

CAPsMAN Case Study

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CAPsMAN Features

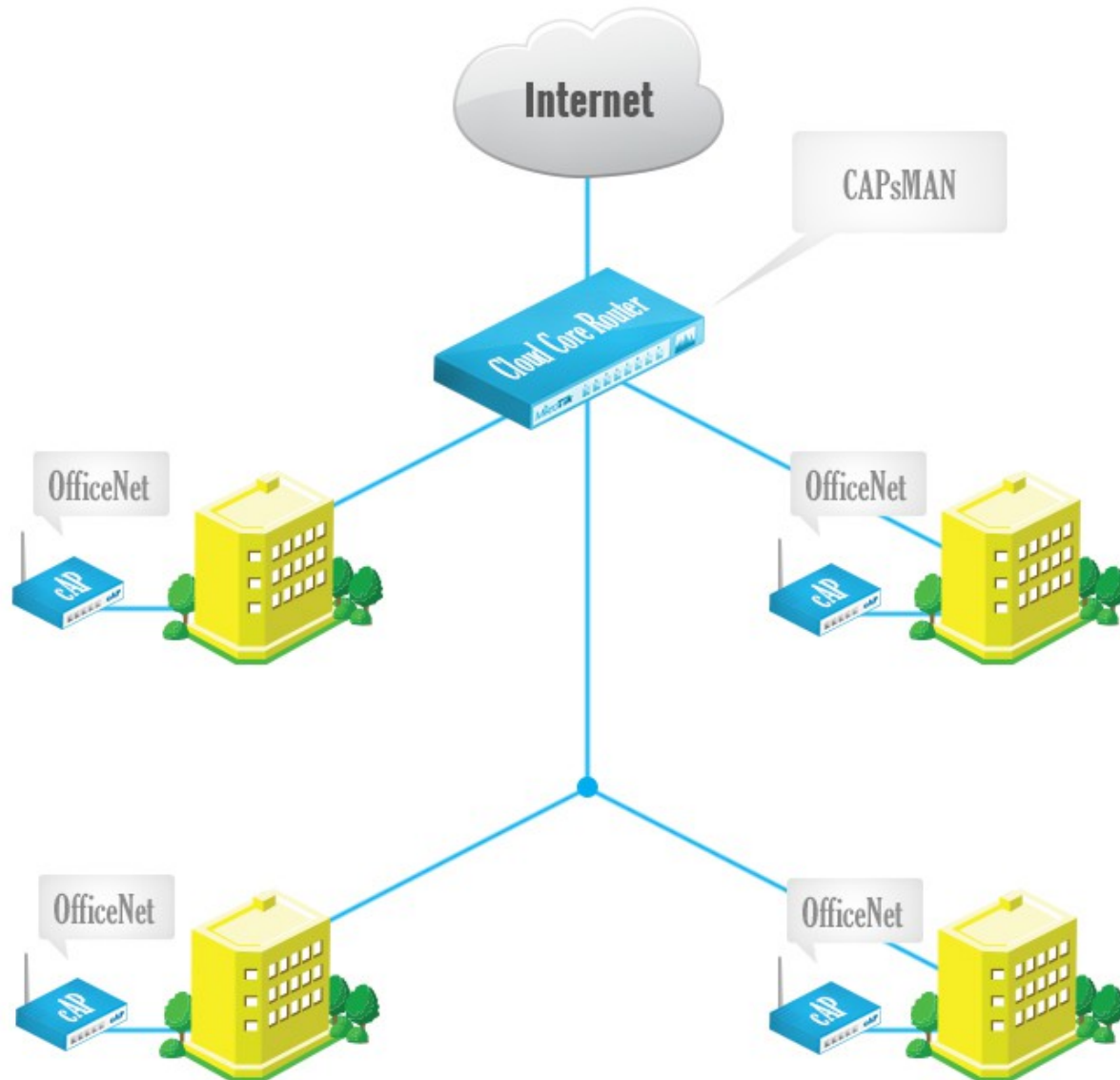
- Centralized management of RouterOS APs
- Dual Band AP support
- Provisioning of APs
- MAC and IP Layer communication with APs
- Certificate support for AP communication
- Full and Local data forwarding mode
- RADIUS MAC authentication
- Custom configuration support

