

MikroTik Enterprise Wireless Networks

and

CAPsMAN

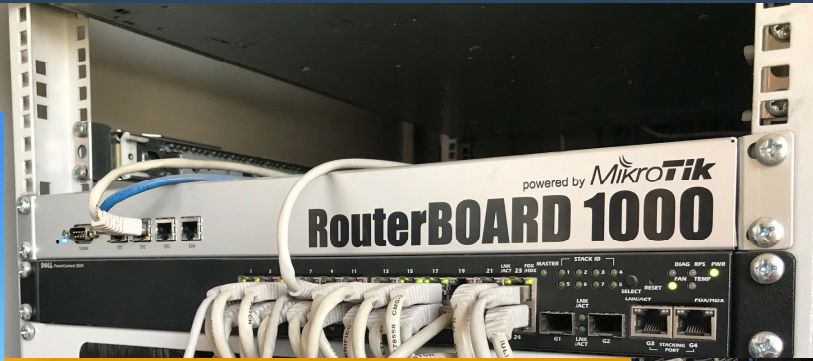
mum
Budapest
31.May.2019

A person is standing at a podium on a stage, addressing an audience seated in a conference room. The room has a dark ceiling with recessed lighting and blue curtains in the background. The person is wearing a light-colored shirt and dark trousers. The audience is visible in the foreground, seated in rows of chairs.

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



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 come 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!

Sárkányok



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?

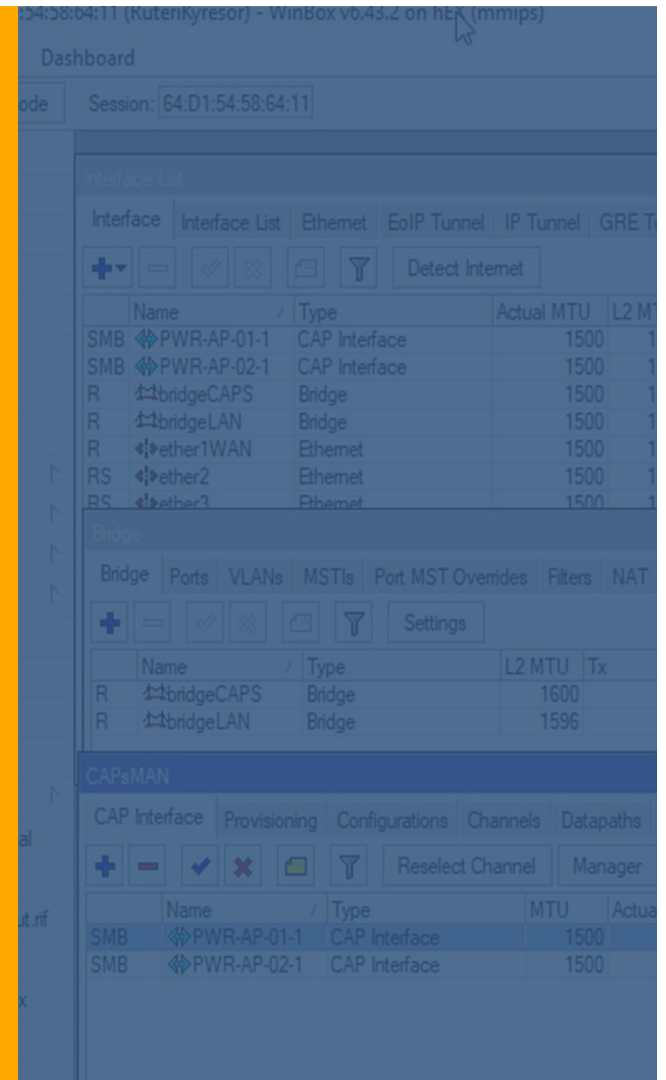
CAPsMAN, is a centralizing system by MikroTik. It gives the possibility to create a system of controlled access points, called CAPs, by a Controller called CAPsManager.

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: $41^{\circ} 17' 60.00''$ N
Longitude: $19^{\circ} 26' 60.00''$ 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

