

Le bonding avec Mikrotik

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Wifispares/Atlanteam



www.wifispares.com

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



www.atlanteam.com

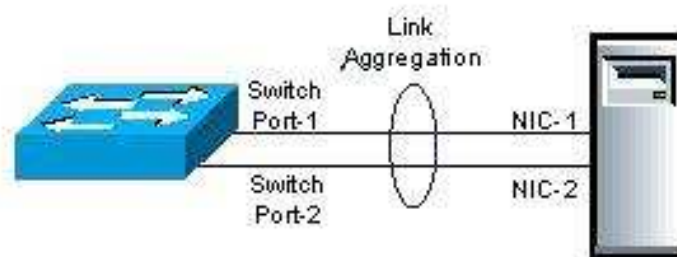
- Ingénierie réseau
- Solution hotspot propriétaire
- Liaisons point-à-point
- Géolocalisation
- Détection de présence

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

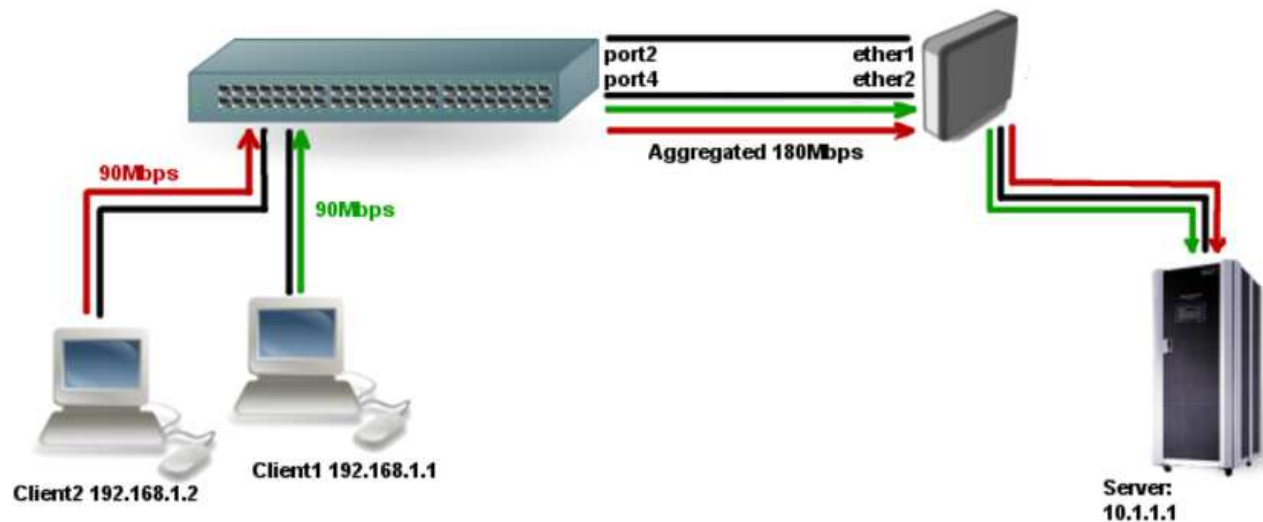


Source : wikipedia

- ➡ 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

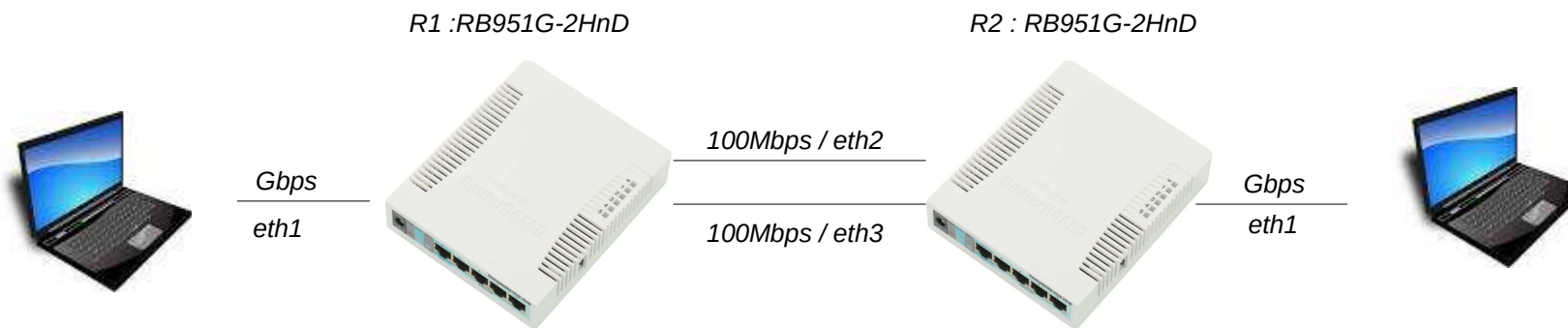
- Détecter le lien défaillant et agir
- MII
 - Basé sur l'état de l'interface
 - Lien ethernet actif = pas de panne
- ARP
 - Basé sur la réponse à des requêtes ARP
 - Plus fiable que MII
- Attention aux mélanges
 - Ex: Pas de ARP avec LACP

