Redundancy and Performance on Point to Point link

Philippe ROBERT

Speaker

Philippe ROBERT – p.robert@engitech.ch

MCTNA – MTCRE – MTCTCE – MTCUME – MTCWE certified as trainer MikroTik since 2013

(Microsoft – VMware – Citrix certifications)

ENGITECH S.A. , Genève – Suisse

Consulting, training et MikroTik official Switzerland distributor servers management, datacentre, wireless network…

Projects

- Network infra support:

  ISP – WISP – VPN

  Brussell: myfifi.net

- Setup & Services

  WIFI – VPN …

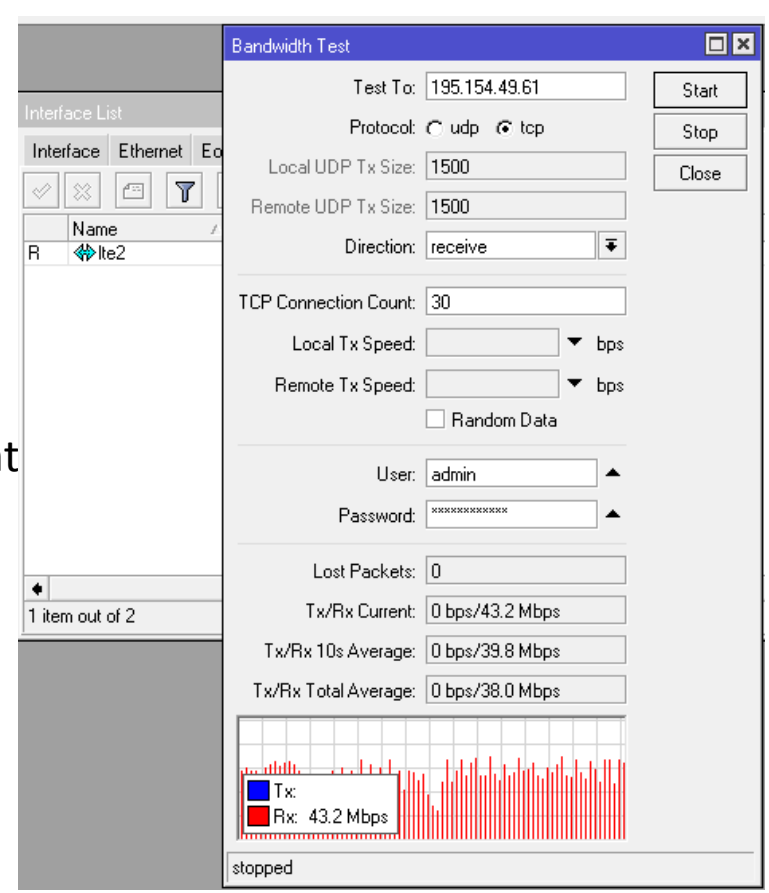
- LTE

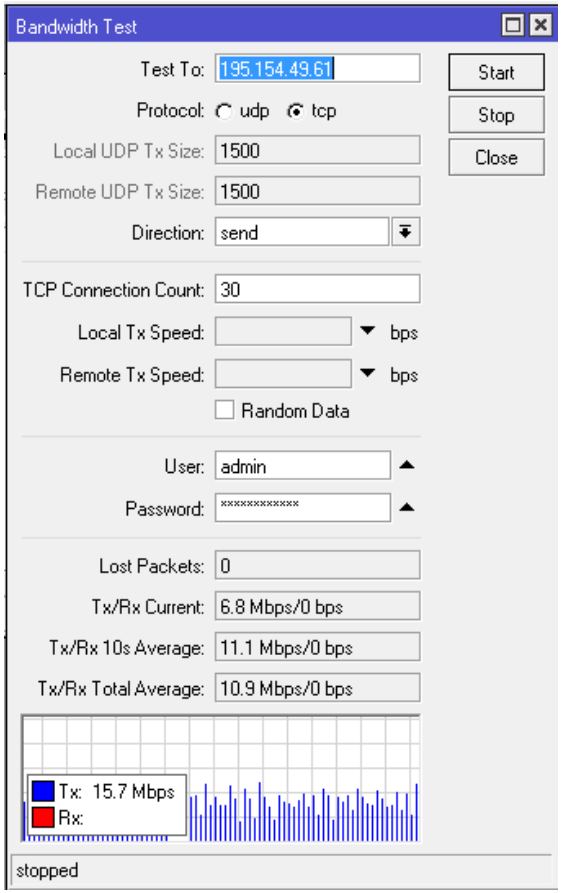
LTE

Wireless Antenna
LTE Antenna

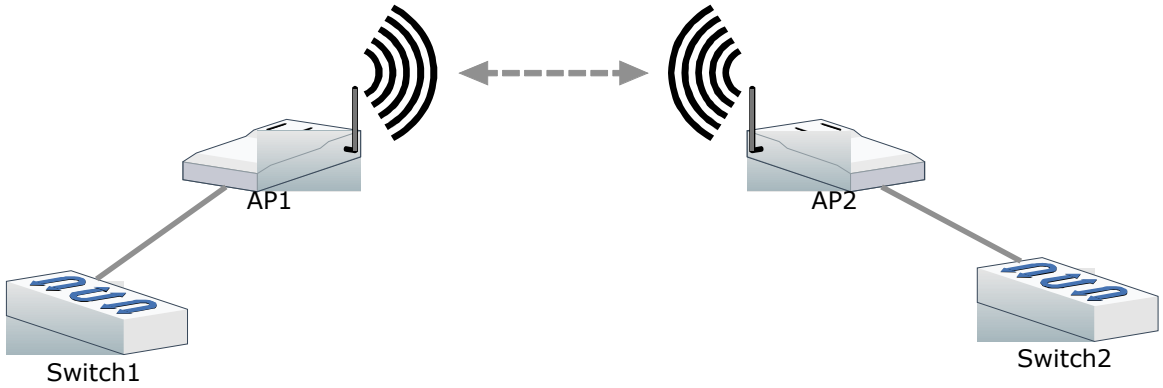
40mbs down
10mbps up

Existing ADSL
Setup replacement





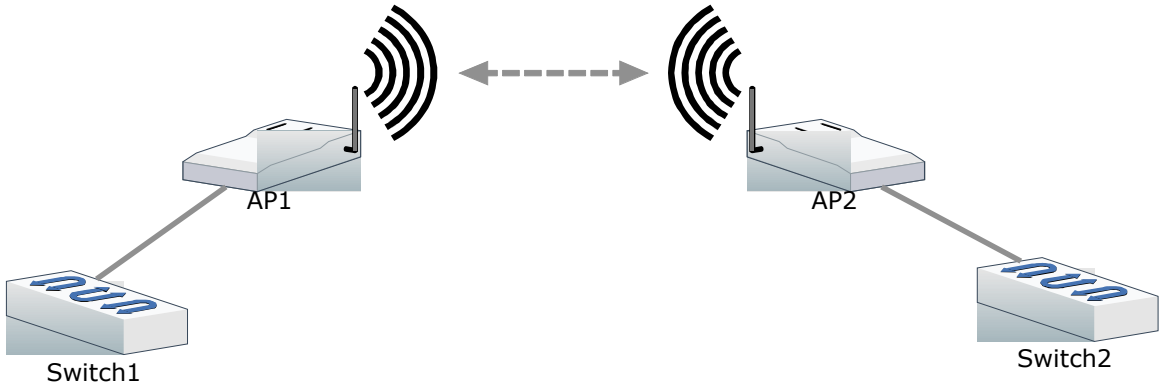
Link 2 Wireless Points



2 possibilities :

