Wireless AP and CAPsMAN Case Study

Uldis Cernevskis

MikroTik, Latvia

MUM Cuba

January 2016

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

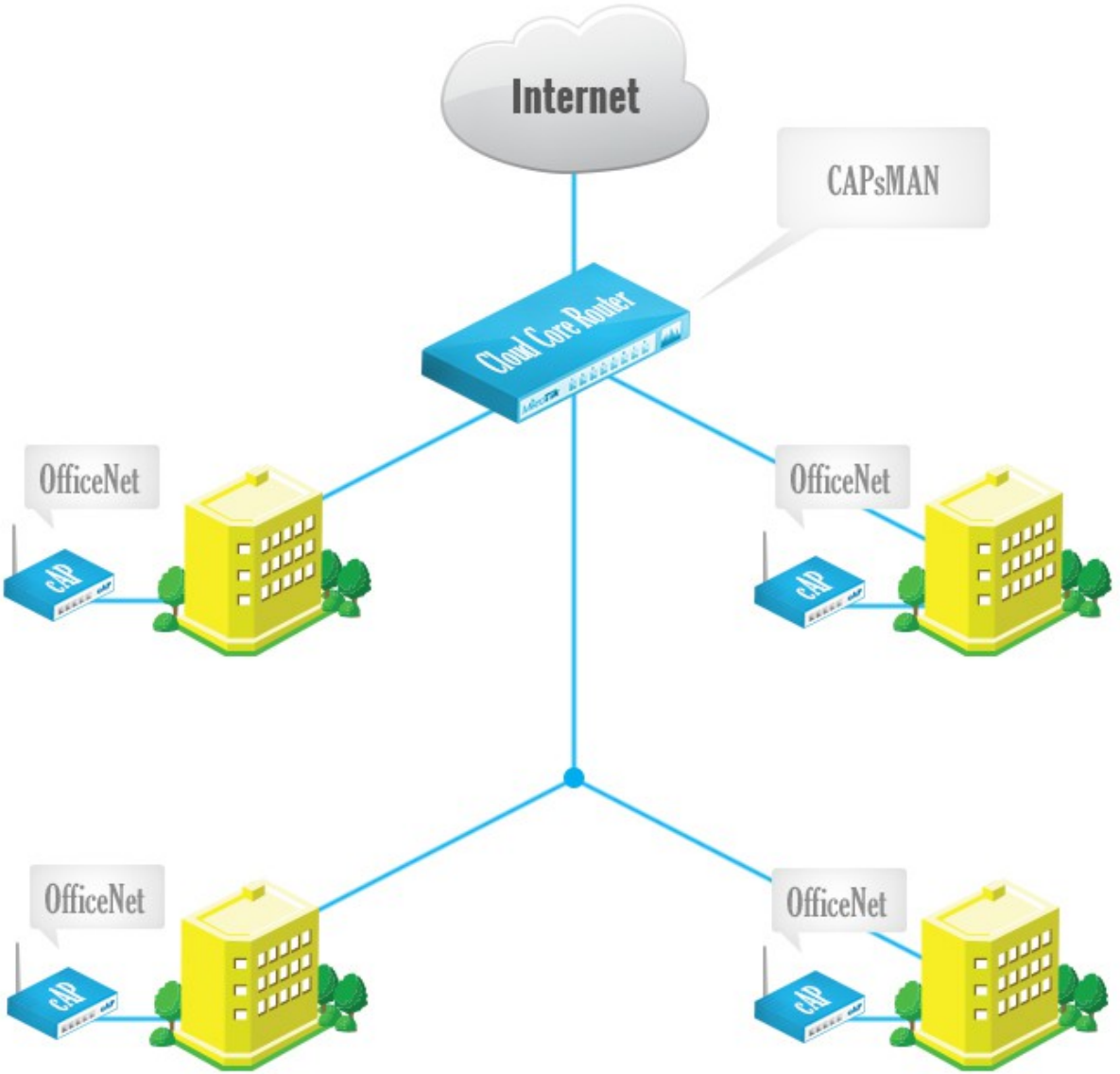
- CAPsMAN
  - x86, CHR and RouterBOARD based device
  - Newest RouterOS v6 version
  - Wireless-fp/cm2 package installed and enabled

- 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 for any questions on the CHR usage