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
```

Interface <ether2_BOND1>

General Ethern Overall Stats Rx Stats Tx Stats Status Traffic

☒ Auto Negotiation

Tx Flow Control: off

Rx Flow Control: off

Advertise

☒ 10M half ☒ 10M full

☒ 100M half ☒ 100M full

☐ 1000M half ☐ 1000M full

OK Cancel Apply Disable Comment Torch Cable Test Blink Reset MAC Address Reset Counters

enabled running slave link ok

Mise en pratique #1 : ethernet

Configuration : bonding

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

Interface <bonding1>

General Bonding Status Traffic

Slaves: ether2_BOND1 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

OK Cancel Apply Disable Comment Copy Remove Torch

enabled running slave

Mise en pratique #1 : ethernet

Configuration : bridge

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

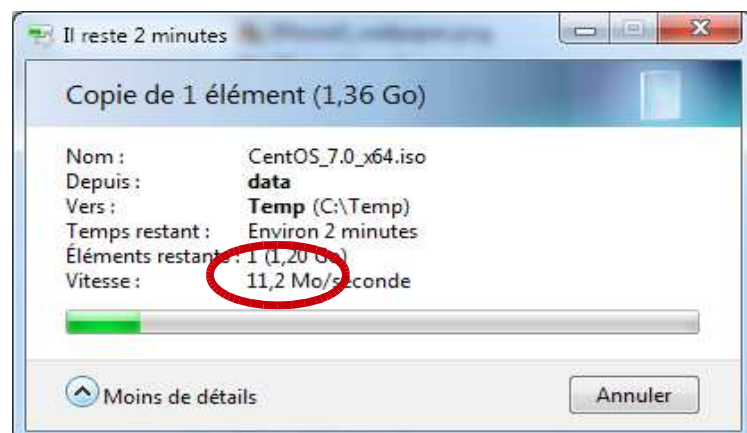
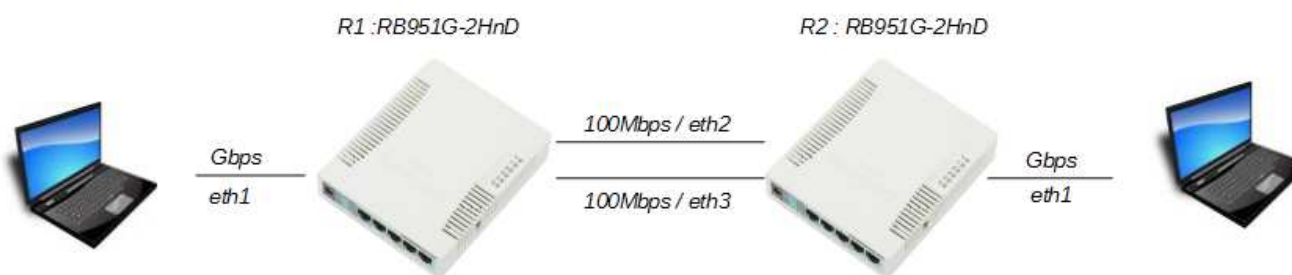
```
/interface bridge port  
add bridge=bridge1 interface=ether1_PC  
add bridge=bridge1 interface=bonding1
```

Bridge							
Bridge Ports Filters NAT Hosts							
+ - ✓ ✕ [icon] [icon] Settings							
	Name	Type	L2 MTU	Tx	Rx	Tx Pack	
R	bridge1	Bridge	1598	82.7 kbps		22.2 kbps	

Bridge							
Bridge Ports Filters NAT Hosts							
+ - ✓ ✕ [icon] [icon]							
	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

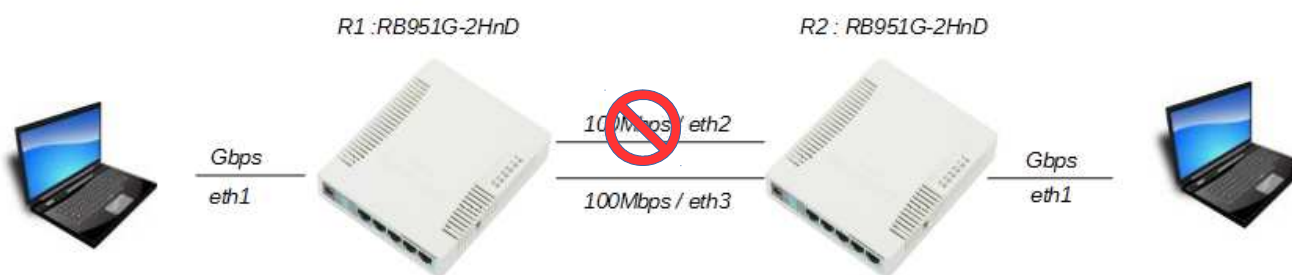
Copie de fichier



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

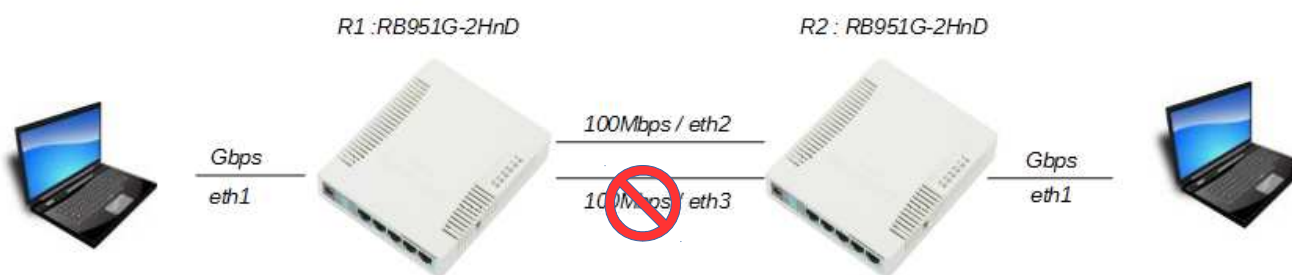
Test de redondance : coupure eth2



Interface List							
Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE							
+ - ✓ ✗ [icon] [icon]							
	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

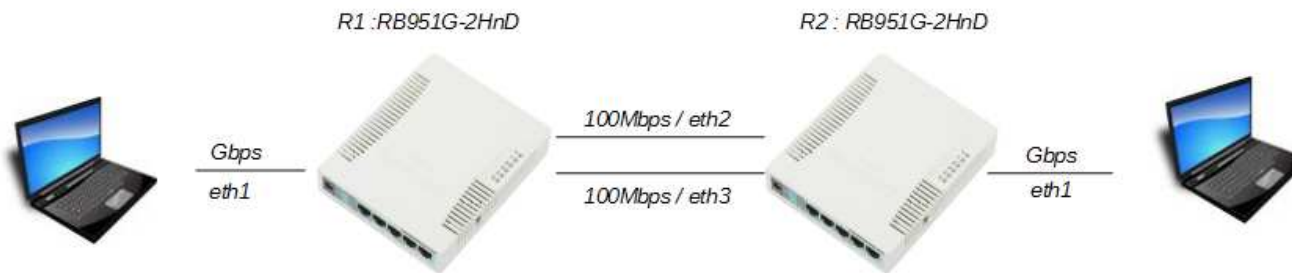


Interface List

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.	Rx 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 »

Interface <bonding1>

General Bonding Status Traffic

Slaves: ether2_BOND1 ether3_BOND2

Mode: balance rr

Primary: none

Link Monitoring: arp

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

OK Cancel Apply Disable Comment Copy Remove Torch

enabled running 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
```

