDWARE & SOFTWARE USED IN THIS PRESENTATION

**(CONTINUED...)**

## Free VoIP SIP Softphone Application for PC

X-Lite



Download Link: <https://www.counterpath.com/XLiteForWindows>

## Free VoIP SIP Softphone Application for Android

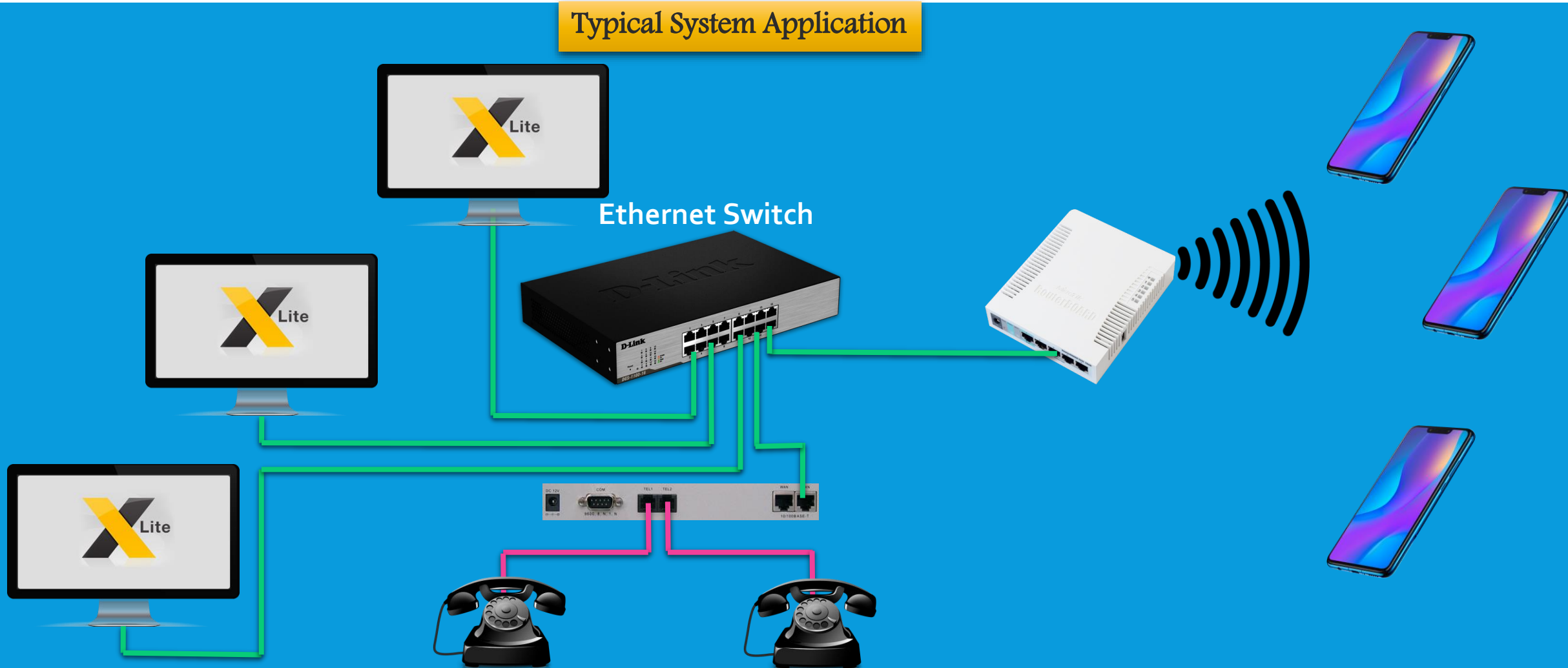


Download Link: <https://play.google.com/store/apps/details?id=com.csipsimple>

# 1. HARDWARE & SOFTWARE USED IN THIS PRESENTATION

(CONTINUED...)

Typical System Application



## 2. WHAT IS METAROUTER?

- **MetaROUTER** is a way to have logical routers running on your existing **RouterBOARD**.
  - **Since v3.21 support for MetaROUTER on mipsbe platform,**
  - **Since v3.26 support for MetaROUTER on PPC (RB1000).**
- Virtual environment allows user to partition system into different administrative domains.
- Able to run either RouterOS or OpenWRT patched Linux.
- Each RouterOS instance requires **at least 16MB Ram**, 32MB Ram recommended.
- Commonly deployed for customer administered router (RouterOS) or running specific simple task without need of dedicated server (Squid proxy, **Asterisk PBX**, Apache webserver).
- Currently MetaROUTER can be used on:
  - **RB400, RB700 series** except models with SPI flash, **RB900 series** except models with SPI flash, **RB2011** boards.
  - Listed PPC boards: **RB1000, RB1100, RB1100AH** and **RB800**.

## 2. WHAT IS METAROUTER?

**(CONTINUED...)**

### ➤ MetaROUTER Limitations & Faults:

- Only 8 instances per RouterBOARD.
- No CF or microSD devices can be used for running images.
- No ability to export running virtual image back into a file.
- OpenWRT on MetaROUTER won't properly shutdown when RouterOS reboots.
- Limited by available Ram (256MB 450G).
- No ability to monitor running states with Dude Server.
- Host Router on occasion reboots with watchdog timeout error (V3.28)



### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

#### ➤ The MetaROUTER Winbox Interface

The screenshot shows the Mikrotik WinBox interface. On the left sidebar, the 'MetaROUTER' option is circled in red. A red arrow points from this circle to the '+' icon in the toolbar of the 'MetaROUTERs' window. The 'MetaROUTERs' window displays a table with the following data:

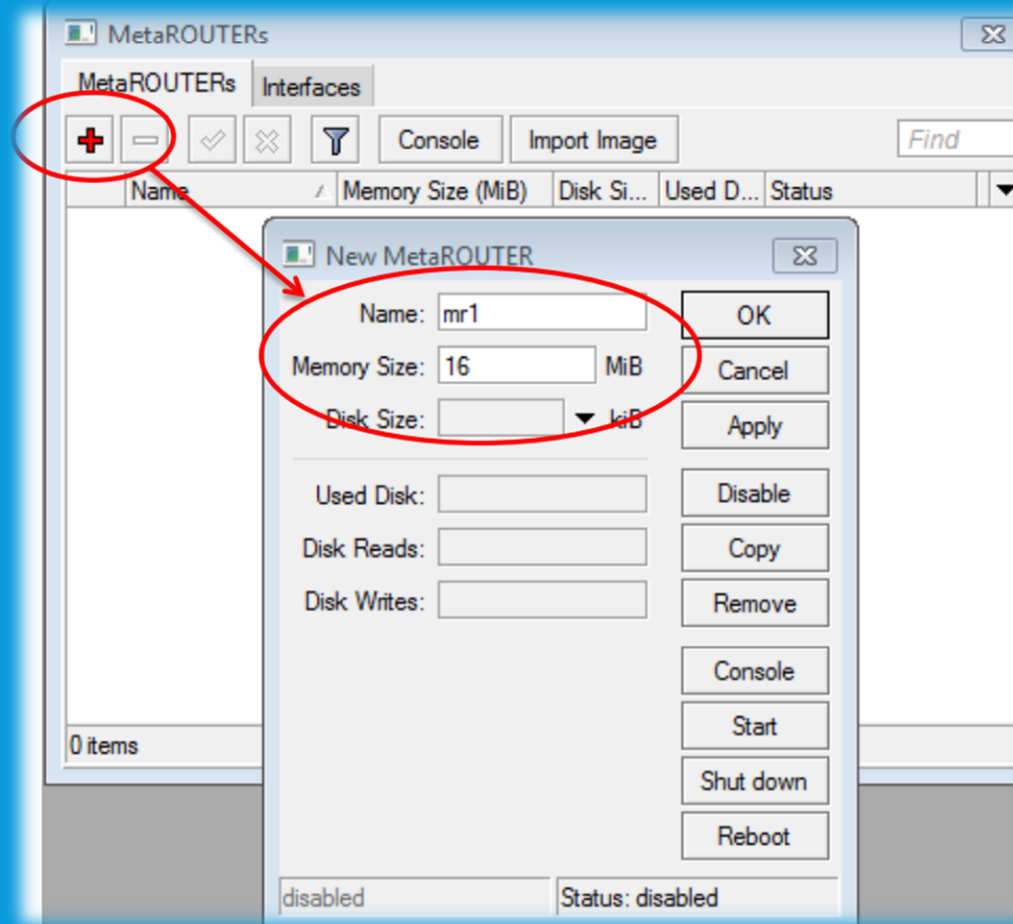
Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
mr1	16		195	running
mr2	16		195	running
mr3	16		195	running
mr4	16		195	running
mr5	16		195	running
mr6	16		195	running
mr7	16		195	running

7 items

### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

(CONTINUED...)

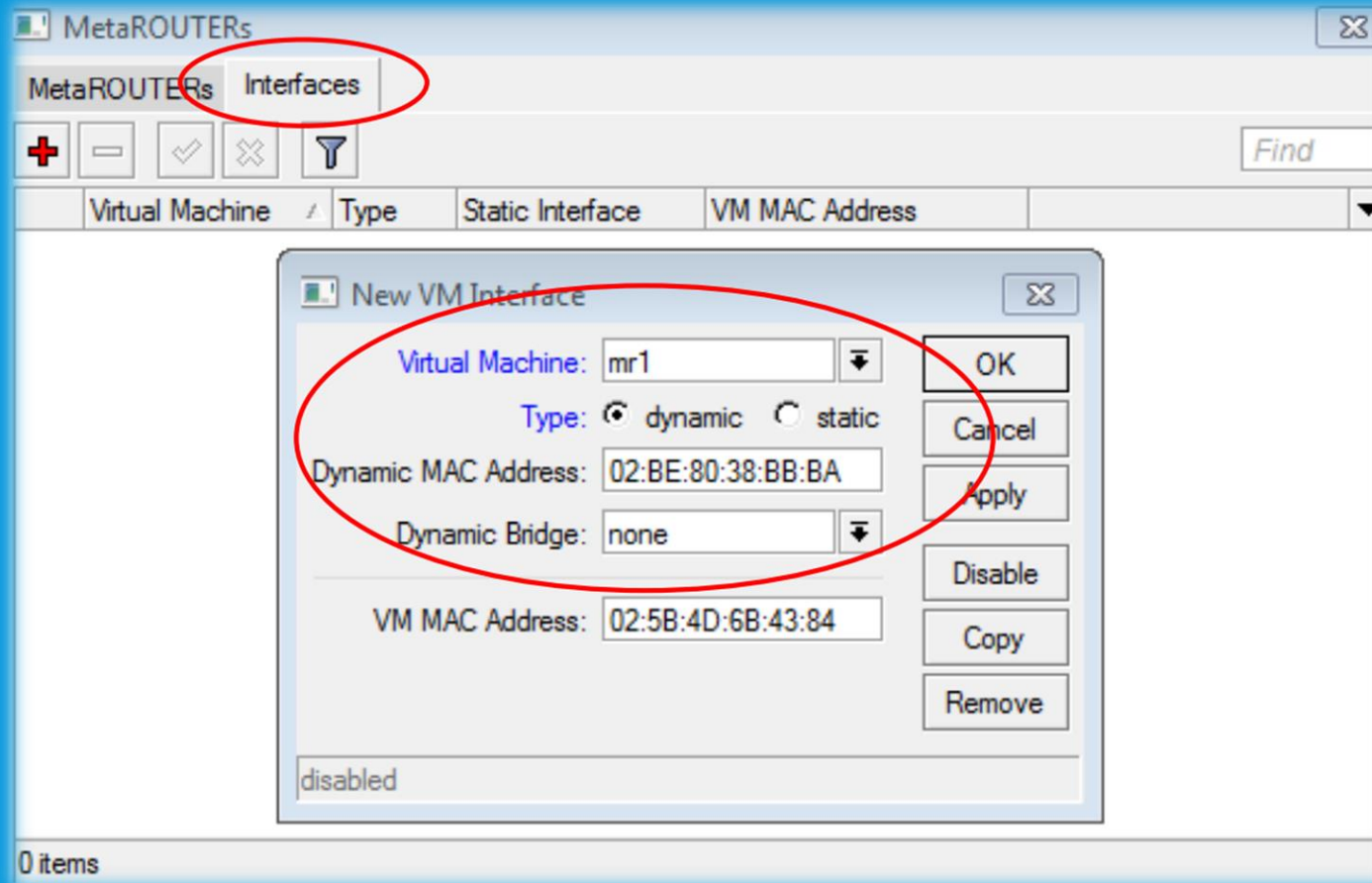
#### ➤ Creating a MetaROUTER



### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

(CONTINUED...)

#### ➤ Dynamic Interface Creation



### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

(CONTINUED...)

