

# Le bonding avec Mikrotik

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MUM Paris 2016

# Wifispares/Atlanteam



[www.wifispares.com](http://www.wifispares.com)

- Spécialiste Mikrotik
- Conseils dans le choix des modèles
- Paramétrage sur mesure
- Formation



[www.atlanteam.com](http://www.atlanteam.com)

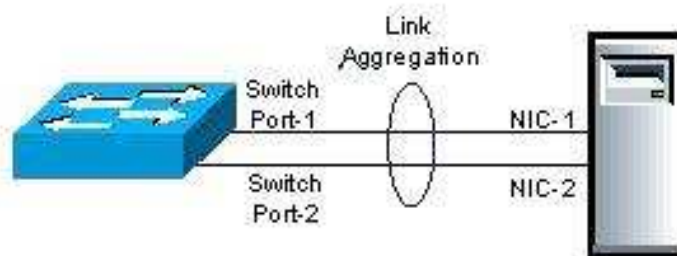
- Ingénierie réseau
- Solution hotspot propriétaire
- Liaisons point-à-point
- Géolocalisation
- Détection de présence

# Table des matières

- Le bonding : présentation, définitions
- Exemple 1 : ethernet
- Exemple 2 : Wifi
- Exemple 3 : ADSL

# Le bonding

- En Anglais : coller, assembler
- Groupement de ports physiques en un seul lien logique



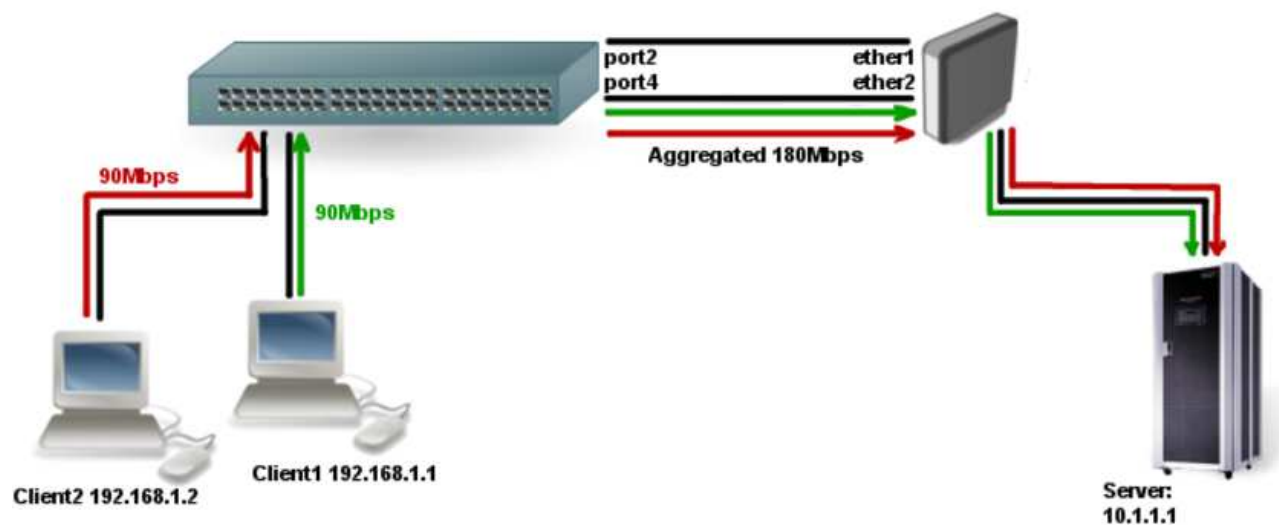
Source : wikipedia

➡ Répartition de charge → débit++ !

➡ Redondance → fiabilité++ !

# Le bonding / LACP

Standard IEEE 802.3ad



Source : wiki Mikrotik

- Intéropérabilité avec d'autres constructeurs
- Les flux réseaux sont déterminés par un hash MAC
- Conçu pour des interfaces ethernet
- Détection de panne basée sur l'état de l'interface réseau

# Le bonding / autres modes

- Balance XOR
  - Similaire à LACP mais non standard
  - Le hash prend en compte MAC/IP/Port
- Balance TLB
  - Transmit Load Balancing
  - Equilibrage des trames émises
- Balance ALB
  - Adaptive Load Balancing
  - Equilibrage des trames émises ET reçues

# Le bonding / autres modes

- Broadcast

- Les mêmes informations sont envoyées sur tous les liens
- Pas de répartition de charge

- Active-backup

- Un seul lien est réellement utilisé, l'autre est en attente

- Balance RR

- Round Robin (Tourniquet)
- C'est le seul mode permettant une répartition de charge par paquet !
- Attention aux paquets qui arrivent *éventuellement* dans le désordre

# Tolérance aux pannes

- Détecter le lien défaillant et agir
- MII
  - Basé sur l'état de l'interface
  - Lien ethernet actif = pas de panne
- ARP
  - Basé sur la réponse à des requêtes ARP
  - Plus fiable que MII
- Attention aux mélanges
  - Ex: Pas de ARP avec LACP

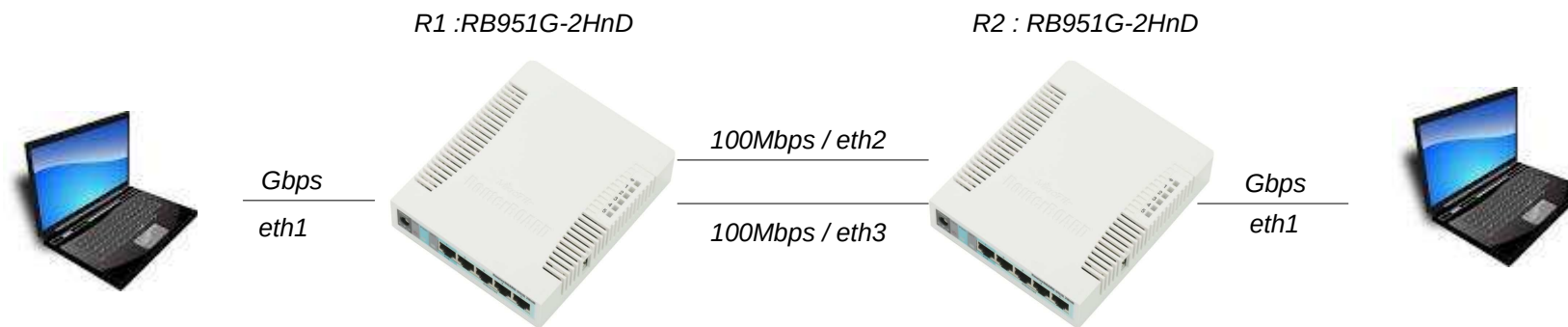


# Mise en pratique #1

Liaison ethernet

# Mise en pratique #1 : ethernet

## Vue globale



Liaison entre R1 et R2 volontairement bridée

# Mise en pratique #1 : ethernet

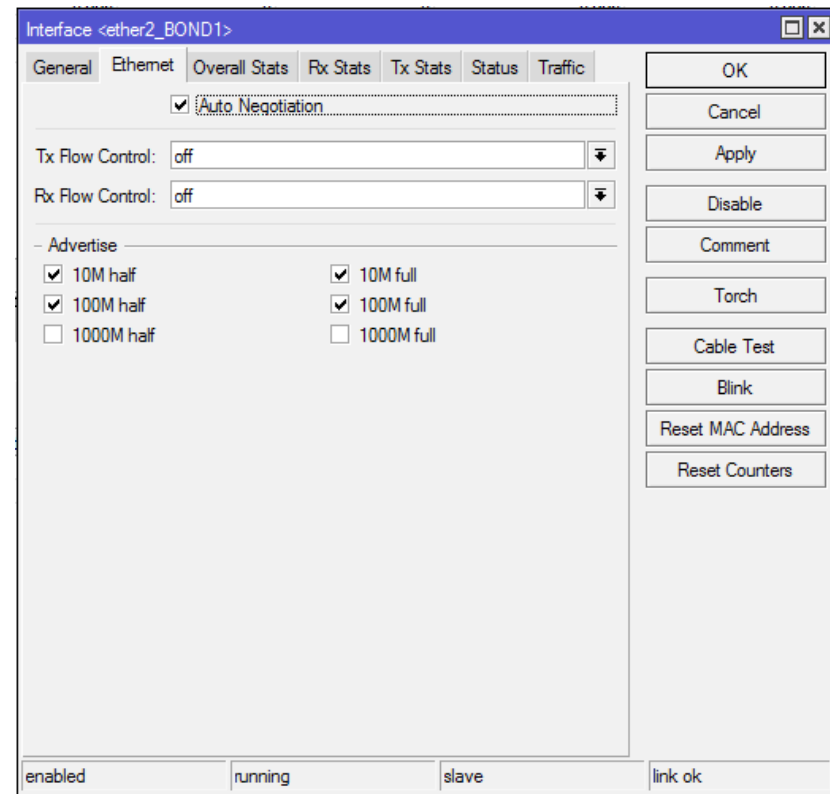
## Configuration : interfaces ethernet

```
/interface ethernet
```

```
set [ find default-name=ether1 ] name=ether1_PC
```

```
set [ find default-name=ether2 ] name=ether2_BOND1  
advertise=10M-half,10M-full,100M-half,100M-full
```

```
set [ find default-name=ether3 ] name=ether3_BOND2  
advertise=10M-half,10M-full,100M-half,100M-full
```



The screenshot shows the Mikrotik WinBox configuration window for the interface `ether2_BOND1`. The window has several tabs: `General`, `Ethernet`, `Overall Stats`, `Rx Stats`, `Tx Stats`, `Status`, and `Traffic`. The `Ethernet` tab is active. In this tab, the `Auto Negotiation` checkbox is checked. Below this, there are two dropdown menus for `Tx Flow Control` and `Rx Flow Control`, both set to `off`. Under the `Advertise` section, there are four checkboxes: `10M half` (checked), `10M full` (checked), `100M half` (checked), and `1000M full` (unchecked). On the right side of the window, there is a vertical stack of buttons: `OK`, `Cancel`, `Apply`, `Disable`, `Comment`, `Torch`, `Cable Test`, `Blink`, `Reset MAC Address`, and `Reset Counters`. At the bottom of the window, there are four status indicators: `enabled`, `running`, `slave`, and `link ok`.

