



# HỆ THỐNG VIỄN THÔNG

## BÀI THỰC HÀNH 1

## XÂY DỰNG TỔNG ĐÀI VoIP ASTERISK

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## MỤC LỤC

<b>1</b>	<b>THÔNG TIN .....</b>	<b>3</b>
<b>2</b>	<b>CÀI ĐẶT – ĐĂNG NHẬP .....</b>	<b>4</b>
<b>3</b>	<b>ĐĂNG KÍ TÀI KHOẢN VỚI ZOIPER.....</b>	<b>8</b>
<b>4</b>	<b>TẠO DIALPLAN VỚI NGŨ CẢNH LIÊN LẠC NỘI BỘ.....</b>	<b>12</b>
<b>5</b>	<b>CẬP NHẬT THÔNG TIN NGŨ CẢNH.....</b>	<b>14</b>
<b>6</b>	<b>KIỂM CHỨNG .....</b>	<b>15</b>



## 1 THÔNG TIN

MSSV	HỌ TÊN	VAI TRÒ	EMAIL
1712006	Phùng Duy Bình	Thành viên	<a href="mailto:1712006@student.hcmus.edu.vn">1712006@student.hcmus.edu.vn</a>

**X = 6**

## 2 CÀI ĐẶT – ĐĂNG NHẬP

- Cài đặt Trixbox trên phần mềm VMWare 15.5 để được hỗ trợ tốt nhất
- Sau khi cài đặt, đăng nhập vào hệ thống với tài khoản/mật khẩu: **root/ 123456**

```
Welcome to trixbox CE
-----

For access to the trixbox web GUI use this URL
eth0 http://192.168.144.131

For help on trixbox commands you can use from this
command shell type help-trixbox.

trixbox1 login: root
Password:
[trixbox1.localdomain ~]# asterisk -r
```

- Nhập lệnh **#ifconfig** để hiển thị địa chỉ ip của website cấu hình

```
command shell type help-trixbox.

trixbox1 login: root
Password:
[trixbox1.localdomain ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:0C:29:9C:0B:38
          inet addr:192.168.144.131  Bcast:192.168.144.255  Mask:255.255.255.0
          inet6 addr: fe80::c98:328c:fe9c:b38/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1369 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1712 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:177422 (173.2 KiB)  TX bytes:958559 (936.0 KiB)
          Interrupt:67 Base address:0x2000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:2720 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2720 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:193356 (188.8 KiB)  TX bytes:193356 (188.8 KiB)

[trixbox1.localdomain ~]#
```

- Nhập lệnh **#asterisk -r** để kết nối đến Asterisk



```
Interrupt:67 Base address:0x2000

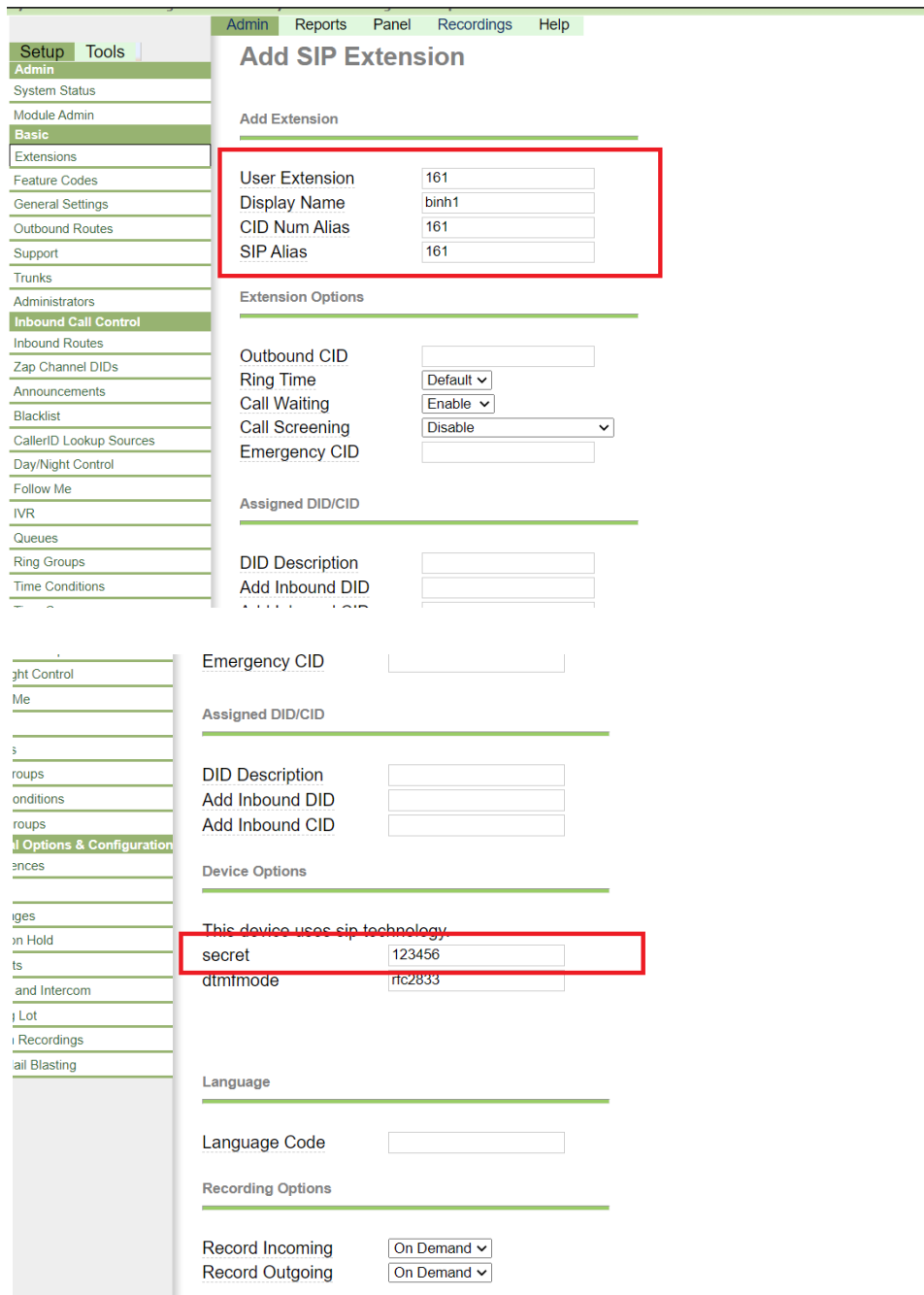
lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:16436  Metric:1
        RX packets:2720 errors:0 dropped:0 overruns:0 frame:0
        TX packets:2720 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:193356 (188.8 KiB)  TX bytes:193356 (188.8 KiB)

[trixbox1.localdomain ~]# asterisk -r
Asterisk 1.6.0.26-FONCORE-r70, Copyright (C) 1999 - 2010 Digium, Inc. and others
Created by Mark Spencer <markster@digium.com>
Asterisk comes with ABSOLUTELY NO WARRANTY; type 'core show warranty' for details.
This is free software, with components licensed under the GNU General Public
License version 2 and other licenses; you are welcome to redistribute it under
certain conditions. Type 'core show license' for details.
=====
Connected to Asterisk 1.6.0.26-FONCORE-r78 currently running on trixbox1 (pid =
5215)
Verbosity is at least 3
trixbox1*CLI> _
```

