

# MikroTik RouterOS & RouterBOARD Wireless features overview

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# Overview

- Gift RouterBOARD wAP
- Wireless quick guide
- Wireless-rep package



# WAP



# Black and White edition





# Specification

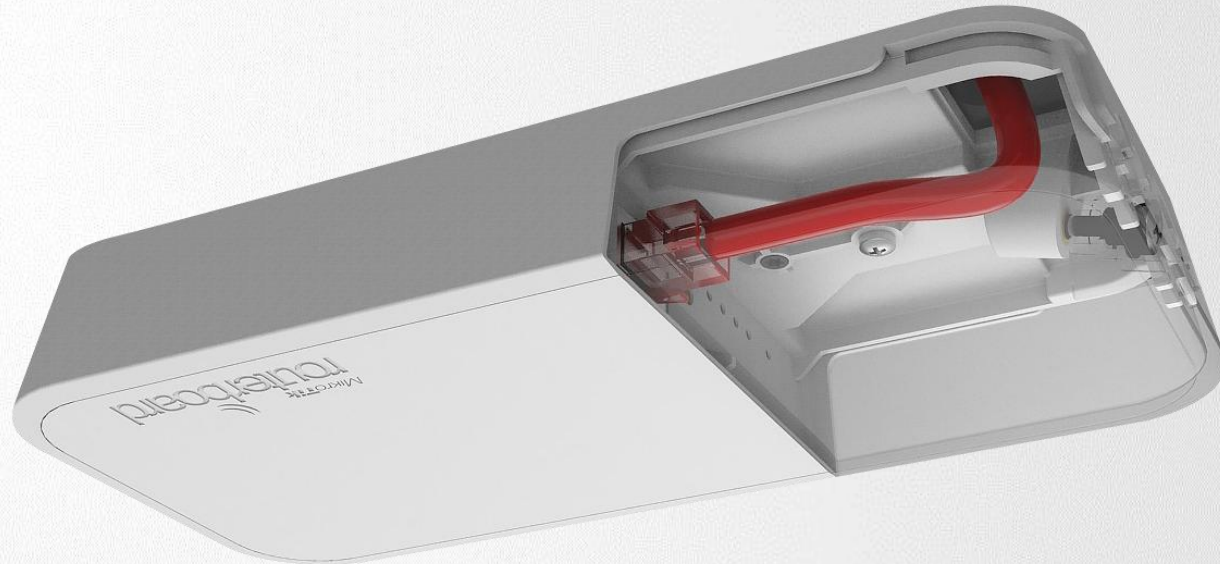
- CPU 650 MHz
- RAM 64 MB
- Flash 16 MB
- Wireless 802.11b/g/n dual-chain
- Gain 2dBi antennas
- Ethernet 10/100Mbps
- Voltage 11-57V
- Consumption up to 4W
- Operating Temperatures -40C to +70C
- Dimensions 185 x 85 x 30 mm

# Features

- 2 chain Wireless radio
- Jack and PoE power option
- Wide power input range (11-57V)
- Supports 802.3af/at and Passive PoE
- Low Power Consumption
- High Operating Temperatures
- Suitable for indoor and outdoor
- Waterproof case design



# Usage Cases

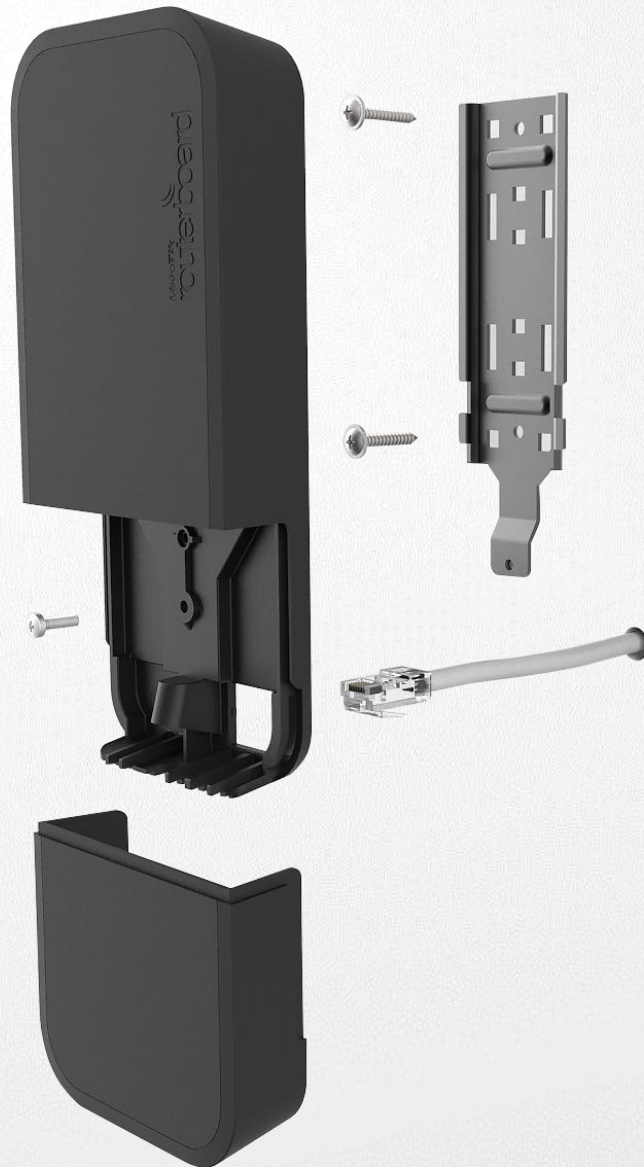


## Use it on the ceiling!

- The wAP comes bundled with all the necessary things to be mounted on ceiling
- Cable breakout provides ability to run cable through the ceiling



# Usage Cases



Use it on the wall!

