

# CAPsMAN Quick Setup Guide, Latest version new features , How to maintain a failover controller(CAPsMAN)



Georgios Argyrides

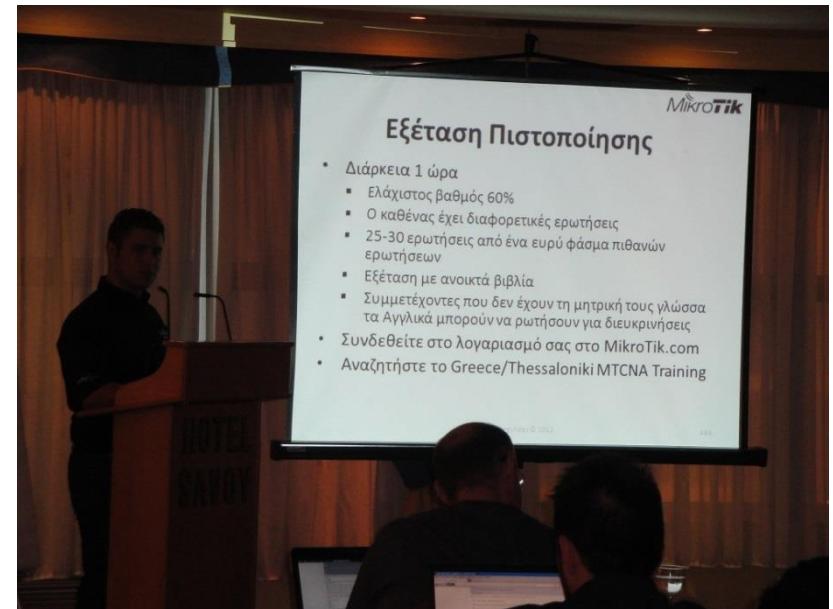
MUM Middle East - Dubai

17<sup>th</sup> October 2016

# About Me

My Name:  
Georgios Argyrides

➤ You can call me “George”  
(its easier)



# About Me

- Born in Cyprus  
(Europe, Near Greece)
  - Can Speak English & Greek

## Experience:

- Computer Technician
  - Satellite TV & Aerial Engineer
  - VoIP Consultant / Voice Engineer
  - Systems / Network Administrator
  - Server Infrastructure Engineer
  - Internet Security Consultant
  - ISP / WISP Consultant
- 
- 1<sup>st</sup> MikroTik Certified Consultant in Greece since 2011
  - 1<sup>st</sup> MikroTik Certified Trainer in Greece since 2012



# About Me

## **Education: Academic & Professional Qualifications**

- BSc (Hon) Applied Computing (UK)
- All MikroTik Certificates
  - MTCNA,MTCRE,MTCWE,MTCTCE,MTCUME,MTCINE
- MikroTik Certified Trainer
- Cyberoam Certified Network & Security Professional (CCNSP)
- RIPE Database Expert Course

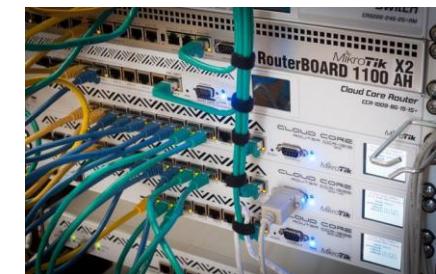
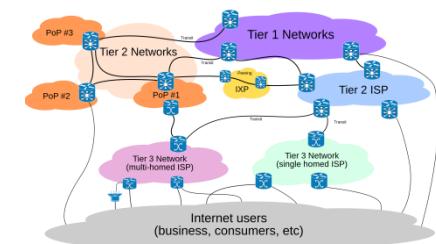
# About Me

- Providing MikroTik Training (On-Site)



- Providing On-Demand/Long Term worldwide:
  - Consultancy Services
  - Network Architecture Services
  - Project Management Services

➤ My contact details at the end of this Presentation



# This Presentation Objective

- CAPsMAN Quick Setup
- Latest CAPsMAN new features
- Some Wireless-rep new features
- How to maintain a failover controller (CAPsMAN)

# CAPsMAN Features

- Centralized management of RouterOS APs
- Dual Band AP support
- Provisioning of APs
- MAC and IP Layer communication with APs
- Certificate support for AP communication
- Full and Local data forwarding mode
- RADIUS MAC authentication
- Custom configuration support

# Definitions

?CAP?? CAPs? CAPsMAN? AP? Router?

## CAPsMAN

- Controlled Access Point system Manager

➤ CAPsMAN = a MikroTik router

## CAP

- Controlled Access Point

➤ CAP = a MikroTik router

➤ CAPs = many Mikrotik routers

# Requirements

| CAPsMAN                                      | CAPs  |
|--|---|
| 1. x86 or RouterBOARD based device           | 1. X86 or RouterBOARD based device            |
| 2. RouterOS v6.11+ version (Use Latest!)     | 2. RouterOS v6.11+ version(Use Latest!)       |
| 3. Wireless-fp package installed and enabled | 3. Atheros chipset (a/b/g/n/ac) wireless card |
|  | 4. Wireless-fp package installed and enabled  |
|  | 5. At least Level4 RouterOS license           |

# CAPsMAN v1 & v2

- ❖ Wireless-fp package introduces CAPsMAN v1 (2014 ROS v6.11+)
- ❖ Wireless-cm2 package introduces CAPsMAN v2 (2015 ROS 6.23+)
  - Improvements
  - Some new features

| Package List          |                 |         |                      |                      |
|-----------------------|-----------------|---------|----------------------|----------------------|
|                       | Name            | Version | Build Time           | Scheduled            |
| 1                     | routeros-mipsbe | 6.33    | Nov/06/2015 12:49:27 |                      |
| 2                     | advancedt...    | 6.33    | Nov/06/2015 12:49:27 |                      |
| 3                     | dhcp            | 6.33    | Nov/06/2015 12:49:27 |                      |
| 4                     | hotspot         | 6.33    | Nov/06/2015 12:49:27 |                      |
| 5                     | ipv6            | 6.33    | Nov/06/2015 12:49:27 |                      |
| 6                     | mpls            | 6.33    | Nov/06/2015 12:49:27 |                      |
| 7                     | ppp             | 6.33    | Nov/06/2015 12:49:27 |                      |
| 8                     | routing         | 6.33    | Nov/06/2015 12:49:27 |                      |
| 9                     | security        | 6.33    | Nov/06/2015 12:49:27 |                      |
| 10                    | system          | 6.33    | Nov/06/2015 12:49:27 |                      |
| 11                    | wireless-cm2    | 6.33    | Nov/06/2015 12:49:27 | scheduled for enable |
| 12                    | wireless-fp     | 6.33    | Nov/06/2015 12:49:27 |                      |
| 12 items (1 selected) |                 |         |                      |                      |

- ❖ CAPsMAN v2 is already stable and is widely used
- ⊗ Warning: CAPsMAN/CAP v1 is not compatible with v2!
  - Upgrade or downgrade everything in the network

# CAPsMAN v2 New features

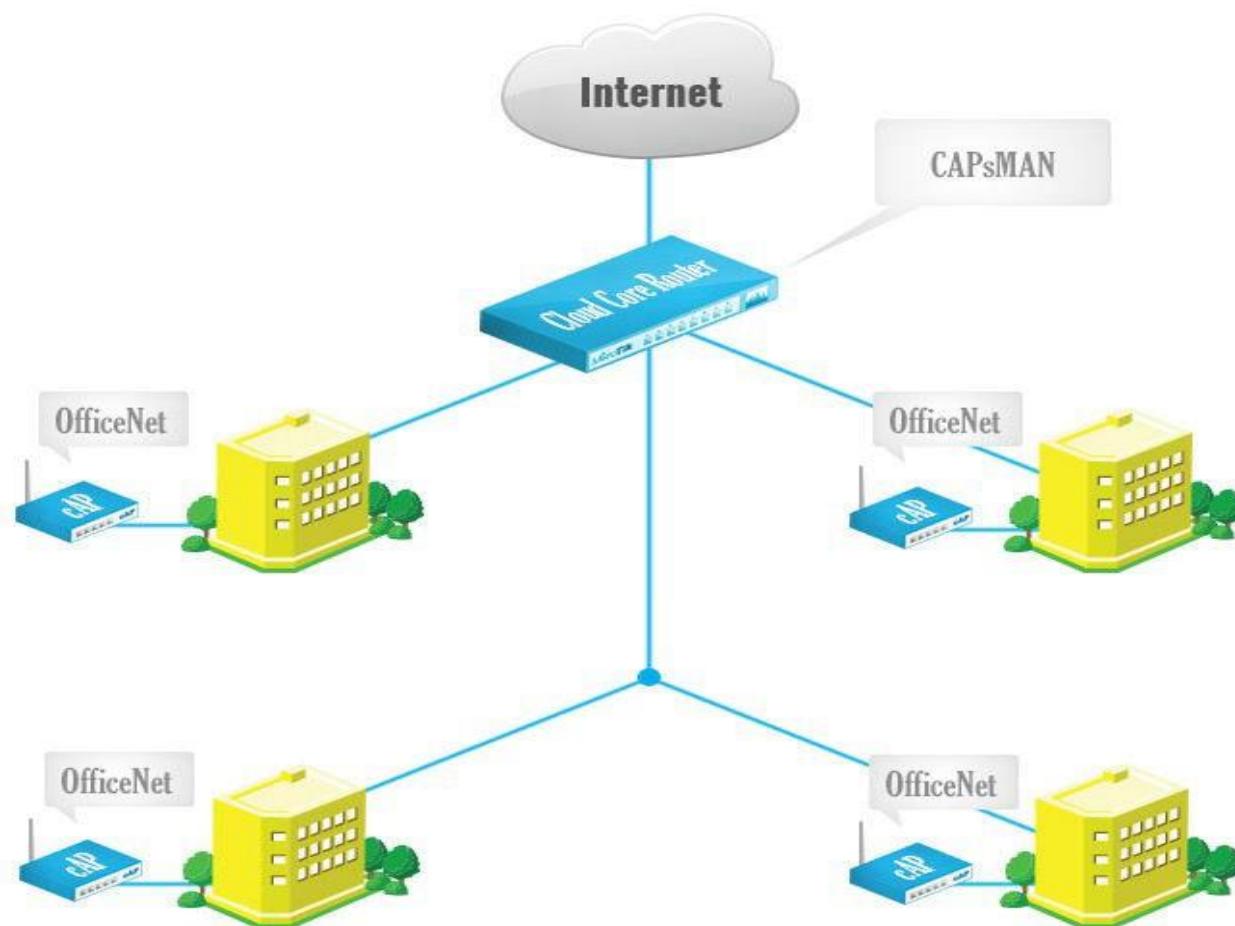
- CAPsMAN automatic upgrade of all CAP clients (configurable)
- Improved CAP<->CAPsMAN data connection protocol
- Added "Name Format, Name Prefix Identity/CommonName Regexp, IP Address Ranges" setting for Provision rules
- Improved logging entries when client roams between the CAPs
- Added L2 Path MTU discovery

# RouterOS 6.37 wireless-rep

Today 17<sup>th</sup> October 2016

- ❖ Wireless package for RouterOS 6.37:
  - Removes **all** existing wireless packages
  - Installs **wireless-rep**
  - **Wireless-rep** is renamed to **wireless**
- ❖ Using 6.37+ is strongly suggested for CAPsMAN
- Lets see CAPsMAN Quick Guide ,later we will discuss wireless-rep new features

