Overview of AI/ML in IEEE 802.11

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Overview

- Std 802.11bf – WLAN Sensing
- AI/ML TIG and SC
- AI Offload SG
- Migrating our MIB to YANG
  - Device management
  - API for AI
  - Virtualizing the management plane

Std 802.11bf
WLAN Sensing

- Std 802.11bf defines a protocol for environmental sensing
- Measurements that can be used to monitor environmental conditions and changes
- E.g., people movement, number of people present, room occupancy, etc.
- Built on sounding (beamforming) waveforms
- Does not define use of the measurements; just defines the sounding exchange and transfer of channel state information

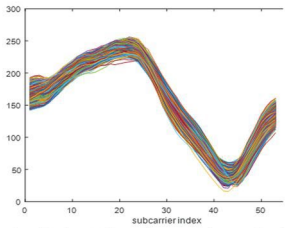


Figure 1: CSI in static environment.

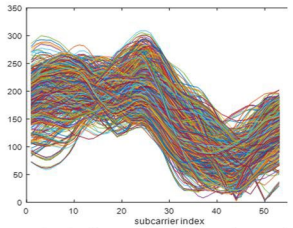
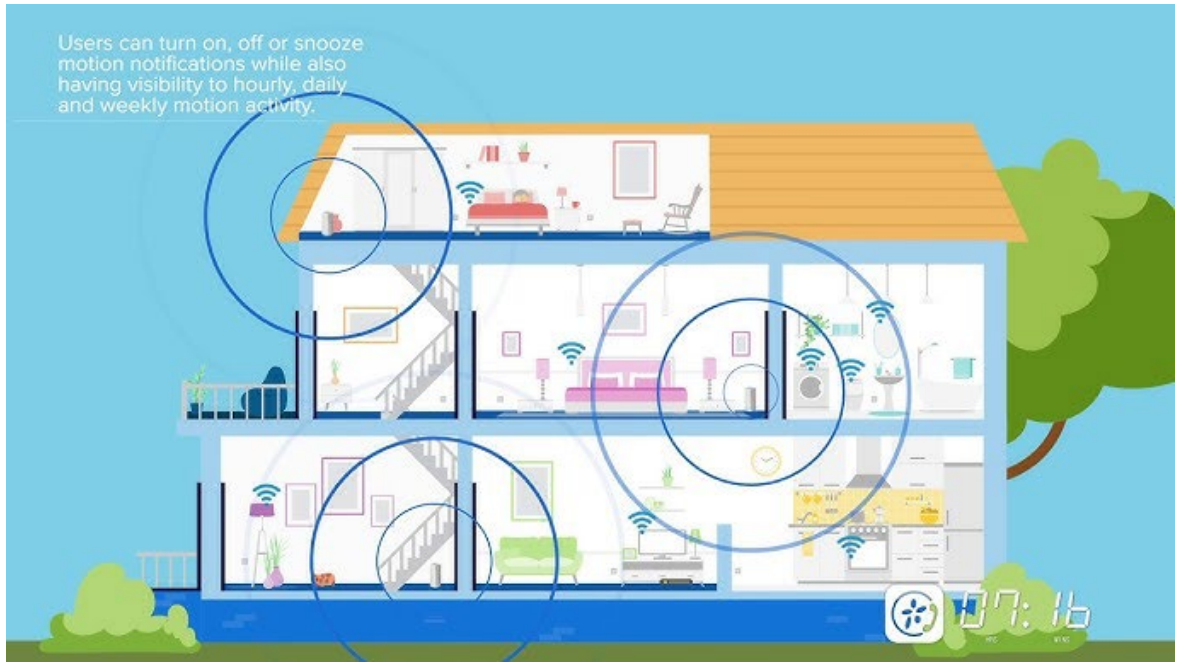


Figure 2: CSI for someone walking through a room. The changing curves over time clearly show the "motion".

