TIA-162-A Telecommunications Cabling Guidelines for Wireless Access Points

Contribution to IEEE 802.3bq 40GBASE-T Task Force
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Wayne Larsen
CommScope

Overview

- Evolving wireless LAN landscape
- Telecommunications cabling topology for WAPs
- Flexibility for coverage, capacity, and growth
- Occupancy considerations
- Installation considerations
- Conclusions and Recommendations

What is changing in Wireless LANs?

- Advances in wireless technology (IEEE 802.11ac) require improvements in supporting cabling infrastructure
- MU-MIMO and beam forming technologies allow simultaneous wireless Gigabit access to multiple clients
- This results in potential backhaul data rates over the supporting cabling infrastructure over 6.9 Gbps
- Cabling infrastructure and LAN applications must anticipate and allow for these backhaul data rates
- Widespread use of WAPs requires “WAP ready cabling” pre-installed and pre-certified to allow “plug and play” WAP deployment

Comparing IEEE 802.11n and 802.11ac

Feature	802.11n	802.11ac
Peak data rates	1x1: 150 Mbps 2x2: 300 Mbps 3x3: 450 Mbps 4x4: 600 Mbps	1x1: 866 Mbps 2x2: 1.7 Gbps 4x4: 3.4 Gbps 8x8: 6.9 Gbps
Modulation	BPSK & QPSK (binary and quadrature phase-shift keying)	BPSK & QPSK, 16 & 64 QAM 256 QAM (optional)
RF band	2.4 GHz and 5 GHz	5 GHz
Channel width	20MHz 40MHz optional	20,40 & 80 MHz 160 & 80+80 (optional)
MIMO	Single-user	Multi-user (optional)
Feature	802.11n	802.11ac

TIA TSB-162-A Scope

This TSB provides guidelines on the topology, design, installation, and testing of telecommunications cabling infrastructure, in compliance with ANSI/TIA-568-C.0 and ANSI/TIA-569-C, for supporting wireless local area networks (WLANs). This TSB describes the cabling between local area network (LAN) equipment and wireless access points including pathways and spaces to support the cabling and wireless access points.

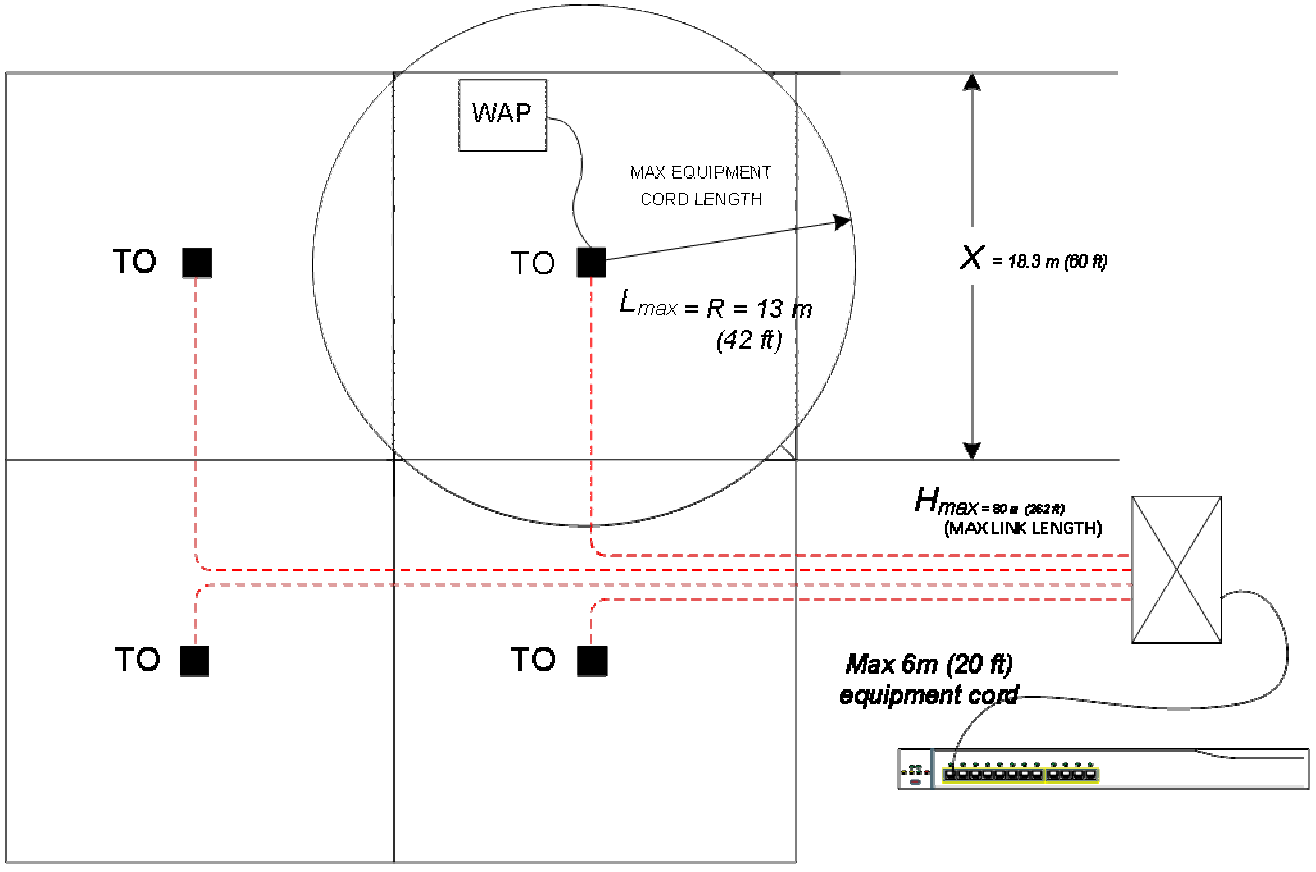
Factors impacting wireless coverage

- Building materials (e.g., concrete, drywall, wood, steel)
- Building configuration (i.e., closed, semi-closed, or open space)
- Building furnishings (e.g., cabinets, partitions, furniture)
- WLAN radio frequency (RF) coverage design (e.g., adjacent floors, directional antennas)
- Occupant density
- Number and types of devices and their usage

Wireless cell and cabling grid sizing

- The cell size is determined by the capacity, throughput, occupancy, and RF survey information.
- Once the cell size is determined, the maximum length of the equipment cord used to attach the WAP to the TO is the fundamental metric to determine horizontal cable length to the outlet serving the access point.
- For the 18.3 m (60 ft) square grid illustrated in TIA TSB-162-A, this maximum radial length of the equipment cord is 13 m (42 ft).
- Using this length and assuming a 20% additional insertion loss in the equipment cord, the maximum length of the permanent link from the TO to the patch panel in the TR is limited to 80 m (242 ft).