- Wall mounting is easy thanks to the provided drill template and screw anchor. Everything included



# New wAP ac

- CPU 720 MHz
- RAM 64 MB
- Flash 16 MB
- Wireless 802.11b/g/n dual-chain
- Wireless 802.11a/n/ac triple-chain
- Gain 2dBi antennas
- Ethernet 10/100/1000Mbps
- Voltage 11-57V
- Consumption up to 12W
- Operating Temperatures -40C to +50C
- Dimensions 185 x 85 x 30 mm

# Wireless quick guide



# Frequency limitations

**Regulatory-domain** – Limit available channels and maximum transmit power for each channel according to the country limitations

**manual-txpower** – Use frequency limitations by country, without limiting the maximum transmit power

**superchannel** – Allow all frequencies supported by the card

**Lock specific frequencies** – Request factory installed lock package, to discard use of specific wireless frequencies

# Wireless usage

**PTP** (Creates a connection between 2 points)

- PTP devices use **directional** antennas to send signal to narrow beam

**PTMP** (Allows multiple clients to establish connection)

## **Sector**

- Uses **semi-directional** antenna to cover a specific range with signal, also called sector antenna

## **Regular (omni)**

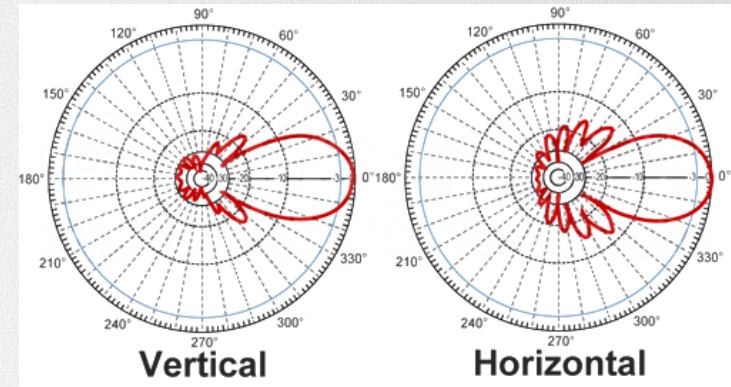
- Uses **omni-directional** antenna
- Allows clients to connect from all directions



# Directional antenna...

## Used for PTP links

- Focused beam
- Increased antenna gain
- Extended distance
- Reduced interference



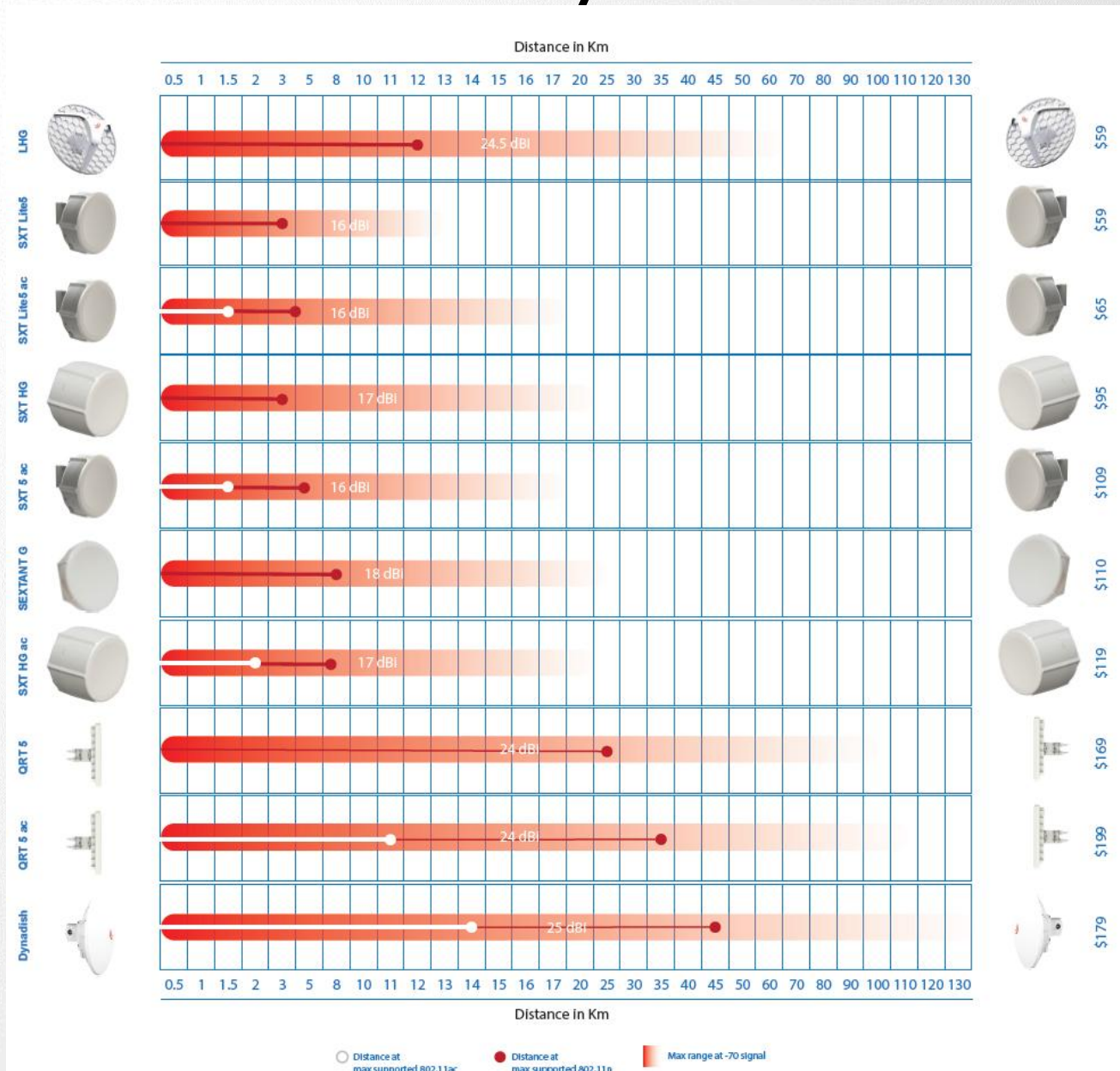
**MikroTik PTP devices:** DynaDish, LHG, SXT, QRT, Sextant