- +Supported 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



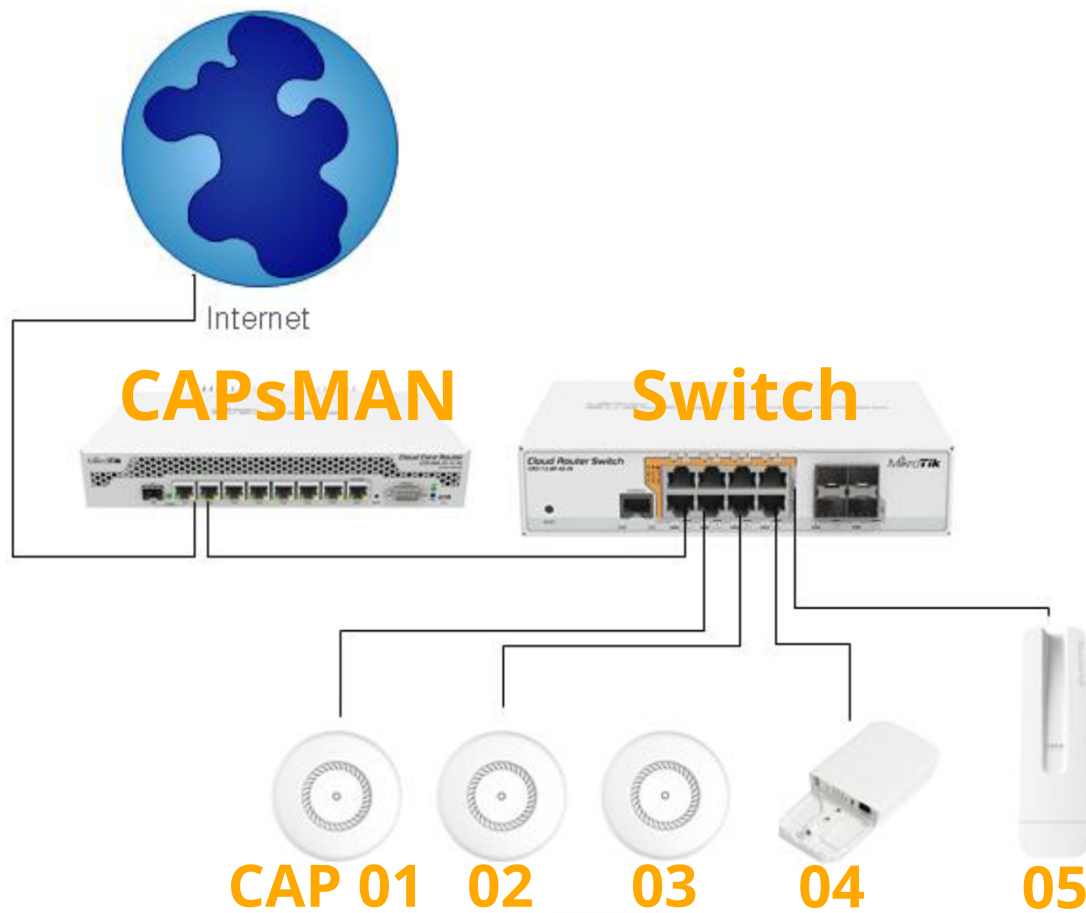
SXT2 & SXT SA5

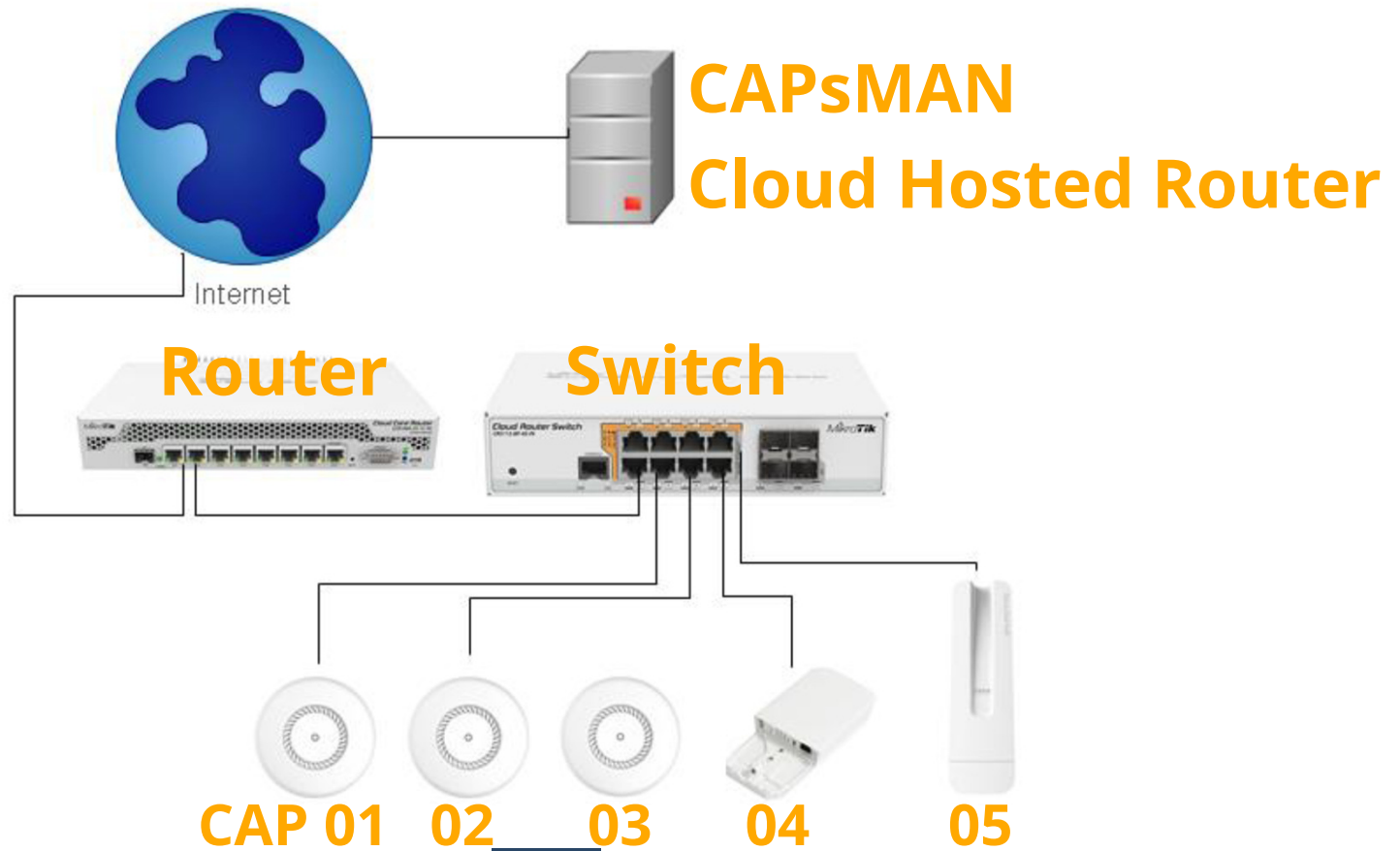


OmniTik 5ac



wAP ac Dual Band

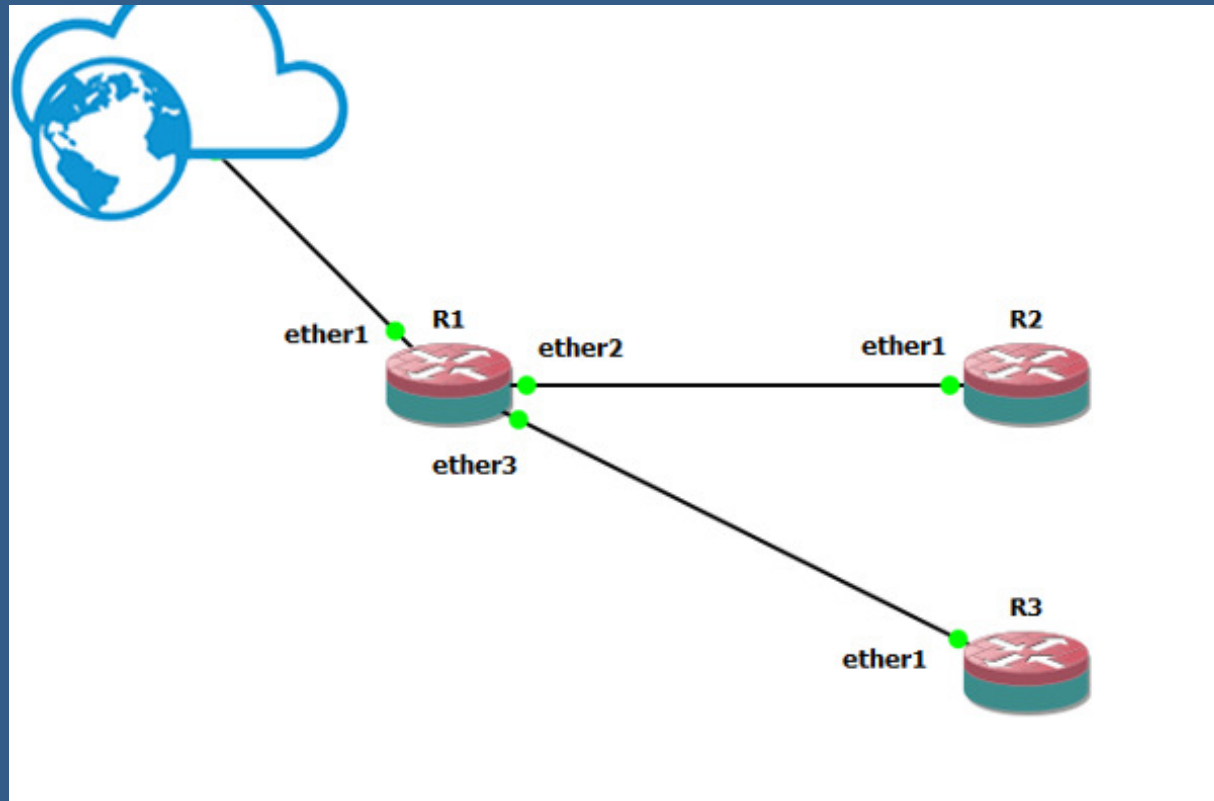




CAPsMAN

 in 5 minutes

Let us take in consideration the network diagram below



ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

Safe Mode Session: 192.168.2.33

Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Switch
Mesh
IP
MPLS
OpenFlow
Routing
System
Queues
Files
Log
RADIUS
Tools
New Terminal
MetaROUTER

Interface List

Interface	Name	Type	Actual MTU	L2 MTU	Tx	Rx
R	bridge 1	Bridge	1500	65535		0 bps
R	ether1Wan	Ethernet	1500	1598	80.5 kbps	11.0 kbps
R	ether2	Ethernet	1500	1598	0 bps	0
	ether3	Ethernet	1500	1598	0 bps	0
	ether4	Ethernet				
	ether5	Ethernet				
X	wlan1	Wireless (Atheros AR9...				
X	wlan2	Wireless (Atheros AR9...				

Address List

Address	Network	Interface
D 192.168.2.33/24	192.168.2.0	ether1Wan

DHCP Client

DHCP Client DHCP Client Options

Interface	Use P...	Add D...	IP Address	Expires After	Stat
ether1Wan	yes	yes	192.168.2.33/24	23:56:15	bound

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

Bridge

Bridge Ports VLANs MS

+ - ✓ ✗

Name	Type
bridge1	Brid

1 item out of 8

1

2

New Interface

General STP VLAN Status Traffic

Name: bridgeCAPS

Type: Bridge

MTU:

Actual MTU:

L2 MTU:

MAC Address:

ARP: enabled

ARP Timeout:

Admin. MAC Address:

Ageing Time: 00:05:00

IGMP Snooping

DHCP Snooping

Fast Forward

3

4

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Torch

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

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

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Files
Log

Address List

Address	Network	Interface
192.168.2.33/24	192.168.2.0	ether1Wan

1 item

New Address

Address: 192.168.8.1/24
Network:
Interface: bridgeCAPS

OK
Cancel
Apply
Disable
Comment
Copy

enabled

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

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

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Quick Set
CAPsMAN
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Queues
Files

Address List

Address	Network
ARP	192.168.2.0
	192.168.8.0

New NAT Rule

Advanced Extra Action Statistics ...