- Sau đó dùng trình duyệt Chrome để truy cập theo địa chỉ ip ở trên
- Từ khung User Mode → switch → đăng nhập với tên đăng nhập / mật khẩu: **maint** / **password**

## TẠO EXTENSION:

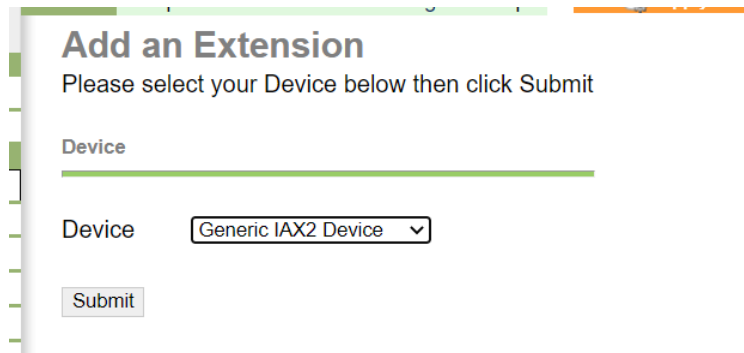
- Truy cập PBX → PBX Setting → Extensions → Add Extension để vào phần cài đặt Extension
- Tạo Extension 161 sử dụng công nghệ SIP
- Chọn **Generic SIP Device** → Submit
- Điền các thông tin tại vùng khoanh đỏ theo hình, sau đó chọn Submit để lưu cấu hình



The screenshot shows the 'Add SIP Extension' form in a PBX administration interface. The left sidebar contains a menu with categories like Setup, Tools, Admin, Basic, and Inbound Call Control. The main form area is titled 'Add SIP Extension' and includes several sections:

- Add Extension:** A red box highlights the following fields:
  - User Extension: 161
  - Display Name: binh1
  - CID Num Alias: 161
  - SIP Alias: 161
- Extension Options:**
  - Outbound CID: (empty field)
  - Ring Time: Default (dropdown)
  - Call Waiting: Enable (dropdown)
  - Call Screening: Disable (dropdown)
  - Emergency CID: (empty field)
- Assigned DID/CID:**
  - DID Description: (empty field)
  - Add Inbound DID: (empty field)
  - Add Inbound CID: (empty field)
- Device Options:**
  - A red box highlights the text 'This device uses sip technology:' followed by:
    - secret: 123456
    - dtmfmode: rfc2833
- Language:**
  - Language Code: (empty field)
- Recording Options:**
  - Record Incoming: On Demand (dropdown)
  - Record Outgoing: On Demand (dropdown)

- Tạo Extension 162 sử dụng công nghệ IAX2
- Chọn **Generic IAX2 Device** → Submit