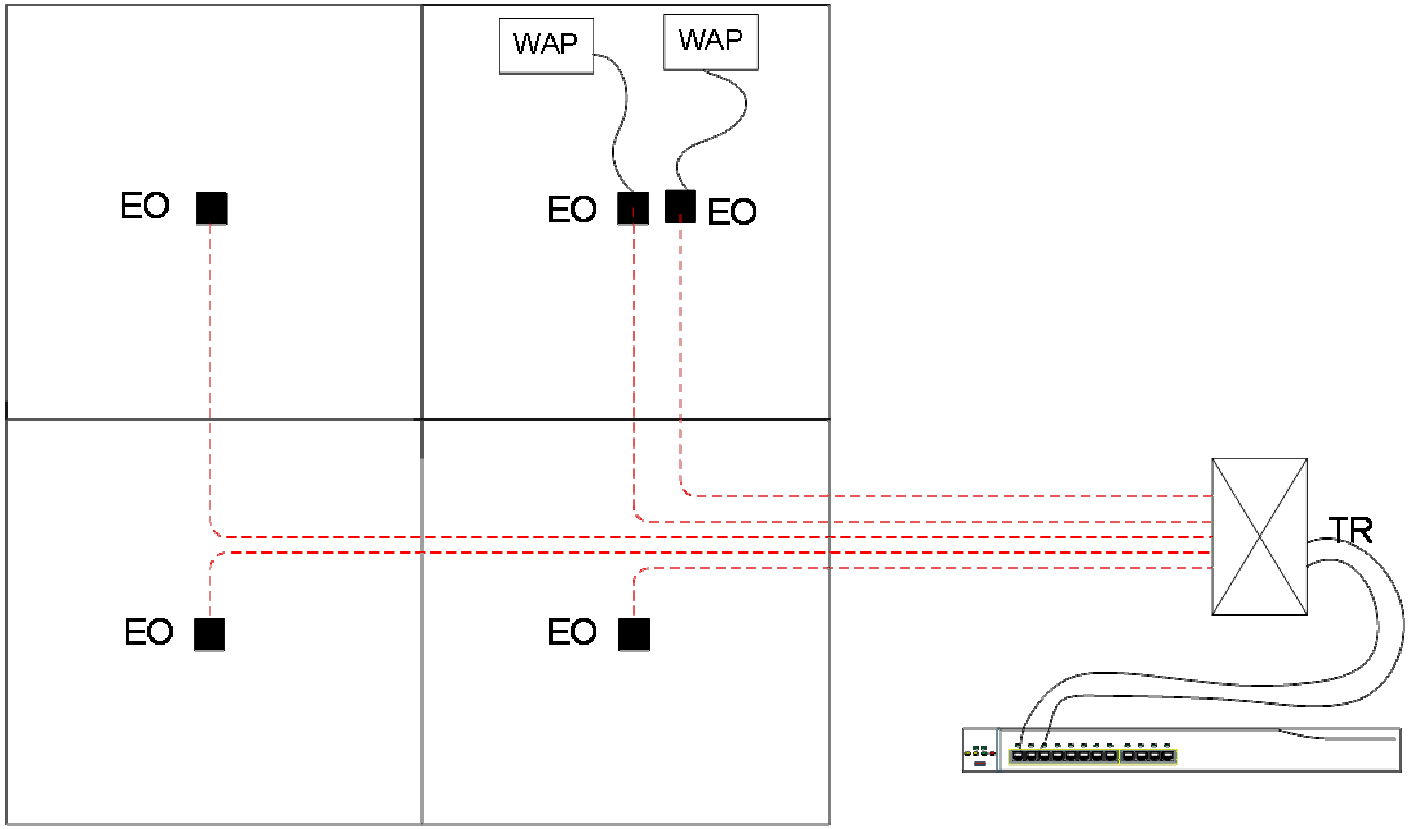
Cabling for typical 60 feet (18.3 m) square uniform cell size



