

# Wireless AP and CAPsMAN Case Study

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# Wireless AP features

- Provides wireless connectivity to Ethernet network resources
- Secure wireless communication using Pre-Shared-Key authentication and AES Encryption
- Wireless access limit by MAC address
- Centralized wireless client authentication using RADIUS

# Wireless AP usage cases

- Apartments
- Residential buildings
- Offices
- Warehouses
- Coffee shops, Restaurants
- Museums, Theaters, Shopping centers
- Hotels
- Airports
- Government institutions
- Parks

# Managing multiple AP's

- Time consuming new AP deployment due to the preconfiguring of the AP's
- Hard to adjust the configuration on all the AP's at the same time
- Hard to track the wireless clients connections among all the AP's

# 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

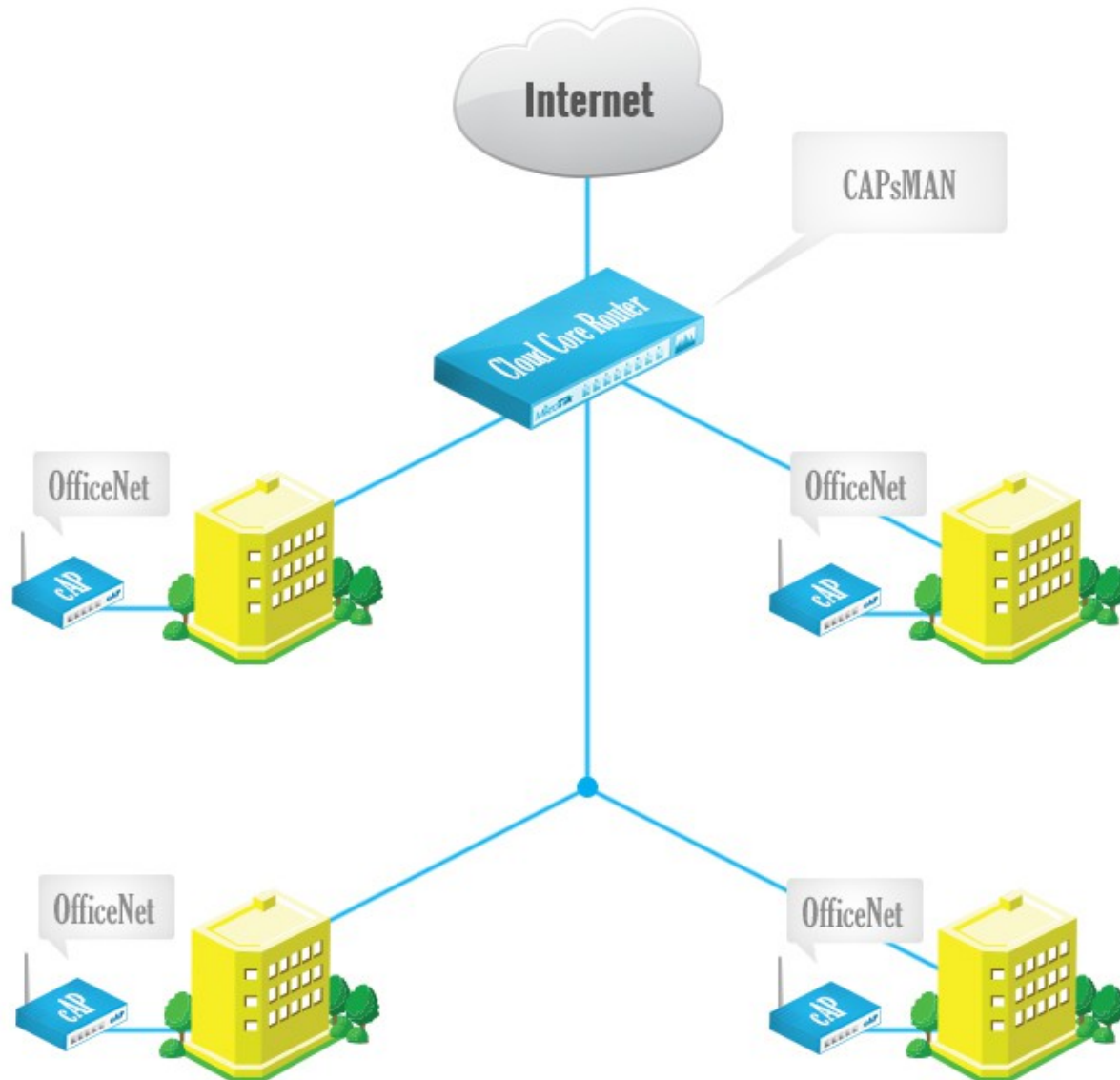
# Requirements

- CAPsMAN
  - x86, CHR and RouterBOARD based device
  - Newest RouterOS v6 version
  - Wireless-fp/cm2 package installed and enabled
  
- CAP
  - X86 or RouterBOARD based device
  - Newest RouterOS v6 version
  - Atheros chipset (a/b/g/n/ac) wireless card
  - Wireless-fp/cm2 package installed and enabled
  - At least Level4 RouterOS license

# CHR image on USB Flashdrive

- CHR RouterOS image in the USB drive
- Follow the instructions for installation on the USB Flashdrive to test RouterOS features
- Email [support@mikrotik.com](mailto:support@mikrotik.com) for any questions on the CHR usage