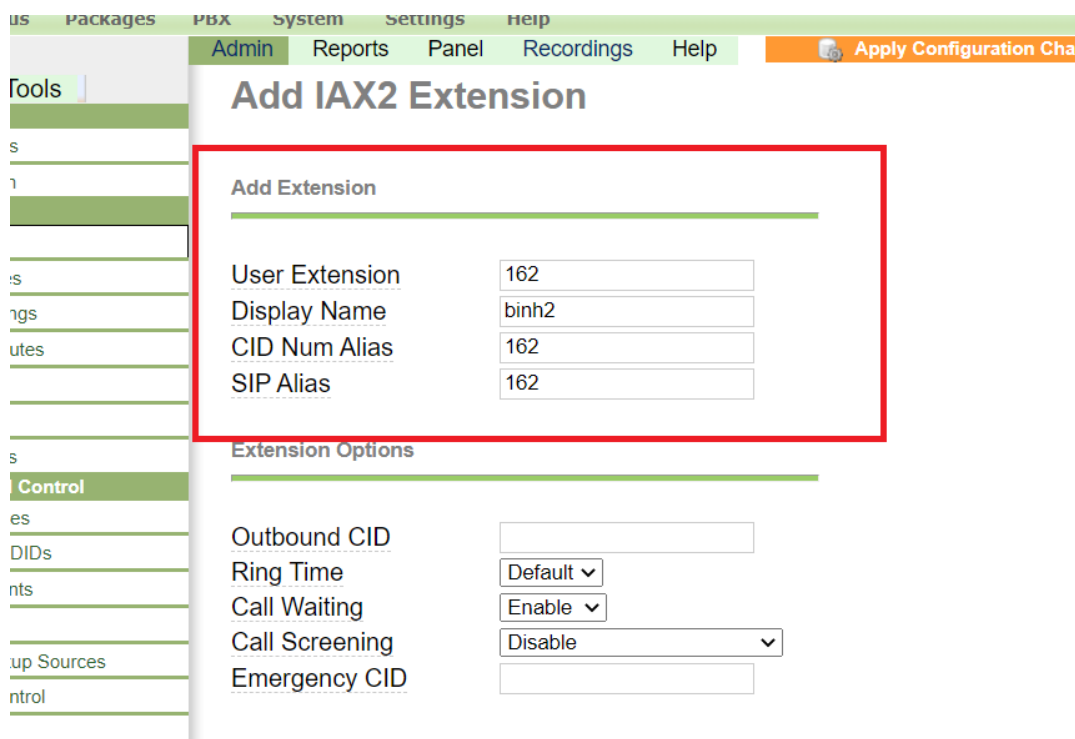


**Add an Extension**  
Please select your Device below then click Submit

Device

Device Generic IAX2 Device

- Điền các thông tin tại vùng khoanh đỏ theo hình, sau đó chọn Submit để lưu cấu hình



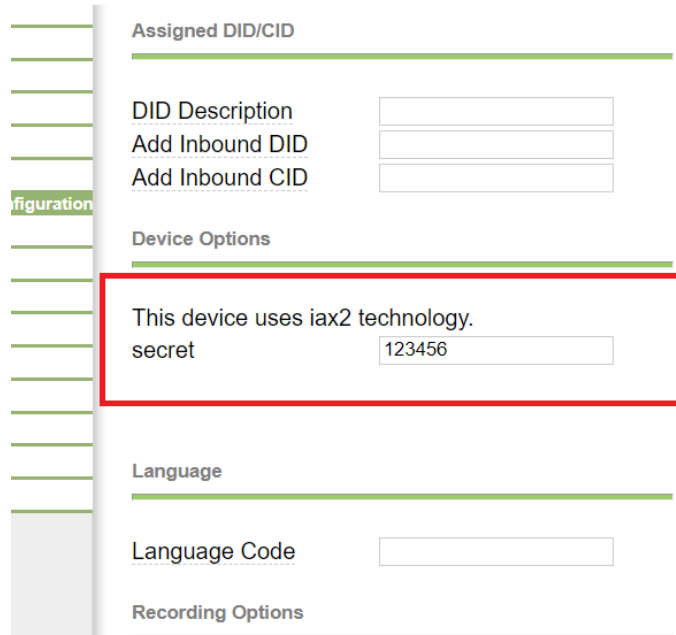
**Add IAX2 Extension**

**Add Extension**

User Extension	<input type="text" value="162"/>
Display Name	<input type="text" value="binh2"/>
CID Num Alias	<input type="text" value="162"/>
SIP Alias	<input type="text" value="162"/>

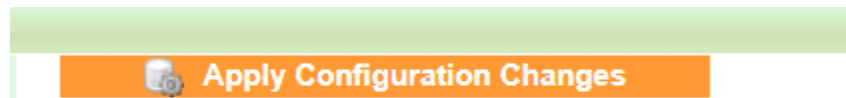
**Extension Options**

Outbound CID	<input type="text"/>
Ring Time	<span>Default</span>
Call Waiting	<span>Enable</span>
Call Screening	<span>Disable</span>
Emergency CID	<input type="text"/>



The screenshot shows the Asterisk configuration interface for a device. The 'Assigned DID/CID' section is at the top. Below it are fields for 'DID Description', 'Add Inbound DID', and 'Add Inbound CID'. The 'Device Options' section is highlighted with a red box and contains the text 'This device uses iax2 technology.' followed by a 'secret' field with the value '123456'. Below this is the 'Language' section with a 'Language Code' field. At the bottom is the 'Recording Options' section.

- Sau đó chọn **Apply Configuration Changes** → **Continue with Reload** để chấp nhận cấu hình đã tạo

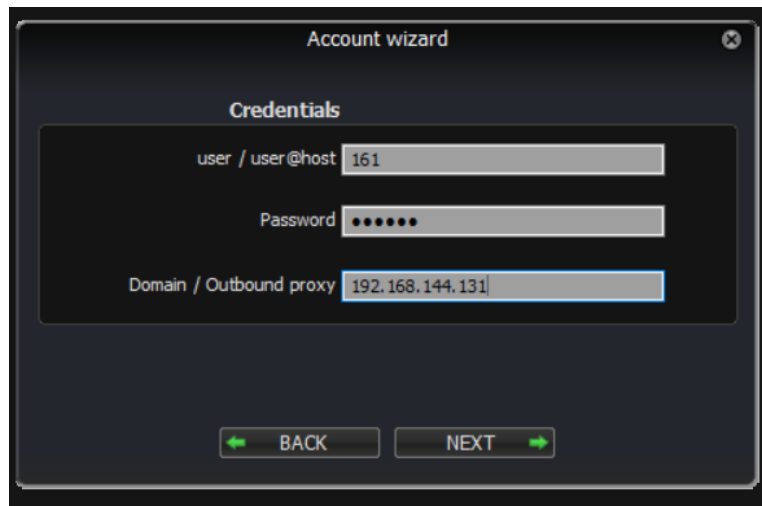


### 3 ĐĂNG KÍ TÀI KHOẢN VỚI ZOIPER

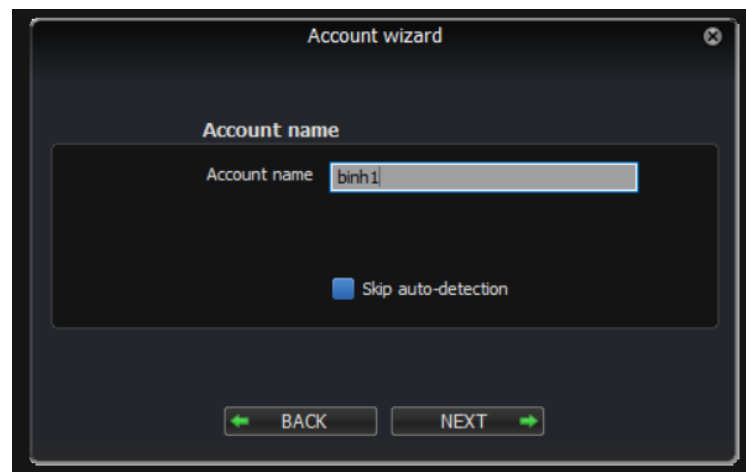
- Mở ứng dụng gọi thoại Zoiper
- Truy cập **Setting** → **Preferences** → **Create Account** để đăng kí tài khoản với tổng đài
- Chọn Account Type ứng với các Extension đã tạo ở bước trước
- SIP** →



