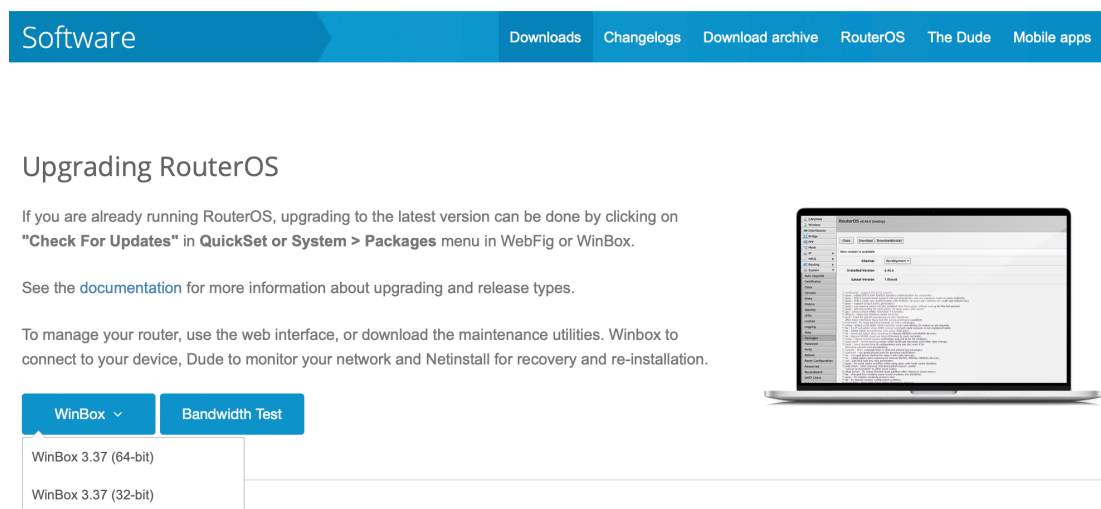


GUIA DE CONFIGURAÇÃO DE CELULAS HAMNET

WINBOX

Para configurar os dispositivos Mikrotik recomendamos a utilização do programa Winbox. Este software para Windows está disponível na página de Downloads da Mikrotik, com o seguinte link : <https://mikrotik.com/download>.

A versão a utilizar depende se a versão de Windows que está a utilizar é de 32 ou 64 bits.



Software Downloads Changelogs Download archive RouterOS The Dude Mobile apps

Upgrading RouterOS

If you are already running RouterOS, upgrading to the latest version can be done by clicking on "Check For Updates" in QuickSet or System > Packages menu in WebFig or WinBox.

See the [documentation](#) for more information about upgrading and release types.

To manage your router, use the web interface, or download the maintenance utilities. Winbox to connect to your device, Dude to monitor your network and Netinstall for recovery and re-installation.

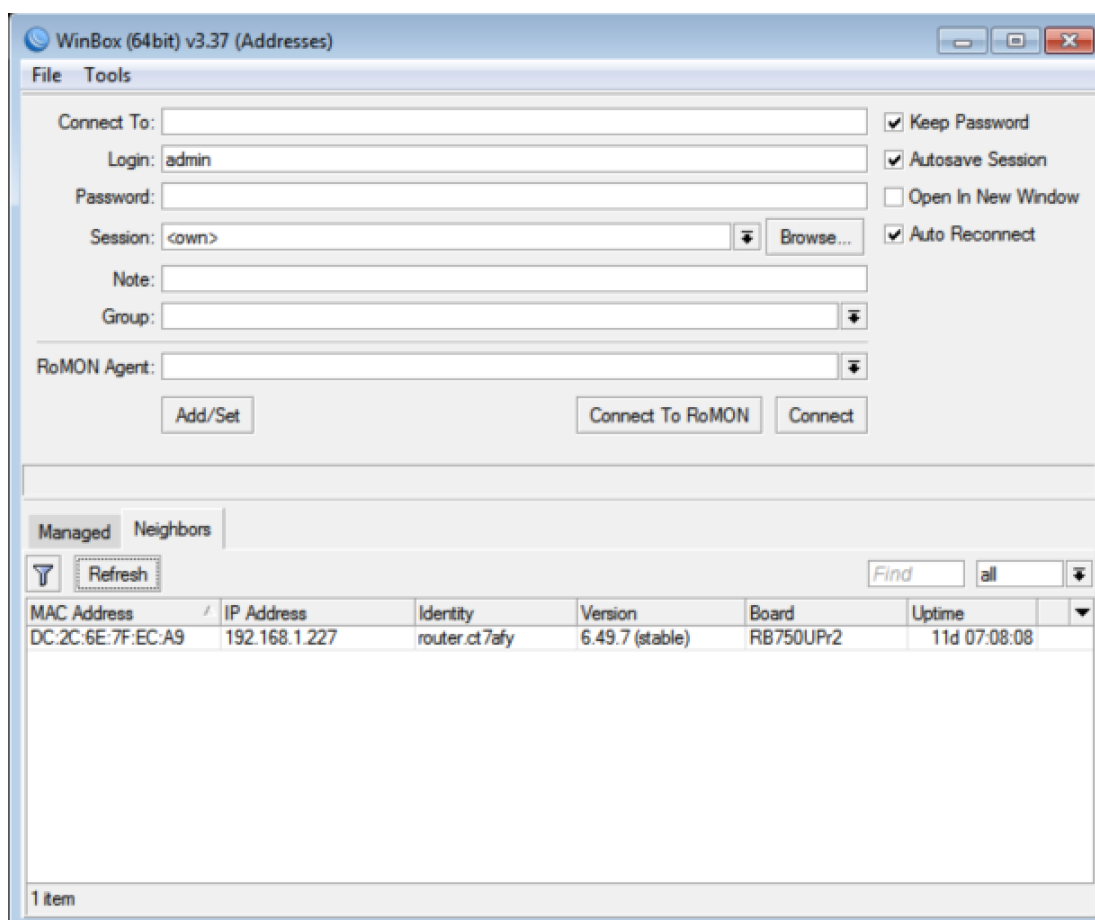
WinBox Bandwidth Test

- WinBox 3.37 (64-bit)
- WinBox 3.37 (32-bit)

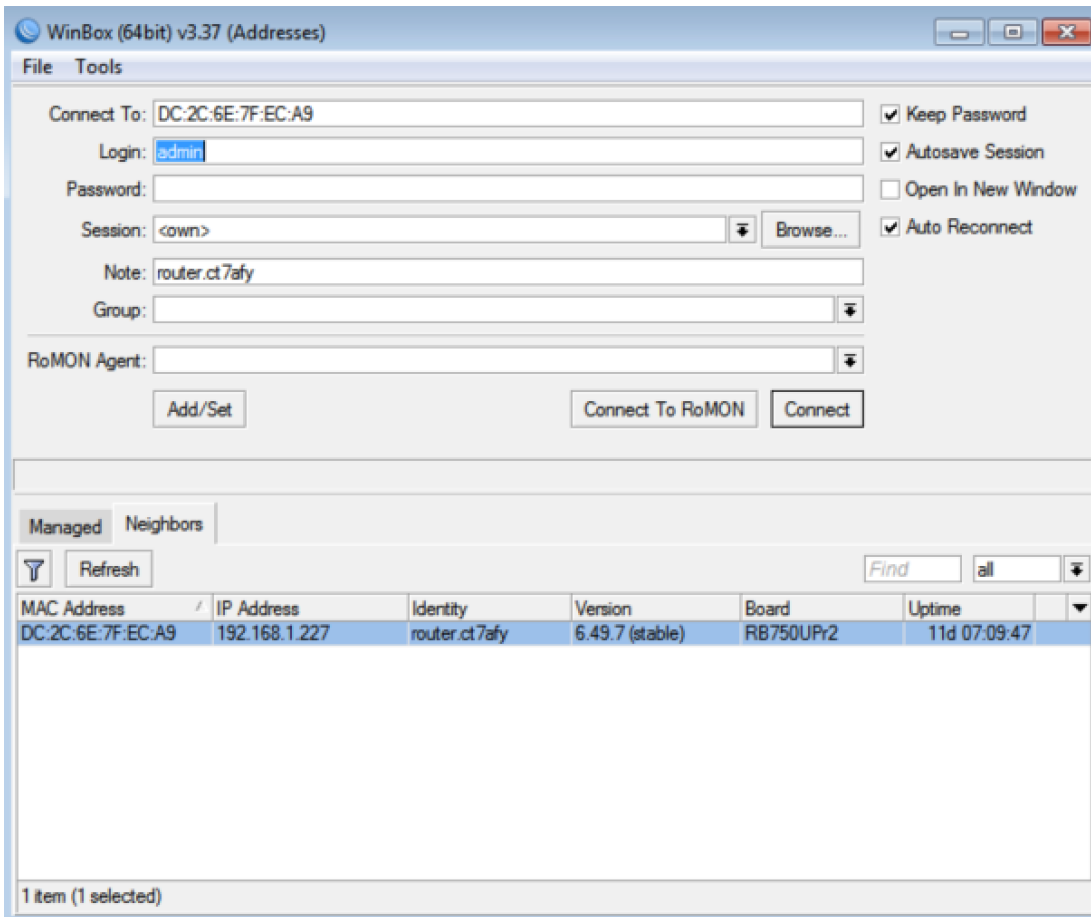
CONFIGURAÇÃO EQUIPAMENTOS UTILIZANDO WINBOX

Para conseguir configurar os dispositivos com o WINBOX deverá ligá-los na mesma rede onde está ligado o computador que está a executar o programa WINBOX que acabou de ir buscar.

