

CAPsMAN para redes empresariales



Prozcenter - ¿Quienes 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



MTC Traffic Control Engineer
Firewall y QoS Avanzado



MTC Routing Engineer
Routing Avanzado



Wireless Engineer
Wireless Avanzado



User Management Engineer
Túneles avanzados y HS



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

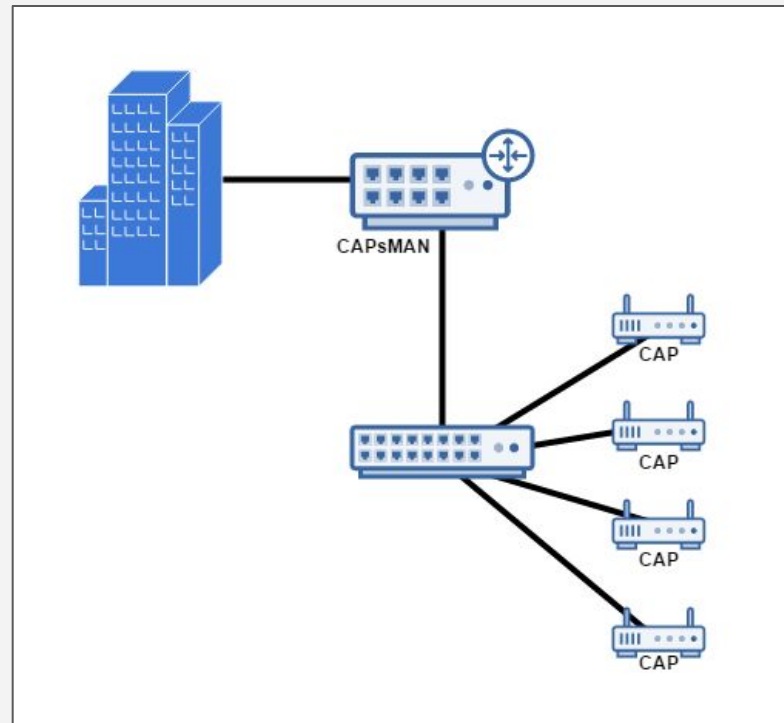
*El **CAPsMAN** tiene los perfiles o configuraciones de redes inalámbricas que serán luego configuradas de forma automática en cada **CAP**. Los CAP sólo se encargan de proveer conectividad inalámbrica a los equipos finales.*

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.

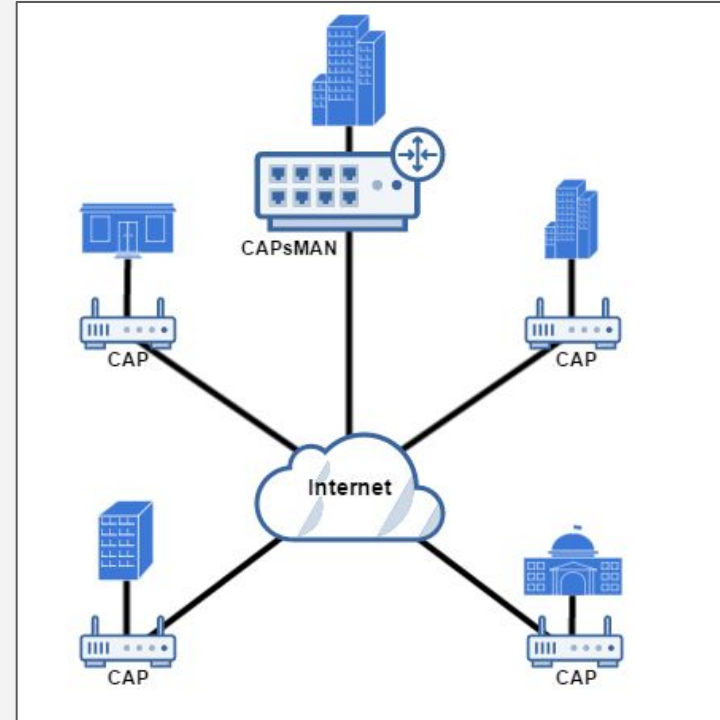


Arquitectura Básica - Distribuida

Red empresarial distribuida: Access Points en distintos segmentos.

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

Access Points: la configuración inalámbrica queda en blanco aunque esta vez pueden ejecutar funciones de Router de Borde (NAT, Firewall, QoS, etc).



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).**

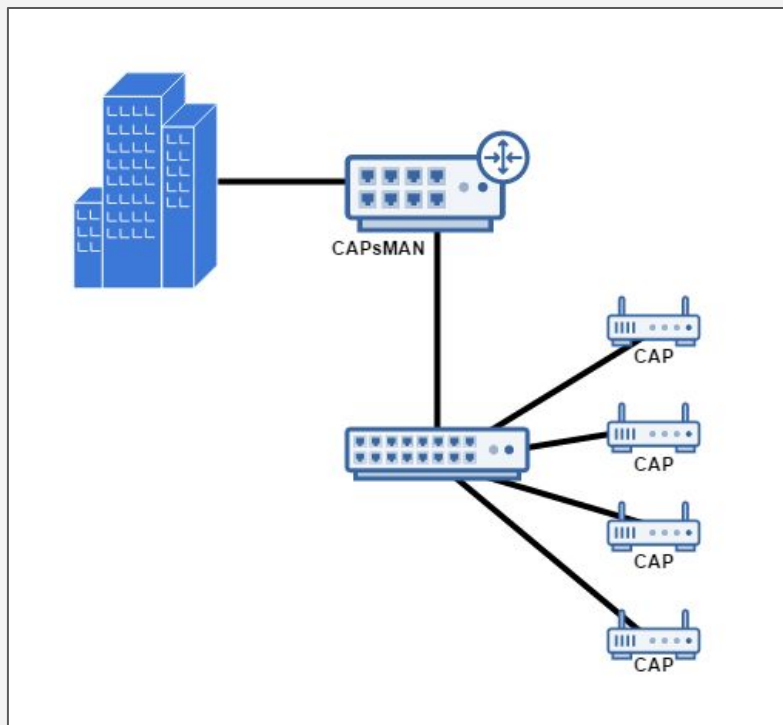
Una vez establecida la comunicación el CAPsMAN agrega el CAP como “interfaz” y trata de configurarla con los parámetros que