**Mikrotik PTP antenna:** mANT – parabolic dish antenna

**mANT can be used with:** NetMetal, BaseBox, NetBox or any other RP-SMA connector compatible device



# Choose by distance

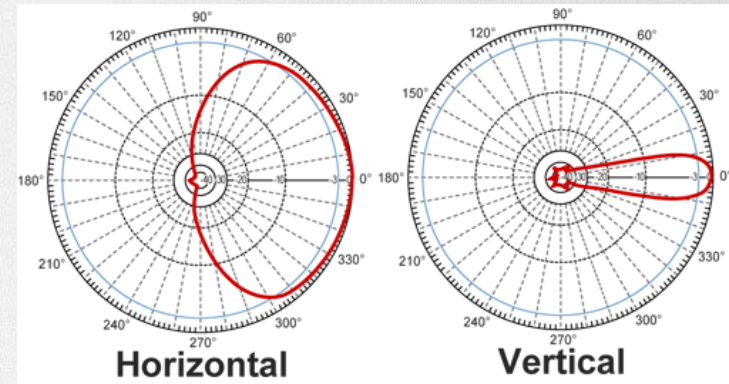




# Sector antenna...

## Used for PTMP links

- Specific angle
- Covers large area
- Allows multiple clients
- Lower interference



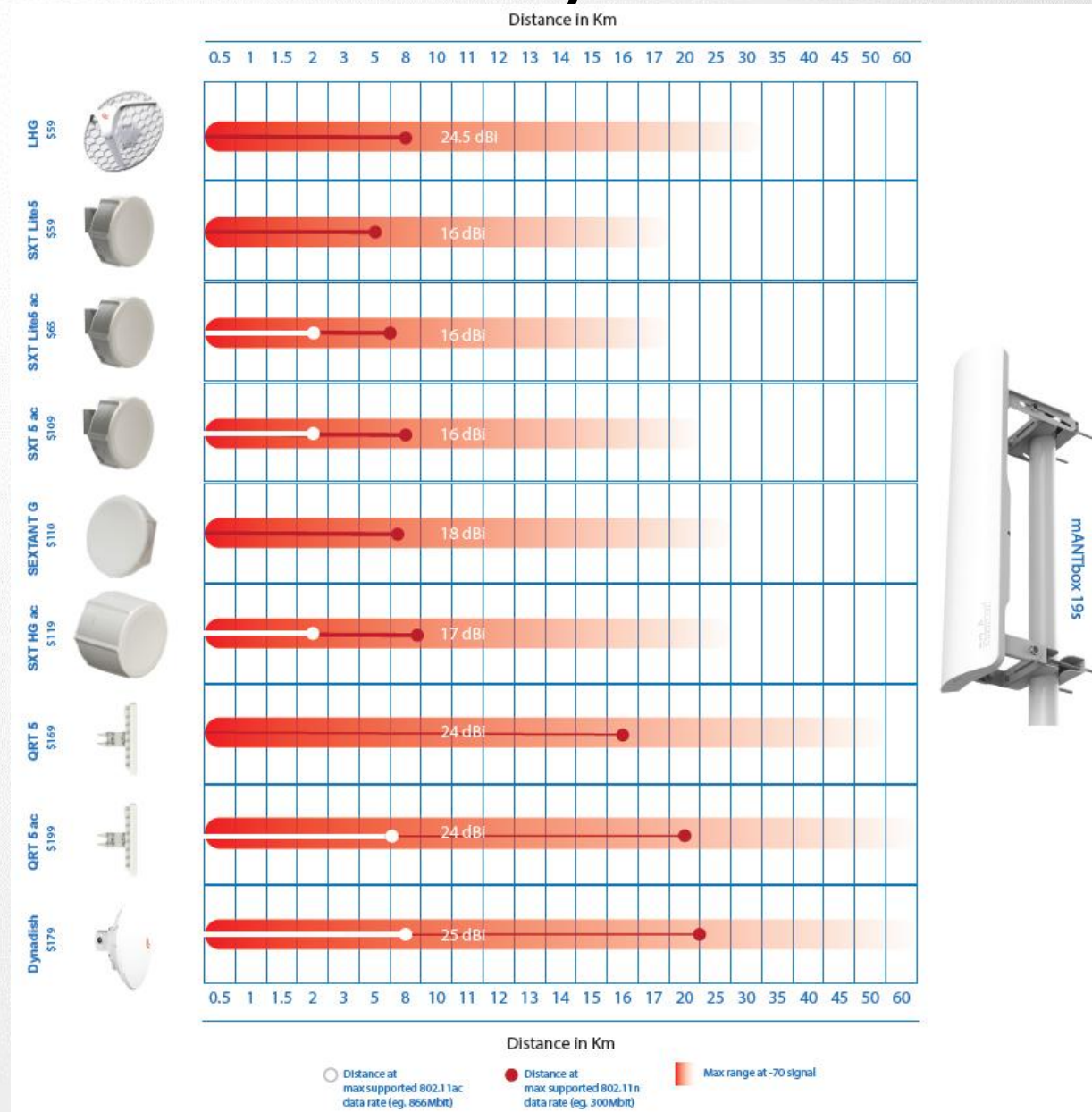
**MikroTik PTMP devices:** SXT SA5, SXT SA5 ac, mANTBox 15s/19s