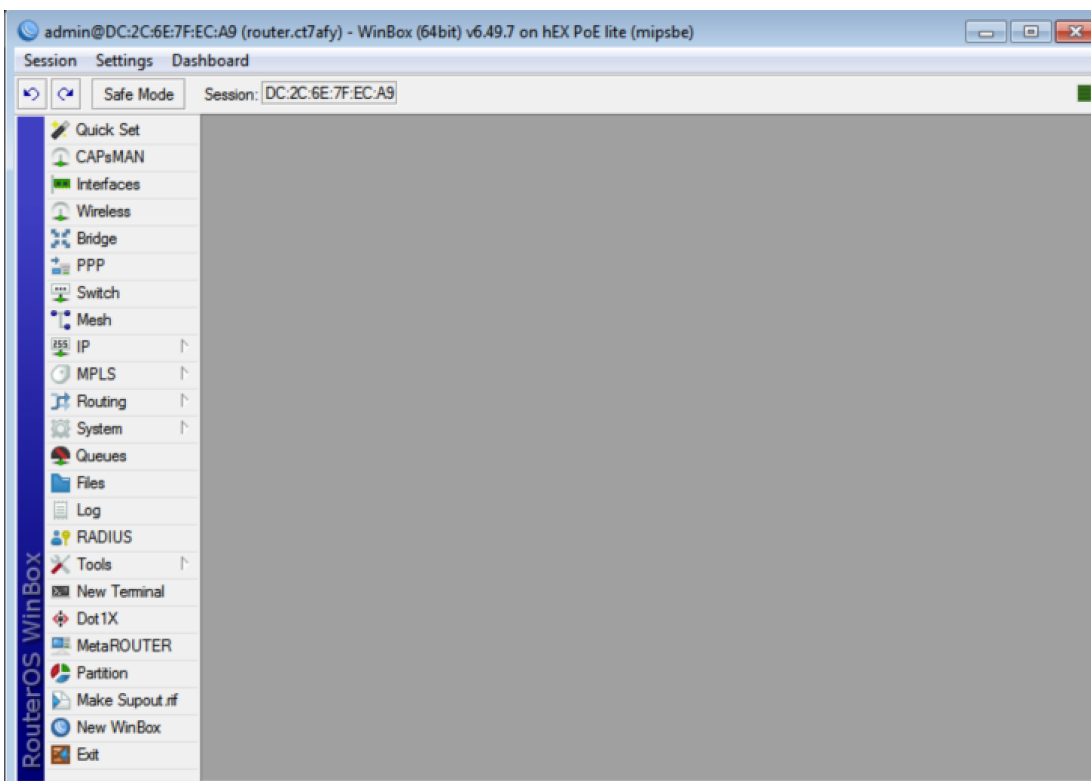
Ao executar o programa aparecerá um ecrã idêntico a este.



Clique no Mac Address do dispositivo que pretende configurar,



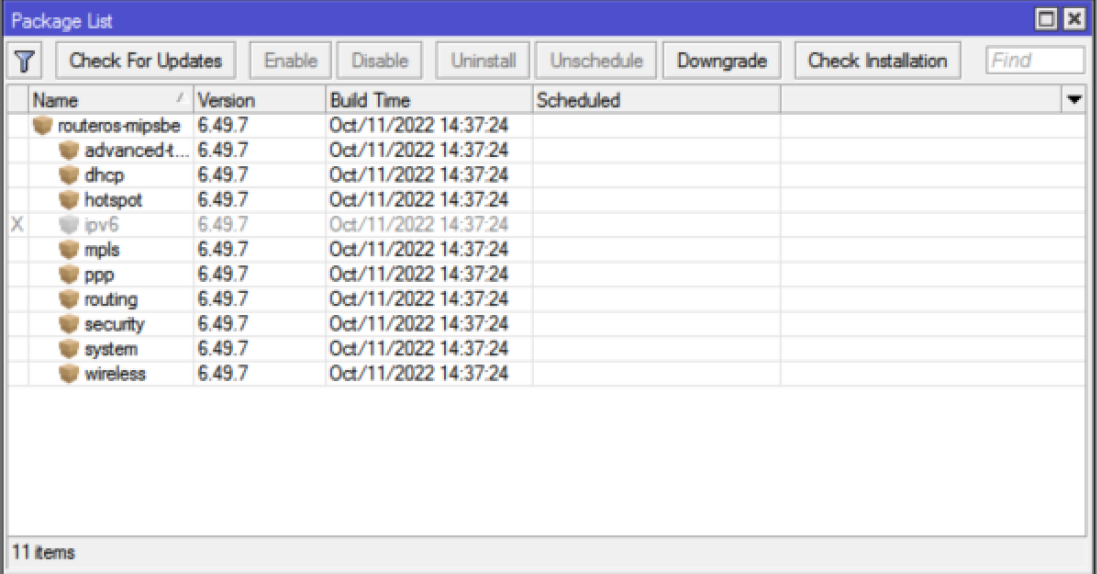
E clique em **Connect**



ACTUALIZAÇÃO DE SOFTWARE E FIRMWARE

Antes de começarmos a configurar os vários dispositivos devemos atualizar os mesmos para a versão 6.49.7. Não é recomendável atualizar para a versão 7.

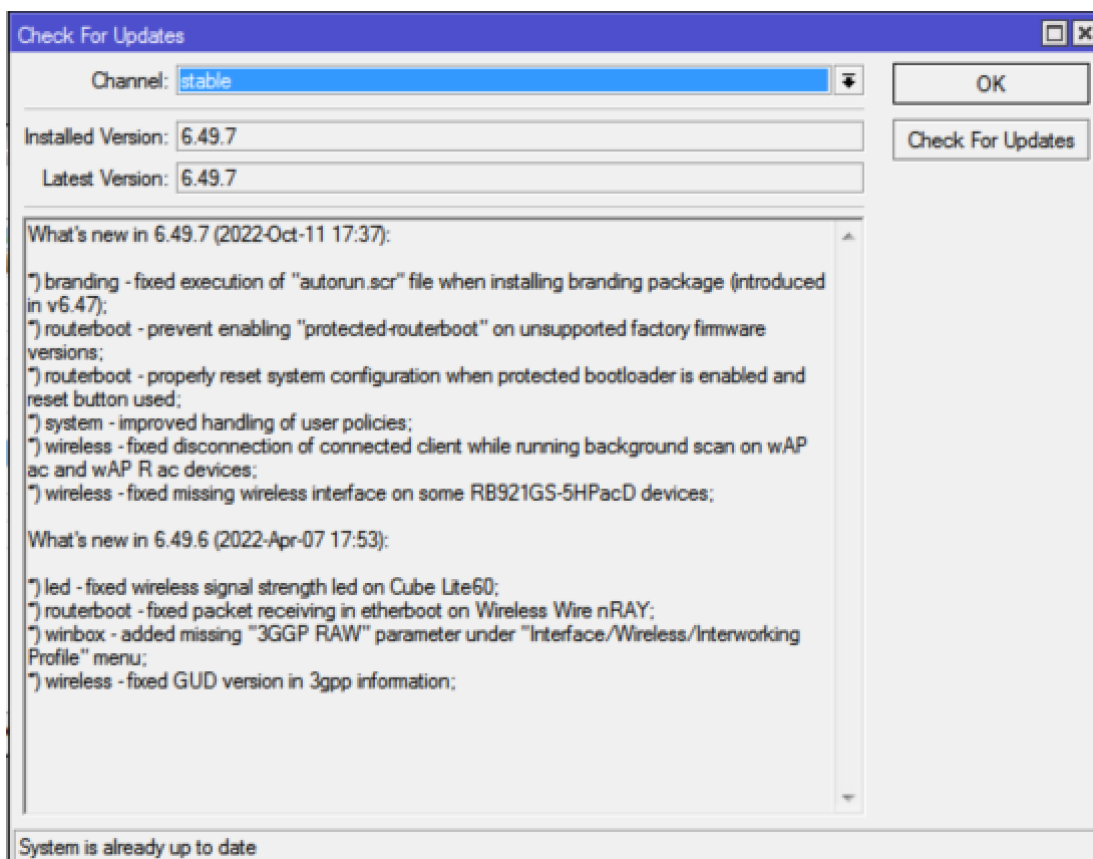
Existem duas formas de o fazer. A primeira consiste em seleccionar no menu da esquerda **System, Packages** e pressionar o botão **Check for Updates**.



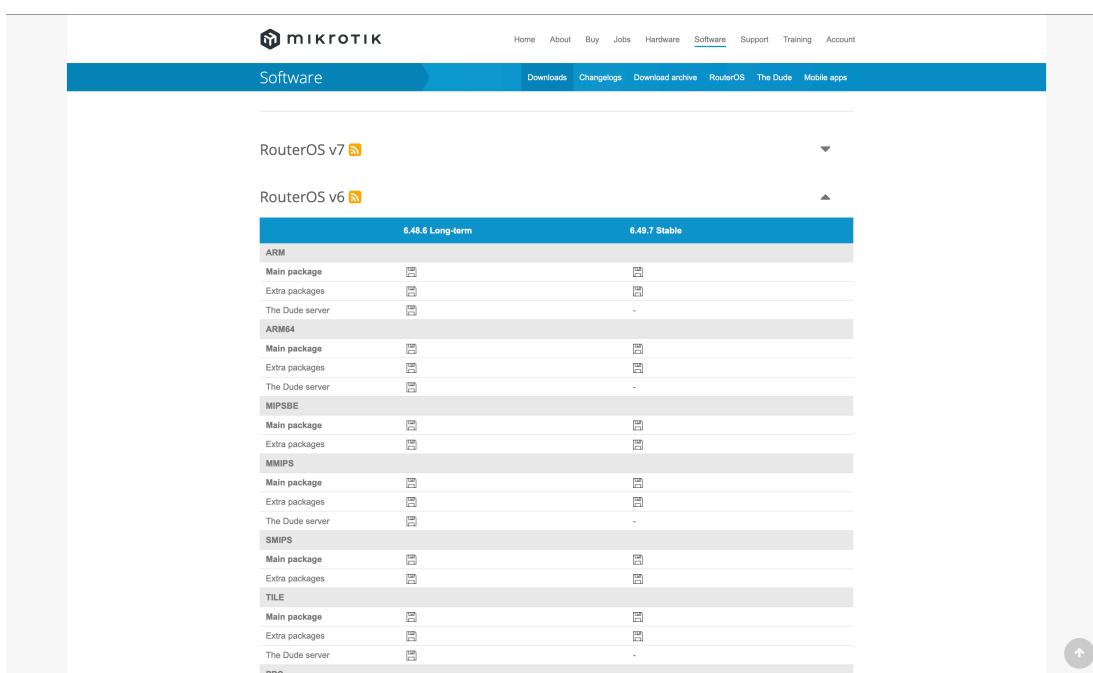
Name	Version	Build Time	Scheduled
routeros-mipsbe	6.49.7	Oct/11/2022 14:37:24	
advanced-t...	6.49.7	Oct/11/2022 14:37:24	
dhcp	6.49.7	Oct/11/2022 14:37:24	
hotspot	6.49.7	Oct/11/2022 14:37:24	
X ipv6	6.49.7	Oct/11/2022 14:37:24	
mpls	6.49.7	Oct/11/2022 14:37:24	
ppp	6.49.7	Oct/11/2022 14:37:24	
routing	6.49.7	Oct/11/2022 14:37:24	
security	6.49.7	Oct/11/2022 14:37:24	
system	6.49.7	Oct/11/2022 14:37:24	
wireless	6.49.7	Oct/11/2022 14:37:24	