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



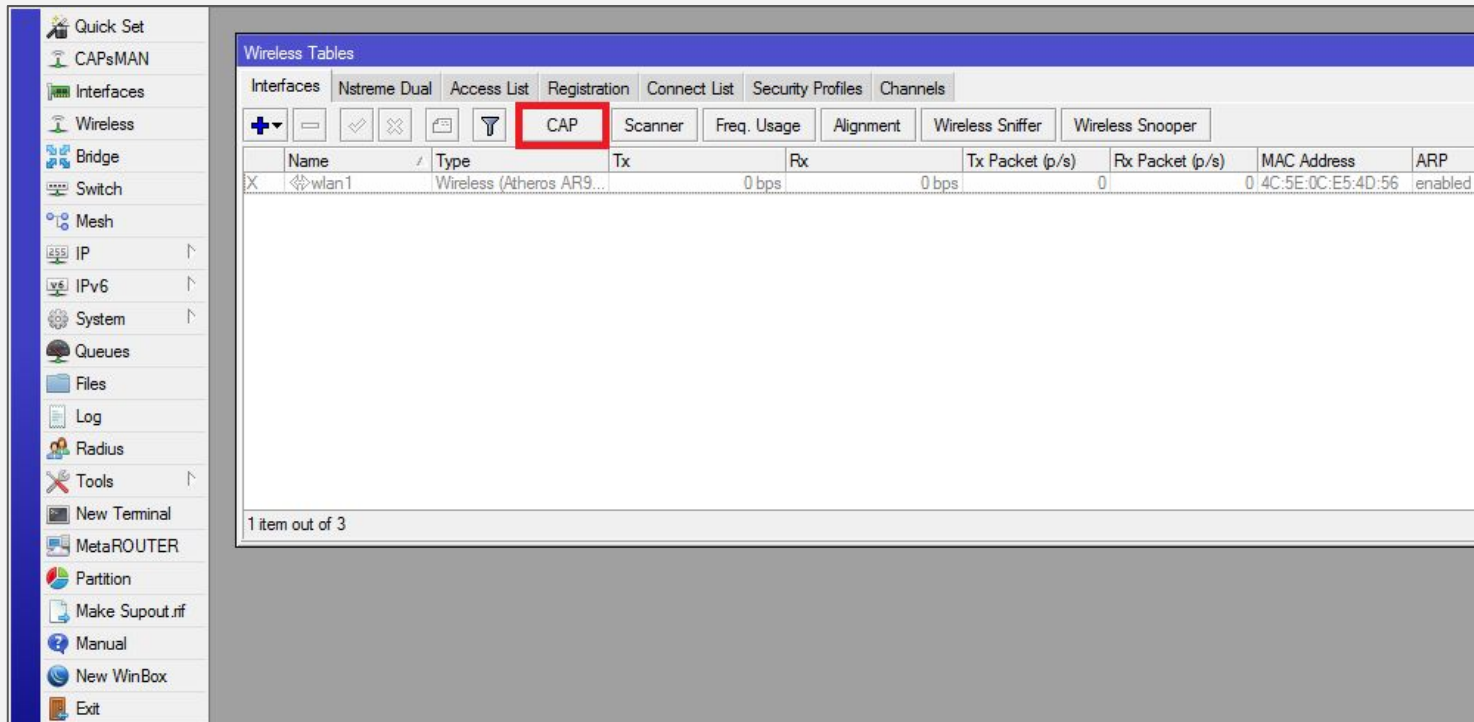
Router de Borde que va a officiar de **CAPsMAN**. Tiene una IP para la WAN (Internet) y una para la LAN (clientes).

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

Configuración de un CAP



Configuración de un CAP



The screenshot shows the MikroTik WinBox interface. On the left is a sidebar with various configuration categories. The main window is titled 'Wireless Tables' and contains several tabs. The 'CAP' tab is highlighted with a red box. Below the tabs is a table with one row of data for 'wlan1'.

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
X 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

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

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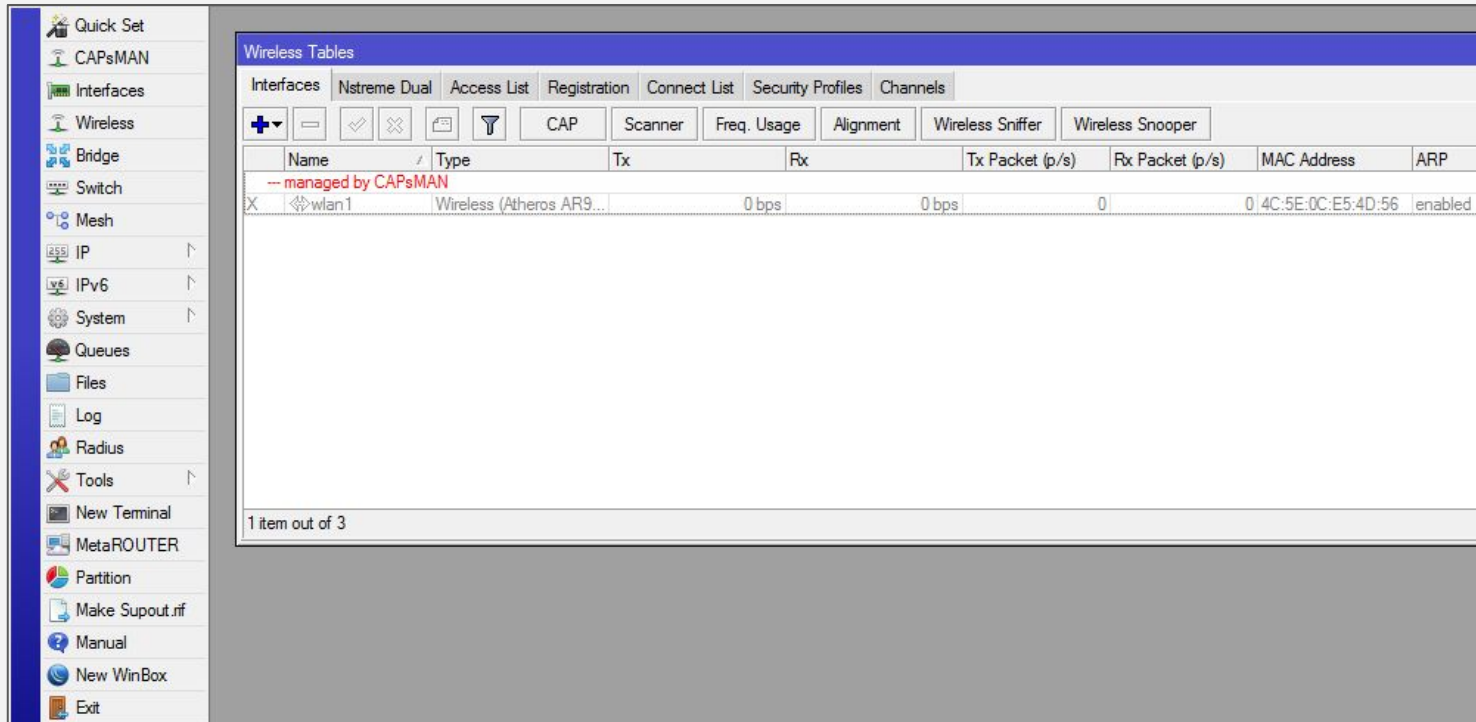
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Configuración de un CAP



The screenshot displays the MikroTik WinBox interface, specifically the 'Wireless Tables' configuration window. The left sidebar shows the navigation menu with options 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 tabs for 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, 'wlan1', is listed with the type 'Wireless (Atheros AR9...)' and is marked as 'enabled'. The status 'managed by CAPsMAN' is visible above the table. The bottom of the window 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