# CAPsMAN Simple Setup

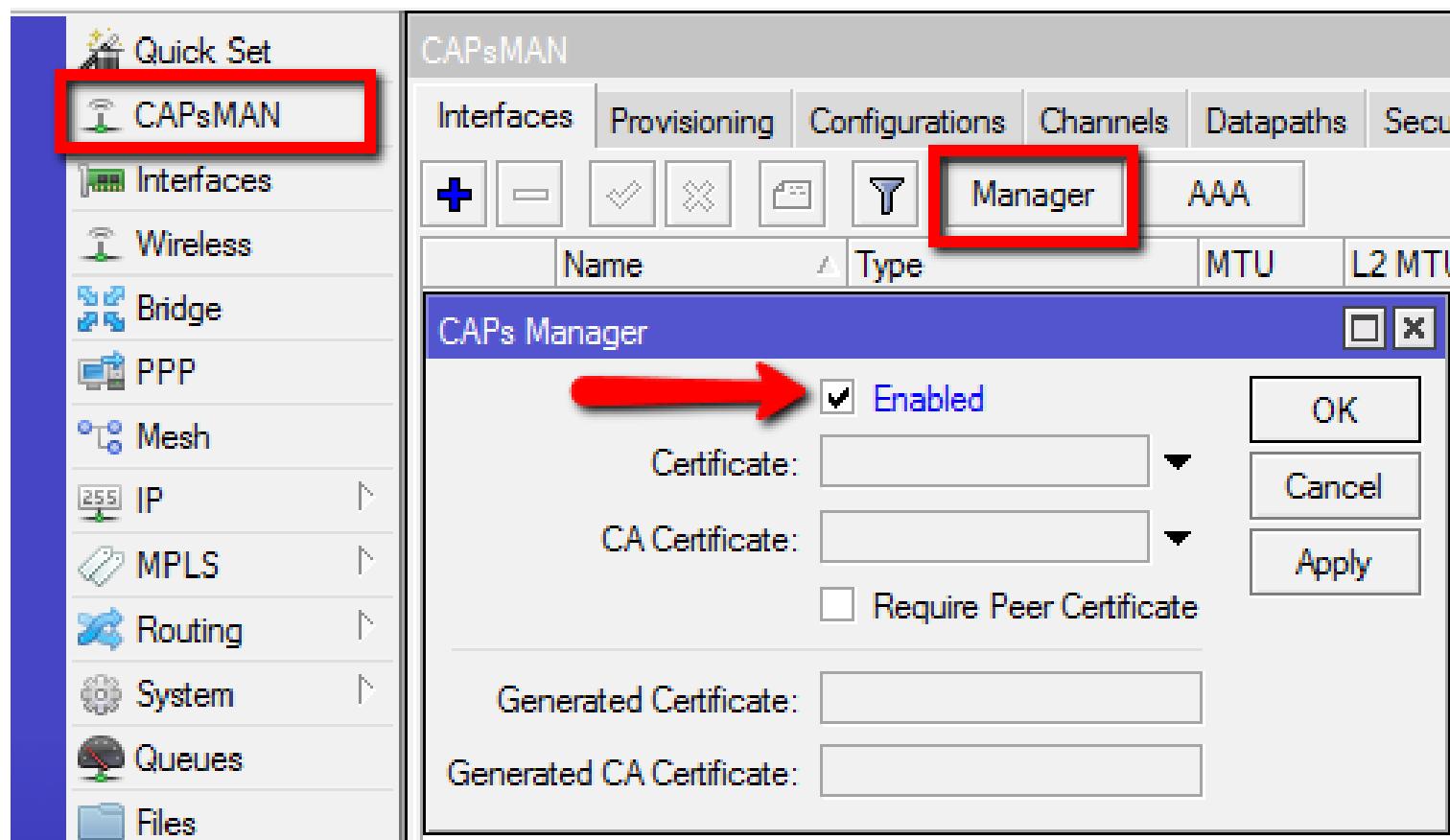


# CAPsMAN Simple Setup

- Enable CAPsMAN service
- Create Bridge interface
- Add IP configuration to Bridge interface
- Create CAPsMAN Configuration
- Create Provisioning rule
- Enable CAP mode on the APs

