

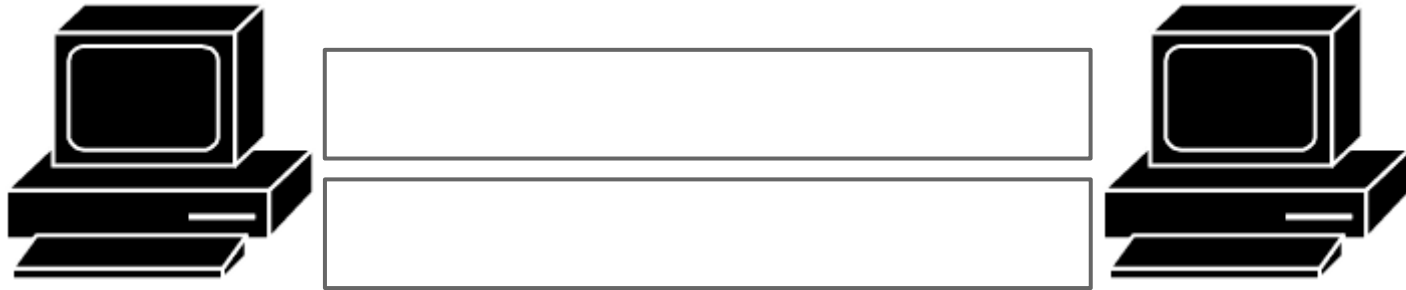
A first look at real Multipath TCP traffic

Benjamin Hesmans, Hoang Tran-Viet, Ramin Sadre, Olivier Bonaventure

`firstname.lastname@uclouvain.be`



MPTCP in lab



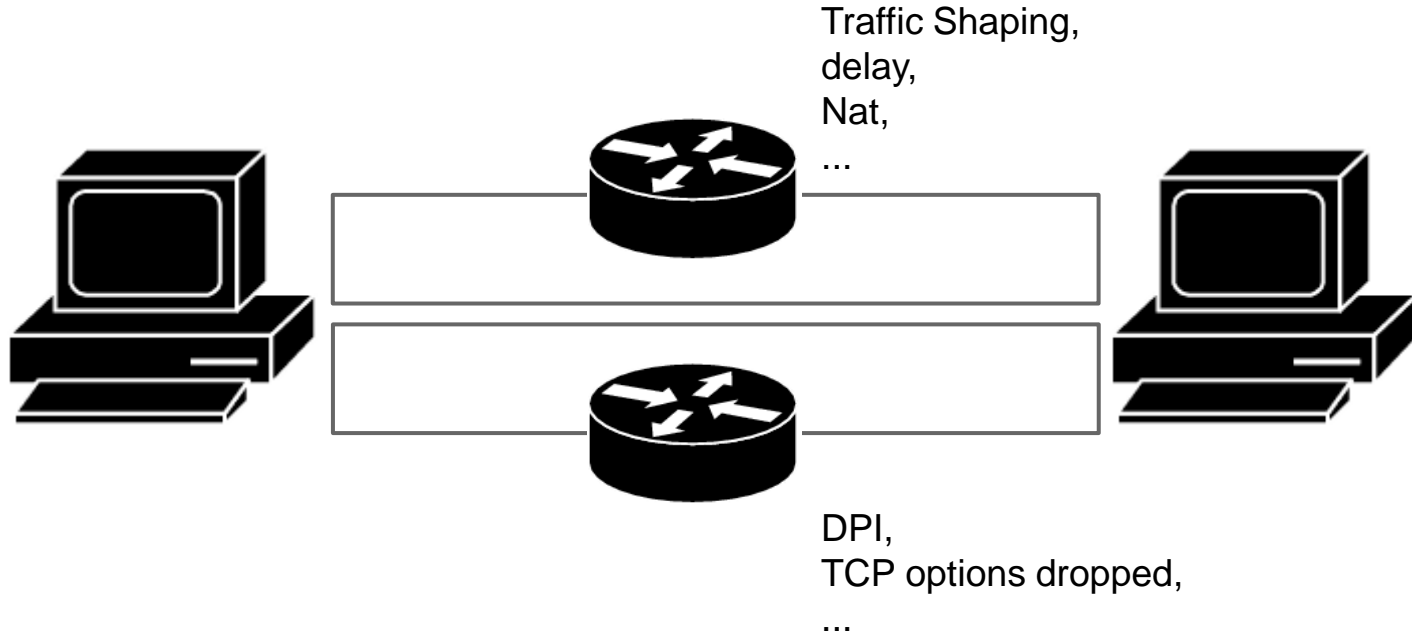
MPTCP in lab



"multipath tcp"