#### ➤ Dynamic VIF Interface

The screenshot displays two windows from the Mikrotik WinBox interface. The top window, titled 'MetaROUTERs', shows a table of virtual machines. The 'Type' column for the 'mr1' VM is circled in red and set to 'dynamic'. The 'VM MAC Address' is '02:5E:C1:1C:81:6C'. The bottom window, titled 'Bridge', shows a table of bridge ports. The 'vif1' interface is circled in red and is listed as a 'designated port' on the 'Bridge-Inside' bridge. The 'Priority (h...)' and 'Path Cost' for 'vif1' are both 80.

Virtual Machine	Type	Static Interface	VM MAC Address
mr1	dynamic		02:5E:C1:1C:81:6C

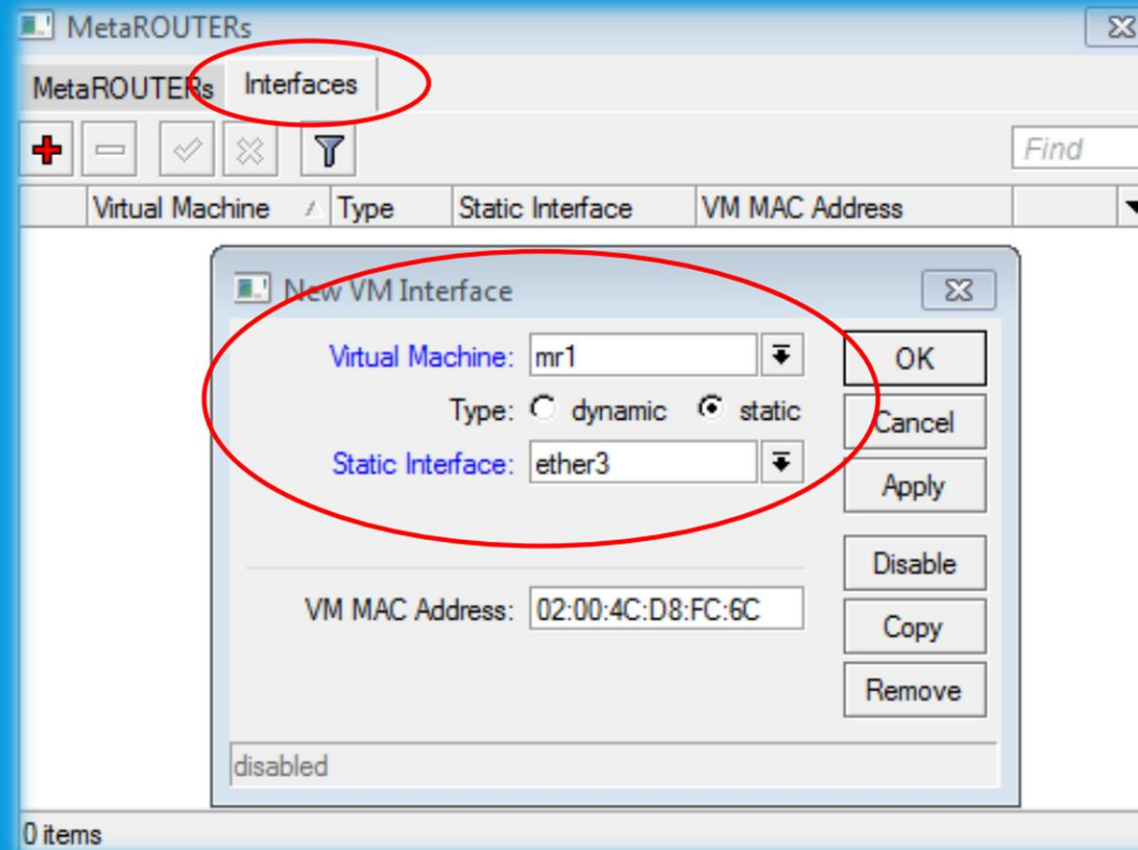
Interface	Bridge	Priority (h...)	Path Cost	Horizon	Role	Root Pat...
inside	Bridge-Inside	80	10		root port	14
vif1	Bridge-Inside	80	10		designated port	

2 items

### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

(CONTINUED...)

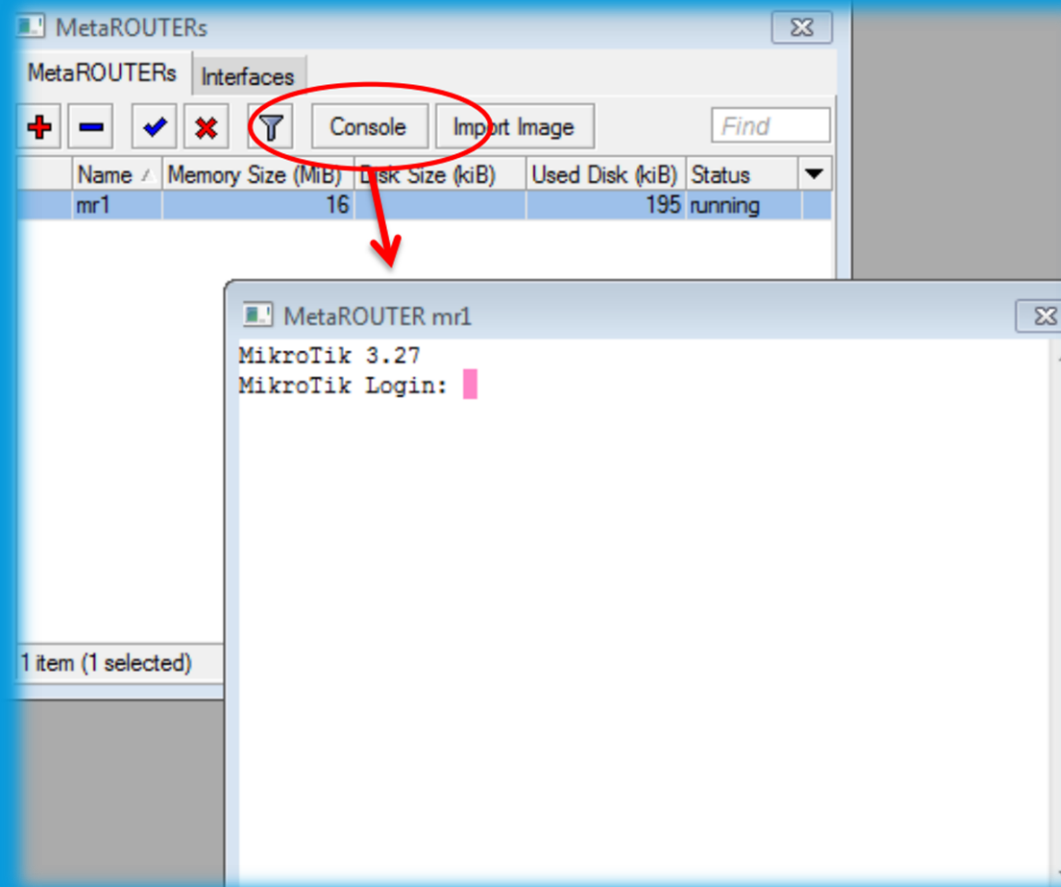
#### ➤ Static Interface Creation



### 3. HOW TO INSTALL METAROUTER IN MIKROTIK ROUTERBOARD?

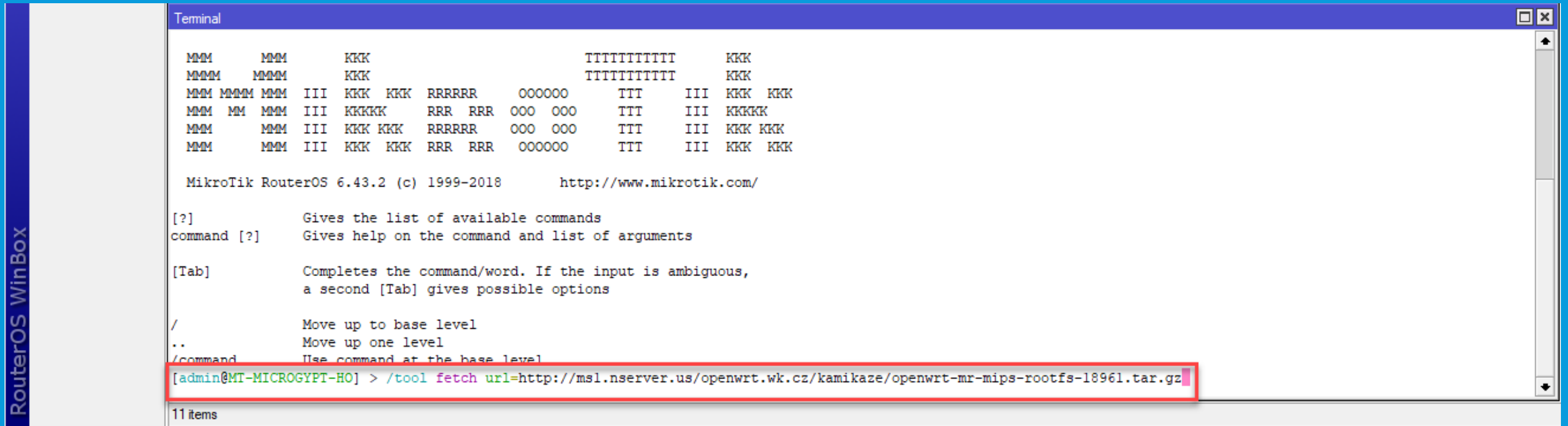
(CONTINUED...)

#### ➤ Console Access



## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

### ➤ Download OpenWRT Image Into Mikrotik



The screenshot shows a terminal window titled "Terminal" with a blue header bar. The terminal content includes ASCII art, version information, and a list of commands. A red box highlights the command being entered: `[admin@MT-MICROGYPT-HO] > /tool fetch url=http://ms1.nserver.us/openwrt.wk.cz/kamikaze/openwrt-mr-mips-rootfs-18961.tar.gz`. The terminal also shows "11 items" at the bottom.

```
Terminal
MMM      MMM      KKK      TTTTTTTTTT      KKK
MMMM     MMMM     KKK      TTTTTTTTTT      KKK
MMM MMMM MMM III  KKK KKK RRRRRR  OOOOOO      TTT      III  KKK KKK
MMM MM  MMM III  KKKKK  RRR RRR  OOO OOO      TTT      III  KKKKK
MMM      MMM III  KKK KKK RRRRRR  OOO OOO      TTT      III  KKK KKK
MMM      MMM III  KKK KKK RRR RRR  OOOOOO      TTT      III  KKK KKK

MikroTik RouterOS 6.43.2 (c) 1999-2018      http://www.mikrotik.com/

[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]       Completes the command/word. If the input is ambiguous,
            a second [Tab] gives possible options

/           Move up to base level
..          Move up one level
/command    Use command at the base level

[admin@MT-MICROGYPT-HO] > /tool fetch url=http://ms1.nserver.us/openwrt.wk.cz/kamikaze/openwrt-mr-mips-rootfs-18961.tar.gz
11 items
```

[admin@MT-MICROGYPT-HO] > /tool fetch url=http://ms1.nserver.us/openwrt.wk.cz/kamikaze/openwrt-mr-mips-rootfs-18961.tar.gz

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

(CONTINUED...)

### ➤ Importing OpenWRT Image As A Virtual Machine

The screenshot displays the MetaROUTER GUI. The sidebar on the left contains various system management options, with 'MetaROUTER' circled in red and labeled '1'. The main panel shows the 'MetaROUTERs' tab, which includes an 'Import Image' button circled in red and labeled '2'. Below this is a table with the following data:

Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
Asterisk	48	32000	17245	running

An 'Import Image' dialog box is open in the foreground. The 'File Name' field contains 'openwrt-mr-mips-roots-18961.tar.gz', which is circled in red and labeled '3'. The 'Memory Size' is set to '16 MiB'. The 'Enabled' checkbox is checked. The 'Start' button is circled in red and labeled '4'. The 'Imported:' field is empty.



## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

(CONTINUED...)

