AeroFlux: A Near-Sighted Controller Architecture for Software-Defined Wireless Networks

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WiFi needs SDN!

• Network services as applications
  – Channel Selection
  – Mobility Management
  – Client Load Balancing
  – WIDS/WIPS Systems
  – Traffic aware TX control
    • Per-flow TX settings
    • e.g., PHY rate, retry, power

Coarse Grained Control
Global visibility

Local Visibility
Frequent Events
Fine Grained Control
The Case for Near-Sighted Controller

• Fine grained control
  – Transmission settings on a per-slice, per-client, and per-flow level
  – Traffic and application aware transmission control
  – E.g., live video streaming optimizations through adaptive (Direct) multicast strategies

• Approach: handle frequent, localized events close to their origin
SDN for WiFi

- OpenFlow (OF) for the integration with wired part
- OF enabled Access Points (APs)
- Separate south-bound interface for WiFi
- Global Controller based on Odin
- Near-Sighted Controller close to the APs
- WiFi specific Agents on APs handle
  - Light Virtual Access Points (per client state)
  - WiFi datapath transmission entries

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Architecture

- **Global Controller for coarse-grained control**
  - Services that require global visibility
  - Middlebox handling beneficial

- **Near-sighted controller for fine grained control**
  - Latency-critical and load-intensive tasks
  - Per-Flow transmission settings
  - Transmission statistic collection

- **Radio Agent exposes all functionalities**
  - LVAP abstraction
  - Handles WiFi Datapath entries
  - Provide interface for statistic collection
Use Case: Live Video Streaming

- Live video multicast stream
- Match through OF rule
- Redirected to Middlebox
- Differentiation
  - Keyframes
  - Interframes
- WiFi DP rule for each subflow
- Transmit keyframes more robust
- Challenge: Frame Aggregation
Current State

- Global Controller
- Datapath Element tested
- Proof of concept NSC
- Near-Sighted Controller is work in progress
- Deployment ongoing (Lab deployment)
- Deployment in production network planned for this Summer