GigaWave Technologies® White Paper

Conducting a WLAN Site Survey and Implementation for the Cisco® Unified Wireless Network

Author: Keven Dech, Director of Training Services, CCSI, CCDA

Introduction

When preparing to conduct a site survey for a Cisco® wireless LAN (WLAN) installation, follow the Cisco network design methodology. Cisco's Prepare, Plan, Design, Implement, Operate, and Optimize (PPDIOO) addresses the network in a phased approach. When conducting a site survey and installation the Prepare, Plan, Design and Implement phases should be followed.

1 Prepare

The prepare phase addresses specifics such as what the organization can justify financially. What the wireless network design should support. What services are to be supported on the wireless network, data, voice, location based services? What clients are to be supported, laptops, handhelds PDA's, active RFID tags? You need to have the answer to all these questions prior to entering the planning phase.

2 Plan

During the planning phase a project plan is developed to manage tasks, responsible parties, resources and milestones.

If there is a current network in place, what will the impact be by adding controllers and access points to the existing network? Is there existing available ports for access points and controllers to be connected to or will additional switches be added to the network to support the controllers and access points? Do current switches for access points support Power over Ethernet (POE)? Will there be N+1, N+N redundancy or N+N+1 redundancy?

If this is to be a new network then the site survey and design phase will dictate what equipment is needed to support the controller based WLAN.

If you purchased the Wireless Control System (WCS) from Cisco, load campus buildings and floor plans that will support WLANs into WCS. Use the planning tool feature in WCS to determine the amount of access points and placement for the services you plan to support, data, voice, location based services.

The WCS can generate access point density and coverage based on the services you have decided to support as well as the amount of users that will access the WLAN. Once you have determined the amount of access points needed this will dictate the amount of controllers needed to support the access points.

Once you have accomplished the above you are ready to perform a site survey which includes the following:

2.1 Layer One Sweep with Cisco Spectrum Expert™

Cisco's Spectrum Expert™ can identify and locate any non 802.11 devices that may cause interference with the proposed WLAN be it in the 2.4 or 5 GHz spectrum or both. Sweep all areas where access points will be deployed with Cisco Spectrum Expert™ to identify any devices that may interfere with the proposed WLAN. These devices could be cordless phones, microwave ovens or any other devices that use the license free Industrial Scientific Medical Band (ISM band) or Unlicensed National Information Infrastructure bands (UNII 1-3) but, are not IEEE 802.11 devices. Once any of these devices are identified that can cause interference they can be removed or replaced by devices that do not operate in the 2.4 or 5 GHZ frequency bands. Cisco Spectrum Expert™ will also identify other 802.11 devices that may be heard from surrounding WLAN installations in the area.

2.2   Performing a WLAN Site Survey

Use Ekahau Site Survey software for the site survey**.** This survey program gives you all the data you need to insure a proper site survey for data, voice or location based services.

The site survey is a process of identifying access point placement for coverage so that additional access points can be placed to achieve the appropriate signal to noise ratio (SNR) for WLAN services supported. The site survey process insures needed signal levels and overlap with minimal interference to other access points**.**

Prior to performing a site survey you must know what devices are being supported on the WLAN to determine appropriate signal levels and these vary depending on the following:

- **Data**
  WLAN data-only networks are dependent only on SNR for data rate supported and proper cell overlap (Normally 10 to 15 percent. Twenty percent is recommended).

- **Voice**
  WLAN voice networks are critical to SNR, data rate supported, and proper overlap (20 percent). Quality of Service (QOS) must also be configured on controllers at installation for voice. Data rates below 18 Mbps should be disabled. It is recommended to use the 5 GHz band due to the amount of channels available (23 in all). This helps to avoid co-channel and adjacent channel interference.

If you are surveying for data and voice only, ensure your cell edges are at a minimum of -67 dBm with 20 percent overlap. Access points on the same channel should have at least a 19 dBm SNR ratio of separation from each other. For more information on deploying WLAN voice refer to the Cisco Unified Wireless IP Phone 7921G Deployment Guide available at Cisco.com.

2.3   Location-based Services

WLAN Location-based Services requires that access points to be placed in such a fashion that the Active RFID tags and 802.11 clients are surrounded by access points for ultimate optimization. (This is a different access point placement strategy than data and voice WLAN only networks). Signal levels heard from RFID tags should be -72 or better. RFID tags reside in the 2.4 GHz frequency range which has only three non-overlapping channels. Monitoring access points should be deployed to insure an adequate density of access points surround the RF devices for location-based services.

Generally, access point separation for location should be between 40 and 70 feet (12 to 21 meters). Access points should not be too close (28 feet [9 meters] or less). Antenna heights should not exceed 20 feet (6 meters).

