FiRa | The Power to Be Precise

ANNUAL REPORT 2024

Expanding the Reach of UWB

Board Chair Message

UWB Growth Through Collaboration

As Chair of the FiRa® Consortium, I am honored to reflect on a year of remarkable progress in expanding the reach of ultra-wideband (UWB) technology. Our collective efforts in 2024 have strengthened FiRa's mission to drive UWB adoption globally, making UWB an essential enabler of secure and precise positioning. This Annual Report captures the significant strides we've made in creating an open, interoperable ecosystem that benefits industries worldwide.

Clint Chaplin
Chair of the FiRa Consortium
Samsung Research America

Expanding UWB's Reach

In 2024, FiRa focused on deepening collaborations and advancing UWB's main capabilities, setting the stage for broader market impact. This has been achieved through key partnerships and liaisons:

- **Joint UWB MAC/PHY Working Group (JUMPWG):** Collaboration with the Car Connectivity Consortium® (CCC) has progressed the use of UWB in Digital Key solutions, enhancing security and interoperability in the automotive industry.

- **Liaison with the Connectivity Standards Alliance:** Aligning technical specifications with the Connectivity Standards Alliance will help streamline UWB's integration into smart home ecosystems.

- **Partnership with omlox:** We are working to ensure that UWB is interoperable with other positioning technologies, such as RFID and Bluetooth® Low Energy, particularly in industrial IoT environments.

Our focus has also been on the development of transformative use cases for UWB, which include:

- **Public transport payment systems** and **tap-free mobile payments**

- **Untracked Navigation** for precise positioning without real-time tracking

- **Logical access control** for secure entry to digital environments

These innovations position UWB for widespread adoption across industries, demonstrating its power to advance connectivity experiences.

Technical Milestones in 2024

This year, we introduced the FiRa Core 3.0 Specifications, which have enhanced UWB's capabilities with two major advancements:

- **Hybrid UWB Scheduling (HUS)**: Enables advanced UWB applications that require various combinations of FiRa features to work together in a predictable way, ensuring optimized performance in complex environments such as public transport systems.
- **Dedicated Data Transfer**: Improves data-heavy applications by allocating time slots exclusively for data transfer, independent of ranging operations.

Security

Security has also been a top priority; in 2024, FiRa made significant strides with:

- The introduction of a **Security Certification Framework**, ensuring UWB devices meet stringent security standards.
- The launch of a **Security Incident Reporting** portal, allowing timely identification and resolution of potential security issues.

Marketing and Outreach

FiRa's Marketing Working Group (MWG) has been pivotal in raising awareness of UWB's potential through new initiatives, including:

- Launching new web pages, publishing new blog articles, and implementing a social media strategy to keep our members and industry informed.
- Hosting the FiRa Showcase in Osaka, an open event demonstrating advanced UWB use cases, which we plan to replicate at future in-person gatherings.

Our Members Drive Success

FiRa's success is driven by the dedication of our members, whose insights and contributions propel the UWB ecosystem forward. As we move into 2025, continued member involvement is critical in realizing the full potential of this transformative technology and shaping the future of UWB.

Becoming a FiRa member or liaison partner offers unparalleled opportunities to contribute to the development of UWB standards, access technical resources, and collaborate with industry leaders. Together, we can accelerate UWB adoption and unlock new possibilities across diverse industries.

In conclusion, 2024 has been a year of progress and innovation, with UWB adoption accelerating across key markets. Collectively, we are expanding UWB's reach and solidifying its role as a foundational technology for the future of connectivity. I look forward to collaborating with all of you as we continue this journey into 2025 and beyond.

Sincerely,
Clint Chaplin
Chair of the FiRa Consortium
Samsung Research America

Expanding the Reach

Expanding the Reach of UWB

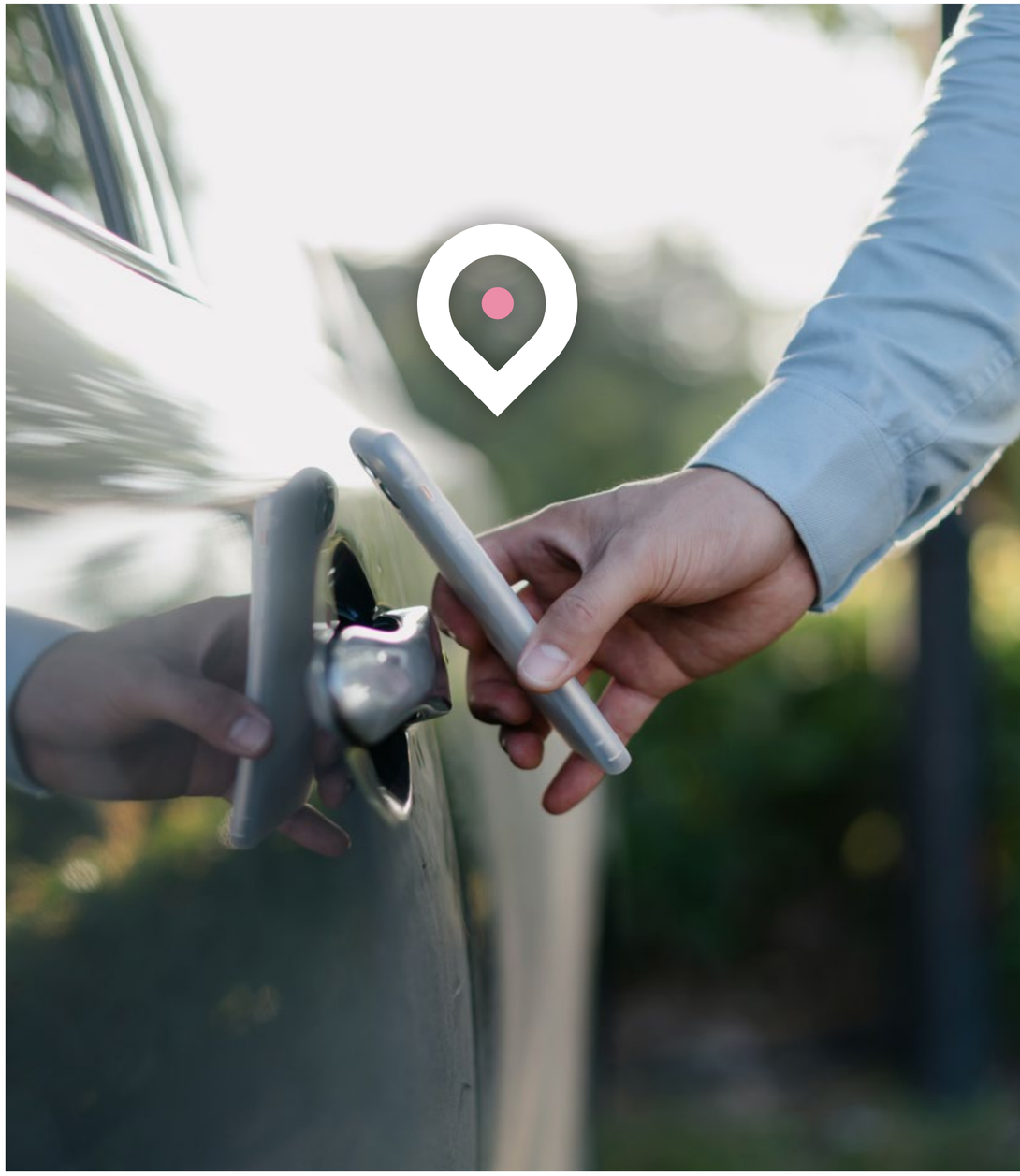
FiRa Consortium is expanding the reach of the UWB industry by ensuring device interoperability, fostering collaboration among member organizations and liaisons, and advancing the technology through its robust Certification Program. The Certification Program is a cornerstone of FiRa's work and is designed to help ensure that UWB devices from different manufacturers can operate seamlessly together. This process, focused on UWB's precise location and fine-ranging capabilities, is critical for expanding UWB's applications in sectors such as automotive, smart home, and consumer electronics.

