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SOLUCIONES IP

MUM MEXICO ON SEPTEMBER 05 - 06,
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Agregación de enlaces inalámbricos: Bonding



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MUM MX 2014

www.INDEX.com.mx

Acerca de INDEX:

- Se funda en el 2002
- Ubicada en Los Mochis, Sinaloa.
- Con oficinas en Culiacán, Mazatlán, Navojoa y Los Cabos B.C.S.
- Alrededor de 25 empleados.
- Su finalidad es ofrecer soluciones de conectividad de redes por medio de tecnologías inalámbricas.
- En 2005 obtiene el aval por parte de Mikrotiks SIA para comercializar e impartir cursos de certificación sobre Mikrotik Router OS en México, Centro y Sudamérica.





Acerca de mi:

- Licenciado en Sistemas Computacionales
- Tiempo laborando en Index Soluciones IP: 8 años
- Puesto actual: Encargado de Proyectos
- Certificaciones MikroTik:
 - MTCNA (2011)
 - MTCWE (2011)
 - MTCTCE (2012)
 - MTCRE (2013)
 - MTCUME (2014)

Presentación:

➤ Escenario:

Mandar Internet desde un punto central a un sitio remoto ubicado a “12” kms. En el punto central el carrier entrega 100mbps de Internet y se pretenden mandar por aire. Una alternativa es instalar varios enlaces inalámbricos punto a punto donde al sumarlos nos den la mayor cantidad de ancho de banda en TCP disponible. RouterOS nos permite hacerlo mediante la técnica de Bonding.



Bonding:

Esta tecnología nos permite la agregación de múltiples interfaces de red convirtiéndolas en un único enlace virtual, obteniendo así mayores velocidades de datos y proporcionar failover.

MikroTik Wiki

En esta presentación se expondrá un laboratorio realizado en oficina y en campo para sumar anchos de banda de enlaces inalámbricos a la interface bonding de MikroTik.



Consideraciones:

- El ancho de banda total alcanzable será de la velocidad del enlace más lento.
- Ejemplo: 2 enlaces inalámbricos por sitio y digamos que un enlace hace los 90 mbps y el otro los 80 mbps su rendimiento total será alrededor de los 160 mbps. (80 X 2).
- Tener en cuenta que más enlaces se pueden unir para lograr una mayor velocidad/disponibilidad.



Monitoreando el enlace:

- Es muy importante que alguna de la opciones de monitorización disponibles este habilitada para comprobar si el enlace está activo o no.
- Sino y si uno de los esclavos fallara, el driver de Bonding continuará enviando paquetes sin darse cuenta que existe otro subyacente (failover).

MikroTik WiKi

Laboratorio en oficina:

- 2 RB2011iLS-IN (Routers / Bonding)
- 4 SXT G-2HnD (Radios inalámbricos- protocolo N)





Laboratorio en oficina:

Configuración técnica

- Interfaces esclavas en ambos routers: ether2 y ether3
- Modo del bonding: balance rr
- Banda de los radios: 2GHz only-N
- Frecuencia de operación: 2317-2507
- Modo de frecuencia: superchannel
- Modo AP: AP-WDS
- Modo cliente: Station-wds
- Tx Power: 5dBm

Interface <bonding1>

General Bonding Traffic

Slaves: ether2 ether3

Mode: balance rr

Primary: none

Link Monitoring: arp

Transmit Hash Policy: layer 2

Down Delay: 0 ms

Up Delay: 0 ms

LACP Rate: 30 s

ARP Interval: 100 ms

ARP IP Targets: 172.16.80.6

OK Cancel Apply Disable Comment Copy Remove Torch

enabled running slave



Laboratorio en oficina:

- Presentación del enlace inalámbrico 1 (test RX – TCP)

admin@D4:CA:6D:6C:0A:A0 (link-1-AP) - WinBox v5.22 on RB SXT G-2HnD (mipsbe)

Safe Mode CPU:100% Hide Passwords

Quick Set

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRP	Bonding	L
Name	Type	L2 MTU	Tx	Rx	Tx			
R bridge1	Bridge	1600	627.4 kbps	43.3 Mbps				
R ether1	Ethernet	1600	83.8 kbps	7.5 kbps				
R wlan1	Wireless (Atheros 11N)	2290	573.4 kbps	43.7 Mbps				
DRA wds1	WDS	2290	558.8 kbps	43.7 Mbps				

Bandwidth Test (Running)

Test To: 172.16.80.2

Protocol: ☐ udp ☒ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: receive

TCP Connection Count: 20

Local Tx Speed: 0 bps

Remote Tx Speed: 0 bps

Random Data

User: admin

Password:

Last Packets: 0

Tx/Rx Current: 0 bps/42.0 Mbps

Tx/Rx 10s Average: 0 bps/41.2 Mbps

Tx/Rx Total Average: 0 bps/40.4 Mbps

Tx: 42.0 Mbps

Rx: 42.0 Mbps

Wireless Tables

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activity (s)	Tx/Rx Signal Strength	Tx/Rx Rate
link-1-cpe	D4:CA:6D:4E:E2:F3	wlan1	2d 16:41:...	no	yes	0.000	-20/-26	270.0Mbps/270.0Mbps

AP Client <D4:CA:6D:4E:E2:F3>

General 802.1x Signal Netreame NV2 Statistics

Last Activity: 0.000 s

Tx/Rx Signal Strength: -20/-26 dBm

Tx/Rx Signal Strength Ch0: -34/-29 dBm

Tx/Rx Signal Strength Ch1: -20/-29 dBm

Tx/Rx Signal Strength Ch2:

Signal To Noise: 71 dB

Tx/Rx CCG: 80/59 %

P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT40-4	-30	00:00:11.42
HT40-5	-30	00:00:00.07
HT40-7	-30	00:00:00.02
HT40-6	-29	00:00:00.00
6Mbps	-26	00:00:00.00
HT20-6	-26	00:00:00.02
HT20-7	-26	00:00:00.01
HT40-3	-18	00:16:09.03
HT20-3	-15	00:16:19.45
HT20-5	-15	00:01:14.58
HT20-4	-14	00:04:04.27
HT40-2	-14	1d 19:08:37.41
HT20-1	-13	1d 23:17:32.75
HT40-0	-13	1d 19:08:48.89
HT40-1	-13	1d 19:08:48.88

Identity Platform Version Board Na...

link-1-CPE	Mikro Tik	5.21	RB SXT ...
R2	Mikro Tik	6.7	RB2011LS



Laboratorio en oficina:

- Presentación del enlace inalámbrico 1 (test TX – TCP)

admin@D4:CA:6D:6C:0A:A0 (link-1-AP) - WinBox v5.22 on RB SXT G-2HnD (mipsbe)

Safe Mode CPU: 100% Hide Passwords

Quick Set

Interface List

Interface	Type	L2 MTU	Tx	Rx
R bridge1	Bridge	1600	44.2 Mbps	483.3 kbps
R ether1	Ethernet	1600	75.3 kbps	8.7 kbps
R wlan1	Wireless (Atheros 11N)	2290	44.2 Mbps	596.5 kbps
DRA wds1	WDS	2290	44.2 Mbps	596.5 kbps

Bandwidth Test (Running)

Test To: 172.16.80.2

Protocol: ☐ udp ☒ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: send

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

☐ Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 43.5 Mbps/0 bps

Tx/Rx 10s Average: 43.9 Mbps/0 bps

Tx/Rx Total Average: 42.1 Mbps/0 bps

Tx: 43.5 Mbps

Rx:

Wireless Tables

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activity (s)	Tx/Rx Signal Strength (...	Tx/Rx Rate
link-1-cpe	D4:CA:6D:4E:E2:F3	wlan1	2d 16:46...	no	yes	0.000	-2/-18	270.0Mbps/270.0Mbps

AP Client <D4:CA:6D:4E:E2:F3>

General 802.1x Signal Nstreme NV2 Statistics

Last Activity: 0.000 s

Tx/Rx Signal Strength: -2/-18 dBm

Tx/Rx Signal Strength Ch0: -8/-24 dBm

Tx/Rx Signal Strength Ch1: -2/-19 dBm

Tx/Rx Signal Strength Ch2:

Signal To Noise: 87 dB

Tx/Rx CQI: 72/78 %

P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT40-4	-21	00:00:47.44
HT40-6	-21	00:00:00.01
HT40-7	-21	00:00:00.02
HT40-5	-20	00:00:00.06
6Mbps	-18	00:00:00.00
HT40-3	-18	00:21:52.83
HT20-5	-17	00:00:46.38
HT20-6	-17	00:00:40.63
HT20-7	-17	00:00:38.18
HT20-3	-15	00:22:03.25
HT40-2	-14	1d 19:14:21.21
HT20-1	-13	1d 23:23:16.55
HT40-0	-13	1d 19:14:32.69
HT40-1	-13	1d 19:14:32.68
HT20-2	-11	1d 20:47:33.48

Laboratorio en oficina:

- Presentación del enlace inalámbrico 1 (test RX – UDP)

admin@D4:CA:6D:6C:0A:A0 (link-1-AP) - WinBox v5.22 on RB SXT G-2HnD (mipsbe)

CPU:54% Hide Passwords

Quick Set

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRPP	Bonding	Wireless
R	bridge1	Bridge	1600	72.4 kbps	80.8 Mbps			
R	ether1	Ethernet	1600	79.4 kbps	8.1 kbps			
R	wlan1	Wireless (Atheros 11N)	2290	25.2 kbps	81.5 Mbps			
DRA	wds1	WDS	2290	9.3 kbps	81.5 Mbps			

Bandwidth Test (Running)

Test To: 172.16.80.2

Protocol: ☒ udp ☐ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: receive

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

Random Data

User: admin

Password:

Lost Packets: 2229

Tx/Rx Current: 0 bps/88.8 Mbps

Tx/Rx 10s Average: 0 bps/92.1 Mbps

Tx/Rx Total Average: 0 bps/84.9 Mbps

Tx: 88.8 Mbps

Rx: 88.8 Mbps

Wireless Tables

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activity (s)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
link-1-cpe	D4:CA:6D:4E:E2:F3	wlan1	2d 16:44:...	no	yes	0.000	-33/-5	300.0Mbps/270.0Mbps

AP Client <D4:CA:6D:4E:E2:F3>

General 802.1x Signal Nstreme NV2 Statistics

Last Activity: 0.000 s

Tx/Rx Signal Strength: -33/-5 dBm

Tx/Rx Signal Strength Ch0: -37/-22 dBm

Tx/Rx Signal Strength Ch1: -35/-5 dBm

Tx/Rx Signal Strength Ch2:

Signal To Noise: 101 dB

Tx/Rx CCC: 84/69 %

P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT40-3	-18	00:19:12.56
HT20-3	-15	00:19:22.98
HT40-2	-14	1d 19:11:40.94
HT20-1	-13	1d 23:20:36.28
HT40-0	-13	1d 19:11:52.42
HT40-1	-11	1d 19:11:52.41
HT20-2	-11	1d 20:44:53.21
HT40-4	-10	00:00:13.37
HT40-5	-9	00:00:00.33
HT40-6	-9	00:00:00.00
HT40-7	-9	00:00:00.34
HT20-4	-8	00:01:20.82
HT20-0	-7	2d 00:21:05.16
HT20-5	-6	00:01:21.22
6Mbps	-5	00:00:00.02

Laboratorio en oficina:

- Presentación del enlace inalámbrico 1 (test TX – UDP)

admin@D4:CA:6D:6C:0A:A0 (link-1-AP) - WinBox v5.22 on RB SXT G-2HnD (mipsbe)

CPU:63% Hide Passwords

Quick Set

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRPP	Bonding	LT
Name	Type	L2 MTU	Tx	Rx				
R bridge1	Bridge	1600	122.6 Mbps	13.6 kbps				
R ether1	Ethernet	1600	73.6 kbps	10.5 kbps				
R wlan1	Wireless (Atheros 11N)	2290	99.5 Mbps	8.8 kbps				
DRA rws1	WDS	2290	122.6 Mbps	8.8 kbps				

Bandwidth Test (Running)

Test To: 172.16.80.2

Protocol: ☒ udp ☐ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: send

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 94.6 Mbps/0 bps

Tx/Rx 10s Average: 96.5 Mbps/0 bps

Tx/Rx Total Average: 89.0 Mbps/0 bps

Tx: 94.6 Mbps

Rx:

Wireless Tables

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activity (s)	Tx/Rx Signal Strength	Tx/Rx Rate
link-1-cpe	D4:CA:6D:4E:E2:F3	wlan1	2d 16:50:...	no	yes	0.010	-13/-5	270.0Mbps/300.0Mbps

