Homework 6

March 23, 2013

CPE-322, Engineering Design VI

A collaborative effort on behalf of

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Paul Di Santi
Robert Stephenson
Stanley Switalski

I pledge my Honor that I have abided by the Stevens Honor System.

Takahiro Akiyama x____________________________________

Paul Di Santi x____________________________________

Robert Stephenson x____________________________________

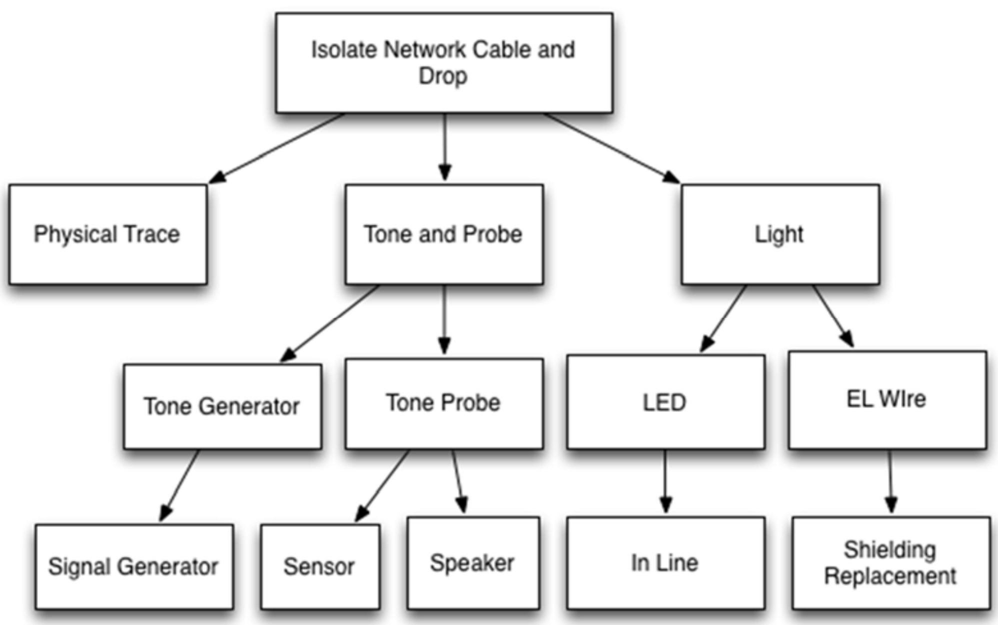
Stanley Switalski x____________________________________

Section 1

Team Member	Takahiro Akiyama	Paul Di Santi	Robert Stephenson	Stanley Switalski
Percentage of Effort Towards Assignment	*25%*	*25%*	*25%*	*25%*