FiRa also serves as a central hub for industry collaboration, bringing together over 100 global companies, including leading technology players like Apple, Bosch, Cisco, Google, HID, NXP, Qorvo, Qualcomm, and Samsung.

Through these collaborations, FiRa ensures that UWB technology remains interoperable, secure, and aligned with global standards, accelerating its deployment across various industries.

Partnerships to Shape the Future of UWB

In addition, **FiRa's relationships** with key industry organizations, including the Car Connectivity Consortium® (CCC), Connectivity Standards Alliance, omlox, EMVCo, ETSI, IEEE, and GlobalPlatform™, help align UWB with other evolving technologies. These partnerships, along with FiRa's efforts in developing specifications for secure access, location-based services, and device-to-device communication, are vital for UWB's continued expansion into new markets like automotive and industrial IoT. By promoting standardization and collaboration, FiRa ensures that UWB technology remains reliable, secure, and scalable for global adoption.



The FiRa Certification Program at Work

When certifying a product with the FiRa Consortium, the comprehensive workflow includes FiRa members, Validated Test Tools, and Authorized Test Laboratories (ATLs), all collaborating in alignment with the latest FiRa Specifications. The end result? A growing number of FiRa Certified Devices.

Here's a look at what was accomplished in 2024:

Validated Test Tools that can be used in conformance testing for FiRa 2.0

Test Tool Vendor	Function	Model
Comarch	MAC Conformance	Comarch MCTT Comarch MCTT 2.0
Comarch	MAC/PHY Interoperability	Comarch ITT Comarch ITT 2.0
Keysight	PHY Conformance	VXT- M941xA
LitePoint	PHY Conformance	Gigg-UWB IQgig-UWB+
National Instruments	PHY Conformance	VST 2nd generation, PXIe-583x VST 3rd generation, PXIe-5842
Rohde & Schwarz	PHY Conformance	CMP200
Welzek	PHY Conformance	T6290F T6290U

Authorized Test Labs

Test Labs authorized to test for FiRa 2.0 MAC Conformance, PHY Conformance, and MAC/PHY Interoperability.

CAICT – China
DT&C – South Korea
SRTC – China
TTA – South Korea

2024 FiRa Certified Devices

Company	Device	Certification Release
Chipsbank	CBU5000V210	2.0
GiantSemi	GT1500	2.0
Maxscend	MXD2710	1.0
NewRadioTech	NRT82885	2.0
NXP	Trimension NCJ29D5	1.0

Core 3.0 Release

FiRa Core 3.0 Introduces Game-Changing UWB Capabilities

With the rise of increasingly complex use cases for UWB technology, FiRa continues to innovate and expand its capabilities.

The introduction of the FiRa Core 3.0 Specifications and FiRa Core 3.0 Certification Program launch in January 2025 adds three new features, two of which are new FiRa enhancements: Hybrid UWB Scheduling (HUS) and Dedicated Data Transfer, which enhance the efficiency and versatility of UWB systems.

As a third enhancement, FiRa adds the CCC Digital Key UWB feature to its Certification Program.

Hybrid UWB Scheduling (HUS)

HUS is designed to manage complex scenarios where multiple UWB applications function simultaneously, such as positioning, device discovery, secure ranging, and data transfer. HUS ensures efficient and smooth operation by coordinating multiple sessions within a single framework. A central controller manages the primary session and allocates air time for secondary sessions using a time-division scheme.

These secondary sessions may involve tasks like ranging or data transfer. Devices are synchronized through a new control message, CM Type 3, which informs them of their role—whether they are managing or simply participating in the session. HUS supports numerous scenarios, making it ideal for environments like public transportation, where multiple UWB functions must coexist smoothly.

Dedicated Data Transfer

In previous specification versions, data transfer was possible by piggybacking data onto ranging messages, which worked well for basic use cases. However, FiRa Core 3.0 introduces a Dedicated Data Transfer mode, allowing devices to use entire time slots solely for data exchange, independent of ranging operations. This results in more efficient communication, especially for data-heavy applications. A new control message, Data Transfer Protocol Management List (DTPML), facilitates this process, making data communication smoother and more organized.

To support the new Dedicated Data Transfer mode, FiRa developed two new specifications: FiRa Link Layer (LL) Technical Specification and FiRa Link Layer (LL) Conformance Test Specification. These define and test various data communication methods, such as connection-oriented and connection-less modes, and include services like segmentation and reassembly, in-order delivery, and error-free retransmission, ensuring reliable data transfer. Additionally, the Link Layer allows the system to manage time slots or delegate control to the UWB system, with basic support for quality of service.

CCC Digital Key UWB

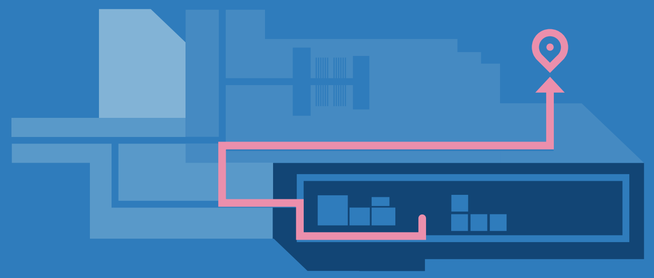
In this core certification version, the car access use case defined by CCC is enabled. UWB is used as a technology to determine the proximity of the mobile device (containing a digital key) to the car. Therefore, CCC defined its specific one-to-many double-sided, two-way ranging protocol.

> These advancements in FiRa Core 3.0 make UWB more efficient and adaptable for complex applications.

Current Applications

Shaping the Future with UWB Applications

FiRa Consortium is at the forefront of driving innovative applications for UWB technology, opening up new possibilities across various sectors. Some of the exciting use cases currently being developed include:

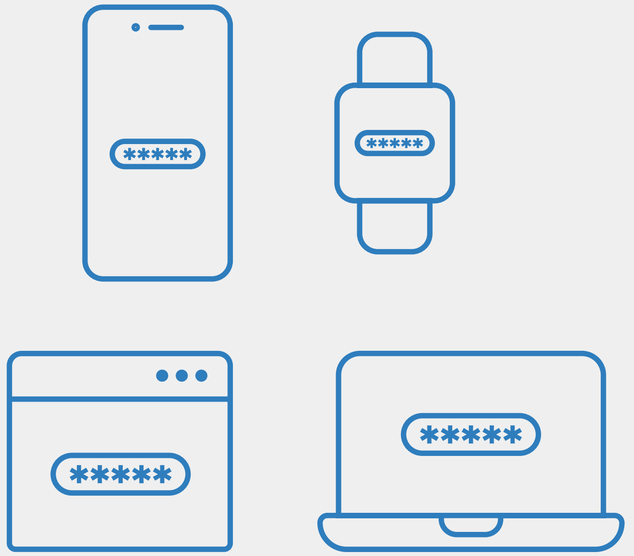


Untracked Navigation

With UWB, users can navigate spaces, like airports or malls, without relying on GPS, making indoor wayfinding more intuitive and precise.

Logical Access

UWB enables secure and seamless access to computers and other devices, making traditional passwords a thing of the past.