- Routing (Layer3) -> need a gateway
- Bridge (Layer2) -> network transparent

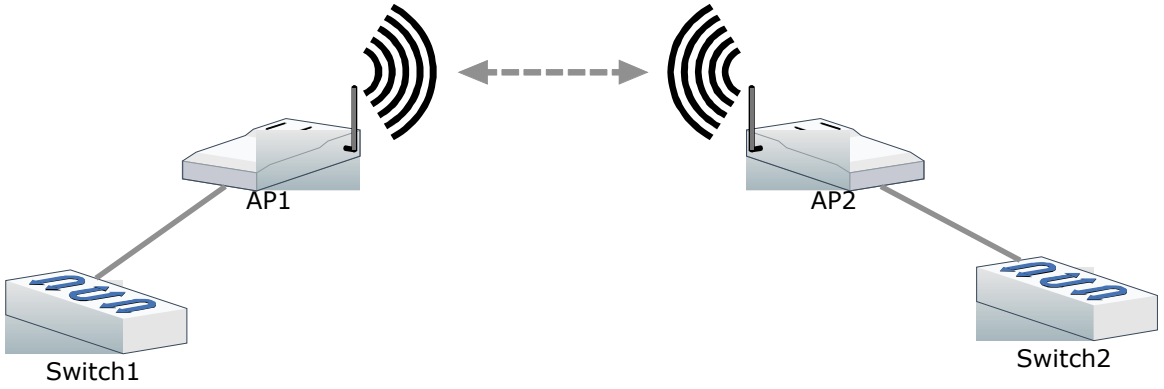
Performance UDP

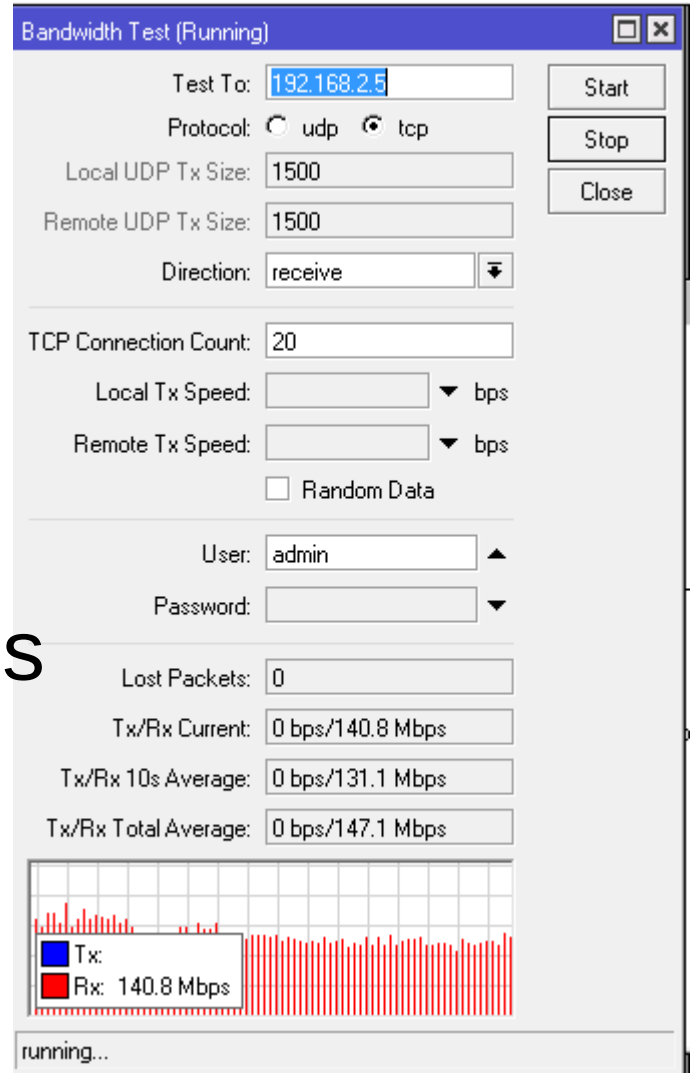


- Routing: 220mbps - 105/105mbps

- Bridge: 220mbps - 115/90mbps

TCP Performance





Routing: 140mbps - 75/75mbps

Bridge: 140mbps - 75/75mbps

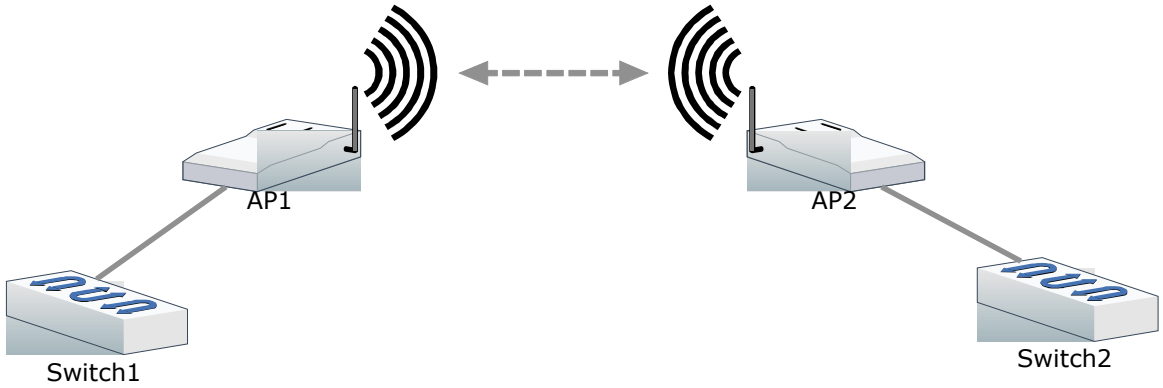
TCP Performance

?????

Where does these 3.88mbps come ?

-> TCP ACK and half-duplex Wireless

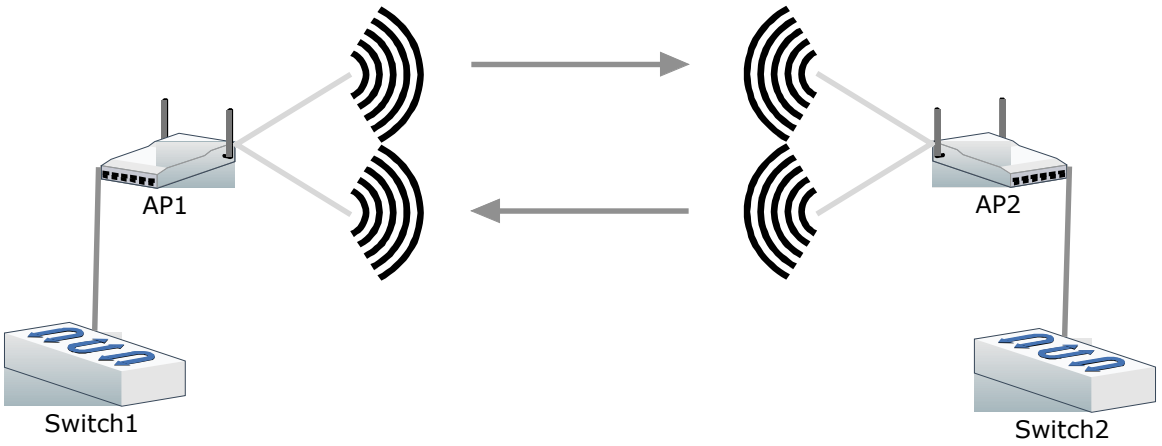
Easy to setup – bridge or routing



BUT :

- no redundancy
- half-duplex (may we solve it?)

Solution :
2 WIFI links with 2 APs



How to do it?

Many way to do it :

- Bonding
- NSTREME DUAL
- OSPF routing (one or another routing way) between the 2 APs
- …

Pro's / Con's

With NSTREME DUAL :

- «FULL-DUPLEX»
- Better speed

- CPU INTENSIVE
- BUT :

  if one LINK down -> no more communication

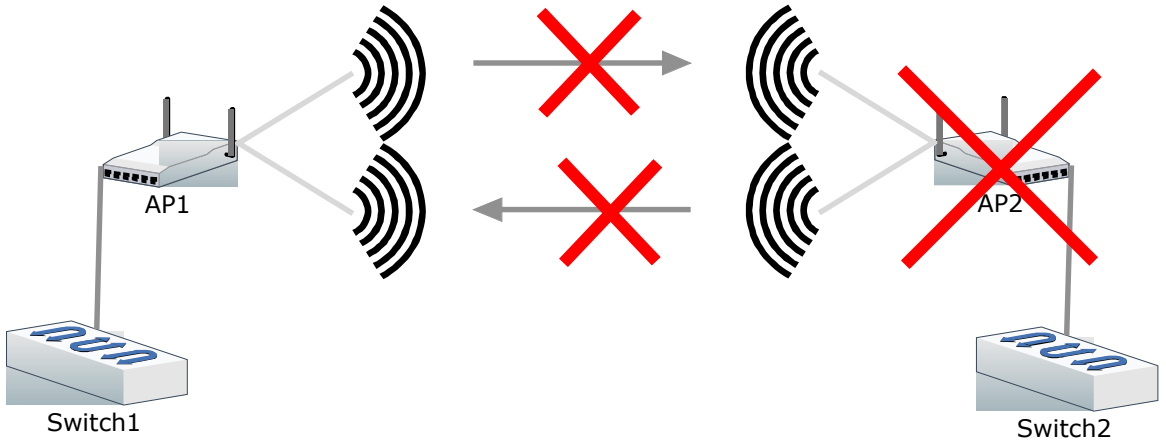
With OSPF :

- «FULL DUPLEX» emulation
- FAILOVER on the link UP

- Not same disadvantages but…

BUT!

- If one AP down, link is down between the two points ->

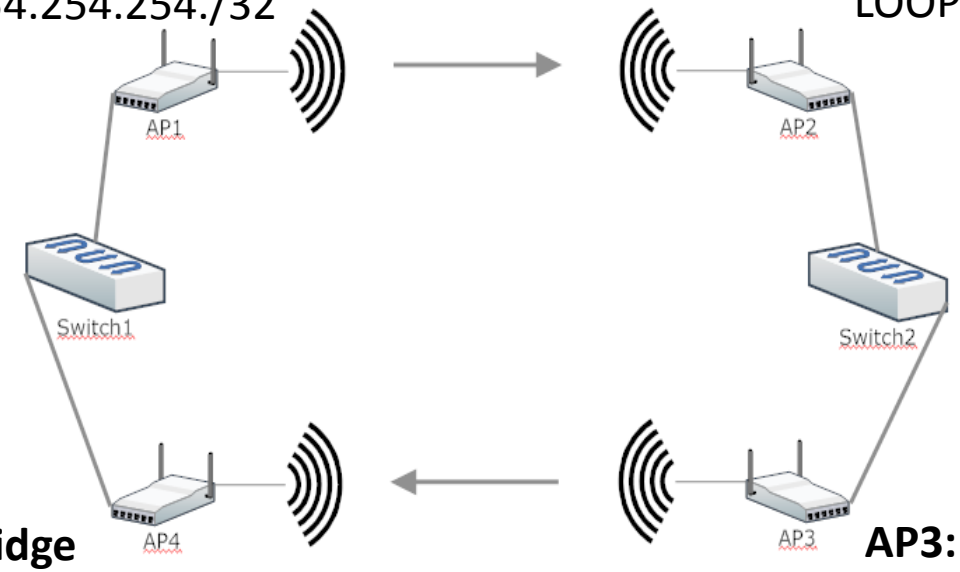


- We may want more redundancy on critical links…

Better solution: 4 APs – 2 wifi links Full redundancy

AP1: **mode AP Bridge**
ETH1: 192.168.1.1/24
WLAN1: 172.16.16.1/30
LOOPBACK: 10.254.254.254./32

AP2: mode station
ETH1: 192.168.2.1/24
WLAN1: 172.16.16.2/30
LOOPBACK: 10.254.254.253./32



Switch1:
192.168.1.10/24

Switch2:
192.168.2.10/24

AP4: mode AP Bridge
ETH1: 192.168.1.2/24
WLAN1: 172.16.17.1/30
LOOPBACK: 10.254.254.251./32

AP3: mode station
ETH1: 192.168.2.2/24
WLAN1: 172.16.17.2/30
LOOPBACK: 10.254.254.252./32

How to setup it?

- With RouterOS there are many ways to do it

- In this example we are going to use VRRP for the Gateway redundancy and OPSF for routing packets and creating a « full-duplex »

V.R.R.P.

- «Virtual Router Redundancy Protocol» provide a solution for agregate routers in a logical group called « Virtual Router »

- Routers from the same group shared the IP Gateway used for the routing

- Link will be UP in less than 3 seconds

V.R.R.P. Setup

Add an interface :

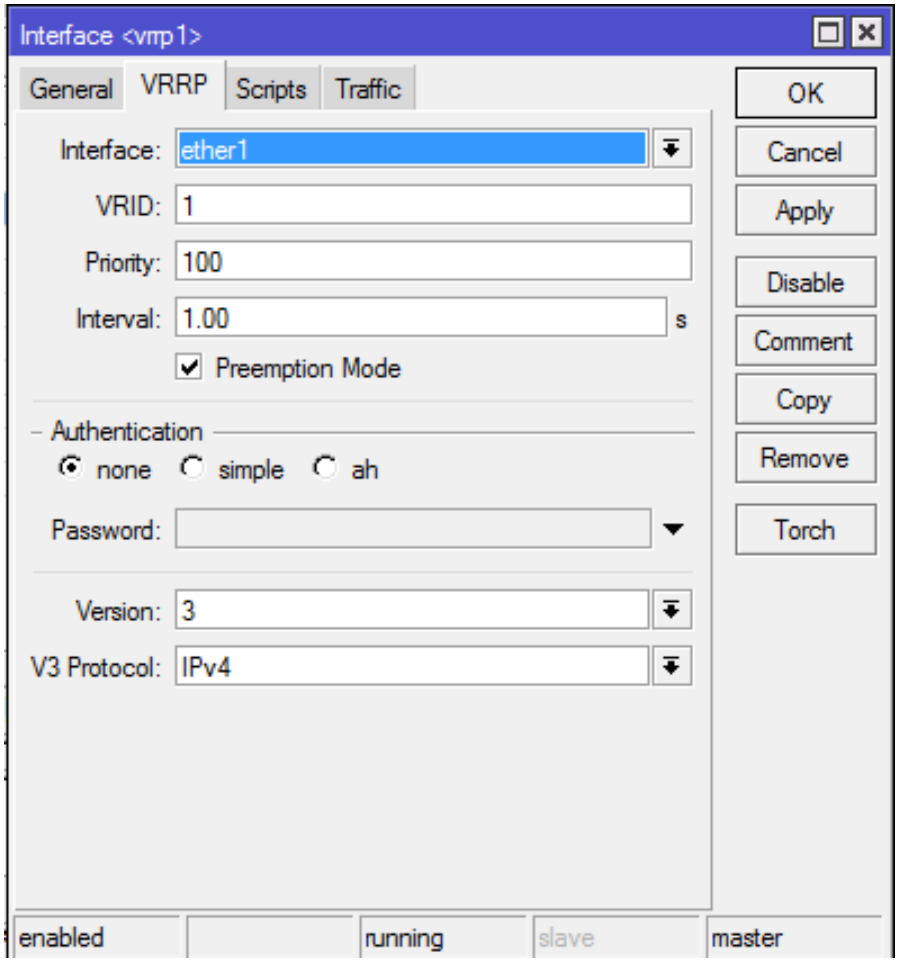
- Interface linked (ether1)
- Setup VRID – unique id unique for the group
- Priority setup
  - -> 100 for the master (AP1 et AP3)
  - -> 50 for the backup (AP2 et AP4)