# CAPsMAN Simple Setup



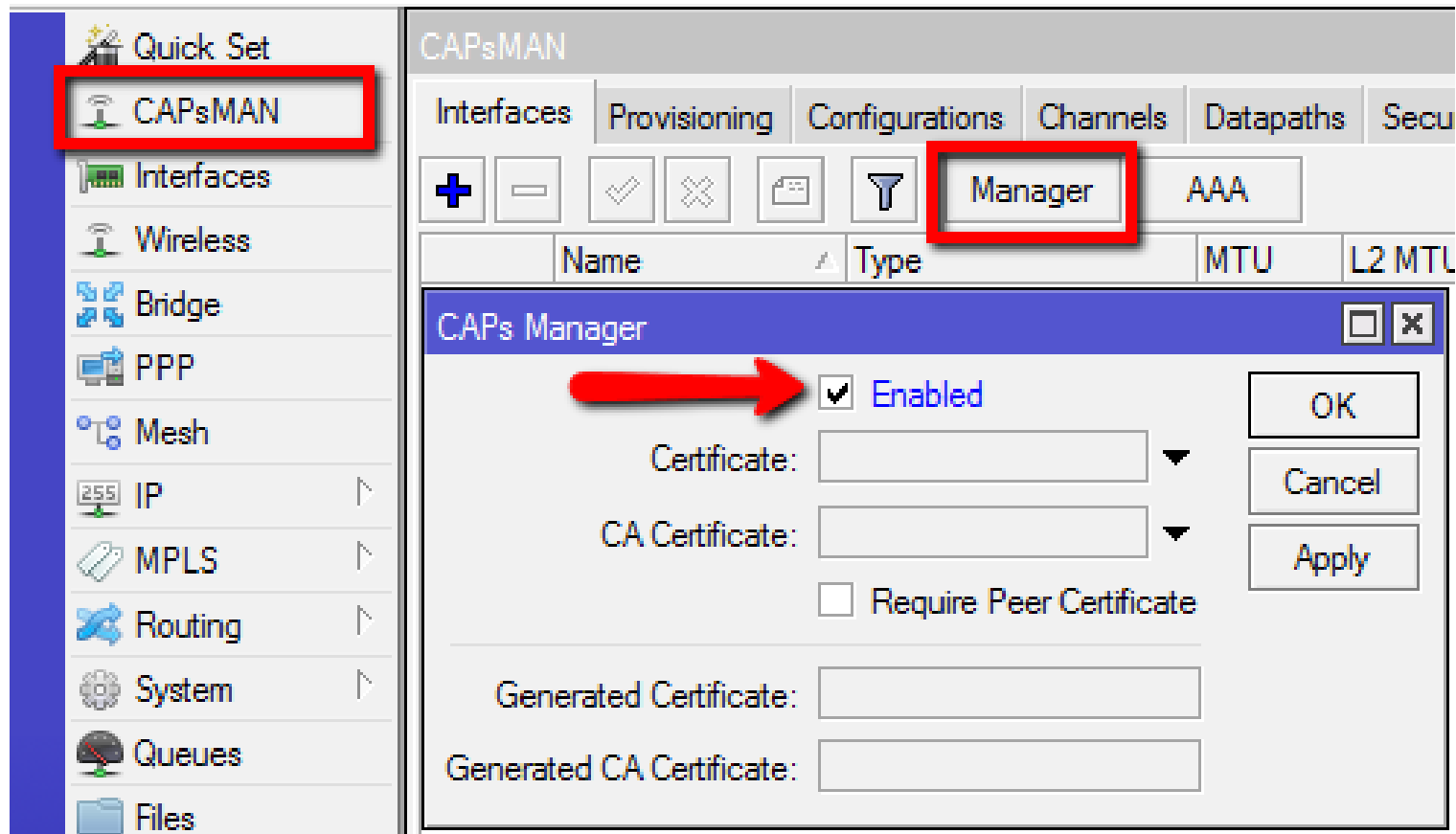


# CAPsMAN Simple Setup

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

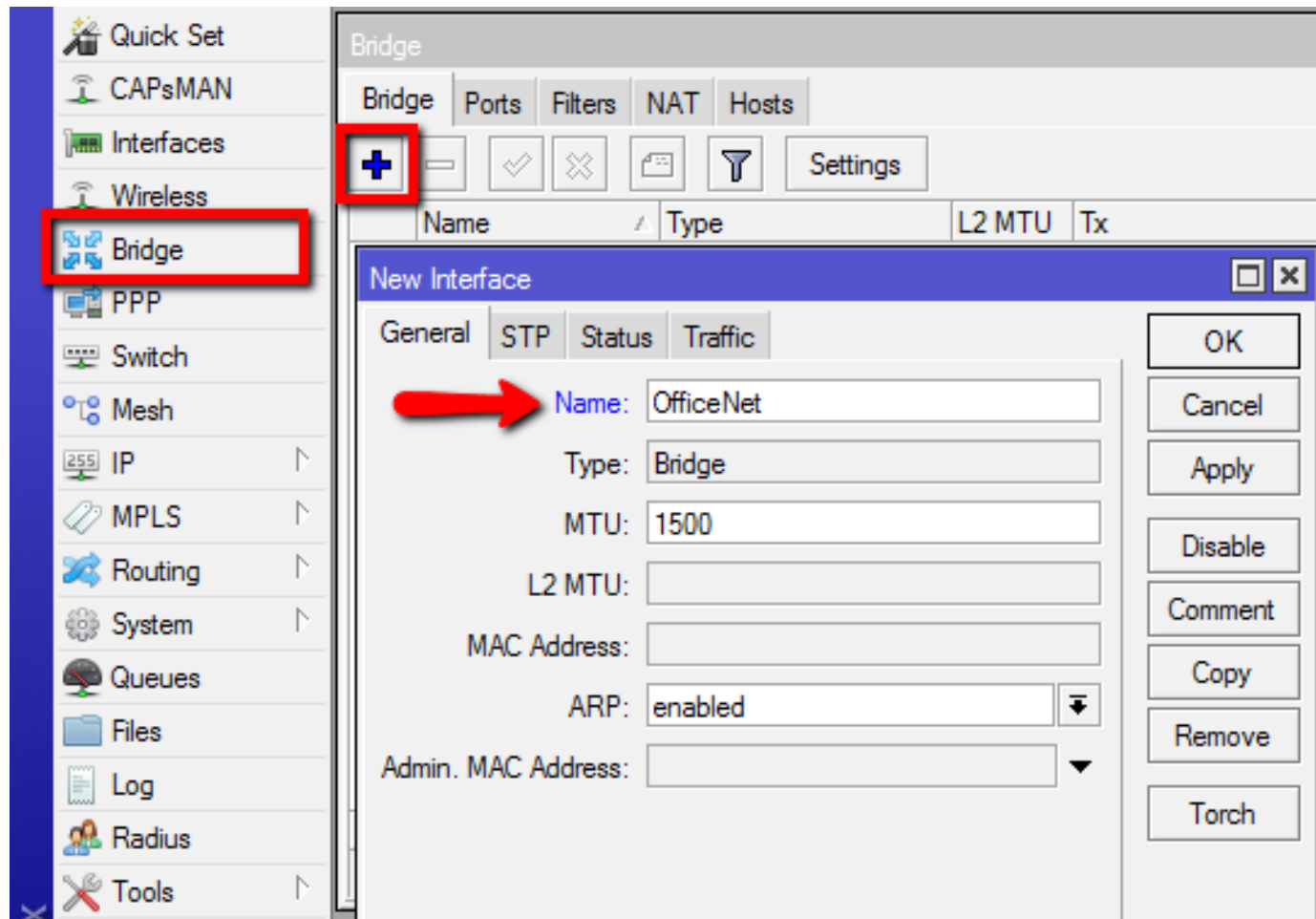
# CAPsMAN Simple Setup

- 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

The screenshot displays the Mikrotik WinBox interface with three windows open, each illustrating a step in the CAPsMAN setup process. Red boxes and numbers highlight key elements:

- Step 1:** The 'Address List' window shows a '+ Add' button (circled in red) and a 'New Address' dialog box. The 'Address' field is set to '10.10.10.1/24' and the 'Interface' is 'OfficeNet'. A red box with the number '1' highlights the 'Interface' dropdown.
- Step 2:** The 'DHCP Server' window shows a '+ Add' button (circled in red) and a 'DHCP Setup' dialog box. The 'DHCP Server Interface' is set to 'OfficeNet'. A red box with the number '2' highlights the 'Interface' dropdown, and another red box with the number '2' highlights the 'Next' button.
- Step 3:** The 'Firewall' window shows the 'Filter Rules' tab with a '+ Add' button (circled in red) and a 'New NAT Rule' dialog box. The 'Chain' is set to 'srcnat' and the 'Action' is 'masquerade'. A red box with the number '3' highlights the 'Chain' dropdown.