➤ Add Virtual Network Interface Into The Imported OpenWRT Virtual Machine

The screenshot displays the MetaROUTER GUI. On the left sidebar, the 'MetaROUTER' option is circled in red and labeled with a '1'. The main window shows the 'Interfaces' tab, which is also circled in red and labeled with a '2'. Below this, a table lists the existing interfaces:

Virtual Machine	Type	Static Interface	VM MAC Address
Asterisk	dynamic		02:79:CF:5B:65:A2

A 'New VM Interface' dialog box is open, with several fields highlighted by red boxes and numbered:

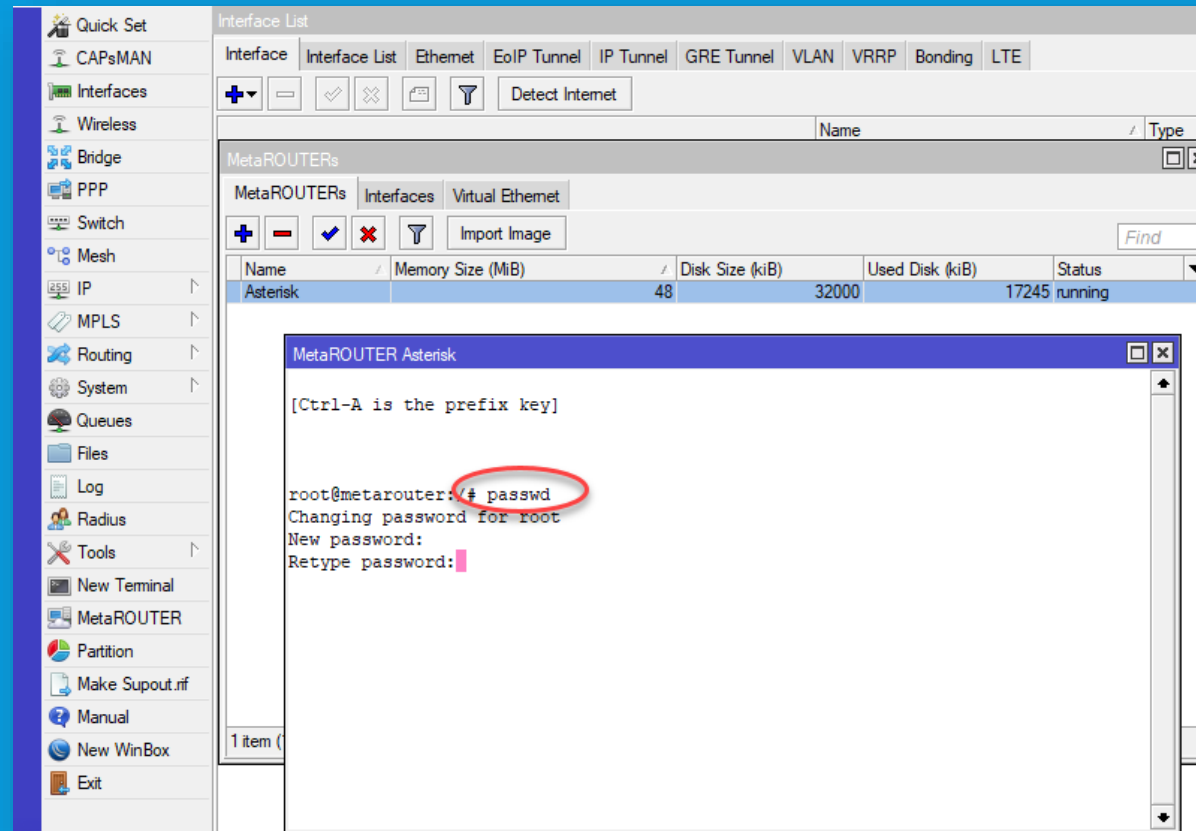
- Field 3: 'Virtual Machine' dropdown menu, set to 'Asterisk'.
- Field 4: 'Type' radio buttons, with 'dynamic' selected.
- Field 5: 'Dynamic Bridge' dropdown menu, set to 'LAN-10'.
- Field 6: 'OK' button.

Other fields in the dialog include 'Dynamic MAC Address' (02:7D:D2:3B:3E:9C) and 'VM MAC Address' (02:8F:03:2A:60:92). The 'enabled' checkbox is checked at the bottom of the dialog.

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

### (CONTINUED...)

- Now, Double Click on the Newly Created Machine and Select **CONSOLE** and Press Enter Key Few Times to Get Command Prompt and Change the Password for root User



The screenshot displays the Asterisk GUI interface. On the left is a sidebar menu with various configuration options. The main window is titled 'Interface List' and contains a table of installed MetaROUTERS. Below the table, a terminal window titled 'MetaROUTER Asterisk' is open, showing the root user at the prompt. The user has entered the command '# passwd' to change the root password, and the system is prompting for a new password and its retype.

Name	Memory Size (MiB)	Disk Size (kiB)	Used Disk (kiB)	Status
Asterisk		48	32000	17245 running

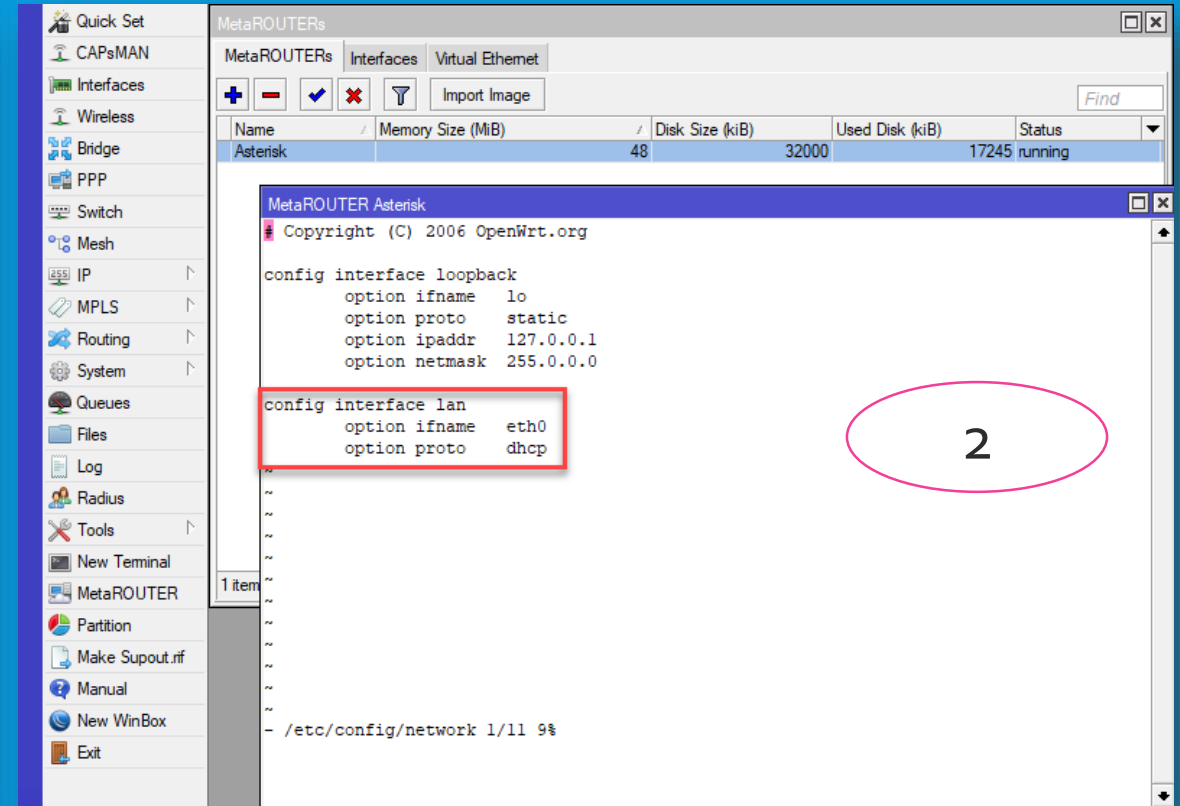
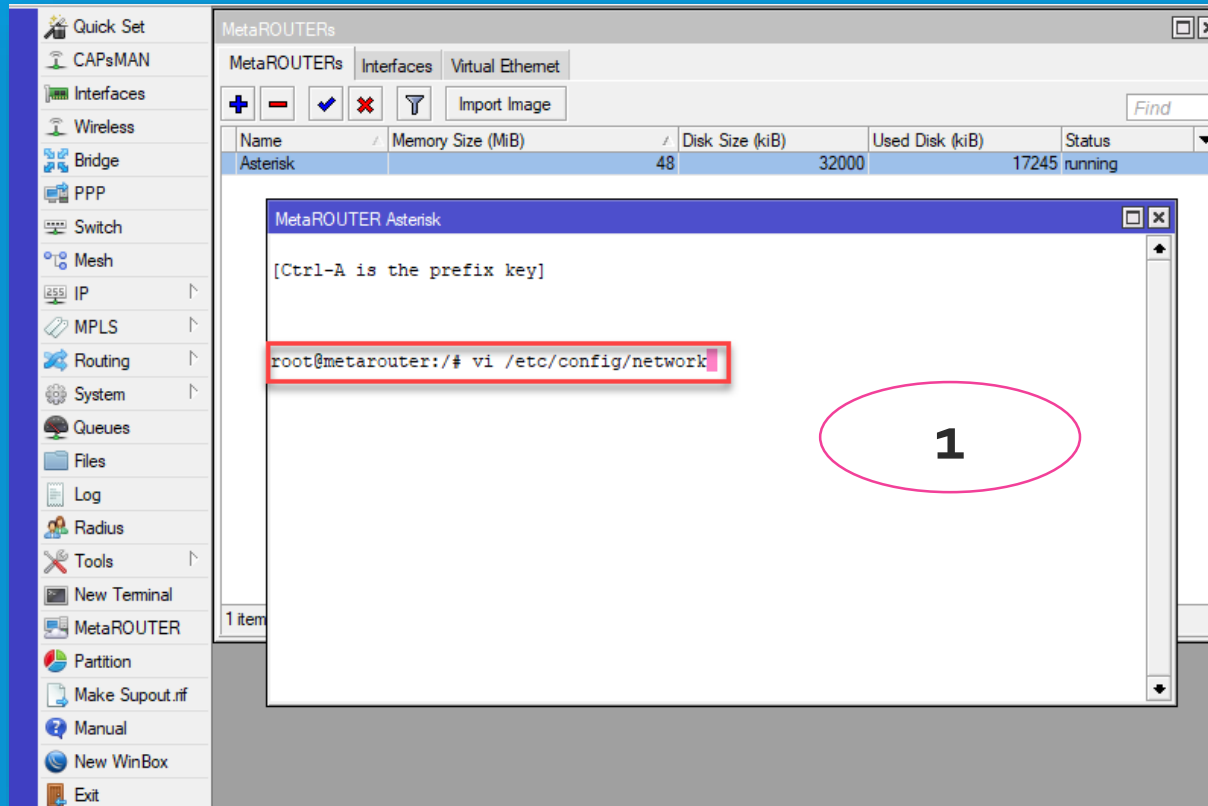
```
[Ctrl-A is the prefix key]

root@metarouter:~# passwd
Changing password for root
New password:
Retype password:
```

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

### (CONTINUED...)

#### ➤ Now, Configure The Virtual Network Interface



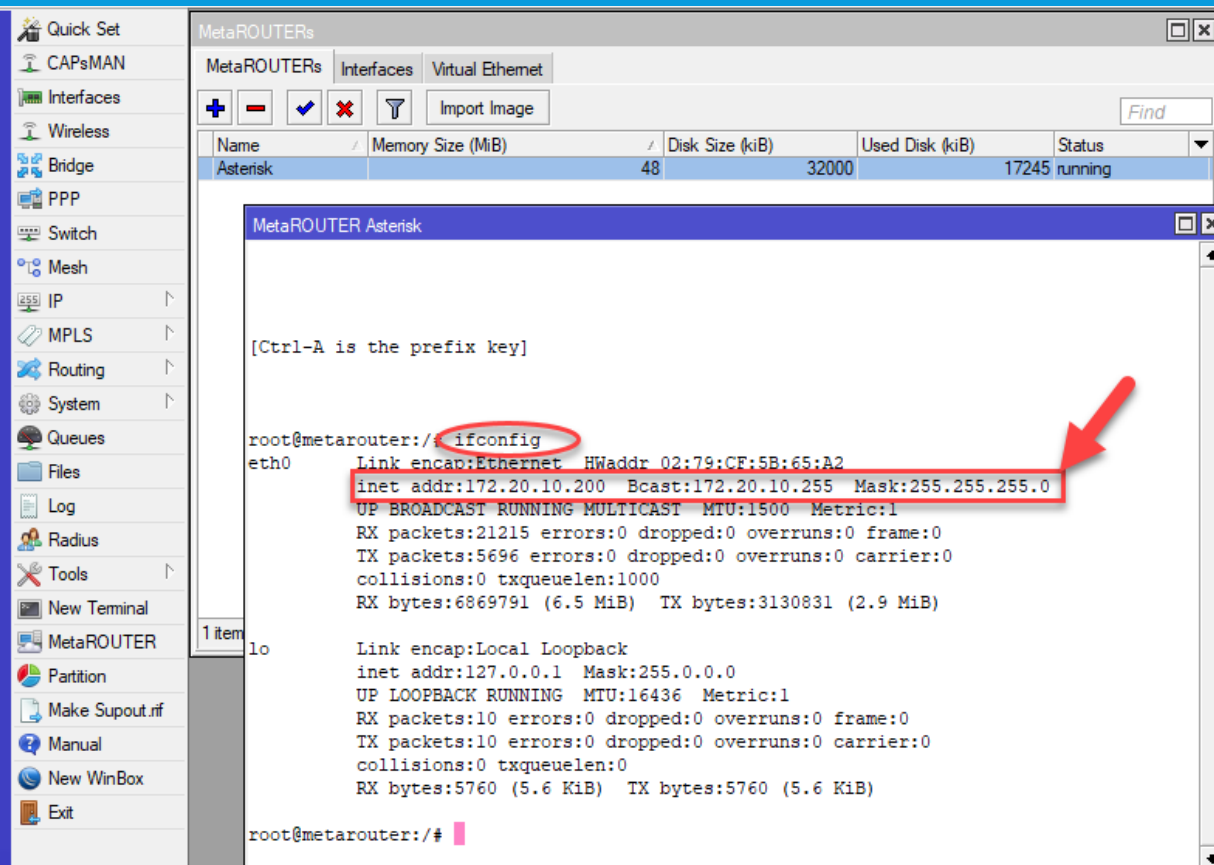
```
root@metarouter:~# /etc/init.d/network enable  
root@metarouter:~# /etc/init.d/network restart
```

3

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

(CONTINUED...)

