

# **The mAP and mAP lite: The Wireless Swiss Knife to have always in your pocket**

by Lorenzo Busatti

UNITED STATES ON APRIL 28 - 29, 2016

# About me

## Lorenzo Busatti

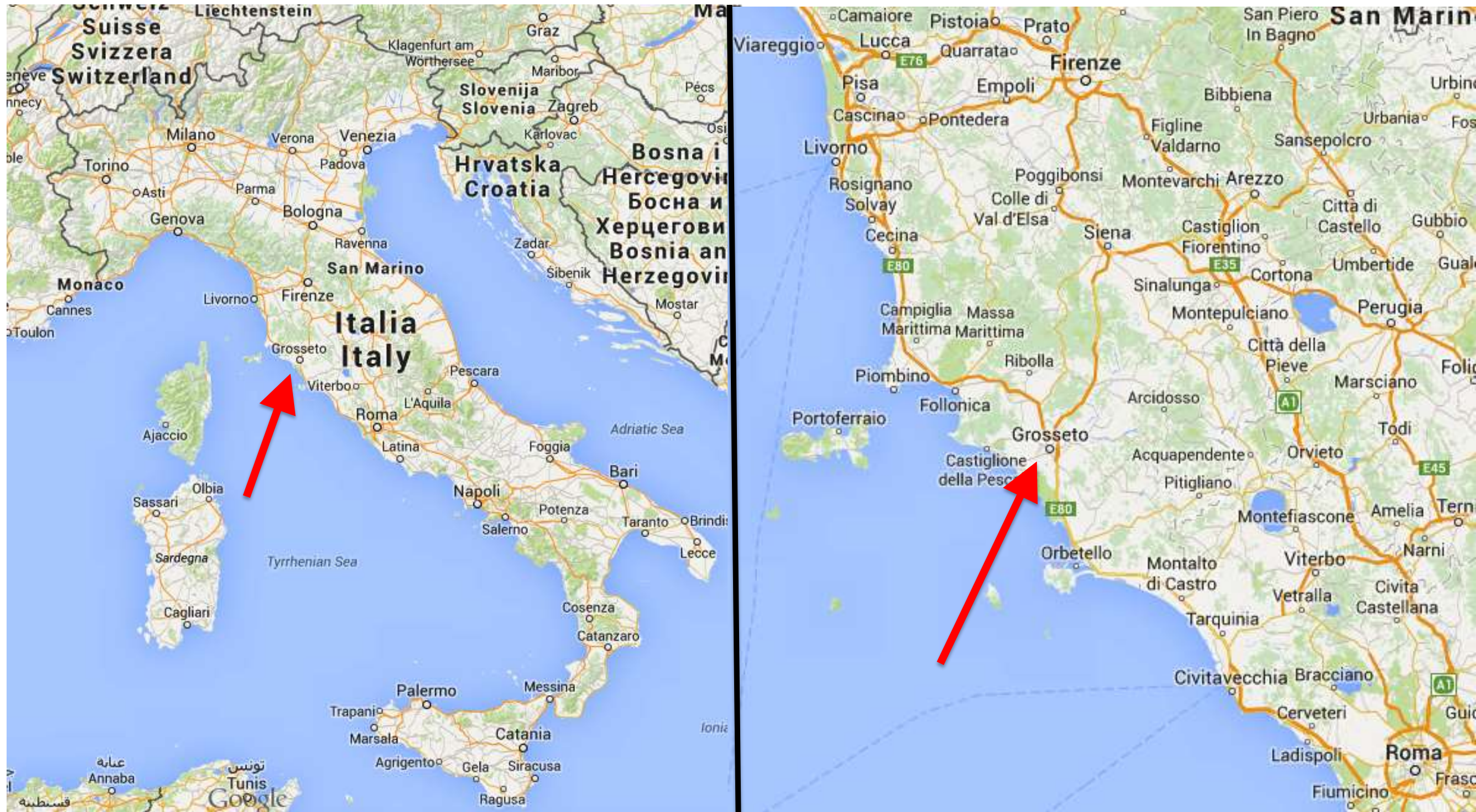
- Founder of Grifonline S.r.l. [ISP] (1997)
- Founder of Linkwave [WISP] (2006)
- MikroTik Trainer (2010)
- Member of RIPE, AMS-IX, MIX-IT







# About me







I'm a MikroTik *enthusiast*



I'm a MikroTik *enthusiast*

I'm a MikroTik *evangelist*

# About me

- Founder (2016) of the



**Non Profit Organization for  
High Quality Training Partners**



*Dedicated to Max*

# mAP and the mAP lite

This presentation is dedicated to the “mAP *family*”:

- A beautiful product;
- So smart;
- With tons of use and applications



# Why this presentation?

I started to think about nice applications that will be perfect with the mAPs at the 10<sup>th</sup> MUM in Prague in the 2015.

Over my concepts, I hope you'll find new way to have RouterOS with you.

# The mAP 2n





# The mAP 2n

<b>CPU</b>	<b>400 MHz</b>
<b>RAM</b>	<b>64 MB</b>
<b>10/100 Eth ports</b>	<b>TWO</b>
<b>USB ports</b>	<b>1 (power and DATA)</b>
<b>Wireless</b>	<b>802.11b/g/n</b>
<b>Number of chains</b>	<b>ONE</b>
<b>Antenna gain</b>	<b>1.2 dBi</b>
<b>Max TX power</b>	<b>17 dBm</b>
<b>Min RX signal</b>	<b>-96 dB</b>
<b>Powerable by</b>	<b>jack, PoE, USB</b>
<b>802.3af support</b>	<b>NO</b>
<b>input voltage</b>	<b>8 V - 57 V</b>
<b>PoE in</b>	<b>YES</b>
<b>PoE out</b>	<b>YES</b>
<b>Dimensions</b>	<b>68x68x19mm</b>
<b>Operating System</b>	<b>RouterOS L4</b>

# The mAP 2n

- I was excited when I bought one
- Powerable by almost everything
- Small
- With PoE out
- USB port for storage or 4G key
- Cost only \$ 45.00
- This is the product that I love to talk about it in my training classes



map<sup>2n</sup>



What is “better”  
than a mAP ?