# Mise en pratique #1 : ethernet

## Configuration : bonding

```
/interface bonding
add mode=802.3ad name=bonding1
slaves=ether2_BOND1,ether3_BOND2
```

The screenshot shows the Mikrotik WinBox configuration window for the bonding1 interface. The window has a title bar "Interface <bonding1>" and a menu bar with "General", "Bonding", "Status", and "Traffic" tabs. The "Bonding" tab is active. The configuration fields are as follows:

- Slaves: ether2\_BOND1 (selected), ether3\_BOND2
- Mode: 802.3ad
- Primary: none
- Link Monitoring: mii
- Transmit Hash Policy: layer 2
- Min. Links: 0
- Down Delay: 0 ms
- Up Delay: 0 ms
- LACP Rate: 30 s
- MII Interval: 100 ms

On the right side, there are buttons for "OK", "Cancel", "Apply", "Disable", "Comment", "Copy", "Remove", and "Torch". At the bottom, there are three status indicators: "enabled", "running", and "slave".

# Mise en pratique #1 : ethernet

## Configuration : bridge

```
/interface bridge  
add name=bridge1
```

```
/interface bridge port  
add bridge=bridge1 interface=ether1_PC  
add bridge=bridge1 interface=bonding1
```

The screenshot shows two views of the Mikrotik WinBox Bridge configuration interface. The top view shows the bridge configuration for 'bridge1' with a table of statistics. The bottom view shows the bridge port configuration for 'bridge1' with a table of port details.

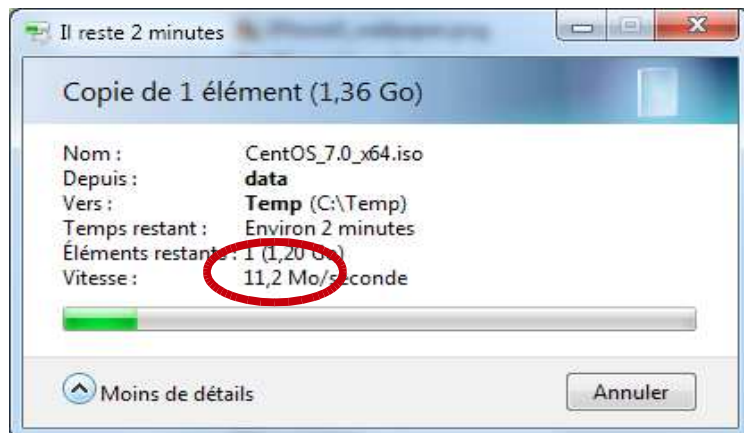
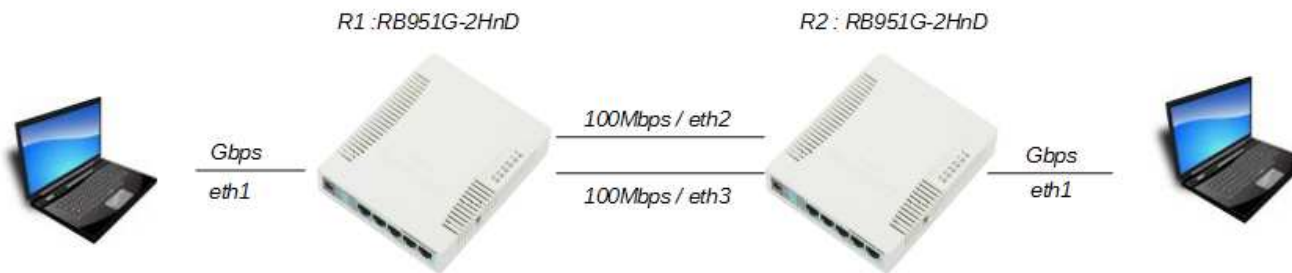
Name	Type	L2 MTU	Tx	Rx	Tx Pack
bridge1	Bridge	1598	82.7 kbps	22.2 kbps	

Interface	Bridge	Priority ...	Path Cost	Horizon	Role	Root Pat...
bonding1	bridge1	80	10		designated port	
ether1_PC	bridge1	80	10		designated port	

# Mise en pratique #1 : ethernet

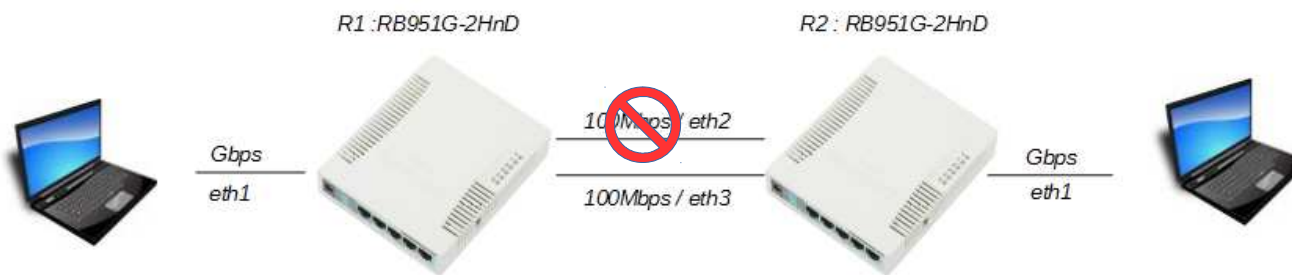
## Copie de fichier



Interface	Name	Type	L2 MTU	Tx	Rx
RS	bonding1	Bonding		96.8 Mbps	2.0 Mbps
R	bridge1	Bridge	1598	82.2 kbps	4.7 kbps
RS	ether1_PC	Ethernet	1598	2.1 Mbps	96.8 Mbps
RS	ether2_BOND1	Ethernet	1598	96.8 Mbps	2.0 Mbps
RS	ether3_BOND2	Ethernet	1598	0 bps	512 bps
	ether4	Ethernet	1598	0 bps	0 bps
	ether5	Ethernet	1598	0 bps	0 bps
X	wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps

# Mise en pratique #1 : ethernet

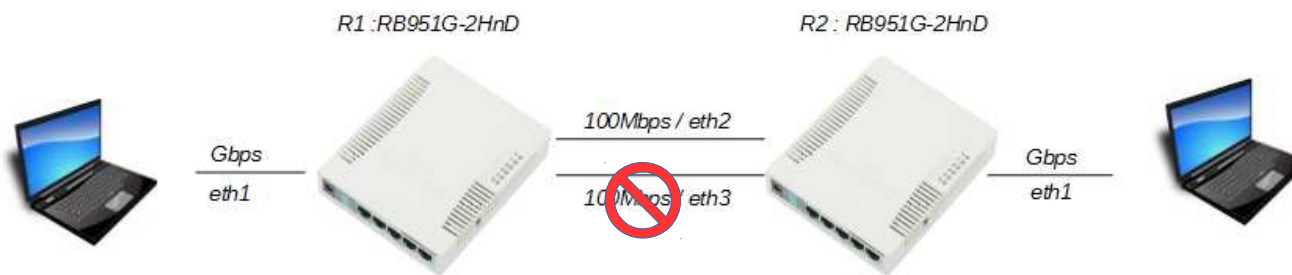
Test de redondance : coupure eth2



Interface List								
Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
+	-	✓	✗	📄	🔍			
Name	Type	L2 MTU	Tx	Rx	T			
RS bonding1	Bonding		97.1 Mbps	2.0 Mbps				
R bridge1	Bridge	1598	81.7 kbps	4.2 kbps				
RS ether1_PC	Ethernet	1598	2.1 Mbps	97.1 Mbps				
S ether2_BOND1	Ethernet	1598	0 bps	0 bps				
RS ether3_BOND2	Ethernet	1598	97.1 Mbps	2.0 Mbps				
ether4	Ethernet	1598	0 bps	0 bps				
ether5	Ethernet	1598	0 bps	0 bps				
X wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps				

# Mise en pratique #1 : ethernet

Test de redondance : coupure eth1

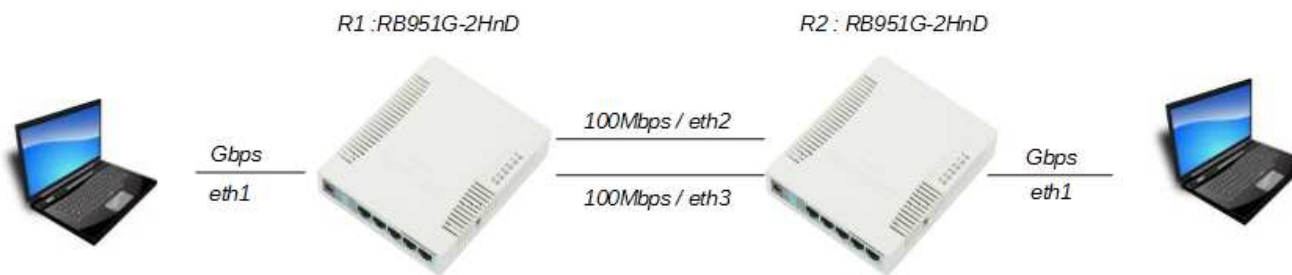


Interface List								
Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
+	-	✓	✗	☰	⌵			
Name	Type	L2 MTU	Tx	Rx	Tx			
RS bonding1	Bonding			99.2 Mbps	2.1 Mbps			
R bridge1	Bridge	1598	79.5 kbps		3.3 kbps			
RS ether1_PC	Ethernet	1598	2.1 Mbps	99.2 Mbps				
RS ether2_BOND1	Ethernet	1598	99.2 Mbps	2.1 Mbps				
S ether3_BOND2	Ethernet	1598	0 bps	0 bps				
ether4	Ethernet	1598	0 bps	0 bps				
ether5	Ethernet	1598	0 bps	0 bps				
X wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps				



# Mise en pratique #1 : ethernet

## Limitation du LACP



```
C:\Utils\iperf>iperf3.exe -c 192.168.1.58 -i 10 -P 2
```

```
Connecting to host 192.168.1.58, port 5201
```

```
[ 4] local 192.168.1.67 port 49246 connected to 192.168.1.58 port 5201
```

```
[ 6] local 192.168.1.67 port 49247 connected to 192.168.1.58 port 5201
```

```
[ ID] Interval      Transfer    Bandwidth
```

```
[ 4]  0.00-10.02 sec  60.5 MBytes 50.7 Mbits/sec
```

```
[ 6]  0.00-10.02 sec  53.0 MBytes 44.4 Mbits/sec
```

```
[SUM] 0.00-10.02 sec 114 MBytes 95.1 Mbits/sec
```

```
iperf Done.
```

