

Experimental resources and research at KAU

Anna Brunstrom



OUR LOCATION NORTHERN EUROPE



3h train, 1h flight

- Karlstad – population 85,000
- County seat of Värmland
- Every tenth inhabitant of Karlstad is a student
- Easy and comfortable life



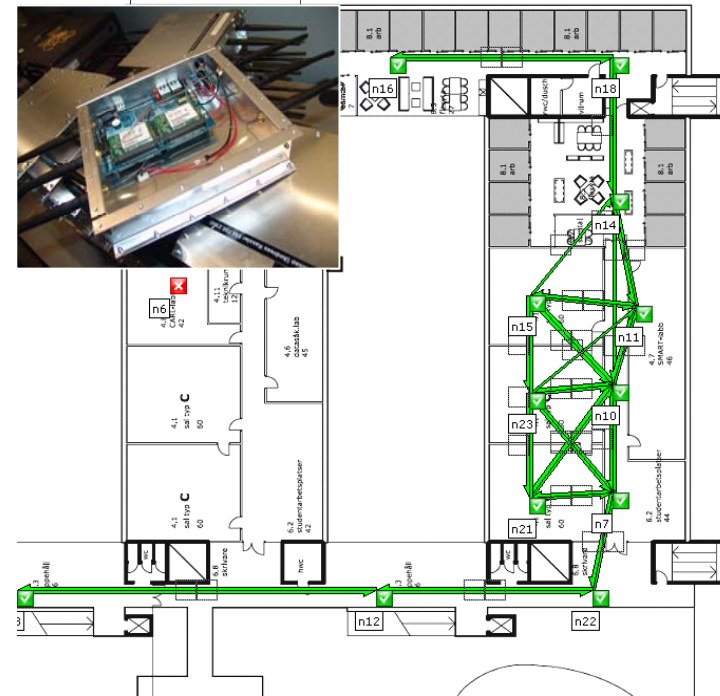


DISCO Group

- 17 (+3) Members
 - 8 Senior researchers
 - 9 PhD students
- Research Areas
 - Latency optimizations
 - Transport layer issues
 - Wireless, mobile and Mesh networks
 - Software-defined networking
 - Cloud-based services
 - QoS/QoE in computer networks



- Multi-radio multi-channel wireless mesh testbed
 - 20 802.11a/b/g/n WLAN based devices
 - 3 radios per node
- Can be accessed remotely
- Connected to GpENI



Supported by



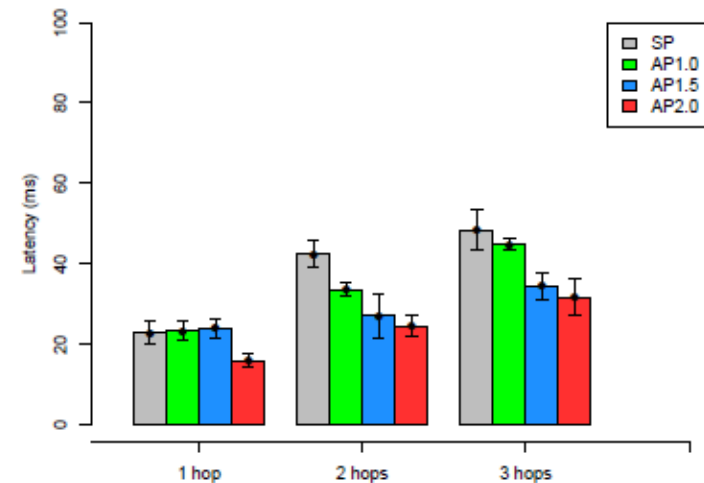
In Collaboration with





KAUMesh – Research Examples

- Channel assignment algorithms
 - Traffic demand-aware channel assignment
 - Hybrid channel assignment
- Adjacent channel interference and channel bandwidth adaptation
- Novel routing and forwarding mechanism
 - combining principles from multi-path and anypath routing
- Packet aggregation





Cellular Measurement Node

- Networks of 4 leading Swedish providers
 - Tre
 - Telia
 - Telenor
 - Tele2
- Technologies
 - 3.5G (HSPA+)
 - 4G (LTE)
- Applications
 - Bulk download / upload
 - Web transfer
 - VoIP / ping
 - Various combinations
- Ongoing measurements since June 2013

