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OverTheBox

An MPTCP Aggregation Solution

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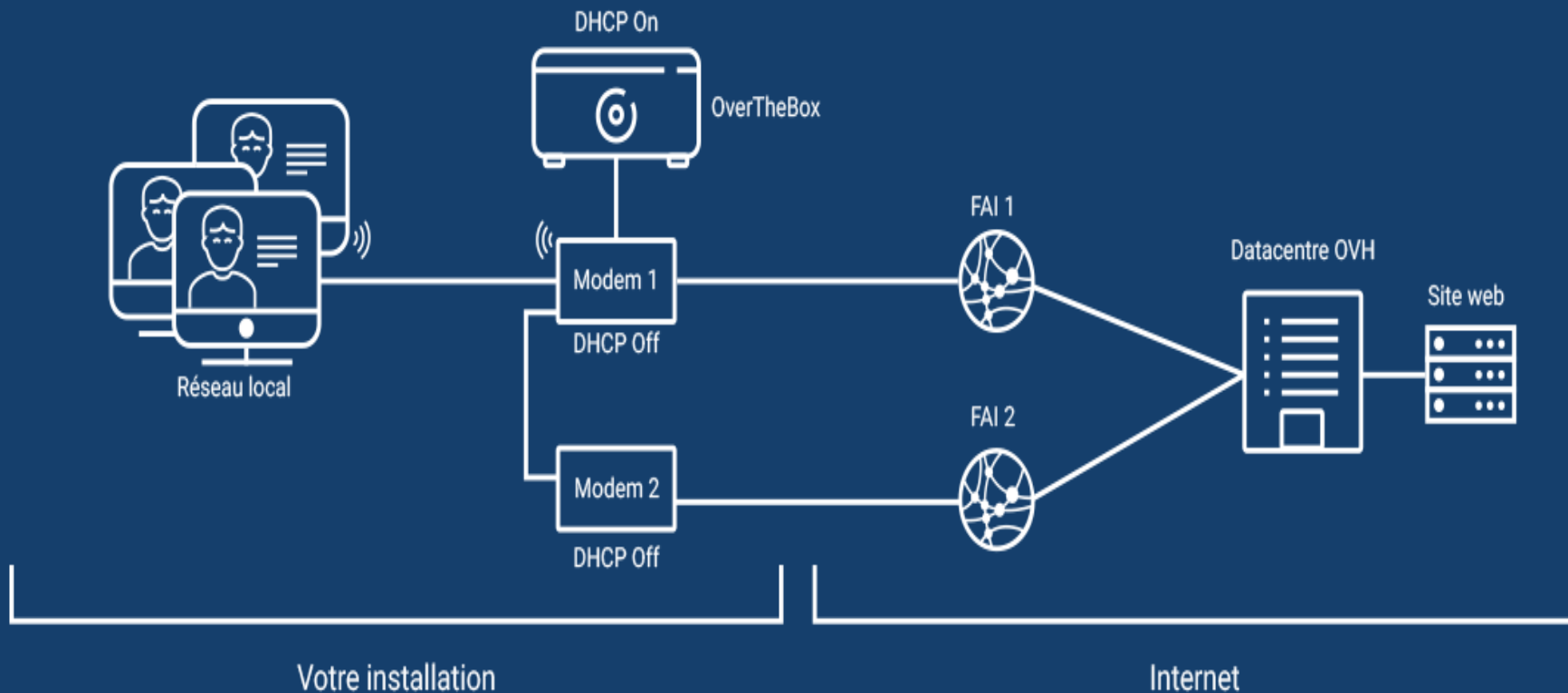
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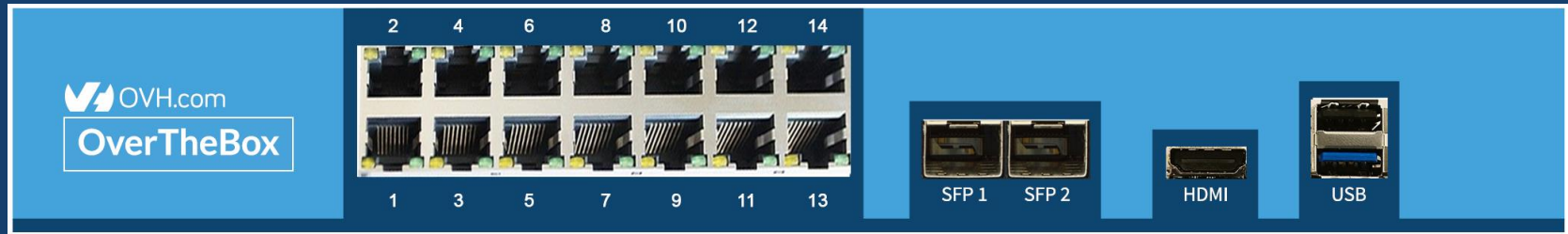
OverTheBox