AP Client <D4:CA:6D:4E:E2:F3>

General 802.1x Signal Netreame NV2 Statistics

Last Activity: 0.010 s

Tx/Rx Signal Strength: -13/-5 dBm

Tx/Rx Signal Strength Ch0: -17/-20 dBm

Tx/Rx Signal Strength Ch1: -17/-5 dBm

Tx/Rx Signal Strength Ch2:

Signal To Noise: 104 dB

Tx/Rx CCQ: 60/85 %

P Throughput:

Signal Strengths

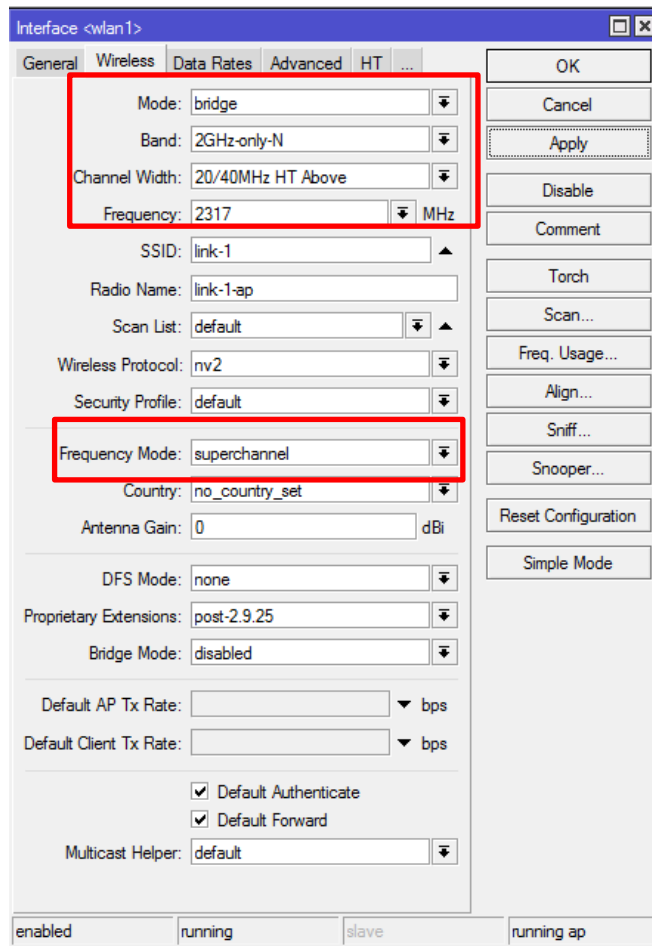
Rate	Strength	Last Measured
HT20-6	-16	00:00:01.82
HT20-3	-15	00:25:33.17
HT40-2	-14	1d 19:17:51.13
HT20-1	-13	1d 23:26:46.47
HT40-0	-13	1d 19:18:02.61
HT40-1	-13	1d 19:18:02.60
HT20-2	-11	1d 20:51:03.40
HT40-3	-11	00:00:03.16
HT20-4	-9	00:00:01.86
HT40-4	-9	00:00:00.33
HT40-5	-9	00:00:02.13
HT40-6	-9	00:00:00.83
HT40-7	-8	00:00:00.06
HT20-0	-7	2d 00:27:15.35
HT20-5	-6	00:00:00.22

Identity Platform Version Board Na..

link-1-CPE	Mikro Tik	5.21	RB SXT ..
R2	Mikro Tik	6.7	RB2011iLS

Laboratorio en oficina:

- Configuración del enlace (equipo Access Point)



Interface <wlan1>

General Wireless Data Rates Advanced HT ...

Mode: bridge

Band: 2GHz-only-N

Channel Width: 20/40MHz HT Above

Frequency: 2317 MHz

SSID: link-1

Radio Name: link-1-ap

Scan List: default

Wireless Protocol: nv2

Security Profile: default

Frequency Mode: superchannel

Country: no_country_set

Antenna Gain: 0 dBi

DFS Mode: none

Proprietary Extensions: post-2.9.25

Bridge Mode: disabled

Default AP Tx Rate: bps

Default Client Tx Rate: bps

☒ Default Authenticate

☒ Default Forward

Multicast Helper: default

OK Cancel Apply Disable Comment Torch Scan... Freq. Usage... Align... Sniff... Snooper... Reset Configuration Simple Mode

enabled running slave running ap

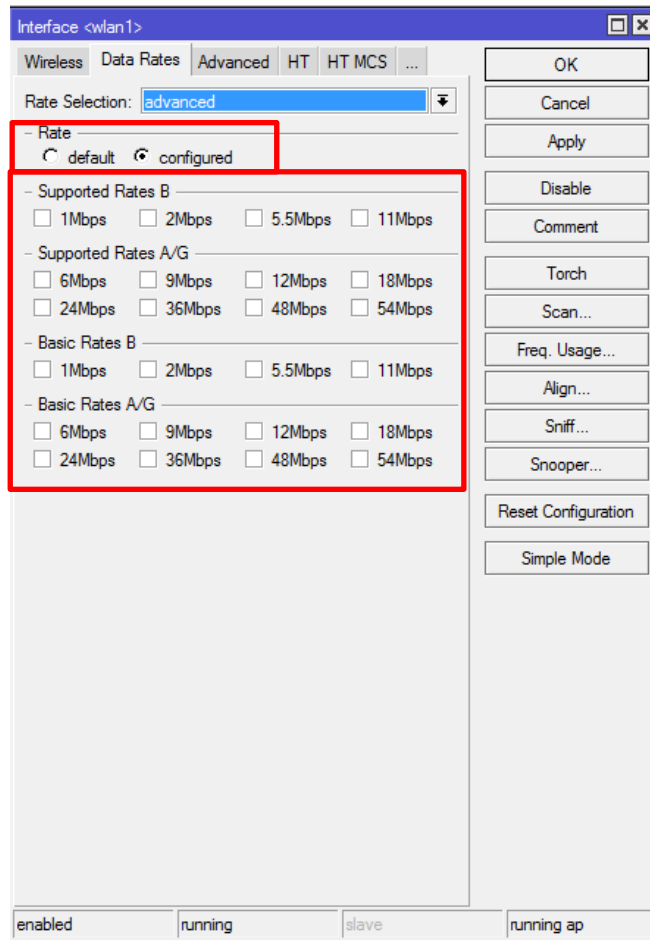
Banda: 2GHz only-N (alcanzar las tazas de datos del protocolo MIMO)

Ancho de canal: 40MHz (en dispositivos “n” aumenta el rendimiento máximo total).

Modo de frecuencia: superchannel

Laboratorio en oficina:

- Configuración del enlace (equipo Access Point)



Interface <wlan1>

Wireless Data Rates Advanced HT HT MCS ...