11 items

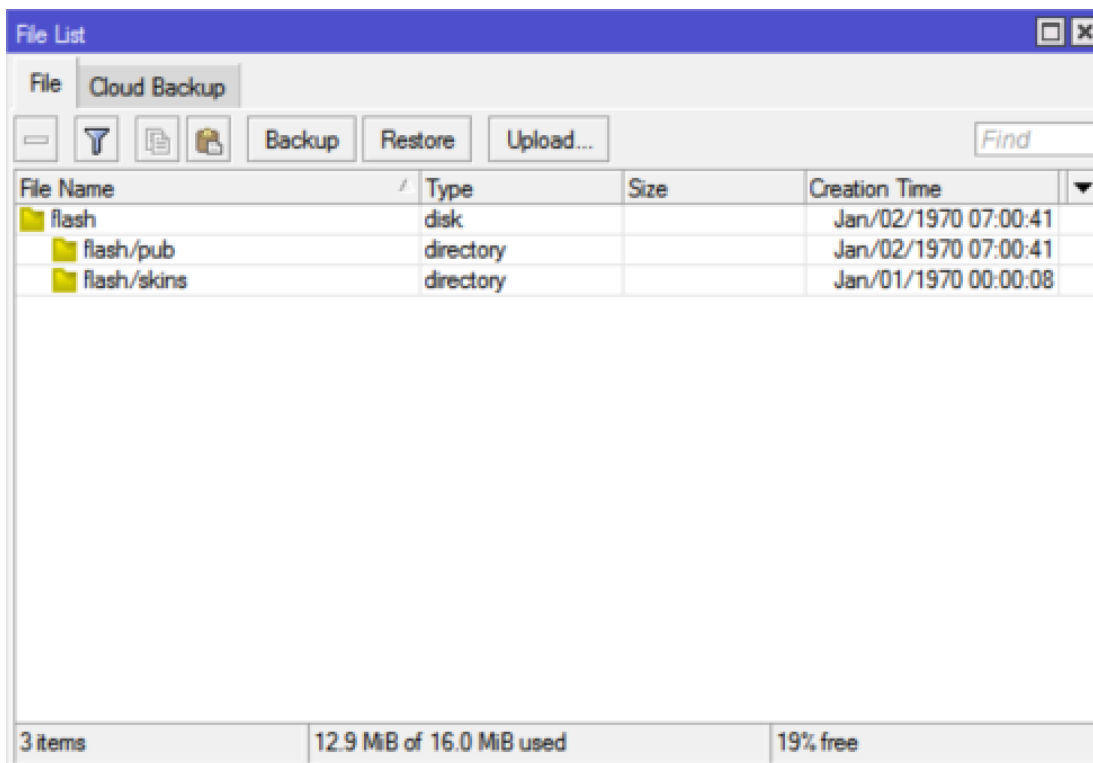
Se o Software instalado não for o 6.49.7, selecione esta versão (em stable) e clique em **Download & Install**.



A segunda opção consiste em fazer o download do software no site da Mikrotik. O ficheiro que deverá ir buscar é o Main Package MIPSBE 6.49.7 Stable.

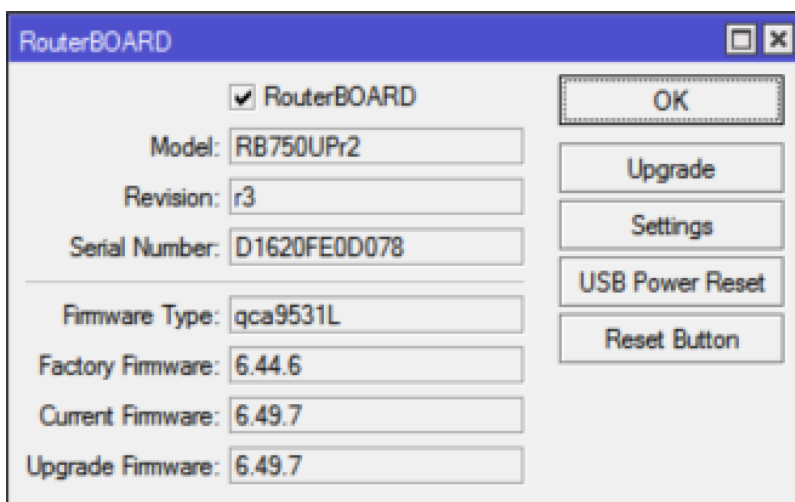


Em seguida copiar ou arrastar o ficheiro para a página de configuração **Files**.



E fazer reboot do dispositivo (utilizando a opção **System, Reboot**) para que o software seja atualizado.

Deverá de seguida atualizar a versão de firmware do equipamento através da opção **System, RouterBoard** e premir o botão **Upgrade**.

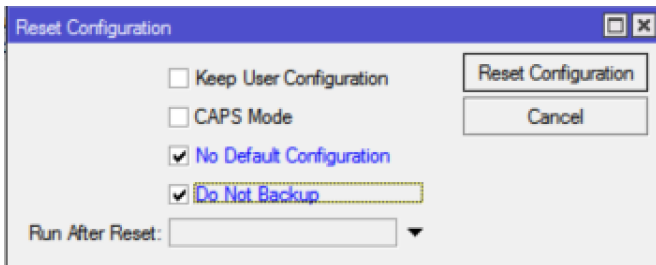


ELIMINAR CONFIGURAÇÃO DEFAULT

Antes de iniciar a configuração dos equipamentos é necessário apagar a configuração 'por defeito' existente no equipamento.

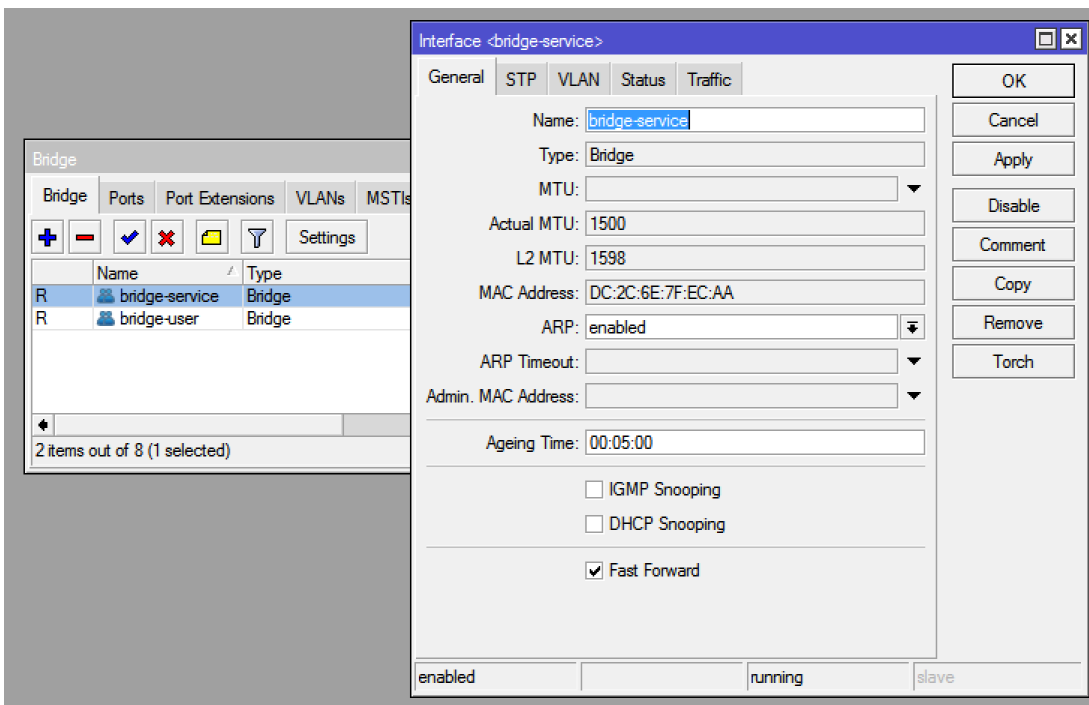
Para tal dever-se-á seleccionar as opções **System** e **Reset configuration**.

Neste ecrã apresentado deverá ser preenchido como na figura e ser premido o botão **Reset Configuration**.






