

# MikroTik new 60GHz implementation and its comparison with other existing MikroTik wireless solutions

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# Wireless band comparison

## 2.4GHz 802.11b/g/n

### *CONS*

- Crowded spectrum
- Low channel count

### *PROS*

- Higher distances
- Better penetration through objects

## 5GHz 802.11a/n/ac

### *CONS*

- DFS and radar detection
- Rapidly Increasing channel widths\*

### *PROS*

- High throughput
- More available channels

## 60GHz 802.11ad

### *CONS*

- Oxygen absorption

### *PROS*

- Highest throughput
- Free spectrum

# Wireless protocols

- 802.11
  - CSMA/CA (carrier sense multiple access/collision avoidance)
  - Easy/fast/compatible
- Nv2
  - TDMA (time division multiple access)
  - Secure/distant/stable/proprietary
- Nstreme
  - Secure/proprietary

# Wireless modes

- AP modes
  - AP-Bridge (multiple clients allowed, requires LVL 4+ license)
  - Bridge (One client allowed LVL 3 license)
- Station modes
  - Station (also works on NV2)
  - Station-wds (also works on NV2)
  - Station-pseudobridge
  - Station-pseudobridge-clone
  - Station bridge (also works on NV2)

# Station modes

- Station
  - No L2 bridging
  - Works on all protocols
  - Needs extra routing
- Station WDS
  - Works only on Router OS
  - Creates separate interface
  - Works on all protocols (802.11 only with ROS)

# Station modes

- Station-pseudobridge
  - Source MAC address replaced by routers MAC
  - Destination MAC replaced with address from mapping table
  - Don't work on Nv2
- Station pseudobridge-clone
  - Similar to station-pseudobridge mode
  - Copies first frames MAC address
  - Don't work on Nv2

# Wireless modes

- Wireless modes for 60GHz
  - Master
  - Slave
  - Sniff
- Configuration under */interface w60g* menu
  - minimum configuration -*
  - master and slave devices have matching SSID and*
  - W60G interfaces are enabled*

# Wireless Wire





# Wireless Wire

## Main features:

- Preconfigured 60GHz radio link (Plug and Play)
- 4 core CPU running at 716MHz, 256MB of RAM  
– fastest outdoor wireless device produced by MikroTik
- Only 5W of maximum power consumption.
- Range of 100 meters or more (1Gbit full duplex speeds)\*
- Beamforming and PtMP support

