Wireless Infrastructure Design Proposal

Preliminary Network Design Assessment for Two-Floor Office Facility

Prepared for: Executive Team

Prepared by: Kirby Manjarres, Network Technician

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1 Executive Summary

This proposal presents a comprehensive wireless infrastructure design for a two-floor office facility in Lake County, Illinois, measuring 132 x 78. The solution addresses the need for robust 802.11ac Wave 2 wireless coverage, supporting 185 current users (projected to grow to 250 within three years) with an average of 2.2 devices per user. The design leverages Cisco Meraki equipment for high-density coverage, centralized management, and advanced security, ensuring compliance with local regulations and the organizations Active Directory (AD) infrastructure. Key features include VLAN-based segmentation for employee and guest traffic, plenum-rated cabling, and scalability for future IP camera integration. A detailed bill of materials, cabling estimates, and implementation timeline are provided to ensure a reliable, secure, and future-proof network.

2 Introduction

The organizations operational efficiency and security depend on a reliable wireless network that supports a growing user base and diverse device ecosystem. This proposal outlines a wireless infrastructure design tailored to the facilitys unique requirements, including high-density areas like meeting and break rooms, robust security for mixed corporate and BYOD environments, and compliance with local building codes. The solution prioritizes scalability, manageability, and integration with existing Cisco networking equipment.

3 Site Description

The facility is a two-floor office space in Lake County, Illinois, with the following characteristics:

- **Dimensions**: 132 x 78 per floor, totaling 20,592 sq.ft.
- **Structure**: Fixed wall offices and Allsteel Concensys cubicles with steel frames, laminate surfaces, and fabric-covered panels; 2x2 aluminum-backed whiteboards in cubicle areas.
- **Ceiling**: 15 structural height with a 12 suspended Armstrong Prelude XL Fireguard system, leaving a 3 active plenum. Ceiling tiles are Armstrong Cortega Second Look (R-factor 1.6, energy absorption 0.28 W/sq.m), supported by 15/16 T-rail at 4 increments (42 lbs capacity per segment).
- **Plenum**: Contains flexible/non-flexible ductwork, sprinkler system, fluorescent lighting (2x4 fixtures with 240VAC electronic ballasts), and cable trays with copper/fiber cabling. All installations must be plenum-rated.
- **Walls and Doors**: Type-C ¡ gypsum board on 16 steel studs; hollow-core interior doors; tempered interior glass; Energy Star-compliant exterior windows/doors with low-e, triple-pane, argon-filled glass.
- **Floors**: 12 thick pre-cast/pre-stressed flexicore concrete panels.

4 Existing Infrastructure Overview

The current networking infrastructure includes:

- **ISP Connection**: 10GigE (5Gbps limited) provided to the 1st-floor network closet.
- **Equipment**: Cisco ISR 1001-X router (1GigE/10GigE), Cisco ASA 5555-X firewall, 4x D-Link DES-3100-28F 24-port 10/100 switches per closet (no PoE).
- **Cabling**: Category 6 plenum-rated cabling in cable trays, 12 strands of 50-micron multimode fiber (LC-terminated) between floors.
- **Wireless**: No existing wireless infrastructure; new Cat6 cabling required for access points (APs) via plenum cable trays.

Installations must be performed by Systimax-certified installers with at least 6 months of experience, holding C-card (low-voltage) certifications, and comply with local codes allowing plenum-rated cabling without conduit.

5 Wireless Network Design

To meet the organizations requirement for 802.11ac Wave 2 coverage, high-density support, and scalability for 250 users with 2.2 devices each (550 total devices), the design includes:

- **AP Placement**: 24 Cisco Meraki MR46 APs (12 per floor) strategically placed for uniform coverage, with additional units in meeting and break rooms to handle high-density zones. Placement accounts for ceiling tile weight limits (42 lbs per 4 segment) and plenum constraints.
- **Coverage and Capacity**: Each MR46 supports up to 512 concurrent clients, providing sufficient capacity for 550 devices with overhead for growth. 802.11ac Wave 2 ensures high throughput and multi-user MIMO for dense environments.
- **Channel Planning**: APs use non-overlapping 5GHz channels (36, 40, 44, etc.) to minimize interference, with 2.4GHz channels (1, 6, 11) for legacy devices. Auto-RF optimization via Meraki dashboard ensures dynamic channel adjustments.
- **Scalability**: Design supports future growth to 300 users (660 devices) and potential IP camera integration without significant infrastructure changes.