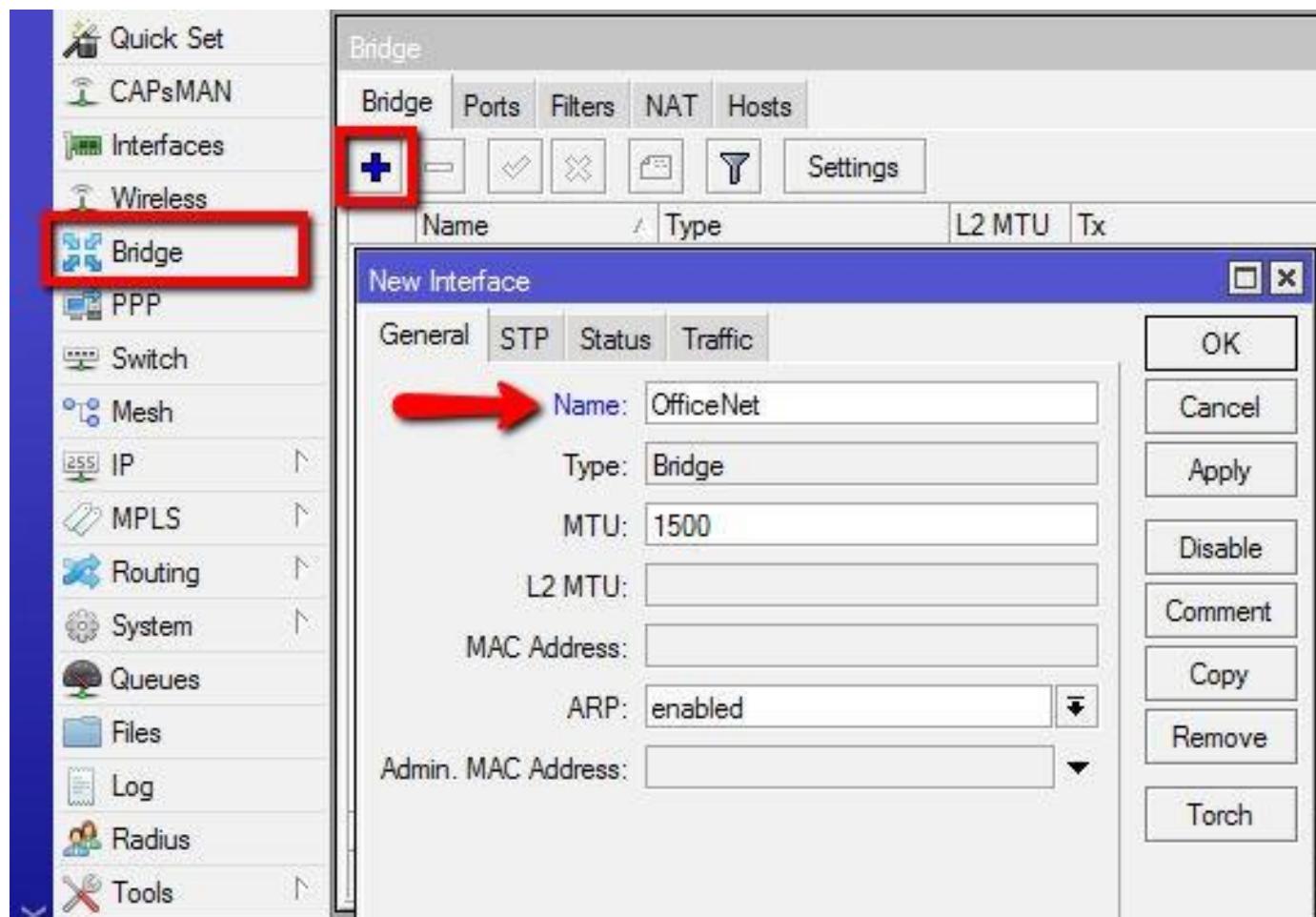
# CAPsMAN Simple Setup

- Enable the CAPsMAN service



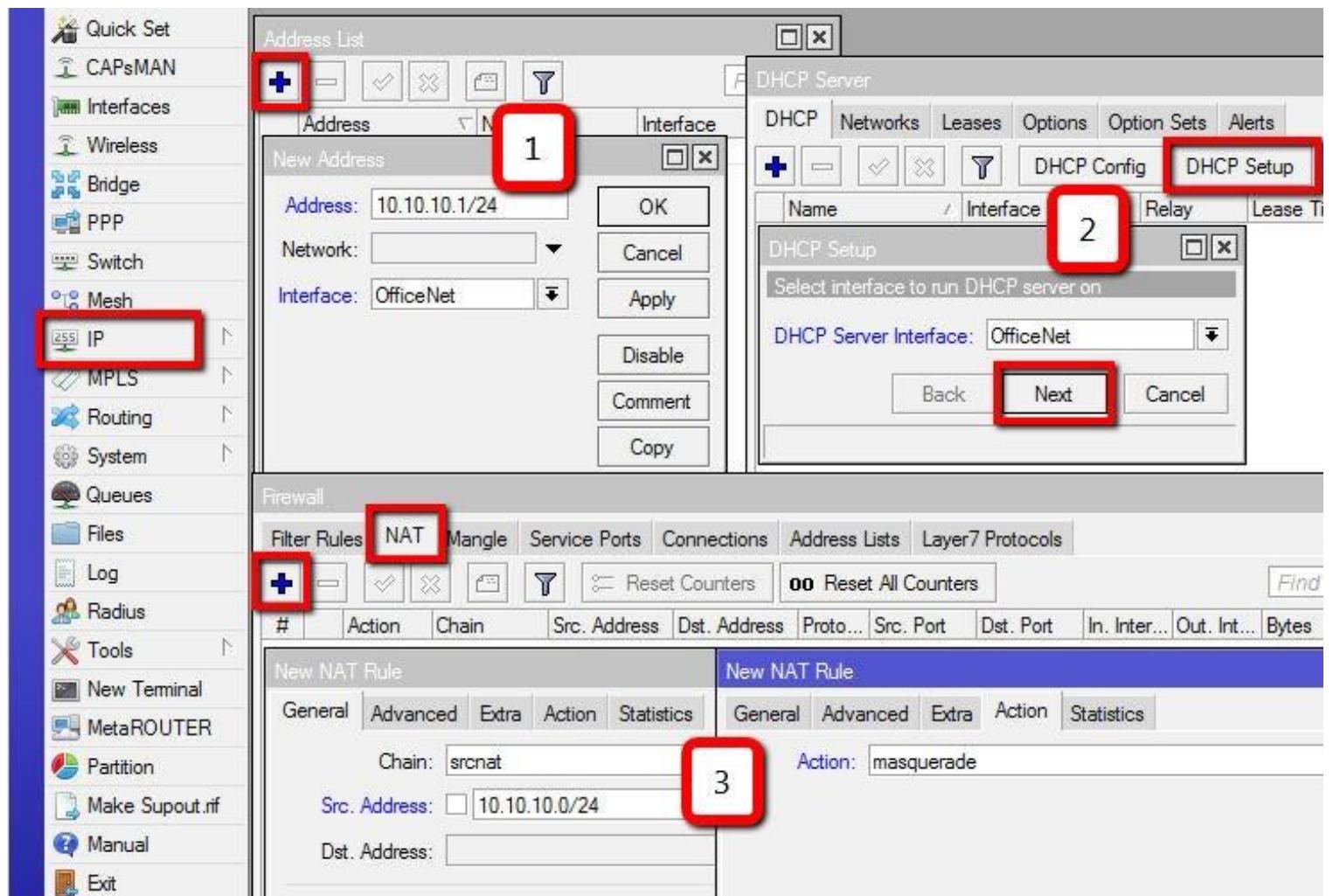
# CAPsMAN Simple Setup

- Create Bridge Interface



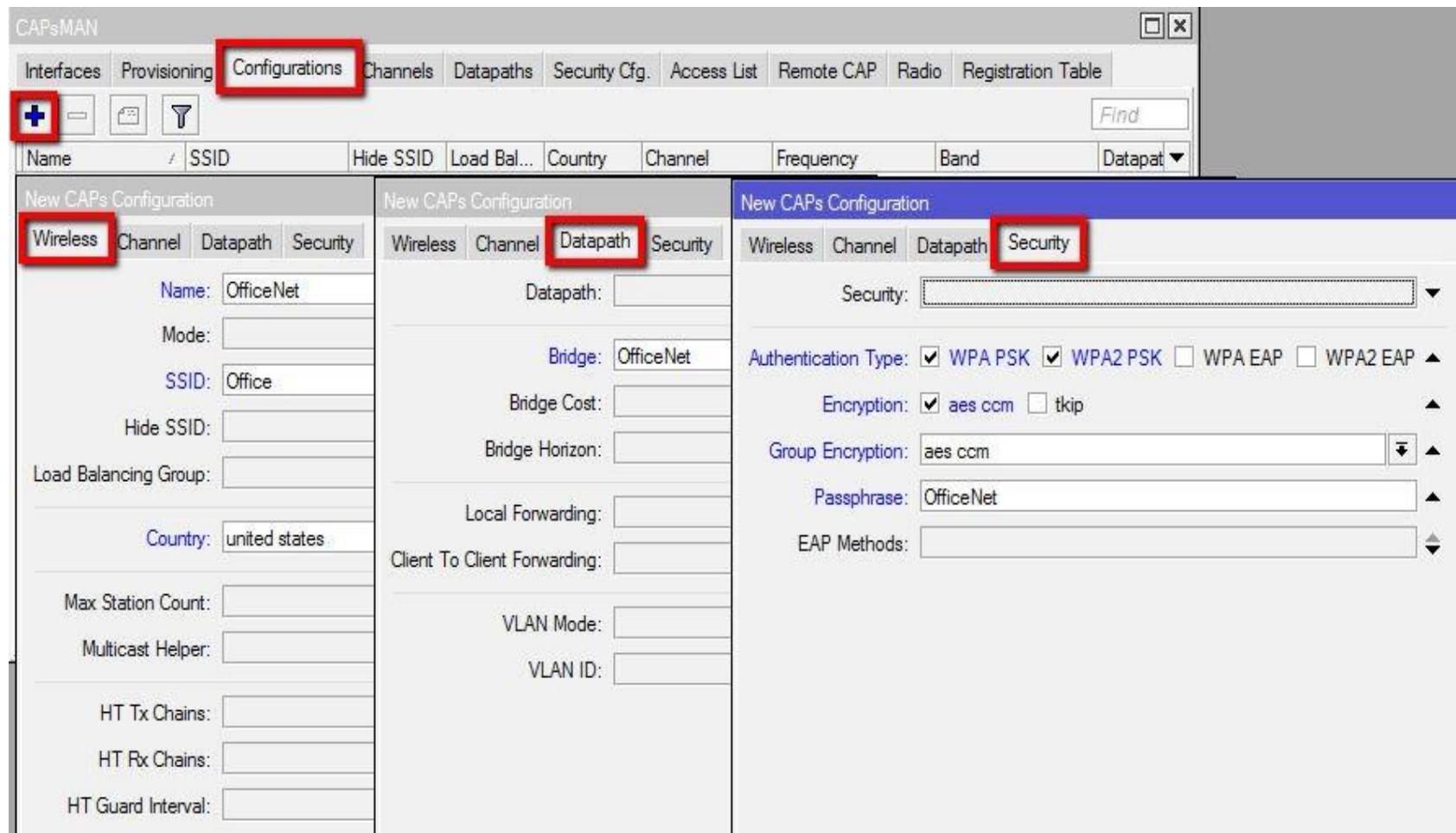
# CAPsMAN Simple Setup

1. Add IP address
2. Add DHCP Server
3. Add NAT rule



# CAPsMAN Simple Setup

- Add new CAPsMAN Configuration

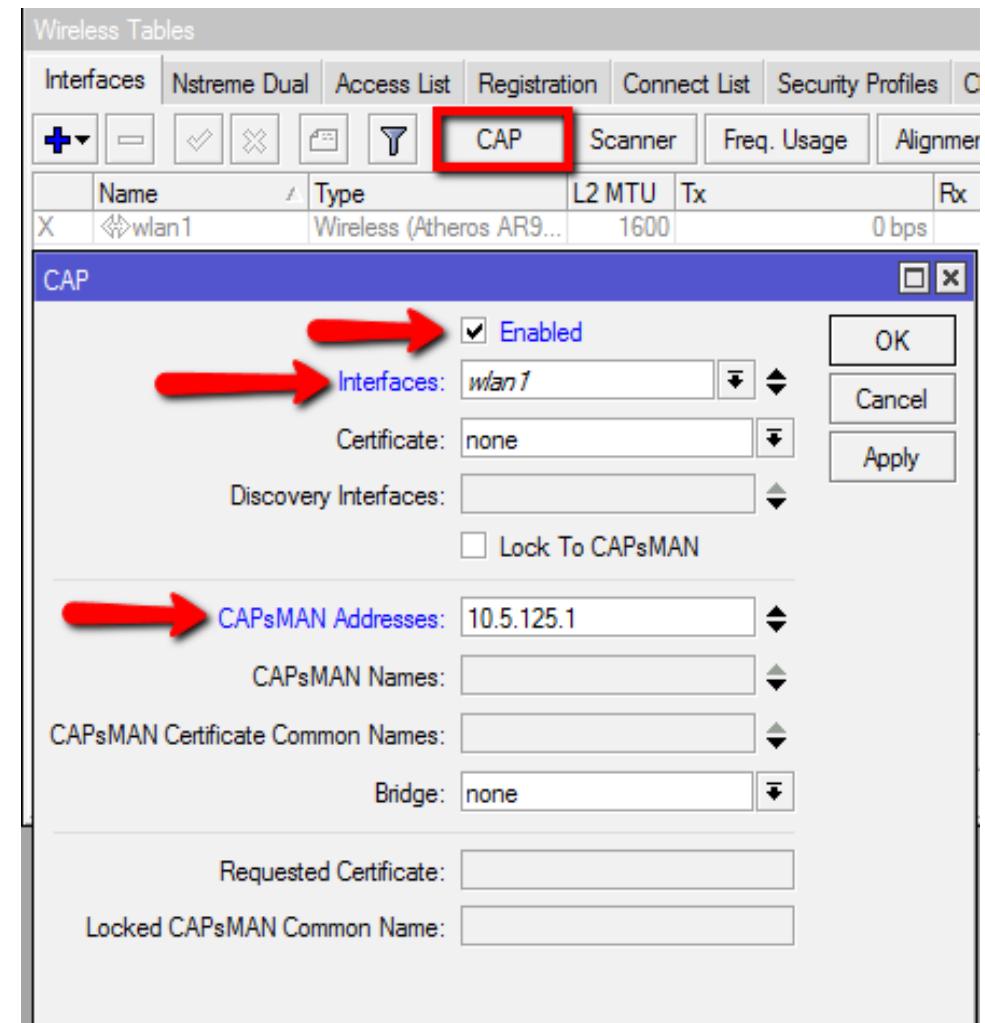


# CAP to CAPsMAN IP Based Connection

## IP (UDP) Layer3

- CAP communicates CAPsMAN using IP protocol
- ✓ Can traverse NAT when required
- Management connection between CAP and CAPsMAN is secured using DTLS
- CAP client data traffic is not secured
  - If encryption is required IPSec or encrypted tunnels can be used

## Specify IP on The CAP



# CAPsMAN and CAP in one board

- Does your CAPsMAN router has a wireless interface too?
- ✓ Enable CAP & Connect it to it self (127.0.0.1) for central management



Wireless Tables

| Interfaces   | Nstreme Dual                        | Access List              | Registration             | Connect List             | Secu                     |
|--|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="button" value="+"/> <input type="button" value="-"/> <input checked="" type="checkbox"/> <input type="button" value="X"/> <input type="button" value="F"/> <input type="button" value="T"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Name   | Type                                | L2 MTU                   | Tx                       |                          |                          |

**CAP**

Enabled

Interfaces:

Certificate:

Discovery Interfaces:

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

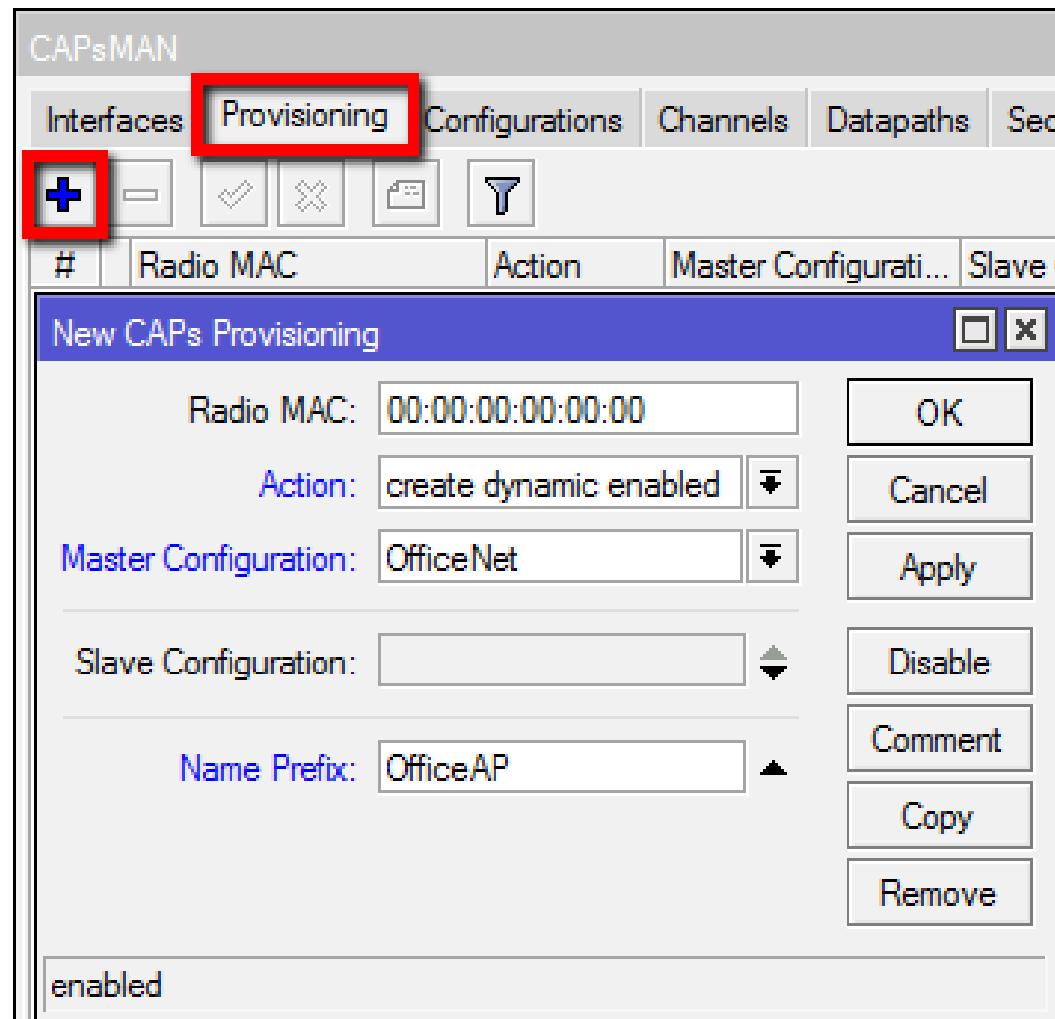
Bridge:

Requested Certificate:

Locked CAPsMAN Common Name:

# CAPsMAN Simple Setup

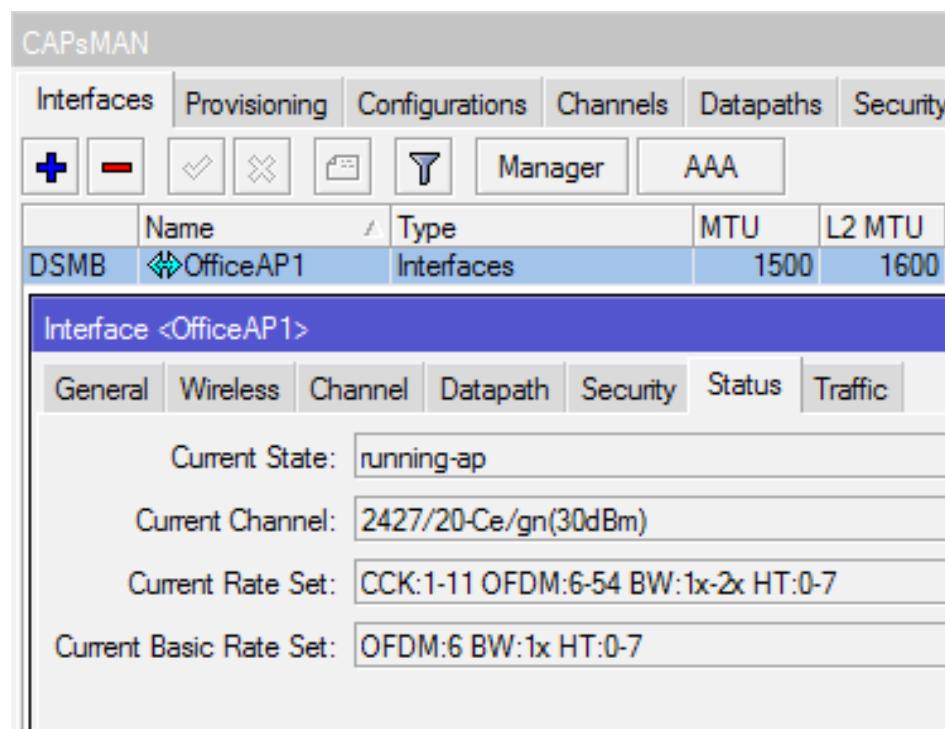
- Add new Provisioning rule



# CAPsMAN Simple Setup

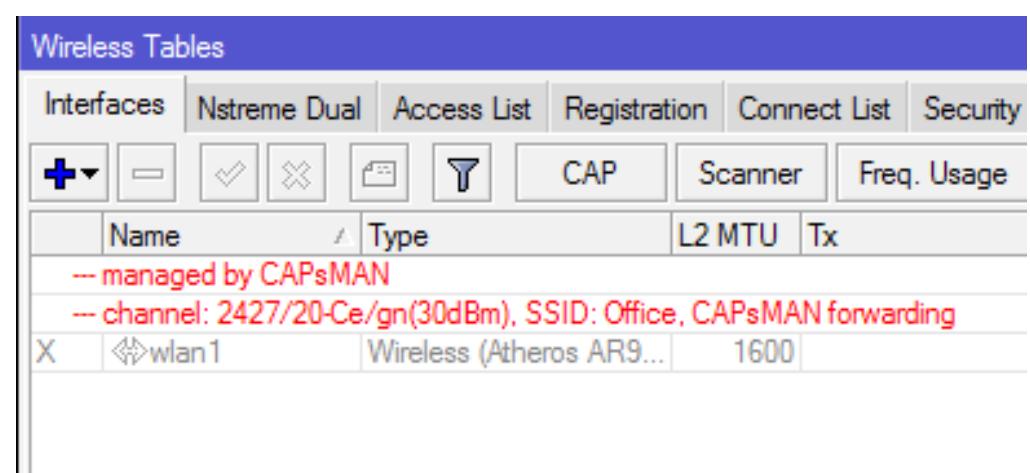
- Check the “Interface” status on:

CAPsMAN



The screenshot shows the CAPsMAN interface status screen. At the top, there's a toolbar with tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, and Security. Below the toolbar is a row of icons: a blue plus sign, a red minus sign, a checkmark, a delete icon, a file icon, a filter icon, a Manager button, and an AAA button. The main table has columns for Name, Type, MTU, and L2 MTU. A row for 'DSMB' shows 'OfficeAP1' as an 'Interfaces' type with MTU 1500 and L2 MTU 1600. Below the table, a section titled 'Interface <OfficeAP1>' displays various parameters: Current State (running-ap), Current Channel (2427/20-Ce/gn(30dBm)), Current Rate Set (CCK:1-11 OFDM:6-54 BW:1x-2x HT:0-7), and Current Basic Rate Set (OFDM:6 BW:1x HT:0-7).

CAP



The screenshot shows the CAP interface status screen. At the top, there's a toolbar with tabs: Interfaces, Nstreme Dual, Access List, Registration, Connect List, and Security. Below the toolbar is a row of icons: a blue plus sign with a dropdown arrow, a red minus sign, a checkmark, a delete icon, a file icon, a filter icon, a CAP button, a Scanner button, and a Freq. Usage button. The main table has columns for Name, Type, L2 MTU, and Tx. A row for 'wlan1' is listed with 'Wireless (Atheros AR9...' as the type and Tx value of 1600. Red text at the bottom of the table area states: '-- managed by CAPsMAN' and '-- channel: 2427/20-Ce/gn(30dBm), SSID: Office, CAPsMAN forwarding'.

# CAPsMAN Registration table

CAPsMAN

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

| Interface | MAC Address       | Tx Rate    | Rx Rate    | Tx Signal | Rx Signal | Uptime       | Tx/Rx Packets | Tx/Rx Bytes       |
|-----------|-------------------|------------|------------|-----------|-----------|--------------|---------------|-------------------|
| OfficeAP3 | 18:34:51:41:75:CD | 65Mbps-... | 65Mbps-... | 0         | -44       | 00:03:17.... | 31 395/33 212 | 29.8 MiB/29.5 MiB |

CAPs AP Client <18:34:51:41:75:CD>

Interface: OfficeAP3

MAC Address: 18:34:51:41:75:CD

Tx Rate: 65Mbps-20MHz/1S

Rx Rate: 65Mbps-20MHz/1S

Tx Rate Set: CCK:1-11 OFDM:6-54 BW:1x HT:0-7

Tx Signal: 0

Rx Signal: -44

Uptime: 00:03:17.70

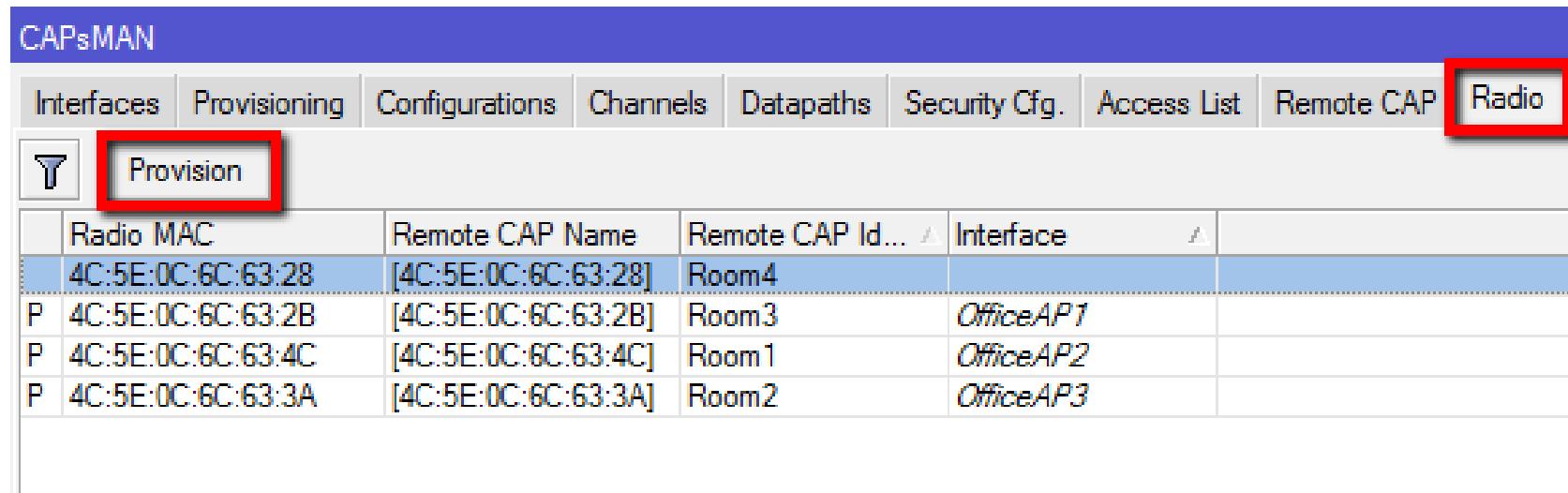
Tx/Rx Packets: 31 395/33 212

Tx/Rx Bytes: 29.8 MiB/29.5 MiB

1 item

# Manual Provisioning

- Changing Provisioning rules doesn't effect already configured CAPs, manual Provisioning required:
  - Remove CAP interface
  - Initiate Provision command on the CAP



The screenshot shows the CAPsMAN software interface. The top navigation bar has tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, and Radio. The Radio tab is highlighted with a red box. Below the tabs is a search bar with a magnifying glass icon and the word 'Provision' highlighted with a red box. The main area is a table with columns: Radio MAC, Remote CAP Name, Remote CAP Id..., and Interface. The table contains four rows of data:

|   | Radio MAC         | Remote CAP Name     | Remote CAP Id... | Interface |
|---|-------------------|---------------------|------------------|-----------|
|   | 4C:5E:0C:6C:63:28 | [4C:5E:0C:6C:63:28] | Room4            |           |
| P | 4C:5E:0C:6C:63:2B | [4C:5E:0C:6C:63:2B] | Room3            | OfficeAP1 |
| P | 4C:5E:0C:6C:63:4C | [4C:5E:0C:6C:63:4C] | Room1            | OfficeAP2 |
| P | 4C:5E:0C:6C:63:3A | [4C:5E:0C:6C:63:3A] | Room2            | OfficeAP3 |

# CAP Identification

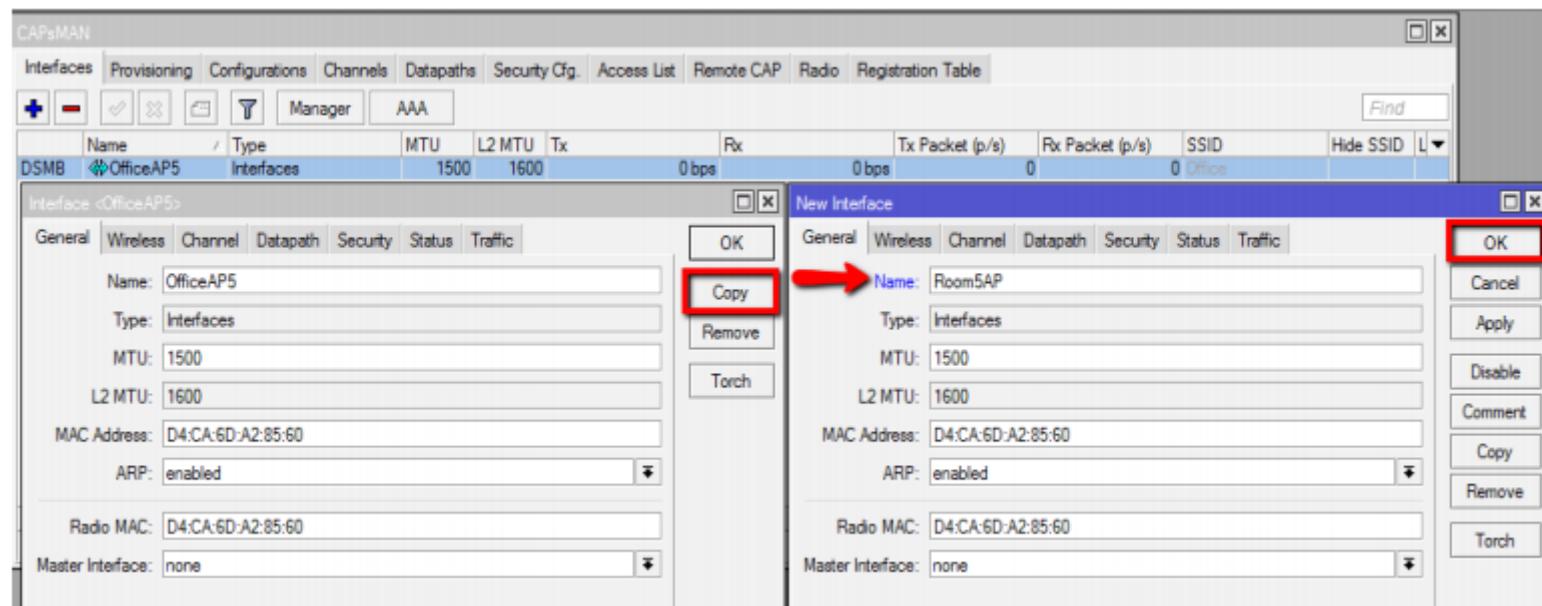
- MAC/IP address
- RouterBoard model
- Serial Number of the Board
- RouterOS version
- System Identity
- Main wireless MAC
- State of the CAP
- Radio count