Action: masquerade

Log

Log Prefix: []

To Ports: []

OK
Cancel
Apply
Disable
Comment
Copy
Remove
Reset Counters
Reset All Counters

1
2
3
4

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

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

Safe Mode Session: 192.168.2.33

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- OpenFlow
- Routing
- System
- Queues
- Files
- Log

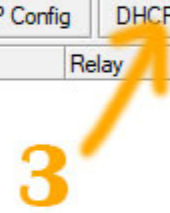
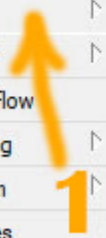
- ARP
- Accounting
- Addresses
- Cloud
- DHCP Client
- DHCP Relay
- DHCP Server
- DNS
- Firewall
- Hotspot
- IPsec
- Kid Control
- Neighbors

DHCP Server

DHCP Networks Leases Options Option Sets Alerts

+ - ✓ ✕ ⏏ DHCP Config DHCP Setup

Name	Interface	Relay	Lease Time
0 items			



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

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

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CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio ...

+ - ✓ ✗ 📄 🗑️ Reselect Channel Manager

Name	Type	MTU	Actual MTU	2 MTU	Tx	Rx
0 items out of 9						

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

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

Safe Mode Session: 192.168.2.33

CAPsMAN

Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio Registration Ta

New CAPs Security Configuration

Name: security1

Authentication Type: WPA PSK WPA2 PSK WPA EAP WPA2 EAP

Encryption: aes ccm tkip

Group Encryption: []

Group Key Update: []

Passphrase: mikrotikriga

Disable PMKID: []

AP Methods: []

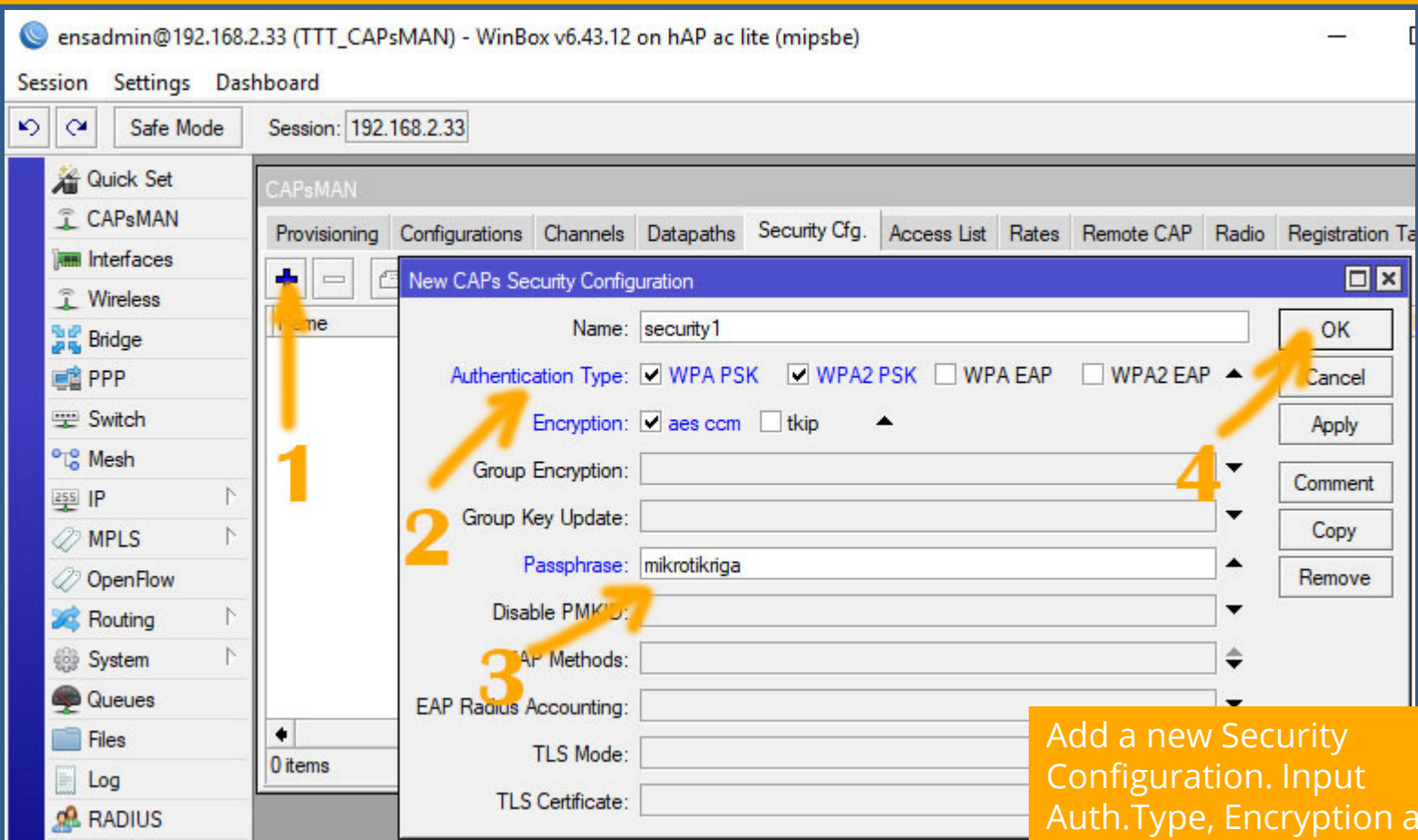
EAP Radius Accounting: []

TLS Mode: []

TLS Certificate: []