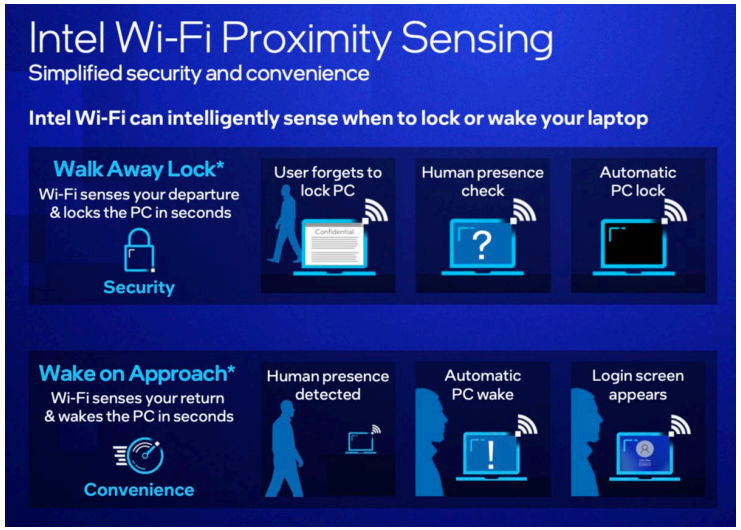


WLAN sensing uses PHY and MAC features of IEEE 802.11 stations to obtain **measurements** that may be useful to estimate **features** of **objects** in an **area of interest**.

- Features = Range, velocity, angular, motion, presence or proximity, gesture, etc.
- Objects = Human, animal, etc.
- Area of interest = Room, car, enterprise, etc.

Proprietary sensing

- There are also proprietary forms of sensing deployed
- For example, proximity sensing on a laptop
- These techniques transmit on one antenna and receive on the other (2x2 system)



AI/ML Standing Committee

- In 2022, a topic interest group was started to write a report on AI/ML in 802.11
- On completion of the report in 2023, it was decided that the topic was of on-going interest, so the group was converted to a standing committee
- The standing committee releases an annual report on AI/ML in 802.11 covering
  - Use cases
  - Areas for possible standardization

Examples of some of the areas investigated

- AI instead of algorithmic techniques for…
  - CSI feedback compression
  - Distributed channel access
  - Roaming enhancements
  - Multi-AP coordination
  - Enhanced PHY Operational Parameter Recommendations
- References:
  - AIML TIG report
  - AIML SC 1st report
  - Status of AIML SC

AI Offload study group

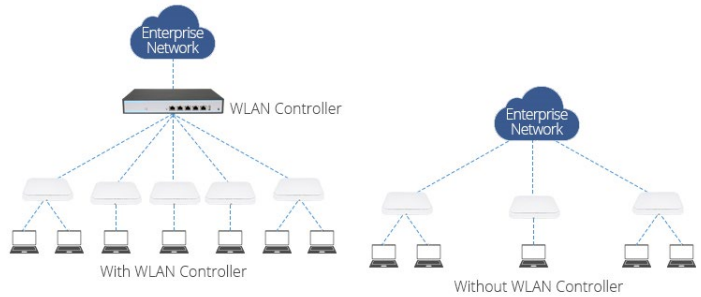
- Developing a project authorization request for a standard amendment:
  - To support the offloading of compute intensive AI inference tasks to edge AI Wi-Fi Access Points and other Wi-Fi enabled edge compute devices
- SG formed in March 2026
- References:
  - Status of AIO SG

Migrating the MIB to YANG

- There is ongoing discussion of replacing the MIB with a YANG model
- Will consider expanding “manageability” to include:
  - AI use cases
  - Cloud manageability

Virtualizing the management entity

- There is interest in having the management entity reside outside the AP
  - Concentrate management of multiple APs in one device (done on a vendor specific basis today)
  - More than a central repository for management state
  - Maybe a raw interface to the AP to generate management frames or initiate management frame exchange sequences

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