



CAPsMAN para redes empresariales



Prozcenter - ¿Quiénes somos?

- Empresa joven, con 12 años de experiencia en Networking y TI.
- Compuesta por profesionales de la industria tecnológica
- Consultores en redes de datos.
- Entrenadores MikroTik.
- Más de 600 alumnos certificados.

¿Qué ofrecemos?

Soporte

- Soporte para ISP y empresas.
- Mantenimientos mensuales.

Proyectos

- Diseños de red.
- StartUP de nuevos ISP.
- Proyectos llave en mano.

Capacitaciones

- Capacitaciones oficiales de Mikrotik.

Consultoría

- Consultoría para pequeñas, medianas y grandes redes.
- Servicio de consultoría por incidentes.

Capacitación - MikroTik



MTC Network Associate
Básico



Wireless Engineer
Wireless Avanzado



MTC Traffic Control Engineer
Firewall y QoS Avanzado



User Management Engineer
Túneles avanzados y HS



MTC Routing Engineer
Routing Avanzado



Inter-networking Engineer
BGP y MPLS

Wi-Fi como base de la vida



El problema de la gestión descentralizada...

Problema dentro de empresas:

- Necesidad de cubrir varias locaciones con Wi-Fi.
- Algunas veces estas locaciones son remotas.
- Generalmente se suelen utilizar varios equipos, y cada uno se gestiona de forma individual.

Solución:

- MikroTik CAPsMAN!

Principal ventaja:

- Fácil de configurar.
- Integrable.
- Versátil y flexible.
- Solución económica.

Introducción y Conceptos Básicos

Introducción

- Significa **C**ontrolled **A**ccess **P**oint **s**ystem **MAN**ager.
- Permite gestión centralizada de redes inalámbricas.
- CAPsMAN Soporta:
 - Autenticación MAC vía RADIUS
 - Autenticación vía WPA/WPA2 y cifrado TKIP / AES
- Límites
 - 32 interfaces por equipo.
 - 32 interfaces virtuales por interfaz física.
 - No soporta para redes Nstreme / Nv2 (por ahora).

Elementos y Nomenclatura

- **CAPsMAN:** También llamado “Manager” es un equipo con o sin interfaces inalámbricas que tiene la capacidad de administrar interfaces de otros dispositivos (llamados CAP). El Manager opcionalmente puede hacer reenvío de tráfico (es decir puede ser Manager y Router de Borde al mismo tiempo).
- **CAP:** son equipos con interfaces inalámbricas que proveen conexión a usuarios finales. Estas interfaces no se configuran localmente sino a través del Manager

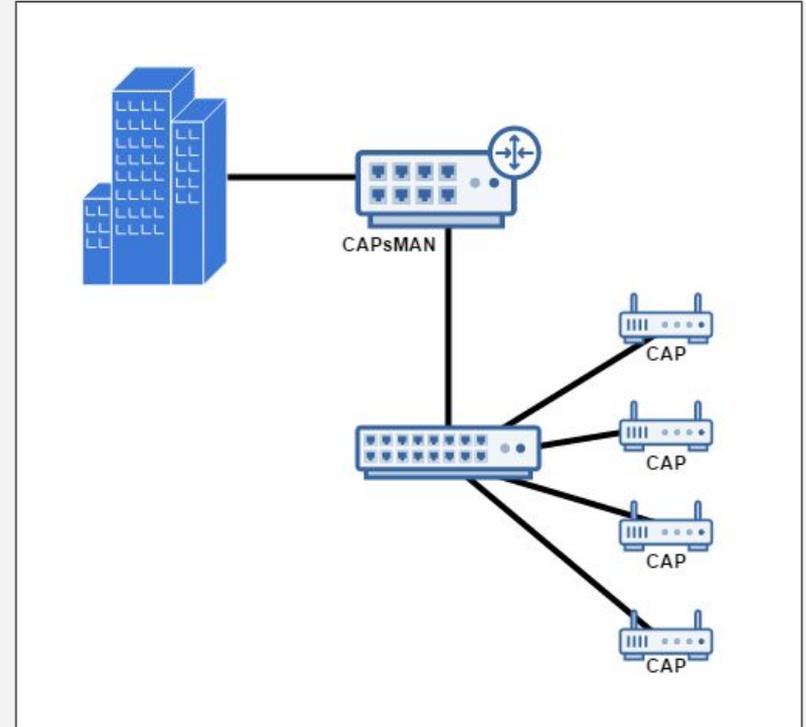
El CAPsMAN tiene los perfiles o configuraciones de redes inalámbricas que serán luego configuradas de forma automática en cada CAP. Los CAP sólo se encargan de proveer conectividad inalámbrica a los equipos finales.

Arquitectura Básica - Típica

Red empresarial típica: Access Points en el mismo segmento que Router de Borde.

Router de Borde: además de ejecutar sus funciones (NAT, Firewall, QoS, etc) corre el CAPsMAN.

Access Points: la configuración inalámbrica queda en blanco.



Comunicación CAPsMAN / CAPs

- Los CAPs se comunican con el CAPsMAN utilizando L2 o L3.
 - **L2:** los CAPs no precisan configuración IP, sólo requieren visibilidad L2 directa o con VLANs, túneles, etc.
 - **L3:** los CAPs requieren configuración IP fija o vía DHCP.
- En ambos casos se utiliza comunicación segura DTLS (UDP 5246).

Comunicación CAPsMAN / CAPs

Para establecer la comunicación, los CAP en principio tratan de contactar a los Managers disponibles en la red utilizando estos métodos:

- 1. Dirección IP configurada manualmente.**
- 2. Dirección IP obtenida por DHCP.**
- 3. Buscando en las interfaces configuradas (por broadcast).**

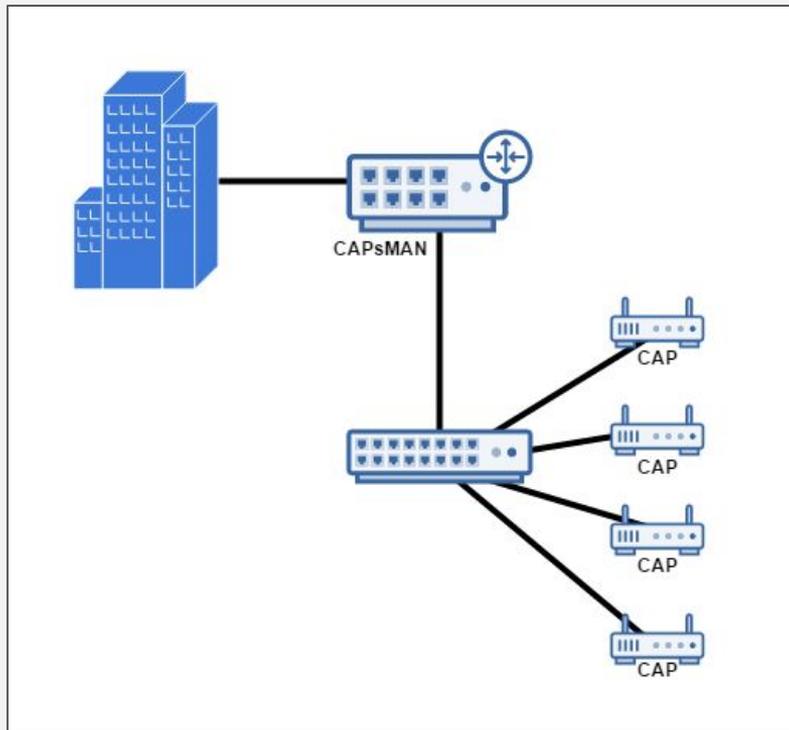
Una vez establecida la comunicación el CAPsMAN agrega el CAP como “interfaz” y trata de configurarla con los parámetros que

Configuración Inicial (y rápida)

Requisitos

- **Paquete wireless-cm2.npk.**
- CAPsMAN funciona desde la versión 6.11, aunque la nueva versión (CAPsMANv2) está operativa desde la 6.22rc7.
- El CAPsMAN (Manager) no requiere interfaz inalámbrica.
- Los CAPs deberían tener al menos una interfaz inalámbrica y licencia L4 para proveer acceso a múltiples clientes.

