

# CAPsMAN Case Study

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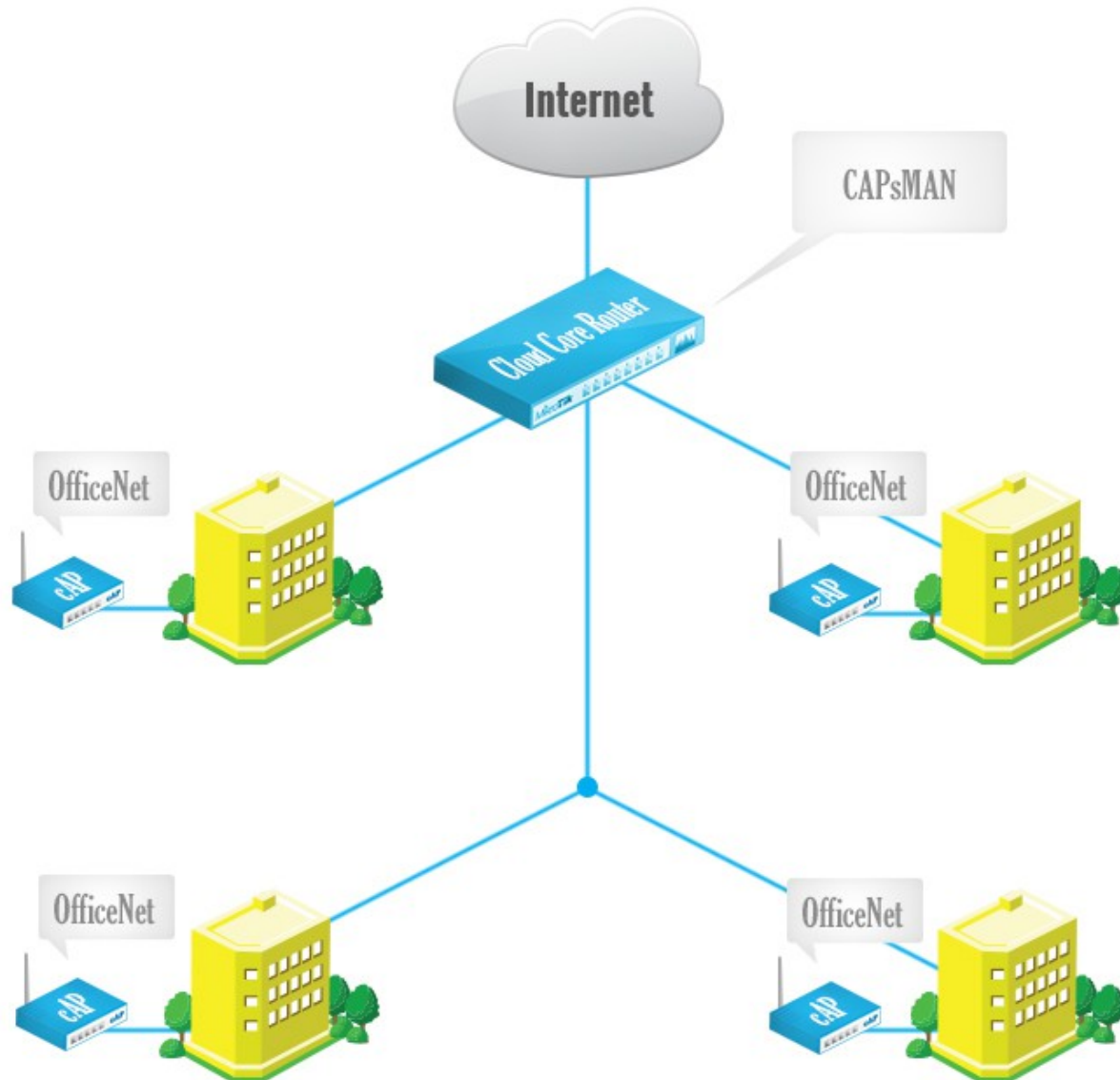
# CAPsMAN Features

- 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 or RouterBOARD based device
  - Newest RouterOS v6 version
  - Wireless-fp 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 package installed and enabled
  - At least Level4 RouterOS license

