MikroTik Enterprise Wireless Networks

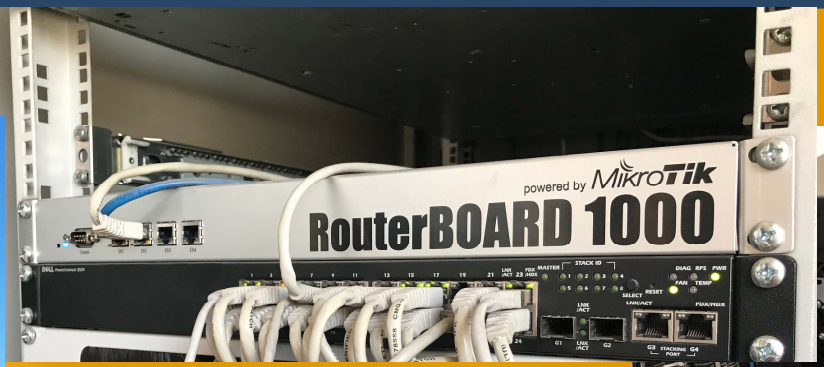
and

CAPsMAN

Hello!

My name is **Erion Demiri**

- 1999 – LAN Networks Supervisor, Infosoft.
- 2001 – IBM Netfinity Servers
- 2001 – Omega Networking and Service
- 2006 – ENS, Easy Network Solutions
- 2007 – MUM Egypt, MT Consultant
- 2011 – MUM Budapest, MTCRE
- 2018 – MUM Tirana, Presenter
- 2019 – MikroTik Certified Trainer, #TR0657

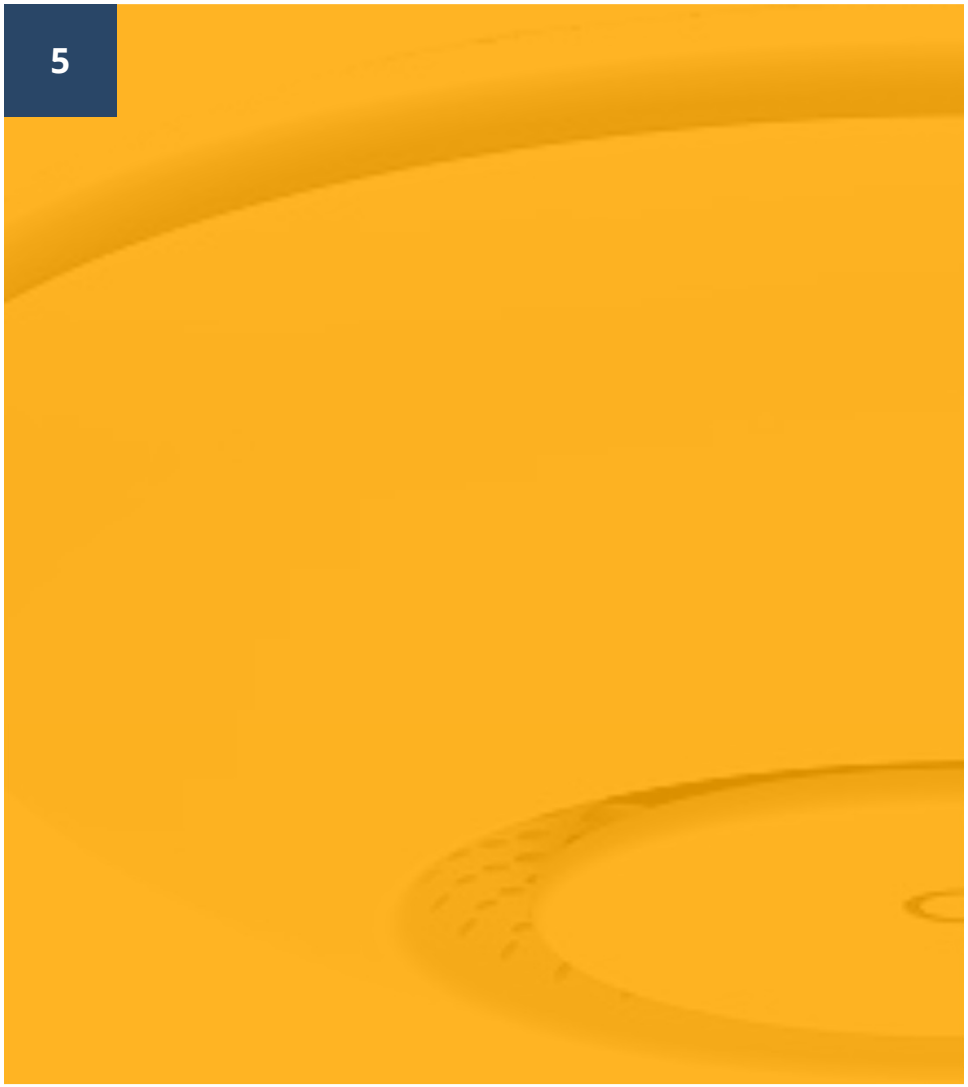


PROJECTS

MikroTik

TRAINING CENTER

5



What are Wireless Networks

Why do we need them

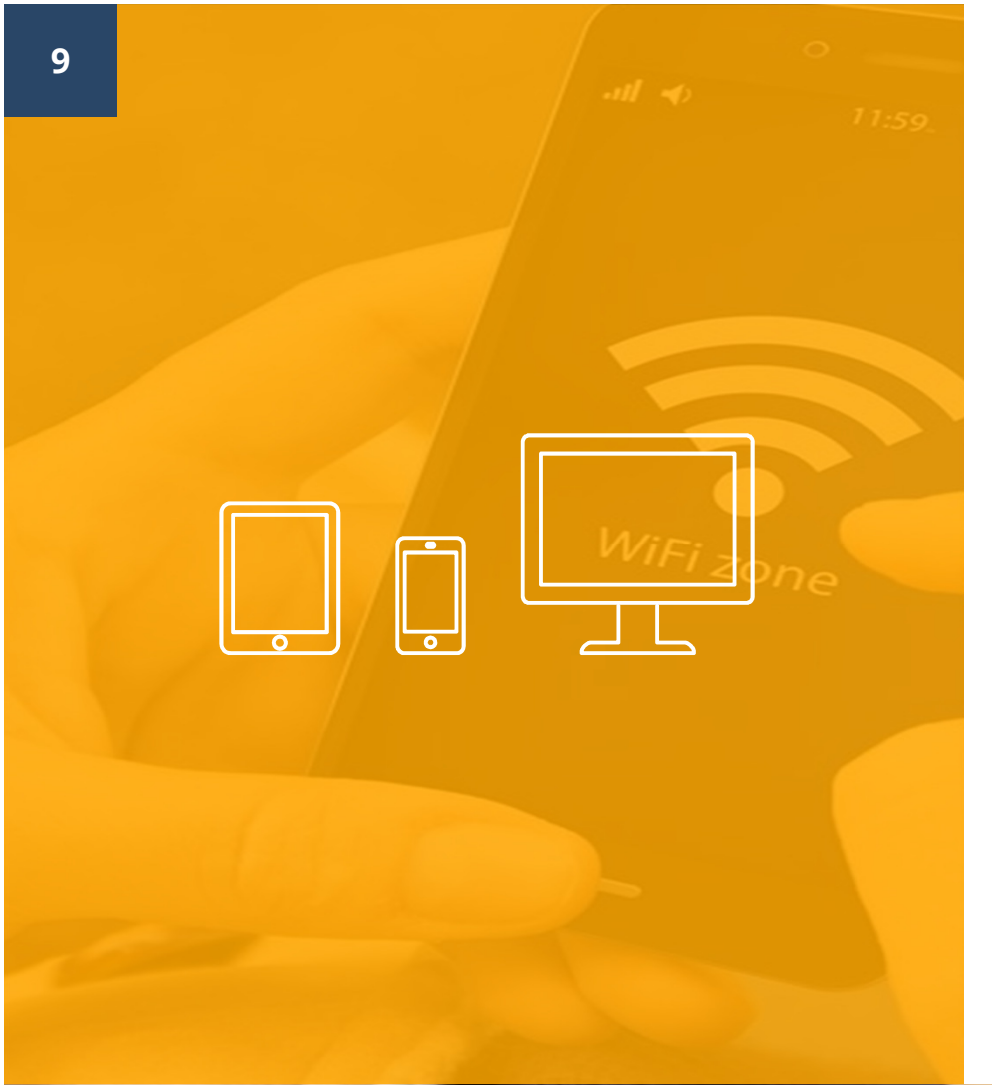
Wireless Networks are everywhere

- (nearly) All mobile devices support them
- The preferred way of connecting to the internet by most people
- Offer liberty of movement
- Go, where no wire can go.

How did it all came to be.

- First we created networks with just one AP.
- The need of expansion of such networks, brought the **idea** of **BIGGER** more powerful APs.
- This didn’t work as expected! **Reasons?**
- We started adding more and more APs to these networks.

We created MONSTERS!



Why Enterprise Wireless Networks

- Multiple Access Points are needed for multiple areas to cover
- Necessity for higher bandwidth, and increasing interference, has brought the need for smaller APs
- The bigger the number of the APs, the **more difficult** is their control

Power is Nothing!

Without Control

MikroTik's Response to this is

CAPsMAN

Controlled Access Points Manager

What is it?

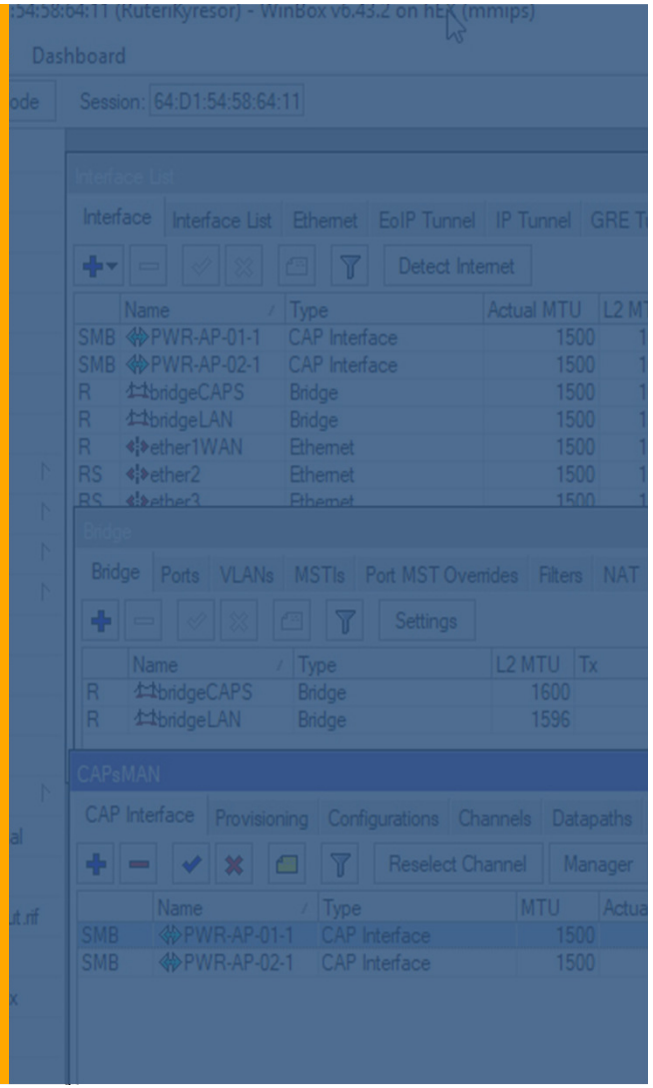
CAPsMAN, is a centralizing system by MikroTik. It gives the possibility to create a system of controlled access points, called CAPs, by a Controller called CAPsManager.

It is completely FREE (as in free beer) and can be used with any Routerboard, and installed in X86 or CHR too.

Since its introduction in 2014, it has changed the way we plan, implement and expand wireless networks.

What is needed

- At least 1 **device**, with 1 wireless card
- Latest version of RouterOS, with level 4 License.



Simplest CAPsMAN

hAP Mini – a device I'm in love with.

It is the cheapest RB with 1 wireless card, and 3 Ethernet ports.

Bigger setup?

Durres Harbour Container Terminal:
Latitude: 41° 17' 60.00" N
Longitude: 19° 26' 60.00" E

27 Towers with 2-3 APs (SXT 2, SXT SA5)
27 x RB260GSP
1 x CSS326-24G-2S+RM
1 x CCR1009-7G-1C

Even BIGGER?