# Comparison with other MikroTik devices

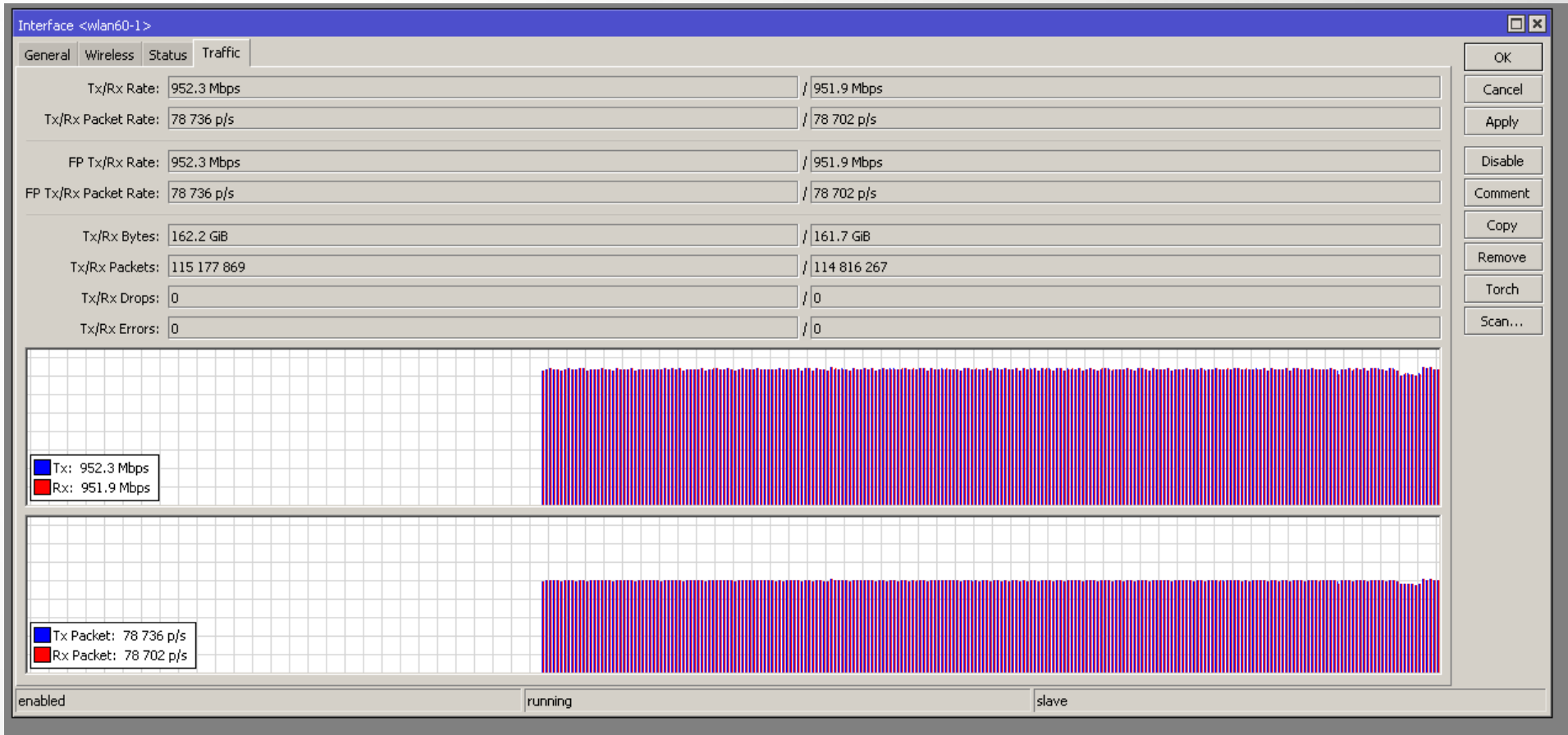
- Highest wireless throughput compared to any MikroTik wireless device at the moment

	Max throughput			Comments
	TX	RX	TX+RX	
<b>2.4GHz dual chain</b>	256Mbps	255Mbps	250Mbps	R11e-2HPnD+RB800 40MHz channel width
<b>5GHz dual chain</b>	558Mbps	561Mbps	570Mbps	R11e-5HPacD+RB800 80MHz channel width
<b>60GHz</b>	1Gbps	1Gbps	2Gbps	Limited by ethernet interface