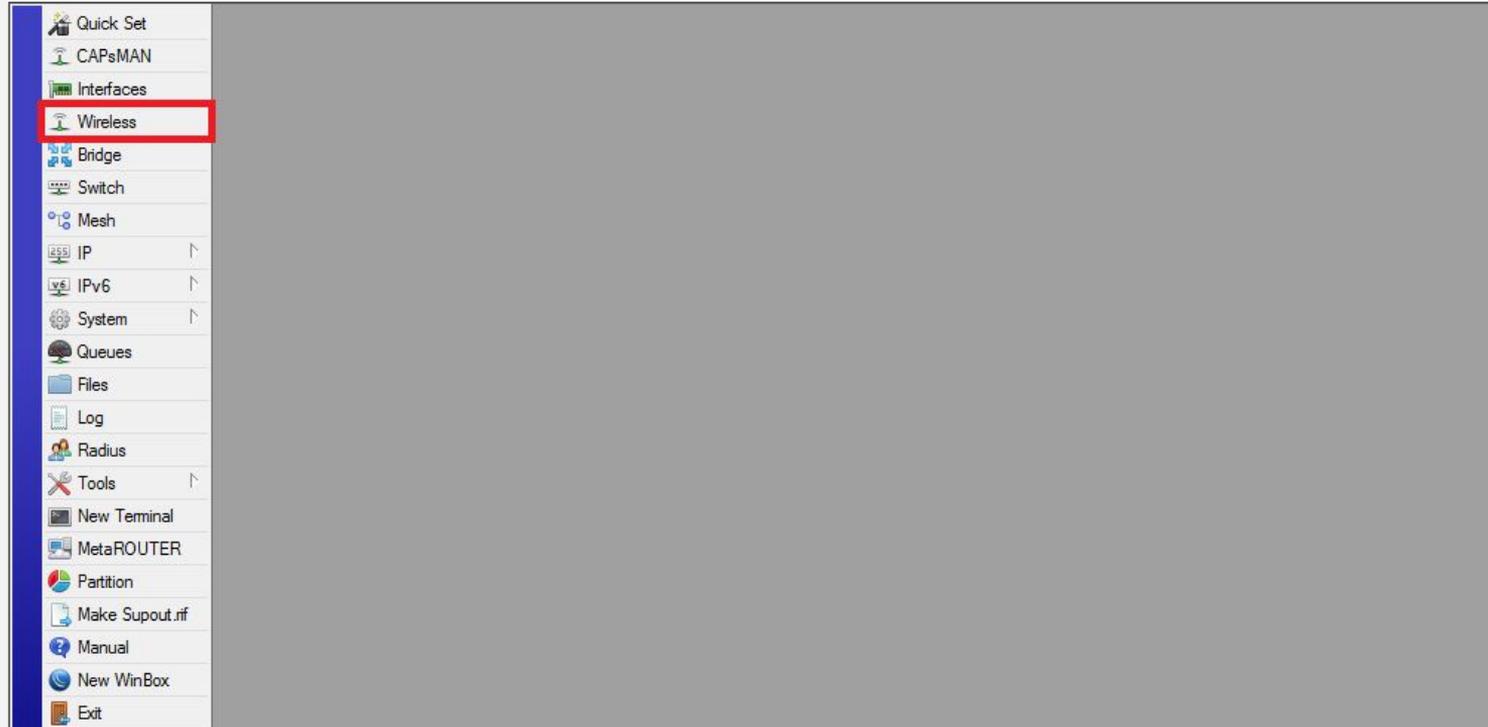
Escenario



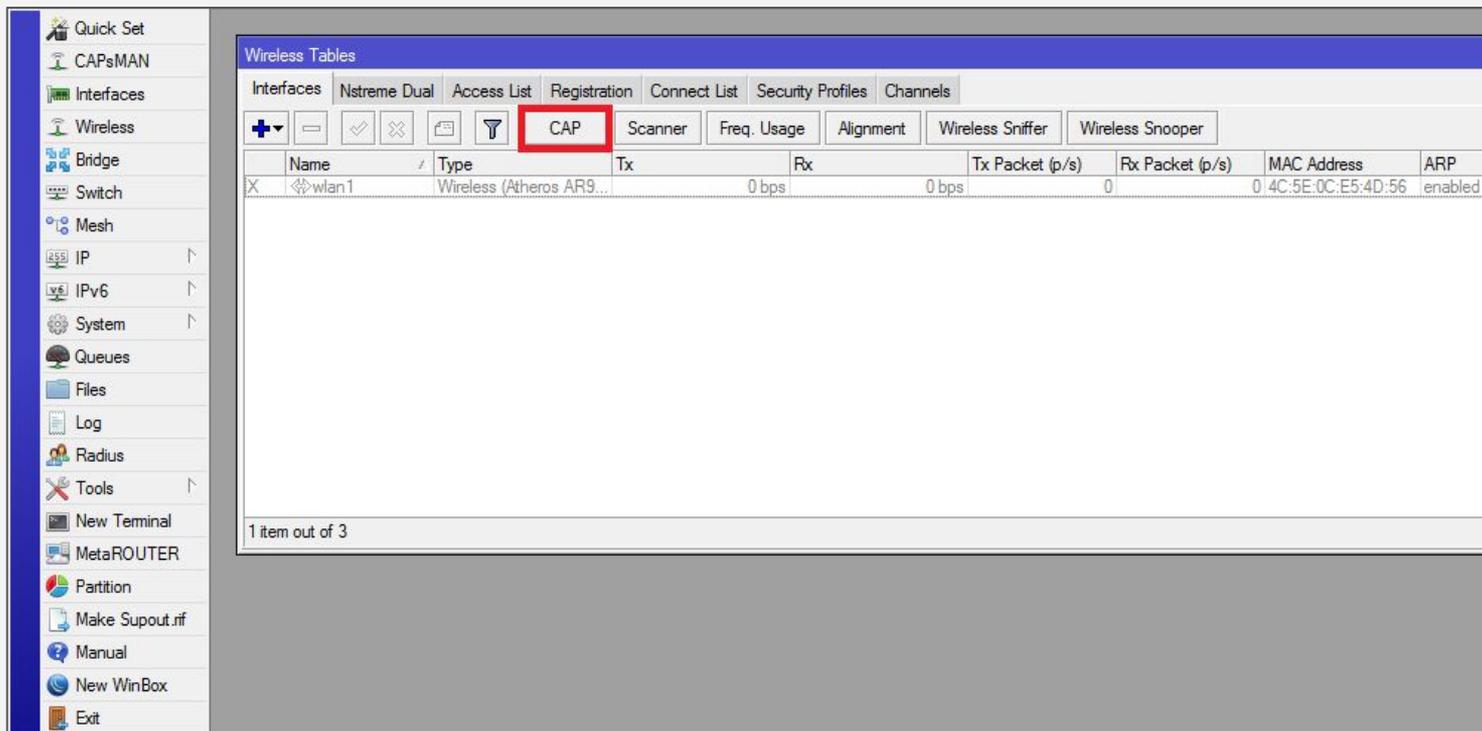
Router de Borde que va a officiar de **CAPsMAN**. Tiene una IP para la WAN (Internet) y una para la LAN (clientes).

Los **AP** se configuraran como **CAPs** y en esta configuración no requieren IPs.

Configuración de un CAP



Configuración de un CAP



Wireless Tables

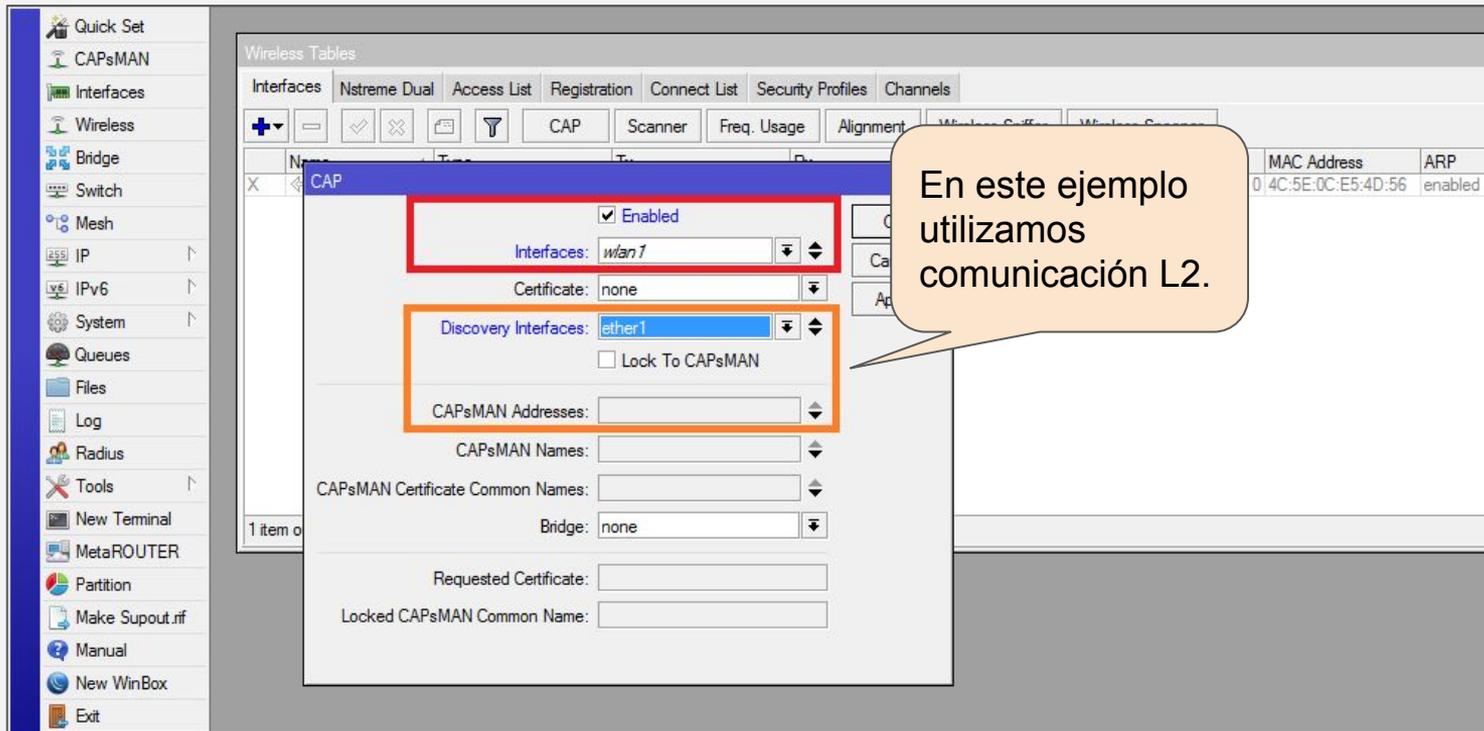
Interfaces | Nstreme Dual | Access List | Registration | Connect List | Security Profiles | Channels

+ - ✓ ✗ [CAP] Scanner | Freq. Usage | Alignment | Wireless Sniffer | Wireless Snooper

Name	Type	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	MAC Address	ARP
wlan1	Wireless (Atheros AR9...	0 bps	0 bps	0	0	4C:5E:0C:E5:4D:56	enabled

1 item out of 3

Configuración de un CAP



The screenshot displays the WinBox interface for configuring a CAP (Controlled Access Point). The left sidebar shows the navigation menu with categories like Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, Switch, Mesh, IP, IPv6, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.rtf, Manual, New WinBox, and Exit.