Public Transport Fare Collection

Imagine hopping on a bus or train and having your fare automatically calculated and paid—UWB is making this possible with touchless fare collection systems.

The potential impact of these use cases on the UWB industry is significant. As FiRa's architecture and specifications for these applications are embraced by major industry players, it introduces high-volume UWB use cases to the market, demonstrating the immense value of UWB technology to both consumers and stakeholders alike.

For FiRa and its members, this success will further solidify FiRa's role as a key player in shaping UWB specifications and device certification. This, in turn, could attract new members from related industries, expanding FiRa's influence across the UWB ecosystem. As development progresses, additional applications will be added, further expanding the range of valuable UWB solutions being created.

Tap-Free Mobile Payment

UWB technology is paving the way for tap-free mobile payments, allowing users to make secure transactions without even taking their smartphone out of their pocket.

Liaisons

Building a Unified UWB Ecosystem Through Industry Collaboration

The FiRa Consortium is actively collaborating with the CCC, Connectivity Standards Alliance, IEEE, omlox, and GlobalPlatform™ to expand and strengthen the UWB ecosystem.

By working with these industry stakeholders, FiRa aims to develop comprehensive technical solutions for UWB-based services and ensure seamless integration across various vertical markets. These partnerships help define key parameters and approaches, driving innovation and growth for UWB technology globally.

Driving UWB Standards Forward for the CCC and its Digital Key

The Car Connectivity Consortium® (CCC) is a cross-industry organization advancing smartphone-to-car connectivity technologies. In 2023, the CCC and FiRa Consortium established the Joint UWB MAC PHY Working Group (JUMPWG) to jointly develop and maintain UWB technology specifications for the CCC Digital Key.

In 2024, the JUMPWG made significant progress, with both organizations collaborating on Core Certification for the CCC's Digital Key UWB System.

The group also assessed how FiRa can best support CCC certification efforts, including test case applicability for CCC devices and vehicle certification. Additionally, JUMPWG focused on jointly advancing functional and security certifications.

CCC and FiRa remain dedicated to collaboration, sharing a unified vision of interoperability to foster a robust UWB device ecosystem. This collaboration is critical to ensuring that UWB technology meets the evolving needs of the industry.

Learn more about the CCC.

Elevating UWB Standards with the Connectivity Standards Alliance

The Connectivity Standards Alliance collaborates to create and evolve universal open standards for the products transforming how we live, work, and play. The Alliance leads the movement toward a more intuitive, imaginative, and useful world.

In 2024, FiRa made a significant stride in the evolution of UWB technology by partnering with the Alliance. This collaboration focuses on enhancing interoperability, reducing development and certification costs, and creating a streamlined certification process for UWB technology.

Looking ahead, this partnership aims to simplify UWB deployments in sectors such as smart home, automotive, and industrial IoT, while encouraging further innovation and growth in the market. The combined efforts of FiRa and the Connectivity Standards Alliance will help UWB technology reach its full potential.

Learn more about the Connectivity Standards Alliance.

Advancing Global UWB Interoperability with IEEE

IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. The organization is committed to being essential to the global technical community and technical professionals everywhere, and universally recognized for the contributions of technology and technical professionals in improving global conditions.

FiRa's journey toward developing a UWB-enabled ecosystem began with leveraging the IEEE standard 802.15.4 and the IEEE 802.15.4z Amendment 1. By supporting the IEEE's work with an interoperable HRP standard, FiRa will be capable of developing service-specific protocols for multiple verticals and defining the necessary parameters for a wide range of applications.

Learn more about the IEEE.

Joining Forces with omlox for Cross-Technology Compatibility

omlox is the world's first open locating standard, designed to enable interoperability in indoor and outdoor locating leveraging technologies like UWB, RFID, Bluetooth® Low Energy, and mobile broadband.

The liaison between omlox and FiRa began in 2023.

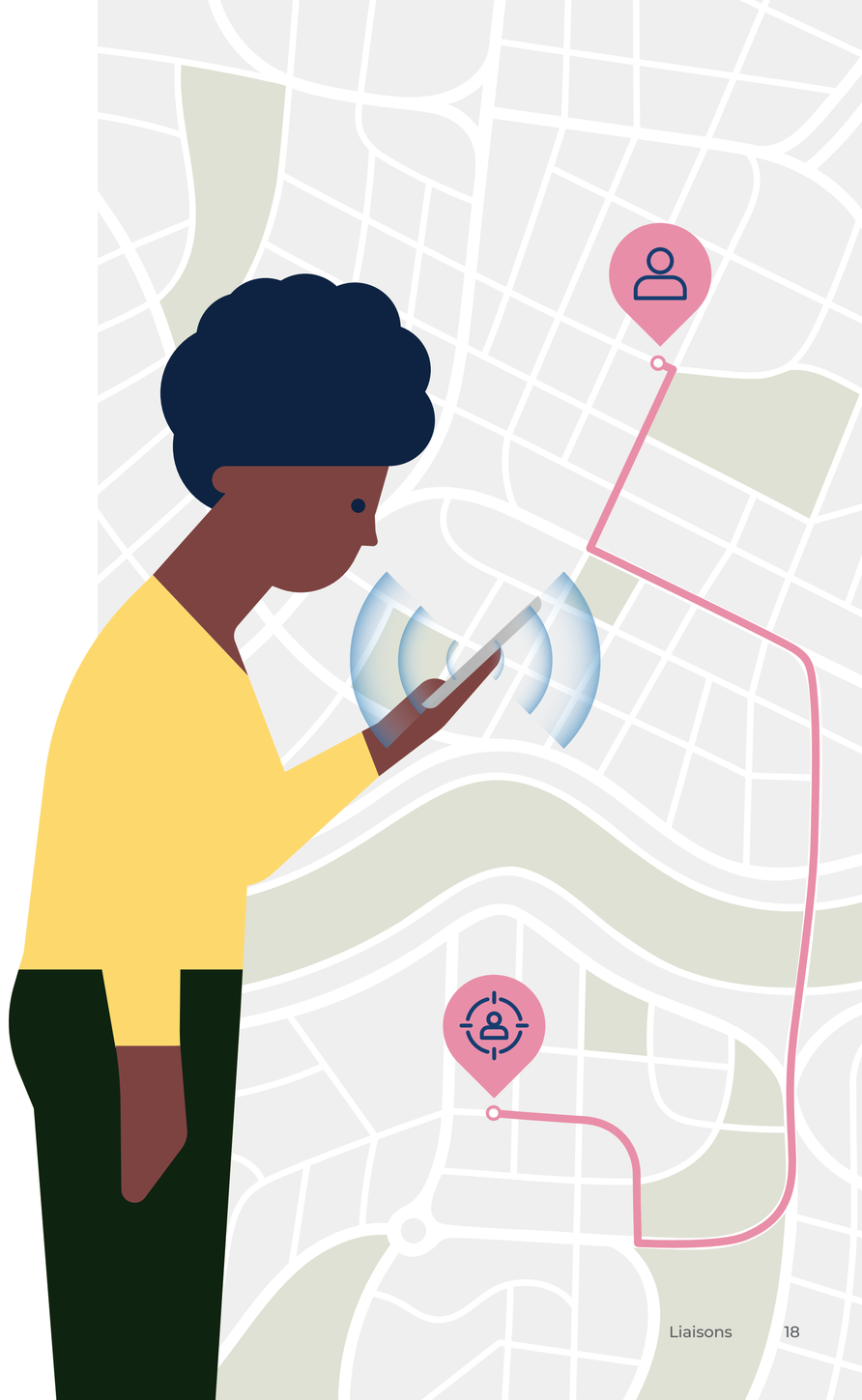
While omlox and FiRa have different missions and approaches toward UWB applications, they share common goals in advancing accurate localization. That is why FiRa and omlox collaborate to examine opportunities for seamless coexistence in their common areas of interest.