- Open Source Client side <https://github.com/ovh/overthebox>
- WANs Aggregation
- WANs Load-Balancing
- WANs Failover
- Encrypted “AES-NI 256 bits”
- QoS
- Openwrt Ecosystem
- Fixed Public IPv4 address

OTB v1



OTBv2



Purpose of the Project

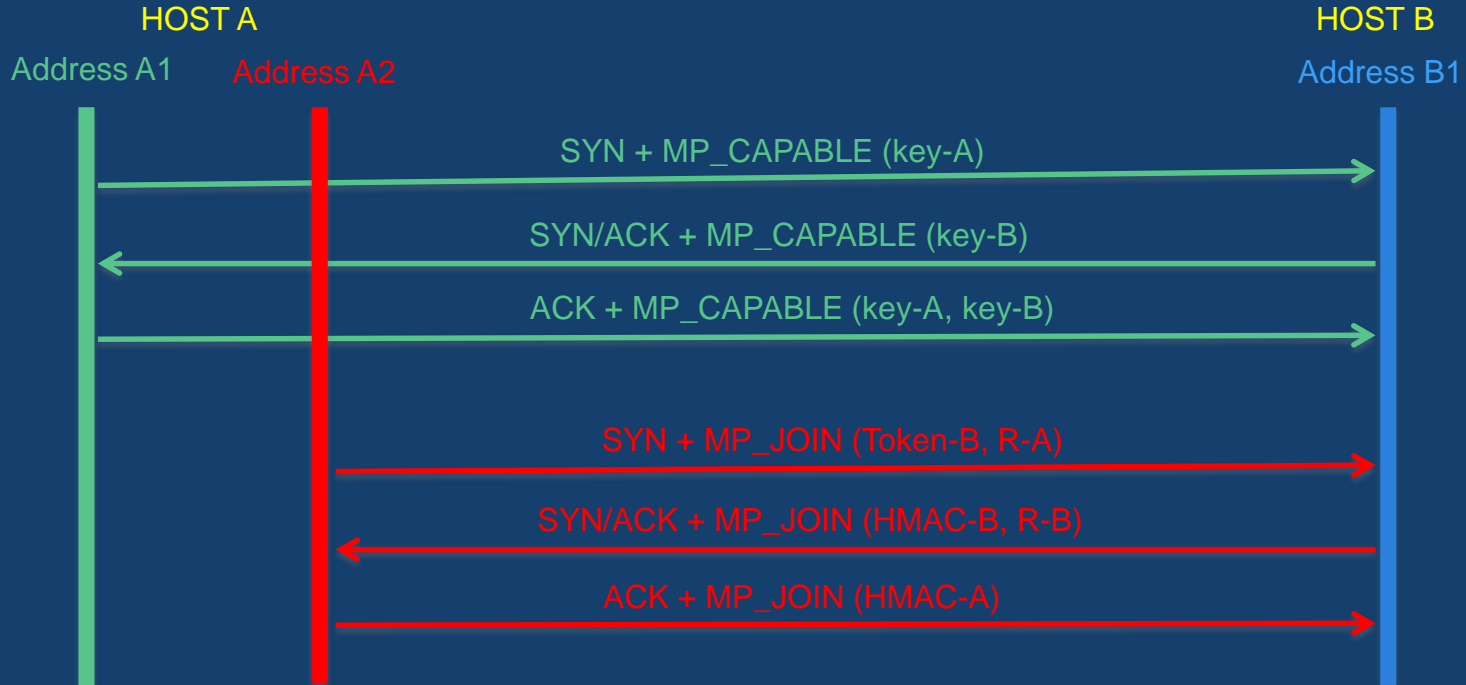
- High speed internet isn't available everywhere.
- Fiber won't be covering all customers in the near future.
- Better Upload speed.
- Secure encrypted connection.
- Reliable internet connection.
- Any ISP choice.
- Any WAN type choice "4G, A/SH/V/DSL, Cable, or Fiber".