CONFIGURAÇÃO DO ROUTER MIKROTIK

O primeiro passo para configurar o router consiste na criação de duas bridges, uma para os endereços para os serviços e outra para os utilizadores:

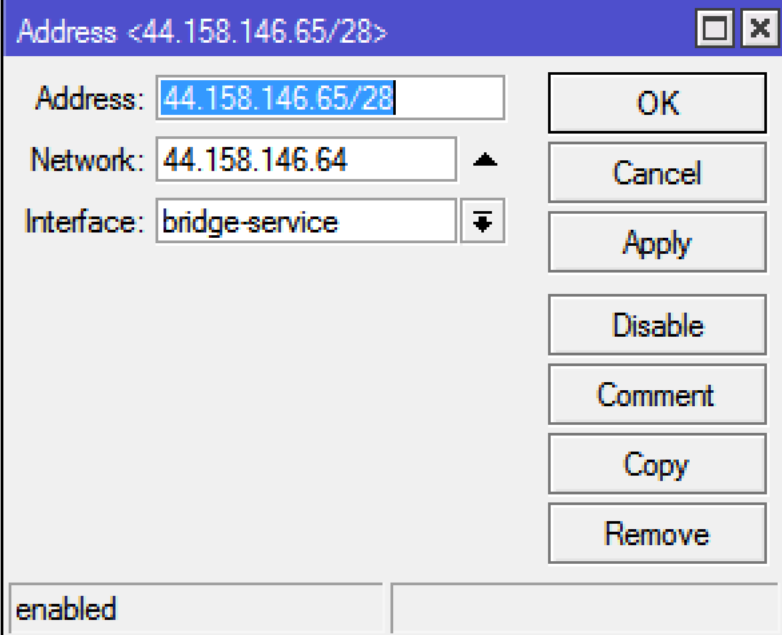


Em seguida tem de se atribuir os endereços IP às interfaces.

Para tal deverá seleccionar no menu da esquerda **IP**, seguido de **Addresses**.

	44.158.146.65...	44.158.146.64	bridge-service
	44.158.146.81...	44.158.146.80	bridge-user
	44.158.147.30...	44.158.147.24	ether5

Clicar no sinal + e adicionar os endereços IP para os serviços, utilizadores e antena Wifi, esta ultima que vai ficar ligada na porta 5.



Address <44.158.146.65/28>

Address: 44.158.146.65/28

Network: 44.158.146.64 ▲

Interface: bridge-service ▼

OK

Cancel

Apply

Disable

Comment

Copy

Remove

enabled

Address <44.158.146.81/28>

Address: 44.158.146.81/28

Network: 44.158.146.80 ▲

Interface: bridge-user ▼

enabled

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Address <44.158.147.30/29>

Address: 44.158.147.30/29

Network: 44.158.147.24 ▲

Interface: ether5 ▼

enabled

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Para atribuir as Bridges às portas clicar no separador **Ports**

#	Interface	Bridge	Horizon	Trusted	Priority (f...	Path Cost	Role	Root Pat...
0 I	ether4	bridge-user		no	80	10	disabled port	
1 IH	ether2	bridge-service		no	80	10	disabled port	
2 H	ether3	bridge-service		no	80	10	designated port	

3 items

Clicar em + para as bridges às portas.

Bridge Port <ether3>

General | STP | VLAN | Status

Interface: ether3

Bridge: bridge-service

Horizon: [dropdown]

Learn: auto

Unknown Unicast Flood

Unknown Multicast Flood

Broadcast Flood

Trusted

Hardware Offload

Multicast Router: Temporary Query

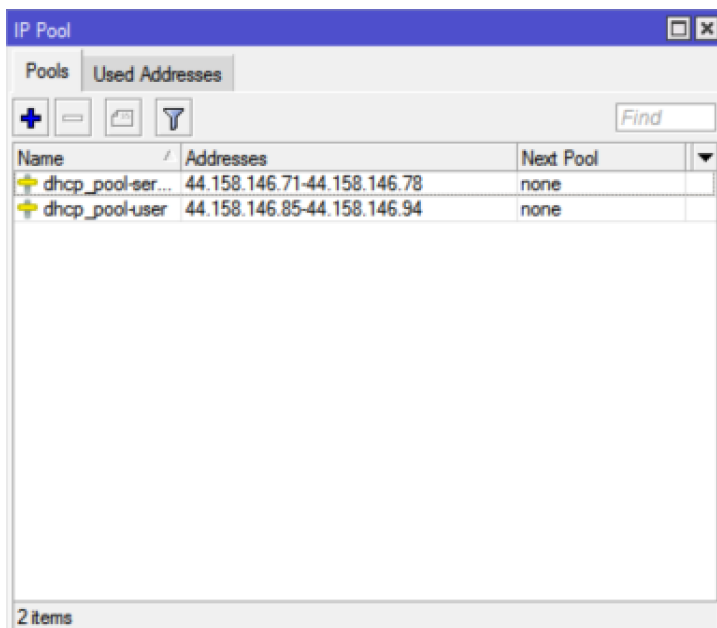
Fast Leave

Buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove

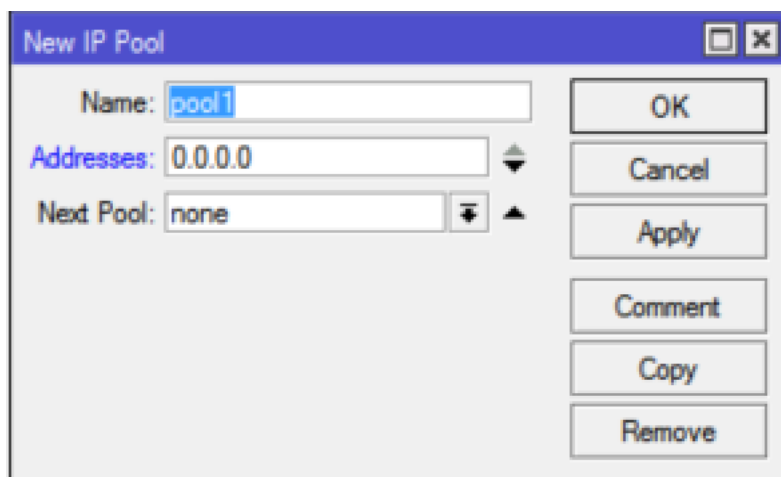
enabled | inactive | Hw. Offload

Em seguida temos de configurar o router como Servidor DHCP para que o este atribua automaticamente os endereços IPs para estas duas categorias de uso.

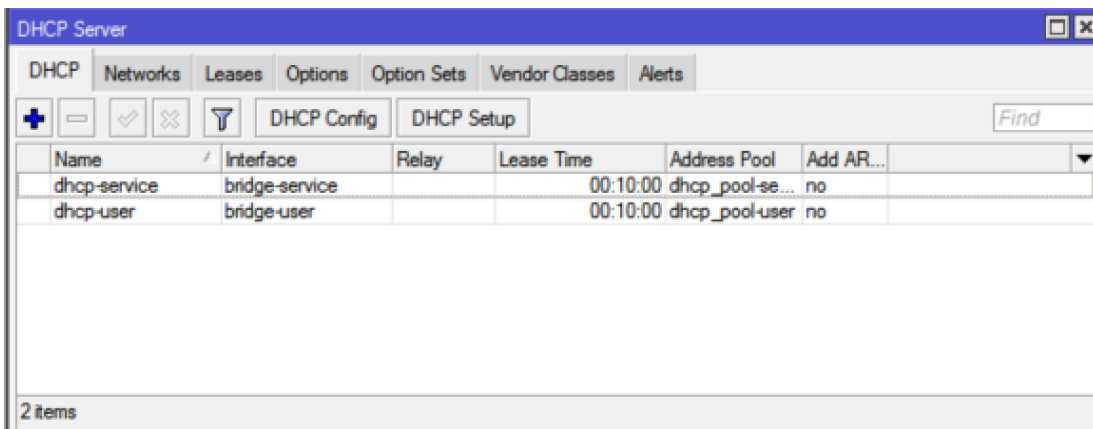
Começamos por criar os dois intervalos de endereços (address pool) selecionando o menu **IP** e **Pool**.



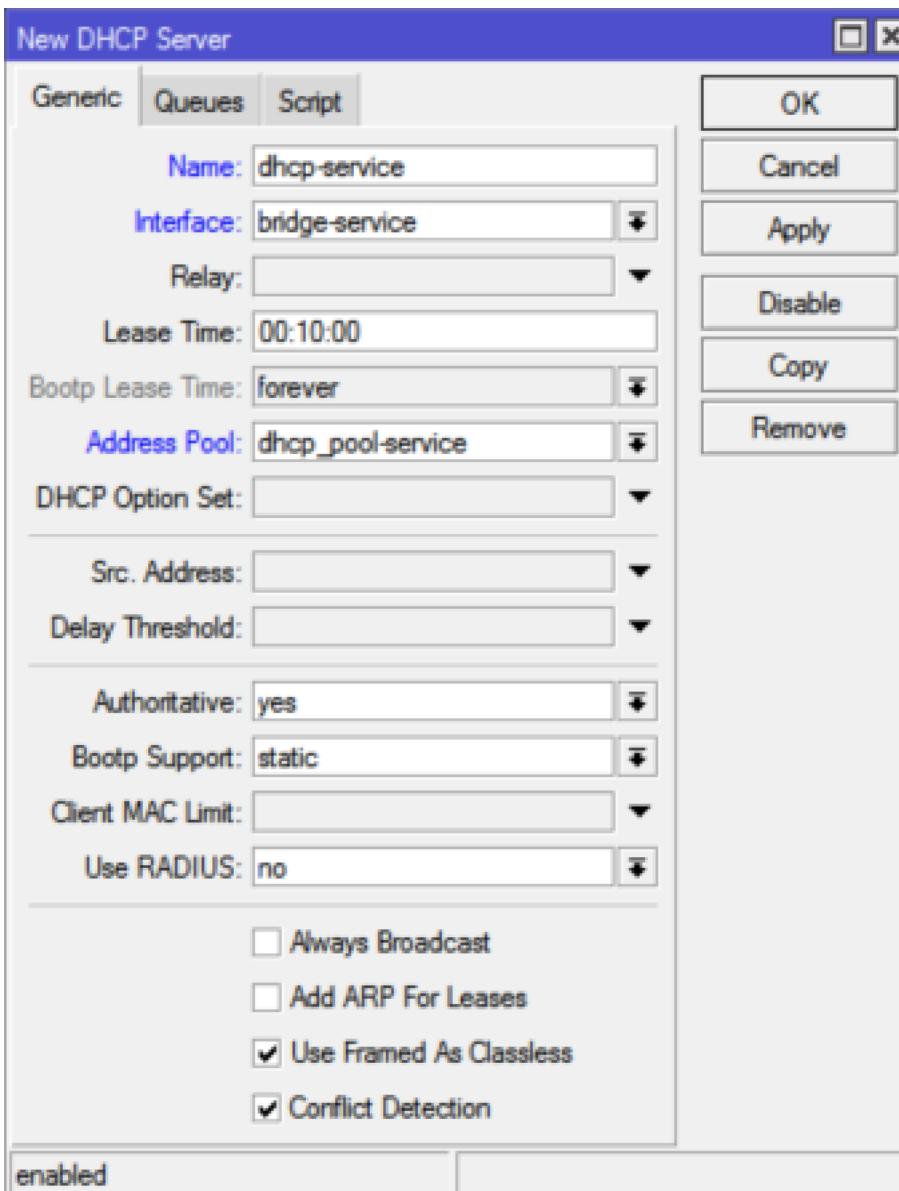
Premer + para aparecer a seguinte janela e preencher os valores para os dois ranges de IP para DHCP.