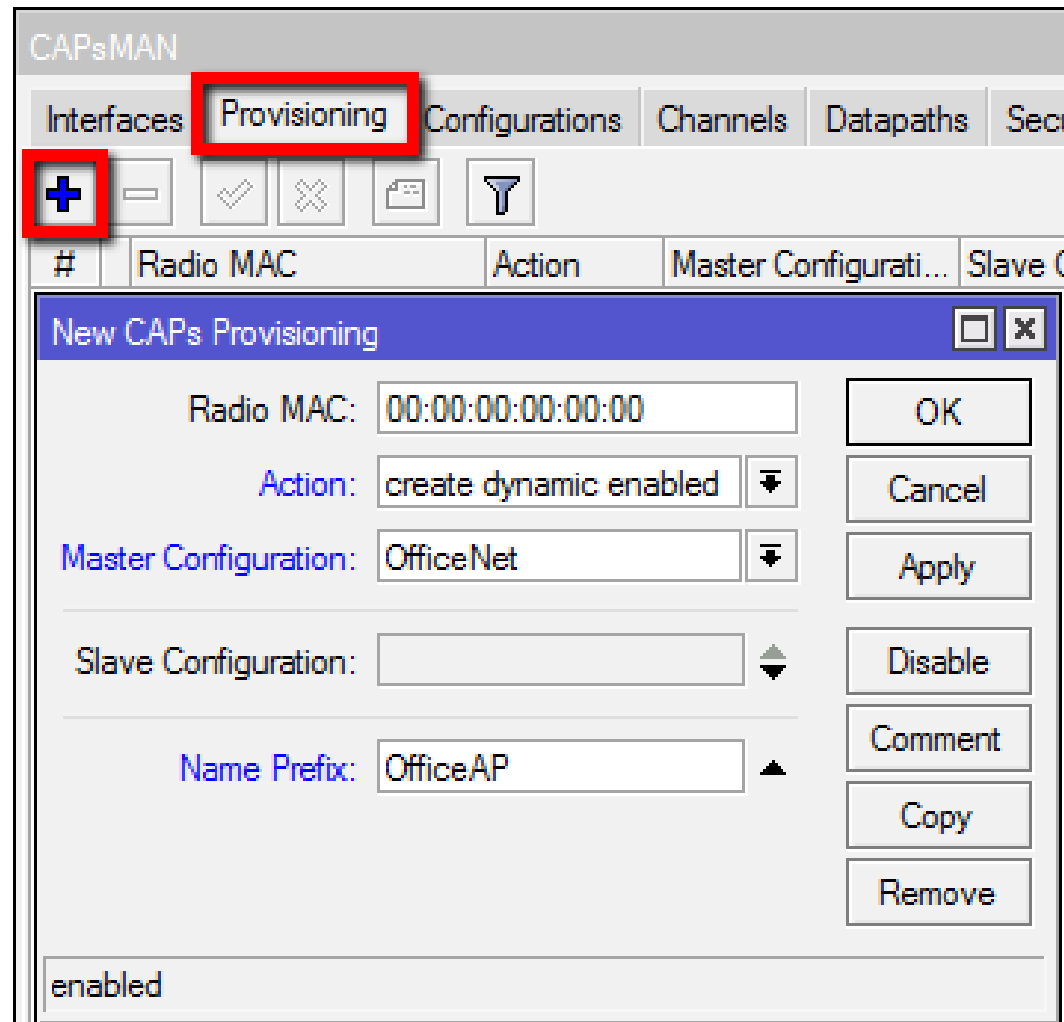
# CAPsMAN Simple Setup

- Add New CAPsMAN Configuration

The screenshot displays the CAPsMAN configuration interface. The 'Configurations' tab is selected and highlighted with a red box. A red box also highlights the '+' icon in the toolbar. Below the toolbar, a table lists configurations with columns for Name, SSID, Hide SSID, Load Bal..., Country, Channel, Frequency, Band, and Datapat. Three configuration panels are visible, each with a red box highlighting a specific tab: 'Wireless' in the first panel, 'Datapath' in the second, and 'Security' in the third. The 'Wireless' panel shows fields for Name (OfficeNet), Mode, SSID (Office), Hide SSID, Load Balancing Group, Country (united states), Max Station Count, Multicast Helper, HT Tx Chains, HT Rx Chains, and HT Guard Interval. The 'Datapath' panel shows fields for Datapath, Bridge (OfficeNet), Bridge Cost, Bridge Horizon, Local Forwarding, Client To Client Forwarding, VLAN Mode, and VLAN ID. The 'Security' panel shows a Security dropdown menu, Authentication Type (WPA PSK, WPA2 PSK, WPA EAP, WPA2 EAP), Encryption (aes ccm, tkip), Group Encryption (aes ccm), Passphrase (OfficeNet), and EAP Methods.

# CAPsMAN Simple Setup

- Add new Provisioning rule



The screenshot shows the CAPsMAN interface with the 'Provisioning' tab selected. A red box highlights the '+' icon in the toolbar, indicating the action to add a new provisioning rule. The 'New CAPs Provisioning' dialog box is open, showing the following fields and options:

| # | Radio MAC         | Action                 | Master Configurati... | Slave C |
|---|-------------------|------------------------|-----------------------|---------|
|   | 00:00:00:00:00:00 | create dynamic enabled | OfficeNet             |         |

Dialog Box Fields:

- Radio MAC: 00:00:00:00:00:00
- Action: create dynamic enabled
- Master Configuration: OfficeNet
- Slave Configuration: (empty)
- Name Prefix: OfficeAP

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

enabled

# CAPsMAN Simple Setup

- Configure the AP to use CAP mode

- Enable wireless-fp package

- Enable CAP mode

- By CAP mode button on some boards

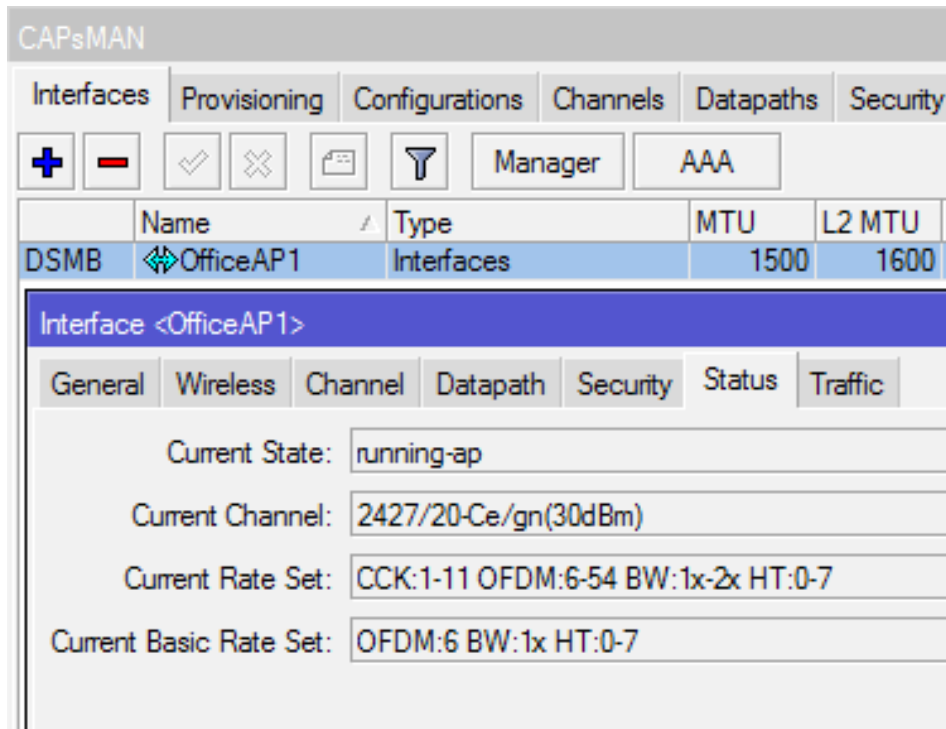
- By configuration in Wireless CAP menu

The screenshot displays the WinBox configuration interface. On the left sidebar, the 'Wireless' menu item is highlighted with a red box. The main window shows the 'Wireless Tables' configuration for a 'CAP' interface. The 'CAP' interface is selected, and its configuration is shown in a sub-window. The 'Enabled' checkbox is checked, and the 'Interfaces' field is set to 'wlan1'. The 'Discovery Interfaces' field is set to 'ether1'. The 'Lock To CAPsMAN' checkbox is unchecked. The 'CAPsMAN Addresses', 'CAPsMAN Names', and 'CAPsMAN Certificate Common Names' fields are empty. The 'Bridge' field is set to 'none'. The 'Requested Certificate' and 'Locked CAPsMAN Common Name' fields are also empty. Red arrows point to the 'Enabled' checkbox, the 'Interfaces' field, and the 'Discovery Interfaces' field. The 'CAP' button in the top toolbar is also highlighted with a red box.

