STATE College Engineering Building

Wireless Site Survey Report

March 28th, 2006
Prepared by
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Table of Contents

Overview

Netrepid was contracted by STATE College (referred to as the "Client") to complete an RF (radio frequency) site survey using access points and RF receiving equipment. The purpose of this survey was to ensure effective RF coverage for the pending wireless network installation and deployment of the Engineering Center.

Executive Summary

Prior to beginning the survey ENGINEER NAME, the Netrepid wireless survey engineer, met with the Network Administrator in the ITS Department. The Network Administrator discussed the expectations and goals that STATE College would like to achieve.

During the walkthrough with The Network Administrator, the key areas of required coverage and areas with potential weaknesses or challenges were identified and noted throughout the building. Structural details were evaluated, further refining the initial site documentation. Areas of congregation, including conference rooms and seating areas were highlighted as principle targets of effective coverage.

Location

The STATE College Engineering Center, in STATE, PA, required an RF site survey. This is to be an extension of their current Trapeze Networks based wireless network.

Building Description

This is an extension of the Engineering Center and consists of two stories. Currently the area is under construction and is approximately 38,000 sq. ft. The survey included the 1st and 2nd floors. The building consisted of several classrooms and offices. Large classrooms were surveyed for capacity.

General Results

The survey revealed that a total of 14 access points will be required. The Signals are strong enough to compensate for obstructions existing in needed coverage areas. Also, the planned power settings allow for adjustment if future changes in the environment occur.

WLAN Survey Results

Overview

To perform the site survey, coverage was checked throughout the three areas using advanced tools at increments of less than 10 feet. Measurements were recorded in decibels and recorded on digital maps of the respective areas. Measurements included the following:

Signal Strength of each AP

A Cisco 1231 AP was used as the platform for this survey. The AP utilized standard "rubber ducky" omni-directional diversity antennas with a 2.2dBi gain. Power settings were adjusted for each AP so as to create a proper coverage area. These settings are documented in Appendix A.

Potential Issues

No potential issues were discovered during the survey.

No unidentified 802.11b/g systems were detected during the survey.

RF Coverage

Coverage is color-coded based on the key shown in the corresponding map section. All values listed are in decibels. Maps are included as Appendix B and include the following:

- Overlapping Signal Strength – This shows the signal strength throughout the entire area measured in decibels. In many areas there is overlapping coverage with multiple Access Points. This map shows the strongest signal regardless of Access Point locations.

Findings

The Engineering Center was conducive to RF coverage. The free space created by the large classrooms and conference rooms allowed for considerable signal penetration. Radio frequency propagation into the walled rooms was also found to produce acceptable levels of coverage. Multiple readings were taken in each room and all offices within the required coverage areas to ensure effective wireless signal. Readings were repeated with the testing of each potential placement location. Radio signal strength was recorded at –75 dBm or greater in all points.

Existing Wireless

Only the current STATE college wireless network was detected.

Conclusions

Summary

The wireless network at the Engineering Center will provide effective connectivity and data rates that should handle all current needs of this site. There is coverage throughout the facility as specified by the client. It is important to note that exact coverage will vary between different client devices as well as changes in the environment.

Next Steps

The next step is to review the recommendations made above and develop a deployment plan. This plan will finalize the details of the design such as cabling, authentication, and hardware settings. From here, the installation can begin.

Appendix A - Access Point Location Information

Place access points at the locations indicated in this document. For all access points, the corresponding ceiling tile brackets, pipe or I-Beam have been marked with red tape to aid in identifying the exact placement location.

ENG - 1st Floor: Access Point 1

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 11
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Inside of Biology Conference Room 1-306

Mounting Description

- Mount on drop ceiling rail

ENG - 1st Floor: Access Point 2

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 1
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Outside of instruments Room 1-315

