

MikroTik Hotspot & Bandwidth Management

Michael Takeuchi, MTCNA, MTC(ALL)E, JNCIA-Junos, CCNA-RS

Areta Informatics College

28 January 2018

Little Things About Me

- My name is **Michael Takeuchi**
- Was MikroTik Certified on MTCNA, MTCRE, MTCINE, MTCUME, MTCWE, MTCTCE, MTCIPv6E
- MikroTik Certified Consultant on mikrotik.com
- Was Juniper Certified on JNCIA-Junos
- Was Cisco Certified on CCNA-RS
- January 2017 – June 2017 Work as Remote Network Engineer at Middle East
- July 2017 – Now Work as Network Analyst at Internet Service Provider (AS38320)



Objective

- Not only can configure the network, but also can explain what you configure to the other
- Not only pass the practical exam, but also can implement what you know on field
- Understand what is Quality of Service
- Understand how hotspot works

Presentation Outline

- Introduction to MikroTik
 - What is MikroTik?
 - MikroTik History
 - MikroTik RouterOS
 - RouterOS Features
 - MikroTik User Interfaces
- Hotspot
 - Hotspot Example Networks
 - How does it work?
 - Hotspot Component
 - Hotspot Setup
- Quality of Services
 - QoS Aspects
- Bandwidth Management
 - Simple Queue
 - Dynamic Queue
- LAB & Discussion

Introduction to MikroTik

MikroTik

- Name of Company & Brand (<https://www.mikrotik.com>)
- Which Has Product (<https://mikrotik.com/products>) :
 - RouterBOARD
 - Wireless Devices
 - Cloud Core Router & Cloud Router Switch
 - **RouterOS** – MikroTik Operating System (Used on MikroTik Product & x86/x64)
- Which Has Program:
 - MikroTik Academy
 - Certification (MTCNA, MTCRE, MTCIPv6E, MTCTCE, MTCUME, MTCWE, MTCINE)
- Headquarter: Riga, Latvia, Europe

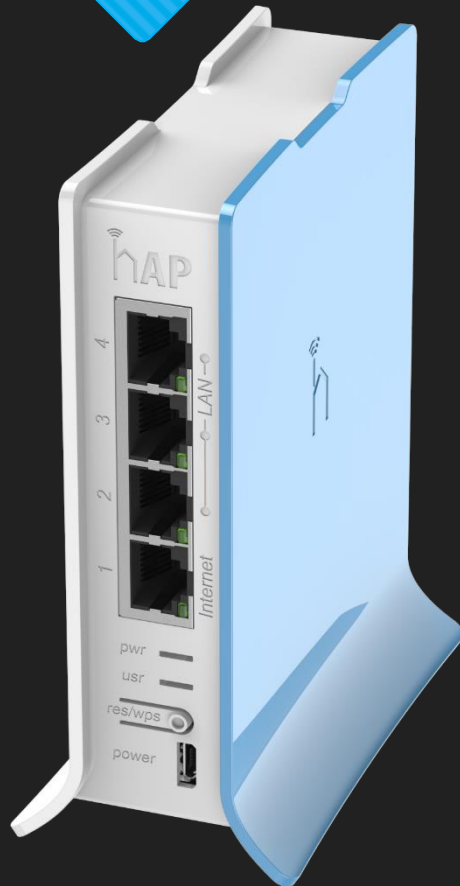
MikroTik History

- Created on 1995 by John Tully (CEO) & Arnis Riekstins (CTO)
- Established on 1996
- First Time Using Linux Kernel 2.2 by 5 – 15 Person
- Be Wireless ISP (WISP) Before Being MikroTik Company

MikroTik RouterOS

- RouterOS is MikroTik's stand-alone operating system based on linux v3.3.5 kernel.
- Can be installed on PC x86 and also Virtualization Environment x64 (CHR)

RouterOS Features



- Routing
- Firewall
- QoS / BW Management
- Server / Services
- Interface
- IPv6

User Interfaces - Console

Terminal

```
MMM      MMM      KKK      TTTTTTTTTTT      KKK
MMMM     MMMM     KKK      TTTTTTTTTTT      KKK
MMM MMMM MMM III KKK KKK RRRRRR 000000 TTT III KKK KKK
MMM MM  MMM III KKKKK RRR RRR 000 000 TTT III KKKKK
MMM      MMM III KKK KKK RRRRRR 000 000 TTT III KKK KKK
MMM      MMM III KKK KKK RRR RRR 000000 TTT III KKK KKK
```

MikroTik RouterOS 6.40.1 (c) 1999-2017 <http://www.mikrotik.com/>

```
[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]        Completes the command/word. If the input is ambiguous,
              a second [Tab] gives possible options

/            Move up to base level
..           Move up one level
/command     Use command at the base level
[takeuchi@MikroTik] > █
```