# The mAP lite



# The mAP lite

<b>CPU</b>	<b>650 MHz</b>
<b>RAM</b>	<b>64 MB</b>
<b>10/100 Eth ports</b>	<b>ONE</b>
<b>USB ports</b>	<b>1 (only for power)</b>
<b>Wireless</b>	<b>802.11b/g/n</b>
<b>Number of chains</b>	<b>TWO</b>
<b>Antenna gain</b>	<b>1.5 dBi</b>
<b>Max TX power</b>	<b>22 dBm</b>
<b>Min RX signal</b>	<b>-96 dB</b>
<b>Powerable by</b>	<b>PoE, USB</b>
<b>802.3af/at support</b>	<b>YES</b>
<b>input voltage</b>	<b>5 V - 60 V</b>
<b>PoE in</b>	<b>YES</b>
<b>PoE out</b>	<b>NO</b>
<b>Dimensions</b>	<b>48x49x11mm</b>
<b>Operating System</b>	<b>RouterOS L4</b>





# The mAP lite

- After the mAP 2n, that I was excited for, with the mAP lite I become euphoric!!
- Smallest than the mAP
- With dual chain antennas
- Cost only \$25.00 😊

# Comparing the mAP family

	mAP 2n	mAP lite
CPU	400 Mhz	650 MHz
RAM	64 MB	64 MB
10/100 Eth ports	TWO	ONE
USB ports	1 (power and data)	1 (only for power)
Wireless	802.11b/g/n	802.11b/g/n
Number of chains	ONE	TWO
Antenna gain	1.2 dBi	1.5 dBi
Max TX power	17 dBm	22 dBm
Min RX signal	-96 dB	-96 dB
Powerable by	Jack, PoE, USB	PoE, USB
802.3af/at support	NO	YES
input voltage	8 V - 57 V	5 V - 60 V
PoE in	YES	YES
PoE out	YES	NO
Price	\$45.00	\$25.00

# Comparing the mAP family

	mAP 2n	mAP lite
CPU	400 Mhz	<b>650 MHz</b>
RAM	64 MB	64 MB
10/100 Eth ports	<b>TWO</b>	ONE
USB ports	1 ( <b>power and data</b> )	1 (only for power)
Wireless	802.11b/g/n	802.11b/g/n
Number of chains	<b>ONE</b>	<b>TWO</b>
Antenna gain	1.2 dBi	<b>1.5 dBi</b>
Max TX power	17 dBm	<b>22 dBm</b>
Min RX signal	-96 dB	-96 dB
Powerable by	<b>Jack, PoE, USB</b>	PoE, USB
802.3af/at support	NO	<b>YES</b>
input voltage	8 V - 57 V	5 V - 60 V
PoE in	YES	YES
PoE out	<b>YES</b>	NO
Price	\$45.00	<b>\$25.00</b>



# Comparing the mAP family

And what about sizes and weight?

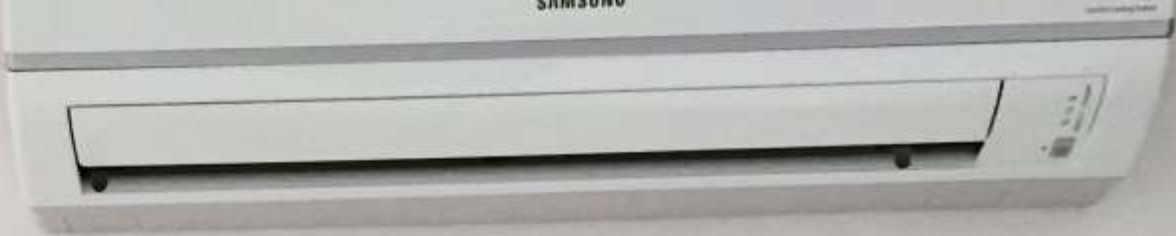


map<sup>2n</sup>

map<sup>lite</sup>







# Unique features

## **mAP 2n:**

2 Ethernet ports

PoE OUT and powerable by a jack

USB for data (and power)