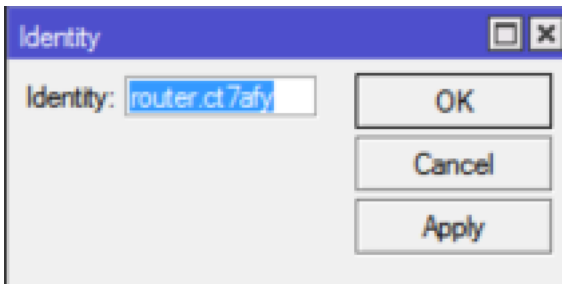
Em seguida selecionar no menu, **IP** seguido de **DHCP Server**.



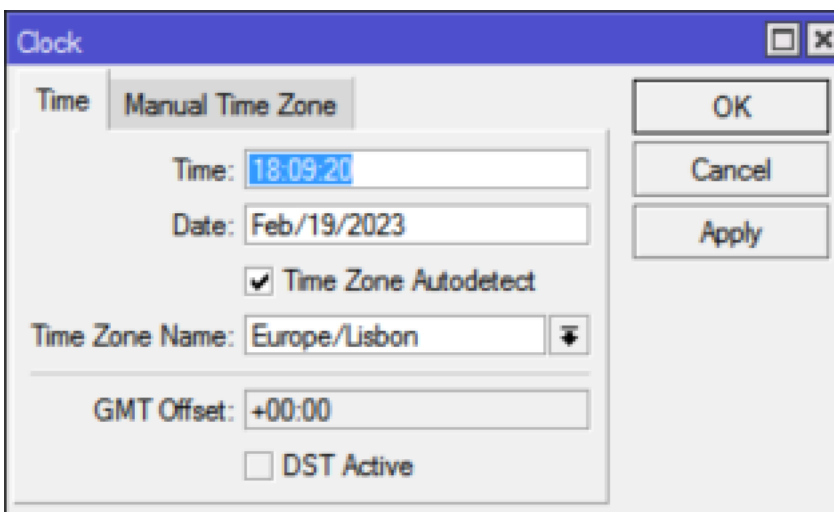
Clicar em + e criar as configurações dhcp-service e dhcp-user como no exemplo em baixo.



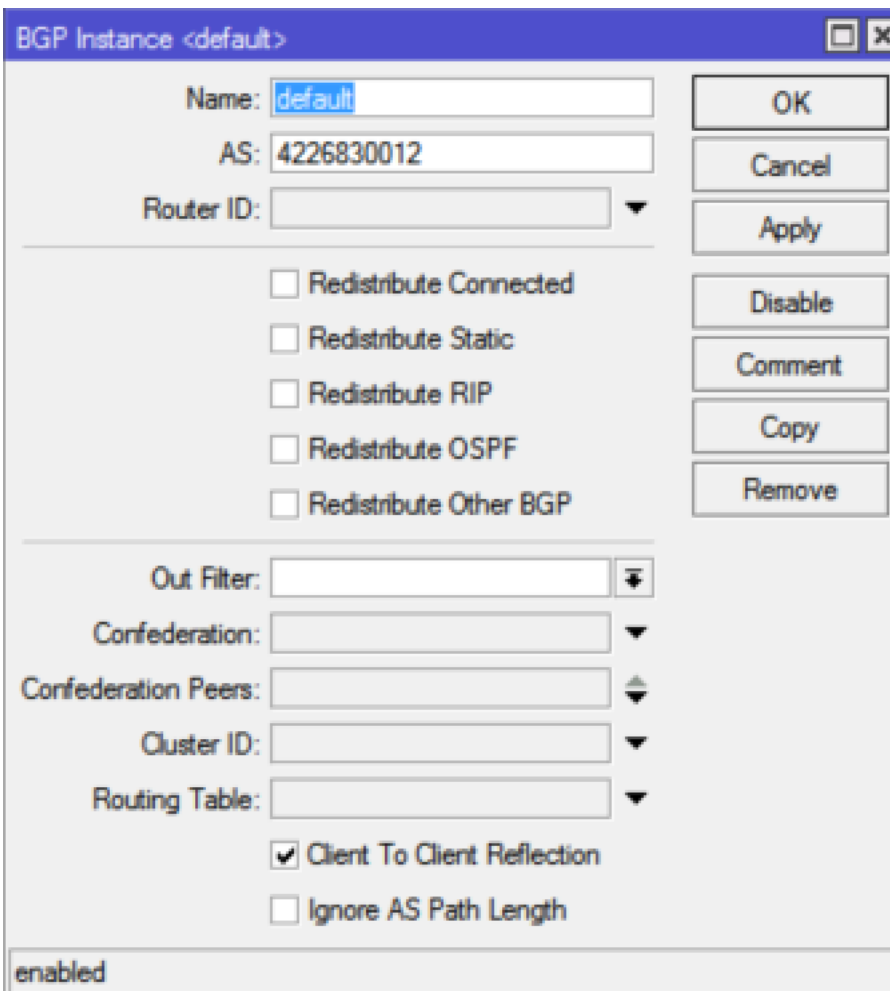
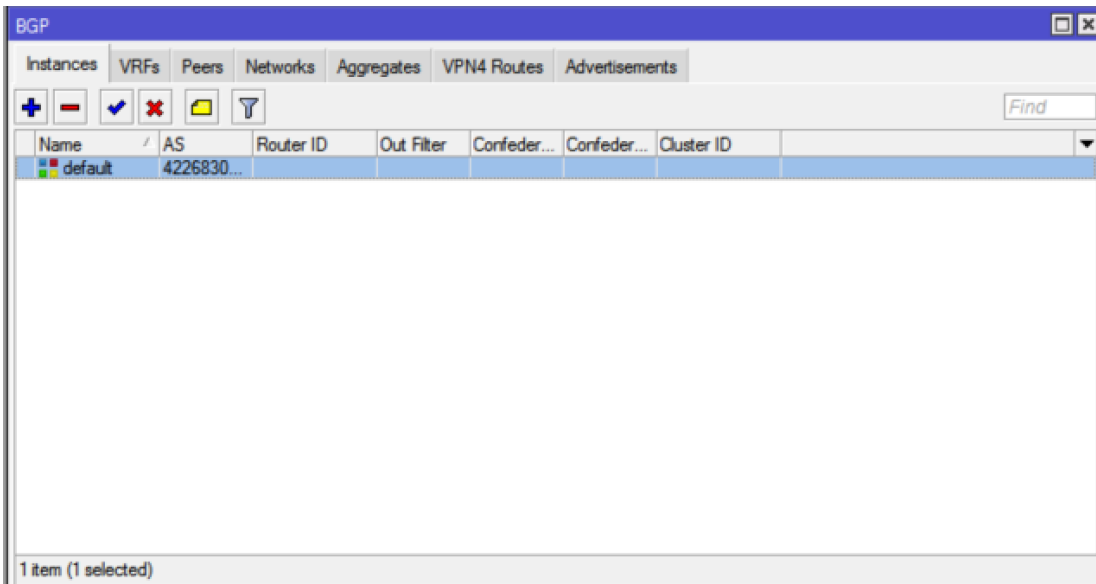
Para atribuir um nome ao router selecionar **System**, e **Identity**.
Preencher o nome no campo respectivo.



Selecionar **Lisbon** a configuração do relógio em **System**, **clock**.



