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Towards a Multipath TCP Aware Load Balancer

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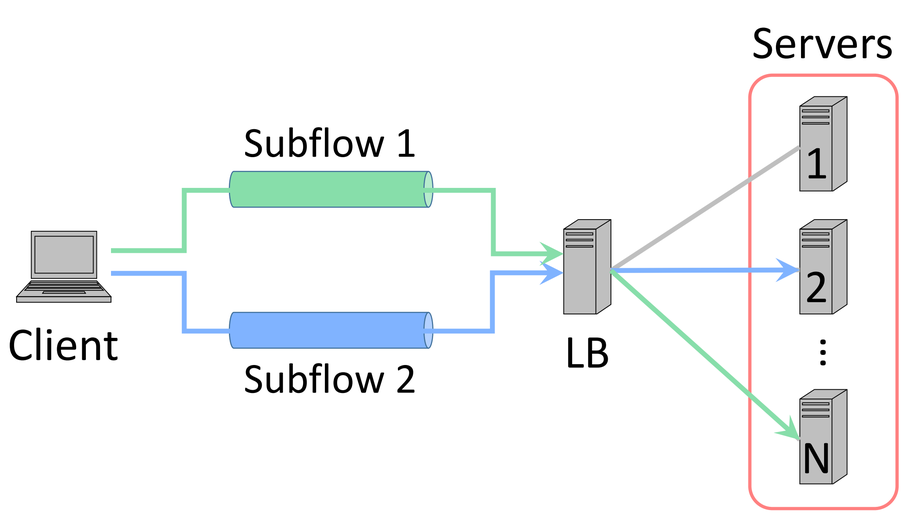
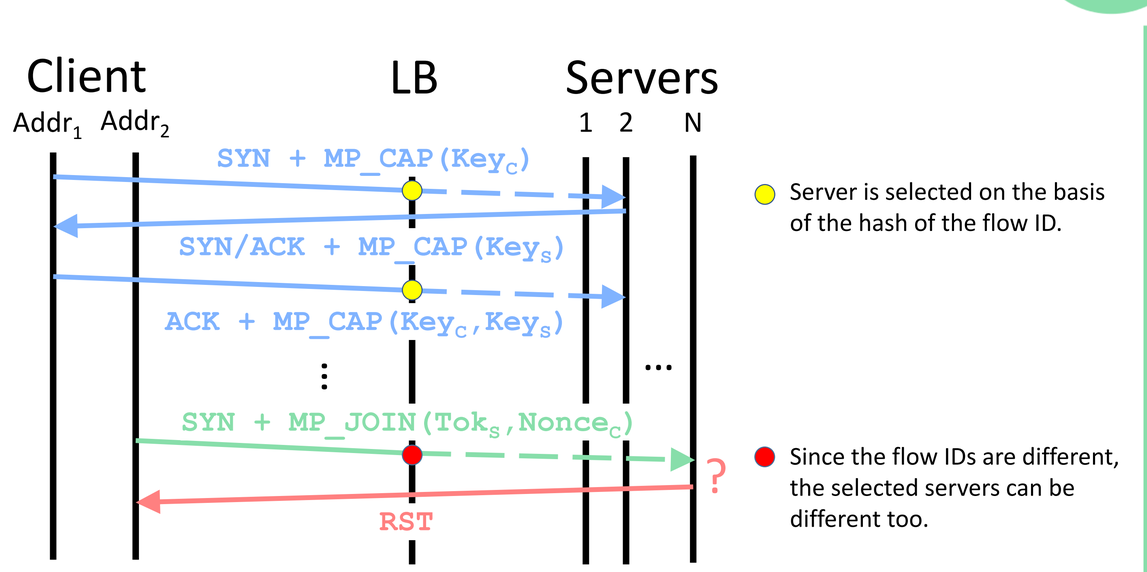
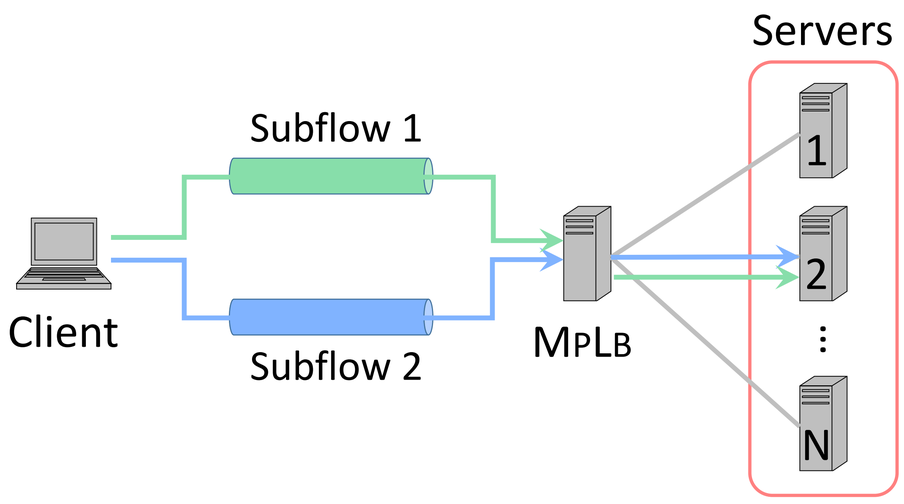
Problem that arises with a load balancer that does not understand MPTCP