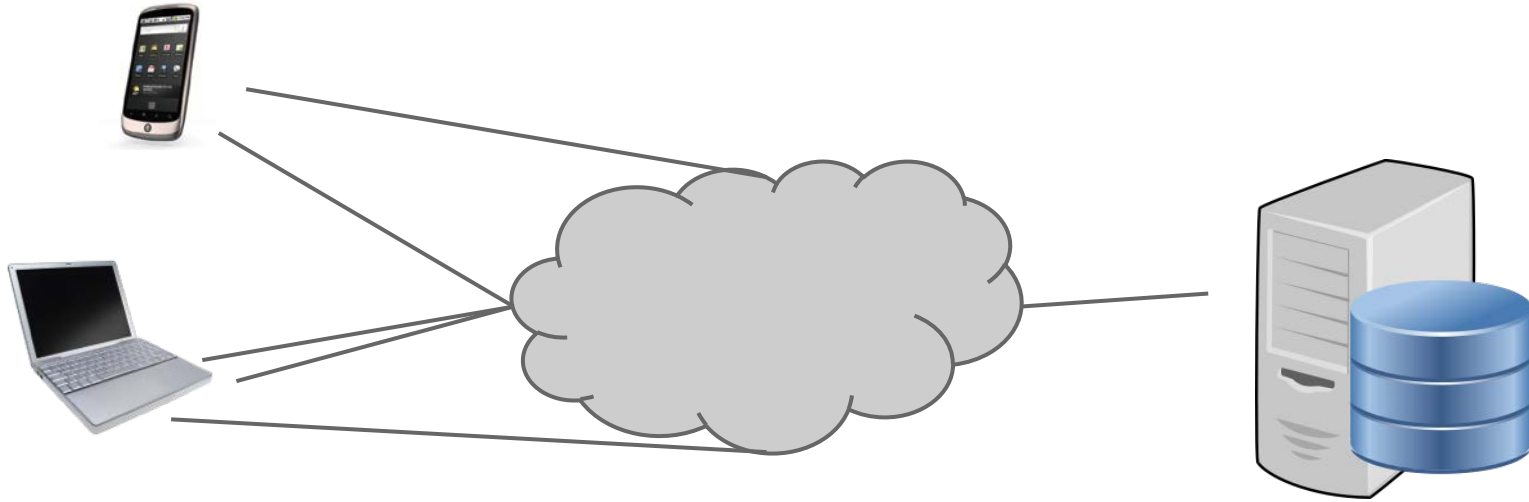
Scholar

About 1,590 results (0.04 sec)



MPTCP in the wild

Siri (Apple iPhone) :
Millions of devices.



**How does MPTCP
behaves in the wild ?**

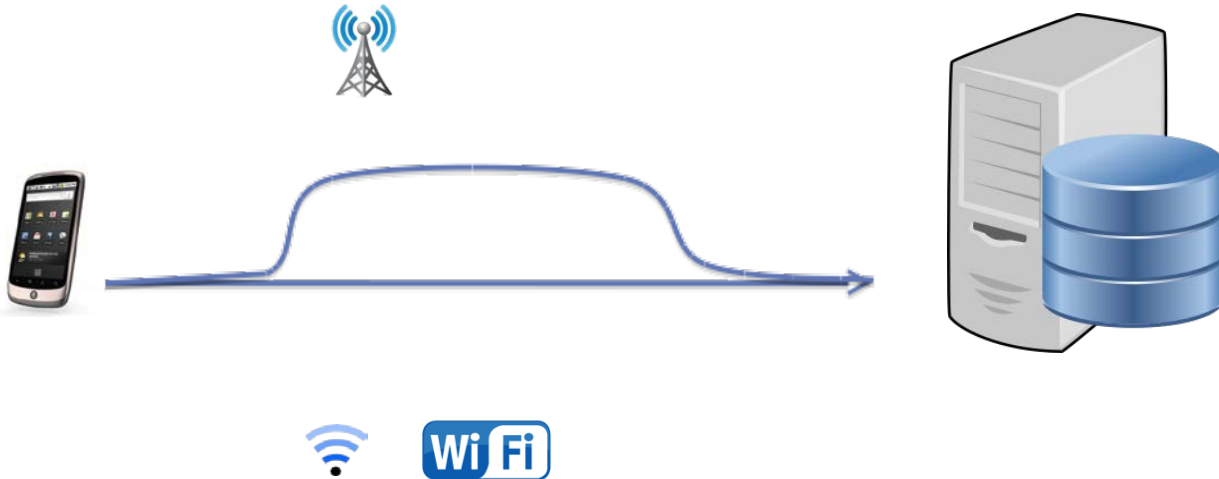
MPTCP in a nutshell

Data Set

Observations

Multipath TCP in a nutshell

New TCP extension to aggregate multiple TCP connections possibly over multiple interfaces.