The screenshot shows the CAPsMAN interface with a blue header bar containing the title 'CAPsMAN'. Below the header is a navigation menu with tabs: 'Interfaces', 'Provisioning', 'Configurations', 'Channels', 'Datapaths', 'Security Cfg.', 'Access List', 'Remote CAP' (which is highlighted with a red box), 'Radio', and 'Registration Table'. Under the 'Remote CAP' tab, there is a search bar with a magnifying glass icon and the word 'Provision'. The main area displays a table with the following columns: Address, Name, Board, Serial, Version, Identity, Base MAC, State, and Radios. The table contains five rows of data:

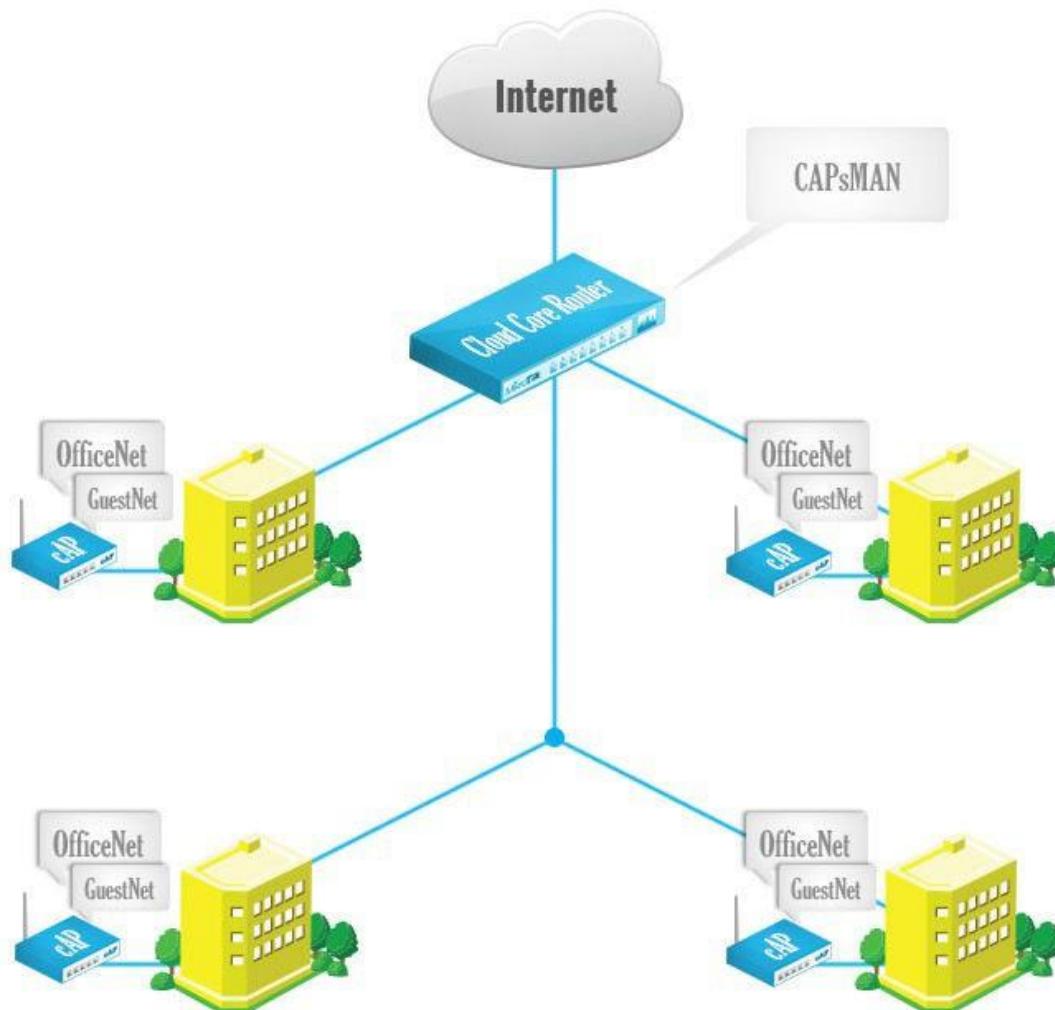
| Address             | Name                | Board   | Serial       | Version | Identity | Base MAC          | State | Radios |
|---------------------|---------------------|---------|--------------|---------|----------|-------------------|-------|--------|
| 4C:5E:0C:6C:63:26   | [4C:5E:0C:6C:63:28] | RBmAP2n | 52760434DCE4 | 6.19    | Room4    | 4C:5E:0C:6C:63:28 | Run   | 1      |
| 4C:5E:0C:6C:63:29   | [4C:5E:0C:6C:63:28] | RBmAP2n | 5276046C9DA3 | 6.19    | Room3    | 4C:5E:0C:6C:63:28 | Run   | 1      |
| 4C:5E:0C:6C:63:38   | [4C:5E:0C:6C:63:3A] | RBmAP2n | 527604845E6A | 6.19    | Room2    | 4C:5E:0C:6C:63:3A | Run   | 1      |
| 4C:5E:0C:6C:63:4A   | [4C:5E:0C:6C:63:4C] | RBmAP2n | 527604D1D5D4 | 6.19    | Room1    | 4C:5E:0C:6C:63:4C | Run   | 1      |
| ::ffff:10.5.125.172 | [D4:CA:6D:A2:85:60] | RBmAP2n | 527602095F22 | 6.19    | Room5    | D4:CA:6D:A2:85:60 | Run   | 1      |

# CAPsMAN static CAP interface

- Interface name or setting does not change after a reboot
- Additional manual setting override
- Copy dynamic interface to make static interface



# CAPsMAN Virtual AP



# CAPsMAN VirtualAP Configuration

- Create new Bridge interface and IP configuration for the VirtualAPs
  - Or use the same bridge interface used for Master AP
- Create a new configuration for the VirtualAP
- Specify the new configuration in Provisioning rule as Slave Configuration
- Remove all CAP interfaces
- Initiate Manual Provisioning on all the CAPs

# CAPsMAN VirtualAP Setup

The screenshot shows the CAPsMAN management interface. The top navigation bar includes tabs for Interfaces, Provisioning, Configurations (which is highlighted with a red box), Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. Below the navigation bar is a toolbar with icons for creating (+), deleting (-), and filtering (magnifying glass). A table lists existing configurations, showing columns for Name, SSID, Hide SSID, Load Bal..., Country, Channel, Frequency, Band, and D. One entry, "OfficeNet" with "Office" as the SSID, is visible.

The main area displays two configuration panels side-by-side, both titled "New CAPs Configuration".

- Left Panel (Wireless Configuration):**
  - Name: GuestNet
  - Mode: (empty)
  - SSID: Guest
  - Hide SSID: (empty)
  - Load Balancing Group: (empty)
  - Country: (empty)
  - Max Station Count: (empty)
  - Multicast Helper: (empty)
  - HT Tx Chains: (empty)
  - HT Rx Chains: (empty)
  - HT Guard Interval: (empty)
- Right Panel (Datapath Configuration):**
  - Datapath: (empty)
  - Bridge: GuestNet
  - Bridge Cost: (empty)
  - Bridge Horizon: (empty)
  - Local Forwarding: (empty)
  - Client To Client Forwarding: (empty)
  - VLAN Mode: (empty)
  - VLAN ID: (empty)

# CAPsMAN VirtualAP Setup

The figure consists of three screenshots of the CAPsMAN software interface:

- Top Left:** Shows the 'Provisioning' tab selected. A dialog box is open for 'CAPs Provisioning <00:00:00:00:00:00>'. It contains fields for 'Radio MAC' (00:00:00:00:00:00), 'Action' (create dynamic enabled), 'Master Configuration' (OfficeNet), 'Slave Configuration' (GuestNet, highlighted with a red box), and 'Name Prefix' (OfficeAP). Buttons include OK, Cancel, Apply, Disable, Comment, Copy, and Remove.
- Top Right:** Shows the 'Interfaces' tab selected. A table lists various interfaces:
 

|      | Name        | Type       | MTU  | L... |
|------|-------------|------------|------|------|
| DSMB | OfficeAP1   | Interfaces | 1500 |      |
| DSB  | OfficeAP1-1 | Interfaces | 1500 |      |
| DSMB | OfficeAP2   | Interfaces | 1500 |      |
| DSB  | OfficeAP2-1 | Interfaces | 1500 |      |
| DSMB | OfficeAP3   | Interfaces | 1500 |      |
| DSB  | OfficeAP3-1 | Interfaces | 1500 |      |
| DSMB | OfficeAP4   | Interfaces | 1500 |      |
| DSB  | OfficeAP4-1 | Interfaces | 1500 |      |
| SMB  | Room5AP     | Interfaces | 1500 |      |
- Bottom:** Shows the 'Radio' tab selected. A table lists provisioned APs:
 

|   | Radio MAC         | Remote CAP Name      | Remote CAP Iden... | Interface |
|---|-------------------|----------------------|--------------------|-----------|
| P | 4C:5E:0C:6C:63:28 | [4C:5E:0C:6C:63:...] | Room4              | OfficeAP1 |
| P | 4C:5E:0C:6C:63:2B | [4C:5E:0C:6C:63:...] | Room3              | OfficeAP3 |
| P | 4C:5E:0C:6C:63:3A | [4C:5E:0C:6C:63:...] | Room2              | OfficeAP5 |
| P | 4C:5E:0C:6C:63:4C | [4C:5E:0C:6C:63:...] | Room1              | OfficeAP2 |
| P | D4:CA:6D:A2:85:60 | [D4:CA:6D:A2:85:...] | Room5              | Room5AP   |

# CAPsMAN static VirtualAP

The screenshot shows the CAPsMAN management interface. At the top, there is a navigation bar with tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. Below the navigation bar is a toolbar with icons for adding (+), deleting (-), saving (checkmark), canceling (cross), and filtering (magnifying glass). There are also buttons for Manager and AAA.

The main area displays a table of interfaces. The columns include Name, Type, MTU, L2 MTU, Tx, Rx, Tx Packet (p/s), and Rx Packet (p/s). The table lists several interfaces, including DSMB, DSB, and SMB types, with names like OfficeAP1 through Room5AP. The Room5AP row is currently selected.

A modal dialog box titled "New Interface" is open over the table. This dialog has two tabs: General and Wireless. The Wireless tab is selected and highlighted with a red box. The General tab is also visible. The Wireless tab contains fields for Configuration (set to GuestNet), Mode (empty), SSID (GuestAP), Hide SSID (empty), Load Balancing Group (empty), Country (empty), and Max Station Count (empty).