CAPsMAN Simple Setup

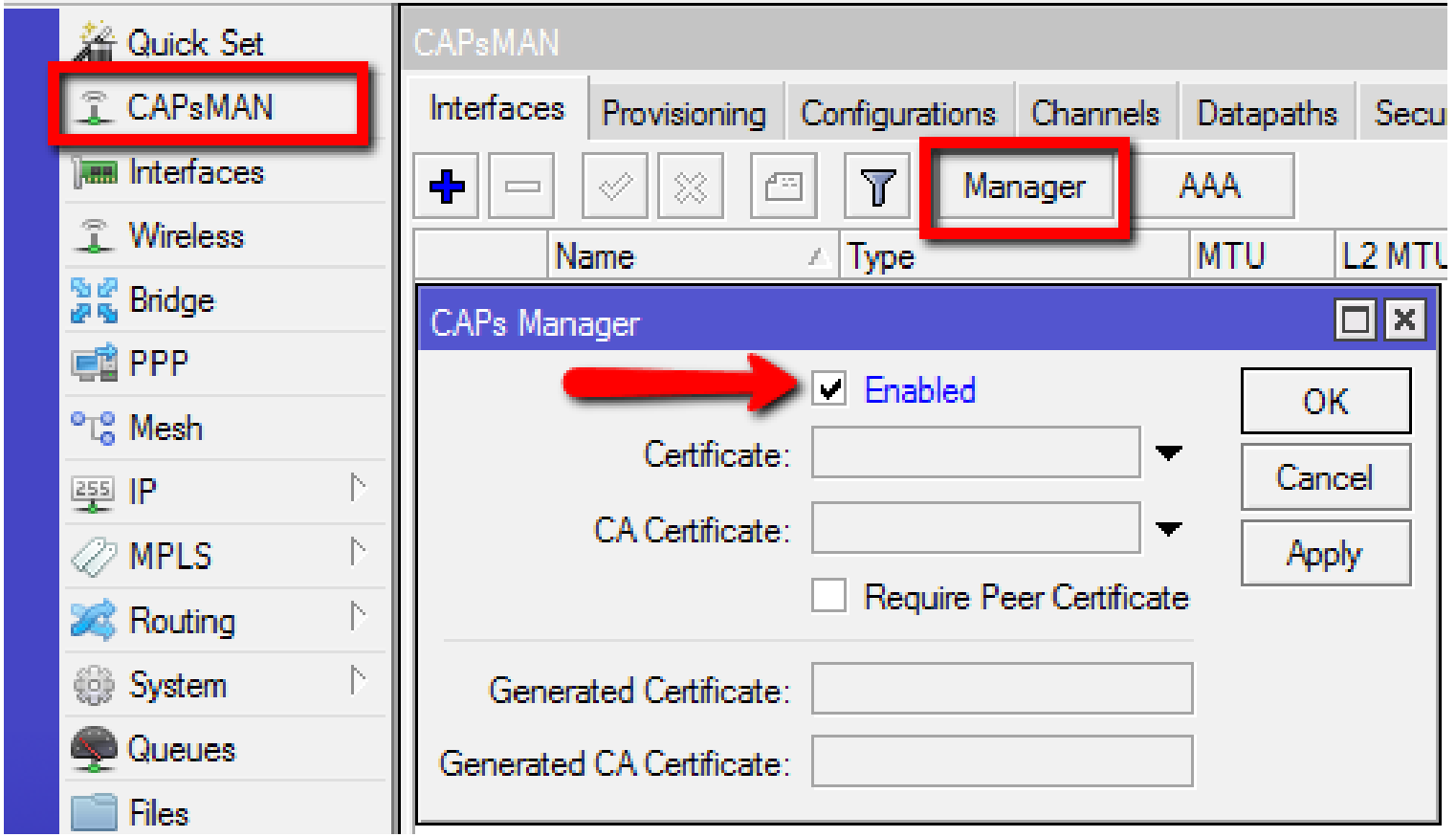


CAPsMAN Simple Setup

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

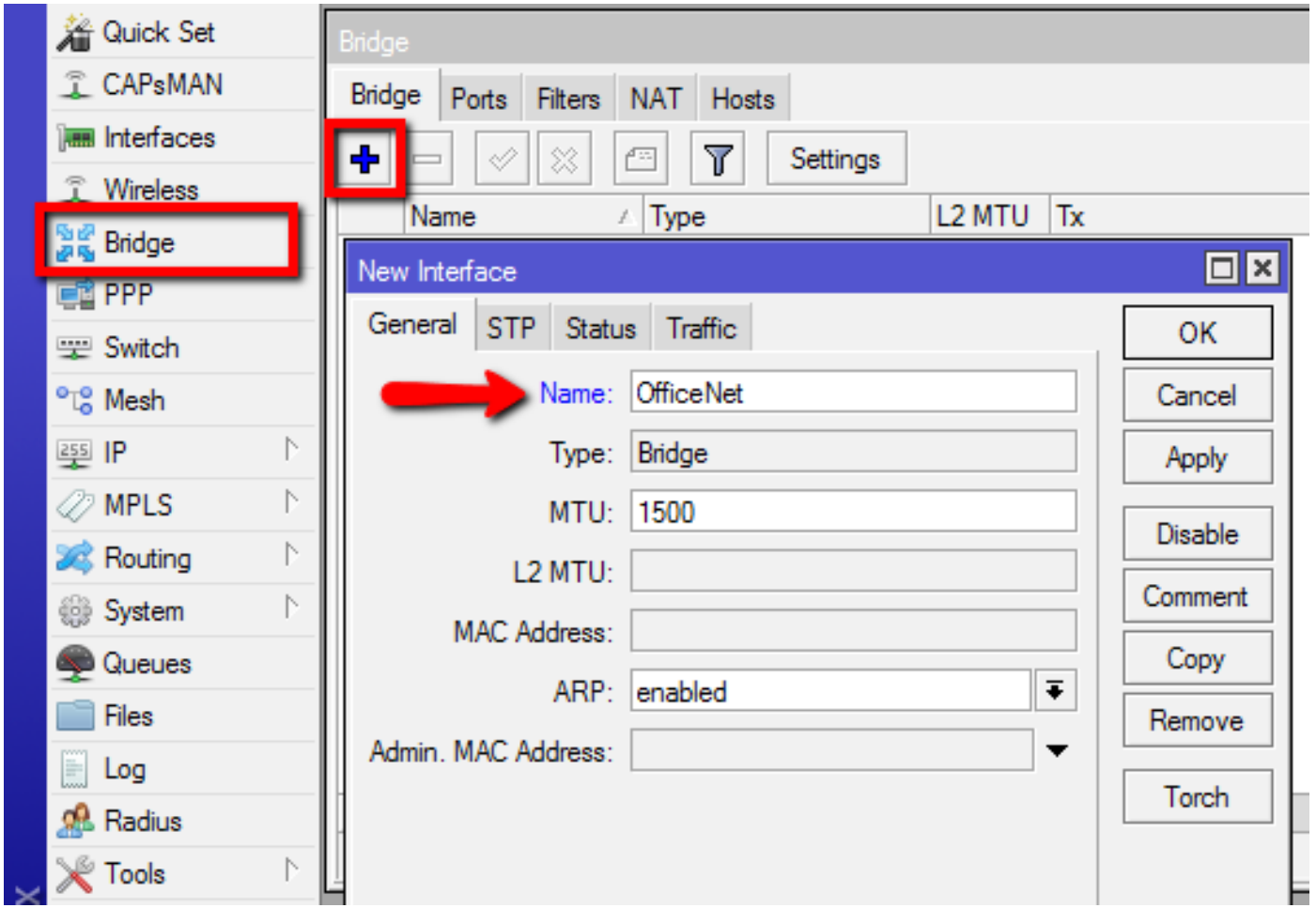
CAPsMAN Simple Setup

- Enable the CAPsMAN service



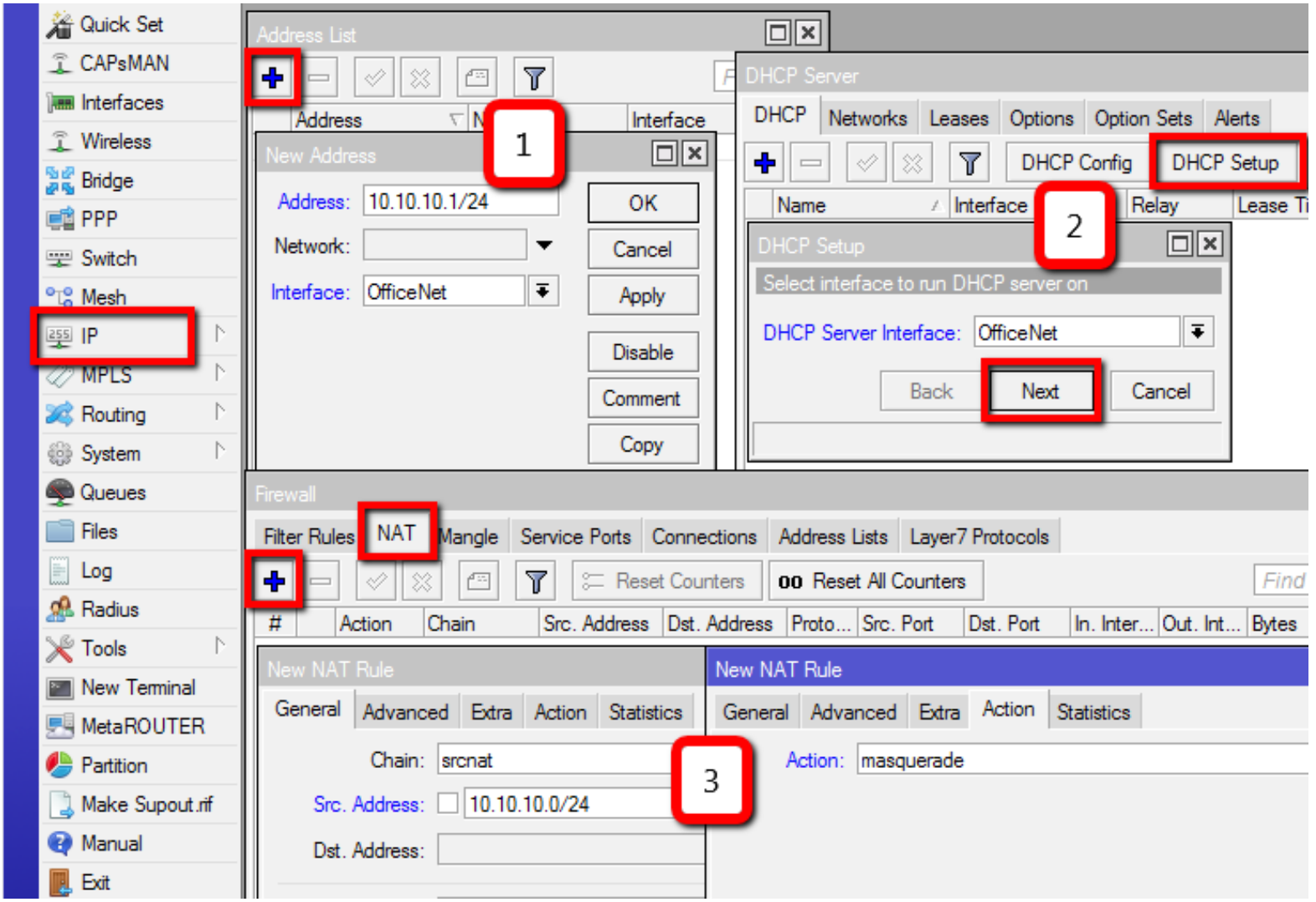
CAPsMAN Simple Setup

- Create Bridge Interface



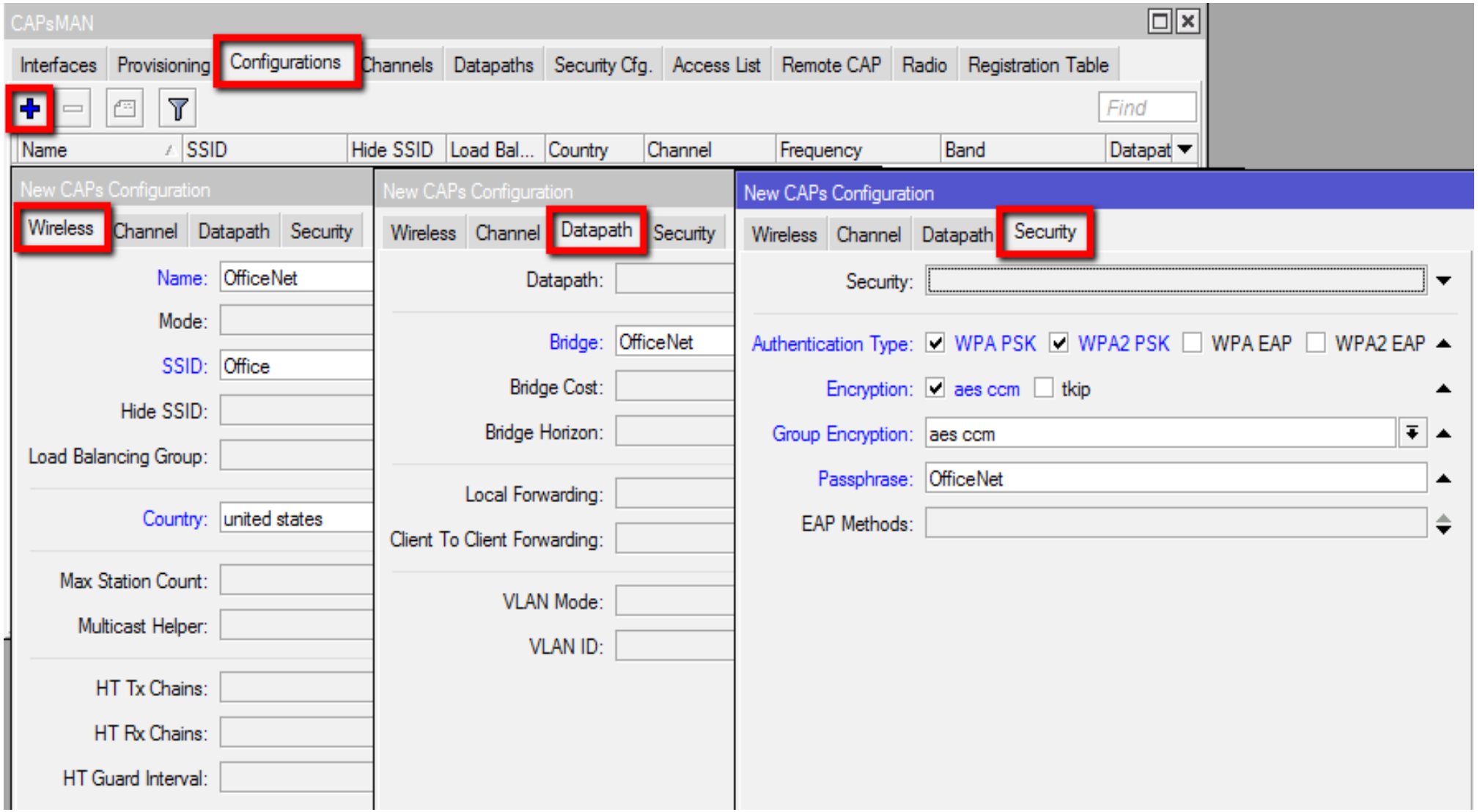
CAPsMAN Simple Setup

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



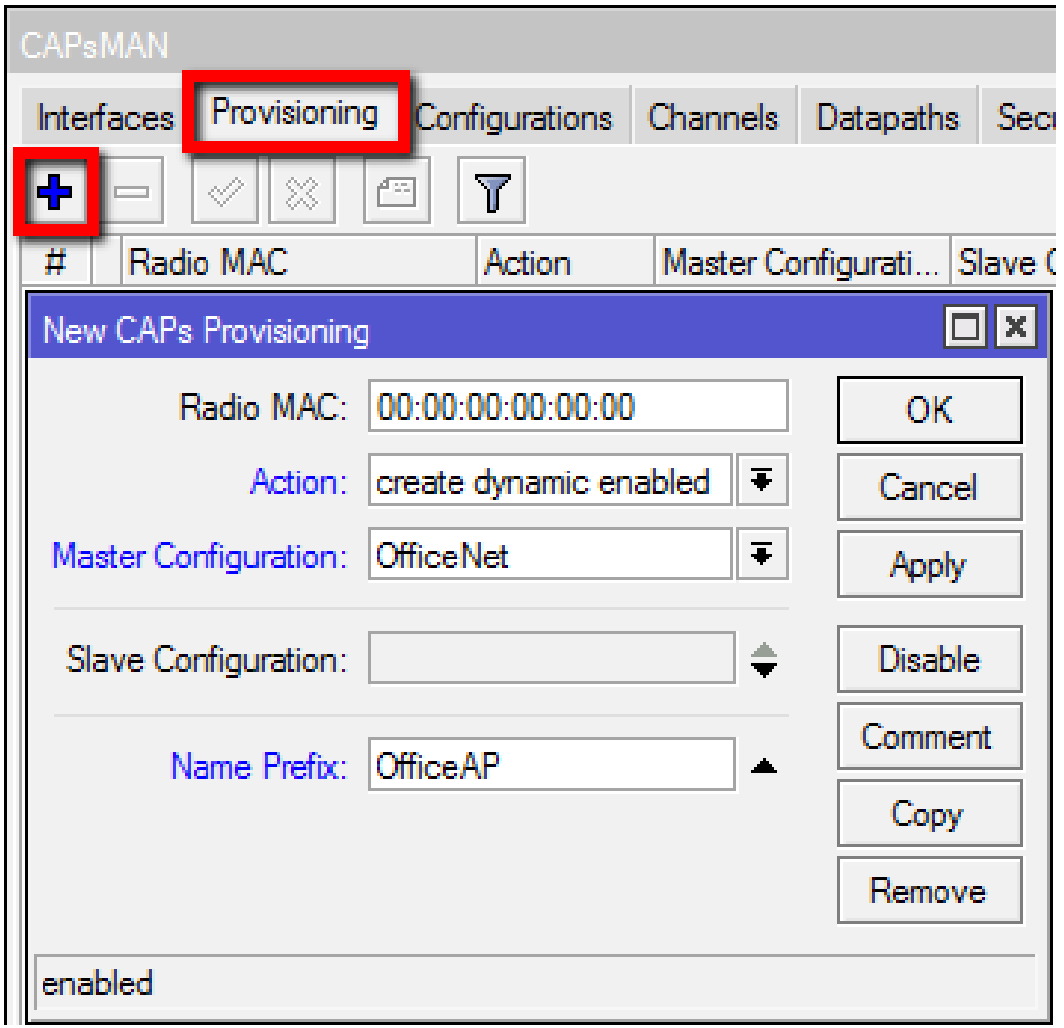
CAPsMAN Simple Setup

- Add New CAPsMAN Configuration



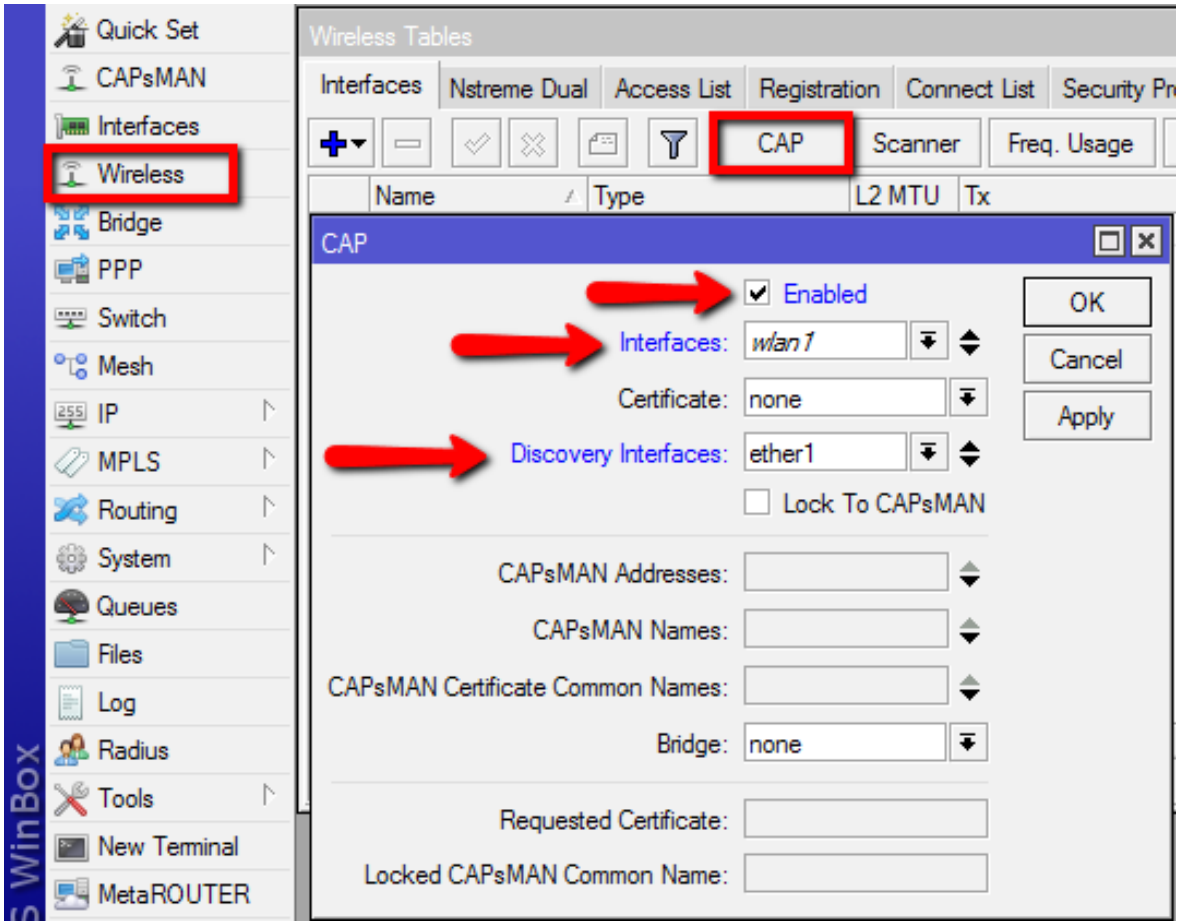
CAPsMAN Simple Setup

- Add new Provisioning rule



CAPsMAN Simple Setup

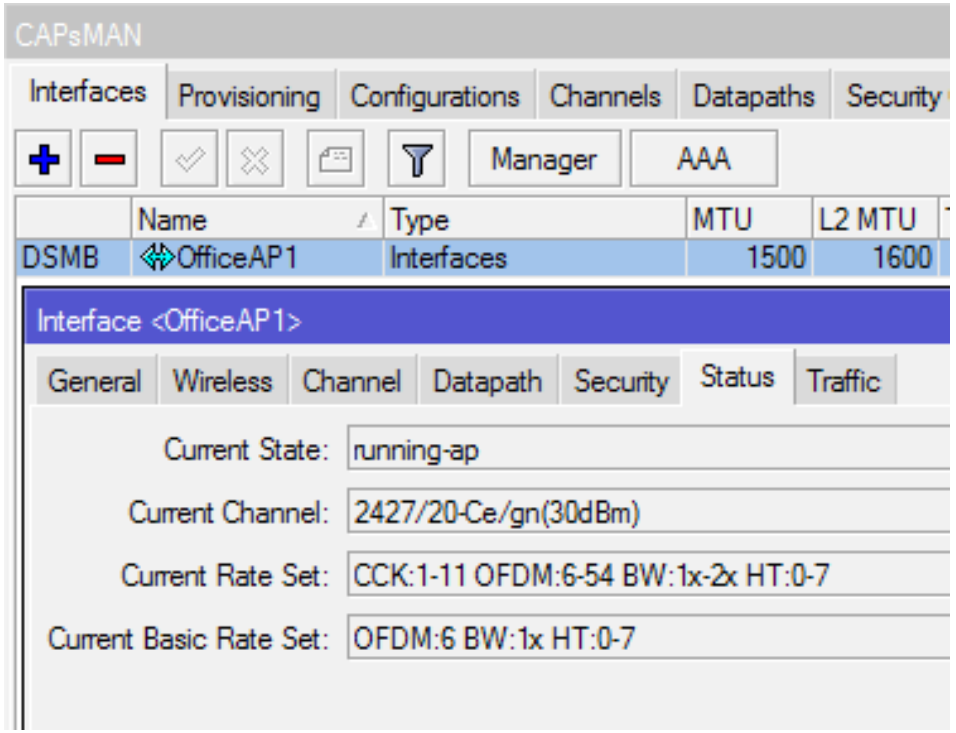
- Configure the AP to use CAP mode