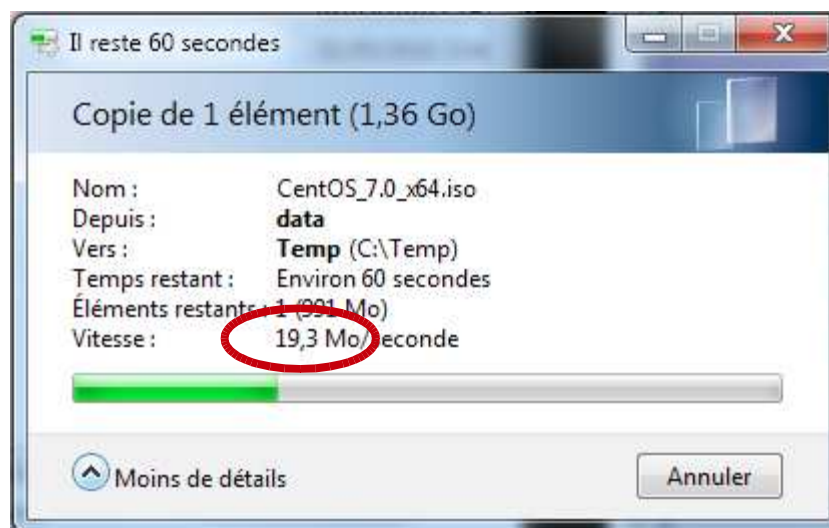
```
[ 4] 10.02-20.01 sec  220 MBytes  184 Mbits/sec
```

```
[ 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 € !!

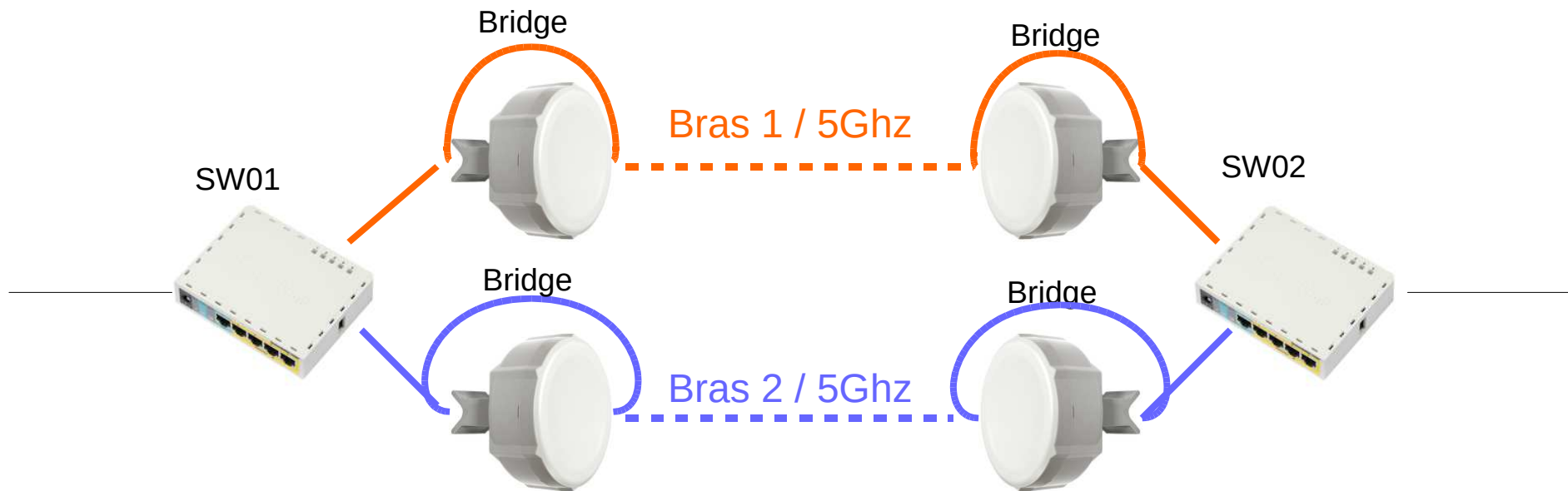
RB750UP



- 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

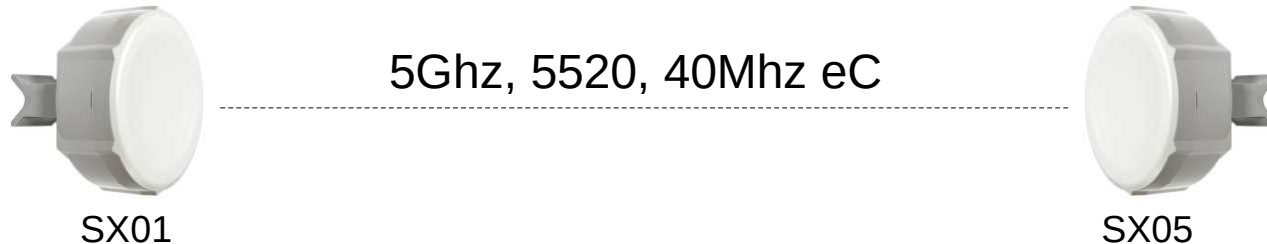
Lien WIFI : préparation



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
```

Interface <wlan1>	
General	Wireless
Mode:	bridge
Band:	5GHz-only-N
Channel Width:	20/40MHz eC
Frequency:	5520 MHz
SSID:	BYA0105
Radio Name:	D4CA6DABEE73
Scan List:	default
Wireless Protocol:	nstreme
Security Profile:	profil_secure
Frequency Mode:	regulatory-domain
Country:	france
Antenna Gain:	16 dBi

```
20/40mhz-eC \  
hide-ssid=yes \  
bridge_wds \  
wds-mode=bridge
```

Mise en pratique #2 : Wifi

Lien WIFI : configuration



Uptime: 10d 11:48:00 ☒

Wireless Tables

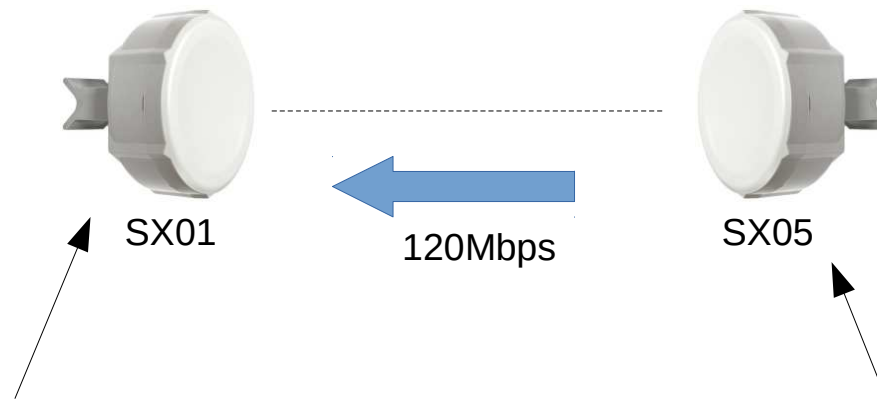
Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels

Find

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
```

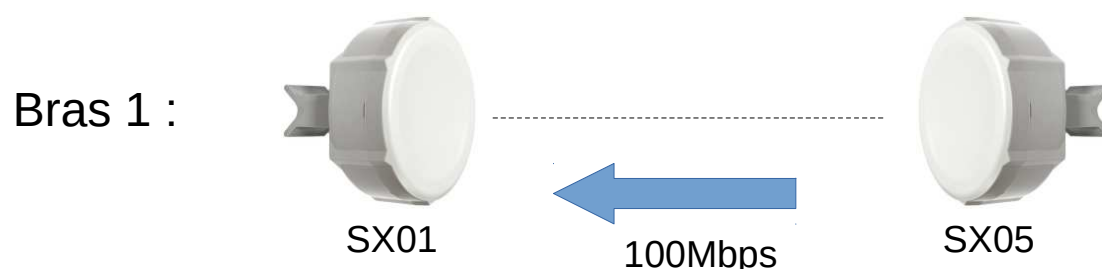
```
ip-dst=10.94.105.10
```

```
/tool traffic-generator
```

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

Mise en pratique #2 : Wifi

Test avec l'outil intégré « traffic-generator »

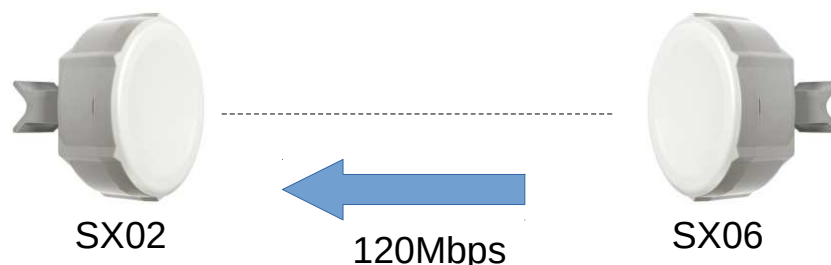


Wireless Tables									
Interfaces Nstreme Dual Access List Registration Connect List Security Profiles Channels									
+ - ✓ ✗ 📁 🔍 CAP Scanner Freq. Usage Alignment Wireless Sniffer Wireless Snooper									
	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	FP Tx	
RS	wlan1	Wireless (Atheros 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)									
<pre>[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</pre>									
<pre>[atlanteam@BYA_SX01] > /interface wireless status: running-ap channel: 5520/20-eC/an(11) wireless-protocol: nstreme noise-floor: -115dBm overall-tx-cq: 71% registered-clients: 1 authenticated-clients: 1 polling: yes csma-disabled: no wmm-enabled: yes</pre>									

Mise en pratique #2 : Wifi

Test avec l'outil intégré « traffic-generator »

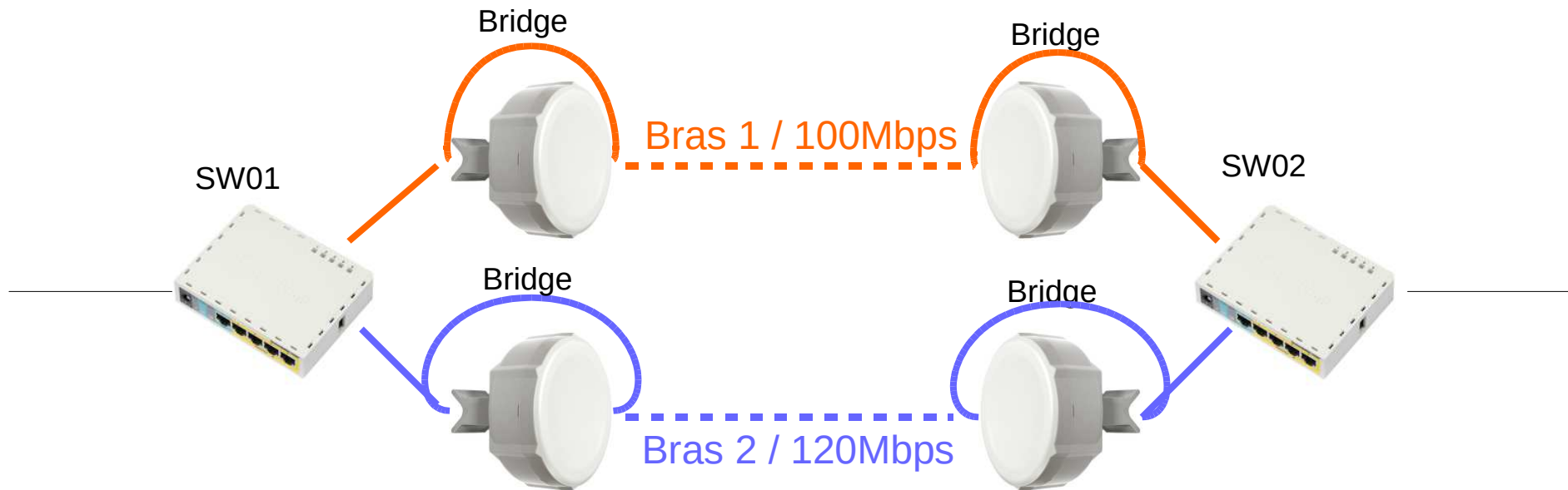
Bras 2 :



