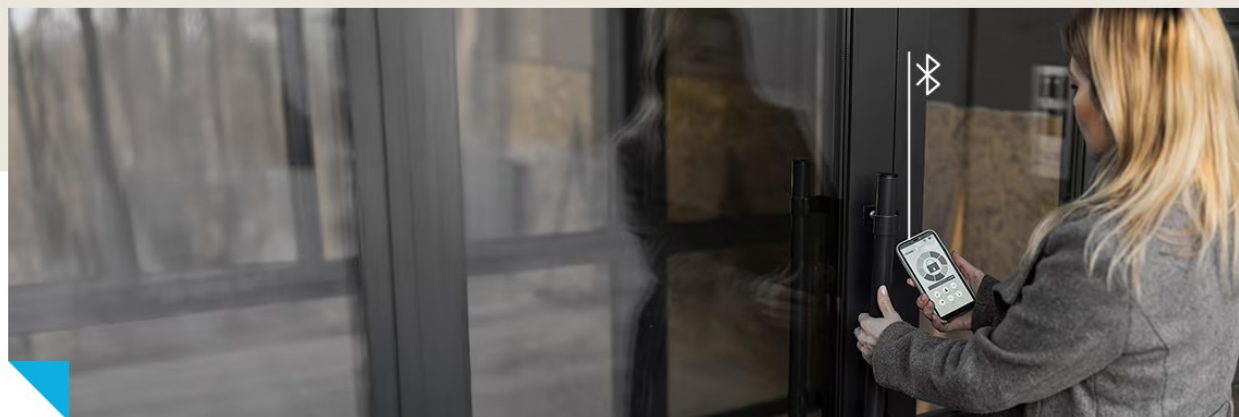


Develop Secure and Accurate Ranging Applications with NXP's MCX W72 Platform



December 16, 2025 by [Miguel Reyes](#)



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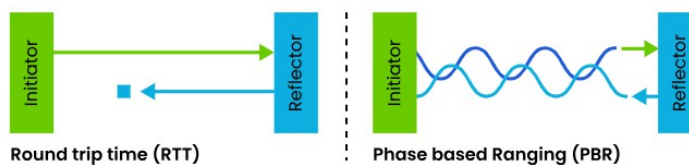


Accurate and secure distance measurements are crucial for industrial IoT (IIoT) environments. Applications range from secure asset tracking and automated warehouse systems to building automation and access control systems. However, standard ranging methods struggle to deliver the accuracy and security features modern IIoT applications demand.

NXP's [MCX W72](#) wireless microcontroller unit (MCU) addresses these challenges with integrated [Bluetooth® Channel Sounding](#) and hardware support via [FRDM-MCXW72](#) and [MCXW72-LOC](#) development boards for rapid prototyping and deployment.

The Benefits of Bluetooth Channel Sounding Technology

For years, Bluetooth ranging relied on Received Signal Strength Indicator (RSSI) and Angle of Arrival/Departure (AoA/AoD) techniques. While simple to implement, these approaches suffer from limited accuracy and security vulnerabilities. For example, RSSI measurements are easily affected by environmental factors and multipath interference. Both methods are susceptible to man-in-the-middle (MITM) attacks where attackers can manipulate signal strength to spoof distance measurements.



This illustrates how Bluetooth Channel Sounding combines round trip time and phase-based ranging measurements.

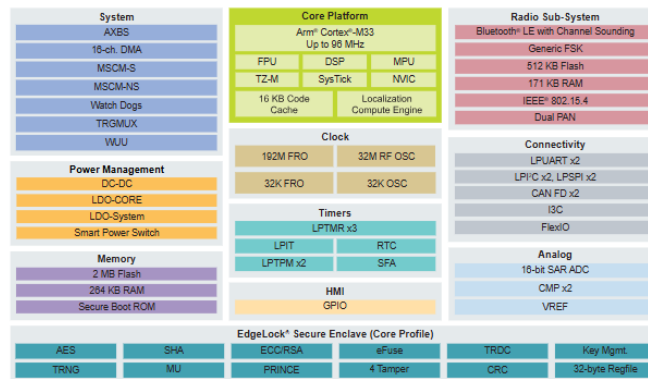
Bluetooth Channel Sounding—a part of the Bluetooth 6.0 specification—takes a fundamentally different approach to distance measurement by combining two complementary techniques: Round Trip Time (RTT) and Phase-Based Ranging (PBR). RTT provides secure, coarse distance estimation via encrypted, time-stamped packets that cannot be reproduced by attackers. PBR then delivers fine-grained accuracy by measuring phase shifts in exchanged tones, achieving the typical accuracy of ± 0.5 meters in open-air environments.

Channel Sounding technology builds a solid defense against relay and amplification attacks by using encrypted packets with timestamps and cross-validating RTT and PBR measurements. This technology is well-suited for applications requiring precise, accurate distance measurements that directly impact security—for example, smart door locks, access control systems, keyless car access, digital home access and building automation systems.

Design your IoT projects with an advanced Bluetooth Channel Sounding and Localization Compute Engine. Order a [FRDM-MCXW72 development board](#) for your next project.

NXP's MCX W72: Channel Sounding for Industrial IoT Applications

The MCX W72 is NXP's Bluetooth 6.0 Channel Sounding-certified wireless MCU designed for industrial IoT applications. The platform supports multi-protocol connectivity including Bluetooth Low Energy (LE), Matter with Thread and Zigbee.



Block diagram of the MCX W72.

For a better experience, download the [block diagram](#).

At the heart of the MCX W72's ranging capabilities is a dedicated Localization Compute Engine (LCE). This specialized hardware accelerates positioning algorithms up to 10 times faster than the main Arm® Cortex®-M33 core, therefore reducing algorithm execution time by nearly 45 %. The result is lower latency and reduced power consumption, both crucial for battery-powered IIoT devices.