Para terminar configurar o roteamento BGP em Instances,
network e Peers



BGP

Instances VRFs Peers Networks **Aggregates** VPN4 Routes Advertisements

+ - ✓ ✕ 📄 🔍 Find

Network	Synchroni...
44.158.146.64/27	no
44.158.147.24/29	yes

2 items

BGP

Instances VRFs Peers Networks **Aggregates** VPN4 Routes Advertisements

+ - ✓ ✕ 📄 🔍 Refresh Refresh All Resend Resend All Find

Name	Instance	Remote Address	Remote AS	M...	R...	TTL	Remote ID	Uptime	Prefix Co...	State
CQ0ELX	default	44.158.147.25	4226830011	no	no	255	44.158.147.25	21d 12.5...	2	established

BGP Peer <CQ0ELX>

General | **Advanced** | Status

Name: CQ0ELX

Instance: default

Remote Address: 44.158.147.25

Remote Port:

Remote AS: 4226830011

TCP MD5 Key:

Nexthop Choice: force self

Multihop

Route Reflect

Hold Time: 180 s

Keepalive Time:

TTL: 255

Max Prefix Limit:

Max Prefix Restart Time:

In Filter:

Out Filter:

AllowAS In:

Remove Private AS

AS Override

Default Originate: never

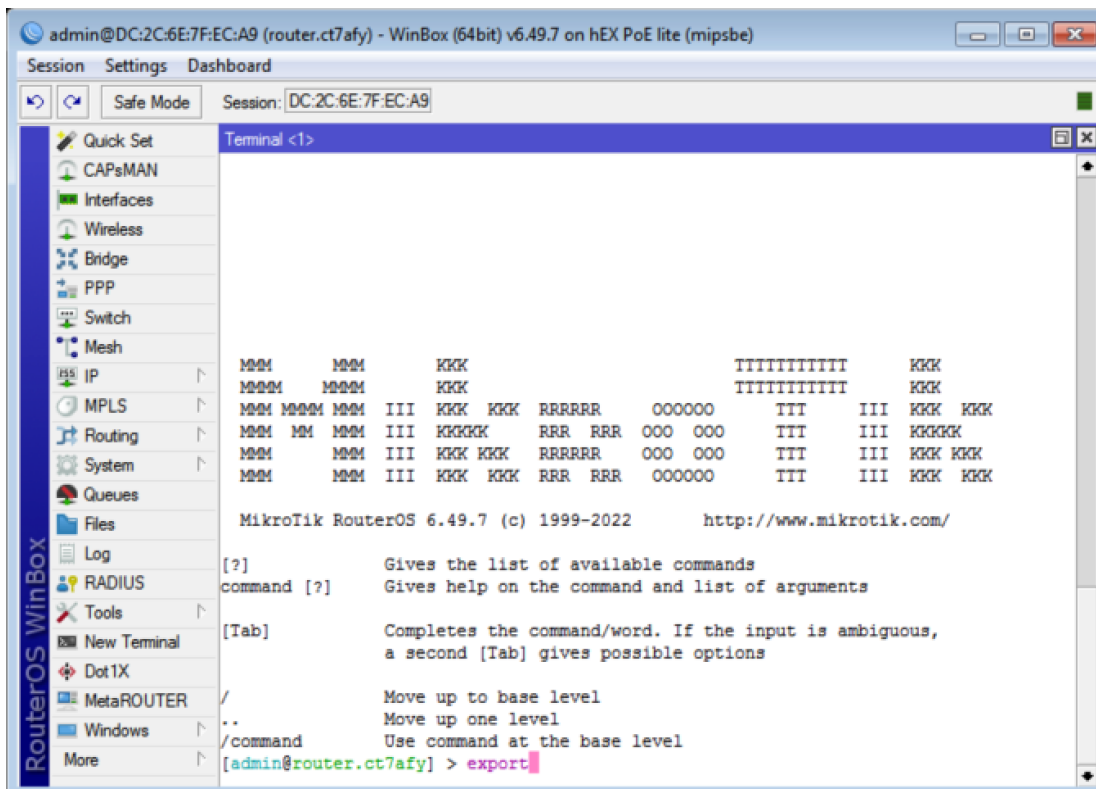
Passive

Use BFD

enabled | established

OK
Cancel
Apply
Disable
Comment
Copy
Remove
Refresh
Refresh All
Resend
Resend All

Para visualizar a configuração do equipamento em forma de comandos de texto deverá abrir um terminal através do menu **New Terminal** e escrever **export**.

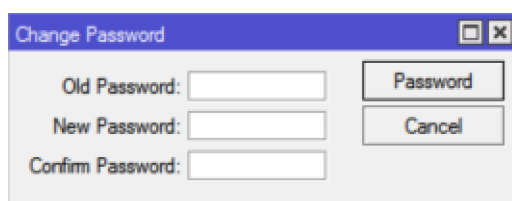


Deverá obter algo parecido com isto:

```
[admin@router.ct7afy] > export
# feb/01/2023 14:54:10 by RouterOS 6.49.7
# software id = D0G1-P4XM
#
# model = RB750UPr2
/interface bridge
add name=bridge-service
add name=bridge-user
/ip pool
add name=dhcp_pool-service ranges=44.158.146.71-44.158.146.78
add name=dhcp_pool-user ranges=44.158.146.85-44.158.146.94
/ip dhcp-server
add address-pool=dhcp_pool-service disabled=no interface=bridge-service
name=dhcp-service
add address-pool=dhcp_pool-user disabled=no interface=bridge-user
name=dhcp-user
/routing bgp instance
set default as=4226830012
/interface bridge port
add bridge=bridge-user interface=ether4
add bridge=bridge-service interface=ether2
add bridge=bridge-service interface=ether3
```

```
/ip address
add address=44.158.146.65/28 interface=bridge-service
network=44.158.146.64
add address=44.158.146.81/28 interface=bridge-user
network=44.158.146.80
add address=44.158.147.30/29 interface=ether5 network=44.158.147.24
/ip dhcp-server network
add address=44.158.146.64/28 dns-server=44.158.146.65
gateway=44.158.146.65
add address=44.158.146.80/28 dns-server=44.158.146.81
gateway=44.158.146.81
/ip dns
set allow-remote-requests=yes
/routing bgp network
add network=44.158.146.64/27 synchronize=no
add network=44.158.147.24/29
/routing bgp peer
add name=CQ0ELX nexthop-choice=force-self remote-address=44.158.147.25
remote-as=4226830011
/system clock
set time-zone-name=Europe/Lisbon
/system identity
set name=router.ct7afy
```

Por ultimo deverá alterar a password do equipamento, se ainda não o fez, através do menu **System, Password**

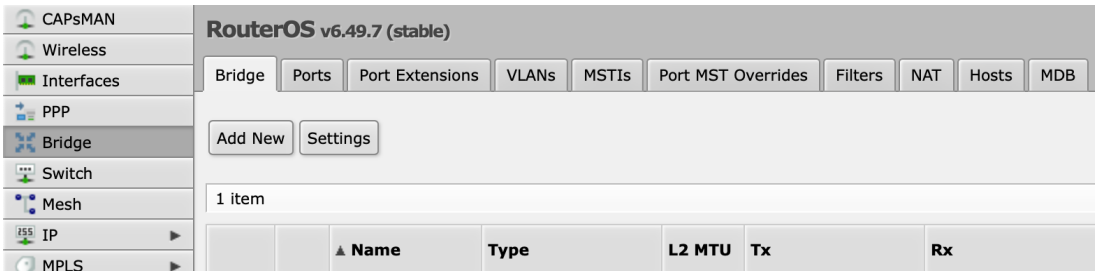


CONFIGURAÇÃO DOS LINKS MIKROTIK

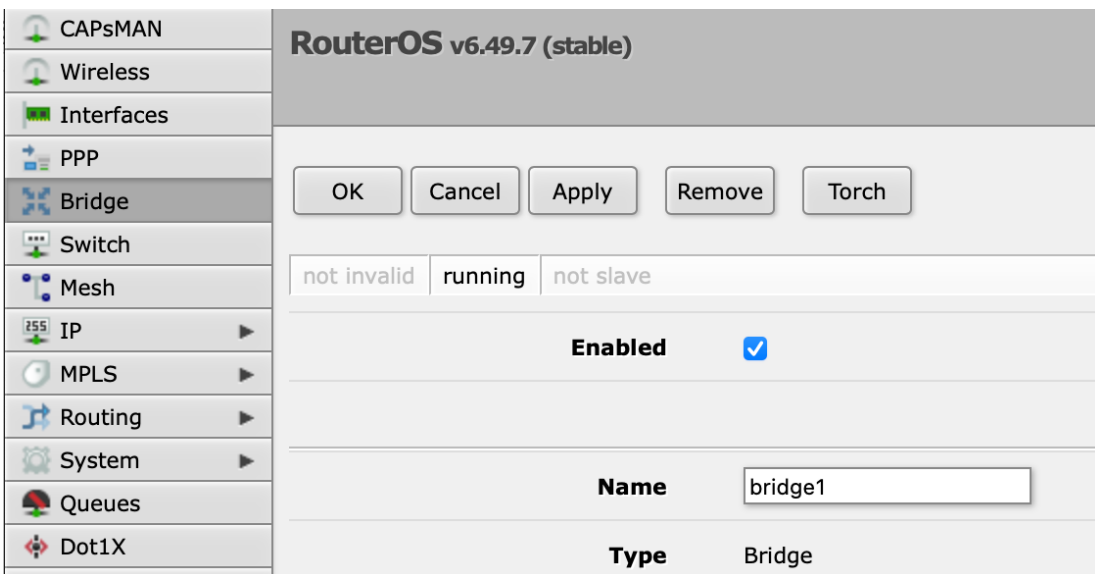
Um dos links é configurado como Access Point e o outro de Station.

O primeiro passo consiste em criar uma Bridge entre a porta Wan e Lan.

Para tal deverá ser seleccionada a opção do menu **Bridge**



Seguido de **Add New** e atribuir um nome à Bridge.



Em seguida associar as portas wlan1 e ether1 à bridge criada.

The screenshot shows the RouterOS v6.49.7 (stable) configuration interface. The left sidebar contains a menu with items: CAPsMAN, Wireless, Interfaces, PPP, Bridge (selected), Switch, Mesh, IP, MPLS, Routing, System, Queues, Dot1X, and Files. The main panel is titled "RouterOS v6.49.7 (stable)" and contains several controls: "OK", "Cancel", "Apply", and "Remove" buttons; two input fields with values "not inactive" and "not Hw. Offload"; an "Enabled" checkbox which is checked; an "Interface" dropdown menu set to "wlan1"; and a "Bridge" dropdown menu set to "bridge1".