# CAPsMAN Simple Setup

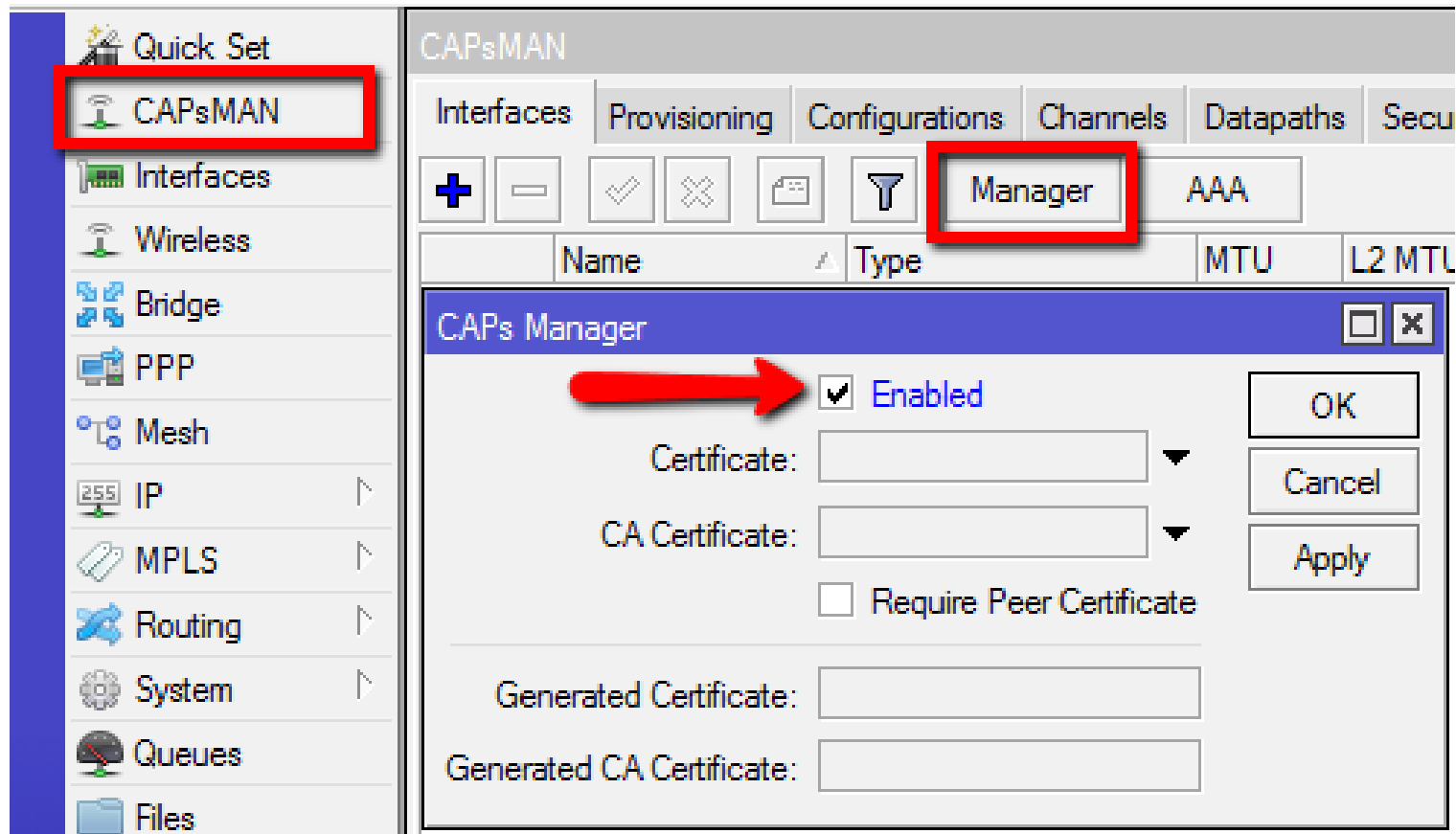


# CAPsMAN Simple Setup

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

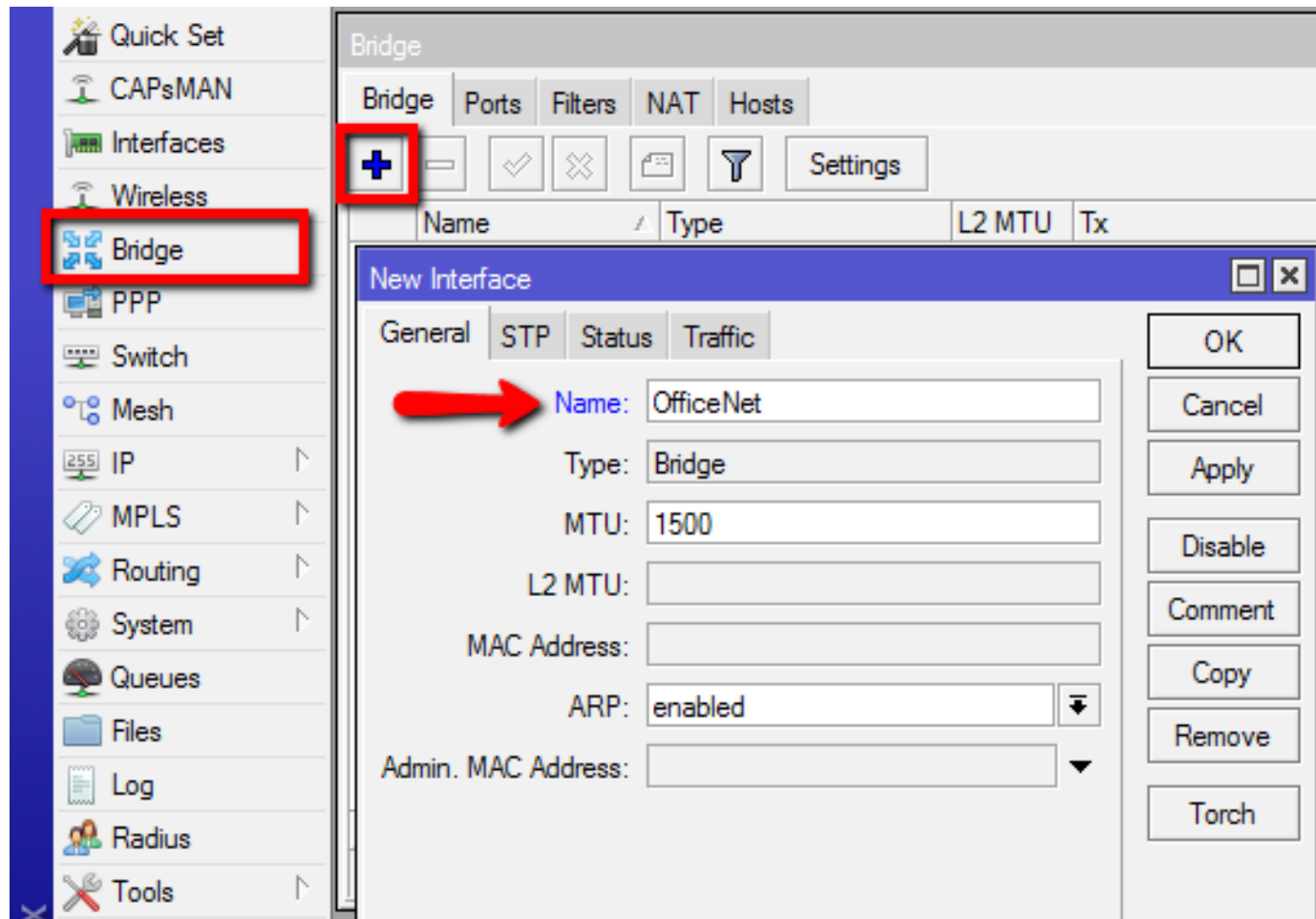
# CAPsMAN Simple Setup

- 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 'New Address' dialog.
- 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 'DHCP Setup' dialog, and another red box with the number '2' highlights the 'Next' button.
- Step 3:** The 'Firewall' window shows the 'Filter Rules' tab selected, 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 'New NAT Rule' dialog.



# 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', 'Datapath', and 'Security'.

**Configurations Tab:**

Name	SSID	Hide SSID	Load Bal...	Country	Channel	Frequency	Band	Datapat
------	------	-----------	-------------	---------	---------	-----------	------	---------

**Wireless Configuration Panel:**

- Name: OfficeNet
- Mode: [ ]
- SSID: Office
- Hide SSID: [ ]
- Load Balancing Group: [ ]
- Country: united states
- Max Station Count: [ ]
- Multicast Helper: [ ]
- HT Tx Chains: [ ]
- HT Rx Chains: [ ]
- HT Guard Interval: [ ]

**Datapath Configuration Panel:**

- Datapath: [ ]
- Bridge: OfficeNet
- Bridge Cost: [ ]
- Bridge Horizon: [ ]
- Local Forwarding: [ ]
- Client To Client Forwarding: [ ]
- VLAN Mode: [ ]
- VLAN ID: [ ]

**Security Configuration Panel:**

- Security: [ ]
- Authentication Type:  WPA PSK  WPA2 PSK  WPA EAP  WPA2 EAP
- Encryption:  aes ccm  tkip
- Group Encryption: aes ccm
- Passphrase: OfficeNet
- EAP Methods: [ ]

# CAPsMAN Simple Setup

- Add new Provisioning rule

The screenshot shows the CAPsMAN software interface. The 'Provisioning' tab is selected and highlighted with a red box. Below the tab, a toolbar contains several icons, with a plus sign icon also highlighted by a red box. A dialog box titled 'New CAPs Provisioning' is open, displaying the following fields and options:

#	Radio MAC	Action	Master Configurati...	Slave C
	Radio MAC: 00:00:00:00:00:00	Action: create dynamic enabled	Master Configuration: OfficeNet	Slave Configuration:
			Name Prefix: OfficeAP	

Buttons on the right side of the dialog box include: OK, Cancel, Apply, Disable, Comment, Copy, and Remove. The status 'enabled' is shown at the bottom left of the dialog box.

# 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' mode. The 'CAP' button in the top toolbar is also highlighted with a red box. The configuration details for the 'CAP' mode are as follows:

Name	Type	L2 MTU	Tx
CAP			

Configuration details for the CAP mode:

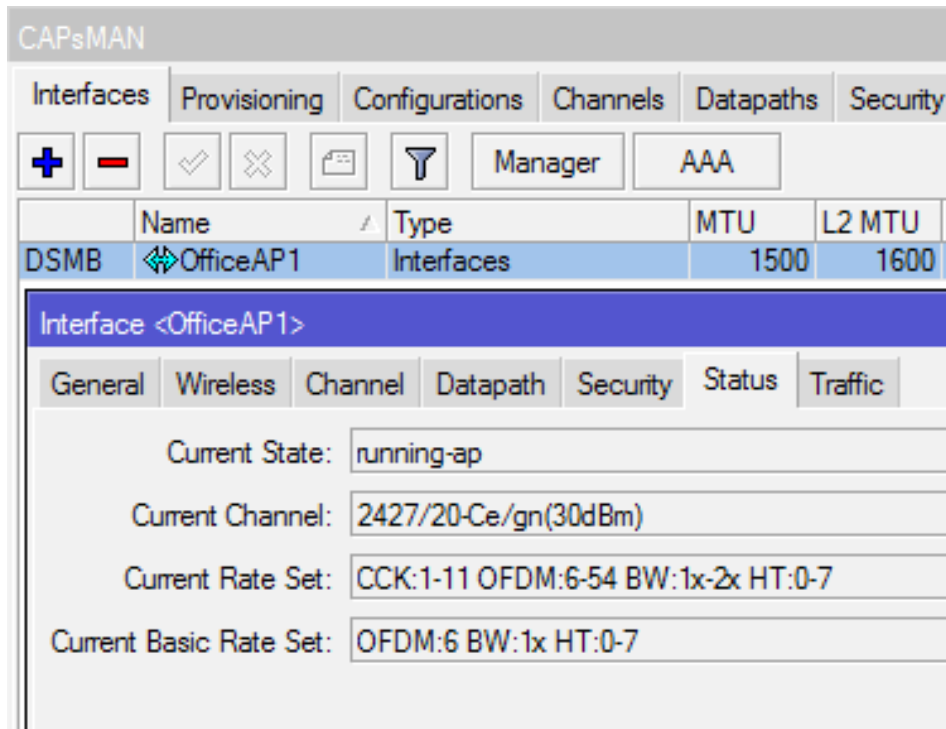
- Enabled
- Interfaces: wlan1
- Certificate: none
- Discovery Interfaces: ether1
- Lock To CAPsMAN
- CAPsMAN Addresses: [empty]
- CAPsMAN Names: [empty]
- CAPsMAN Certificate Common Names: [empty]
- Bridge: none
- Requested Certificate: [empty]
- Locked CAPsMAN Common Name: [empty]

Buttons: OK, Cancel, Apply

# 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

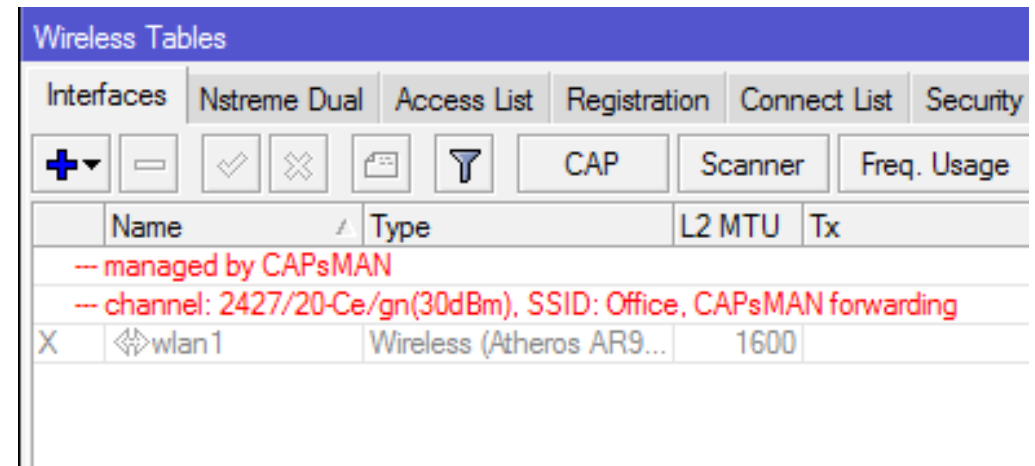
Current State: running-ap

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
X wlan1	Wireless (Atheros AR9...	1600	