- 123 x wsAP ac Lite
- 10 x wAP ac
- 10 x cAP Ac
- 6 x CRS328-24P-4S+RM
- 1 x CCR1009-7G-1C

Hardware Used

Frequency

2.4GHZ

+Suported from most devices

+Passes obstacles easier

+Goes far

-Only 3 non-overlapping channels (1/6/11)

-More interference

-More devices non 802.11

5GHZ

+Much more non-overlapping channels

+Much less interference

+Less devices non 802.11 that use 5GHZ

-Less client devices that has 5GHZ ability

Hardware Used

Environment

Indoor

cAP Lite (2.4)

wsAP ac lite (Dual Band)

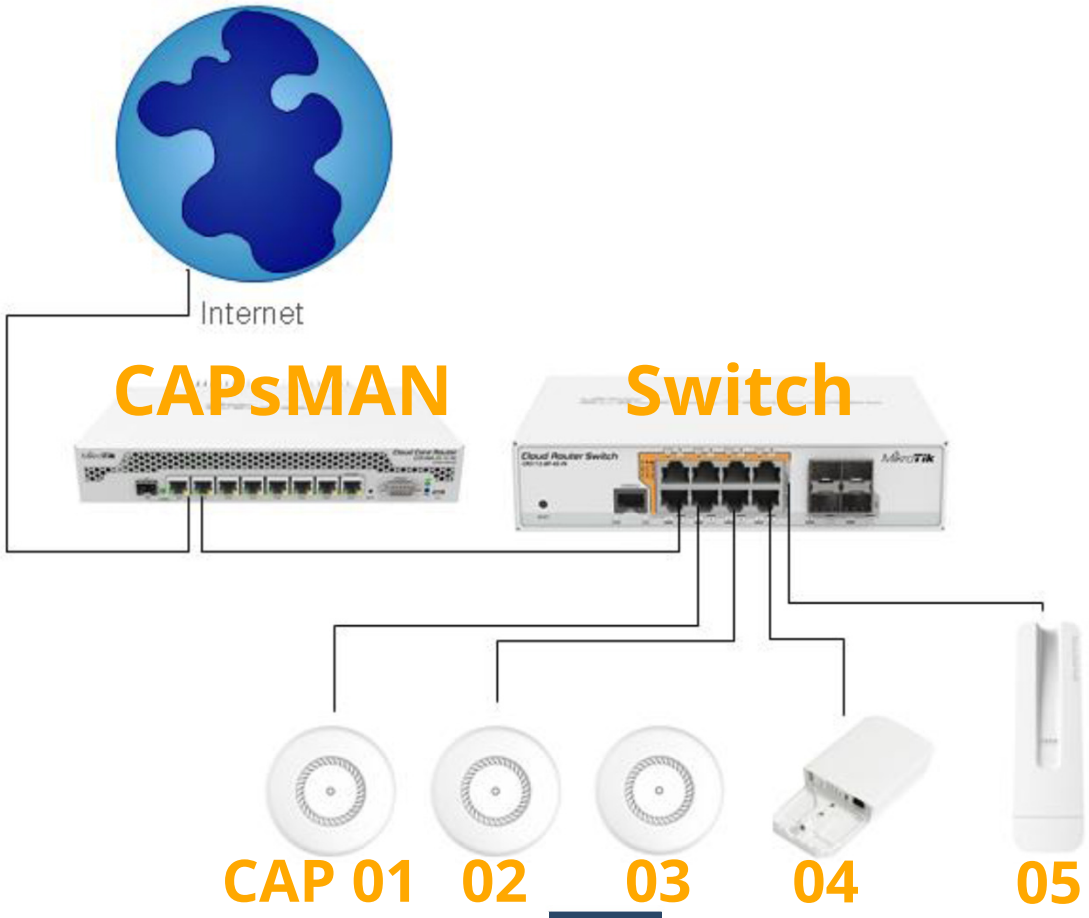
cAP ac (Dual Band)