➤ Now, Check Virtual Network Configuration

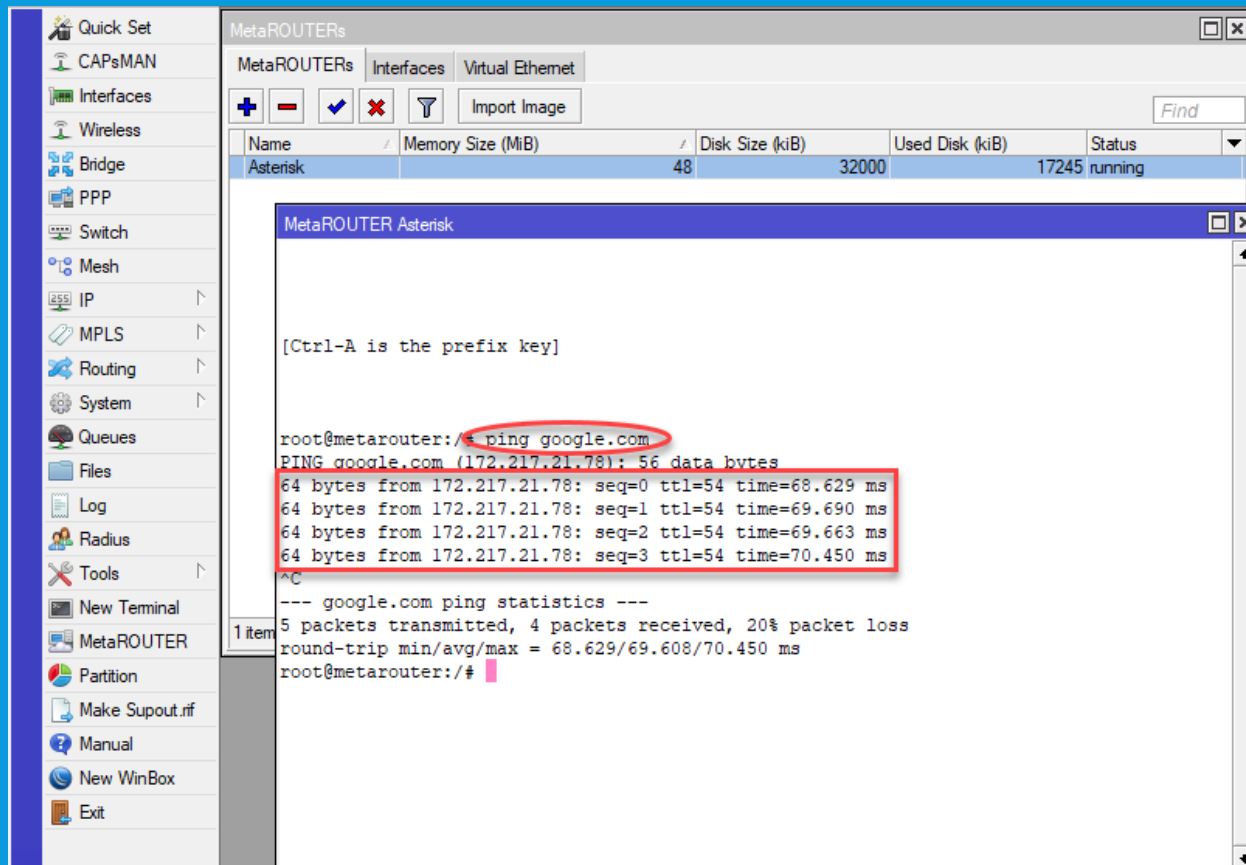


The screenshot shows the MetaRouter GUI with the 'Virtual Ethernet' tab selected. A table lists the 'Asterisk' interface with a memory size of 48 MiB, disk size of 32000 kiB, and used disk of 17245 kiB. Below the table, the configuration for the 'eth0' interface is displayed. The command 'ifconfig' is entered, and the resulting configuration is shown, with the IP address '172.20.10.200' highlighted by a red box and a red arrow pointing to it.

```
root@metarouter:/# ifconfig
eth0  Link encap:Ethernet  HWaddr 02:79:CF:5B:65:A2
       inet addr:172.20.10.200  Bcast:172.20.10.255  Mask:255.255.255.0
       UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
       RX packets:21215 errors:0 dropped:0 overruns:0 frame:0
       TX packets:5696 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:6869791 (6.5 MiB)  TX bytes:3130831 (2.9 MiB)

lo    Link encap:Local Loopback
       inet addr:127.0.0.1  Mask:255.0.0.0
       UP LOOPBACK RUNNING  MTU:16436  Metric:1
       RX packets:10 errors:0 dropped:0 overruns:0 frame:0
       TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:0
       RX bytes:5760 (5.6 KiB)  TX bytes:5760 (5.6 KiB)

root@metarouter:/#
```



The screenshot shows the MetaRouter GUI with the 'Virtual Ethernet' tab selected. The configuration for the 'eth0' interface is the same as in the previous screenshot. Below the configuration, the command 'ping google.com' is entered, and the resulting ping statistics are shown, with the output highlighted by a red box.

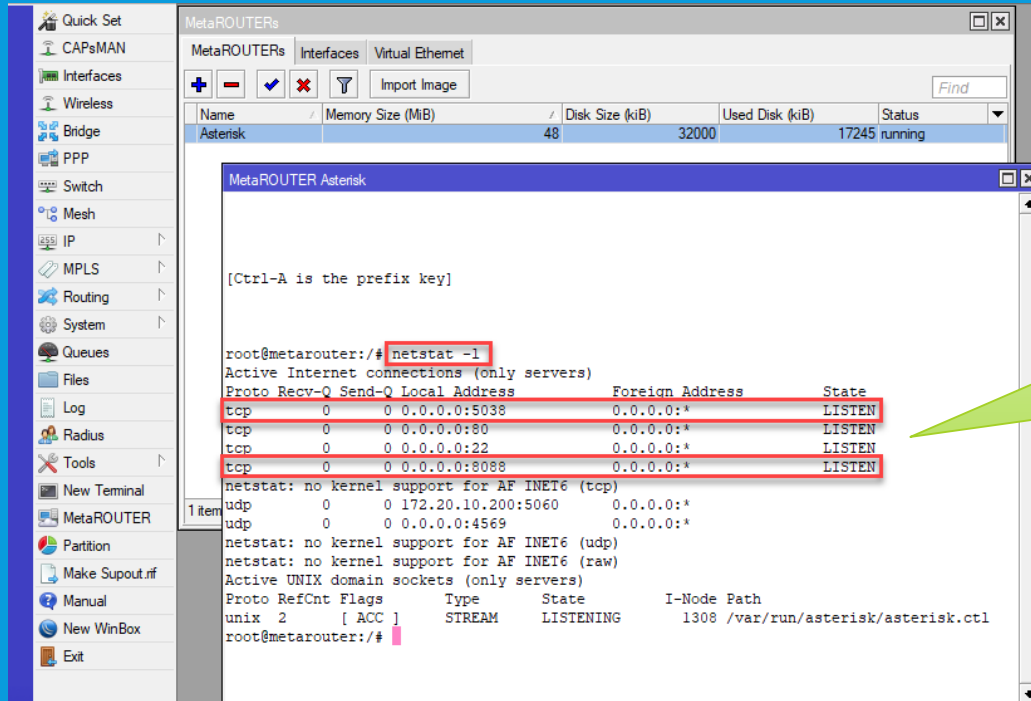
```
root@metarouter:/# ping google.com
PING google.com (172.217.21.78): 56 data bytes
64 bytes from 172.217.21.78: seq=0 ttl=54 time=68.629 ms
64 bytes from 172.217.21.78: seq=1 ttl=54 time=69.690 ms
64 bytes from 172.217.21.78: seq=2 ttl=54 time=69.663 ms
64 bytes from 172.217.21.78: seq=3 ttl=54 time=70.450 ms
^C
--- google.com ping statistics ---
5 packets transmitted, 4 packets received, 20% packet loss
round-trip min/avg/max = 68.629/69.608/70.450 ms
root@metarouter:/#
```

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

### (CONTINUED...)

#### ➤ Update opkg , Install Asterisk , And Start It

```
root@metarouter:/# opkg update
root@metarouter:/# opkg install asterisk18 asterisk18-codec-alaw asterisk18-chan-iax2 asterisk-gui
root@metarouter:/# /etc/init.d/asterisk enable
root@metarouter:/# /etc/init.d/asterisk start
```



The screenshot shows the MetaROUTER GUI with the Asterisk service installed and running. The terminal window displays the output of the `netstat -l` command, showing that ports 5038, 80, 22, and 8088 are listening on the local interface 0.0.0.0.

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State
tcp	0	0	0.0.0.0:5038	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:80	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:22	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:8088	0.0.0.0:*	LISTEN

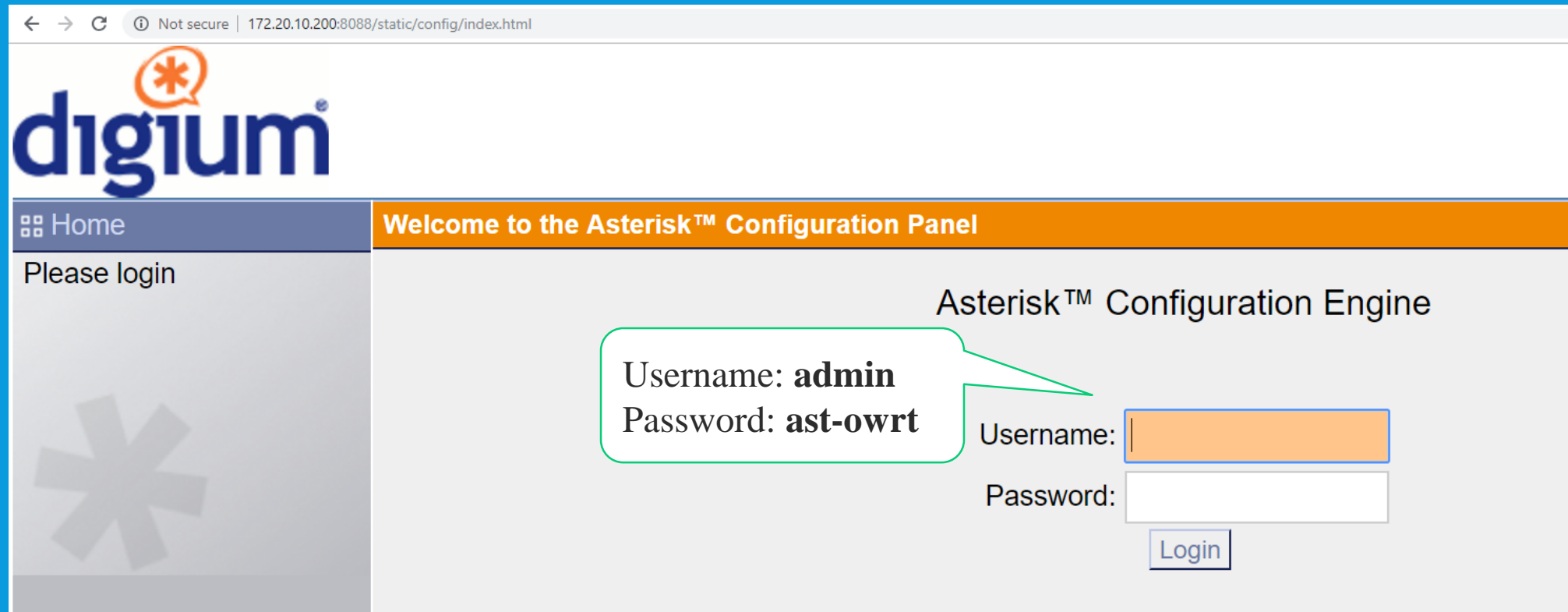
Upon successful start you can see ports 5038 and 8088 started, as shown

## 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

### (CONTINUED...)

➤ Now you can access Asterisk GUI via:

<http://ipofmetarouter:8088> (in our case: 172.20.10.200:8088)



The screenshot shows a web browser window with the URL `172.20.10.200:8088/static/config/index.html`. The page features the Digium logo and a navigation menu with a "Home" link. The main content area is titled "Welcome to the Asterisk™ Configuration Panel" and "Asterisk™ Configuration Engine". A login form is present with fields for "Username:" and "Password:", and a "Login" button. A callout box highlights the default credentials: Username: **admin** and Password: **ast-owrt**.