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

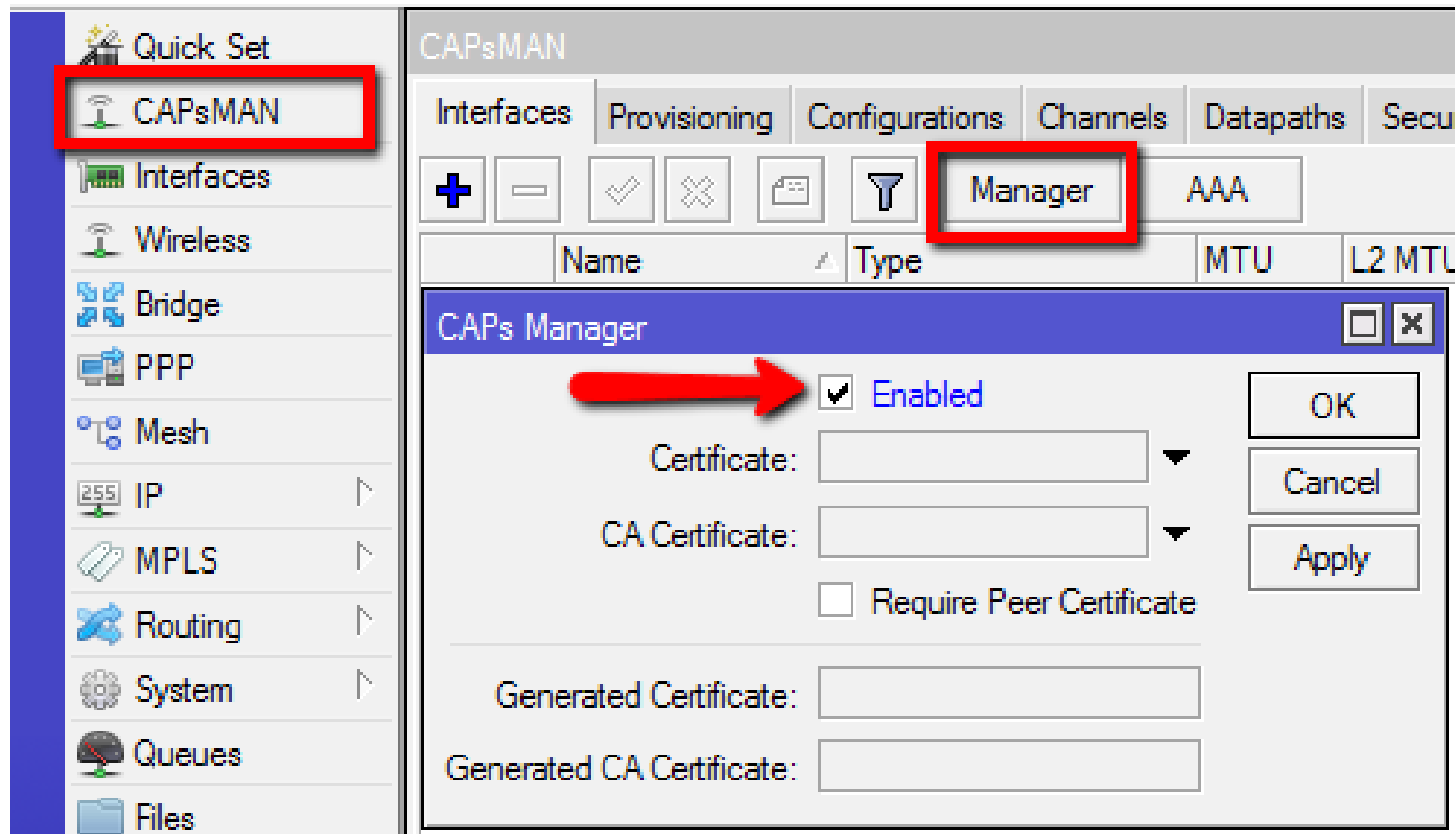


CAPsMAN Simple Setup

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

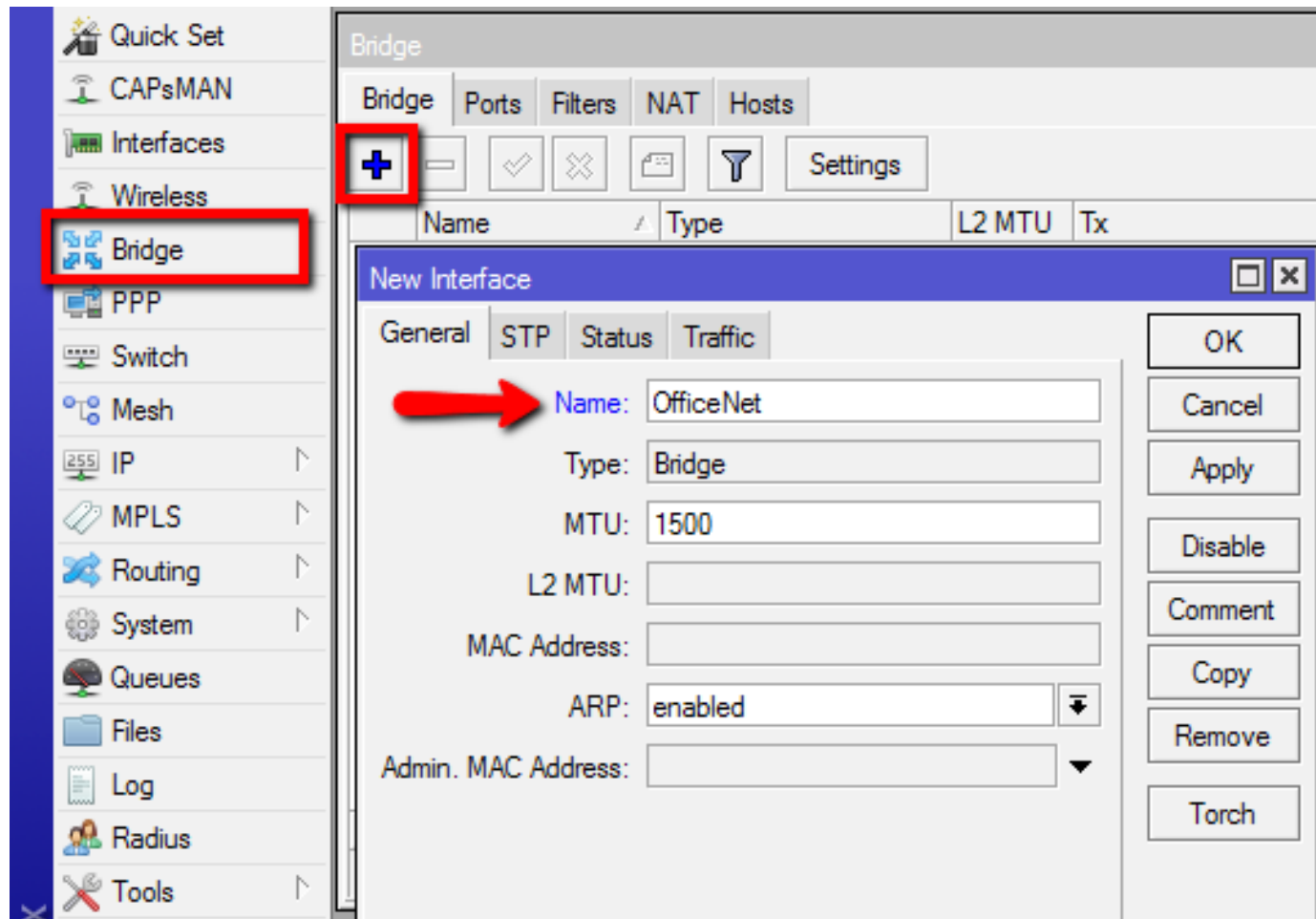
CAPsMAN Simple Setup

- 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 contains '10.10.10.1/24' and the 'Interface' is set to '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

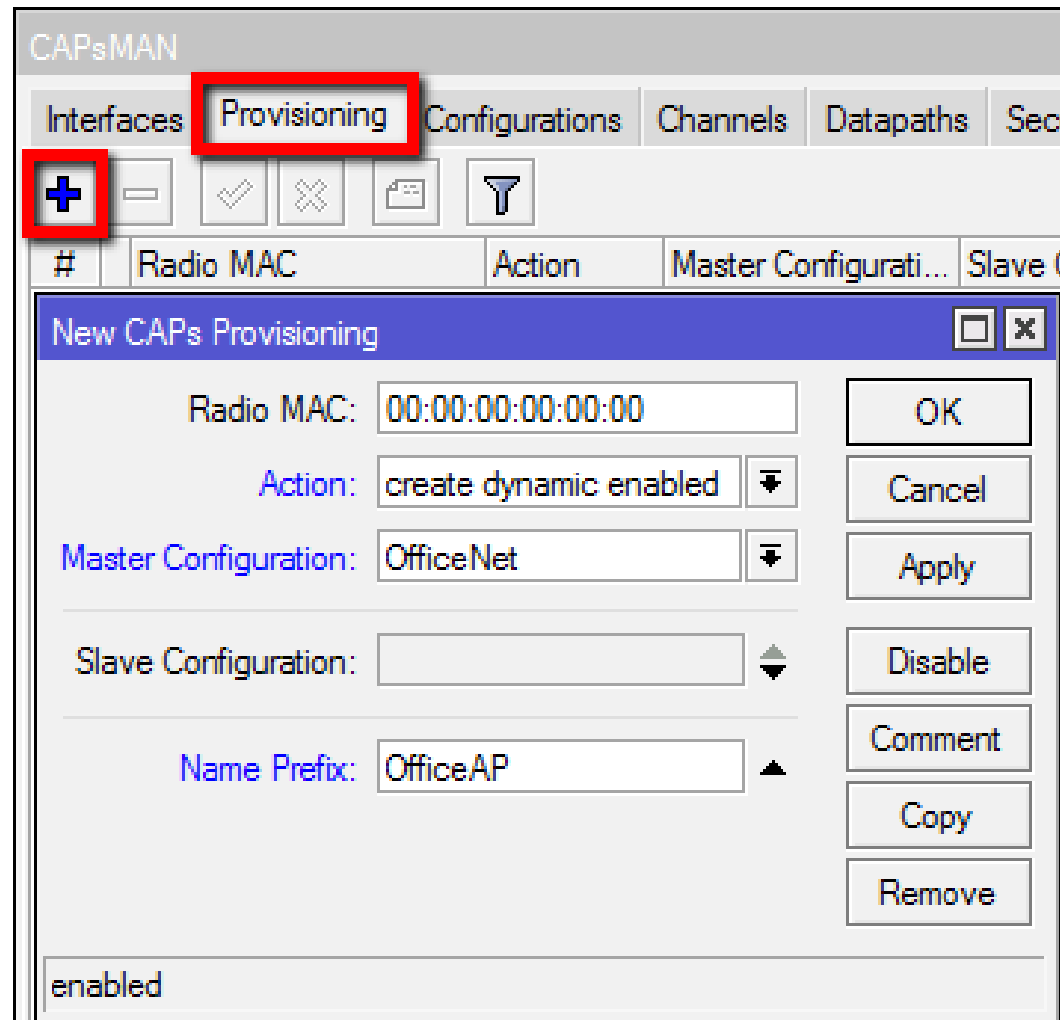
- Add New CAPsMAN Configuration

The screenshot displays the CAPsMAN configuration interface. At the top, the 'Configurations' tab is selected and highlighted with a red box. Below the tab bar, a toolbar contains a plus sign icon (highlighted with a red box) and other navigation icons. A table header shows columns for Name, SSID, Hide SSID, Load Bal..., Country, Channel, Frequency, Band, and Datapat. Below the table, three configuration panels are visible, each with a red box around its tab:

- Wireless:** Name: OfficeNet, Mode: [empty], SSID: Office, Hide SSID: [empty], Load Balancing Group: [empty], Country: united states, Max Station Count: [empty], Multicast Helper: [empty], HT Tx Chains: [empty], HT Rx Chains: [empty], HT Guard Interval: [empty].
- Datapath:** Datapath: [empty], Bridge: OfficeNet, Bridge Cost: [empty], Bridge Horizon: [empty], Local Forwarding: [empty], Client To Client Forwarding: [empty], VLAN Mode: [empty], VLAN ID: [empty].
- Security:** Security: [empty], Authentication Type: WPA PSK WPA2 PSK WPA EAP WPA2 EAP, Encryption: aes ccm tkip, Group Encryption: aes ccm, Passphrase: OfficeNet, EAP Methods: [empty].