  - Enable wireless-fp package
  - Enable CAP mode
    - By CAP mode button on some boards
    - By configuration in Wireless CAP menu



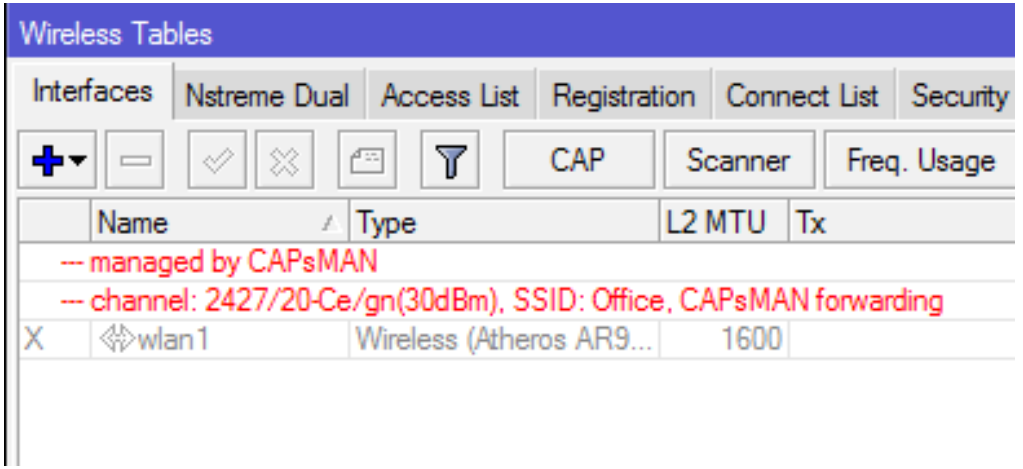
CAPsMAN Simple Setup

- Check the Status of the CAPsMAN CAP interface

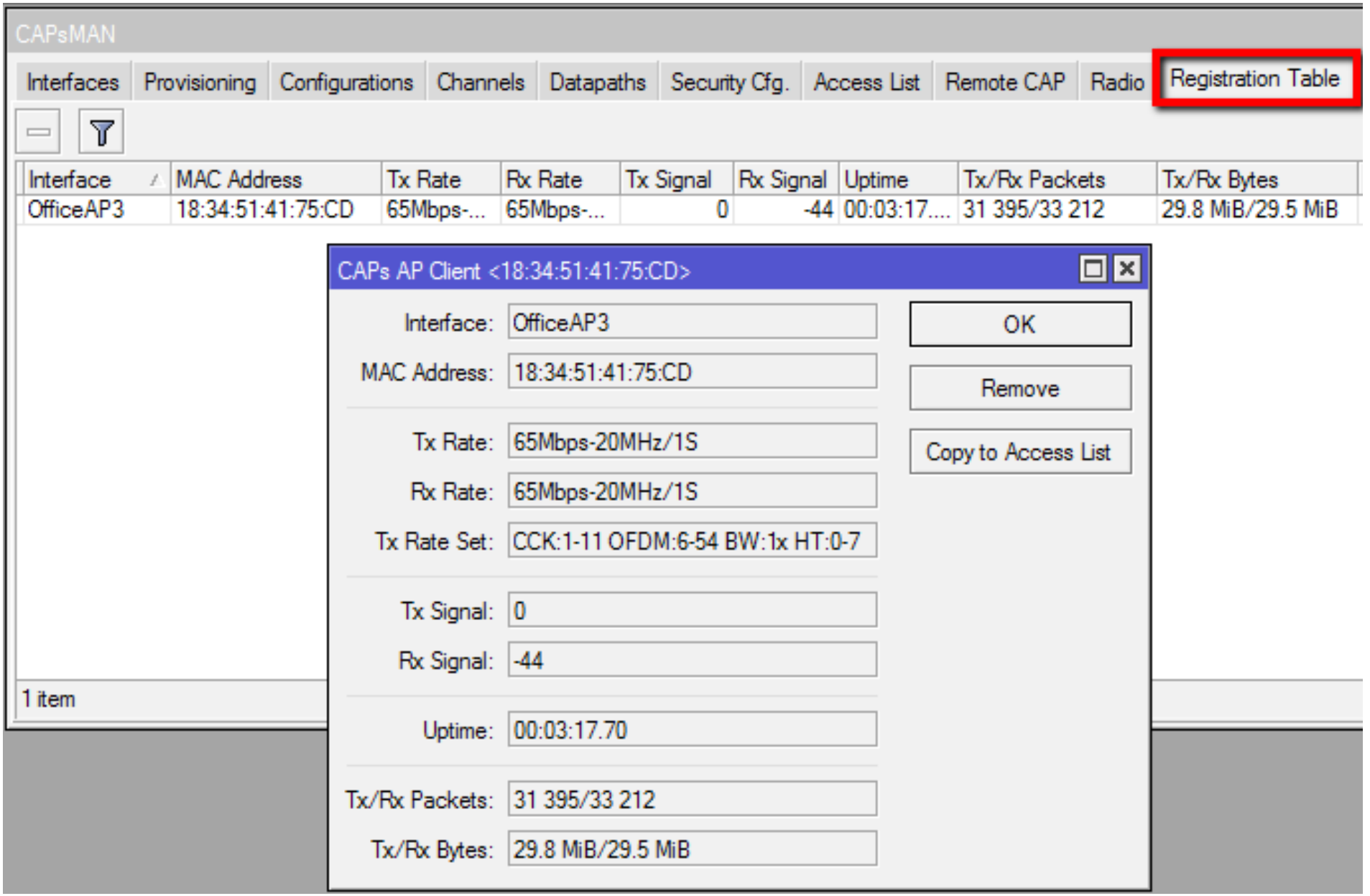
CAPsMAN



CAP



CAPsMAN Registration table



CAP to CAPsMAN Connection

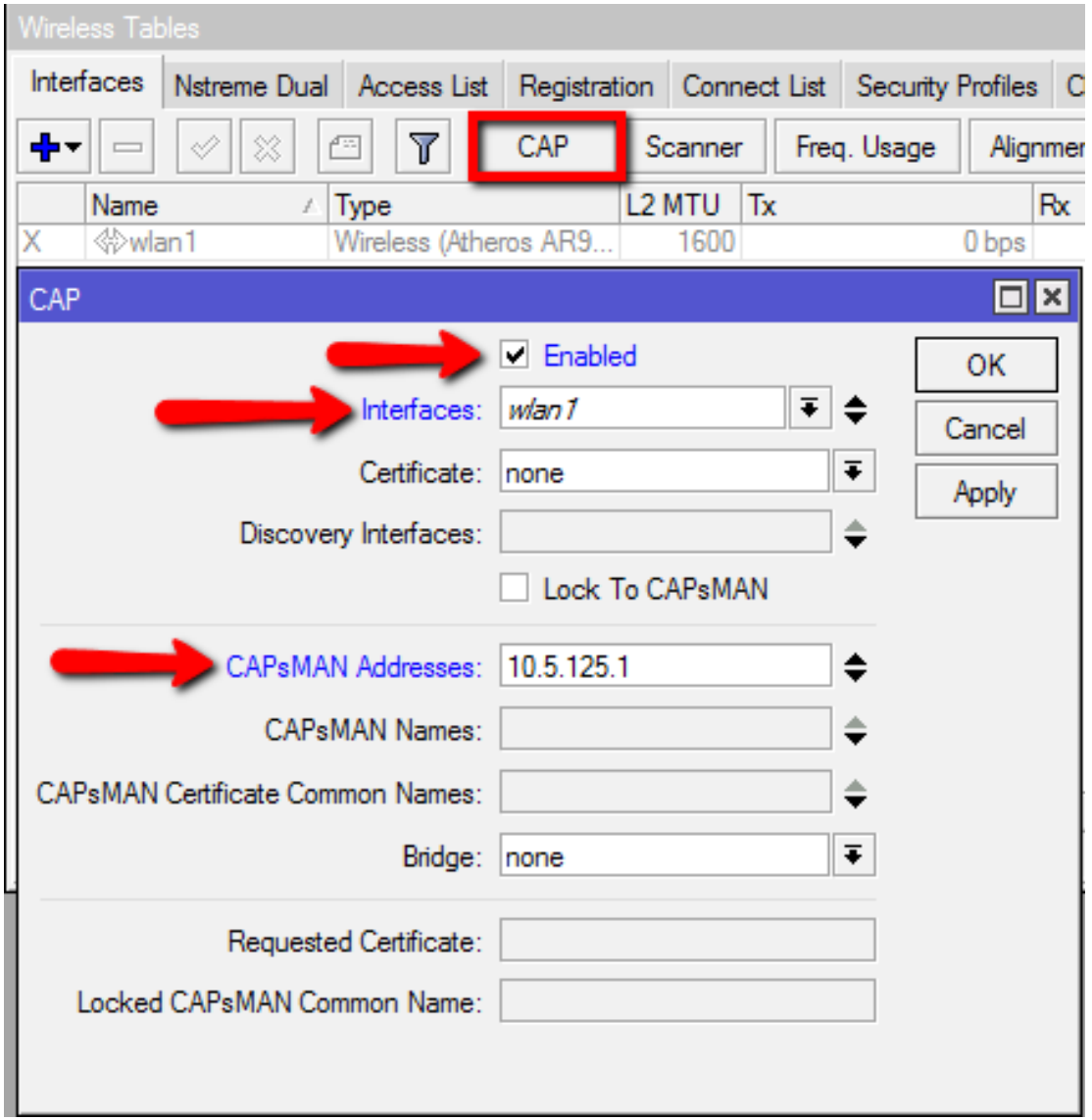
- MAC Layer2:
  - No IP configuration required
  - CAP an CAPsMAN must be in the same Layer 2 network
- IP (UDP) Layer3:
  - CAP must reach the CAPsMAN using IP protocol
  - Can traverse NAT if necessary
- Management connection between CAP and CAPsMAN is secured using DTLS
- CAP client data traffic is 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

