WiFi Project Playbook

A Walkthrough Guide to Implementing WiFi

ACCESSAGILITY

WiFi Project Playbook

Introduction

This is a guide that summarizes the best practices and technical guidance for creating and installing a wireless network. Everything from the initial design to the project's closeout is covered in this playbook. This guide focuses on each stage of a WiFi project, including contract negotiation, design, installation, and service validation.

We hope that this guide helps in gaining a better understanding of what a WiFi project entails.

Requirements Gathering

Initial Call/Email

A WiFi project begins with a call or email between the contractor and the customer as part of the initial bidding process. This call or email is to obtain a better understanding of the requirements and constraints of a project, the customer's devices, and the cabling locations or limitations. The contractor will also request floor plans and approximate scale information in order to get a better idea of the project's requirements.

During this preliminary call/email, the specifics of the project are discussed with the customer. A planning and design questionnaire is given to the customer to complete. The questionnaire helps to determine what work is required to complete the project.

Statement of Work

Once the questionnaire and floor plans have been collected, the scope of work can be determined. After the customer and contractor have discussed the project in full, a Statement of Work and quotation are given to the customer. A Statement of Work is a document that defines project-specific activities, deliverables, and timelines for the services being provided to the customer. The content of the Statement of Work comes from all the collected information such as the questionnaire and the floor plans. The quote provides the pricing for the time and materials associated with the design portion of the project.

WiFi Site Design

Predictive Survey

A predictive survey is just that - predictive. It takes many different factors into account, such as building materials, square footage, number of wireless users, types of applications, and many other variables. It provides the basics for the access point layout and expected speeds.

During a predictive survey, a model of the radio frequency (RF) environment is created using simulation tools. Virtual access points are placed on the floor plan to estimate expected coverage and adjust their numbers and locations.

When conducting the predictive survey, signal propagation is a main component. Signal propagation of 2.4GHz and 5GHz are taken into account. The information provided by the customer about the number of users in a certain area may affect the amount of coverage in that area. Different areas in a facility also impact access point placement and coverage.

At the end of a predictive survey, documentation is presented to the customer describing the methodologies used to come up with the data and the proposed solution. The floor plans originally provided are then mapped with recommended AP placement. The report also includes predictive heat maps that demonstrate the wireless coverage the customer would receive based on the suggested AP placement.

On-Site Survey

During an on-site survey, an engineer takes the predictive site survey results and tests the wireless design in a real world environment. The engineer should be looking for interference, obstructions, and cabling placement which can only be found on-site.

For the on-site survey, engineers will need to obtain access to the entire facility. Full access will assist in the network being designed properly. In order to create an optimally designed network, engineers will complete the following aspects of an on-site survey.

AP-on-a-Stick Survey

Wireless performance depends on a number of factors. In an indoor setting, the type and thickness of walls can impact the range of a network. The same principles also hold true for outdoor installations; the signal can be weakened by trees, buildings, and certain atmospheric conditions or weather. Because of these elements, there is an AP coverage map that is used to determine best AP coverage.

Whenever possible, we try to achieve third AP coverage at most sites. Third AP coverage means a user is connected to three access points at any given time, which allows for constant coverage when moving around a facility. Additionally, when one AP goes down, a user is still connected to two other APs. This ensures the highest level of security as a third AP uses a Wireless Intrusion Detection System (WIDS) and location tracking to triangulate threats to the wireless network.

AP on a Stick

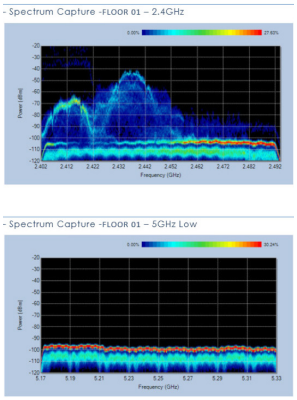
WiFi Project Playbook

Vulnerability Assessment

A vulnerability assessment is a process that defines, identifies, and classifies the security holes within a wireless network. It will help determine what type of wireless devices may be intruding on or around the current network. The assessment also helps in planning the security around current threats facing the infrastructure.