Once the interface created assign a IP which will be shared between the routers

VRRP1 : 192.168.1.254/**32** (AP1 et AP4)

VRRP2 : 192.168.2.254/**32** (AP2 et AP3)

Important : always use a **/32**



OSPF

Link state routing protocol. It collects link state of all available routers and constructs a network map. With this, it identifies the fastest route to reach the destination.

Very quick to fault detection and rebuild its routes, it will bring automatic redundancy to our network of roads

Next, we will configure the "full duplex »

The idea is to create all links and configure OSPF. Then we will add costs to OSPF interfaces for packet traffic takes only 1 way.

OSPF Setup

<u>Add a loopback address:</u>

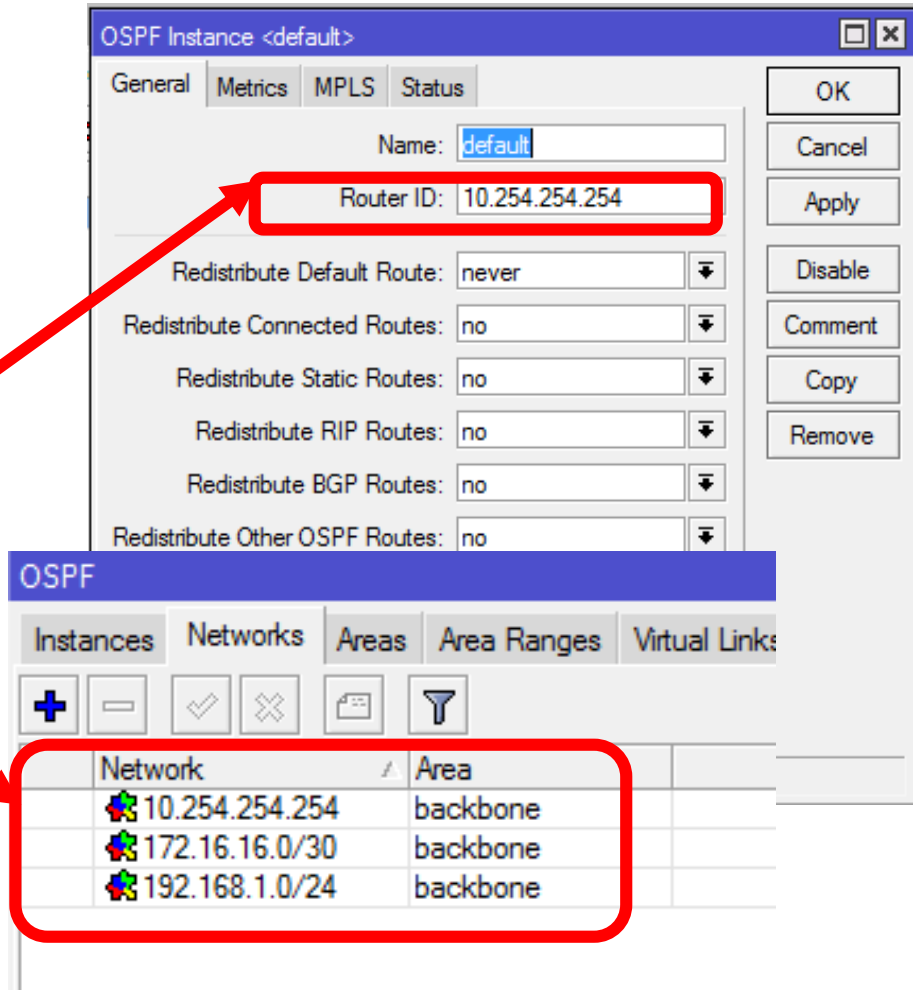
Create a bridge without interface

Assign an address / 32

-> Example (AP1: 10.254.254.254/32)

<u>2 and OSPF configurations:</u>

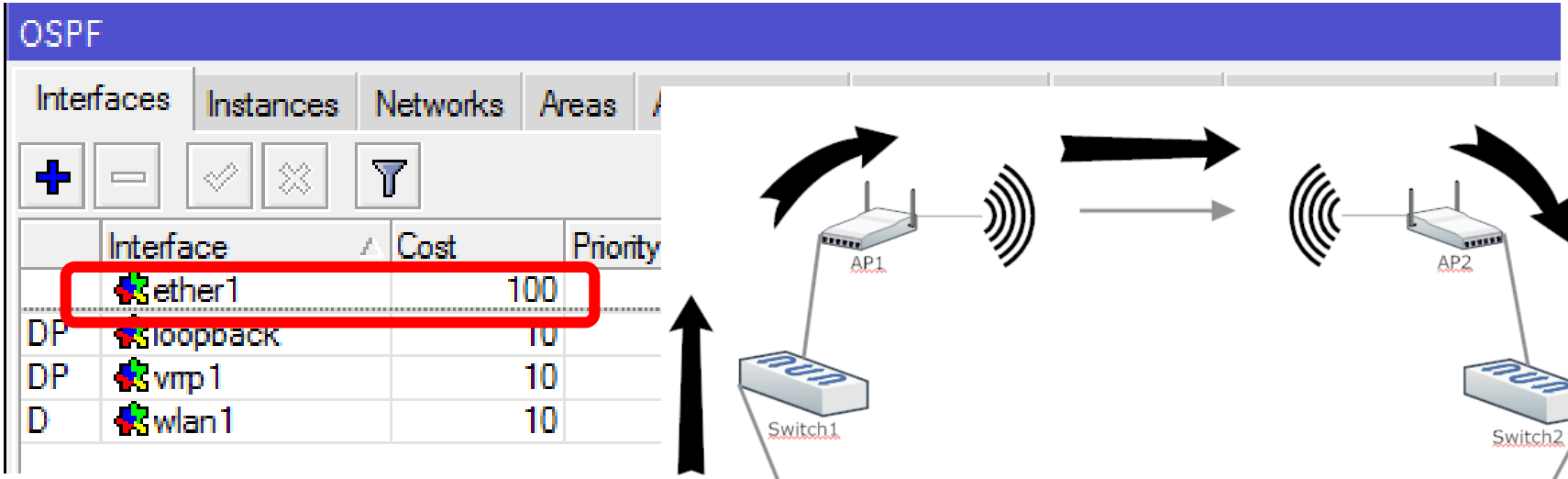
- Router ID = loopback IP address
- Add the different networks that are part of your configuration



«Full-duplex» setup

/routing ospf interface add interface=ether1 cost=100 (AP1,AP3)

/routing ospf interface add interface=wlan1 cost=100 (AP2,AP4)