Điền **Credentials** → **Next**

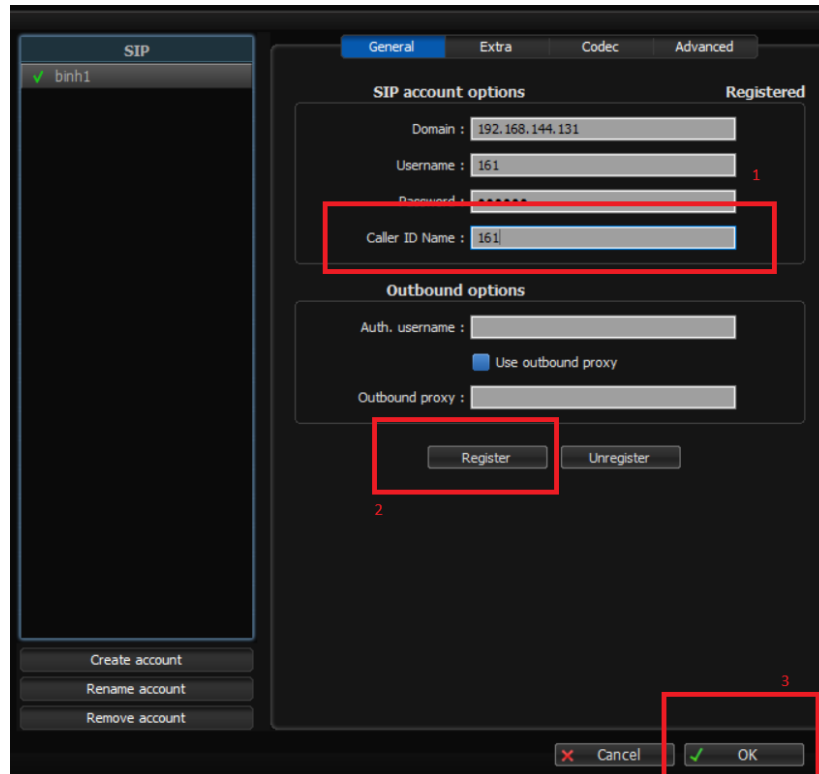


Đặt tên tài khoản → **Next**



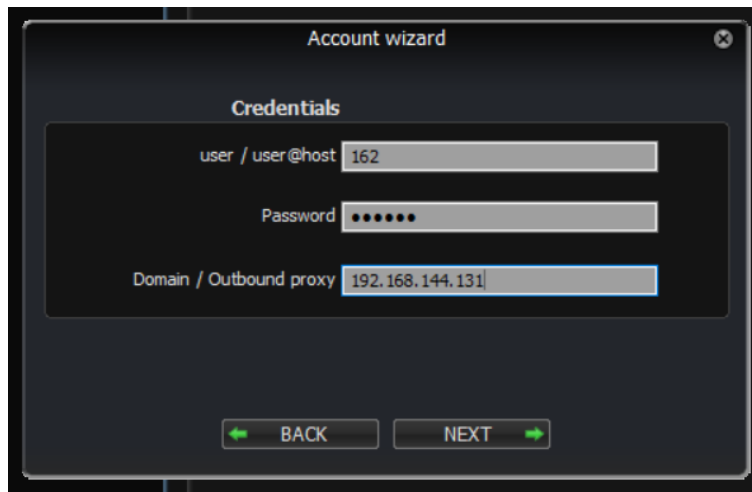
Điền **Caller ID Name** → **Register** → **OK**

- 
- 
- 
-



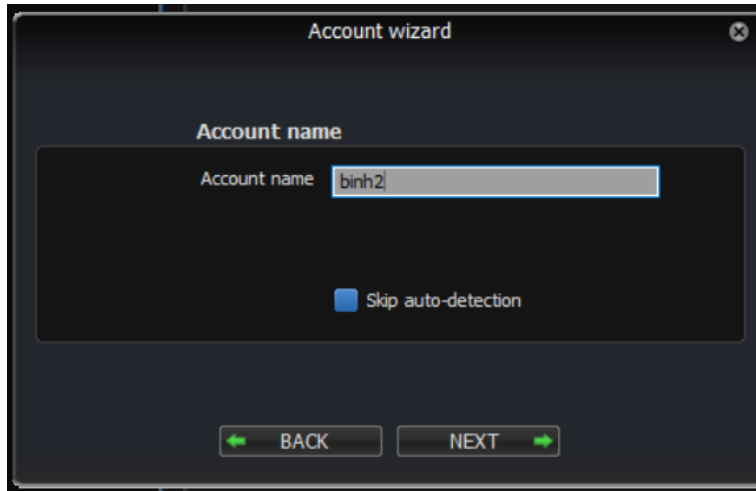
The image shows a software window for configuring SIP accounts. On the left, a list of accounts shows 'binh1' with a green checkmark. Below this list are buttons for 'Create account', 'Rename account', and 'Remove account'. The main area has tabs for 'General', 'Extra', 'Codec', and 'Advanced'. The 'General' tab is active, showing 'SIP account options' and 'Outbound options'. In the 'SIP account options' section, the 'Domain' is '192.168.144.131', 'Username' is '161', 'Password' is masked with dots, and 'Caller ID Name' is '161'. The 'Outbound options' section has 'Auth. username' empty, a checked 'Use outbound proxy' checkbox, and an empty 'Outbound proxy' field. At the bottom of this section are 'Register' and 'Unregister' buttons. At the very bottom of the window are 'Cancel' and 'OK' buttons. Red boxes and numbers highlight specific elements: a red box around the 'Caller ID Name' field is labeled '1'; a red box around the 'Register' button is labeled '2'; and a red box around the 'OK' button is labeled '3'.