(2.3: Location-based Services continued)

The Cisco Wireless Control System considers the floor location ready if the following criteria are met:

- At least four access points are deployed on the floor
- At least one access point is found to reside in each quadrant surrounding the point in
- question
- At least one access point residing in each of at least three of the surrounding quadrants is located within 70 feet of the point in question

For more information on deploying location-based services refer to the Cisco Wi-Fi Location-Based Services 4.1 Design Guide available at Cisco.com.

2.4 Power

Power should be reduced to half power or less of the client power supported. This will enable Auto RF features on the controllers to function properly. Surveying at full power for the data rate supported is not recommended.

3 Design

Once the survey is complete you will have the location and number of access points that will require cabling back to wiring closets throughout the network. The access point count will dictate the minimum number of controllers required to support the WLAN.

Network design, placement and configuration of WLAN controllers can vary greatly due to the size of the network you intend to support, the redundancy you design into the network and the services you intend to support on the network. WLAN controllers can be placed in a data center or a central location or distributed across the campus distribution layer.

When designing the network to support the Cisco WLAN controllers and access points take the top down approach. This means to start at Layer 7 of the Open System Interconnection (OSI) model and work your way down to Layer 1. This will incorporate all applications and services that will run across the wireless network.

- VoWLAN (Voice over Wireless LAN) requires QoS configurations on the controllers that support the voice WLAN/VLAN.
- A WLAN security policy should be developed for implementation.
- Guest networks require that the controller supporting guest services be placed in the DMZ of your network for security reasons.
- If roaming is to occur between access points on different controllers on the network, then you must setup Mobility Groups on the controllers.
- For optimizing Auto RF you should configure RF Groups.

For further information about design and configuration for WLAN controllers refer to the Cisco Enterprise Mobility 4.1 Design Guide and the Wireless LAN Design Guide for High Density Client Environments available at Cisco.com.

4 Implement

Once you have completed your site survey and design, you are ready for installation.

Prior to access point installation, all access point cabling back to wiring closets must be in place with PoE switch ports available for each access point. Ethernet runs should not exceed 100 meters and should be scanned to insure they meet appropriate signal levels and have been terminated properly

The network should support DHCP option 43 or DNS so access points can locate controllers on the network to join.

TEST

- Bring the wireless network up and test all areas for proper coverage, roaming, and services supported.
- Verify that the WCS can see all WLAN controllers and access points installed.
- Use the Ekahau Site Survey tool to do a passive survey of each floor covered. This will give you a visualization of any weak signal areas that need adjustment. You can then make adjustments to correct, if needed.
- If voice services were installed, make test calls throughout the WLAN to ensure that Cisco 7921 or Nokia phones are working properly with Cisco Call Manager.
- If location-based services are to be supported, check how well WCS can locate devices using the location appliances installed. You may need to perform a calibration on each floor with WCS to enhance location-based services.

The Conducting Cisco Unified Wireless Site Survey (CUWSS) v2.0 course is now available from Cisco. This course covers wireless survey methodologies for data, voice and location-based services. The labs include hands-on experience with the following:

- Collecting information for the Site Survey
- Analyzing a virtual walkthrough
- Conducting a walkthrough of the facility
- Estimating access point count with the WCS Planning Tool
- Cisco Spectrum Expert (Layer 1 sweep)
- Locating an Interfering Device with Spectrum Expert
- Ekahau Data Survey
- Ekahau Voice Survey
- Wireless network design game
- WCS calibration for location-based services

About the Author
Keven Dech is a Wireless Training Specialist and Director of Training Services at GigaWave Technologies. Since March of 2001 he has conducted training for Cisco Systems' Aironet Wireless LAN product set. He received his Cisco Certified Systems Instructor (CCSI) status on February 26, 2001. During his time with GigaWave Technologies, Keven has trained Cisco Employees, Cisco distributors, Cisco premier partners, Cisco resellers and Cisco end-users.

Keven Dech brings over 20 years experience in both wireless voice and data communications with a broad knowledge of both licensed and unlicensed wireless systems to the classroom. Keven Dech maintains a 4.70+ average instructor rating out of a maximum rating of 5.00 in the Cisco Certified Systems Instructor rating system. Cisco Systems requires a minimum rating level of 4.25 in the Cisco Certified Systems Instructor rating system. The ratings are based upon student evaluations. Keven has over 3 years of formal Radio Frequency and Electrical systems repair training from the United States Army.

About GigaWave Technologies
GigaWave Technologies, a division of TESSCO Technologies, is the leading provider of innovative training services and certification programs for the dynamic and rapidly expanding WLAN industry. GigaWave Technologies is an authorized Cisco Learning Partner and has the knowledge and expertise to thoroughly train IT professionals on how to design, install, secure and sell WLAN technologies.

For the most current training schedule and to view full course descriptions, go to www.giga-wave.com, email info@giga-wave.com or call 210-375-0085.

GigaWave Technologies® White Paper

10521 Gulfdale
San Antonio, Texas 78216
210-375-0085 Phone
210-375-8382 Fax
info@giga-wave.com
www.giga-wave.com