

Motivation

- Emerging wireless technologies deliver high throughput (LiFi, 5G mmWave) and connect remote places (LEO constellations, e.g., Starlink)
- Common problem: Pervasive and sudden link changes during mobility
- How to shield the application from the connectivity and performance fluctuations?

Intelligently utilize multiple links jointly to increase reliability.

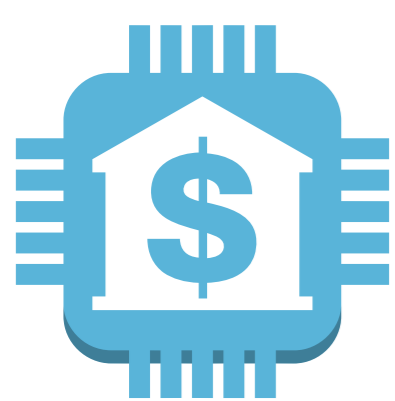
Multipath Enhancements



LEO Link Prediction. Feed model with the observed performance, satellite positions, domain-knowledge to forecast performance.



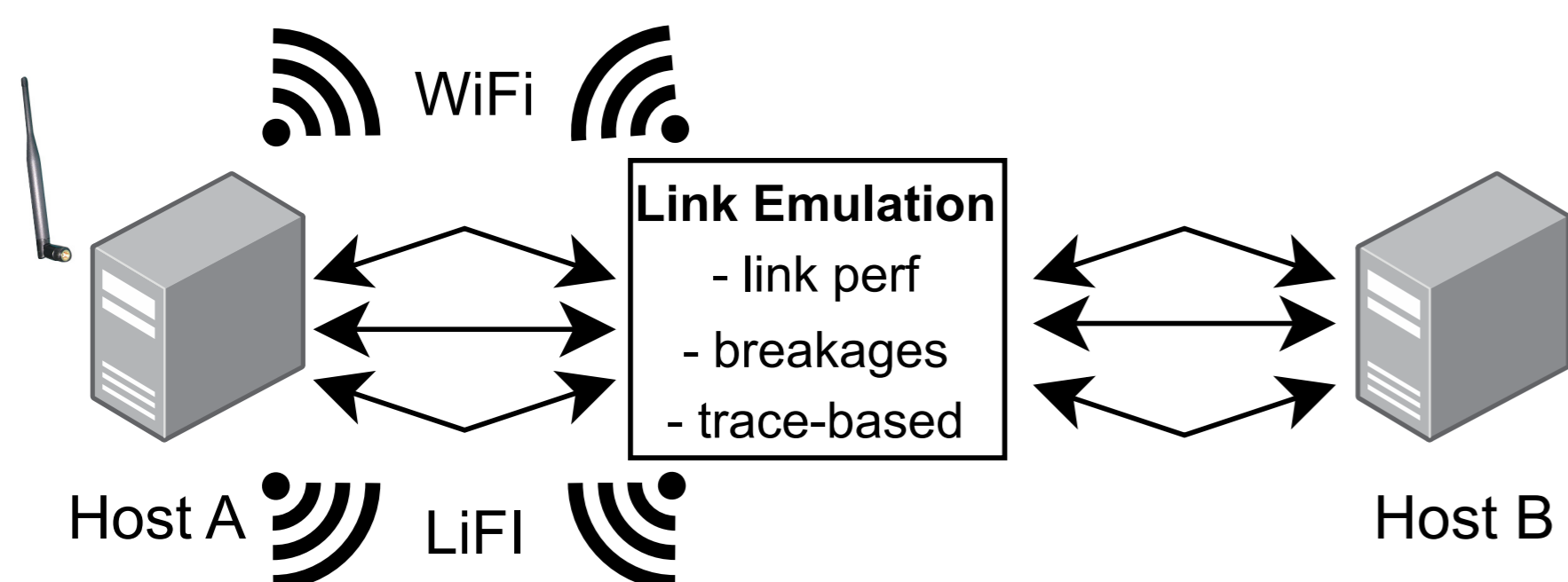
Redundancy. Employ FEC and redundant transmissions proactively.



Cost-aware scheduling. Consider external costs such link usage such as usage fees and energy demands.