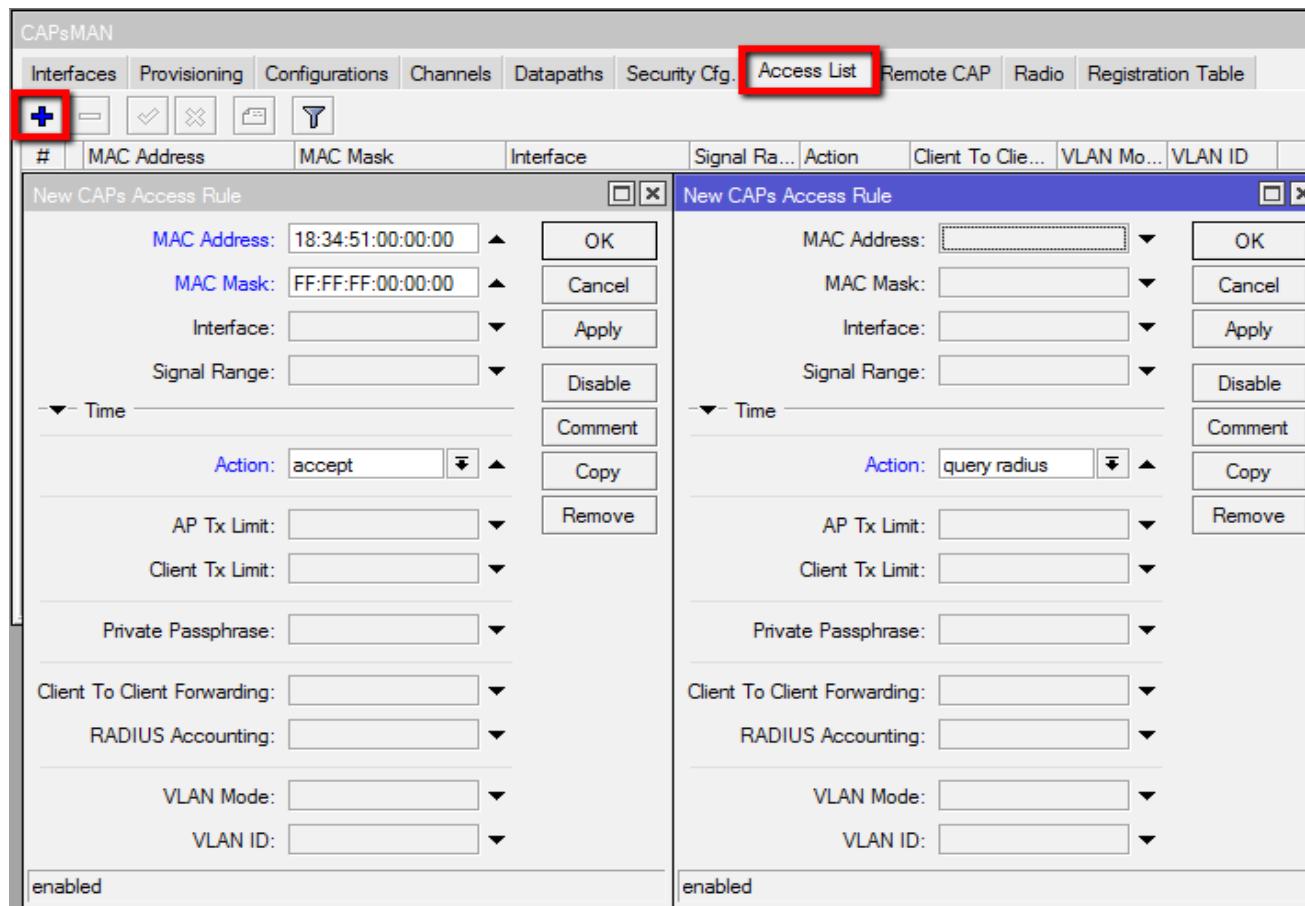
On the right side of the dialog, there is a vertical stack of buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove, and Torch. The "OK" button is at the top of this stack.

# CAPsMAN Access List Features

- MAC Authentication
- Radius Query support
- MAC Mask support
- Signal Range
- Time
- Private Passphrase
- VLAN ID assignment

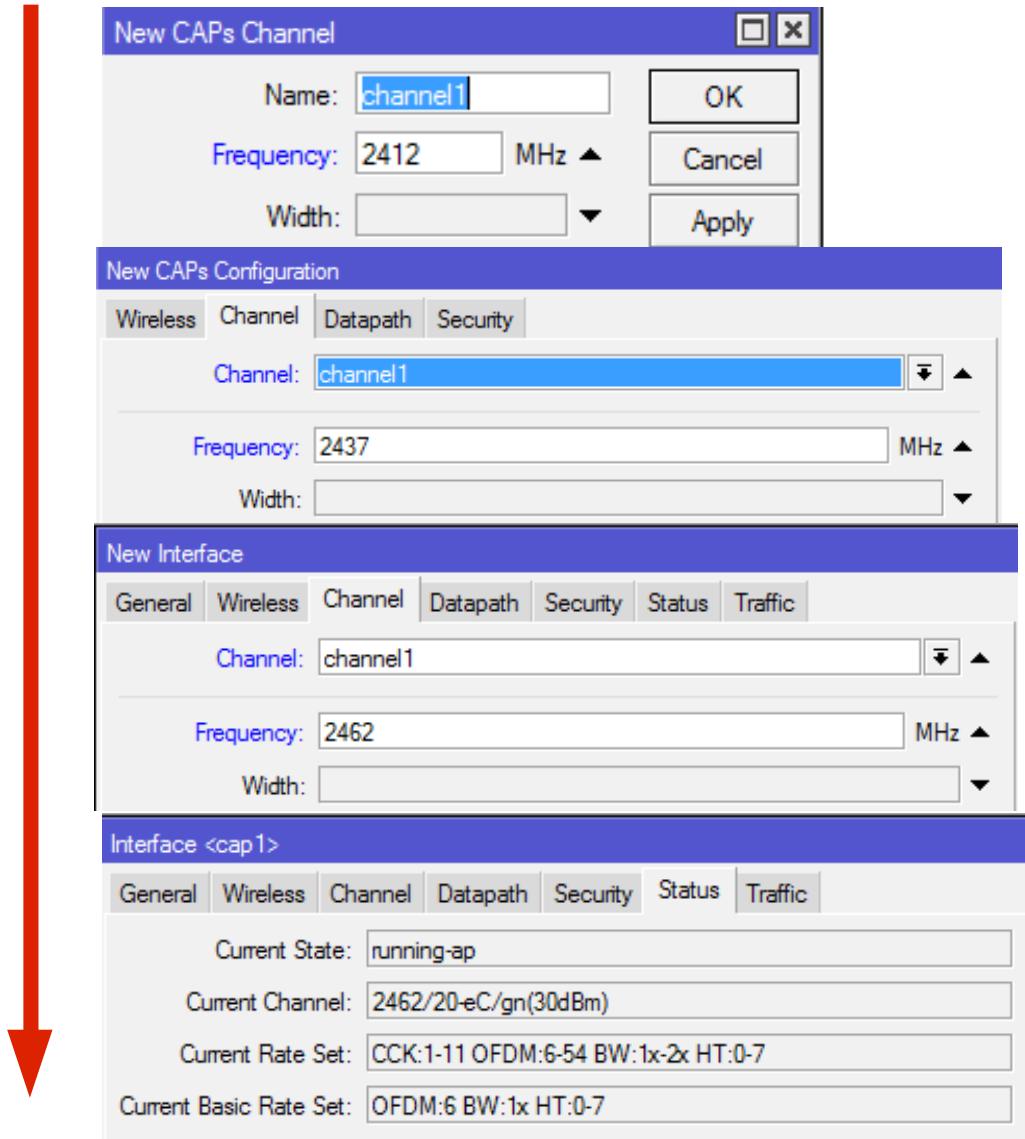
# CAPsMAN Access List

- Allow Apple devices to connect
- Let RADIUS server decide for the rest of devices



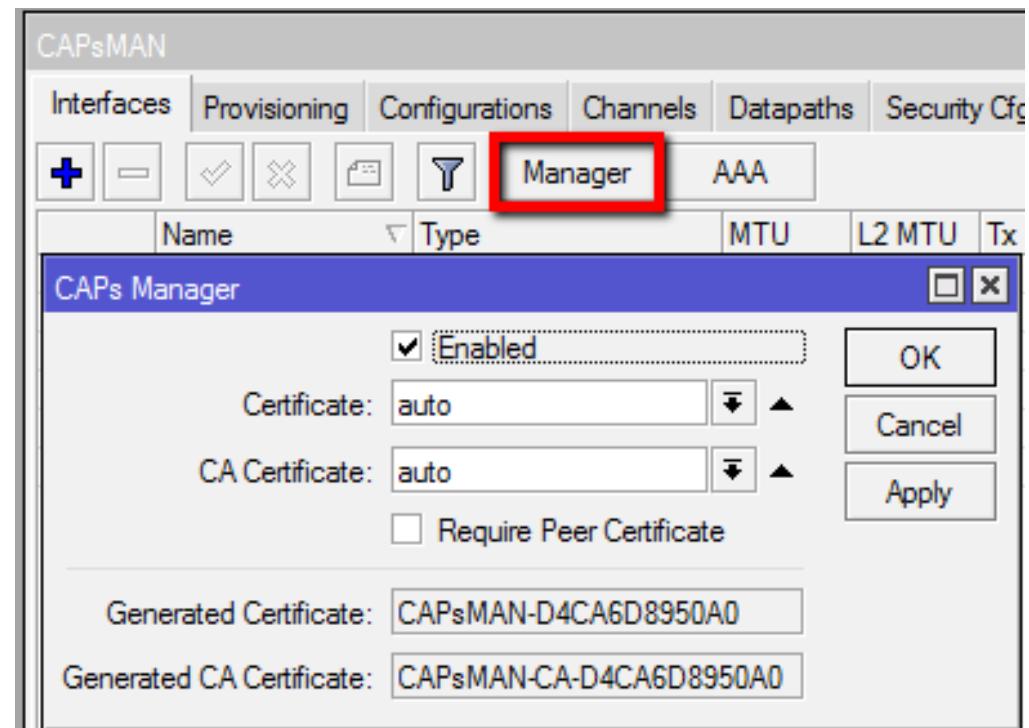
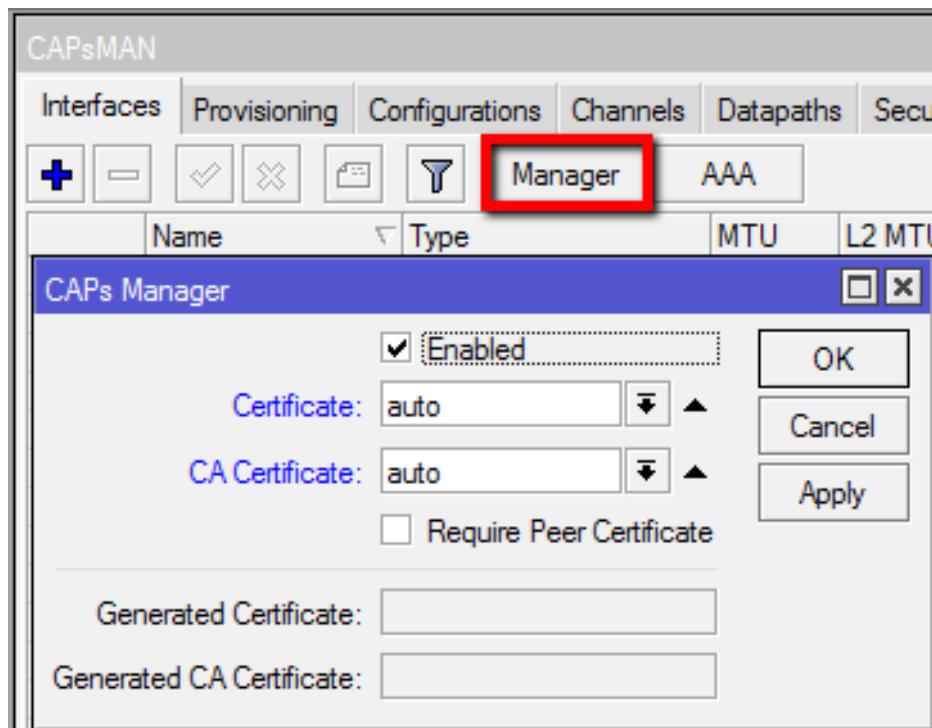
# CAPsMAN Configuration override

- Configuration overrides Channel setting
- Interface overrides Channel and Configuration setting



