

# UNSW Campus Wi-Fi Coverage Design Standards

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## Version History

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# Contents

|                                                       |          |
|-------------------------------------------------------|----------|
| <b>UNSW Campus Wi-Fi Coverage Design Standards</b>    | <b>1</b> |
| 1. Purpose                                            | 3        |
| 2. Scope                                              | 3        |
| 3. Definition                                         | 3        |
| 4. Objectives                                         | 3        |
| 5. Signal Strength Targets                            | 3        |
| 6. Dependencies and Constraints                       | 3        |
| 7. RF Design Guidelines                               | 4        |
| 7.1. Indoor                                           | 4        |
| 7.2. Outdoor                                          | 4        |
| 8. Spectrum and Technology Assumptions                | 4        |
| 9. RTLS Coverage Requirements                         | 4        |
| 10. AP Placement Assumptions                          | 4        |
| 11. High-Density Space Design                         | 5        |
| 12. AP Placement and RF Design Process                | 5        |
| 12.1. Design Workflow                                 | 5        |
| 12.2. AP Placement Principles                         | 5        |
| 12.3. Predictive Survey Requirements                  | 5        |
| 12.4. Design Acceptance Criteria                      | 6        |
| 12.5. Design Sign-Off Artefacts                       | 6        |
| 12.6. Post-Implementation Validation                  | 6        |
| <b>Appendix A: Wireless Design Sign-Off Checklist</b> | <b>7</b> |

# 1. Purpose

This document defines the design standards for wireless network implementations across UNSW campuses. It translates high-level design principles and vendor guidance into enforceable design standards to ensure consistent, high-performance, and scalable Wi-Fi service delivery.

## 2. Scope

This standard applies to all new wireless deployments, upgrades and significant modifications across indoor and outdoor UNSW locations, including learning spaces, offices, public areas and selected outdoor environments.

## 3. Definition

This document defines the standards required for an effective Wi-Fi deployment in UNSW. The approach leverages vendor best practices, while accounting for UNSW-specific physical, aesthetic, and infrastructure constraints. The objective is to achieve ubiquitous wireless coverage with predictable performance.

## 4. Objectives

The wireless network shall be designed to achieve the following objectives:

- Increased speed and throughput through next-generation wireless protocols such as Wi-Fi 6E and Wi-Fi 7.
- Expanded and validated coverage using predictive surveys for all in-scope indoor and outdoor locations.
- Target signal strength between -50 dBm (Excellent) and -67 dBm (Good) in all users-accessible areas.
- High capacity and scalability to support increased user density and simultaneous device connections.
- Improved reliability through modern RF design practices and updated network infrastructure.
- Support for IoT and third-party applications, including real-time location services (RTLS).

## 5. Signal Strength Targets

The following Received Signal Strength Indicator (RSSI) thresholds define acceptable coverage levels:

- Excellent: -50 dBm
- Good: -67 dBm (minimum design target for primary coverage)
- Minimum usable: -80 dBm

## 6. Dependencies and Constraints

Wireless design outcomes depend on several external factors:

- Existing wired access layer limitations related to PoE (Power over Ethernet) delivery and throughput.
- Availability and accuracy of floorplan data for predictive RF (Radio Frequency) surveys.



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- UNSW aesthetic and heritage considerations which may restrict optimal AP placement.

Design assumptions must be revisited when these dependencies change.

## 7. RF Design Guidelines

### 7.1. Indoor

Indoor RF design shall follow Aruba best practices:

- Single AP visibility for RTLS where required, with primary AP RSSI of at least -65 dBm.
- Hexagonal AP placement is preferred but not mandatory where it is physically impractical.
- Ceiling-mounted APs for ceiling heights below 5.2 m.
- High-density spaces must use APs capable of 60W PoE and greater than 1 Gbps throughput.
- Predictive designs must use marked-up floorplans with accurate wall and material data.

### 7.2. Outdoor

Outdoor wireless deployments shall prioritise coverage and capacity:

- Omni-directional antennas must only be used on standalone poles or structures away from buildings.
- Sector APs or antennas are required on Wi-Fi-enabled buildings and must be correctly tilted.
- APs should be installed on unobstructed walls rather than undercrofts.
- Sector WAPs or antennas should be designed for their coverage zones to intersect to eliminate black spots.
- High-density outdoor areas require multiple overlapping APs to maximise capacity.

## 8. Spectrum and Technology Assumptions

Wireless design is based on 5 GHz and 6 GHz operation, with minimal reliance on 2.4 GHz due to high Co-channel Interference (CCI) risk.

Dynamic Frequency Selection (DFS) Non-Occupancy Period of 12 hours apply on 5 GHz channels.

Outdoor 6 GHz operation is pending ACMA (Australian Communications and Media Authority) approval.

All APs have a single uplink connection to access switches. Dual-uplink option is not cost effective.

## 9. RTLS Coverage Requirements

Where RTLS is required, spatial RF targets are:

- Primary AP RSSI: minimum -67 dBm
- Secondary and Tertiary APs: minimum -75 dBm where feasible

## 10. AP Placement Assumptions

Design assumptions include:

- APs mounted on ceilings or overhead structures indoors.
- External mounting only for outdoor APs.