# CAPsMAN Simple Setup

- Check the Status of the CAPsMAN CAP interface

## CAPsMAN



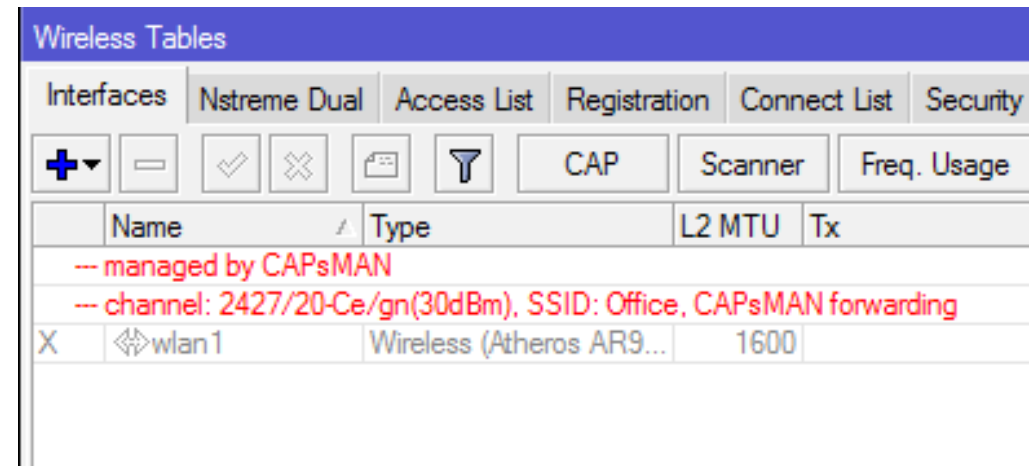
The screenshot shows the CAPsMAN configuration interface. The 'Interfaces' tab is selected, and the 'OfficeAP1' interface is highlighted. The interface is currently in a 'running-ap' state. The configuration details are as follows:

| Name           | Type       | MTU  | L2 MTU |
|----------------|------------|------|--------|
| DSMB OfficeAP1 | Interfaces | 1500 | 1600   |

Interface <OfficeAP1>

| General  | Wireless | Channel | Datapath | Security | Status | Traffic |
|--|----------|---------|----------|----------|--------|---------|
| 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 |          |         |          |          |        |         |
| Current Basic Rate Set: OFDM:6 BW:1x HT:0-7          |          |         |          |          |        |         |

## CAP



The screenshot shows the Wireless Tables configuration interface. The 'CAP' tab is selected, and the 'wlan1' interface is highlighted. The interface is currently in a 'running' state. The configuration details are as follows:

| Name  | Type                     | L2 MTU | Tx |
|---|--------------------------|--------|----|
| --- managed by CAPsMAN  |                          |        |    |
| --- channel: 2427/20-Ce/gn(30dBm), SSID: Office, CAPsMAN forwarding |                          |        |    |
| X wlan1   | Wireless (Atheros AR9... | 1600   |    |



# CAPsMAN Registration table

CAPsMAN

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

[-] [Filter]

| 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 |

1 item

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

OK

Remove

Copy to Access List

# CAP to CAPsMAN Connection

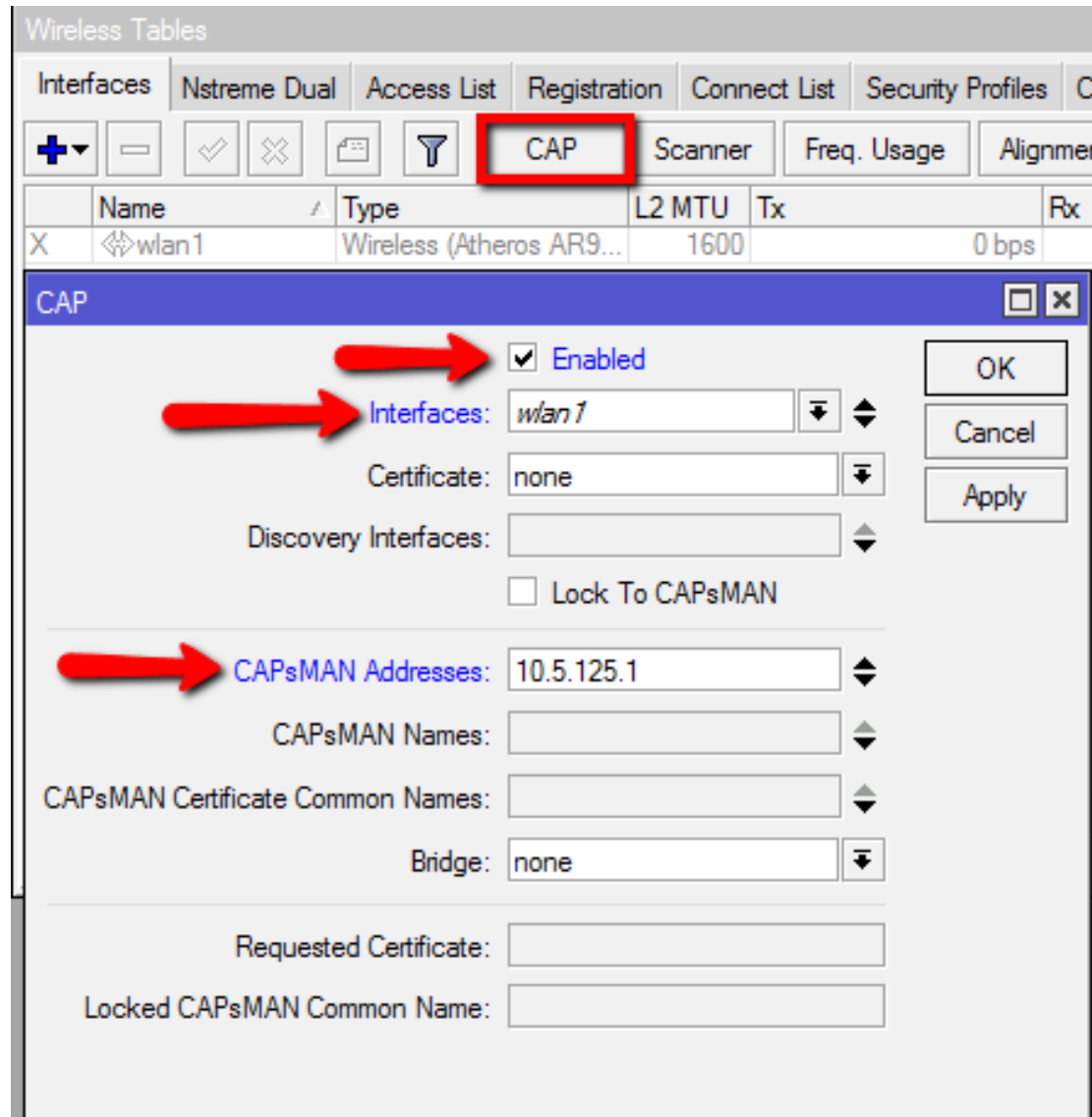
- MAC Layer2:
  - No IP configuration required
  - CAP and CAPsMAN must be in the same Layer 2 network
- IP (UDP) Layer3:
  - CAP must reach the CAPsMAN using IP protocol
  - Can traverse NAT if necessary
- Management connection between CAP and CAPsMAN is secured using DTLS
- CAP client data traffic is not secured – if necessary additional encryption by using IPSec or encrypted tunnels is needed

# CAPsMAN Selection on CAP

- CAP attempts to contact CAPsMAN and build available CAPsMAN list:
  - List of CAPsMAN IPs
  - List of CAPsMAN IPs obtained from DHCP
  - Broadcasting on configured interfaces using IP and MAC Layer
- CAP selects the CAPsMAN based on such rules:
  - If CAPsMAN names setting is matched it will prefer that CAPsMAN earlier in the list
  - MAC layer connectivity to CAPsMAN is preferred over IP connectivity
  - If list is empty it will connect to any available CAPsMAN

# CAPsMAN with Layer3

- On the CAP specify the IP address of the CAPsMAN



The screenshot shows the Mikrotik WinBox interface for configuring a CAP (Client Authentication Profile). The 'CAP' tab is selected in the 'Wireless Tables' window. The configuration dialog is open, showing the following settings:

- Enabled:**  (indicated by a red arrow)
- Interfaces:** wlan1 (indicated by a red arrow)
- Certificate:** none
- Discovery Interfaces:** (empty)
- Lock To CAPsMAN:**
- CAPsMAN Addresses:** 10.5.125.1 (indicated by a red arrow)
- CAPsMAN Names:** (empty)
- CAPsMAN Certificate Common Names:** (empty)
- Bridge:** none
- Requested Certificate:** (empty)
- Locked CAPsMAN Common Name:** (empty)

Buttons for OK, Cancel, and Apply are visible on the right side of the dialog.