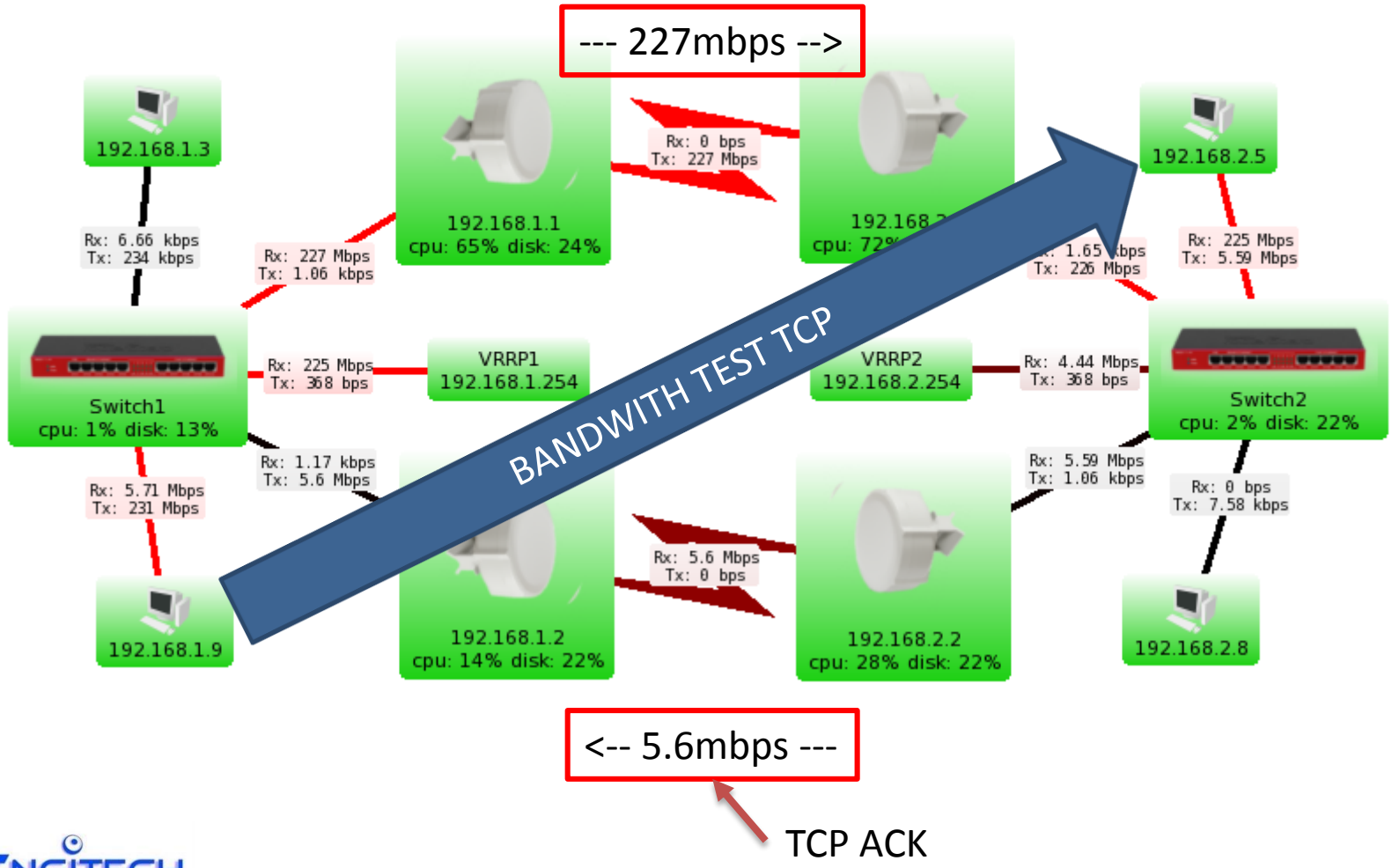


It creates the IP packet's way

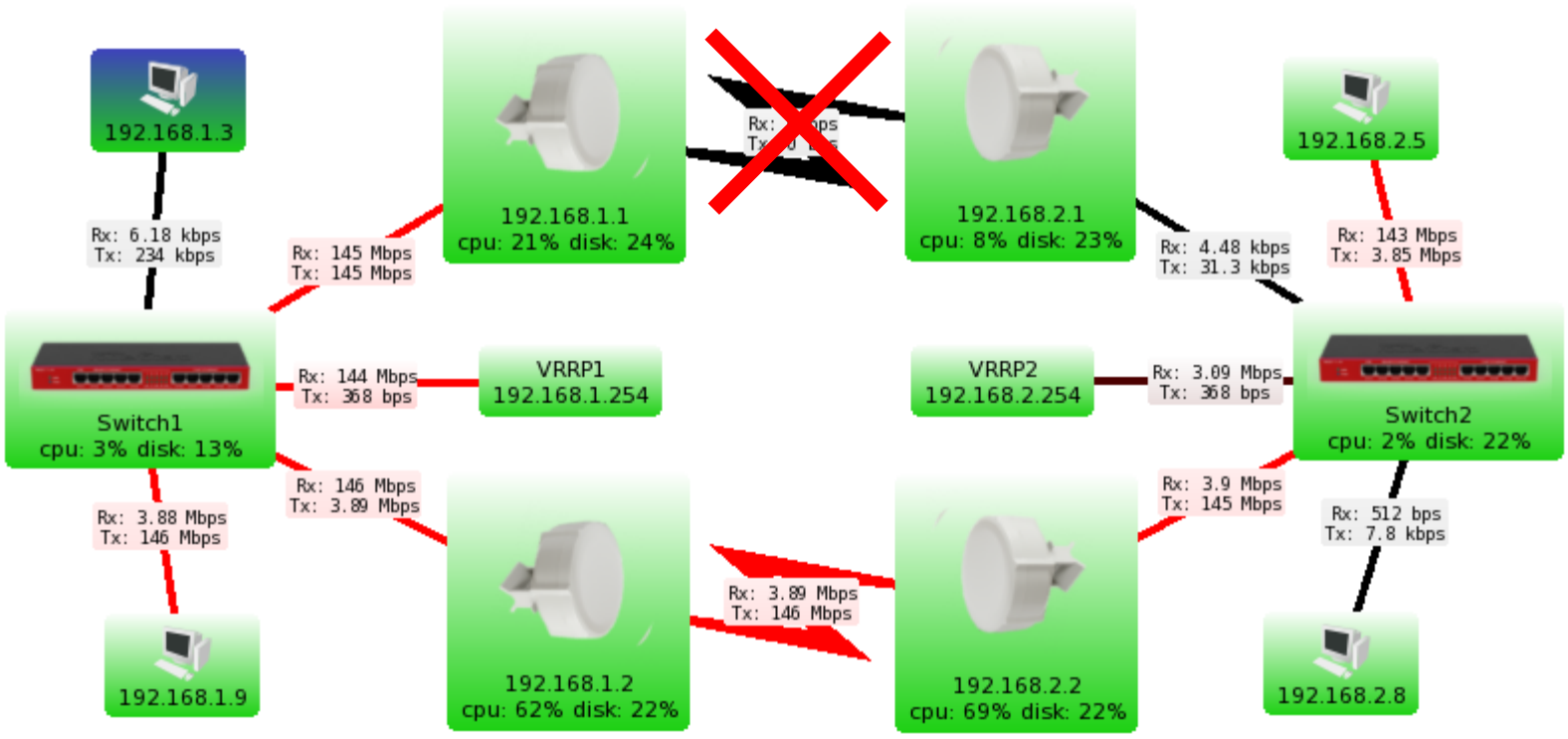
VRRP & OSPF done

If you remember we were at 140mbps for TCP bandwith test ....