VDSL Bonding		MLPPP	
<ul style="list-style-type: none"> + Low level “CO/CPE chipset” + HW no conf needed Client side 	<ul style="list-style-type: none"> - Same ISP/DSLAM - Special Modems - Limited # links - Limited to distance from NRA ~1km 	<ul style="list-style-type: none"> + L2 bonding + Easy to config 	<ul style="list-style-type: none"> - Same ISP/LNS - RR Algorithm - Stability
MLVPN		MPTCP	
<ul style="list-style-type: none"> + VPN Software + Any ISP + Any WAN type 	<ul style="list-style-type: none"> - No HW encryption - Non equivalent links problems 	<ul style="list-style-type: none"> + Kernel Support + High efficiency + Any ISP + Any WAN type 	<ul style="list-style-type: none"> - Only TCP - Hard to troubleshoot

Multipath TCP

- An extension of TCP defined by IETF rfc6824.
- MPTCP highly supported and maintained by UCL, Apple, Intel, ...
- MPTCP is backward compatible with legacy TCP protocol.
- MPTCP capable of handling multiple paths “multihoming”.
- Link hot add/drop up to 8 different paths.
- MPTCP uses TCP option 30 : subflows and tokens.

MPTCP Session



Different working modes :

1- ON/OFF

Ex: aggregation multiple ADSL lines.

2- MASTER(ON)/ BACKUP

Ex: ADSL + 4G connection.

3- HANDOVER

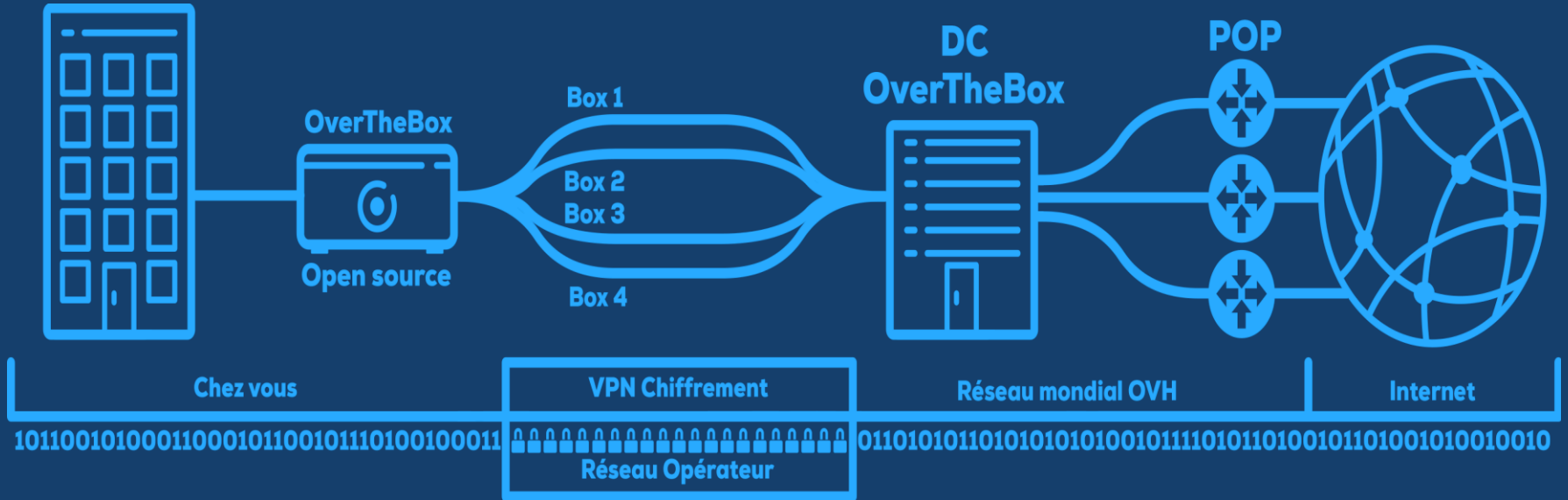
Ex: Wifi + 4G connection.