- IAX2 →  
Điền **Credentials** → Next



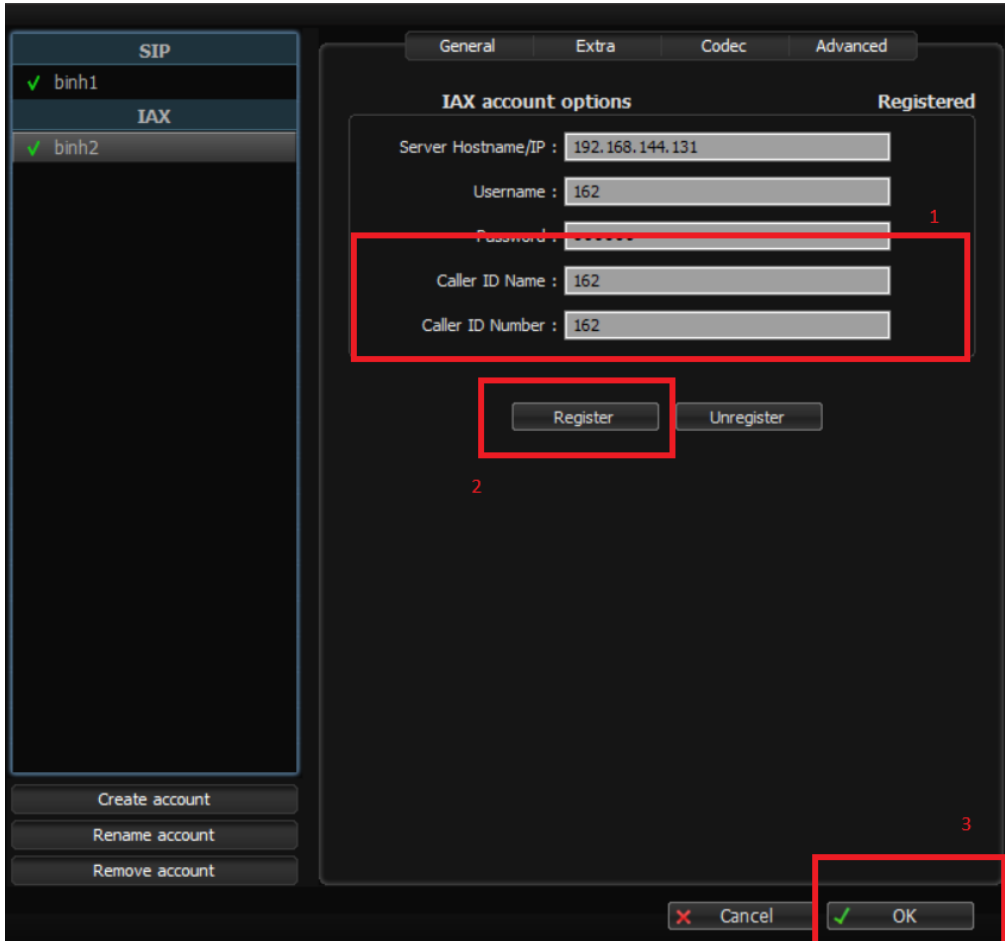
The image shows a dialog box titled 'Account wizard' with a close button in the top right corner. The main title is 'Credentials'. It contains three input fields: 'user / user@host' with the value '162', 'Password' with masked dots, and 'Domain / Outbound proxy' with the value '192.168.144.131'. At the bottom are two buttons: 'BACK' with a left arrow and 'NEXT' with a right arrow.

Điền **Account Name** → **Next**



The 'Account wizard' dialog box is shown. It has a title bar with a close button. The main content area is titled 'Account name'. Below the title, there is a text input field labeled 'Account name' containing the text 'binh2'. Below the input field, there is a checkbox labeled 'Skip auto-detection' which is currently unchecked. At the bottom of the dialog, there are two buttons: 'BACK' with a left arrow and 'NEXT' with a right arrow.

Điền **Caller ID Name**, **Caller ID Number** → **Register** → **OK**



The 'SIP/IAX account configuration' window is shown. On the left, there is a list of accounts under two tabs: 'SIP' and 'IAX'. Under 'SIP', there is a checkmark and 'binh1'. Under 'IAX', there is a checkmark and 'binh2'. Below the list are three buttons: 'Create account', 'Rename account', and 'Remove account'. On the right, there are four tabs: 'General', 'Extra', 'Codec', and 'Advanced'. The 'General' tab is selected. Below the tabs, there is a section titled 'IAX account options' with a 'Registered' status indicator. The fields in this section are: 'Server Hostname/IP' (192.168.144.131), 'Username' (162), 'Password' (masked with dots), 'Caller ID Name' (162), and 'Caller ID Number' (162). A red box highlights the 'Caller ID Name' and 'Caller ID Number' fields. Below these fields are two buttons: 'Register' and 'Unregister'. A red box highlights the 'Register' button. At the bottom right, there are three buttons: 'Cancel', 'OK', and a green checkmark button. A red box highlights the 'OK' button. There are three red numbers: '1' next to the 'Password' field, '2' next to the 'Register' button, and '3' next to the 'OK' button.