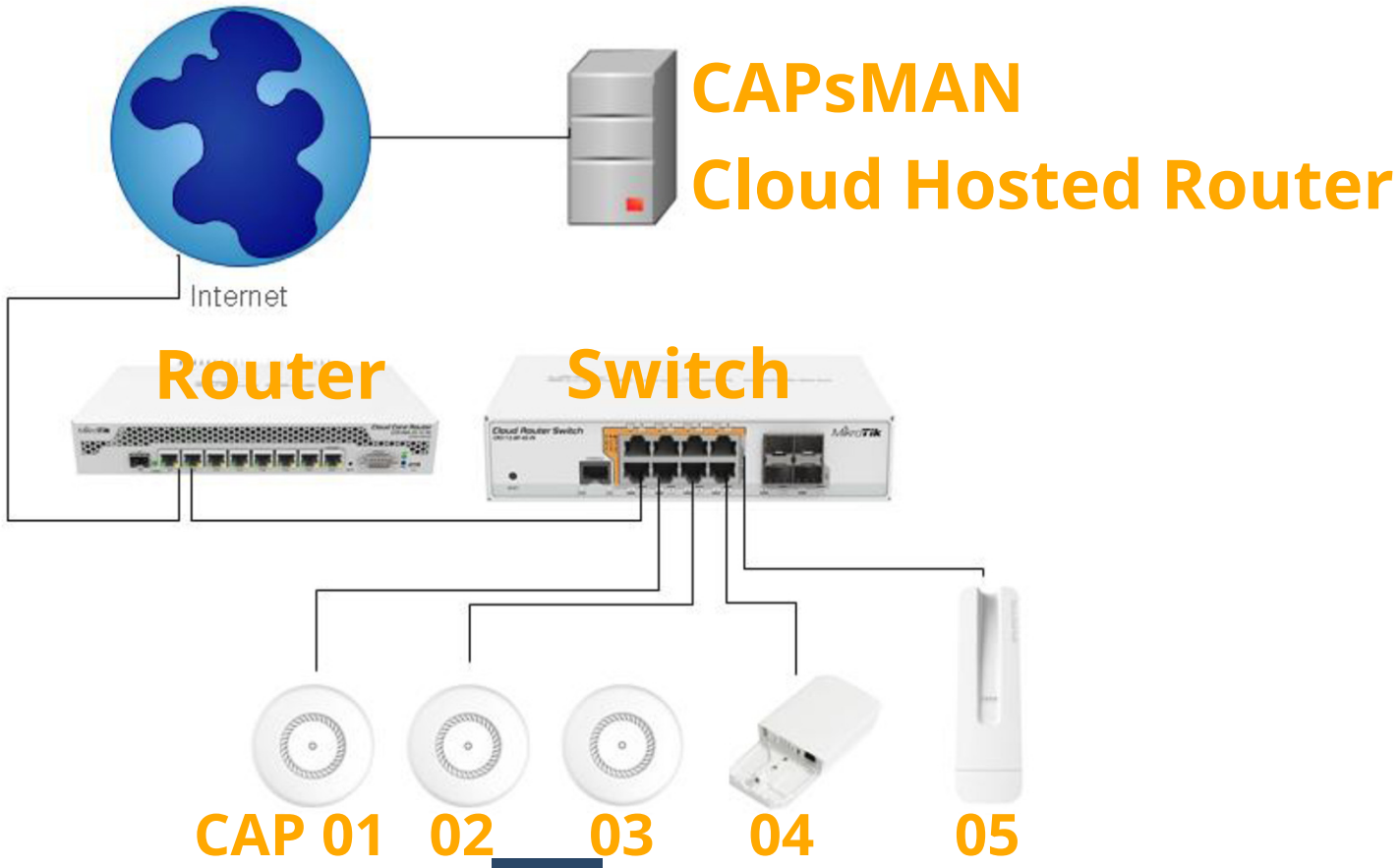
Outdoor

SXT2 & SXT SA5

OmniTik 5ac

wAP ac Dual Band

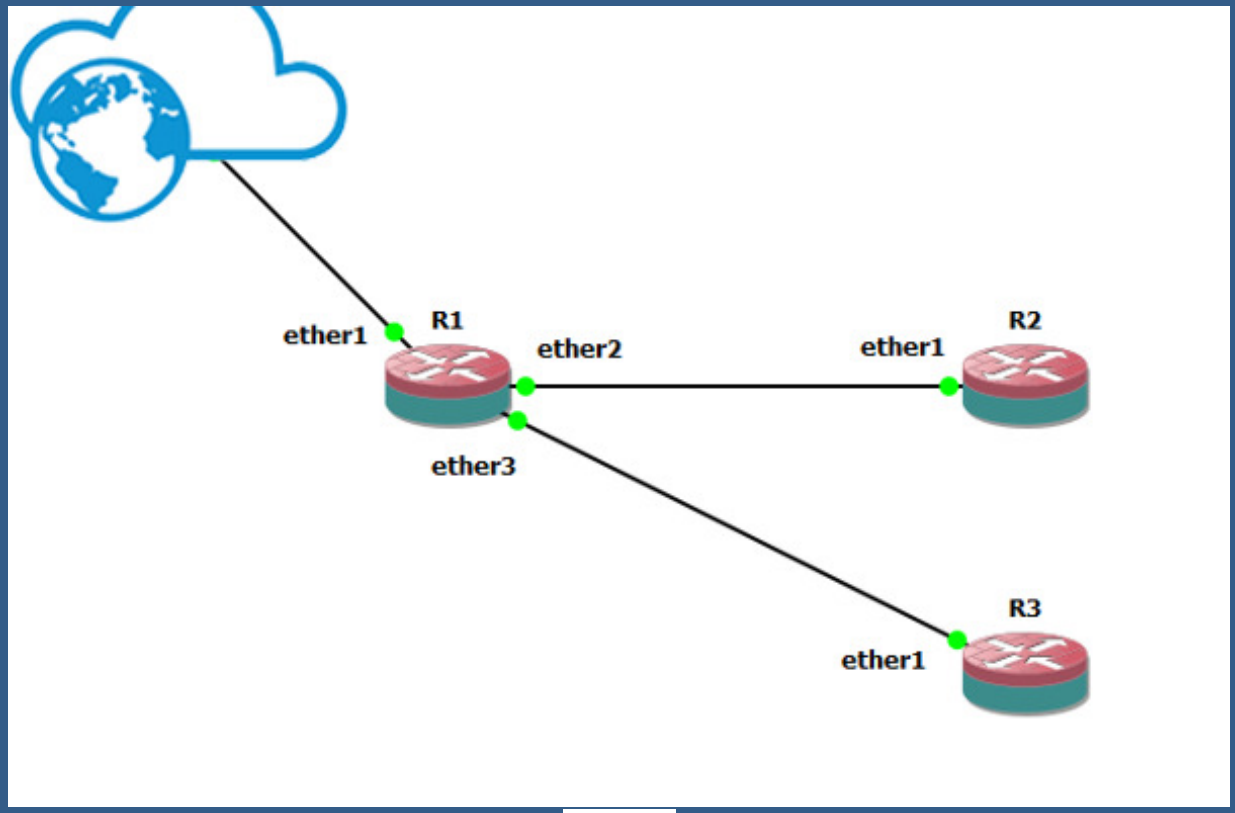

Internet
CAPsMAN
Switch
CAP 01
02
03
04
05

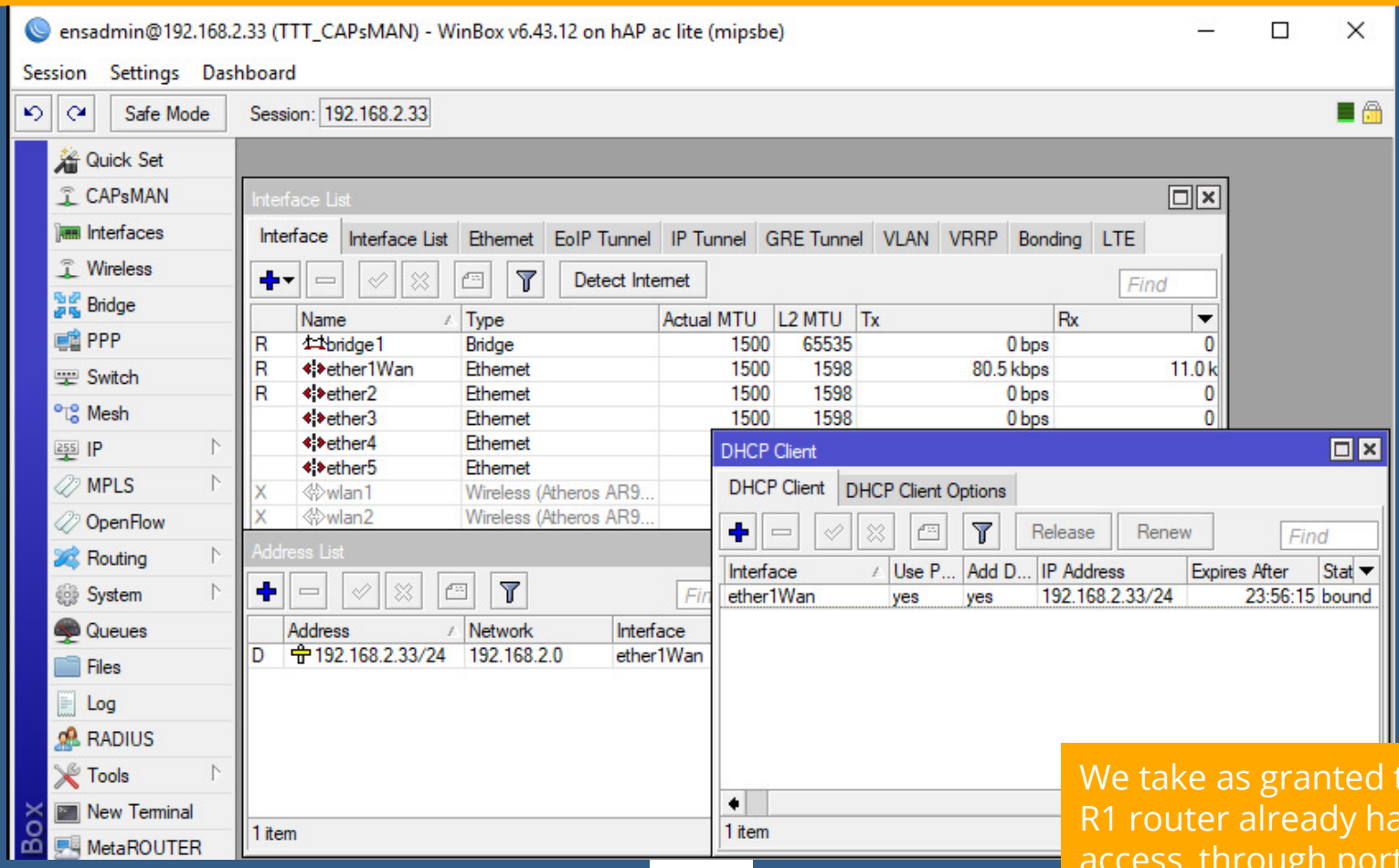

CAPsMAN
Cloud Hosted Router
Internet
Router
Switch
CAP 01
02
03
04
05

CAPsMAN

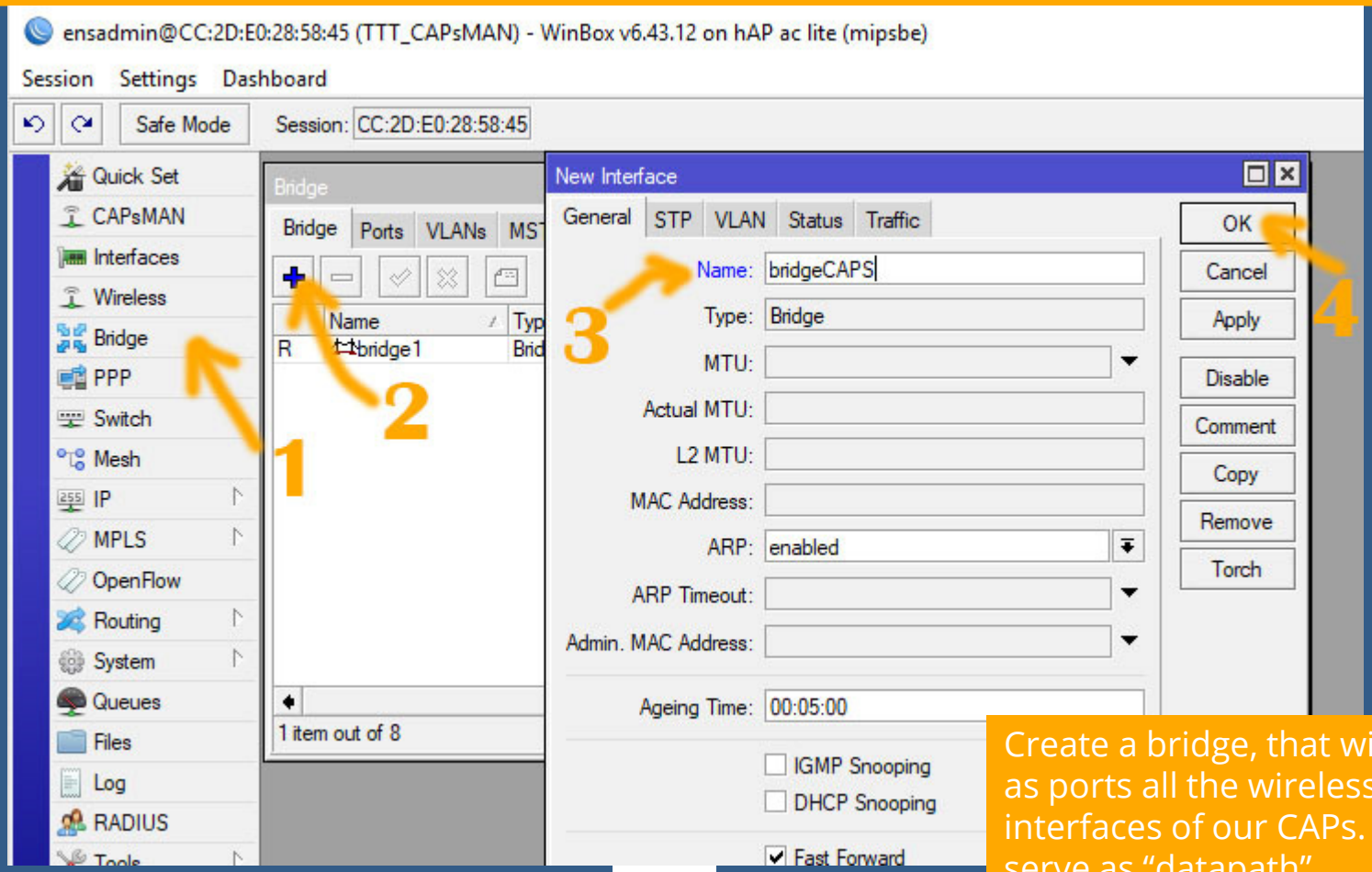
🕓 in 5 minutes

Let us take in consideration the network diagram below

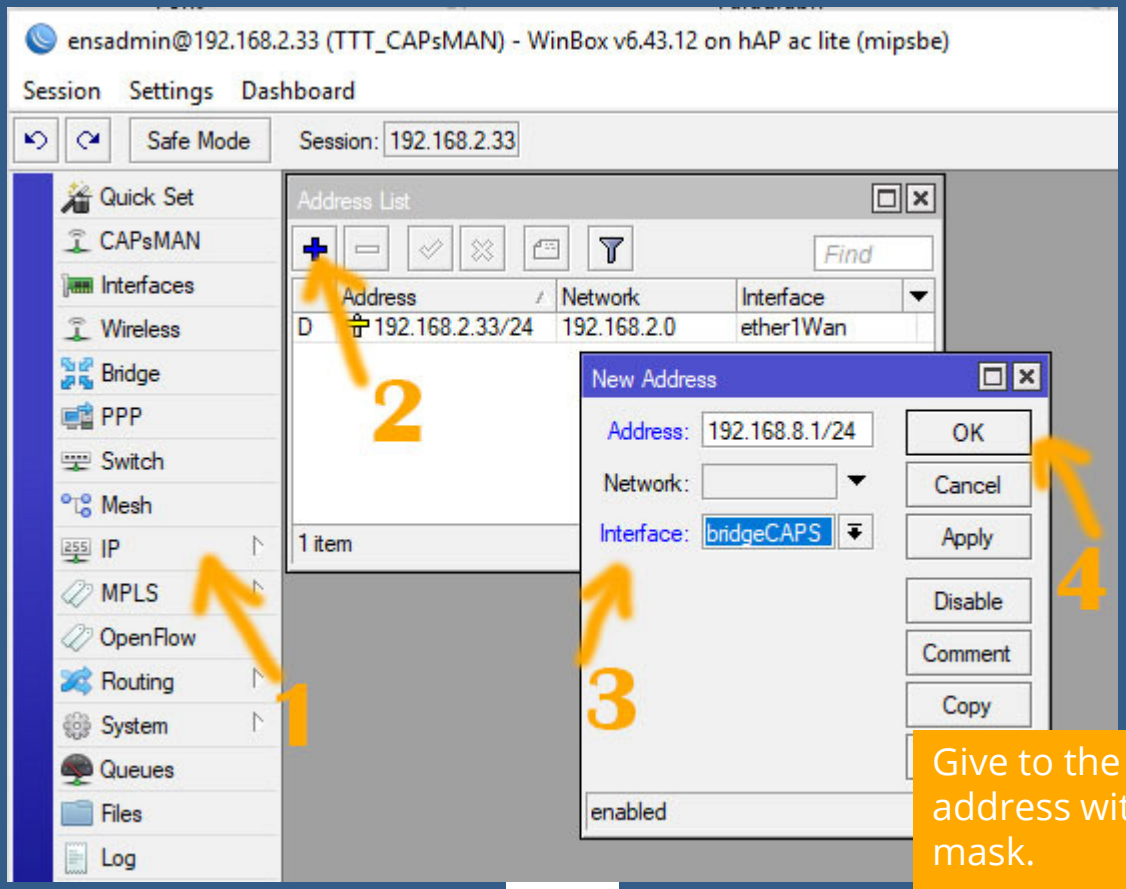




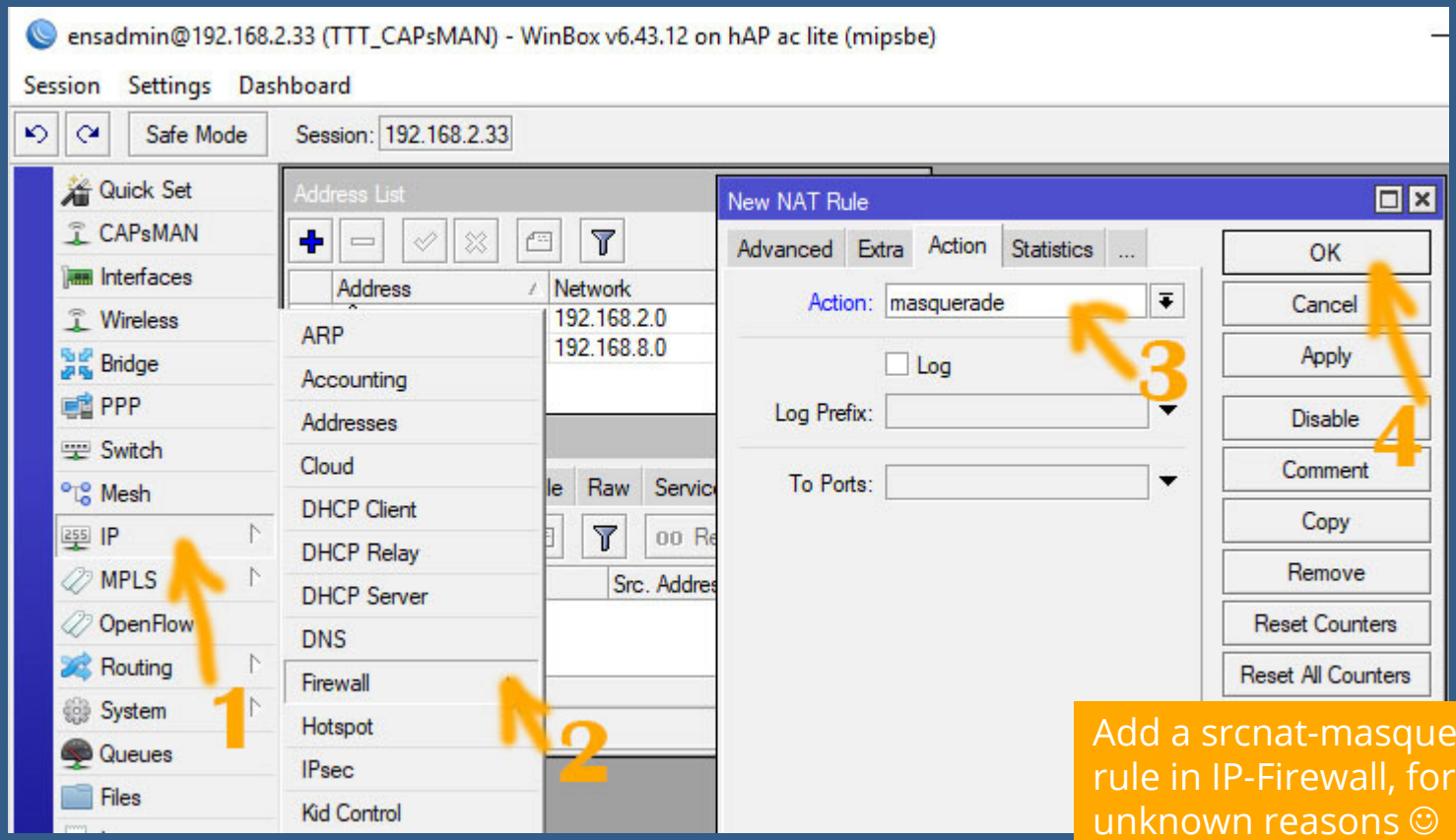
We take as granted that our R1 router already has internet access, through port Ether1



