Intelligent and Comprehensive Spectrum Monitoring

Densification, Narrowbanding and Spectrum Sharing have forced spectrum owners to co-exist. Rapid access to knowledge is the key.

Challenge

In developed countries, governments have been reallocating spectrum to address demand. In addition to exclusive licenses, governments are encouraging sharing as a way to expand access (ex: 3.5 GHz in the United States).

In less developed countries, spectrum is actively being mapped for future network infrastructure. The importance wireless plays in emerging economies is well understood.

In either scenario, more spectrum is now being utilized. Much like urbanization of populations, wireless stakeholders are being forced to co-exist with one another. Market shifts, such as densification & Narrowbanding, have migrated signals even closer together, making consistent and intelligent monitoring an essential component to spectrum management. Not just monitoring though, intelligent surveillance, **capable of delivering knowledge rapidly.**

The radio spectrum is a finite resource. Similar to real estate, there is only so much of it. A little over a decade ago, there was enough spectrum to support wireless utilization. Wi-Fi and LTE were in their infancy. The Blackberry, was the standard for smart devices and 3G was more than sufficient to handle traffic.

Nearly a decade later, wireless is the preferred method to handle last mile connectivity. Communication capacity improvements make live video streaming possible on mobile devices. Reduction in size, weight and power consumption requirements, combined with advancements in computer processing, have increased the amount of mobility options available. IoT sensor networks now communicate vital information 24x7.

The Challenge

RF is unpredictable. A decade ago, before the wireless revolution, there were enough trained professionals who understood the science of RF inside and out. As more students have focused their studies on advanced computer design and application development, the number of skilled RF engineers has not increased at the levels required. Add to this, the additional infrastructure, new applications and standards. What was once handled by a single engineer or technician, is now the responsibility of a multifunctional team.

Innovation has delivered increased capability to the consumer, public and private organizations. Unfortunately, innovation in spectrum management systems have not kept pace. Entities with a high reliance on LMR and DMR, are reliant on spectrum analyzers in a highly reactive methodology. Mobile operators augment that approach, with automated systems such as SON, but Self-optimizing networks can only make adjustments based on the data available.

The rapid growth of wireless technology requires more than just reactive monitoring, with limited data sets. The characteristics of today's protocols make discovering the root cause of issues complex. Operators are utilizing reduced transmit power, burst data transmission, non-contiguous spectrum (aggregation) and complex waveforms. Spectrum also needs to be monitored as an ecosystem. Densification, Narrowbanding and Spectrum Sharing initiatives dictate the need to monitor and incorporate adjacent, as well as co-channel behavior into analysis.

Paramount to all of this, is the need for relevant knowledge. Typical monitoring systems aggregate mountains of information but do little to "bridge the gap" to action. Having access to data, does not convey knowledge. Monitoring systems must enable their operators to take command of an RF environment. Transform unstructured and complex wireless data into action. Provide on demand intelligence improving efficiency and optimization.

Solution

DGS SigBase™ systems are autonomous sensor nodes, capable of fast scanning (40 MHz to 6 GHz) and intelligent analysis.

- Event analysis engines process spectrum at the edge, characterizing and storing **relevant** wireless activity.

- Reports transition complex and largely unstructured data, into knowledge for ease of use.

- Interactive, autonomous and remote operations, are all possible with SigBase. The systems are configurable remotely, with knowledge displayed on a **single pane of glass.**

- Multiple data sources are seamlessly combined to provide comprehensive spectral awareness.

- Modular hardware and software systems improve functionality while extending life expectancy.

Intelligent Spectrum Monitoring

Intelligent spectrum monitoring requires a complete overhaul to the monitoring paradigm. Raw, time-stamped and geolocated data is no longer sufficient. Systems need to be fast enough to not only capture every signal within a specified bandwidth, but powerful enough to transform largely unstructured data into meaningful answers. Collection activities also need to be streamlined, with the systems configured for multiple operational scenarios.

SigBase™ is an autonomous and intelligent spectrum monitoring system. With up to 360 MHz of real-time bandwidth (SigBase 6000) and a control engine capable of configuring a single, or multiple independent receivers. The system was built to monitor and assess even the most demanding communication environments.

SigBase™ is delivered with preconfigured jobs, insuring that the correct data sets are collected and the desirable actions are performed. On-board learning engines build models regarding the customary and expected signal activity. These baseline environmental models are the basis for optimization efforts such as channel planning, interference detection and the identification of illicit activity.

SigBase™ nodes can operate independently or as part of a distributed network of nodes. All are controllable from a web based user interface, designed to display knowledge on a single pane of glass. Data evaluation is holistic:

- Contiguous and disparate bands are included in analysis.
- Systems draw upon real-time, learned, user supplied, and publicly available data sets to reach relevant conclusions.

Differentiators - Automated, Intelligent, Agile

- SigBase automates the processes of data collection and analysis, which are traditionally manual and cumbersome:
  - reducing operational bandwidth required.
  - shortening the time to distill actionable knowledge.

- Complex network deployments are replaced with flexible, easy and secure setups:
  - reducing installation time and need to revisit the site.
  - providing faster access to information.
  - fostering an easier approval process with enterprise IT.

- Machine learning automates baselining, triggering and alarming reducing the complexity associated with monitoring spectrum:
  - simplifying the process of finding intermittent interference events.
  - highlighting and alerting the presence of bad actors.
  - identifying the presence of unauthorized transmissions/jammers.

- SigBase provides an agile user interface, which is simple-to-operate, can integrate with, or be integrated with 3rd party systems:
  - allowing critical personnel to easily ascertain actional data on-site or remotely.
  - facilitating the combination of multiple situational intelligence tools in one common platform.

Dynamic Reporting – Usage and Occupancy

Downlink Cellular Demod Application

Digital Global Systems – Intelligent Spectrum Monitoring

Soon, mobile data subscriptions will outnumber the population nearly 2 to 1. Governments globally continue to allocate spectrum to satisfy demand. Wireless creates jobs, enables enterprise to service their client and has become essential for interpersonal communication. The power to intelligently analyze wireless activity and provide relevant knowledge in a timely fashion is essential. SigBase™ simplifies spectrum monitoring by processing large, unstructured data sets the edge and distilling relevant knowledge.

SigBase™ represents the next generation of spectrum monitoring.

Next Steps

To learn more about Digital Global System's CLEARSKY™, please contact your DGS account representative or e-mail sales@digitalglobalsystems.com

About Digital Global Systems

Digital Global Systems focuses on automated and intelligent spectrum management solutions. Digital Global Systems has over 30 patents focused on analyzing wireless environments and delivering knowledge to security professionals globally. Additional information can be found at www.digitalglobalsystems.com

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