## **mAP lite:**

Smaller and lighter than the mAP 2n

Powerful wireless with 2 chains

802.3af/at support

Cheaper

With a magnet





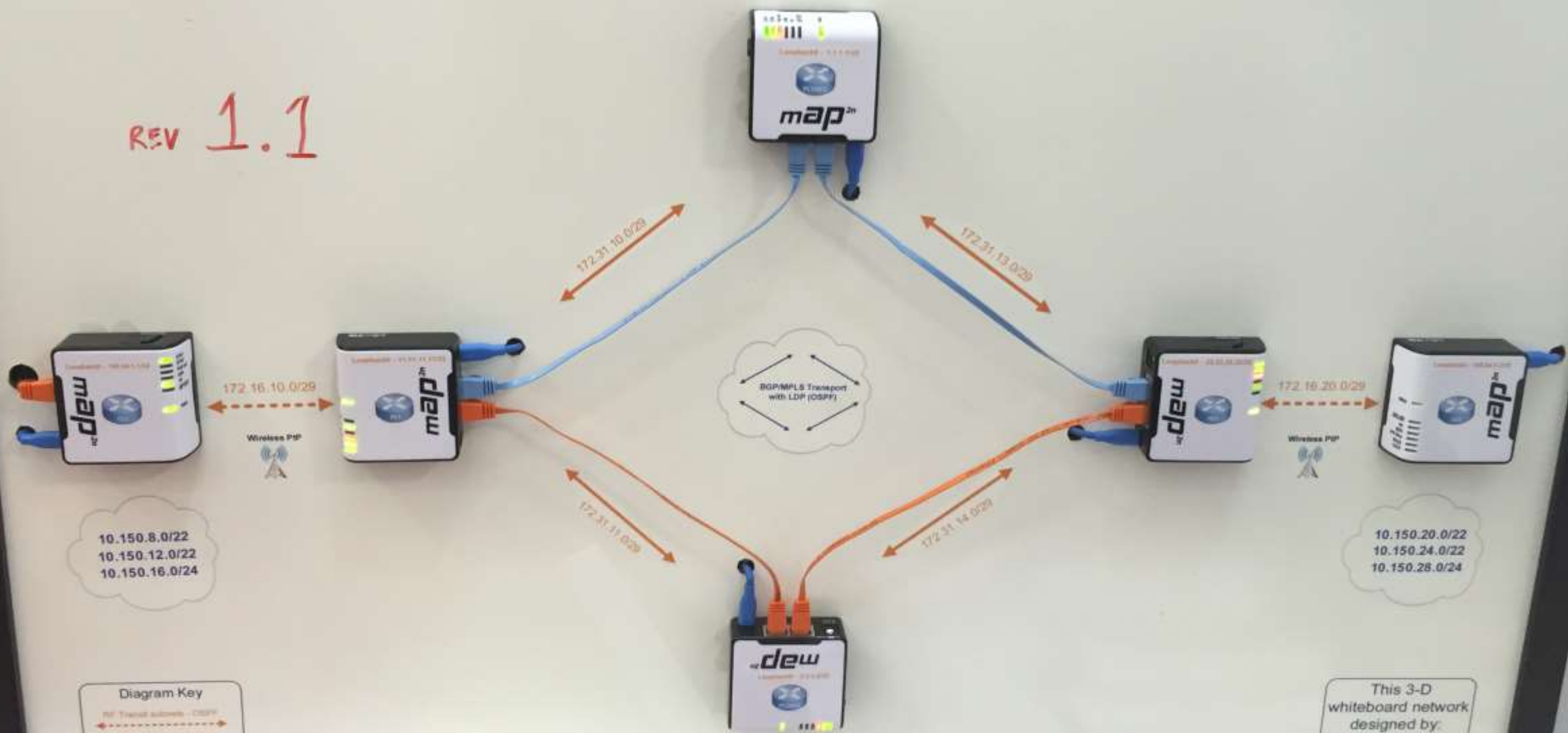
# The power of RouterOS

- ALL the functions and his POWER into these small devices!
- APs, firewall, traffic shaper, hotspot, ospf, ... and also MPLS, BGP and the usermanager!
- Awesome!
- No, doesn't run the Dude server

# WORLD'S SMALLEST MPLS ISP

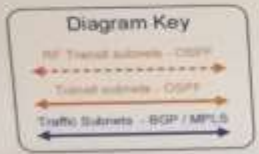
Powered by  
**MikroTik**

REV 1.1



10.150.8.0/22  
10.150.12.0/22  
10.150.16.0/24

10.150.20.0/22  
10.150.24.0/22  
10.150.28.0/24



This 3-D whiteboard network designed by:  
**ArchiTechs**  
MANAGED SERVICES

PACKETS

An LSA Type 5 packet walks into a bar and asks the bartender for a drink.

FRAMES

# Wireless performances

Trying them on the field, I didn't find differences in wireless performances.

They have different Wireless chip:

- AR9331 on mAP 2n
- QCA9533 on mAP lite

The mAP 2n seem to receive better signals

# Wireless performances

Testing the mAP 2n (against hAP ac lite, indoor)

admin@4C:5E:0C:CA:1A:B7 (MikroTik) - WinBox v6.35.1 on mAP (mipsbe)

board

Session: 4C:5E:0C:CA:1A:B7

### Wireless Tables

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

[-] [Filter] [00] Reset

Radio Name	MAC Address	Interface	Uptime	AP	...	Last Activi...	Tx/Rx Signal ...	Tx Rate	Rx Rate
D4CA6DB...	D4:CA:6D:B7:E5:EE	wlan1	00:02:21	yes	no	0.000	-47/-55	11Mbps	121.5Mbps...

Lost Packets: 3581

Tx/Rx Current: 0 bps/90.9 Mbps

Tx/Rx 10s Average: 0 bps/101.9 Mbps

Tx/Rx Total Average: 0 bps/96.3 Mbps

running...



# Wireless performances

Testing the mAP lite (against hAP ac lite, indoor)

admin@4C:5E:0C:14:47:EA (MikroTik) - WinBox v6.35.1 on mAP lite (mipsbe)

oard

Session: 4C:5E:0C:14:47:EA

Wireless Tables

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

[-] [Filter] [Reset] Find

Radio Name	MAC Address	Interf...	Uptime	AP	...	Last ...	Tx/Rx Signal ...	Tx Rate	Rx Rate
↕ D4CA6DB...	D4:CA:6D:B7:E5:EE	wlan1	00:03:27	yes	no	0.000	-43/-57	270Mbps-40MHz/25/SGI	120Mbps-40MHz/25/SGI

1 item

Lost Packets: 5918

Tx/Rx Current: 0 bps/100.8 Mbps

Tx/Rx 10s Average: 0 bps/88.8 Mbps

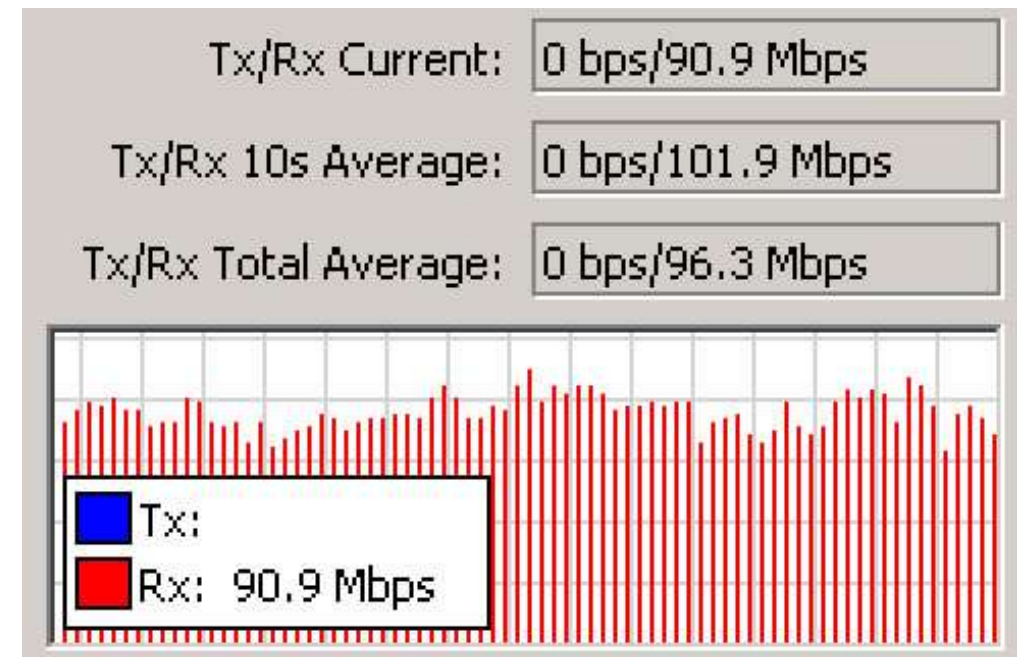
Tx/Rx Total Average: 0 bps/70.2 Mbps

running...