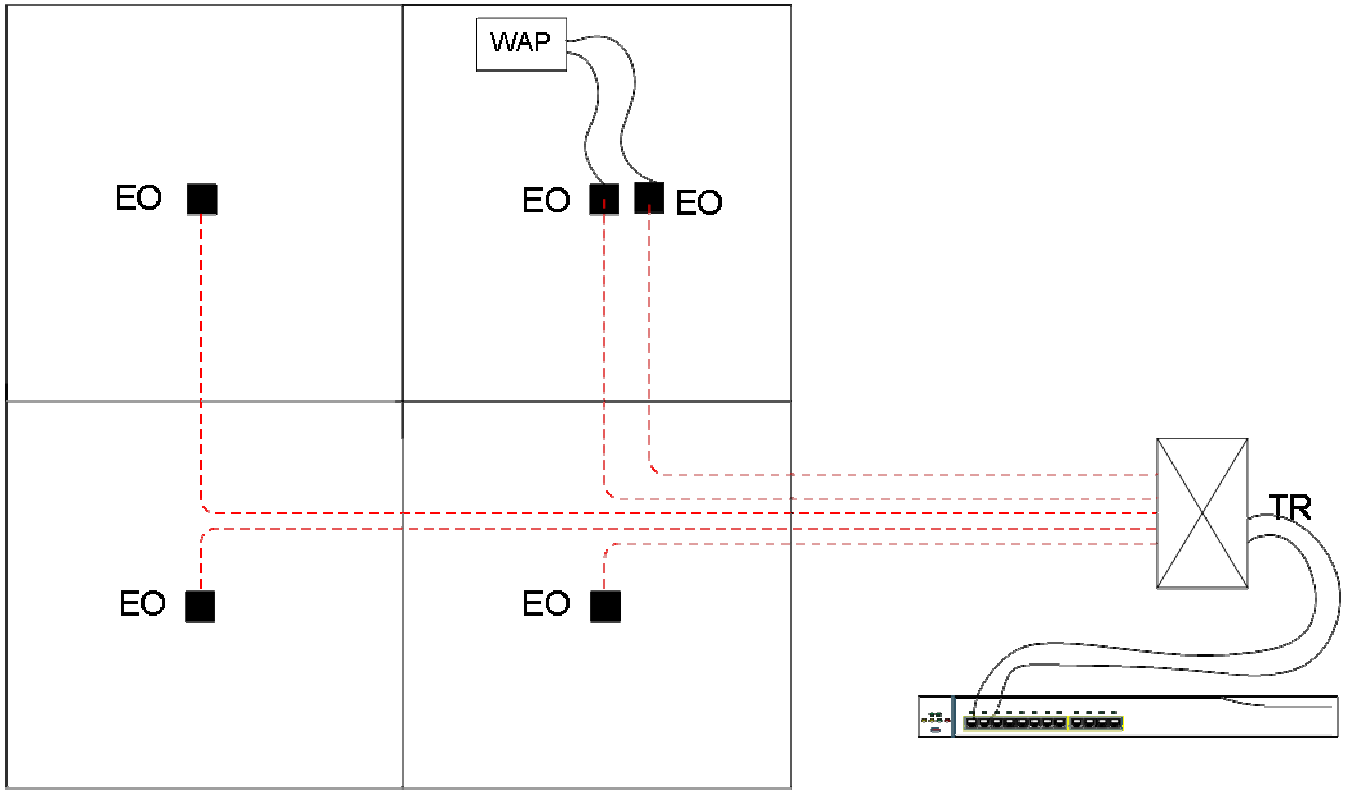
WAP density for places of assembly (TIA-4966)

Occupancy (people)	Number of WAPs needed
1-25	1
26-50	2
51-75	3
76-100	4
101-125	5
126-200	9
201-300	14
301-400	18
401-500	21