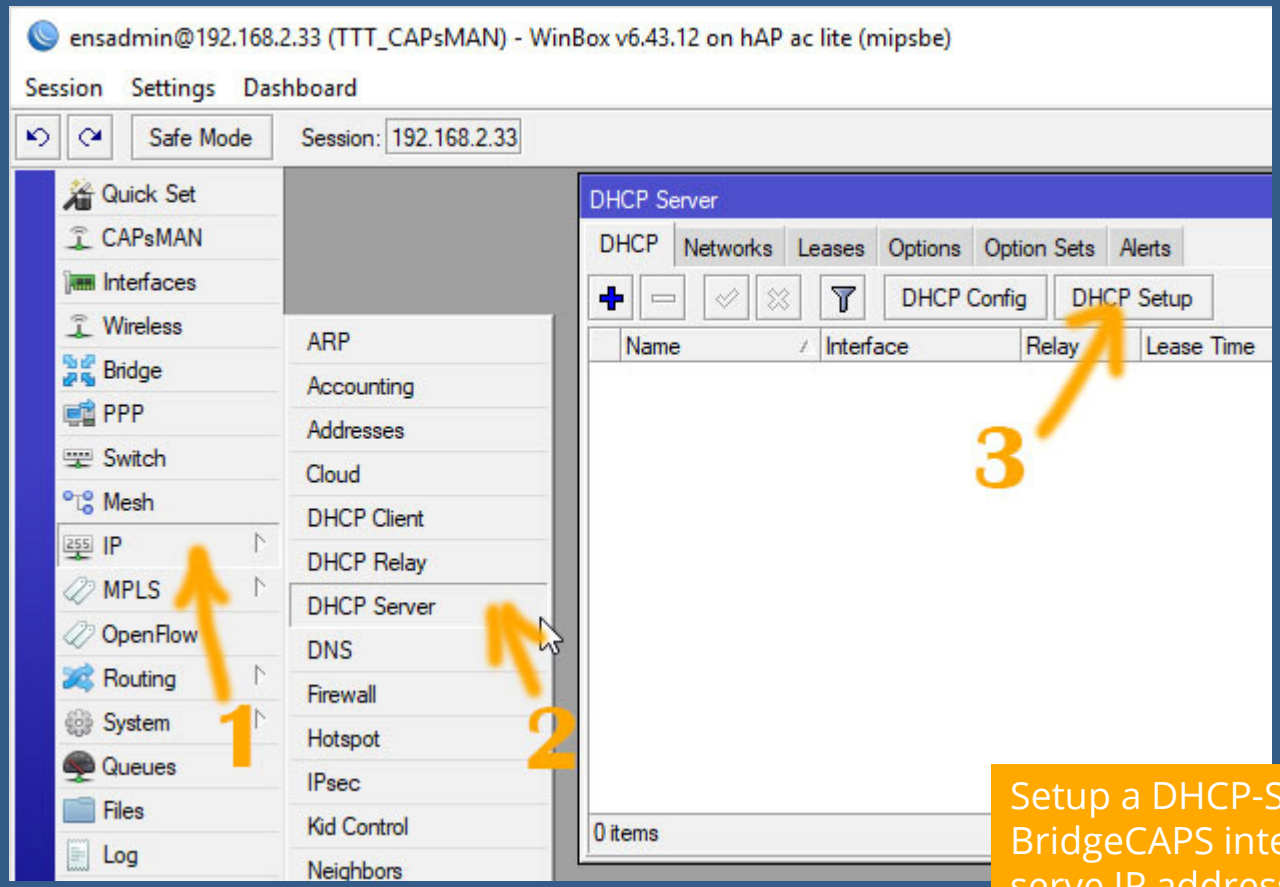
Create a bridge, that will have as ports all the wireless interfaces of our CAPs. It will serve as “datapath”.



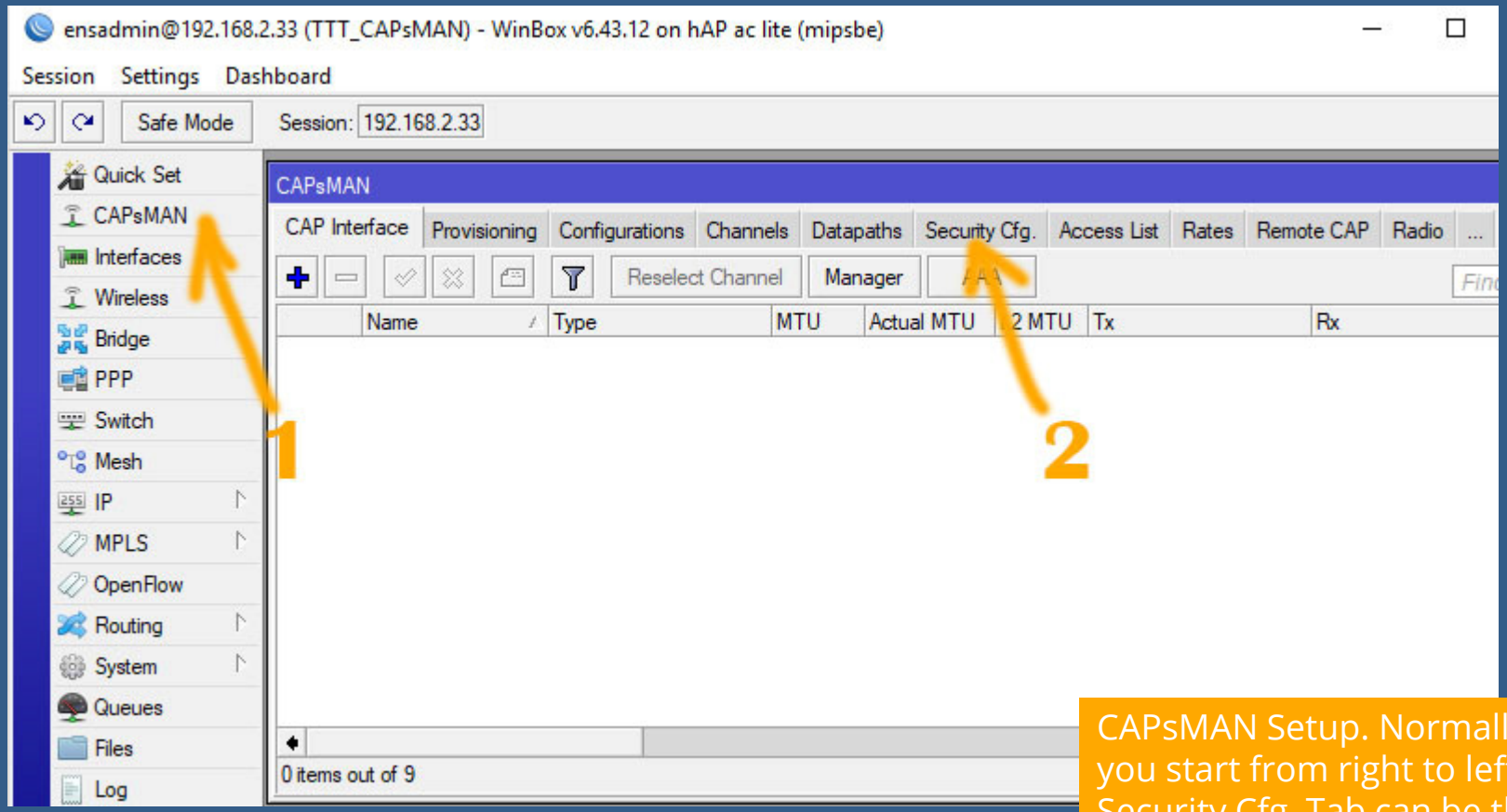
Give to the bridge an IP address with the desired mask.



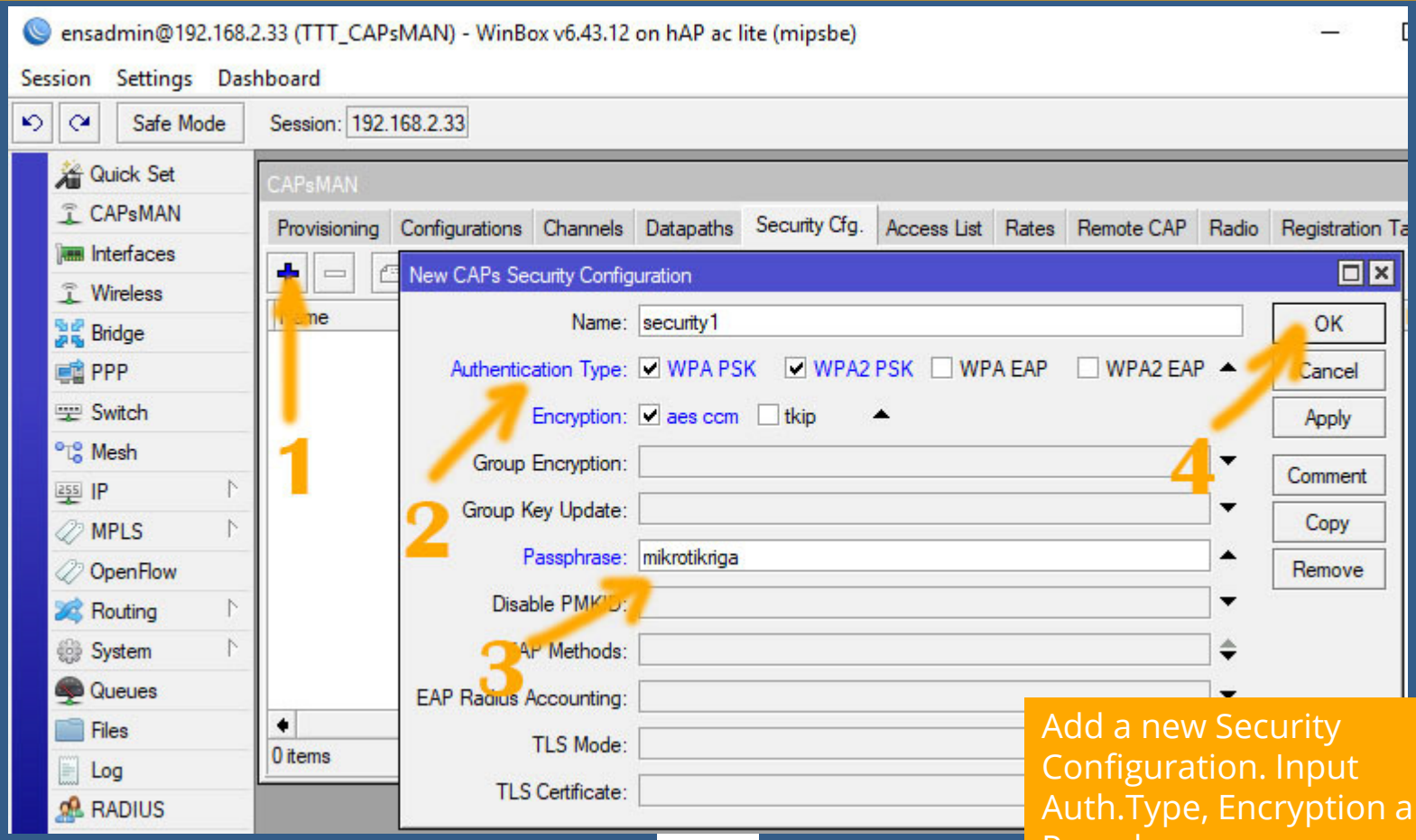
Add a srcnat-masquerade rule in IP-Firewall, for unknown reasons ☺



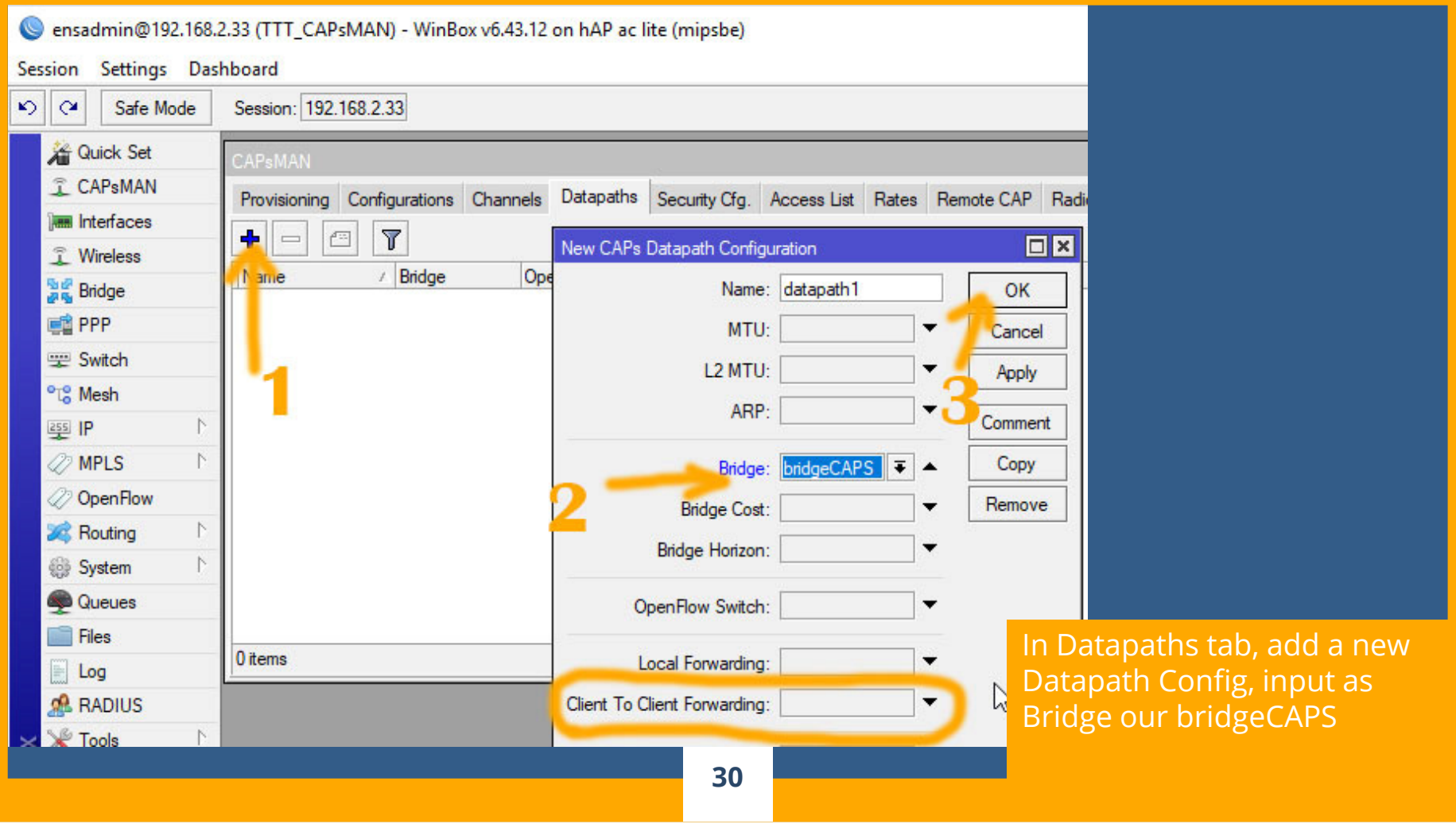
Setup a DHCP-Server in the BridgeCAPS interface. It will serve IP addresses to the clients of the Wifi Network