OK Cancel Apply Comment Copy Remove

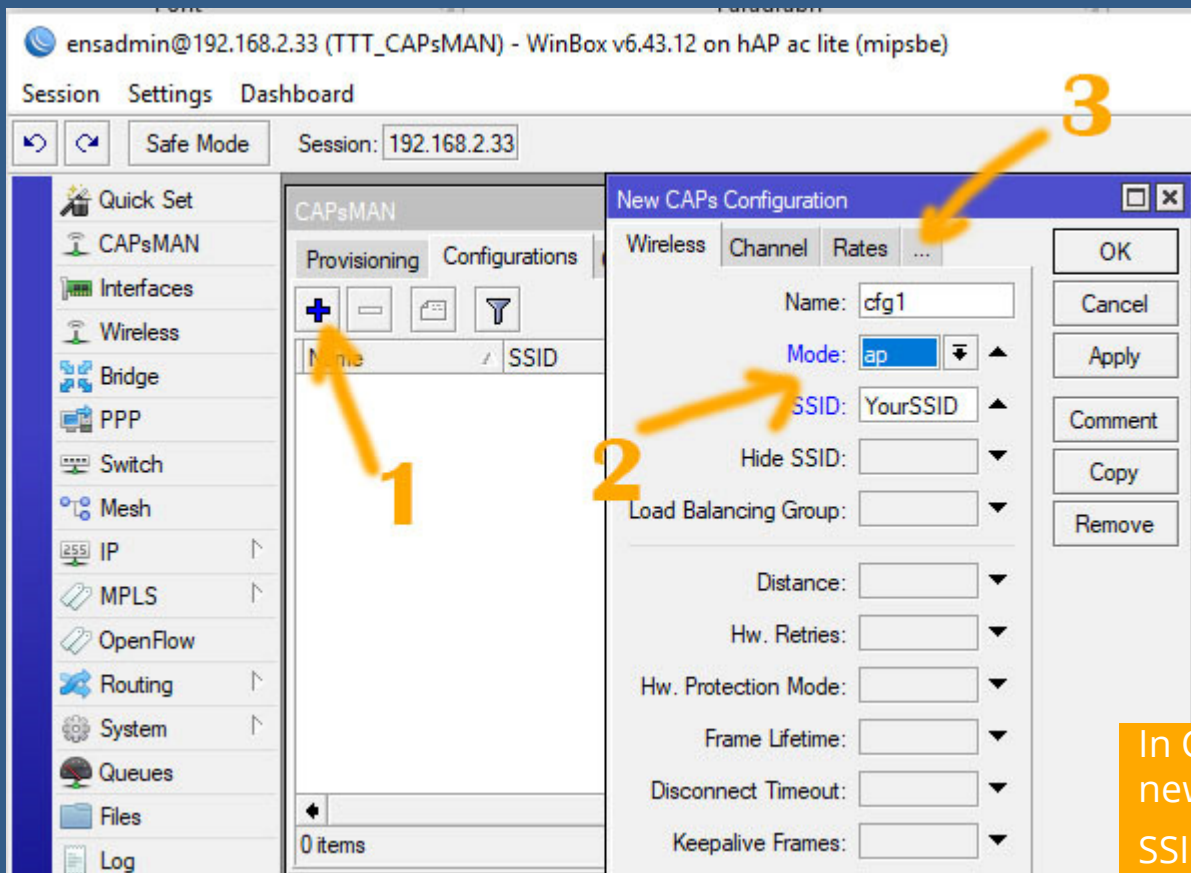
0 items



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

The screenshot shows the WinBox interface for CAPsMAN configuration. The 'Datapaths' tab is selected. A dialog box titled 'New CAPs Datapath Configuration' is open, allowing for the creation of a new datapath. The 'Name' field is set to 'datapath1'. The 'Bridge' dropdown menu is set to 'bridgeCAPS'. The 'Client To Client Forwarding' field is circled in yellow. Orange annotations include: '1' pointing to the '+' icon to add a new datapath; '2' pointing to the 'Bridge' dropdown menu; and '3' pointing to the 'OK' button.

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.

ensadmin@192.168.2.33 (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

Safe Mode Session: 192.168.2.33

Quick Set
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Interfaces
Wireless
Bridge
PPP
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IP
MPLS
OpenFlow
Routing

CAPsMAN
Provisioning Configurations

New CAPs Configuration

Channel Rates Datapath Security ...

Datapath: datapath1

MTU: 33
L2 MTU:
ARP: configurations
Bridge: ?
Bridge Cost: SSID
Bridge Horizon:

New CAPs Configuration

Channel Rates Datapath Security ...