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:

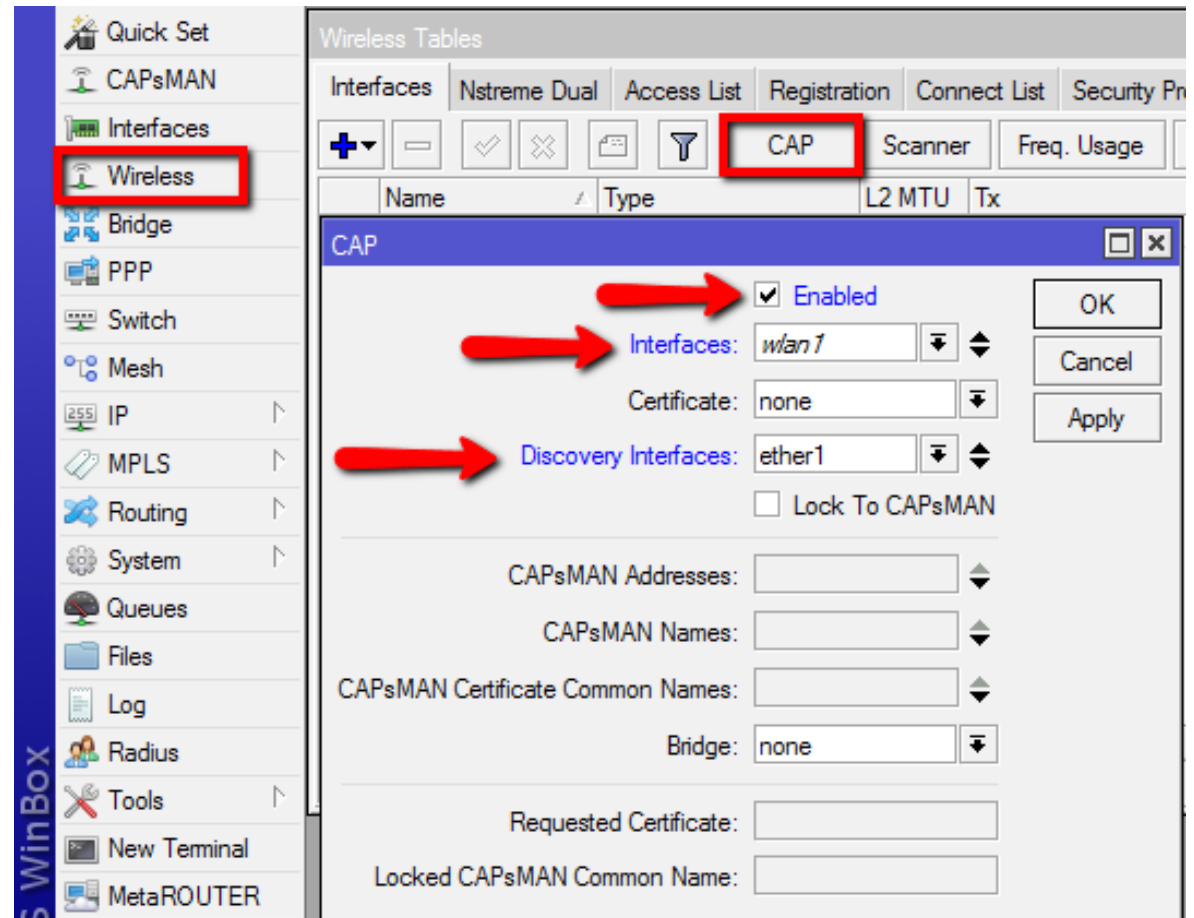
- Radio MAC: 00:00:00:00:00:00
- Action: create dynamic enabled
- Master Configuration: OfficeNet
- Slave Configuration: (empty)
- Name Prefix: OfficeAP

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

enabled

CAPsMAN Simple Setup

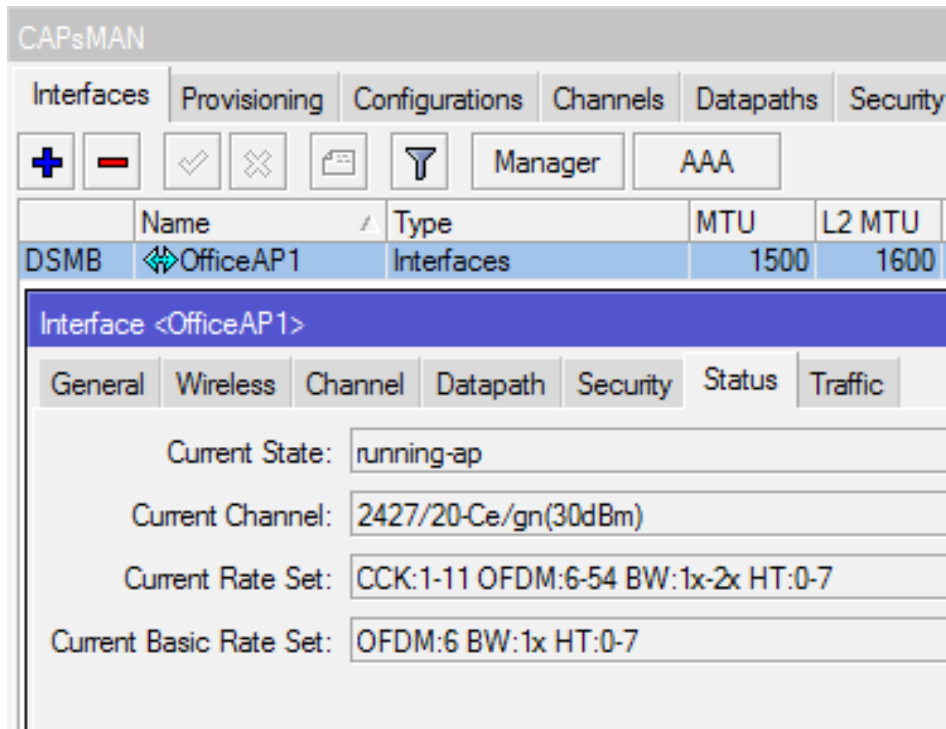
- Configure the AP to use CAP mode
 - Enable wireless-fp package
 - Enable CAP mode
 - By CAP mode button on some boards
 - By configuration in Wireless CAP menu