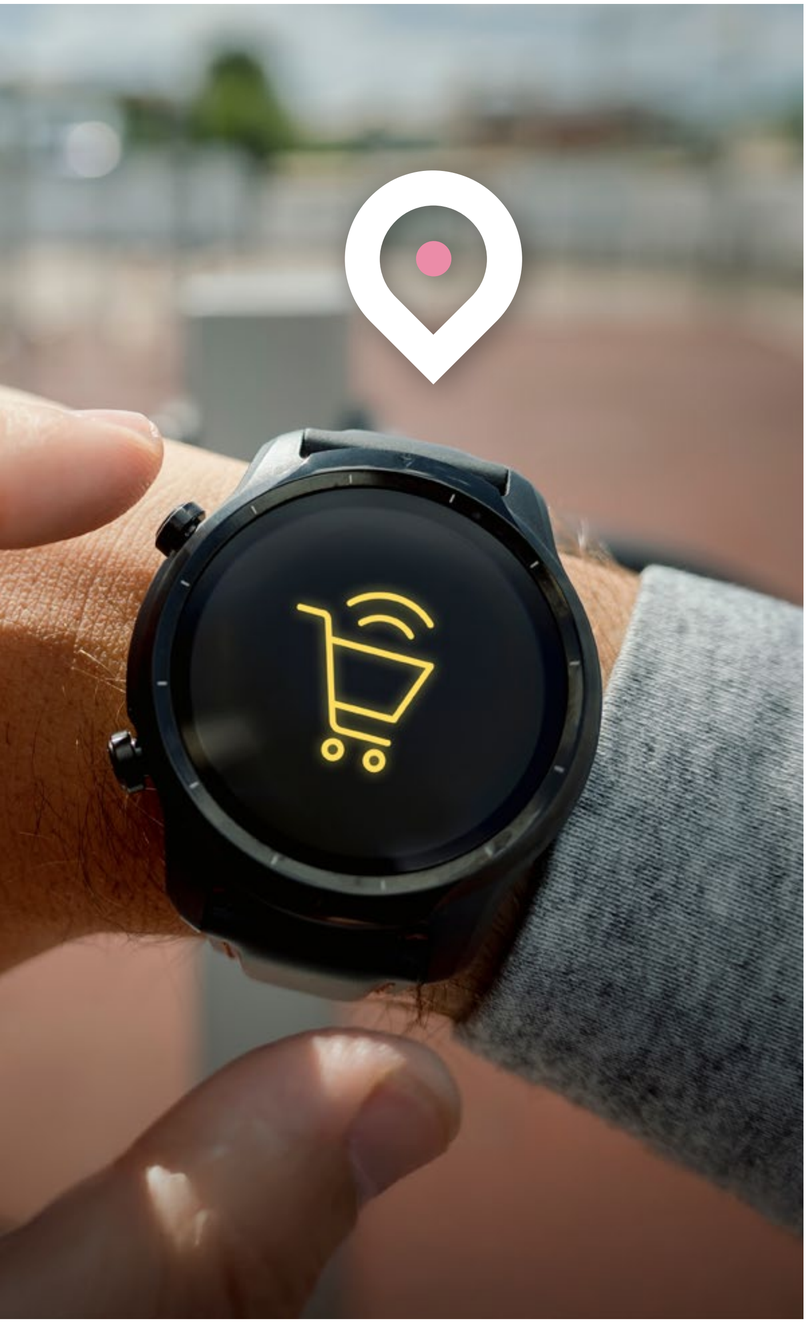
Even though omlox focuses on industrial use cases, and FiRa has many consumer-oriented use cases, this liaison is a good opportunity for complementarity between the two organizations.

As UWB adoption rapidly grows, FiRa and omlox solutions will inevitably appear in the same environments. By working together, both organizations aim to maintain an optimal user experience, allowing for the harmonious use of their technologies across various scenarios.

FiRa's partnership with omlox reflects its commitment to ensuring our solutions integrate smoothly into industrial environments, benefiting from omlox's expertise, and enabling broader compatibility.

Learn more about omlox.





Aligning to Elevate UWB Security Protocols with GlobalPlatform

GlobalPlatform™ is the standard for secure digital services and devices and develops specifications that enable collaborative and open ecosystems. This includes two important technologies that FiRa uses to enhance security and functionality:

- **Secure Element**: The GlobalPlatform Framework allows FiRa to securely deploy and manage its applications, like the FiRa Applet, into a device's Secure Element, ensuring that all necessary data is securely managed. Additionally, this framework enables the FiRa Applet to establish secure communication with other devices when needed.
- **Security Evaluation Standard for IoT Platforms (SESIP)**: FiRa is currently developing a security profile based on the Security Evaluation Standard for IoT Platforms (SESIP) to strengthen protection for UWB technology. Since security is critical in the UWB environment, staying aligned with the latest SESIP standards helps FiRa maintain robust security measures.

FiRa's collaborative relationship with GlobalPlatform, established in 2024, enables FiRa to request new features when necessary and ensure that security remains a key focus as UWB technology evolves.

Learn more about GlobalPlatform.

Building a Streamlined UWB-Supported Payment Ecosystem with EMVCo

FiRa is collaborating with EMVCo®, a global technical body that helps enable safe, reliable, and convenient payments worldwide. EMVCo's specifications ensure that payment products work securely and seamlessly across different platforms and technologies, thus making them a key partner for future UWB-supported payment systems.

The release of FiRa 3.0 in 2024 will provide the basis for both organizations to work jointly on the requirements for secure, convenient, and efficient transactions using UWB technology. With UWB's widespread use in smartphones and wearables, its built-in security measures make it an attractive option for enhancing payment systems in various use cases.

FiRa and its members aim to demonstrate the potential of UWB in secured wireless payments, laying the foundation for global adoption. The first demonstration was presented by JCB (EMVCo Member) during the FiRa face-to-face member meeting in Osaka in October 2024.

Learn more about EMVCo.

