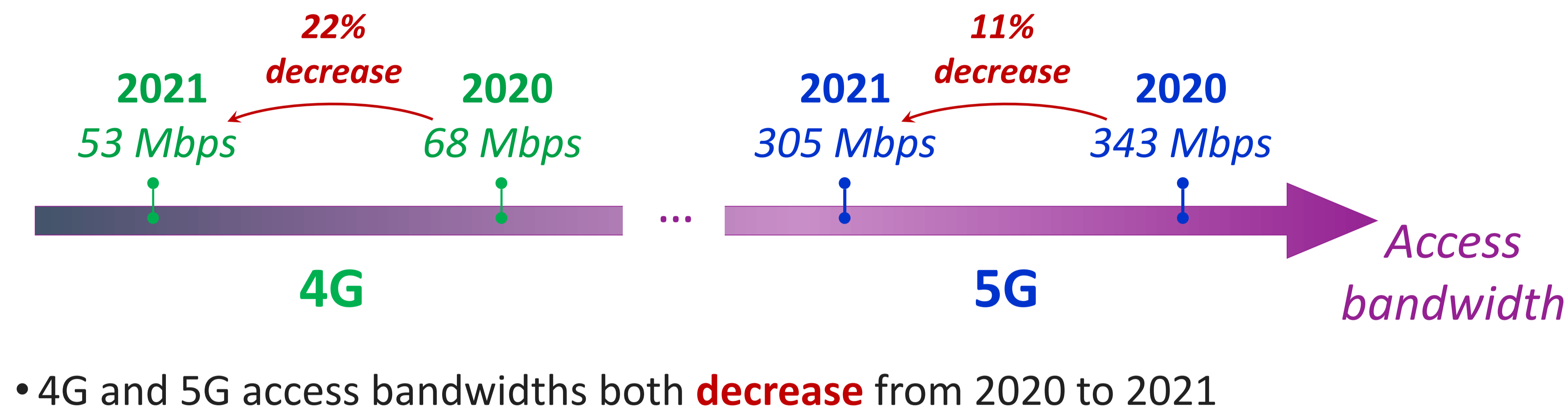
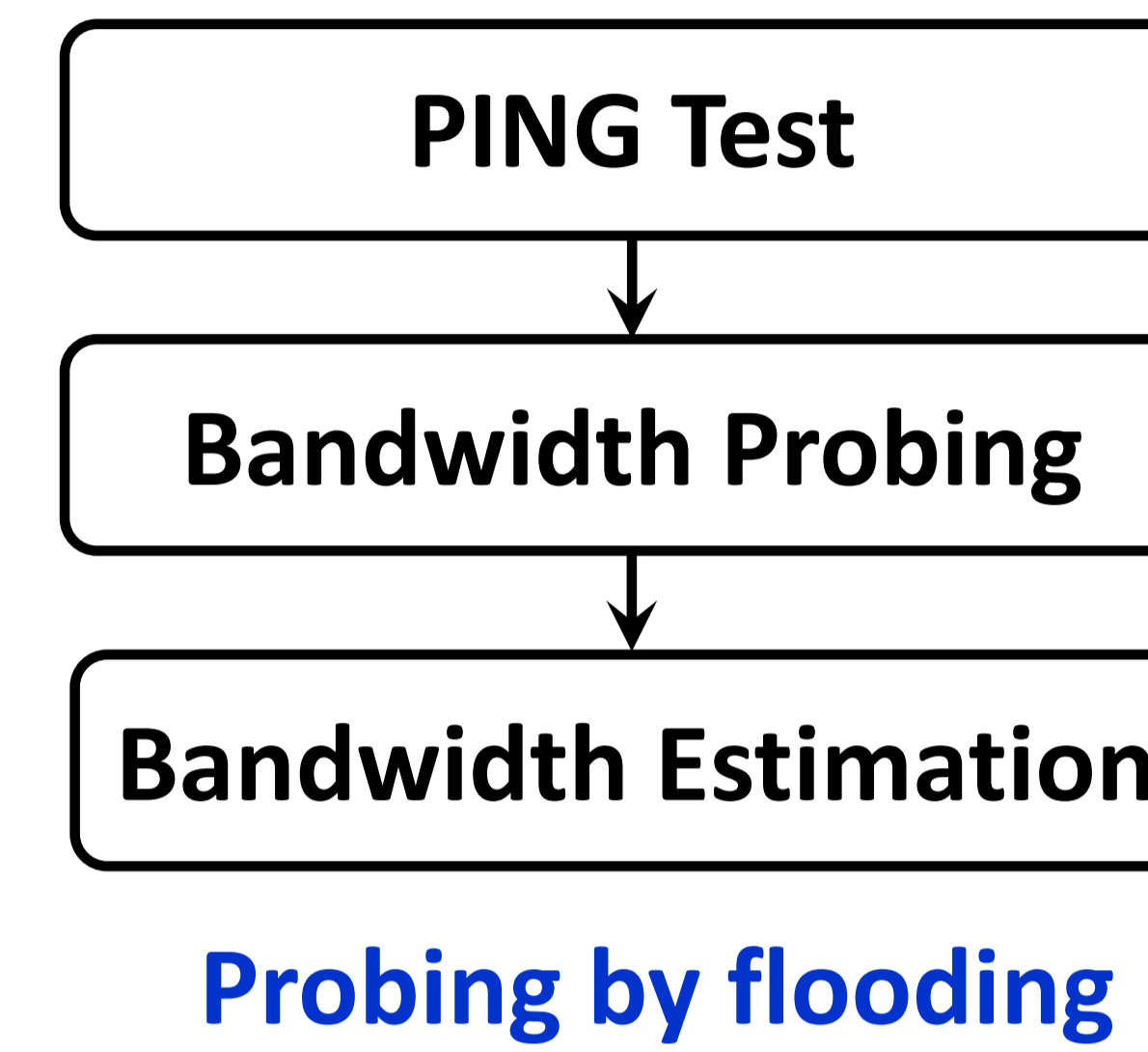