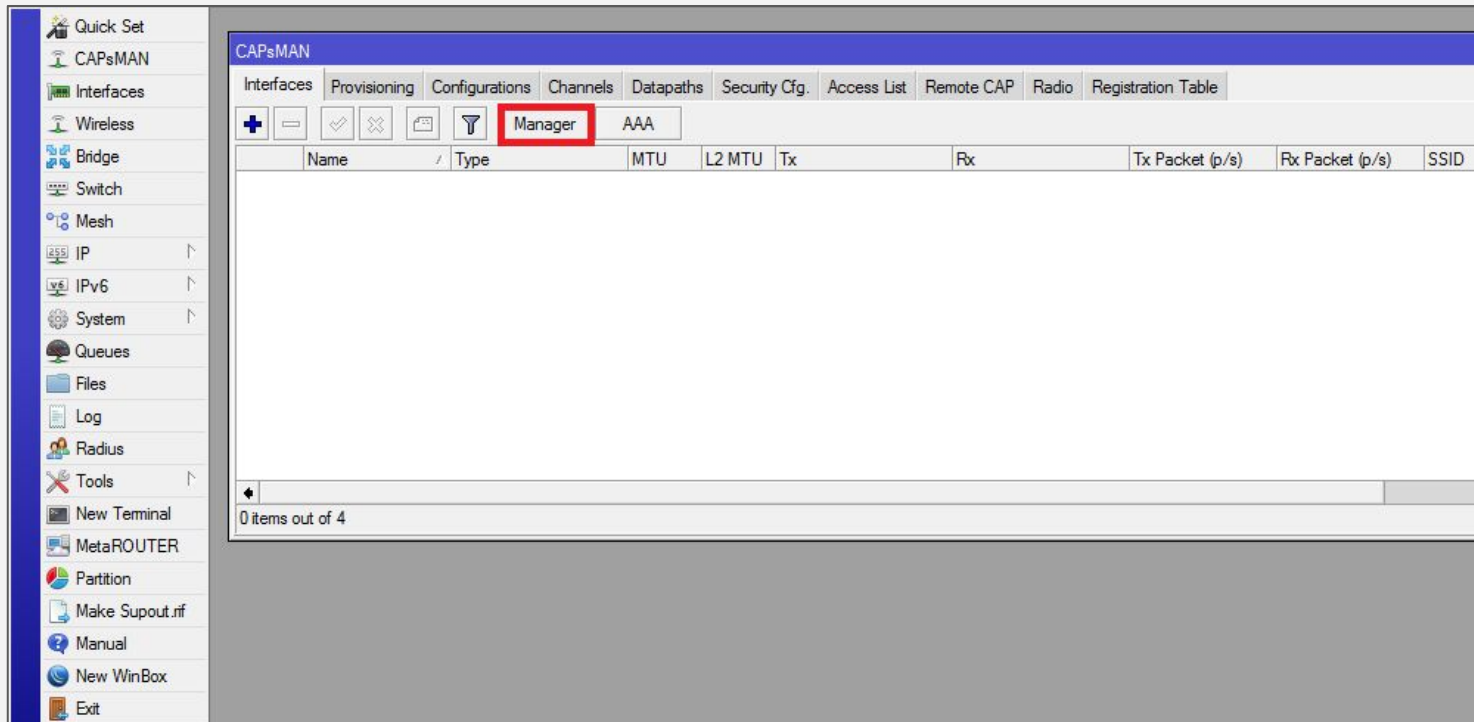
```
/interface wireless cap  
set discovery-interfaces=ether1 enabled=yes \  
interfaces=wlan1
```