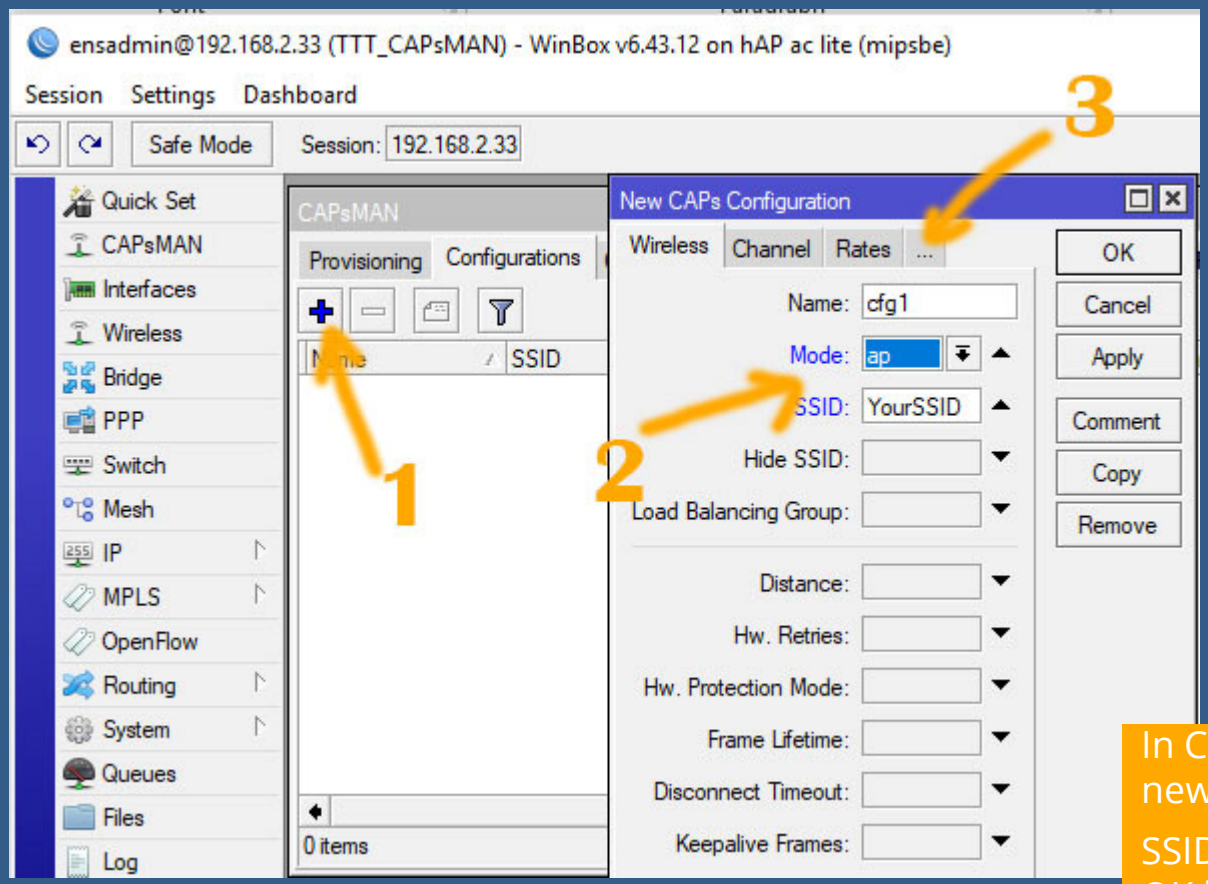
CAPsMAN Setup. Normally you start from right to left. Security Cfg. Tab can be the first.



Add a new Security Configuration. Input Auth.Type, Encryption and Passphrase

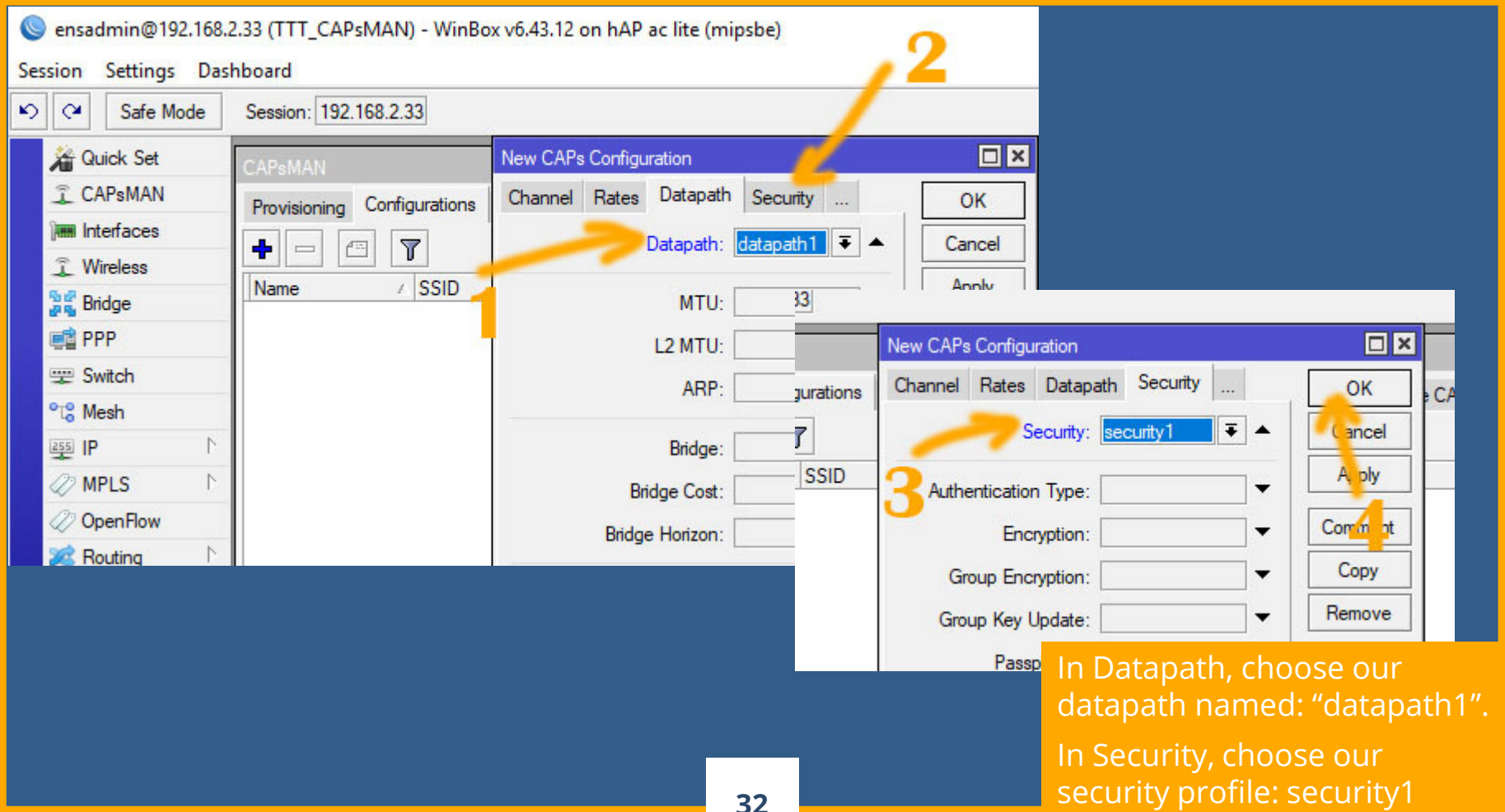


In Datapaths tab, add a new Datapath Config, input as Bridge our bridgeCAPS



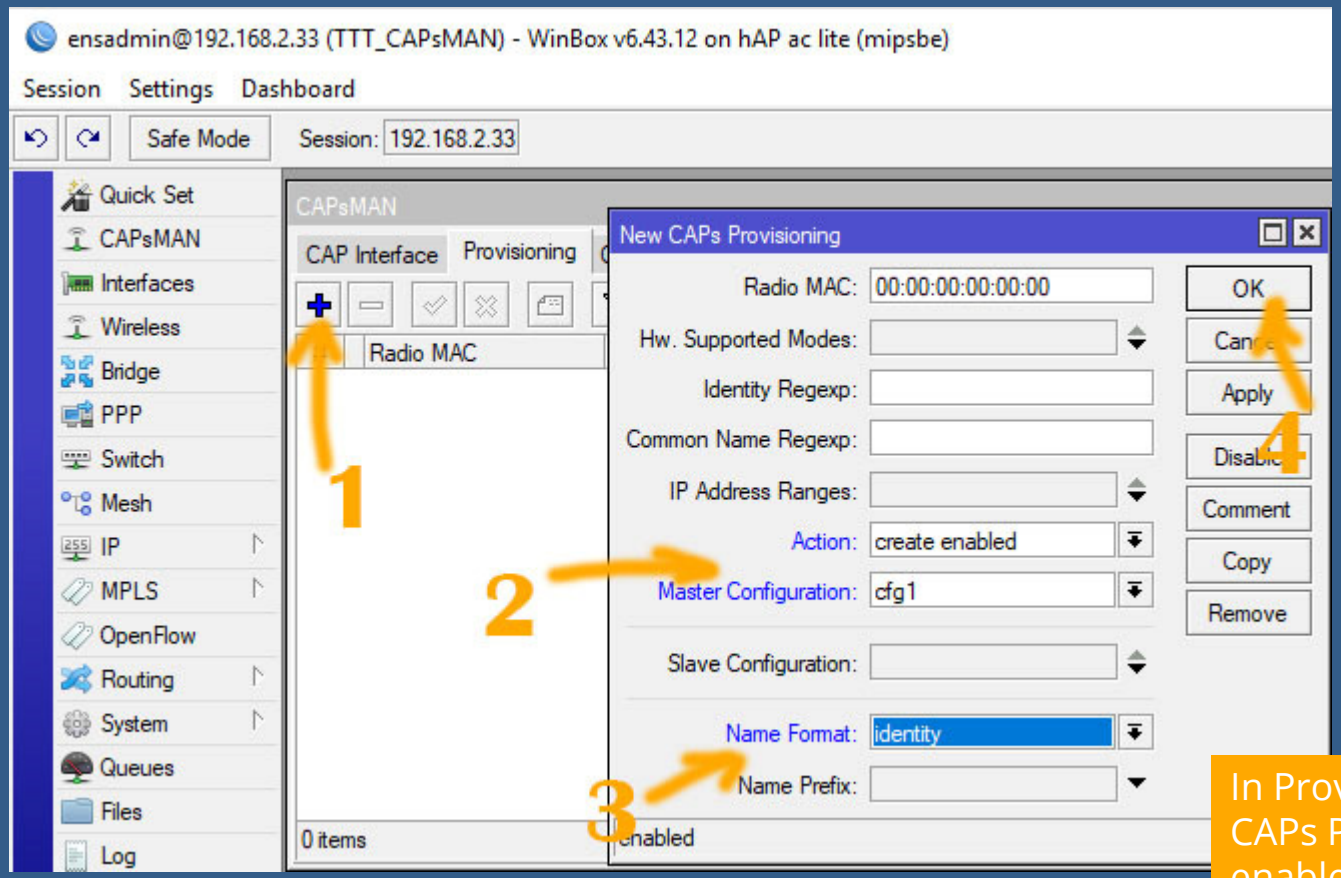
In Configurations tab, add a new config, Mode: ap,

SSID: yourSSID. Don't press OK but go to tab Datapath in this window.