Interface List								
Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE								
+ - [] [x] [] [] [] [] [] [] []								
	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 kbps	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:					noise-floor: -11dBm			
2.1kbps					overall-tx-cq: 70%			
name: wlan1					status: running-ap			
rx-packets-per-second: 10 138					channel: 5580/20-eC/an(11dBm)			
rx-bits-per-second: 122.7Mbps					wireless-protocol: 802.11			
fp-rx-packets-per-second: 10 138					noise-floor: -11dBm			
fp-rx-bits-per-second: 122.7Mbps					overall-tx-cq: 81%			
rx-drops-per-second: 0					registered-clients: 1			
rx-errors-per-second: 0					authenticated-clients: 1			
tx-packets-per-second: 3					current-distance: 1			
tx-bits-per-second: 2.0kbps					wmm-enabled: yes			
fp-tx-packets-per-second: 3					current-tx-powers: 6Mbps:8(8/11),9Mbps			
fp-tx-bits-per-second: 2.0kbps					HT20-1:8(8/11),HT20-			
tx-drops-per-second: 0					HT40-2:8(8/11),HT40-			
tx-errors-per-second: 0					notify-external-fdb: no			
[Q quit D dump C-z pause]					[Q quit D dump C-z pause]			

Mise en pratique #2 : Wifi

Construction du bonding

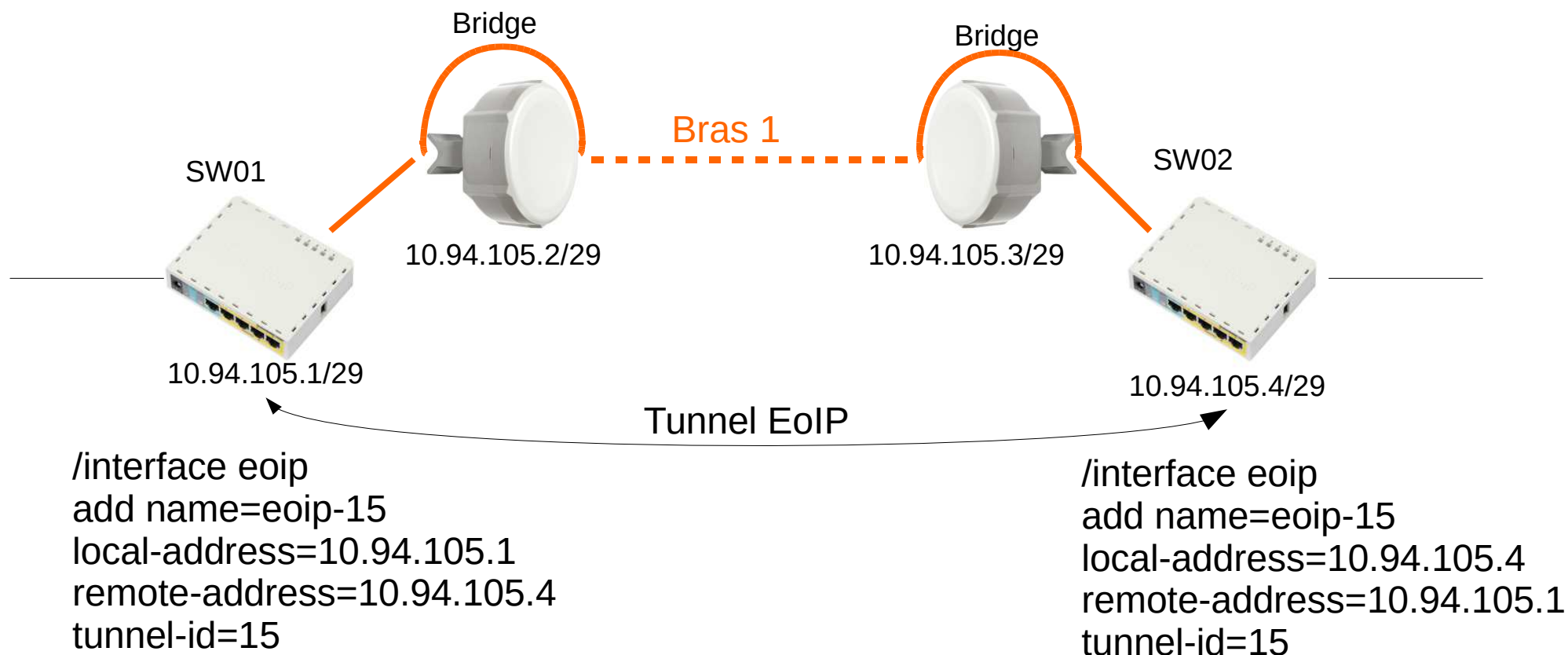