Rate Selection: advanced

Rate
☐ default ☒ configured

Supported Rates B
☐ 1Mbps ☐ 2Mbps ☐ 5.5Mbps ☐ 11Mbps

Supported Rates A/G
☐ 6Mbps ☐ 9Mbps ☐ 12Mbps ☐ 18Mbps
☐ 24Mbps ☐ 36Mbps ☐ 48Mbps ☐ 54Mbps

Basic Rates B
☐ 1Mbps ☐ 2Mbps ☐ 5.5Mbps ☐ 11Mbps

Basic Rates A/G
☐ 6Mbps ☐ 9Mbps ☐ 12Mbps ☐ 18Mbps
☐ 24Mbps ☐ 36Mbps ☐ 48Mbps ☐ 54Mbps

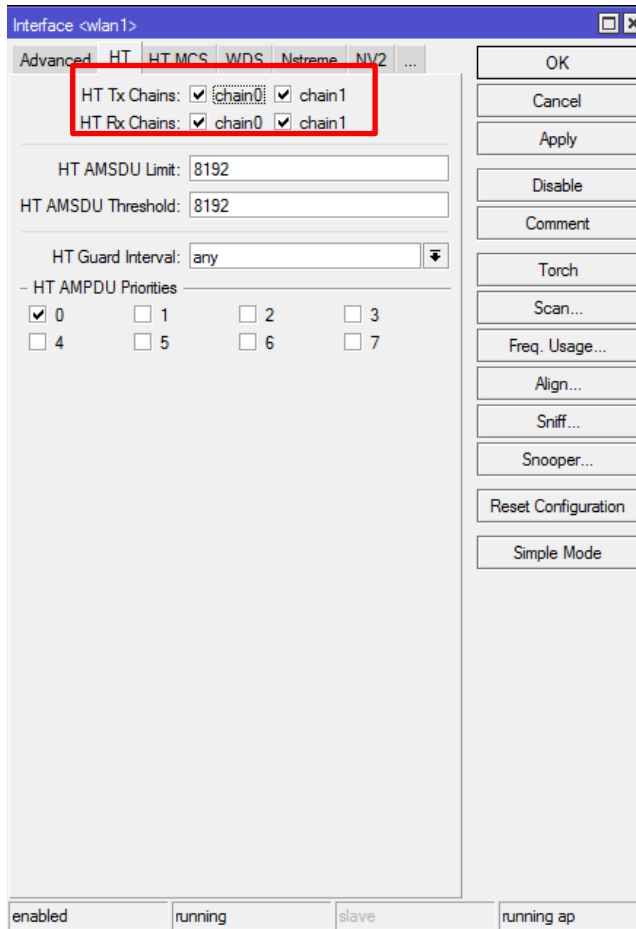
OK Cancel Apply Disable Comment Torch Scan... Freq. Usage... Align... Sniff... Snooper... Reset Configuration Simple Mode

enabled running slave running ap

Habilitar la opción configuración de los Rates para poder manipular los HT en “N”

Laboratorio en oficina:

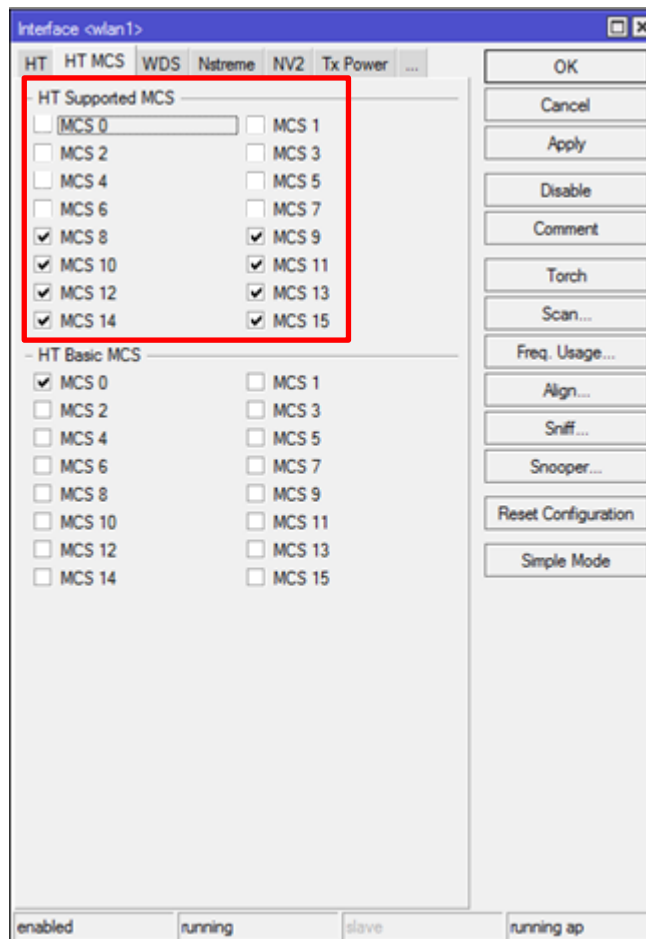
- Configuración del enlace (equipo Access Point)



Habilitar la opción que nos permitirá trabajar con 2 cadenas (2x2) en el protocolo MIMO.

Laboratorio en oficina:

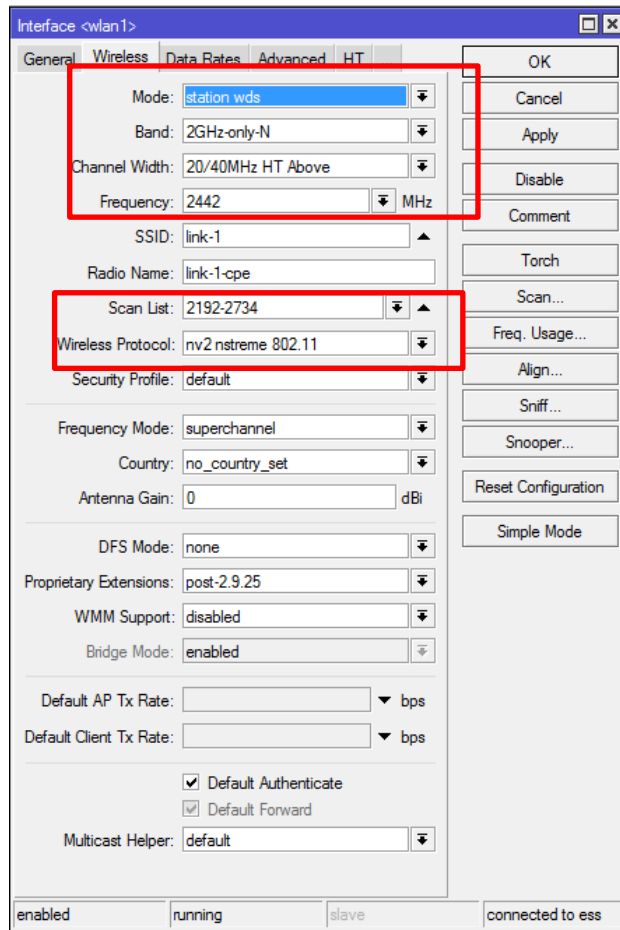
- Configuración del enlace (equipo Access Point)



Habilitar la opción que nos permitirá manipular los esquemas de modulación y codificación de las tasas de datos en el protocolo MIMO.