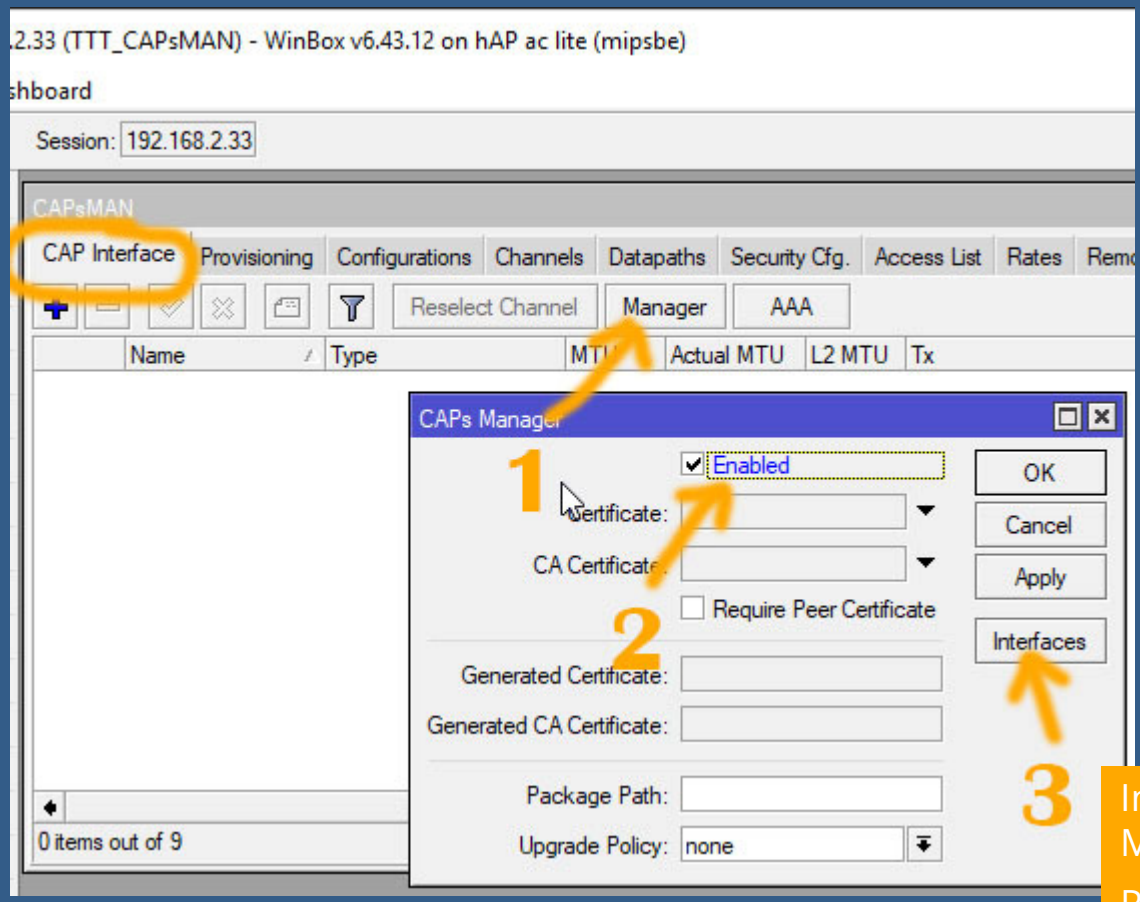


In Datapath, choose our datapath named: “datapath1”.

In Security, choose our security profile: security1

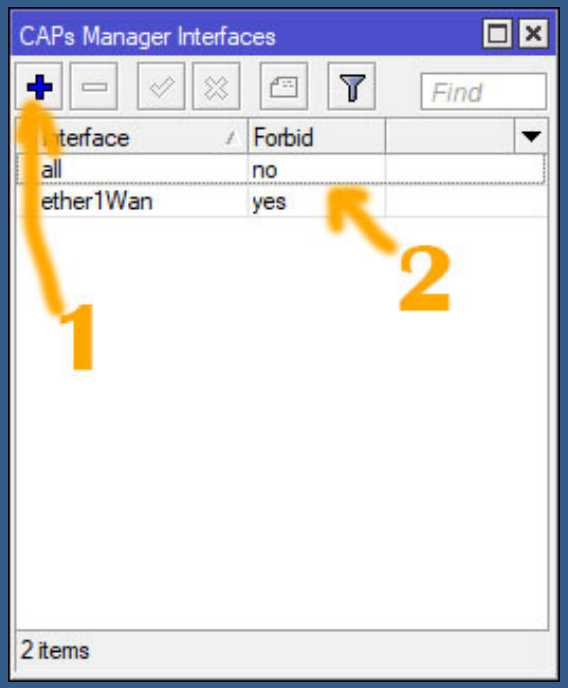


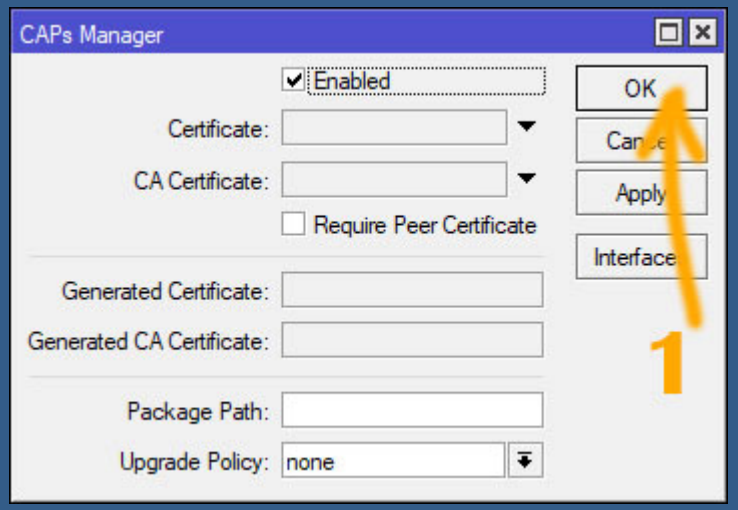
In Provisioning, we add a new CAPs Prov., Action: create enabled, Name Format: Identity.



In CAP Interface, press: Manager, Enable it.

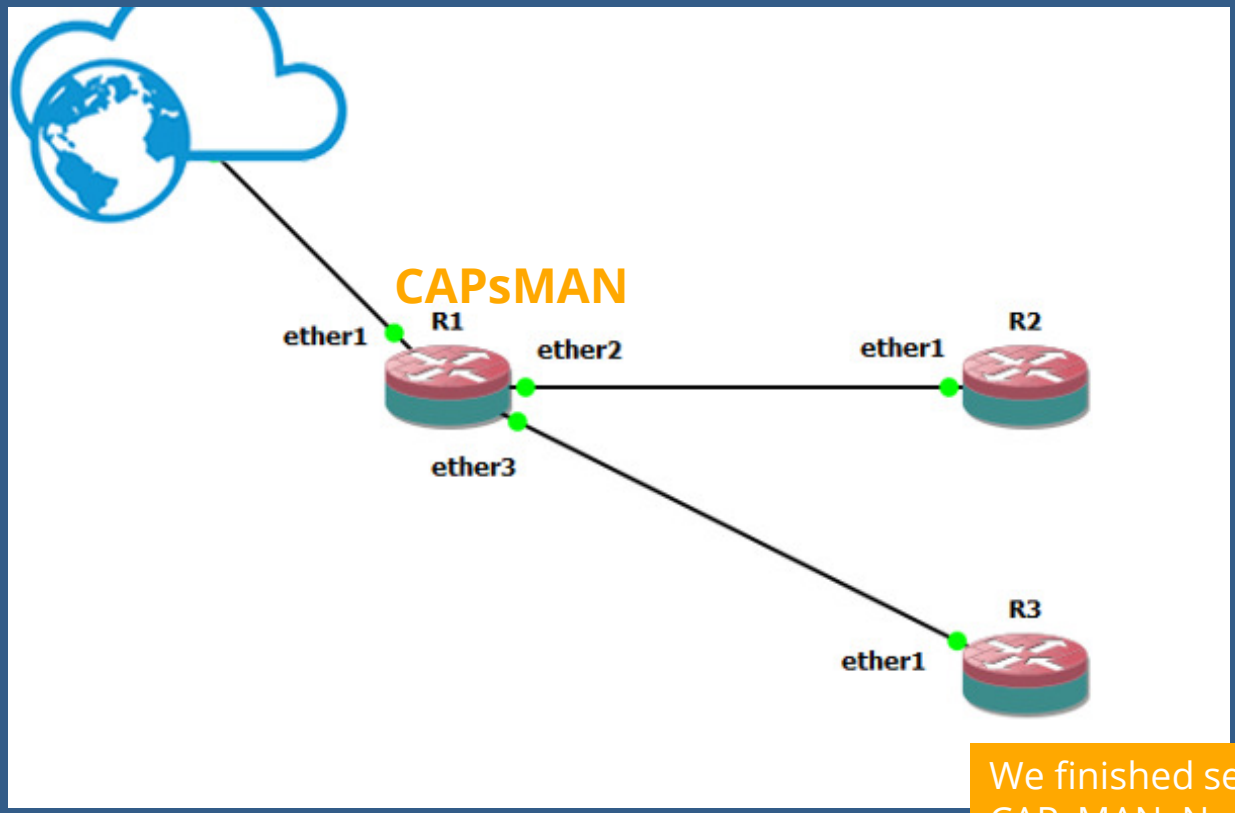
Press Interfaces button



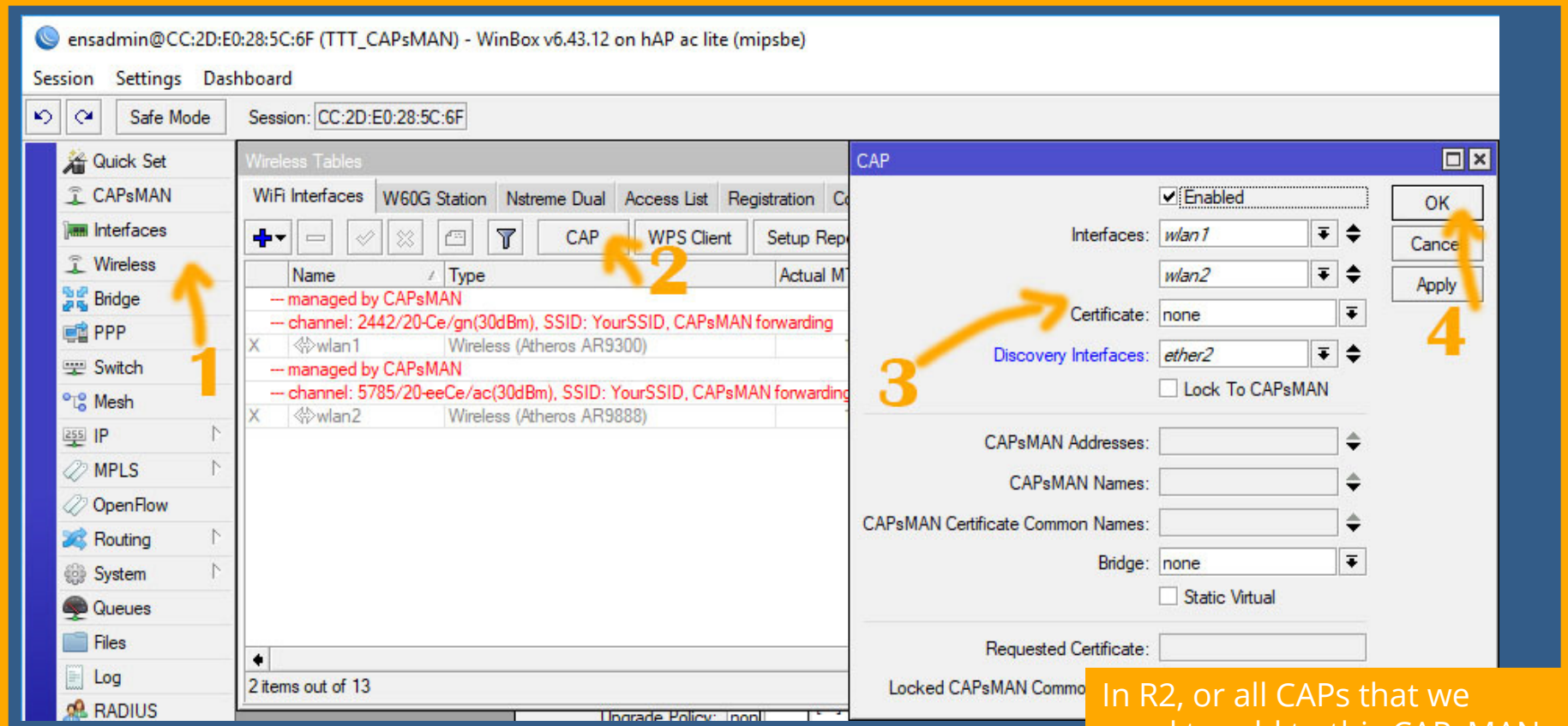


Add the interface where you have your internet connection: ether1Wan with forbid=yes

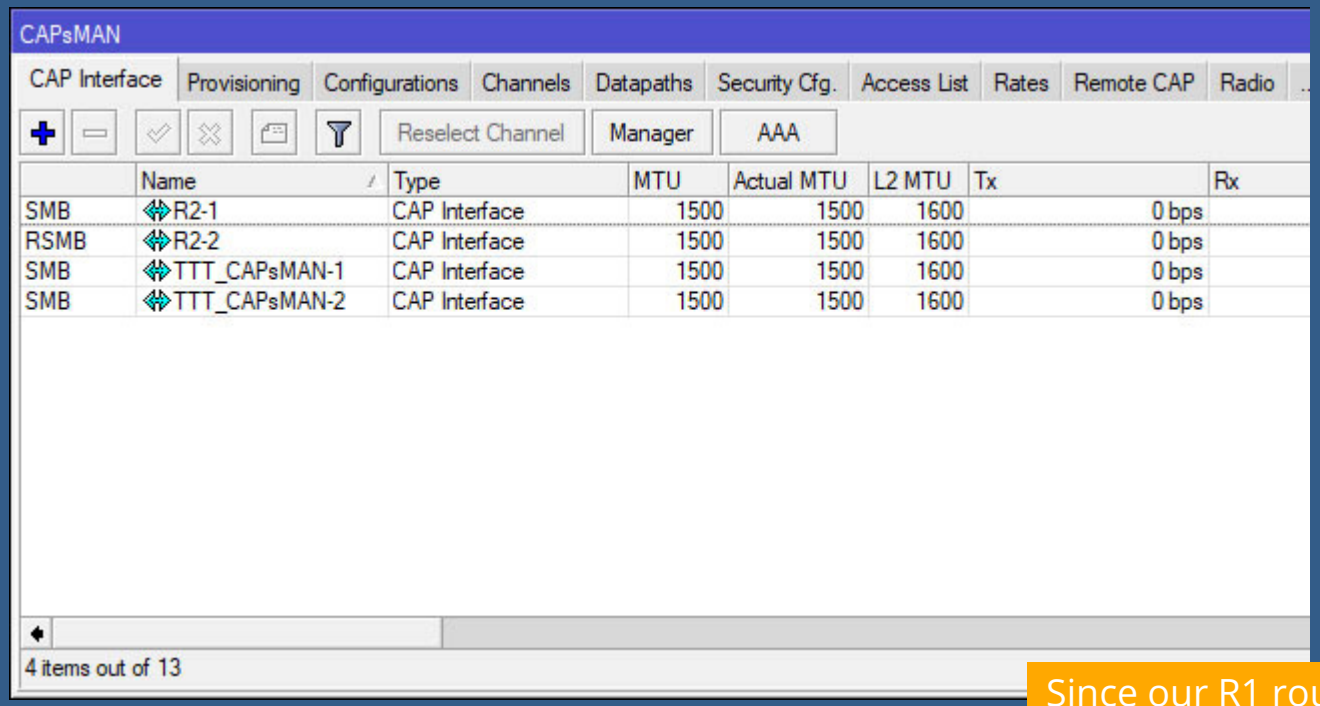
Last, press OK in CAPs Manager Window.