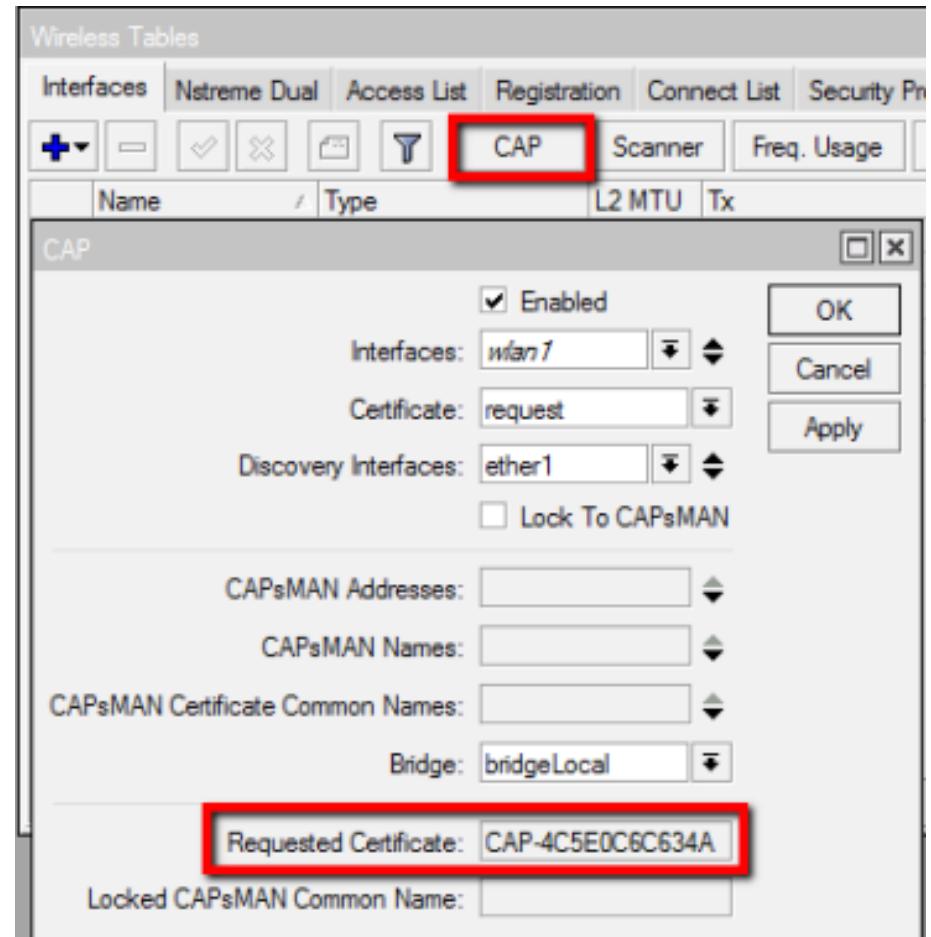
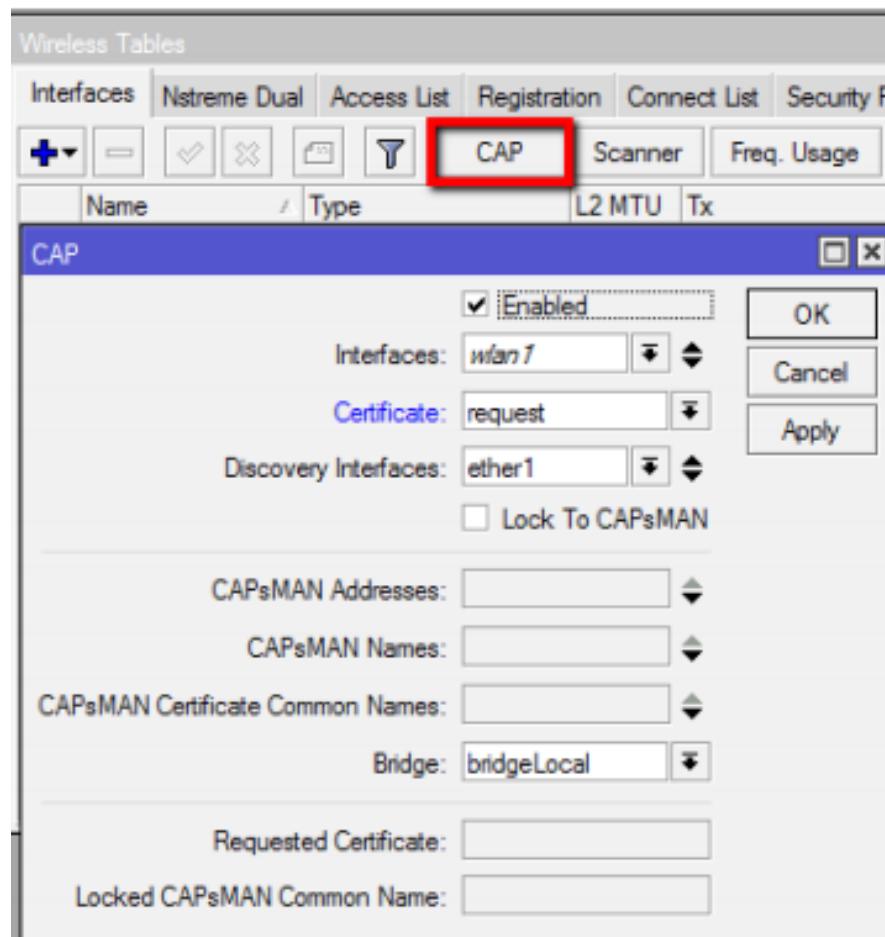
# CAPsMAN Auto Certificate

- Enable Certificate and CA Certificate on CAPsMAN



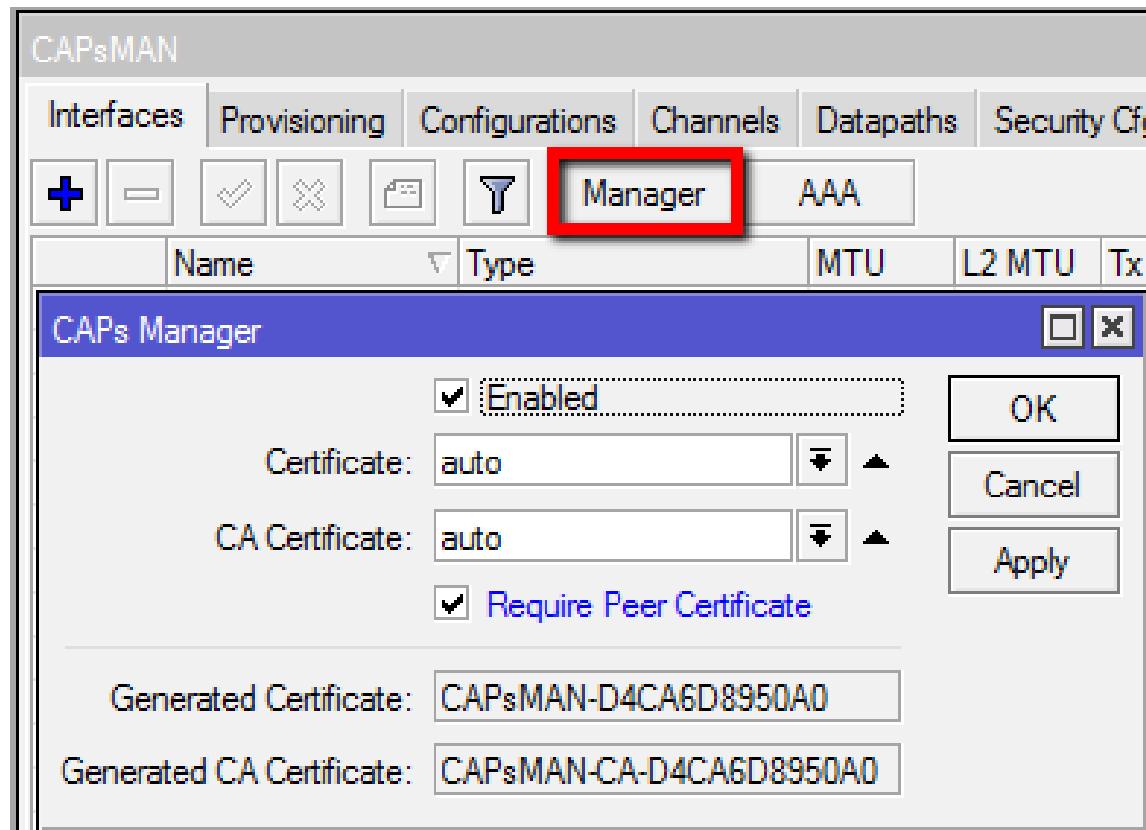
# CAPsMAN Auto Certificate

- Enable “Request” Certificate on CAP



# CAPsMAN Auto Certificate

- Accept connections only from CAPs with valid certificate

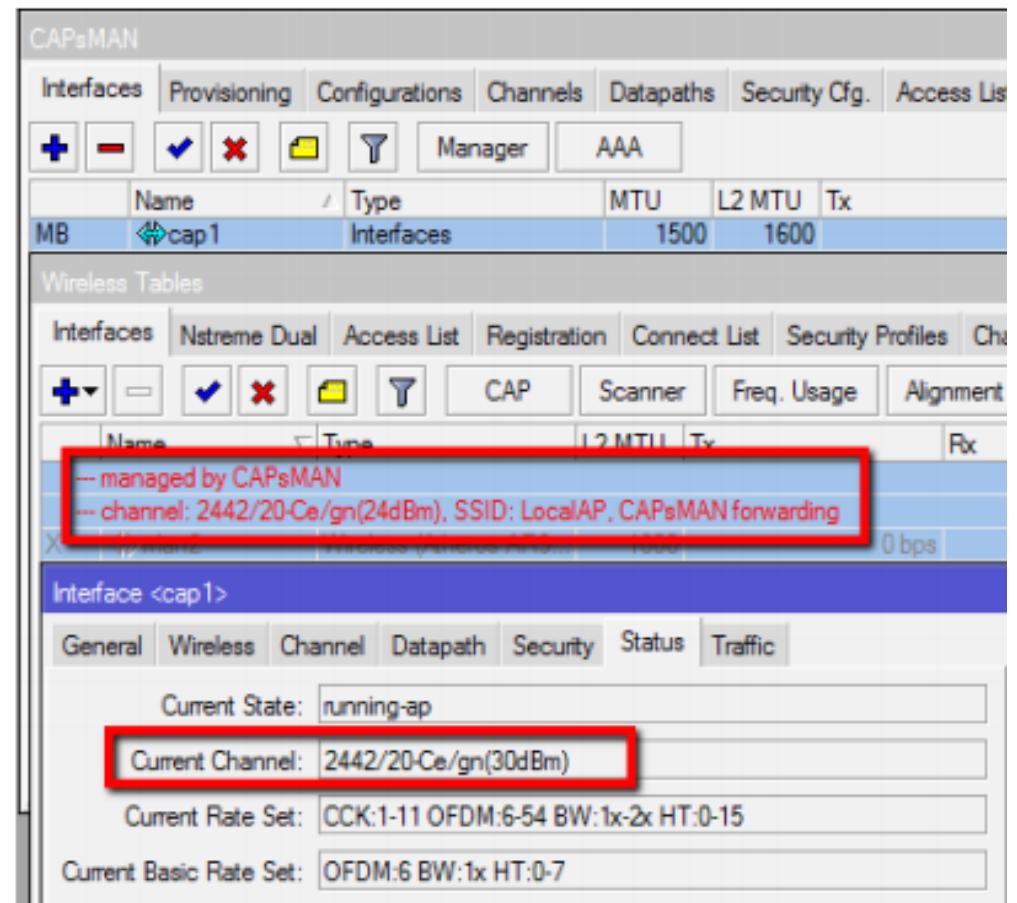


# CAPsMAN Antenna Gain (Country Regulations)

- Antenna-gain value is taken from the CAP interface
- Must be configured on AP before you enable radio in CAP mode