Mounting Description

- Mount on drop ceiling rail

ENG - 1st Floor: Access Point 3

Proposed Configuration

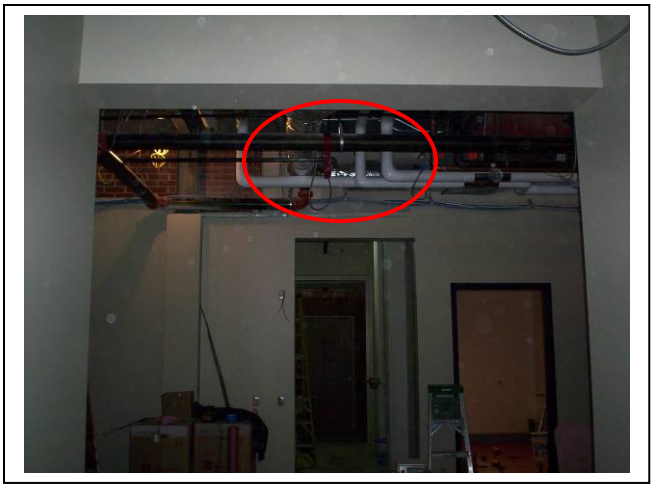
- Protocol: 802.11b/g
- Channel: 11
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Outside of research labs Room's 1-325 & 1-326

Mounting Description

- Mount on drop ceiling rail



ENG - 1st Floor: Access Point 4

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 11
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of environmental science lab Room 1-318

Mounting Description

- Mount on drop ceiling rail

ENG - 1st Floor: Access Point 5

Proposed Configuration

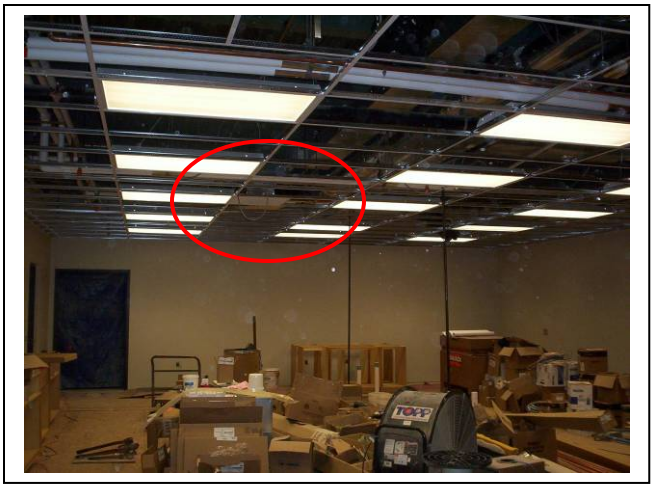
- Protocol: 802.11b/g
- Channel: 6
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of microbiology lab Room 1-322

Mounting Description

- Mount on drop ceiling rail



ENG - 1st Floor: Access Point 6

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 1
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of general biology lab Room 1-321

Mounting Description

- Mount on drop ceiling rail

ENG - 1st Floor: Access Point 7

Proposed Configuration

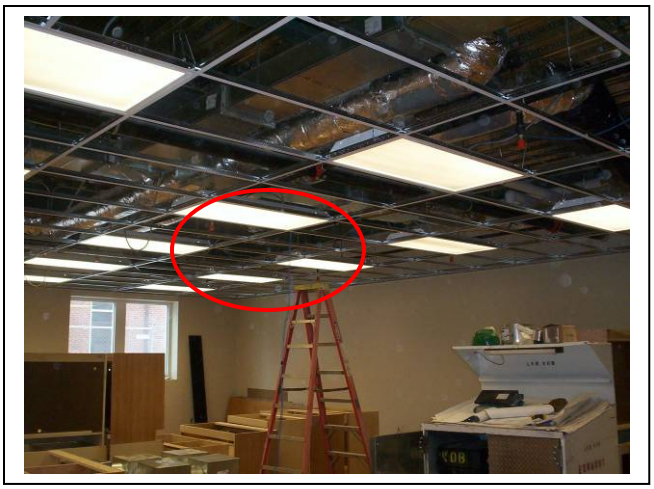
- Protocol: 802.11b/g
- Channel: 6
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of ecology/plant taxology lab Room 1-319

Mounting Description

- Mount on drop ceiling rail



ENG – 2nd Floor: Access Point 8

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 11
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of developmental/invert lab Room 2-319

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 9

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 6
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of genetics lab Room 2-318

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 10

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 1
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of molecular biology lab Room 2-322

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 11

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 6
- Output power: 4 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 7 dBm or 5 mW

Location Description

- Inside of cell bio lab Room 2-321

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 12

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 1
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Outside of research labs Room's 2-323 & 2-325

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 13

Proposed Configuration

- Protocol: 802.11b/g
- Channel: 11
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Outside of instruments Room 2-315