Mais... <http://wiki.mikrotik.com/wiki/Manual:Interface/Bonding> dit :

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

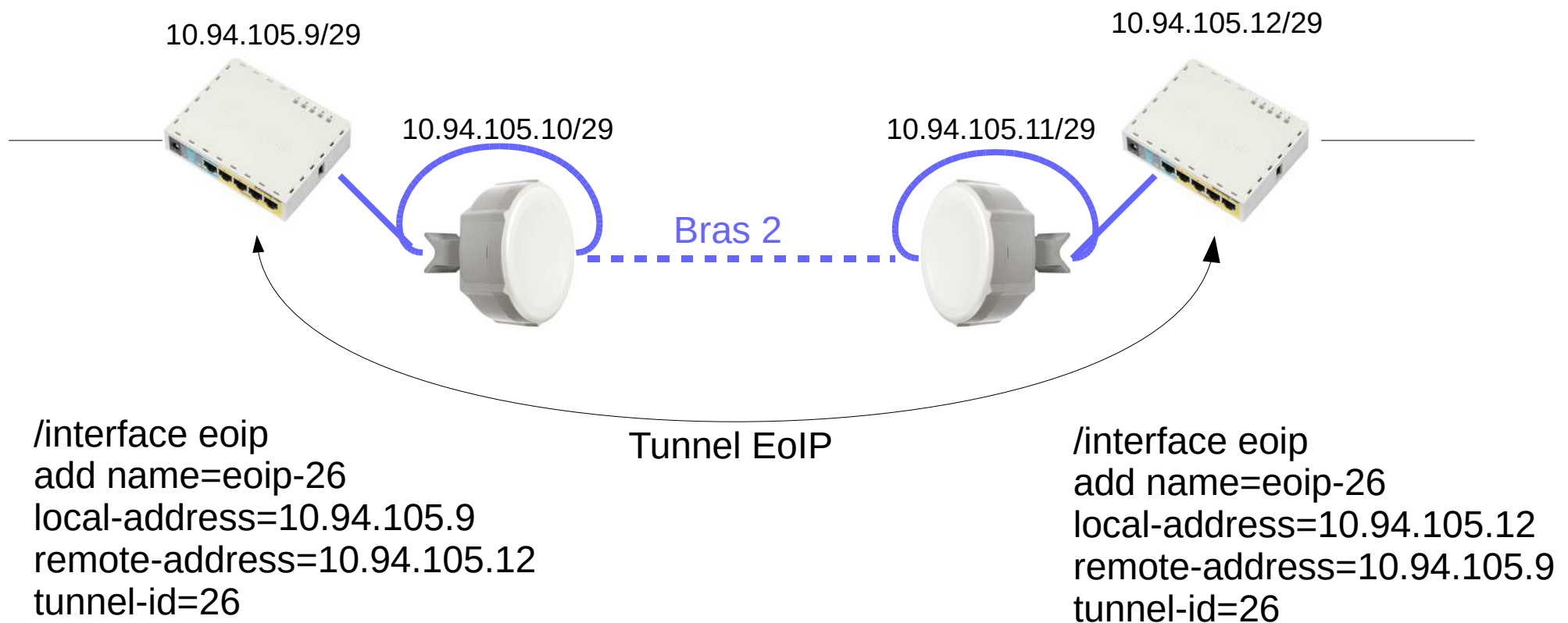
Mise en pratique #2 : Wifi

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			
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: 13 013 12 184 14 838
rx-drops-per-second: 0 0 0
rx-errors-per-second: 0 0 0
rx-bits-per-second: 157.5Mbps 78.8Mbps 95.1Mbps
tx-packets-per-second: 4 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
RS	bonding-Fort							
R	bridge_switch							
RS	eoip-15							
RS	eoip-26							
RS	ether1_LAN_RN141							
R	ether2_FORT_5580_SX02							
R	ether3_FORT_5520_SX01							
	ether4							
	ether5							

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

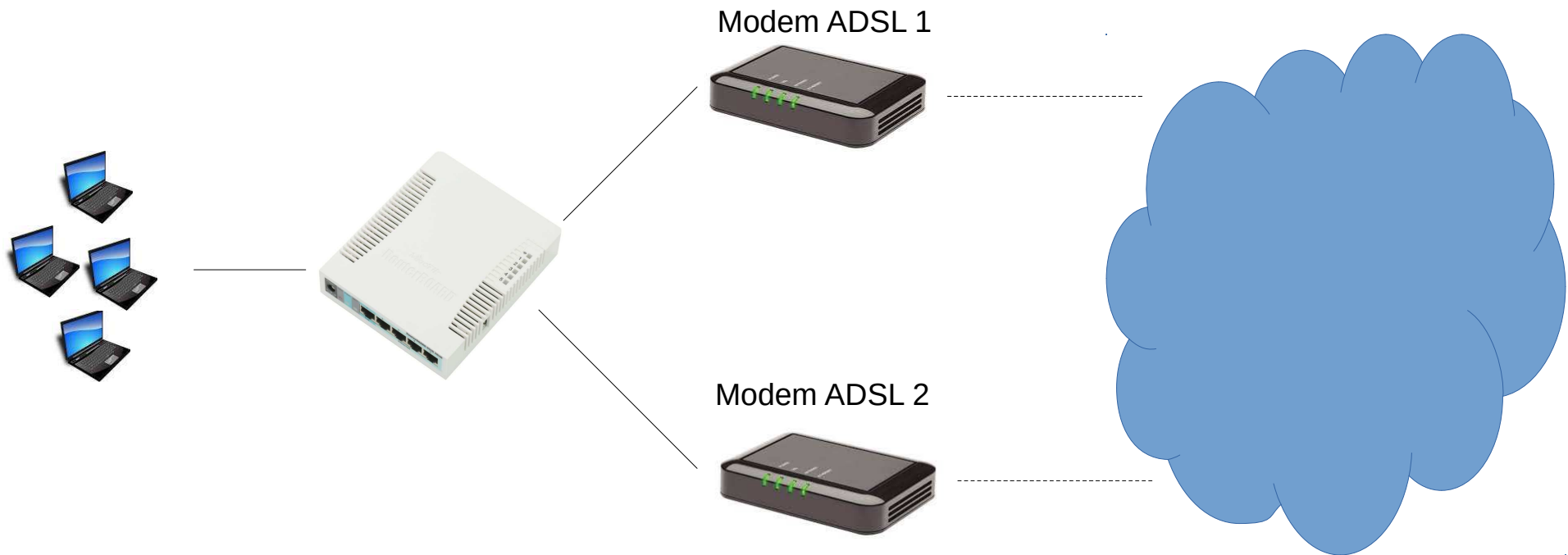
```
45 10.94.105.35 56 64 1ms
46 10.94.105.35 56 64 2ms
47 10.94.105.35 56 64 4ms
48 10.94.105.35 56 64 2ms
49 10.94.105.35 56 64 1ms
50 10.94.105.35 56 64 11ms
51 10.94.105.35 56 64 3ms
52 10.94.105.35 timeout
53 10.94.105.35 timeout
54 10.94.105.35 timeout
55 10.94.105.35 56 64 125ms
56 10.94.105.35 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