**Mikrotik PTMP antenna:** mANT 15s/19s – sector antenna

**mANT can be used with:** NetMetal, BaseBox, NetBox or any other RP-SMA connector compatible device



# Choose by distance

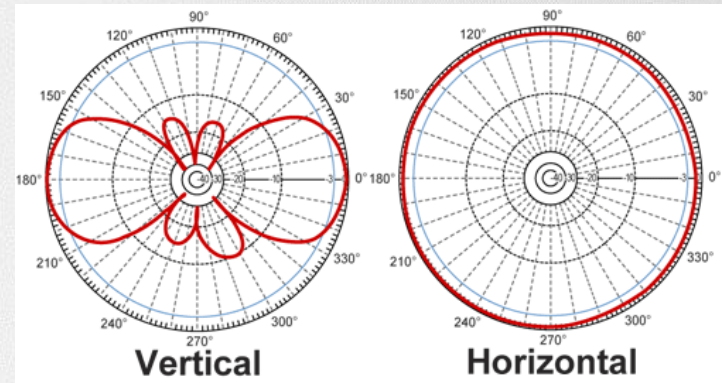




# Omni antenna...

## Used to cover 360 degrees

- Receives and transmits signals to all directions
- Do not need to be pointed
- Allows multiple clients



**MikroTik industrial omni devices:** RB Groove, RB Metal, OmniTIK

**MikroTik home/office wireless devices** are equipped with omni antennas

**RouterBOARD:** any wireless device with attached omni antenna

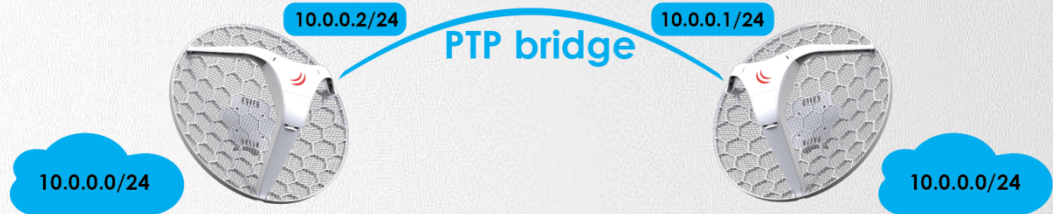


# Wireless **station** modes

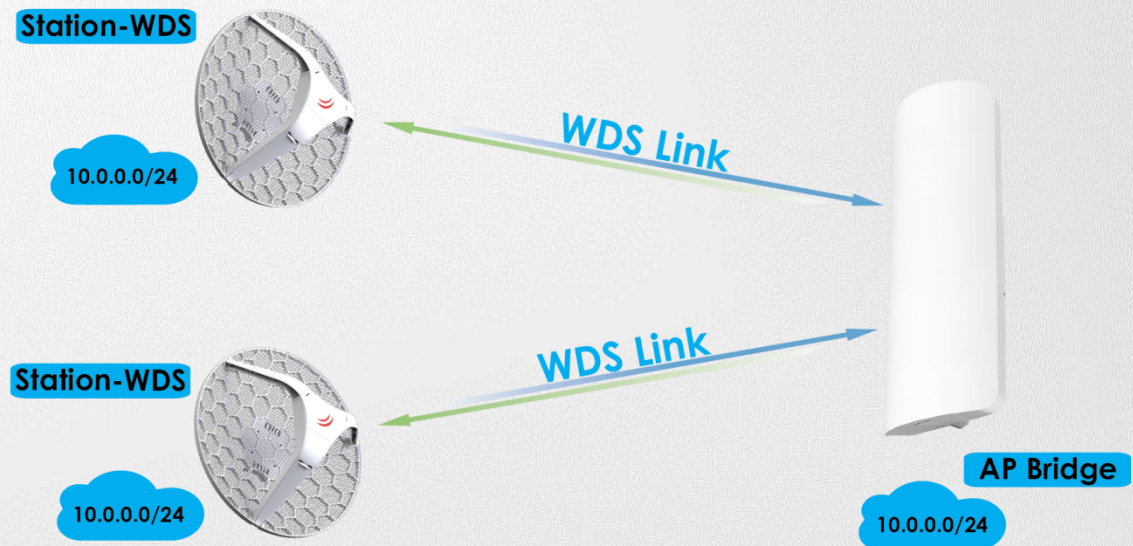
## Station



## Station-bridge



## Station-WDS



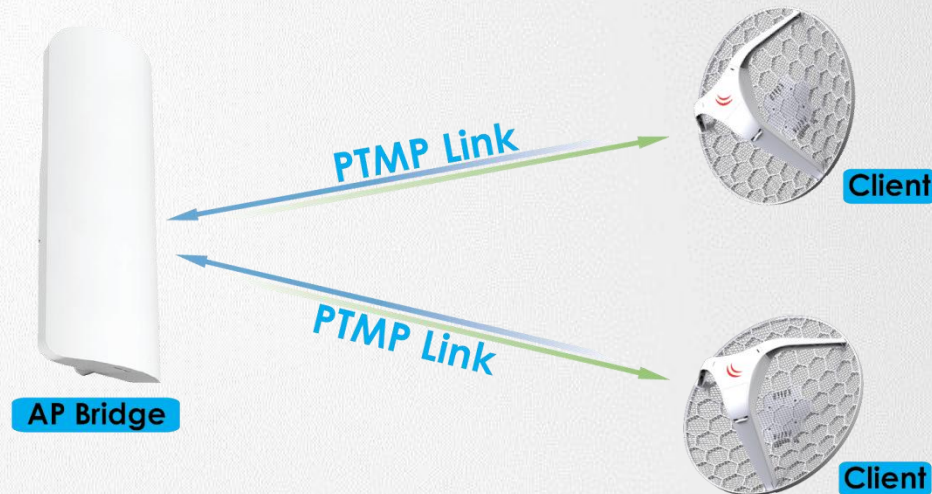


# Wireless **AP** modes

## Bridge



## AP-Bridge



## WDS-Slave



# Wireless modes

## **AP modes:**

- AP-bridge (Requires at least level 4 license)
- bridge (Requires at least level 3 license)

## **Station modes:**

- Requires at least level 3 license

**Other modes are available!**



# Router as station

Configure wireless settings manually to connect to any access point.

