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TECH BULLETIN
 # 1012

Products Affected:
CTI# 5600 Show DMX System

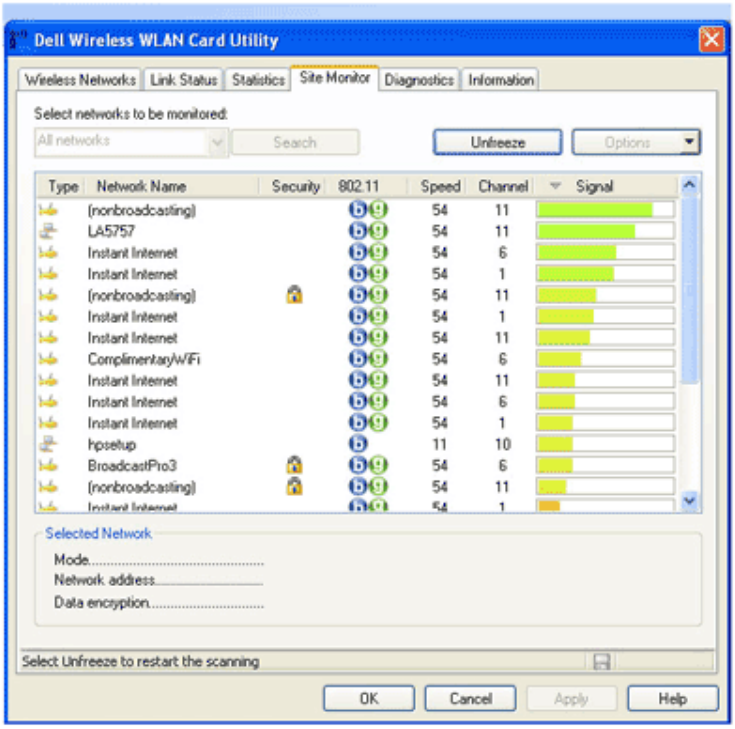
Overview:
How to Perform a Wireless DMX Site Survey

Details:

One of the key features of the SHoW DMX™ System is its ability to peacefully coexist in the crowded 2.4GHz wireless spectrum. The prevalence of Wi-Fi networks and their increasing importance to theatrical productions pose a unique challenge for the wireless transmission of DMX. The SHoW DMX System has three methods for mitigating its interference on other devices. This article will explain how to go about identifying and avoiding other devices in the spectrum. Both free tools and affordable hardware solutions will be discussed. The goal is to quickly and accurately configure the SHoW DMX System for the best performance of it and all other wireless devices.

Why do a survey?
The purpose of performing a site survey is to locate and identify other devices in the same frequency range as the SHoW DMX System. Once this information is gathered, it will be evaluated to ascertain what devices are show critical and should be avoided. In the most basic systems a laptop with a wireless network card is all that is required. In some more advanced situations, a spectrum analyzer is helpful in identifying other 2.4GHz devices that are not Wi-Fi.

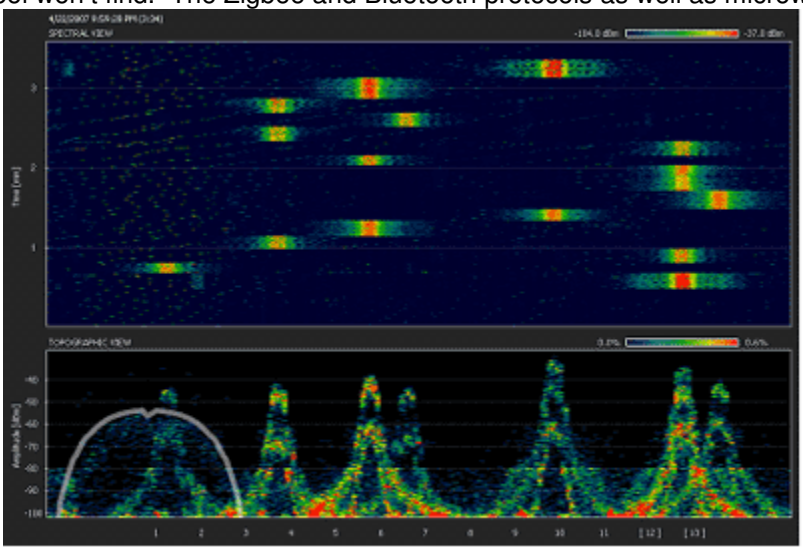
Free survey tools
There are a number of free tools available on the internet for surveying Wi-Fi access points. These tools will tell you what the Service Set Identifiers (SSID) are for the networks within range. They will also tell you the signal strength and broadcast channel for each network. The SSID and broadcast channel are both user selectable items in the configuration of most access points. The SSID, also known as the network name, is the name assigned to the access point. In the United States, there are eleven overlapping broadcast channels for access points. The most common channels are one, six and eleven as they do not overlap with each other. It is highly likely that there will be multiple access points on the same broadcast channel. This should not affect the signal fidelity of the Wi-Fi data. The Received Signal Strength Indicator (RSSI) is typically a numeric value measured in dBm. The greater the RSSI value, the closer or more powerful the radio in the access point.