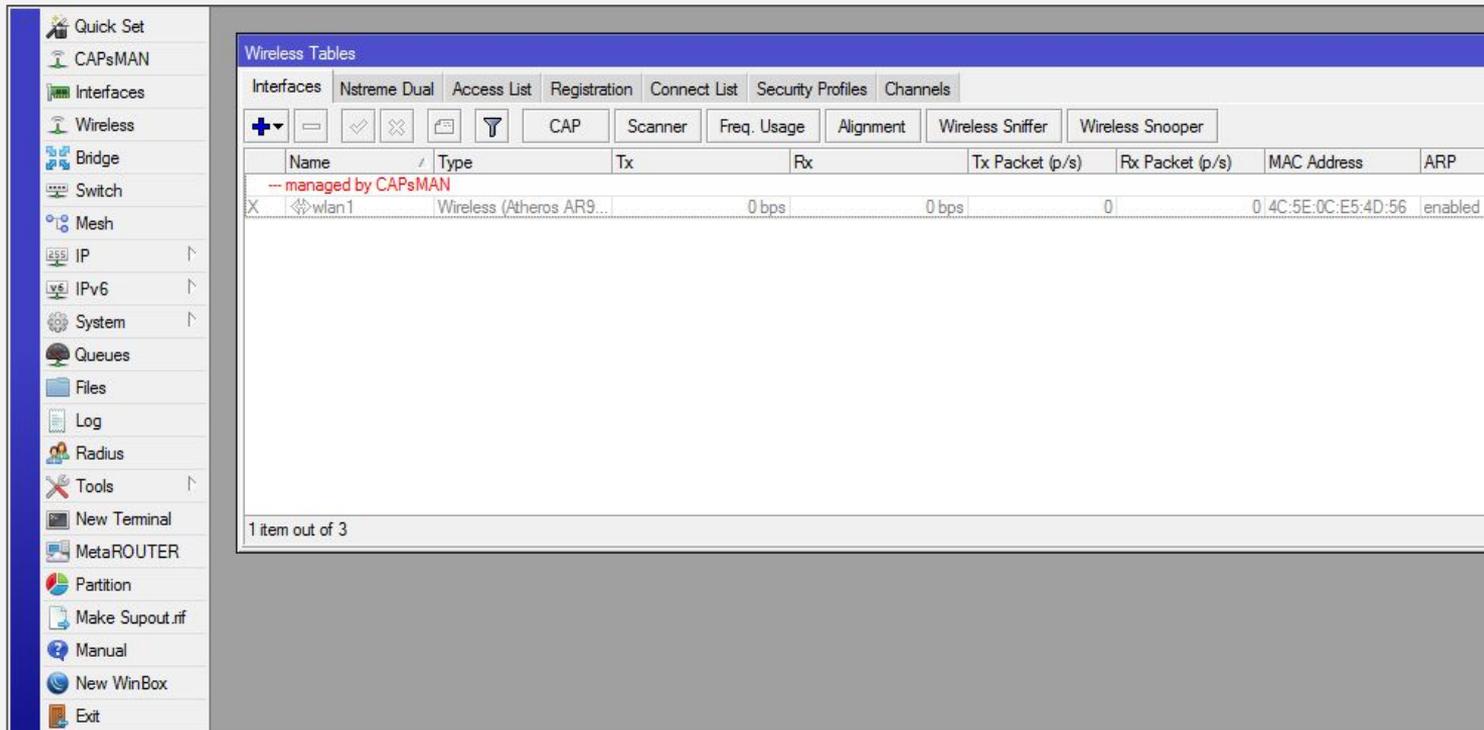
The main window is titled "Wireless Tables" and has several tabs: Interfaces, Nstreme Dual, Access List, Registration, Connect List, Security Profiles, and Channels. The "CAP" tab is active, showing a table with one entry. A configuration dialog box is open over the table, with the following fields:

- Enabled
- Interfaces: *wlan1* (highlighted with a red box)
- Certificate: none
- Discovery Interfaces: *ether1* (highlighted with an orange box)
- Lock To CAPsMAN
- CAPsMAN Addresses: (empty)
- CAPsMAN Names: (empty)
- CAPsMAN Certificate Common Names: (empty)
- Bridge: none
- Requested Certificate: (empty)
- Locked CAPsMAN Common Name: (empty)

A speech bubble on the right side of the dialog box contains the text: "En este ejemplo utilizamos comunicación L2."

MAC Address	ARP
014C:5E:0C:E5:4D:56	enabled

Configuración de un CAP



The screenshot displays the MikroTik WinBox interface, specifically the 'Wireless Tables' configuration window. The left sidebar shows the navigation menu with 'Wireless' selected. The main window is titled 'Wireless Tables' and contains several tabs: 'Interfaces', 'Nstreme Dual', 'Access List', 'Registration', 'Connect List', 'Security Profiles', and 'Channels'. The 'Interfaces' tab is active, showing a table of wireless interfaces. The table has columns for Name, Type, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), MAC Address, and ARP. A single interface is listed: 'wlan1', which is a 'Wireless (Atheros AR9...)' interface. The table also shows a status '0' for Tx and Rx packets, and a MAC address of '4C:5E:0C:E5:4D:56'. The interface is marked as 'enabled'. Below the table, it indicates '1 item out of 3'.

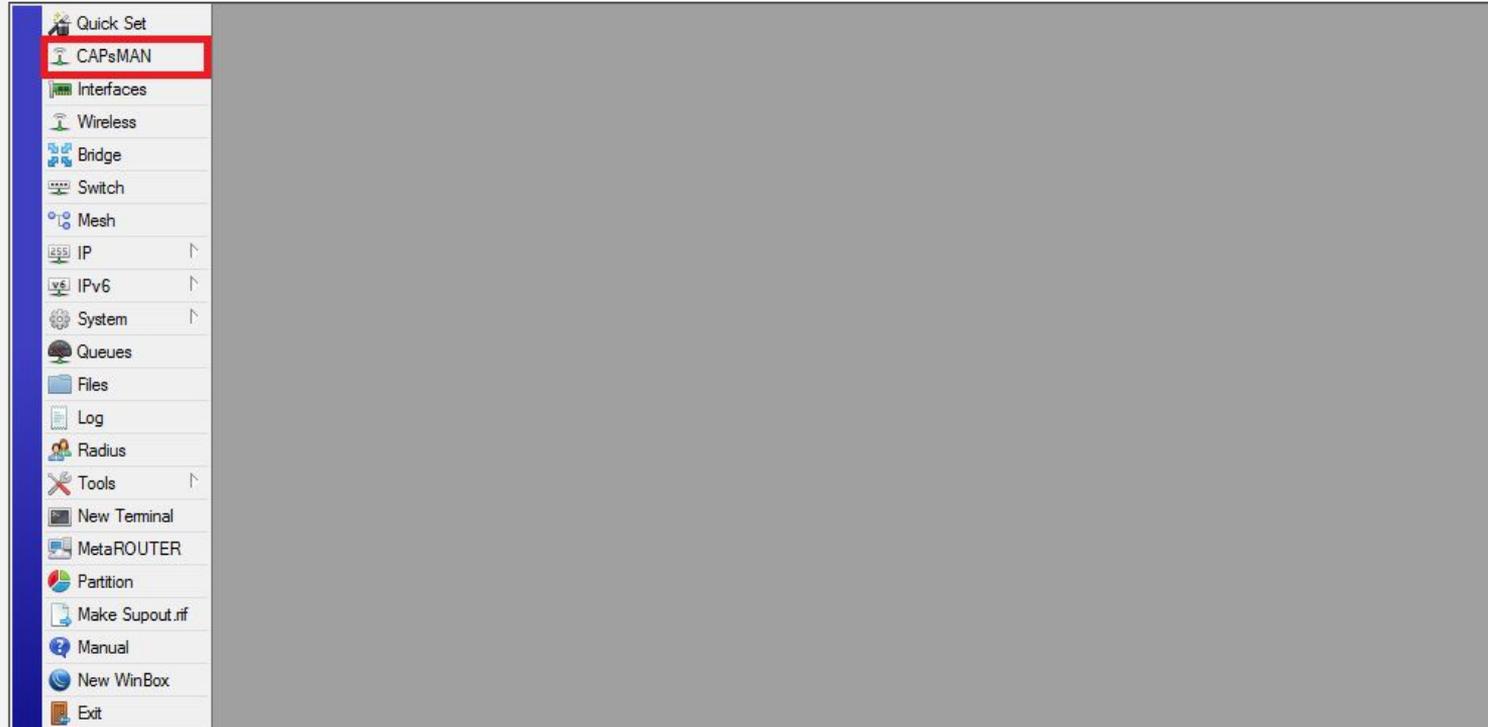
Name	Type	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	MAC Address	ARP
--- managed by CAPsMAN							
X wlan1	Wireless (Atheros AR9...	0 bps	0 bps	0	0	4C:5E:0C:E5:4D:56	enabled

Configuración de un CAP

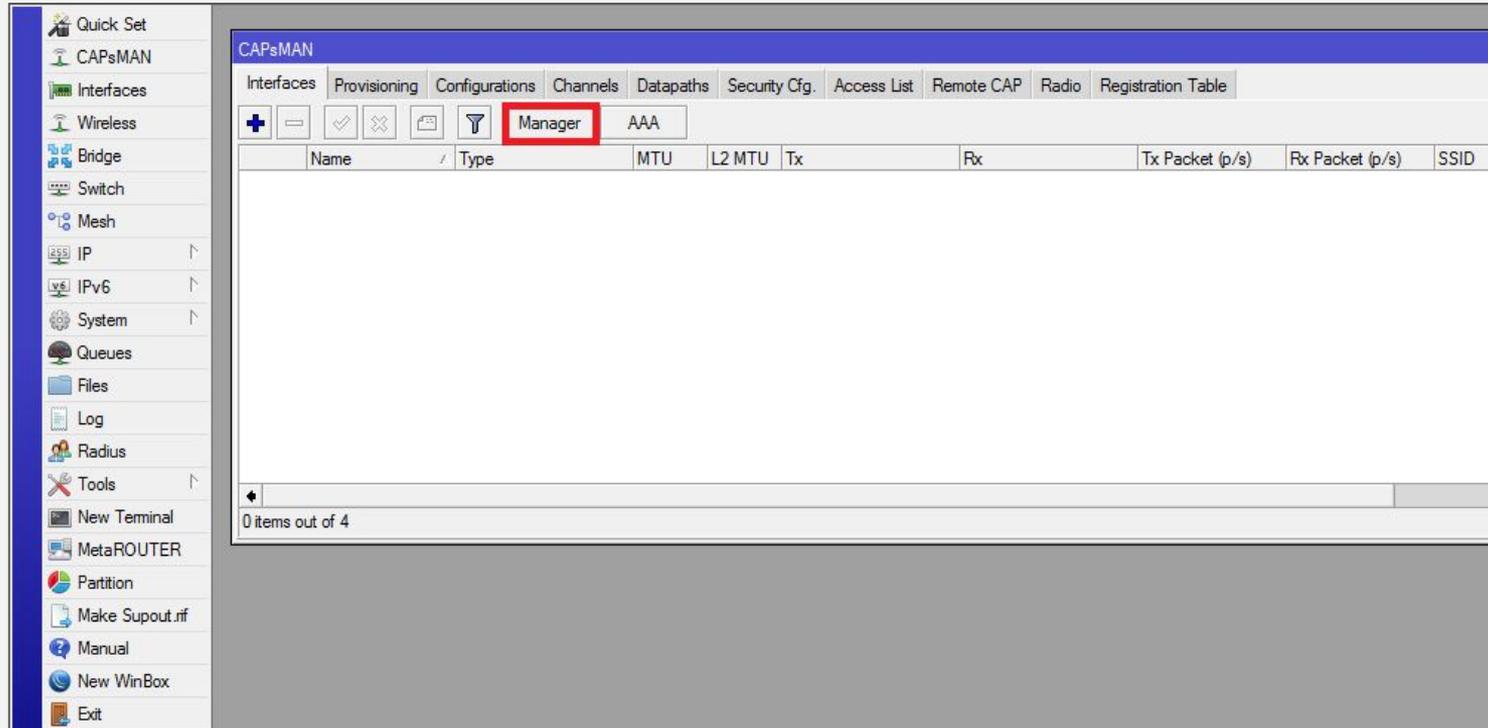
```
/interface wireless cap  
set discovery-interfaces=ether1 enabled=yes \  
interfaces=wlan1
```

```
/system identity set name=CAP
```