Laboratorio en oficina:

- Configuración del enlace (equipo Cliente)



Mismos parámetros de configuración del AP para el enganche solo cambiaran:

- Modo: station-wds
- Scan List: 2192-2734



Laboratorio en oficina:

- Presentación del enlace inalámbrico 2 (test RX – TCP)

admin@D4:CA:6D:6D:D7:2F (link-2-AP) - WinBox v6.12 on RB SXT G-2HnD (mipsbe)

Safe Mode CPU: 100% Hide Passwords

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRP	Bonding	LTE
Name / Type								
R bridge1 Bridge								
RS ether1 Ethernet								
RS wlan1 Wireless (Atheros AR9...								
DRS wlan1 Wireless (Atheros AR9...								

Bandwidth Test (Running)

Test To: 172.16.80.4
Protocol: ☒ udp ☐ tcp
Local UDP Tx Size: 1500
Remote UDP Tx Size: 1500
Direction: receive
TCP Connection Count: 20
Local Tx Speed: bps
Remote Tx Speed: bps
Random Data: ☐
User: admin
Password:
Lost Packets: 0
Tx/Rx Current: 0 bps/71.9 Mbps
Tx/Rx 10s Average: 0 bps/64.5 Mbps
Tx/Rx Total Average: 0 bps/64.2 Mbps

AP Client <00:0C:42:E9:41:77>

General 802.1x Signal Natrem NV2 Statistics

Last Activity: 0.000 s
Tx/Rx Signal Strength: -9/-5 dBm
Tx/Rx Signal Strength Ch0: -26/-11 dBm
Tx/Rx Signal Strength Ch1: -9/-7 dBm
Tx/Rx Signal Strength Ch2:
Signal To Noise: 102 dB
Tx/Rx CCQ: 67/81 %

P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT40-0	-8	00:01:12.85
HT20-0	-7	00:00:08.27
HT20-1	-7	00:00:08.48
HT20-2	-7	00:00:08.47
HT20-3	-7	00:00:45.98
HT20-5	-7	00:00:05.15
HT20-7	-7	00:00:05.15
HT40-3	-7	00:00:09.47
HT40-6	-7	00:00:00.00
HT40-7	-7	00:00:00.12
HT20-4	-6	00:00:08.58

Neighbor List

Neighbors Discovery Interfaces

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

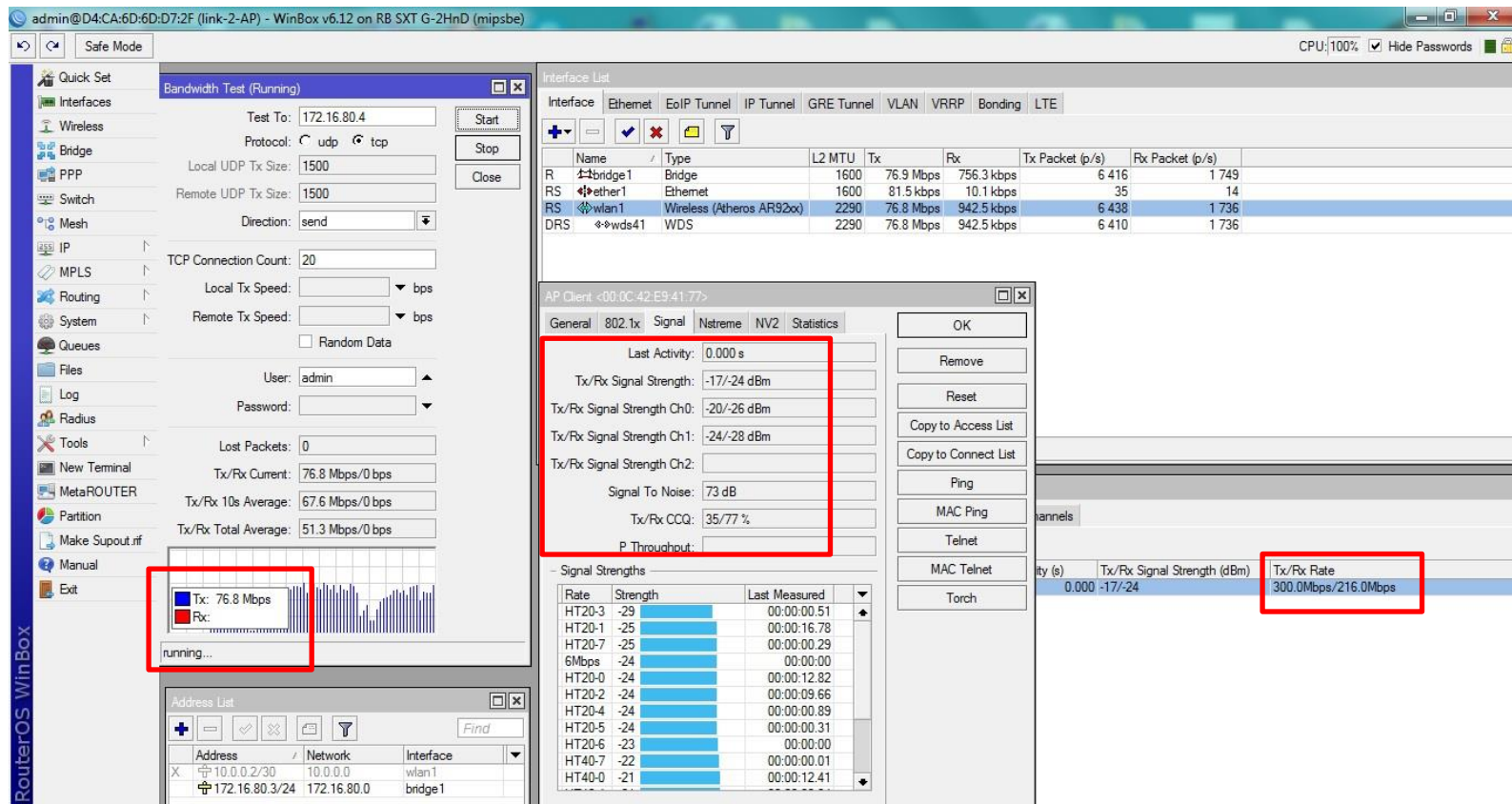
00 Reset

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activity (s)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
link-2-cpe	00:0C:42:E9:41:77	wlan1	00:01:30	no	yes	0.000	-9/-5	240.0Mbps/270.0Mbps