--- managed by CAPsMAN

--- 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**

[-] [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

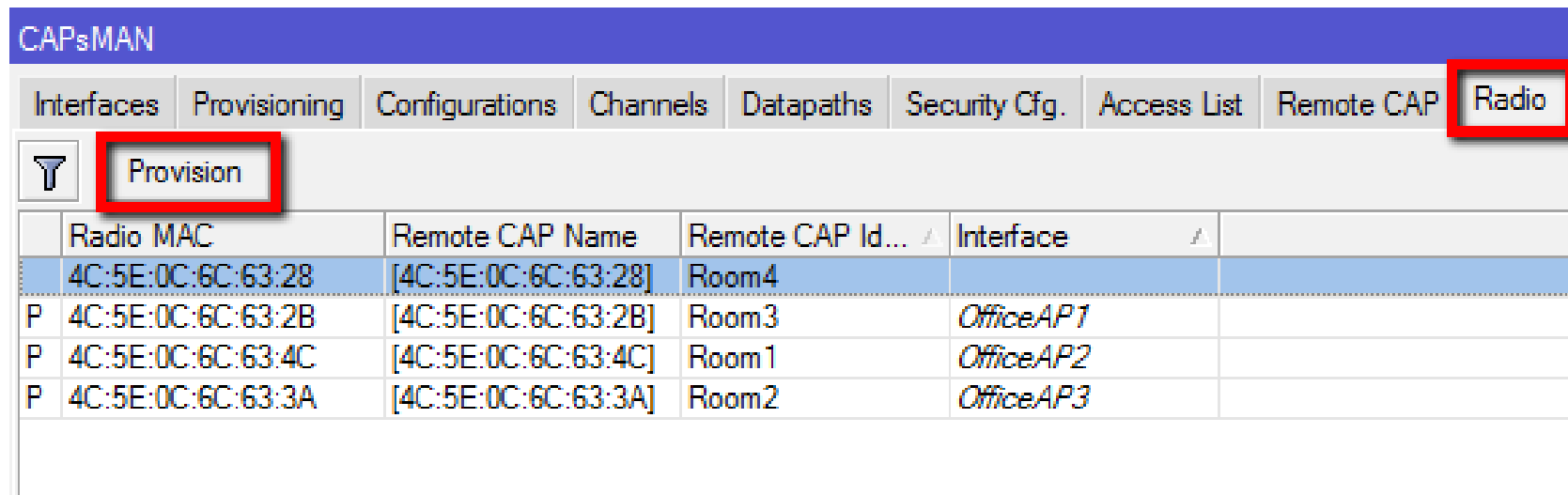
OK

Remove

Copy to Access List

# 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 web interface. The 'Radio' tab is selected and highlighted with a red box. Below it, the 'Provision' button is also highlighted with a red box. The main table displays the following 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 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

Wireless Tables

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

Name	Type	L2 MTU	Tx	Rx
wlan1	Wireless (Atheros AR9...	1600		0 bps

**CAP**

Enabled

Interfaces: wlan1

Certificate: none

Discovery Interfaces:

Lock To CAPsMAN

CAPsMAN Addresses: 10.5.125.1

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: none

Requested Certificate:

Locked CAPsMAN Common Name:

OK  
Cancel  
Apply

# 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

Name	Type	L2 MTU	Tx	Rx
------	------	--------	----	----

CAP

Enabled

Interfaces:

Certificate:

Discovery Interfaces:

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge:

Requested Certificate:

Locked CAPsMAN Common Name:

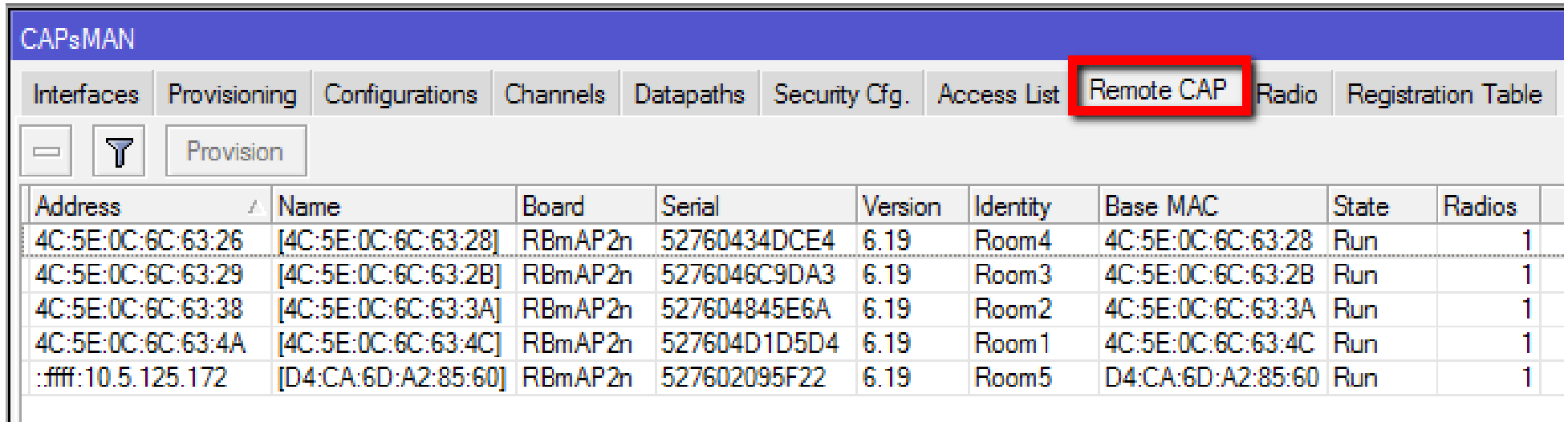
OK

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 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

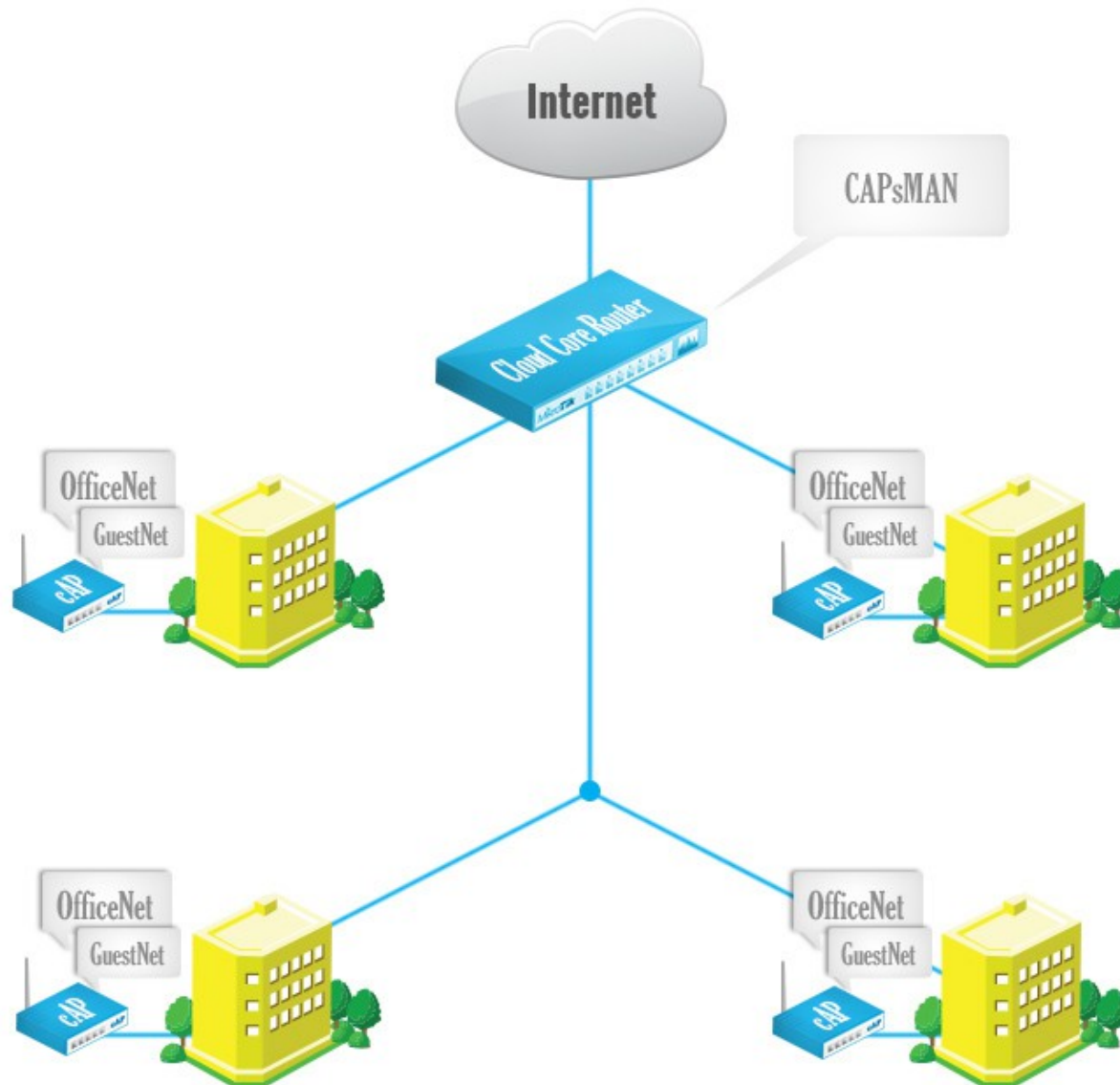
The screenshot displays the CAPsMAN configuration interface. At the top, there are tabs for 'Interfaces', 'Provisioning', 'Configurations', 'Channels', 'Datapaths', 'Security Cfg.', 'Access List', 'Remote CAP', 'Radio', and 'Registration Table'. Below these tabs is a toolbar with icons for adding, deleting, and refreshing, along with a 'Manager' button and an 'AAA' dropdown menu. 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 the 'General' tab. The 'Name' field is 'OfficeAP5', 'Type' is 'Interfaces', 'MTU' is '1500', 'L2 MTU' is '1600', 'MAC Address' is 'D4:CA:6D:A2:85:60', 'ARP' is 'enabled', and 'Radio MAC' is 'D4:CA:6D:A2:85:60'. The 'Master Interface' is set to 'none'. A red box highlights the 'Copy' button in the bottom right corner of this window.