# Wireless performances

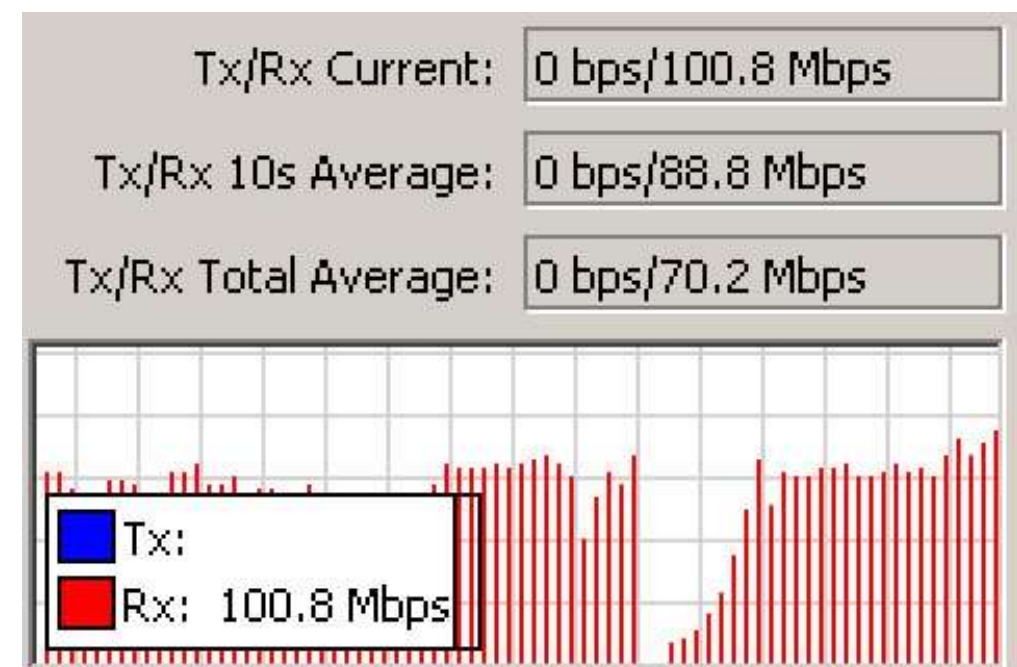
## mAP

Tx/Rx Signal ...	Tx Rate	Rx Rate
-47/-55	11Mbps	121.5Mbps...



## mAP lite

Tx/Rx Signal ...	Tx Rate	Rx Rate
-43/-57	270Mbps-40MHz/25/SGI	120Mbps-40MHz/25/SGI



# Practical applications of the mAPs

Probably they was designed as low cost home AP.

But these products are applicable in amazing wireless projects and in the security field.

# My 1<sup>st</sup> impact

The first time I saw the mAP, I had this “vision”:





# Inline pentest

(A security application for the mAP)



**uz dew**



# Inline pentest

“Inline” security test (and with poe) with the mAP:

- Vlan untagging
- Traffic filtering and manipulating (using the L2 bridge firewall)
- Traffic dump “live” on screen
- Traffic dump to remote Wireshark (wifi connected)

# Inline pentest

We're not at the Black Hat conference, so from here you have to use your own imagination about security applications of the mAP 😊



# Wireless Applications

# Wireless applications

Your mAP can be:

- A “simple” stand-alone AP
- An AP under a CAPsMAN control

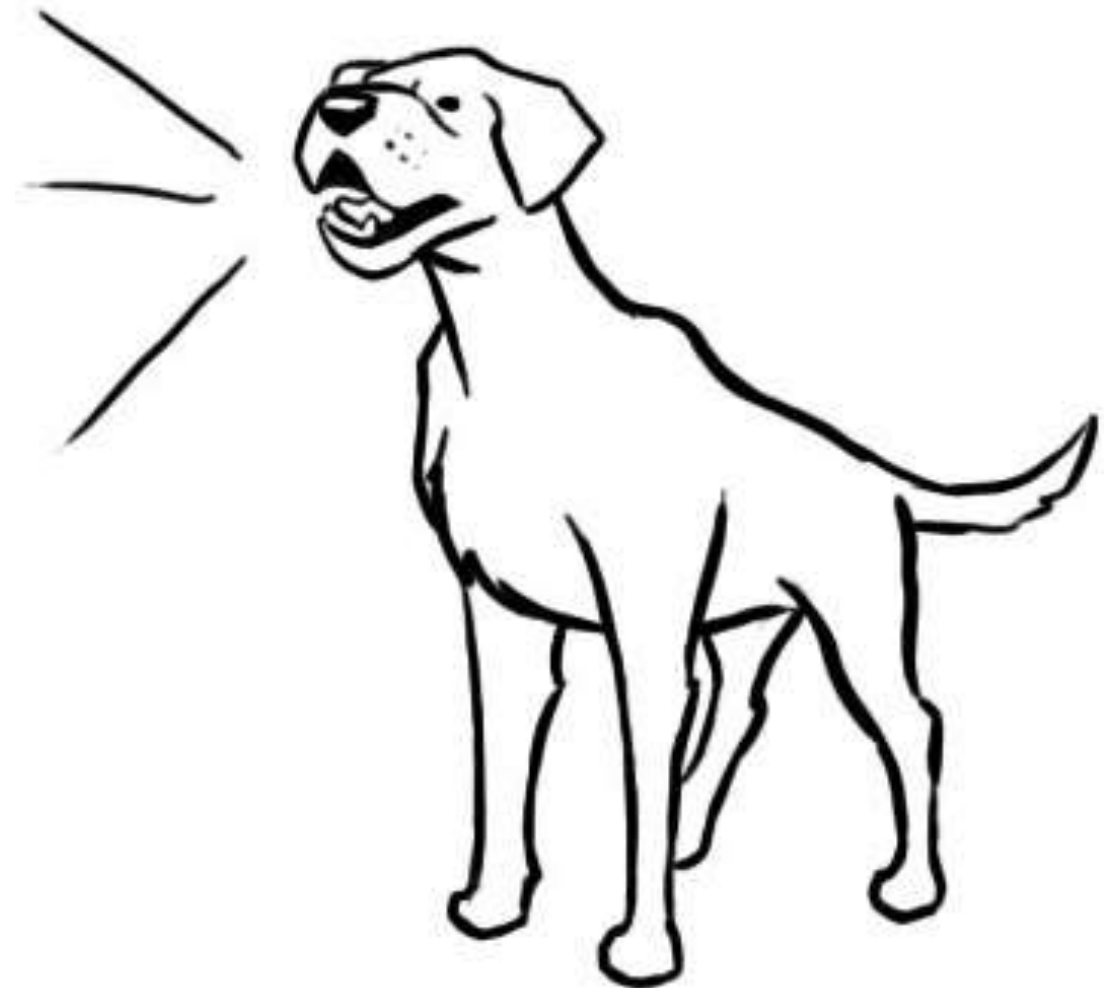
But since ROS 6.35 (**wireless-rep**) can be:

- A repeater
- A station with multiple Virtual APs

# Granular wireless coverage

“Some” vendors say that they support up to 500 concurrent user.

