

Multipath TCP in action

A view from server-side

Viet Hoang TRAN

Université catholique de Louvain, Belgium

hoang.tran@uclouvain.be



Main Objectives

Multipath TCP is rising as a significant improvement at the transport layer. This work aims at providing an in-depth understanding of how the protocol behaves in real world.

Introduction

Multipath TCP (MPTCP) is an extension to regular TCP, it appears to the network as regular TCP with a new option type.

MPTCP uses multiple TCP connections possibly over multiple interfaces and expose them as a single logical TCP connection to applications. Each TCP connection through the network is called a *subflow*.

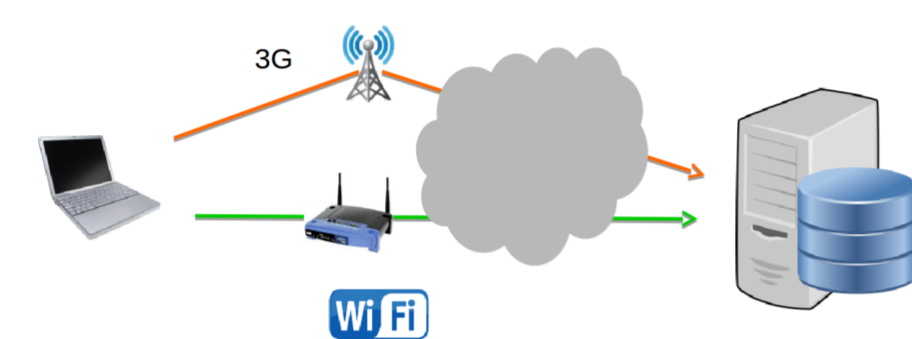


Figure 1: An example of Multipath TCP

How data is distributed?

The MPTCP scheduler will decide to send each outgoing data segment through which subflow. By default, the scheduler prioritizes the subflow having **lowest RTT**.

Methods

We measured at server side[1]: We collect MPTCP traces from site **multipath-tcp.org**. This is the largest public deployment that support MPTCP, beside Apple's SIRI app.

The server has a single interface, but with dual IPv4/IPv6 stack.

This trace has been collected in a duration of five months, consisting of ~190.000 MPTCP connections from 10.300 client IP addresses, located in 588 different ASes.

How quickly MPTCP creates additional subflows?