Multipath TCP benefits

- Goodput aggregation
- Handover
- Use IPv4 / IPv6 dual stack
- Low RTT

Multipath TCP characteristics

- Backward compatible with TCP
- seamless at the application level
- designed to be robust against middleboxes

MPTCP in a nutshell

Data Set

Observations

Data collection

- One week long packet trace collected on multipath-tcp.org
- 134 GiBytes of data
- about 20% MPTCP
- mainly IPv4
- traces will be available

Diversity



Dataset characteristics

Collection period	Nov. 17 – 24, 2014		
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All TCP	Total	IPv4	IPv6
# of packets [Mpkt]	136.1	128.5	7.6
# of bytes [GiByte]	134.0	129.0	5.0

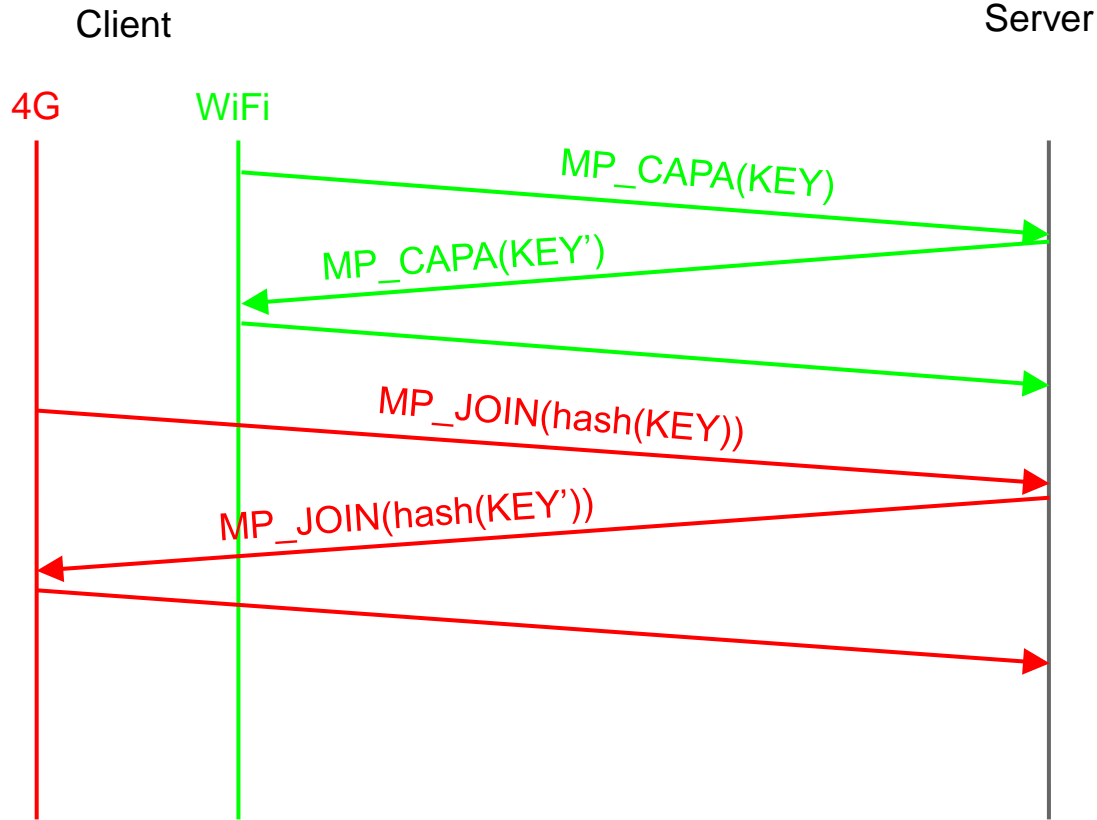
Multipath TCP	Total	IPv4	IPv6
# of packets [Mpkt]	29.4	25.0	4.4
# of bytes [GiByte]	20.5	18.5	2.0