My question is:  
With how much  
Bandwidth each one?



# Granular wireless coverage

Few “powerful” APs Vs a “team” of mAPs.

The total bandwidth is incomparable.



# Granular wireless coverage

An hotel floor,  
40 rooms.

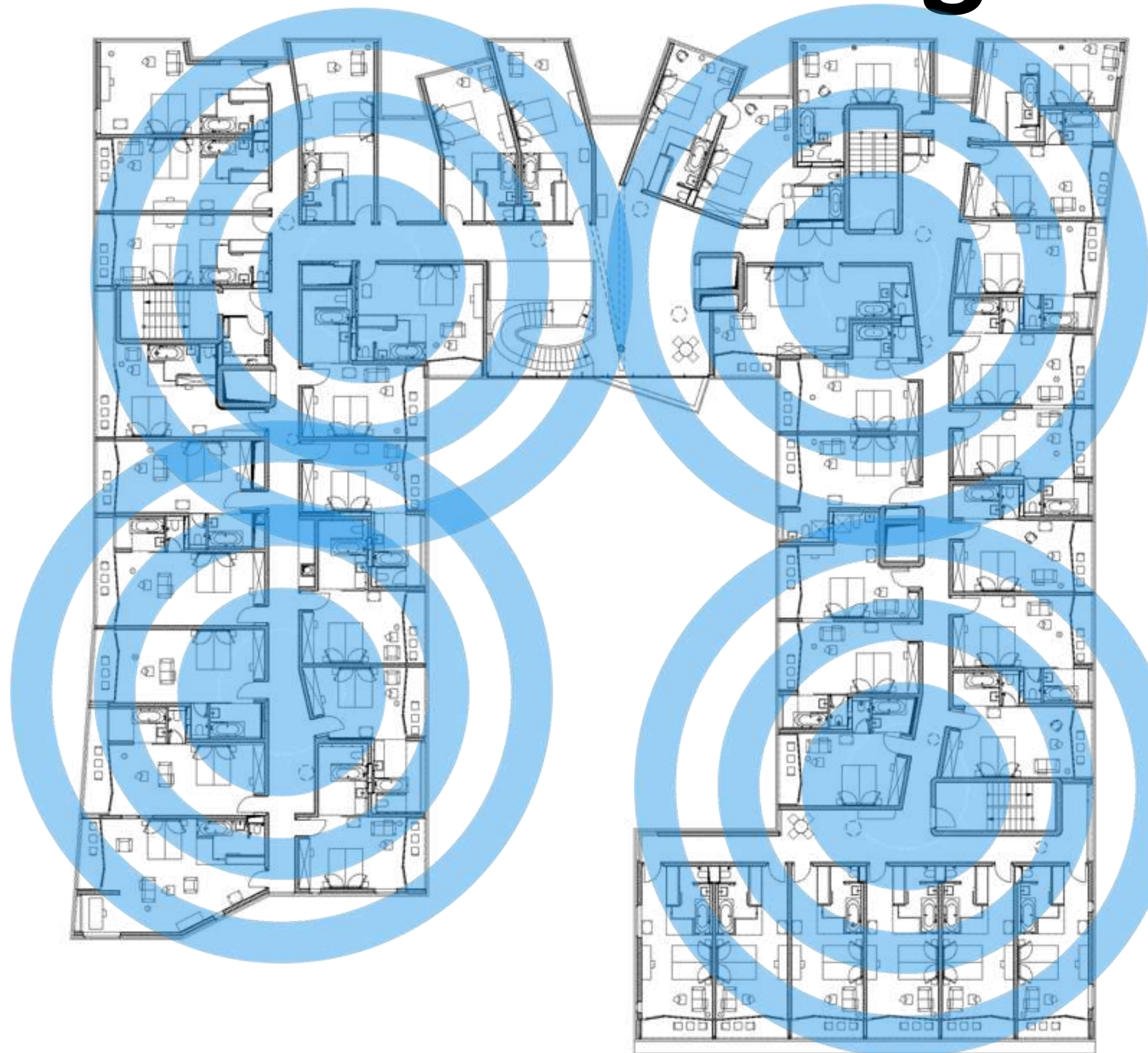
With 2 peoples  
each one the max  
total is 80 peoples.



# Common wireless coverage

A "Common"  
hotel coverage:  
4 "expensive"  
APs per floor.

Max total BW:  
100 Mbps each.

