



EXECUTIVE SUMMARY

This customer has hired FireOwls to complete a full Wireless Design, Engineering and Construction across 9 distribution warehouses in the United States and Canada. These warehouses range from 100,000 – 200,000 square feet. The business goal is improve warehouse operations and usage of an ERP system with hand scanners connecting to the wireless network. The use case is for warehouse floor operations personnel to be able to scan product on 60 foot high shelves without any wireless connectivity issues.

STATEMENT OF WORK – WIRELESS BUILDOUT SERVICES

I. WLAN DESIGN SERVICES (Greenfield):

- a. A planning session will be organized to kick off the project. In this discussion, we will review the following topics:
 - i. Confirm onsite contact information, work hours, work rules/restrictions, safety requirements, and site access.
 - ii. Review Scope of Work with the Client Project Team and confirm it meets the objectives and goals for the Wireless LAN design.
 - iii. Confirm areas in scope: Warehouse, Office, Outdoor patios, etc.
 - iv. Confirm areas out of scope: garden areas etc.
 - v. Exterior coverage
 1. Identify areas in scope for coverage that have WAP mounting restrictions.
 2. Requested Coverage Areas
- b. Survey areas in scope within the facility totaling approximately 150,000 square feet:
 - i. Wireless RF Survey
 1. Perform an onsite design survey and spectrum analysis on both the 2.4 GHz and 5 GHz bands. The overall survey, and its subsequent design, will provide optimal WLAN performance addressing issues such as: range, coverage, client density, and availability. The final deliverable document will include graphical representations of proposed WAP placements and coverage maps depicted on customer-provided site floor plans.
 2. This 802.11 RF design will provide coverage for: 802.11 Data
 - a. Excluded: VoWLAN, RTLS, High Density
 - ii. The following design parameters will be used for the site survey. Any variation from the parameters listed below will be noted in the final deliverable.
 1. 13.0mW max AP signal strength
 2. Target -65 dBm RSSI for edge of data cells at 5 GHz
 3. A signal strength of -70 dBm for data cell overlap
 4. Wireless access points and any applicable external antennae placement recommendations shall have a 5-foot allowance for movement
 5. Wireless access points will not be placed within 15 linear feet of sources for RF interference
 - iii. Wireless Access Point Models
 1. The survey will be performed using the following wireless access points:
 - a. Cisco 3800 series external (3802e or equivalent)



- b. Cisco compatible external antennae: patch and omni (as applicable)
- c. Wireless RF Spectrum Analysis
 - i. For all areas within WLAN coverage scope, test and determine sources, levels, locations and types of RF interference using the following guidelines:
 - 1. Use Ekahau Pro with Sidekick for spectrum analysis
 - 2. Walk the facility scanning for interference in both the 2.4 GHz and 5 GHz frequencies
 - 3. Provide screenshots of spectrum captures on 2.4 GHz and 5 GHz
 - d. Structured Cabling System Design
 - i. Review customer provided As-Built drawings (existing conditions).
 - ii. Perform an onsite survey for the Structured Cabling System design as applicable to support the WLAN Design:
 - 1. Document existing Structured Cabling System conditions, noting any deficiencies from current corporate standards, industry standards, and building codes.
 - 2. Identify locations of MDF and IDF Equipment, existing and/or new, to support wireless access points within 90 meters cable route distance for PoE and data connectivity.
 - 3. As applicable, design a fiber optic cable backbone between MDF and IDFs.
 - 4. As applicable, design a Category 6/6A structured cabling system for PoE and data connectivity to wireless access points recommended in the WLAN design.
 - 5. As applicable, provide recommendations for the following:
 - a. Pathways (J-hooks, conduit, sleeves, etc.)
 - b. Equipment mounting details
 - e. FireOwls will provide a Survey Design Report to include the following:
 - i. WLAN Design Report (PDF)
 - ii. SCCS Design (AutoCAD and PDF)
 - iii. Wireless access point locations (proposed and as-built, as applicable)
 - iv. Signal Strength (dBm) for both 2.4 GHz and 5 GHz
 - v. RF propagation testing:
 - 1. Channels Used
 - 2. Transmit Power
 - 3. Propagation testing locations
 - vi. SNR (dB) for both 2.4 GHz and 5 GHz
 - vii. Spectrum Analysis for 2.4 GHz and 5 GHz
 - f. Propagation & SNR Heat Maps
 - i. Tool: Ekahau Pro with Sidekick
 - ii. Provide floor plans indicating coverage, areas of concern, or out of scope
 - 1. Out of scope areas are to be noted (I.E. offices, electrical rooms, bathrooms, etc.)
 - iii. Provide propagation heat maps for both 2.4 GHz and 5 GHz, coverage at -65 dBm signal strength
 - iv. Provide SNR heat maps for both 2.4 GHz and 5 GHz, SNR at -25 dB
 - v. Include signal legend on all diagrams.
 - vi. Diagrams will show all access points depicted on floor plans (one Diagram per band)
 - vii. Access Points will be named using customer's standard, as applicable