In our project we use the first 2 modes, as the 3rd mode is more likely for mobile devices.

OVH MPTCP RECIPE

- Both endpoints should support MPTCP.
- Only TCP traffic is aggregated.
- OTB is redirecting all the traffic into central proxy on OVH DC.
- DDOS protected.
- Fixed IPV4.

Aggregation path



TCP & Non-TCP

The local traffic is divided into 2 types:

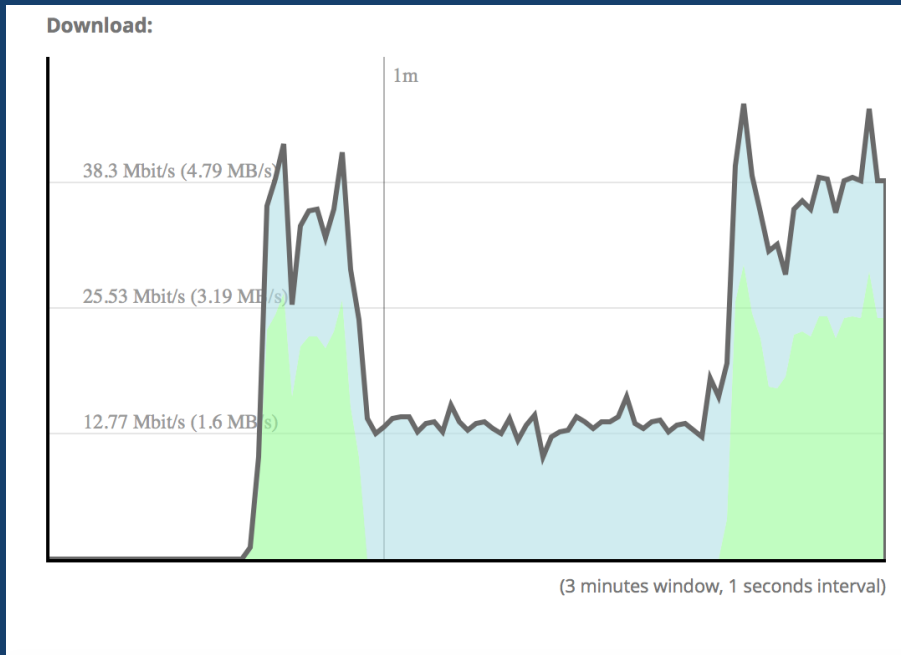
1- TCP traffic, more than 90% of internet traffic are TCP, including web browsing, FTP, SSH, IMAP, POP, etc..

This type of traffic is handled by shadowsocks.

2- Non-TCP traffic “UDP, ICMP, GRE, etc.. ” which represents the remaining of the internet traffic, like VOIP, VPN tunneling, video streaming & broadcasting, ...

Such traffic is handled by Glorytun.