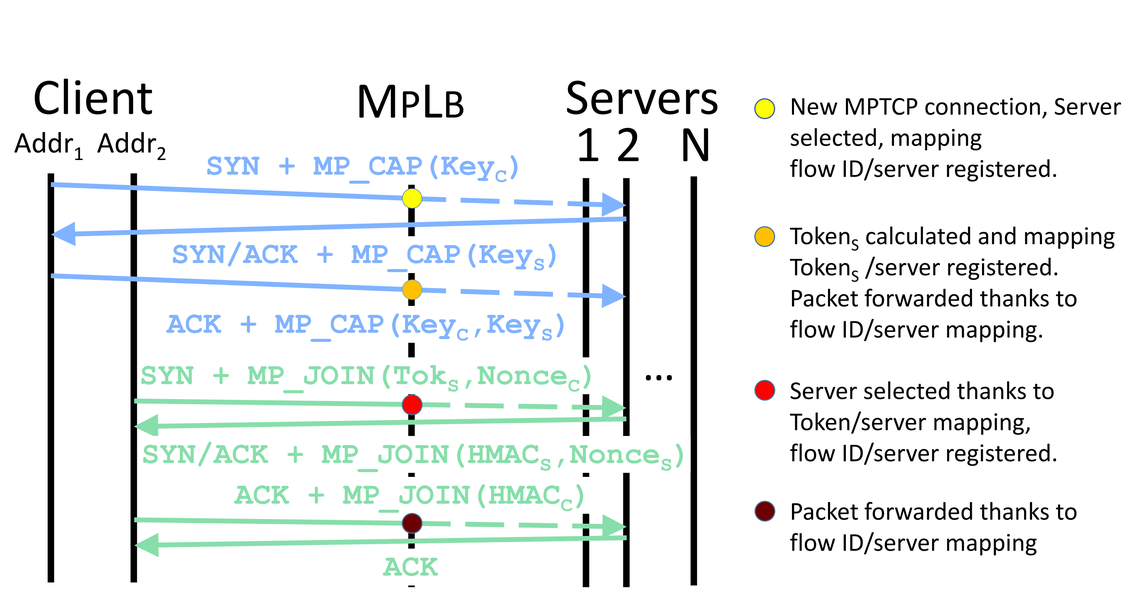
Multipath TCP [1] is a TCP extension enabling to create multiple subflows between hosts. Each subflow has its own 5-tuple and is forwarded independently of the others in the Internet. But a load balancer (LB) could balance different subflows of a MPTCP connection to distinct servers.



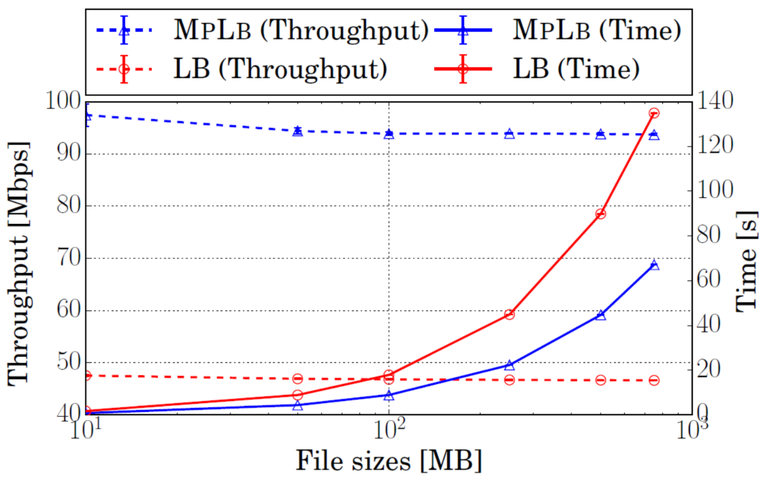
Proposed solution: a load balancer that is MPTCP aware



Our proposed solution registers the subflow authentication materials that are exchanged between the host during the first subflow establishment in the MP_CAPABLE option. Hence, new subflows belonging to a previously encountered MPTCP Connection can be recognized and forwarded to the proper server.



Proof of concept experimentation



MPLB performance vs. unaware load-balancer

We implemented both situations presented above. We used 4 VMs:

1. A Client;
2. A load balancer implemented using Click [2];
3. 2 Servers.

Servers and Client are MPTCP capable (MPTCP linux version 0.89 [3]).

We implemented 2 versions of the load balancer.

The first load balancer (in RED) does not understand MPTCP and simply hashes the IP_src and IP_dest of the Client.

The second load balancer (in BLUE) is our MPLB implementation.

The client is connected to the LB thanks to two links limited at 50 Mbps (this is a software limitation).

We can see in the graph that there is a factor 2 between both time and throughput curves. In fact, MpLb manages to use both links between the client and the LB to transmit data.

The link between the LB and the server was set up to not be the limiting factor of the exchange.

Future work

- Deeper tests on more complex topologies;
- Case of several load balancers in parallel.

References

[1] A. Ford, C. Raiciu, M. Handley, and O. Bonaventure, "TCP extensions for multipath operation with multiple addresses," Internet Engineering Task Force, RFC 6824, January 2013.

[2] E. Kohler, R. Morris, B. Chen, J. Jannotti, and F. Kaashoek, "The click modular router," ACM Transactions on Computer Systems, vol. 18, no. 3, pp. 263–297, August 2000.

[3] C. Paasch, S. Barré et al., "Multipath TCP in the Linux kernel," available from http://www.multipath-tcp.org

measurement architecture experimentation

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