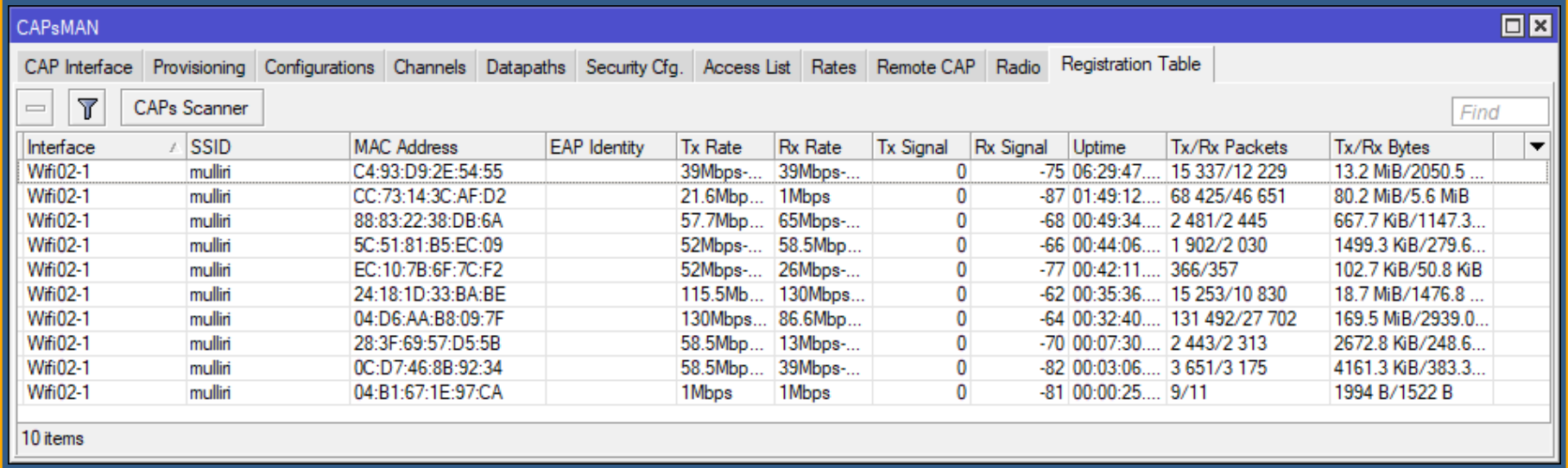
We finished setting-up CAPsMAN. Now let's setup the CAPs.



In R2, or all CAPs that we need to add to this CAPsMAN, we do the following in Interface -> Wireless -> CAP



Since our R1 router, has wireless interfaces of its own, we can also add them to the CAPsMAN. This is the final view of our setup.



Monitor client connections in Registration Table.

```
/interface bridge add name=bridgeCAPS
/ip address add interface=bridgeCAPS address=192.168.8.1/24
/caps-man datapath
add bridge=bridgeCAPS client-to-client-forwarding=no local-forwarding=no
name=datapath1
/caps-man security
add authentication-types=wpa-psk,wpa2-psk encryption=aes-ccm name=security1
passphrase=\
  mikrotikriga
/caps-man configuration
add datapath=datapath1 mode=ap name=cfg1 security=security1 ssid=YourSSID
/caps-man manager
set enabled=yes
/caps-man provisioning
add action=create-enabled master-configuration=cfg1 name-format=identity
```

```
/interface wireless cap set discovery-interfaces=ether1 interfaces=wlan1,wlan2
enabled=yes
```

VS

Any difference?

Extensive setups

Frequency tunning

Use only non-overlapping

Permit only g/n

Limit data-rates

Virtual SSID

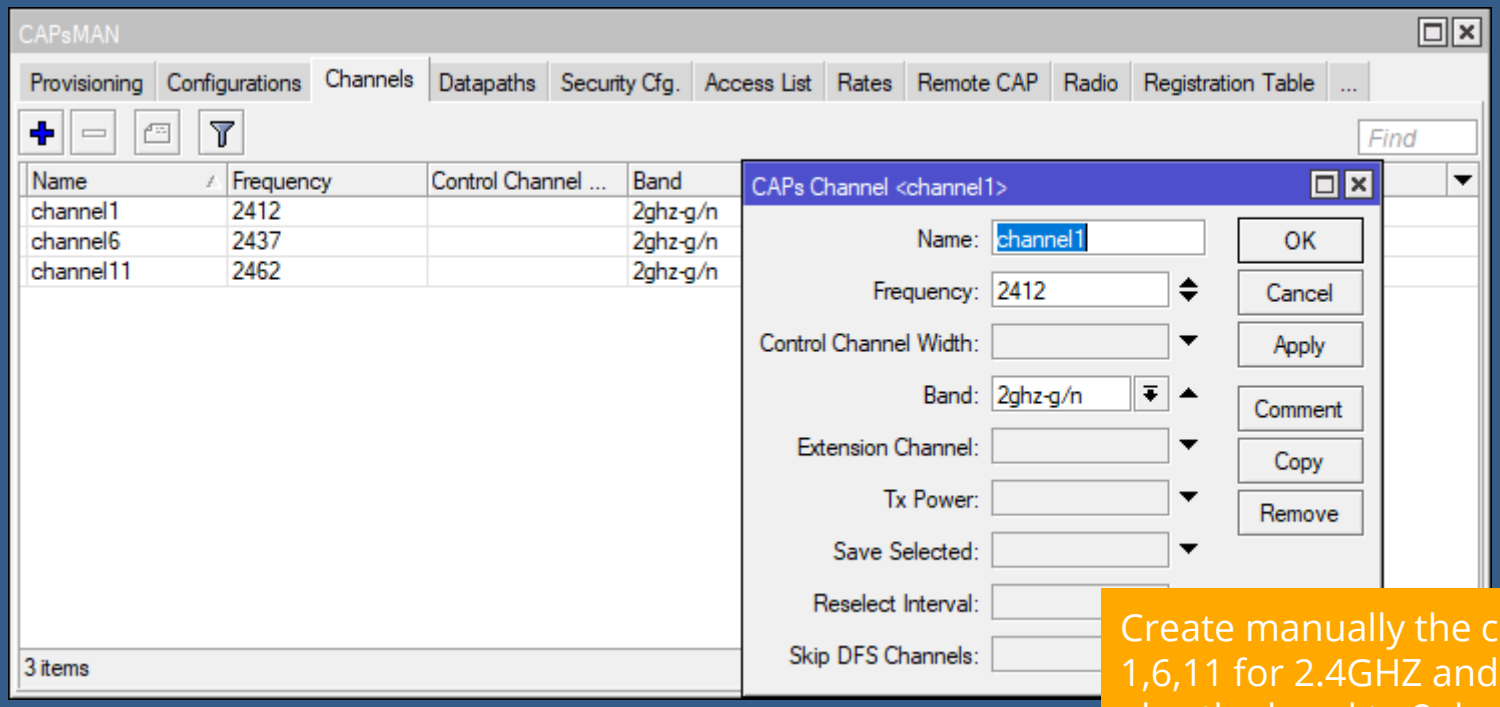
Offer multiple SSID in the same APs, giving possibility to have different networks in the same physical setup

VLANs

Use of VLANs in these networks, gives the possibility to create smaller and isolated networks for different purposes

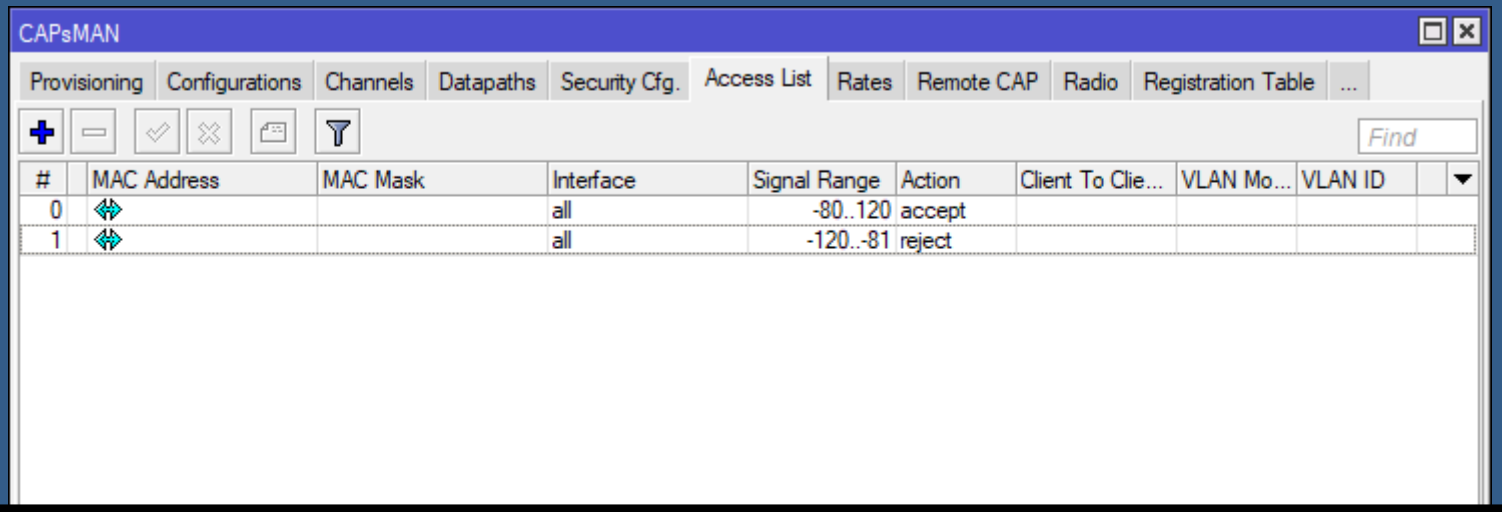
Access Control

Play with access control options, to have as much control as possible over the clients connecting, based on signal, mac, etc