Configuración del CAPsMAN



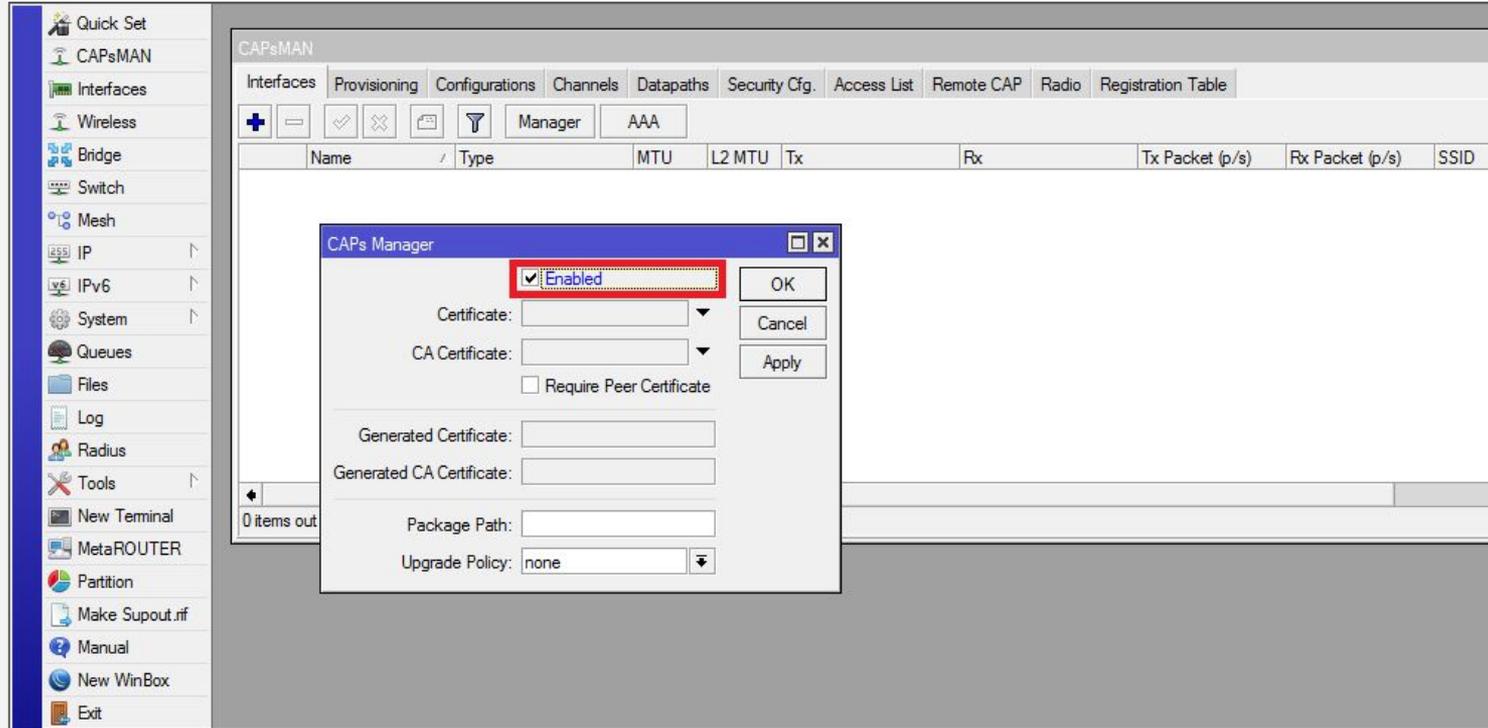
Configuración del CAPsMAN



The screenshot shows the CAPsMAN configuration window in WinBox. The 'Manager' tab is selected and highlighted with a red box. The table below displays the configuration for 4 items.

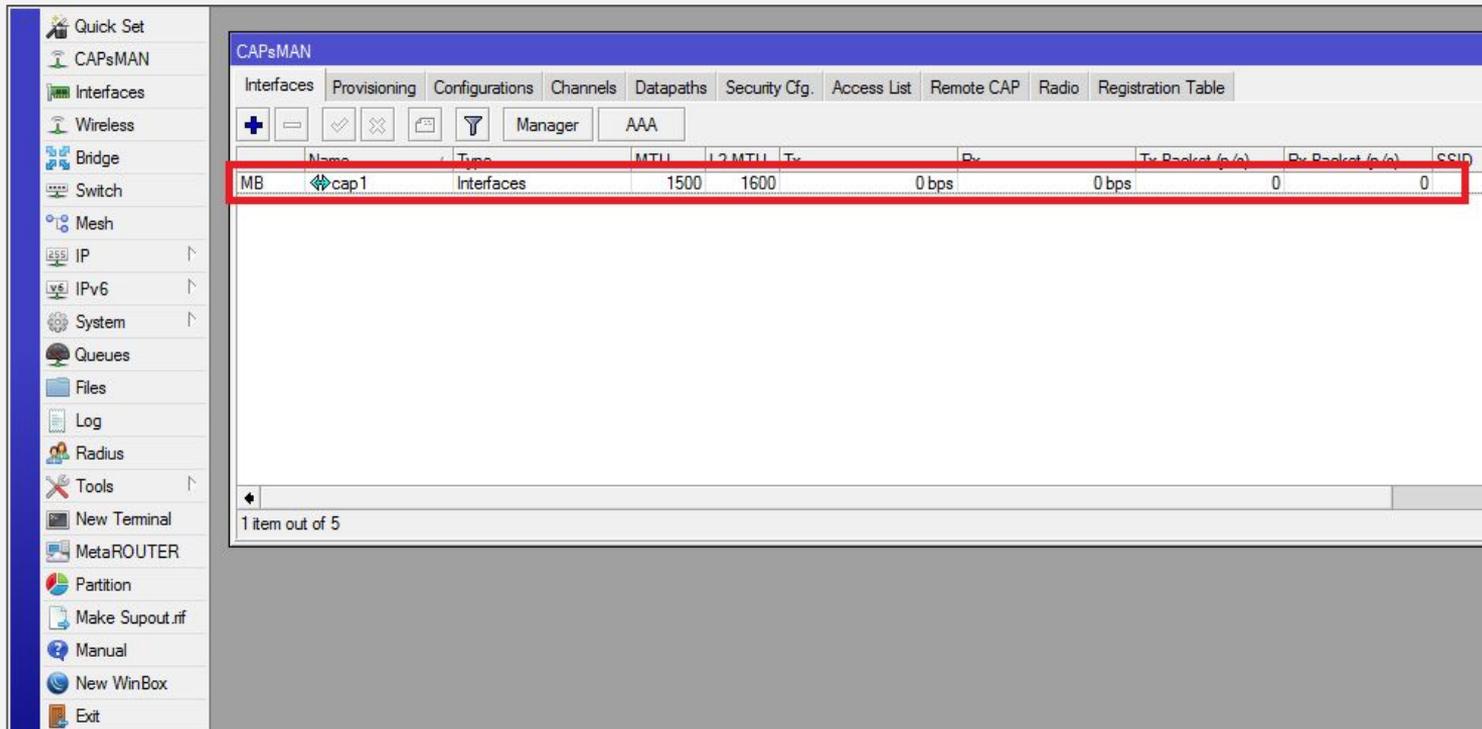
Name	Type	MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	SSID
0 items out of 4								

Configuración del CAPsMAN



The screenshot shows the WinBox interface for configuring CAPsMAN. On the left is a sidebar with navigation options: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, Switch, Mesh, IP, IPv6, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.tif, Manual, New WinBox, and Exit. The main window is titled 'CAPsMAN' and has several tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. Below the tabs are buttons for '+', '-', 'checkmark', 'cross', 'document', 'funnel', 'Manager', and 'AAA'. A table with columns 'Name', 'Type', 'MTU', 'L2 MTU', 'Tx', 'Rx', 'Tx Packet (p/s)', 'Rx Packet (p/s)', and 'SSID' is visible. A 'CAPs Manager' dialog box is open in the foreground, featuring a red-bordered checkbox labeled 'Enabled' which is checked. Other fields in the dialog include 'Certificate:', 'CA Certificate:', 'Require Peer Certificate' (unchecked), 'Generated Certificate:', 'Generated CA Certificate:', 'Package Path:', and 'Upgrade Policy: none'. Buttons for 'OK', 'Cancel', and 'Apply' are also present.