- Configure security profiles (authentication-type, mode, key)
- Configure wireless settings (station mode, frequency, band, SSID)

Or use **wireless scan** feature!

# Wireless scan

The fastest way to connect to AP

The screenshot shows a software interface for managing wireless networks. The top window, titled "Wireless Tables", has several tabs: "Interfaces", "Nstreme Dual", "Access List", "Registration", "Connect List", "Security Profiles", and "Channels". The "Scanner" tab is highlighted with a red box. Below the tabs are various icons and buttons, including "CAP", "WPS Client", "Setup Repeater", "Scanner", "Freq. Usage", "Alignment", "Wireless Sniffer", and "Wireless Snooper". A table below shows network statistics for the "wlan1" interface.

Name	Type	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx
wlan1	Wireless (Atheros AR9...	0 bps	1280 bps	0	2	0 bps	1280

1 item out of 6 (1 selected)

The bottom window, titled "Scanner", shows the interface for performing a scan. The "Interface" is set to "wlan1". There is a "Background Scan" checkbox which is unchecked. On the right side, there are buttons for "Start", "Stop", "Close", "Connect" (highlighted with a red box), and "New Window". Below these buttons is a table of detected APs.

Address	SSID	Channel	Signa...	Noise...	Signa...	Radio Name	RouterO...
30:91:8F:9E:5A:03	TNCAP9...	2437/20-Ce/gn	-77	-108	31		
D4:CA:6D:83:77:03	BackBone	2447/20-eC/gn	-70	-107	37	D4CA6D837703	6.35.1
4E:5E:0C:61:B4:63	testAP	2447/20-eC/gn	-44	-107	63	4C5E0C61B463	6.36rc10

3 items (1 selected)



# Create AP using Quickset

The screenshot shows the RouterOS WinBox interface with the 'Quick Set' window open for a 'Home AP'. The interface is divided into several sections for configuration:

- Wireless:** Network Name: HomeAP, Frequency: 2447 MHz, Band: 2GHz-B/G/N, Country: no\_country\_set, MAC Address: 00:0C:42:37:B1:37. Includes a 'WPS Accept' button.
- Internet:** Address Acquisition: Automatic, IP Address, Netmask, Gateway, MAC Address: 00:E1:42:E1:B1:32, Firewall Router checkbox.
- Local Network:** IP Address: 192.168.88.1, Netmask: 255.255.255.0 (/24), DHCP Server checked, DHCP Server Range: 192.168.88.10-192.168.88.100, NAT checked, UPnP unchecked.
- VPN:** VPN Access unchecked, VPN Address field.
- System:** Check For Updates, Reset Configuration buttons, Password and Confirm Password fields.

The left sidebar contains navigation options: Quick Set, CAPsMAN, Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Partition, Make Supout.rf, Manual, New WinBox, and Exit.

A table under 'Wireless Clients' shows the following data:

MAC Address	In ACL	Last IP	Uptime	Sig
D8:E1:C4:D8:27:08	no	192.168.4.203	00:01:47	-25

At the bottom, there is a signal strength indicator showing 'Signal Strength: -30 dB' and buttons for 'Copy To ACL' and 'Remove From ACL'.

# Frequency scan

Use scan tool, to find the best frequency

The screenshot displays the Mikrotik WinBox interface. The top toolbar includes various tools, with 'Freq. Usage' highlighted in red. Below the toolbar, the 'Wireless Tables' window shows a table with columns for Name, Type, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), FP Tx, and FP Rx. The 'wlan1' interface is selected. Below this, the 'Freq. Usage (Running)' window is open, showing the interface 'wlan1' and a table of frequency usage data.