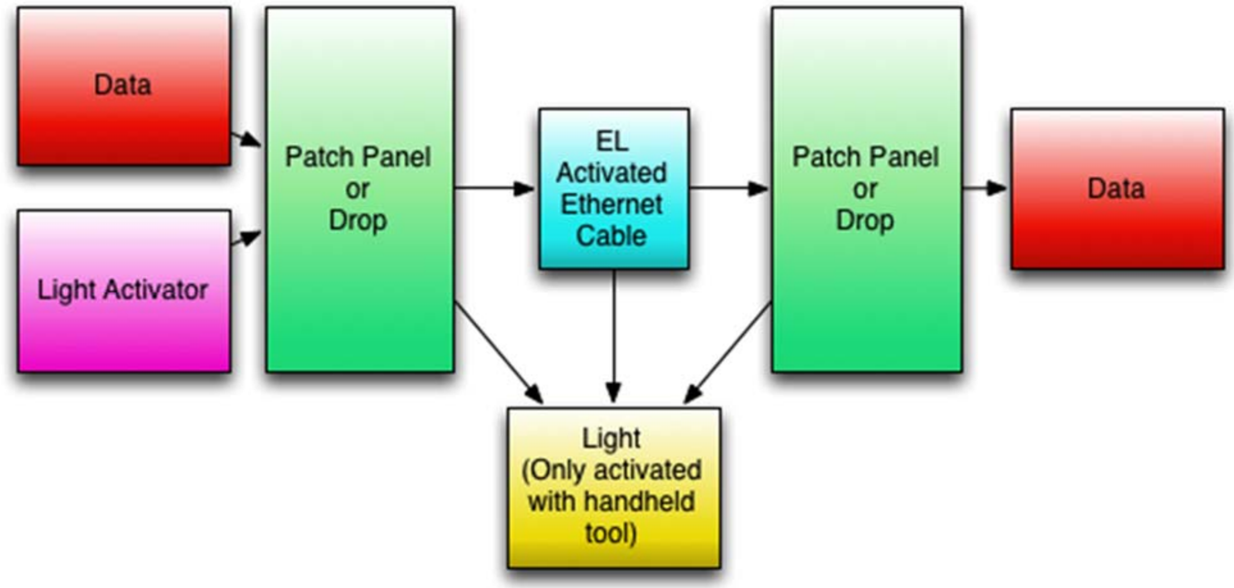
Section 2 – Functionality of Project

As outlined in previous reports, our project aims to resolve an issue many network engineers face. When network documentation and changes aren't maintained, a network often becomes a mess of cables. No longer are you sure that cable A runs to room A. It is a serious issue that can take a lot of time to resolve. Overall there are three ways to resolve this issue. These ways have been outlined in our Function-Means tree diagram below.



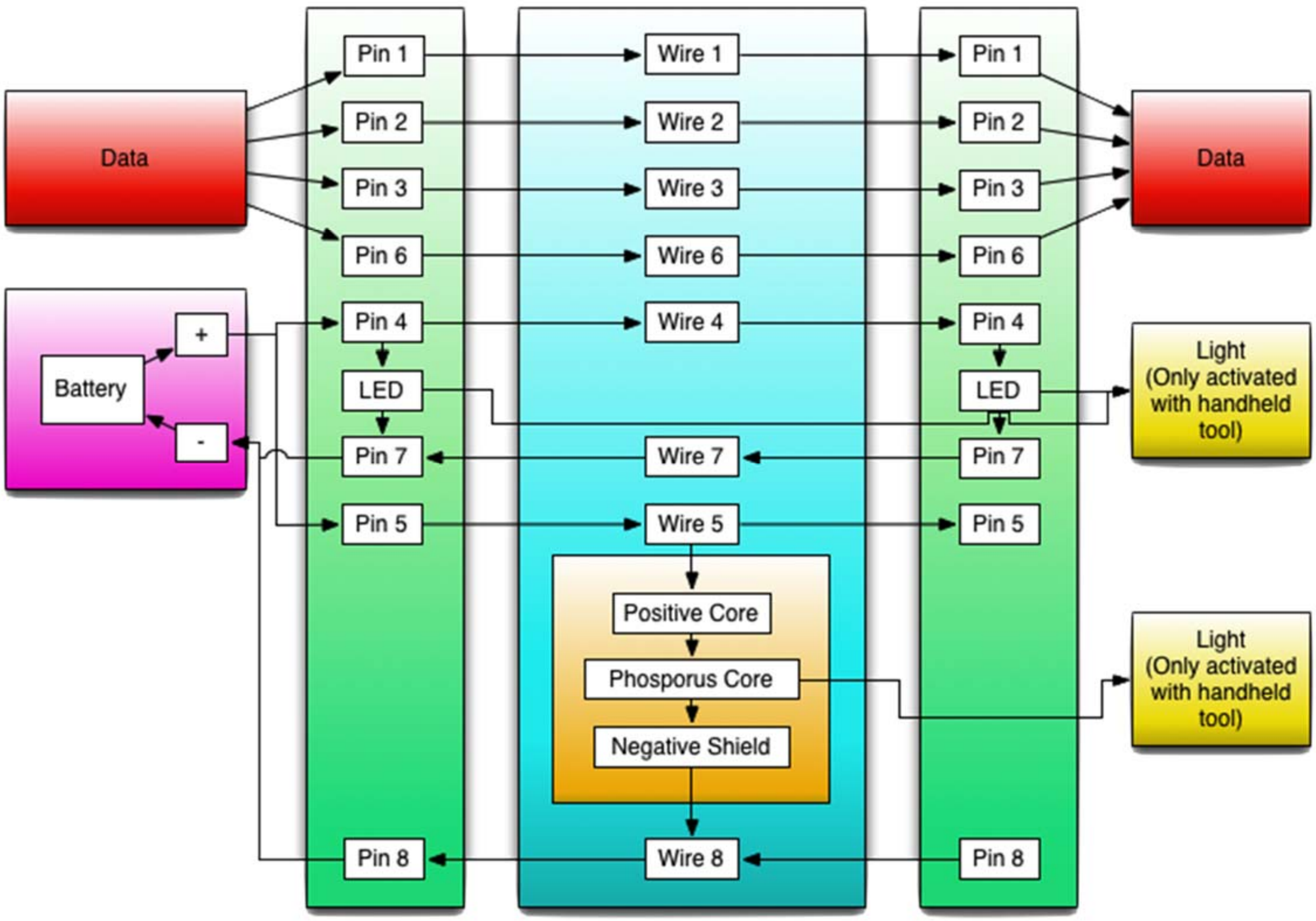
1. Physical Trace – This requires that the network engineer trace the cable, which runs from a central location to a remote drop through a series of tubes and ducts, from its source to the destination. While this may be practical for cables that run short distances, most drops/IDFs/MDFs are connected with Ethernet cable running tens of feet long through very tight and cramped places.
2. Tone and Probe – This is a two-piece tool that will generate a signal and push that signal over the Ethernet cable. The tone generator will plug into a drop and the probe will be used at a patch panel. The probe will be run along the patch panel and will play the tone that is being pushed over the Ethernet cable once the matching port is found. The issue with this solution is that it is not directly tied into each port. As such, with all the other signals being generated on neighboring patch panel ports, the probe will often pick up and play this interference. The ultimate result is an extensive amount of time wasted trying to isolate noise from the tone generator.
3. Light – This is our solution. An LED will be tied into each port of a patch panel or network drop. Packaging a small battery with an Ethernet head together, the voltage will travel across the unused pins of the installed Ethernet cable and directly illuminate an LED on the patch panel or drop to indicate corresponding ports. If a client wants to see specifically where a cable is running, they can also install our EL Ethernet wire which, when the package is plugged into a port, will illuminate both the LED and the cable itself.