NOW -> TCP ACK packets are handled correctly with this design



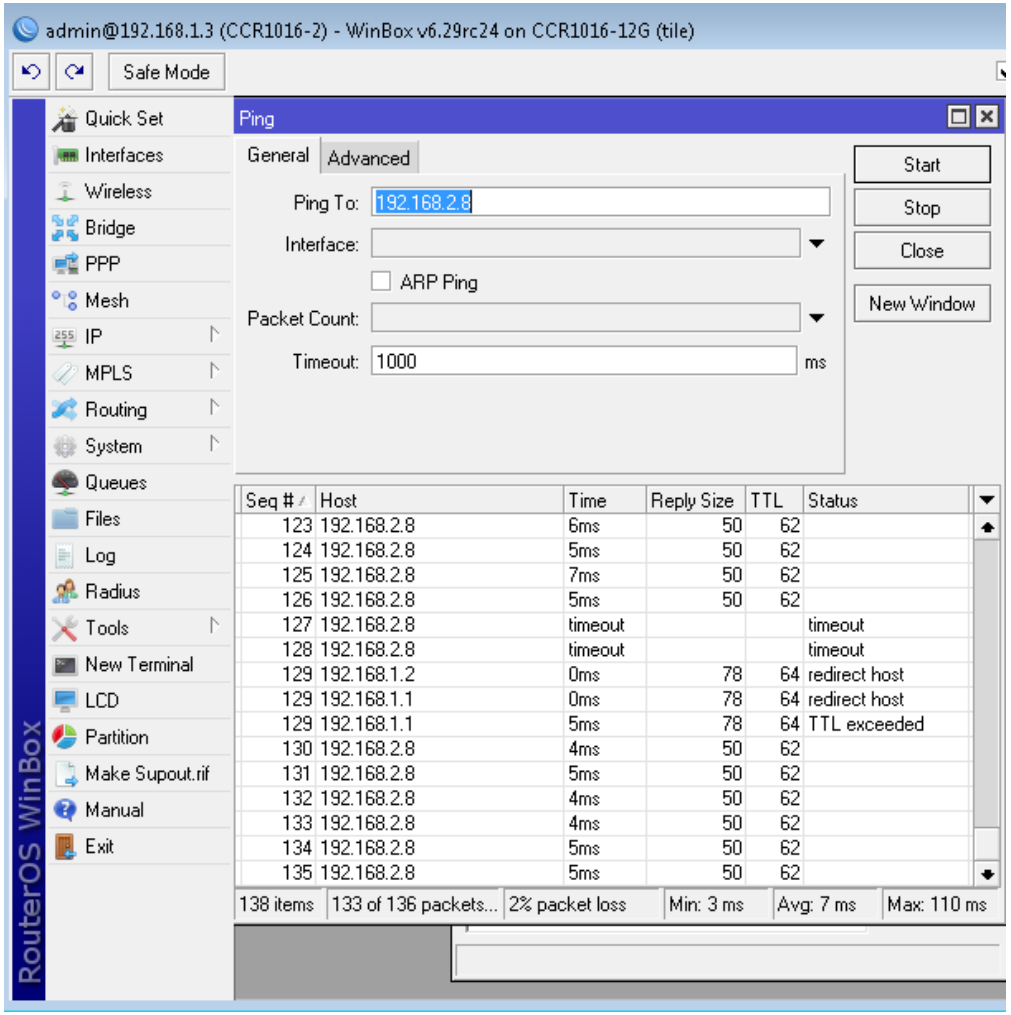
Redundancy – 1 link cut



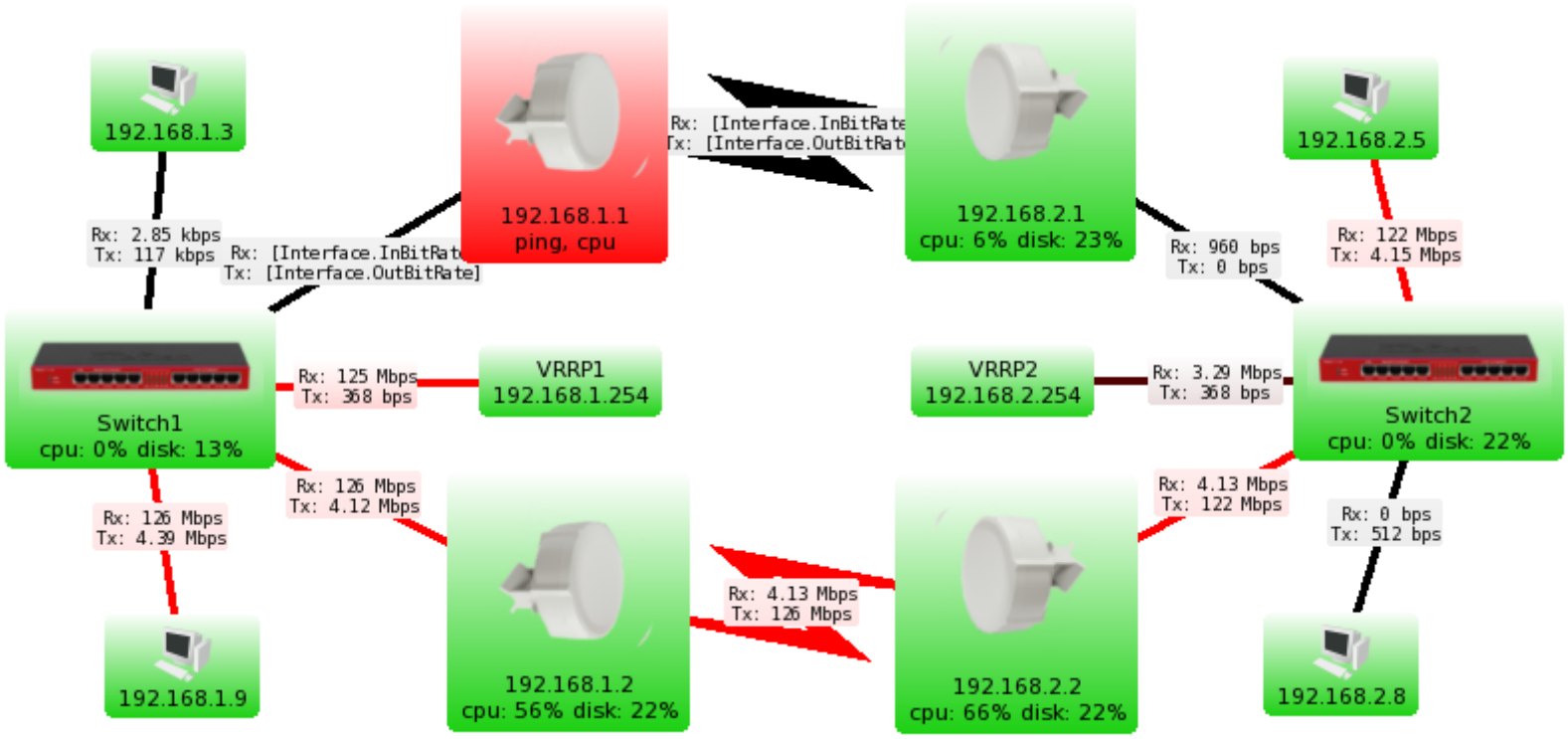
Redundancy – 1 link cut

5 Pings and still running

OSPF bring back the link



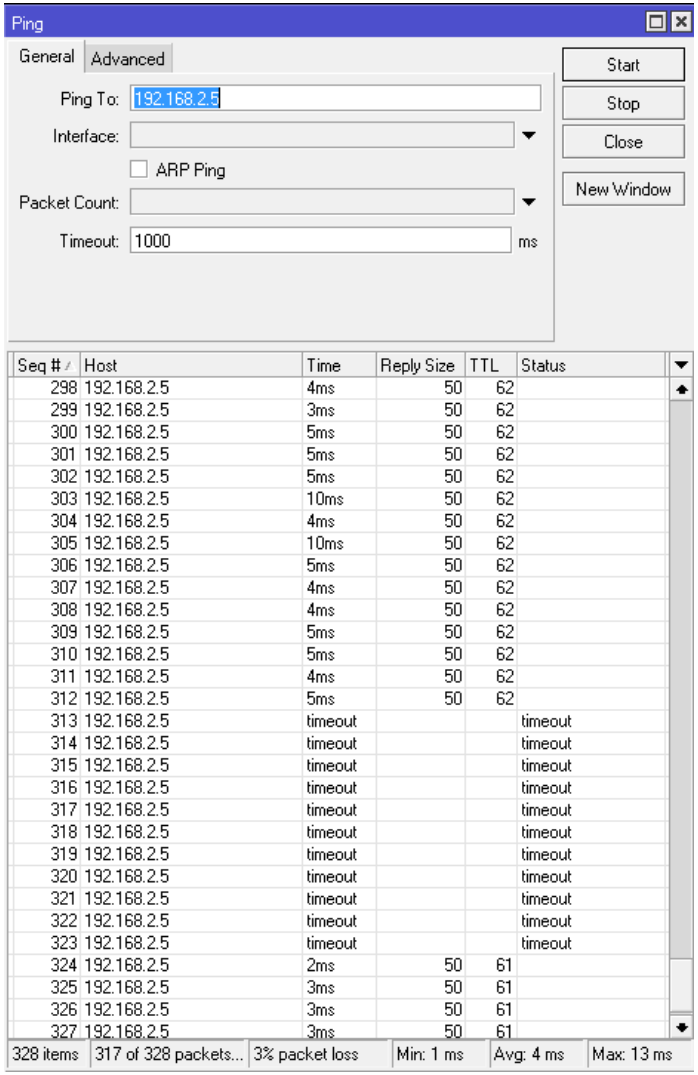
Redundancy – 1 AP down



Redundancy – 1 AP down

10 Pings everything running

OSPF and VRRP operating



Seq #	Host	Time	Reply Size	TTL	Status
298	192.168.2.5	4ms	50	62	
299	192.168.2.5	3ms	50	62	
300	192.168.2.5	5ms	50	62	
301	192.168.2.5	5ms	50	62	
302	192.168.2.5	5ms	50	62	
303	192.168.2.5	10ms	50	62	
304	192.168.2.5	4ms	50	62	
305	192.168.2.5	10ms	50	62	
306	192.168.2.5	5ms	50	62	
307	192.168.2.5	4ms	50	62	
308	192.168.2.5	4ms	50	62	
309	192.168.2.5	5ms	50	62	
310	192.168.2.5	5ms	50	62	
311	192.168.2.5	4ms	50	62	
312	192.168.2.5	5ms	50	62	
313	192.168.2.5	timeout			timeout
314	192.168.2.5	timeout			timeout
315	192.168.2.5	timeout			timeout
316	192.168.2.5	timeout			timeout
317	192.168.2.5	timeout			timeout
318	192.168.2.5	timeout			timeout
319	192.168.2.5	timeout			timeout
320	192.168.2.5	timeout			timeout
321	192.168.2.5	timeout			timeout
322	192.168.2.5	timeout			timeout
323	192.168.2.5	timeout			timeout
324	192.168.2.5	2ms	50	61	
325	192.168.2.5	3ms	50	61	
326	192.168.2.5	3ms	50	61	
327	192.168.2.5	3ms	50	61	

328 items | 317 of 328 packets... | 3% packet loss | Min: 1 ms | Avg: 4 ms | Max: 13 ms

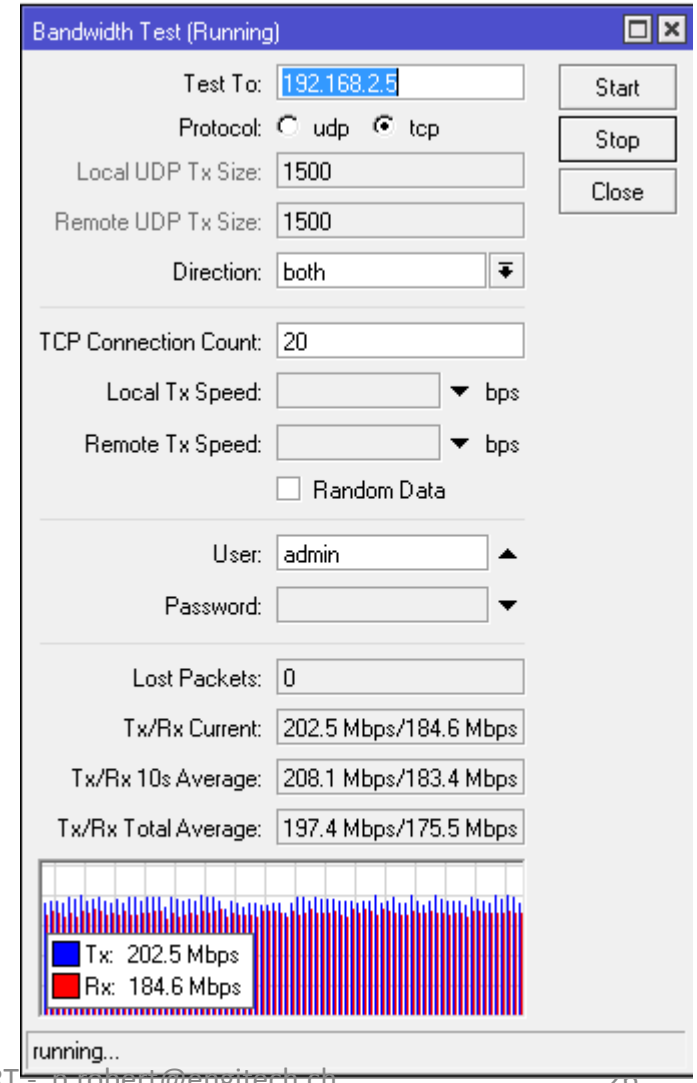
Redundancy running … what about the performance?

TCP : 200mbps/185mbps

385mbs in total …..

Before setup, TCP provided oneway 140mbs …

2x hardware -> 3x performance!



Routing done

- Full Redundancy
- Full-duplex maximum speed

…Could we use this setup for doing a bridge (Layer 2) ?

Bridge

How to do it:

- EOIP
- VPLS
- …

The winner is: VPLS!

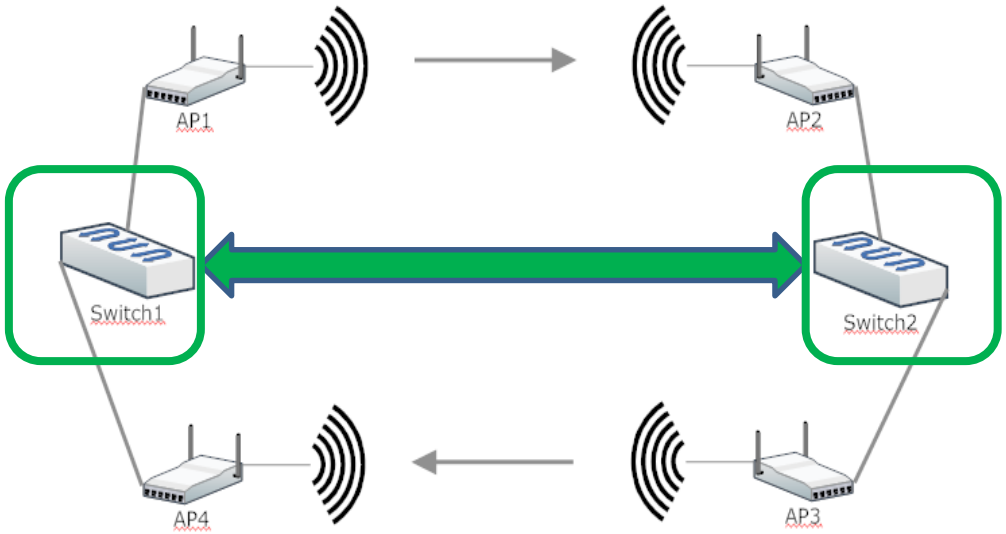
- Less CPU usage and better speed

VPLS ?

VPLS is a point to point vpn (or multipoint)

It creates a tunnel over **MPLS**.

The VPN TUNNEL will be created on Switchs (RB2011).



MPLS

MPLS?