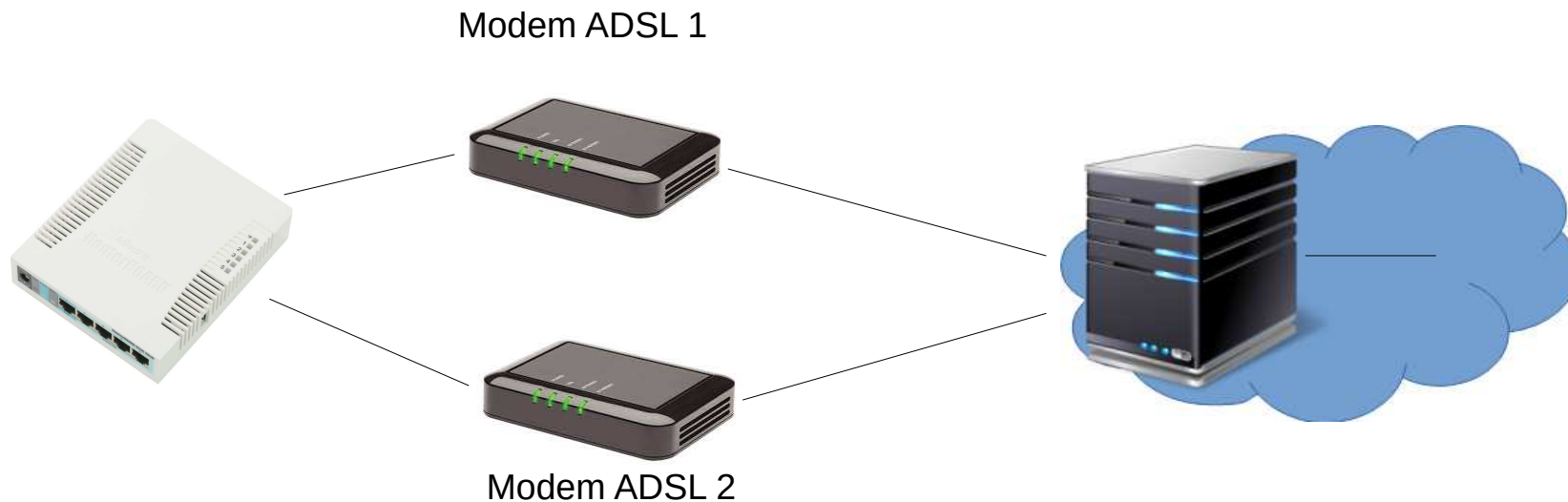
Vue globale



Objectif : redondance, répartition de charge, agrégation

Mise en pratique #3 : ADSL

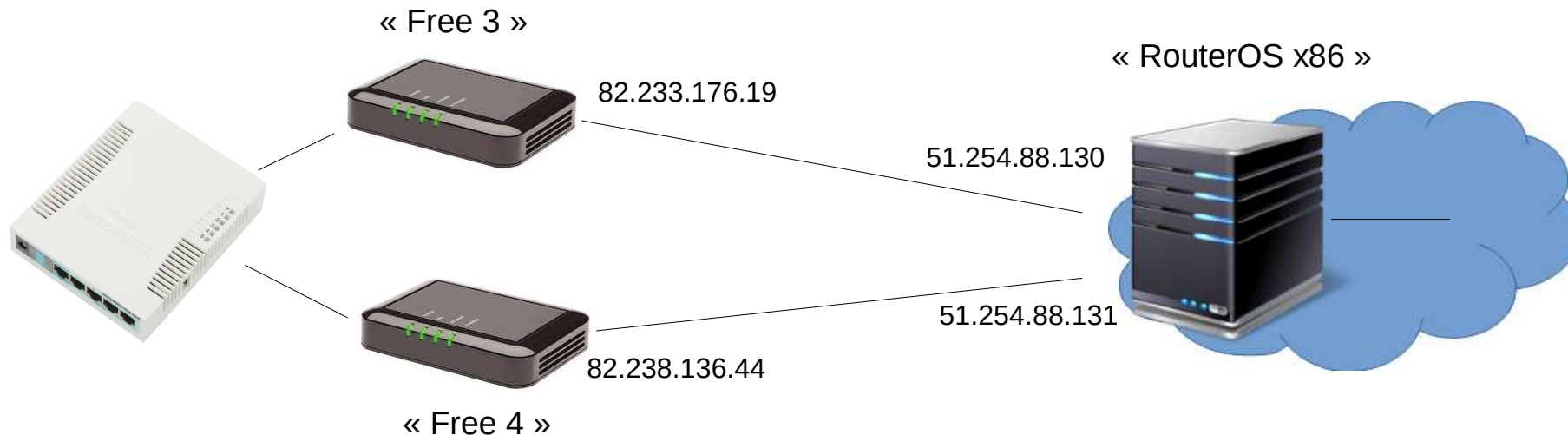
Architecture choisie



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 main table lists various hardware categories and their corresponding software packages. The 'X86' category is highlighted with a red box.

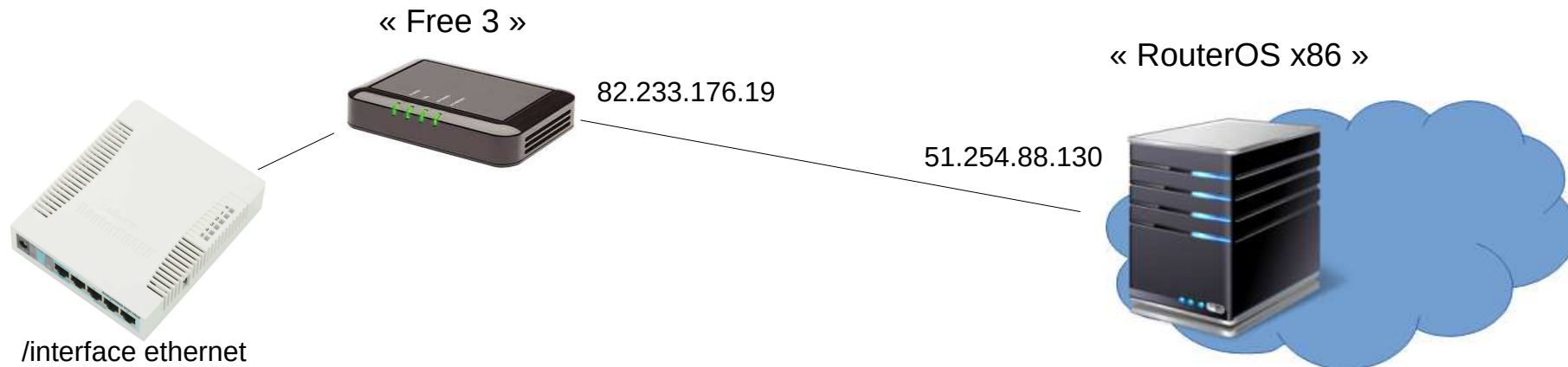
	6.32.4 (Bugfix only)	6.35.2 (Current)	5.26 (Legacy)	6.36rc12 (Release candidate)
MIPSBE	CRS, NetBox, NetMetal, PowerBox, QRT, RB9xx, hAP, mAP, RB4xx, cAP, hEX, wAP, BaseBox, DynaDish, RB2011, SXT, OmniTik, Groove, Metal, Sextant, RB7xx			
Main package	↓	↓	↓	↓
Extra packages	↓	↓	↓	↓
SMIPS	hAP lite			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

The 'Cloud Hosted Router' section is also visible, showing a table of images and their download links.

	6.32.4 (Bugfix only)	6.35.2 (Current)
images	img, vmdk, vhd, vhdx, vdi	
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
```

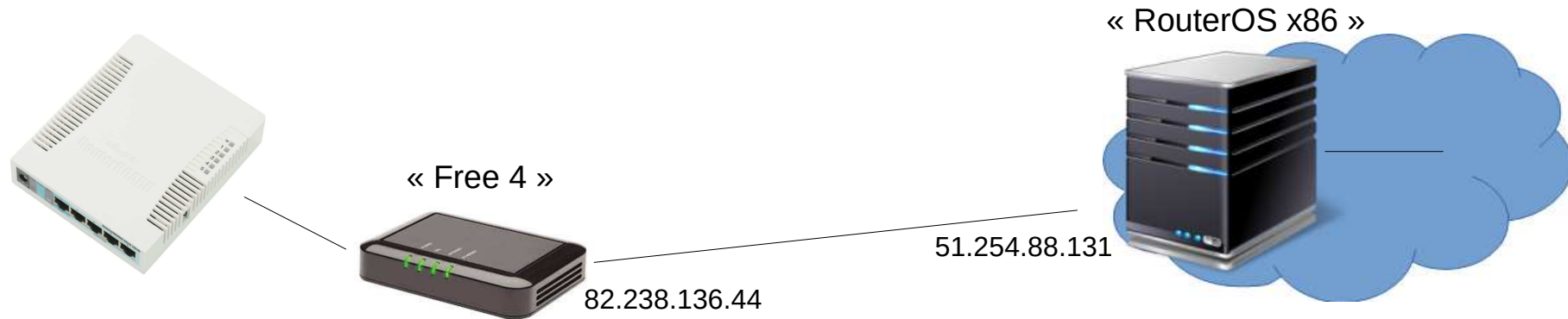
```
/ip route
dst-address=51.254.88.130/32
gateway=82.233.176.254
```