Demos

Inspiring Demos in Osaka: Showcasing UWB Innovations and Future Potential

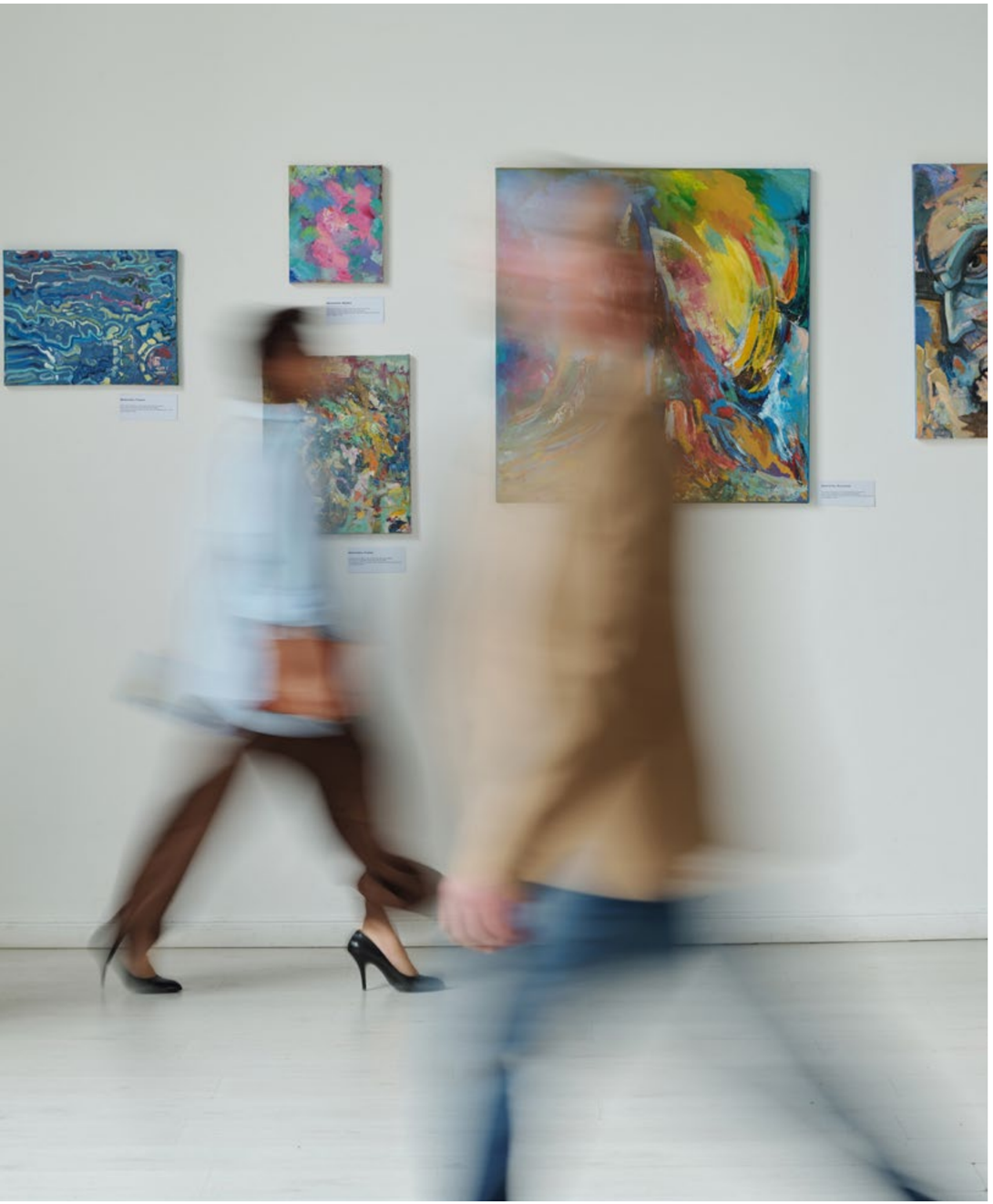
During the October FiRa Consortium's face-to-face event in Osaka, Japan, members and guests experienced an unprecedented opportunity to network and explore advanced UWB implementations. For the first time, both FiRa members and non-members showcased their UWB-enabled solutions, sparking insightful discussions on the future of UWB technology. Three key demonstrations underscored the versatility and growing impact of UWB:

1. iMago and JCB: Chikazuite-Check

This UWB-enabled payment solution aims to streamline the checkout experience through minimal interaction. By leveraging UWB and Bluetooth® Low Energy technologies, "Chikazuite-Check" allows users to pre-configure their checkout preferences—such as payment type, age verification, and eco-friendly options—via a smartphone app. Upon entering a store, the app automatically relays this information to the cashier's system, simplifying the entire payment process without requiring the user to remove their phone or speak with staff. Designed with insights from Japanese youth, this solution responds to a growing desire for seamless, low-contact transactions.

2. Pinpoint: Indoor Navigation Using FiRa DL-TDoA

Pinpoint demonstrated how UWB can enhance indoor navigation accuracy. The setup allowed attendees to use commercially available smartphones, such as Google Pixel 8 Pro, Samsung Galaxy S24, and Galaxy S21, for real-time location tracking, providing precise navigation on an Android app. By using the FiRa Distance-Based Location-Time Difference of Arrival (DL-TDoA) method, this demonstration showed how the technology enables accurate indoor positioning in any environment. The potential applications were clear: large venues, airports, or shopping malls, where users could benefit from real-time indoor guidance on their devices.



3. Sharp: Interactive Museum Experience Using FiRa DL-TDoA

In a compelling showcase of location-based services, Sharp unveiled an interactive museum tour concept. With the FiRa DL-TDoA-based system, users could explore a simulated museum and receive contextual information, such as artwork descriptions, based on their precise position. The demo illustrated how UWB could transform educational, cultural, or commercial spaces, providing a rich, immersive experience where location-specific information is delivered in real-time as users approach different exhibits.

This gathering of FiRa members and external companies facilitated deep discussions on UWB technology's current use cases and potential advancements. Participants exchanged insights on FiRa technology and UWB's future, as well as practical applications that could reshape consumer experiences across industries. Overall, the event was highly appreciated by attendees, further cementing the value of UWB as an innovative force in today's technology landscape.

> These partnerships help define key parameters and approaches, driving innovation and growth for UWB technology globally.

Beyond Core 3.0

FiRa’s Path Beyond Core 3.0

Moving beyond its 3.0 Core Technical Specifications release, FiRa will focus on expanding UWB asset tracking capabilities by introducing Uplink Time Difference of Arrival (UL-TDoA). FiRa will also continue to enhance core feature coexistence, enabling the possibility for the infrastructure to support the execution of both UL-TDoA and DL-TDoA.

Additionally, FiRa will continue to refine and optimize 3.0 core feature set capabilities to meet the evolving requirements of real-world deployments. These improvements will ensure that FiRa technology remains at the forefront of UWB innovations, delivering solutions that meet the demands of a growing range of applications.

UWB as a Global Standard

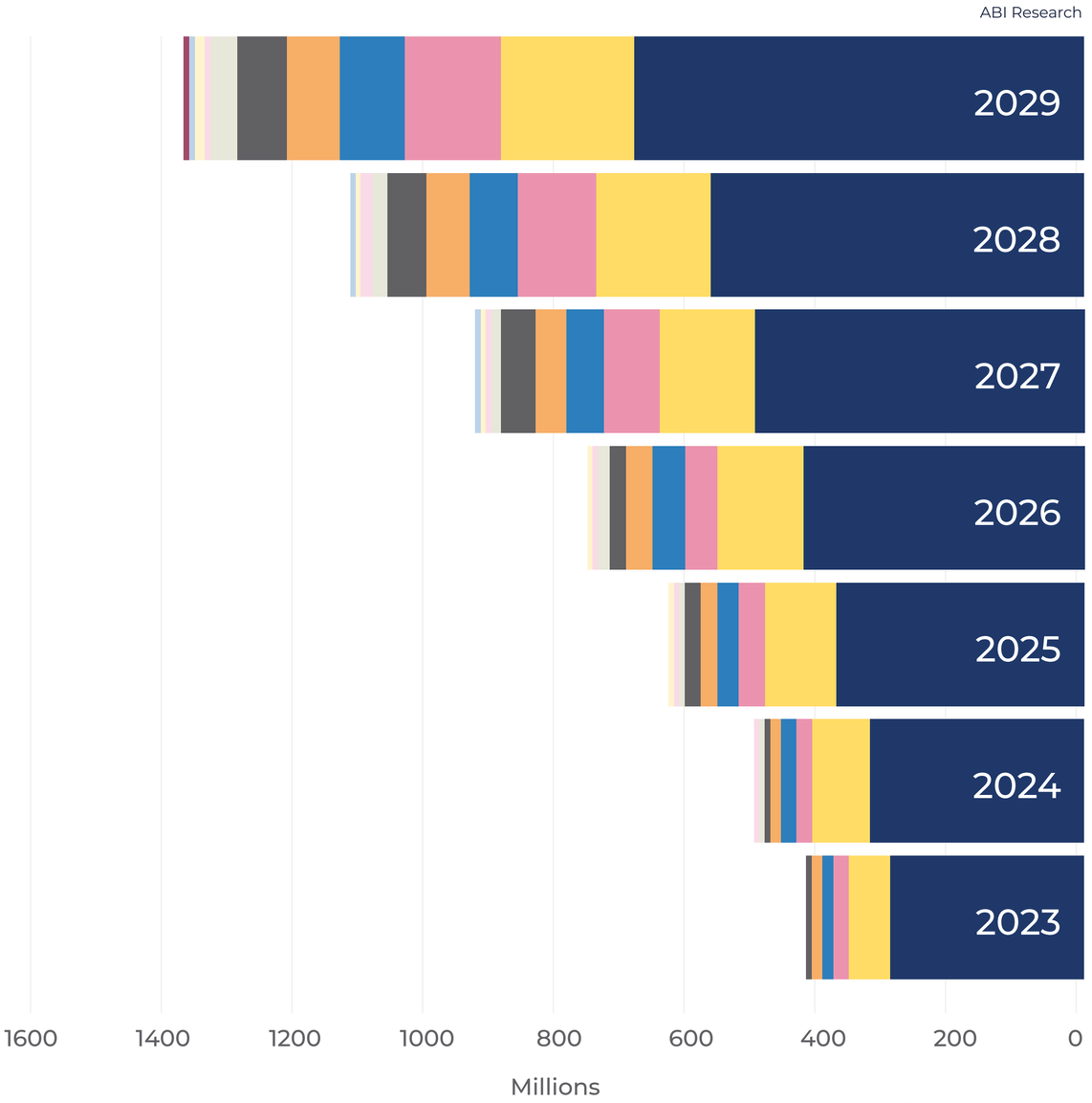
UWB: Solidifying its Role as the Global Standard