NXP's MCX W72 handles security through its integrated EdgeLock® Secure Enclave Core Profile, which isolates sensitive cryptographic operations including key storage and trusted boot processes. Additionally, the advanced Bluetooth LE radio supports up to 24 simultaneous connections, providing robust connectivity for complex IIoT deployments where multiple devices need to communicate and coordinate ranging operations.

Hardware Enablement: Development Boards for Rapid Prototyping

To help developers bring Bluetooth® Channel Sounding into real-world applications, NXP provides dedicated hardware platforms for rapid prototyping. These boards simplify evaluation, reduce time-to-market, and offer flexible options for building secure, accurate ranging solutions.

FRDM-MCXW72 Development Platform

The FRDM-MCXW72 brings NXP's proven FRDM platform approach to wireless development. This cost-effective board comes preprogrammed with a wireless demo that works immediately with the NXP IoT Toolbox mobile app, allowing developers to evaluate basic functionality within minutes of unboxing. The board offers multiple expansion options including Arduino headers, mikroBUS and peripheral module (Pmod) connectors, which makes it easy to add sensors and peripherals for application-specific prototyping. An on-board MCULink debugger based on the LPC55S69 also eliminates the need for external debug tools. Additional features include external flash memory, inter-integrated circuit (I²C) sensors, a light sensor, RGB and blue LEDs, controller area network (CAN) connectivity, a printed circuit board (PCB) antenna and a uFL connector for conductive (cable) measurements.

MCXW72-LOC Localization Board

For developers focused specifically on Channel Sounding applications, the MCXW72-LOC offers a purpose-built evaluation platform. This IIoT evaluation kit provides exhaustive testing capabilities for the MCX W72's multiprotocol wireless support, including Bluetooth LE, Zigbee, Thread, Matter and CAN connectivity.

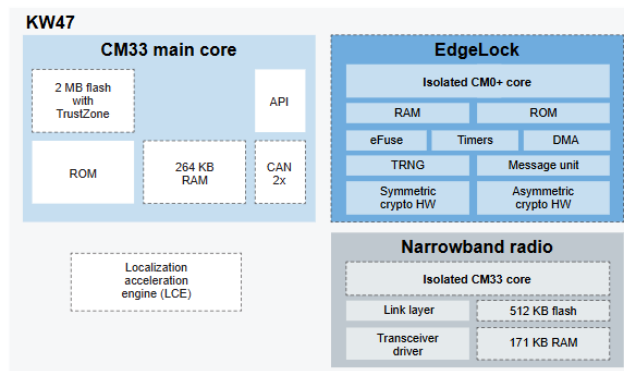
The MCXW72-LOC features a dual antenna diversity system where an RF switch dynamically selects between two 2.4 GHz antennas, improving ranging accuracy compared to the single antenna on the FRDM-MCXW72 board. SMA connectors can be selected instead of antennas by re-soldering the capacitor. This enables conductive (cable) measurement experiments.

The MCXW72-LOC board comes pre-programmed with a channel sounding demo. Developers can pair two MCXW72-LOC boards to seamlessly demonstrate wireless ranging sessions and evaluate performance in real-world conditions. The platform also offers an advanced MCU-Link debug probe, power and low-power options, dual CAN transceivers, buttons, switches, LEDs and a MikroE Click connector for easy sensor integration.

Development Ecosystem Support

Both boards are fully compatible with NXP's development ecosystem. The MCUXpresso software development kit (SDK) provides drivers, examples and comprehensive documentation. Additionally, the Application Code Hub (ACH) offers expert-written code examples to accelerate development while the Expansion Board Hub (EHB) connects developers with compatible add-on boards from NXP and our ecosystem partners. NXP's proprietary algorithms handle the task of converting raw Channel Sounding measurements into accurate distance estimations, abstracting the difficult math for application developers.

NXP's KW47: Bringing Channel Sounding to Automotive Systems



KW47 architecture.

For a better experience, download the [block diagram](#).

While the MCX W72 targets IIoT, NXP's KW47 brings the same Channel Sounding capabilities to automotive applications. As NXP's first automotive-grade Bluetooth 6.0 Channel Sounding MCU, the KW47 meets the AEC-Q100 Grade 2 qualification and supports Automotive Software Process Improvement and Capability Determination (ASPICE), Motor Industry Software Reliability Association (MISRA) software standards and AUTOSAR with CAN communication.

NXP's KW47 enables secure digital key systems and car access applications with impressive range—offering the capability to detect drivers up to 100 meters away with 20-50 cm accuracy at close range. The shared platform architecture between KW47 and MCX W72—including the same LCE and EdgeLock security ensures a consistent development experience and interoperability across automotive and IIoT applications. The KW47-LOC development board also provides automotive developers with evaluation tools similar to the MCXW72-LOC for IIoT applications.

Production-Ready Solutions Available

NXP's MCX W72 and KW47 are in production. Development boards are available now, allowing developers to start prototyping right away to prepare for production launches.

Unlock the possibilities. Discover the [FRDM-MCXW72](#).

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Miguel Reyes is a System Enablement Engineer at NXP Semiconductors, where he leads product development for Automotive Bluetooth Low Energy (LE) and IoT applications. His work focuses on advanced Bluetooth LE features such as Channel Sounding, as well as support for IEEE 802.15.4-based protocols, including Matter, ZigBee and OpenThread. With nearly 15 years of experience at NXP, Miguel has been a key contributor across the Systems, Applications and Enablement teams, working on a wide range of embedded systems and wireless connectivity solutions. His efforts have been instrumental in driving customer engagement and mass-market enablement for NXP's wireless portfolio, particularly within the automotive and IoT sectors.