# Mise en pratique #1 : ethernet

Amélioration : « balance XOR »

Interface <bonding1>

General Bonding Status Traffic

Slaves: ether2\_BOND1  
ether3\_BOND2

Mode: balance xor

Primary: none

Link Monitoring: mii

Transmit Hash Policy: layer 3 and 4

Min. Links: 0

Down Delay: 0 ms

Up Delay: 0 ms

LACP Rate: 30 s

MII Interval: 100 ms

OK  
Cancel  
Apply  
Disable  
Comment  
Copy  
Remove  
Torch

enabled running slave

# Mise en pratique #1 : ethernet

## Amélioration : « balance XOR »

```
C:\Utils\iperf>iperf3.exe -c 192.168.1.58 -i 10 -P 2 -l 512k  
Connecting to host 192.168.1.58, port 5201
```

```
[ 4] local 192.168.1.67 port 49297 connected to 192.168.1.58 port 5201  
[ 6] local 192.168.1.67 port 49298 connected to 192.168.1.58 port 5201
```

```
[ID] Interval      Transfer    Bandwidth  
[ 4] 0.00-10.02 sec 102 MBytes 85.7 Mbits/sec  
[ 6] 0.00-10.02 sec 101 MBytes 84.7 Mbits/sec  
[SUM] 0.00-10.02 sec 204 MBytes 170 Mbits/sec
```

Interface List								
Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
Name	Type	L2 MTU	Tx	Rx	Tx P			
RS bonding1	Bonding		190.5 Mbps	3.5 Mbps				
R bridge1	Bridge	1598	72.9 kbps	4.9 kbps				
RS ether1_PC	Ethernet	1598	3.6 Mbps	191.4 Mbps				
RS ether2_BOND1	Ethernet	1598	95.4 Mbps	1782.2 kbps				
RS ether3_BOND2	Ethernet	1598	95.1 Mbps	1777.1 kbps				
ether4	Ethernet	1598	0 bps	0 bps				
ether5	Ethernet	1598	0 bps	0 bps				
X wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps				

# Mise en pratique #1 : ethernet

Nouvelle Amélioration : « balance RR »

The screenshot shows the Mikrotik WinBox configuration window for an interface named 'bonding1'. The 'Bonding' tab is active, showing the following settings:

- Slaves: ether2\_BOND1, ether3\_BOND2
- Mode: balance rr (highlighted with a red box)
- Primary: none
- Link Monitoring: arp (highlighted with a red box)
- Transmit Hash Policy: layer 2
- Min. Links: 0
- Down Delay: 0 ms
- Up Delay: 0 ms
- LACP Rate: 30 s
- ARP Interval: 100 ms
- ARP IP Targets: 192.168.1.90 (highlighted with a red box)

Buttons on the right include OK, Cancel, Apply, Disable, Comment, Copy, Remove, and Torch. At the bottom, the interface status is shown as 'enabled', 'running', and 'slave'.

# Mise en pratique #1 : ethernet

## Nouvelle Amélioration : « balance RR »

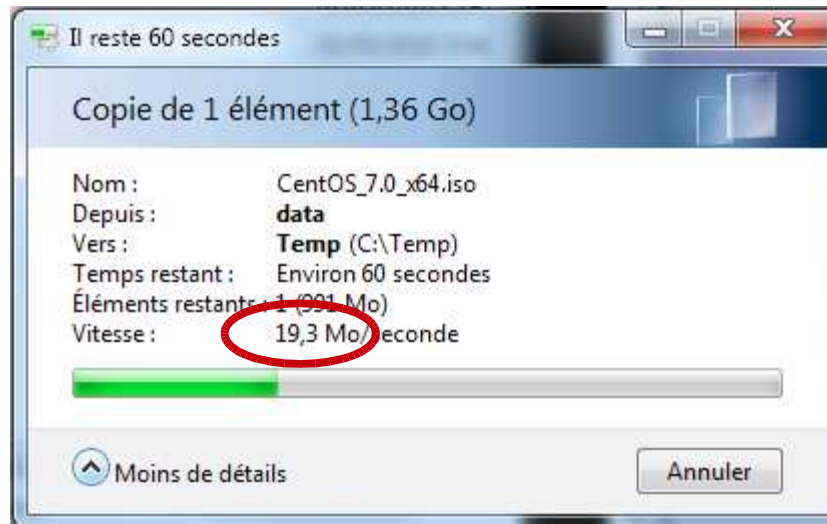
```
C:\Utils\iperf>iperf3.exe -c 192.168.1.58 -i 10 -P 1 -l 512k -t 30  
Connecting to host 192.168.1.58, port 5201
```

```
[ 4] local 192.168.1.67 port 49309 connected to 192.168.1.58 port 5201  
[ID] Interval      Transfer    Bandwidth  
[ 4] 0.00-10.02 sec  225 MBytes 189 Mbits/sec  
[ 4] 10.02-20.01 sec  220 MBytes 184 Mbits/sec  
[ 4] 20.01-30.01 sec  222 MBytes 186 Mbits/sec
```

Interface List							
Interface							
Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE							
+ - ✓ ✗ 📄 🏠							
	Name	Type	L2 MTU	Tx	Rx	Tx P	
RS	bonding1	Bonding		198.5 Mbps	7.8 Mbps		
R	bridge1	Bridge	1598	79.7 kbps	23.0 kbps		
RS	ether1_PC	Ethernet	1598	7.9 Mbps	199.7 Mbps		
RS	ether2_BOND1	Ethernet	1598	99.2 Mbps	3.9 Mbps		
RS	ether3_BOND2	Ethernet	1598	99.2 Mbps	3.8 Mbps		
	ether4	Ethernet	1598	0 bps	0 bps		
	ether5	Ethernet	1598	0 bps	0 bps		
X	wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps		

# Mise en pratique #1 : ethernet

Nouvelle Amélioration : « balance RR »



# Mise en pratique #2

Liaison Wifi point-à-point

# Mise en pratique #2 : Wifi

## Vue globale

- Plate-forme de transporteur routier
- Nouvel entrepôt (extension)
- Besoin : liaison rapide (LAN) et fiable
- En pleine campagne
- ~800m





# Mise en pratique #2 : Wifi

RBSXT5nDr2



- Antenne directionnelle 15°
- 5Ghz 802.11a/n @40Mhz (300Mbps)
- Gain d'antenne : 16dBi
- POE IN 8-30v
- RouterOS
- ~60 € !!

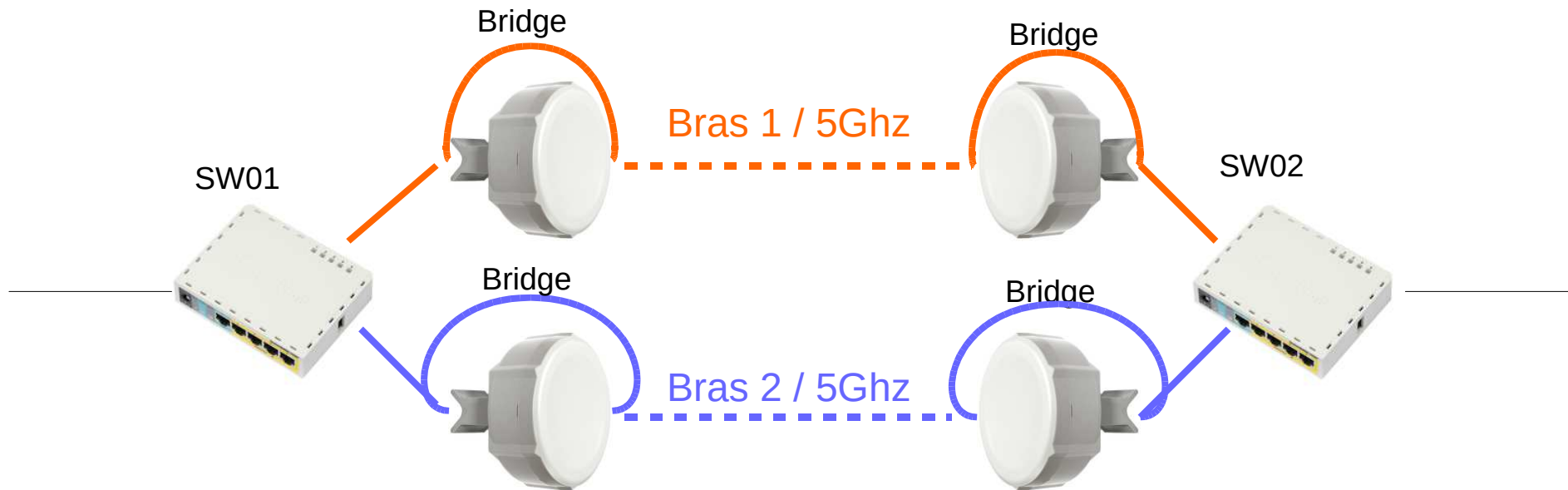
RB750UP



- Routeur 5 ports fast ethernet
- POE OUT 8-30V sur 4 ports
- RouterOS
- ~60 € !!