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

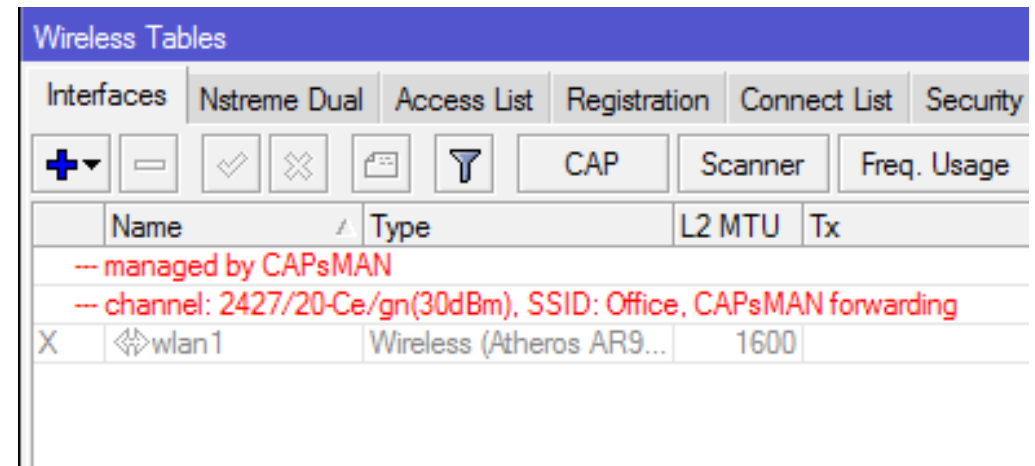
Current State: running-ap

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

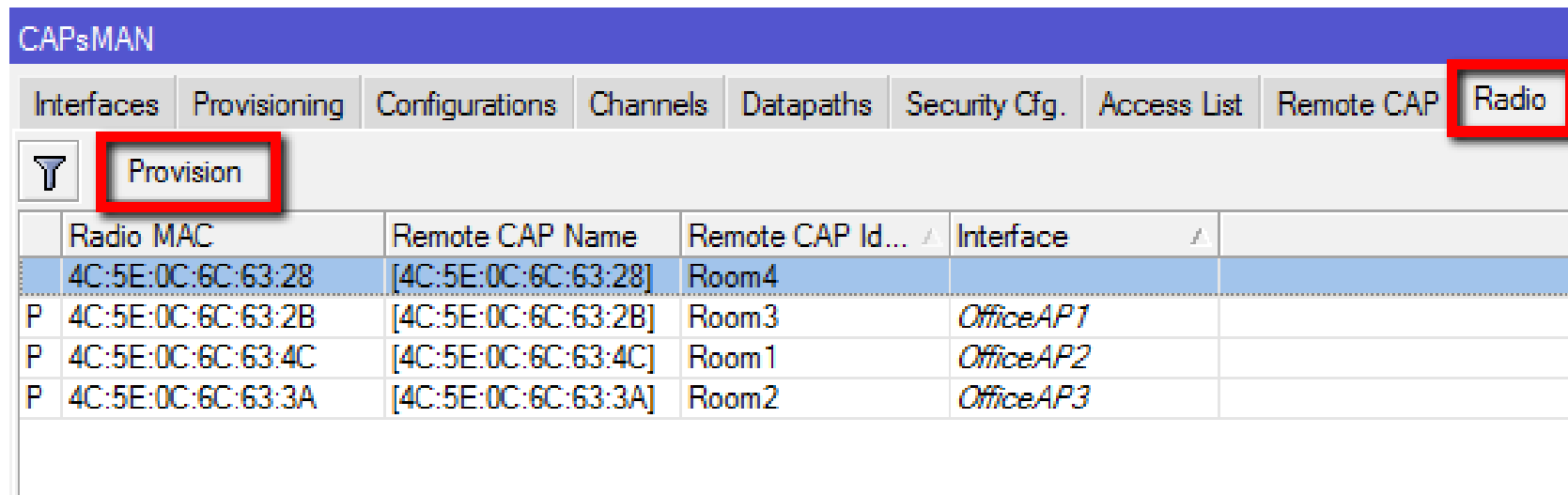
OK

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

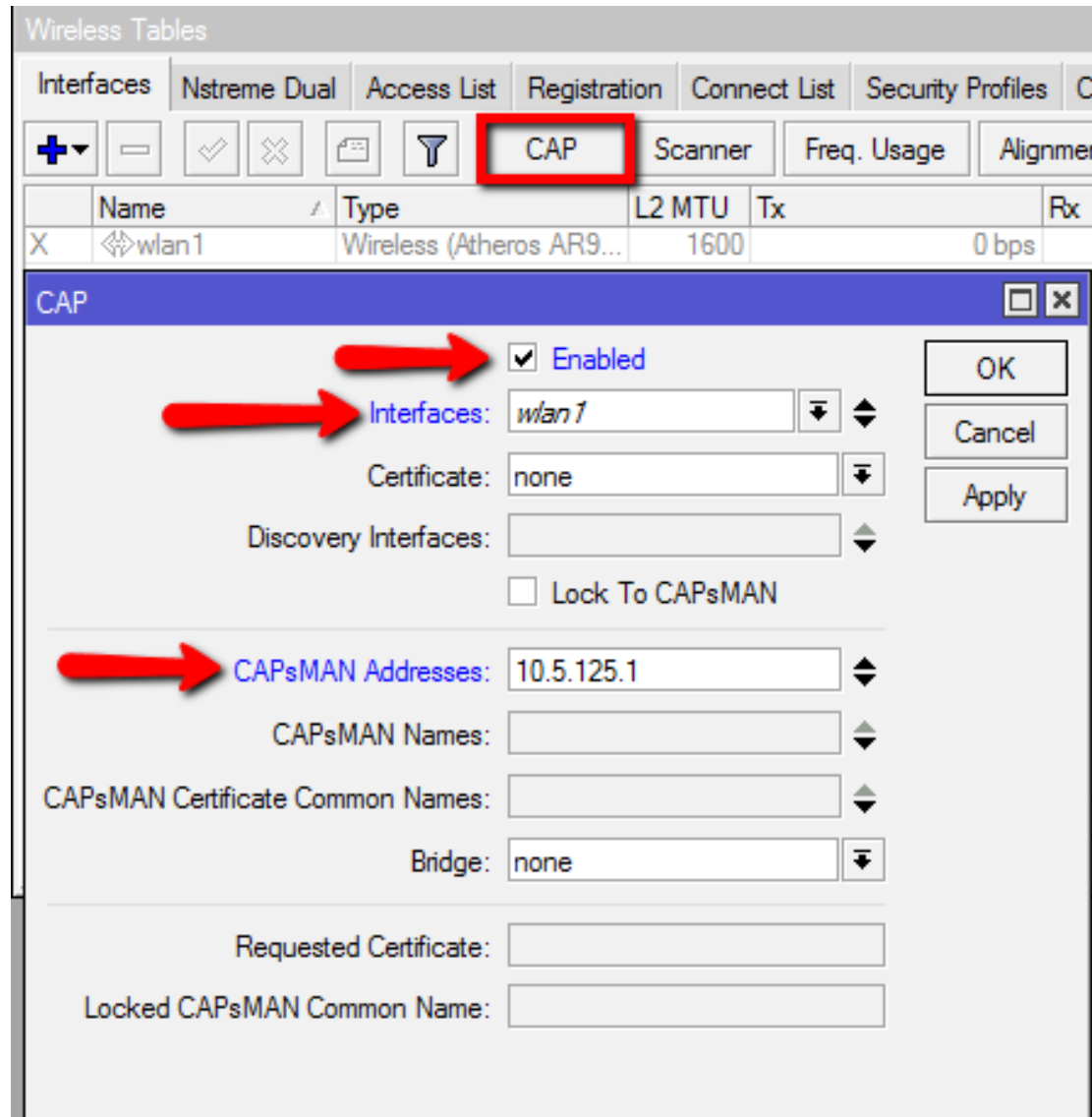
- MAC Layer2:
 - No IP configuration required
 - CAP and CAPsMAN must be in the same Layer 2 network
- IP (UDP) Layer3:
 - CAP must reach the CAPsMAN using IP protocol
 - Can traverse NAT if necessary
- Management connection between CAP and CAPsMAN is secured using DTLS
- CAP client data traffic is not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



The screenshot shows the Mikrotik WinBox interface for configuring a CAP (Client Access Point). 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

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:

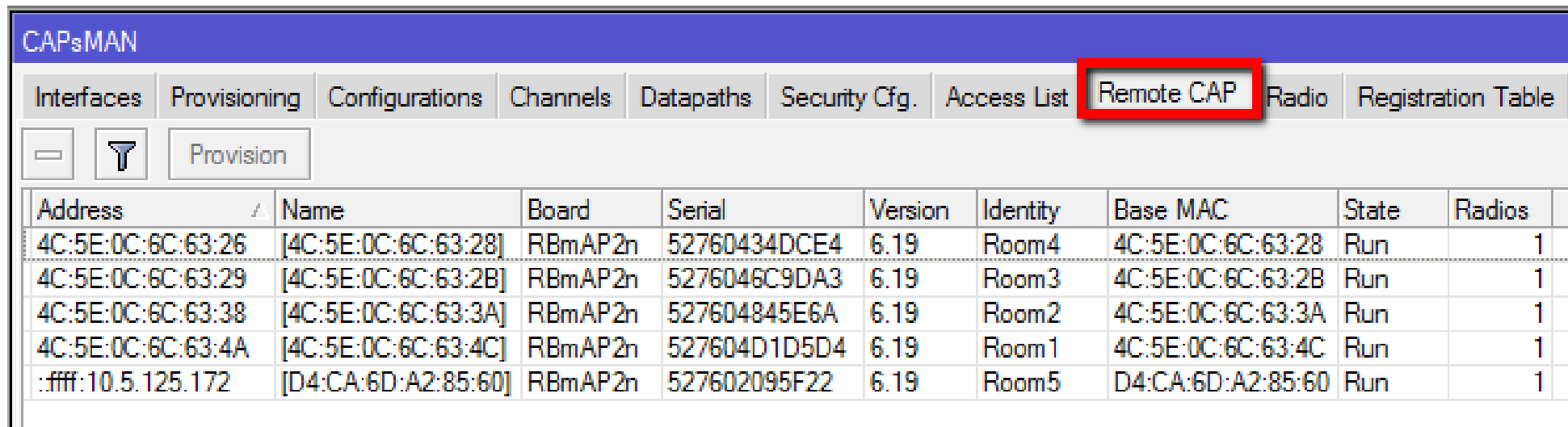
OK

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 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