Adding an additional WAP to a cell



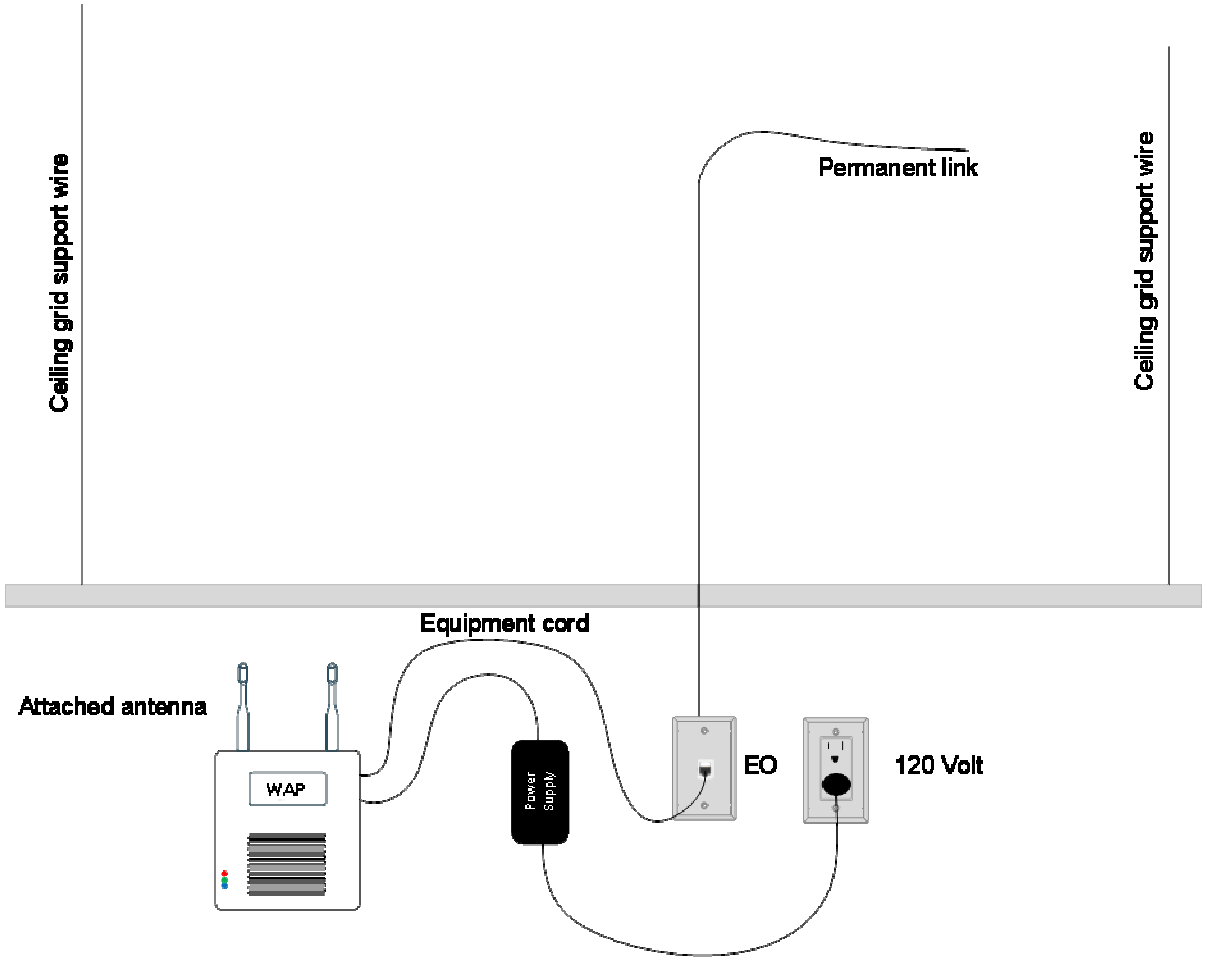
Example of link aggregation



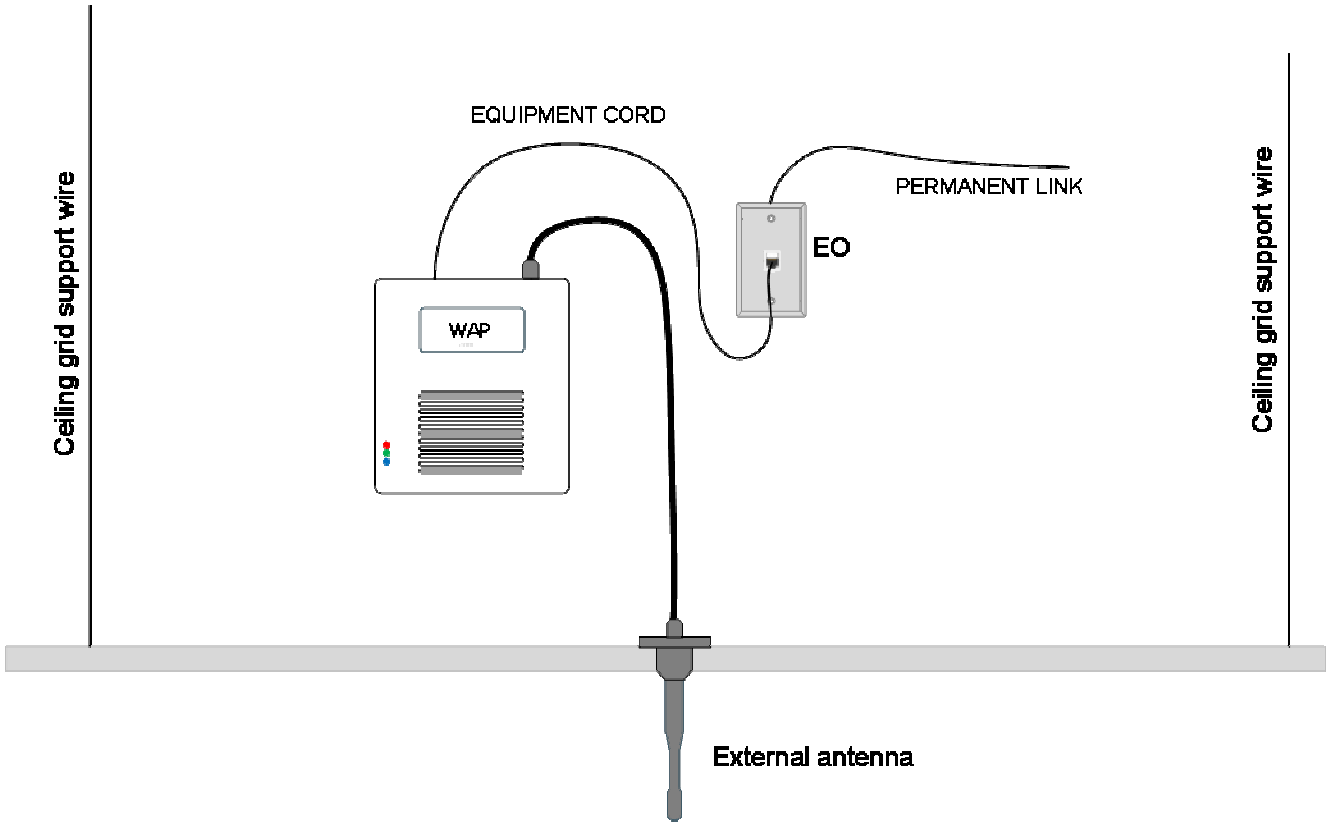
Mounting and Installation

- Wall mount above drop ceiling
- Wall mount below drop ceiling
- In the grid ceiling mount

