

First Experimentations with iOS Multipath TCP in the Wild

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iOS Multipath TCP

- Initially for Apple Siri
- Now available for any application since iOS 11



Performance of Multipath TCP?

Typical multipath use cases

- (Bandwidth aggregation)
- Network handover

How does the iOS implementation behaves

- with different network traffics?
 - Bulk transfer, light latency-sensitive traffic,...
- under user mobility situation?
 - i.e., does it perform network handover "efficiently"?

MultipathTester

- WiFi reachability tester
 - Under bidirectional light fixed-rate streaming traffic
 - Can Multipath TCP quickly react to network handover?
- Multipath benchmark
 - Bulk transfer, goodput probing, latency with light traffic,...
 - With optional aggregation behavior
- Result visualization
 - e.g., how does the congestion window evolve during iperf?
- Compare with (Multipath) QUIC protocol

Since its Deployment (March 8th - March 20th)

- 205 tests run
 - Including 22 mobile ones (10 with actual network handover)
- 50 different users
 - Mostly from Europe
 - With 1/3 from America

First Mobile Results: Methodology

Orange B 20:12 22%

Mobile Tests

How far can you reach your WiFi?
The record is 24.5 m.

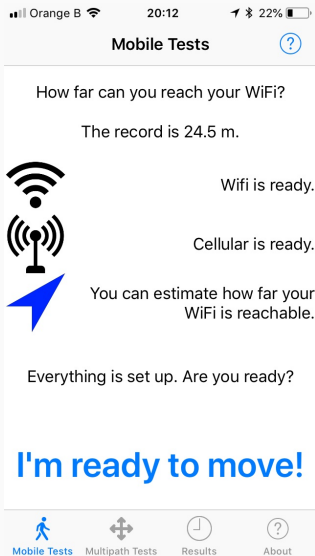
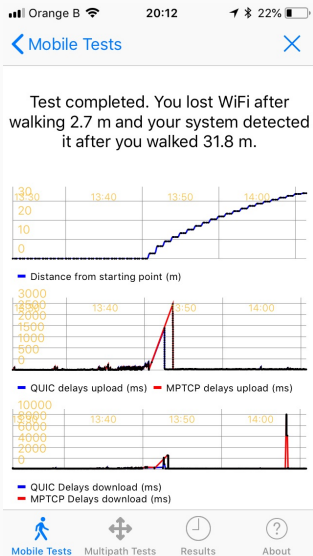
Wifi is ready.
Cellular is ready.

You can estimate how far your WiFi is reachable.

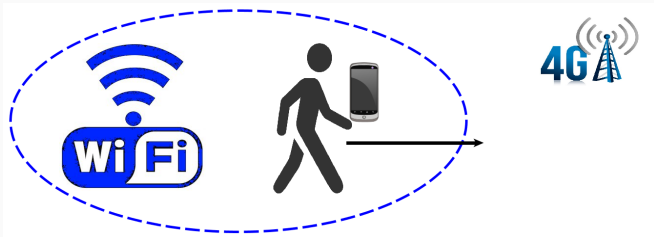
Everything is set up. Are you ready?

I'm ready to move!