Mounting Description

- Mount on drop ceiling rail

ENG – 2nd Floor: Access Point 14

Proposed Configuration

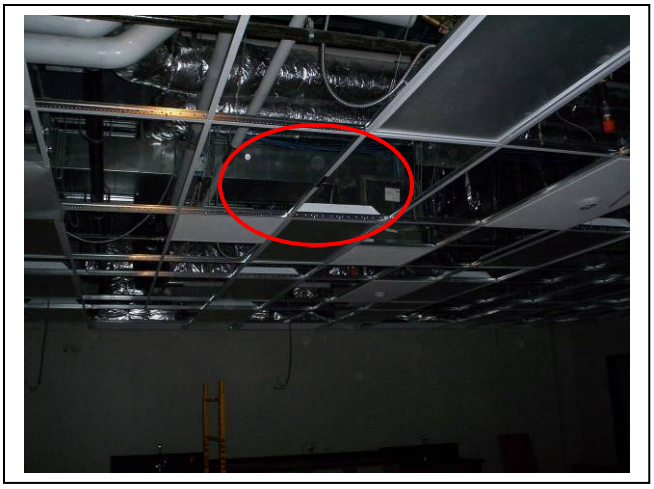
- Protocol: 802.11b/g
- Channel: 6
- Output power: 11 dB
- Antenna Gain: 3 dBi
- Total estimated EIRP: 14 dBm or 25 mW