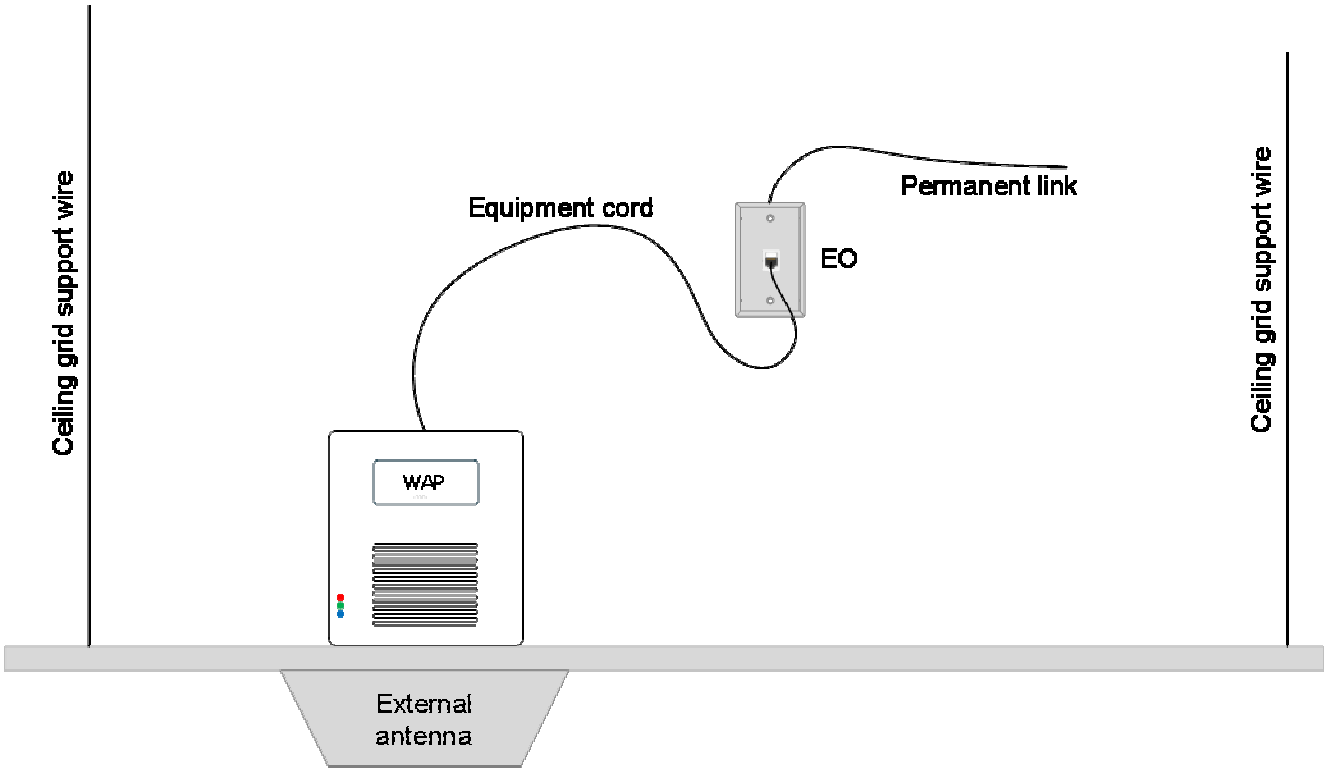
Wall mount below drop ceiling



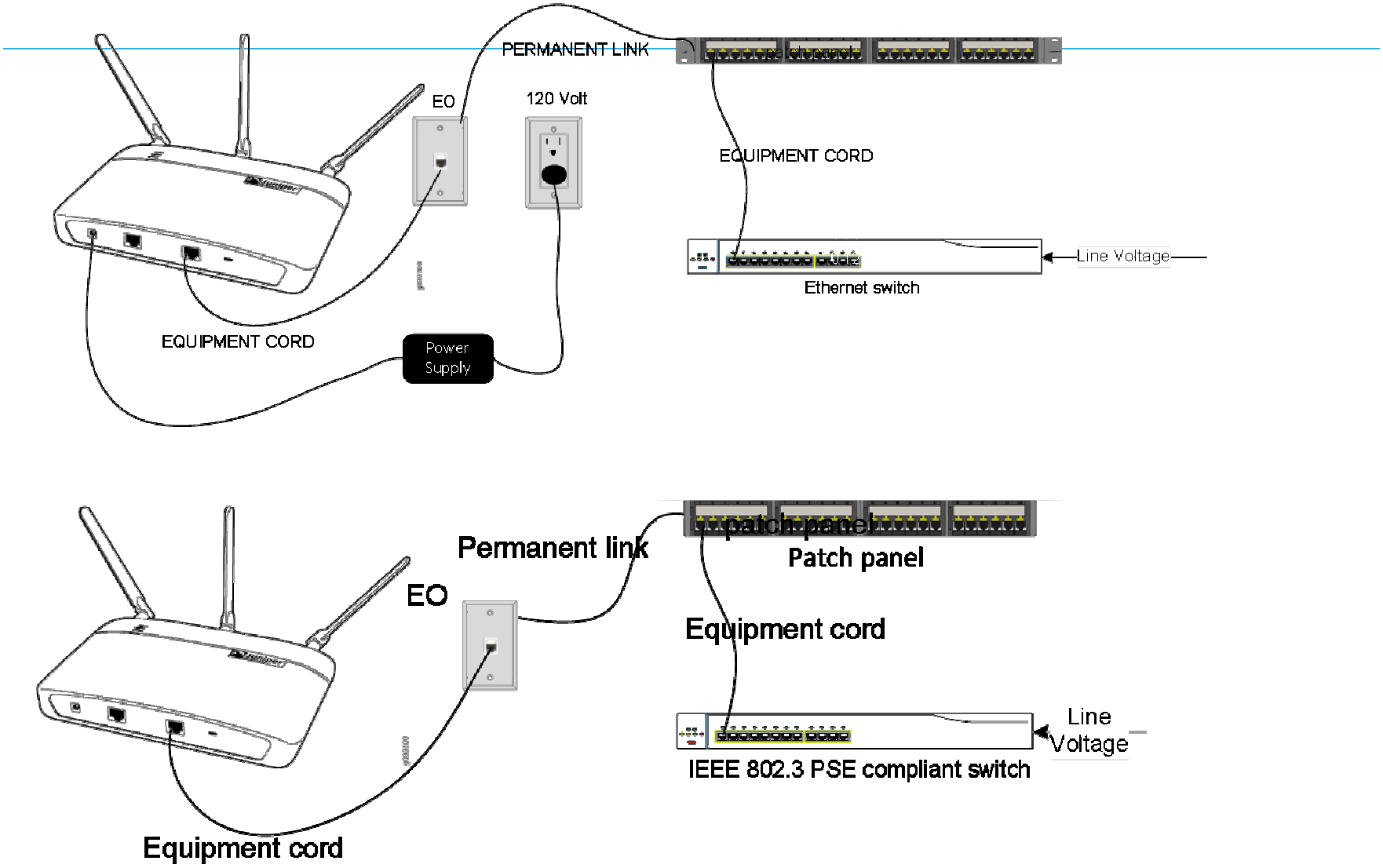
Wall mount above drop ceiling



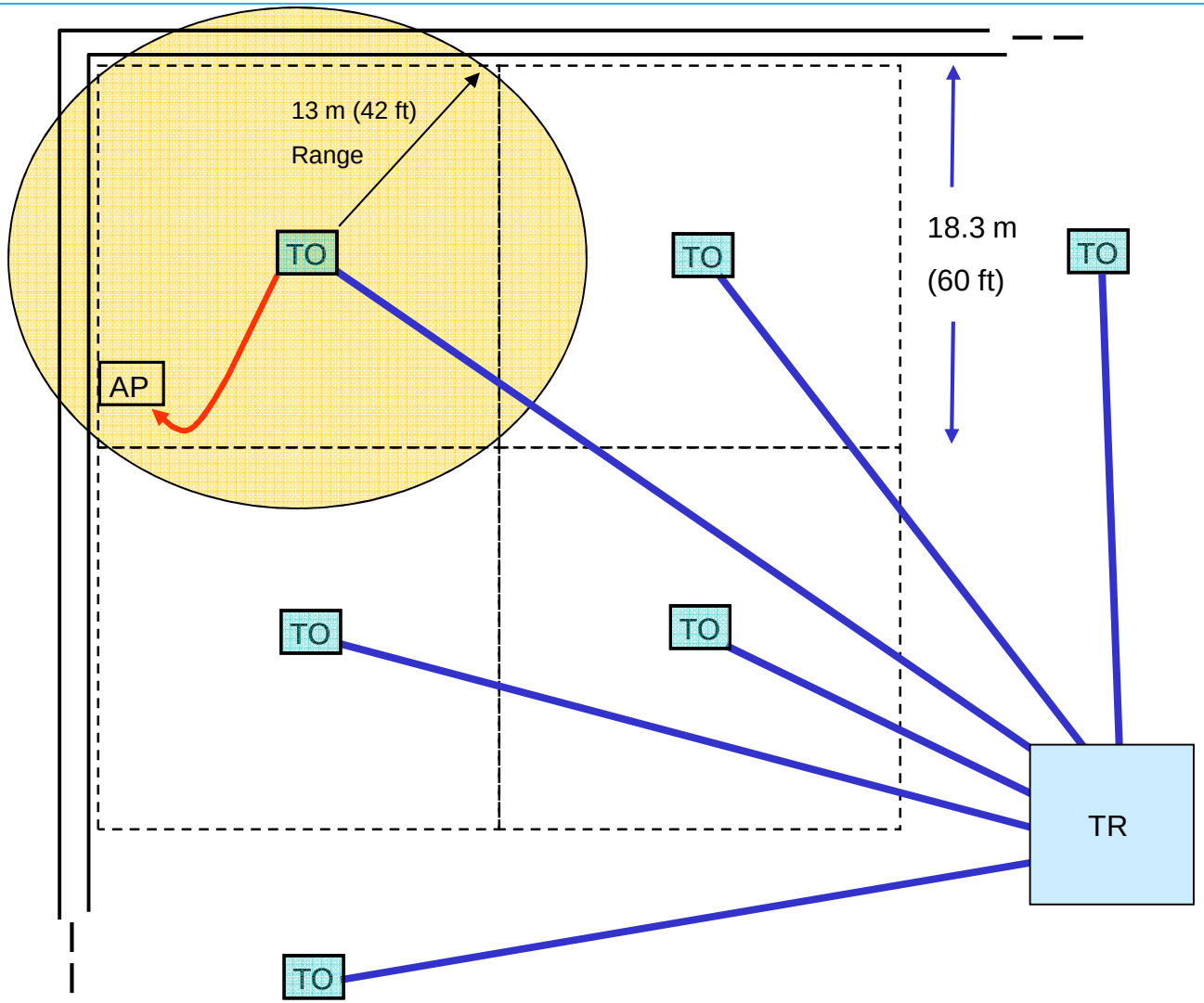
In-grid ceiling mount example