# Mise en pratique #2 : Wifi

## Solution retenue



# Mise en pratique #2 : Wifi

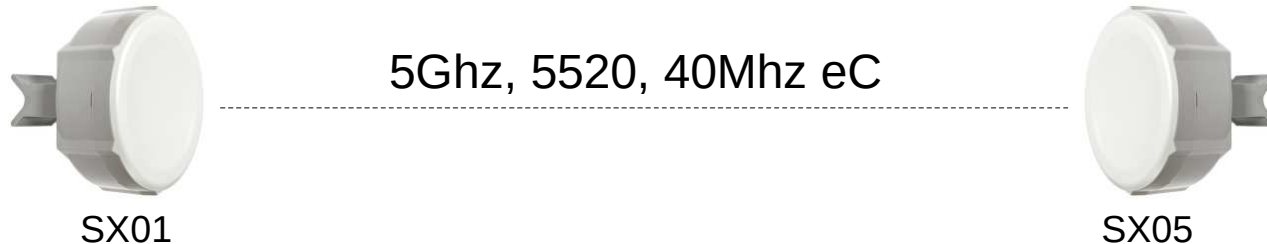
## Lien WIFI : préparation



Scan de l'environnement :  
/interface wireless spectral-history

# Mise en pratique #2 : Wifi

## Lien WIFI : configuration



```
/interface wireless security-profiles
set [ find default=yes ]
add authentication-types=wpa2-psk name=profil_secure
wpa2-pre-shared-key=PASSPHRASE1337
```

```
/interface wireless
set [ find default-name=wlan1 ] antenna-gain=16 band=5ghz-onlyn channel-width=20/40mhz-eC \
country=france disabled=no frequency=5520 frequency-mode=regulatory-domain hide-ssid=yes \
mode=bridge security-profile=profil_secure ssid=BYA0105 wds-default-bridge=bridge_wds \
wds-mode=dynamic-mesh wireless-protocol=nstreme
/interface wireless nstreme
set wlan1 enable-nstreme=yes
```

# Mise en pratique #2 : Wifi

## Lien WIFI : configuration



SX01

5Ghz, 5520, 40Mhz eC



SX05

```
/interface wlan1  
set [ find default-wlan1 ]  
add authentication-mode=wpa2-pre-shared-key
```

```
/interface wlan1  
set [ find default-wlan1 ]  
country=fr  
mode=bridge  
wds-mode=bridge  
/interface wlan1  
set wlan1 enabled
```

General	Wireless	Data Rates	Advanced	HT	HT MCS	WDS	Nstreme	Tx Power	Current Tx Power	Status	Traffic
Interface <wlan1>											
Mode: <input type="text" value="bridge"/>											
Band: <input type="text" value="5GHz-only-N"/>											
Channel Width: <input type="text" value="20/40MHz eC"/>											
Frequency: <input type="text" value="5520"/> MHz											
SSID: <input type="text" value="BYA0105"/>											
Radio Name: <input type="text" value="D4CA6DABEE73"/>											
Scan List: <input type="text" value="default"/>											
Wireless Protocol: <input type="text" value="nstreme"/>											
Security Profile: <input type="text" value="profil_secure"/>											
Frequency Mode: <input type="text" value="regulatory-domain"/>											
Country: <input type="text" value="france"/>											
Antenna Gain: <input type="text" value="16"/> dBi											

```
channel-width=20/40mhz-eC \  
hide-ssid=yes \  
wds-mode=bridge_wds \  
wds-enabled=yes
```

# Mise en pratique #2 : Wifi

## Lien WIFI : configuration



Uptime: 10d 11:48:00

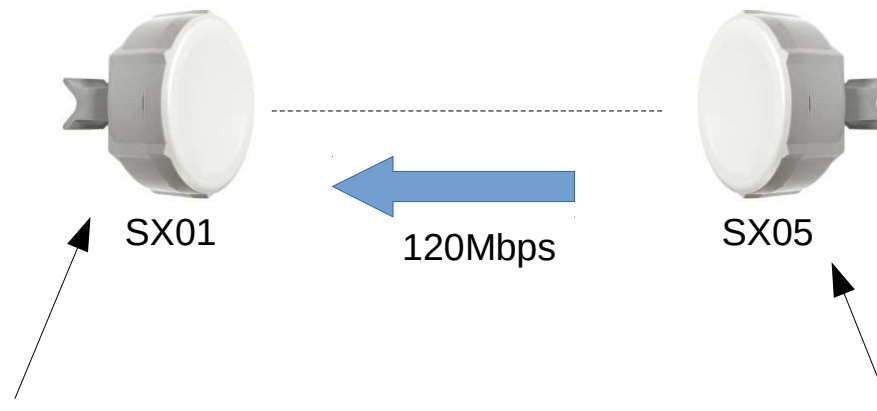
**Wireless Tables**

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

Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activit...	Tx/Rx Signal ...	Tx Rate	Rx Rate
000C42C...	00:0C:42:CB:CC:77	wlan1	10d 11:47:32	no	yes	0.000	-73/-69	216Mbps-40MH...	243Mbps-...

# Mise en pratique #2 : Wifi

Test avec l'outil intégré « traffic-generator »



## Visualisation

```
/interface wireless monitor wlan1
```

et/ou

```
/interface monitor-traffic wlan1
```

## Génération de flux tcp

```
/tool traffic-generator packet-template
```

```
add header-stack=mac,ip,udp
```

```
name=packet-test-download
```

```
ip-protocol=tcp
```

```
ip-src=10.94.105.11
```

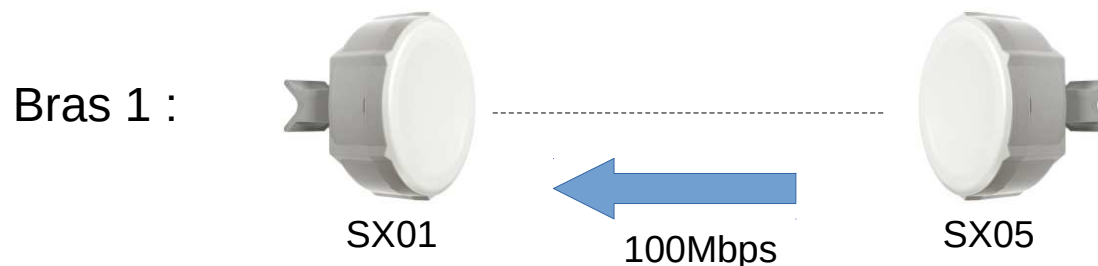
```
ip-dst=10.94.105.10
```

```
/tool traffic-generator
```

```
start mbps=120 tx-template=packet-test-download
```

# Mise en pratique #2 : Wifi

Test avec l'outil intégré « traffic-generator »



Wireless Tables

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

+ - ✓ ✗ 📁 🔍 CAP Scanner Freq. Usage Alignment Wireless Sniffer Wireless Snooper

	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx
RS	wlan1	Wireless (Atheros AR92xx)	1600	2.1 kbps	106.4 Mbps	4	8 792	
DRS	wds2	WDS	1600	1752 bps	106.4 Mbps	3	8 792	

2 items out of 4 (1 selected)

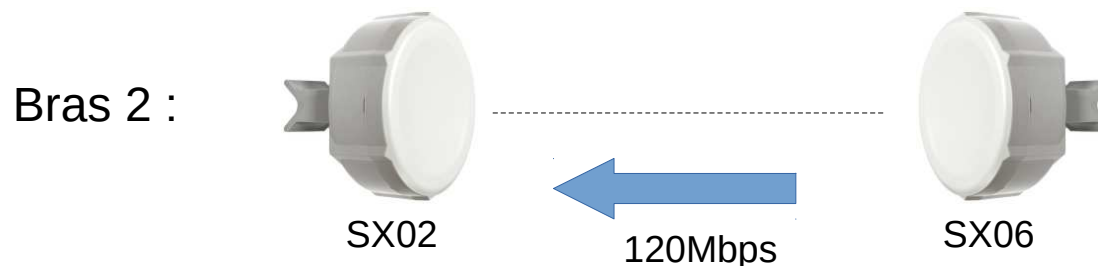
```
[atlanteam@BYA_SX01] > /interface monitor-traffic wlan1
name: wlan1
rx-packets-per-second: 8 792
rx-bits-per-second: 106.4Mbps
fp-rx-packets-per-second: 8 792
fp-rx-bits-per-second: 106.4Mbps
rx-drops-per-second: 0
rx-errors-per-second: 0
tx-packets-per-second: 4
tx-bits-per-second: 2.1kbps
fp-tx-packets-per-second: 2
```

```
[atlanteam@BYA_SX01] > /interface wireless wlan1
status: running-ap
channel: 5520/20-eC/an(11)
wireless-protocol: nstreme
noise-floor: -115dBm
overall-tx-ccq: 71%
registered-clients: 1
authenticated-clients: 1
polling: yes
csma-disabled: no
wmm-enabled: yes
```



# Mise en pratique #2 : Wifi

Test avec l'outil intégré « traffic-generator »



Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)		
R bridge_wds	Bridge	1598	54.4 kbps	122.7 Mbps	10	10 143		
RS ether1	Ethernet	1598	55.7 kbps	7.6 Mbps	12	10		
R wlan1	Wireless (Atheros AR9...	1600	2.0 kbps	122.7 Mbps	3	10 138		
DRS wds1	WDS	1600	2.0 kbps	122.7 Mbps	3	10 138		