Spectrum Analysis

The Spectrum Analysis detects, identifies, and helps locate individual sources of radio frequency interference, including non-WLAN devices such as Bluetooth, cordless phones, ZigBee, microwave ovens, and wireless game controllers.



Spectrum Analysis

Survey Records

During a site survey, it is necessary to gather as much information as possible in order to accurately plan the installation. Records can include any data and documentation obtained throughout the survey. Pictures are taken to document the existing cabling, power, and connections in the Telecom closet.

Equipment

An on-site survey will also determine the equipment that is commonly required for a WiFi installation project. The following list includes the various types of software, hardware, and equipment needed to complete the work.

Software

Internet Service

Firewall/Gateway

Network Access Control (NAC) Solutions

Wireless Network Management Software

Security Software

Licenses

Hardware

Access Points

Antennas

Mounting Brackets

Racks/Cabinets

Cabling

Cable Jacks

Rack Equipment

Wireless Controllers

Power Over Ethernet Injectors

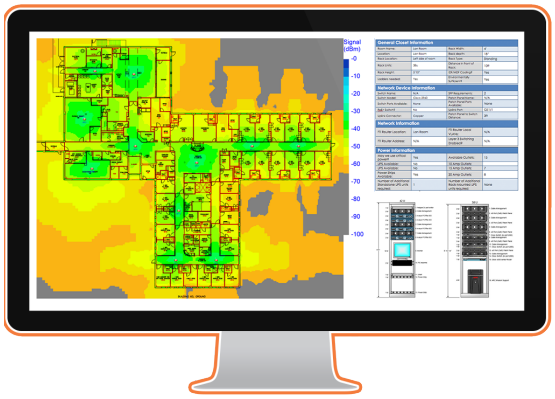
Switches

Uninterruptable Power Supply Software

Site Survey Report

The final piece of an on-site survey is the survey report. The report is created from collected data received by the engineer during the survey. It will include information about the facility's architecture, noise levels, network security, and overall AP coverage.

The engineers examine the data closets, physical building structure, and cabling routes. They verify the physical locations of the access points, and makes recommendations for mounting techniques to ensure the installed access points will not cause any safety risks. Also, the engineers measure the radio frequency coverage pattern in order to determine the appropriate placement of the wireless access points.



Site Survey Report

Configuration & Installation

Arrival

Before arriving to the site on the first day, the engineers make contact with the point of contact (PoC) to inquire about parking and provide an estimated time of arrival. Once inside the facility, the install team will locate the staging area and take inventory of the shipped equipment.

The project lead discusses restricted access areas, performs a site walk through, and inquires about hardware locations with the point of contact. During the walk through, the engineers take note of any problem areas such as high ceilings or drywall.

Boxes of Cable

Staging

Staging is done the first day engineers are on site. All of the shipped equipment is moved to the staging area and unpacked. During this time, supply situations are assessed and inventory is taken. Once all of the equipment is unpacked, the team lead and PoC review the installation schedule and make adjustments as needed.

It is important to understand that wireless networking is not completely wireless. Wires and cables are necessary to connect the APs to both power and data.

Cable Pulling

Cable pulling is when the engineers run the cables from the APs to the closet with the power supply. The cables are placed up above the ceiling tiles and routed around the facility to the closet. Typically, a day's goal is for each team to pull 8-12 cables. The install team tries to keep cable boxes and other materials out of the way as much as possible. Before moving to the next pull, cables are dressed, ceiling tiles are closed, and the floors are cleared of equipment.