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

Configuración del CAPsMAN

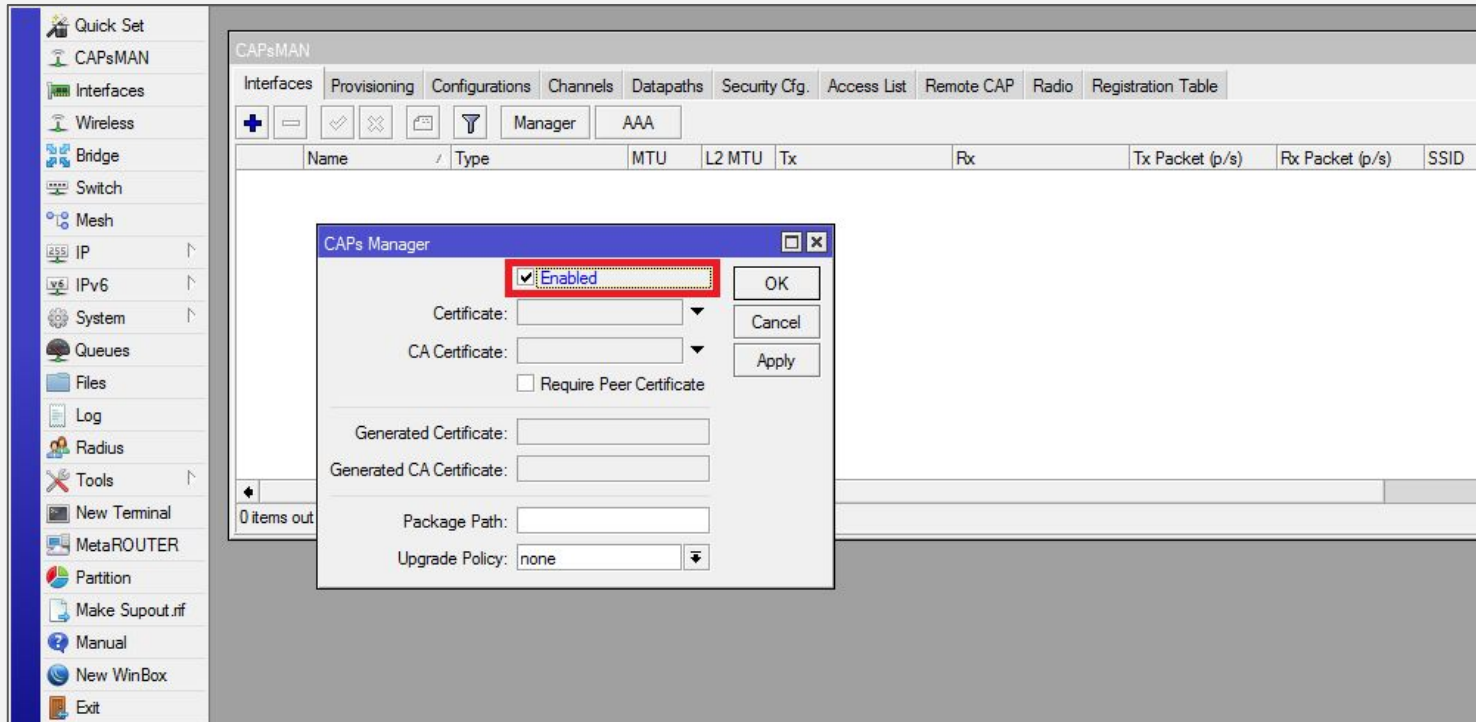


Configuración del CAPsMAN



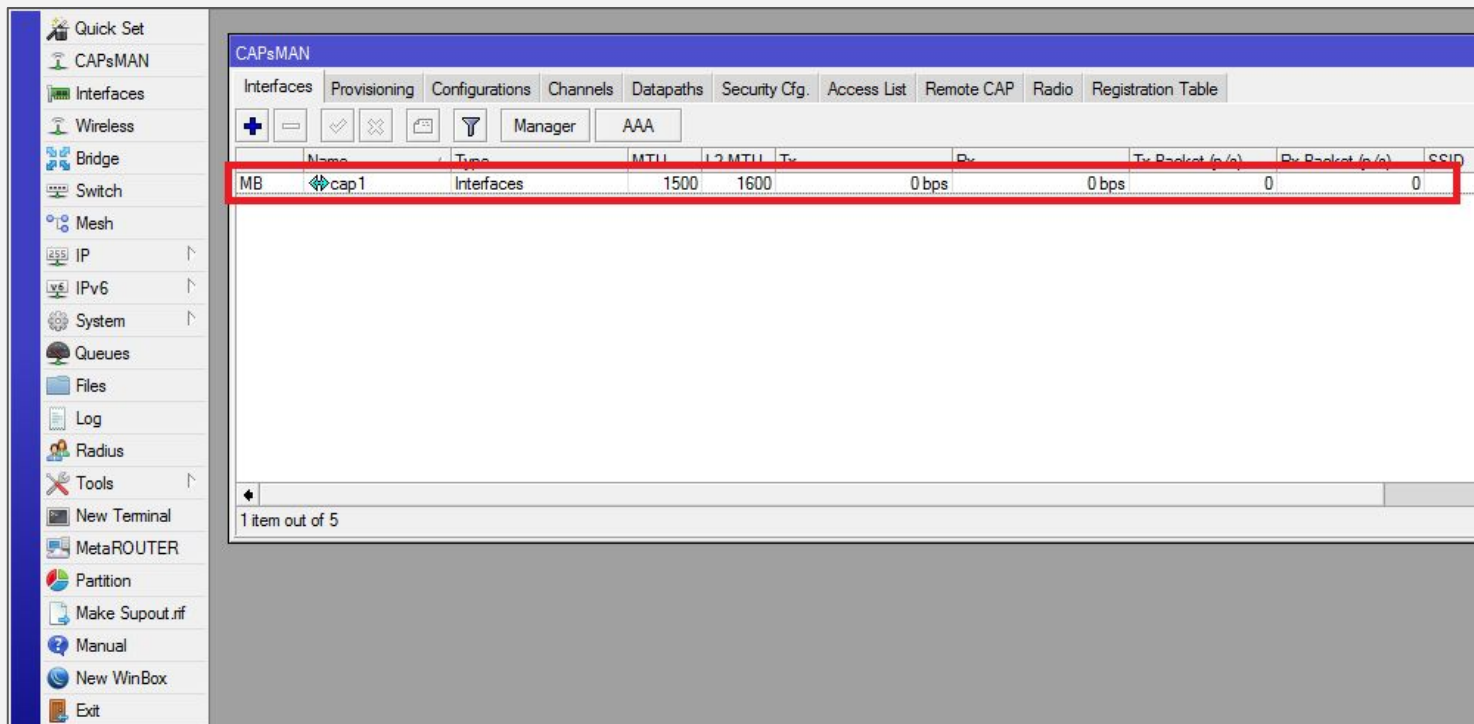
The screenshot shows the CAPsMAN configuration interface. The left sidebar contains the following menu items: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, Switch, Mesh, IP, IPv6, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.nif, Manual, New WinBox, and Exit. The main window displays the CAPsMAN configuration page with the following tabs: Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. The 'Manager' tab is highlighted with a red box. Below the tabs is a table with the following columns: Name, Type, MTU, L2 MTU, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), and SSID. The table is currently empty, showing '0 items out of 4'.

Configuración del CAPsMAN



The screenshot shows the MikroTik WinBox interface for configuring CAPsMAN. The left sidebar contains a navigation menu with the following items: 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 displays the 'CAPsMAN' configuration page with tabs for Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. The 'Provisioning' tab is active, showing a table with columns: Name, Type, MTU, L2 MTU, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), and SSID. A 'CAPs Manager' dialog box is open, showing the 'Enabled' checkbox checked and highlighted with a red rectangle. Other options in the dialog include Certificate, CA Certificate, Require Peer Certificate, Generated Certificate, Generated CA Certificate, Package Path, and Upgrade Policy.

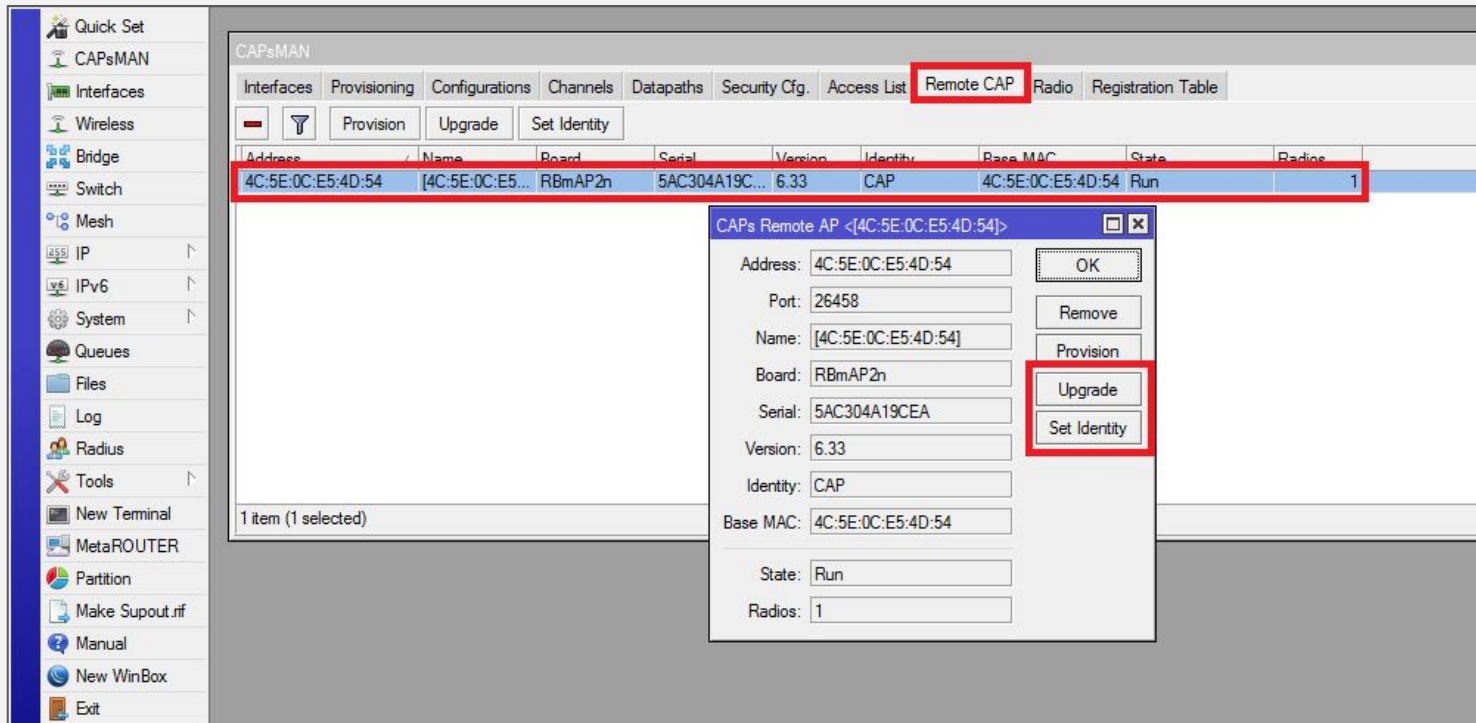
Configuración del CAPsMAN



The screenshot shows the CAPsMAN configuration interface. The left sidebar contains the following menu items: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, Switch, Mesh, IP, IPv6, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.nif, Manual, New WinBox, and Exit. The main window displays the 'CAPsMAN' configuration page with tabs for Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. The 'Interfaces' tab is active, showing a table with the following columns: Name, Type, MTU, L2 MTU, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), and SSID. The table contains one entry: 'cap1' of type 'Interfaces' with MTU 1500, L2 MTU 1600, Tx 0 bps, Rx 0 bps, Tx Packet 0, and Rx Packet 0. The table is highlighted with a red border. Below the table, it shows '1 item out of 5'.