To the right, the 'New Interface' configuration window is open, also in the 'General' tab. The 'Name' field is 'Room5AP', 'Type' is 'Interfaces', 'MTU' is '1500', 'L2 MTU' is '1600', 'MAC Address' is 'D4:CA:6D:A2:85:60', 'ARP' is 'enabled', and 'Radio MAC' is 'D4:CA:6D:A2:85:60'. The 'Master Interface' is set to 'none'. A red box highlights the 'OK' button in the bottom right corner of this window. A red arrow points from the 'Copy' button in the first window to the 'Name' field in the second window.

# 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 web interface. At the top, a navigation menu includes 'Interfaces', 'Provisioning', 'Configurations', 'Channels', 'Datapaths', 'Security Cfg.', 'Access List', 'Remote CAP', 'Radio', and 'Registration Table'. The 'Configurations' tab is highlighted with a red box. Below the menu, a toolbar contains a '+' icon (highlighted with a red box), a '-' icon, a document icon, and a funnel icon. A table lists existing configurations with columns: Name, SSID, Hide SSID, Load Bal..., Country, Channel, Frequency, and Band. One entry is 'OfficeNet' with SSID 'Office' and Country 'united sta...'. Below the table, two configuration panels are shown. The left panel, titled 'New CAPs Configuration', has tabs for 'Wireless', 'Channel', 'Datapath', and 'Security'. The 'Wireless' tab is selected and highlighted with a red box. It 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 panel, also titled 'New CAPs Configuration', has tabs for 'Wireless', 'Channel', 'Datapath', and 'Security'. The 'Datapath' tab is selected and highlighted with a red box. It contains fields for Datapath, Bridge (GuestNet), Bridge Cost, Bridge Horizon, Local Forwarding, Client To Client Forwarding, VLAN Mode, and VLAN ID.

# CAPsMAN VirtualAP Setup

CAPsMAN

Interfaces **Provisioning** Configurations Channels Datapaths Sec

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

	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 static VirtualAP

CAPsMAN

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

**+** - ✓ ✗ 📄 🔍 Manager AAA

	Name	Type	MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)
DSMB	OfficeAP1	Interfaces	1500	1600	0 bps	0 bps	0	
DSB	OfficeAP1-1	Interfaces	1500	1600	0 bps	0 bps	0	
DSMB	OfficeAP2	Interfaces	1500	1600	0 bps	0 bps	0	
DSB	OfficeAP2-1	Interfaces	1500	1600	0 bps	0 bps	0	
DSMB	OfficeAP3	Interfaces	1500	1600	0 bps	0 bps	0	
DSB	OfficeAP3-1	Interfaces	1500	1600	0 bps	0 bps	0	
DSMB	OfficeAP4	Interfaces	1500	1600	0 bps	0 bps	0	
DSB	OfficeAP4-1	Interfaces	1500	1600	0 bps	0 bps	0	
SMB	Room5AP	Interfaces	1500	1600	0 bps	0 bps	0	

New Interface

**General** Wireless Channel Datapath Security

Name: Room5VAP  
Type: Interfaces  
MTU: 1500  
L2 MTU:  
MAC Address: 00:00:00:00:00:00  
ARP: enabled  
Radio MAC: 00:00:00:00:00:00  
Master Interface: Room5AP

New Interface

General **Wireless** Channel Datapath Security Status Traffic

Configuration: GuestNet  
Mode:  
SSID: GuestAP  
Hide SSID:  
Load Balancing Group:  
Country:  
Max Station Count:

OK  
Cancel  
Apply  
Disable  
Comment  
Copy  
Remove  
Torch

# CAPsMAN Access List Features

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

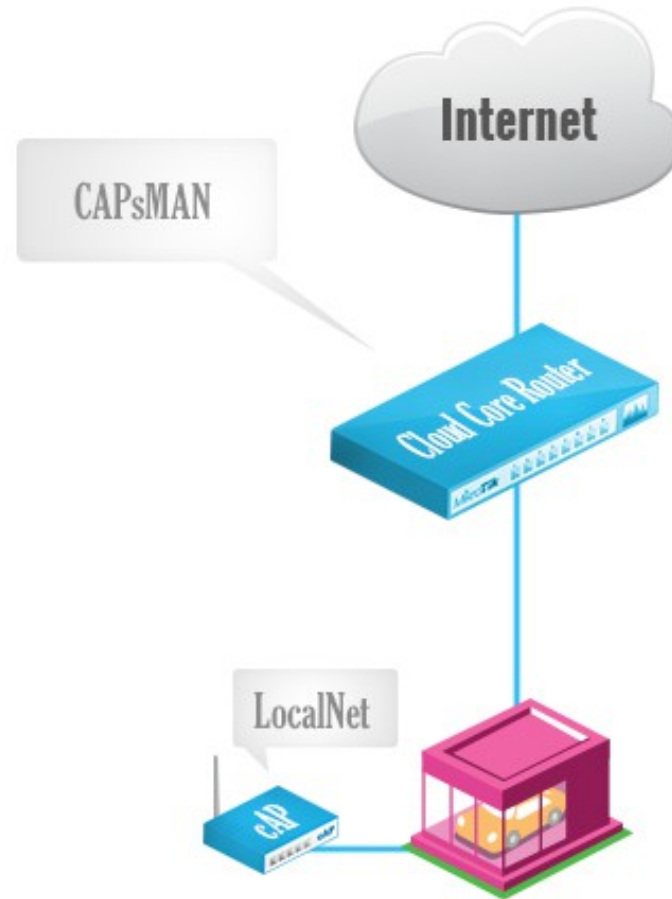
# CAPsMAN Access List

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

The screenshot displays the CAPsMAN configuration interface. The 'Access List' tab is selected and highlighted with a red box. Below the tab, a table lists access rules. A red box highlights the '+' icon for adding a new rule. Two 'New CAPs Access Rule' dialog boxes are open, showing configuration options for MAC Address, MAC Mask, Interface, Signal Range, Action, and other parameters. The left dialog shows a rule with MAC Address 18:34:51:00:00:00 and Action 'accept'. The right dialog shows a rule with Action 'query radius'. Both rules are currently 'enabled'.