User Interfaces - WinBox

RouterOS WinBox

takeuchi@192.168.94.28 (MikroTik) - WinBox v6.40.1 on hAP mini (smips)

Session Settings Dashboard

Safe Mode Session: 192.168.94.28

Quick Set CAPsMAN Interfaces Wireless Bridge PPP Switch Mesh IP IPv6 MPLS OpenFlow Routing System Queues Files Log Radius Tools New Terminal Make Supout.tif Manual New WinBox Ext

Route List

Routes Nexthops Rules VRF

Find all

	Dest. Address	Gateway	Distance	Routing Mark	Pref. Source
AS	0.0.0.0/0	192.168.94.1 reachable ether1	1		
DAC	192.168.90.0/29	br-local reachable	0		192.168.90.1
DAC	192.168.94.0/27	ether1 reachable	0		192.168.94.28

Address List

Find

Address	Network	Interface
192.168.90.1/29	192.168.90.0	br-local
192.168.94.28/27	192.168.94.0	ether1

2 items

User Interfaces - WebFig

RouterOS v6.40.1 (stable)

Quick Set WebFig Terminal

Interface List

Add New

5 items

		▲ Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx
[D]	R	↕ br-local	Bridge	1500	1598	122.0 kbps	14.6 kbps	20	19	0 bps	14.6 kbps
[D]	R	↕ ether1	Ethernet	1500	1598	6.0 kbps	61.0 kbps	8	10	6.0 kbps	73.2 kbps
[D]	RS	↕ ether2	Ethernet	1500	1598	123.4 kbps	14.2 kbps	21	17	122.4 kbps	14.6 kbps
[D]		↕ ether3	Ethernet	1500	1598	0 bps	0 bps	0	0	0 bps	0 bps
[D]	S	↕ wlan1	Wireless (Atheros AR9	1500	1600	0 bps	0 bps	0	0	0 bps	0 bps

Hotspot

Hotspot

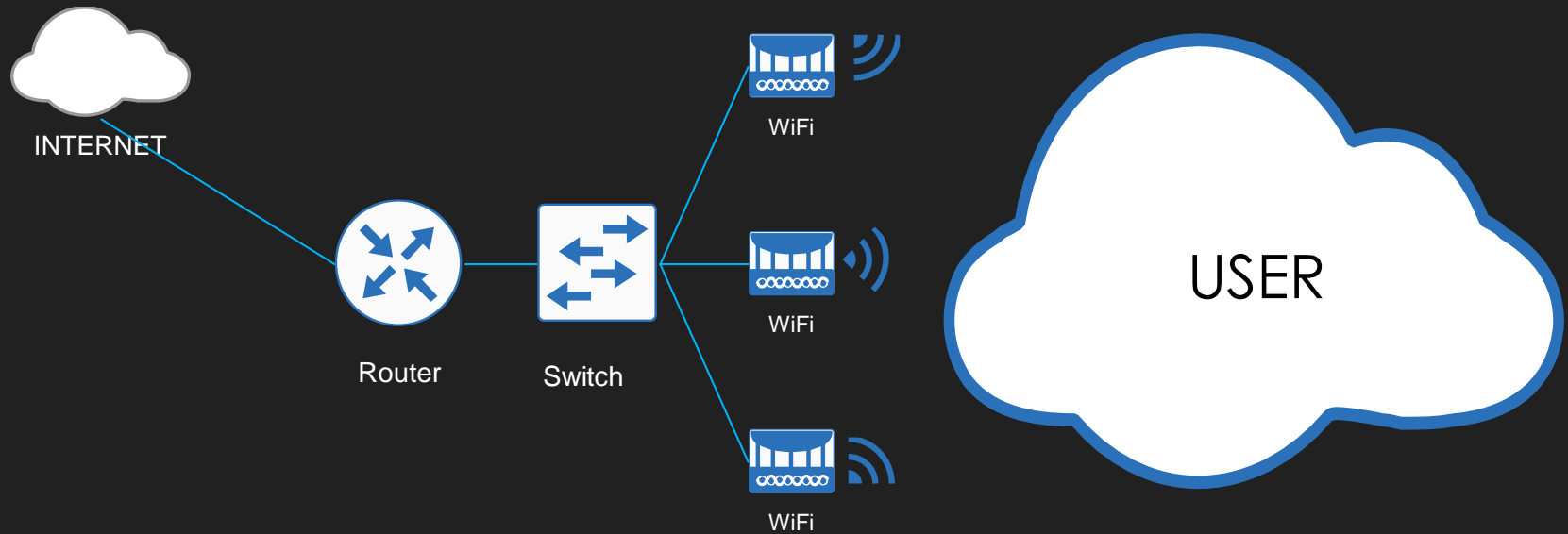
The MikroTik HotSpot Gateway provides authentication for clients before access to public networks .