- Asterisk thông báo đăng kí thành công tài khoản

```

== Parsing '/etc/asterisk/sip_custom.conf': == Found
== Parsing '/etc/asterisk/sip_additional.conf': == Found
== Parsing '/etc/asterisk/sip_custom_post.conf': == Found
== Parsing '/etc/asterisk/users.conf': == Found
== Manager 'admin' logged off from 127.0.0.1
== Manager 'admin' logged off from 127.0.0.1
== Parsing '/etc/asterisk/sip_notify.conf': == Found
trixbox1*CLI> /var/www/html/panel/safe_opserver: line 7: 5279 Terminated
$FOPWEBROOT/op_server.pl
== Manager 'admin' logged on from 127.0.0.1
trixbox1*CLI>
trixbox1*CLI>
trixbox1*CLI>
trixbox1*CLI>
-- Registered SIP '161' at 192.168.144.1 port 36628
-- Unregistered SIP '161'
-- Registered SIP '161' at 192.168.144.1 port 36628
-- Unregistered SIP '161'
-- Registered SIP '161' at 192.168.144.1 port 36628
-- Registered IAX2 '162' (AUTHENTICATED) at 192.168.144.1:4569
-- Unregistered IAX2 '162' (AUTHENTICATED)
-- Registered IAX2 '162' (AUTHENTICATED) at 192.168.144.1:4569
-- Unregistered IAX2 '162' (AUTHENTICATED)
-- Registered IAX2 '162' (AUTHENTICATED) at 192.168.144.1:4569
trixbox1*CLI>

```

## 4 TẠO DIALPLAN VỚI NGŨ CẢNH LIÊN LẠC NỘI BỘ

- Tại website → PBX → Config File Editor
- Tại tab /etc/asterisk → sip\_additional.conf → tìm đến dòng **context** → sửa thành **noibo** → chọn **Update** để tạo ngữ cảnh cho SIP

/etc/asterisk
/var/www/html/panel
/etc
/ftpboot
Re-Read Configs

sip\_additional.conf
Edit: sip\_additional.conf

0.0.0.0/0.0.0.0  
123456  
161@device  
50  
5060

sip\_additional.conf  
Header  
161

```

; Do NOT edit this file as it is auto-generated by FreePBX. All modifications to
; this file must be done via the web gui. There are alternative files to make
; custom modifications, details at: http://freepbx.org/configuration_files
;

[161]
deny=0.0.0.0/0.0.0.0
type=friend
secret=123456
qualify=yes
port=5060
pickupgroup=
permit=0.0.0.0/0.0.0.0
nat=yes
mailbox=161@device
host=dynamic
dtmfmode=rfc2833
dial=sip/161
context=noibo
canreinvite=no
callgroup=
callerid=device <161>
accountcode=
call-limit=50

```

1

Update

2

- Tương tự với **iax\_additional.conf** để tạo ngữ cảnh cho IAX2



- Tại **extension.conf** → cấu hình [noibo] theo cú pháp sau → **Update**

[noibo]

exten=>161,1,Playback(/var/lib/asterisk/sounds/demo-congrats) (*thực hiện chế độ nhạc chờ*)

exten=>161,2,Dial(SIP/161,15) (*Gọi đến số 161 với giao thức SIP*)

exten=>162,1,Playback(/var/lib/asterisk/sounds/demo-congrats) (*thực hiện chế độ nhạc chờ*)

exten=>162,2,Dial(IAX2/162,15) (*Gọi đến số 162 với giao thức IAX2*)

;exten=>162,n,VoiceMail(162@vm-demo,u) (*có thể thêm vào để sử dụng voicemail*)

;exten=>162,n,Hangup() (*có thể thêm vào để tự động cúp máy*)

exten=>\_90X.,1,Playback(/var/lib/asterisk/sounds/demo-congrats)

exten=>\_90x.,2,Dial(\${EXTEN:1})

**extensions.conf**

/etc/asterisk
/var/www/html/panel
/etc
/ftpboot
Re-Read Configs

**extensions.conf**

- Header
- noibo
- from-trunk
- from-pstn
- from-pstn-e164-us
- from-pstn-toheader
- from-did-direct
- macro-dial
- macro-exten-vm
- macro-simple-dial
- macro-get-vmcontext
- macro-fixcid
- macro-rg-group
- macro-outisbusy
- macro-hangupcall
- macro-faxreceive
- macro-dialout
- macro-dialout-default
- macro-dialout-trunk-predial-hook
- macro-dumpvars
- macro-user-logon
- macro-user-logoff
- macro-privacy-mgr
- macro-saytext

**Edit: extensions.conf**

```

; If you need to use [macro-dialout-trunk-predial-hook], [ext-did-custom], or
; [from-internal-custom] for example, place these in this file or they will get overwritten.
#include extensions_custom.conf

;-----
; cấu hình noi bo
[noibo]
exten=>161,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>161,2,Dial(SIP/161,15)

exten=>162,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>162,2,Dial(IAX2/162,15)
exten=>162,n,VoiceMail(162@vm-demo,u)
exten=>162,n,Hangup()

exten=>_90X.,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>_90X.,2,Dial(${EXTEN:1})

;-----
[from-trunk]                                ; just an alias since VoIP shouldn't be called PSTN
include => from-pstn

[from-pstn]
include => from-pstn-custom                  ; create this context in extensions_custom.conf to include
include => ext-did
include => ext-did-post-custom

```

Update

161  
162

## 5 CẬP NHẬT THÔNG TIN NGỮ CẢNH

- Tại Trixbox, lần lượt gõ các lệnh **sip reload**, **iax2 reload**, **dialplan reload** để cập nhật cấu hình.
- Ngoài ra có thể dùng lệnh **dialplan show noibo** để truy xuất config của Dialplan noibo

```

-- Registered extension context 'ael-dundi-e164-canonical' (0x8f924d0) in lo
cal table 0x902f0c8; registrar: pbx_ael
-- merging incls/swits/igpats from old(ael-dundi-e164-canonical) to new(ael-
dundi-e164-canonical) context, registrar = pbx_config
-- Time to scan old dialplan and merge leftovers back into the new: 0.000749
sec
-- Time to restore hints and swap in new dialplan: 0.000001 sec
-- Time to delete the old dialplan: 0.000418 sec
-- Total time merge_contexts_delete: 0.001168 sec
trixbox1*CLI> dialplan show noibo
[ Context 'noibo' created by 'pbx_config' ]
'161' =>
fig]      1. Playback(/var/lib/asterisk/sounds/demo-congrats) [pbx_con
fig]      2. Dial(SIP/161,15) [pbx_config]
'162' =>
fig]      1. Playback(/var/lib/asterisk/sounds/demo-congrats) [pbx_con
fig]      2. Dial(IAX2/162,15) [pbx_config]
          3. VoiceMail(162@vm-demo,u) [pbx_config]
          4. Hangup() [pbx_config]
'_90X.' =>
fig]      1. Playback(/var/lib/asterisk/sounds/demo-congrats) [pbx_con
fig]      2. Dial(${EXTEN:1}) [pbx_config]

-- 3 extensions (8 priorities) in 1 context. ==
trixbox1*CLI> _