#	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 tabs, a toolbar contains a plus sign icon, also highlighted with a red box. A table lists existing configurations:

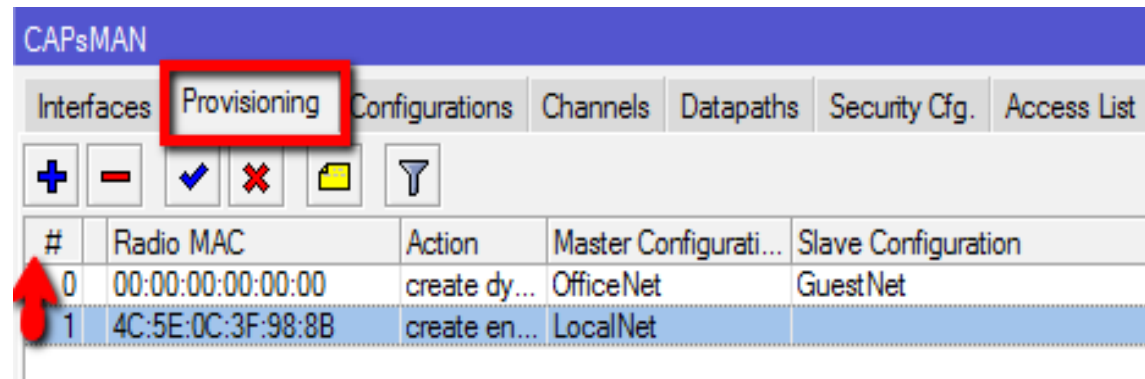
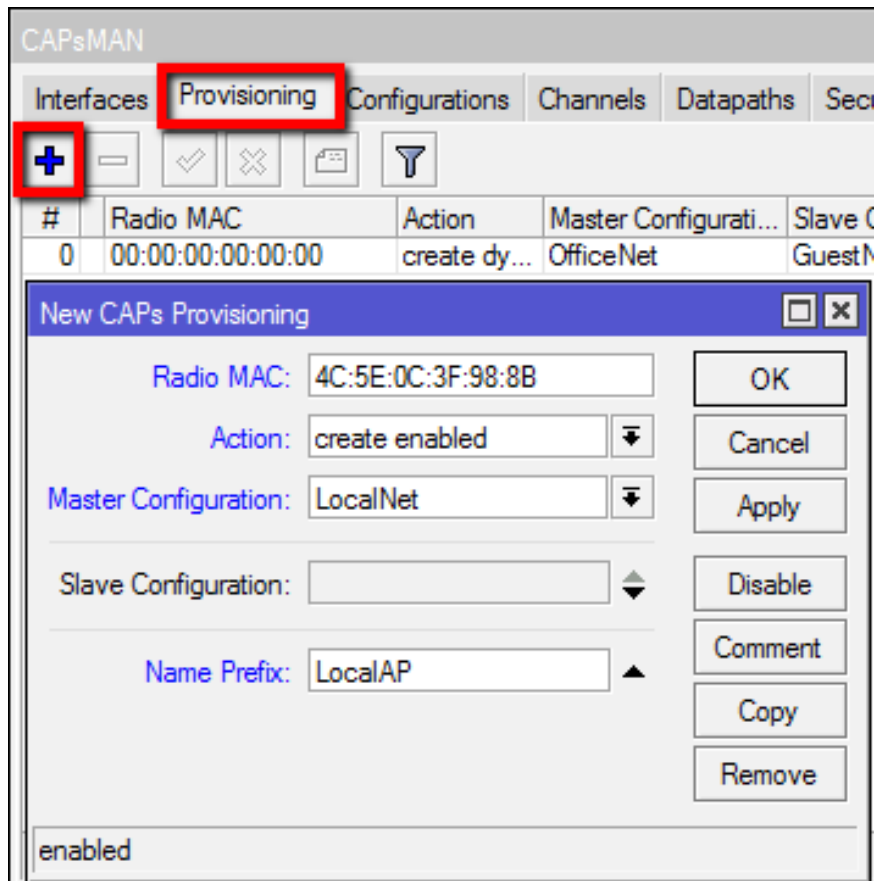
Name	SSID	Hide SSID	Load Bal...	Country	Channel	Frequency	Band	Datapath	Bridge	VLAN M...
GuestNet	Guest								GuestNet	
OfficeNet	Office			united sta...					OfficeNet	

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

- Wireless Panel:** The 'Wireless' tab is selected and 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 selected and 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 selected and 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.