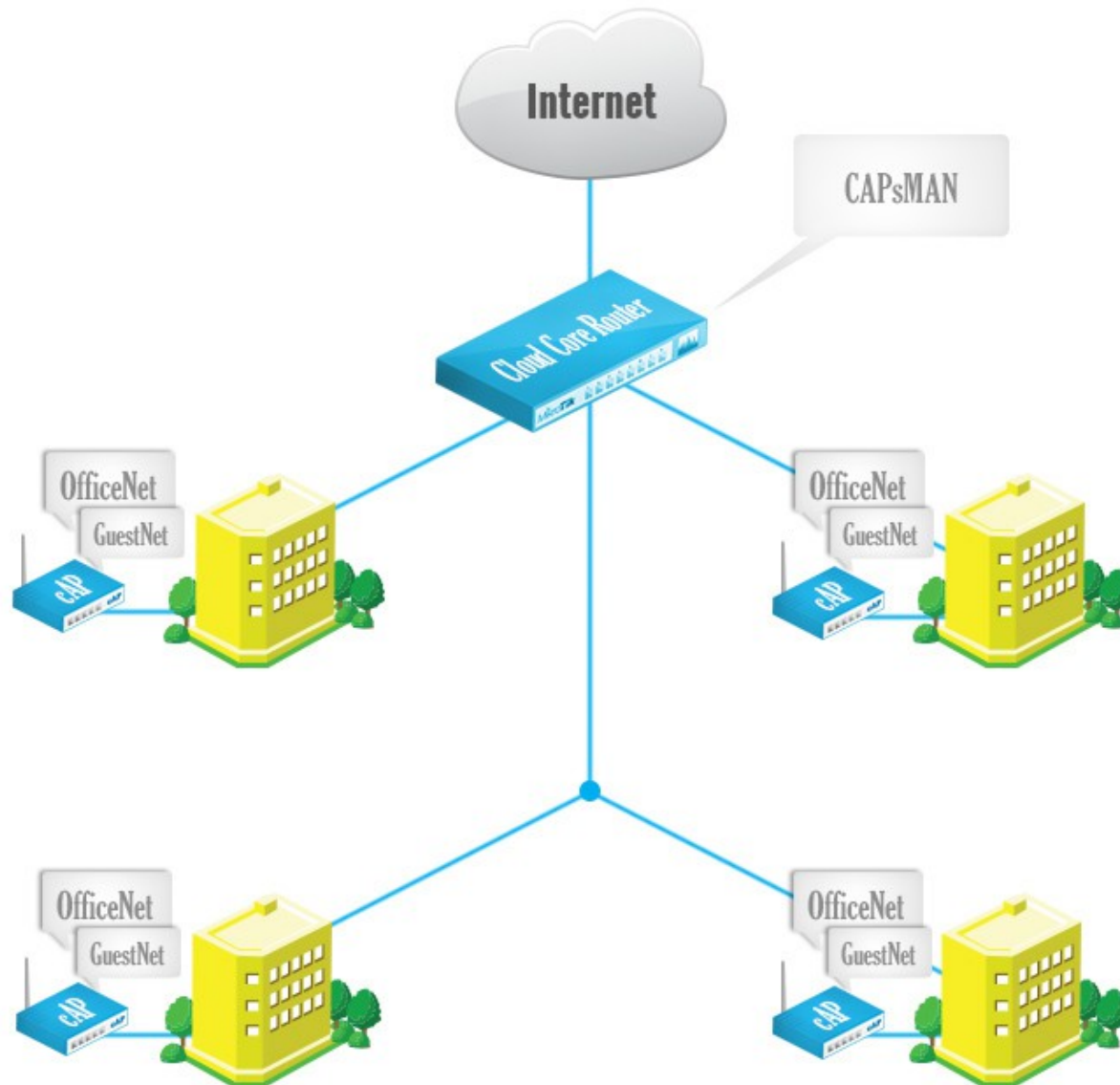
- No interface name change or setting change after the reboot
- Additional manual setting override
- Copy dynamic interface to make static interface

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 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 selected and highlighted with a red box. Below the menu, a toolbar contains a plus sign icon (highlighted with a red box), a minus sign icon, a document 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 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

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 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

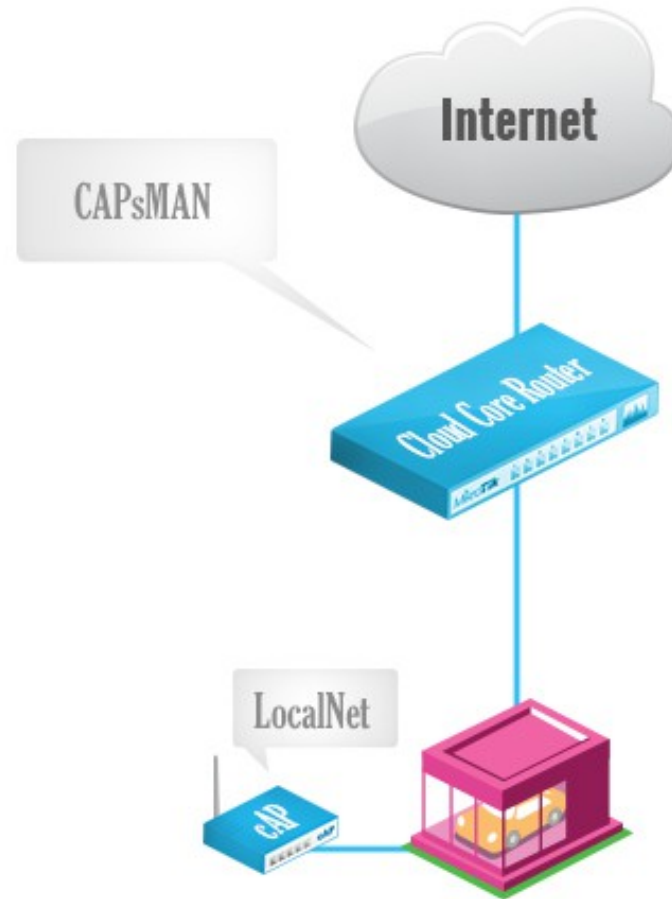
- MAC Authentication
- Radius Query support
- MAC Mask support
- Signal Range
- Time
- Private Passphrase
- VLAN ID assignment

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 toolbar contains a '+' icon, also highlighted with a red box. The main area shows a table with columns: #, MAC Address, MAC Mask, Interface, Signal Ra..., Action, Client To Clie..., VLAN Mo..., and VLAN ID. Two 'New CAPs Access Rule' dialog boxes are open, side-by-side. The left dialog box has the following fields: MAC Address (18:34:51:00:00:00), MAC Mask (FF:FF:FF:00:00:00), Interface (empty), Signal Range (empty), Action (accept), AP Tx Limit (empty), Client Tx Limit (empty), Private Passphrase (empty), Client To Client Forwarding (empty), RADIUS Accounting (empty), VLAN Mode (empty), and VLAN ID (empty). The right dialog box has the following fields: MAC Address (empty), MAC Mask (empty), Interface (empty), Signal Range (empty), Action (query radius), AP Tx Limit (empty), Client Tx Limit (empty), Private Passphrase (empty), Client To Client Forwarding (empty), RADIUS Accounting (empty), VLAN Mode (empty), and VLAN ID (empty). Both dialog boxes have 'OK', 'Cancel', 'Apply', 'Disable', 'Comment', 'Copy', and 'Remove' buttons. The status 'enabled' is shown at the bottom of each dialog box.