\*Real life traffic throughput comparison

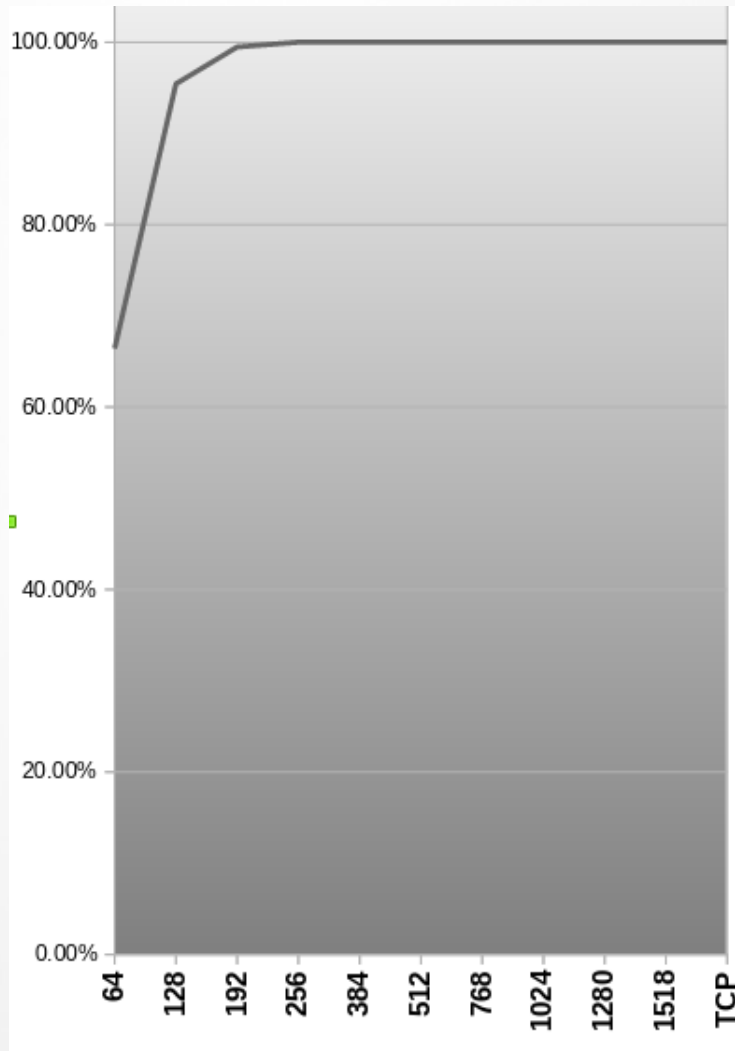
- Great value for short wireless links

# Performance in 100 meter link



\*Winbox traffic graph showing “Wireless Wire” speed on 100m link

# Performance comparison to wired network



Throughput (<0,1% loss)	Theoretical max		4096 Streams both ways		
	kpps	Mbps	kpps	Mbps	%
64	2976.1	1,523.8	1977	1,012.2	<b>66.43</b>
128	1689.2	1,729.7	1612	1,650.7	<b>95.43</b>
192	1179.2	1,811.3	1173	1,801.7	<b>99.47</b>
256	905.8	1,855.1	905.8	1,855.1	<b>100.00</b>
384	618.8	1,901.0	618.8	1,901.0	<b>100.00</b>
512	469.9	1,924.7	469.9	1,924.7	<b>100.00</b>
768	317.2	1,948.9	317.2	1,948.9	<b>100.00</b>
1024	239.4	1,961.2	239.4	1,961.2	<b>100.00</b>
1280	192.3	1,969.2	192.3	1,969.2	<b>100.00</b>
1518	162.5	1,973.4	162.5	1,973.4	<b>100.00</b>
TCP connection	181.6	1,970.6	181.6	1,970.6	<b>100.00</b>

\*All UDP tests are done with Xena Networks specialized test equipment (XenaBay), and done according to RFC2544 (Xena2544) with 0,1% acceptable loss

\*\*TCP tests done by using iperf3:

<https://iperf.fr/>

# Point to Multi Point support

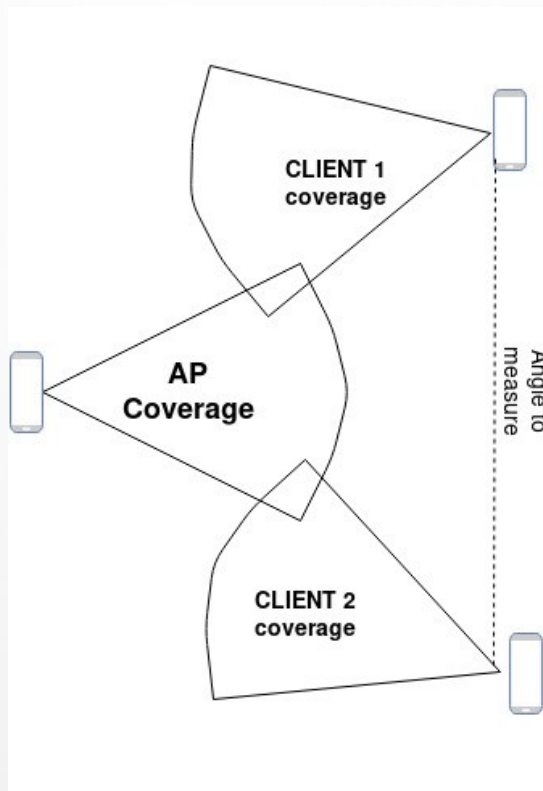
- Experimental support already available from 6.41rc4 (currently\* not supported in current and bugfix versions )

*\*21 October 2017*

- Requires level 4 license for Master device
- Connected clients are treated as individual interfaces – easy to configure and manage