UWB continues to cement its position as the global standard, driven by its unrivaled precision, enhanced security, and low power consumption. With location accuracy within 10 cm, UWB is far more precise than competing wireless protocols, especially in applications requiring high-resolution spatial awareness.

According to Grand View Research, by 2030 the UWB market is expected to reach $4.7 billion USD, a significant leap from $1.4 billion USD in 2021 with a Compound Annual Growth Rate (CAGR) of 18.9% during this period (Figure 1). This is a solid indication of UWB's robust growth trajectory across industries such as automotive and consumer electronics.

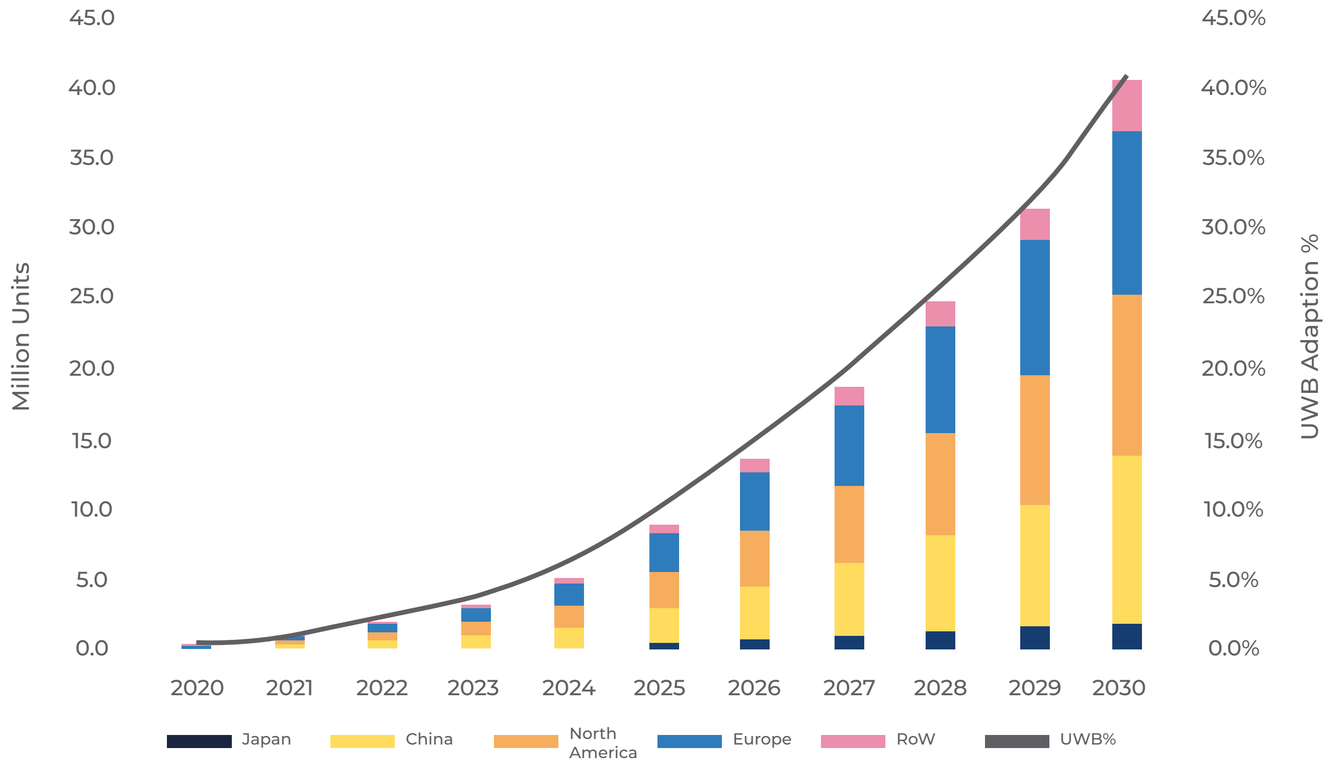
ABI Research has found that consumer-based UWB technology is rapidly expanding, with smartphones leading growth from 292.9 million units in 2023 to 675.9 million by 2029, alongside significant increases in wearables, IoT, automotive, and smart home sectors. By 2029, these markets collectively highlight UWB's transformative role in connected devices and everyday applications (Figure 1).

Figure 1
UWB-Enabled Device Shipments World Markets: 2023 to 2029



For the UWB-related automotive vertical, ABI Research projects that 75% of new cars will be equipped with UWB-enabled digital car keys by 2025. In addition, TSR projects that Europe will be the main market for UWB cars followed by North America. By 2030, European UWB cars are expected to reach more than half the market share, 59.5%, with 11.8 million units. In the same timeframe, North American vehicles are projected to obtain 59% of total car sales with 11.5 million units (Figure 2).

Figure 2
UWB Automotive Key Access Market Forecast by Area



Techno System Research Co., Ltd. (TSR)

Industry Leaders Driving UWB Adoption

The alignment of major industry stakeholders, including Apple, Samsung, BMW, Honda, and Volkswagen, has accelerated UWB's integration into commercial products. With UWB now standard in flagship smartphones and automotive applications like the CCC Digital Key, its adoption has reached a pivotal mass. FiRa Consortium's efforts, alongside the IEEE (802.15.4z), to establish rigorous Certification Programs have been essential in fostering device interoperability and ensuring global market acceptance.

Looking ahead to 2025, the deployment of UWB is geared to expand beyond current applications into smart infrastructure, creating more seamless connectivity between smart homes, cities, and vehicles. The rollout of the FiRa 3.0 Certification Program—covering PHY, MAC, LL, and IOP testing—will further solidify UWB's position within the IoT ecosystem. As we move toward broader UWB integration, its path to becoming as universal as Wi-Fi is clearer than ever.