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 bar, a table lists existing configurations:

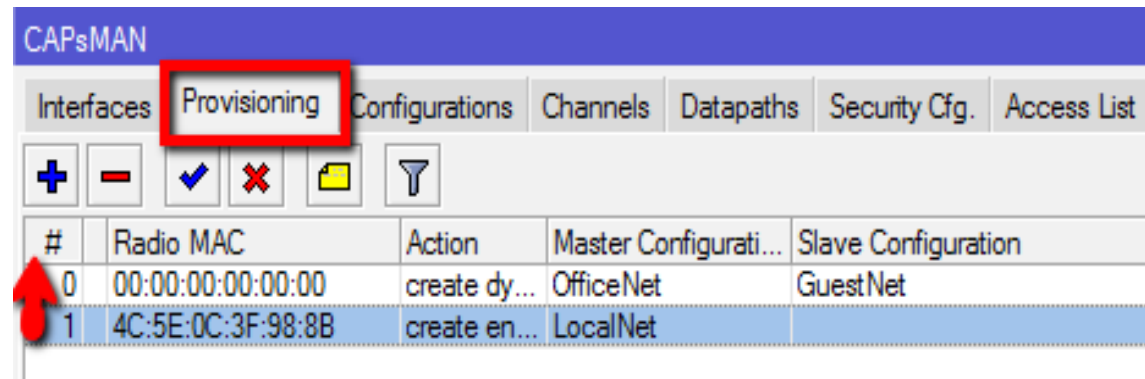
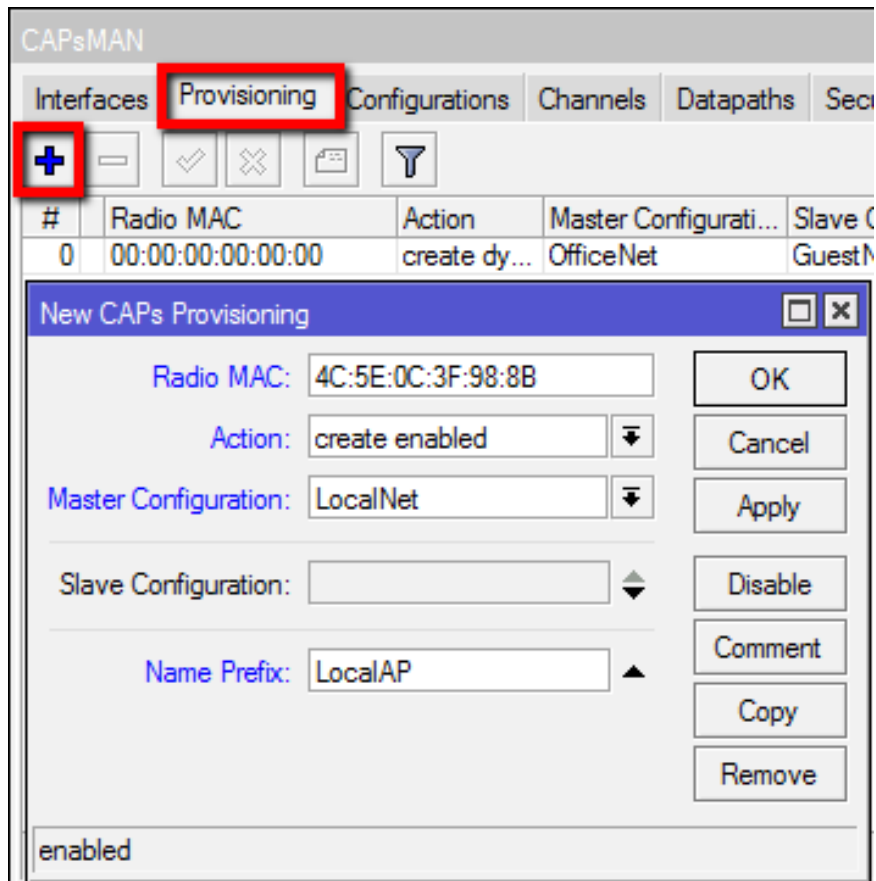
Name	SSID	Hide SSID	Load Bal...	Country	Channel	Frequency	Band	Datapath	Bridge	VLAN M...
GuestNet	Guest								GuestNet	
OfficeNet	Office			united sta...					OfficeNet	

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.