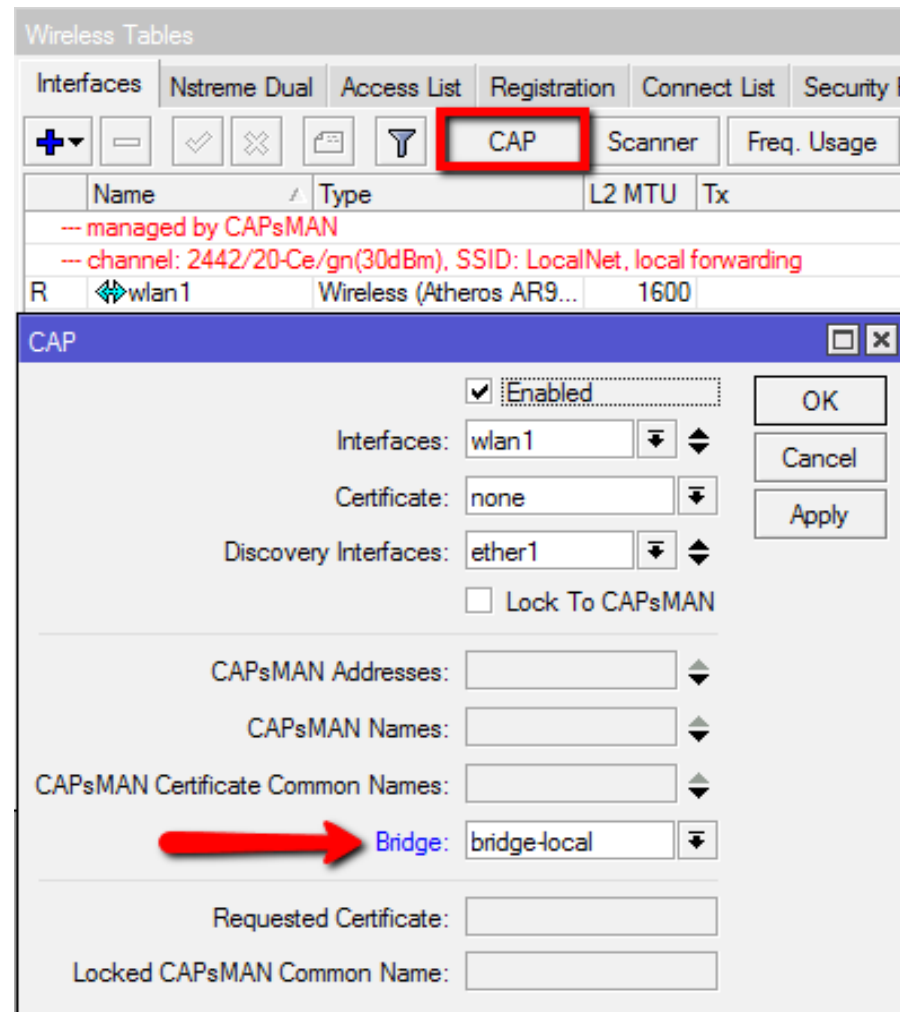
# CAPsMAN Local Forwarding

- Create Provisioning rule
- Move above the default Provisioning rule

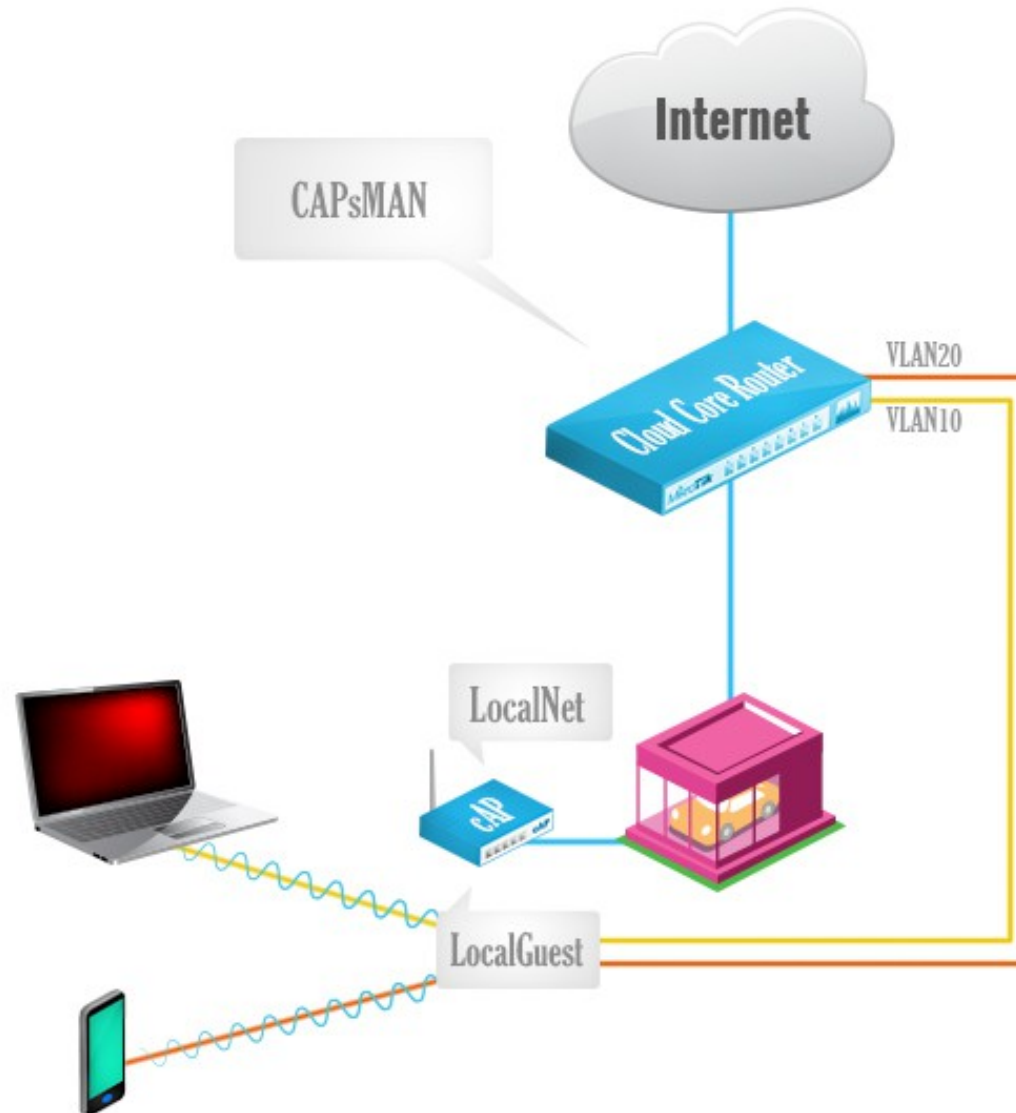


# CAPsMAN Local Forwarding

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



# CAPsMAN VLAN Assignment





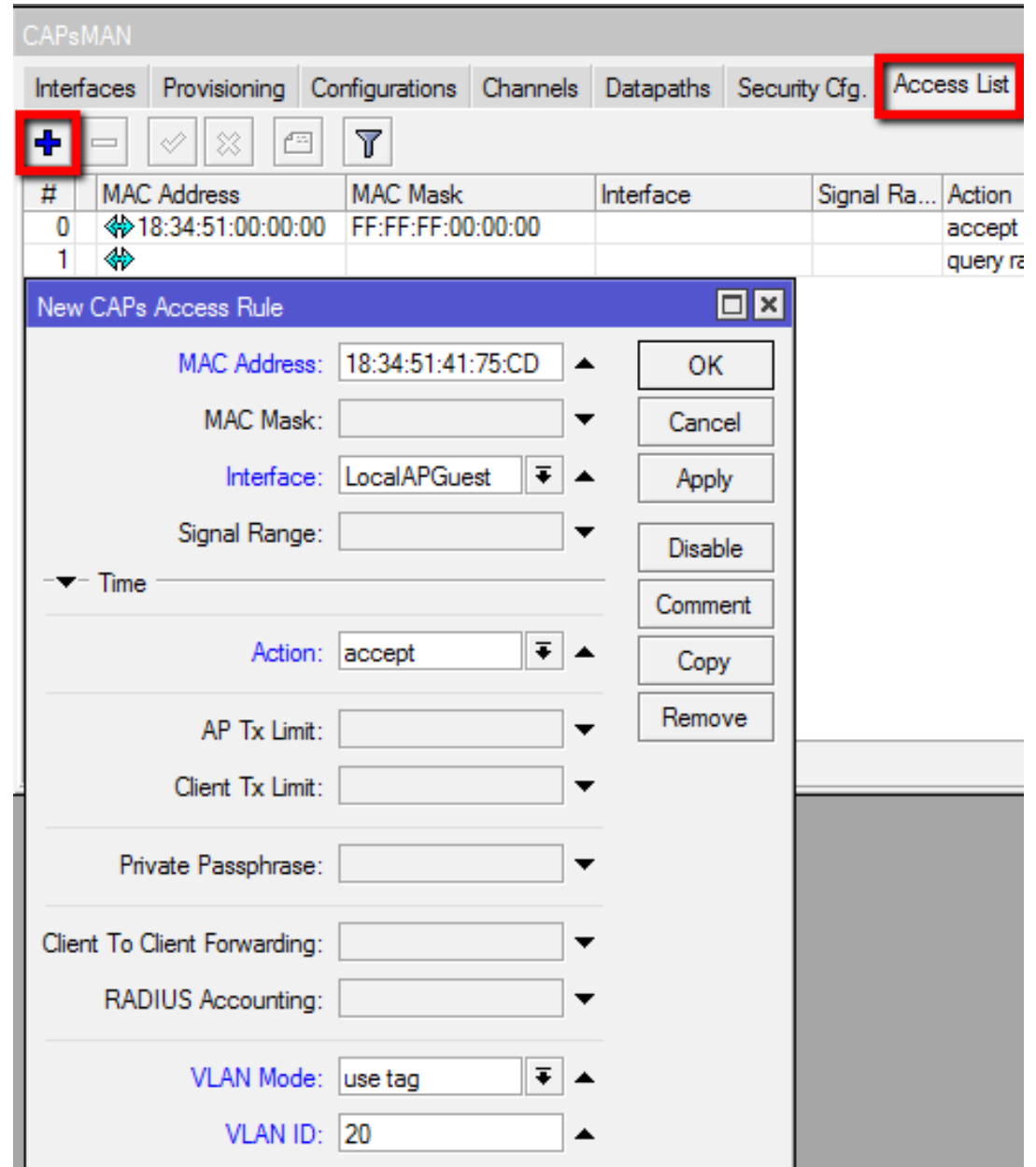
# CAPsMAN VLAN Assignment

- When using Local Forwarding CAPsMAN can assign VLAN ID to specific CAP interface or even specific wireless client
- Create Slave interface with Vlan tag

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 is a toolbar with icons for adding (+), removing (-), saving (checkmark), deleting (X), and other functions, along with 'Manager' and 'AAA' buttons. A table lists existing interfaces, with 'LocalAP1' highlighted. Below the table are three 'New Interface' configuration panels. The first panel has the 'General' tab selected, showing fields for Name (LocalAPGuest), Type (Interfaces), MTU (1500), L2 MTU, MAC Address (00:00:00:00:00:00), ARP (enabled), Radio MAC (00:00:00:00:00:00), and Master Interface (LocalAP1). The second panel has the 'Wireless' tab selected, showing fields for Configuration, Mode, SSID (LocalGuest), Hide SSID, Load Balancing Group, Country, Max Station Count, Multicast Helper, HT Tx Chains, HT Rx Chains, and HT Guard Interval. The third panel has the 'Datapath' tab selected, showing fields for Datapath, Bridge, Bridge Cost, Bridge Horizon, Local Forwarding (checked), Client To Client Forwarding, VLAN Mode (use tag), and VLAN ID (10). Red boxes highlight the '+' icon, the 'General' tab, the 'Wireless' tab, and the 'Datapath' tab.

# CAPsMAN VLAN Assignment

- Create Access List rule for specific client to get tagged to Management Vlan on the same CAP interface
- Move the Access List rule above the previous ones



The screenshot displays the CAPsMAN web interface. The 'Access List' tab is highlighted in red. Below the navigation tabs, a table lists existing rules. A dialog box titled 'New CAPs Access Rule' is open, showing the following configuration:

#	MAC Address	MAC Mask	Interface	Signal Ra...	Action
0	18:34:51:00:00:00	FF:FF:FF:00:00:00			accept
1					query ra

**New CAPs Access Rule**

MAC Address: 18:34:51:41:75:CD  
MAC Mask:   
Interface: LocalAPGuest  
Signal Range:   
Time:   
Action: accept  
AP Tx Limit:   
Client Tx Limit:   
Private Passphrase:   
Client To Client Forwarding:   
RADIUS Accounting:   
VLAN Mode: use tag  
VLAN ID: 20