Security: security1

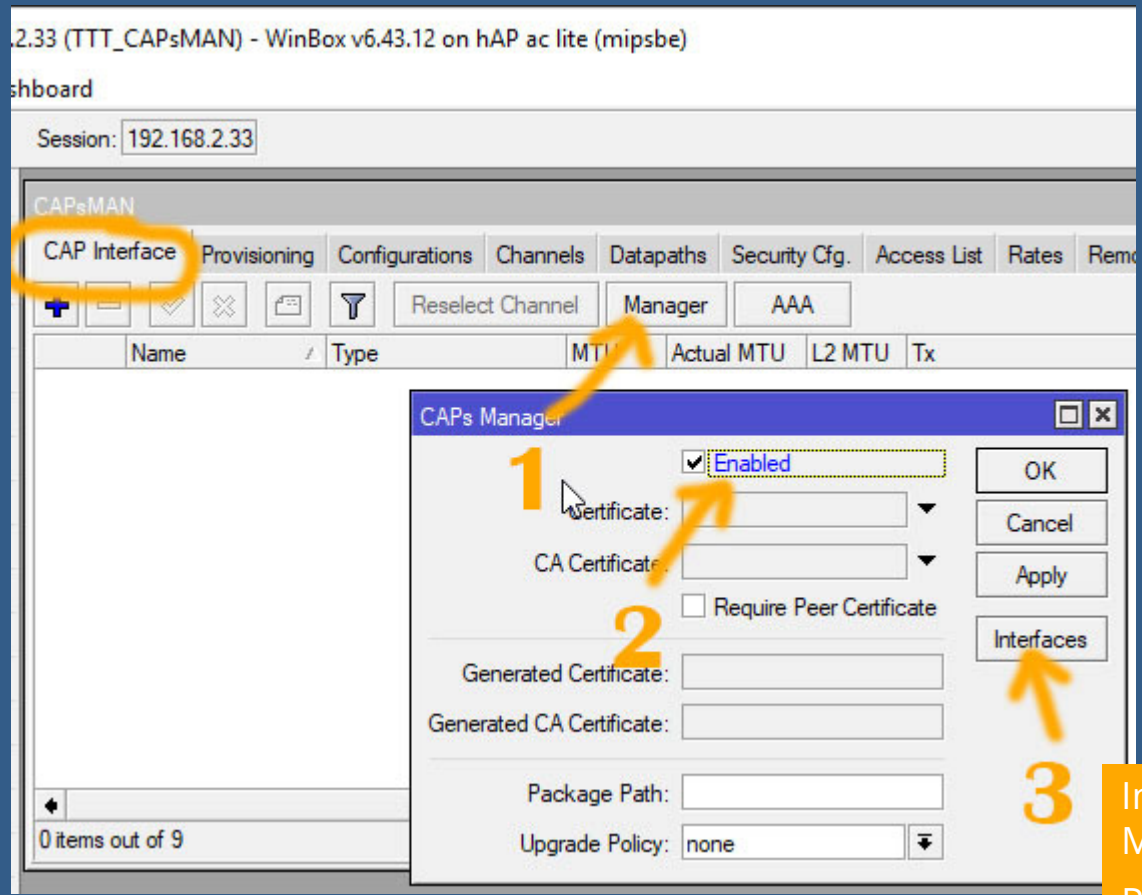
Authentication Type:
Encryption:
Group Encryption:
Group Key Update:

OK
Cancel
Apply
Commit
Copy
Remove

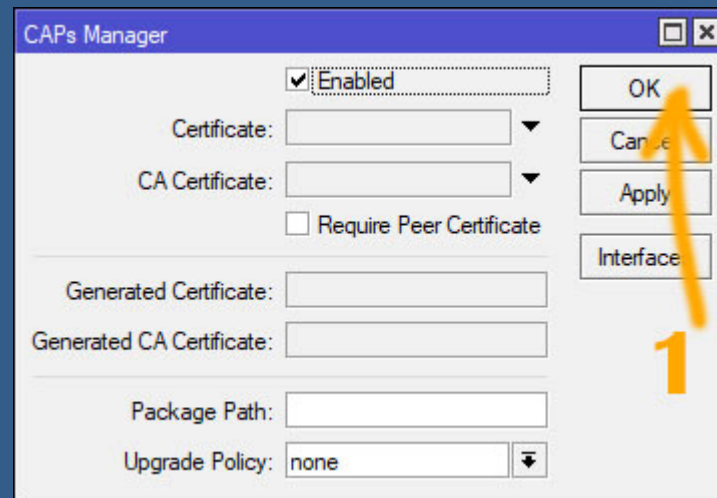
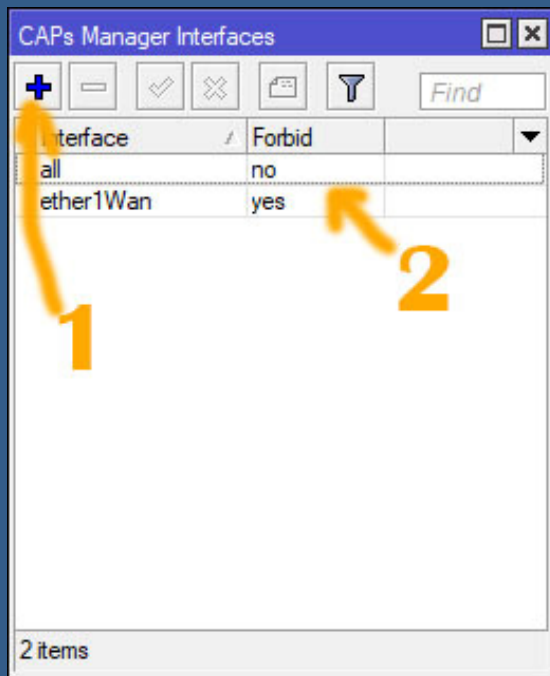
In Datapath, choose our datapath named: "datapath1".
In Security, choose our security profile: security1

The screenshot shows the WinBox interface for CAPsMAN provisioning. On the left is a sidebar menu with categories like Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, OpenFlow, Routing, System, Queues, Files, and Log. The main area is split into 'CAP Interface' and 'Provisioning' tabs. The 'Provisioning' tab is active, showing a table with 'Radio MAC' as the header and '0 items' at the bottom. A 'New CAPs Provisioning' dialog box is open over the table, containing the following fields: Radio MAC (00:00:00:00:00:00), Hw. Supported Modes, Identity Regexp, Common Name Regexp, IP Address Ranges, Action (create enabled), Master Configuration (cfg1), Slave Configuration, Name Format (identity), and Name Prefix. On the right side of the dialog are buttons for OK, Cancel, Apply, Disable, Comment, Copy, and Remove. Four orange arrows with numbers 1 through 4 point to: 1. The plus icon in the CAP Interface tab; 2. The 'New CAPs Provisioning' dialog box; 3. The 'Action' dropdown menu; 4. The 'Apply' button.