MPTCP in a nutshell

Data Set

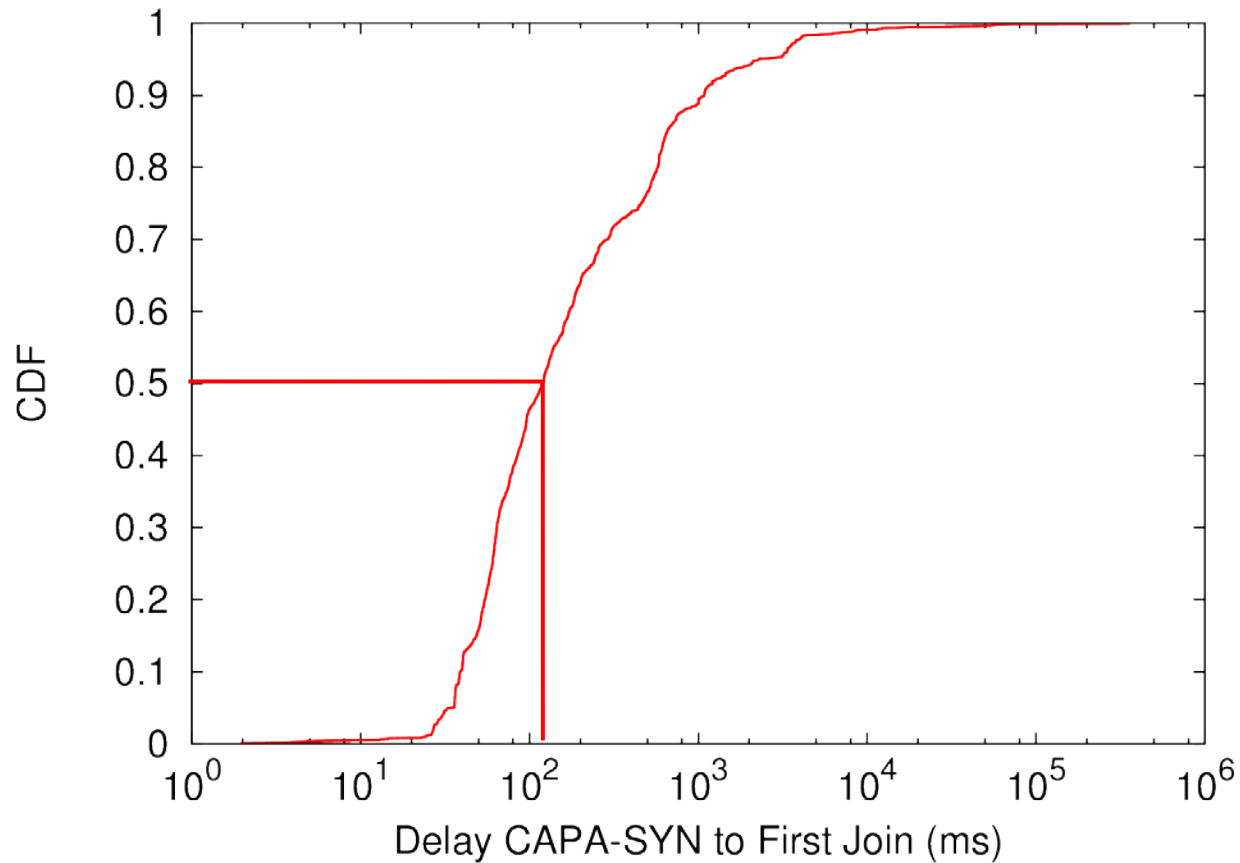
Observations

Flow establishment



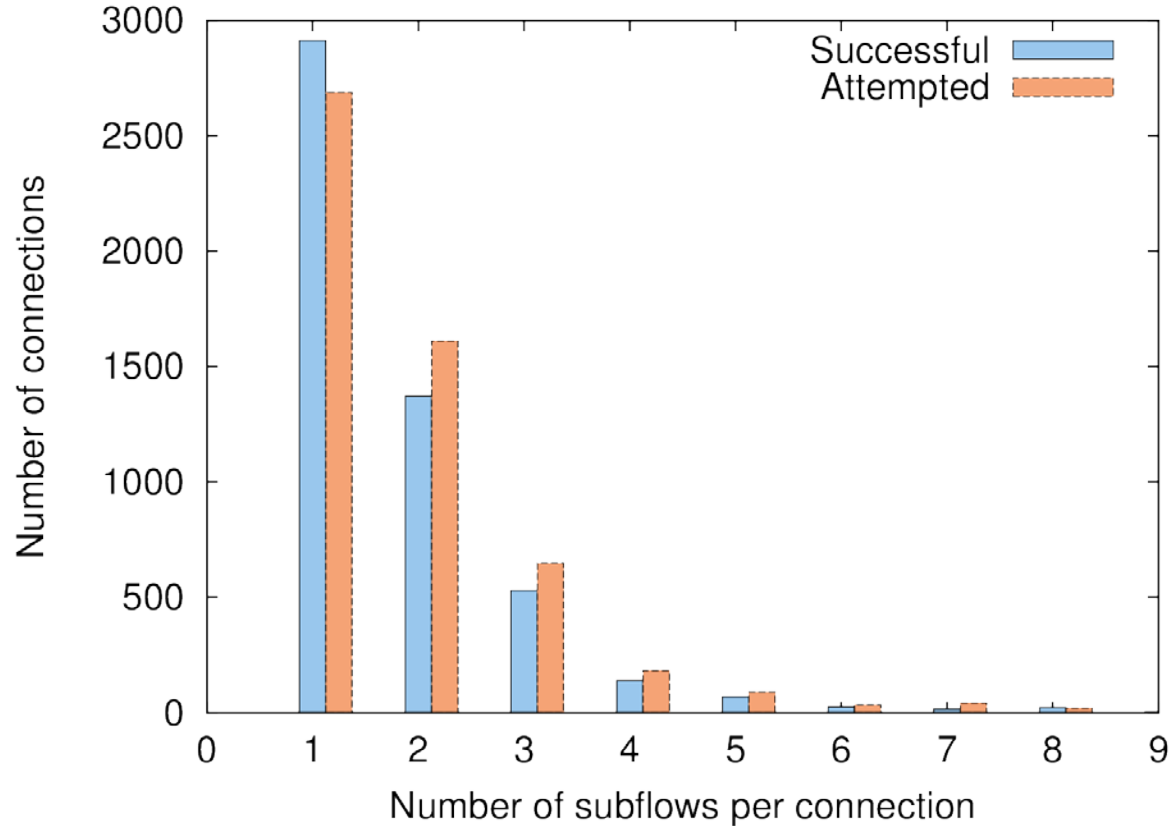
**How much time does it
take to establish a
second subflow ?**

Time to establish a second subflow