MPLS is a high level performance way for delivery data from one network node to another

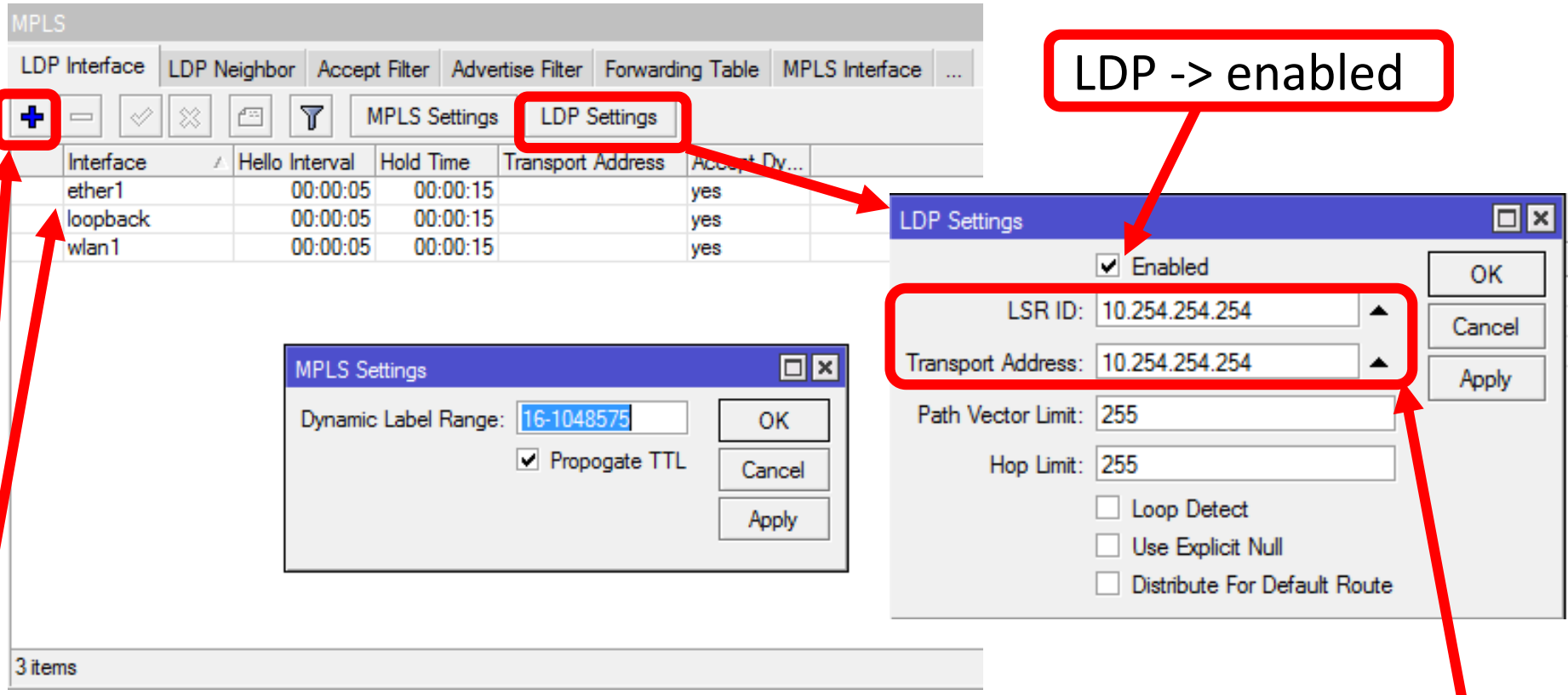
All the component of the solution need to be compatible and configured with MPLS (SXT and RB2011 in this case).

MPLS is acting like a switch over IP packet

MPLS is creating tags for all diferrent routes between routers

The only think which has the router to do, is to saw the MPLS tag. This tag is built of a header of 4 bytes (to compare with a IPV4 header = 40bytes, 10 times greater). With this information, the router knows where to forward the packet.

MPLS Setup



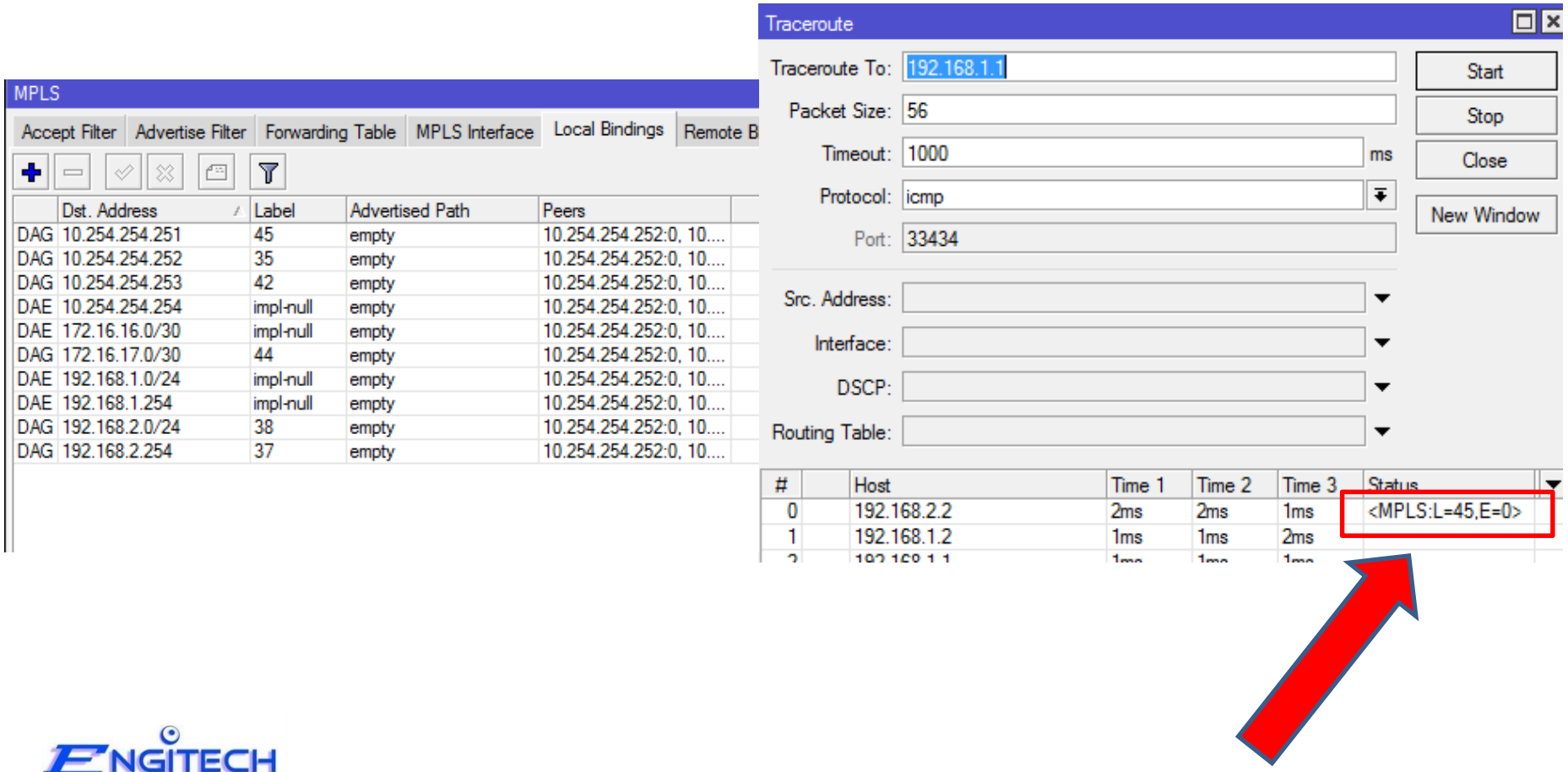
LDP -> enabled

Add LDP interface: all interfaces that belong to the MPLS network

Setup the ID and destination address (Loopback IP)

MPLS verification

- Traceroute -> Labels MPLS



MPLS


192.168.1.3
Rx: 472 bps
Tx: 0 bps
Switch1
cpu: 0% disk: 13%
Rx: 200 Mbps
Tx: 210 Mbps
192.168.1.9
Rx: 7.74 kbps
Tx: 200 Mbps
192.168.1.1
cpu: 65% disk: 24%
Rx: 220 Mbps
Tx: 368 bps
VRRP1
192.168.1.254
Rx: 2.4 kbps
Tx: 205 Mbps
192.168.1.2
cpu: 67% disk: 22%
L1 (5180) -41
Rx: 215 Mbps (300 Mbps)
Tx: 0 bps (6.5 Mbps)
L2 (5520) -30
Rx: 608 bps (6.5 Mbps)
Tx: 204 Mbps (300 Mbps)
192.168.2.1
cpu: 73% disk: 23%
Rx: 4.46 kbps
Tx: 215 Mbps
VRRP2
192.168.2.254
Rx: 196 Mbps
Tx: 968 bps
192.168.2.2
cpu: 63% disk: 22%
Rx: 205 Mbps
Tx: 368 bps
192.168.2.5
Rx: 220 Mbps
Tx: 200 Mbps
Switch2
cpu: 0% disk: 22%
Rx: 0 bps
Tx: 1.15 kbps
192.168.2.8

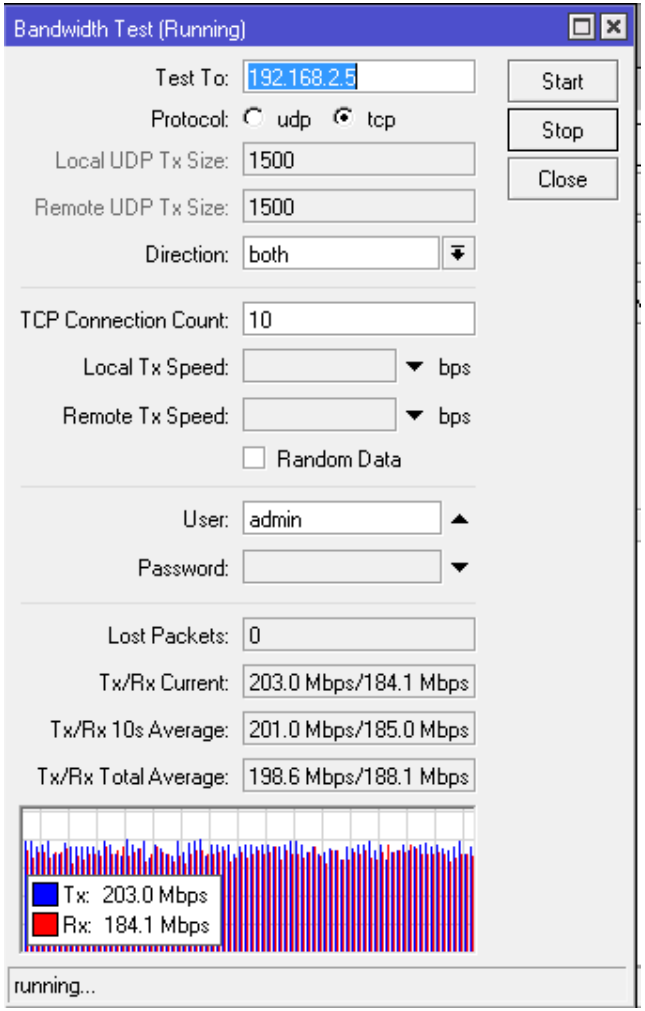
Speed of MPLS network

Result:

TCP FULL-DUPLEX

Almost 200mbps / 200mbps

Indeed 400mbps in total.