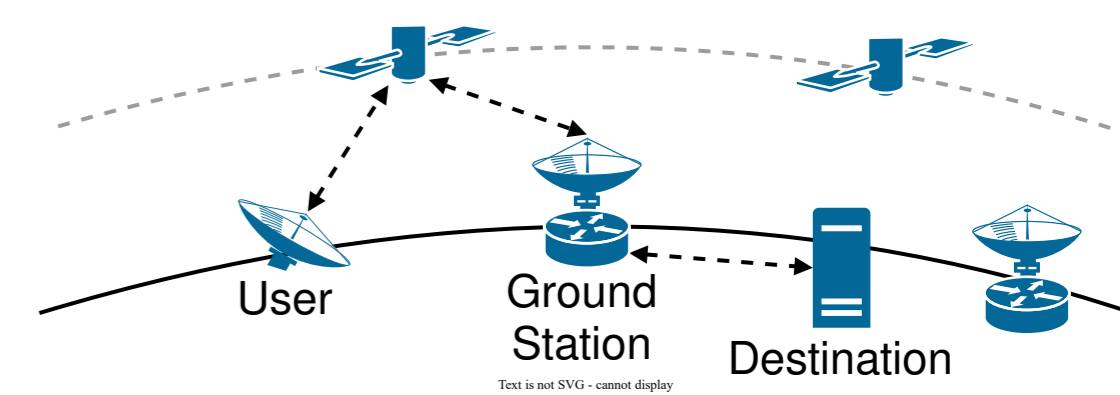
Testbed

- Integrates physical wireless (WiFi, currently LiFi) and emulated links
- Mobility emulation based on collected traces
- Supports established MPTCP schedulers, e.g., BLEST, MuSher, and ECF, and MPQUIC-based approaches