You can change the password and other stuff in `/etc/asterisk/manager.conf`

# 4. HOW TO INSTALL ASTERISK 1.8 WITH GUI?

## (CONTINUED...)

The screenshot displays the Asterisk GUI interface. The browser address bar shows '172.20.10.200:8088/static/config/index.html'. The interface includes a sidebar with navigation options and a main content area with several panels.

**System Status**

Please click on a panel to manage related features

**Trunks**

Status	Trunk	Type	Username	Port/Hostname/IP
	FreePBX	sip		172.20.10.16
	CME	sip		172.20.15.254

**Extensions**

Extension	Name/Label	Status	Type
9990	Win7 X-Lite	Free	SIP/IAX User
9991	FXS08 T1	Free	SIP/IAX User
9992	FXS08 T2	Free	SIP/IAX User
9993	FXS08 T3	Free	SIP/IAX User
9994	FXS08 T4	Free	SIP/IAX User
9995	FXS08 T5	Free	SIP/IAX User
9996	FXS08 T6	Free	SIP/IAX User
9997	FXS08 T7	Free	SIP/IAX User
9998	FXS08 T8	Free	SIP/IAX User
9999	Haytham HuaweiY7	Free	SIP/IAX User
-- "No Extension assigned"	Check Voicemails		VoiceMailMain
-- "No Extension assigned"	Dial by Names		Directory

**Queues**

No () - 0 calls, 0 agents

Service Level:  
Calls Completed:  
Calls Abandoned:

**Conference Rooms**

No Parked Calls

**System Info**

General Network Memory Disk

Hostname:  
OS Version:  
Linux metarouter 2.6.31.10 #9 Fri Dec 27 23:12:48 CET 2013 mips unknown

Asterisk Build:  
Asterisk/1.8.11.1  
Asterisk GUI-version : 2.1.0-rc1

Server Date & Timezone  
Thu Jan 1 04:16:46 UTC 1970

Uptime:  
04:16:46 up 4:16,  
Load Average: 0.00, 0.00, 0.00

# 5. BASIC ASTERISK SERVER CONFIGURATION

## a. SIP EXTENSION CONFIGURATION



- System Status
- Trunks
- Outgoing Calling Rules
- Dial Plans
- Users
- Ring Groups
- Music On Hold
- Call Queues
- Voice Menus
- Time Intervals
- Incoming Calling Rules
- Voicemail
- Paging/Intercom
- Conferencing
- Follow Me
- Directory
- Call Features
- VoiceMail Groups
- Voice Menu Prompts
- System Info
- Backup
- Options**
- Admin Settings.

General Preferences

2

General Preferences

Language

Change Password

Reboot

Advanced Options

Global OutBound CID :

Global OutBound CID Name :

Operator Extension :

Ring Timeout :

Enable Idle Image Display :

VoIP Phone Digit Map :

VoIP Phone Digit Timeout :

### Extension preferences:

Disable Extension Ranges:  3

User Extensions :  to  4

Conference Extensions :  to

VoiceMenu Extensions :  to

RingGroup Extensions :  to

Queue Extensions :  to

VoiceMail Group Extensions :  to

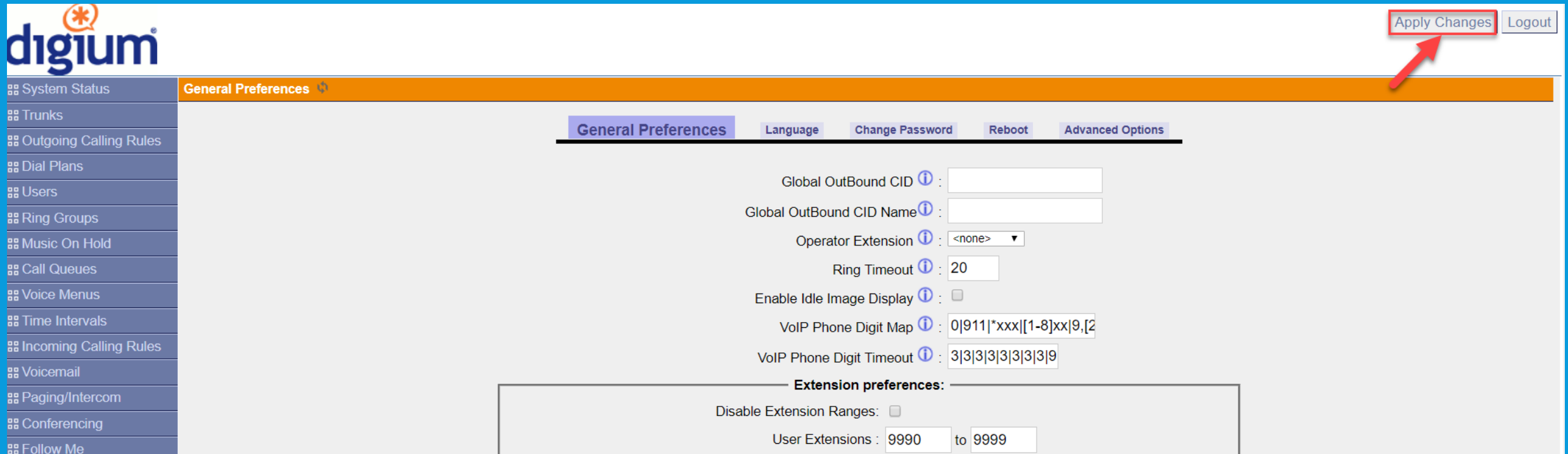
1

5



# 5. BASIC ASTERISK SERVER CONFIGURATION

## a. SIP EXTENSION CONFIGURATION



The screenshot displays the Digium Asterisk web interface. On the left is a navigation menu with items like System Status, Trunks, Outgoing Calling Rules, Dial Plans, Users, Ring Groups, Music On Hold, Call Queues, Voice Menus, Time Intervals, Incoming Calling Rules, Voicemail, Paging/Intercom, Conferencing, and Follow Me. The main content area is titled "General Preferences" and includes sub-tabs for "General Preferences", "Language", "Change Password", "Reboot", and "Advanced Options". The configuration fields are as follows:

- Global OutBound CID:
- Global OutBound CID Name:
- Operator Extension:
- Ring Timeout:
- Enable Idle Image Display:
- VoIP Phone Digit Map:
- VoIP Phone Digit Timeout:

Below these fields is a section for "Extension preferences" with a checkbox for "Disable Extension Ranges" and a field for "User Extensions" set to "9990 to 9999". In the top right corner, there are "Apply Changes" and "Logout" buttons, with a red arrow pointing to the "Apply Changes" button.

# 5. BASIC ASTERISK SERVER CONFIGURATION

## a. SIP EXTENSION CONFIGURATION



- System Status
- Trunks
- Outgoing Calling Rules
- Dial Plans
- Users**
- Ring Groups
- Music On Hold
- Call Queues
- Voice Menus
- Time Intervals
- Incoming Calling Rules
- Voicemail
- Paging/Intercom
- Conferencing
- Follow Me
- Directory
- Call Features
- VoiceMail Groups
- Voice Menu Prompts
- System Info
- Backup

User Extensions on PBX

List of User Extensions

### Create New User

General :

Extension:  CallerID Name:  DialPlan:

Internal CallerID: 9999 CallerID Number:

Enable Voicemail for this User

VoiceMail Access PIN code:  Email Address:

Technology

SIP  IAX Analog Station:  flash:  rxflash:

Codec Preference : First:  Second:  Third:  Fourth:  Fifth:

VoIP Settings

MAC Address:  Line Number:  LineKeys:

SIP/IAX Password:  IAX: Require Call Token:

IAX: Max Call Numbers:

NAT:  Can Reinvite:  DTMF Mode:  insecure:

Other Options

3-Way Calling (analog)  In Directory  Call Waiting (analog)

ADA User  Is Agent Pickup Group:

# 5. BASIC ASTERISK SERVER CONFIGURATION

## a. SIP EXTENSION CONFIGURATION



Apply Changes Logout

- System Status
- Trunks
- Outgoing Calling Rules
- Dial Plans
- Users  
Users is a shortcut for quickly adding and removing all the necessary configuration components for any new phone.
- Ring Groups
- Music On Hold
- Call Queues

### User Extensions on PBX

[+ Create New User](#) [Modify Selected Users](#) [X Delete Selected Users](#)

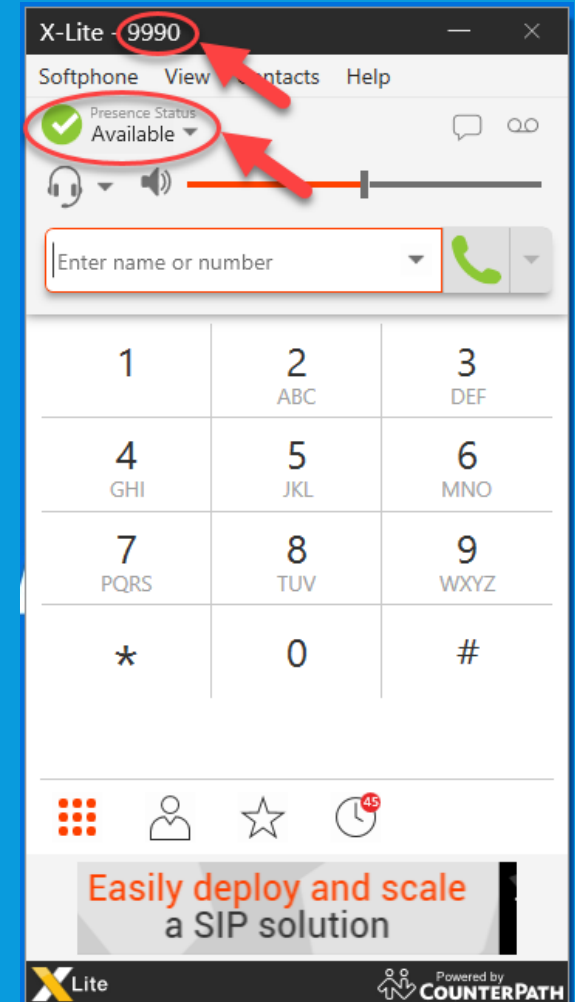
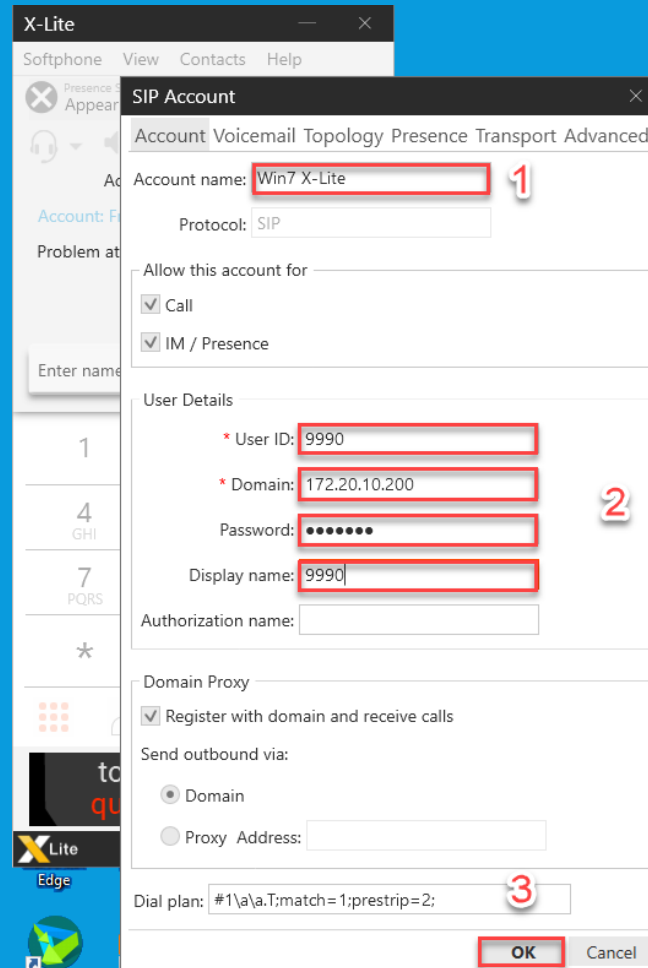
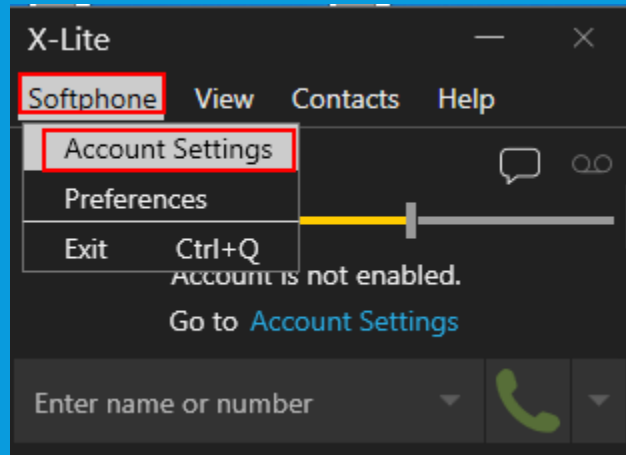
### List of User Extensions