Xinlei Yang, Hao Lin, Zhenhua Li, Xingyao Li, Xudong Wu, Yunhao Liu, *et al.*

Suprising and Frustrating Status Quo



Bandwidth Testing Services (BTSes) & Challenges

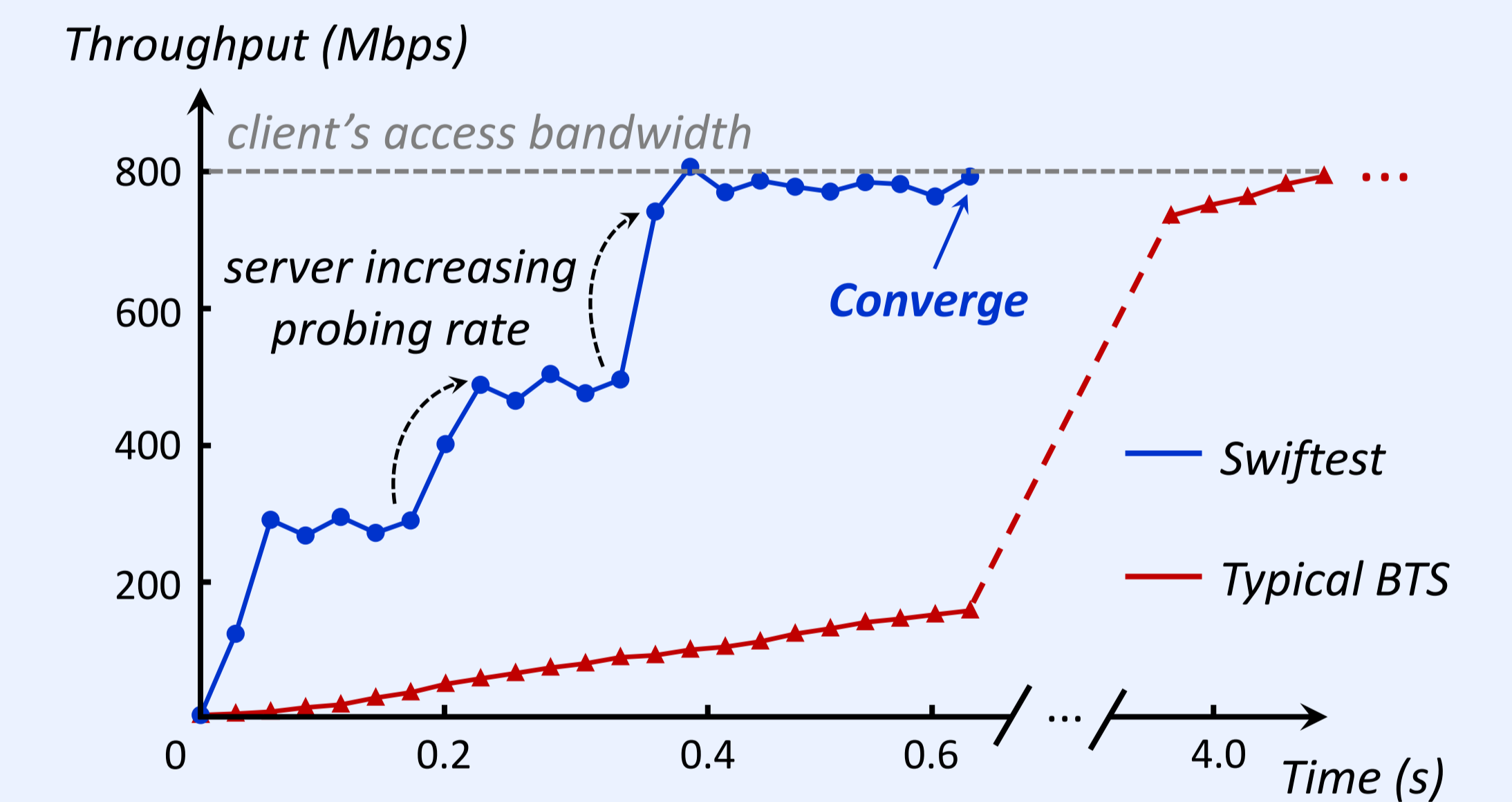
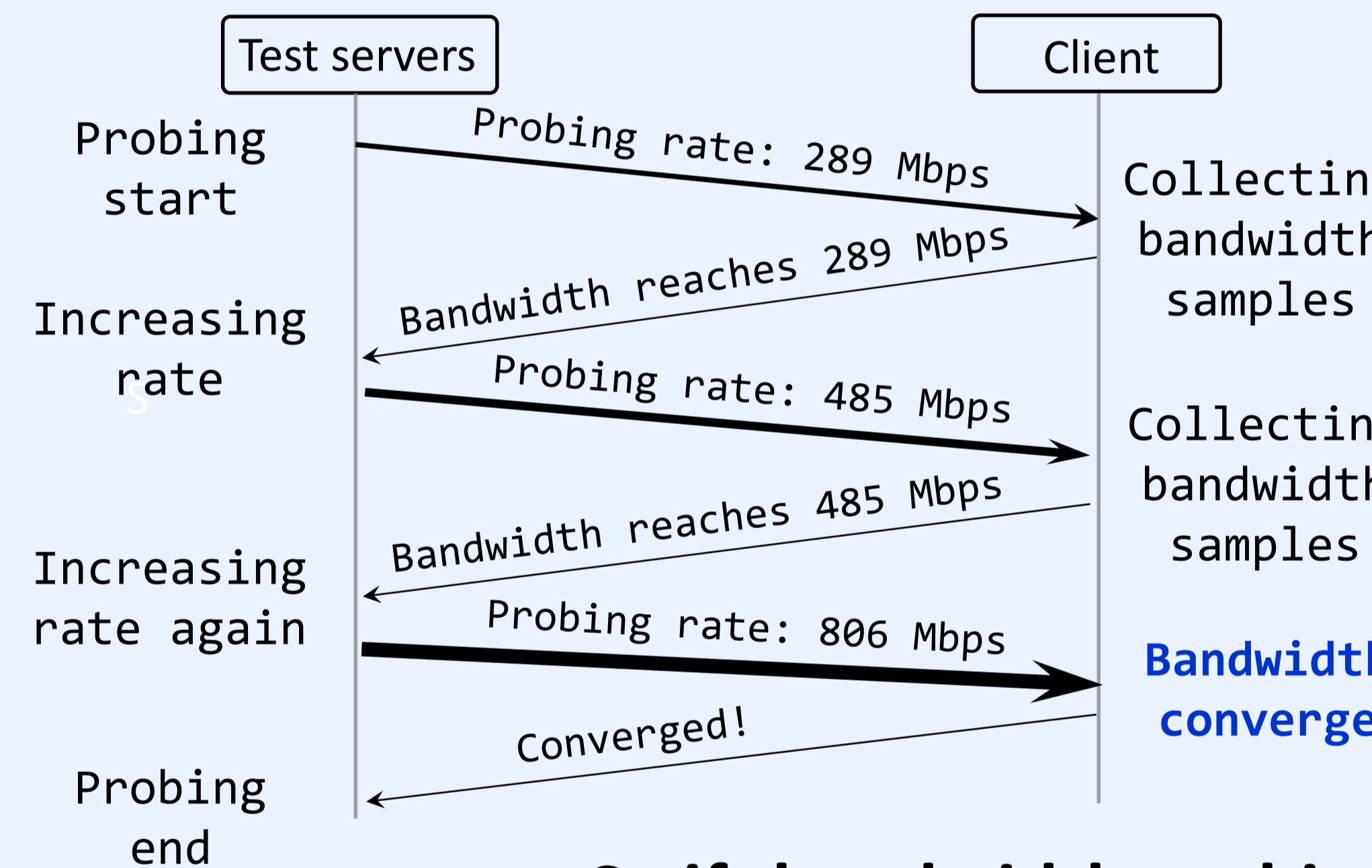