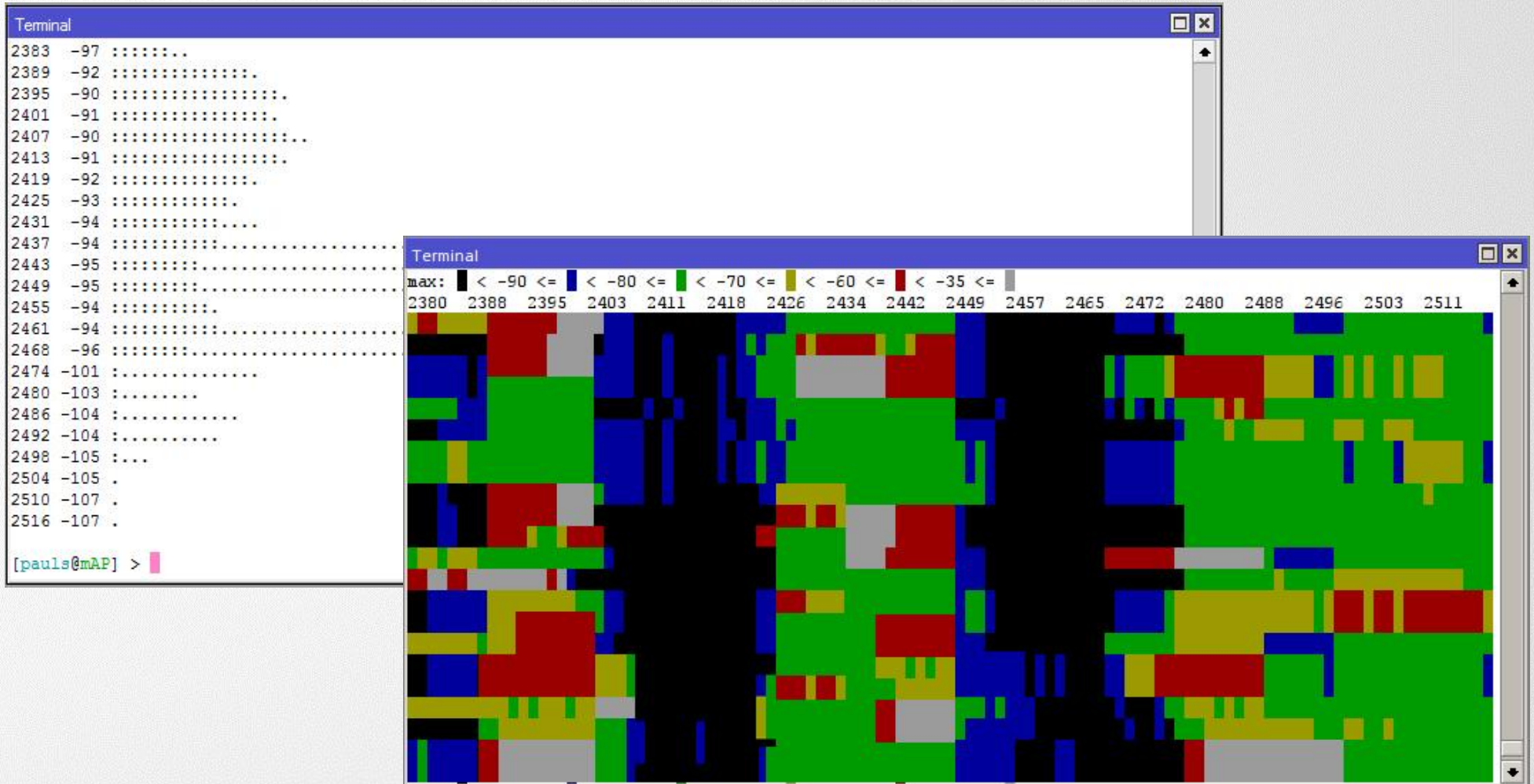
Frequency (MHz)	Usage	Noise F...
2412	0.5	-113
2417	2.1	-110
2422	15.3	-109
2427	13.5	-110
2432	17.0	-111
2437	18.2	-111
2442	29.8	-111
2447	17.3	-111
2452	3.7	-110
2457	0.6	-110
2462	0.2	-111

11 items



# CLI wireless spectral scan

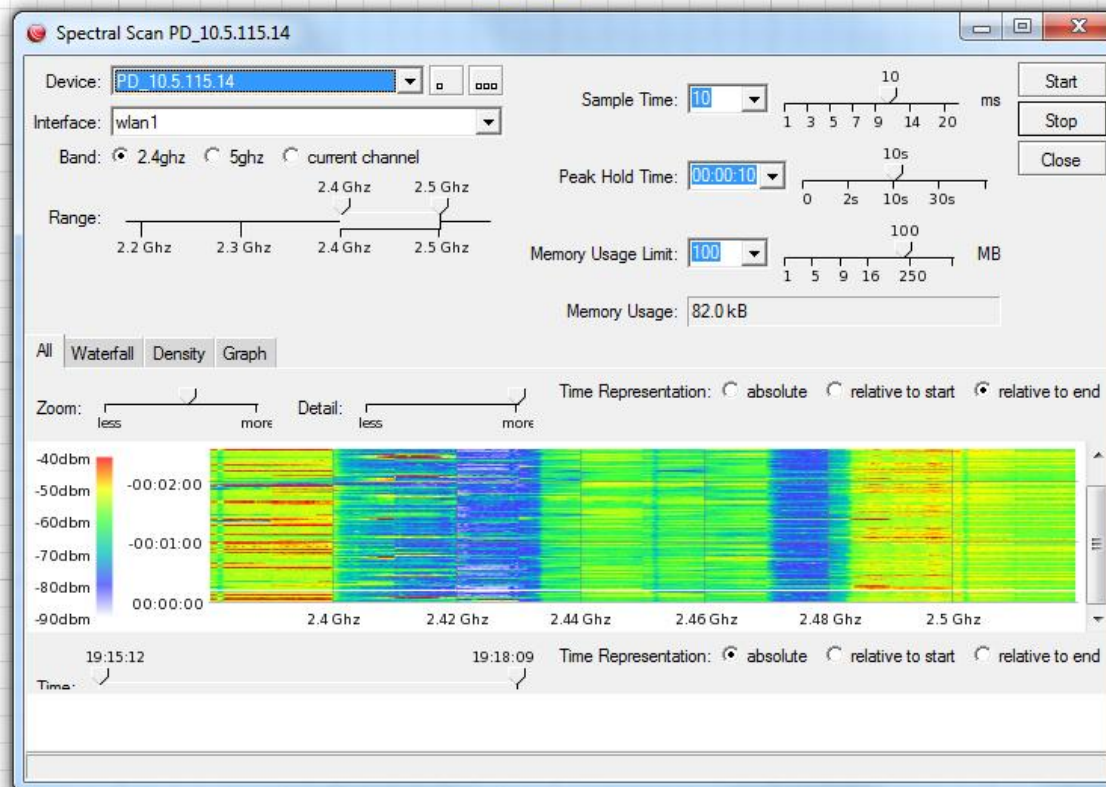
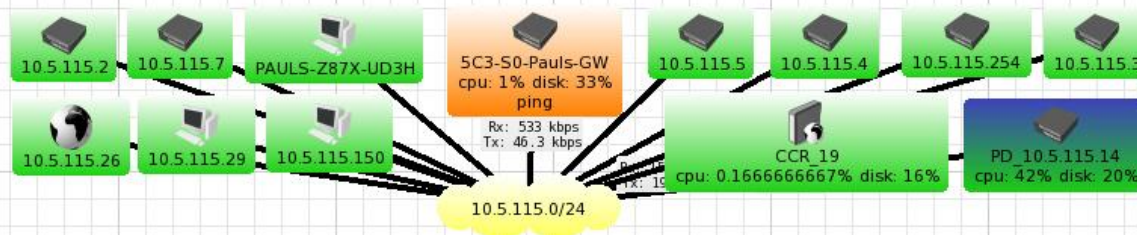
Use terminal to check used frequencies





