

APPENDIX C

Minimum Specifications of the Wireless Solution

VENDOR NOTE: This document contains a sample of what vendors will be responsible for as well as what the minimum specifications for the wireless solution will be. While no major changes are planned before the final version is released, some modifications may be made. The following is for reference only, so vendors may get an idea of exactly what the end result of this project should look like across all schools.

Vendor Steps

Vendors are expected to perform the following steps when conducting site surveys:

1. Obtain a facility diagram in order to identify the potential RF (Radio Frequency) obstacles.
2. Manually inspect the building and materials to determine initial RF propagation expectations and hardware mounting concerns.
3. Determine preliminary Access Point locations. Considerations include:
 - a. Wired network access, cell coverage and overlap, channel selection, and mounting locations for the Access Point and any external antennas (if required).
 - b. The final ratio of Access Points to wireless users should be approximately 25:1.
 - c. Cell coverage overlap should be approximately 15 to 20%.
 - d. A signal-to-noise ratio of at least 25dBm should be maintained throughout the solution.
4. Perform the actual surveying in order to verify Access Point locations. Vendors should make sure to use the same Access Point model for the survey that will be used in the final wireless solution. When the survey is performed, relocate Access Points as deemed needed and re-test.
5. Based on optimal Access Point location, determine the most efficient way to route cabling back to an MDF/IDF. If no access to the wired network is available within maximum range of the cable, determine where new IDFs or junctions should be placed.
6. Inspect the MDF/IDFs and determine what hardware needs to be installed. Considerations include:
 - a. Hardware must fully integrate with the existing network.
 - b. Minimum power requirements if current hardware needs to be upgraded or replaced.
7. Document the findings. Record the locations and log signal readings for each Access Point, as well as data rates at outer boundaries. Prepare a map or detailed summary of how many cable drops are needed and where, what infrastructure needs to be installed,

and what electrical changes need to be made in the MDF/IDFs. Documentation should also identify any existing hardware that can be re-used for the wireless platform, and any hardware that would be rendered unusable.

Detailed Specifications

The following sections provide detailed specifications that all vendors should adhere to when designing a WLAN solution for each building/site.

Section 1 - Specifications for the Wireless Controller and Access Points

The vendor must provide a WLAN solution meeting the following requirements at a minimum:

- Dual-radio, dual-band wireless access points with 802.11a/n (5 Ghz) and 802.11b/g/n (2.4 Ghz) connectivity with MIMO (Multiple-In-Multiple-Out) capability for 802.11n.
- Access points must be powered by IEEE standard PoE (802.3af) or PoE+ (802.3at).
- Access points must support tunneled traffic.
- Full redundancy is required throughout the wireless platform. All wireless security and services must continue to function if connectivity to the controller is lost. Backup controller must have sufficient capacity to manage all Access Points when a failure occurs in a primary controller.
- Wireless platform must support an 802.1X supplicant to prevent use by unwanted devices.
- Wireless platform must support latest secure authentication and encryption standards.
- Wireless platform must be capable of supporting a customizable, centralized Captive Portal
- Access point must support automatic channel selection and transmit power controls. Optimal channel selection must be reconfigured dynamically and without the need for user action.
- Upon failure of an Access Point, the Wireless controller must expand neighboring Access Point coverage to eliminate any uncovered areas.
- QoS (Quality of Service) must be supported throughout the entire solution proposed by the vendor.
- Access Points must support multiple SSIDs and fast, secure roaming and handover.
- Solution must support location-based services providing an API to integrate location and presence capabilities with third-party applications.
- Solution must support GUI-based management.

Section 2 – Specifications for Switching and Infrastructure

Vendor bid specifications must provide a stackable and/or blade expandable style switch family with the following minimum specifications:

- Multiple port density configurations from 12 to 384 ports (48 per switch * 8 switches) depending on number of Access Points required.
- Multiple connectivity options comprised of 10/100/1000 Ethernet ports, and fiber (1/10Gb).