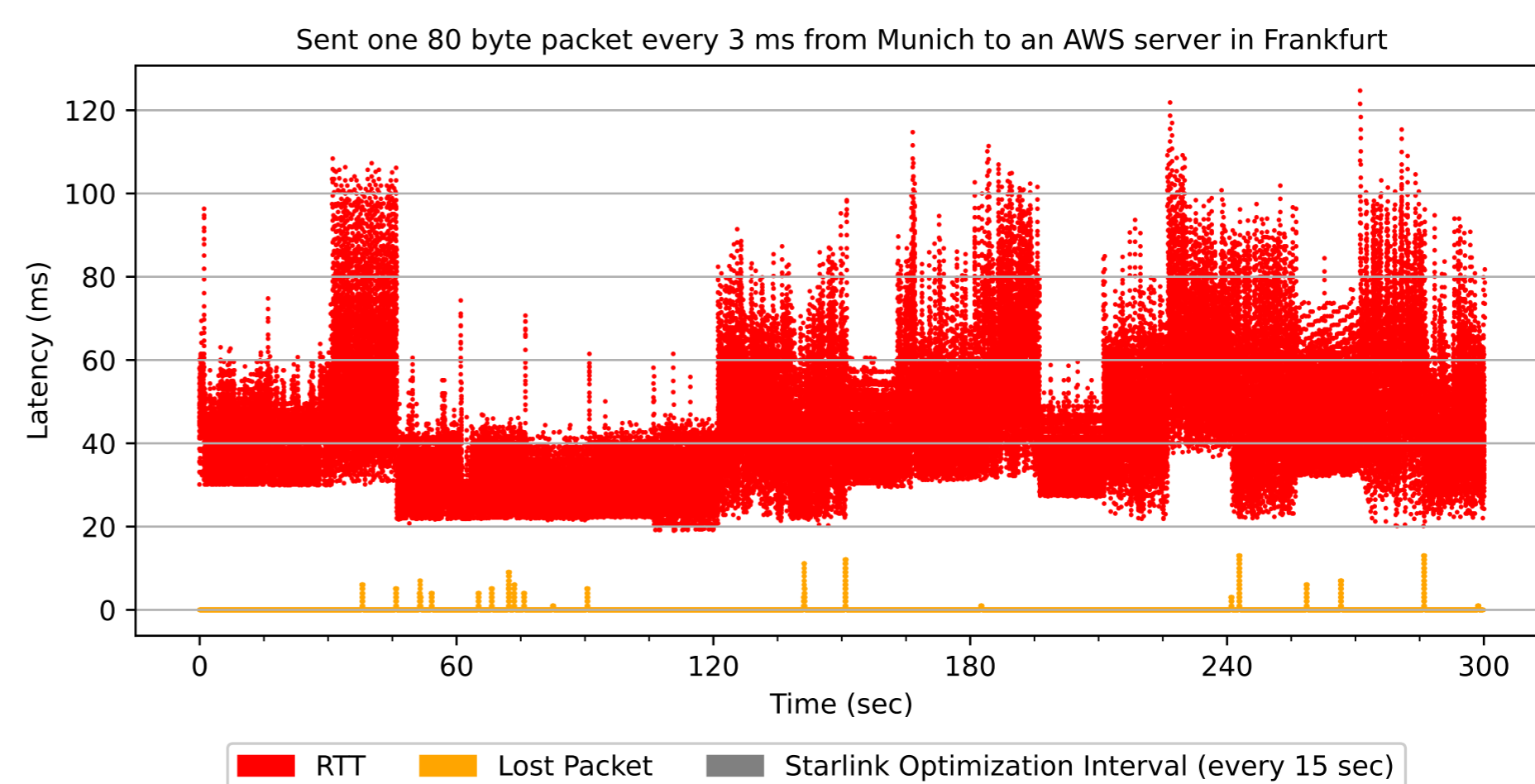


Starlink Behavior

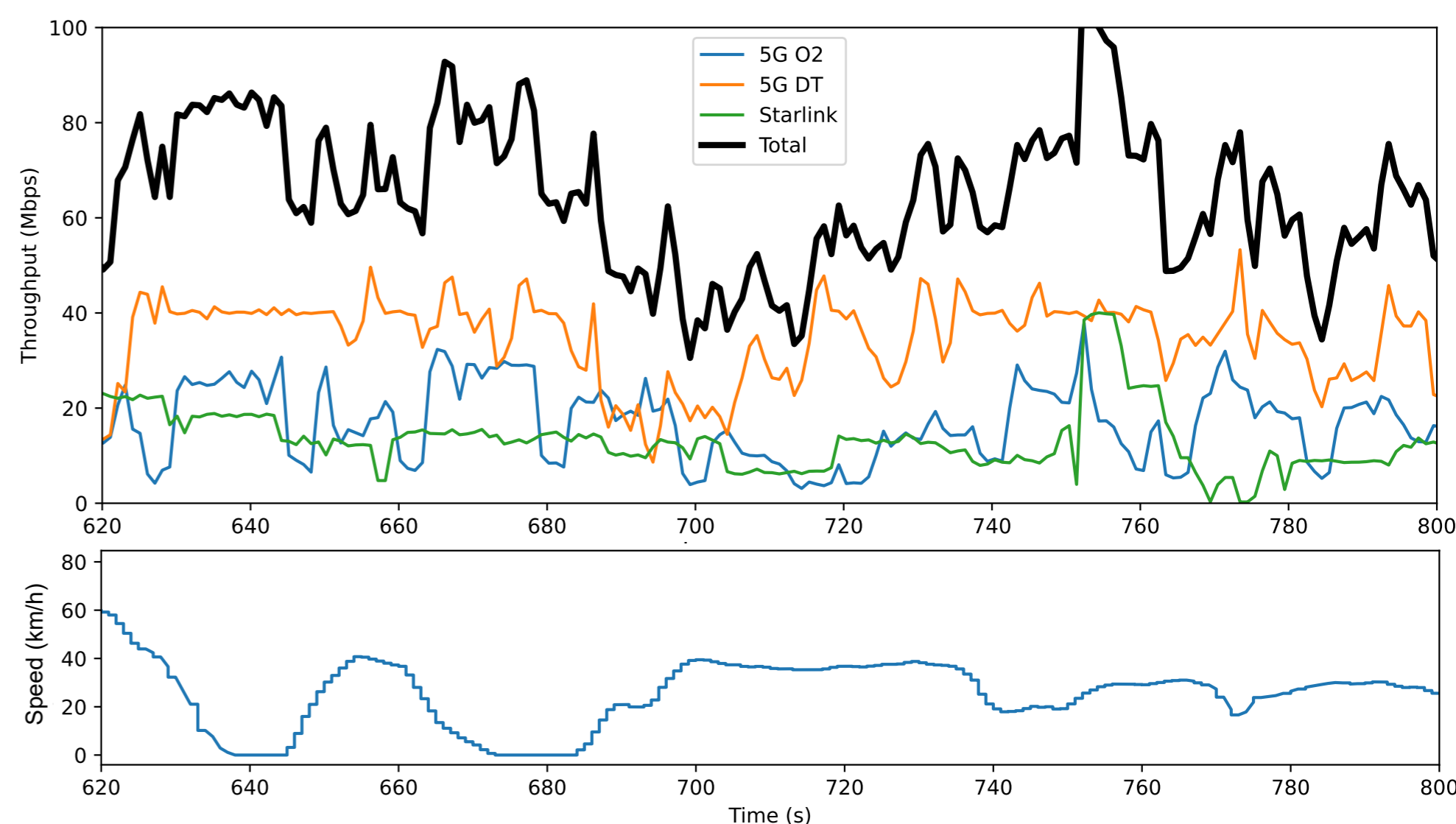
Starlink exhibits periodic latency shifts between “reconfiguration intervals”.