The screenshot shows the RouterOS v6.49.7 (stable) configuration interface. The left sidebar contains a menu with items: CAPsMAN, Wireless, Interfaces, PPP, Bridge (selected), Switch, Mesh, IP, MPLS, Routing, System, Queues, Dot1X, and Files. The main panel is titled "RouterOS v6.49.7 (stable)" and contains several controls: "OK", "Cancel", "Apply", and "Remove" buttons; two input fields with values "not inactive" and "not Hw. Offload"; an "Enabled" checkbox which is checked; an "Interface" dropdown menu set to "ether1"; and a "Bridge" dropdown menu set to "bridge1".

De seguida atribuímos os endereços a utilizar em **IP, Addresses**.

RouterOS v6.49.7 (stable)

OK Cancel Apply Remove

not invalid

Enabled	<input checked="" type="checkbox"/>
Address	<input type="text" value="44.158.147.26/29"/>
Network	<input type="text" value="44.158.147.24"/>
Interface	<input type="text" value="bridge1"/>
Comment	<input type="text"/>

Para definir o endereço DNS em **IP, DNS**

RouterOS v6.49.7 (stable)

Apply Static Cache

Servers ▼ 44.158.147.25 ▲

Dynamic Servers

Use DoH Server ▼

Verify DoH Certificate

Allow Remote Requests

Max UDP Packet Size 4096

Query Server Timeout 2.000 s

Query Total Timeout 10.000 s

Max. Concurrent Queries 100

Max. Concurrent TCP Sessions 20

Cache Size 2048 KiB

Cache Max TTL 7d 00:00:00

Cache Used 25 KiB

Definir o nome em **System, Identity**

No nome deverá ser utilizado o prefixo `trx-`, seguido do nome da célula onde o link se está a ligar e separado de um ponto da célula onde está instalado.

The screenshot shows the RouterOS v6.49.7 (stable) configuration interface. The left sidebar contains a menu with the following items: CAPsMAN, Wireless, Interfaces, PPP, Bridge, Switch, Mesh, IP, MPLS, Routing, System, Auto Upgrade, Certificates, Clock, Console, Disks, Health, and History. The main content area is titled "RouterOS v6.49.7 (stable)" and features an "Apply" button. Below the button, the "Identity" field is set to "trx-ct7afy.cq0elx".

Para definir a time zone, selecionar System e Clock

The screenshot shows the RouterOS v6.49.7 (stable) configuration interface with the "System" menu item selected. The left sidebar now includes "Auto Upgrade", "Certificates", "Clock", and "Console". The main content area is titled "RouterOS v6.49.7 (stable)" and features an "Apply" button. Below the button, the "Clock" settings are displayed:

- Time**: 11:24:00
- Date**: Feb/21/2023
- Time Zone Autodetect**:
- Time Zone Name**: Europe/Lisbon
- GMT Offset**: +00:00

Para ativar SNMP, selecionar **IP**, **SNMP** e clicar em **enabled**

RouterOS v6.49.7 (stable)

Apply Communities

Enabled

Contact Info

Location

Para definir a rota selecionar **IP** seguido de **Route**

RouterOS v6.49.7 (stable)

OK Cancel Apply Remove

not invalid active static

Enabled

Dst. Address

Gateway reachable bridge1

Check Gateway

Type

Distance

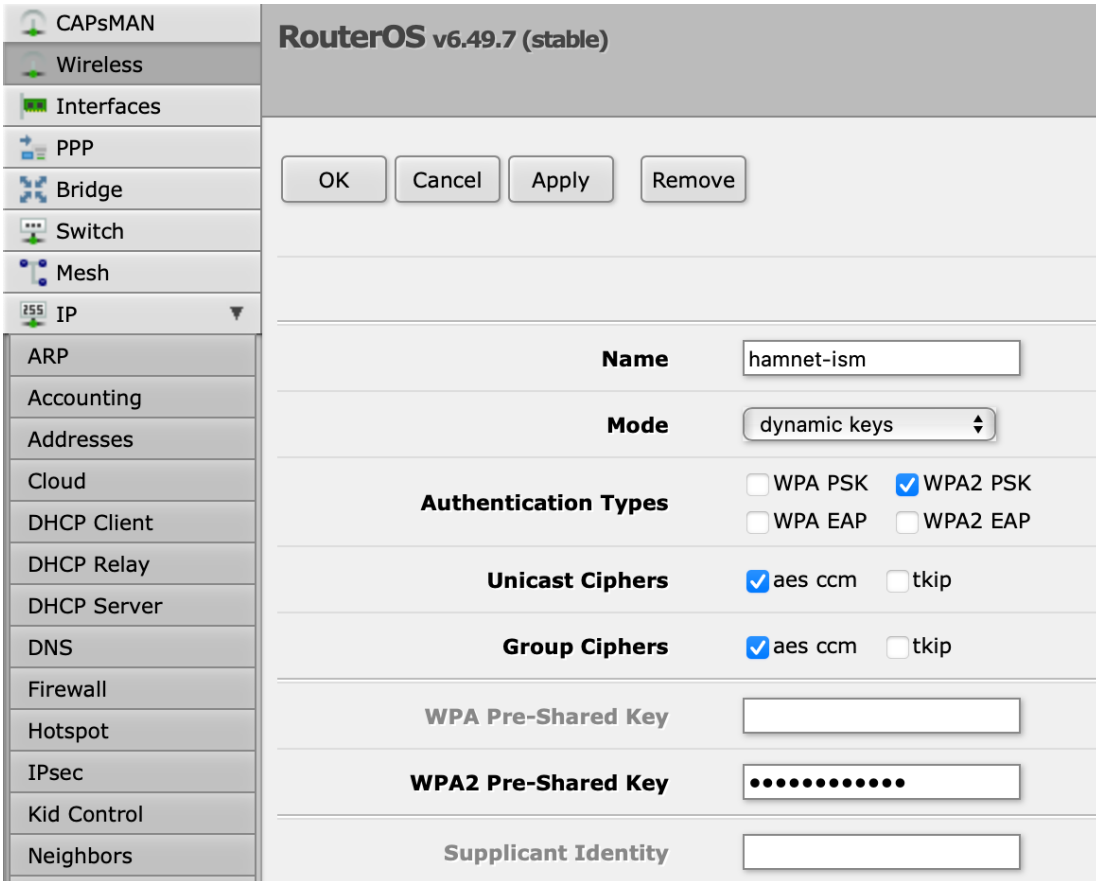
Scope

Target Scope

Routing Mark

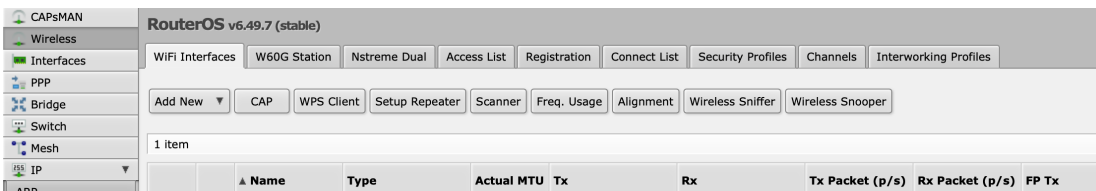
Prof. Source

Em seguida criar o perfil de segurança em **Wireless** e tab **Security Profiles**



O campo **WPA2 Pre-Shared Key** deverá ser preenchido com **amateurradio**

Para terminar criar a interface Wireless com **Add New**



RouterOS v6.49.7 (stable)

OK Cancel Apply Advanced Mode WPS Accept WPS

connected to ess not invalid running slave

Enabled

Name wlan1

Type Wireless (Atheros AR9888)

MTU 1500

Actual MTU 1500

L2 MTU 1600

MAC Address E4:8D:8C:F8:88:43

ARP enabled

ARP Timeout ▼

Mode station bridge

Band 5GHz-A/N/AC

Channel Width 20MHz

Frequency 5735 MHz

SSID ▲ HAMNET-CT7AFY-CQ0ELX

Security Profile hamnet-ism

Frequency Mode superchannel

Country no_country_set

Installation outdoor

O modo a selecionar deverá ser **station bridge**.

Selecionar **Nstreme**

Enable Nstreme



A configuração em modo terminar deverá ser idêntica a esta :

```
[admin@trx-ct7afy.cq0elx] > export
# feb/01/2023 15:10:25 by RouterOS 6.49.7
# software id = U68Z-5C2M
#
# model = 911G-5HPacD
/interface bridge
add name=bridge1
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
add authentication-types=wpa2-psk mode=dynamic-keys name=hamnet-ism
supplicant-identity="" wpa2-pre-shared-key=amateurradio
/interface wireless
set [ find default-name=wlan1 ] band=5ghz-a/n/ac country=no_country_set
disabled=no disconnect-timeout=15s frequency=5735 frequency-
mode=superchannel hw-retries=15 mode=station-bridge radio-name=CQ0ELX
scan-list=5735 security-profile=hamnet-ism ssid=HAMNET-CT7AFY-CQ0ELX
/interface wireless nstreme
set wlan1 enable-nstreme=yes
/interface bridge port
add bridge=bridge1 interface=wlan1
add bridge=bridge1 interface=ether1
/ip address
add address=44.158.147.26/29 interface=bridge1 network=44.158.147.24
/ip dns
set servers=44.158.147.25
/ip route
add distance=1 gateway=44.158.147.25
/snmp
set enabled=yes
/system clock
set time-zone-name=Europe/Lisbon
/system identity
set name=trx-ct7afy.cq0elx
```

A configuração do outro link deverá ser idêntico com a diferença de que deverá ser configurado como **AP Bridge**

RouterOS v6.49.7 (stable)