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	

Configuración del CAPsMAN



The screenshot displays the CAPsMAN configuration interface. On the left is a sidebar with various system settings. The main window has tabs for Interfaces, Provisioning, Configurations, Channels, Datapaths, Security Cfg., Access List, Remote CAP, Radio, and Registration Table. The 'Remote CAP' tab is active, showing a table of remote access points. A red box highlights the first row of the table. Below the table, a dialog box titled 'CAPs Remote AP <[4C:5E:0C:E5:4D:54]>' is open, showing configuration details for the selected AP. A red box highlights the 'Upgrade' and 'Set Identity' buttons in the dialog.

Table Data:

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

Dialog Box Fields:

- 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

Ahora, volviendo al CAP...

Wireless Tables

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

CAP | Scanner | Freq. Usage | Alignment | Wireless Sniffer | Wire

	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.”.

CAPsMAN

Interfaces

Provisioning

Configurations

Channels

Datapaths

Security Cfg.

Access List

Remote CAP

Radio

Registration Ta

+

-

✓

✗

📄

🔍

Manager

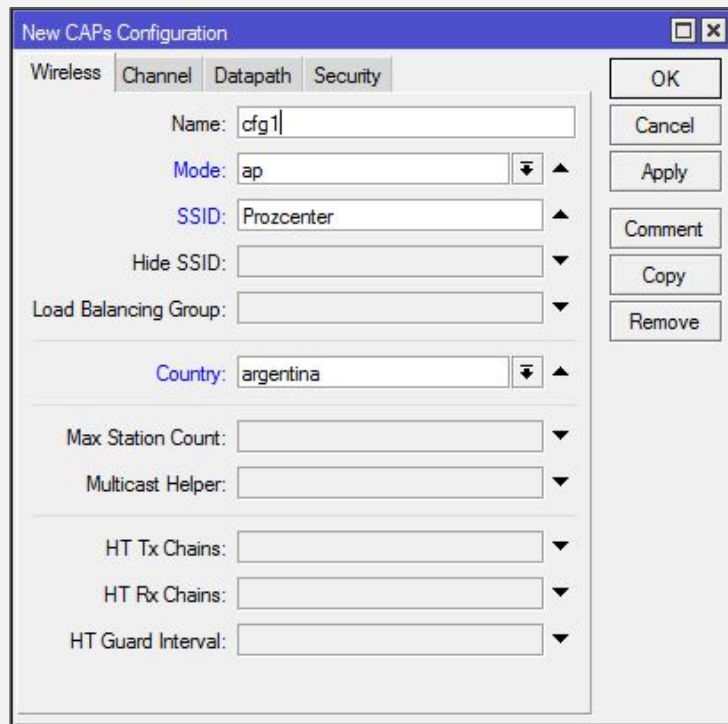
AAA

	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**.

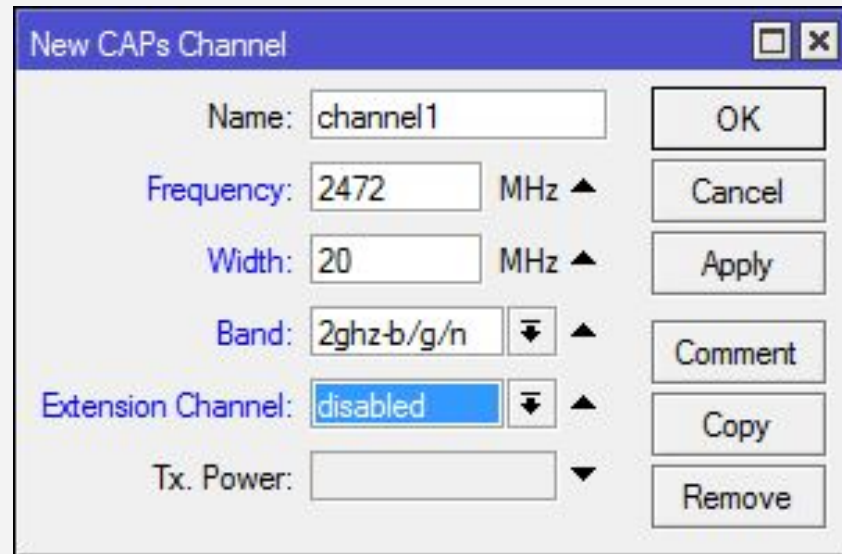
Estas configuraciones se pueden cargar para todos los CAP del controlador, para un grupo o para un solo CAP.



The image shows a screenshot of a software window titled "New CAPs Configuration". The window has a blue title bar and a standard Windows-style interface. It contains several tabs: "Wireless", "Channel", "Datapath", and "Security". The "Wireless" tab is currently selected. Inside this tab, there are several input fields and dropdown menus. The "Name" field contains "cfg1". The "Mode" dropdown is set to "ap". The "SSID" field contains "Prozcenter". The "Hide SSID" field is empty. The "Load Balancing Group" field is empty. The "Country" dropdown is set to "argentina". Below these, there are several more fields: "Max Station Count", "Multicast Helper", "HT Tx Chains", "HT Rx Chains", and "HT Guard Interval", all of which are currently empty. On the right side of the window, there is a vertical stack of buttons: "OK", "Cancel", "Apply", "Comment", "Copy", and "Remove".

Conceptos - Solapa Channels

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



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

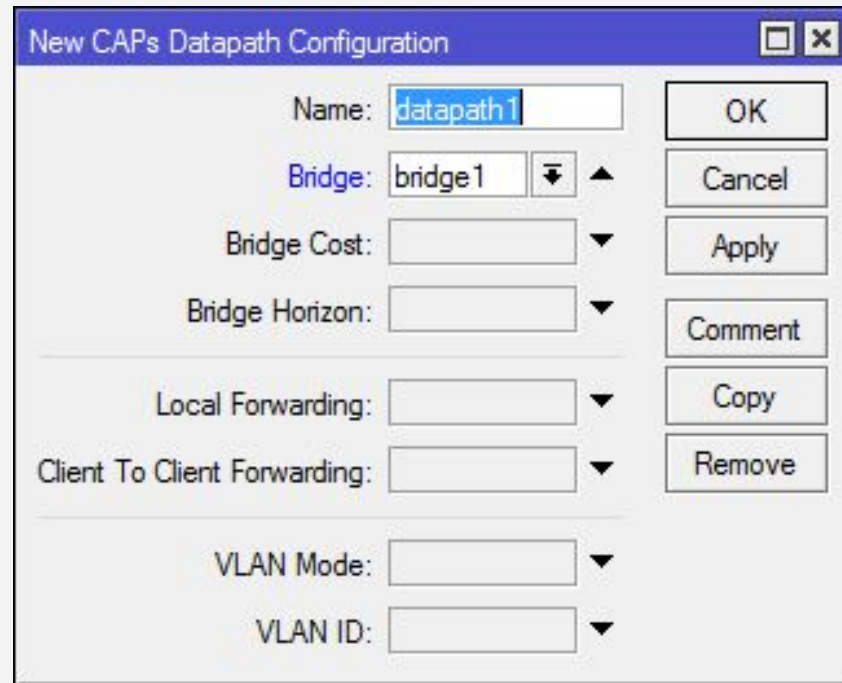
Field	Value	Unit/Action
Name	channel1	
Frequency	2472	MHz ▲
Width	20	MHz ▲
Band	2ghz-b/g/n	▼ ▲
Extension Channel	disabled	▼ ▲
Tx. Power		▼

Buttons: OK, Cancel, Apply, Comment, Copy, 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.