```
/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

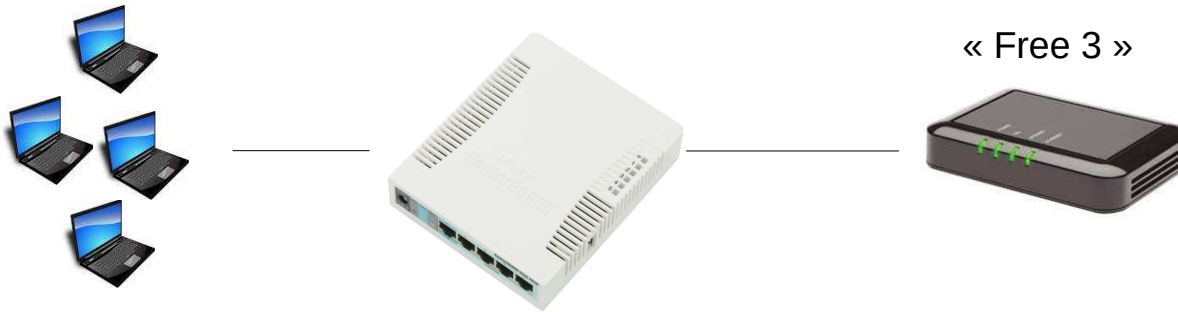
```
/interface bonding
add name=bonding1
slaves=eoip-free3,eoip-free4
link-monitoring=arp
arp-interval=200ms arp-ip-targets=10.0.0.1
```

```
/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

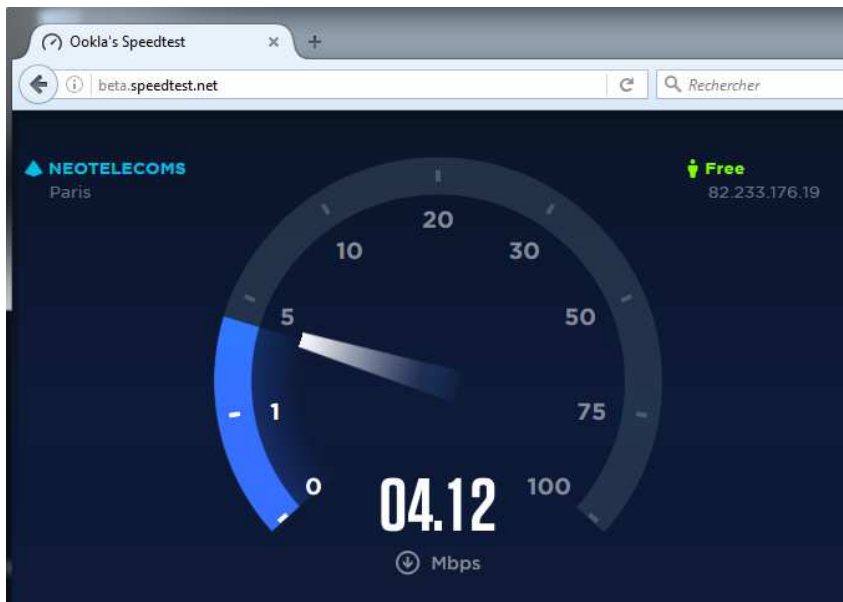


Route <0.0.0.0/0>

General	Attributes
Dst. Address: 0.0.0.0/0	
Gateway: 82.233.176.254 reachable ether3_FREE3	

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

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



Interface List

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

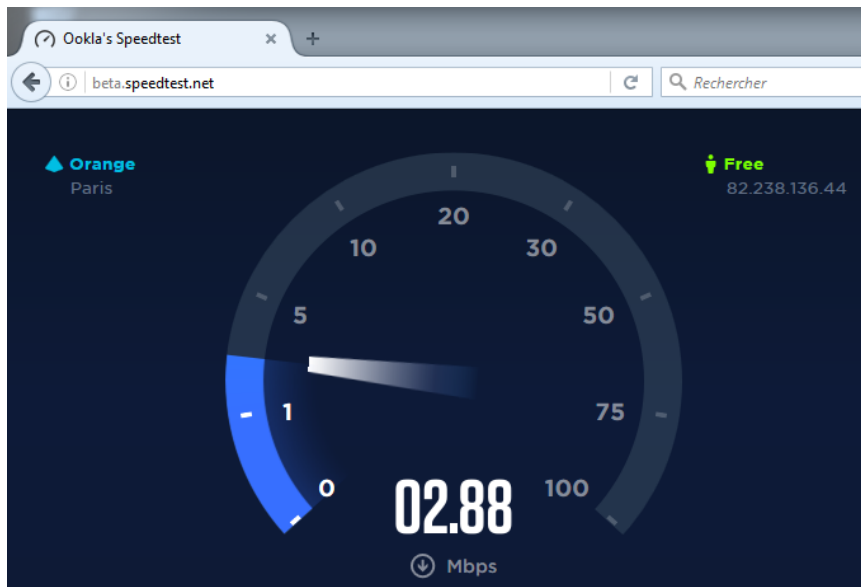


« Free 4 »

Route <0.0.0.0/0>

General	Attributes
Dst. Address: 0.0.0.0/0	
Gateway: 82.238.136.254	reachable ether4_FREE4

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



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

Mise en pratique #3 : ADSL

Test bonding / performances



Route <0.0.0.0/0>

General Attributes

Dst. Address: 0.0.0.0/0

Gateway: 10.0.0.1 reachable bonding1

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

Ookla's Speedtest

beta.speedtest.net/result/5316413148

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 List							
Interface	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding
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			
R 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			
R 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		
X	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