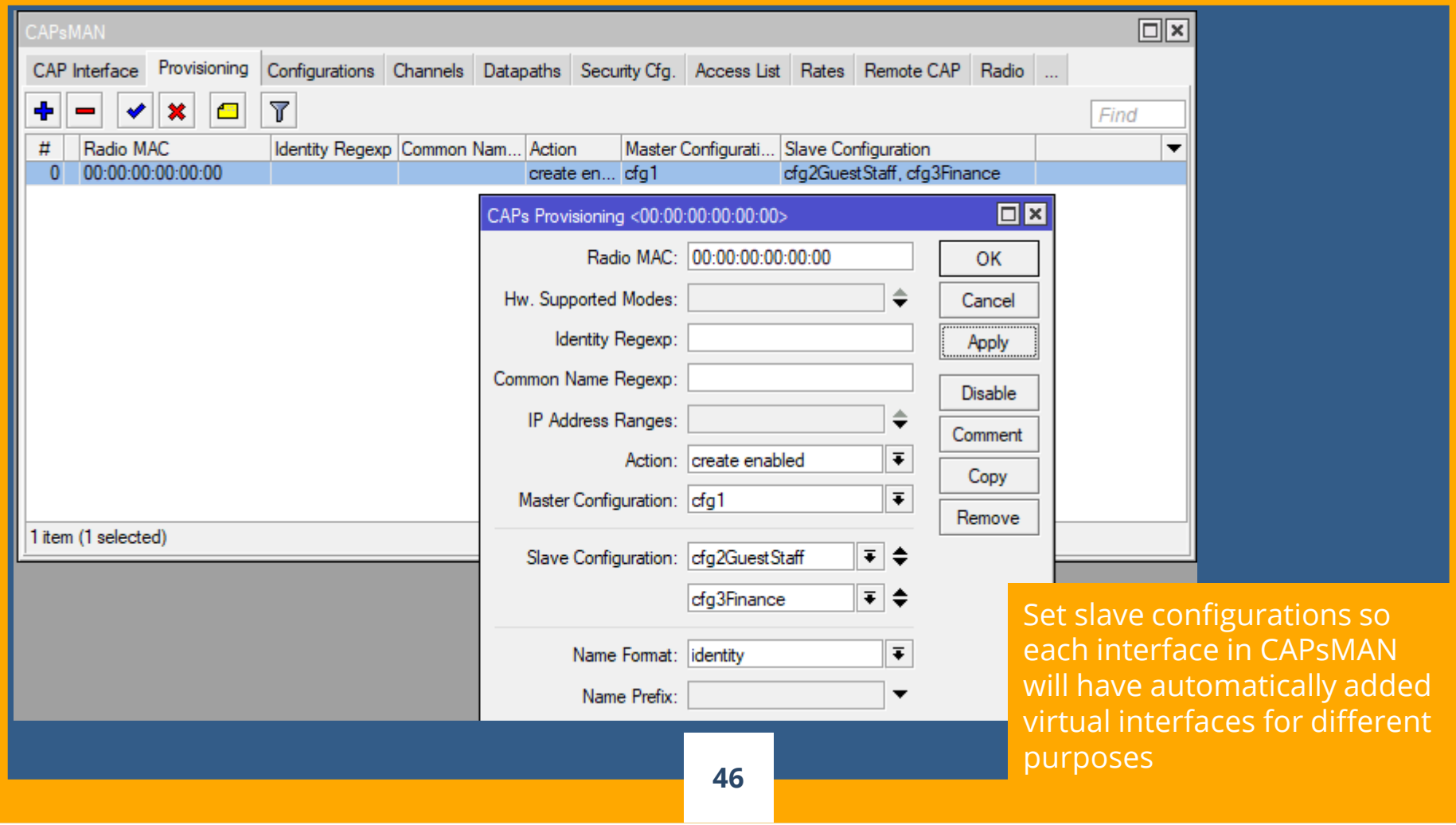
Create manually the channels 1,6,11 for 2.4GHZ and put also the band to 2ghz-g/n to not use the old nasty 2ghz-b.

Input the channels manually for each interface.

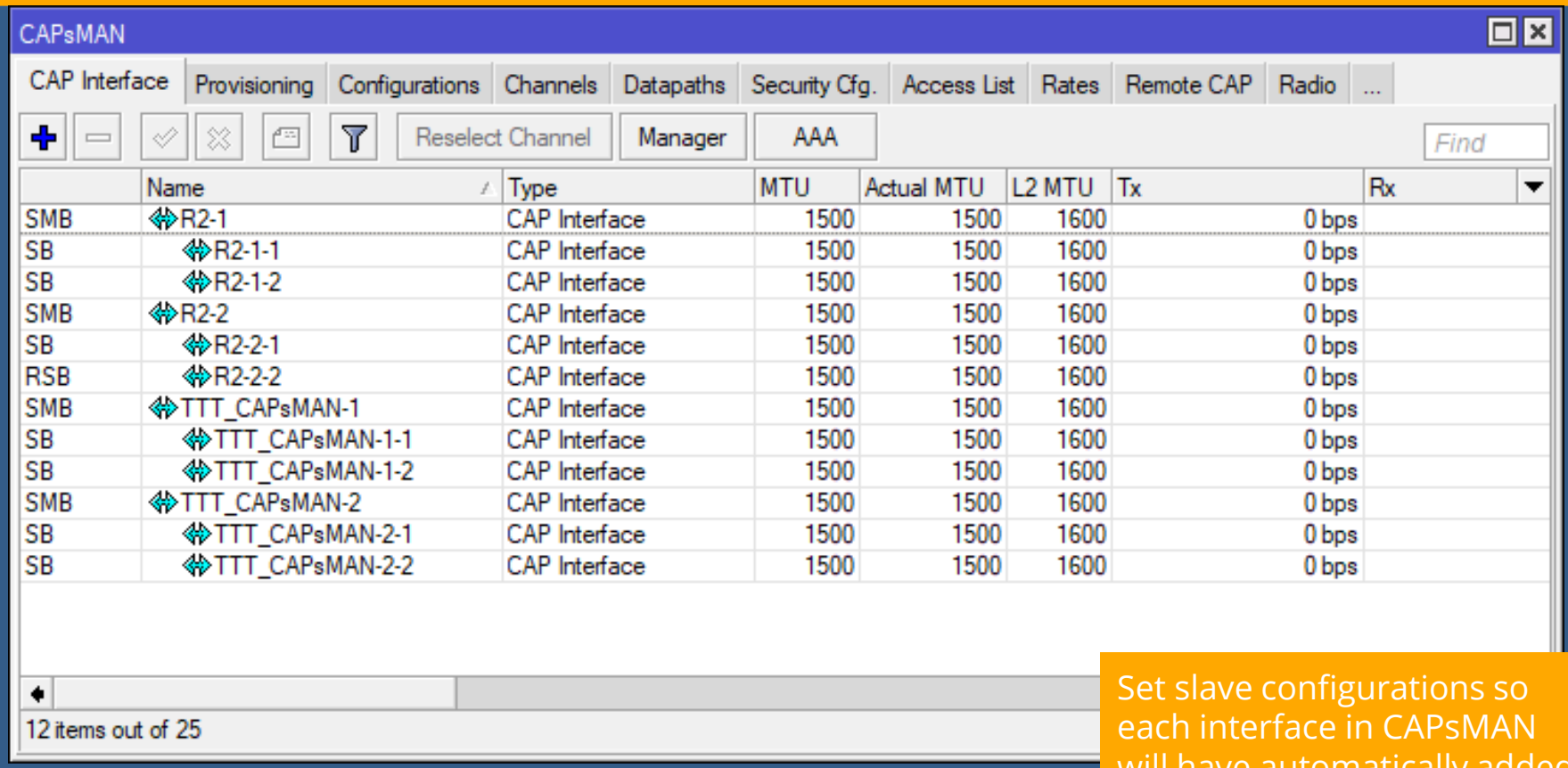



```
/caps-man access-list
add action=accept allow-signal-out-of-range=10s disabled=no interface=any \
  signal-range=-80..120 ssid-regexp=""
add action=reject allow-signal-out-of-range=10s disabled=no interface=any \
  signal-range=-120..-81 ssid-regexp=""
```

Make roaming as easy as possible.



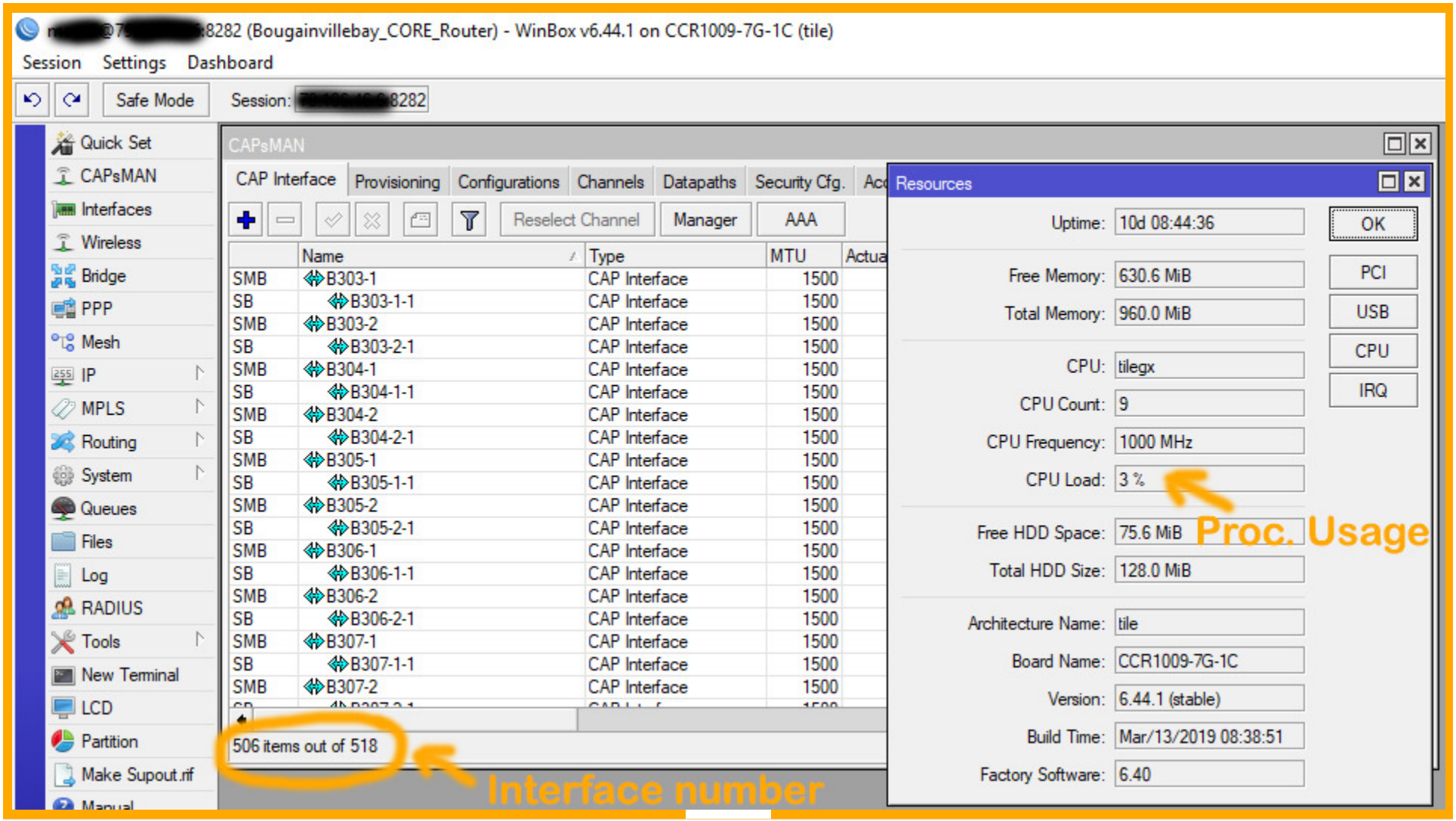
Set slave configurations so each interface in CAPsMAN will have automatically added virtual interfaces for different purposes



Set slave configurations so each interface in CAPsMAN will have automatically added virtual interfaces for different purposes

Multiroom Resort Setup

- 123 x wsAP ac Lite
- 10 x wAP ac
- 10 x cAP Ac
- 6 x CRS328-24P-4S+RM
- 1 x CCR1009-7G-1C


8282 (Bougainvillebay_CORE_Router) - WinBox v6.44.1 on CCR1009-7G-1C (tile)
Session Settings Dashboard
Safe Mode
Session:
8282
Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Mesh
IP
MPLS
Routing
System
Queues
Files
Log
RADIUS
Tools
New Terminal
LCD
Partition
Make Supout.rif
Manual
CAPsMAN
CAP Interface
Provisioning
Configurations
Channels
Datapaths
Security Cfg.
Reselect Channel
Manager
AAA
Name
Type
MTU
SMB B303-1 CAP Interface 1500
SB B303-1-1 CAP Interface 1500
SMB B303-2 CAP Interface 1500
SB B303-2-1 CAP Interface 1500
SMB B304-1 CAP Interface 1500
SB B304-1-1 CAP Interface 1500
SMB B304-2 CAP Interface 1500
SB B304-2-1 CAP Interface 1500
SMB B305-1 CAP Interface 1500
SB B305-1-1 CAP Interface 1500
SMB B305-2 CAP Interface 1500
SB B305-2-1 CAP Interface 1500
SMB B306-1 CAP Interface 1500
SB B306-1-1 CAP Interface 1500
SMB B306-2 CAP Interface 1500
SB B306-2-1 CAP Interface 1500
SMB B307-1 CAP Interface 1500
SB B307-1-1 CAP Interface 1500
SMB B307-2 CAP Interface 1500
506 items out of 518
Interface number
Resources
Uptime: 10d 08:44:36
Free Memory: 630.6 MiB
Total Memory: 960.0 MiB
CPU: tilegx
CPU Count: 9
CPU Frequency: 1000 MHz
CPU Load: 3 %
Free HDD Space: 75.6 MiB
Total HDD Size: 128.0 MiB
Architecture Name: tile
Board Name: CCR1009-7G-1C
Version: 6.44.1 (stable)
Build Time: Mar/13/2019 08:38:51
Factory Software: 6.40
OK
PCI
USB
CPU
IRQ
Proc. Usage

Conclusion

After we setup **CAPsMAN**, we have:

- Much more control over the Wifi Network
- Easier expansion
- More stable client connections
- A nearly unlimited number of options on configurations of such networks

- **Happy Clients**
- **Paid Invoices** 😍

Thank you for your attention!

Questions?

Drop an e-mail at **erioni@gmail.com** and/or
follow **Mikrotik.Albania** in Instagram