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

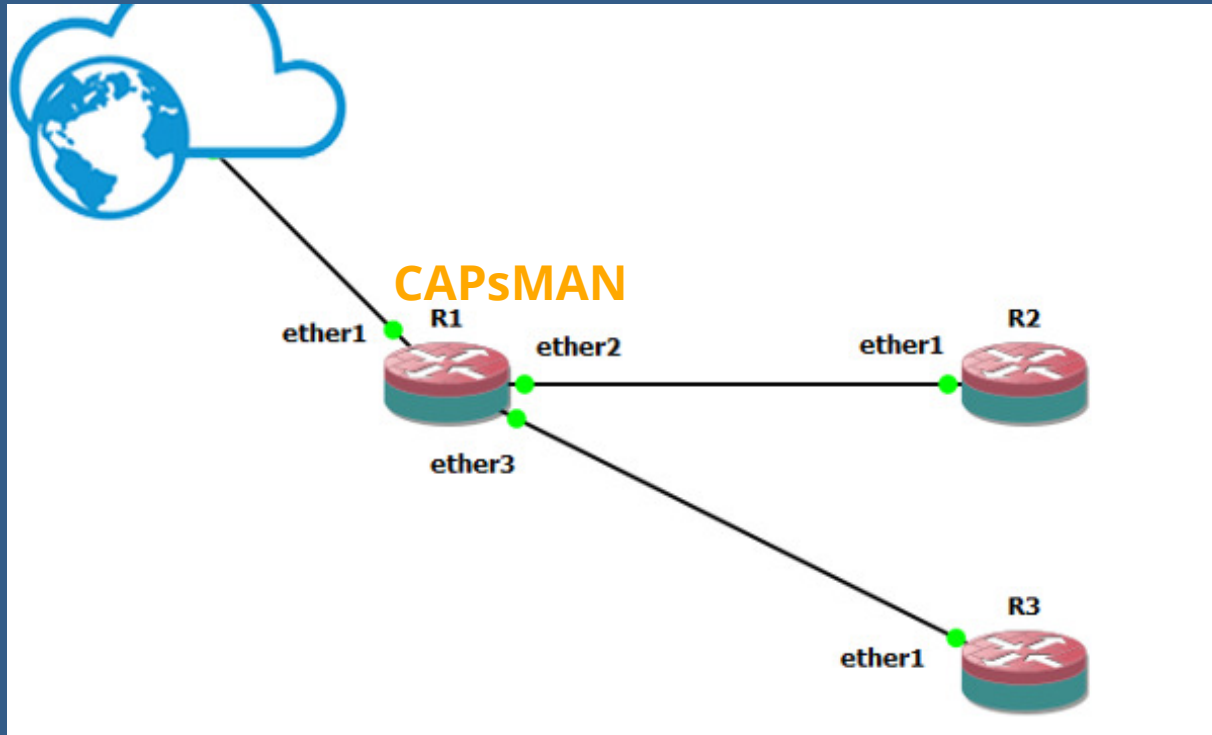


In CAP Interface, press:
Manager, Enable it.
Press Interfaces button



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.

ensadmin@CC:2D:E0:28:5C:6F (TTT_CAPsMAN) - WinBox v6.43.12 on hAP ac lite (mipsbe)

Session Settings Dashboard

Safe Mode Session: CC:2D:E0:28:5C:6F

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- OpenFlow
- Routing
- System
- Queues
- Files
- Log
- RADIUS

Wireless Tables

WiFi Interfaces W60G Station Nstreme Dual Access List Registration CAP WPS Client Setup Rep

	Name	Type	Actual M
	-- managed by CAPsMAN		
	-- channel: 2442/20-Ce/gn(30dBm), SSID: YourSSID, CAPsMAN forwarding		
X	wlan1	Wireless (Atheros AR9300)	
	-- managed by CAPsMAN		
	-- channel: 5785/20-eeCe/ac(30dBm), SSID: YourSSID, CAPsMAN forwarding		
X	wlan2	Wireless (Atheros AR9888)	

2 items out of 13

CAP

Enabled

Interfaces: wlan1
wlan2

Certificate: none

Discovery Interfaces: ether2

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: none

Static Virtual

Requested Certificate:

Locked CAPsMAN Commo

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

CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio

+ - ✓ ✕ 📄 🗑️ Reselect Channel Manager AAA

	Name	Type	MTU	Actual MTU	L2 MTU	Tx	Rx
SMB	R2-1	CAP Interface	1500	1500	1600		0 bps
RSMB	R2-2	CAP Interface	1500	1500	1600		0 bps
SMB	TTT_CAPsMAN-1	CAP Interface	1500	1500	1600		0 bps
SMB	TTT_CAPsMAN-2	CAP Interface	1500	1500	1600		0 bps

◀ 4 items out of 13

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.

CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio Registration Table

CAPs Scanner Find

Interface	SSID	MAC Address	EAP Identity	Tx Rate	Rx Rate	Tx Signal	Rx Signal	Uptime	Tx/Rx Packets	Tx/Rx Bytes
Wifi02-1	mulliri	C4:93:D9:2E:54:55		39Mbps-...	39Mbps-...	0	-75	06:29:47...	15 337/12 229	13.2 MiB/2050.5 ...
Wifi02-1	mulliri	CC:73:14:3C:AF:D2		21.6Mbp...	1Mbps	0	-87	01:49:12...	68 425/46 651	80.2 MiB/5.6 MiB
Wifi02-1	mulliri	88:83:22:38:DB:6A		57.7Mbp...	65Mbps-...	0	-68	00:49:34...	2 481/2 445	667.7 KiB/1147.3...
Wifi02-1	mulliri	5C:51:81:B5:EC:09		52Mbps-...	58.5Mbp...	0	-66	00:44:06...	1 902/2 030	1499.3 KiB/279.6...
Wifi02-1	mulliri	EC:10:7B:6F:7C:F2		52Mbps-...	26Mbps-...	0	-77	00:42:11...	366/357	102.7 KiB/50.8 KiB
Wifi02-1	mulliri	24:18:1D:33:BA:BE		115.5Mb...	130Mbps...	0	-62	00:35:36...	15 253/10 830	18.7 MiB/1476.8 ...
Wifi02-1	mulliri	04:D6:AA:B8:09:7F		130Mbps...	86.6Mbp...	0	-64	00:32:40...	131 492/27 702	169.5 MiB/2939.0...
Wifi02-1	mulliri	28:3F:69:57:D5:5B		58.5Mbp...	13Mbps-...	0	-70	00:07:30...	2 443/2 313	2672.8 KiB/248.6...
Wifi02-1	mulliri	0C:D7:46:8B:92:34		58.5Mbp...	39Mbps-...	0	-82	00:03:06...	3 651/3 175	4161.3 KiB/383.3...
Wifi02-1	mulliri	04:B1:67:1E:97:CA		1Mbps	1Mbps	0	-81	00:00:25...	9/11	1994 B/1522 B

10 items

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 tuning

Use only non-overlapping
Permit only g/n
Limit data-rates

VLANs

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

Virtual SSID

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

Access Control

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



The screenshot shows the CAPsMAN interface with the 'Channels' tab selected. A table lists three channels: channel1 (2412), channel6 (2437), and channel11 (2462), all with a band of 2ghz-g/n. A configuration dialog for 'channel1' is open, showing fields for Name, Frequency, Control Channel Width, Band, Extension Channel, Tx Power, Save Selected, Reselect Interval, and Skip DFS Channels. The dialog also includes buttons for OK, Cancel, Apply, Comment, Copy, and Remove.

Name	Frequency	Control Channel ...	Band
channel1	2412		2ghz-g/n
channel6	2437		2ghz-g/n
channel11	2462		2ghz-g/n

3 items

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.

CAPsMAN

Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio Registration Table ...

+ - ✓ ✕ 📄 🔍 Find

#	MAC Address	MAC Mask	Interface	Signal Range	Action	Client To Clie...	VLAN Mo...	VLAN ID	
0	↕		all	-80..120	accept				
1	↕		all	-120..-81	reject				

```

/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.

CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio ...

+ - ✓ ✗ 📁 🔍 Find

#	Radio MAC	Identity Regexp	Common Nam...	Action	Master Configurati...	Slave Configuration
0	00:00:00:00:00:00			create en...	cfg1	cfg2GuestStaff, cfg3Finance

1 item (1 selected)

CAPs Provisioning <00:00:00:00:00:00>

Radio MAC: 00:00:00:00:00:00

Hw. Supported Modes: [dropdown]

Identity Regexp: [text]

Common Name Regexp: [text]

IP Address Ranges: [dropdown]

Action: create enabled

Master Configuration: cfg1

Slave Configuration: cfg2GuestStaff

 cfg3Finance

Name Format: identity

Name Prefix: [dropdown]

OK Cancel Apply Disable Comment Copy Remove

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

CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Access List Rates Remote CAP Radio ...

+ - ✓ ✗ [Icon] [Icon] Reselect Channel Manager AAA Find

	Name	Type	MTU	Actual MTU	L2 MTU	Tx	Rx
SMB	↔ R2-1	CAP Interface	1500	1500	1600		0 bps
SB	↔ R2-1-1	CAP Interface	1500	1500	1600		0 bps
SB	↔ R2-1-2	CAP Interface	1500	1500	1600		0 bps
SMB	↔ R2-2	CAP Interface	1500	1500	1600		0 bps
SB	↔ R2-2-1	CAP Interface	1500	1500	1600		0 bps
RSB	↔ R2-2-2	CAP Interface	1500	1500	1600		0 bps
SMB	↔ TTT_CAPsMAN-1	CAP Interface	1500	1500	1600		0 bps
SB	↔ TTT_CAPsMAN-1-1	CAP Interface	1500	1500	1600		0 bps
SB	↔ TTT_CAPsMAN-1-2	CAP Interface	1500	1500	1600		0 bps
SMB	↔ TTT_CAPsMAN-2	CAP Interface	1500	1500	1600		0 bps
SB	↔ TTT_CAPsMAN-2-1	CAP Interface	1500	1500	1600		0 bps
SB	↔ TTT_CAPsMAN-2-2	CAP Interface	1500	1500	1600		0 bps

12 items out of 25

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



WinBox v6.44.1 on CCR1009-7G-1C (tile)

Session Settings Dashboard

Safe Mode Session: [REDACTED]

Quick Set CAPsMAN Interfaces Wireless Bridge PPP Mesh IP MPLS Routing System Queues Files Log RADIUS Tools New Terminal LCD Partition Make Supout.tif Manual

CAPsMAN

CAP Interface Provisioning Configurations Channels Datapaths Security Cfg. Acc

+ - [check] [x] [info] [filter] Reselect Channel Manager AAA

	Name	Type	MTU	Actual
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	
SB	B307-2-1	CAP Interface	1500	

506 items out of 518

Resources

Uptime: 10d 08:44:36 OK

Free Memory: 630.6 MiB PCI

Total Memory: 960.0 MiB USB

CPU: tilegx CPU

CPU Count: 9 IRQ

CPU Frequency: 1000 MHz

CPU Load: 3% Proc. Usage

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

Interface number

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