How many subflows are established ?

Number of subflows per connection



Round Trip Time difference between subflows

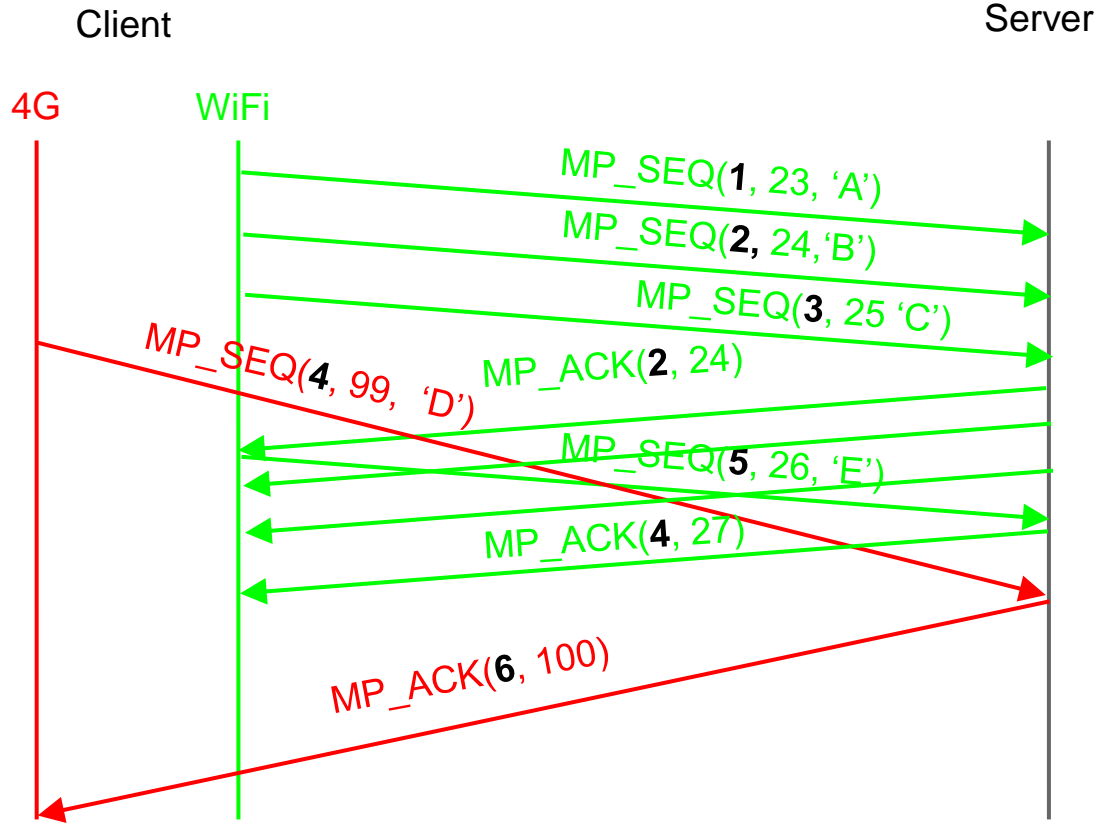
MPTCP needs to select a subflow when it has data to send