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- Assumed ceiling height of 2.5 m where unknown.
- Assumed floor/ceiling attenuation of 15–25 dBm.
- Best-effort coverage only for roofs, risers, toilets, stairwells, and lift shafts.

## 11. High-Density Space Design

High-density areas are defined as exceeding 0.6 people per square metre with up to three devices per user. These areas shall use Aruba AP-755 access points with tri-radio support and 4x4 Multiple Input Multiple Output (MIMO). Capacity planning must support a minimum of 40 and a maximum of 150 client associations per radio, with wired uplink exceeding 1 Gbps where required.

## 12. AP Placement and RF Design Process

All wireless designs must follow a structured and repeatable AP placement and RF design process to ensure consistency, predictability, and compliance with the Coverage by Design standard.

### 12.1. Design Workflow

The RF design process shall consist of the following stages:

1. Requirements Definition – Identify use cases, density requirements, RTLS needs, and service expectations.
2. Data Collection – Obtain validated architectural floorplans, ceiling heights, wall materials, and constraints.
3. Predictive Survey – Perform predictive modelling in Ekahau or Aruba Central using approved assumptions.
4. AP Placement Optimisation – Adjust AP locations to meet coverage, capacity, and RTLS requirements.
5. Peer Review – Design reviewed by wireless engineering peers for compliance and risk.
6. Implementation Validation – Confirm as-built installation matches approved design.
7. Post-Deployment Verification – Validate RF performance using active or passive surveys where required.

### 12.2. AP Placement Principles

APs shall be placed to achieve target RSSI levels across all in-scope areas.

Hexagonal placement patterns are preferred for uniform coverage.

APs must avoid placement near large metal objects, plant rooms, and RF obstructions.

High-density areas require capacity-driven placement rather than coverage-only placement.

Outdoor APs must be aligned with antenna radiation patterns and environmental exposure considerations.

### 12.3. Predictive Survey Requirements

Predictive surveys must:

- Use Ekahau or Aruba Central with up-to-date AP models and antenna patterns.
- Include wall and attenuation modelling based on known or assumed construction materials.
- Clearly identify exclusion zones and best-effort coverage areas.



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- Document assumptions where information is incomplete.

## 12.4. Design Acceptance Criteria

| Category     | Requirement                   | Acceptance Threshold                       |
|--------------|-------------------------------|--------------------------------------------|
| Coverage     | Primary AP RSSI               | $\geq -67$ dBm in all in-scope areas       |
|              | Secondary AP RSSI (RTLS)      | $\geq -75$ dBm where feasible              |
| Capacity     | Client Associations per Radio | 40 (min) / 150 (max)                       |
| Spectrum     | 2.4 GHz Reliance              | Minimised or disabled where CCI exists     |
| Wired Uplink | AP Uplink Capacity            | >1 Gbps for high-density APs               |
| Placement    | Mounting Compliance           | Ceiling or approved external mounting only |

## 12.5. Design Sign-Off Artefacts

A wireless design shall not be approved until the following artefacts are provided:

- Predictive RF heatmaps (RSSI, SNR, and capacity where applicable).
- AP placement diagrams with labels and mounting details.
- Documented assumptions and constraints.
- Confirmation of wired infrastructure readiness.
- Formal peer review sign-off.

## 12.6. Post-Implementation Validation

Following deployment, validation activities must include:

- Passive or active RF surveys to confirm coverage targets.
- Verification of AP placement against approved design.
- Remediation planning where acceptance criteria are not met.



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# Appendix A: Wireless Design Sign-Off Checklist

This checklist must be completed and approved prior to implementation of any wireless deployment or upgrade. All items marked as 'No' require documented remediation or a formally approved exception.

| Category             | Checklist Item                                         | Compliant (Yes/No) | Comments / Exceptions |
|----------------------|--------------------------------------------------------|--------------------|-----------------------|
| Scope & Requirements | Use cases and density requirements defined             |                    |                       |
| Scope & Requirements | RTLS requirements identified                           |                    |                       |
| Documentation        | Validated architectural floorplans used                |                    |                       |
| Documentation        | Assumptions clearly documented                         |                    |                       |
| RF Design            | Predictive RF survey completed in Aruba Central        |                    |                       |
| RF Design            | Primary RSSI $\geq -67$ dBm across in-scope areas      |                    |                       |
| RF Design            | RTLS RSSI targets met where required                   |                    |                       |
| Capacity             | High-density areas designed for capacity, not coverage |                    |                       |
| Capacity             | Client association limits respected                    |                    |                       |
| Spectrum             | 2.4 GHz minimised or disabled where appropriate        |                    |                       |
| Placement            | AP placement follows indoor/outdoor guidelines         |                    |                       |
| Placement            | Mounting heights and locations approved                |                    |                       |
| Infrastructure       | Wired uplink capacity sufficient for AP type           |                    |                       |
| Infrastructure       | PoE budget validated                                   |                    |                       |
| Compliance           | ACMA and regulatory constraints addressed              |                    |                       |
| Review               | Peer review completed                                  |                    |                       |

## Approval

By signing below, the approvers confirm that the wireless design complies with the UNSW Coverage by Design Standard, or that approved exceptions have been formally documented.

| Role              | Name & Signature | Date |
|-------------------|------------------|------|
| Wireless Engineer |                  |      |
| Project Manager   |                  |      |



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