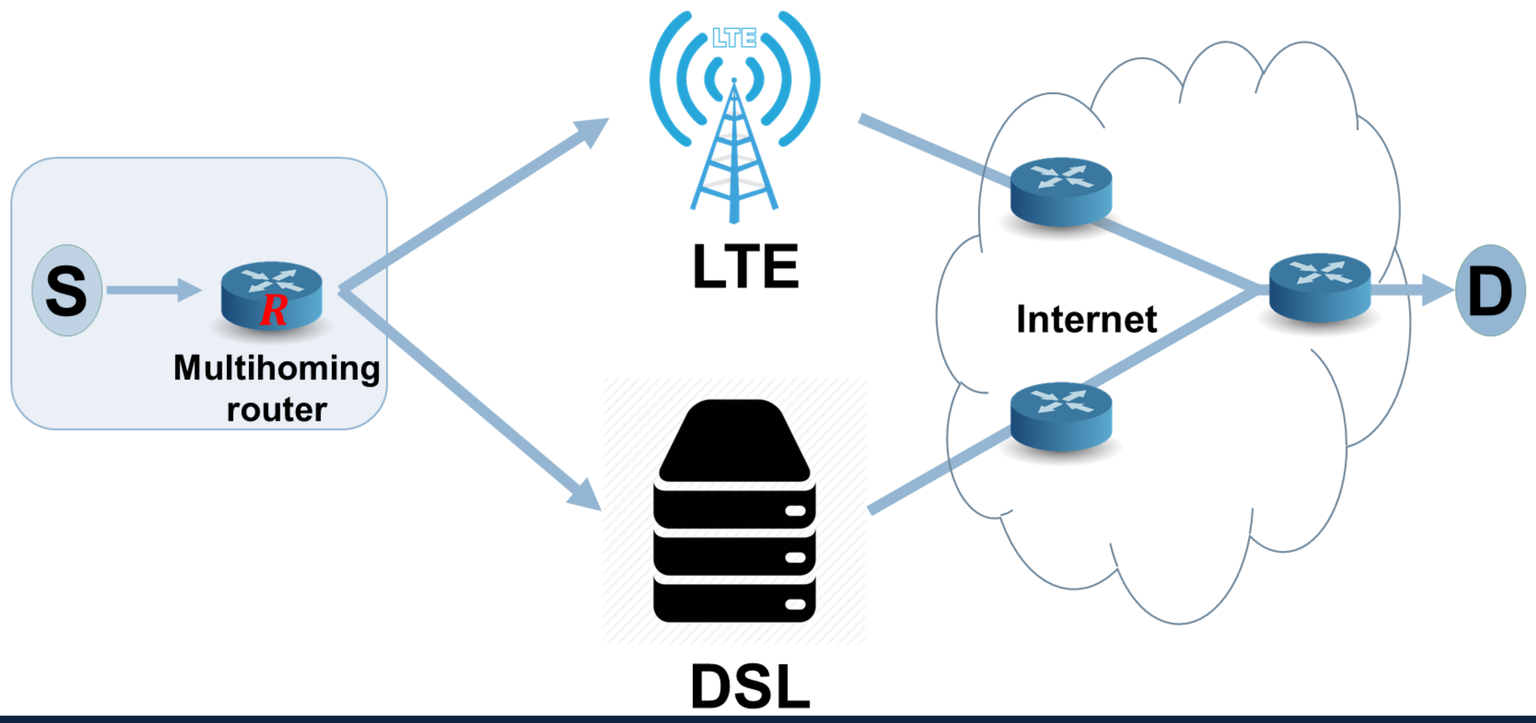
2SYN: Congestion-Aware Multihoming

Kfir Toledo (IBM Research) • *Isaac Keslassy (Technion)*
Emails: kfir.toledo@ibm.com | isaac@technion.ac.il

Multihoming Problem

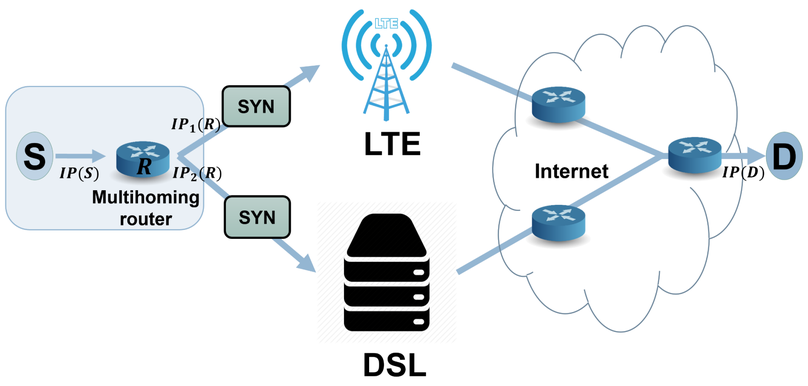
Fundamental problem:
How should router R route a new flow?