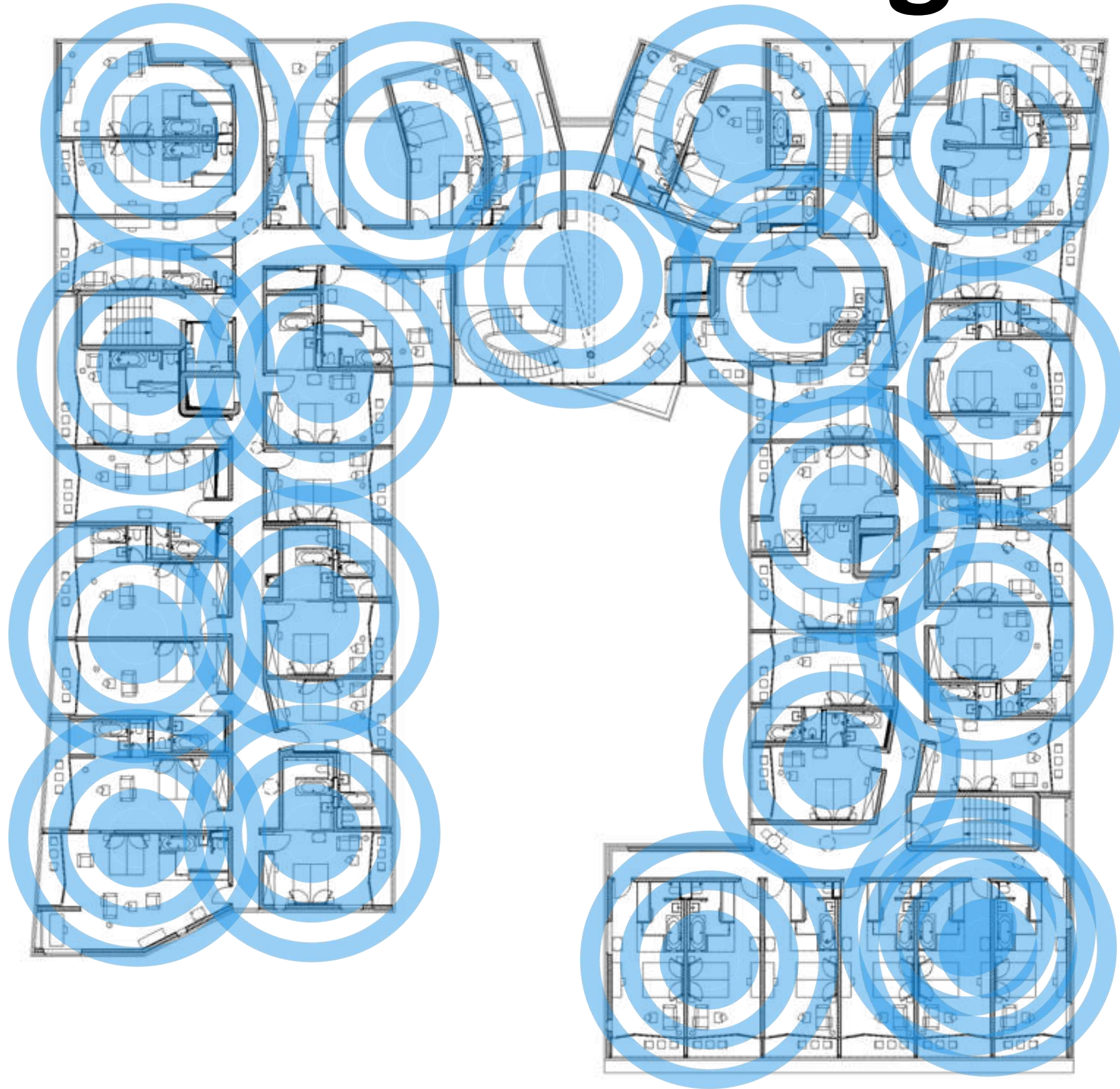




# Granular wireless coverage

“Granular” hotel coverage:  
20 mAP lite per floor.

Max total BW:  
50 Mbps each.



# Common wireless coverage

The “common” version:

4 “expensive” APs: \$ 500.00 each

1 “expensive” controller: \$ 1,000.00

Total devices expenses: \$ 3,000.00

Total maximum BW: 400 Mbps

Min bandwidth each one: 5 Mbps



# Granular wireless coverage

The “Granular” version:

20 mAP lite: \$ 25.00 each

1 RB3011 as CAPsMAN: \$ 179.00

Total devices expenses: \$ 679.00

Total maximum BW: 1 Gbps

Min bandwidth each one: 12,5 Mbps

# Granular wireless coverage

The “Granular” Vs “Common” version:

Saved more than: \$ 2,000.00

Provided more than **double bandwidth**

**More reliable** (if one fail you'll loose the 5% instead the 25%)

# The mAP lite as **The Wireless Swiss Knife**

# The Wireless Swiss Knife

Thanks to the size of the mAP lite, the easy powering and the power of RouterOS, I developed my personal Wireless Swiss Knife:

a new “friend” always with me.



# The Wireless Swiss Knife

He can “sleep” in your pocket 😊

Yes, it's a little bit *nerd*, that will jump you in the 80's 😊

But is very useful, you should consider that.