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

# CAPsMAN VLAN Assignment

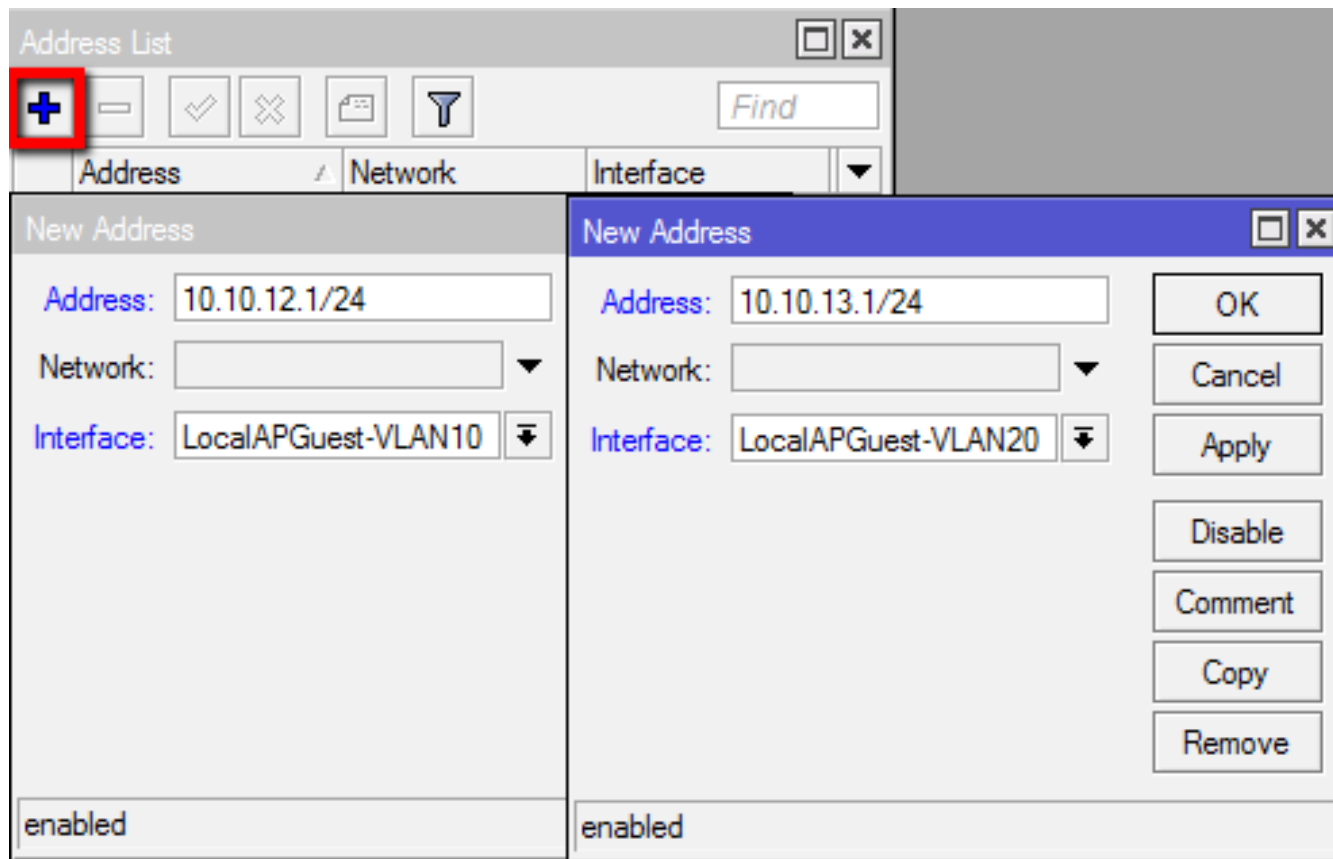
- Create VLAN interfaces on the CAPsMAN router interface where the CAPs are connected

The screenshot displays the 'Interface List' window in the CAPsMAN configuration tool. The 'VLAN' tab is selected and highlighted with a red box. A red box also highlights the '+' icon in the toolbar, indicating the 'Add New Interface' action. Below the toolbar, two configuration panels for 'New Interface' are shown side-by-side. The left panel is for 'LocalAPGuest-VLAN10' and the right panel is for 'LocalAPGuest-VLAN20'. Both panels have the 'Type' set to 'VLAN' and 'MTU' set to '1500'. The 'VLAN ID' is set to '10' for the first interface and '20' for the second. The 'Interface' is set to 'local' for both. The 'Use Service Tag' checkbox is unchecked in both panels.

Name	Type	MTU	L2 MTU	Tx	Rx
LocalAPGuest-VLAN10	VLAN	1500			
LocalAPGuest-VLAN20	VLAN	1500			

# CAPsMAN VLAN Assignment

- Assign IPs to VLAN interfaces on CAPsMAN



# 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 panels, each representing a different CAP configuration. The 'Channel' tab is selected in each panel, and the 'Channel' field is highlighted with a red box. The 'Both Bands' configuration is currently selected and highlighted in blue.

Name	SSID	Hide SSID	Load Bal...	Country	Channel	Frequency	Band
CAPs Configuration <Both Bands>							
Wireless	Channel	Datapath	Security				
	Channel:						
	Frequency:						
	Width:	20					
	Band:	5ghz-a/n					
	Extension Channel:						
	Tx. Power:						
CAPs Configuration <5ghz Config>							
Wireless	Channel	Datapath	Security				
	Channel:						
	Frequency:						
	Width:	20					
	Band:	5ghz-a/n					
	Extension Channel:						
	Tx. Power:						
CAPs Configuration <2.4ghz Config>							
Wireless	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
cap10	Interfaces	1500	1600	0 bps	0 bps
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 Configuration override

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



New CAPs Channel

Name:

Frequency:  MHz ▲

Width:  ▼

OK  
Cancel  
Apply

New CAPs Configuration

Wireless Channel Datapath Security

Channel:

Frequency:  MHz ▲

Width:  ▼

New Interface

General Wireless Channel Datapath Security Status Traffic

Channel:

Frequency:  MHz ▲

Width:  ▼

Interface <cap1>

General Wireless Channel Datapath Security Status Traffic

Current State:

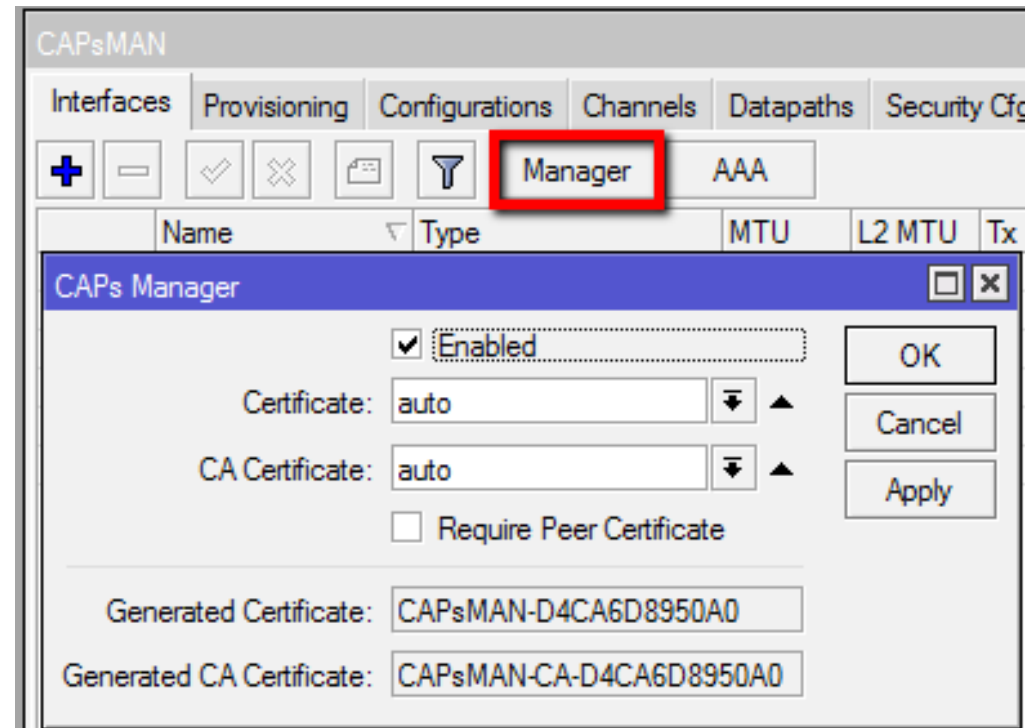
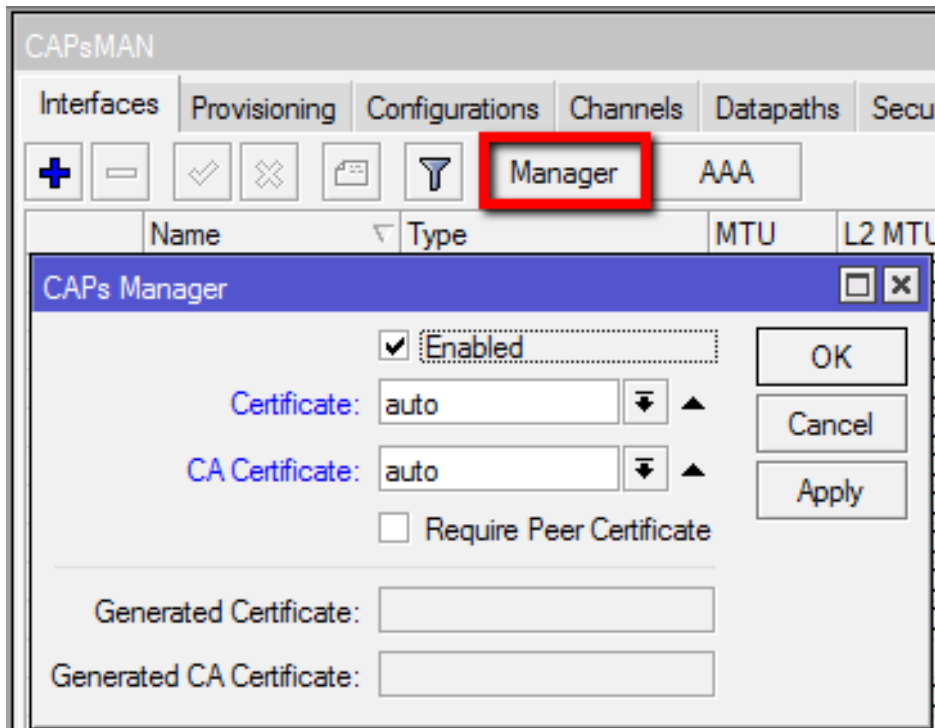
Current Channel:

Current Rate Set:

Current Basic Rate Set:

# CAPsMAN Auto Certificate

- Enable Certificate and CA Certificate on CAPsMAN



# CAPsMAN Auto Certificate

- Enable request Certificate on CAP

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Pr

+ - ✓ ✕ [Filter] **CAP** Scanner Freq. Usage

Name	Type	L2 MTU	Tx
CAP			

Enabled

OK

Cancel

Apply

Interfaces: *wlan1*

Certificate: request

Discovery Interfaces: ether1

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: bridgeLocal

Requested Certificate:

Locked CAPsMAN Common Name:

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Pr

+ - ✓ ✕ [Filter] **CAP** Scanner Freq. Usage

Name	Type	L2 MTU	Tx
CAP			

Enabled

OK

Cancel

Apply

Interfaces: *wlan1*

Certificate: request

Discovery Interfaces: ether1

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

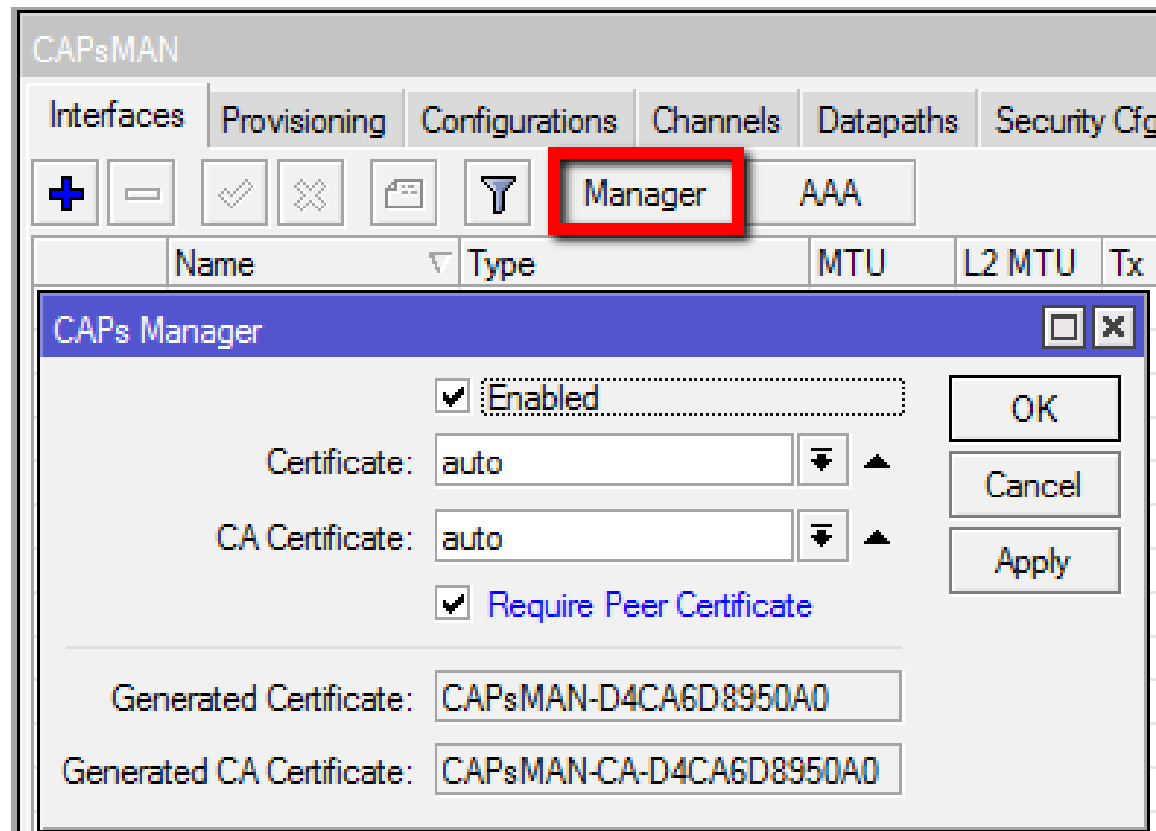
Bridge: bridgeLocal

Requested Certificate: CAP-4C5E0C6C634A

Locked CAPsMAN Common Name:

# CAPsMAN Auto Certificate

- Allow CAPsMAN to accept connections only from CAPs with valid certificate



# CAP Lock To CAPsMAN

- Enable Lock To CAPsMAN on CAP – certificate is required

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles

+ - ✓ ✗ CAP Scanner Freq. Usage

Name	Type	L2 MTU	Tx
CAP			

CAP

Enabled

Interfaces: wlan1

Certificate: request

Discovery Interfaces: ether1

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: bridgeLocal

Requested Certificate: CAP-4C5E0C6C634A

Locked CAPsMAN Common Name:

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles

+ - ✓ ✗ CAP Scanner Freq. Usage Alignm

Name	Type	L2 MTU	Tx
CAP			

CAP

Enabled

Interfaces: wlan1

Certificate: request

Discovery Interfaces: ether1

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

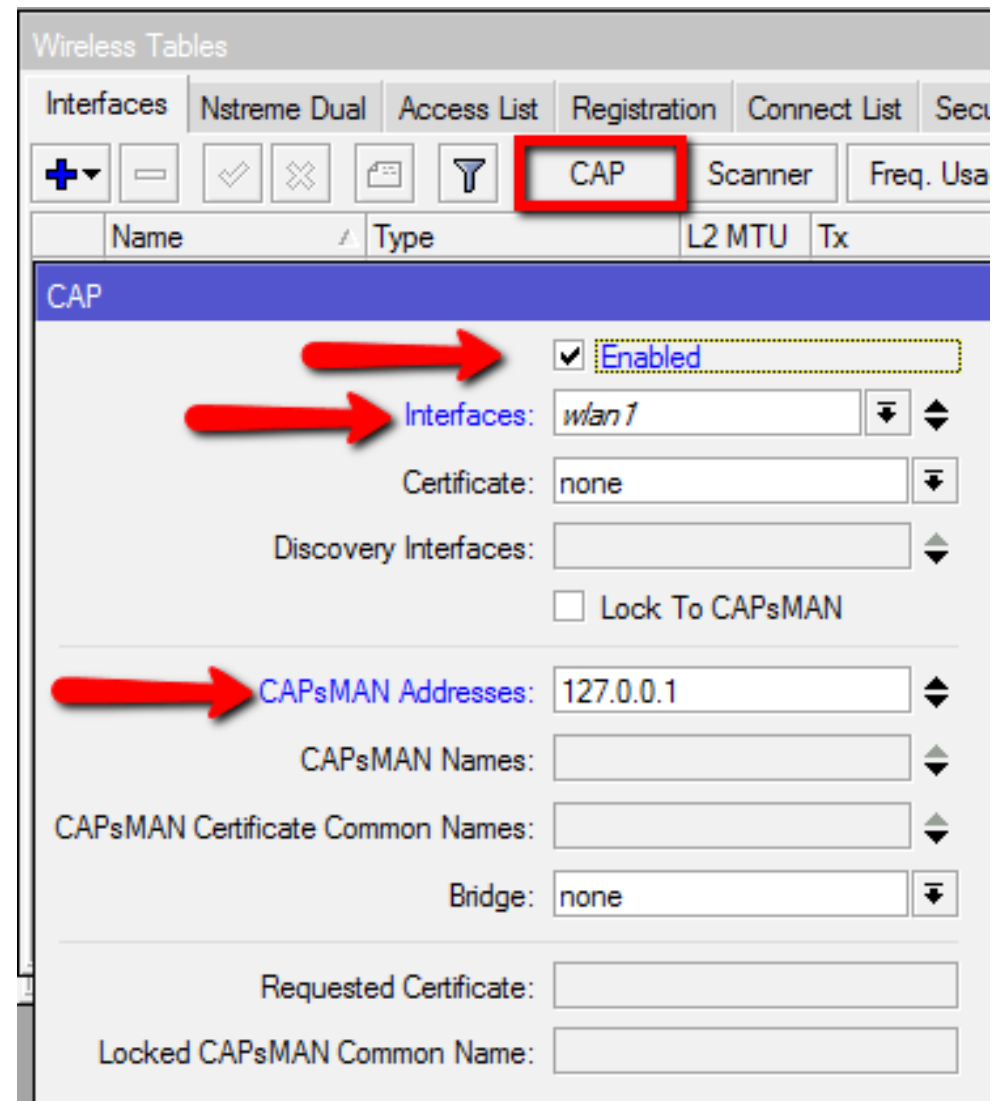
Bridge: bridgeLocal

Requested Certificate: CAP-4C5E0C6C634A

Locked CAPsMAN Common Name: CAPsMAN-D4CA6D8950A0

# CAPsMAN and CAP in one board

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



# 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'.

Name	Type	MTU	L2 MTU	Tx
cap1	Interfaces	1500	1600	

Name	Type	L2 MTU	Tx	Rx
---	managed by CAPsMAN			
---	channel: 2442/20-Ce/gn(24dBm), SSID: LocalAP, CAPsMAN forwarding			

Interface <cap1>

Current State: running-ap

Current Channel: 2442/20-Ce/gn(30dBm)

Current Rate Set: CCK:1-11 OFDM:6-54 BW:1x-2x HT:0-15

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.