Laboratorio en oficina:

- Presentación del enlace inalámbrico 2 (test TX – TCP)





Laboratorio en oficina:

- Presentación del enlace inalámbrico 2 (test RX – UDP)

admin@D4:CA:6D:6D:D7:2F (link-2-AP) - WinBox v6.12 on RB SXT G-2HnD (mipsbe)

Safe Mode CPU:56% Hide Passwords

RouterOS WinBox

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRPP	Bonding	LTE
Name / Type								
R Bridge1 Bridge								
RS ether1 Ethernet								
RS wlan1 Wireless (Atheros AR9...								
DRS wlan1 Wireless (Atheros AR9...								

Bandwidth Test (Running)

Test To: 172.16.80.4

Protocol: ☒ udp ☐ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: receive

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

Random Data

User: admin

Password:

Lost Packets: 610

Tx/Rx Current: 0 bps/132.2 Mbps

Tx/Rx 10s Average: 0 bps/111.5 Mbps

Tx/Rx Total Average: 0 bps/103.2 Mbps

Tx: 132.2 Mbps

AP Client <00:0C:42:E9:41:77>

General 802.1x Signal Netreame NV2 Statistics

Last Activity: 0.000 s

Tx/Rx Signal Strength: 2/-5 dBm

Tx/Rx Signal Strength Ch0: 2/-8 dBm

Tx/Rx Signal Strength Ch1: -5/-9 dBm

Tx/Rx Signal Strength Ch2:

Signal To Noise: 102 dB

Tx/Rx CCQ: 81/58 %

P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT40-0	-8	00:04:27.82
HT20-3	-7	00:04:00.95
HT40-7	-7	00:00:00.00
HT20-4	-6	00:03:23.55
HT40-1	-6	00:04:27.43
HT40-2	-6	00:04:26.11
HT40-5	-6	00:00:03.47
6Mbps	-5	00:00:00.00
HT40-3	-5	00:00:14.69
HT40-6	-3	00:00:02.53
HT40-4	-1	00:00:08.49

Neighbor List

Neighbors Discovery Interfaces

Wireless Tables

Interfaces Netreame Dual Access List Registration Connect List Security Profiles Channels

Radio Name / MAC Address interface Uptime AP W... Last Activity (s) Tx/Rx Signal Strength (dBm) Tx/Rx Rate

link-2-cpe	00:0C:42:E9:41:77	wlan1	00:04:45	no	yes	0.000	2/-5	270.0Mbps/300.0Mbps
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Laboratorio en oficina:

- Presentación del enlace inalámbrico 2 (test TX – UDP)

admin@D4:CA:6D:6D:D7:2F (link-2-AP) - WinBox v6.12 on RB SXT G-2HnD (mipsbe)

CPU: 73% Hide Passwords

Bandwidth Test (Running)

Test To: 172.16.80.4
 Protocol: udp tcp
 Local UDP Tx Size: 1500
 Remote UDP Tx Size: 1500
 Direction: send
 TCP Connection Count: 20
 Local Tx Speed: bps
 Remote Tx Speed: bps
 Random Data: ☐
 User: admin
 Password:
 Lost Packets: 0
 Tx/Rx Current: 141.3 Mbps/0 bps
 Tx/Rx 10s Average: 133.4 Mbps/0 bps
 Tx/Rx Total Average: 56.4 Mbps/0 bps

Interface List

Interface	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)
R	bridge1	Bridge	1600	169.4 Mbps	11.6 kbps	14 006	23
RS	ether1	Ethernet	1600	74.2 kbps	8.8 kbps	25	12
RS	wlan1	Wireless (Atheros AR92xx)	2290	165.1 Mbps	5.4 kbps	13 668	11
DRS	wds41	WDS	2290	169.4 Mbps	5.4 kbps	14 003	11

AP Client <00:0C:42:E9:41:77>

General 802.1x Signal Ntreme NV2 Statistics

Last Activity: 0.000 s
 Tx/Rx Signal Strength: 2/-5 dBm
 Tx/Rx Signal Strength Ch0: -4/-6 dBm
 Tx/Rx Signal Strength Ch1: 2/-10 dBm
 Tx/Rx Signal Strength Ch2:
 Signal To Noise: 110 dB
 Tx/Rx CCQ: 55/90 %
 P Throughput:

Signal Strengths

Rate	Strength	Last Measured
HT20-1	-25	00:03:26.42
HT20-0	-24	00:03:22.46
HT20-2	-24	00:03:19.30
HT40-0	-21	00:03:22.05
HT40-1	-19	00:03:16.15
HT20-5	-12	00:00:00.70
HT40-2	-12	00:03:06.55
HT20-6	-6	00:00:04.51
HT20-7	-6	00:00:00.41
6Mbps	-5	00:00:00.00
HT20-3	-5	00:00:14.08

Channels

Channel	Frequency (MHz)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
1	2412	-25	270.0Mbps/240.0Mbps

Address List

Address	Network	Interface
10.0.0.2/30	10.0.0.0	wlan1
172.16.80.3/24	172.16.80.0	bridge1

RouterOS WinBox



Laboratorio en oficina:

Test bonding Rx tcp

admin@4C:5E:0C:5A:A1:F6 (R1) - WinBox v6.7 on RB2011iLS (mipsbe)

Safe Mode CPU:100% Hide Passwords

RouterOS WinBox

Interfaces

- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- MetaROUTER
- Partition
- Make Supout.nf
- Manual
- Exit