Uninterrupted traffic

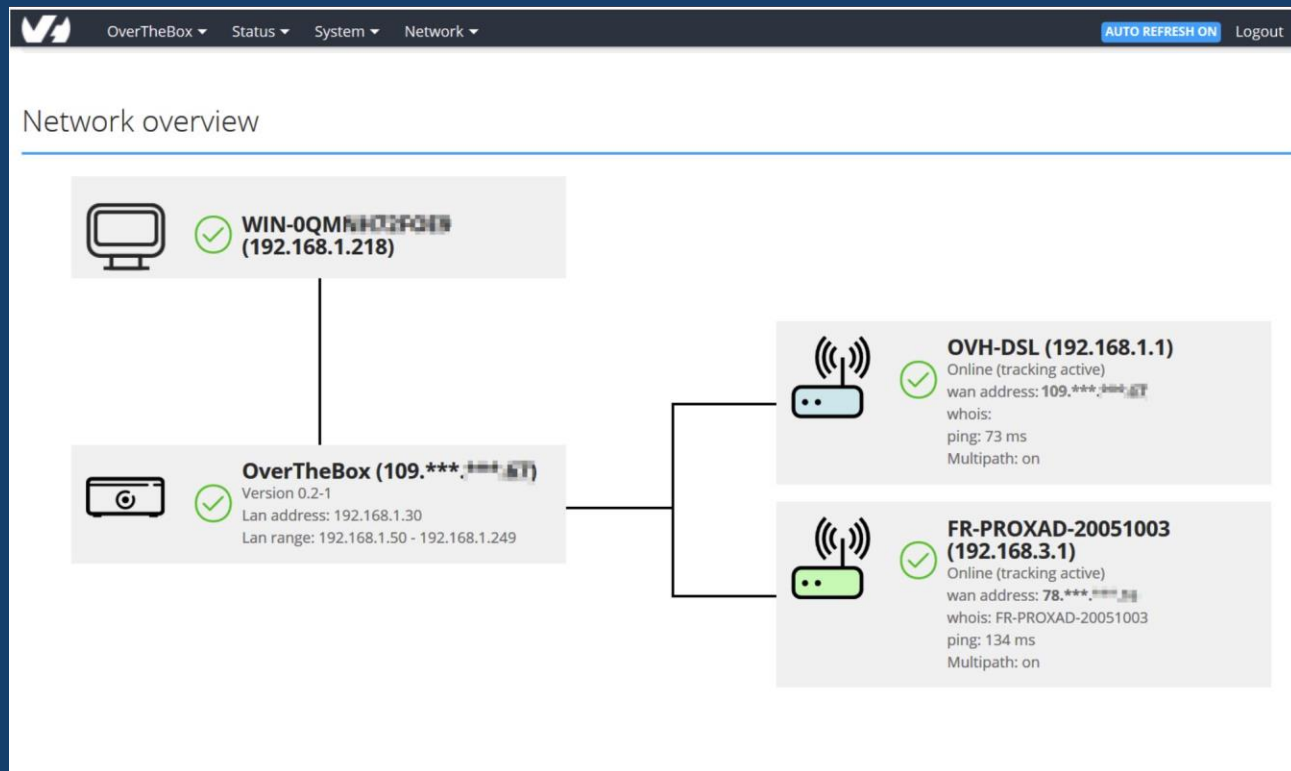


Download had been started, couple of ADSL connections used « green & blue graphs »

Once, green ADSL is offline, traffic is Uninterrupted, download session is still active using the other ADSL, with 50% of aggregated traffic.

Soon as the green ADSL is back online, download is back to 100%.

Test made by tomshardware.fr using 2 ADSL connections, ALICE “FREE” & OVH “Collect over SFR”.



Download/upload speed ratio 3,6/0.5Mbps & 4/0.5Mbps and 70ms & 100ms latency for each connection.