Configuración del CAPsMAN

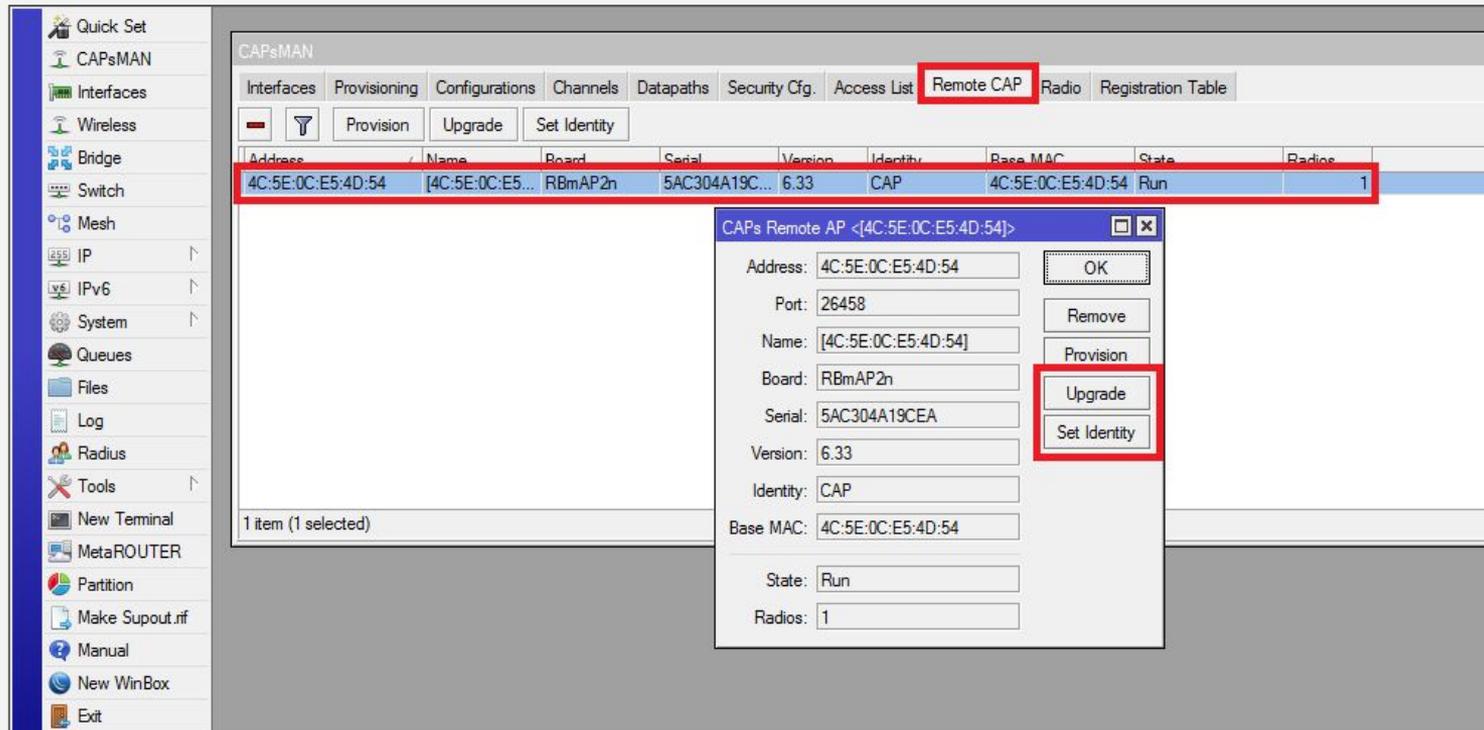


The screenshot displays the CAPsMAN configuration interface. The left sidebar contains a navigation menu with options: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, Switch, Mesh, IP, IPv6, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.rtf, Manual, New WinBox, and Exit. The main window is titled 'CAPsMAN' and has several tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. Below the tabs are buttons for '+', '-', a checkmark, a cross, a document, a funnel, 'Manager', and 'AAA'. A table lists the configured interfaces, with the first row highlighted in red:

Name	Type	MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	SSID
cap1	Interfaces	1500	1600	0 bps	0 bps	0	0	

At the bottom of the table area, it indicates '1 item out of 5'.

Configuración del CAPsMAN



The screenshot displays the Mikrotik WinBox interface for CAPsMAN configuration. The left sidebar contains various system tools and settings. The main window shows the CAPsMAN configuration page with several tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. The 'Remote CAP' tab is active, showing a table with one entry selected. A dialog box titled 'CAPs Remote AP <[4C:5E:0C:E5:4D:54]>' is open, displaying the configuration details for the selected Remote CAP. The 'Upgrade' button in the dialog is highlighted with a red box.

Address	Name	Board	Serial	Version	Identity	Base MAC	State	Radios
4C:5E:0C:E5:4D:54	[4C:5E:0C:E5...	RBmAP2n	5AC304A19C...	6.33	CAP	4C:5E:0C:E5:4D:54	Run	1

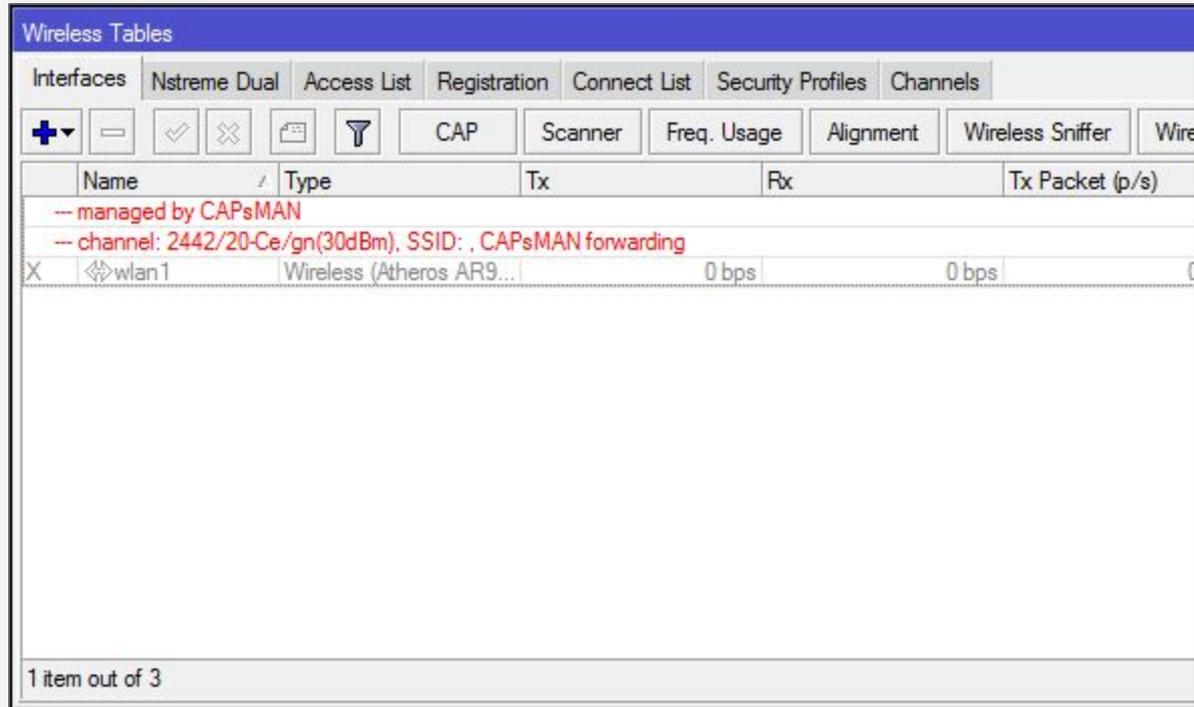
1 item (1 selected)

CAPs Remote AP <[4C:5E:0C:E5:4D:54]>

Address: 4C:5E:0C:E5:4D:54
Port: 26458
Name: [4C:5E:0C:E5:4D:54]
Board: RBmAP2n
Serial: 5AC304A19CEA
Version: 6.33
Identity: CAP
Base MAC: 4C:5E:0C:E5:4D:54
State: Run
Radios: 1

Buttons: OK, Remove, Provision, Upgrade, Set Identity

Ahora, volviendo al CAP...



The screenshot shows a software interface titled "Wireless Tables". It has several tabs: "Interfaces", "Nstreme Dual", "Access List", "Registration", "Connect List", "Security Profiles", and "Channels". Below the tabs is a toolbar with icons for adding, removing, checking, and deleting items, along with a filter icon. There are also buttons for "CAP", "Scanner", "Freq. Usage", "Alignment", "Wireless Sniffer", and "Wireless".

	Name	Type	Tx	Rx	Tx Packet (p/s)
	--- managed by CAPsMAN				
	--- channel: 2442/20-Ce/gn(30dBm), SSID: , CAPsMAN forwarding				
X	wlan1	Wireless (Atheros AR9...	0 bps	0 bps	0

1 item out of 3

Configuración del CAPsMAN

```
/caps-man manager set enabled=yes
```

```
/interface wireless cap  
set discovery-interfaces=ether1 enabled=yes \  
interfaces=wlan1
```

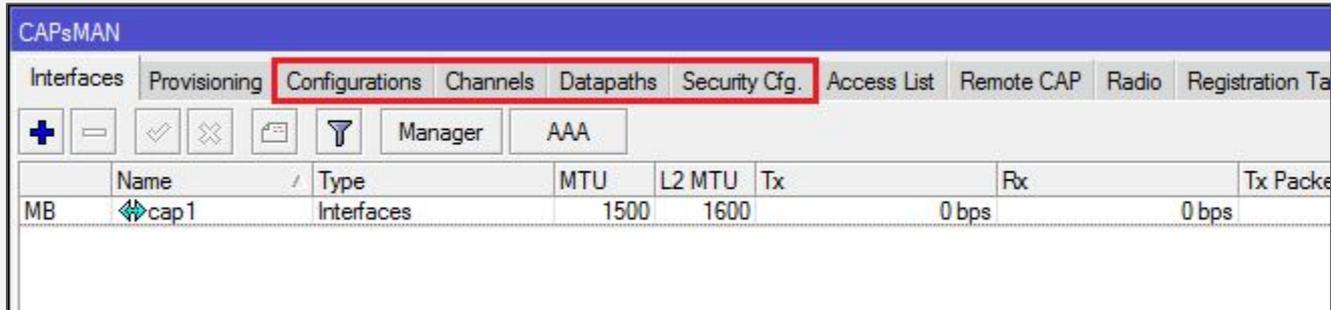
```
/system identity  
set name=Manager
```

Configuración de redes inalámbricas

Conceptos

El CAPsMAN puede entregar parámetros de configuración para cada interfaz. Esas configuraciones se encuentran en:

“Configuration”, “Channels”, “Datapathsh” y “Security Cfg.”.