- g. Spectrum Analysis Report
 - i. Tool: Ekahau Pro with Sidekick
 - ii. Spectrum analysis report will include a screen capture illustrating the RF baseline of the environment.
 - iii. A brief description detailing possible sources of interference found, as applicable.
- h. Structured Cabling Design Drawings
 - i. AutoCAD (.dwg) package and PDF package.
 - ii. MPOE, MDF, and IDF locations and names.
 - iii. Cable supports and pathways.
 - iv. Single-line fiber optic cable routes.
 - v. Single-line Category 6/6A cable routes.
 - vi. Access point locations and names.
 - vii. Notes and details.
 - viii. Fiber optic logical topology single-line riser diagram

II. WIRELESS CONSTRUCTION SERVICES

- a. Logistics
 - i. Inventory all customer furnished equipment and materials related to the Scope of Work.
 - ii. Customer shall provide a secure area for the storage of all materials and equipment necessary to complete the Scope of Work. The technicians shall be issued a key to allow access to the secure storage area without delay.
 - iii. Customer shall be responsible for the delivery and receipt of all Customer furnished materials at the job site.
- b. Telecom Build Out
 - i. Perform the following tasks at the Telecom as shown on the Drawings:
 - 1. Furnish and install Category 6 4-pair cable segments from Telecom to each access point shown on the WLAN Drawings.
 - 2. If available, reuse existing Category 6 cable in office area for the new Access Point
 - 3. Terminate each cable at the wireless access point with (1) Category 6 jack insert placed into a surface mount box.
 - 4. Leave a 12' service coil if cable distance is available.
 - 5. Install 24-port modular patch panel with RJ45 jack inserts into the cabinet. o Please note: If the existing patch panel have available open ports. Use existing first before installing a new patch panel.
 - ii. IDF Build Out
 - 1. Perform the following tasks at IDF location
 - a. Install 2" EMT sleeve into the top of the cabinet, secured to the backboard/wall with Unistrut, straps, and connectors. Sleeve shall extend to ceiling deck.
 - b. Assess existing patch cords and potentially uninstall all patch cords and install new 1'-2' patch cords back to the same location and port.
 - c. Furnish and install Category 6 4-pair cable segments from IDF cabinet to each access point to be determined from WLAN Design.



Wireless Statement of Work

- d. Terminate each cable at the wireless access point with (1) Category 6 jack insert placed into a surface mount box. Leave a 12' service coil if cable distance is available.
- e. Install (1) 24-port modular patch panel with RJ45 jack inserts into the cabinet. Use existing first before installing a new patch panel.
2. Grounding / Bonding
 - a. Furnish and install #6 THHN green wire and compression lugs from rack/cabinets/Ladder Rack to building steel
3. Non-Continuous Lateral Cable Support
 - a. Furnish and install J-hooks (or equivalent) to support lateral cable runs. J-hooks will be spaced 5 feet or less on center whenever possible.
 - b. Anchor J-hooks to the ceiling deck/structure or walls with appropriate hardware.
4. Fiber Optic Cable Installation
 - a. Install 12-fiber OM3 multimode armored cable from T-Comm to IDF as identified on the Drawing.
 - b. Fusion Splice LC-style pigtail connectors to terminate each end of fiber optic strands.
 - c. Install 12-port LC coupler panel into the existing fiber enclosure at the T-Comm and IDF
- iii. Network Equipment Installation
 1. Customer shall furnish a Network Diagram depicting interconnections between equipment for the MDF and IDFs.
 2. Install customer furnished LAN/WLAN network switches and optical fiber SFP modules into MDF rack and IDF cabinets as shown on the Network Diagram. Customer furnished network equipment shall include mounting brackets and rack screws.
 3. Install customer furnished UPS in MDF rack and IDF cabinets.
 4. Install Category 6 patch cords.
 5. Install LC-LC duplex OM3 patch cords.
 6. Verify link light connectivity of patched copper and fiber network ports.
- iv. Wireless Access Points Installation
 1. NOTE: ALL ACCESS POINTS MUST BE INSTALLED IN THE LOCATIONS SHOWN ON THE PRINT CORRESPONDING TO THE MAC ADDRESS PROVIDED ON THE INVENTORY REPORT.
 2. ACCESS POINT AND ANTENNAS MUST BE LOCATED WITHIN 5 FT OF LOCATION SHOWN ON THE DRAWING. REPORT ANY REQUEST FOR DEVIATION PRIOR TO INSTALLATION.
 3. Furnish and install hardware to mount all access points and antennas i.e. beam clamps, toggle bolts, washers, unistrut, etc. to attach factory mounts and brackets to the building structure.
 4. Factory mounts and brackets, including articulating patch antenna mounts and brackets, shall be furnished by the customer.
 5. Furnish and install (1) 1/8" steel braided wire tether to access point and antennas, attached to building structure.