Paris, France

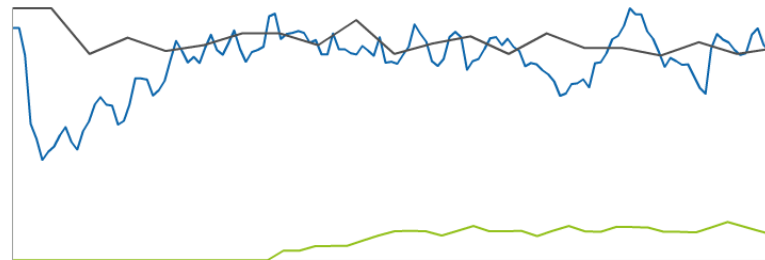
100%



Latence

Réception

Envoi



Lucé, Centre
1 Gb/s Celio
FR

Choix du serveur



Latence

Moyenne 73.31 ms
Gigue 7.000 ms

70.00 ms



Réception

Moyenne 3.174 Mb/s

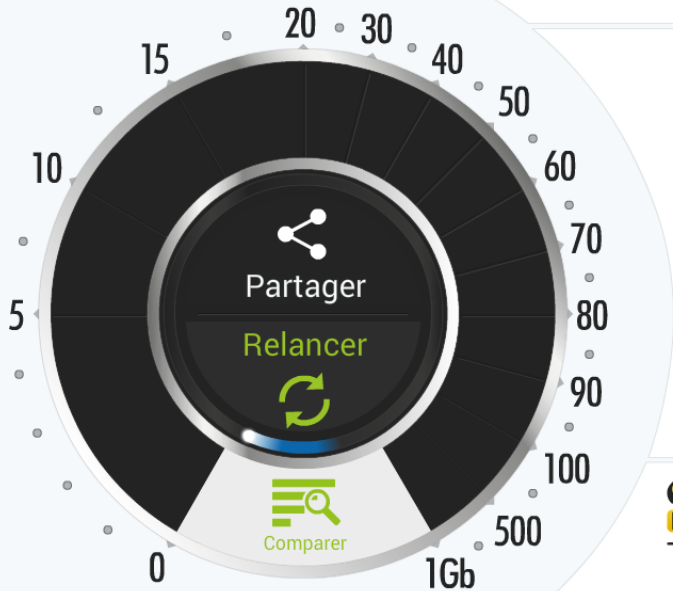
3.601 Mb/s



Envoi

Moyenne 0.279 Mb/s

0.485 Mb/s



Opérateur : OVH Telecom
Adresse IP : 109.190. / AS35540

Lecteur : Adobe Windows
Version : WIN 20,0,0,306
Mode : TCP - IPv6 Ready

OVH



Vitry, France

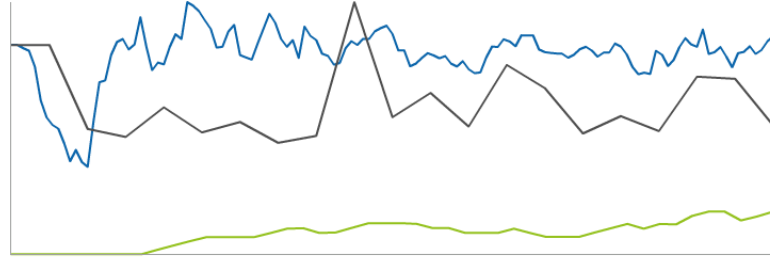
1. PRODUIT | 2. MARCHÉ



Latence

Réception

Envoi

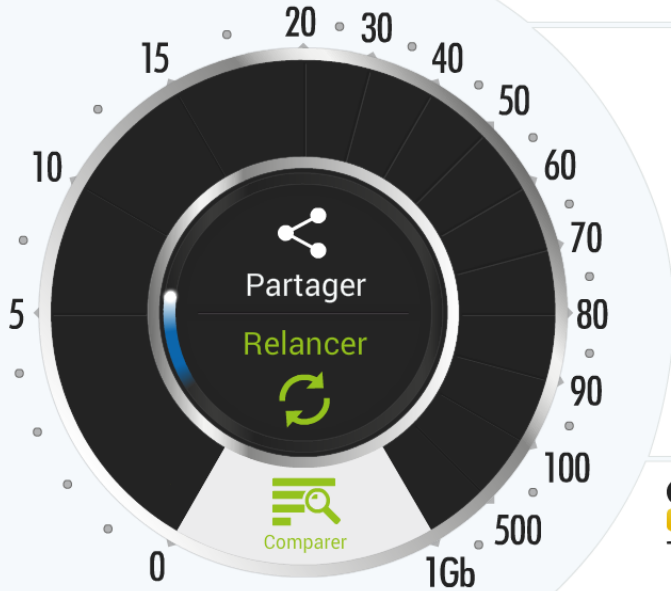


Vitry-sur-Seine, Île-de-France

4 Gb/s Online

FR

Choix du serveur



Opérateur : Free
 Adresse IP : 78.200. / AS12322

Lecteur : Adobe Windows
 Version : WIN 20,0,0,306
 Mode : TCP - IPv6 Ready



Latence

Moyenne 123.3 ms
 Gigue 61.00 ms

102.0 ms



Réception

Moyenne 3.576 Mb/s

3.919 Mb/s

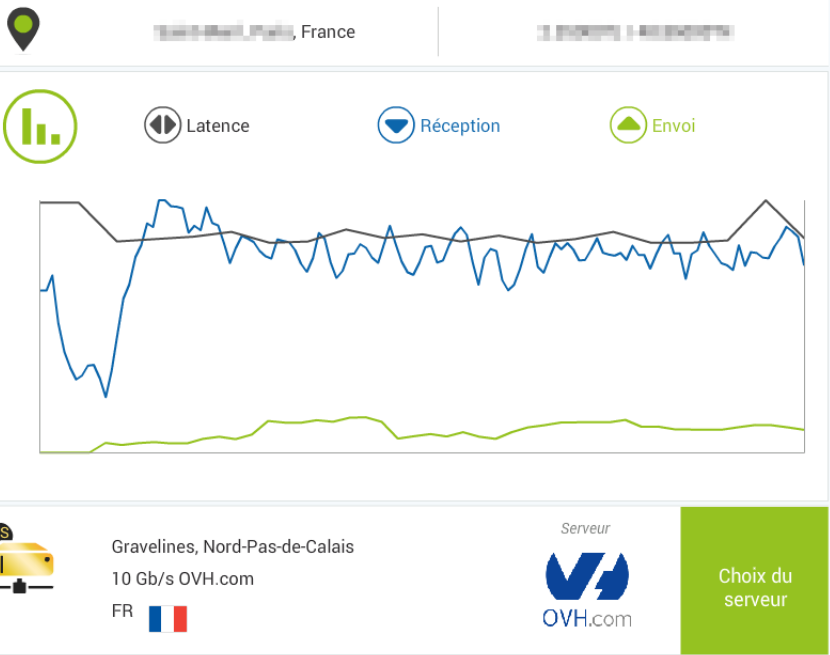
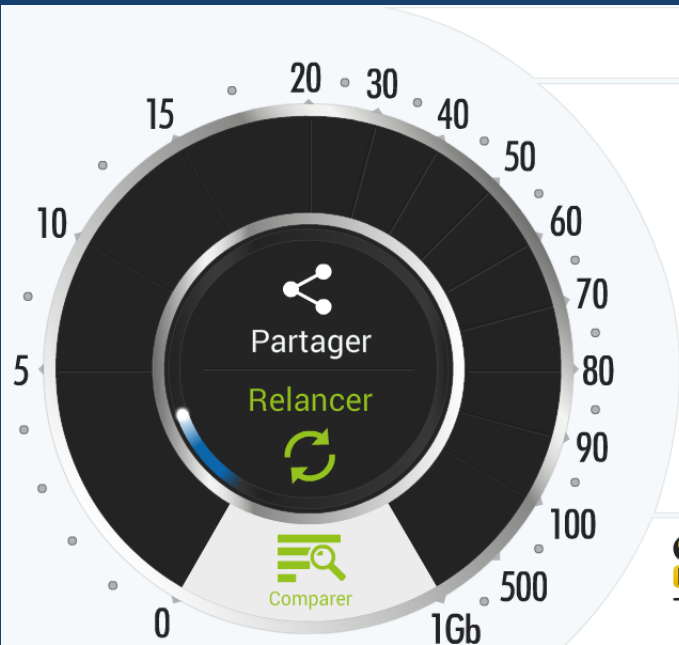


Envoi

Moyenne 0.359 Mb/s

0.536 Mb/s

FREE



Opérateur : OVH SAS
 Adresse IP : 109.190.100.100 / AS35540

Lecteur : Adobe Windows
 Version : WIN 20,0,0,306
 Mode : TCP - IPv6 Ready

Latence
 Moyenne 88.56 ms
 Gigue 5.500 ms
86.50 ms