# Dude

## Scan wireless from Dude



- Settings
- Appearance
- Tools
  - Reprobe
  - Ack
  - Unack
  - Upgrade
  - Force Upgrade
  - Notes
  - Remove
  - Select Adjacent
- Ping
- Traceroute
- Snmpwalk
- Winbox
- Terminal
- Remote Connection
- Torch
- Bandwidth Test
- Spectral Scan
- Telnet
- Web
- Ftp
- Dude



# Results

Compare throughput in different frequencies

Frequency	Rx Mbps	Tx Mbps	Rx CCQ	Tx CCQ
2407	46.8	46	42	37
2417	74.7	70.3	66	76
2427	88.8	90.2	84	88
2437	98.1	97.3	89	86
2447	77.4	70.7	75	77
2457	63.3	65.4	62	65
2467	85.8	86.8	87	84
2477	95.8	93.3	62	92
2487	66	59.1	57	55

# Test throughput

Measure throughput between wireless devices

The screenshot displays the BTest Server application interface. On the left is a menu with options like 'New Terminal', 'Partition', 'Make Supout.rif', 'Manual', 'New WinBox', and 'Exit'. The main window is titled 'Bandwidth Test (Running)'. It shows the following configuration and results:

- Test To:** 192.168.1.1
- Protocol:**  udp  tcp
- Local UDP Tx Size:** 1500
- Remote UDP Tx Size:** 1500
- Direction:** both
- TCP Connection Count:** 20
- Local Tx Speed:** [ ] bps
- Remote Tx Speed:** [ ] bps
- Random Data
- User:** admin
- Password:** [ ]
- Lost Packets:** 947
- Tx/Rx Current:** 182.8 Mbps/179.9 Mbps
- Tx/Rx 10s Average:** 183.8 Mbps/177.0 Mbps
- Tx/Rx Total Average:** 172.0 Mbps/166.9 Mbps

At the bottom, a bar chart shows the current Tx (blue) and Rx (red) rates. A legend indicates: Tx: 182.8 Mbps, Rx: 179.9 Mbps. The status bar at the bottom left says 'running...'.



# Wireless Snooper

Monitor wireless devices

The screenshot displays the 'Wireless Snooper' application interface. At the top, there are several tabs: 'Interfaces', 'Nstreme Dual', 'Access List', 'Registration', 'Connect List', 'Security Profiles', and 'Channels'. Below these are various tool icons and buttons like 'CAP', 'WPS Client', 'Setup Repeater', 'Scanner', 'Freq. Usage', 'Alignment', 'Wireless Sniffer', and 'Wireless Snooper' (which is highlighted). A search bar labeled 'Find' is also present.

The main window shows a table with the following columns: Name, Type, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), FP Tx, and FP Rx. One item is listed: wlan1, Wireless (Atheros AR9...), 0 bps, 0 bps, 0, 0, 0 bps, 0.

Below this is a 'Wireless Snooper (Running)' window. It has a dropdown menu for 'Interface:' set to 'wlan1'. On the right side, there are buttons for 'Start', 'Stop', 'Close', 'Settings', and 'New Window'. A search filter is set to 'all'.

The main data table in the 'Wireless Snooper (Running)' window has the following columns: Channel, Address, SSID, Signal, Of Freq. (%), Of Traf. (%), Bandwidth, Net..., and Stati... The table contains 20 rows of data, including entries for various channels and addresses, such as 'BackBone' and 'testAP'.

Channel	Address	SSID	Signal	Of Freq. (%)	Of Traf. (%)	Bandwidth	Net...	Stati...
2412/2...				13.1		107.0 kbps	0	0
2417/2...				0.0		0 bps	0	0
2422/2...				10.0		81.7 kbps	0	0
2427/2...	4C:5E:0C:61:B4:63	BackBone	-36	12.6	95.8	102.7 kbps		
2427/2...				13.1		102.7 kbps	0	1
2432/2...				2.2		20.6 kbps	0	0
2437/2...	30:91:8F:9E:5A:03	TNCAP9E...		2.2	100.0	20.5 kbps		1
2437/2...	30:91:8F:9E:5A:03	TNCAP9E...	-77	2.2	100.0	20.5 kbps		
2437/2...				2.2		20.5 kbps	1	1
2442/2...				3.8		34.4 kbps	0	0
2447/2...	4E:5E:0C:61:B4:63	testAP		2.3	63.6	21.7 kbps		1
2447/2...	D4:CA:6D:83:77:03	BackBone		1.3	36.3	12.5 kbps		2
2447/2...	4E:5E:0C:61:B4:63	testAP	-45	2.3	63.6	21.7 kbps		
2447/2...	D4:CA:6D:83:77:03	BackBone	-78	1.3	36.3	12.5 kbps		
2447/2...	54:35:30:60:51:F3		-41	0.0	0.0	0 bps		
2447/2...	B4:E1:C4:D8:27:08	BackBone	-30	0.0	0.0	0 bps		
2447/2...				3.7		34.3 kbps	2	4
2452/2...				4.9		46.0 kbps	0	0
2457/2...				0.0		0 bps	0	0
2462/2...				0.0		0 bps	0	0



