WIFI SENSING / RF INTELLIGENCE

Read the signals. Understand the space.

Explore presence and motion insight through WiFi channel measurements, signal processing and AI.



A wireless link can become a sensing input.

TELCOSIS is developing a sensing pipeline that connects AP firmware and Channel State Information (CSI) acquisition with analytics and controller integration. Initial motion-detection work uses real WiFi signal data.

01

Motion awareness

Detect changes associated with movement. Validate the event and false-alarm behavior in each space.

02

Presence research

Explore presence and occupancy insight through separately validated models and installation profiles.

03

Smart-space events

Evaluate event-driven building workflows through APIs, with application-specific integration.

Research, validation & pilot development. The illustration is conceptual; broader sensing applications remain under evaluation.

SYSTEM ARCHITECTURE & AI PIPELINE

From channel measurements to meaningful events.

TELCOSIS Controller | Device configuration & operational visibility

Capture settings, device health, model versions and application integration

01 / CAPTURE	02 / PREPARE	03 / INFER	04 / PUBLISH
CSI / RF data	**Quality & features**	**Temporal models**	**Events / API**

Proposed pipeline. Inference can run at the edge or in a separate service, subject to platform resources and deployment scope.

Acquire with context

Record chipset, firmware, radio configuration, timestamps and capture settings. Check missing samples and measurement quality before inference.

Learn from labeled events

Start with interpretable temporal-feature baselines. Compare candidate AI models using labeled motion and empty-room intervals from separate sessions.



COMPATIBLE AP / SENSING CONCEPT

CSI export depends on chipset, driver and firmware.
WiFi connectivity alone does not establish sensing support.

Publish quality-aware insight.

Define explicit event states such as motion detected, no motion and measurement unavailable. Attach a timestamp, quality indicator and model version.

Build for real spaces.

Test fans, doors, HVAC, furniture changes and adjacent-room movement. Hold out rooms and placements to expose failure modes and model drift.

Camera-free measurement.
Purpose-limited event processing.

Reference architecture; not a statement of universal AP compatibility or IEEE 802.11bf conformance. Event handling and retention are configured for the intended application.

TECHNICAL CAPABILITIES & VALIDATION

Engineer the signal. Validate the sensing outcome.

The TELCOSIS workstream combines measurement acquisition, signal processing, AI inference and operational integration. Each application requires its own evidence and acceptance criteria.

Measurement input	CSI / RF measurements, including available subcarrier and antenna information; amplitude / phase access depends on the capture path.*
Radio configuration	Evaluate 2.4, 5 or 6 GHz operation, channel width, sampling cadence and antenna geometry for the selected hardware and environment.*
Signal preparation	Timestamp validation, sample-gap checks, outlier handling, normalization and temporal feature extraction.*
AI & algorithms	Motion-energy baselines and candidate temporal classifiers; versioned models, thresholds and held-out evaluation.*
Initial sensing scope	Initial motion-detection work with real CSI. Presence, occupancy estimation and finer-motion tasks require separate development and validation.
Event integration	Proposed event API with time interval, event class, quality / confidence and model version; edge or service-based inference options.*
Data governance	Access controls, data minimization, purpose limitation and defined retention for measurements and derived events.*
WiFi coexistence	Measure sensing overhead alongside client service, airtime, acquisition gaps and network load.
Standards direction	IEEE 802.11bf-2025 defines WLAN sensing enhancements. Standards alignment and interoperability require explicit implementation tests.*

* Development / validation scope, dependent on hardware, firmware, acquisition and deployment. No numerical accuracy, room coverage, universal device support or medical diagnostic capability is claimed.

MEASURE THE EVENT UNDER REAL OPERATING CONDITIONS

Detection
Precision, recall and false alarms per time interval

Responsiveness
Event latency, missing samples and unavailable-state behavior

Robustness
Held-out rooms, confounders and WiFi service coexistence

Start with one event. Validate across rooms. Expand with evidence.

TELCOSIS Networks | Wireless Broadband Alliance Member
BUDOTEK, Dudullu Organized Industrial Zone, Istanbul, Türkiye

References: IEEE 802.11bf-2025 / NIST: sensing performance and data-communication impact (2024).
Standards and research references do not imply TELCOSIS certification. October 2026.