- Test results cannot support in-depth analysis
- **coarse-grained** results: bandwidth & latencies only
- Slow and costly testing process
- **excessive** data usage and **long** test duration

Swiftest: Ultra-Fast, Ultra-Light BTS in One Second

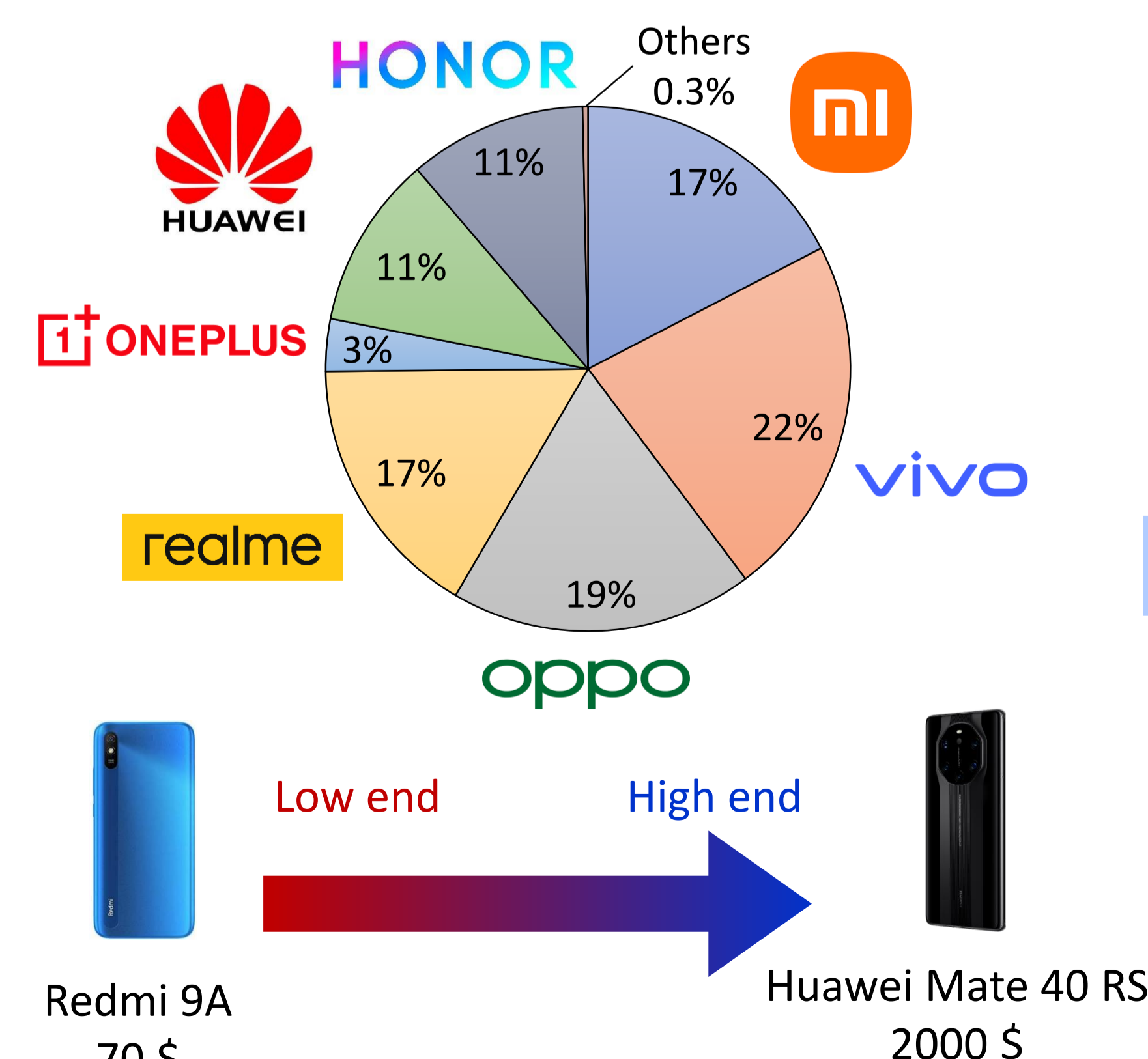
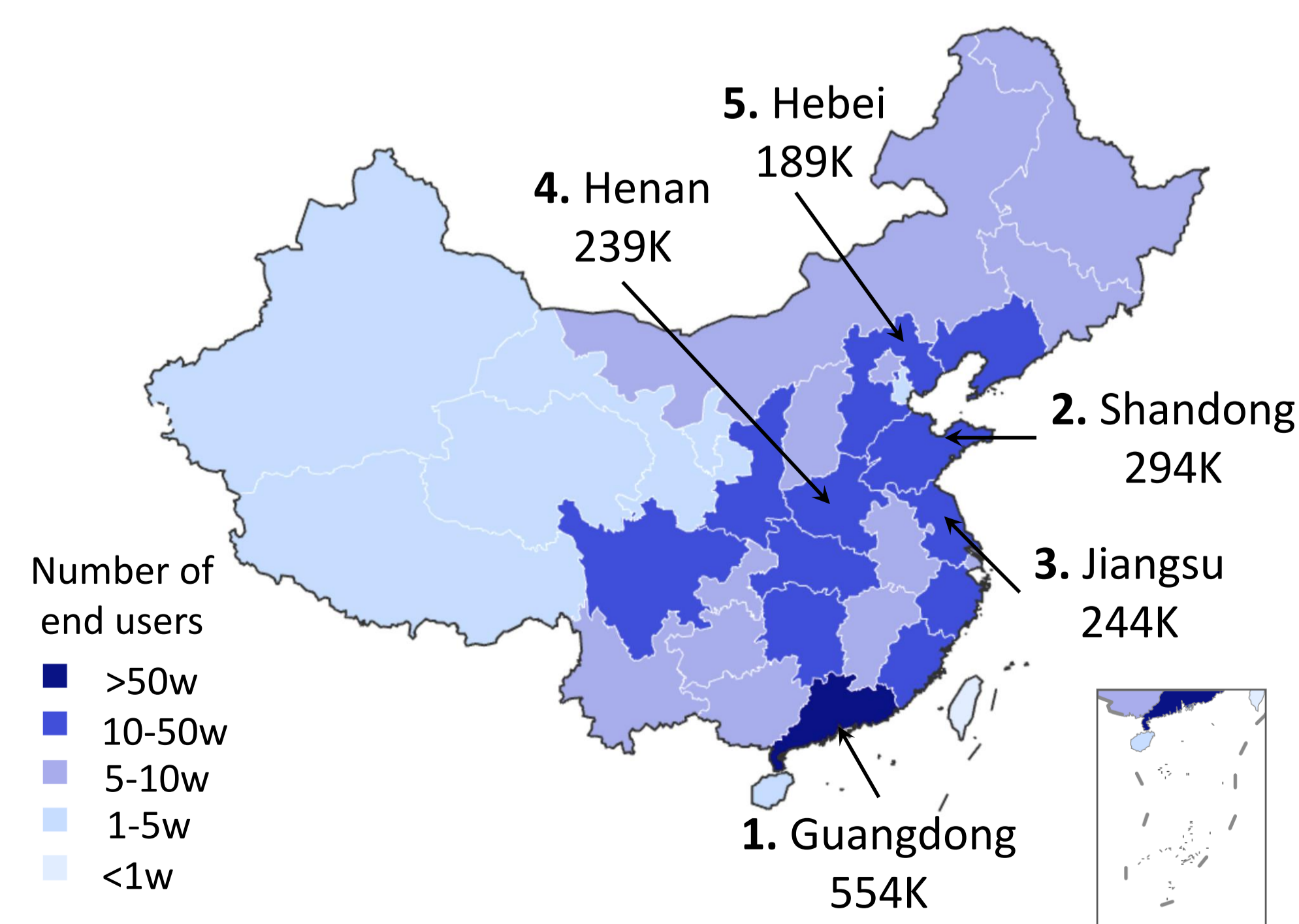
| | 4G | 5G | WiFi |
|------------------|--|--|--|
| MAC layer | LTE band, Cell bandwidth, EARFCN code, ... | 5G band, Cell bandwidth, NRARFCN code, ... | WiFi standard, Max TX/RX Linkspeed, Current Linkspeed, ... |
| PHY layer | Signal strength, SNR, RSSI, ... | Signal strength, SNR, RSSI, ... | WiFi RSSI, WiFi frequency, Channel width, ... |