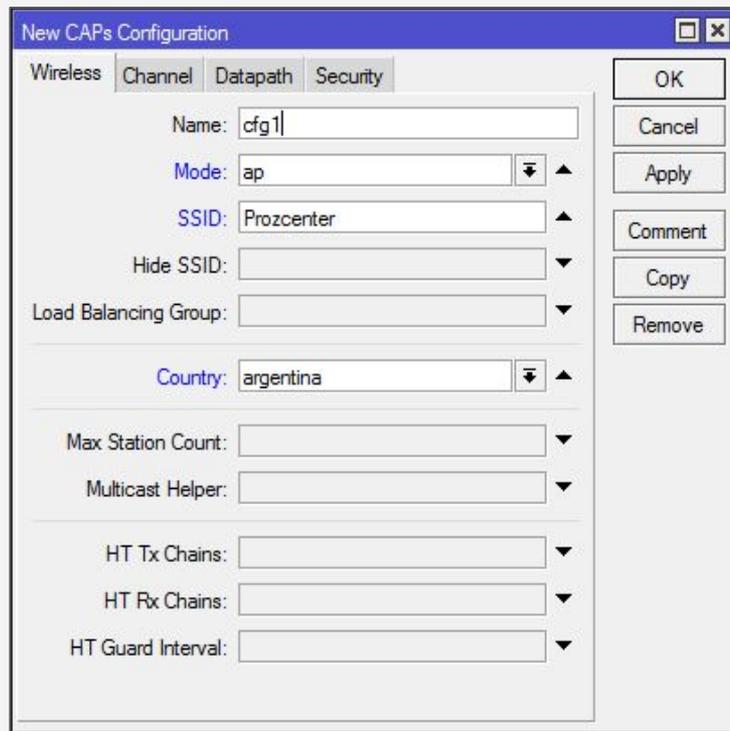
The screenshot shows the CAPsMAN configuration interface. The 'Configurations' tab is highlighted in red. Below the tabs, there are several icons and buttons: a plus sign, a minus sign, a checkmark, a cross, a document icon, a funnel icon, 'Manager', and 'AAA'. Below these are two buttons: 'Manager' and 'AAA'. Below the buttons is a table with the following data:

	Name	Type	MTU	L2 MTU	Tx	Rx	Tx Packe
MB	cap1	Interfaces	1500	1600		0 bps	0 bps

Conceptos - Solapa Configurations

Configuration: se encuentran los perfiles principales para cada red inalámbrica. Acá se configura **SSID**, **país**, **canales** y **seguridad**.

Estas configuraciones se pueden cargar para todos los CAP del controlador, para un grupo o para un solo CAP.



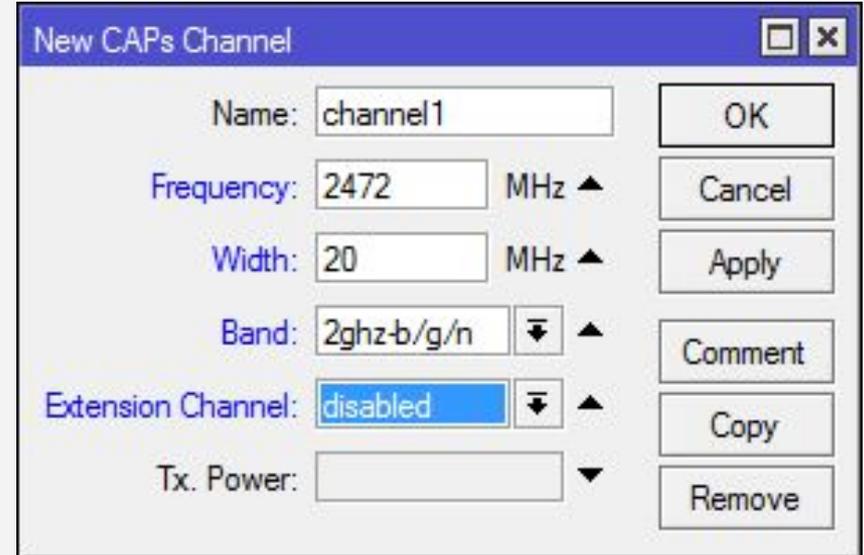
The screenshot shows a 'New CAPs Configuration' dialog box with the following fields and options:

- Wireless** tab selected.
- Name:** cfg1
- Mode:** ap
- SSID:** Prozcenter
- Hide SSID:** (unchecked)
- Load Balancing Group:** (empty)
- Country:** argentina
- Max Station Count:** (empty)
- Multicast Helper:** (unchecked)
- HT Tx Chains:** (empty)
- HT Rx Chains:** (empty)
- HT Guard Interval:** (empty)

Buttons on the right side: OK, Cancel, Apply, Comment, Copy, Remove.

Conceptos - Solapa Channels

Channels: configuraciones relativas a los canales, como por ejemplo banda, frecuencia y ancho de canal.



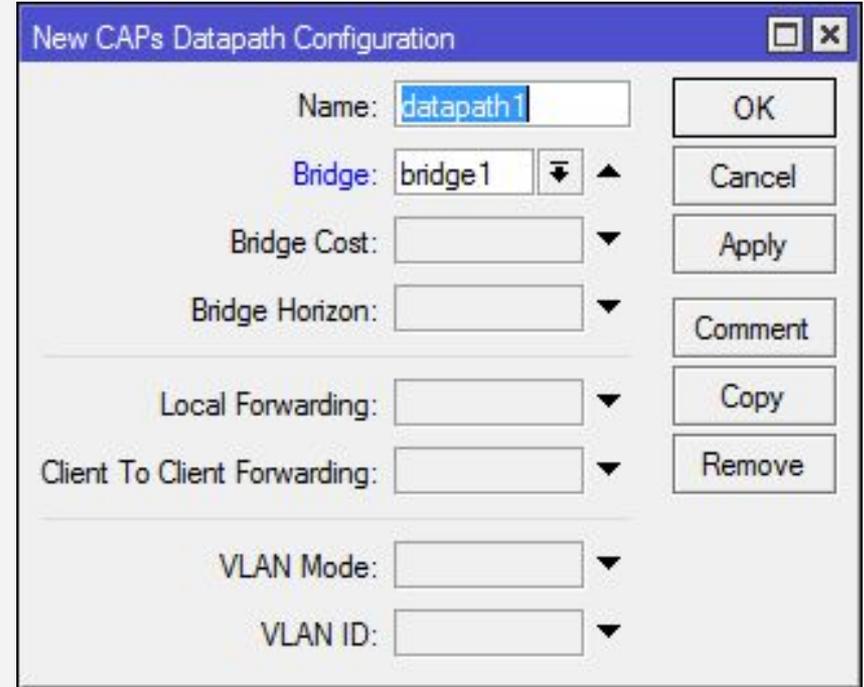
The image shows a dialog box titled "New CAPs Channel" with a blue title bar and standard window controls (minimize, maximize, close). The dialog contains several input fields and a vertical stack of buttons on the right. The fields are: "Name" with the value "channel1"; "Frequency" with the value "2472" and "MHz" and an up arrow; "Width" with the value "20" and "MHz" and an up arrow; "Band" with the value "2ghz-b/g/n" and a dropdown arrow and an up arrow; "Extension Channel" with the value "disabled" and a dropdown arrow and an up arrow; and "Tx. Power" with an empty field and a down arrow. The buttons on the right, from top to bottom, are: "OK", "Cancel", "Apply", "Comment", "Copy", and "Remove".

Name:	channel1	OK
Frequency:	2472 MHz ▲	Cancel
Width:	20 MHz ▲	Apply
Band:	2ghz-b/g/n ▼ ▲	Comment
Extension Channel:	disabled ▼ ▲	Copy
Tx. Power:	▼	Remove

Conceptos - Solapa Datapaths

Datapaths: configuración

relacionada con el bridge donde se integrará la interfaz de los CAPs. De esta forma se configura el reenvío de tráfico hacia el CAPsMAN.



New CAPs Datapath Configuration

Name:

Bridge: ▼ ▲

Bridge Cost:

Bridge Horizon:

Local Forwarding:

Client To Client Forwarding:

VLAN Mode:

VLAN ID:

OK

Cancel

Apply

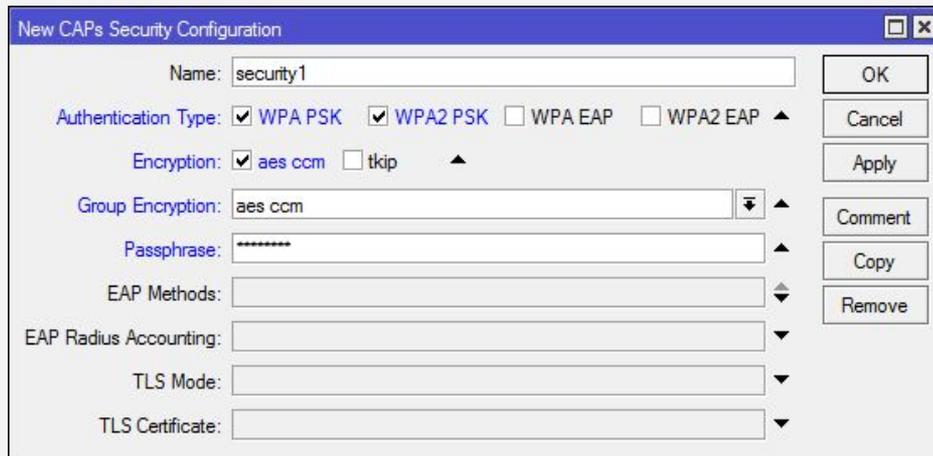
Comment

Copy

Remove

Conceptos - Solapa Security Cfg.

Security Cfg.: configuraciones de autenticación y cifrado. Soporta método estáticos (como llaves pre compartidas), EAP y TLS.