Security

Building a Secure UWB Ecosystem

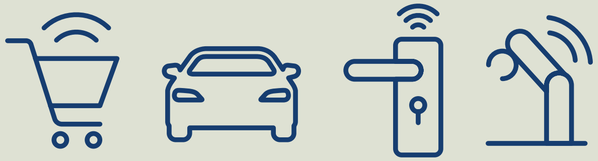
In the past year, FiRa and its Security Working Group (SWG) have made significant progress in enhancing the security of UWB technology, ensuring it remains safe and reliable for widespread adoption across various industries.

Industry Collaboration

FiRa continues to collaborate with the CCC to align UWB module security certification. This partnership helps harmonize security standards across devices like smartphones, wearables, and IoT products. Future collaborations with organizations like the Connectivity Standards Alliance are also planned, broadening the scope of UWB security efforts.

Security Certification Framework

The SWG has been laying the foundation for a UWB Security Certification Program, led by the Physical Access Control Systems (PACS) Tiger Team. This certification is crucial for ensuring UWB devices meet industry security standards, with a focus on applications in areas like automotive, smart homes, and consumer electronics. Establishing this framework positions FiRa as a leader in UWB security.



Security Incident Reporting Portal:

To ensure timely responses to security threats, the SWG introduced a Security Incident Reporting portal. This system allows for quick reporting and mitigation of potential security issues, helping FiRa stay proactive in addressing vulnerabilities and complying with evolving regulatory requirements.

Refining Security Requirements:

The SWG has also focused on enhancing input into market requirements documents (MRDs), which now outline security considerations for various UWB use cases. By collaborating with other working groups, the SWG ensures that UWB security levels not only meet market expectations but also comply with important regional regulations such as the E.U.'s Cyber Resilience Act and the U.S. Cyber Trust Mark. This work helps establish that UWB technology is equipped to meet the evolving demands of global markets.

Broader System Security:

The Physical Access Control System (PACS) Security Analysis Tiger Team has been working to identify and address security-sensitive components within FiRa's ecosystem. Its findings will drive future security improvements, ensuring UWB remains secure from the Physical Layer through to overall system protection.

Looking forward, the SWG aims to fully integrate its Security Certification Program into the broader FiRa Certification Program. This will provide a unified and comprehensive certification process that focuses on both functional and security compliance for UWB products. Through these efforts, the SWG is ensuring that UWB technology remains secure, trusted, and ready for global adoption.

> The Security Working Group is ensuring that UWB technology remains secure, trusted, and ready for global adoption.

Apple Study Unveils New Method to Realize UWB Ranging Security

A recent Apple® study explores secure ranging with UWB Impulse Radio (UWB-IR), focusing on the IEEE 802.15.4z standard, which is crucial for establishing distance-bounding between devices. Specifically, it investigates the use of an encrypted waveform, the Scrambled Timestamp Sequence (STS), and demonstrates how to realize provable security in UWB ranging. The researchers reviewed earlier STS receiver designs, identified vulnerabilities, and proposed a reference design with provable security. Their findings demonstrate that with the proper receiver design, secure ranging can be reliably achieved using the STS waveform, even in the face of unknown potential attacks.

Study Implications

The importance of this research lies in its implications for UWB-ranging security. The new receiver design strengthens protection against distance-manipulation attacks, which could compromise security in real-world applications like keyless car entry or mobile payments. By characterizing the performance of this secure STS receiver, the study establishes a foundation for secure ranging in UWB systems, ensuring that distance measurements remain accurate and tamper-proof. It can be further implied from the study that a FiRa-compliant PHY can be made robust against all feasible attacks including the Ghost Peak attacks when an adequate receiver design is implemented.

This work is significant for the UWB industry as it addresses concerns about the physical layer's security and provides a methodology for evaluating and enhancing UWB systems. These advancements will play a critical role in enabling UWB secure-ranging applications and ensuring widespread trust in UWB technology for secure transactions and access control.

You can access the study here: Secure Ranging with IEEE 802.15.4z HRP UWB.

Marketing Results

Elevating FiRa, UWB Innovation, and Our Members

Over the past year, FiRa's Marketing Working Group (MWG) has focused on promoting UWB technology, FiRa, and its members. From supporting UWB industry events to creating web-based resources for security and UWB technical deployment, the MWG has played a key role in highlighting member achievements and driving industry visibility.

Industry Events

FiRa is fortunate to have dedicated members who actively represent the organization at UWB-related industry events. Their thoughtful and engaging presentations showcase FiRa's leadership and drive interest in UWB technology across the industry. A heartfelt thank you to everyone who contributed.

- For a second year, **Bjoern Scharfen, VP of Digital Security and Identity from Infineon** gave a presentation at the Secure Technology Alliance Identity & Payments Summit in February. It was entitled "FiRa Consortium Insights on Use Cases."
- **Sanjit Bardhan, VP of Mobile at HID Global** (pictured), gave a Tech Talk at ISC West 2024: Ultra-Wideband (UWB) Explained and How it Impacts Access Control and the Security Industry in April.
- **Pinpoint** supported FiRa at two events in September:
  - Co-founder and CEO Marko Rößler (photo on next page) was at LEGIC Connect24 and presented: Enabling Interactive Navigation with UWB.
  - Dr. Thomas Graichen, Co-founder and COO, spoke at InnoTrans24 about UWB Positioning in Public Transport.

Thank you to all the members that represented FiRa Consortium at the above events as well as at embedded world, CES, electronica, and others throughout 2024.

Major Website Updates

Since FiRa's website is its portal for current and potential members, and the UWB ecosystem, it's an MWG priority to keep it current, dynamic, and useful. 2024 saw two major updates to **firaconsortium.org**.

- **Security Incident Reporting**
  FiRa has created an online portal for members and non-members to report potential security vulnerabilities easily. Vulnerability Reports bring vital issues to FiRa's attention so its security experts can investigate and address them promptly.
- **Devices and Development Tools**
  FiRa launched Phase 1 of a new website section: UWB Devices and Development Tools. This technological deployment-oriented page has been designed to provide members, developers, and device-makers with an accessible and comprehensive overview of the latest UWB devices and development tools that are closely or indirectly related to FiRa technology.

The new section offers insights into devices, their capabilities, and detailed resources for developers.

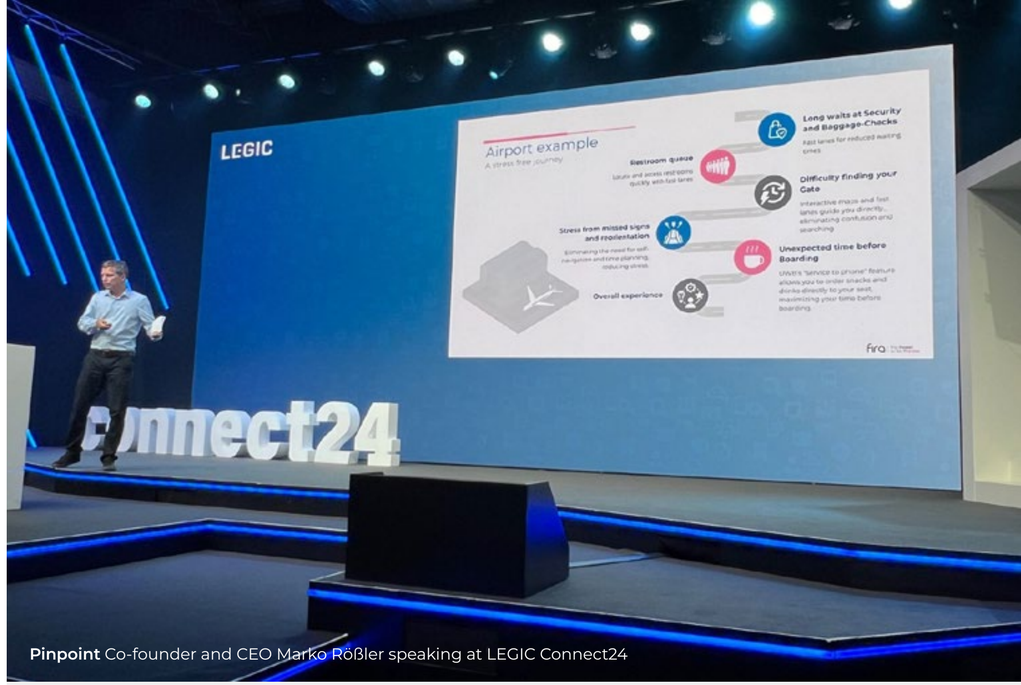
This initiative was driven by the need to support the FiRa community with up-to-date, reliable information on tools that help enable a quicker time-to-market, and seamless integration and innovation in UWB technology.