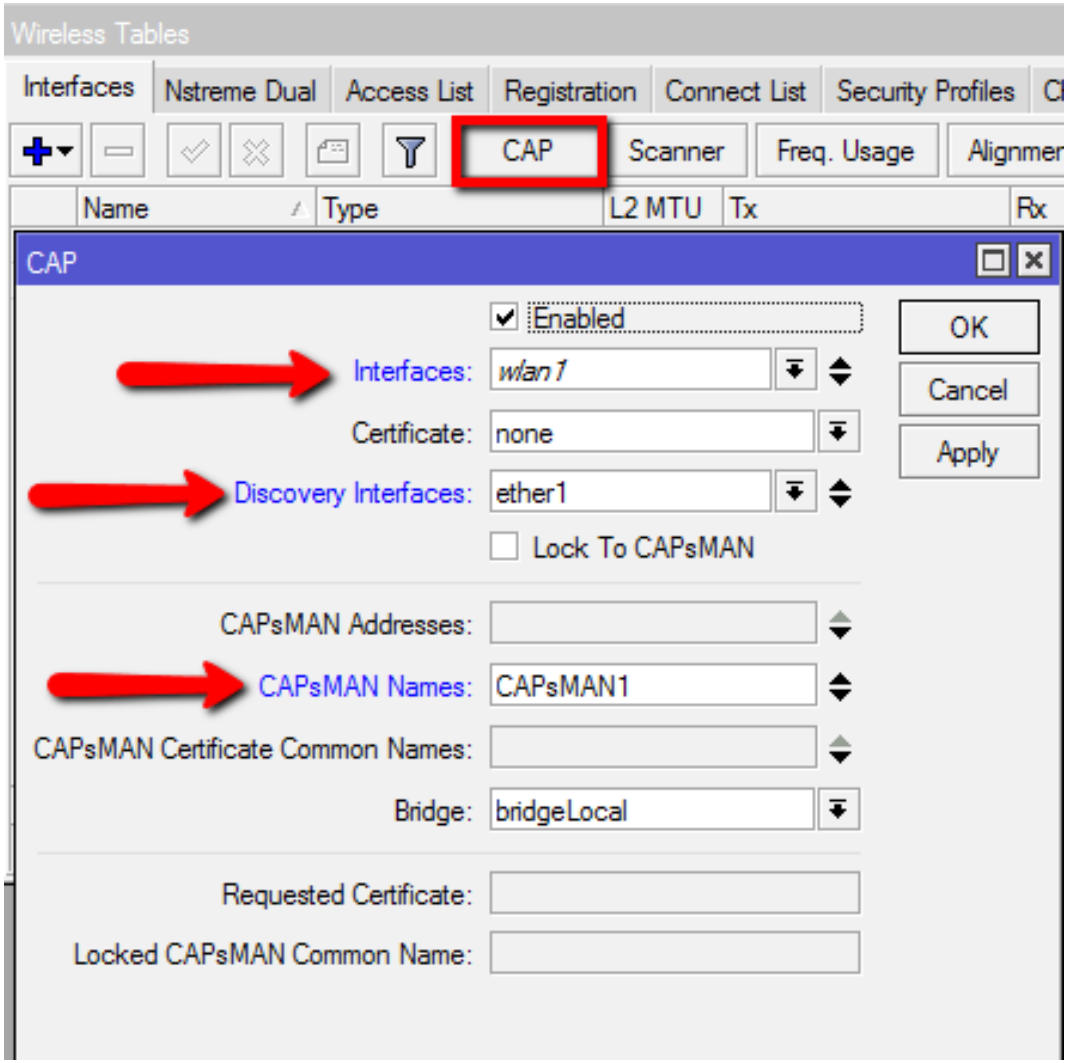
CAPsMAN with Layer3

- On the CAP specify the IP address of the CAPsMAN



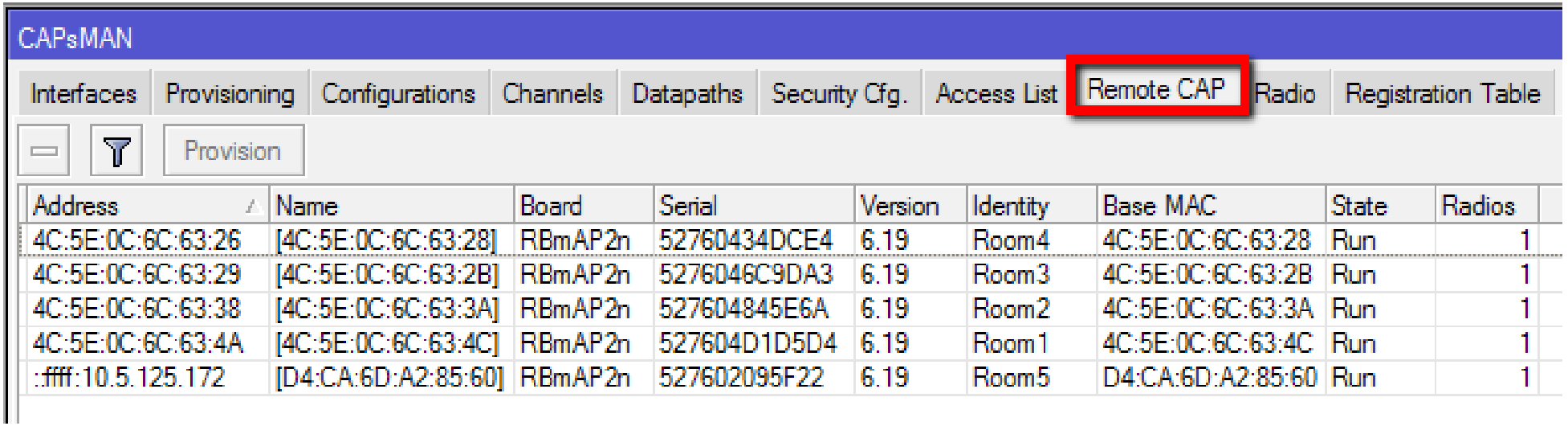
CAPsMAN selection using Name

- On the CAP specify the CAPsMAN identity name



CAP Identification

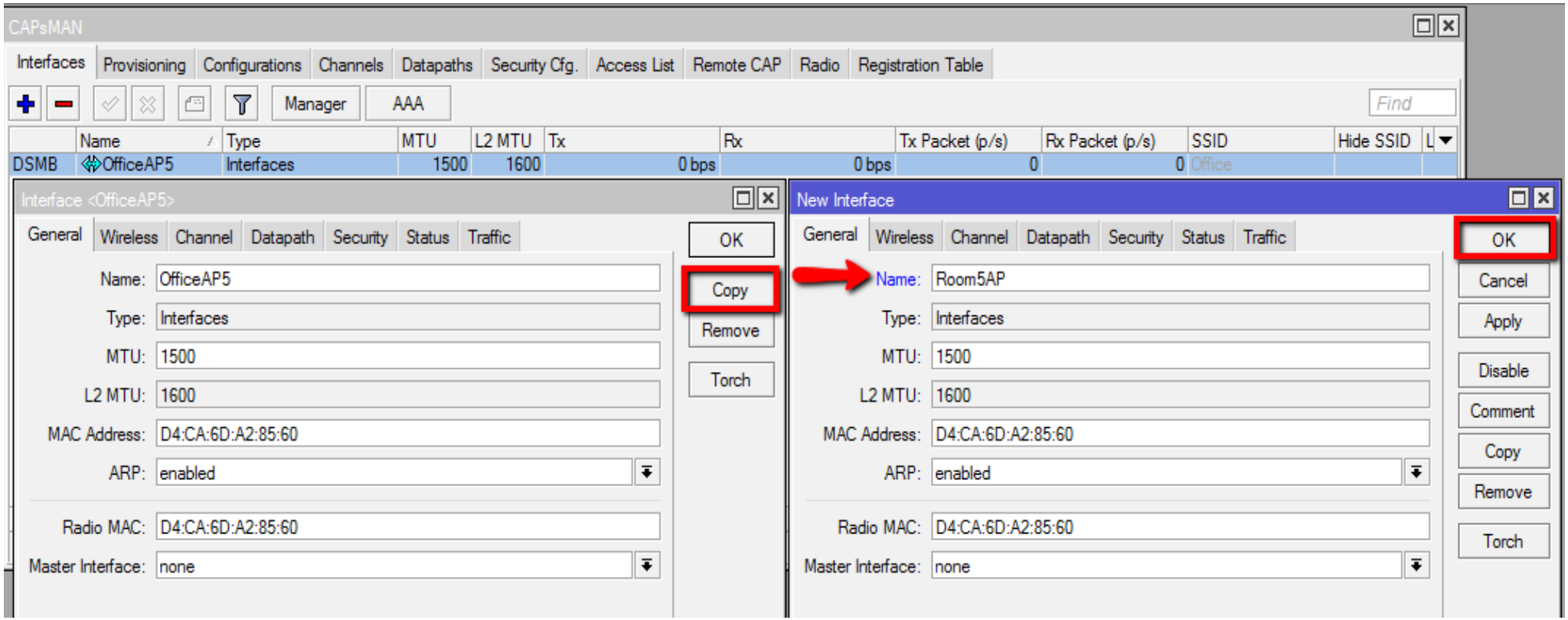
- MAC/IP address
- RouterBoard model
- Serial Number of the Board
- RouterOS version
- System Identity
- Main wireless MAC
- State of the CAP
- Provided radio count