Section 3 – Functionality of Components



The above black box diagram depicts the whole package that we will advertise to clients. Being that we are developing a modified version of a standard network tool, our product will still need to be able to pass data over all eight Ethernet pins. In order to illuminate anything, a Light Activator must be used in order to supply the voltage necessary to power the lighting components. The patch panel and/or network drops will come with LEDs installed, which will be lit when power is passed through them. The last component is a custom manufactured Ethernet cable which has EL wire components wrapped around its shielding. When power is applied to this layer, it will illuminate down the path of the wire. Due to the nature of EL wire, the wire will illuminate only as far as the cable is not damaged, another selling point of our product.

Section 4 – Interfaces Between Components



Starting with a fundamental function of our patch panel, data will be passed over pins 1,2,3,6 of the patch panel untouched by our added components. This is to ensure any impedance our LEDs may add will not corrupt the data.

The Light Activator will be composed of a simple battery. After plugged into an Ethernet port, it will pass voltage over the unused data pins. In order to maintain the IEEE 802.3af standard, the positive end of the circuit will be attached to pins 4 and 5. The negative end of the circuit will be attached to pins 7 and 8.

The LED, which is used to indicate corresponding ports, will be tied in parallel to pins 4 and pins 7. Maintaining the IEEE 802.3af standard, the positive lead will be connected to pin 4 and the negative lead connected to pin 7. Pins 4 and 7 will then be tied into the Ethernet cable which carries the signal/voltage to the corresponding drop or patch panel. Here the voltage will continue to flow into the corresponding LED and complete the circuit by returning the negative portion of the circuit over pin 7. If the customer has decided to only install our EL Ethernet wire, due to the nature of the patch panel, there will be an open circuit across pins 4 and 7 since there is no LED available to complete the circuit.

This same Light Activator will also activate the EL component, so long as the customer has decided to install our EL Ethernet wire. Much like how the LEDs are connected, the positive core of the EL shielding will be connected to pin 5 and the negative shield connected to pin 8. In the event that the customer has decided to only install the patch panel, due to the nature of the patch panel, there will be an open circuit across pins 5 and 8. As such, we will not need to worry about a short circuit.

Section 5 – Performance Metrics

Being that our group's project is fairly light in terms of components, we do not have very many performance metrics available. Our greatest concern is how much voltage we will need to pump over the Ethernet cable in order to light up the LED and EL components without burning or breaking anything. Our preliminary idea is to use two AA batteries in series with a current limiter at the head of it.