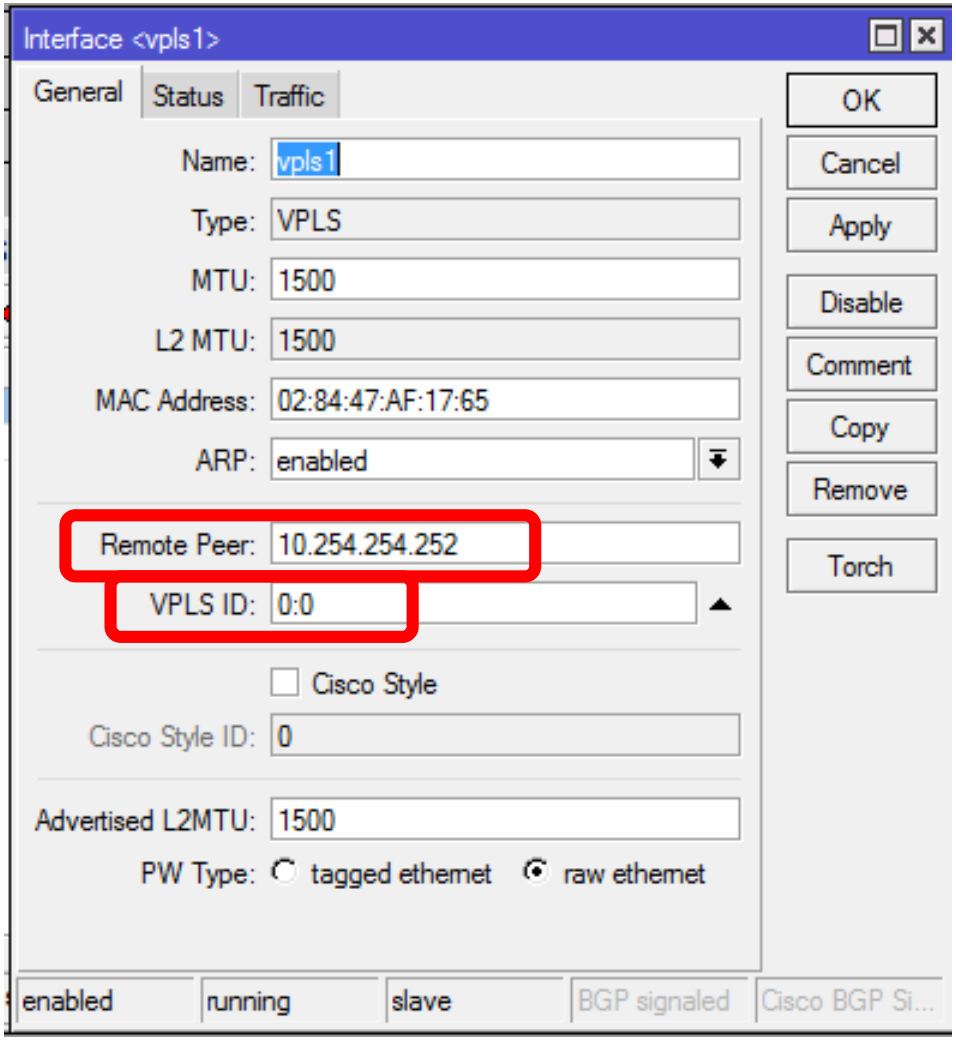


VPLS setup

It's needed to create the interface on both side of the tunnel, on the two RB2011.

Only two parameters need to be setup in our case:

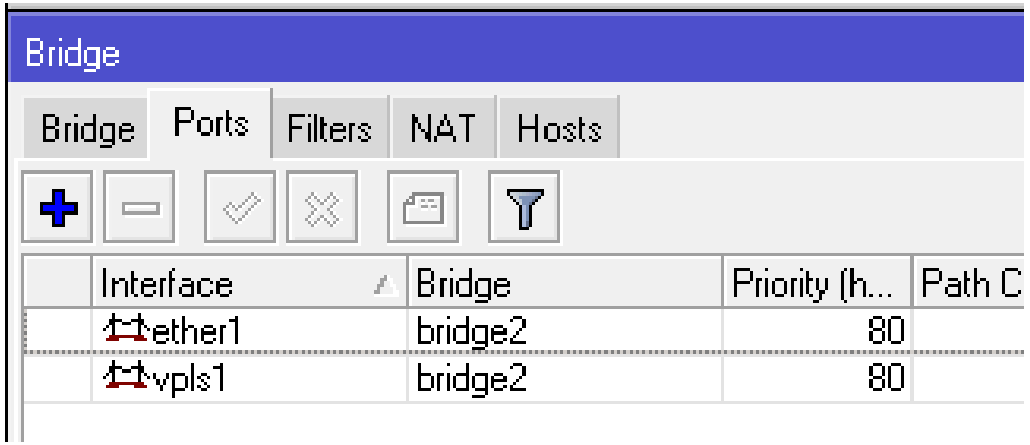
- Remote Peer, with the Switch IP address on the other side of the tunnel
- VPLS ID



VPLS Bridge

At the RB2011 level, eth1 to eth5 are defined on the switch.

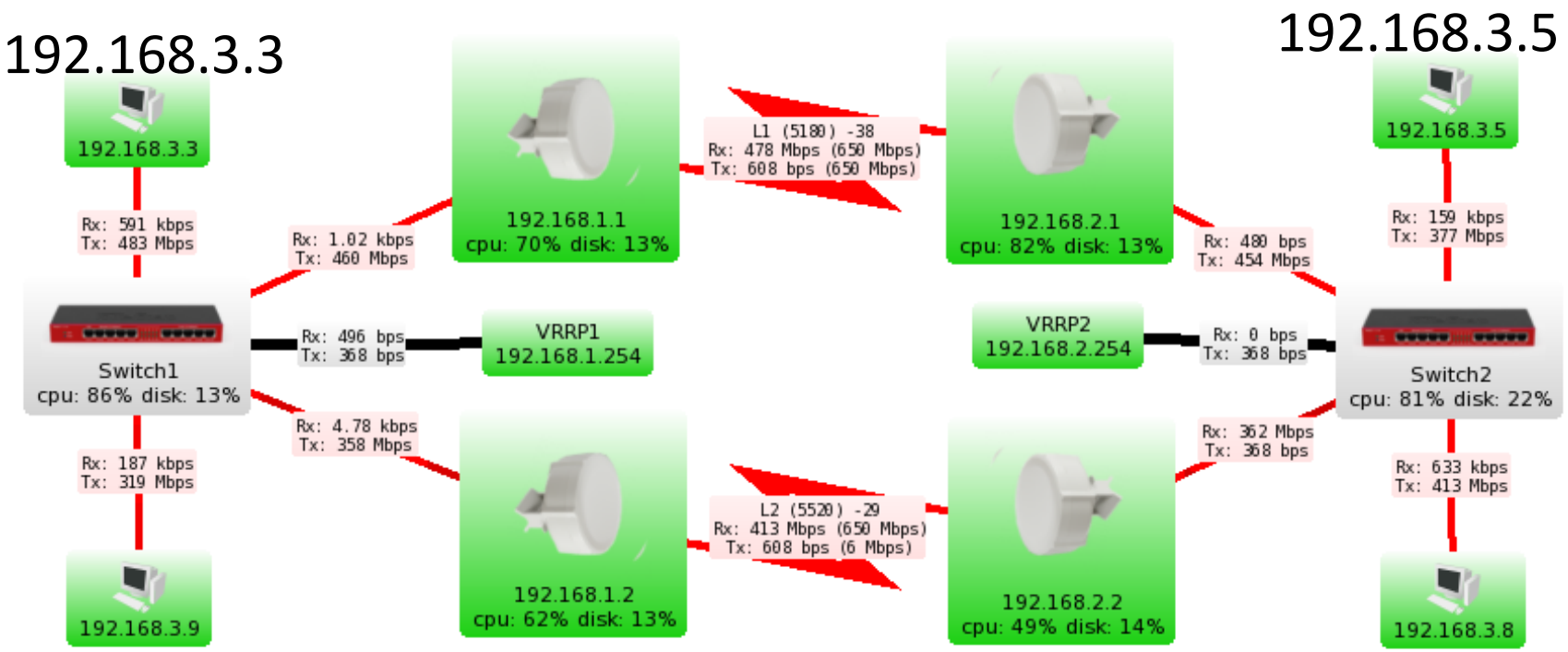
Just create a bridge, add the port eth1 (which is the master) and the tunnel VPLS interface



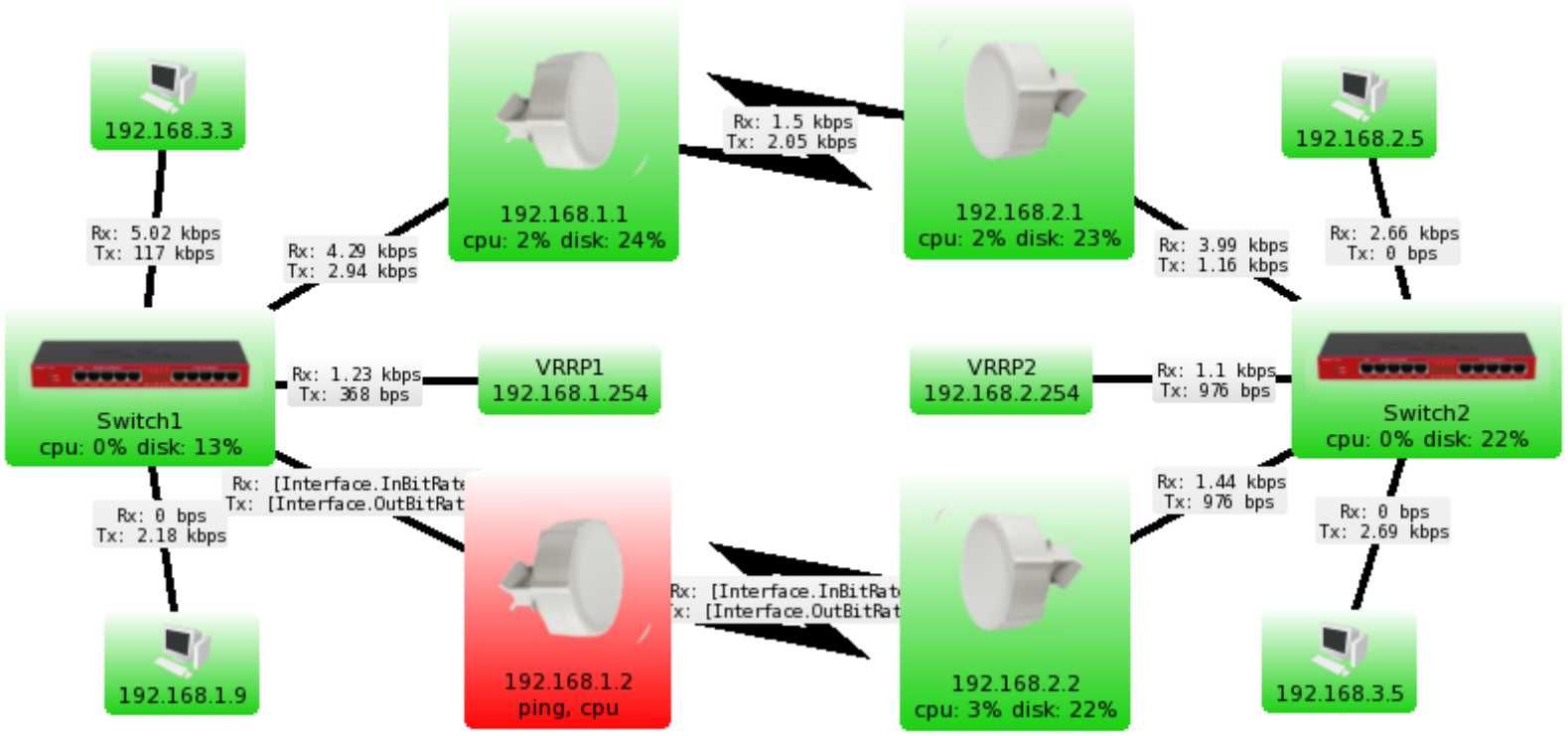
VPLS

Once the tunnel is created, we have a Layer 2 network, computers on the both side will be in the same IP range.