6. Install customer furnished wireless access points, mounted to building structure.
7. Install Omni antennas at locations shown on the Drawings.
8. Install Patch antennas with articulating brackets at the locations and in the direction (azimuth) shown on the Drawings.
9. Furnish and install Category 6 patch cord between the surface mount box and the access point.
10. Testing
 - a. Test Category 6 UTP cable segments with the Fluke DTX-1800 or equivalent for compliance with TIA/EIA568 Category 6 testing standards.
 - b. Test fiber strands with the power-meter bi-directionally.
 - c. Test reports will be provided in PDF and native test file formats
 - d. Labeling
 - i. Label all cabinets and fiber enclosures.
 - ii. Label all fiber optic cables with self-laminating fiber optic cable tags.
 - iii. Label all UTP labels with self-adhesive wrap around cable labels.
 - iv. Label all access points.
 - v. All label identification will be machine printed.
 - vi. Labeling scheme shall be per Customer's specified format.

III. WIRELESS CONTROLLER

- a. Configure Management of Controllers
 - i. Administration of Controller
 1. Managing Licenses
 2. Managing Software
 3. Managing Configuration
 4. Network Time Protocol Setup
 5. High Availability
 6. Managing Certificates
 7. AAA Administration
 8. Managing Users
 9. Ports and Interfaces
 10. IPv6 Clients
 11. Access Control Lists
 12. Multicast/Broadcast Setup
 13. Controller Security
 14. SNMP
 - ii. Configure Mobility
 1. Auto-Anchor Mobility
 2. Mobility Groups
 3. Configuring New Mobility
 4. Monitoring and Validating Mobility
 - iii. Configure Wireless



1. Country Codes
 2. Radio Bands
 3. Radio Resource Management
 4. Wireless Quality of Service
 5. Location Services
 6. Wireless Intrusion Detection System
 7. Advanced Wireless Tuning
 8. Timers
 - iv. Configure Access Points
 1. AP Power and LAN Connections
 2. AP Connectivity to Cisco WLC
 3. Managing APs
 4. AP Groups
 - v. Configure the Client Network
 1. Client Traffic Forwarding Configurations
 2. Quality of Service
 3. WLANs
 4. Per-WLAN Wireless Settings
 5. WLAN Interfaces
 6. WLAN Timeouts
 7. WLAN Security
 8. Client Roaming
 9. DHCP
 10. Client Data Tunneling
 11. AP Groups
 12. Workgroup Bridges
- IV. WIRELESS SECURITY DESIGN AND IMPLEMENTATION (requires additional security software)
- a. Implement SSO between the primary Cisco 5508 and the the HA-SKU 5508
 - b. Enable LAG on the WLC leveraging 8x1G interfaces for improved throughput and fault tolerance
 - c. Switch configuration review, planning, configuration, and testing
 - d. Implement client segmentation via dynamic interface/VLAN based on AP Group
 - e. Implement client segmentation via dynamic interface/VLAN based on AAA override/AD group
 - f. Implement an ISE infrastructure to ensure stability prior to integrating internal wireless
 - g. Review PKI, certificates deployed to endpoints (machine/user), and native supplicant configuration
 - h. Review configuration and test three WLAN scenarios (TLS, PEAP, guest)
 - i. Design and implement guest portal configuration
 - j. Migrate the current internal wireless network to 802.1X
 - k. Discuss options for guest network authentication (e.g. web portal for acceptable use terms or authentication)
 - l. Configure and test sponsor guest portal
 - m. Configure and test AUP guest portal
 - n. Demonstrate manual remediation in ISE based on suspected infected endpoint (from external tool)
 - o. Demonstration manual blacklist of endpoint and CoA