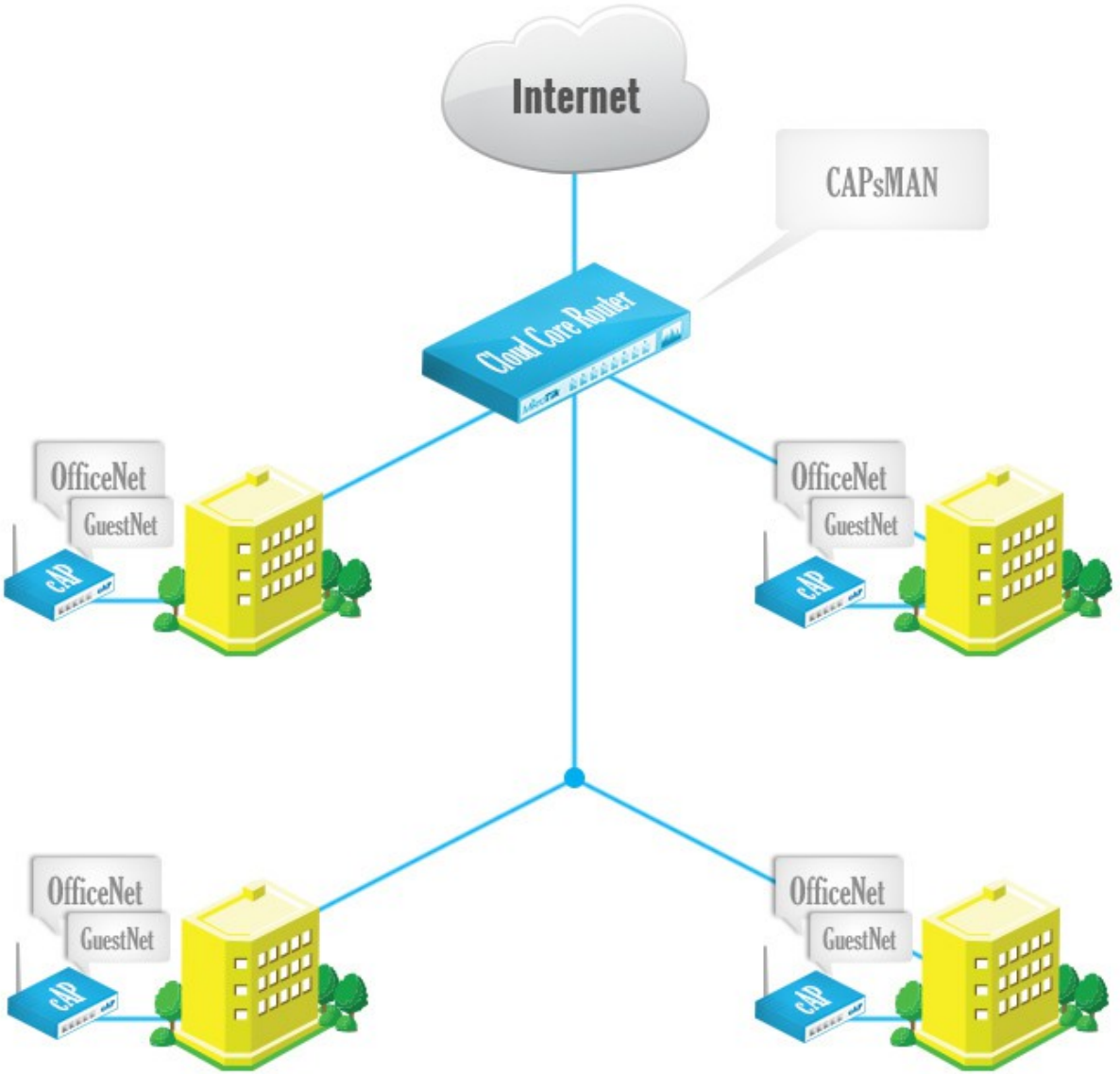
Address	Name	Board	Serial	Version	Identity	Base MAC	State	Radios
4C:5E:0C:6C:63:26	[4C:5E:0C:6C:63:28]	RBmAP2n	52760434DCE4	6.19	Room4	4C:5E:0C:6C:63:28	Run	1
4C:5E:0C:6C:63:29	[4C:5E:0C:6C:63:2B]	RBmAP2n	5276046C9DA3	6.19	Room3	4C:5E:0C:6C:63:2B	Run	1
4C:5E:0C:6C:63:38	[4C:5E:0C:6C:63:3A]	RBmAP2n	527604845E6A	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
:ffff:10.5.125.172	[D4:CA:6D:A2:85:60]	RBmAP2n	527602095F22	6.19	Room5	D4:CA:6D:A2:85:60	Run	1

CAPsMAN static CAP interface

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



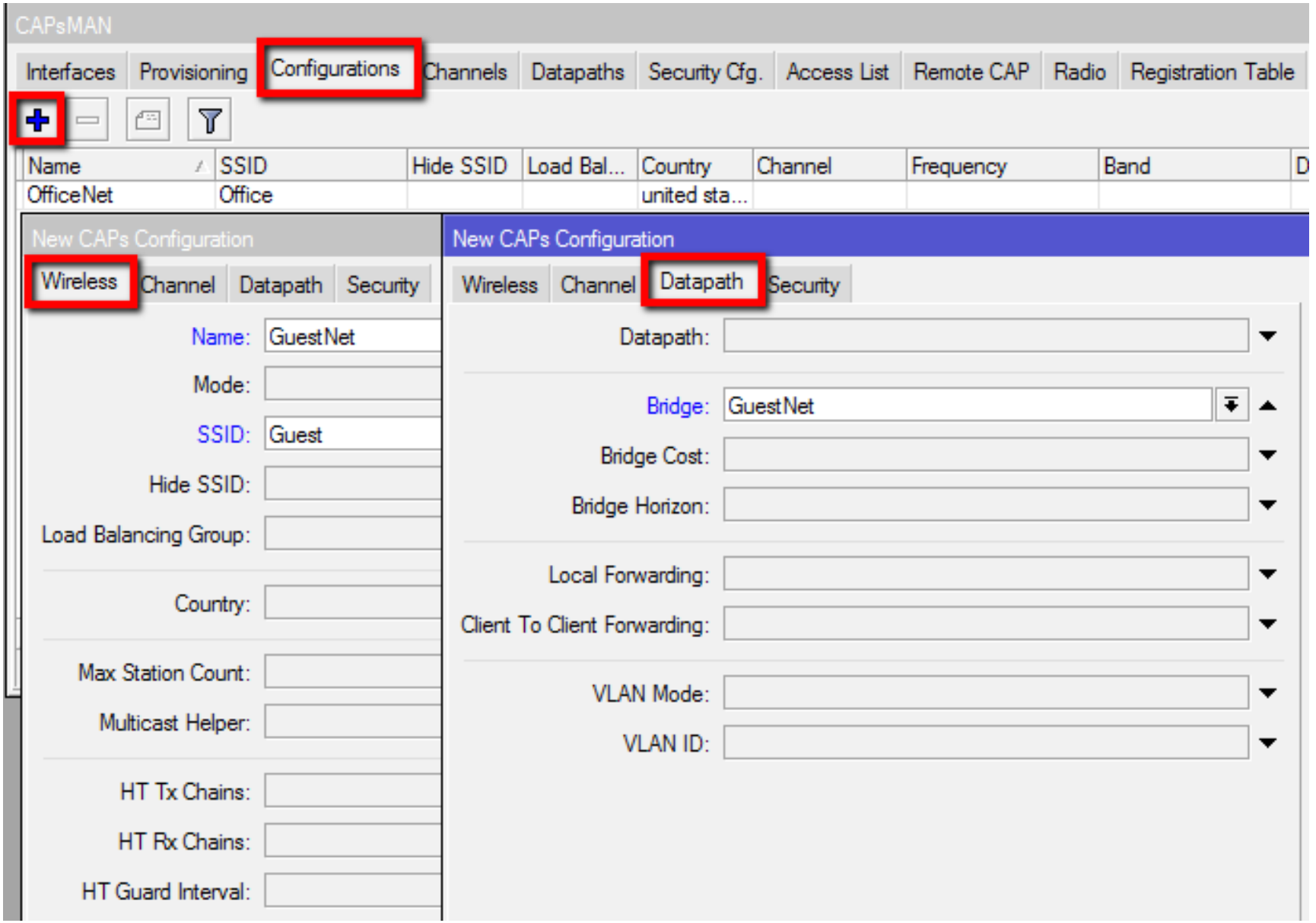
CAPsMAN VirtualAP



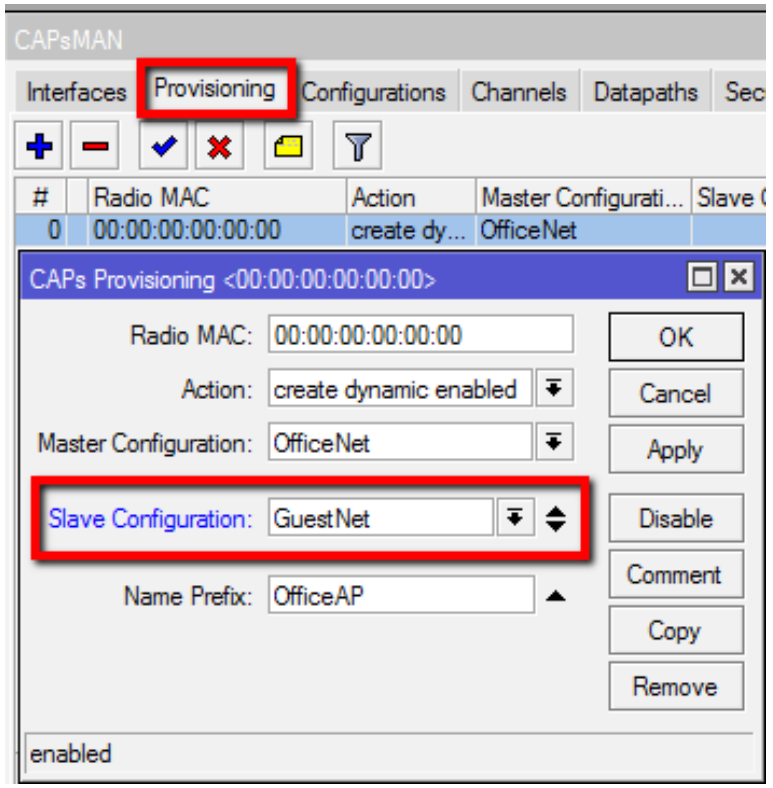
CAPsMAN VirtualAP Configuration

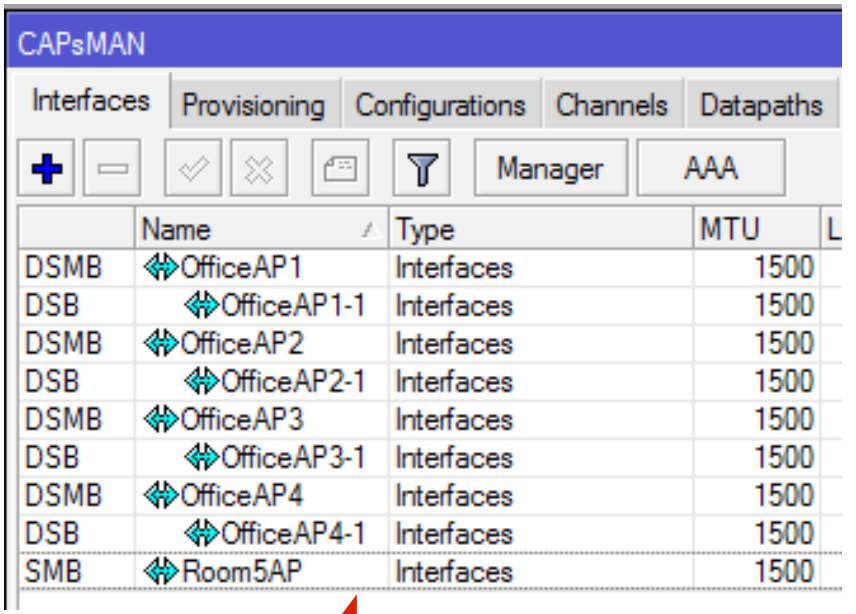
- Create new Bridge interface and IP configuration for the VirtualAPs or use the same bridge interface as Master AP
- Create a new configuration for the VirtualAP
- Specify the new configuration in Provisioning rule as Slave Configuration
- Remove all CAP interfaces
- Initiate Manual Provisioning on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