```

## Edit: noibo

```
[noibo]

exten=>161,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>161,2,Dial(SIP/161,15)

exten=>162,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>162,2,Dial(IAX2/162,15)
exten=>162,n,VoiceMail(162@vm-demo,u)
exten=>162,n,Hangup()

exten=>_90X.,1,Playback(/var/lib/asterisk/sounds/demo-congrats)
exten=>_90X.,2,Dial(${EXTEN:1})
```

-----

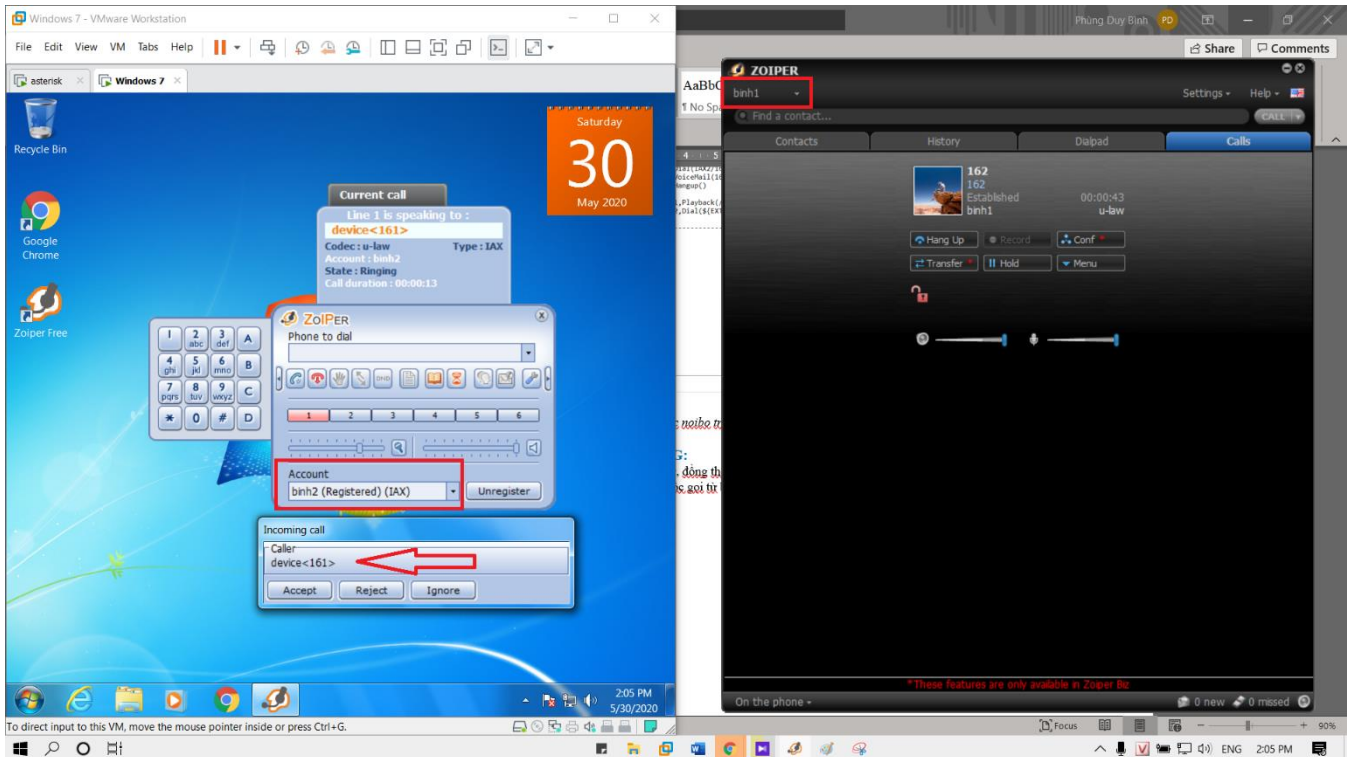
Update

⇒ Xuất hiện mục noibo trong *extension.conf*

## 6 KIỂM CHỨNG

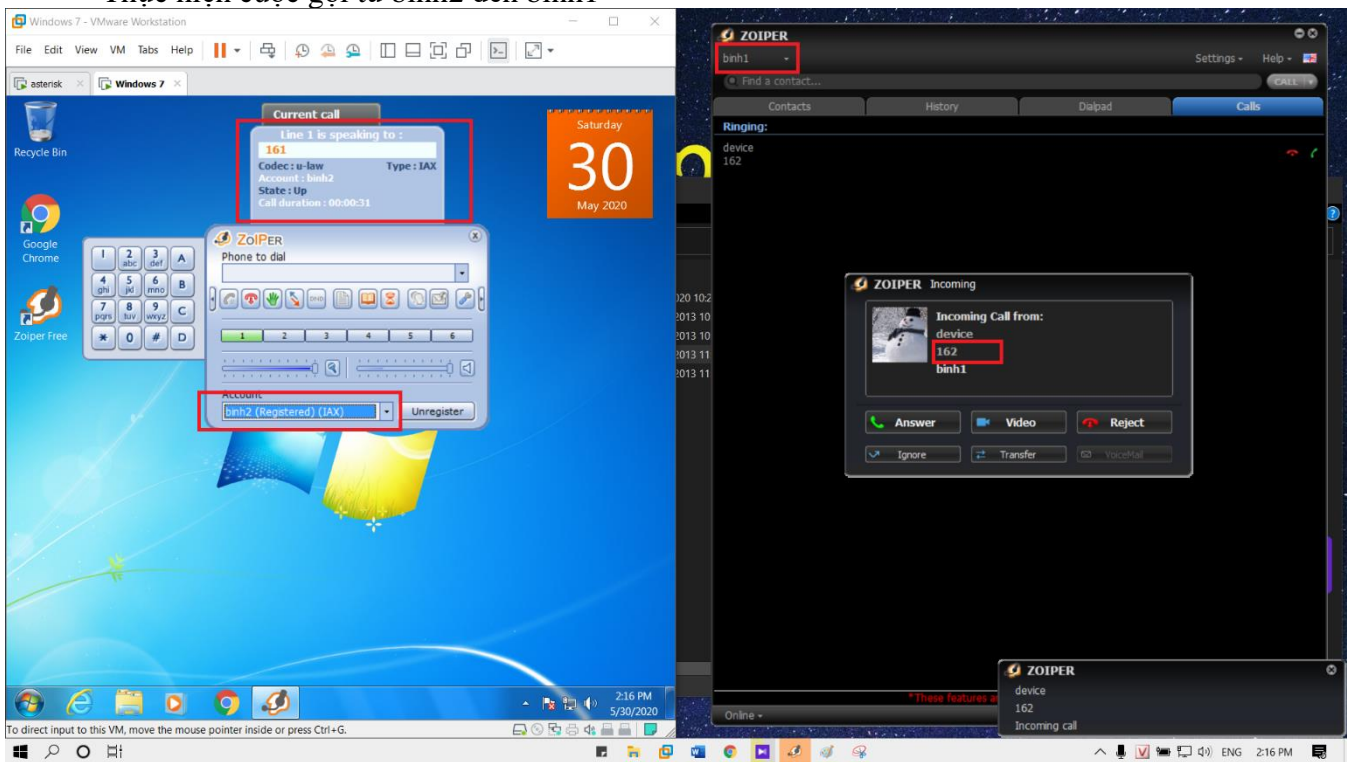