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRPP	Bonding	LTE
RS	bonding1	Bonding						
R	bridge1	Bridge						
R	ether1	Ethernet						
RS	ether2	Ethernet						
RS	ether3	Ethernet						
	ether4	Ethernet						
	ether5	Ethernet						
	ether6	Ethernet						
	ether7	Ethernet						
S	ether8	Ethernet						
R	ether9	Ethernet						
	ether10	Ethernet						
XS	vpls1	VPLS						

14 items (1 selected)

Neighbor List

Neighbors Discovery Interfaces

Interface	IP Address	MAC Address	Identity	Platform	Version	Board Name	IPv6	Age (s)	Uptime
bridge1	172.16.80.3	D4:CA:6D:6D:D7:2F	link-2-AP	MikroTik	6.12	RB SXT G-2HnD	no	9	5d 05:42:32
bridge1	172.16.80.4	00:0C:42:E9:41:76	link-2-CPE	MikroTik	6.12	RB SXT G-2HnD	no	18	5d 05:42:32
bridge1	172.16.80.6	4C:5E:0C:52:6F:A6	R2	MikroTik	6.7	RB2011iLS	no	52	3d 23:58:11
bridge1	172.16.80.2	D4:CA:6D:4E:E2:F3	link-1-CPE	MikroTik	5.21	RB SXT G-2HnD	no	32	6d 23:57:34
bridge1	172.16.80.1	D4:CA:6D:6C:0A:A0	link-1-AP	MikroTik	5.22	RB SXT G-2HnD	no	31	00:04:12

Bandwidth Test (Running)

Test To: 172.16.80.6

Protocol: udp tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: receive

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 0 bps/124.5 Mbps

Tx/Rx 10s Average: 0 bps/79.7 Mbps

Tx/Rx Total Average: 0 bps/76.8 Mbps

Tx: 0 bps

Rx: 124.5 Mbps

Running...

Laboratorio en oficina:

Test bonding Tx tcp

admin@4C:5E:0C:5A:A1:F4 (R1) - WinBox v6.7 on RB2011iLS (mipsbe)

Uptime: 00:13:15 CPU: 100% Hide Passwords

Safe Mode

Interfaces

- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- MetaROUTER
- Partition
- Make Supout.rtf
- Manual
- Exit

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
RS	bonding1	Bonding						
R	bridge1	Bridge						
RS	ether1	Ethernet						
RS	ether2	Ethernet						
RS	ether3	Ethernet						
	ether4	Ethernet						
	ether5	Ethernet						
	ether6	Ethernet						
R	ether7	Ethernet						
S	ether8	Ethernet						

Interface <bonding1>

General Bonding Traffic

Tx/Rx Rate: 115.0 Mbps / 6.4 Mbps

Tx/Rx Packet Rate: 10 051 p/s / 9 483 p/s

Tx/Rx Bytes: 1913.7 MiB / 6.7 GiB

Tx/Rx Packets: 1 404 399 / 5 197 270

Tx/Rx Drops: 0 / 0

Tx/Rx Errors: 0 / 0

Tx: 115.0 Mbps

Rx: 6.4 Mbps

Tx Packet: 10 051 p/s

Rx Packet: 9 483 p/s

enabled running slave

Bandwidth Test (Running)

Test To: 172.16.80.6

Protocol: ☐ udp ☒ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: send

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

☐ Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 143.7 Mbps/0 bps

Tx/Rx 10s Average: 125.9 Mbps/0 bps

Tx/Rx Total Average: 114.3 Mbps/0 bps

Tx: 143.7 Mbps

Rx:

running...

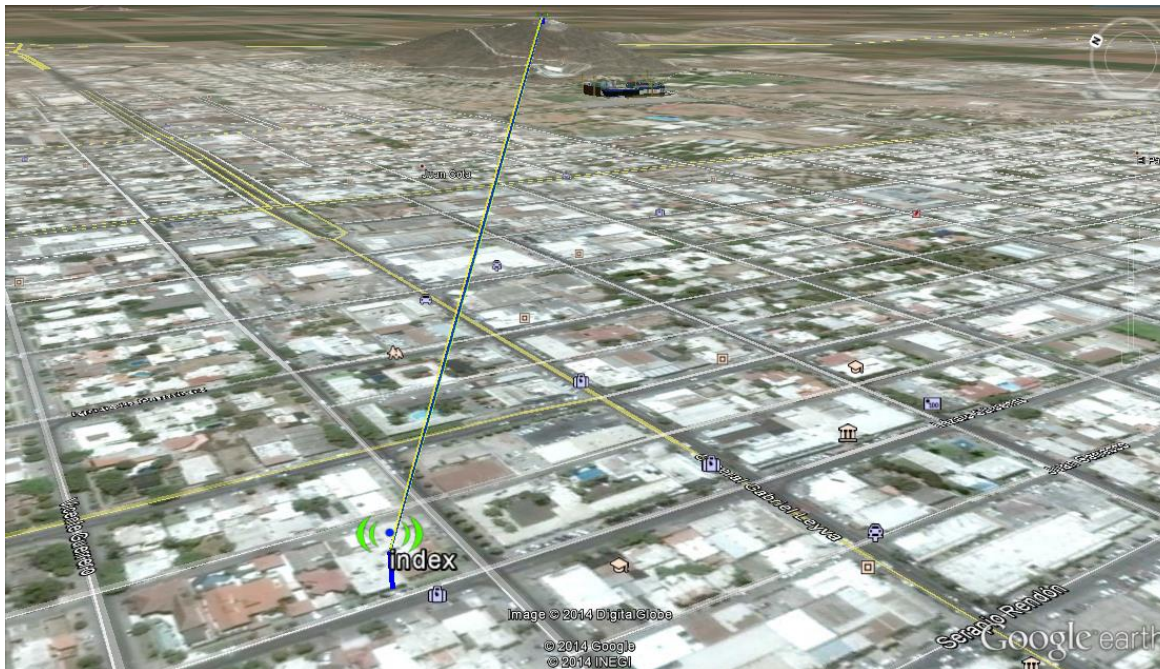
/	IP Address	MAC Address	Identity	Platform	Version	Board Name
	172.16.80.3	D4:CA:6D:6D:D7:2F	link-2-AP	Mikro Tik	6.12	RB SXT G-2HnD
	172.16.80.6	4C:5E:0C:52:6F:A6	R2	Mikro Tik	6.7	RB2011iLS
	172.16.80.2	D4:CA:6D:4E:E2:F3	link-1-CPE	Mikro Tik	5.21	RB SXT G-2HnD
	172.16.80.1	D4:CA:6D:6C:0A:A0	link-1-AP	Mikro Tik	5.22	RB SXT G-2HnD
	172.16.80.4	00:0C:42:E9:41:76	link-2-CPE	Mikro Tik	6.12	RB SXT G-2HnD