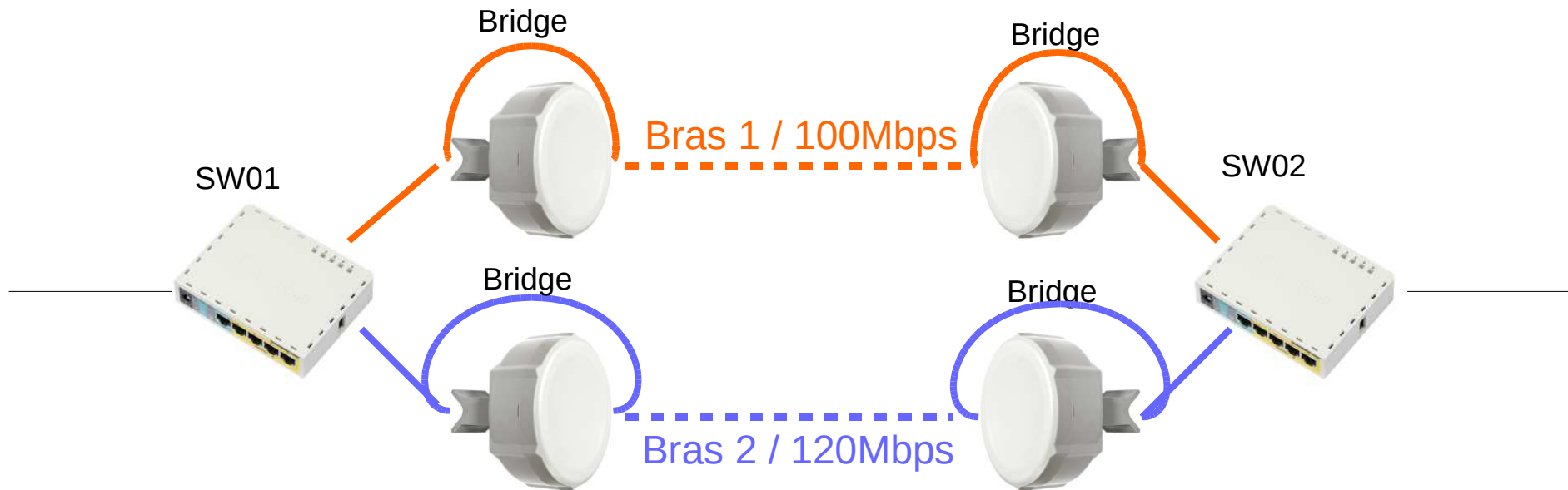
4 items

```
cs=per-second:
2.1kbps
    name: wlan1
    rx-packets-per-second: 10 138
    rx-bits-per-second: 122.7Mbps
    fp-rx-packets-per-second: 10 138
    fp-rx-bits-per-second: 122.7Mbps
    rx-drops-per-second: 0
    rx-errors-per-second: 0
    tx-packets-per-second: 3
    tx-bits-per-second: 2.0kbps
    fp-tx-packets-per-second: 3
    fp-tx-bits-per-second: 2.0kbps
    tx-drops-per-second: 0
    tx-errors-per-second: 0
    [Q quit|D dump|C-z pause]

noise-floor: -111dBm
overall-tx-ccq: 70%
status: running-ap
channel: 5580/20-eC/an(11dBm)
wireless-protocol: 802.11
noise-floor: -111dBm
overall-tx-ccq: 81%
registered-clients: 1
authenticated-clients: 1
current-distance: 1
wmm-enabled: yes
current-tx-powers: 6Mbps:8(8/11),9Mbps
HT20-1:8(8/11),HT20-
HT40-2:8(8/11),HT40-
notify-external-fdb: no
[Q quit|D dump|C-z pause]
```

# Mise en pratique #2 : Wifi

## Construction du bonding

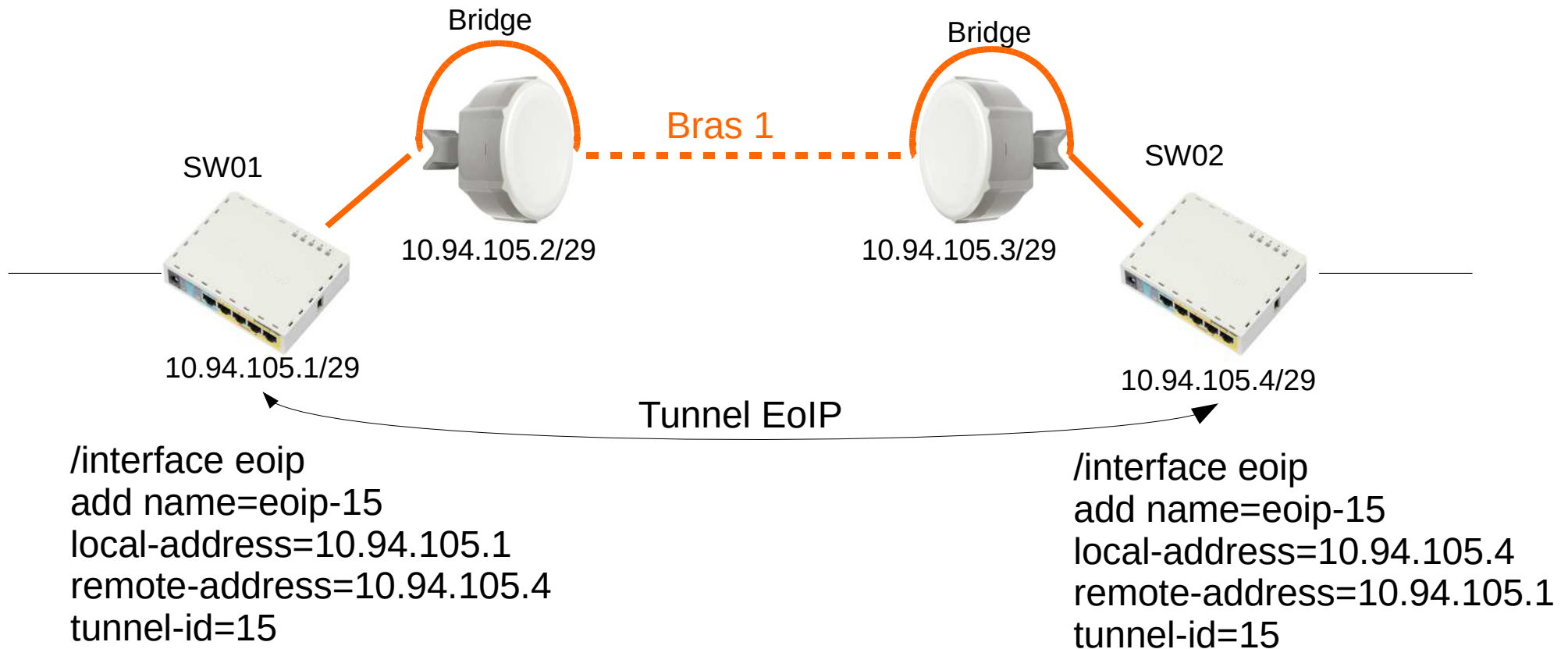


Mais... <http://wiki.mikrotik.com/wiki/Manual:Interface/Bonding> dit :

« Make sure that you do not have IP addresses on interfaces which will be enslaved for bonding interface! »

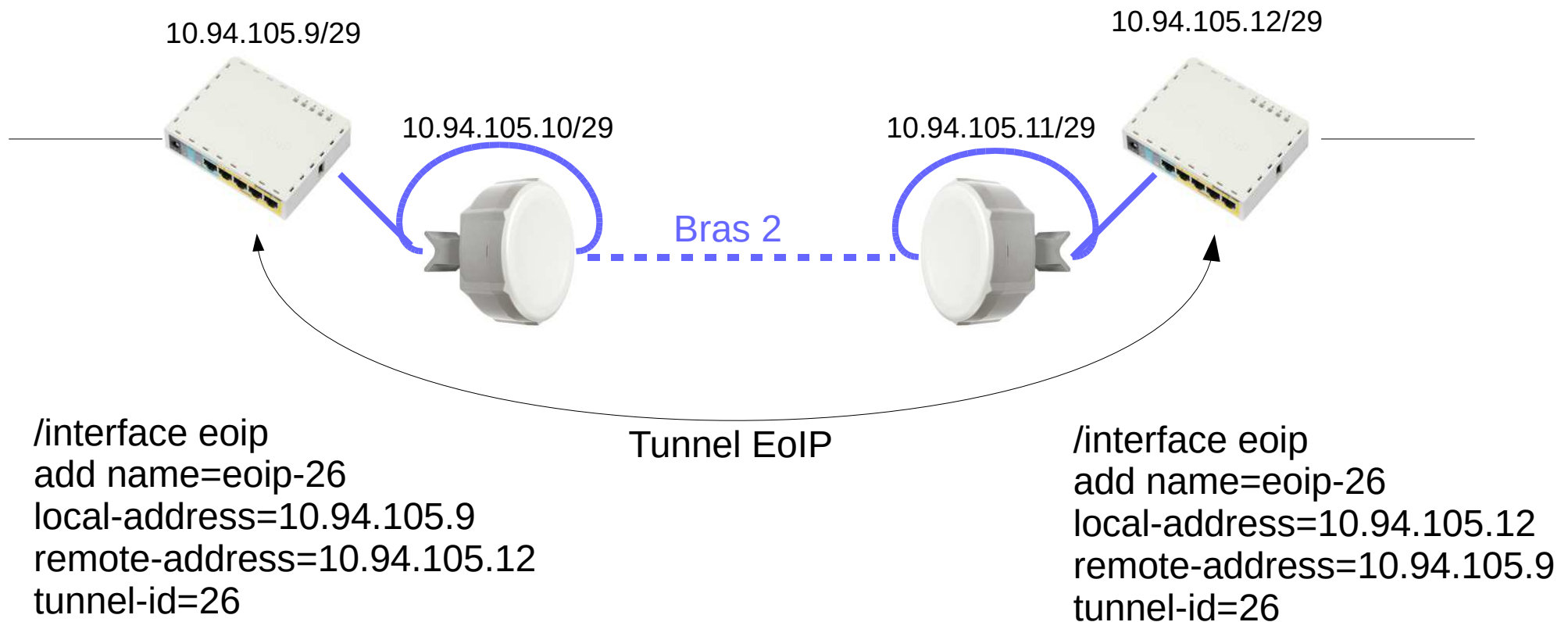
# Mise en pratique #2 : Wifi

## Tunnel EoIP « bras 1 »



# Mise en pratique #2 : Wifi

## Tunnel EoIP « bras 2 »



# Mise en pratique #2 : Wifi

## Construction du bonding

Bras 1 : eoip-15

SW01  
10.94.105.34/29



SW02  
10.94.105.35/29



Bras 2 : eoip-26

```
/interface bonding
name=bonding-Fort
mode=balance-rr
slaves=eoip-15, eoip-26
link-monitoring=arp
add arp-interval=1s
arp-ip-targets=10.94.105.35
```

```
/ip address
add address=10.94.105.34/29
interface=bonding-Fort
```

```
/interface bonding
name=bonding-RN141
mode=balance-rr
slaves=eoip-15, eoip-26
link-monitoring=arp
add arp-interval=1s
arp-ip-targets=10.94.105.34
```

```
/ip address
add address=10.94.105.35/29
interface=bonding-RN141
```