- Mở lại Zoiper, đồng thời mở máy ảo có cài đặt Zoiper
- Đăng nhập với **Zoiper trên máy chủ là binh1** (sử dụng SIP, 161), **Zoiper trên máy ảo là binh2** (sử dụng IAX2, 162)
- Thực hiện cuộc gọi từ binh1 đến binh2



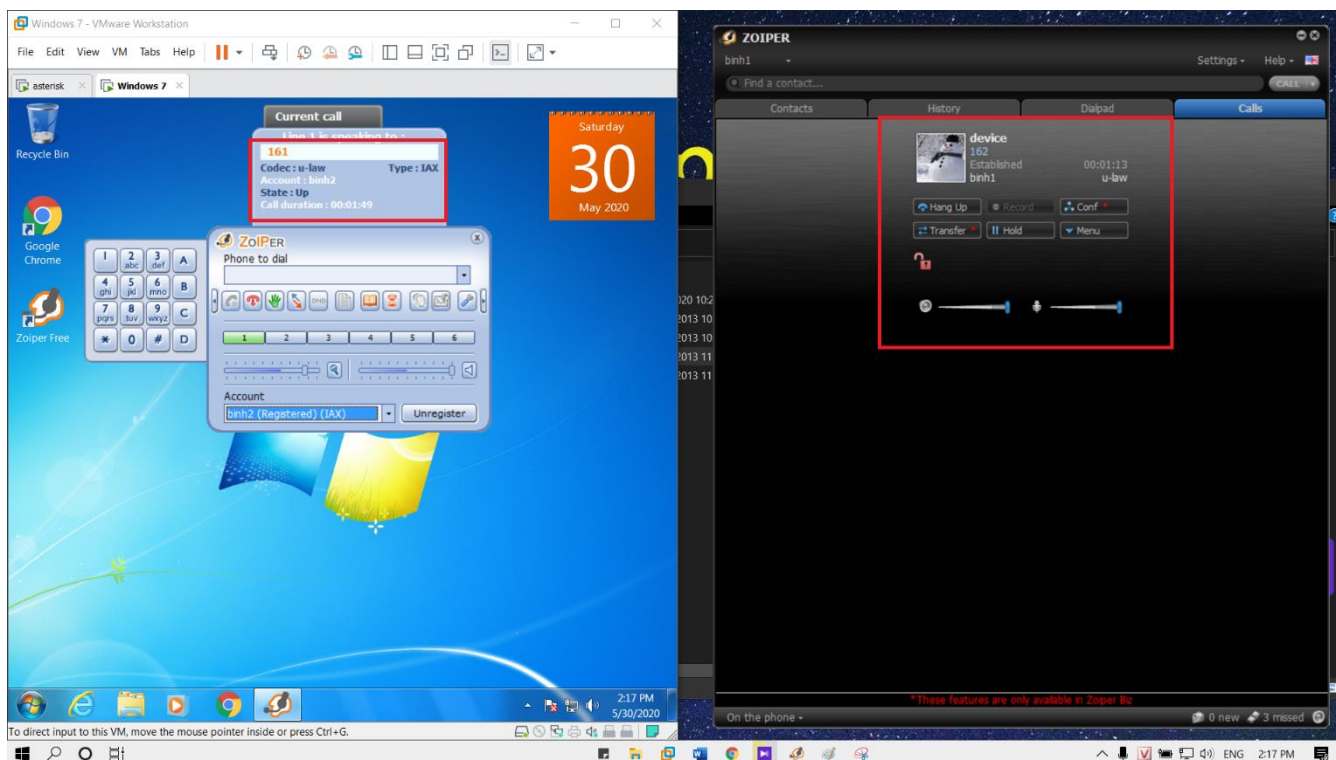


⇒ binh2 nhận được cuộc gọi từ binh1

- Thực hiện cuộc gọi từ binh2 đến binh1







*Màn hình hội thoại đang diễn ra*

Đã hoàn thành thực hiện cấu hình tổng đài Asterisk sử dụng liên lạc nội bộ. Những chức năng mới sẽ được cập nhật sau!