Mobile Tests Multipath Tests Results About

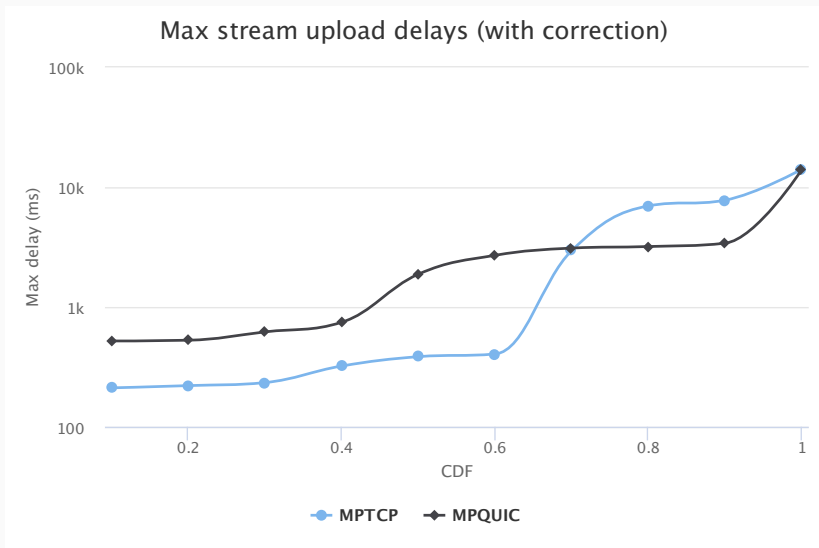
The image shows the 'Mobile Tests' setup screen. At the top, the status bar shows 'Orange B', '20:12', and '22%' battery. The title 'Mobile Tests' is centered with a help icon. Below, a large question asks 'How far can you reach your WiFi?' followed by 'The record is 24.5 m.' To the left is a large icon of a WiFi signal tower with a blue arrow pointing towards the text 'You can estimate how far your WiFi is reachable.' Below this, it says 'Everything is set up. Are you ready?' and a large blue button reads 'I'm ready to move!'. At the bottom is a navigation bar with four icons: a person (Mobile Tests), a crosshair (Multipath Tests), a clock (Results), and a question mark (About).

First Mobile Results: Methodology

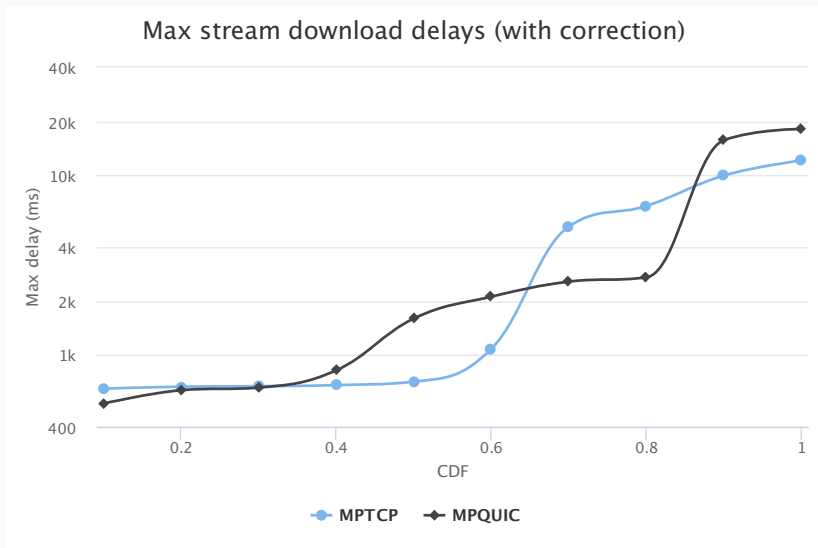


- Run 20 KB/s streaming traffic in both direction
 - i.e., 10 chunks of 2000 bytes per second
 - For both Multipath TCP and Multipath QUIC
 - Use interactive mode
- Collect application latency between data chunk and applicative ack
- Test stops when system declares WiFi as lost

Maximum Delay Observed (Upload)



Maximum Delay Observed (Download)



What's Next?

- The iOS Multipath TCP interactive mode seems quite good in upload
 - Compared to a naive Multipath QUIC scheduling scheme
- Only preliminary results
 - Only 10 points so far...
- Looking for kind volunteers 😊
 - Interesting results will be posted on <https://multipath-quic.org>

MultipathTester



[https://itunes.apple.com/us/app/multipathtester/
id1351286809](https://itunes.apple.com/us/app/multipathtester/id1351286809)

Feedback welcomed at quentin.deconinck@uclouvain.be 😊