# PtMP performance

- Beamforming capability provides larger coverage area



Distance in meters			
AP -CLIENT 1	AP -CLIENT 2	CLIENT 1 - CLIENT 2	Angle degrees
100	99	62	36.3
93	99	94	58.5
93	102	105	63.7
91.6	89	93	61.9
99	89	111.5	72.5
109	89	130	81.3
76	89	119	91.9
87.7	89	140	104.8
82.7	89	152	124.5

*\*Tests done with 200Mbit full duplex traffic to each client device*

# PtMP performance

- Up to 200Mbps simultaneously to each client in PtMP setup with 4 clients

```
[admin@60_AP] > interface monitor-traffic wlan60-slave-1,wlan60-slave-2,wlan60-slave-3,wlan60-slave-4
      name: wlan60-slave-1 wlan60-slave-2 wlan60-slave-3 wlan60-slave-4
rx-packets-per-second:      16 431      16 034      16 106      16 933
rx-bits-per-second:         198.7Mbps   193.9Mbps   194.8Mbps   204.8Mbps
fp-rx-packets-per-second:   16 431      16 034      16 106      16 933
fp-rx-bits-per-second:     198.7Mbps   193.9Mbps   194.8Mbps   204.8Mbps
rx-drops-per-second:        0          0          0          0
rx-errors-per-second:       0          0          0          0
tx-packets-per-second:      16 431      16 050      16 106      16 622
tx-bits-per-second:         198.7Mbps   194.1Mbps   194.8Mbps   201.0Mbps
fp-tx-packets-per-second:   16 431      16 050      16 106      16 622
fp-tx-bits-per-second:     198.7Mbps   194.1Mbps   194.8Mbps   201.0Mbps
tx-drops-per-second:        0          0          0          0
tx-queue-drops-per-second:  13         364        318         0
tx-errors-per-second:       0          0          0          0
-- [Q quit|D dump|C-z pause]
```

# Live demo

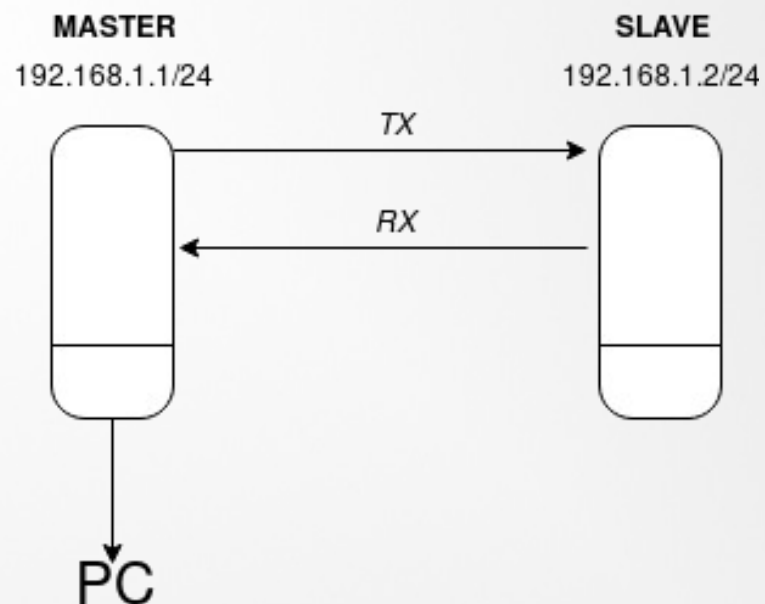
Few suggestions for wireless link testing

- It's preferred not to run bandwidth testing tools on wireless devices
- Btest
- Traffic-generator
- Iperf and iperf3
- Other tools



# Live Demo

## Test setup:



```
/tool traffic-generator packet-template  
add ip-dst=192.168.1.1 ip-gateway=192.168.1.2 ip-src=192.168.1.10 name=test1 udp-dst-port=100-300  
/tool traffic-generator stream  
add mbps=900 name=stream1 packet-size=1500 tx-template=test1
```

# Live demo

- To start Traffic Generator run:

*/tool traffic-generator start*

- To stop:

*/tool traffic-generator stop*

- To run temporary Traffic-Generator with extra arguments:

*/tool traffic-generator quick mbps=300 packet-size=256 duration=100*

**Thank you for your attention**

**Questions?**