# Mise en pratique #2 : Wifi

## Test

SW01  
10.94.105.34/29



SW02  
10.94.105.35/29



Bonding : eoip-15 + eoip-26



Interface List										
Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE		
+	-	✓	✗	📄	🔍					
Name	Type	L2 MTU	Tx	Rx						
RS bonding-Fort	Bonding			3.4 kbps	156.6 Mbps					
R bridge_switch	Bridge	1600	74.4 kbps	155.1 Mbps						
RS eoip-15	EoIP Tunnel	65535	2.1 kbps	71.2 Mbps						
RS eoip-26	EoIP Tunnel	65535	1344 bps	85.3 Mbps						
RS ether1_LAN_RN141	Ethernet	1600	74.8 kbps	5.6 kbps						
R ether2_FORT_5580_SX02	Ethernet	1598	2.1 kbps	93.4 Mbps						
R ether3_FORT_5520_SX01	Ethernet	1598	2.0 kbps	78.7 Mbps						
ether4	Ethernet	1598	0 bps	0 bps						
ether5	Ethernet	1598	0 bps	0 bps						

```
[atlanteam@BYA_SW01] > /interface monitor-traffic bonding-Fort, ether3_FORT_5520_SX01, ether2_FORT_5580_SX02
name: bonding-Fort ether3_FORT_5520_SX01 ether2_FORT_5580_SX02
rx-packets-per-second: 13 013 12 184 14 838
rx-drops-per-second: 0 0 0 0
rx-errors-per-second: 0 0 0 0
rx-bits-per-second: 157.5Mbps 78.8Mbps 95.1Mbps
tx-packets-per-second: 2 2 2
tx-drops-per-second: 0 0 0
tx-errors-per-second: 0 0 0
tx-bits-per-second: 2.6kbps 1408bps 1408bps
[Q quit|D dump|C-z pause]
```

# Mise en pratique #2 : Wifi

## Panne !

Interface List

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
Name	Type	L2 MTU	Tx	Rx				
RS bonding-Fort	Bonding		2.1 kbps	92.0 Mbps				
R bridge_switch	Bridge	1600	109.6 kbps	91.2 Mbps				
RS eoip-15	EoIP Tunnel	65535	704 bps	0 bps				
RS eoip-26	EoIP Tunnel	65535	1400 bps	92.1 Mbps				
RS ether1_LAN_RN141	Ethernet	1600	109.6 kbps	0.0 kbps				
R ether2_FORT_5580_SX02	Ethernet	1598	2.4 kbps	102.1 Mbps				
R ether3_FORT_5520_SX01	Ethernet	1598	4.3 kbps	32.1 kbps				
ether4	Ethernet	1598	0 bps	0 bps				
ether5	Ethernet	1598	0 bps	0 bps				

9 items

```
[atlanteam@BYA_SW01] > /interface monitor-traffic bonding-Fort,ether3_FORT_5520_SX01,ether2_FORT_5580_SX02
name: bonding-Fort ether3_FORT_5520_SX01 ether2_FORT_5580_SX02
rx-packets-per-second: 7 611 4 14 749
rx-drops-per-second: 0 0 0 0
rx-errors-per-second: 0 0 0 0
rx-bits-per-second: 92.1Mbps 29.1kbps 94.2Mbps
tx-packets-per-second: 5 5 4
tx-drops-per-second: 0 0 0
tx-errors-per-second: 0 0 0
tx-bits-per-second: 3.5kbps 3.5kbps 3.0kbps
```

Terminal

```
45 10.94.105.35 56 64 1ms
46 10.94.105.35 56 64 2ms
47 10.94.105.35 56 64 4ms
48 10.94.105.35 56 64 2ms
49 10.94.105.35 56 64 1ms
50 10.94.105.35 56 64 11ms
51 10.94.105.35 56 64 3ms
52 10.94.105.35 timeout
53 10.94.105.35 timeout
54 10.94.105.35 timeout
55 10.94.105.35 56 64 125ms
56 10.94.105.35 timeout
57 10.94.105.35 timeout
58 10.94.105.35 56 64 129ms
59 10.94.105.35 56 64 76ms
sent=60 received=55 packet-loss=8% min-rtt=1ms avg-rtt=10ms max-rtt=129ms
SEQ HOST SIZE TTL TIME STATUS
60 10.94.105.35 56 64 45ms
61 10.94.105.35 56 64 43ms
62 10.94.105.35 56 64 43ms
63 10.94.105.35 56 64 49ms
64 10.94.105.35 56 64 43ms
65 10.94.105.35 56 64 45ms
66 10.94.105.35 56 64 43ms
67 10.94.105.35 56 64 45ms
68 10.94.105.35 56 64 44ms
69 10.94.105.35 56 64 43ms
70 10.94.105.35 56 64 44ms
71 10.94.105.35 56 64 45ms
72 10.94.105.35 56 64 42ms
73 10.94.105.35 56 64 64ms
74 10.94.105.35 56 64 44ms
75 10.94.105.35 56 64 42ms
76 10.94.105.35 56 64 38ms
```