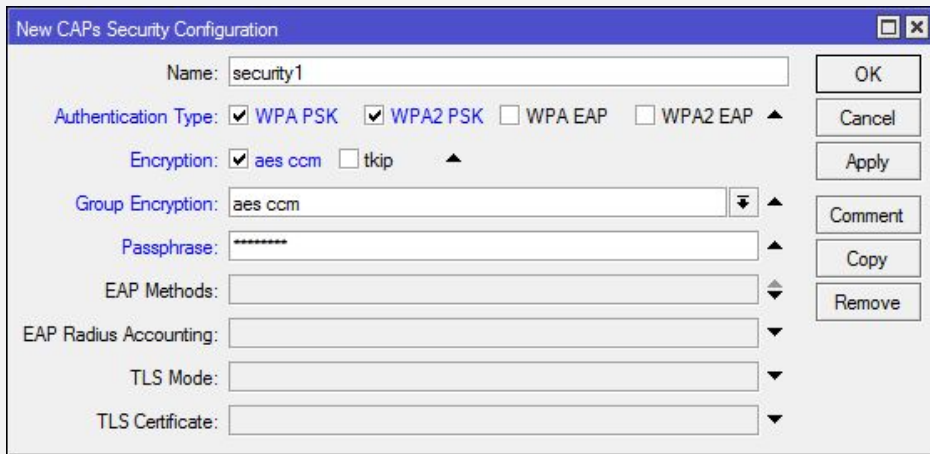
The image shows a 'New CAPs Datapath Configuration' dialog box. It contains several input fields and a list of buttons on the right. The 'Name' field is set to 'datapath1'. The 'Bridge' field is set to 'bridge1' and has a dropdown arrow. The 'Bridge Cost' field is empty. The 'Bridge Horizon' field is empty. The 'Local Forwarding' field is empty. The 'Client To Client Forwarding' field is empty. The 'VLAN Mode' field is empty. The 'VLAN ID' field is empty. The buttons on the right are OK, Cancel, Apply, Comment, Copy, and Remove.

Field	Value
Name	datapath1
Bridge	bridge1
Bridge Cost	
Bridge Horizon	
Local Forwarding	
Client To Client Forwarding	
VLAN Mode	
VLAN ID	

Buttons: 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.

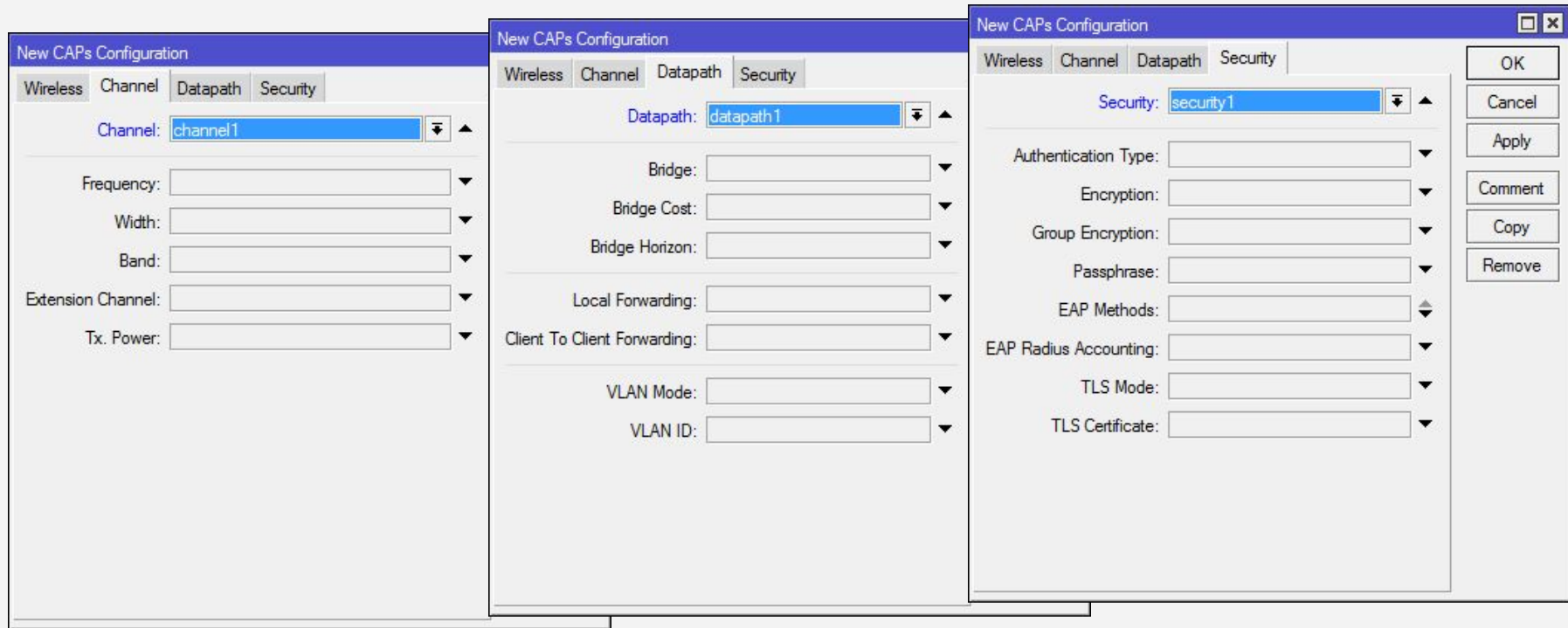


The image shows a 'New CAPs Security Configuration' dialog box. It contains the following fields and controls:

- Name:** security1
- Authentication Type:** ☒ WPA PSK ☒ WPA2 PSK ☐ WPA EAP ☐ WPA2 EAP
- Encryption:** ☒ aes ccm ☐ tkip
- Group Encryption:** aes ccm
- Passphrase:** [masked]
- EAP Methods:** [empty list box]
- EAP Radius Accounting:** [empty text box]
- TLS Mode:** [empty text box]
- TLS Certificate:** [empty text box]

On the right side, there are buttons: OK, Cancel, Apply, Comment, Copy, and Remove.

Conceptos - Solapa Configurations (de nuevo)



The image displays three overlapping windows titled "New CAPs Configuration", each showing a different tab of the configuration interface.