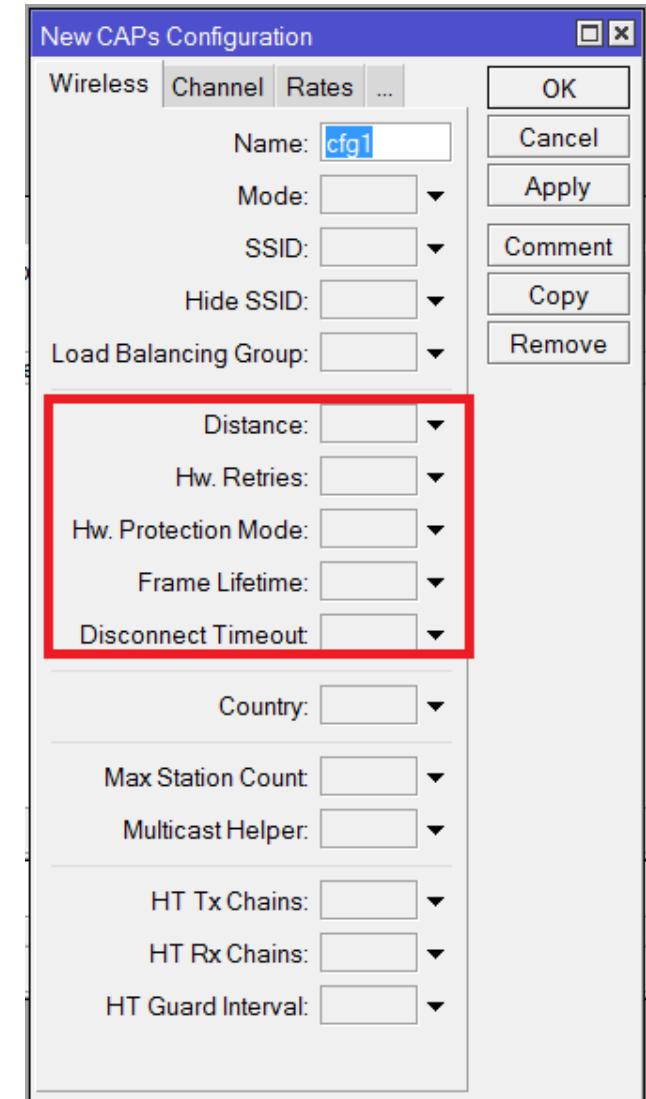
## Example

- Antenna-gain: 6dBi
- EIRP: 30dB

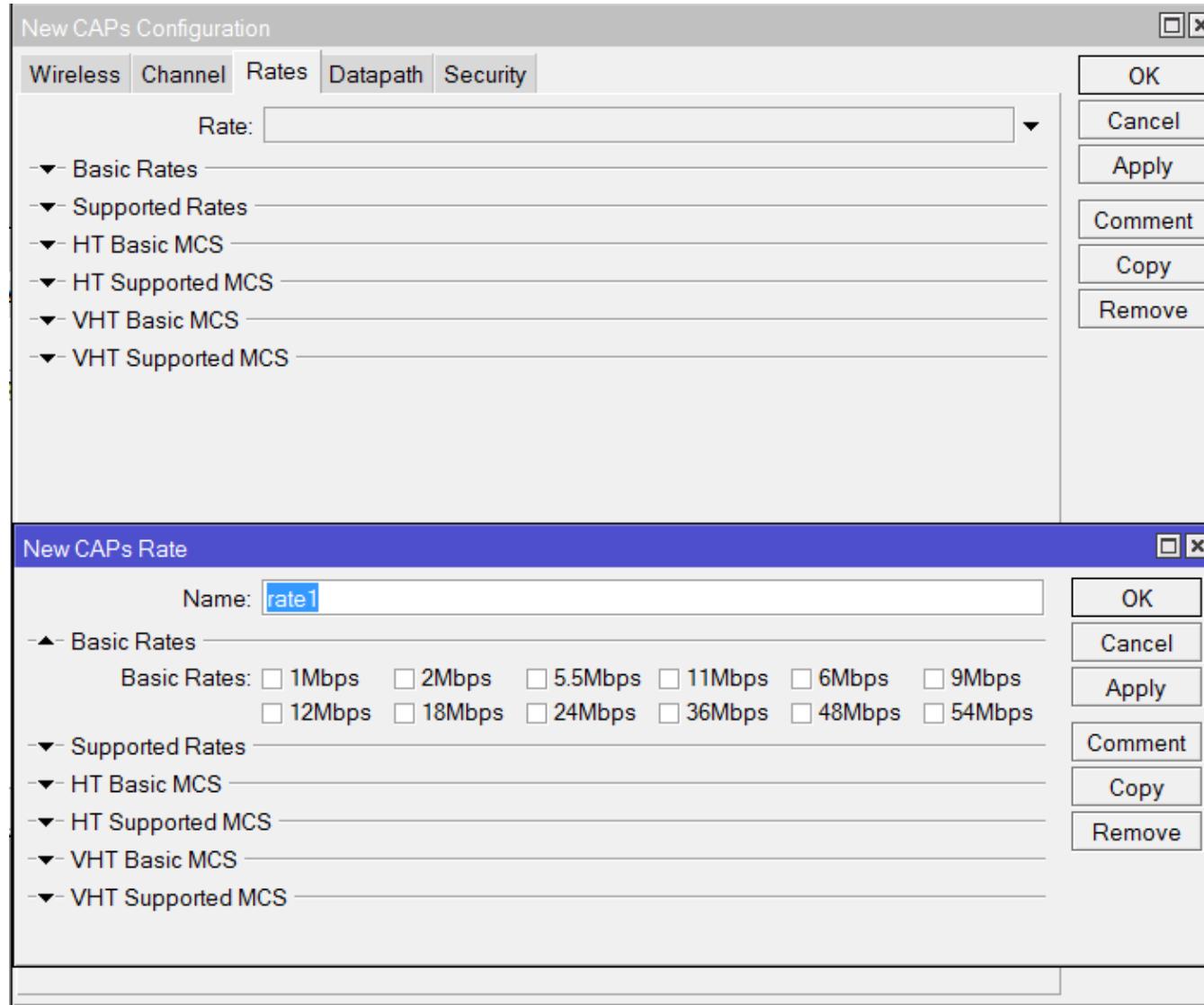


# CAPsMAN Latest version new features in configuration - wireless

- 16<sup>th</sup> October 2014 i have advised MikroTik to include **wireless tuning parameters** also in CAPsMAN:
  - Configurable Basic and Supported Data-Rates
  - hw-retries,
  - disconnect-timeout
  - rts/cts
  - Etc..
- ✓ Today 17<sup>th</sup> October i am glad that everything is there! ☺ Thanks!
  - Full CAPs control

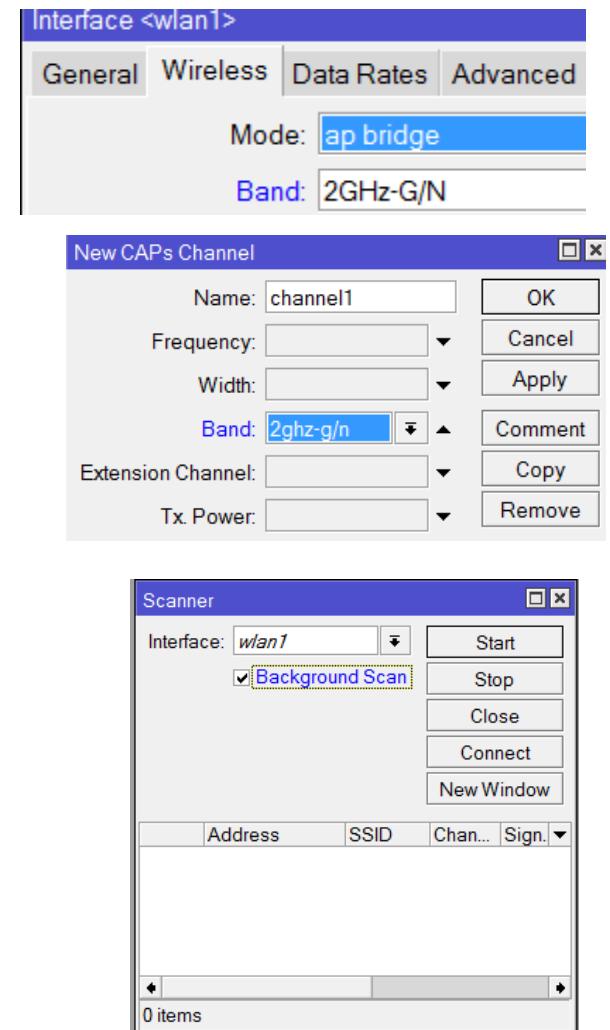


# CAPsMAN Latest version new features in configuration - RATES



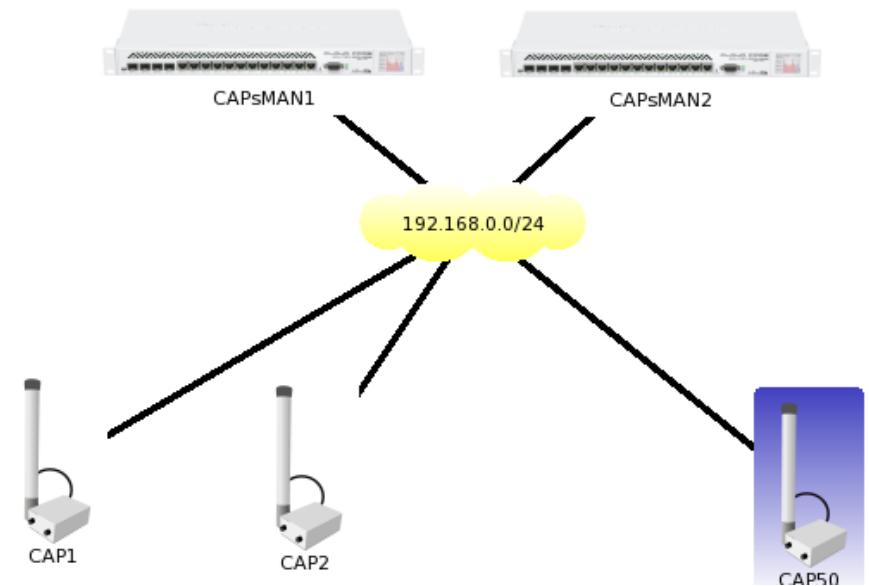
# Wireless-rep package – Other new features useful for CAPsMAN

- Regular Wireless Interface and CAPsMAN support '2ghz-g/n' band setting
  - basic-rates – 6-54Mbps
  - supported – 6-54Mbps
  - ht-basic-mcs – None
  - ht-supported-mcs – 0-23
- Background scan
  - Not included in CAPsMAN but it can be used on CAPs



# Maintain a failover controller (CAPsMAN)

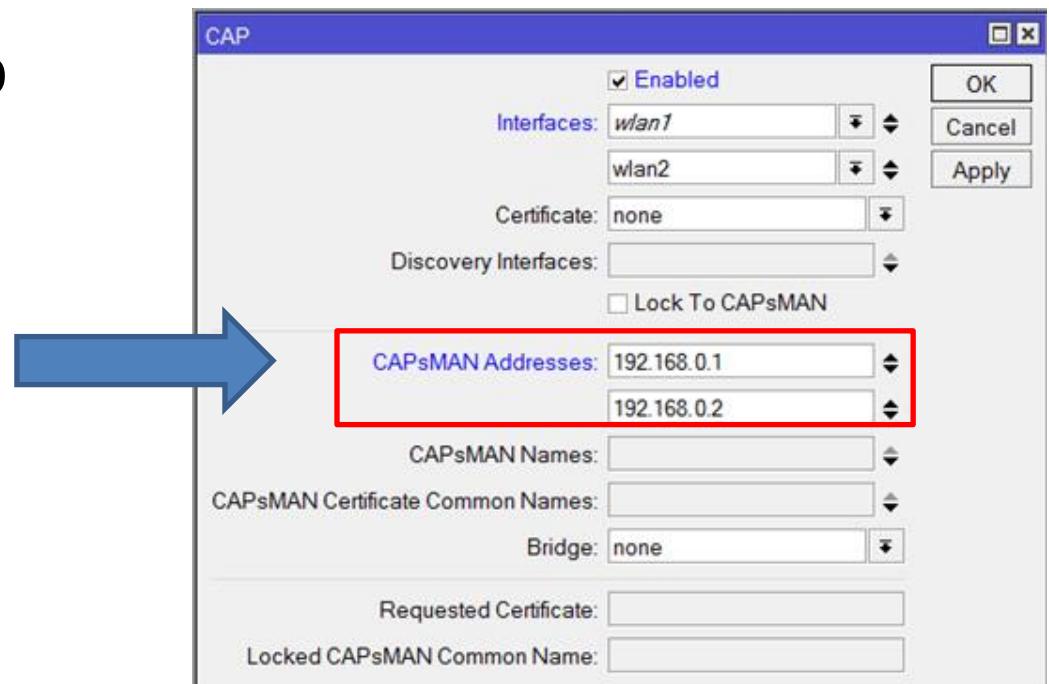
- In big networks you have
  - Many CAPs
  - Many active users
- Most times your customer will require redundancy
  - A bad power supply can take down whole network



# Maintain a failover controller (CAPsMAN)

- Its possible to create the same configuration on a second or maybe third router to act as a backup CAPsMAN

➤ Just configure multiple CAPsMAN addresses on **every** CAP



# Comments? Questions?

**Thank You!**  
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# More Comments? Questions?



## Thank You!

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