# CAPsMAN selection using Name

- On the CAP specify the CAPsMAN identity name

Wireless Tables

Interfaces | Nstreme Dual | Access List | Registration | Connect List | Security Profiles | CAP

+ | - | ✓ | ✗ | 📄 | 🗑️ | CAP | Scanner | Freq. Usage | Alignmer

| Name | Type | L2 MTU | Tx | Rx |
|------|------|--------|----|----|
| CAP  |      |        |    |    |

CAP

Enabled

Interfaces:

Certificate:

Discovery Interfaces:

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge:

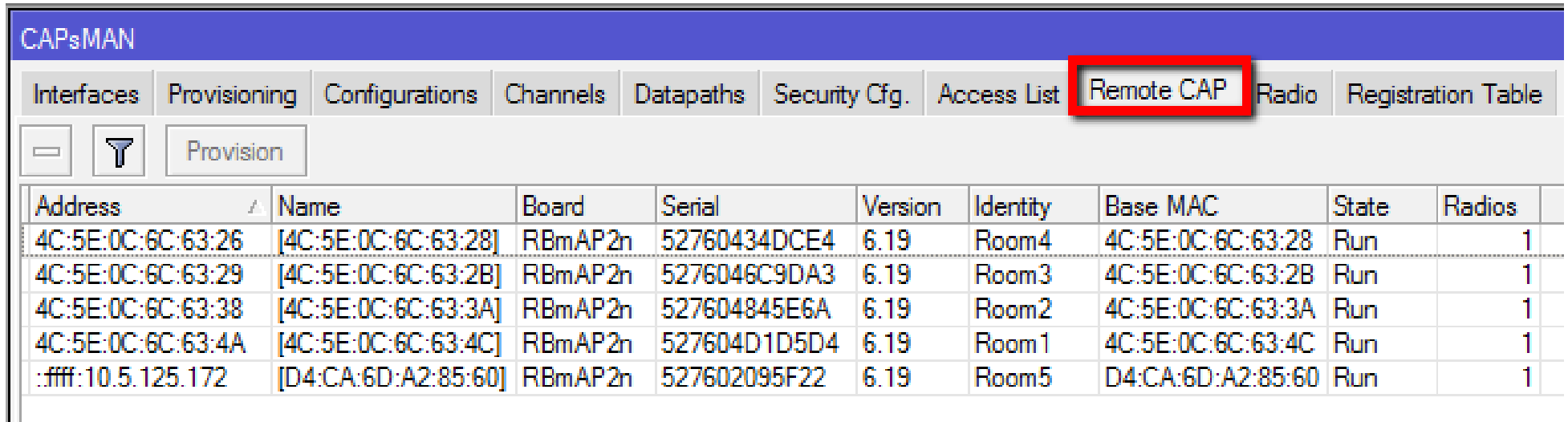
Requested Certificate:

Locked CAPsMAN Common Name:

OK  
Cancel  
Apply

# CAP Identification

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



The screenshot shows the Mikrotik CAPsMAN web interface. The 'Remote CAP' tab is selected and highlighted with a red box. Below the navigation tabs, there are buttons for 'Provision' and a filter icon. The main content 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 representing different CAPs.

| 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:63:2B] | RBmAP2n | 5276046C9DA3 | 6.19    | Room3    | 4C:5E:0C:6C:63:2B | 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      |
| :fff: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

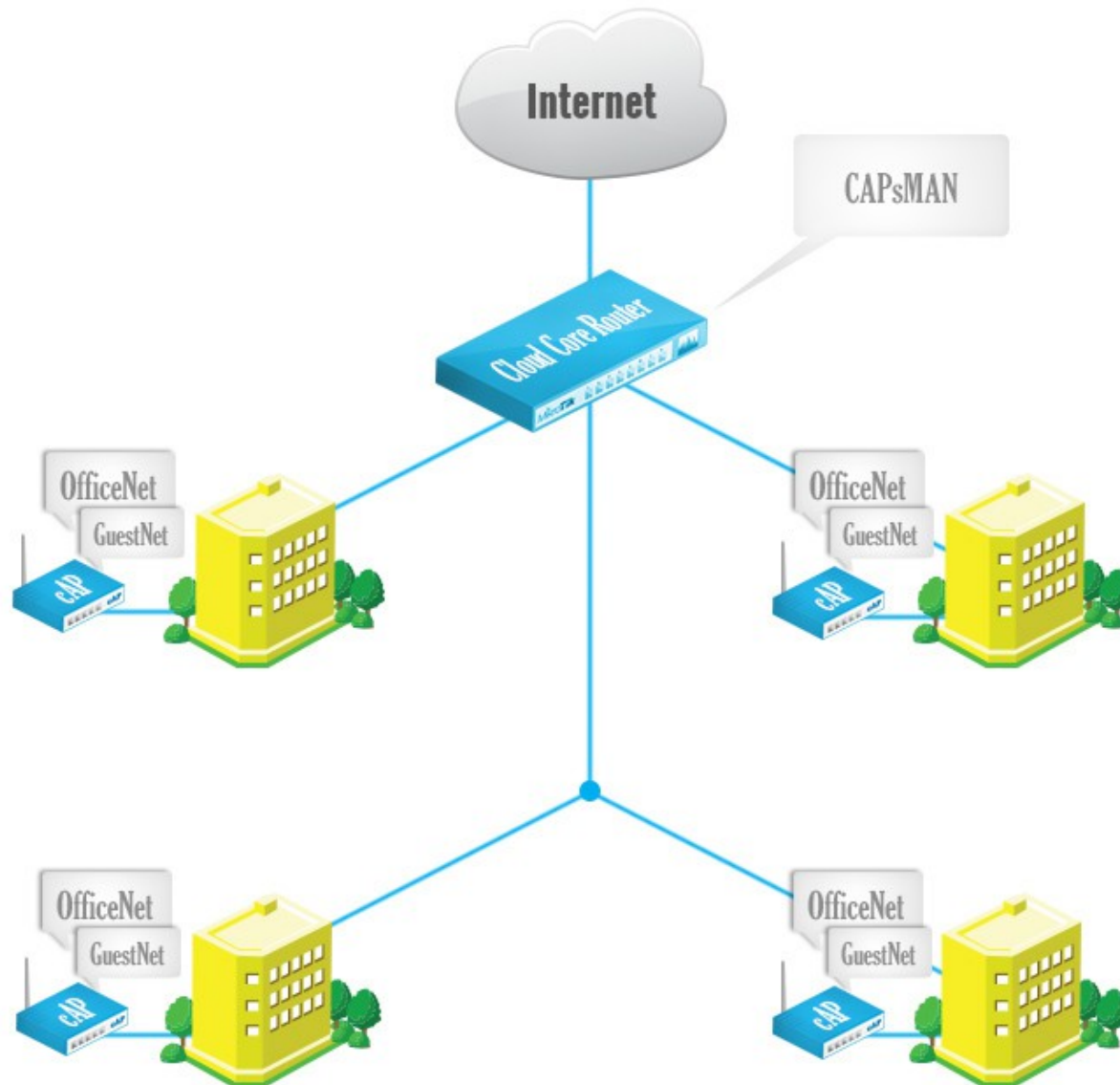
- No interface name change or setting change after the reboot
- Additional manual setting override
- Copy dynamic interface to make static interface

The screenshot displays the CAPsMAN configuration interface. At the top, there are tabs for 'Interfaces', 'Provisioning', 'Configurations', 'Channels', 'Datapaths', 'Security Cfg.', 'Access List', 'Remote CAP', 'Radio', and 'Registration Table'. Below these are icons for adding, deleting, and refreshing, along with a 'Manager' button and an 'AAA' dropdown. A table lists the current interfaces:

| Name      | Type       | MTU  | L2 MTU | Tx    | Rx    | Tx Packet (p/s) | Rx Packet (p/s) | SSID   | Hide SSID |
|-----------|------------|------|--------|-------|-------|-----------------|-----------------|--------|-----------|
| OfficeAP5 | Interfaces | 1500 | 1600   | 0 bps | 0 bps | 0               | 0               | Office |           |

Below the table, the 'Interface <OfficeAP5>' configuration window is open, showing fields for Name, Type, MTU, L2 MTU, MAC Address, ARP, Radio MAC, and Master Interface. The 'Copy' button is highlighted with a red box. A red arrow points from this 'Copy' button to the 'New Interface' window, where the 'Name' field is set to 'Room5AP' and the 'OK' button is also highlighted with a red box.