- All applicable ports providing connectivity to an Access Point must provide power in accordance with IEEE standard 802.3at (PoE+) and support gigabit throughput to each AP simultaneously.
- Switch stacks must operate as a single managed device regardless of stack size (applies to throughput, management, and overall performance) via a single IP address.
- Switches must not use ports from the user's available port density to create said stacks. Dedicated connections and bandwidth for traffic between switches in the stack is required.
- Must store source IP address, MAC address, host name, user name, and activity status for all ports.
- Must support ARP broadcast protection.
- Must support BPDU port protection.
- Must support Ingress Rate Limiting
- Must support QoS via all common industry standards.
- Must support IEEE 802.3ad Link Aggregation with at least 8 ports per LAG
- Must support Closed Loop Stacking
- Must support redundant stack management
- Must support external load-sharing and redundant power options
- Must support IEEE 802.1x User Authentication
- Must support MAC and Web-based (PWA) authentication
- Must support MAC Port Locking (Dynamic and Static)
- Must support RFC 3580 (Dynamic VLAN Assignment based on 802.1x or MAC authentication with at least 8 RFC 3580 authenticated users per port
- Must support secure management via SSHv2, SSL, SNMPv3, AES and RADIUS
- Must support the following RMON groups: Statistics, History, Alarms, Events, Filters, Packet Capture
- Must support Many-to-One and One-to-One Port Mirroring
- Must support configuration for Secure Guest Access without requiring use of VLANs or ACLs
- Must support configuration for K-12 embedded AUP without requiring VLANs or ACLs
- Must support IEEE 802.1s & 802.1w Spanning Tree related standards.
- Must support IGMP Snooping v1/2/3
- Must support IEEE 802.1q encapsulation for VLANs, port-based VLANs, protocol-based VLANs and tagged-based VLANs with full support for the GARP and GVRP protocols.

Section 3 – Bid Specifications for Network Cabling and Interconnects

As part of the turnkey installation, the physical network connections must meet the following:

- All copper cabling should be Cat6 or greater and be certified for gigabit throughput. No cable shall exceed its maximum recommended length (i.e. 100m for Cat6) including any patch cables at termination points.
- All Fiber Optic cabling shall provide a minimum of 3 separate links per run (6 strands).
- Cabling will interface with existing network backbone at core junction points.
- Cabling will terminate into patch panels and/or network boxes with appropriate faceplates and keystones. All terminations shall be done with the appropriate end connectors or patch panels (Cat6 or greater).

- Cabling below a ceiling is to be placed into conduit and properly terminated into network boxes with appropriate faceplates and keystones. Existing building conduits may be utilized where available/appropriate. Low voltage Ethernet should not be ran through the same conduit as high voltage lines.
- After installation, all cabling must be tested to verify connectivity between MDF/IDFs and Access Points, to ensure that all runs have been installed and terminated correctly, and that that the run meets industry standards regarding crosstalk and packet loss.
- All wall penetrations must be properly sealed according to Fire Marshall specifications.
- Cables and panels must be appropriately labeled and easily traced using a schema agreed upon with the individual School District's IT Department.
- Vendor must provide a post-installation schematic detailing all cabling routes and termination points.

Section 4 – Post Installation System Training

Following the successful completion of the project, the vendor is to provide a minimum of one day of training on the proper configuration, daily operation, and maintenance of the system.

This training shall be performed on-site at a mutually agreed upon date at the local school district's requested sites. The training will be for no more than 10 individuals who work directly for, or closely with the Technology Department. This training session may be recorded on audio & video.

The vendor will provide at minimum 2 copies of all installation, configuration, and training materials. This includes any and all materials offered by the vendor deemed to be helpful in the day to day operations of the system. In addition, a digital copy of these materials would be preferred but not required.

Section 5 – Other Related Bid Specifications

The proposed contract should include three years of warranty on all aspects of this RFP. This includes warranties on all equipment and items associated with the installation. It is understood that if purchased with E-rate funding, any ineligible warranties will be excluded from the contract or purchased with non-Erate funds. Quoted prices must remain effective for the entirety of the E-rate year for which the application was made (July 1- June 30).

The successful vendor will be required to participate in the Universal Service Fund (USF) and will provide the appropriate discounts if applicable to this project. The successful vendor also agrees to file Form 474 (Service Provider Invoice) to collect the USF portion of the funded project and will bill the individual school district only for the discounted portion and for non-eligible items. If the individual school district does not receive USF funding for this project, the school district may choose not to purchase these services. Please provide your SPIN identification number and USF listed company name. The vendor must also provide, at the end of the annual contracted period and without additional cost, a complete copy of all serviced bills from all contacted locations, for use in facilitating USF applications.