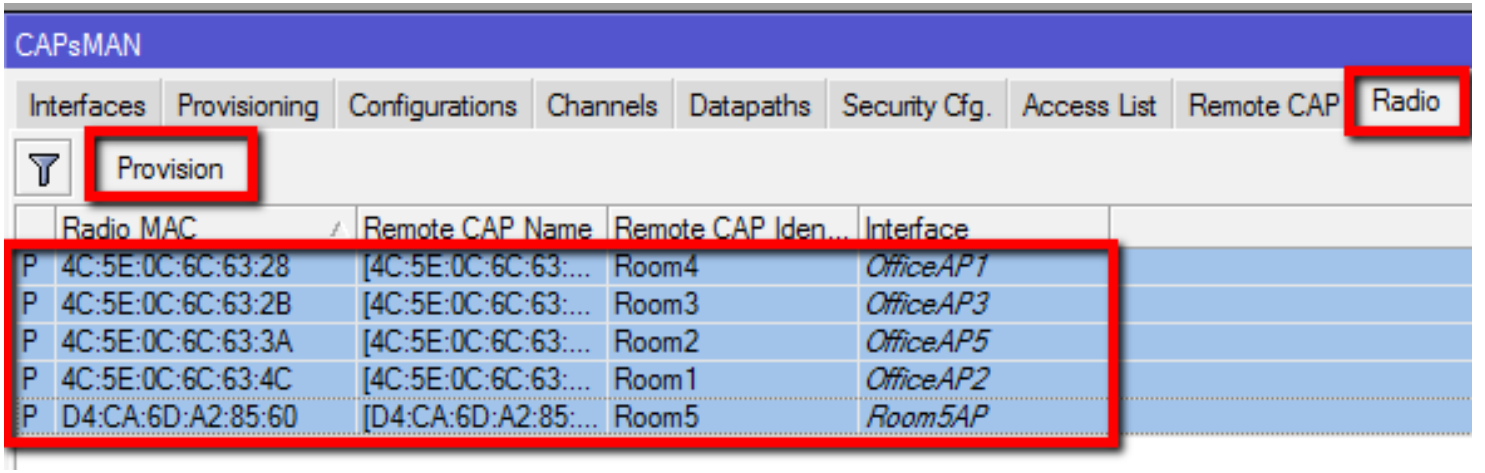
CAPsMAN VirtualAP Setup



CAPsMAN VirtualAP Setup





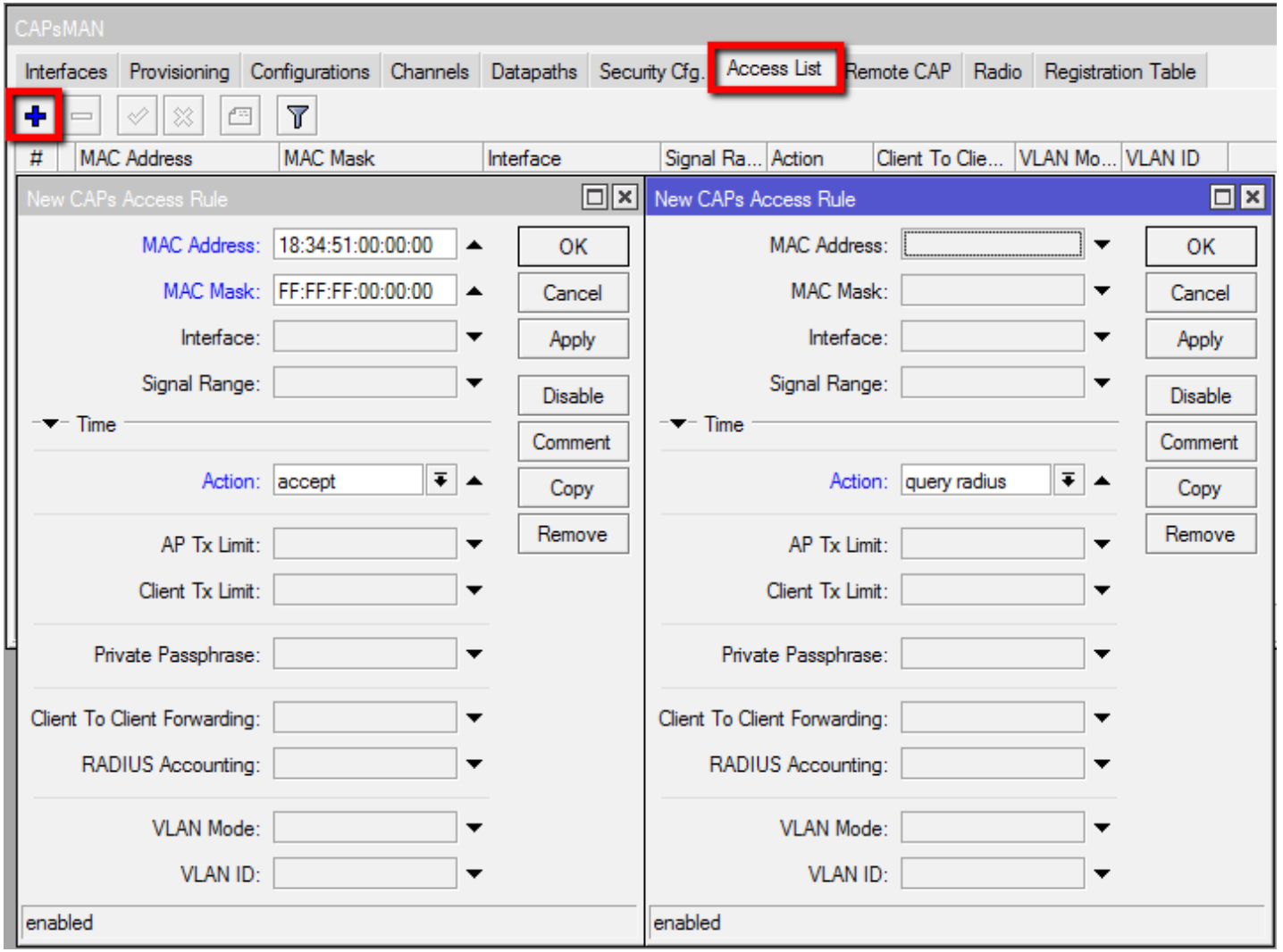


CAPsMAN Access List Features

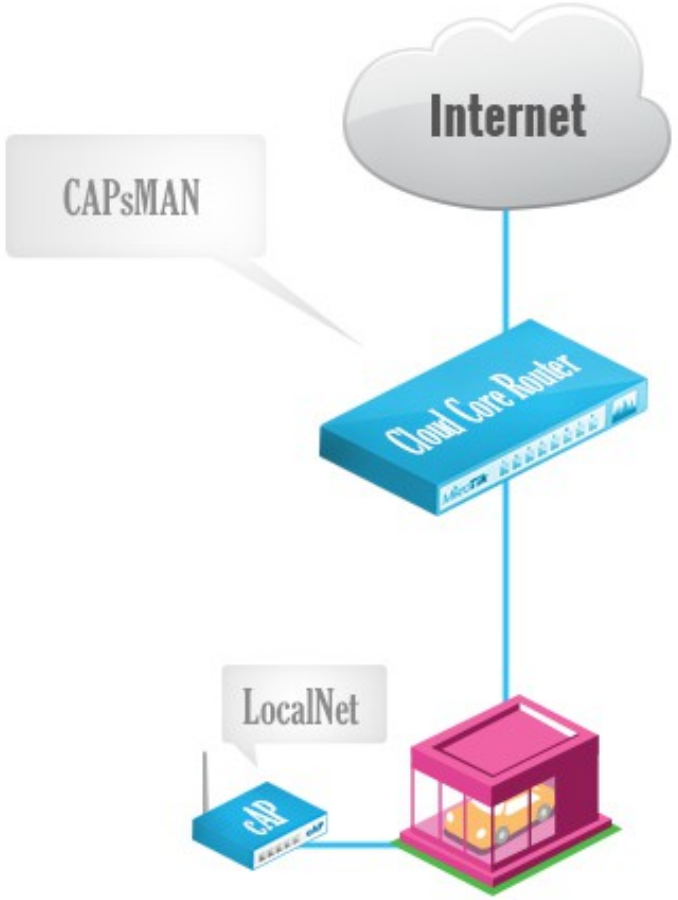
- MAC Authentication
- Radius Query support
- MAC Mask support
- Signal Range
- Time
- Private Passphrase
- VLAN ID assignment