Dressing

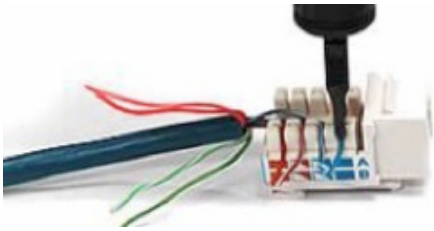
There are numerous cables that run in and out of the Telecom closet. Closet dressing is the term used when organizing the cables to ensure that everything is labelled correctly and the cables are less likely to get tangled or damaged. The install team uses Velcro to connect cables together to ensure that they are easily identifiable. Correctly dressing a closet means looping the cables on top of the rack or in the tray. This keeps cables well organized so that people can come in later to modify the closet if necessary.

Just like in the closet, the cables that run above the ceiling are organized and dressed. If possible, the install team tries to follow existing cable runs and use existing hardware such as J-hooks, wire rings, and data trays. When completing a closet to AP dressing, engineers make sure that the cables are not interfering with anything else above the ceiling. The goal is to keep the cables as neat as possible so that they do not get tangled.

Termination

Cables are looped neatly on top of the rack or in the tray until termination. Cable termination should be completed with 7-10 feet of slack from the ceiling and looped neatly with zip ties. Extra cable length is allotted in order for cables to be moved and adjusted without getting damaged.

Once the closets have been dressed, they can be terminated. Terminating a closet means that engineers take the cables that run from the APs to the closets and connect them to a newly installed patch panel. In the closet, the patch panel is attached to the rack and acts as an extension from the AP cable to the switch. Doing this allows for easy repairs as the cabling from the panel to the switch can be replaced instead of the entire cable that runs throughout the facility.



Terminating Cable

Testing

The installation team performs different tests to ensure that the cables are working properly. To test cables, a networking device is used to determine or locate any breaks in the cable. The engineers maintain a master document with a list of cable measurements, switch information, patch panel information, and various other metrics so that damaged cables can be easily located.

Hardware Installation

Wireless LAN Controllers (WLC) are AP controllers that are mounted to a server rack. A WLC is a device that acts as the brains of a wireless network setup. The WLC tells each AP what settings to have at any given time so as not to disrupt the rest of the wireless infrastructure.

Hanging an AP is the process of attaching an AP to the ceiling. The engineers find the most secure place to hang the AP and install it. An AP installation is relatively standard regardless of whether the ceiling is tiled, concrete, or sheet metal.

The installation of the patch cable is the termination of cables from the AP to the switch. The termination can happen in two different locations – at the AP and at the patch panel. The cables are then dressed to keep them neat and in order.

All of the patch cables and patch panels are labelled based on what AP they are connected to so that everyone knows where all the APs are terminated. This is to ensure that if and when someone needs to service an AP, the engineer on site will know exactly where the AP is terminated.

Typical Mounted AP

Service Turn Up & Acceptance

Install Validation

The controller is turned on and configured for the post-site survey. The post-install survey is done after the installation to confirm that the wireless infrastructure meets the coverage requirements determined at the beginning of the project. This is achieved by setting up the controller to a test configuration and running tests to come up with a representation of the current wireless infrastructure coverage. The controller is then restored to the intended controller configuration and confirmed that it works.

The engineering team verifies all of the APs and their locations against to the AP Inventory. The location of every AP is recorded, including room number, cubicle name, and column number. After validating the installation and gathering all records, a post-install document is created. The document describes all the findings from the installation so that the customer can have a full report of the work that was completed.

Customer Closeout

On the last day of the project, the customer is taken on a walk through and provided an Installation Acceptance document. After the facility walk through, the customer signs the acceptance document that details all the work that was done and the changes that were made throughout the duration of the project. Then the engineer demonstrates how to properly connect to and use the new wireless network.

A few weeks after the project's completion, a closeout survey is sent to the customer to accurately quantify the services provided and acquire customer feedback. The survey inquires about project accuracy, improvement suggestions, and overall customer satisfaction.