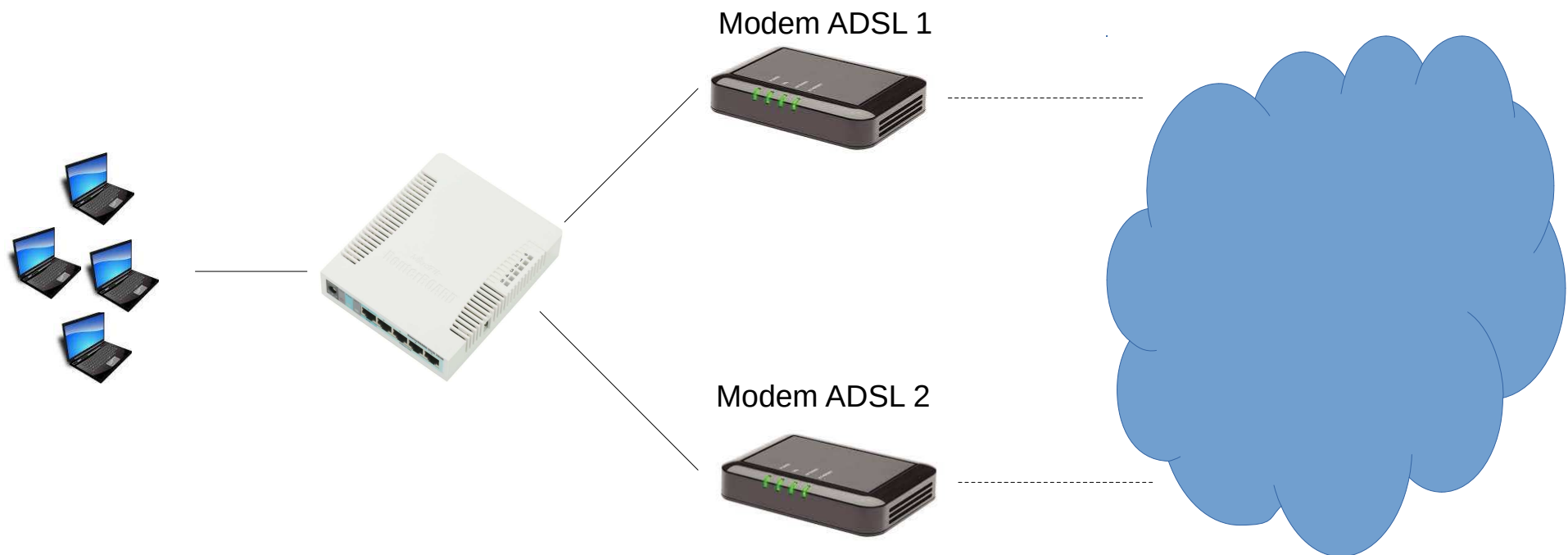
# Mise en pratique #3

## Liaisons ADSL



# Mise en pratique #3 : ADSL

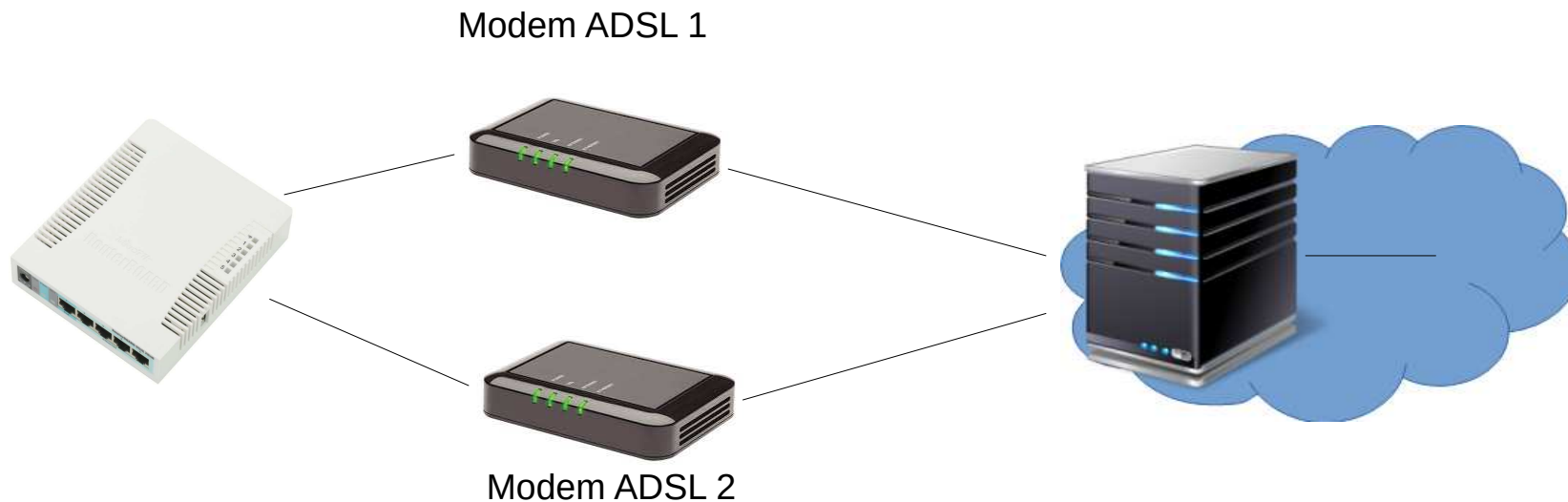
## Vue globale



Objectif : redondance, répartition de charge, agrégation

# Mise en pratique #3 : ADSL

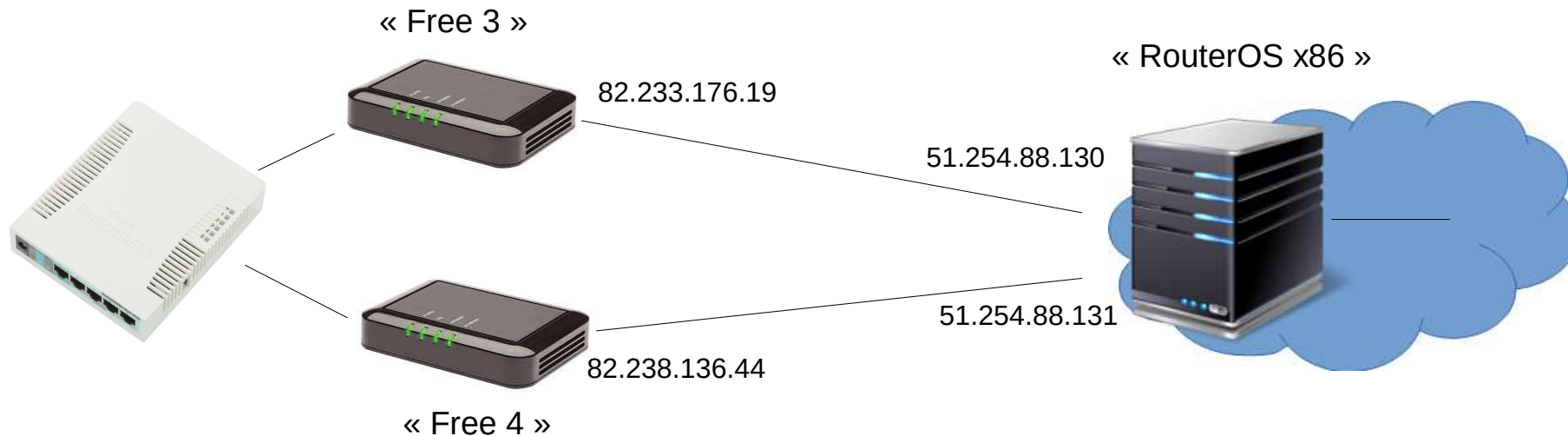
## Architecture choisie



1 Serveur RouterOS « dans le cloud » servira d'extrémité au bonding

# Mise en pratique #3 : ADSL

## Implémentation



1 Serveur RouterOS x86 « dans le cloud » servira d'extrémité au bonding

# Mise en pratique #3

« RouterOS x86 ?? »

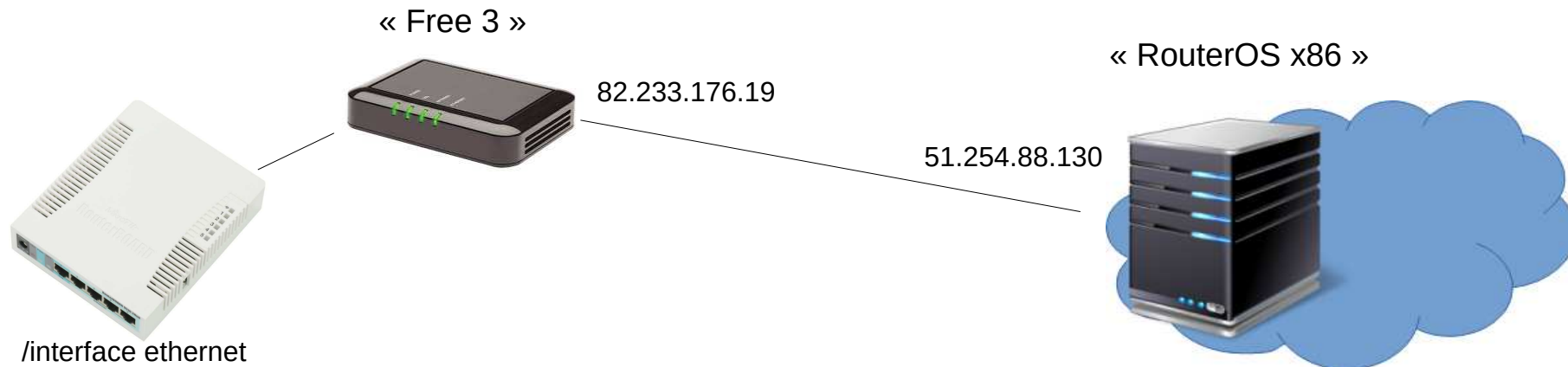
The screenshot shows the MikroTik RouterOS download page. The 'X86' section is highlighted with a red box. The 'Main package' link for X86 is also highlighted. The 'Cloud Hosted Router' page is also visible, showing various images and packages available for download.

	6.32.4 (Bugfix only)	6.35.2 (Current)	5.26 (Legacy)	6.36rc12 (Release candidate)
<b>MIPSBE</b> <small>CRS, NetBox, NetMetal, PowerBox, QRT, RB9xx, hAP, mAP, RB4xx, cAP, hEX, wAP, BaseBox, DynaDish, RB2011, SXT, OmniTik, Groove, Metal, Sextant, RB7xx</small>				
<b>Main package</b>	↓	↓	↓	↓
Extra packages	↓	↓	↓	↓
<b>SMIPS</b> <small>hAP lite</small>				
<b>Main package</b>	↓	↓		
Extra packages	↓	↓		
<b>TILE</b> <small>CCR</small>				
<b>Main package</b>	↓	↓		
Extra packages	↓	↓		
The Dude server	-	↓		
<b>PPC</b> <small>RB3xx, RB600, RB8xx, RB1xxx</small>				
<b>Main package</b>	↓	↓		
Extra packages	↓	↓		
<b>ARM</b> <small>RB3011</small>				
<b>Main package</b>	-	↓		
Extra packages	-	↓		
The Dude server	-	-		
<b>X86</b> <small>RB230, X86</small>				
<b>Main package</b>	↓	↓		
Extra packages	↓	↓		
CD Image	↓	↓		
The Dude server	-	↓		

	6.32.4 (Bugfix only)	6.35.2 (Current)
<b>images</b> <small>img, vmdk, vhd, vhdx, vdi</small>		
The Dude client	-	↓
The Dude server	-	↓
VMDK image	-	↓
VHDX image	-	↓
VDI image	-	↓
Raw disk image	-	↓
Extra packages	-	↓
Changelog	-	📄
MD5	-	Σ

# Mise en pratique #3 : ADSL

## Configuration : bras « Free3 »



```
/interface ethernet  
set [ find default-name=ether3 ] name=ether3_FREE3
```

```
/ip dhcp-client  
interface=ether3_FREE3  
add add-default-route=no  
use-peer-dns=no use-peer-ntp=no
```

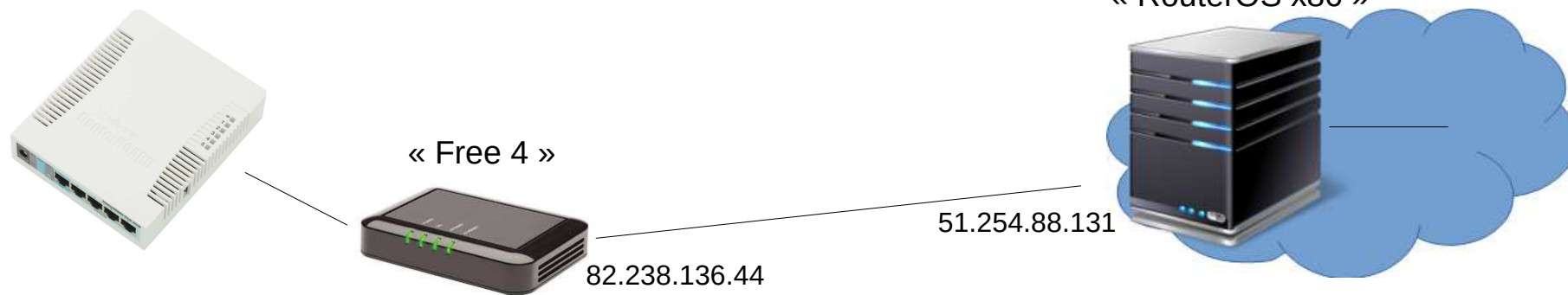
```
/ip route  
dst-address=51.254.88.130/32  
gateway=82.233.176.254
```

```
/interface eoip  
add name=eoip-free3  
local-address=82.233.176.19  
remote-address=51.254.88.130  
tunnel-id=1003
```

```
/interface eoip  
add name=eoip-free3  
local-address=51.254.88.130  
remote-address=82.233.176.19  
tunnel-id=1003
```

# Mise en pratique #3 : ADSL

## Configuration : bras « Free4 »



```
/interface ethernet
set [ find default-name=ether4 ] name=ether4_FREE4
```

```
/ip dhcp-client
add interface=ether4_FREE4
add-default-route=no
use-peer-dns=no use-peer-ntp=no
```

```
/ip route
add dst-address=51.254.88.131/32
gateway=82.238.136.254
```

```
/interface eoip
add name=eoip-free4
local-address=82.238.136.44
remote-address=51.254.88.131
tunnel-id=1004
```

```
/interface eoip
add name=eoip-free4
local-address=51.254.88.131
Remote-address=82.238.136.144
tunnel-id=1004
```

# Mise en pratique #3 : ADSL

## Configuration du bonding

10.0.0.2/30



Bras eoip-free3



Bras eoip-free4



10.0.0.1/30



```
/interface bonding
add name=bonding1
slaves=eoip-free3, eoip-free4
link-monitoring=arp
arp-interval=200ms arp-ip-targets=10.0.0.1
```

```
/ip address
add address=10.0.0.2/30 interface=bonding1
```

Address List			
	Address	Network	Interface
	10.0.0.2/30	10.0.0.0	bonding1
D	82.233.176.19/24	82.233.176.0	ether3_FREE3
D	82.238.136.44/24	82.238.136.0	ether4_FREE4
	192.168.0.252/24	192.168.0.0	ether1_LAN

```
/interface bonding
add name=bonding1
slaves=eoip-free3, eoip-free4
link-monitoring=arp
arp-interval=200ms arp-ip-targets=10.0.0.1
```

```
/ip address
add address=10.0.0.1/30 interface=bonding1
```

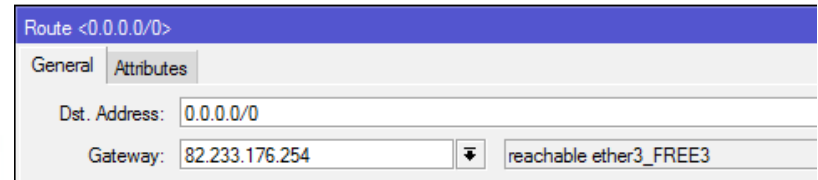
Address List			
	Address	Network	Interface
	10.0.0.1/30	10.0.0.0	bonding1
	51.254.88.130	37.187.141.254	ether1
	51.254.88.131	37.187.141.254	ether2