AP placement and coverage maps will be provided as markups on the facilitys drawings, detailing channel assignments and cable paths.

6 Equipment Recommendations

The following equipment is recommended to meet performance, security, and management requirements:

7 Security and Segmentation

To ensure privacy and reliability, the network implements:

- **VLAN Segmentation**:

Device	Quantity	Description
Cisco Meraki MR46	24	802.11ac Wave 2 Wi-Fi 6 APs, 4x4:4 MU-MIMO, PoE, up to 3.5Gbps
Cisco Meraki MS355-48X	2	48-port PoE+ switches, 740W power budget, 10GigE uplinks
Cisco Meraki MX250	1	Security appliance with firewall, routing, and AD-integrated authentication
CMP-Rated Cat6 Cable	24 spools	Plenum-rated Category 6 Ethernet cable for AP connectivity
Meraki MA-PWR-30W	24	PoE injectors for APs (if switch PoE is insufficient)

Table 1: Recommended Equipment

  - **Guests**: VLAN 2018, IP range 172.18.128.0/17, restricted to internet and public-facing organization services.
  - **Employees**: VLANs 20192027 (one per department), IP range 172.18.0.0/17, access to internal resources.

- **Authentication**: Meraki MX250 integrates with the organizations AD for employee authentication via a cloud-hosted RADIUS server. Guests use a captive portal with time-limited access.
- **SSIDs**: Separate SSIDs for Employee (WPA3-Enterprise) and Guest (WPA2-Personal).
- **Firewall Policies**: Cisco Meraki MX250 restricts guest traffic to external services, blocks inter-VLAN communication, and enforces content filtering.
- **Device Compatibility**: Supports Windows 10 (corporate), Windows, macOS, iOS, Android, and ChromeOS (BYOD).

8 Cable Path and Material Estimate

New Cat6 cabling will be routed through existing plenum cable trays to each AP. Estimated cabling requirements, based on AP placement and network closet proximity, are:

- **First Floor**: 12 APs, total 1,200 ft (average 100 ft per AP, adjusted for tray paths).
- **Second Floor**: 12 APs, total 1,400 ft (average 116.7 ft per AP, accounting for longer runs).
- **Total**: 2,600 ft of CMP-rated Cat6 cable, divided into 24 spools.

Cable paths will be documented in drawing markups, ensuring compliance with plenum-rated material requirements.

9 Implementation Timeline

The implementation timeline for deploying the wireless infrastructure is as follows:

Phase	Timeline
Site Survey	Weeks 1-2
Equipment Procurement	Weeks 3-4
Cabling and AP Installation	Weeks 5-7
Configuration and Testing	Weeks 8-9
User Training	Weeks 10
Ongoing Support	Months 3 Onward

Table 2: Implementation Timeline

10 Final Considerations

- **Management**: Cisco Merakis cloud-based dashboard provides centralized monitoring, configuration, and analytics via web or mobile app.
- **Future-Proofing**: Infrastructure supports Wi-Fi 6 upgrades, IP camera integration, and user growth to 300.
- **Compliance**: Systimax-certified installers with C-card certifications ensure adherence to local codes and manufacturer warranties.
- **Cost Efficiency**: Cisco Meraki offers enterprise-grade features with predictable licensing costs. A detailed cost estimate will be provided upon request.

11 Conclusion

This wireless infrastructure design provides the organization with a secure, scalable, and high-performance network tailored to its two-floor facility. By leveraging Cisco Meraki equipment, VLAN segmentation, and AD-integrated authentication, the solution meets current needs for 185 users and supports growth to 250 users. The Security Team is ready to collaborate with the Executive Team to finalize plans and initiate implementation. Contact Kirby Manjarres at network.support@organization.com or 1-847-555-6789 for further details.