Scheduler

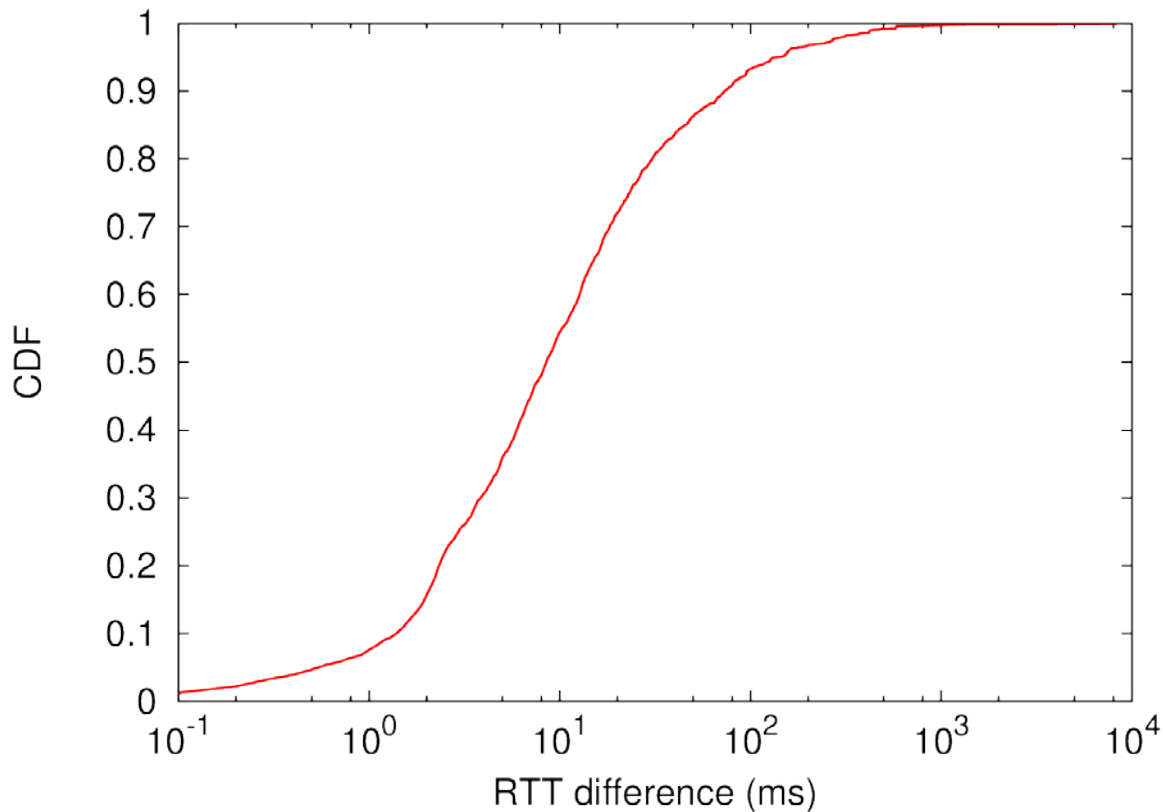
The default scheduler works as follow :
select the subflow with the lowest RTT among the subflows that have room inside their congestion window

MPTCP has its own SEQ/ACK in TCP options

MPTCP reordering



RTT difference can be large



Conclusion

- One week long analysis of real MPTCP traffic
- Data will be available soon
- MPTCP works out of the lab
- More details are available in the paper

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Questions ?