# Mise en pratique #3 : ADSL

## Test Free3 seule

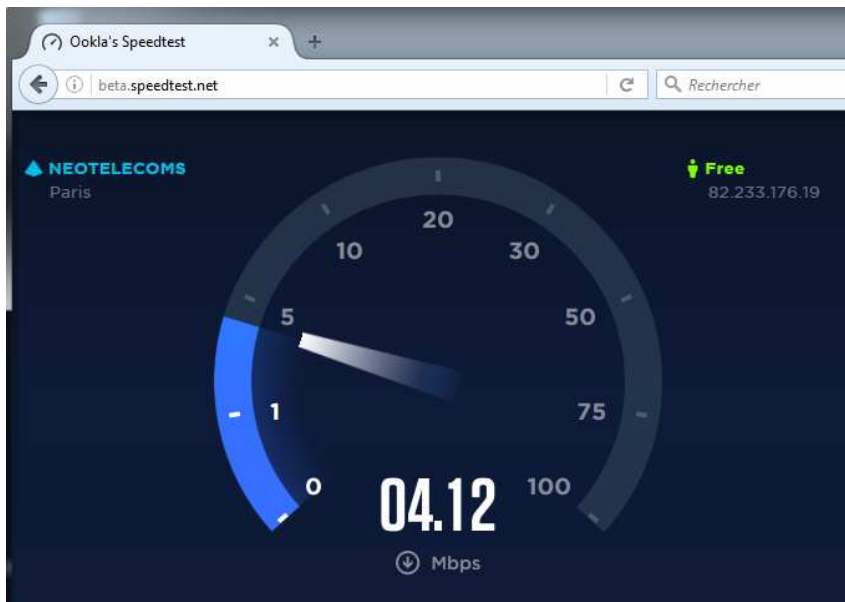


« Free 3 »



```
/ip route
add gateway=82.233.176.254
```

```
/ip firewall nat
add action=masquerade chain=srcnat
src-address=192.168.0.0/24
```



Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
+	-	✓	✗	✗	✗	✗	✗	✗
Name	Type	L2 MTU	Tx	Rx	Tx Pa			
R bonding1	Bonding		13.4 kbps	6.7 kbps				
RS eoip-free3	EoIP Tunnel	65535	6.7 kbps	3.3 kbps				
RS eoip-free4	EoIP Tunnel	65535	6.7 kbps	3.3 kbps				
R ether1_LAN	Ethernet	1598	4.5 Mbps	169.4 kbps				
ether2	Ethernet	1598	0 bps	0 bps				
R ether3_FREE3	Ethernet	1598	169.3 kbps	4.4 Mbps				
R ether4_FREE4	Ethernet	1598	7.0 kbps	7.0 kbps				
ether5	Ethernet	1598	0 bps	0 bps				
X wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps				

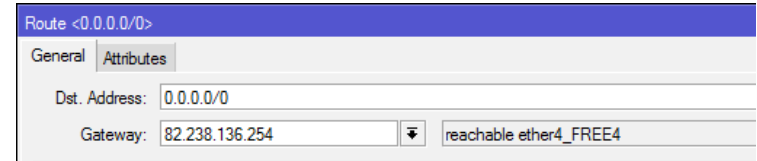


# Mise en pratique #3 : ADSL

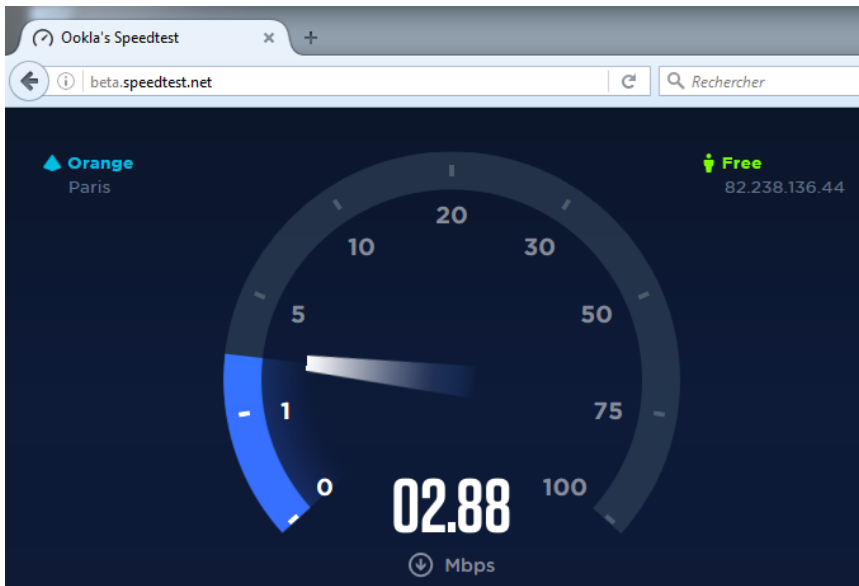
## Test Free4 seule



« Free 4 »



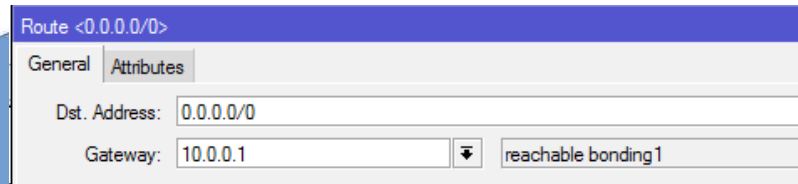
```
/ip route
set [ find dst-address="0.0.0.0/0" ]
Gateway=82.238.136.254
```



Interface	Name	Type	L2 MTU	Tx	Rx	Tx Pac
R	bonding1	Bonding		13.4 kbps	6.7 kbps	
RS	eoip-free3	EoIP Tunnel	65535	6.7 kbps	3.3 kbps	
RS	eoip-free4	EoIP Tunnel	65535	6.7 kbps	3.3 kbps	
R	ether1_LAN	Ethernet	1598	3.3 Mbps	87.4 kbps	
	ether2	Ethernet	1598	0 bps	0 bps	
R	ether3_FREE3	Ethernet	1598	7.0 kbps	7.5 kbps	
R	ether4_FREE4	Ethernet	1598	87.4 kbps	3.2 Mbps	
	ether5	Ethernet	1598	0 bps	0 bps	
X	wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps	

# Mise en pratique #3 : ADSL

## Test bonding / performances



```
/ip route
set [ find dst-address="0.0.0.0/0" ]
gateway=10.0.0.1
```

**Orange** Paris

**OVH** 51.254.88.131

**TEST AGAIN**

**PING** 48 ms

**DOWNLOAD** 5.60 Mbps

**UPLOAD** 1.75 Mbps

SHARE THIS RESULT

Link

Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
Name	Type	L2 MTU	Tx	Rx	Tx P.			
R bonding1	Bonding		655.0 kbps	6.0 Mbps				
RS eoip-free3	EoIP Tunnel	65535	326.3 kbps	3.0 Mbps				
RS eoip-free4	EoIP Tunnel	65535	328.6 kbps	3.0 Mbps				
R ether1_LAN	Ethernet	1598	6.2 Mbps	463.8 kbps				
ether2	Ethernet	1598	0 bps	0 bps				
R ether3_FREE3	Ethernet	1598	337.6 kbps	3.2 Mbps				
R ether4_FREE4	Ethernet	1598	339.9 kbps	3.2 Mbps				
ether5	Ethernet	1598	0 bps	0 bps				
X wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps				

# Mise en pratique #3 : ADSL

## Test bonding / pannes

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE

	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx
R	bonding1	Bonding		7.5 kbps	3.8 kbps	11	11	
RS	eoip-free3	EoIP Tunnel	65535	7.5 kbps	3.8 kbps	11	11	
S	eoip-free4	EoIP Tunnel	65535	0 bps	0 bps	0	0	
R	ether1_LAN	Ethernet	1598	75.9 kbps	6.4 kbps	10	10	
R	ether2	Ethernet	1598	0 bps	0 bps	0	0	
R	ether3_FREE3	Ethernet	1598	7.8 kbps	7.8 kbps	11	11	
X	ether4_FREE4	Ethernet	1598	0 bps	0 bps	0	0	
R	ether5	Ethernet	1598	0 bps	0 bps	0	0	
X	wlan1	Wireless (Atheros AR9...	1600	0 bps	0 bps	0	0	

9 items (1 selected)

```
437 10.0.0.1 56 64 43ms
438 10.0.0.1 56 64 51ms
439 10.0.0.1 56 64 42ms
sent=440 received=279 packet-loss=36% min-rtt=41ms avg-rtt=49ms max-rtt=100ms
SEQ HOST SIZE TTL TIME STATUS
440 10.0.0.1 56 64 50ms
441 10.0.0.1 56 64 42ms
442 10.0.0.1 56 64 56ms
443 10.0.0.1 56 64 41ms
444 10.0.0.1 56 64 50ms
445 10.0.0.1 56 64 43ms
446 10.0.0.1 56 64 51ms
447 10.0.0.1 56 64 50ms
448 10.0.0.1 56 64 49ms
449 10.0.0.1 56 64 51ms
450 10.0.0.1 56 64 50ms
451 10.0.0.1 56 64 51ms
452 10.0.0.1 56 64 51ms
453 10.0.0.1 56 64 50ms
454 10.0.0.1 56 64 51ms
455 10.0.0.1 56 64 49ms
```

# Mise en pratique #3 : ADSL

## Limitations du « balance-rr » sur ADSL

- Nécessité d'avoir lignes ADSL équivalentes
- Perte de bande passante (tunnels) ~ 15 %
- Attention à l'ordre des paquets → retransmissions

# Conclusion

- 3 cas de figure très différents (à la base)
- Richesse des fonctionnalités de RouterOS
- Solutions simples et élégantes

# Questions

**Merci pour votre attention**

**Le bonding avec Mikrotik**

**Benoît PHILIPPON**  
**Wifispares / Atlanteam**

**MUM Paris 2016**