Wi-5: Advanced Features for Low-cost Wi-Fi APs

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Objectives of the Project

The Wi-5 Project *(What to do With the Wi-Fi Wild West)* proposes an architecture based on an integrated and coordinated set of smart Wi-Fi APs:

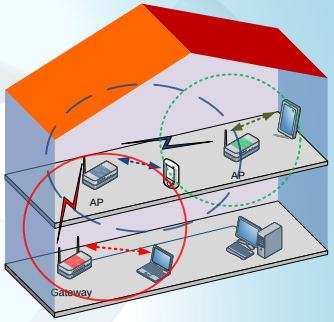
- To efficiently reduce interference between neighboring Wi-Fi APs and provide optimized connectivity.
- To develop new business models to support this.

Solutions must be able to run:

- On the operator's APs (low cost).
- On top of the existing PHY and MAC Wi-Fi layers (no modifications to 802.11 are considered).

Use cases

- Airport/train station
- Dense apartment building
- Pico-cell street deployment
- Large home/SOHO: multiple APs in the same property
- Community Wi-Fi: Creating 2 SSIDs and 2 VLANs, one private and one public



Solutions being developed

Shared in https://github.com/Wi5

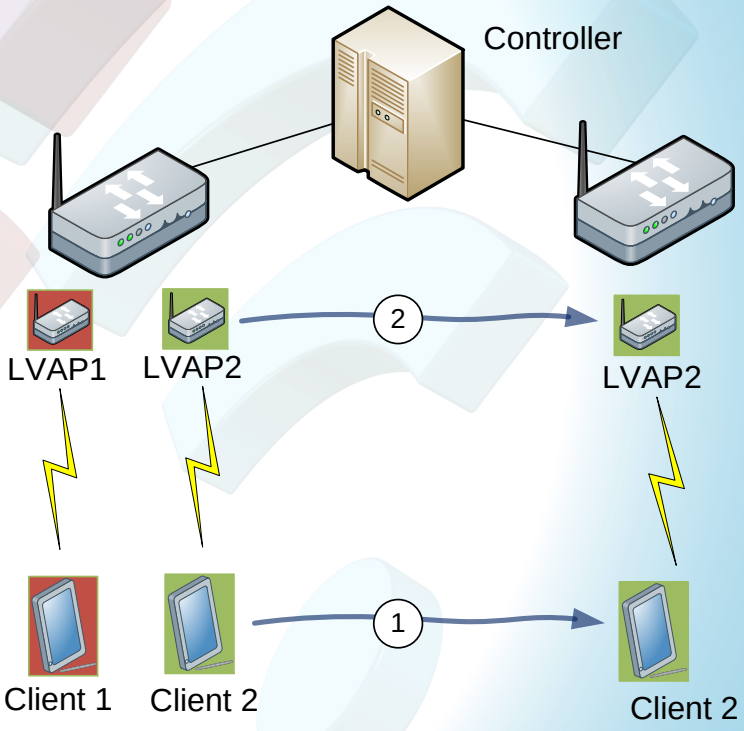
Objective: An open-source and low cost platform supporting advanced features currently available in enterprise-grade Wi-Fi APs:

- Optimal frequency planning
- Load balancing
- Seamless handover
- Transmit power control
- Intelligent frame/packet grouping
- Interference measurement

The solutions must be scalable.

Concept of Light Virtual Access Point (LVAP)

- A central controller (an OpenFlow SDN controller) creates an LVAP (Light Virtual AP) for each terminal, which is dynamically assigned to the physical AP where the terminal is located at each moment.
- The AP will use a different LVAP (which includes a specific MAC) for communicating with each terminal.
- The terminal will only "see" a single AP, even if it is actually moving between a number of them, thus avoiding the need for re-association.
- Odin* is being extended.

