

First Experiments with Multipath QUIC

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Motivations for Multipath

Increasing Multipath TCP deployments

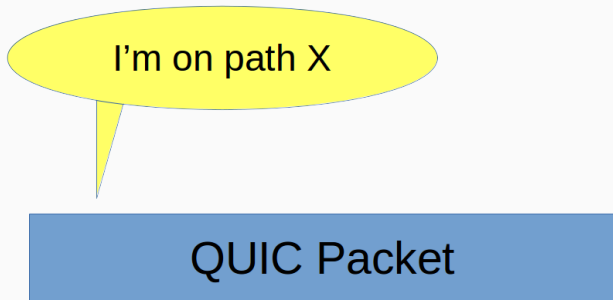
- Korean Telecom
- Apple iOS11

QUIC can also benefit from multiple paths

- Bandwidth aggregation
- Network handover

How can we do that?

Intuition for Multipath QUIC



Adding Multipath is not (so) difficult

Only a few protocol changes required

- Put a Path ID in the Public Header
- Packet Number linked to Path ID, not Connection ID
- Per Path ID acknowledgment with ACK Frame

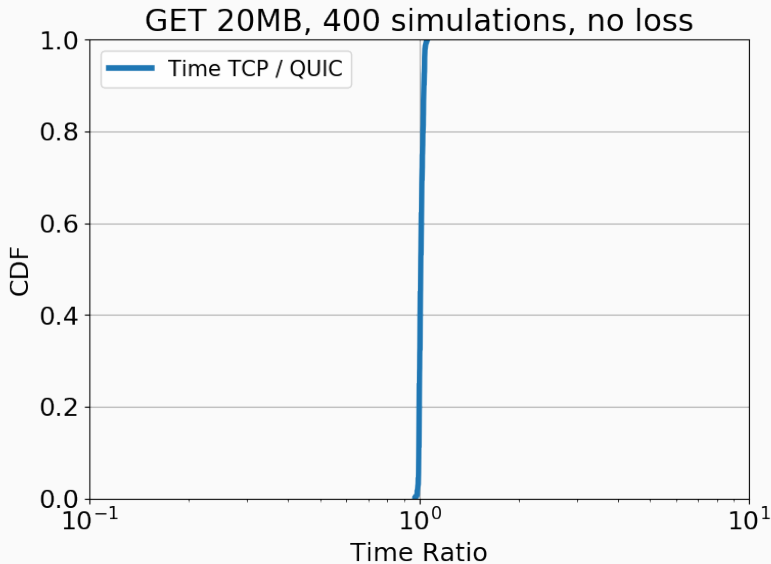
And basically that's it!

First Experiments with Multipath

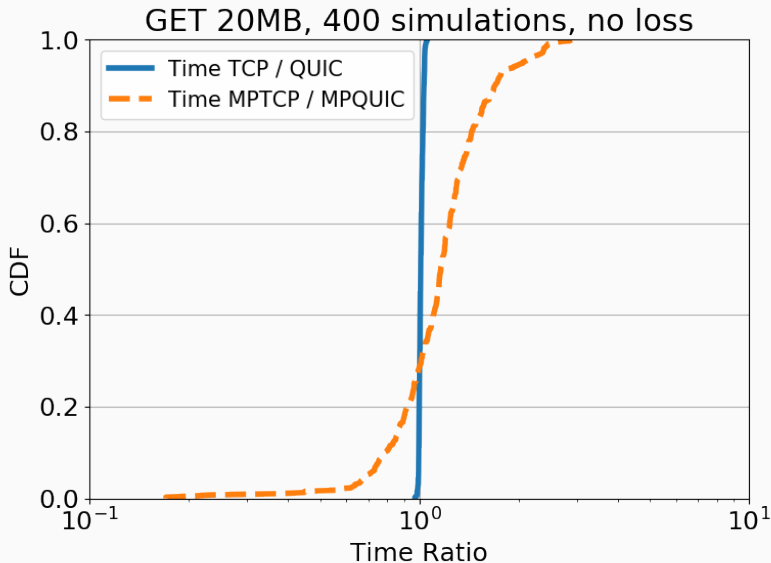
- Implemented in quic-go
 - Added multipath-specific algorithms
- Download of 20 MB file on a two-path topology in Mininet setup
 - Over a single stream
 - Collect the transfer time
- Applying experimental design on 2x200 topologies

Factor	Minimum	Maximum
Capacity [Mbps]	0.1	100
Round-Trip-Time [ms]	0	50
Queuing Delay [ms]	0	100
Random Loss [%]	0	2.5

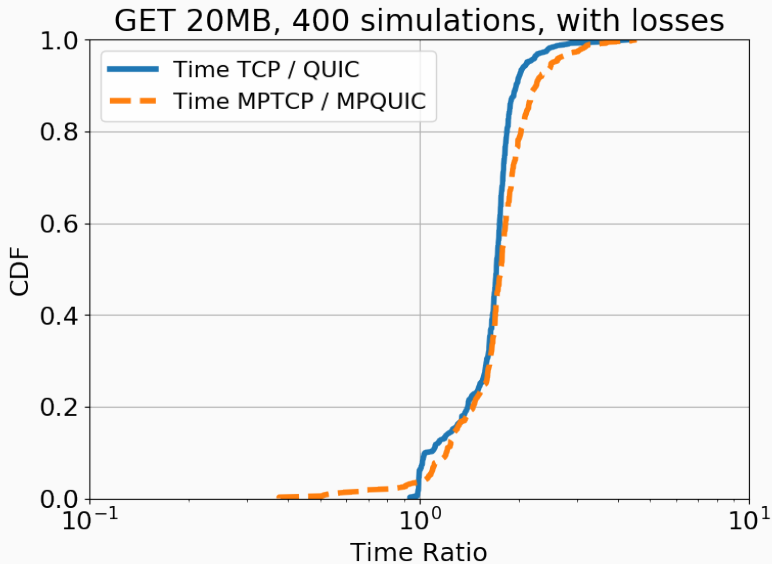
First Experiments with Multipath – Results, no loss



First Experiments with Multipath – Results, no loss



First Experiments with Multipath – Results, with losses



Conclusion

- Bringing Multipath to QUIC is (quite) simple
- Multipath could provide better aggregation with QUIC than TCP

Thanks for your attention!

Feel free to ask questions 😊