Measurement Data Collection

Methods, Hurdles and efficiency improvements

ASGMT
American School of Gas Measurement Technology

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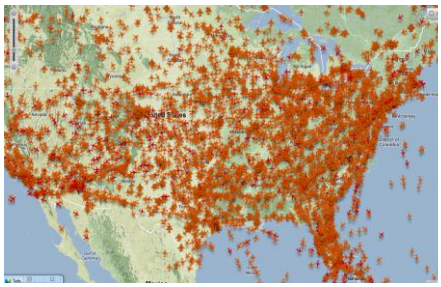
Envision how airline flight concentrations might appear similar to radio traffic. How successful would they be operating with their own agendas, standards and requirements? Operating completely out of control!

You are operating in a free for all of unlicensed wireless transmission!



To understand and improve success in the collection of SCADA and EFM data you must first understand what's in the field their frequencies and communication methods.

Frequency ranges typically utilized in the field are 900 MHz and 2.4 GHz. These frequency ranges were released as "junk band" or public use by the FCC in the 1980's and 1990's. These frequencies were adopted by everything from cell phone manufacturers, wireless home phones, two way handheld radios and many more.

Statistics indicate that there are currently between 750,000 and 1,200,000 radios deployed in the oil and gas fields across the U.S. and sales expectations for 2013 are upwards of 100,000.

In the O&G world we can expect a great many of these to end up in the Bakken play.

As frequency increases the signal is easier to deflect so as you move from 900 mhz radios to 2.4ghz you can expect to deal with more signal deflection and interference from towers, tree's buildings etc. Simply put they signal is easier to block and redirect than the older 900 mhz range.

Radio technology is now making it easier to select a frequency and port, and maintain it. However, many installing radios continue to use the default RF network and ports. This causes adjacent properties to conflict with each other because they constantly try to negotiate and establish connections with sites that are not within your companies operation.

In a perfect world each company in each field would have their own assigned IP's, TCP port range and RF network range. But since we don't live in that world one company will pick ranges that work for them, place towers and repeaters as they require them. Many times this increases the failure rate for another company so they make changes or add repeaters etc.. and the fight continues perpetually. Signal to noise ratios decrease shortening RF range and increasing failures.

The Wattenburg field in Northeast Colorado is a prime example in that RF ranges have been continuously reduced over the last several years from as far as 32 miles to now less than a 6 mile range. Some companies are more successful than others in defending their ranges but overall success is not what it was and the noise floor has been ever increasing which is what typically causes the communication problems encountered by field engineers.

So what can you do about it

How do you recognize, and monitor for predictive failures caused by this pattern of behavior?

1. Review templates for data being requested that is unused in the point schema and remove.
2. Count those bytes, know what is going out and coming in!
3. Monitor request response times, transaction sizes, retires and trend for degradation and predictive failure monitoring.
4. Understand the environment you are working in and streamline your RF network to avoid conflicts with neighboring properties
5. Be creative about statistical data reporting and monitoring.

ISM Statistics

- 1.2 Million radios currently in the field with per year sales of 100,000+ (900 and 2.4ghz frequency range)
- Add to this all cell phones, wireless wifi, bluetooth and other devices on the public bands still in use since 1985.
- The number of RF devices now climbs into the billions!

Why Everything Wireless Is 2.4 GHz From WIRED Magazine By Gizmodo

"A glance at FCC regulations confirms any suspicions. A band of frequencies clustered around 2.4 GHz has been designated, along with a handful of others, as the Industrial, Scientific, and Medical radio bands. "A lot of the unlicensed stuff — for example, Wi-Fi — is on the 2.4-GHz or the 900-Mhz frequencies, the ISM bands. You don't need a license to operate on them." That's Ira Kelpz, Deputy Chief, Office of Engineering and Technology at the Federal Communications Commission, explaining precisely why these ISM bands are attractive to gadget makers: They're free to use. If routers and cordless phones and whatever else are relegated to a small band 2.4 GHz, then their radio waves won't interfere with, say, cellphones operating at 1.9 GHz, or AM radio, which broadcasts between 535 kHz and 1.7 MHz.

Wired magazine quote

"The ISM is, in effect, a ghetto for unlicensed wireless transmission, recommended first by a quiet little agency in a Swiss office of the UN, called the ITU, then formalized, modified and codified for practical use by the governments of the world, including, of course, our own FCC."

What you should be doing today!

- **Know your data priority and timing in your configuration to improve efficiency.**
  - Organize and optimize your polling schedules
  - Organize and optimize your data requests
  - Do not request what you do not use!
- **Track communication statistics that allow you to visualize the outside world. This will determine and measure the success of your changes or implementations.**
- **Monitor and alarm for predictive failures before they become down time !**
- **Learn about Fresnel Zone and how it affects you!**
  - *Pennsylvania regulations impact this greatly by not allowing towers to be taller than treetop height.*

Answer to one of the most common questions!

How much data is in an average EFM record ?

- Calculate approximately .75k per day for EFM data (750bytes per record)
- 3 x Daily EFM data = Approx. 2.5k
- 5 hours x Log Period data = Approx. 4.2k

This Includes the characteristics used in the AGA calculations

- IE: If you collect 3 days or hours of data expect 2.5k of traffic with protocol overhead.
- IF you collect Daily and Log period expect 5k of data.
- Confirm your own overhead by reviewing SCADA logs for the MAXIMUM byte counts returned for requests!