Left Window (Channel Tab):

- Channel:
- Frequency:
- Width:
- Band:
- Extension Channel:
- Tx. Power:

Middle Window (Datapath Tab):

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

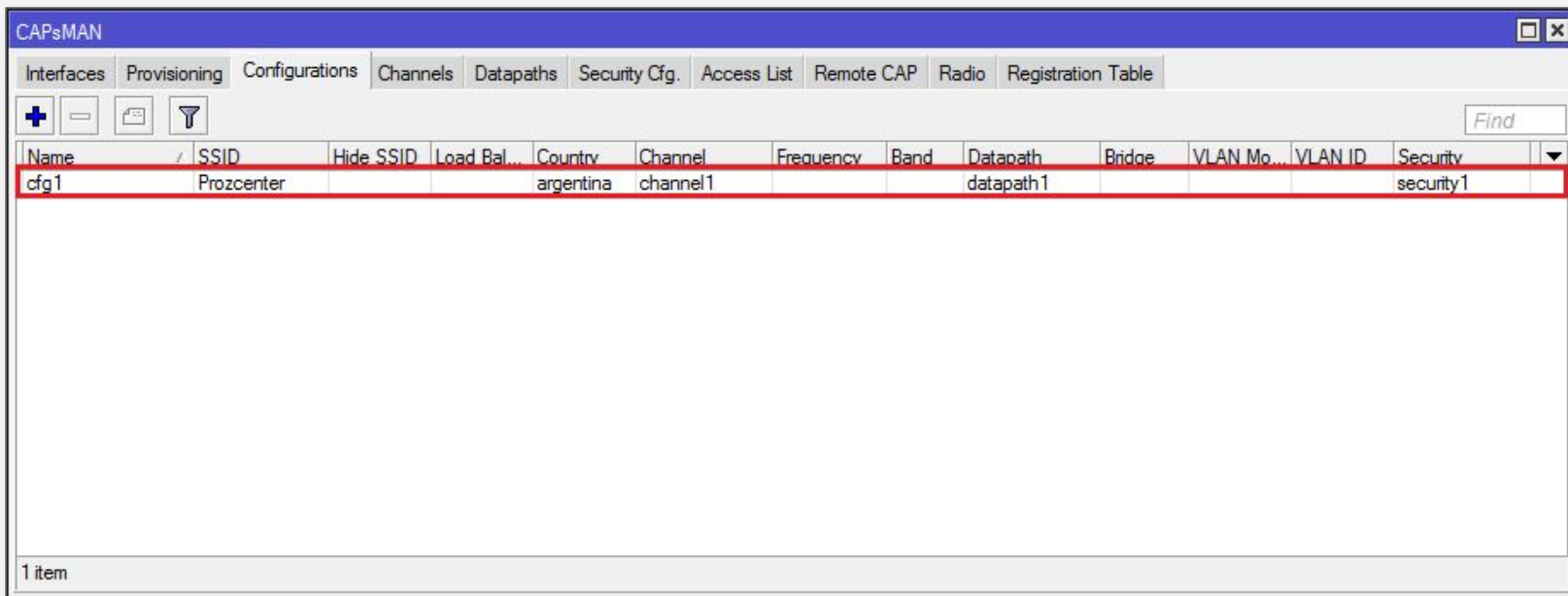
Right Window (Security Tab):

- Security:
- Authentication Type:
- Encryption:
- Group Encryption:
- Passphrase:
- EAP Methods:
- EAP Radius Accounting:
- TLS Mode:
- TLS Certificate:

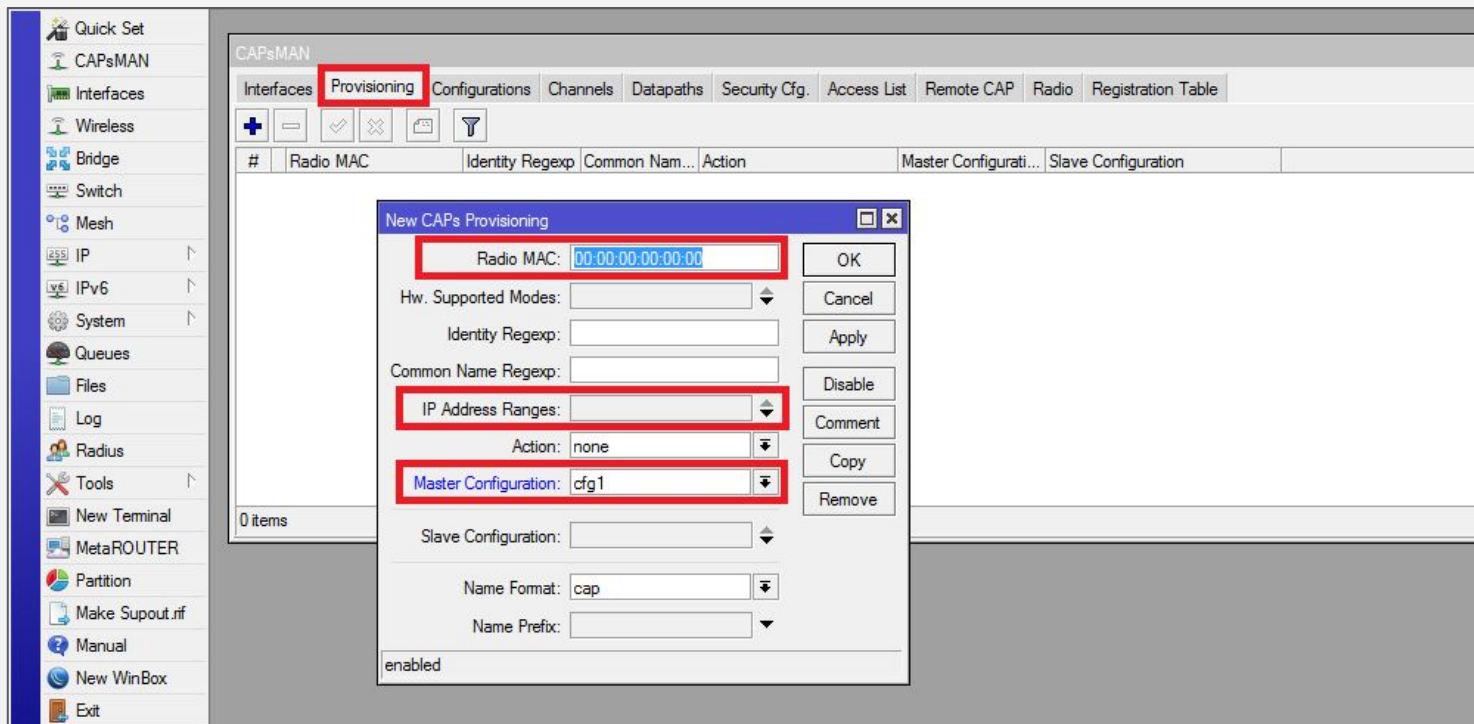
Buttons on the right side of the Security tab: OK, Cancel, Apply, Comment, Copy, Remove.

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**”.



Conceptos - Solapa Provisioning



The screenshot displays the CAPsMAN Provisioning interface. On the left is a sidebar menu with various network configuration options. The main window has a tabbed interface with 'Provisioning' selected. A 'New CAPs Provisioning' dialog box is open, showing fields for Radio MAC, Identity Regexp, Common Name Regexp, IP Address Ranges, Action, Master Configuration, Slave Configuration, Name Format, and Name Prefix. The 'Radio MAC' field is set to '00:00:00:00:00:00', 'IP Address Ranges' is empty, 'Action' is 'none', 'Master Configuration' is 'cfg1', and 'Name Format' is 'cap'. The 'enabled' checkbox is checked.