Laboratorio en campo:

Enlace instalado en sitio

- Distancia: 3 km.
- Altura en oficina: 6-8 mts.
- Altura en repetidor: 132 mts. sobre nivel del mar y 4 mts. de torre



Laboratorio en campo:

- Enlace instalado en oficina





Laboratorio en campo:

- Enlace instalado en repetidor





Laboratorio en campo:

Test Rx tcp

Interface List

Interface	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)
R bonding1	Bonding		4.5 Mbps	78.2 Mbps	6 612	7 113
R bonding1	Bridge	1598	121.6 kbps	5.7 kbps	17	9
RS ether1	Ethernet	1598	0 bps	0 bps	0	0
RS ether2	Ethernet	1598	2.2 Mbps	38.2 Mbps	3 306	3 433
RS ether3	Ethernet	1598	2.2 Mbps	39.9 Mbps	3 306	3 680
ether4	Ethernet	1598	0 bps	0 bps	0	0
ether5	Ethernet	1598	0 bps	0 bps	0	0
ether6	Ethernet	1598	0 bps	0 bps	0	0
ether7	Ethernet	1598	0 bps	0 bps	0	0
RS ether8	Ethernet	1598	145.2 kbps	8.4 kbps	22	11
ether9	Ethernet	1598	0 bps	0 bps	0	0
ether10	Ethernet	1598	0 bps	0 bps	0	0
sf1	Ethernet	1598	0 bps	0 bps	0	0

13 items

Neighbor List

Discovery Interfaces

Interface	IP Address	MAC Address	Identity	Platform	Version	Board Name	IPv6	Age (s)	Uptime
bonding1	172.16.80.1	D4:CA:6D:6C:0A:A0	link-1-AP	Mikro Tik	5.22	RB SXT G-2HnD	no	41	6d 00:2
bonding1	172.16.80.3	D4:CA:6D:6D:D7:2F	link-2-AP	Mikro Tik	6.12	RB SXT G-2HnD	no	39	6d 00:2
bonding1	172.16.80.4	00:0C:42:E9:41:76	link-2-CPE	Mikro Tik	6.12	RB SXT G-2HnD	no	24	1d 06:45:16
bonding1	172.16.80.2	D4:CA:6D:4E:E2:F3	link-1-CPE	Mikro Tik	5.21	RB SXT G-2HnD	no	15	1d 06:43:15
bonding1	172.16.80.6	4C:5E:0C:52:6F:A6	R2	Mikro Tik	6.7	RB2011HS	no	25	1d 06:50:11
bridge1	169.254.105.232	00:00:00:00:00:00					no	137	00:00:00

Bandwidth Test (Running)

Test To: 172.16.80.6

Protocol: ☒ udp ☐ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: receive

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

☐ Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 0 bps/67.9 Mbps

Tx/Rx 10s Average: 0 bps/64.8 Mbps

Tx/Rx Total Average: 0 bps/64.8 Mbps

Tx: 67.9 Mbps

01:49 p.m.
30/08/2014



Laboratorio en campo:

Test Tx tcp

admin@4C-5E-0C-5A-A1-F5 (R1) - WinBox v6.7 on RB2011iLS (mipsbe) CPU:100% Hide Passwords

Safe Mode

RouterOS WinBox

Interfaces

- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- MetaROUTER
- Partition
- Make Supout rf
- Manual
- Exit

Interface List

Interface	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)
R bonding1	Bonding		68.9 Mbps	3.7 Mbps	6184	5670
R bridge1	Bridge	1598	126.7 kbps	6.5 kbps	19	11
RS ether1	Ethernet	1598	0 bps	0 bps	0	0
RS ether2	Ethernet	1598	34.4 Mbps	1884.6 kbps	3092	2838
RS ether3	Ethernet	1598	34.4 Mbps	1893.5 kbps	3092	2832
RS ether4	Ethernet	1598	0 bps	0 bps	0	0
RS ether5	Ethernet	1598	0 bps	0 bps	0	0
RS ether6	Ethernet	1598	0 bps	0 bps	0	0
RS ether7	Ethernet	1598	0 bps	0 bps	0	0
RS ether8	Ethernet	1598	150.4 kbps	10.1 kbps	24	14
RS ether9	Ethernet	1598	0 bps	0 bps	0	0
RS ether10	Ethernet	1598	0 bps	0 bps	0	0
RS sfp1	Ethernet	1598	0 bps	0 bps	0	0

13 items

Neighbors List

Interface	IP Address	MAC Address	Identity	Platform	Version	Board Name	IPv6	Age (s)	Uptime
bonding1	172.16.80.1	D4 CA 6D 6C 0A A0	link-1-AP	MicroTik	5.22	RB SXT G-2HnD	no	48	6d 00:2
bonding1	172.16.80.3	D4 CA 6D 6D D7 2F	link-2-AP	MicroTik	6.12	RB SXT G-2HnD	no	46	6d 00:2
bonding1	172.16.80.4	00 0C 42 E9 41 76	link-2-CPE	MicroTik	6.12	RB SXT G-2HnD	no	31	1d 06:47:16
bonding1	172.16.80.2	D4 CA 6D 4E E2 F3	link-1-CPE	MicroTik	5.21	RB SXT G-2HnD	no	22	1d 06:45:15
bonding1	172.16.80.6	4C 5E 0C 52 6F A6	R2	MicroTik	6.7	RB2011iLS	no	32	1d 06:52:11

Bandwidth Test (Running)

Test To: 172.16.80.6

Protocol: ☐ udp ☒ tcp

Local UDP Tx Size: 1500

Remote UDP Tx Size: 1500

Direction: send

TCP Connection Count: 20

Local Tx Speed: bps

Remote Tx Speed: bps

☐ Random Data

User: admin

Password:

Lost Packets: 0

Tx/Rx Current: 80.3 Mbps/0 bps

Tx/Rx 10s Average: 53.2 Mbps/0 bps

Tx/Rx Total Average: 53.2 Mbps/0 bps

Graph: Tx 80.3 Mbps, Rx running

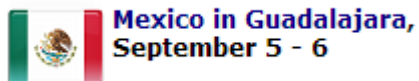
ES 01:51 p.m. 30/08/2014

PreBook 4530s

MUM MEXICO ON SEPTEMBER 05 - 06,
2014

Register for this event!

¡Gracias!



José Luis Sotelo Lavagnino

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