Cross-layer and cross-technology measurement



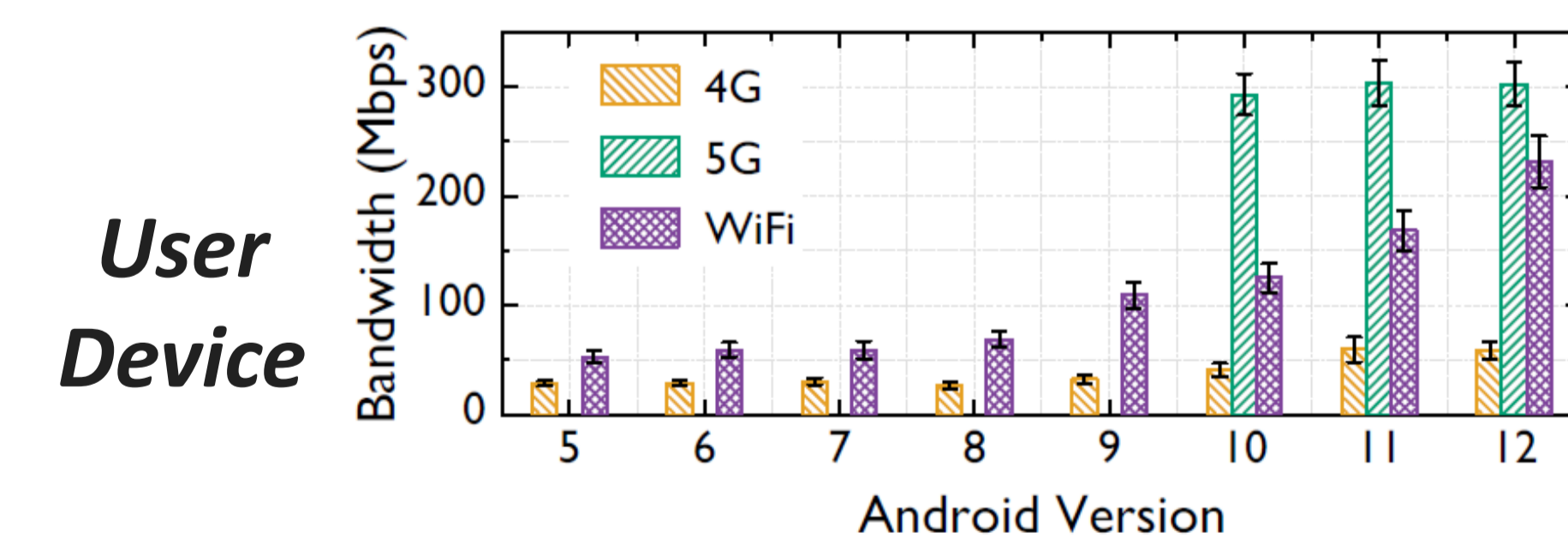
Swift bandwidth probing with statistical guidance

