Adapting 60 GHz Links to Mobile Clients

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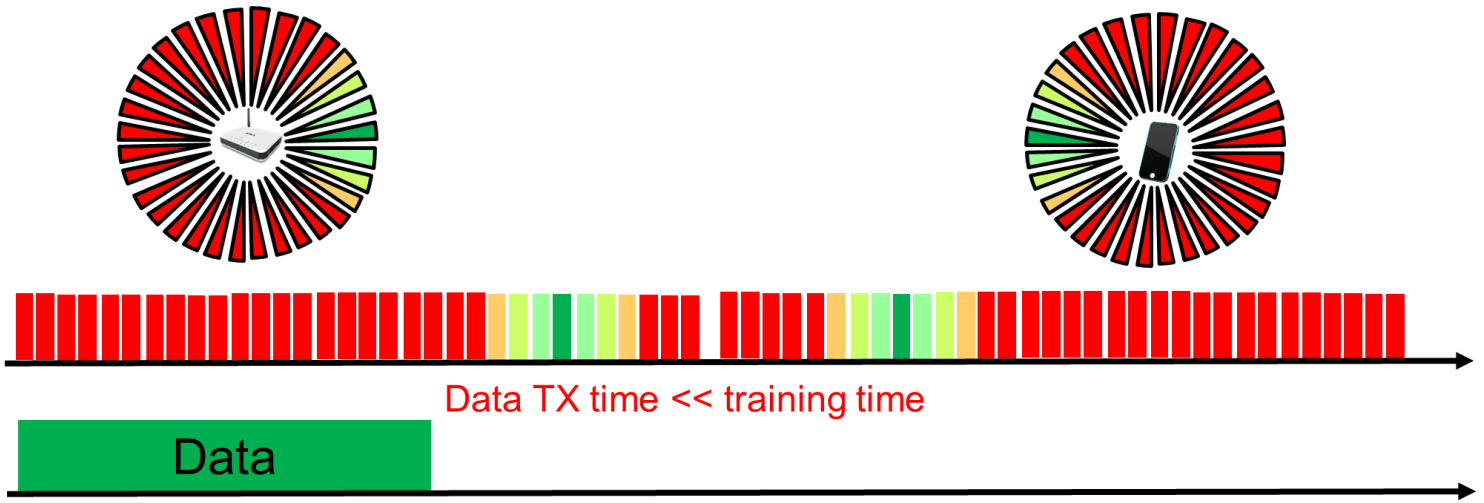
802.11ad with Mobile Clients

- Blockage and misalignment due to nodal mobility can intermittently break links and require re-training
- Training overhead to recover from link breakage
  - Exhaustive search over all sectors at both ends
  - Minimum beamwidth 3^o, 128 sectors (~9 ms training time)
  - 2 ms max data transmission slot

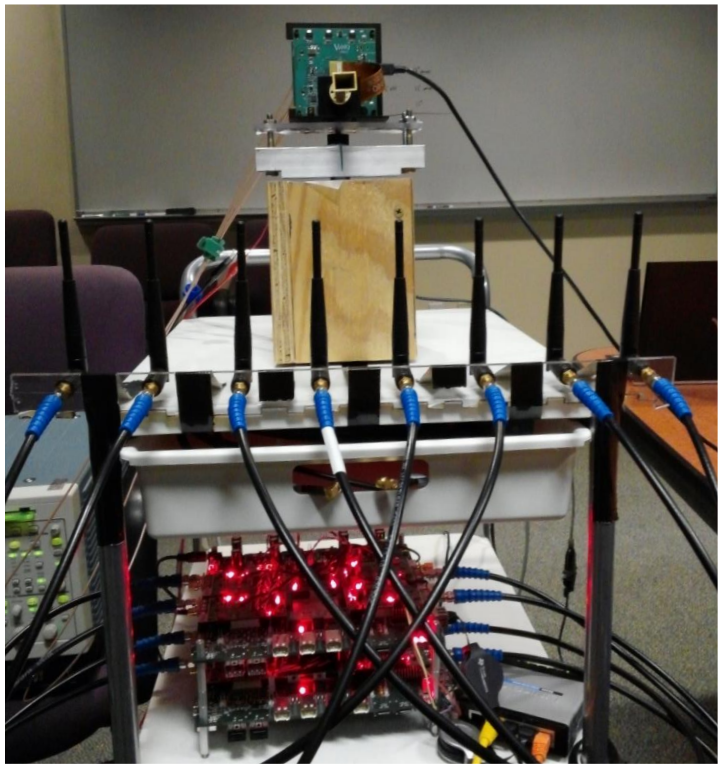


MOCA: Mobility resilience and Overhead Constrained Adaptation (MobiHoc 2016)

- Beam Sounding
  - Estimate link parameters before transmissions
- Preemptive Fast Recovery
  - Proactive search for alternate beam-pairs during beam sweeps
- Joint Rate-Beamwidth Adaptation
  - Model driven joint adaptation to maximize average link throughput

Out of Band Steering (Infocom 2015)

- Out of band hints to select 60 GHz beams
- Using antenna arrays in legacy bands to estimate AOA and directly steer mmW beams
- Dual-band implementation
- Challenges
  - Multi-path leads to errors
  - Large arrays
  - Energy consumption



Tracking Indicator LEDs on APs for Beam Steering (HotMobile 2018)

- Exploiting light source on APs to get direction estimates
- Collocated phased array and LED
- Cannot get phase from light measurements
  - Photodiode array to estimate AOA in 3D
  - Dominant LOS propagation of light
- Zero-overhead beam selection and tracking