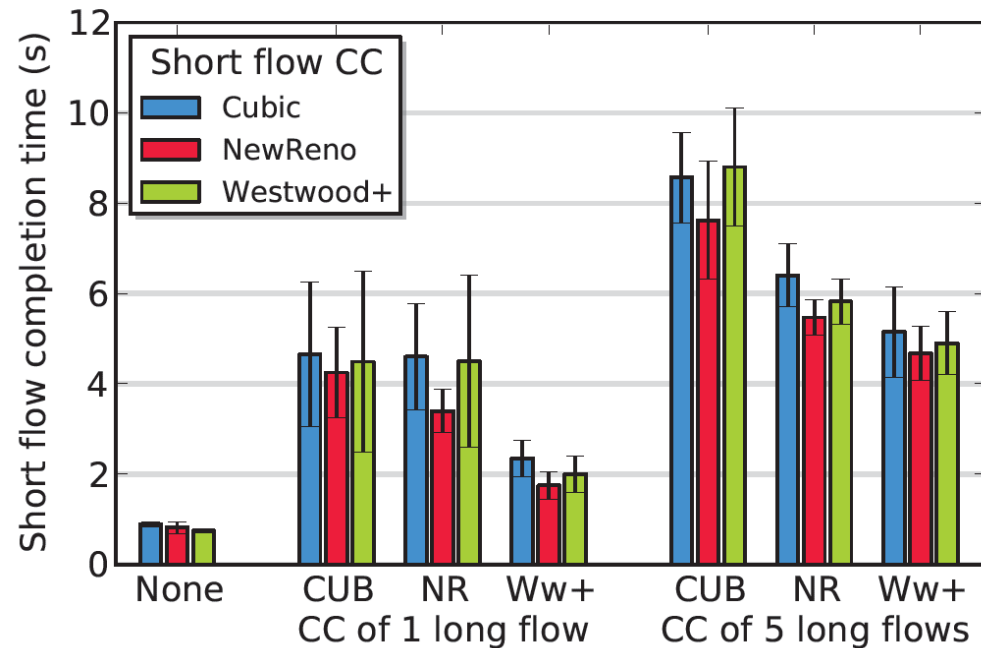
TELE2





Cellular Research Examples

- Impact of bufferbloat in cellular networks
 - Interaction between different applications
 - Interaction with congestion control
- Protocol efficiency
 - Measurements used as input for modeling



Web response times of short flows over 3.5G using different congestion control (cc) algorithms and background loads.



3rd place IEEE NetSys 2013 Demo

CloudMAC

Winner of 2012 ACM Mobicom Student Research Competition

■ Problem

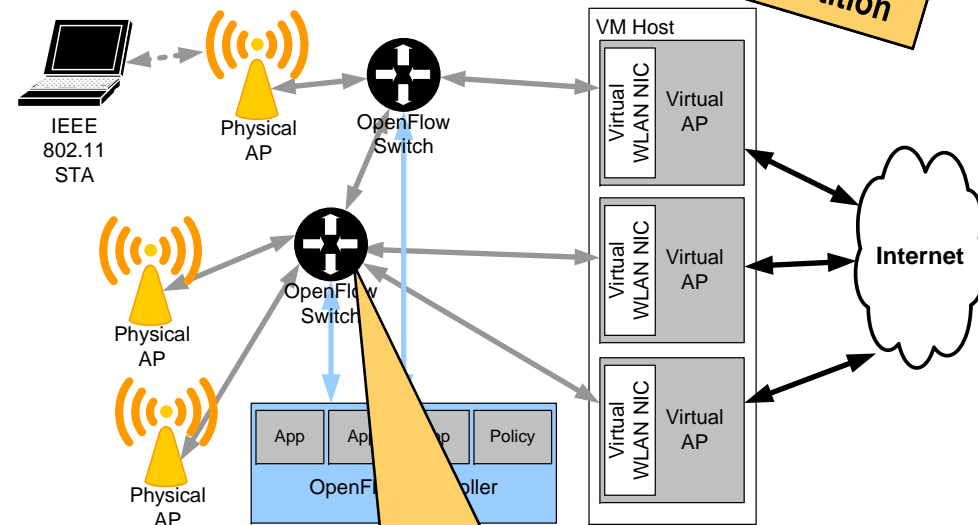
- AP hardware and software are getting fatter
- No standard, vendor-independent way to deploy network applications
- Fast IEEE 802.11 PHY layers make centralized control planes difficult