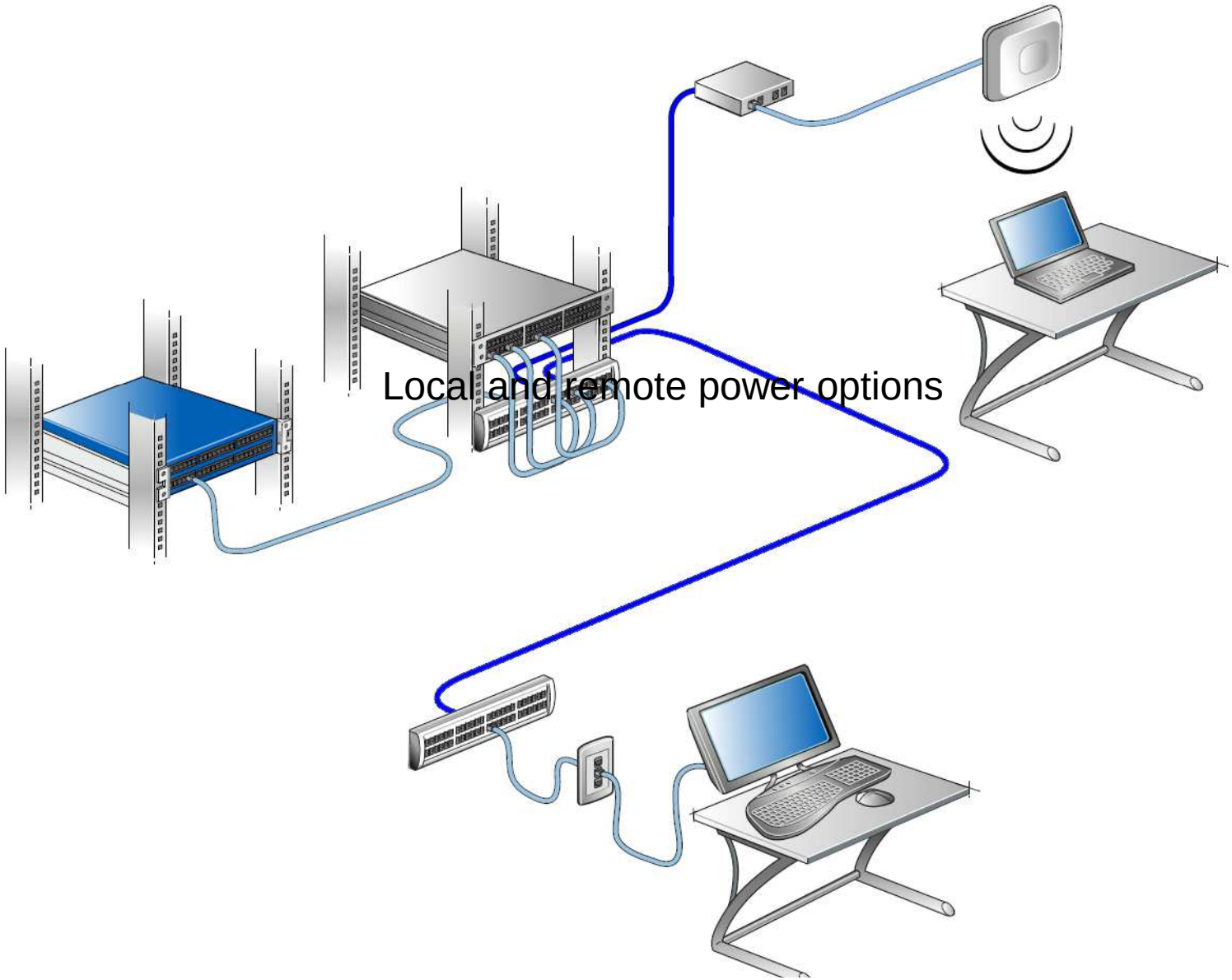
Local and remote power options



Direct cabling from the telecommunications room to WAPs



Zone cabling topology for WAPs



Square-grid WAP cabling design for a

