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OverTheBox
An MPTCP Aggregation Solution
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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
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”.
<table>
<thead>
<tr>
<th>VDSL Bonding</th>
<th>MLPPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Low level “CO/CPE chipsets”</td>
<td>+ L2 bonding</td>
</tr>
<tr>
<td>+ HW no conf needed Client side</td>
<td>+ Easy to config</td>
</tr>
<tr>
<td>- Same ISP/DSLAM</td>
<td>- Same ISP/LNS</td>
</tr>
<tr>
<td>- Special Modems</td>
<td>- RR Algorithm</td>
</tr>
<tr>
<td>- Limited # links</td>
<td>- Stability</td>
</tr>
<tr>
<td>- Limited to distance from NRA ~1km</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MLVPN</th>
<th>MPTCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ VPN Software</td>
<td>+ Kernel Support</td>
</tr>
<tr>
<td>+ Any ISP</td>
<td>+ High efficiency</td>
</tr>
<tr>
<td>+ Any WAN type</td>
<td>+ Any ISP</td>
</tr>
<tr>
<td>- No HW encryption</td>
<td>+ Any WAN type</td>
</tr>
<tr>
<td>- Non equivalent links problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Only TCP</td>
</tr>
<tr>
<td></td>
<td>- Hard to troubleshoot</td>
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</tbody>
</table>
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

HOST A
Address A1

Address A2

HOST B
Address B1

SYN + MP_CAPABLE (key-A)

SYN/ACK + MP_CAPABLE (key-B)

ACK + MP_CAPABLE (key-A, key-B)

SYN + MP_JOIN (Token-B, R-A)

SYN/ACK + MP_JOIN (HMAC-B, R-B)

ACK + MP_JOIN (HMAC-A)
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
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.
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.
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
Thank you
Questions ??