Réception
 Moyenne 6.454 Mb/s
7.296 Mb/s

Envoi
 Moyenne 0.699 Mb/s
0.952 Mb/s

OTB

Conclusion

- MPTCP proved to be successful protocol.
- Supported by all ISP networks in France (As tested by our clients).
- High bonding efficiency up to 92%.
- Stable.
- Promising solution highly maintained.
- Current scheduler is not optimized for links with big speed difference.
- VOIP and RT services don't act well when tunneled over TCP, that's why we came up with home made solution multiple UDP VPN (R&D mode).

Sources & useful links

- <https://www.ovhtelecom.fr/overthebox/>
- <https://github.com/ovh/overthebox>
- <https://github.com/ovh/overthebox-feeds>
- <https://github.com/ovh/overthebox-openwrt>
- <https://github.com/angt/glorytun>
- <https://github.com/shadowsocks>
- <https://multipath-tcp.org>
- <https://tools.ietf.org/html/rfc6824>
- <https://tools.ietf.org/html/draft-bonaventure-mptcp-backup-00>
- <http://inl.info.ucl.ac.be/system/files/cell06-paasch.pdf>
- <https://www.ietf.org/slides/slides-edu-multipath-tcp-00.pdf>
- <http://multipath-tcp.org/data/MultipathTCP-netsys.pdf>
- <http://www.tomshardware.fr/articles/ovh-overthebox,2-2425-3.html>



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Thank you

Questions ??