New CAPs Security Configuration

Name: security1

Authentication Type: WPA PSK WPA2 PSK WPA EAP WPA2 EAP ▲

Encryption: aes ccm tkip ▲

Group Encryption: aes ccm ▼ ▲

Passphrase: ***** ▲

EAP Methods: ▼ ▲

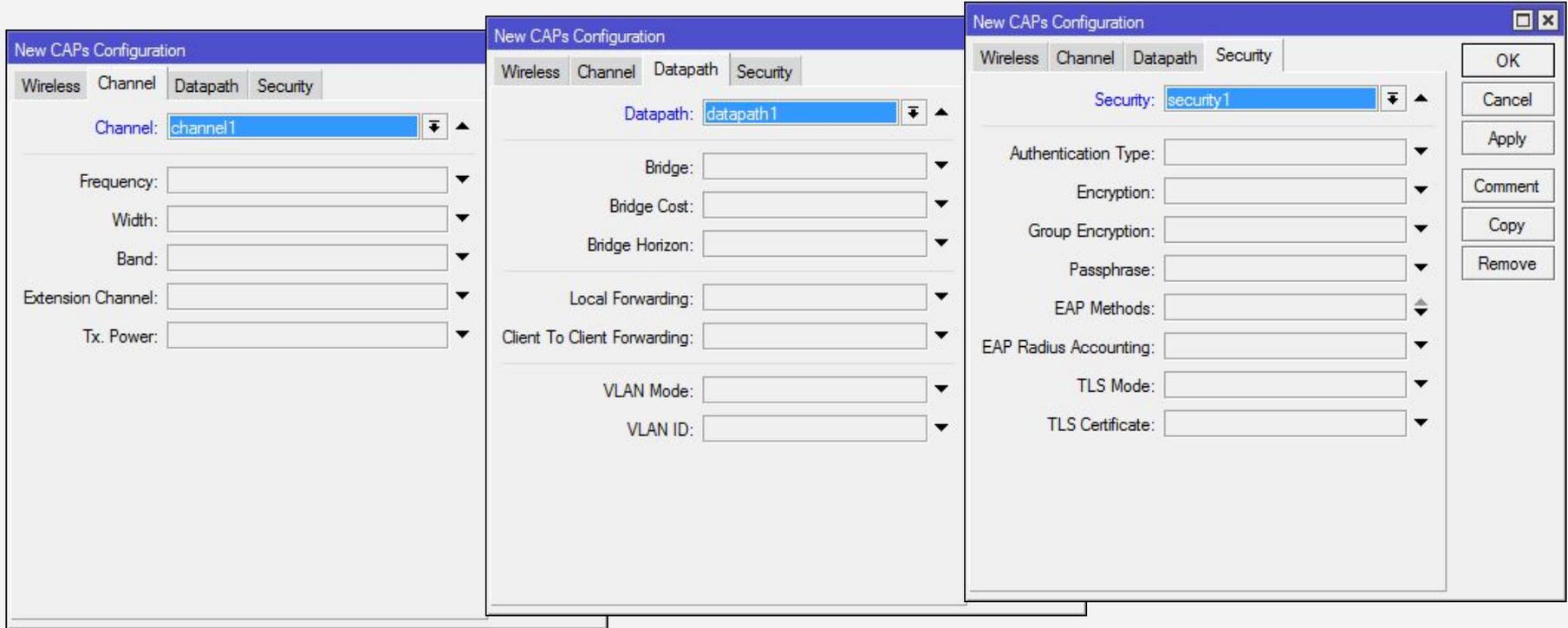
EAP Radius Accounting: ▼

TLS Mode: ▼

TLS Certificate: ▼

OK
Cancel
Apply
Comment
Copy
Remove

Conceptos - Solapa Configurations (de nuevo)



The image displays three overlapping screenshots of the 'New CAPs Configuration' dialog box, illustrating the configuration steps across different tabs.

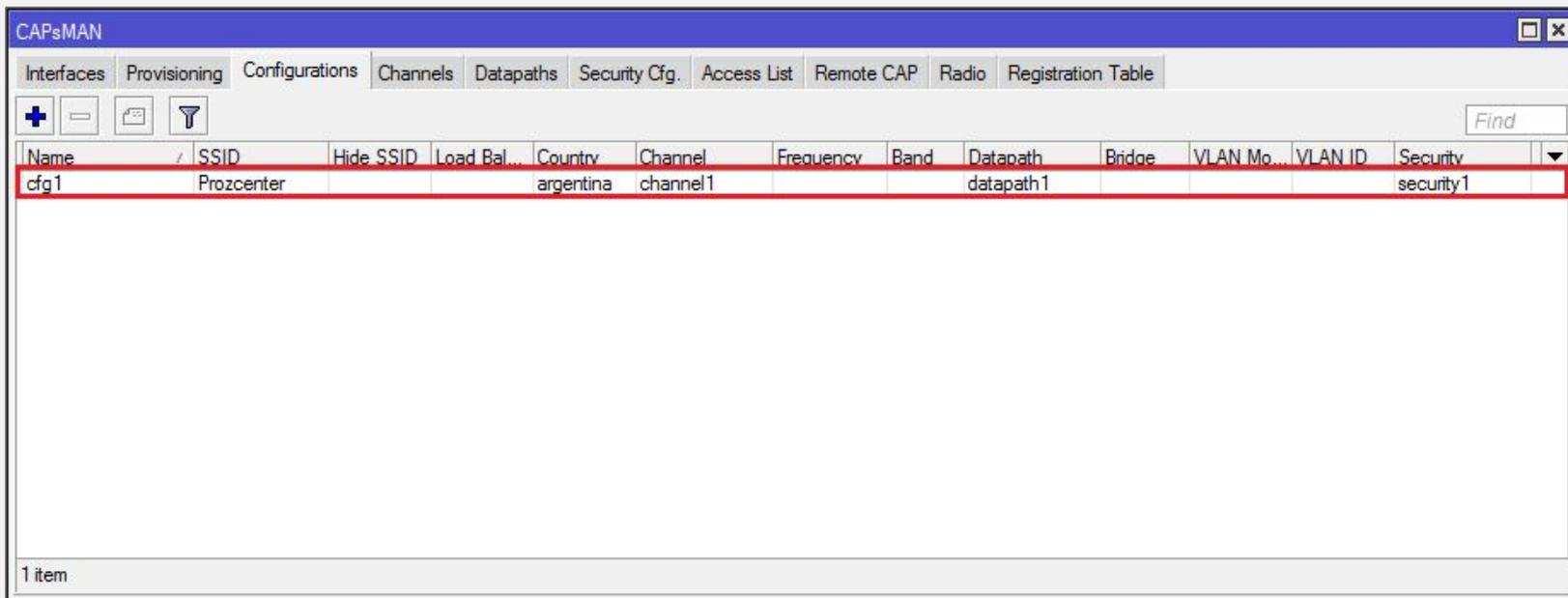
Left Screenshot (Channel Tab): Shows the 'Channel' configuration options. The 'Channel' dropdown is set to 'channel1'. Other fields include 'Frequency', 'Width', 'Band', 'Extension Channel', and 'Tx. Power', all with downward arrow icons.

Middle Screenshot (Datapath Tab): Shows the 'Datapath' configuration options. The 'Datapath' dropdown is set to 'datapath1'. Other fields include 'Bridge', 'Bridge Cost', 'Bridge Horizon', 'Local Forwarding', 'Client To Client Forwarding', 'VLAN Mode', and 'VLAN ID', all with downward arrow icons.

Right Screenshot (Security Tab): Shows the 'Security' configuration options. The 'Security' dropdown is set to 'security1'. Other fields include 'Authentication Type', 'Encryption', 'Group Encryption', 'Passphrase', 'EAP Methods', 'EAP Radius Accounting', 'TLS Mode', and 'TLS Certificate', all with downward arrow icons. On the right side of this dialog, there are buttons for 'OK', 'Cancel', 'Apply', 'Comment', 'Copy', and 'Remove'.

Conceptos - Solapa Configurations (de nuevo)

Una vez creada la configuración (al menos una), se la puede cargar en los diversos AP utilizando la Solapa “Provisioning”.

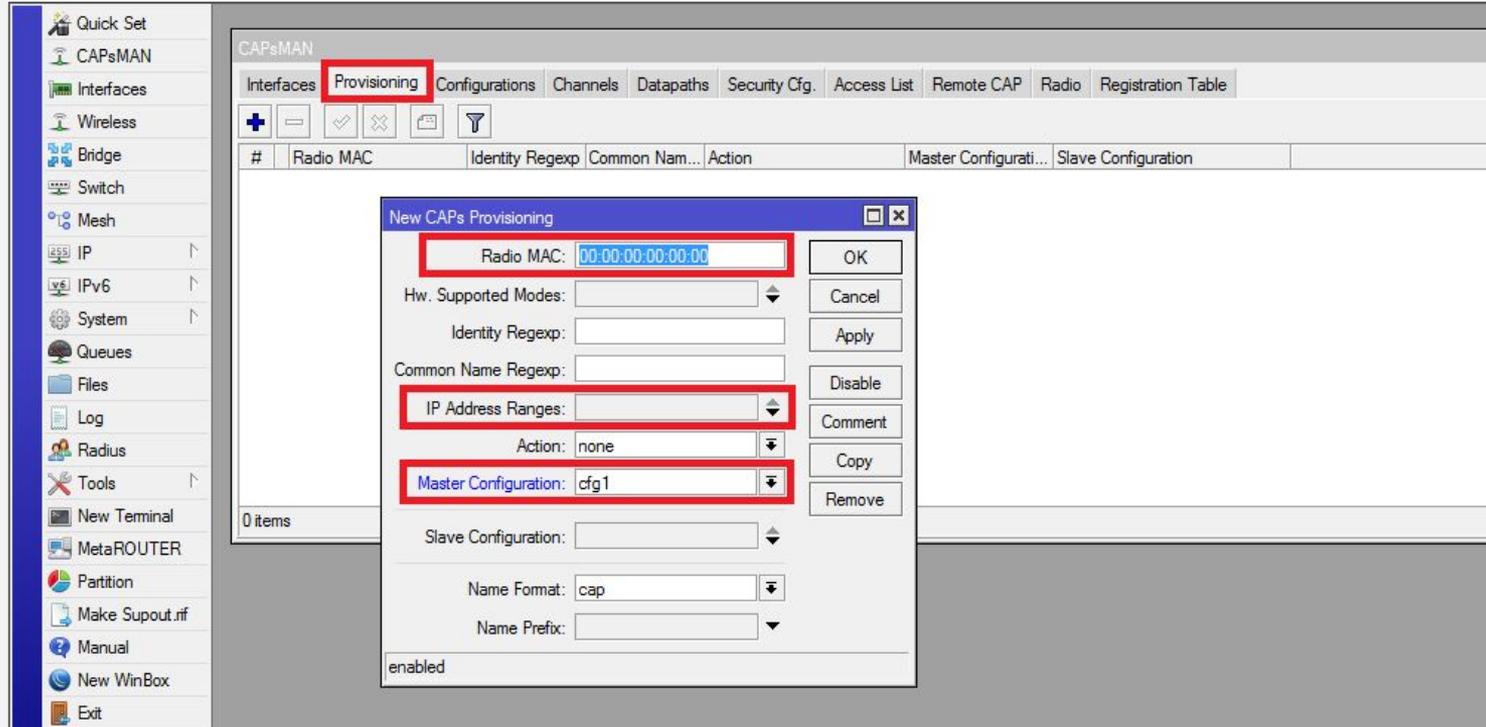


The screenshot shows the CAPsMAN web interface. The 'Configurations' tab is selected. A table lists the configurations, with one row highlighted in red:

Name	SSID	Hide SSID	Load Bal...	Countrv	Channel	Frequency	Band	Datapath	Bridoe	VLAN Mo...	VLAN ID	Security
cfg1	Prozcenter			argentina	channel1			datapath1				security1

At the bottom left of the interface, it indicates '1 item'.