- HotSpot Gateway features:

1. different authentication methods of clients using local client database on the router, or remote RADIUS server
2. users accounting in local database on the router, or on remote RADIUS server
3. walled-garden system, access to some web pages without authorization
4. login page modification, where you can put information about the company
5. automatic and transparent change any IP address of a client to a valid address

<https://wiki.mikrotik.com/wiki/Manual:IP/Hotspot>

Hotspot Example Networks



How does it works?

1. User try to open browser
2. User try to open website
3. If the ip or mac not listed in cookies and ip binding or walled-garden the user will be redirected to miktotik hotspot login page
4. User doing authentication
5. If match with database on local router or RADIUS
 - Then
 - Authenticated (Logged in)
 - Else
 - Prohibited

Hotspot Component

1. Firewall Filter
2. Firewall NAT
3. Firewall Mangle
4. DHCP Server + IP Pool
5. Proxy Server
6. DNS Server
7. Queue

Hotspot Setup

- [admin@MikroTik] /ip dhcp-client
- [admin@MikroTik] add interface=WAN disabled=no
- [admin@MikroTik] /ip address
- [admin@MikroTik] add address=192.168.88.1/24 interface=LAN

Hotspot Setup

○ [admin@MikroTik] /ip hotspot> setup

Select interface to run HotSpot on

hotspot interface: LAN

Set HotSpot address for interface

local address of network: 192.168.88.1/24

masquerade network: yes

Hotspot Setup

Set pool for HotSpot addresses

address pool of network: 192.168.88.2-192.168.88.254

Select hotspot SSL certificate

select certificate: none

Select SMTP server

ip address of smtp server: 0.0.0.0

Hotspot Setup

Setup DNS configuration

dns servers: 192.168.88.1

DNS name of local hotspot server

dns name: myhotspot

Create local hotspot user

name of local hotspot user: admin

password for the user:

○ [admin@MikroTik] /ip hotspot>

Quality of Services

Quality of service (QoS) is the description or measurement of the overall performance of a service, such as a telephony or computer network or a cloud computing service, particularly the performance seen by the users of the network.

QoS Aspects

1. Packet loss

occurs when one or more packets of data travelling across a computer network fail to reach their destination.

2. Bit rate

is the number of bits that are conveyed or processed per unit of time.

3. Throughput

is the maximum rate of production or the maximum rate at which something can be processed.

4. Transmission delay

is the amount of time required to push all the packet's bits into the wire. In other words, this is the delay caused by the data-rate of the link.

QoS Aspects

5. Availability

The ratio of (a) the total time a functional unit is capable of being used during a given interval to (b) the length of the interval.

6. Jitter

is the deviation from true periodicity of a presumably periodic signal, often in relation to a reference clock signal. In clock recovery applications it is called **timing jitter**.

Bandwidth Management

Bandwidth management is the process of measuring and controlling the communications (traffic, packets) on a network link, to avoid filling the link to capacity or overfilling the link, which would result in network congestion and poor performance of the network.

Simple Queue

- Can be used to easy limit the data rate of:
 - Client's download (↓) speed
 - Client's upload (↑)speed
 - Client's total speed (↓ + ↑)

/queue simple

add name=PC1 target=192.168.88.11 max-limit=1M/1M

Dynamic Queue

- Queue type for optimising large QoS deployments by limiting per 'sub-stream'
- Substitute multiple queues with one
- Several classifiers can be used:
 - source/destination IP address
 - source/destination port

Dynamic Queue

- Rate - max available data rate of each substream
- Limit - queue size of single sub-stream (KiB)
- Total Limit - max amount of queued data in all sub-streams (KiB)

Dynamic Queue – Example

- Goal: limit all clients to 1Mbps download and 1Mbps upload bandwidth
- Create 2 new queue types
 - 1 for Dst Address (download limit)
 - 1 for Scr Address (upload limit)
- Set queues for LAN and WAN interfaces

Dynamic Queue – Example

```
/queue type
```

```
add name="PCQ_download" kind=pcq pcq-rate=1M pcq-  
classifier=dst-address
```

```
add name="PCQ_upload" kind=pcq pcq-rate=1M pcq-  
classifier=src-address
```

```
/queue simple
```

```
add max-limit=1M/1M name=PCQ  
queue=PCQ_upload/PCQ_download target=192.168.88.0/24
```

http://mikrotik.co.id/artikel_lihat.php?id=98

LAB & Discussion