# Wireless Sniffer

## Capture frames & packets

The screenshot displays the 'Wireless Tables' application interface, which is used for monitoring and capturing wireless network traffic. The interface is divided into three main sections:

- Wireless Tables (Top):** This section shows a list of available wireless interfaces. The 'wlan1' interface is selected. The 'Wireless Sniffer' tab is active, and the 'Find' button is visible.
- Wireless Sniffer (Middle):** This section provides configuration options for the sniffer. The interface is set to 'wlan1'. The 'Start' button is highlighted, indicating that the sniffer is currently running. Other settings include memory size (9.9 KiB), memory saved packets (32), and memory over limit packets (352).
- Wireless Sniffed Packets (Bottom):** This section displays a list of captured packets. The table below shows the details of the captured packets.

Time (s)	Interfa...	Channel	Signal ...	Rate	Dst.	Src.	Type
0.069	wlan1	2447/20-eC/gn	-42	1Mbps	FF:FF:FF:FF:FF:FF	4E:5E:0C:61:B4:63	beacon
0.073	wlan1	2447/20-eC/gn	-70	1Mbps	FF:FF:FF:FF:FF:FF	D4:CA:6D:83:77:03	beacon
0.172	wlan1	2447/20-eC/gn	-42	1Mbps	FF:FF:FF:FF:FF:FF	4E:5E:0C:61:B4:63	beacon
0.176	wlan1	2447/20-eC/gn	-68	1Mbps	FF:FF:FF:FF:FF:FF	D4:CA:6D:83:77:03	beacon
0.227	wlan1	2447/20-eC/gn	-41	1Mbps	D4:CA:6D:83:77:03	4C:5E:0C:61:B4:63	unknown
0.229	wlan1	2447/20-eC/gn	-69	1Mbps	4C:5E:0C:61:B4:63	D4:CA:6D:83:77:03	unknown
0.274	wlan1	2447/20-eC/gn	-41	1Mbps	FF:FF:FF:FF:FF:FF	4E:5E:0C:61:B4:63	beacon



rep

Wireless-

package

# Wireless-rep package

- Repeater setup
- Background scan
- Virtual Wireless Interfaces
- WPS client
- New Wireless Scan features
- Scan-list Step support
- Station Roaming support
- G/N band support
- CAPsMAN additional settings enabled
- CAPsMAN Rates support



# Repeater Setup

- Allow to receive signal from the AP and repeat the signal using the same physical interface locally for connecting other clients
- Allows to extend wireless service for the wireless clients
- Steps that this setup command does:
  - Configure wireless interface to connect to the AP
  - Create a Virtual AP interface
  - Create Bridge interface
  - Adds both (main and virtual) interfaces to bridge ports

# Background Scan

- Supported for 802.11 protocol only
- Working conditions
  - Wireless interface should be enabled
  - For AP mode – when operating on fixed channel
  - For Station mode – when connected to AP
- Supported also on Virtual interfaces
  - Scan is only performed in channel where master interface is running



# Virtual Wireless Interfaces

- Supported for 802.11 protocol only
- Virtual AP and Client interface can be added on the same physical interface
- Multiple Virtual Wireless interfaces can be added
- Background scan is supported on Virtual Wireless Interfaces and is only performed in channel where master interface is running

# WPS Client Support

- Allows wireless client to get Pre-Shared Key configuration of the AP that has WPS Server enabled
- Gets information from any WPS Server running or can be specified to get only with specific SSID or MAC address
- Received configuration is shown on the screen and can be also saved to a new wireless security profile



# Wireless Scan features

- Scan to file
  - Allows to save the scan results in a CSV format file
  - Supported with background scan
- Scan Round setting
  - Allows to do full scan of the scan-list and then stop scanning
  - Useful for remote scans on the clients
  - Supported with background scan as well

# Scan-list Step feature

- Scan-list Step feature allows to make compact scan-list entries
- To make scan-list from 5500-5700 with 20mhz step now you need just one entry:
  - Scan-list=5500-5700:20
  - In system it will create scan-list with such frequencies:  
5500,5520,5540,5560,5580,5600,5620,5640,5660,  
5680,5700



# Station Roaming support

- Supported for 802.11 protocol only
- While connected to AP station does periodic background scans to look for a better AP
- When a better AP is found station roams to the new AP
- Time intervals between scans becomes shorter when signal becomes worse
- Time intervals between scans becomes longer when signal becomes better

# G/N Band Setting

- Regular Wireless Interface and CAPsMAN supports '2ghz-g/n' band setting
  - basic-rates – 6-54Mbps
  - supported – 6-54Mbps
  - ht-basic-mcs – None
  - ht-supported-mcs – 0-23



# CAPsMAN Settings

- CAPsMAN now supports the following settings:
  - distance – default value is 'indoors'
  - hw-retries
  - hw-protection-mode
  - frame-lifetime
  - disconnect-timeout

# CAPsMAN Rates support

- CAPsMAN supports Rates configuration tab:
  - Basic – B and A/G basic-rates
  - supported – B and A/G supported data-rates
  - ht-basic-mcs – N basic-rates
  - ht-supported-mcs – N supported data-rates
  - vht-basic-mcs – AC basic rates
  - vht-supported-mcs – AC supported data-rates



Suggestions?  
Feature requests?

**THANK YOU!**