CAPsMAN Access List

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

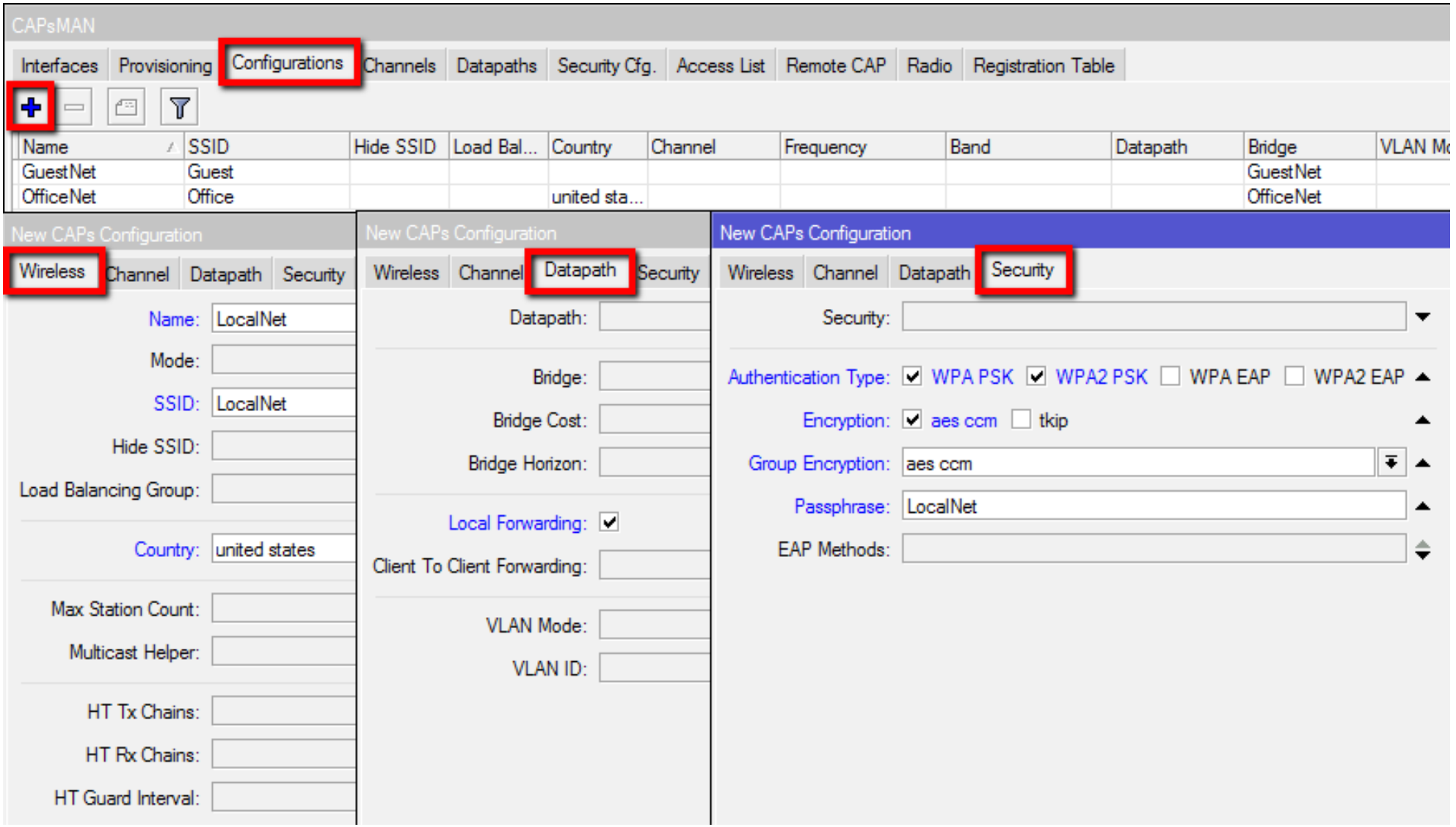


CAPsMAN Local Forwarding Setup



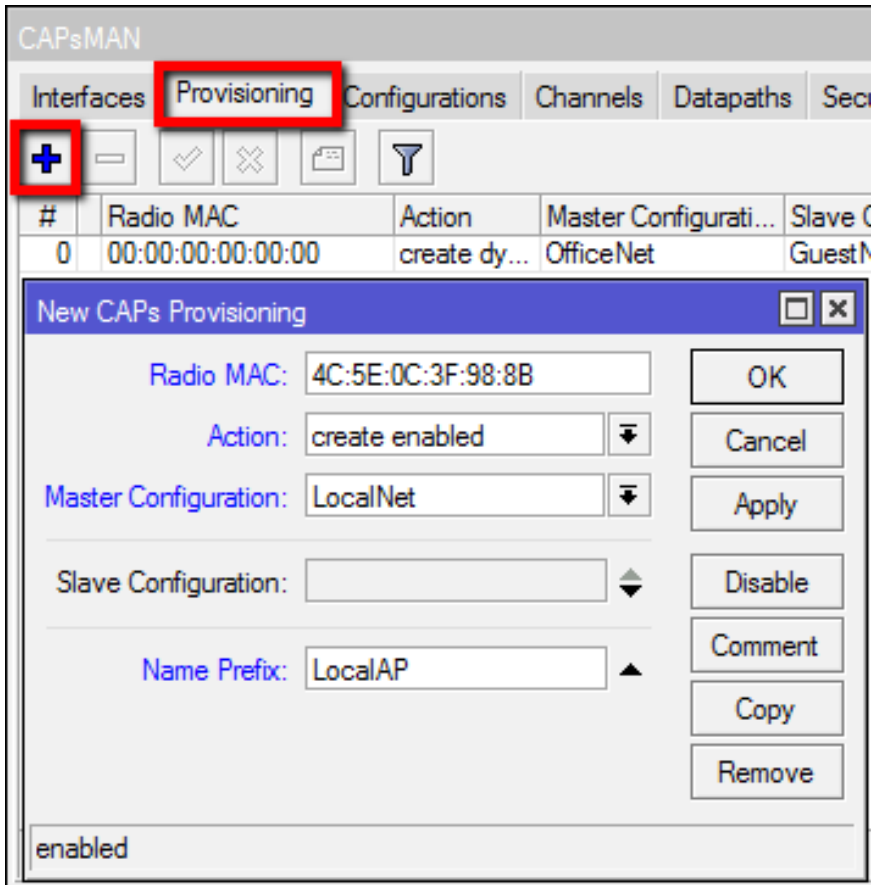
CAPsMAN Local Forwarding

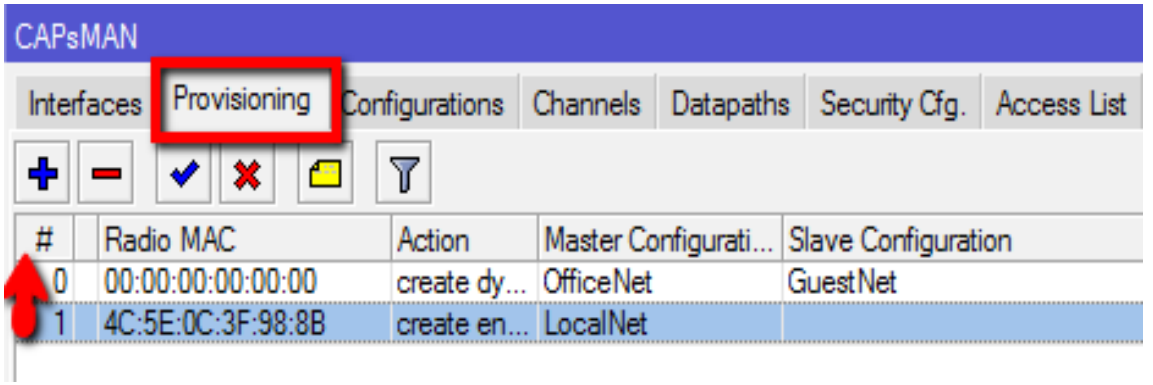
- Create a Local Forwarding configuration



CAPsMAN Local Forwarding

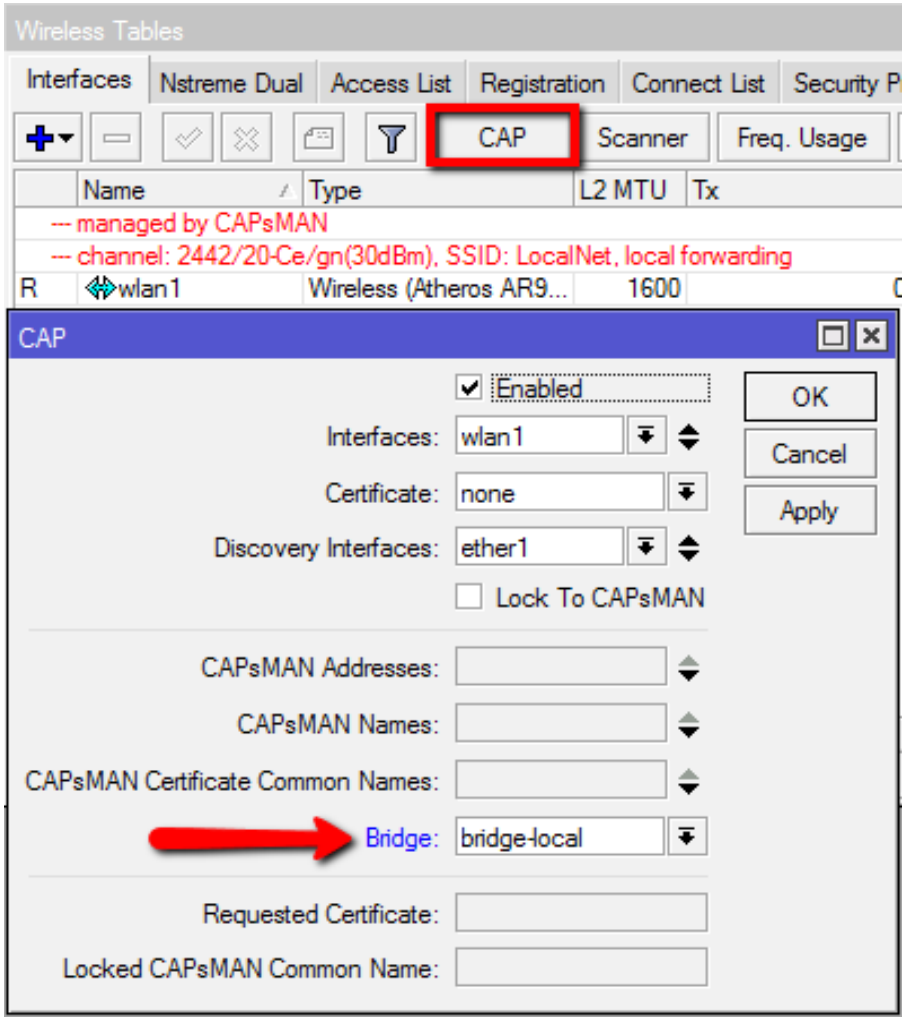
- Create Provisioning rule
- Move above the default Provisioning rule