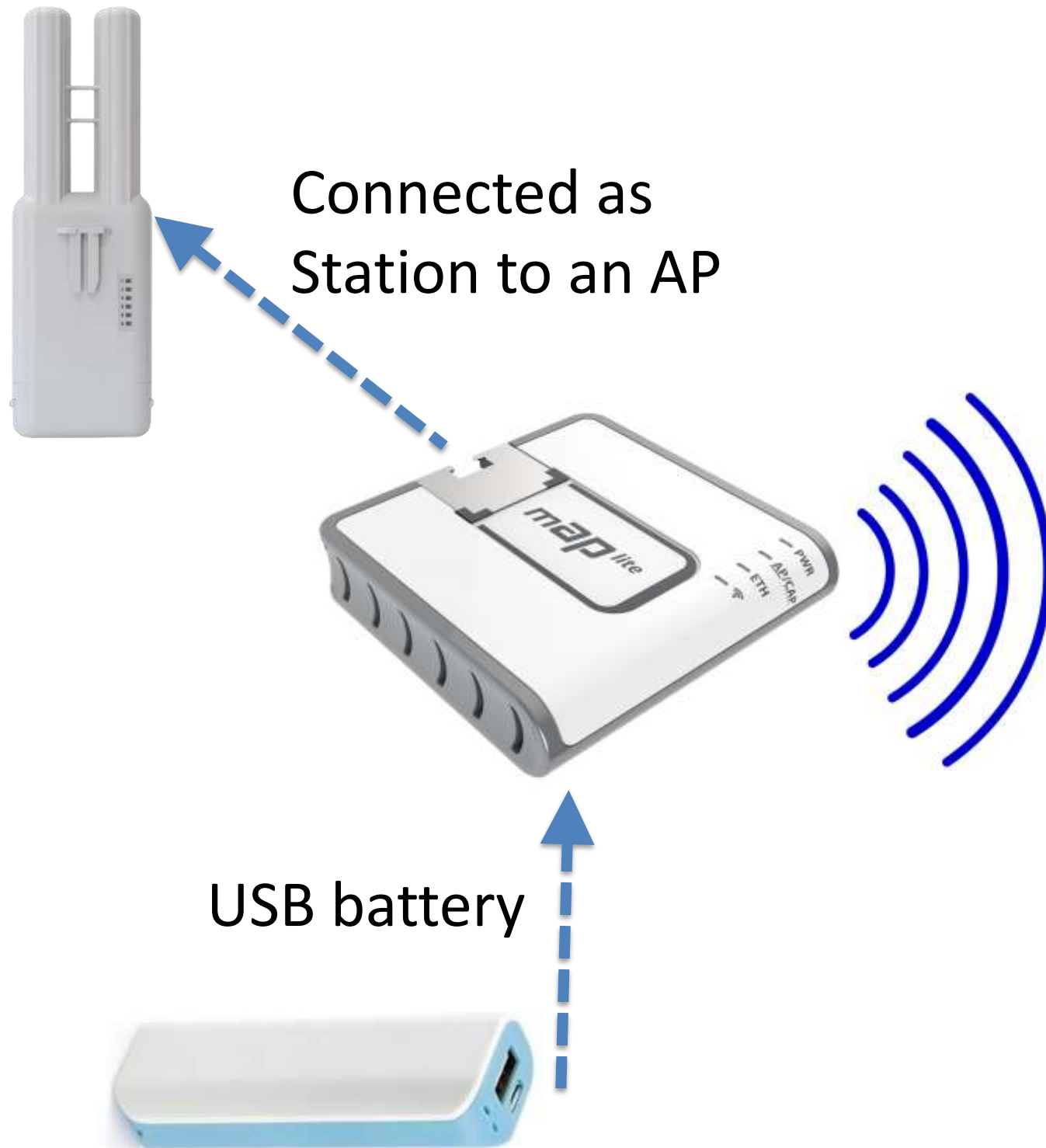
# The Wireless Swiss Knife

The basic idea is to have lot of functions with you, easy manageable by a smartphone.

I build functions using Virtual APs:

1 function = 1 VirtualAP

# The Wireless Swiss Knife



## Multiple SSID:

- MyBridged
- MyRouted
- MyVPN
- MyFriends
- FreeInternet
- FastInternetAccess
- MyIPv6
- FunnyThings



# The Wireless Swiss Knife

## Step ONE: MyBridged

VirtualAP, with WPA2, in a Bridge with the physical WLAN (when applicable).

Useful for a “level 2” access in the wireless network.



# The Wireless Swiss Knife

## Step TWO: MyRouted

VirtualAP, with WPA2, with IP address, DHCP server, masquerade.

Your “standard” SSID for browsing the net.

# The Wireless Swiss Knife

## Step TWO: MyRouted

Using the Netwatch you can control the **wireless led** for knowing when there is internet available. With a quick look!



# The Wireless Swiss Knife

## Step TWO: MyRouted

Using the Netwatch you can control the **wireless led** for knowing when there is internet available. With a quick look!

```
/tool netwatch  
add comment="Check Internet" down-  
script="system leds set 1 type=off" host=\  
8.8.8.8 up-script="system leds set 1  
type=on"
```

# The Wireless Swiss Knife

For working when outside the office you need a VPN.

But the only protocol that work in **every** occasion, behind nat, hotspot and firewall is **SSTP**, not supported by smartphone and OSs  $\neq$  Windows



# The Wireless Swiss Knife

## Step THREE: MyVPN

Create SSTP client to your office, with care about nat and routes.

VirtualAP, with WPA2, with a routed SSTP client, and filters, to the office.

# The Wireless Swiss Knife

## Step THREE: MyVPN

Using the Netwatch you can control the **CAP led** for knowing when the SSTP VPN is available.

With a quick look!



# The Wireless Swiss Knife

## Step THREE: MyVPN

Using the Netwatch you can control the **CAP led** for knowing when the SSTP VPN is available.

```
/tool netwatch
add comment="Check SSTP VPN" down-
script="system leds set 2 type=off" host=\
<IP_inside_the_VPN> up-script="system leds
set 2 type=on"
```

# The Wireless Swiss Knife

## Step FOUR: MyFriends

VirtualAP, with a different WPA2, with a different subnet, DHCP server, masquerade.

For providing WiFi at the friends with you. It's nice "to share". 😊



# The Wireless Swiss Knife

## Step FOUR: MyFriends

Thanks to the firewall, your friends should not communicate with the other networks and, most important, with the VPN!

# The Wireless Swiss Knife

## Step FOUR: MyFriends

You know your friends:

But thanks to the Queues they will have a lower priority than your network.

# The Wireless Swiss Knife

## Step FIVE: FreeInternet

If you have a lot of friends near you, a better choice will be to use an Hotspot, instead a simple WPA2 PSK sharing.

# The Wireless Swiss Knife

## Step FIVE: FreeInternet

VirtualAP, no encryption, with a different subnet, DHCP server, masquerade and an HotSpot!

# The Wireless Swiss Knife

## Step FIVE: FreeInternet

Thanks to the firewall, the HotSpot users should not communicate with the other networks and, most important, with the VPN!



# The Wireless Swiss Knife

## Step FIVE: FreeInternet

You don't personally know all these new friends:

But thanks to the Queues they will have a lower priority than the others.

# The Wireless Swiss Knife

## STEP Six: FastInternetAccess

Why not to try to get a free beer  
thanks to unknown peoples near me?

# The Wireless Swiss Knife

## STEP Six: FastInternetAccess

VirtualAP, no encryption, with a different subnet, DHCP server, masquerade.

And the **UserManager** with the **PayPal** integration!

# The Wireless Swiss Knife

## STEP Six: FastInternetAccess

Thanks to the firewall, this HotSpot users should not communicate with the other networks and, most important, with the VPN!

# The Wireless Swiss Knife

## STEP Six: FastInternetAccess

These are customers that pay:  
thanks to the Queues they will have a  
better priority than the others, but  
less than your private networks.