An example of a free tool built into a laptop for analyzing WiFi traffic.

Other tools

Free tools are great for identifying Wi-Fi signals, but there are many other devices that transmit in the 2.4GHz spectrum that a free tool won't find. The Zigbee and Bluetooth protocols as well as microwave ovens and some cordless phones also broadcast in this range. A spectrum analyzer is a useful tool in identifying all of the radio frequency (RF) in a certain range. Figure one illustrates what a cordless phone and a Wi-Fi access point set to channel one looks like on a spectrum analyzer. While the access point would register on a free tool, there would be no evidence of the other devices. The Wi-Spy USB spectrum analyzer is an affordable tool for this purpose.



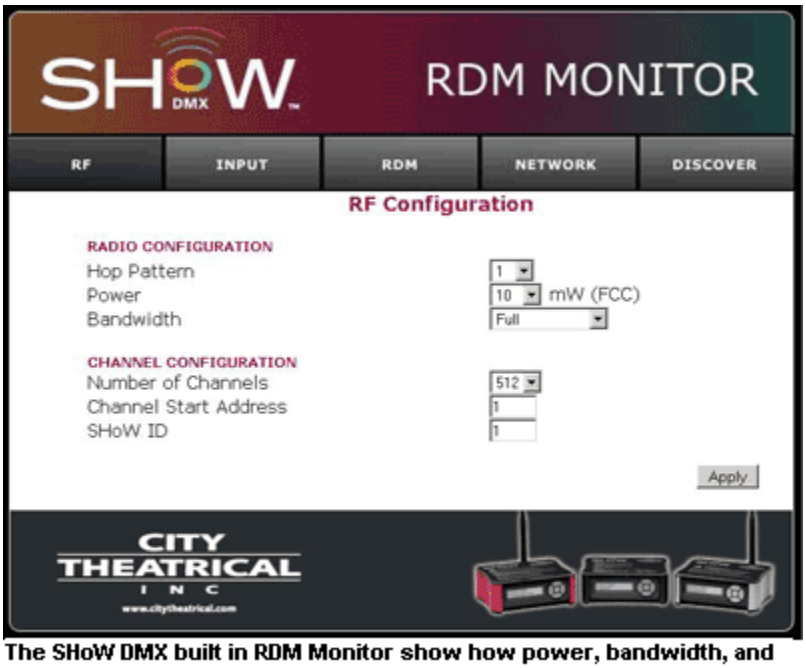
Screen shot of WiSpy

After you have done your survey. . .

Once the survey is performed, the data must be analyzed to determine the best configuration for the SHoW DMX System. The first step is to decide what data is most important. If there are Wi-Fi access points listed for Stage Management or the Audio Department, they may be more important than the Starbucks next door or the free internet everyone is using to check e-mail. The goal here isn't to avoid everything, your data is important too. The idea is to peacefully coexist with the other show critical devices.

SHoW DMX has three methods for limiting its impact on other devices. The first is the adjustable output power. This is analogous to the volume of an audio system. You only need to use enough transmit power to reach the receivers. Like audio, if the volume is too high, distortion may occur. In many indoor theatre situations, 10mW is adequate power.

The second method is the adjustable bandwidth. The Show DMX System has four bandwidth options. The first option, full bandwidth, transmits across the entire 2.4GHz spectrum. The next three options limit the



The SHoW DMX built in RDM Monitor show how power, bandwidth, and number of channels broadcast can be varied to decrease the effect on WiFi signals in the area.

bandwidth to leave open air for other devices to transmit uninterrupted. The three options use Wi-Fi channels 1 thru 6, 4 thru 9 or 7 thru 11. When transmitting on Wi-Fi 7 thru 11, the SHoW DMX System leaves open Wi-Fi channels 1 thru 6. This would allow for access points set to channel one and six.

The last method is limiting the DMX burst size. If a full universe of DMX isn't needed, then transmitting less channels will produce less RF interference. For instance, if only 64 channels are needed, 64 is only 1/8 of 512 which means that 7/8 of the time the radio will be silent. This will greatly decrease the effect on other systems in the area.

Lab tests have shown that even without employing any of these interference mitigation techniques, the SHoW DMX System may only reduce the Wi-Fi throughput by 40%-60%. In most internet related tasks, this may never even be noticeable. The default settings of the system may be all that is required.

Conclusion

The 2.4 GHz area of the RF spectrum has many benefits. It is globally accepted for license free radio use. The wave form has a good mix of range and obstacle penetration. The down side to these benefits is that many devices now have to share this increasingly crowded spectrum. SHoW DMX is designed to play well with other devices. With some free and inexpensive tools, you can ensure all of the wireless devices in your production will peacefully coexist.

Free tools:

Network Stumbler: http://www.netstumbler.com
InSSIDer: http://www.metageek.net/products/inssider/download

Tools that you can buy:

WiSpy: http://www.metageek.net