Location Description

- Inside of anatomy/physiology lab Room 2-306

Mounting Description

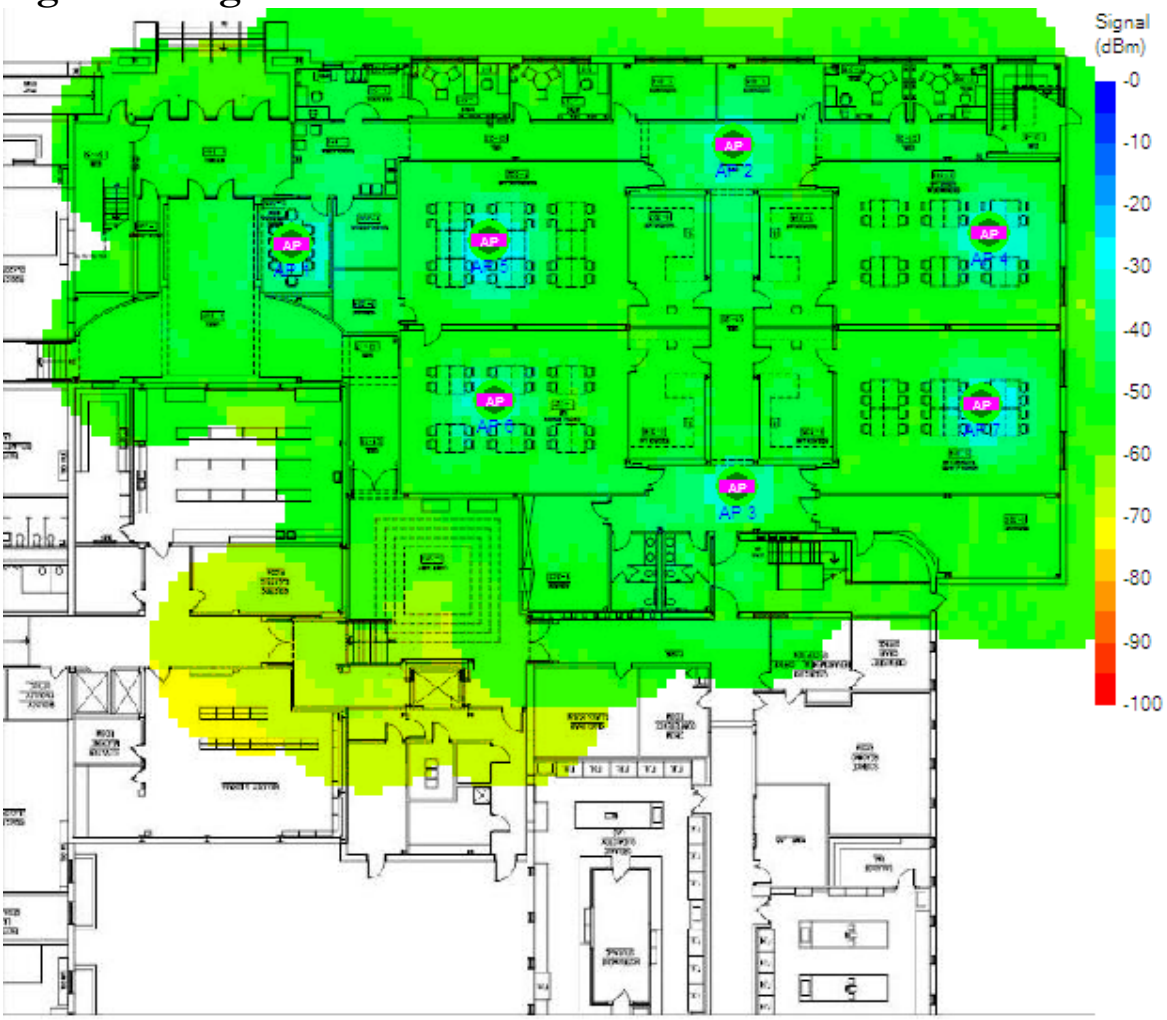
- Mount on drop ceiling rail



Appendix B – Coverage Maps

ENG - 1st Floor - Overlapping Coverage – 802.11g

Signal Strength



Signal Strength coverage (RSSI) of the selected access points. The strongest RSSI is shown per location.

ENG – 2nd Floor - Overlapping Coverage – 802.11g

Signal Strength

Signal Strength coverage (RSSI) of the selected access points. The strongest RSSI is shown per location.

Appendix C - Network Configuration

Data Cabling

Plenum available for running cable from access points to wiring closets. No special requirements needed.

Power, Cabling and Networking Requirements:

Power to every access point location will depend on the choice of access point and/or customers preference.

AC at Access Point Location:

All equipment should be powered from a dedicated 24 hour, 120 VAC, 15A amp circuit that is controlled by its own breaker within the breaker panel. A filtered uninterrupted power source is preferred and recommended, if available. Electrical boxes should be mounted facing up so that the transformer may be plugged in from the top with the weight of the transformer resting on the workbox. The transformer should also be tie wrapped to the electrical workbox.

Power-Over-Ethernet:

If any or all of the access points are using "Power-over-Ethernet", then AC power will be needed at the MDF / IDF hub locations. A dedicated 24-hour, 120 VAC, 15A amp circuit that is controlled by its own breaker within the breaker panel is recommended. A filtered uninterrupted power source is preferred and recommended, if available. See attached Power over Ethernet drawing.

Ethernet Cable:

Each access point must be connected to the wired network via a Category 5/5e UTP cable unless a media adapter is used. The recommended method is for the Cat 5/5e UTP cable to originate from a patch panel at the MDF / IDF and terminate into a surface mounted biscuit jack at the access point. A Category 5/5e - patch cable is used to patch the access point to the workbox.
See attached cabling best practices guidelines.

Networking Requirements:

Each access point will require an available hub / switch port. Each designated hub / switch location that is specified for the designated access point must be within the 100 meter Ethernet specification for Cat 5 cabling. Each access point will require 1 patch cable if A/C power is utilized at the access point or 2 patch cables if PoE is utilized. See attached network design best practices guidelines.

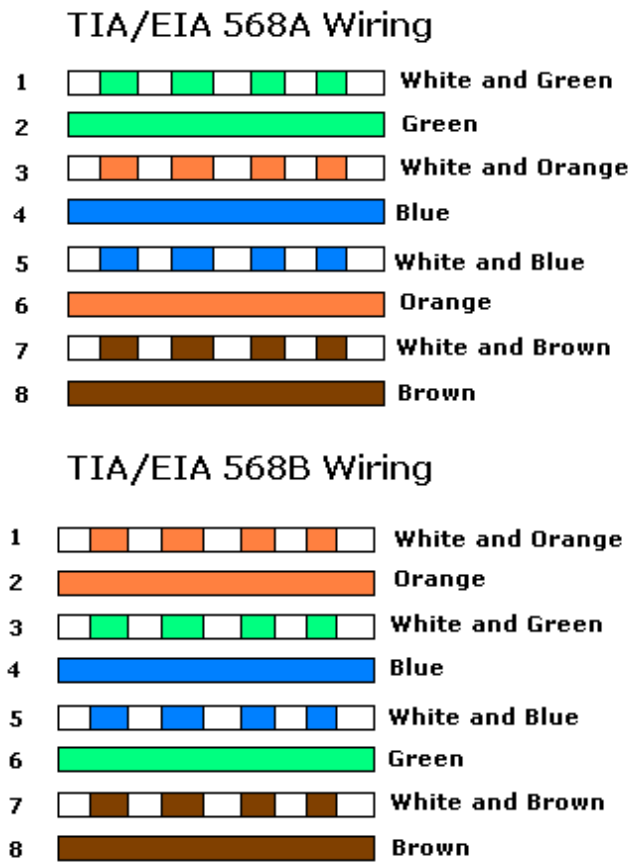
Appendix D - Network Cabling Best Practices Guidelines