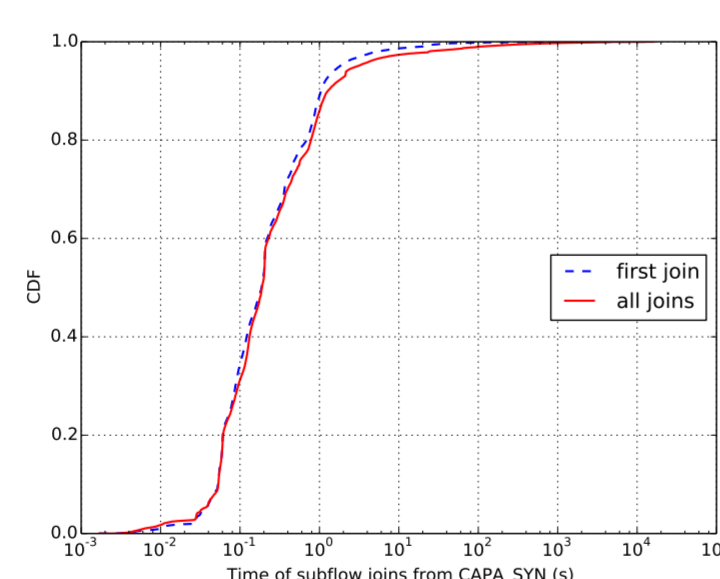


Figure 2: Time (in s) to create additional subflows

Subflow round-trip-time

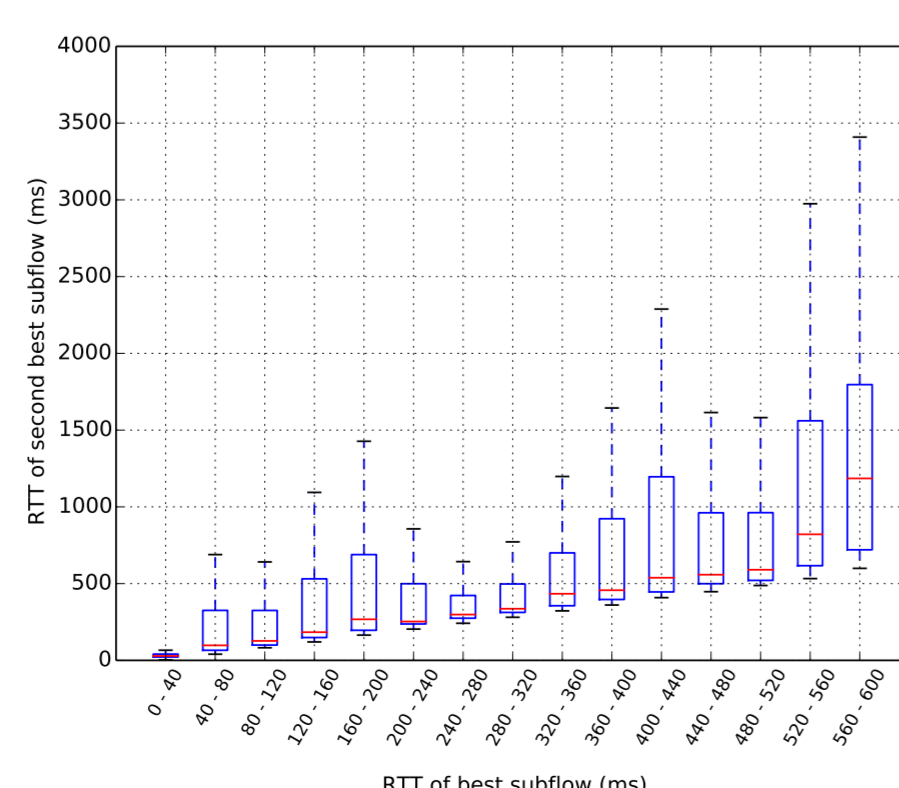


Figure 3: Average RTT of the best subflow vs. that of the second-best subflow of the same MPTCP connection

Data distribution between subflows

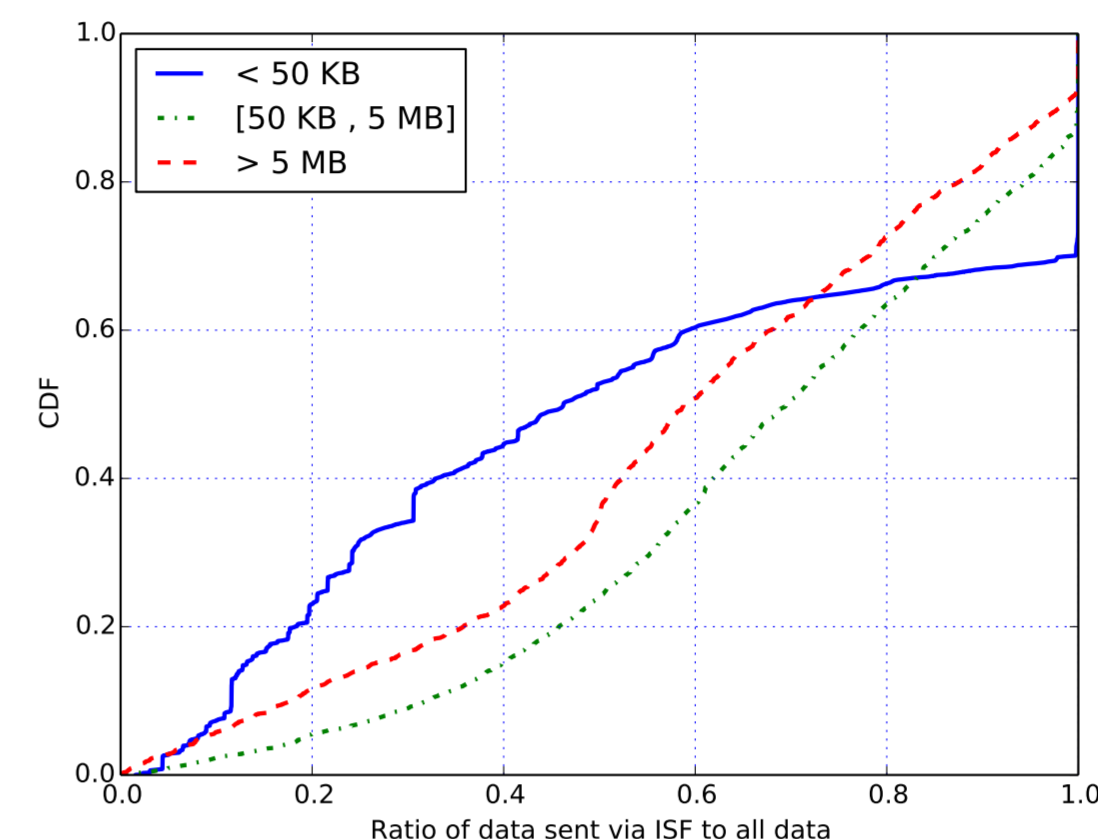


Figure 4: Ratio of data sent via initial subflow vs. total

Ratio	$R > 0.5$	$R = 1$
Connections	> half traffic via ISF	all traffic via ISF
Smaller than 50 KB	47.5%	29.6%
From 50 KB to 5 MB	76.6%	13.8%
Larger than 5 MB	65.5%	6.7%

Table 1: Ratio of data sent via initial subflow

Forthcoming Research

While above work provides various information of real Multipath TCP traffic :

- Lacks of client-side view, difficult to infer about client.
- Server and most clients use Linux implementation.

For these reasons, we envision to create both server-side and client-side test applications on other MPTCP implementation, especially for Apple's: OS X and iOS.

References

- [1] Viet-Hoang Tran, Quentin De Coninck, Benjamin Hesmans, Ramin Sadre, and Olivier Bonaventure. Observing real multipath TCP traffic. *Computer Communications*, pages –, 2016.

Acknowledgements

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