Left Sidebar Menu:

- 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
- Exit

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

Table Headers: #, Radio MAC, Identity Regexp, Common Nam..., Action, Master Configurati..., Slave Configuration

Table Content:

#	Radio MAC	Identity Regexp	Common Nam...	Action	Master Configurati...	Slave Configuration
0 items						

New CAPs Provisioning Dialog:

- Radio MAC: 00:00:00:00:00:00
- Hw. Supported Modes: [Dropdown]
- Identity Regexp: [Text]
- Common Name Regexp: [Text]
- IP Address Ranges: [Dropdown]
- Action: none
- Master Configuration: cfg1
- Slave Configuration: [Dropdown]
- Name Format: cap
- Name Prefix: [Text]
- enabled

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

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**

1 item

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

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

Gestión de CAPs por capa 3

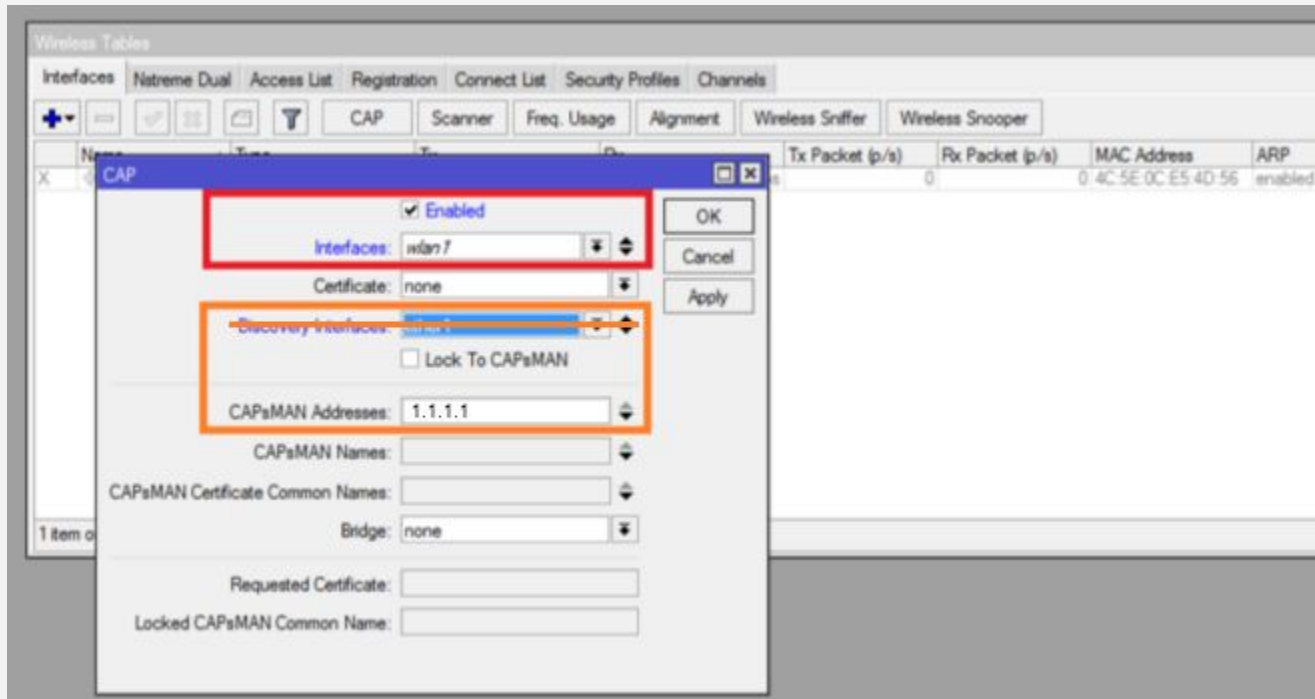
Gestión vía Capa 3

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.

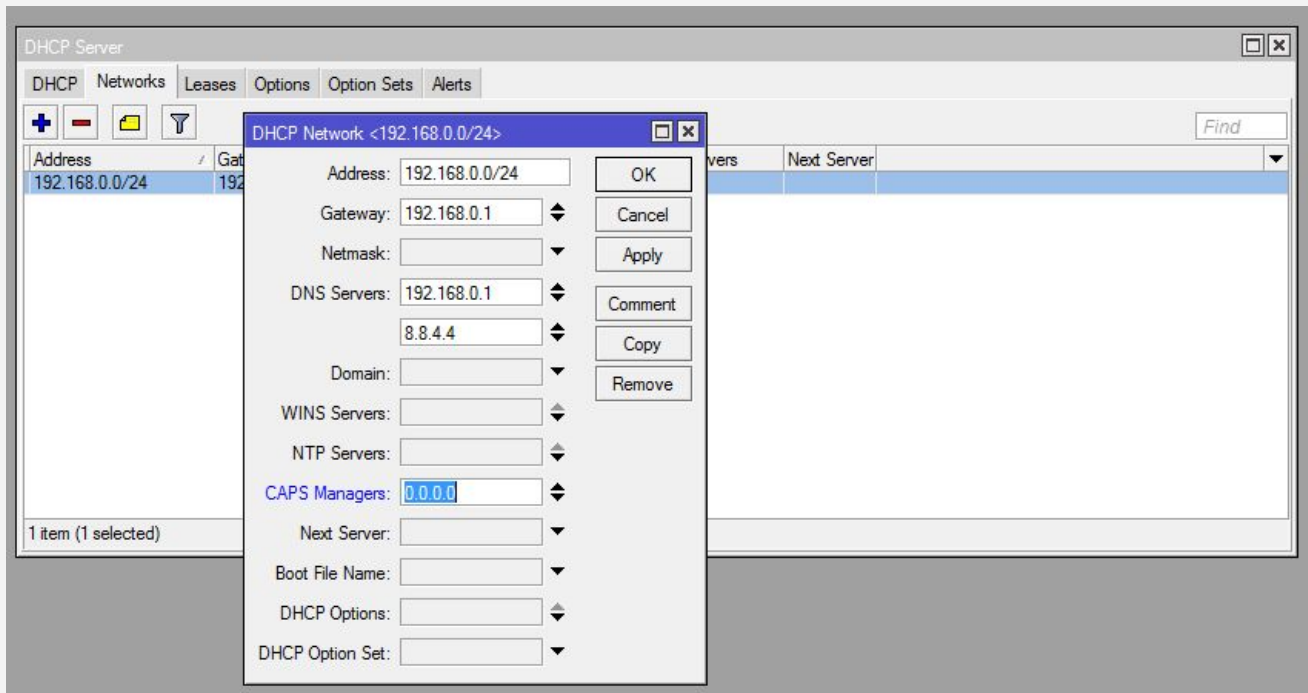
Gestión vía Capa 3

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...

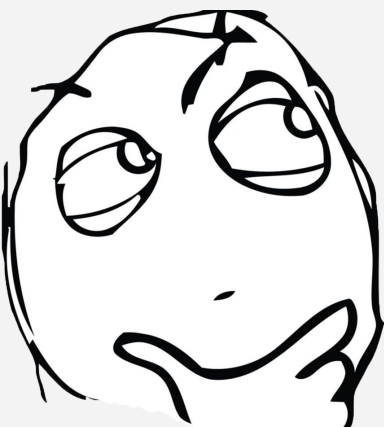


Más funciones (para investigar en sus casas...)

- 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!