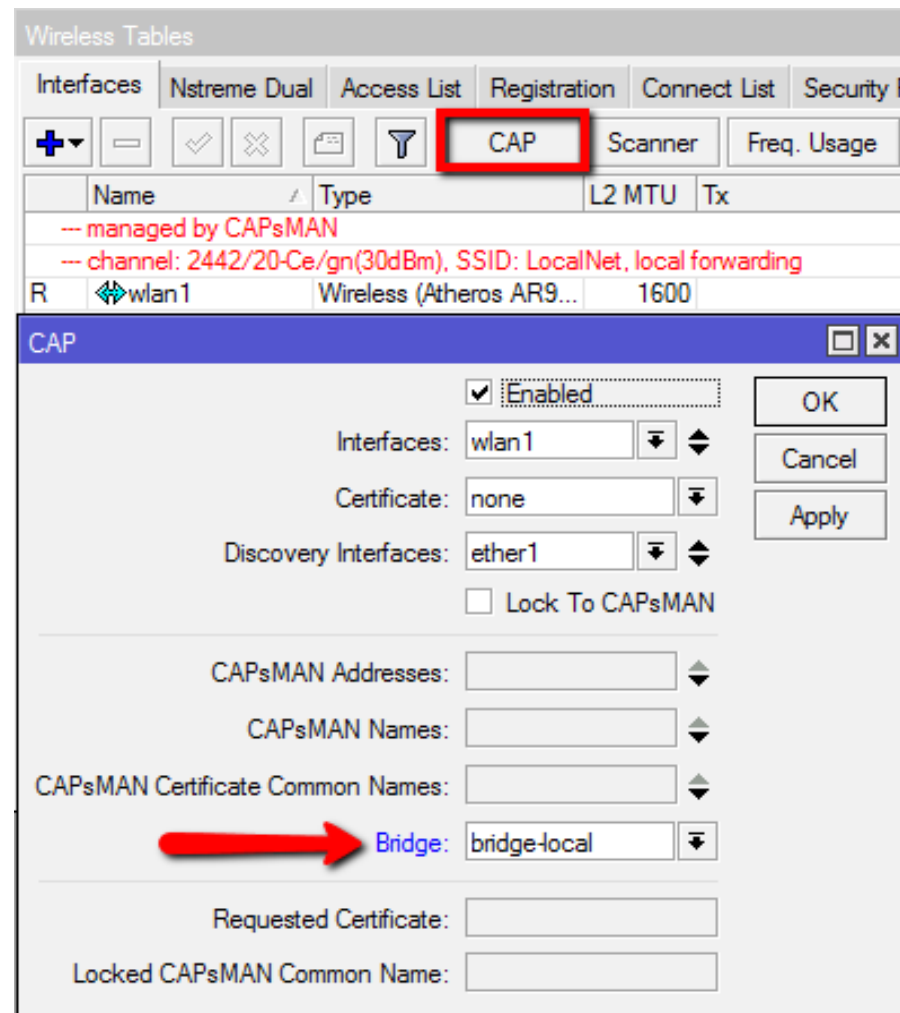
CAPsMAN Local Forwarding

- Create Provisioning rule
- Move above the default Provisioning rule

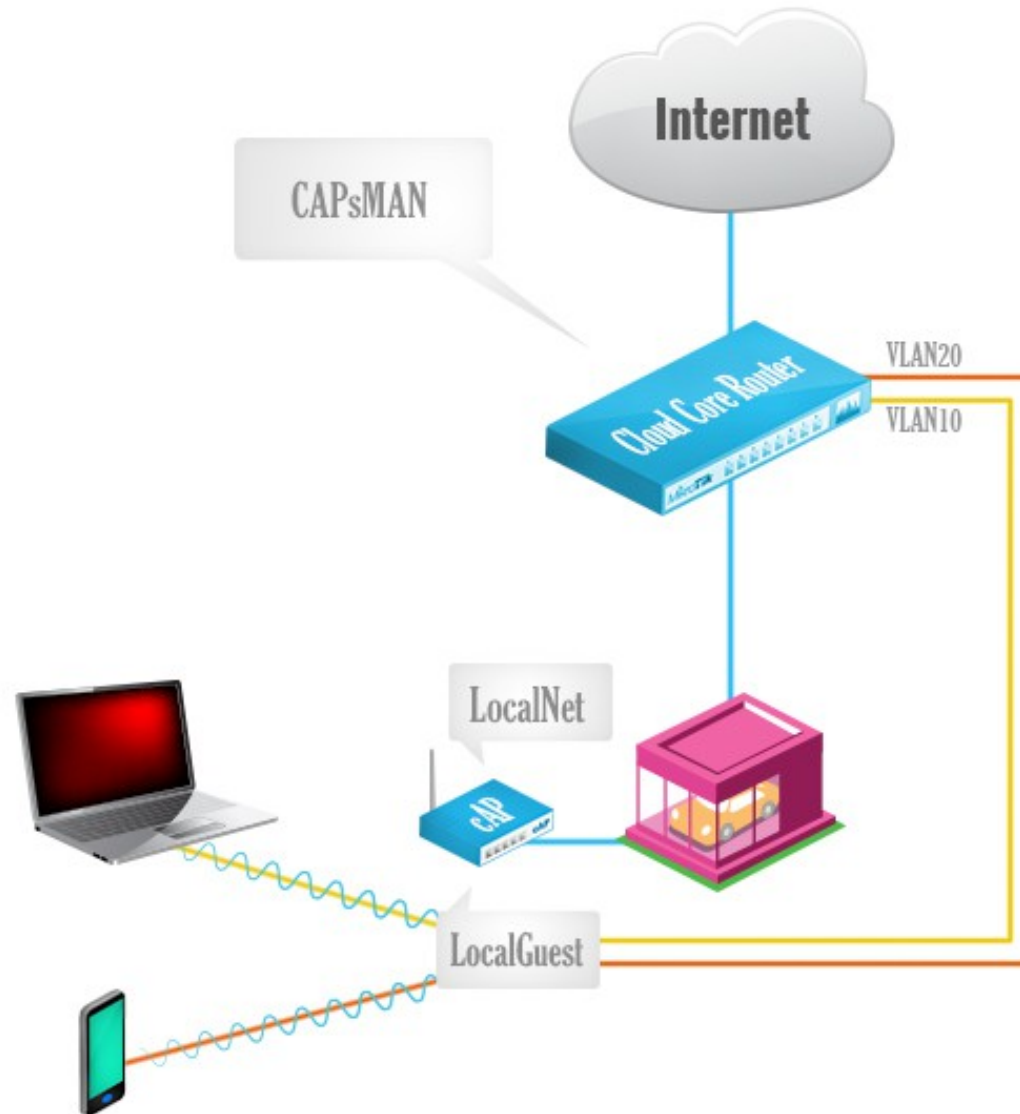


CAPsMAN Local Forwarding

- 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, ARP (enabled), Radio MAC, 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 shows the CAPsMAN web interface with the 'Access List' tab selected. A table displays existing rules, and a 'New CAPs Access Rule' dialog box is open for 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

CAPsMAN VLAN Assignment

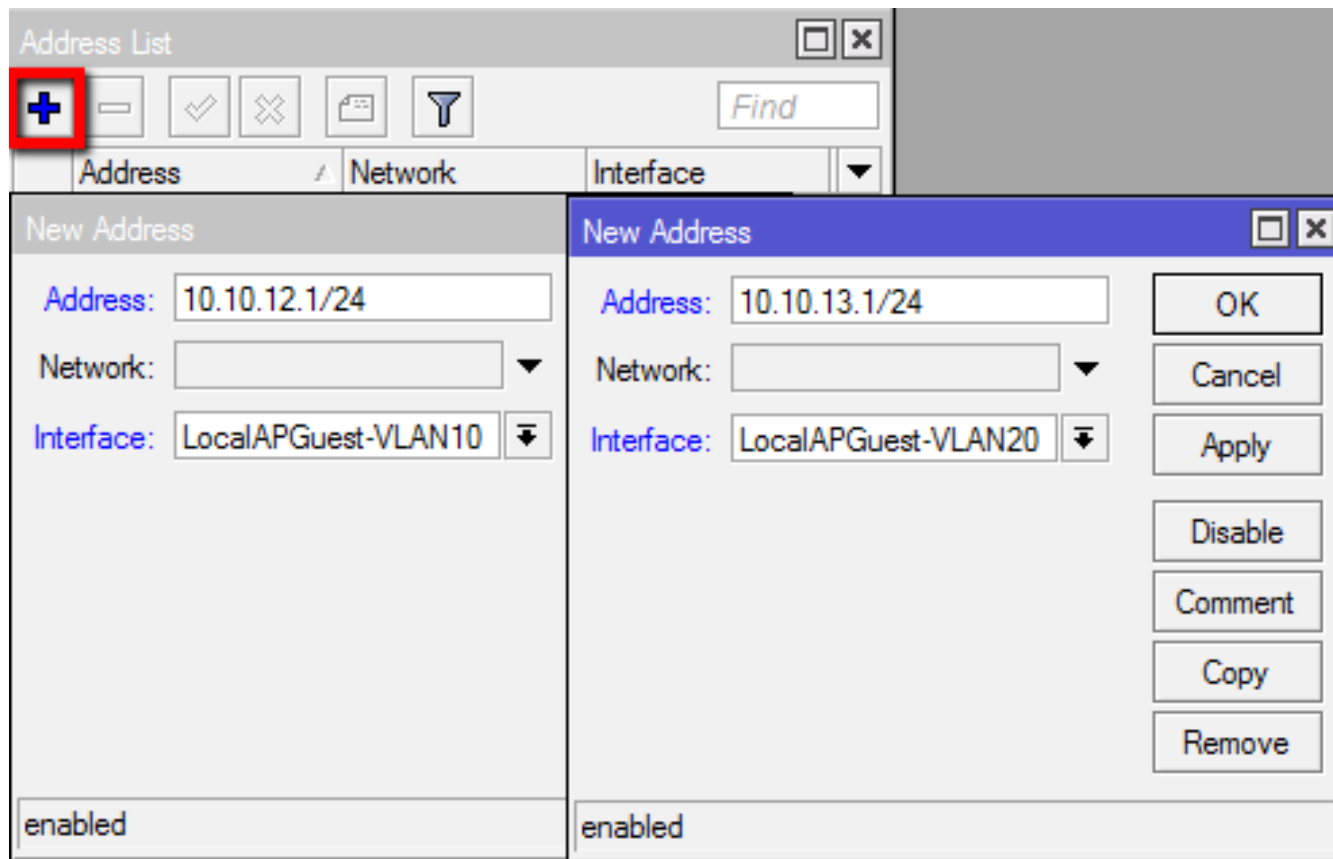
- Create VLAN interfaces on the CAPsMAN router interface where the CAPs are connected

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 'New Interface' configuration panels are visible. The left panel is for 'LocalAPGuest-VLAN10' and the right panel is for 'LocalAPGuest-VLAN20'. Both panels show the following configuration details:

Field	Value
Name	LocalAPGuest-VLAN10 (left) / LocalAPGuest-VLAN20 (right)
Type	VLAN
MTU	1500
L2 MTU	
MAC Address	
ARP	enabled
VLAN ID	10 (left) / 20 (right)
Interface	local
Use Service Tag	<input type="checkbox"/>

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 highlighted in red in each panel.