Nationwide Bandwidth Testing over 3.54M Users

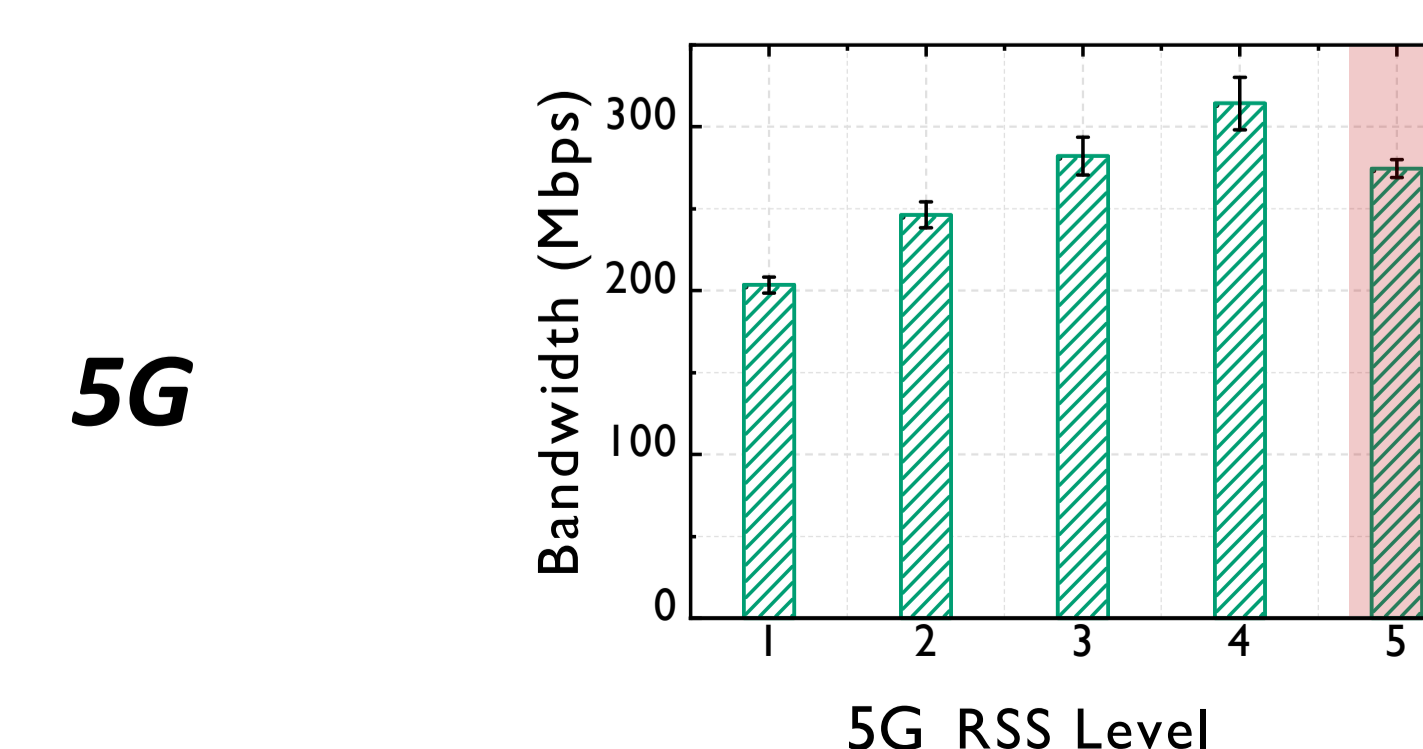


User device models

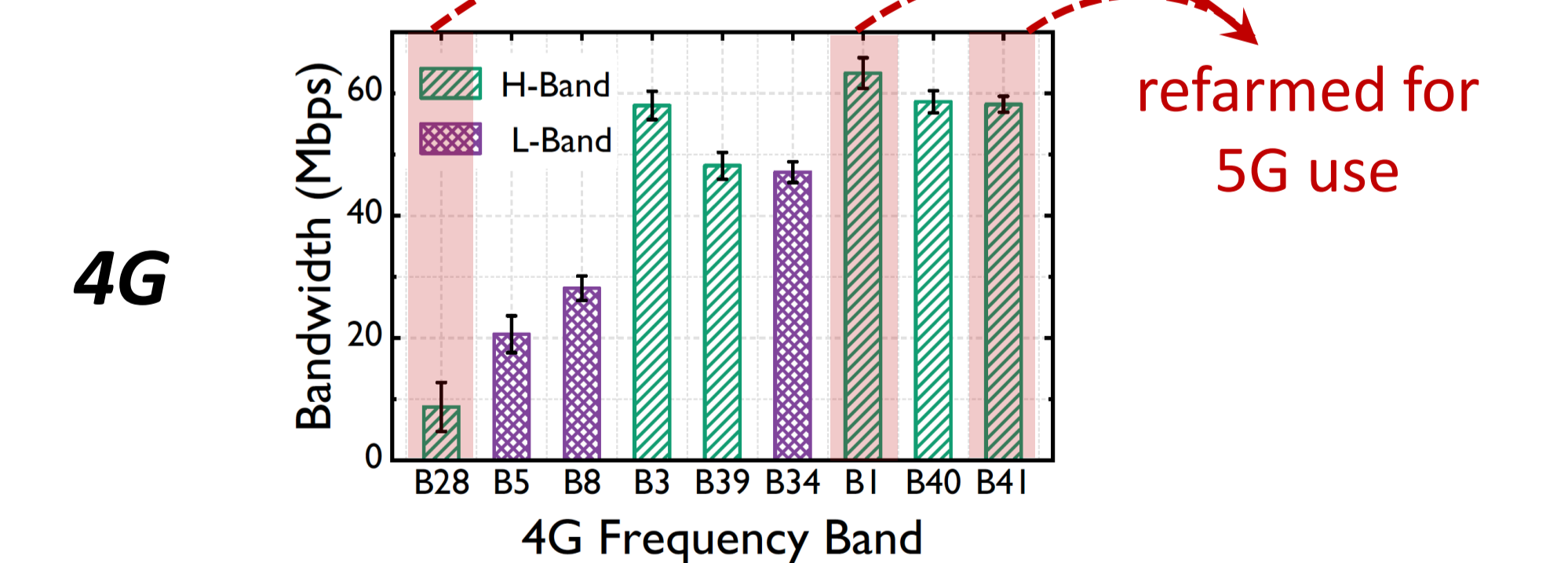
Major Findings



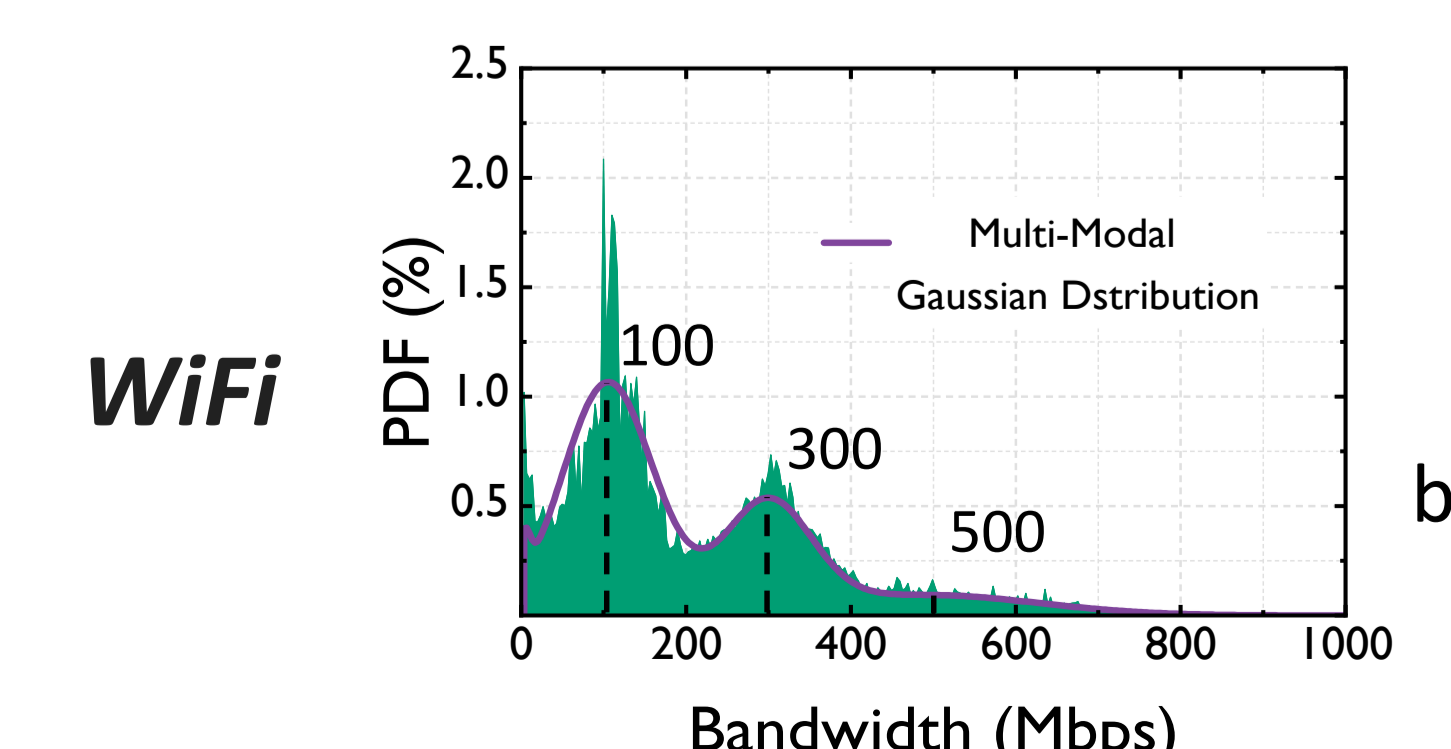
- Software: higher-version Android \approx higher bandwidth
- Hardware: **no obvious influence** on bandwidth



- Stronger RSS \neq higher 5G access bandwidth



- 4G bandwidth decreases due to **spectrum refarming**



- WiFi bandwidth is limited by **wired access**

Geo-distribution of end users