In Bridge mode, we are not using VRRP created before…



VPLS Redundancy



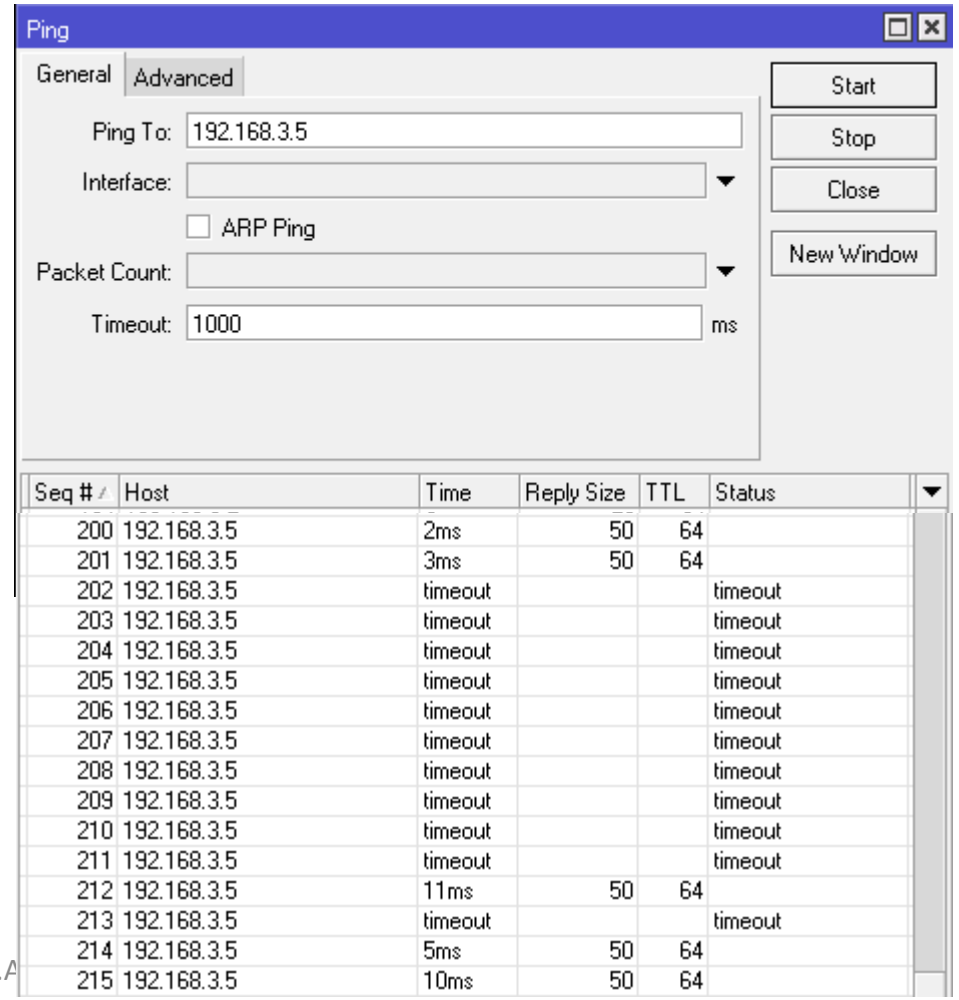
VPLS Redundancy

PING de 192.168.3.3 vers 192.168.3.5 :

12 pings and it’s running

OSPF is again calculating a new path

Once done the VPLS tunnel must be recreated over MPLS



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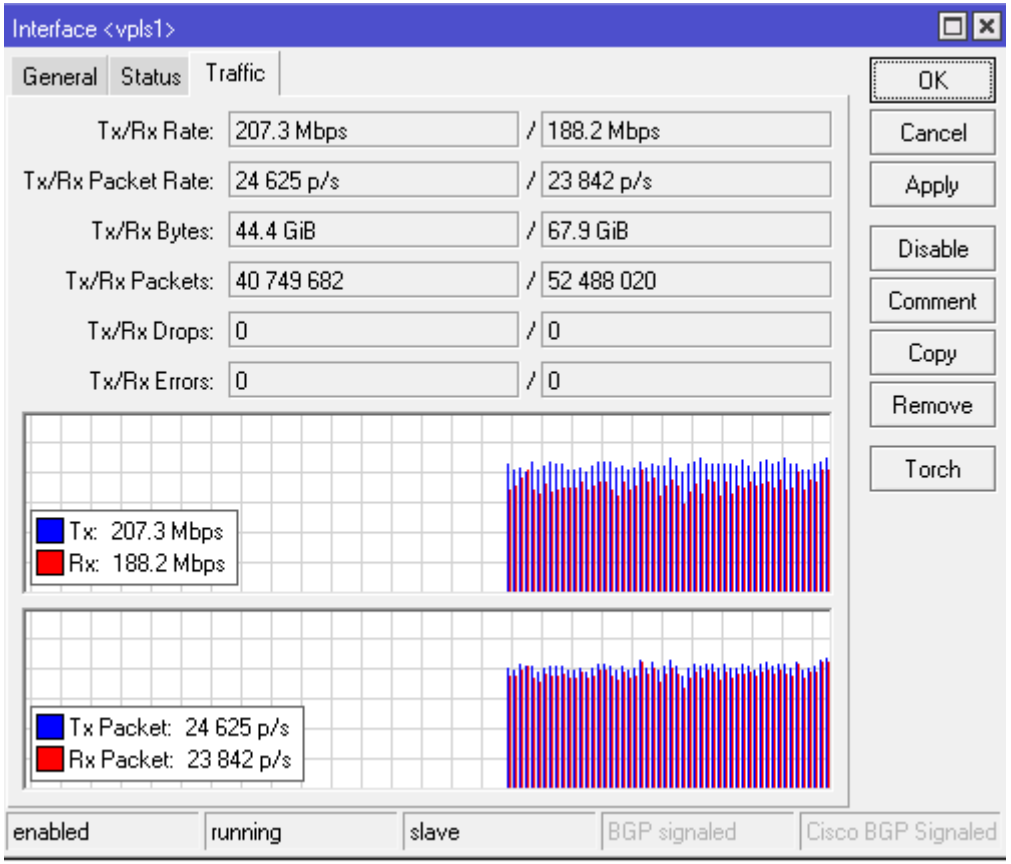
Bridge speed

Result:

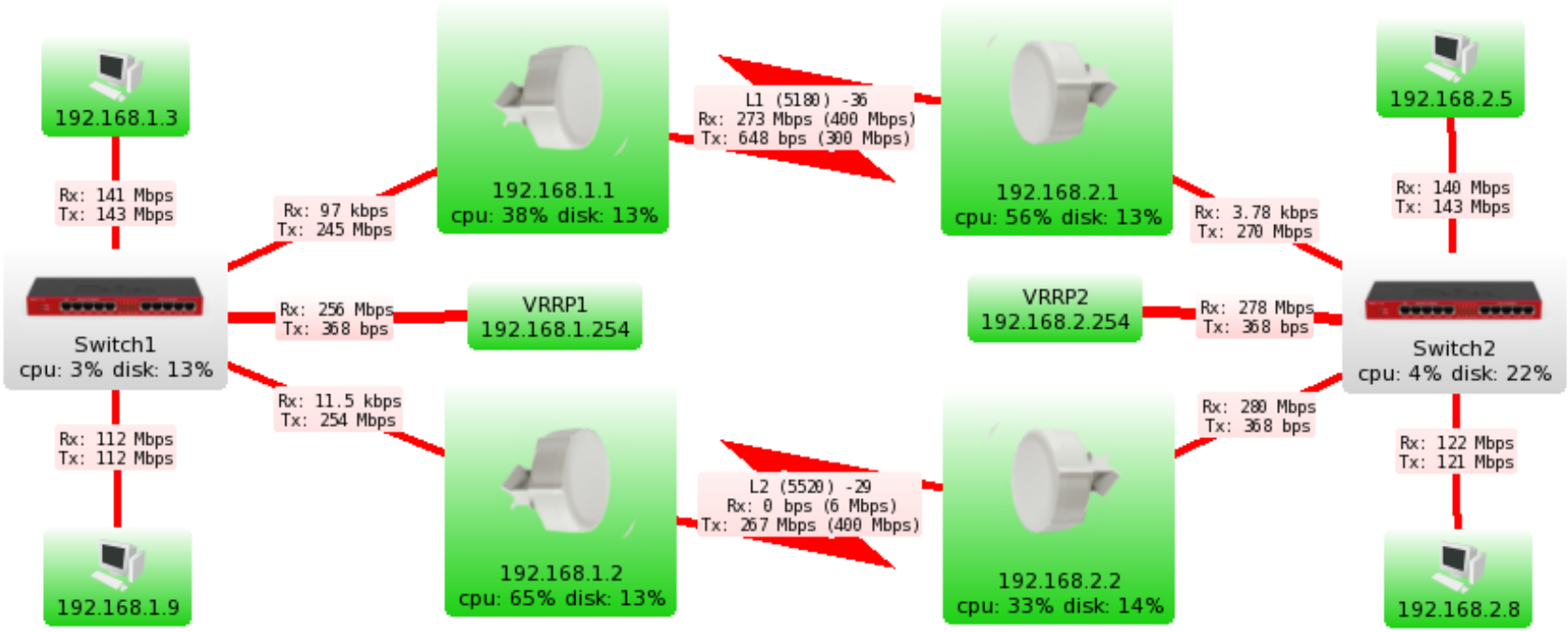
TCP FULL-DUPLEX

200mbps / 200mbps

400mbps in total.



Some result with 802.11ac



In 20mhz -> TCP -> 130mbps / 130mbps

In 40mhz -> TCP -> 250mbps / 250mbps

Conclusion

- We can reach on the same configuration redundancy for the rounting or the bridge

- Why not?

  HArdware used : 4x SXT G and 2x RB2011

  This is one of the possible configuration. Other are possible that will fit within your infrastructure.

  Do not hesitate to contact me.

Philippe ROBERT - p.robert@engitech.ch