[Where to Buy](#)

<input type="checkbox"/>	Extension	Full Name	Port	SIP	IAX	DialPlan	OutBound CID	Edit	Delete
<input type="checkbox"/>	9990	Win7 X-Lite	--	Yes	Yes	DefaultDialPlan	9990	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9991	FXS08 T1	--	Yes	Yes	DefaultDialPlan	9991	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9992	FXS08 T2	--	Yes	Yes	DefaultDialPlan	9992	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9993	FXS08 T3	--	Yes	Yes	DefaultDialPlan	9993	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9994	FXS08 T4	--	Yes	Yes	DefaultDialPlan	9994	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9995	FXS08 T5	--	Yes	Yes	DefaultDialPlan	9995	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9996	FXS08 T6	--	Yes	Yes	DefaultDialPlan	9996	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9997	FXS08 T7	--	Yes	Yes	DefaultDialPlan	9997	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9998	FXS08 T8	--	Yes	Yes	DefaultDialPlan	9998	<a href="#">Edit</a>	<a href="#">X Delete</a>
<input type="checkbox"/>	9999	Haytham HuaweiY7	--	Yes	Yes	DefaultDialPlan	9999	<a href="#">Edit</a>	<a href="#">X Delete</a>

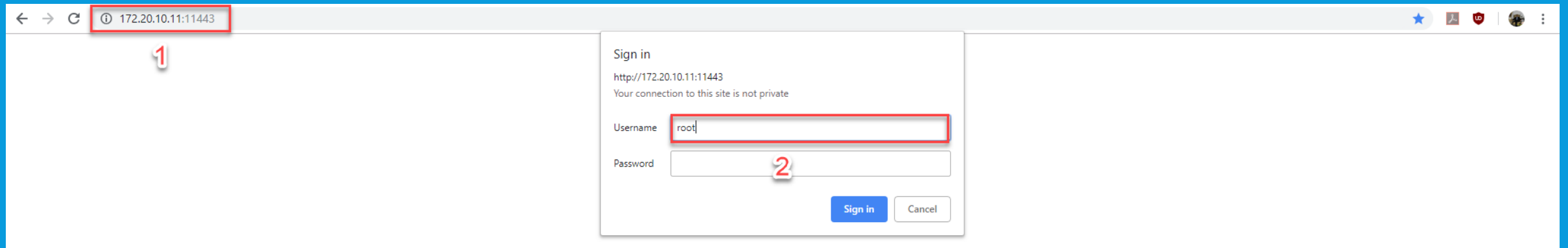
# 5. BASIC ASTERISK SERVER CONFIGURATION

## b. REGISTER YOUR PC / ANDROID MOBILE PHONE WITH ASTERISK



## 5. BASIC ASTERISK SERVER CONFIGURATION

### c. REGISTER ANALOG TELEPHONE ADAPTER (ATA) WITH ASTERISK



# 5. BASIC ASTERISK SERVER CONFIGURATION

## c. REGISTER ANALOG TELEPHONE ADAPTER (ATA) WITH ASTERISK

← → ↻ Not secure | 172.20.10.11:11443

### VoIP Gateway

- Network Configuration
  - > WAN Setting
  - > LAN Setting
- General Configuration
- Advanced Configuration
- Management
- Reboot

#### WAN Setting

Connection mode	Static IP ▾
Current IP address	172.20.10.11
DNS Server mode	<input checked="" type="radio"/> Auto <input type="radio"/> Manual
Primary DNS address	163.121.128.134
Secondary DNS address	163.121.128.135
WAN Link Speed	Auto ▾
HTTP port for WEB management(80,1024~65535)	11443
Remote access restriction	<input checked="" type="radio"/> Enable <input type="radio"/> Disable

#### Static IP

IP address	172.20.10.11
Subnet mask	255.255.255.0
Default gateway	172.20.10.254

Apply

# 5. BASIC ASTERISK SERVER CONFIGURATION

## c. REGISTER ANALOG TELEPHONE ADAPTER (ATA) WITH ASTERISK

VoIP Gateway

**Network Configuration**

**General Configuration** <sup>1</sup>

- > SIP Setting <sup>2</sup>
- > SIP Advanced Setting
- > Payload Type Setting
- > Line Setting
- > QoS Setting
- > NAT Setting
- > Speed Dial Setting
- > Caller ID Setting
- > CDR Setting
- > Syslog Setting

**Advanced Configuration**

**Management**

**Reboot**

**SIP Setting**

	Enable	IP Address	Port	Domain Name	Expire Time(sec)	MWI TTL(sec)
Primary proxy/P2P IP	<input checked="" type="checkbox"/>	172.20.10.200	5060	<sup>3</sup>	60	0
Secondary proxy	<input type="checkbox"/>		5060		60	0
Outbound proxy	<input type="checkbox"/>		5060			

**Primary proxy Call Number Configuration**

Enable	Line	Register	Account	Number	Password	Display Name
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1008	1008	....	1008	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9991	9991	.....	9991	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9992	9992	.....	9992	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9993	9993	.....	9993	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9994	9994	.....	9994	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9995	9995	.....	9995	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9996	9996	.....	9996	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9997	9997	.....	9997	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9998	9998	.....	9998	

**Apply** <sup>5</sup>

<sup>4</sup>

# 5. BASIC ASTERISK SERVER CONFIGURATION

## c. REGISTER ANALOG TELEPHONE ADAPTER (ATA) WITH ASTERISK



System Status

Please click on a panel to manage related features

Trunks

Outgoing Calling Rules

Dial Plans

Users

Ring Groups

Music On Hold

Call Queues

Voice Menus

Time Intervals

Incoming Calling Rules

Voicemail

Paging/Intercom

Conferencing

Follow Me

Directory

Call Features

VoiceMail Groups

Voice Menu Prompts

System Info

Logout

System Status

\* Trunks

Status	Trunk	Type	Username	Port/Hostname/IP
	FreePBX	sip		172.20.10.16
	CME	sip		172.20.15.254

\* Extensions

All Analog Features IAX SIP

Free Ringing Busy UnAvailable

Extension	Name/Label	Status	Type
9990	Win7 X-Lite	Messages : 0/0	SIP/IAX User
9991	FXS08 T1	Messages : 0/0	SIP/IAX User
9992	FXS08 T2	Messages : 0/0	SIP/IAX User
9993	FXS08 T3	Messages : 0/0	SIP/IAX User
9994	FXS08 T4	Messages : 0/0	SIP/IAX User
9995	FXS08 T5	Messages : 0/0	SIP/IAX User
9996	FXS08 T6	Messages : 0/0	SIP/IAX User
9997	FXS08 T7	Messages : 0/0	SIP/IAX User
9998	FXS08 T8	Messages : 0/0	SIP/IAX User
9999	Haytham HuaweiY7	Messages : 0/0	SIP/IAX User
-- *No Extension assigned		Check Voicemails	VoiceMailMain
-- *No Extension assigned		Dial by Names	Directory

\* Queues

No () - 0 calls, 0 agents

Service Level:  
Calls Completed:  
Calls Abandoned:

\* Conference Rooms

\* Parking Lot

Caller ID	Channel	Extension	Timeout
No Parked Calls			

\* System Info

General Network Memory Disk

Hostname:

OS Version:

Linux metarouter 2.6.31.10 #9 Fri Dec 27 23:12:48 CET 2013 mips unknown

Asterisk Build:

Asterisk/1.8.11.1  
Asterisk GUI-version : 2.1.0-rc1

Server Date & Timezone

Thu Jan 1 15:02:38 UTC 1970

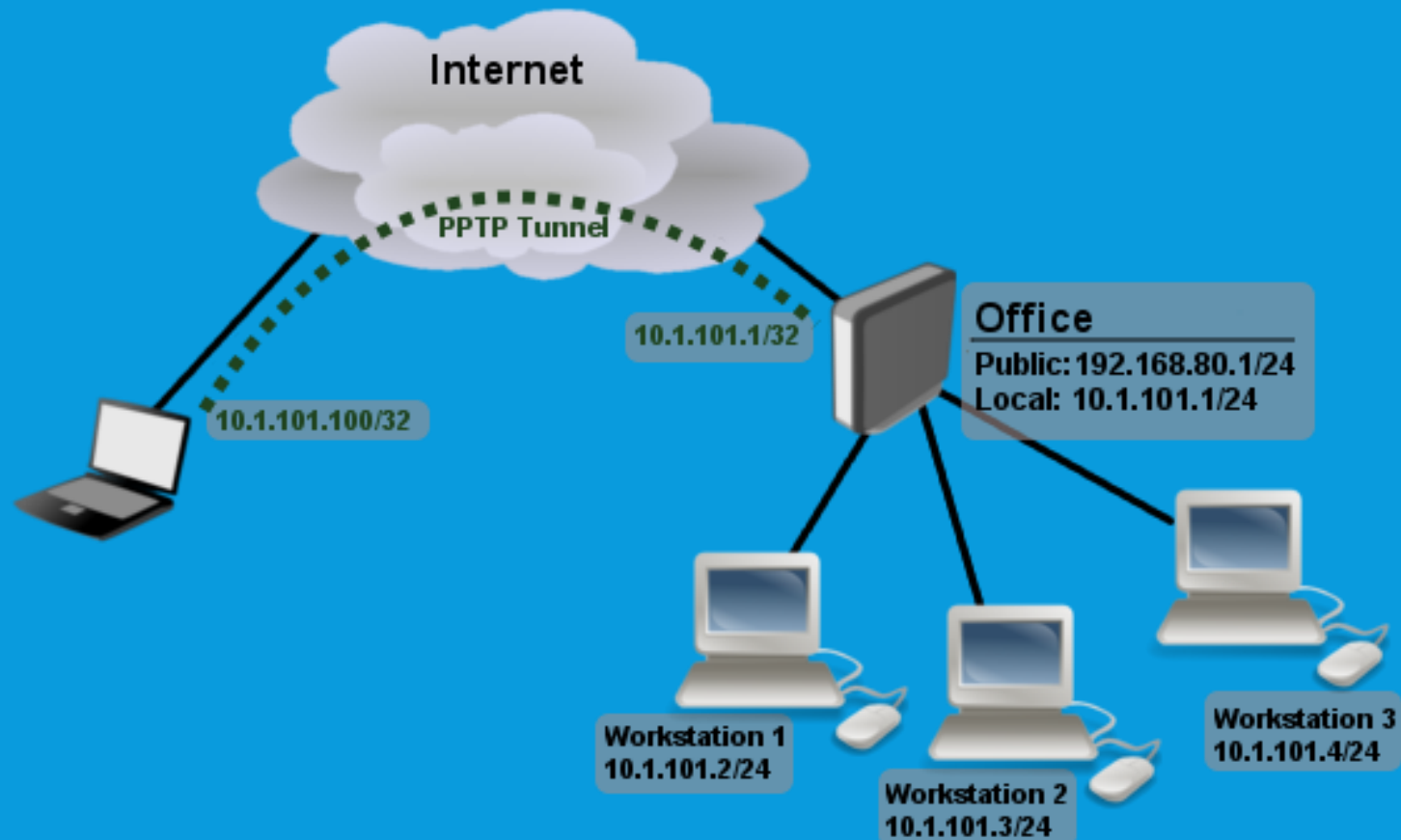
Uptime:

15:02:37 up 15:02,  
Load Average: 0.09, 0.04, 0.00



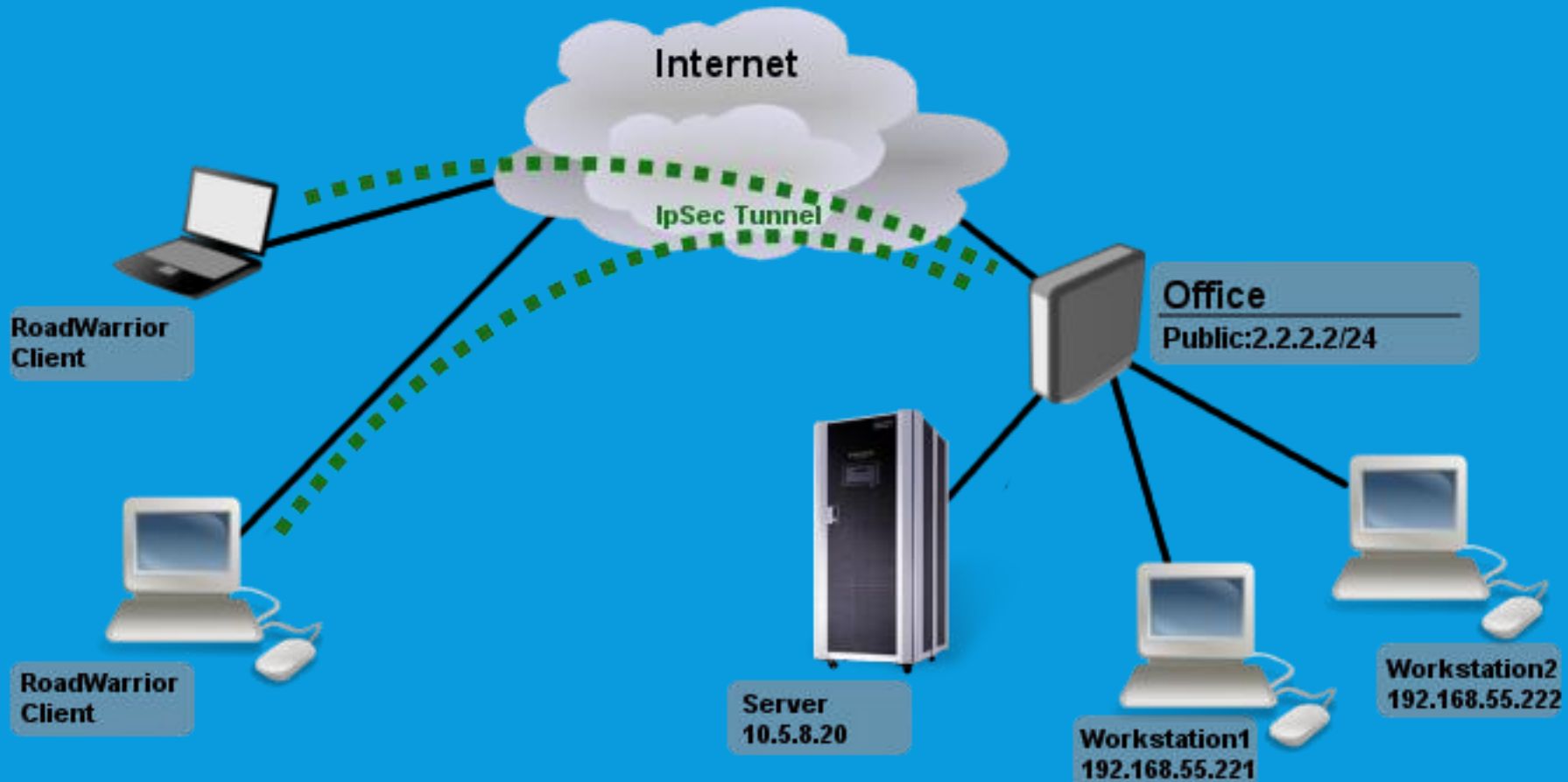
## 6. WHAT IS NEXT?

- a. **Send/Receive Calls Using Your Asterisk Server While You Are Anywhere Across The Globe!**



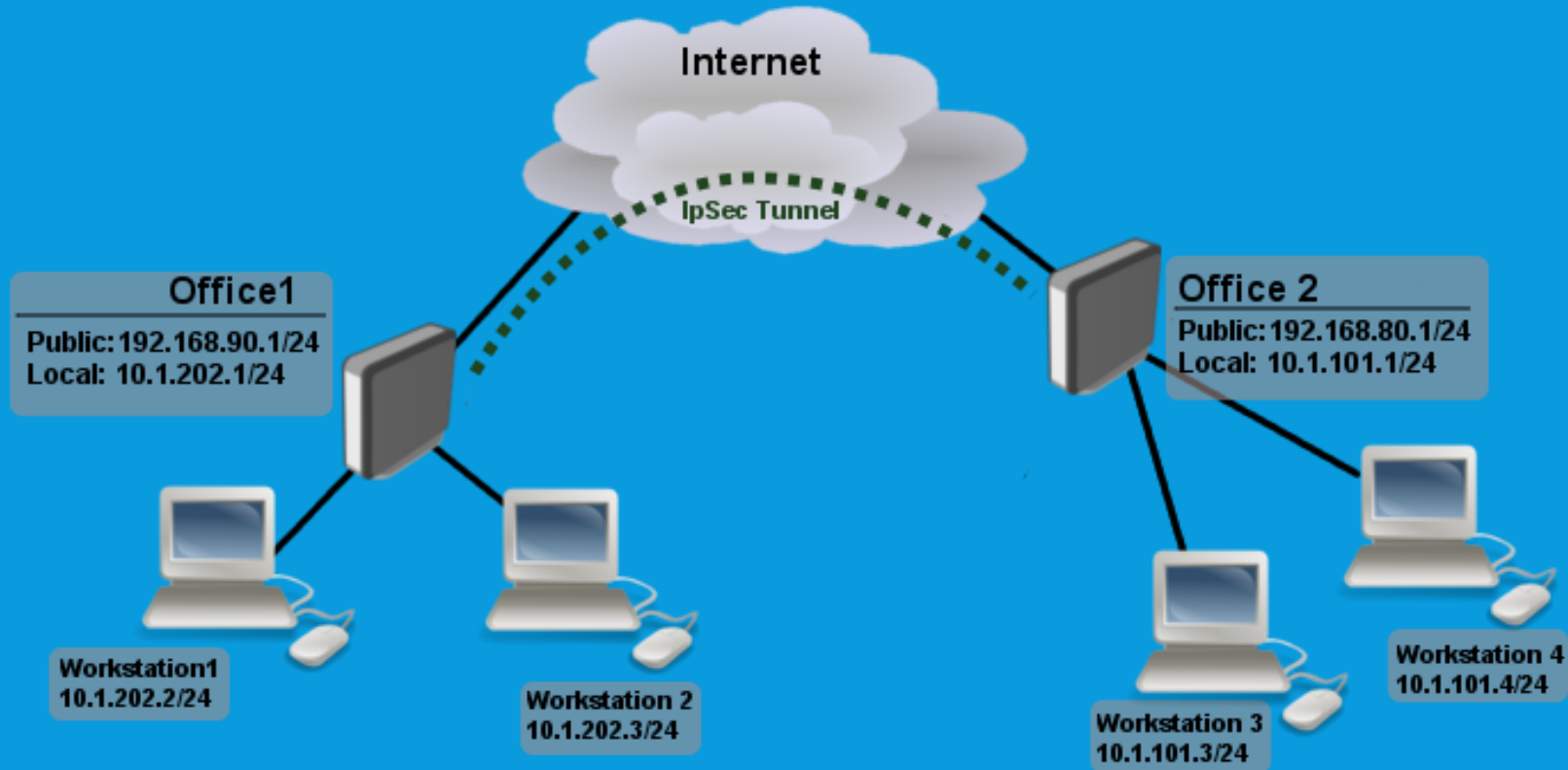
## 6. WHAT IS NEXT?

- a. **Send/Receive Calls Using Your Asterisk Server While You Are Anywhere Across The Globe!**



## 6. WHAT IS NEXT?

### b. Connecting Two Asterisk Servers Together Via SIP Trunk



# 6. WHAT IS NEXT?

## b. Connecting Two Asterisk Servers Together Via SIP Trunk



System Status  
**Trunks**  
Trunks are outbound lines used to allow the system to make calls to the real world. Trunks can be VoIP lines or traditional telephony lines.

- Outgoing Calling Rules
- Dial Plans
- Users
- Ring Groups
- Music On Hold
- Call Queues
- Voice Menus
- Time Intervals
- Incoming Calling Rules
- Voicemail
- Paging/Intercom
- Conferencing
- Follow Me
- Directory
- Call Features
- VoiceMail Groups
- Voice Menu Prompts
- System Info

Logout

Manage SIP & IAX trunks **2**

**1** Analog Trunks **VOIP Trunks** T1/E1/BRI Trunks

**3** + New SIP/IAX Trunk

Provider Name	Type	Hostname/IP	Username

**Edit SIP trunk trunk\_1** X

Provider Name **4**: FreePBX

Hostname **5**: 172.20.10.16

Username:

Password:

Codecs: First: u-law **6** Second: a-law Third: GSM Fourth: None Fifth: None

CallerID **7**: <9999>

FromDomain:

FromUser:

AuthUser:

insecure: no

Outbound Proxy:

Enable Remote MWI:

**8**

IP Address of Asterisk Server In Remote Site

# 6. WHAT IS NEXT?

## b. Connecting Two Asterisk Servers Together Via SIP Trunk



Logout

- System Status
- Trunks
- Outgoing Calling Rules
- Dial Plans
- Users
- Ring Groups
- Music On Hold
- Call Queues
- Voice Menus
- Time Intervals
- Incoming Calling Rules** 1
- Voicemail
- Paging/Intercom
- Conferencing

Incoming Calling Rules

+ New Incoming Rule 2

Incoming Calling Rules

Trunk - CME

Time Interval	Pattern	Destination	Sort
---------------	---------	-------------	------

Trunk - FreePBX

Time Interval	Pattern	Destination	Sort
none (no Time Intervals matched)			

**New Incoming Rule** X

Trunk : FreePBX

Time Interval : None (no Time Intervals matched)

Pattern : 999X 3

Destination : Local Extension by DID

Local Extension by DID Pattern : \${EXTEN:999X}

# 6. WHAT IS NEXT?

## b. Connecting Two Asterisk Servers Together Via SIP Trunk



Logout

- System Status
- Trunks
- Outgoing Calling Rules**
- Calling Rules define dialing permissions and routing rules.
- Dial Plans
- Users
- Ring Groups
- Music On Hold
- Call Queues
- Voice Menus
- Time Intervals
- Incoming Calling Rules
- Voicemail
- Paging/Intercom
- Conferencing
- Follow Me
- Directory
- Call Features
- VoiceMail Groups
- Voice Menu Prompts
- System Info

**Manage Calling Rules**

**Outgoing Calling Rules**

**+ New Calling Rule** Restore Default Calling Rules

An outgoing calling rule pairs an extension pattern with a trunk used to dial the pattern. This allows different patterns to be dialed through different trunks (e.g. "local" 7-digit dials through an FXO but "long distance" 10-digit dials through a low-cost SIP trunk). See the Dial Plans section to associate only individual outgoing call rules.

**Edit Calling Rule**

Calling Rule Name: FreePBX

Pattern: \_99[0-4]X

Caller ID: <9999>

Send to Local Destination

Destination: [Dropdown]

Send this call through trunk:

Use Trunk: FreePBX

Strip: 0 digits from front

and Prepend these digits: [Input] before dialing

using this filter: [Input]

Use FailOver Trunk

fail over Trunk: [Dropdown]

Strip: [Input] digits from front

and Prepend these digits: [Input] before dialing

using this filter: [Input]

Cancel Save

## 6. WHAT IS NEXT?

### c. Does Your Mikrotik Need To Have A Static IP Address?

The image shows a screenshot of the Mikrotik WinBox interface. On the left, a sidebar menu is visible with categories like Interfaces, Wireless, Bridge, PPP, Mesh, IP, MPLS, Routing, System, Queues, and File. The 'IP' category is selected, and a sub-menu is open showing 'Accounting', 'Addresses', 'Cloud', and 'DHCP Client'. A red arrow labeled '1' points to the 'IP' category, and another red arrow labeled '2' points to the 'Cloud' option in the sub-menu.

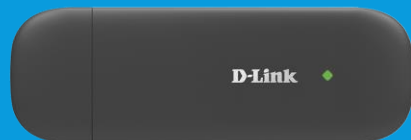
The main window displays the 'Cloud' configuration dialog. It has a title bar 'Cloud' with a red arrow labeled '3' pointing to it. The dialog contains the following fields and controls:

- DDNS Enabled
- Update Time
- Public Address: 199.21.228.155
- DNS Name: 449602d0cb99.sn.mynetname.net (This field is highlighted with a red box and a red arrow labeled '5' pointing to it.)
- Buttons: OK, Cancel (with a red arrow labeled '4' pointing to it), Apply (with a red box around it), and Force Update.

A red callout box at the bottom right contains the text: "To be Used by Remote Clients to Connect to the VPN Server running on the RouterBOARD".