1. Use a certified cabling contractor
2. Use Cat 5/5e or better cable to support 100 Mbps Ethernet.

> The following table defines the properties of each currently defined cable type (as of July'200)

EIA/TIA Category	Speed	LAN	100M Support	ISO Spec	EIA/TIA Spec
Category 3	16Mhz	10Mbit/s	100Base-T4		
Category 4	20Mhz	16Mbit/s	100Base-T4		
Category 5 (5e)	100Mhz	100Mbit/s	100Base-TX	ISO/IEC-11801	TIA/EIA-568-A-5

3. Use colored cables to differentiate capacity – recommend blue for 100 Mbps.
4. Follow TIA/EIA 568 Structured Cabling Standards
5. Settle on a consistent wiring scheme – either 568A or 568B (recommend using 568B). This includes making sure that all punched down end of the cable are wired to the same pinot or communications will fail.

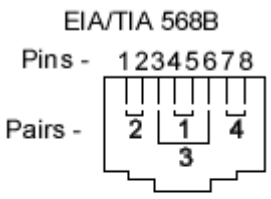


6. Use the (8) wire 100baseT specification.

The following cable description is for the wiring of BOTH ends (RJ45 connectors) with your category 5 wiring colors (TIA/EIA 568A or 568B though the example uses 568B colors).

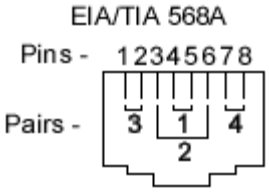
Pin No.	Strand color	Name
1	white and orange	TX_D1+
2	Orange	TX_D1-
3	white and green	RX_D2+
4	Blue	BI_D3+
5	white and blue	BI_D3-
6	Green	RX_D2-
7	white and brown	BI_D4+
8	Brown	BI_D4-

568B
(Recommended)



Pin Colours
1 White and Orange
2 Orange
3 White and Green
4 Blue
5 White and Blue
6 Green
7 White and Brown
8 Brown

568A



Pin Colours
1 White and Green
2 Green
3 White and Orange
4 Blue
5 White and Blue
6 Orange
7 White and Brown
8 Brown

7. Stay within the recommended TIA/EIA cable limitations
   10/100 Base T Horizontal cabling 90 meters Max (295 ft.) Patch cable not to exceed a total of 10 meters (33 ft.) or 5 meters (16 ft.) per patch cable
8. Use certified cat5/5E stranded cable patch cables for patching between devices.
9. Keep cables at least 2 feet away from fluorescent light boxes and other sources of electrical interference. Keep cables away from devices that can introduce noise into them.
10. Test every part of the network including patch cables as you install it.
11. Always use more cable than you need. Leave plenty of slack (10’ service loop recommended)
12. Do not over-cinch cables when using cable ties.
13. Avoid stretching UTP cable (tension when pulling cables)
14. Do not bend cables to less than 4 times the diameter of the cable.
15. Cable supports shall be spaced 4 to 5 ft. apart.
16. Do not support cables from ductwork, sprinkler piping, water piping, conduit, or other system supports.
17. Run cables in 90-degree routes. Do not run cables diagonally across ceiling space.
18. Use plenum rated cable in Plenum airspace as per the NEC and fire codes.
19. All wiring shall be certified to meet or exceed the specifications as set forth in TIA/EIA-568 for Category 5/5e requirements.
20. Cable should be tested end to end and the results saved for future reference. Ensure the test includes certification of all eight (8) wires. PoE uses four (4) of the wires.
21. Label all cables, patch panels, work area outlets and document for future reference.