

CASE STUDY

UWB solutions



Your Experienced Partner in UWB Development Implementation and Certification

Starting its cooperation with the **FiRa Consortium** in 2020, Comarch has played a pivotal role in advancing ultra-wideband (UWB) technology. Collaborating with multiple vendors, Comarch contributed to the **creation of FiRa 1.0, FiRa 2.0, and FiRa 3.0 standards and test specifications**.

So far, Comarch has participated in several commercial projects regarding UWB technology. We have our own products for testing UWB FiRa and we provide services for companies creating their UWB solutions. We have used and implemented solutions based on **Qorvo, NXP** and **SPARK Microsystems** modules.

UWB Consultancy Projects

Comarch's performed an Ultra-Wideband (UWB) stack architecture review for our client **SPARK Microsystems** ensuring that the solution is robust, scalable, and future-proof. Comarch was responsible for:

- **Architecture validation** to ensure the architecture's scalability, modularity, extensibility, and readiness for future features, all aligned with industry best practices.
- **Performance evaluation** to assess throughput, reliability, energy efficiency, synchronization, signal processing, data flow, resource allocation, and UWB radio usage. Diagnosing and removing bottlenecks and design flaws.
- **Interoperability assessment, code review and documentation.**

For a Tier 1 automotive customer, Comarch conducted a technical consultation which included:

- Software architecture design
- Application design review
- Concept study
- Performance evaluation
- Code review, best practices and documentation
- Recommendation and improvement suggestions (bottlenecks, security)

UWB Stack Implementation



SPARK Microsystems

To better align with our clients' business needs, we focus on stack improvements based on our previous review:

- **Time optimization** to reorganize configuration for faster execution and parallelized statistical calculations to avoid UWB communication delays.
- **Memory optimization** to improve memory allocation to reduce waste.
- **Low power mode** to enable the MCU to enter low power mode.
- **Credit flow** to implement a device communication flow control mechanism.
- **New features**, adding communication scheduling based on time slot configuration.
- **General improvements** including additional stack optimization enhancements.

FiRa UWB



SPARK Microsystems

Comarch developed its own MAC layers dedicated for Comarch FiRa test tools.

For FiRa 1.0 and FiRa 2.0 based on the Qorvo module.

For FiRa 2.0 and FiRa 3.0 based on the NXP module.

UWB Device Control SDK Tool Implementation

Comarch engineers developed a tool that was the part of SDK used to demonstrate the capabilities of the UWB module. The Comarch team was responsible for implementation of the application logic and user interface.

Examples of functionalities:

- **Bidirectional communication** allowing the GUI to send and receive requests, configurations, and status updates with the firmware.
- **Wireless statistics and plotting**, so the GUI displayed wireless and application statistics, with support for exporting data in formats like PDF and CSV.
- **Device management** including options to detect, connect, and manage carrier boards, including renaming boards and verifying firmware compatibility.
- **Advanced configuration** introducing a DataLink application which allowed users to configure advanced parameters such as antenna diversity, modulation, and PHY rates, along with detailed metrics like data rate and packet delivery ratio.

These are just a few examples of the SDK tool's functionality.

UWB FiRa Test Tools

Comarch developed and now offers **MAC conformance and interoperability test tools** for the FiRa 1.0, FiRa 2.0 and FiRa 3.0 Standards.

Comarch is a member of the JUMPWG created between [FiRa Consortium](#) and [Car Connectivity Consortium](#). Test cases dedicated for the **CCC Digital Key 3.0** are part of the FiRa 3.0 MAC Conformance test tool.

Comarch's solution is used by every FiRa authorized test laboratory and many UWB vendors. Comarch's test tools enable accurate debugging, ensuring that solutions meet the requirements of FiRa standards. By providing these tools, Comarch helps vendors streamline development, enhance compliance, and significantly reduce time to market for UWB FiRa products

Our test tools are used by FiRa members

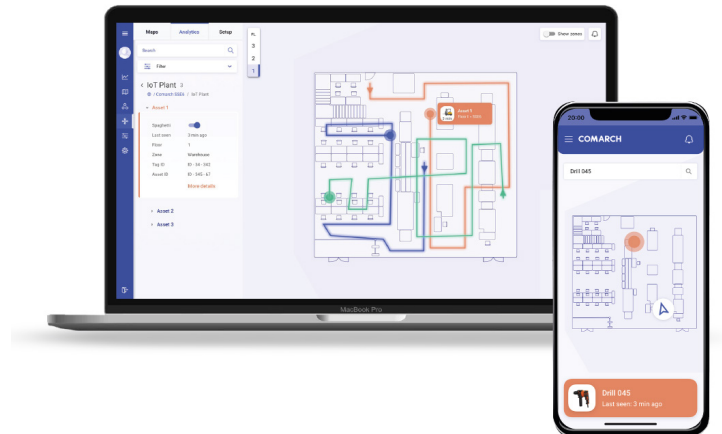


Our own UWB products

Comarch has created and commercially offers Asset Tracking solution based on **UWB technology**. Application was created on the Qorvo module (Decawave DWM1001C).

Comarch IoT Asset Tracking solution has been commercially implemented in:

- Tempered glass factory,
- Private aircraft factory,
- Aluminum castings factory,
- Campervans factory.



There Are More Technologies We Can Help You With

We have experience with a wide range of communication technologies, including **RFID, NFC, Bluetooth Classic, BLE, Wi-Fi, and UWB**. This means we can support the creation of dual-module solutions that combine multiple wireless technologies.

Comarch also has in-depth understanding of various operating systems, including **FreeRTOS and Zephyr**.

Our expertise in these areas allows us to select the most appropriate platforms for specific projects, ensuring the stability, flexibility and high performance of **embedded solutions**. As a result, we are able to develop systems that meet technical and business requirements and deliver optimal performance across a range of applications.

Why Choose Comarch?

Comarch is an expert in UWB technology, backed by a team with extensive experience in delivering various complex projects. We specialize in innovative solutions tailored to the evolving needs of our customers. Our approach combines flexibility with the latest trends, enabling the efficient implementation of UWB systems in various industries, including automotive, IoT and audio-video.

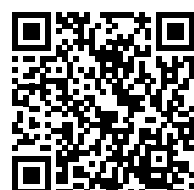
- We provide **comprehensive UWB development services** including custom features or additional functionalities.
- As an **official supplier of FiRa's UWB test tools**, we have been working with them for five years to refine the standard, align our test tools with FiRa's specifications, and support the entire FiRa UWB ecosystem.
- **UWB is just one of the many wireless technologies we are experts in.** Our broad expertise across multiple technologies allows us to leverage our knowledge and skills to further advance this technology.



Case Study
Spark Microsystems



ComarchTechnologies



Comarch UWB