OK Cancel Apply Advanced Mode WPS Accept WPS Client

running ap not invalid running slave

Enabled

Name wlan1

Type Wireless (Atheros AR9888)

MTU 1500

Actual MTU 1500

L2 MTU 1600

MAC Address E4:8D:8C:FA:55:31

ARP enabled

ARP Timeout ▼

Mode ap bridge

Band 5GHz-A/N/AC

Channel Width 20MHz

Frequency 5735 MHz

SSID ▲ HAMNET-CT7AFY-CQ0ELX

Security Profile hamnet-ism

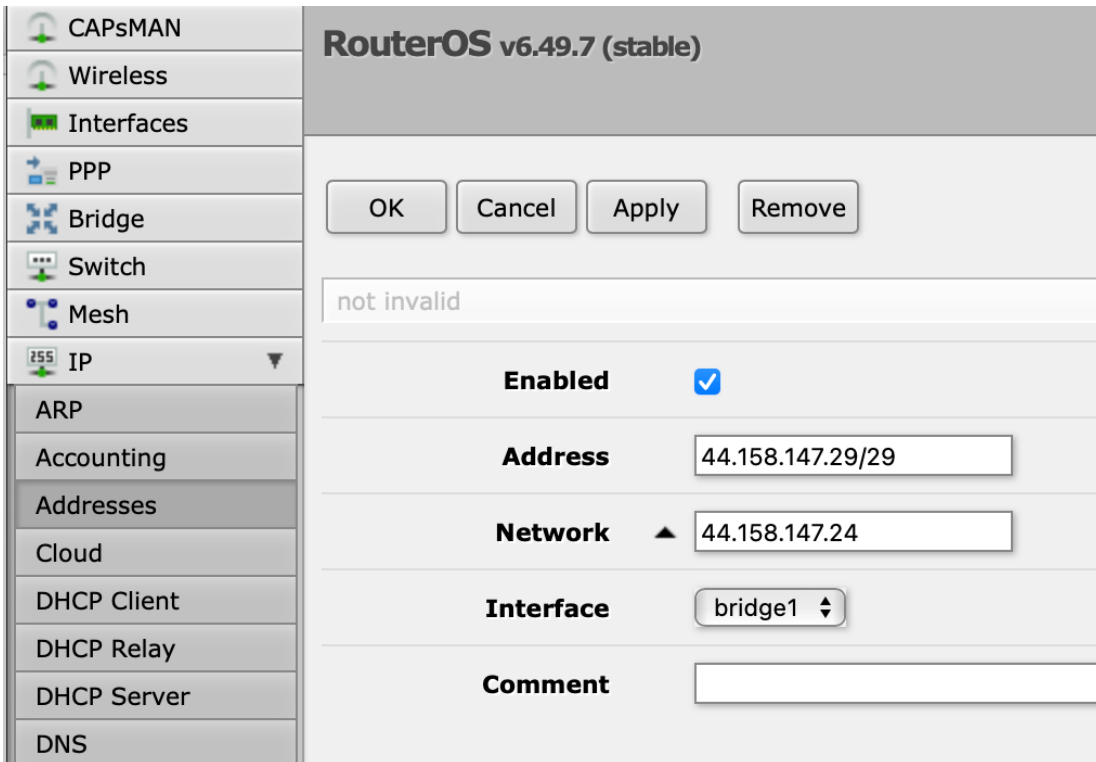
WPS Mode push button

Frequency Mode superchannel

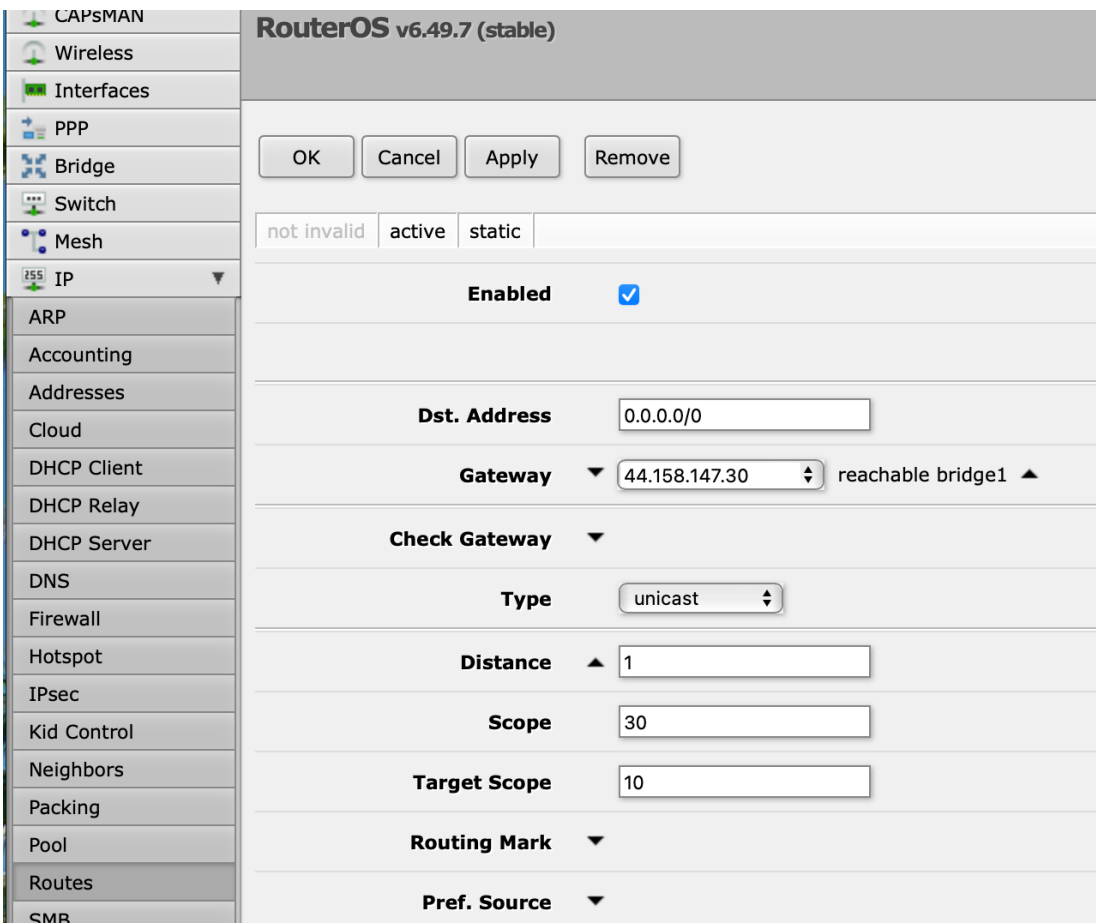
Country no_country_set

Installation outdoor

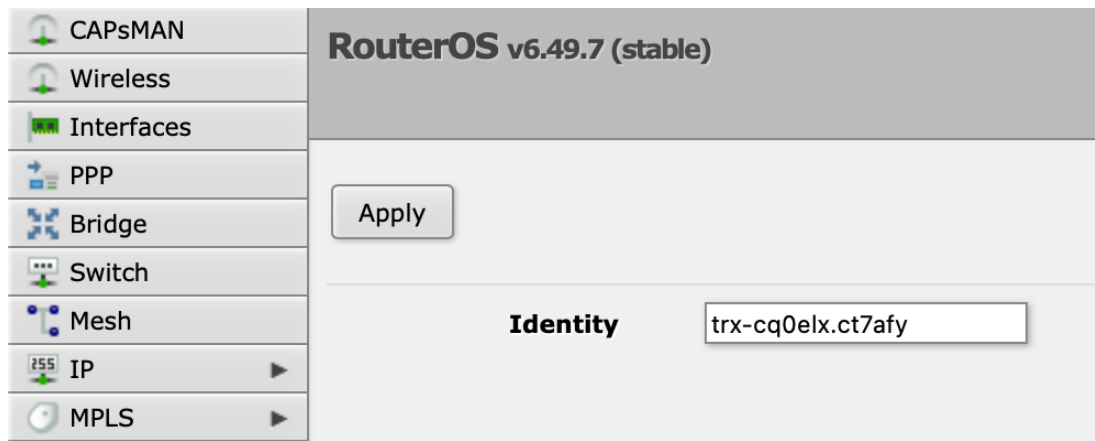
O endereço deverá ser ajustado ao novo link, neste caso 44.158.147.29/29



O endereço da gateway alterado em IP, Routes



E finalmente o nome do equipamento.



A configuração em modo terminar deverá ser idêntica a esta :

```
[admin@trx-cq0elx.ct7afy] > export
# feb/01/2023 15:12:43 by RouterOS 6.49.7
# software id = 6GQA-2AF4
#
# model = 911G-5HPacD
/interface bridge
add name=bridge1
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
add authentication-types=wpa2-psk mode=dynamic-keys name=hamnet-ism
supplicant-identity="" wpa2-pre-shared-key=amateurradio
/interface wireless
set [ find default-name=wlan1 ] band=5ghz-a/n/ac country=no_country_set
disabled=no disconnect-timeout=15s frequency=5735 frequency-
mode=superchannel hw-retries=15 mode=ap-bridge radio-name=CT7AFY
scan-list=5735 security-profile=hamnet-ism ssid=HAMNET-CT7AFY-CQ0ELX \
  wds-mode=dynamic
/interface wireless nstreme
set wlan1 enable-nstreme=yes
/interface bridge port
add bridge=bridge1 interface=wlan1
add bridge=bridge1 interface=ether1
/ip address
add address=44.158.147.29/29 interface=bridge1 network=44.158.147.24
/ip dns
set servers=44.158.147.30
/ip route
```

```
add distance=1 gateway=44.158.147.30
/snmp
set enabled=yes
/system clock
set time-zone-name=Europe/Lisbon
/system identity
set name=trx-cq0elx.ct7afy
```

Não esquecer de no final alterar as passwords de ambos os links cono descrito na configuração do Router.