# The Wireless Swiss Knife

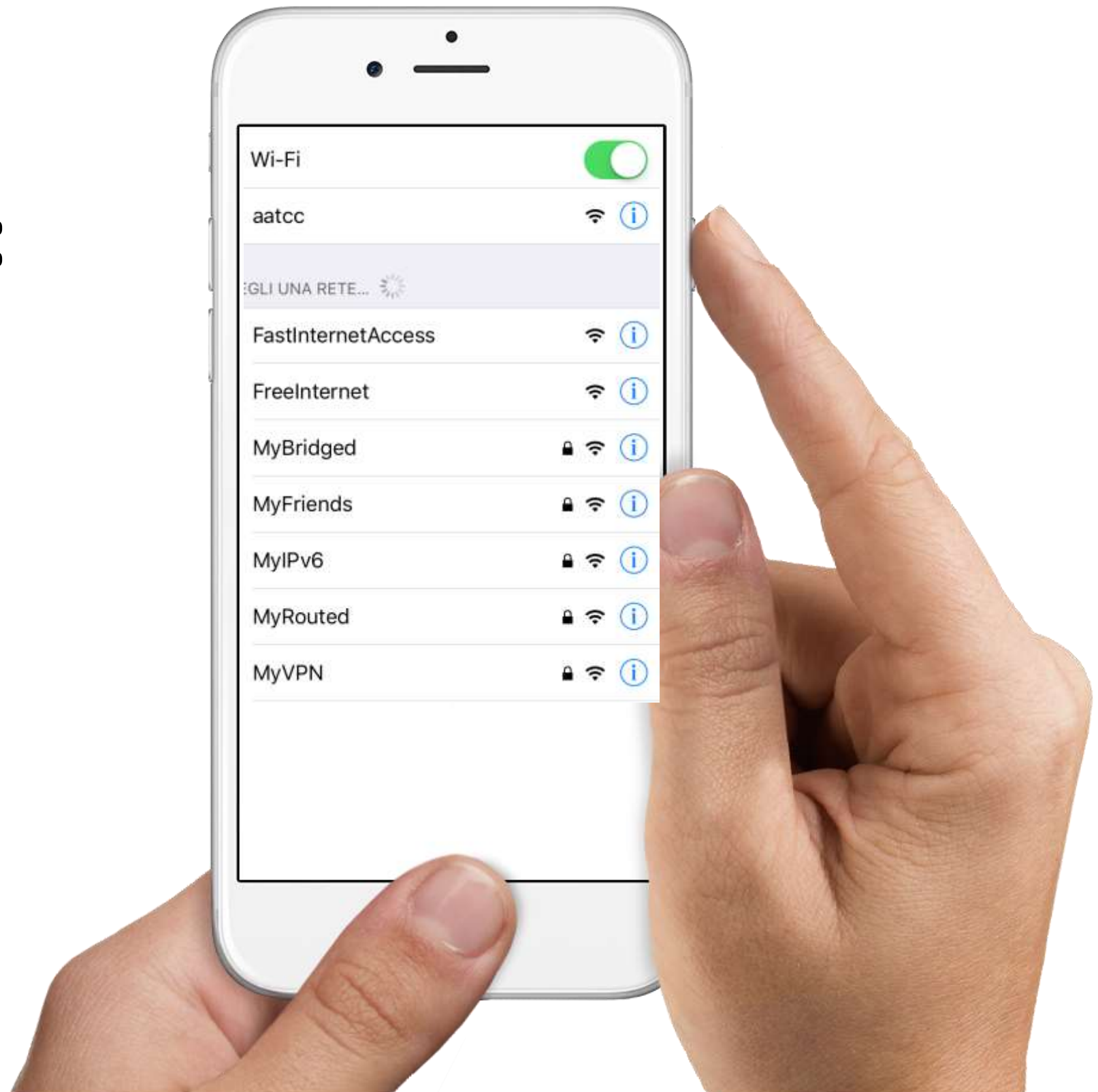
## STEP Seven: IPv6 tunnel

If you need IPv6 and the wireless network you're using doesn't provide them, you can route them into a tunnel to your office.

Will be difficult to have a standard IPv6 tunnel working behind someone else  
NAT!

# The Wireless Swiss Knife

How will look  
these networks:



# The Wireless Swiss Knife

**Interesting tool: background scan!**

With this new tool (**wireless-rep 6.35** and newer) you can scan for networks without stopping to work!

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- MetaROUTER
- Partition
- Make Supout.rif
- Manual
- New WinBox
- Exit

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

+ - [Icons] CAP WPS Client Setup Repeater Scanner Freq. Usage Alignment Wireless Sniffer Wireless Snooper

	Name	Type	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	FP Rx
R	wlan1	Wireless (Atheros AR...	3.8 kbps	30.1 kbps	6	34		0 bps
;;; MyBridged								
S	wlan2	Virtual						
;;; MyRouted								
R	wlan3	Virtual						
;;; MyVPN								
	wlan4	Virtual						
;;; MyFriends								
	wlan5	Virtual						
;;; FreeInternet								
	wlan6	Virtual						
;;; FastInternetAccess								
	wlan7	Virtual						
;;; MyIPv6								
	wlan8	Virtual						

Scanner (Running)

Interface: wlan1

Background Scan

Start Stop Close Connect New Window

	Address	SSID	Channel	Sign...	Nois...	Sign...	Radio Name	Router...
A	2C:E6:CC:33:CF:39	aatcc	2437/20/gn(30dBm)	-67	0	0		
A	00:18:6E:A1:B0:CD	aatcc	2462/20/g(30dBm)	-92	0	0		
A	C4:01:7C:0A:75:99	aatcc	2437/20/gn(30dBm)	-91	0	0		

3 items

8 items out of 11

# The Wireless Swiss Knife

## STEP Eight: FunnyThings

In few occasions will be nice to create some confusion around you: but just for fun! 😊



# The Wireless Swiss Knife

## STEP Eight: FunnyThings


The idea is:

To create 100 fake VirtualAP (with no internet behind) with just funny names.

Using a script for creating them, and another one for removing them.

# The Wireless Swiss Knife

## STEP Eight: FunnyThings

Andrew Cox from  **Bright WiFi** is a  
Scripting “Wizard”. He wrote for me  
few lines of code for doing the job.

Let's see how work!

What do we need more  
now?

# A “dual band” mAp lite!

At the MUM in Ljubljana I asked John to make it:

but as I can see they didn't make it in these 2 months 😊

And yes, it can be a little bigger ;)

# Wrap up

- ✓ The mAP and the mAP lite are so powerful than you expect
- ✓ The use in the real world can solve lot of business needs
- ✓ The limits isn't in technology anymore
- ✓ The limits are in your skill and in your Fantasy!



# The last question

What is better than a mAP lite?

# Better than one mAP lite?

Two mAP lite

Ten mAP lite;

Hundreds of mAP lite;

Thousands of mAP lite;

Millions of mAP lite .....

# Wrap up

- ✓ I hope you enjoyed my presentation and from today you'll start to watch at the mAP *family* from a different perspective 😊

# Thank you!

## Q & A

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[training@grifonline.it](mailto:training@grifonline.it)