■ Approach

- Split AP in a physical and virtual AP (hosted in a data center)
- Use OpenFlow to control wireless transmission

■ Implementation

- Modified Linux Kernel/OpenWRT



Mapping between physical and virtual AP
Set per flow parameters for transmission (e.g. TX power)

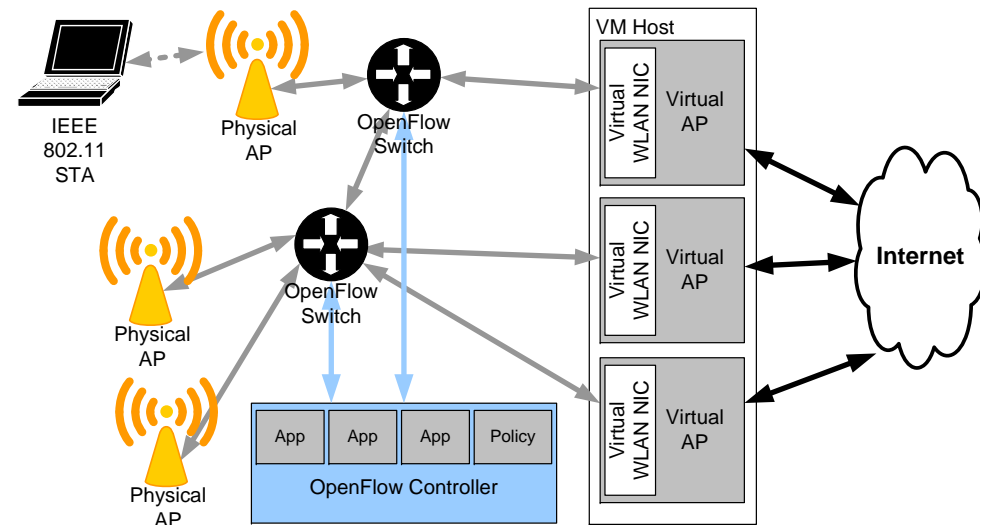
In Collaboration with Deutsche Telekom

■ Usage scenarios

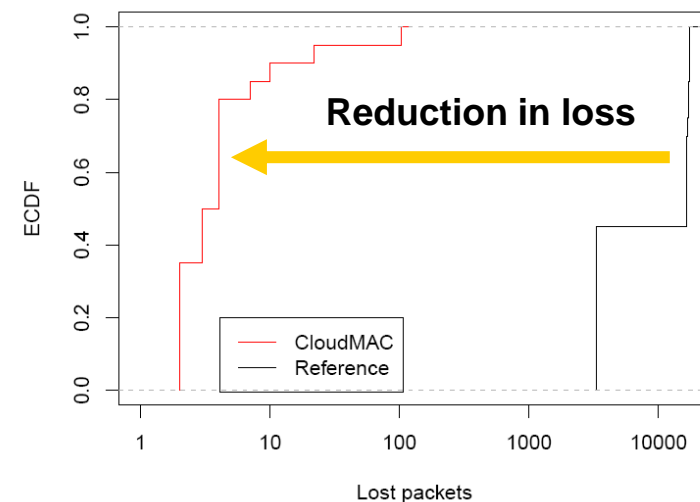
- Management of enterprise WLANs, Home networks
- Seamless AP switching
- Mobility management
- Load balancing
- Energy efficiency

■ More information

- <https://www.youtube.com/watch?v=r6sNBtd5Krg&%0Bfeature=plcp>



Number of lost packets





Other Experimental Software

- Additional QoS scheduling algorithms added to Open vSwitch
 - SFQ (Stochastic Fair Queuing), CoDel (Controlled-Delay Active Queue Management), FQ-CoDel (Fair Queue CoDel)
 - Integration with Common Open Research Emulator (CORE)

