The Importance of Frequency Hopping

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Are you a fan of those 1940s black-and-white movies where a damsel in distress gets rescued by a rough-and-ready private eye? If so, then you've probably seen actress Hedy Lamarr. In real life, Hedy was no damsel in distress. She was one of the primary inventors of technology now seen in Wi-Fi®, *Bluetooth*® and code-division multiple access (CDMA).

The technology Hedy Lamarr helped invent is frequency-hopping spread-spectrum (FHSS) radio technology. FHSS is a wireless technology that spreads signals over rapidly changing frequencies. Each available frequency band is divided into subfrequencies. Signals rapidly change, or "hop," among these subfrequency bands in a pre-determined order.

Used in global industrial applications for over 60 years, 900MHz FHSS radios equipped with TI's chipsets like the SimpleLink™ Sub-1 GHz CC1310 wireless microcontroller (MCU) now have the ability to host process-automation apps for the intelligent command and control of remote sensors and devices.

Without having to leverage expensive Wi-Fi bandwidth, lay fiber or employ cost-prohibitive cellular, companies can now take advantage of proven low-power FHSS technology to automate processes at the network edge.

The proliferation of smart sensors and high-bandwidth devices makes low-power FHSS technology a viable and cybersecure wireless data option for oil and gas, unmanned systems (like unmanned aerial vehicles [UAVs] and robots) and original equipment manufacturer (OEM) wireless integration. Because innovators like TI have developed such powerful chips, FHSS is no longer restricted to pure telemetry or input/output (I/O).

Indeed, FHSS increasingly supports voice and video, and can scale to form self-healing mesh networks. Moreover, FHSS transmits data over much longer distances than Wi-Fi, Bluetooth, LoRa or zigbee – up to 60 miles in some cases.

Because FHSS is a wireless technology that spreads its signal over rapidly hopping radio frequencies, it is highly resistant to interference and is difficult to intercept. Interference at a specific frequency only affects the transmission during that extremely short interval, making FHSS inherently cybersecure.

By employing intelligent TI-based FHSS technology, organizations can take advantage of real-world fog computing and intelligent edge communication devices that are cybersecure and resilient. When deployed as process-automation nodes, these devices (pictured in Figure 1) can make decisions and take action at the access level (or at the sensor or device). Indeed, not only is FHSS a reliable and robust option for Internet of Things (IoT) networks, it is also a low capex and opex solution that can work for years without maintenance.
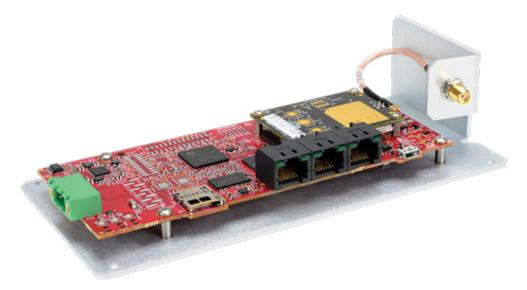
Figure 1. FreeWave's Newest 900 MHz, FHSS Data Radio, the Z9-P. Offers Programmability for True Edge Intelligence. Also, Available in Ruggedized Enclosure.

Contact FreeWave to learn more about FHSS technology and order a couple of TI-powered radios that you can program (in Python, Node-RED and Node.js) for real-world fog and edge applications.

Also, find out more information about the CC1310 wireless MCU and other products within the SimpleLink MCU platform.

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