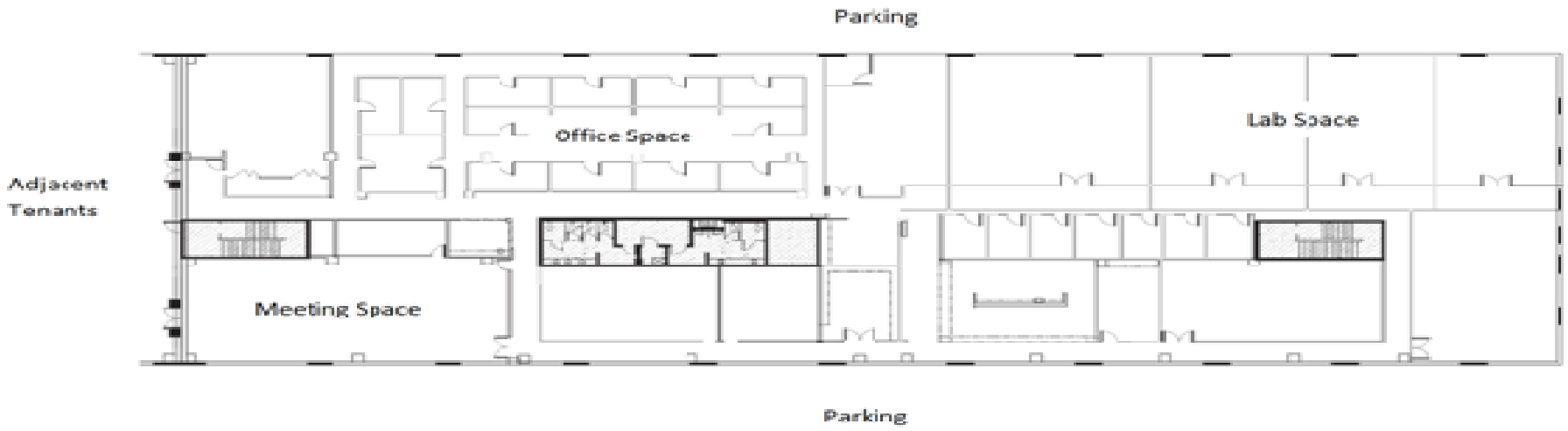


Figure 4: Sample floor plan of a small, one-story facility

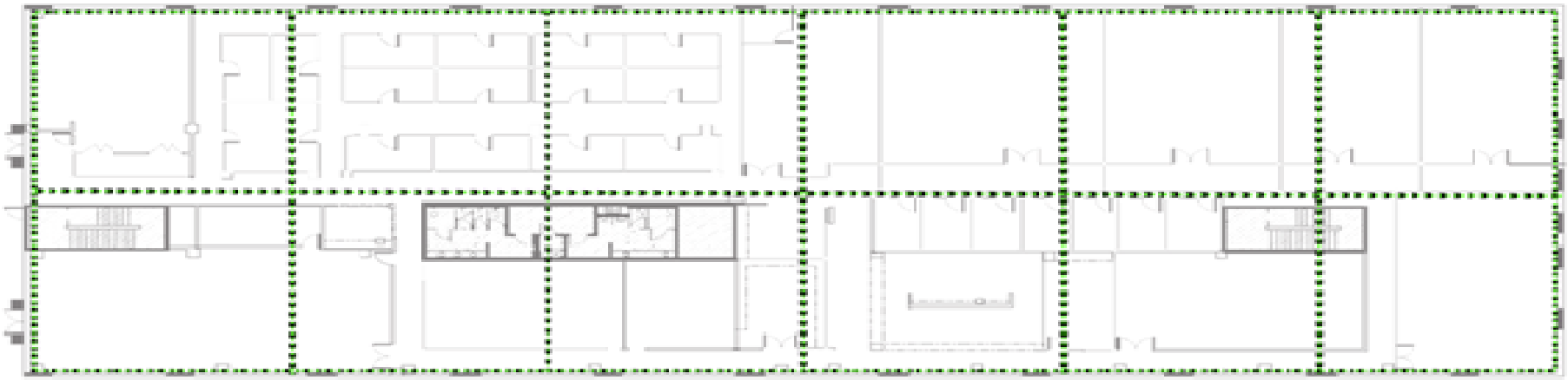


Figure 8: Sample floor plan configured for a square-grid deployment as suggested by TIA TSB-162-A