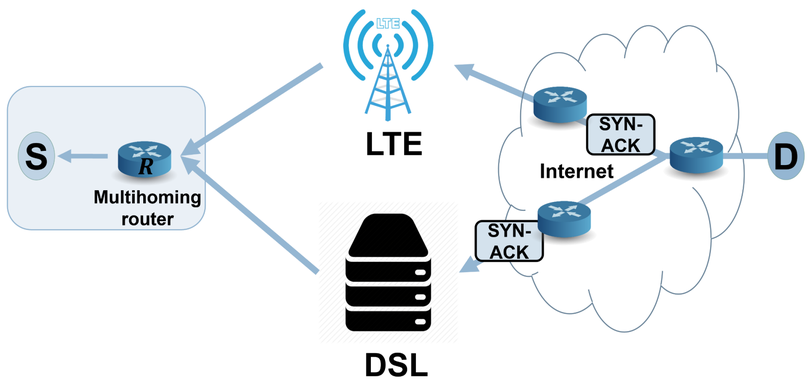
Current alternatives:

- **Static fail-over algorithm**
  - ✗Not congestion-aware
- **Static load-balancing algorithm**
  - ✗Not congestion-aware
- **MPTCP(Multipath TCP)**
  - ✗Requires D to be compatible

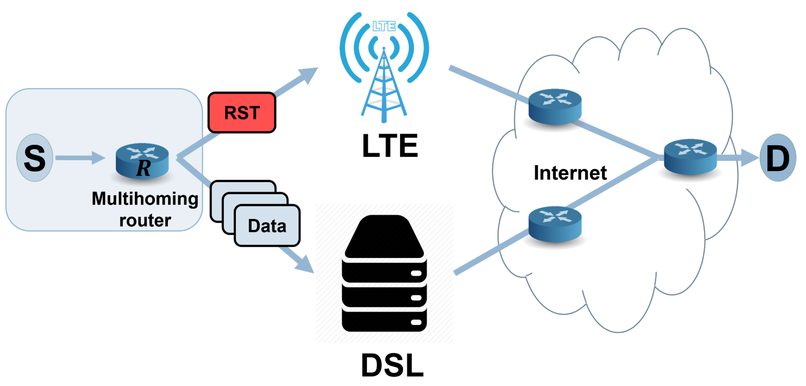
2SYN Algorithm



1st step: duplicate SYN



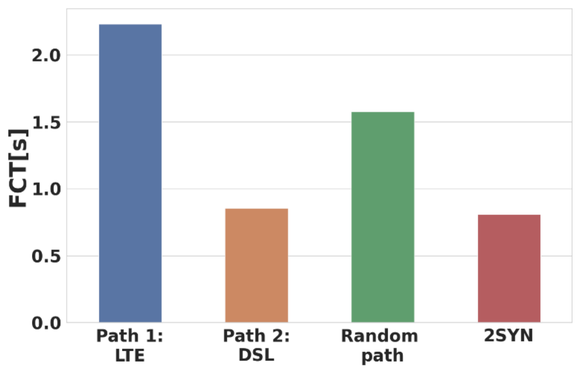
2nd step: wait for first SYN-ACK



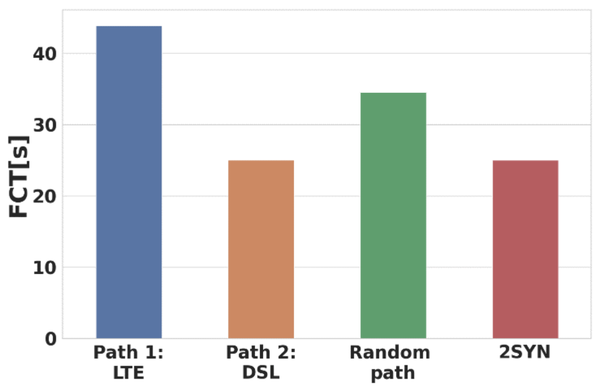
3rd step: pick path and cancel other paths

- **Intuition:** 2SYN picks the path with the shortest initial delay, aiming to minimize the flow completion time.
- **Implemented in Linux:** https://github.com/kfirtoledo/2SYN-Multihoming

Real World Experiments: LTE vs DSL



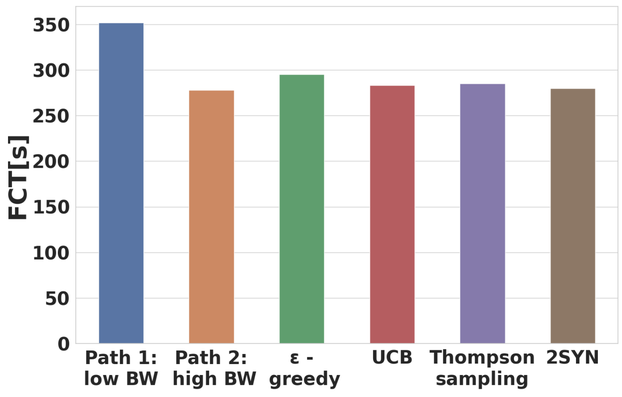
Web search: Download link



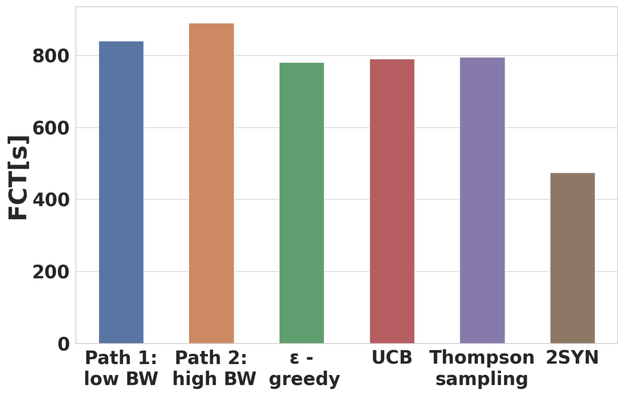
30MB file: Upload link

Evaluation setup: Israel to England
Path1: 4G LTE
Path2: DSL link

Can ML Learn the Best Path?



Constant: without bandwidth drop



With bandwidth drop

Why not?
Less reactive to changes

Evaluation setup:
Compared against Multi-Armed Bandit algorithms

1. 5 flows, Low BW: 200 Mbps, High BW: 300 Mbps, 50 files of 10MB
2. 5 flows, Low BW: 200 Mbps, High BW: 300 Mbps with bandwidth drop to 100 Mbps after 40% of files are sent, 20 files of 200MB