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:

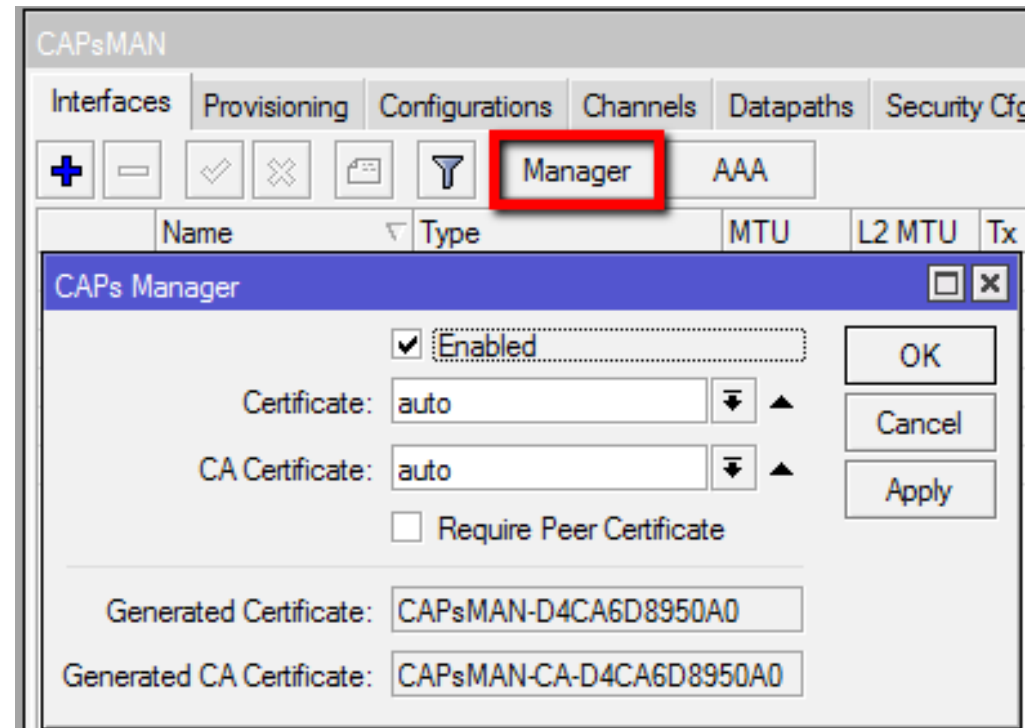
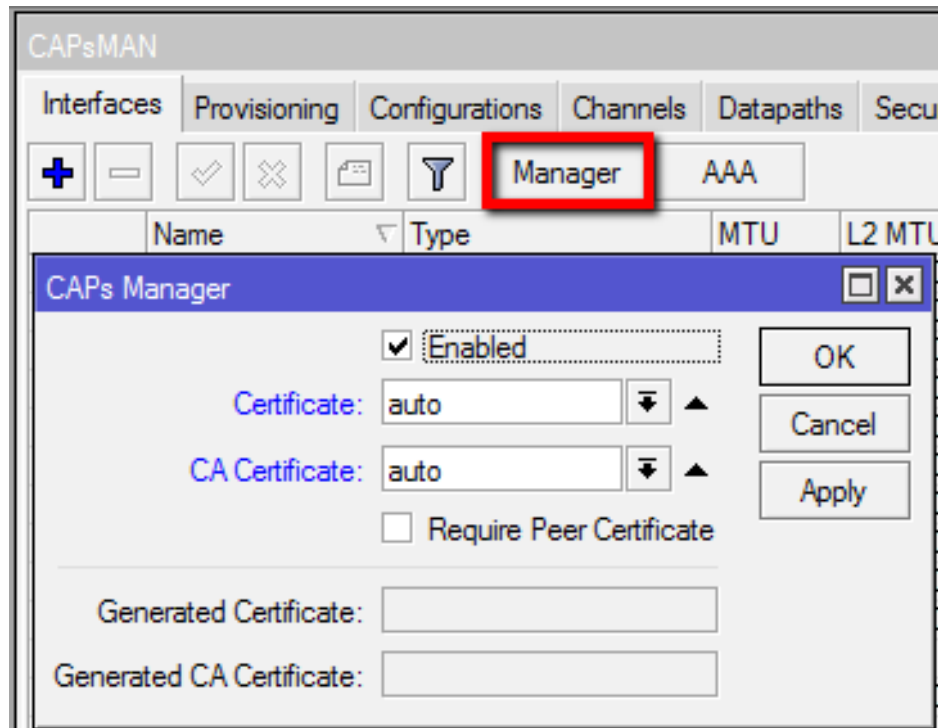
Current Channel:

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

+ - ✓ ✗ [CAP] Scanner Freq. Usage

Name	Type	L2 MTU	Tx
CAP			

Enabled

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:

OK
Cancel
Apply

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Pr

+ - ✓ ✗ [CAP] Scanner Freq. Usage

Name	Type	L2 MTU	Tx
CAP			

Enabled

Interfaces: wlan1

Certificate: request

Discovery Interfaces: ether1

Lock To CAPsMAN

CAPsMAN Addresses:

CAPsMAN Names:

CAPsMAN Certificate Common Names:

Bridge: bridgeLocal

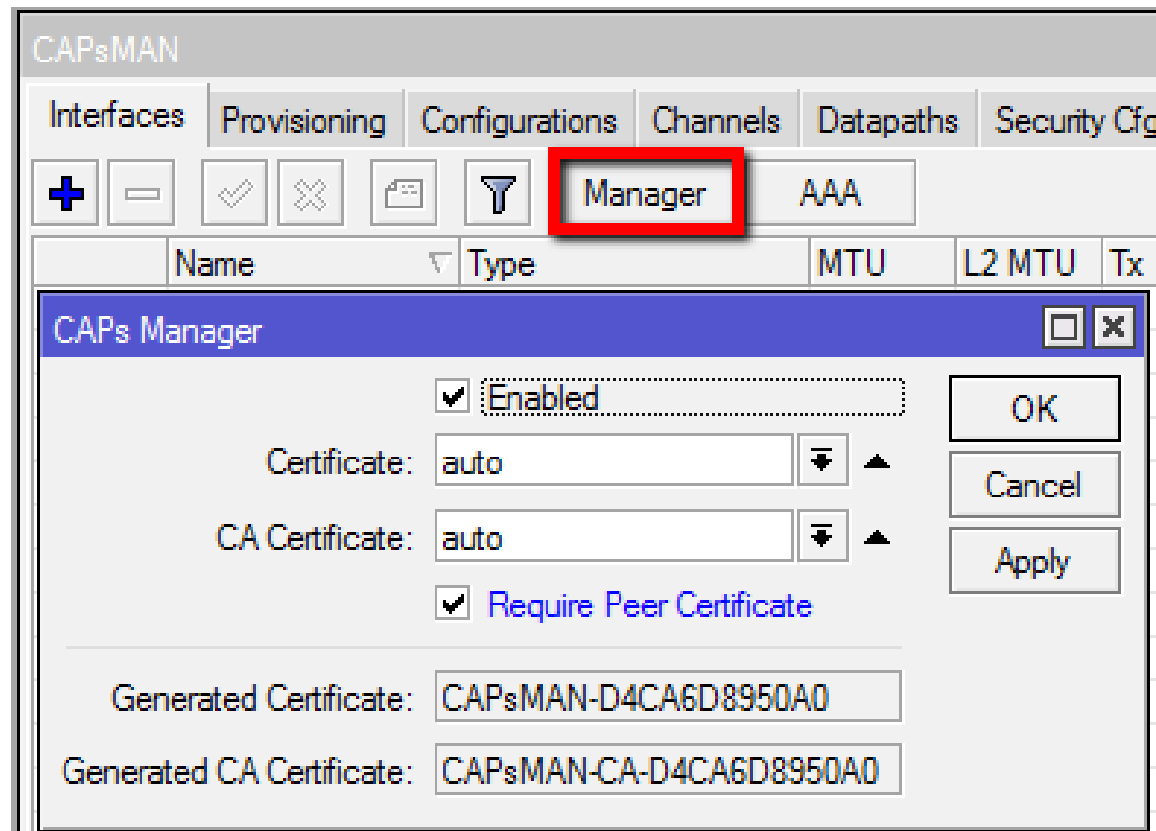
Requested Certificate: CAP-4C5E0C6C634A

Locked CAPsMAN Common Name:

OK
Cancel
Apply

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:

OK Cancel Apply

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

OK Cancel Apply

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.