## 6. WHAT IS NEXT?

### d. Can We Use A Broadband USB Modem For Internet Connection?



Interface List

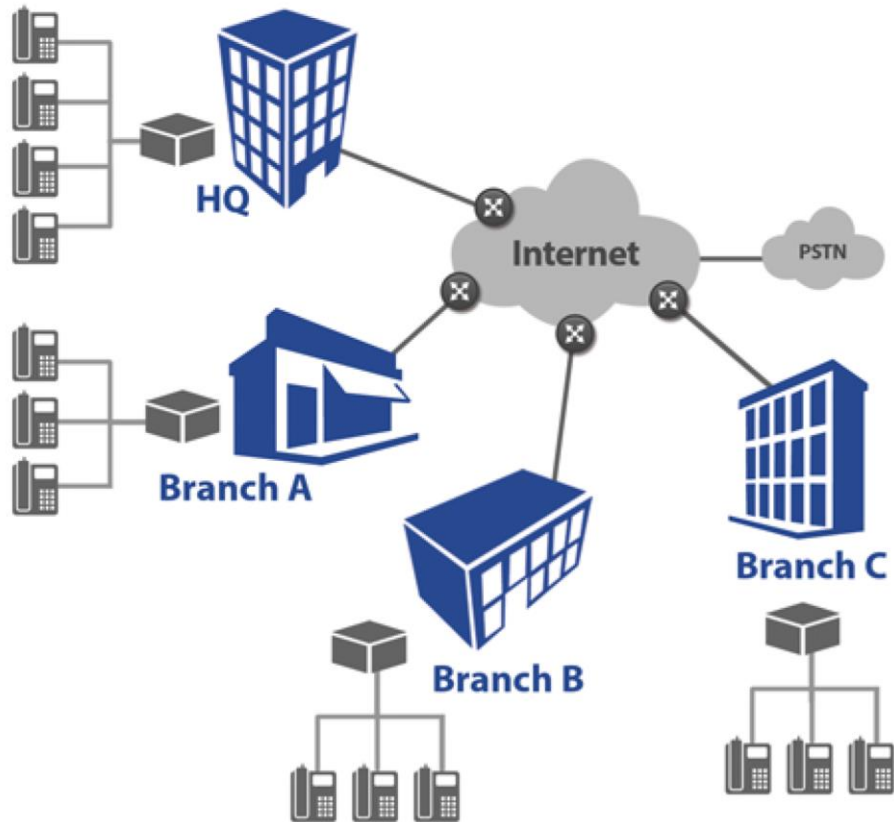
Interface	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx	FP Tx Packet (p/s)	FP Rx Packet (p/s)
RS	::: Amria-Hamra EoIP Tunnel 162	↔ Amria-Hamra-EoIP-Tunnel-162	EoIP Tunnel	1458	65535	0 bps	3.8 kbps	0	3	0 bps	0 bps	0
RS	::: Amria-Hamra EoIP Tunnel 172	↔ Amria-Hamra-EoIP-Tunnel-172	EoIP Tunnel	1458	65535	0 bps	992 bps	0	2	0 bps	0 bps	0
R	::: Amria-Hamra OVPN Tunnel	↔ Amria-Hamra-OVPN-Client-1	OVPN Client	1500		143.9 kbps	11.1 kbps	16	18	0 bps	0 bps	0
R	::: Amria-Hamra OVPN Tunnel 2	↔ Amria-Hamra-OVPN-Client-2	OVPN Client	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	::: Huawei USB Modem No.1: USB Port 1 [--- LAN-173 ---]	↔ Huawei-1	LTE	1500		162.9 kbps	30.7 kbps	23	23	0 bps	33.0 kbps	0
R	::: Huawei USB Modem No.2: USB Port 1 [--- LAN-175 ---]	↔ Huawei-2	LTE	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
R	::: LAN-15 bridge: [--- ether2 & wlan ---]	↔ LAN-15	Bridge	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0
RS	::: LAN-15 Bridge Port No.1: ether2	↔ LAN-15-1	Ethernet	1500	1598	0 bps	0 bps	0	0	448 bps	0 bps	1
R	::: LAN-162 Bridge: [--- ether3 & Amria-Hamra-EoIP-Tunnel-162 ---]	↔ LAN-162	Bridge	1458	1598	0 bps	3.1 kbps	0	2	0 bps	0 bps	0
RS	::: LAN-162 Bridge Port No.1: ether3	↔ LAN-162-1	Ethernet	1500	1598	3.7 kbps	0 bps	2	0	4.9 kbps	0 bps	5
RS	::: LAN-172 Bridge Port No.1: ether3 [*** VLAN 172 ***]	↔ LAN-172-1	VLAN	1500	1594	992 bps	0 bps	2	0	0 bps	0 bps	0
R	::: LAN-172 Bridge: [--- ether3 & Amria-Hamra-EoIP-Tunnel-172 ---]	↔ LAN-172	Bridge	1458	1594	0 bps	424 bps	0	1	0 bps	0 bps	0
R	::: Max-Hamra OVPN Tunnel	↔ Max-Hamra-OVPN-Client	OVPN Client	1500		0 bps	0 bps	0	0	0 bps	0 bps	0
X	::: [=== Disabled ===] Mobilin 3G USB Modem	↔ Mobilin	PPP Client			0 bps	0 bps	0	0	0 bps	0 bps	0
S	::: WAN Interface: ether1	↔ WAN	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0
S	::: LAN-15 Bridge Port No.2: wlan	↔ WLAN	Wireless (Atheros AR9...	1500	1600	0 bps	0 bps	0	0	0 bps	0 bps	0
		↔ ether4	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0
		↔ ether5	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps	0
DRS		↔ vif1	Virtual Ethernet	1500		472 bps	0 bps	1	0	0 bps	0 bps	0



## 6. WHAT IS NEXT?

### e. Why Not Integrate Your Asterisk Server With Your Existing Business Telecommunication Systems?!

SIP Trunking Diagram



```
!
dial-peer voice 9990 voip
description Microgypt Asterisk [9990 - 9999]
destination-pattern 999.
session protocol sipv2
session target ipv4:172.20.10.200
dtmf-relay rtp-nte
codec g711ulaw
no vad
!
```

```
dial-peer voice 9900 voip
description Microgypt FreePBX [9900 - 9949]
destination-pattern 99[0-4].
session protocol sipv2
session target ipv4:172.20.10.16
dtmf-relay rtp-nte
codec g711ulaw
no vad
```

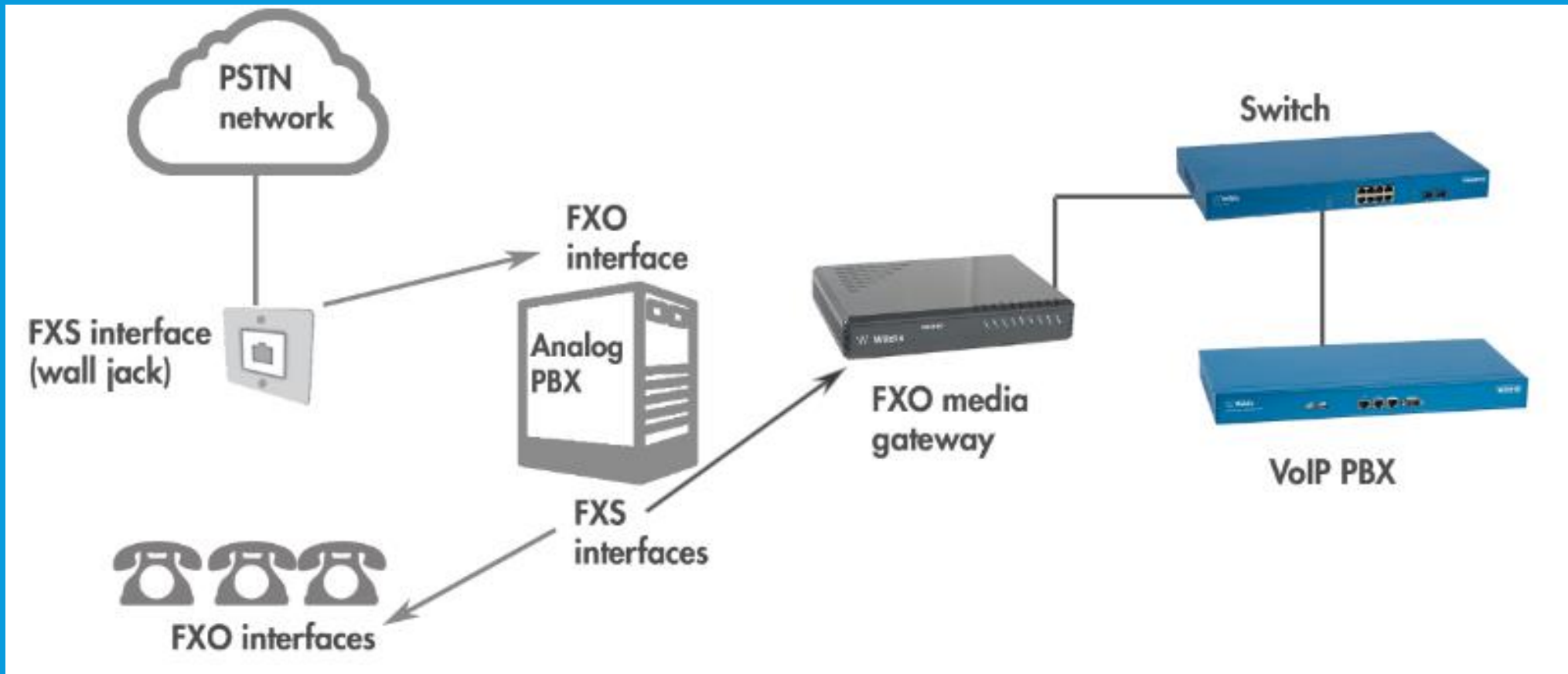
```
!
!
!
!
telephony-service
--More--
```

Dial Peer Configuration In  
Cisco CME Router  
Connected to the Mikrotik  
RB951Ui-2HnD Running  
Asterisk Server Through  
OpenVPN Tunnel

## 6. WHAT IS NEXT?

### f. Can We Make Outbound Calls to PSTN Using our Asterisk Server?

#### ❖ Using FXO Media Gateway

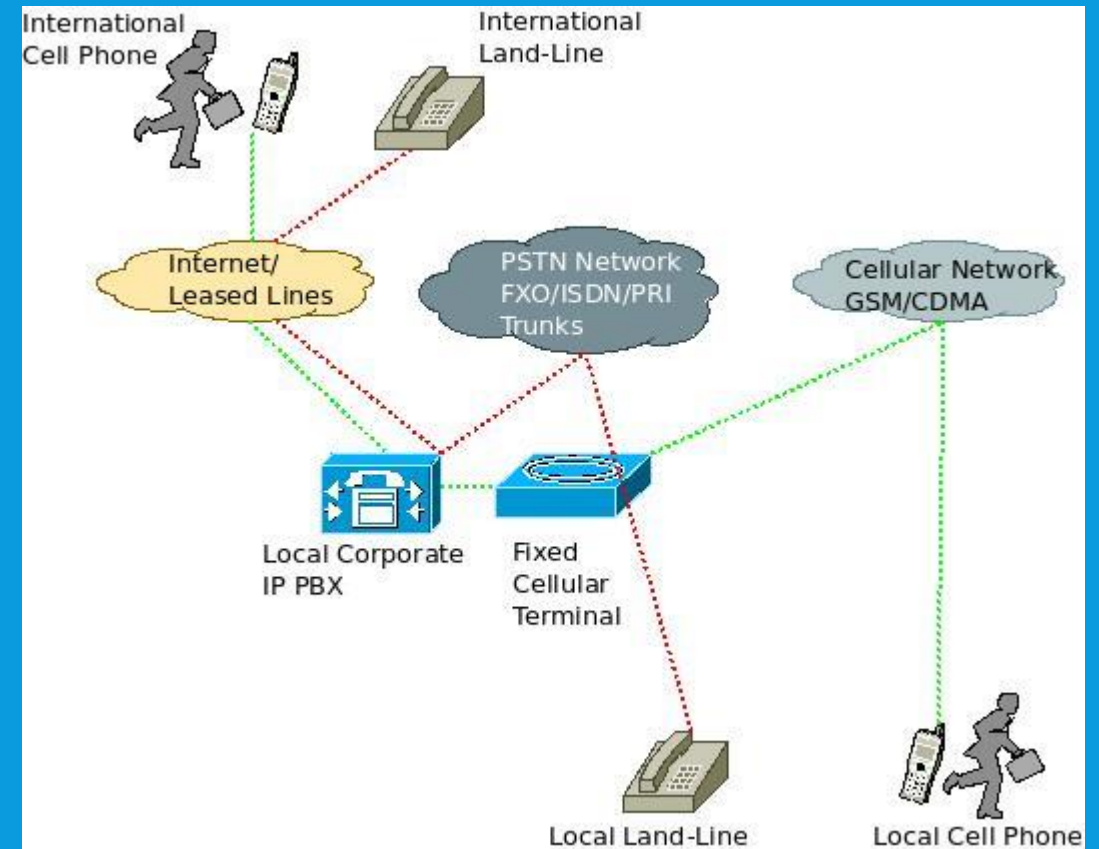


## 6. WHAT IS NEXT?

### f. Can We Make Outbound Calls to PSTN Using our Asterisk Server?

#### ❖ Using DISA

**DISA** (Direct Inward System Access) allows someone calling in from outside the telephone switch (PBX) to obtain an “internal” system dial tone and dial calls as if from one of the extensions attached to the telephone switch.



# Thanks for your Attention



If later, feel free to contact me:



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<https://www.facebook.com/haythamaboulabbas>



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