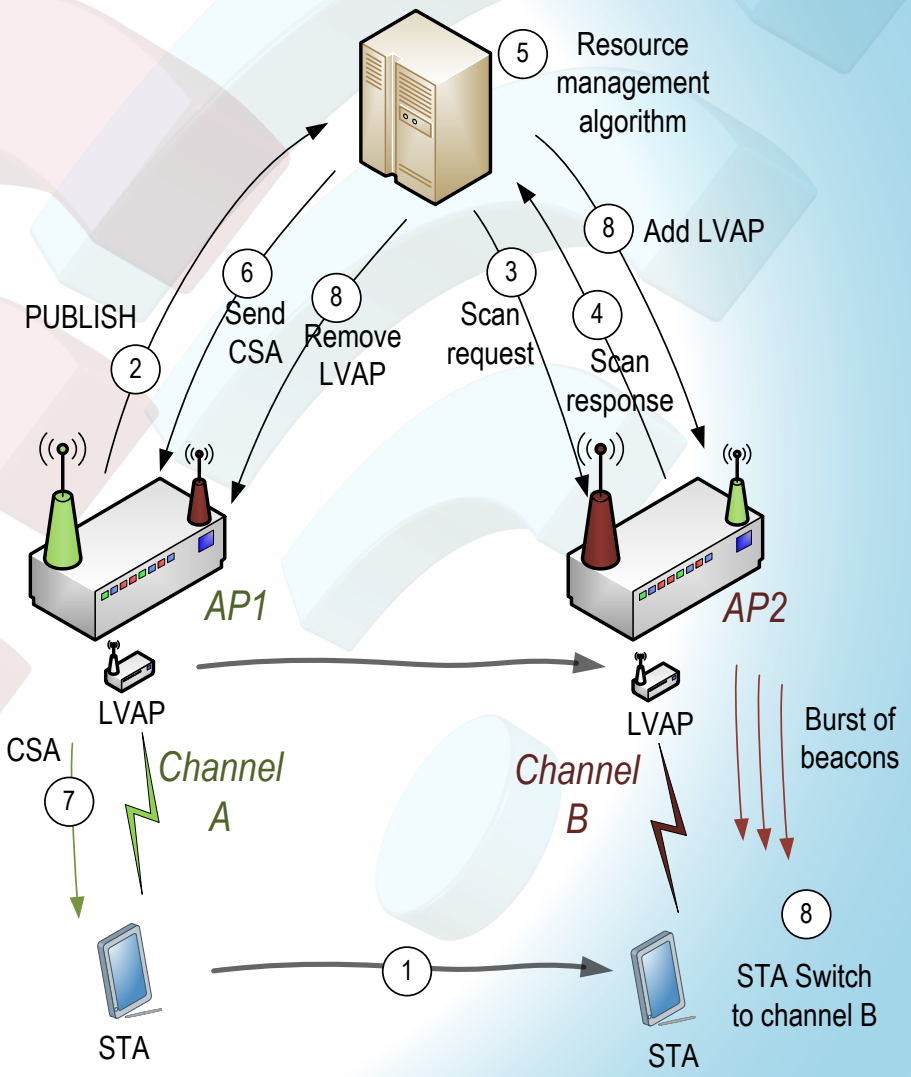


* J. Schulz-Zander, L. Suresh, N. Sarrar, A. Feldmann, T. Hühn, R. Merz, "Programmatic orchestration of wifi networks," in USENIX Annual Technical Conference (USENIX ATC 14), pp. 347-358, Jun 2014.

Example: Seamless Handoff

A reactive application that manages the handover of a STA (Station), when the user is moving.

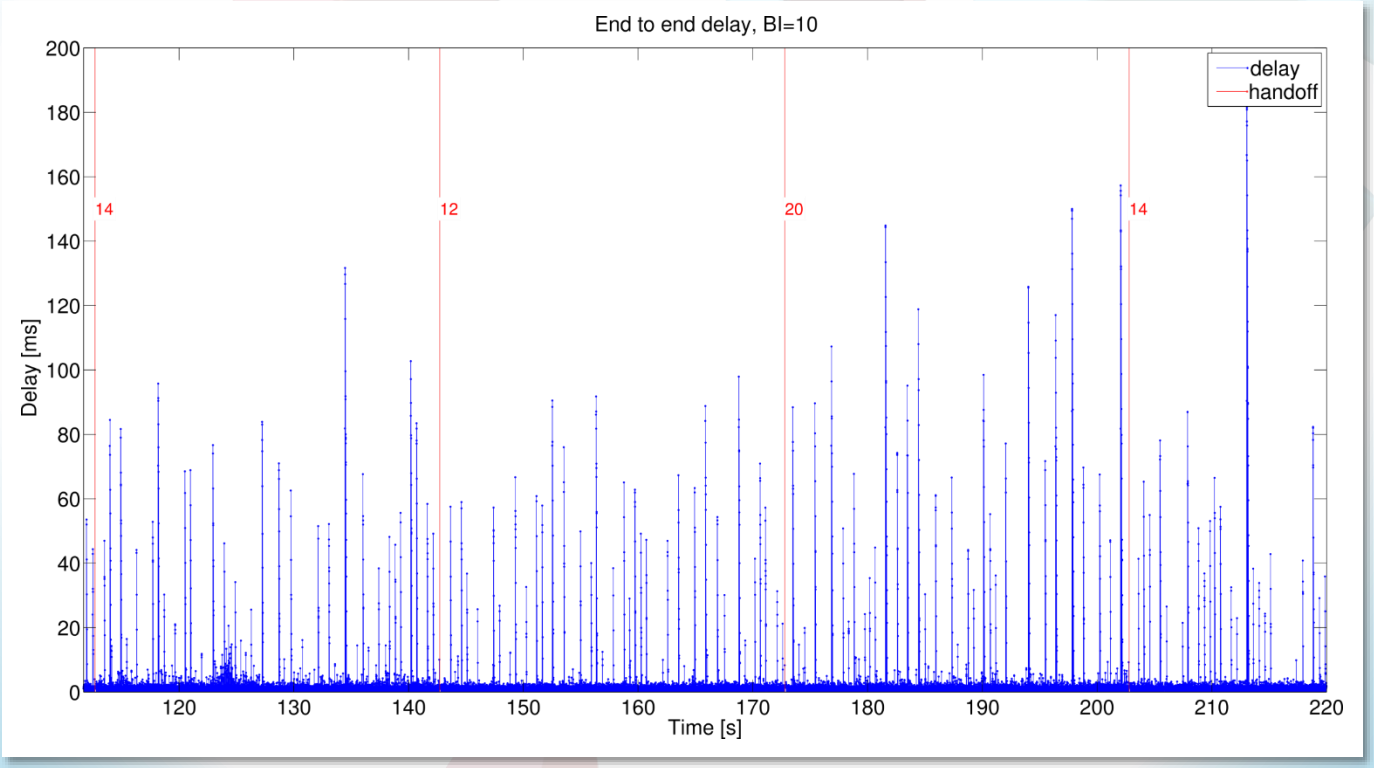
- The origin AP detects the movement and reports it to the controller (2)
- The controller sends a scan request to the destination AP (3)
- The controller makes a decision, and moves the STA to the destination AP (7 and 8).
- The STA only "sees" a channel switch, not a re-association. It only takes 20-100 ms.



Seamless Handoff results

Two machines are generating traffic of a real-time online game.

The delay mainly corresponds to the wireless technology, and does not significantly increase around the handoff (numbers in red are the number of packets lost in a handoff).



Delay of *Quake 3* packets when no background traffic is present. Beacon interval 10ms

THANK YOU VERY MUCH

http://www.wi5.eu/ https://github.com/Wi5

European Union
Horizon 2020

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