Conceptos - Solapa Provisioning



The screenshot displays the CAPsMAN Provisioning configuration window. The 'Provisioning' tab is selected in the top navigation bar. A 'New CAPs Provisioning' dialog box is open, showing the following fields:

- Radio MAC: 00:00:00:00:00:00
- IP Address Ranges: (empty)
- Master Configuration: cfg1

The dialog also includes fields for Identity Regexp, Common Name Regexp, Action (set to none), Slave Configuration, Name Format (set to cap), and Name Prefix. The 'enabled' checkbox is checked. The background window shows a table with columns: #, Radio MAC, Identity Regexp, Common Nam..., Action, Master Configurati..., and Slave Configuration. The table currently contains 0 items.

Conceptos - Solapa Provisioning

Alterando el orden de las entradas en “Provisioning” se puede cargar configuraciones:

- 1) **A un CAP específico**
- 2) **A un grupo de CAPs**
- 3) **A todos los CAP (Radio MAC 00:00:00:00:00:00)**

Conceptos - Solapa Registration Table

CAPsMAN

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

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

1 item

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

Interface:

MAC Address:

Tx Rate:

Rx Rate:

Tx Rate Set:

Tx Signal:

Rx Signal:

Uptime:

Tx/Rx Packets:

Tx/Rx Bytes:

OK

Remove

Copy to Access List

Gestión de CAPs por capa 3

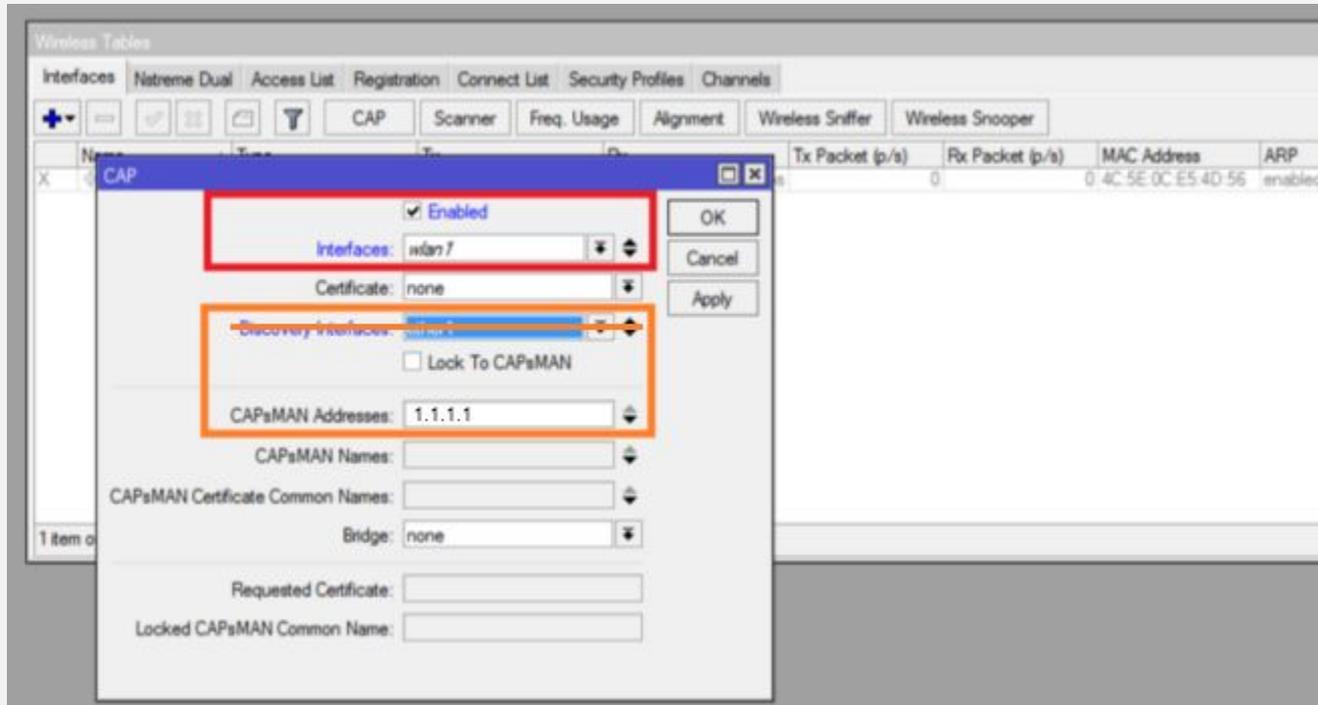
Gestión vía Capa 3

Para poder gestionar a los CAP vía Capa 3 podemos utilizar los siguiente métodos:

- IP fija en el CAP.
- DHCP para los CAP con opción de Manager.

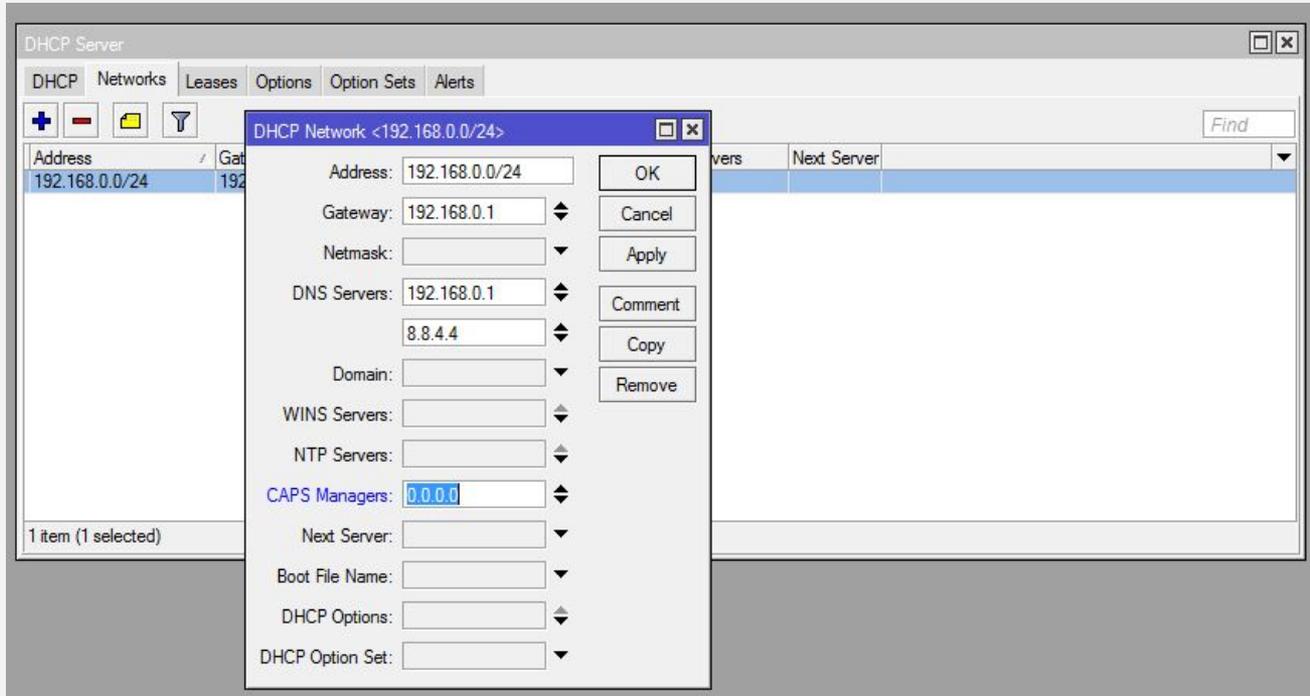
Gestión vía Capa 3

IP fija en el CAP



Gestión vía Capa 3

DHCP para los CAP con opción de Manager.



Hardware

Hardware Recomendado

CAPsMAN: cualquier RouterBOARD o hardware x86 con RouterOS!

CAPs: cAP2n, mAP2nD, RB951x, RB751x, cualquier RB con radio...

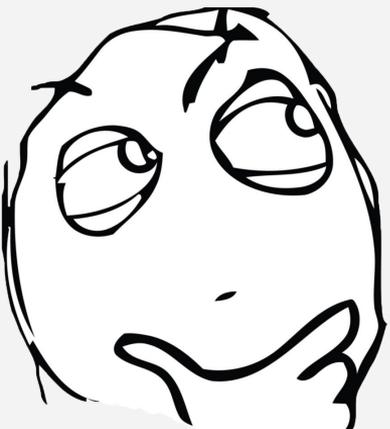


Más funciones (para investigar en sus casas...)

- Soporte para APs Dual Band.
- Comunicación entre APs Controlador utilizando Certificados.
- Upgrade automático de firmwares.
- Cambio de Identity de los CAP.
- Control de acceso estático, o por RADIUS.
- Mas info en <http://wiki.mikrotik.com/index.php?title=Manual:CAPsMAN>



¿Dudas?





¡Muchas Gracias!


routerboard


*Mikro***Tik**