RF planning for a typical office building

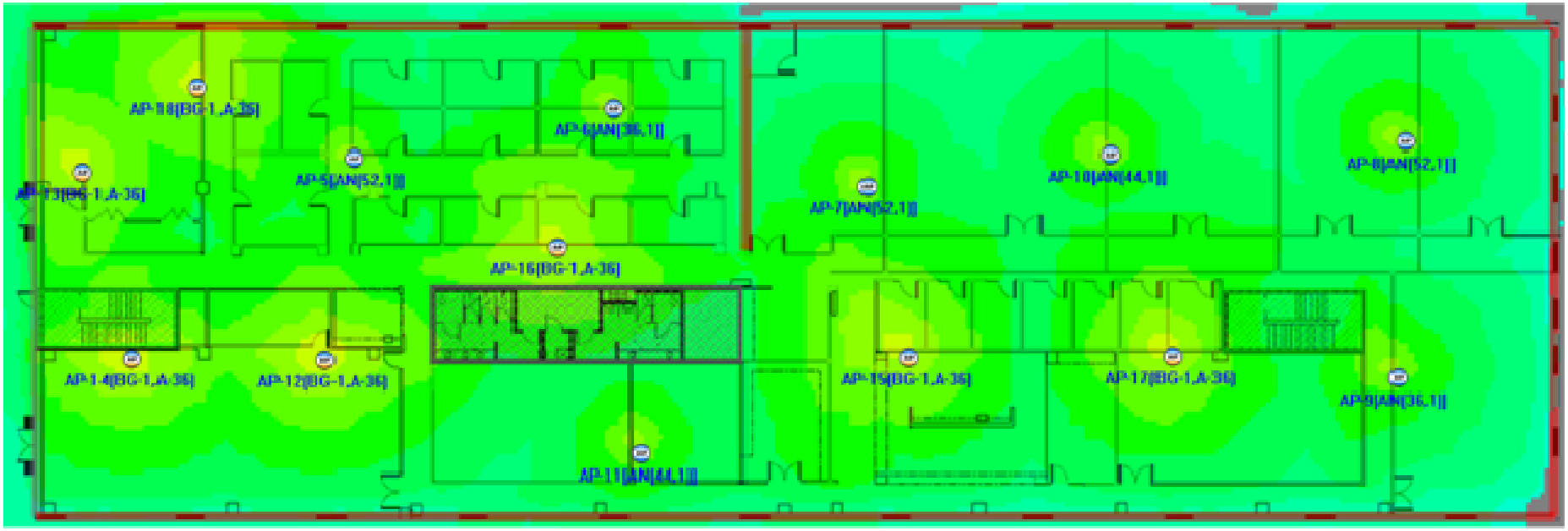


Figure 9: RF planning diagram example of a high-density AP deployment

Structured cabling in accordance with TIA TSB-162-A for the typical office building

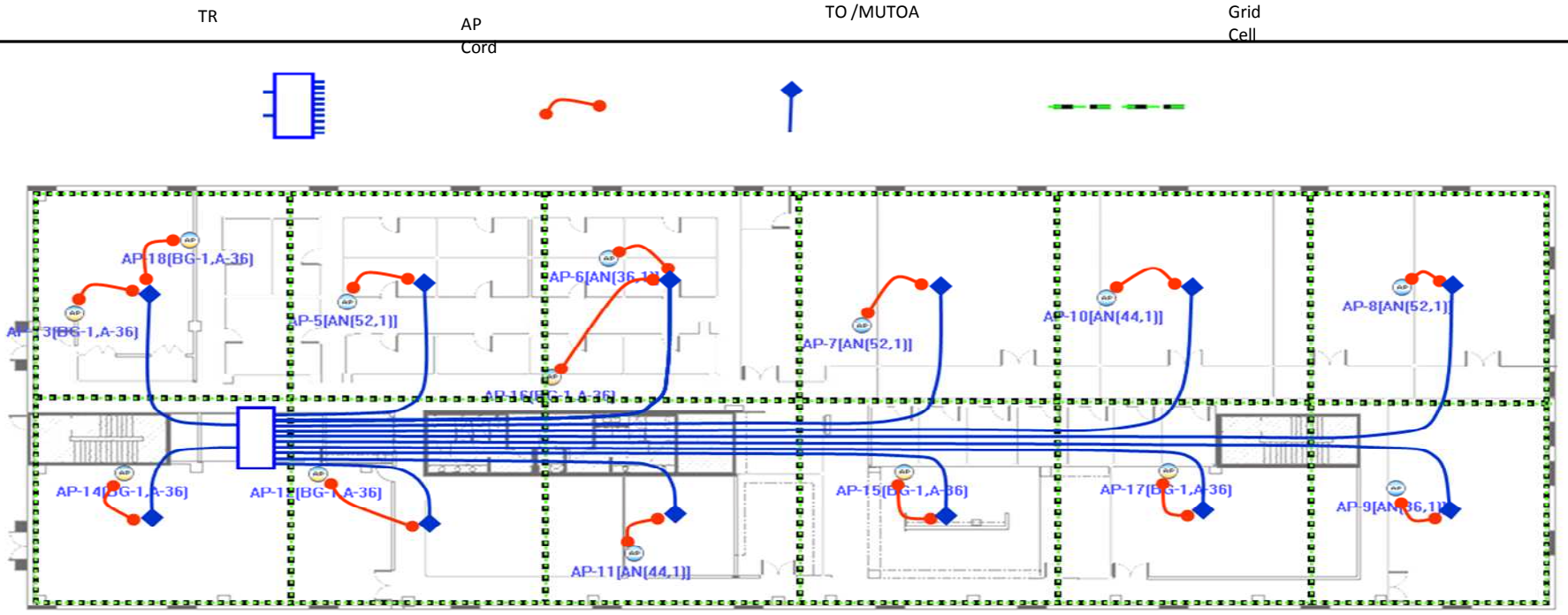


Figure 10: Structured cabling diagram to support the AP design illustrated in Figure 8

TIA TSB-162-A recommendations

- Pre-cabling using the square cell grid strategy that allows easy plug-in and flexible positioning of WAPs
- Maximum 60 ft (18.3 m) square cell that can be smaller to allow higher data rates or support increased occupancy
- Category 6A cabling to each WAP for higher data rates and increased power delivery