CAPsMAN Local Forwarding

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

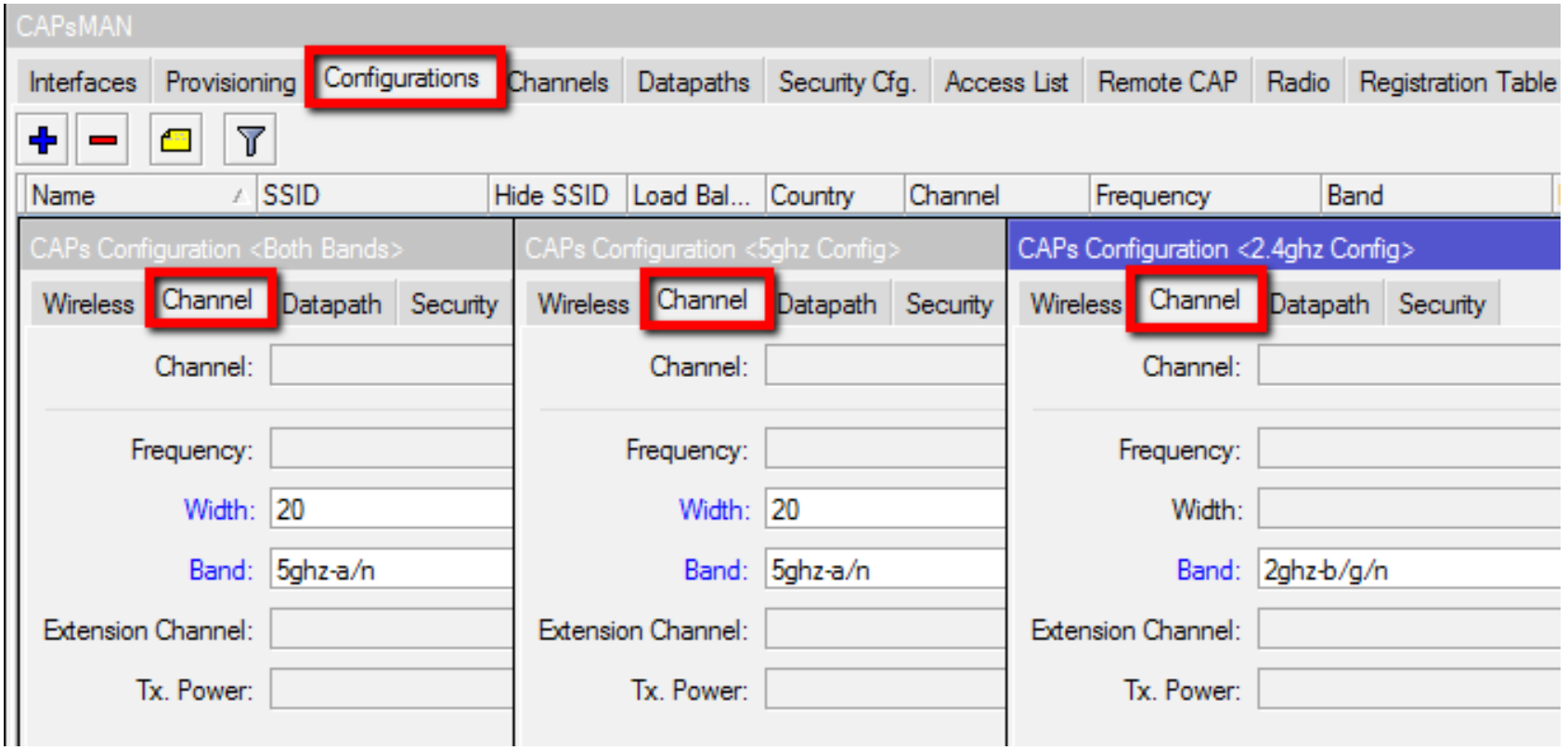


CAPsMAN Dual Band CAP

- 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

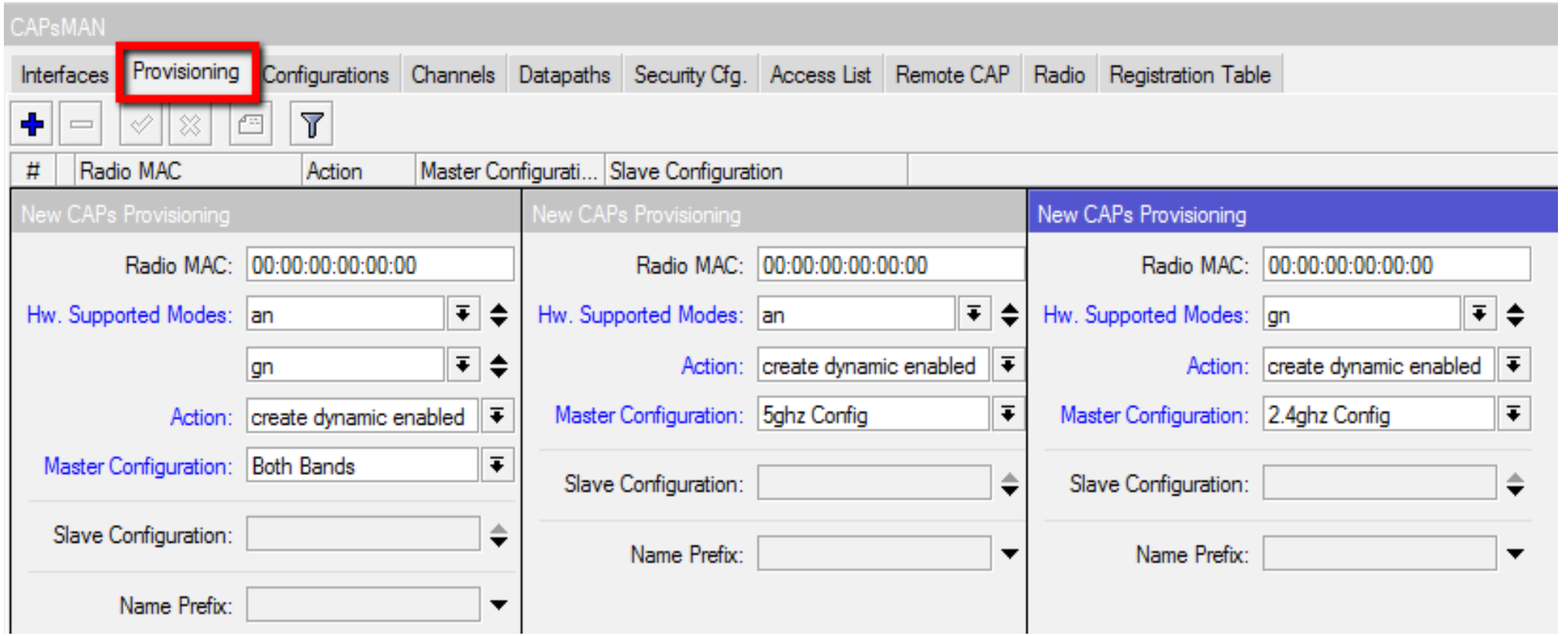
CAPsMAN Dual Band CAP

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

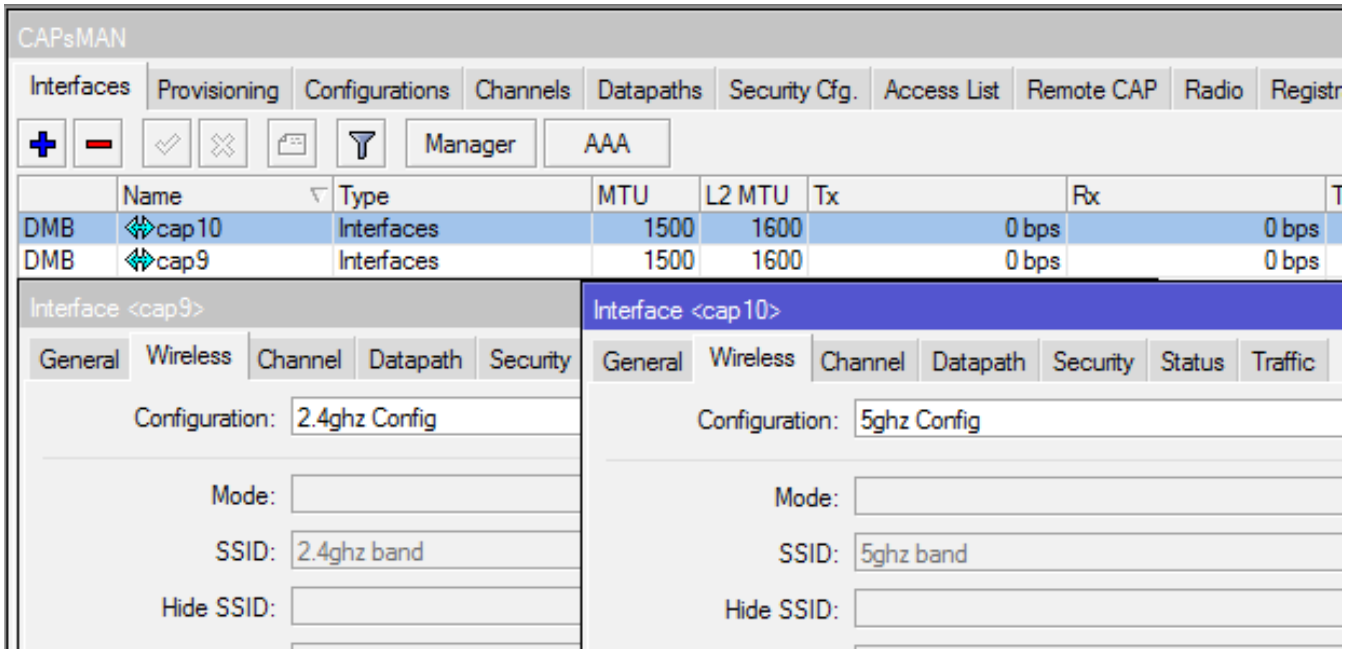


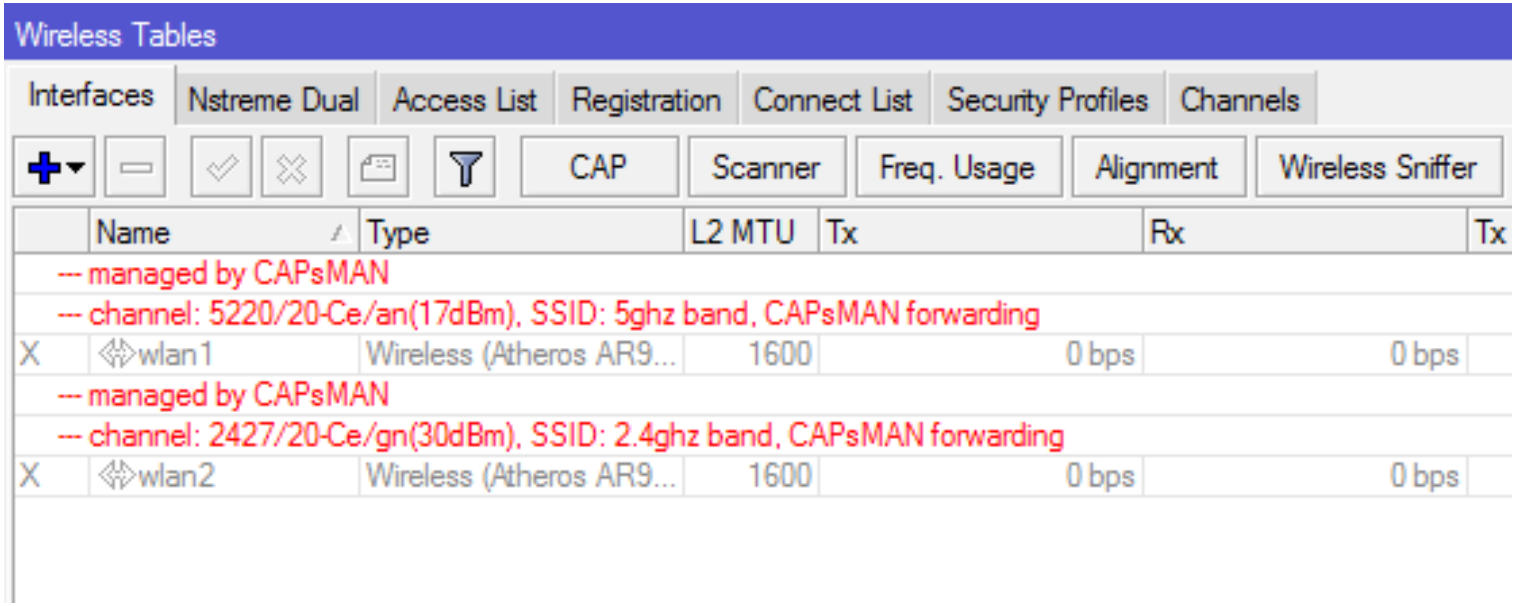
CAPsMAN Dual Band CAP

- 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



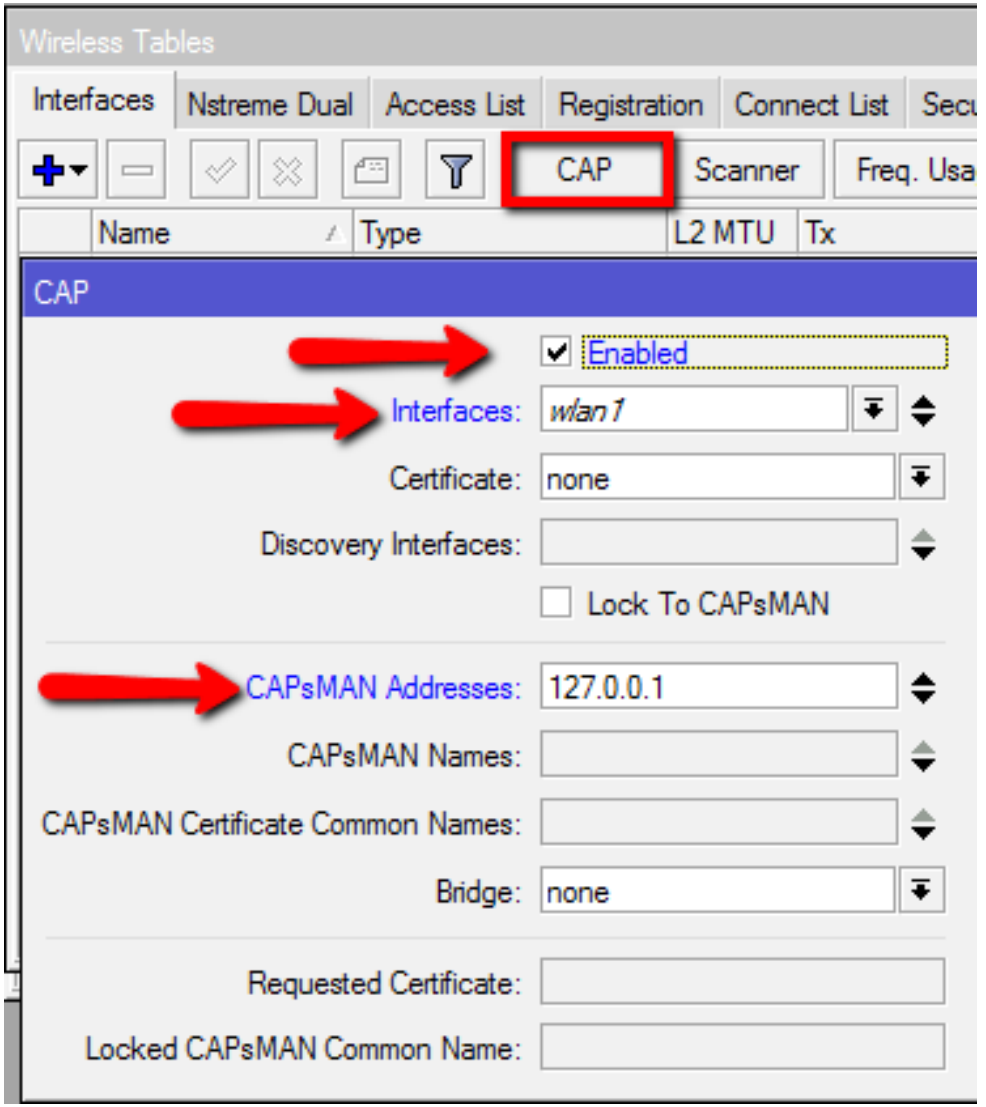
CAPsMAN Dual Band CAP





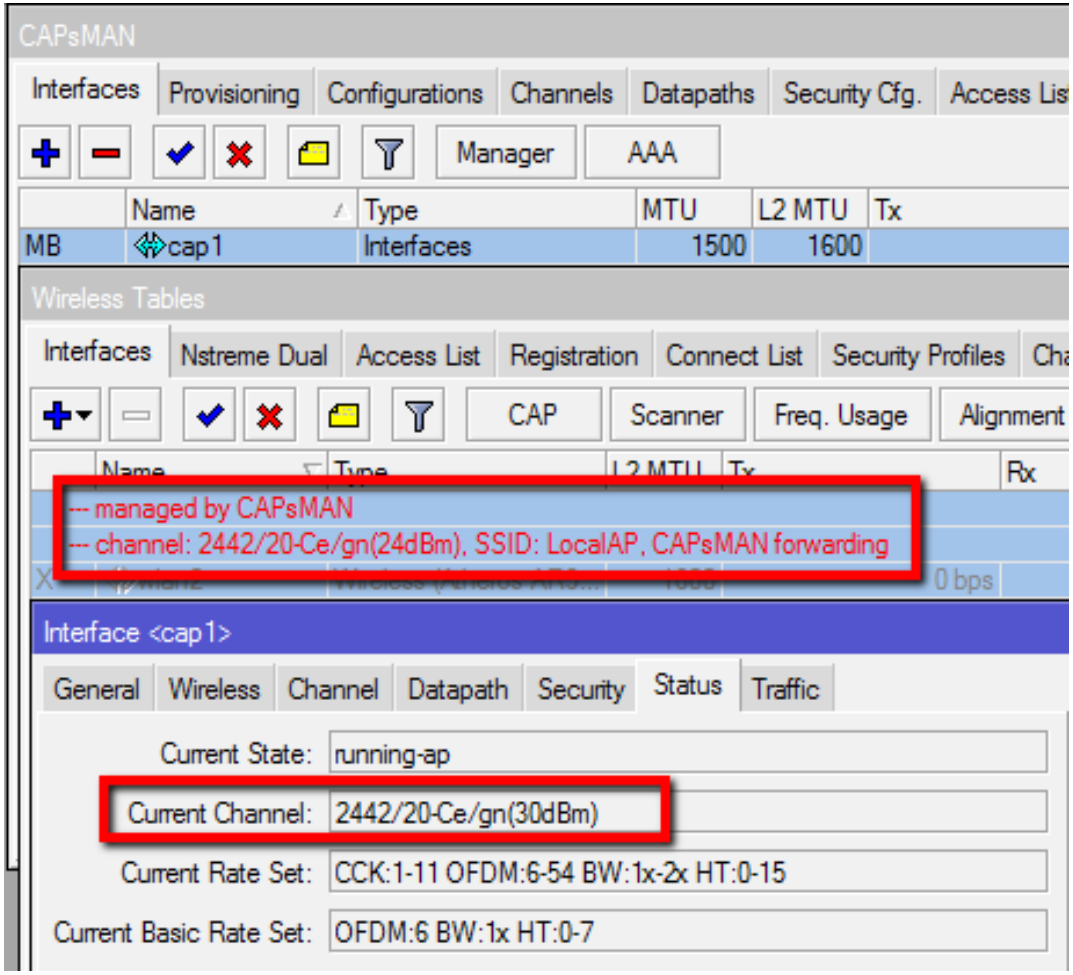
CAPsMAN and CAP in one board

- 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



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.