RTT Measurements over Starlink

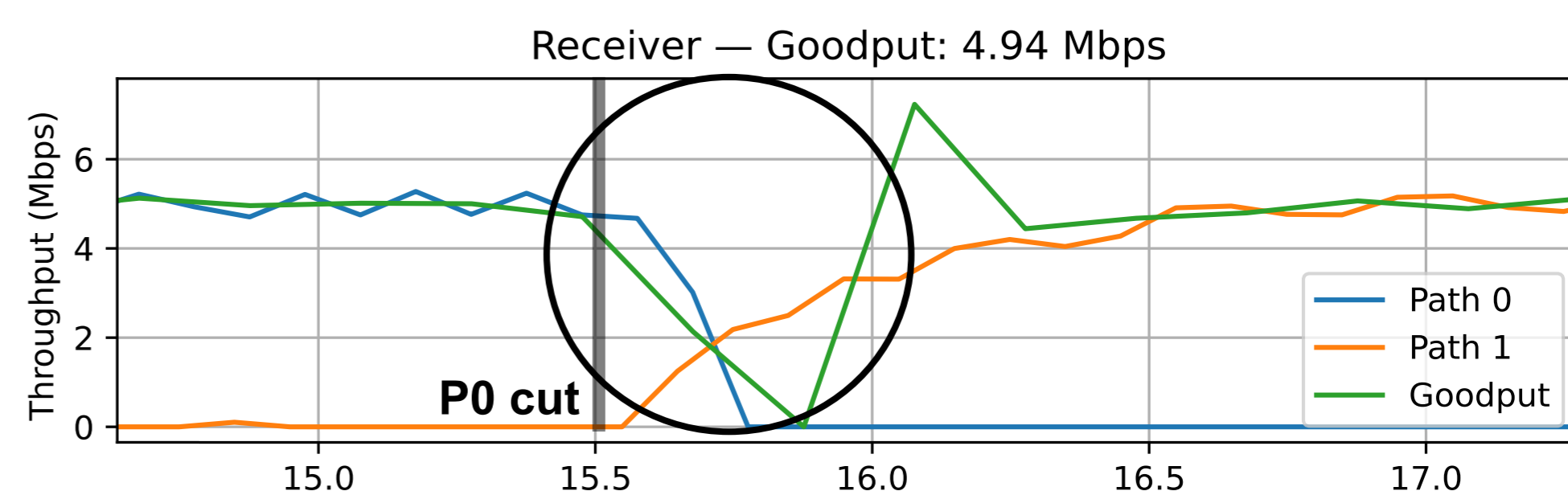


Mobile Measurements



Uplink data transform during mobility. The car was equipped with two 5G modems and Starlink.

Multipath Failover



At sec 15.5, path 0 (blue) fails and path 1 becomes active. The application-delivered goodput still drops due to retransmissions.