# CAPsMAN VirtualAP





# CAPsMAN VirtualAP Configuration

- Create new Bridge interface and IP configuration for the VirtualAPs or use the same bridge interface as 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 displays the CAPsMAN configuration interface. At the top, a navigation bar includes tabs for 'Interfaces', 'Provisioning', 'Configurations', 'Channels', 'Datapaths', 'Security Cfg.', 'Access List', 'Remote CAP', 'Radio', and 'Registration Table'. The 'Configurations' tab is selected and highlighted with a red box. Below the navigation bar, a toolbar contains a plus sign icon (highlighted with a red box), a minus sign icon, a speech bubble icon, and a funnel icon. A table lists existing configurations with columns for Name, SSID, Hide SSID, Load Bal..., Country, Channel, Frequency, and Band. One entry is visible: 'OfficeNet' with SSID 'Office' and Country 'united sta...'. Below the table, two 'New CAPs Configuration' dialog boxes are shown. The left dialog has the 'Wireless' tab selected (highlighted with a red box) and contains fields for Name (GuestNet), Mode, SSID (Guest), Hide SSID, Load Balancing Group, Country, Max Station Count, Multicast Helper, HT Tx Chains, HT Rx Chains, and HT Guard Interval. The right dialog has the 'Datapath' tab selected (highlighted with a red box) and contains fields for Datapath, Bridge (GuestNet), Bridge Cost, Bridge Horizon, Local Forwarding, Client To Client Forwarding, VLAN Mode, and VLAN ID.

CAPsMAN

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

+ - [ ] [ ]

| Name      | SSID   | Hide SSID | Load Bal... | Country       | Channel | Frequency | Band | D |
|-----------|--------|-----------|-------------|---------------|---------|-----------|------|---|
| OfficeNet | Office |           |             | united sta... |         |           |      |   |

New CAPs Configuration

**Wireless** Channel Datapath Security

Name: GuestNet

Mode: [ ]

SSID: Guest

Hide SSID: [ ]

Load Balancing Group: [ ]

Country: [ ]

Max Station Count: [ ]

Multicast Helper: [ ]

HT Tx Chains: [ ]

HT Rx Chains: [ ]

HT Guard Interval: [ ]

New CAPs Configuration

Wireless Channel **Datapath** Security

Datapath: [ ]

Bridge: GuestNet

Bridge Cost: [ ]

Bridge Horizon: [ ]

Local Forwarding: [ ]

Client To Client Forwarding: [ ]

VLAN Mode: [ ]

VLAN ID: [ ]

# CAPsMAN VirtualAP Setup

CAPsMAN

Interfaces **Provisioning** Configurations Channels Datapaths Sec

+ - ✓ ✗ 📁 🔍

| # | Radio MAC         | Action       | Master Configurati... | Slave C |
|---|-------------------|--------------|-----------------------|---------|
| 0 | 00:00:00:00:00:00 | create dy... | OfficeNet             |         |

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

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

Action: create dynamic enabled Cancel

Master Configuration: OfficeNet Apply

**Slave Configuration: GuestNet** Disable

Name Prefix: OfficeAP Comment

Copy

Remove

enabled

CAPsMAN

Interfaces Provisioning Configurations Channels Datapaths

+ - ✓ ✗ 📄 🔍 Manager AAA

|      | 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 |   |

CAPsMAN

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

🔍 **Provision**

|   | 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 Access List Features

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

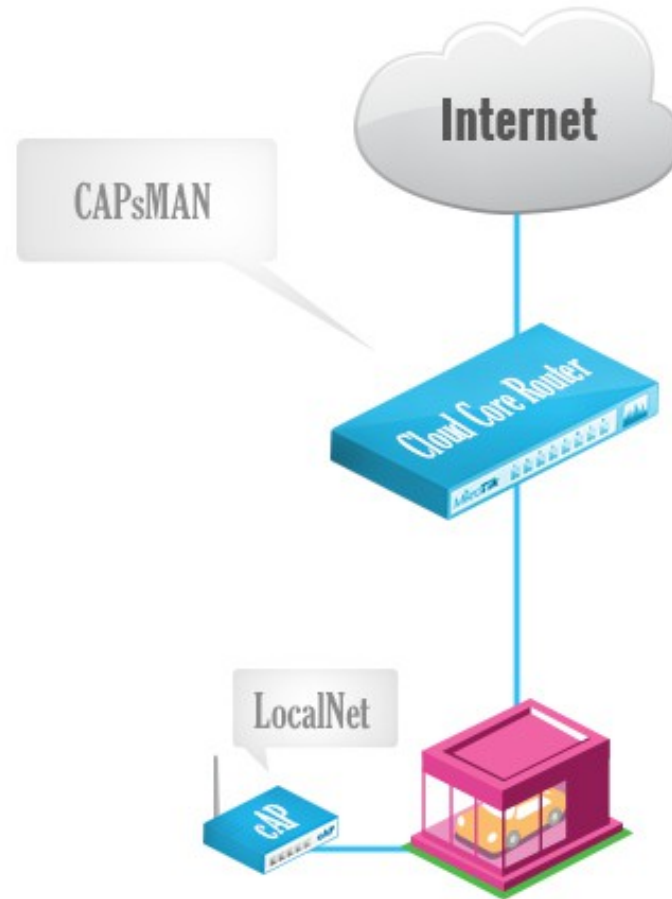
# CAPsMAN Access List

- Allow Apple devices to connect
- Rest of the connections pass to the RADIUS

The screenshot shows the CAPsMAN configuration interface with the 'Access List' tab selected. Two 'New CAPs Access Rule' dialog boxes are open, side-by-side. The left dialog is for a rule with MAC Address 18:34:51:00:00:00 and Action 'accept'. The right dialog is for a rule with Action 'query radius'. Both dialogs have fields for MAC Mask, Interface, Signal Range, Time, AP Tx Limit, Client Tx Limit, Private Passphrase, Client To Client Forwarding, RADIUS Accounting, VLAN Mode, and VLAN ID. The 'enabled' checkbox is checked at the bottom of each dialog.

| # | MAC Address       | MAC Mask          | Interface | Signal Ra... | Action       | Client To Clie... | VLAN Mo... | VLAN ID |
|---|-------------------|-------------------|-----------|--------------|--------------|-------------------|------------|---------|
|   | 18:34:51:00:00:00 | FF:FF:FF:00:00:00 |           |              | accept       |                   |            |         |
|   |                   |                   |           |              | query radius |                   |            |         |

# CAPsMAN Local Forwarding Setup



# CAPsMAN Local Forwarding

- Create a Local Forwarding configuration

The screenshot displays the CAPsMAN configuration interface. At the top, the 'Configurations' tab is selected and highlighted with a red box. Below the navigation tabs, a '+' icon is highlighted with a red box. A table lists existing configurations:

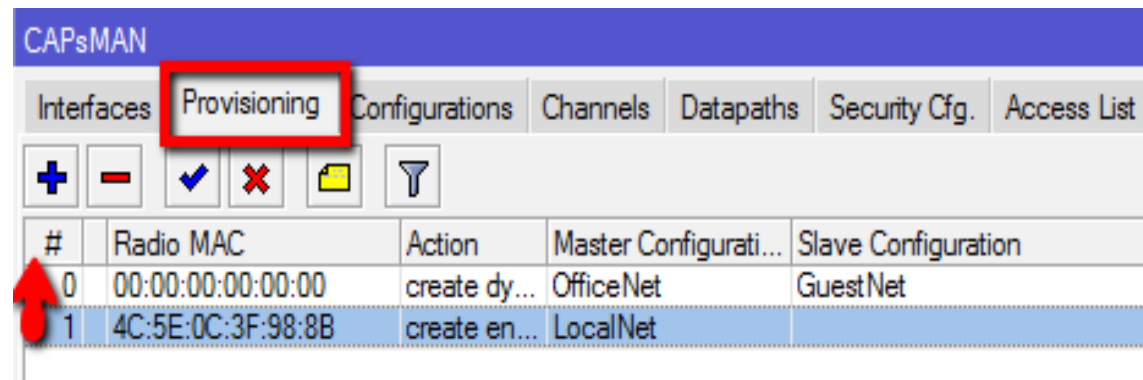
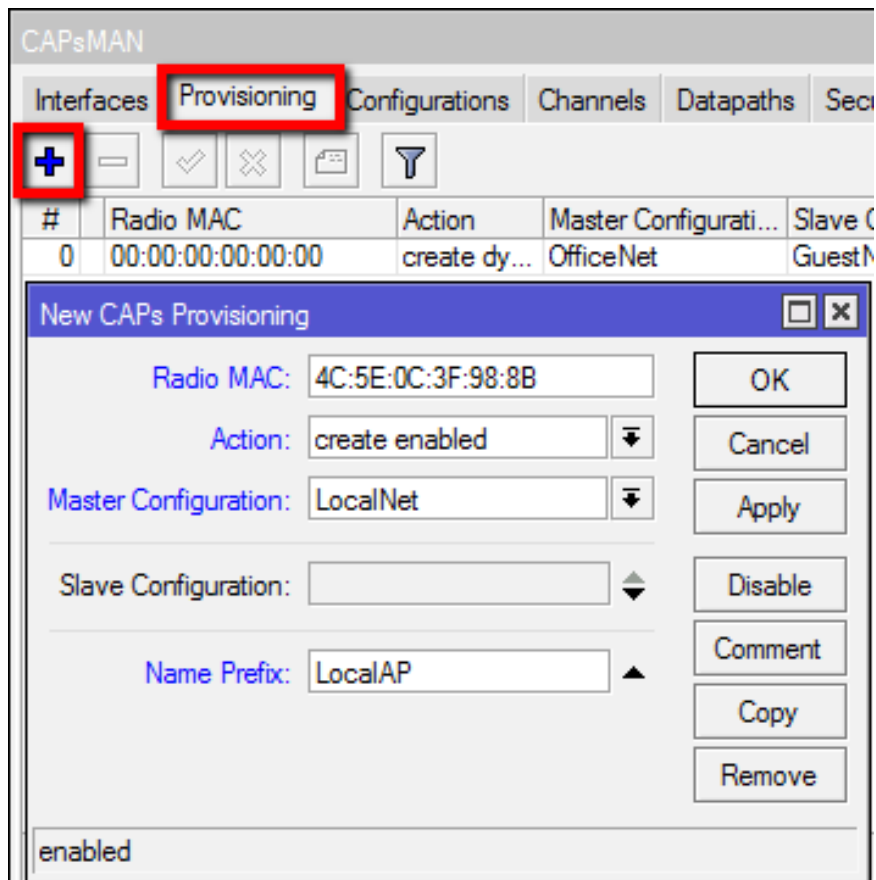
| Name      | SSID   | Hide SSID | Load Bal... | Country       | Channel | Frequency | Band | Datapath | Bridge    | VLAN M... |
|-----------|--------|-----------|-------------|---------------|---------|-----------|------|----------|-----------|-----------|
| GuestNet  | Guest  |           |             |               |         |           |      |          | GuestNet  |           |
| OfficeNet | Office |           |             | united sta... |         |           |      |          | OfficeNet |           |

Below the table, three configuration panels are shown for a new configuration named 'LocalNet':

- Wireless Panel:** The 'Wireless' tab is highlighted with a red box. Fields include Name (LocalNet), Mode, SSID (LocalNet), Hide SSID, Load Balancing Group, Country (united states), Max Station Count, Multicast Helper, HT Tx Chains, HT Rx Chains, and HT Guard Interval.
- Datapath Panel:** The 'Datapath' tab is highlighted with a red box. Fields include Datapath, Bridge, Bridge Cost, Bridge Horizon, Local Forwarding (checked), Client To Client Forwarding, VLAN Mode, and VLAN ID.
- Security Panel:** The 'Security' tab is highlighted with a red box. Fields include Security, Authentication Type (WPA PSK and WPA2 PSK checked), Encryption (aes ccm checked), Group Encryption (aes ccm), Passphrase (LocalNet), and EAP Methods.

# CAPsMAN Local Forwarding

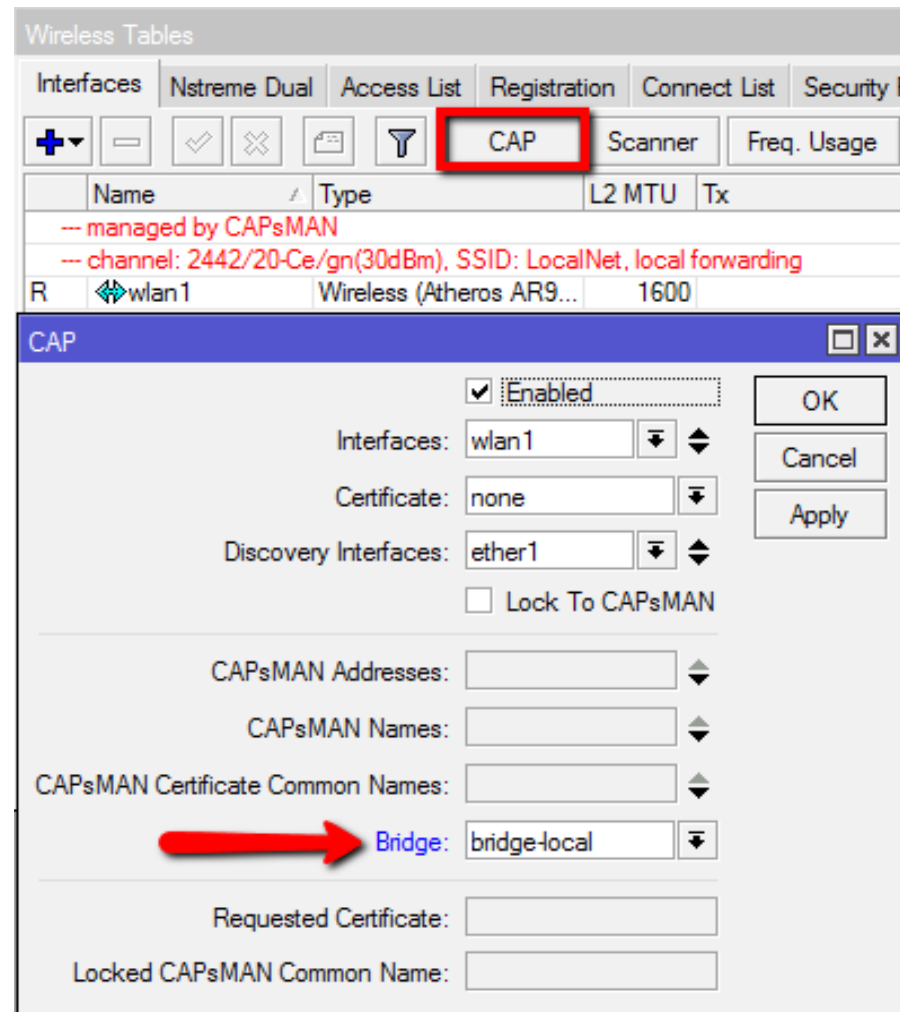
- Create Provisioning rule
- Move above the default Provisioning rule





# CAPsMAN Local Forwarding

- On CAP specify the Bridge interface for CAP or use routing for access to network



# CAPsMAN Dual Band CAP

- If the Channel settings are not specified it will automatically use the supported band/channel
- If specific Channel settings are required then specific Provisioning rules are required
  - Custom Channel settings
  - Dual band wireless interface support

# CAPsMAN Dual Band CAP

- Create 3 configurations:
  - Config for both bands radio
  - Config for 5ghz only radio
  - Config for 2.4ghz only radio

The screenshot shows the CAPsMAN web interface with the 'Configurations' tab selected. The interface is divided into three configuration panels, each with a 'Channel' tab highlighted in red. The panels are:

- CAPs Configuration <Both Bands>**: Channel, Datapath, Security. Channel: [ ], Frequency: [ ], Width: 20, Band: 5ghz-a/n, Extension Channel: [ ], Tx. Power: [ ]
- CAPs Configuration <5ghz Config>**: Channel, Datapath, Security. Channel: [ ], Frequency: [ ], Width: 20, Band: 5ghz-a/n, Extension Channel: [ ], Tx. Power: [ ]
- CAPs Configuration <2.4ghz Config>**: Channel, Datapath, Security. Channel: [ ], Frequency: [ ], Width: [ ], Band: 2ghz-b/g/n, Extension Channel: [ ], Tx. Power: [ ]

# CAPsMAN Dual Band CAP

- Create 3 Provisioning rules
  - For A/N,G/N hardware use Both Bands config
  - For A/N hardware use 5ghz config
  - For G/N hardware use 2.4ghz config

CAPsMAN

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

+ - ✓ ✗ ☰ ⏏

| #                     | Radio MAC                           | Action | Master Configurati... | Slave Configuration |
|-----------------------|-------------------------------------|--------|-----------------------|---------------------|
| New CAPs Provisioning |                                     |        |                       |                     |
|                       | Radio MAC: 00:00:00:00:00:00        |        |                       |                     |
|                       | Hw. Supported Modes: an             |        |                       |                     |
|                       | gn                                  |        |                       |                     |
|                       | Action: create dynamic enabled      |        |                       |                     |
|                       | Master Configuration: Both Bands    |        |                       |                     |
|                       | Slave Configuration:                |        |                       |                     |
|                       | Name Prefix:                        |        |                       |                     |
| New CAPs Provisioning |                                     |        |                       |                     |
|                       | Radio MAC: 00:00:00:00:00:00        |        |                       |                     |
|                       | Hw. Supported Modes: an             |        |                       |                     |
|                       | Action: create dynamic enabled      |        |                       |                     |
|                       | Master Configuration: 5ghz Config   |        |                       |                     |
|                       | Slave Configuration:                |        |                       |                     |
|                       | Name Prefix:                        |        |                       |                     |
| New CAPs Provisioning |                                     |        |                       |                     |
|                       | Radio MAC: 00:00:00:00:00:00        |        |                       |                     |
|                       | Hw. Supported Modes: gn             |        |                       |                     |
|                       | Action: create dynamic enabled      |        |                       |                     |
|                       | Master Configuration: 2.4ghz Config |        |                       |                     |
|                       | Slave Configuration:                |        |                       |                     |
|                       | Name Prefix:                        |        |                       |                     |

# CAPsMAN Dual Band CAP

CAPsMAN

Interfaces Provisioning Configurations Channels Datapaths Security Cfg. Access List Remote CAP Radio Registr

+ - ✓ ✗ ☰ ⏏ Manager AAA

|     | Name  | Type       | MTU  | L2 MTU | Tx    | Rx    |
|-----|-------|------------|------|--------|-------|-------|
| DMB | cap10 | Interfaces | 1500 | 1600   | 0 bps | 0 bps |
| DMB | cap9  | Interfaces | 1500 | 1600   | 0 bps | 0 bps |

Interface <cap9>

General Wireless Channel Datapath Security

Configuration: 2.4ghz Config

Mode:

SSID: 2.4ghz band

Hide SSID:

Interface <cap10>

General Wireless Channel Datapath Security Status Traffic

Configuration: 5ghz Config

Mode:

SSID: 5ghz band

Hide SSID:

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

+ - ✓ ✗ ☰ ⏏ CAP Scanner Freq. Usage Alignment Wireless Sniffer

|   | Name  | Type                     | L2 MTU | Tx | Rx    | Tx    |
|---|---|--------------------------|--------|----|-------|-------|
|   | -- managed by CAPsMAN   |                          |        |    |       |       |
|   | -- channel: 5220/20-Ce/an(17dBm), SSID: 5ghz band, CAPsMAN forwarding   |                          |        |    |       |       |
| X | wlan1   | Wireless (Atheros AR9... | 1600   |    | 0 bps | 0 bps |
|   | -- managed by CAPsMAN   |                          |        |    |       |       |
|   | -- channel: 2427/20-Ce/gn(30dBm), SSID: 2.4ghz band, CAPsMAN forwarding |                          |        |    |       |       |
| X | wlan2   | Wireless (Atheros AR9... | 1600   |    | 0 bps | 0 bps |

# CAPsMAN and CAP in one board

- Enable CAPsMAN Manager and create the configuration
- Configure the CAP to look for IP 127.0.0.1

Wireless Tables

Interfaces | Nstreme Dual | Access List | Registration | Connect List | Secu

+ - ✓ ✗ [CAP] Scanner Freq. Usa

| Name | Type | L2 MTU | Tx |
|------|------|--------|----|
| CAP  |      |        |    |

Enabled

Interfaces: wlan1

Certificate: none

Discovery Interfaces:

Lock To CAPsMAN

CAPsMAN Addresses: 127.0.0.1

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: none

Requested Certificate:

Locked CAPsMAN Common Name:

# CAPsMAN Antenna-gain

- Antenna-gain value is taken from the CAP interface
- Must be configured on AP before enable radio in CAP mode
- Example with 6db antenna-gain and 30db EIRP

The screenshot displays the CAPsMAN configuration interface. The top section shows a table of interfaces with columns for Name, Type, MTU, L2 MTU, and Tx. The interface 'cap1' is selected. Below this, the 'Wireless Tables' section is visible, showing a table with columns for Name, Type, L2 MTU, Tx, and Rx. A red box highlights the text: '--- managed by CAPsMAN' and '--- channel: 2442/20-Ce/gn(24dBm), SSID: LocalAP, CAPsMAN forwarding'. The bottom section shows the configuration for 'Interface <cap1>' with tabs for General, Wireless, Channel, Datapath, Security, Status, and Traffic. A red box highlights the 'Current Channel' field, which is set to '2442/20-Ce/gn(30dBm)'. Other fields include 'Current State: running-ap', 'Current Rate Set: CCK:1-11 OFDM:6-54 BW:1x-2x HT:0-15', and 'Current Basic Rate Set: OFDM:6 BW:1x HT:0-7'.

# CAPsMAN v2 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



# CAPsMAN v2 compatibility

- CAPsMAN v2 is NOT compatible with current CAPsMAN v1 (CAPsMAN v1 CAP devices will not be able to connect to CAPsMAN v2 and CAPsMAN v2 CAP devices will not be able to connect to CAPsMAN v1).
- Both CAPsMAN and CAP devices should have wireless-cm2 package installed in order to make CAPsMAN v2 system to work.

# Upgrade to CAPsMAN v2

- Option1: Install a new temporary CAPsMAN v2 router in same network where the current CAPsMAN router is and start upgrading CAPs with wireless-cm2 package. All CAPs with the v2 will connect to the new temporary CAPsMAN v2 router. After every CAP is upgraded to v2, upgrade your current CAPsMAN to v2 and then turn off the temporary CAPsMAN v2 router.
- Option2: Upgrade your CAPs and then CAPsMAN to v2 at the same time. In this case you could have little more downtime unless you schedule all the CAPs to reboot/install at the same time.