FiRa members, this is your opportunity to display devices from your company, or even from your customers and partners.

You can submit your products here.

Member Promotional Channel

FiRa MWG created a promotional channel for its members in 2024 to share company UWB-related news or information. You can now share your information with the MWG at **FiRaInternalPromotion@firaconsortium.org**. The information will be reviewed and once approved, the message will be sent to all FiRa members.



Pinpoint Co-founder and CEO Marko Rößler speaking at LEGIC Connect24

> Thank you to all the members that represent FiRa Consortium at industry events.

FiRa Membership

Since 2019, the FiRa Consortium has built a strong, diverse global network of thought leaders spanning multiple sectors and disciplines. Our community remains highly engaged and continues to drive advancements in UWB technology. By fostering deep collaboration and leveraging the expertise of our dedicated members, FiRa remains at the forefront of innovation, shaping the future of UWB worldwide.

FiRa members are united in their mission to **unlock the full potential** of UWB technology by:

- Advancing an open and interoperable UWB ecosystem
- Delivering innovative products and solutions that drive this ecosystem forward
- Accelerating the introduction of cutting-edge technologies to the market
- Creating unique opportunities to advocate for the widespread adoption and benefits of UWB

Global Collaboration Fuels FiRa's Success

FiRa Consortium's global membership is made up of leading innovators from diverse industries and regions, all united by a shared commitment to advancing UWB technology. This international collaboration fosters a vibrant exchange of expertise, driving the development of open and interoperable UWB solutions that benefit markets worldwide.

Europe

Denmark
Finland
France
Germany
Italy
Netherlands
Norway
Switzerland

APAC

China
Japan
South Korea
Taiwan

Middle East

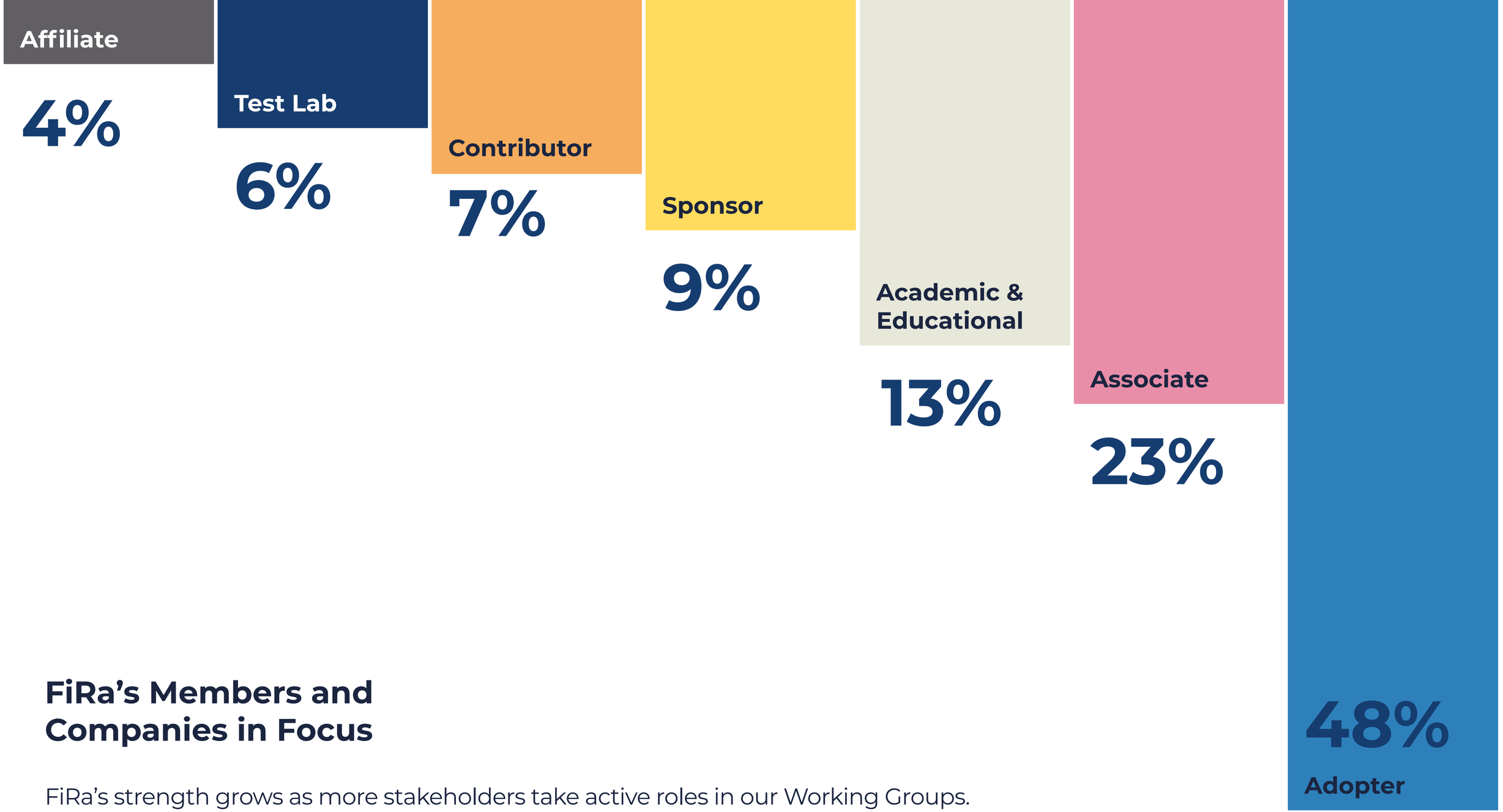
Israel

North America

United States

Eurasia

Turkey



FiRa’s Members and Companies in Focus

FiRa’s strength grows as more stakeholders take active roles in our Working Groups.

Sponsor Members

FiRa's Sponsor members, long-standing leaders in technology and innovation, make up the FiRa Board. This diverse group is focused on building a strong, sustainable UWB ecosystem to support the next generation of emerging applications.

Contributor Members

FiRa's Contributor members provide essential technical and market expertise, shaping the specifications that power a seamless, interoperable UWB ecosystem.

Take a look at FiRa's members here.

FiRa Working Groups

In 2024, the FiRa Consortium's progress was driven by the dedication and innovation of our Working Groups. These teams played a pivotal role in advancing the development and adoption of UWB technology. Below is a highlight of their key accomplishments over the past year, along with a glimpse into their strategic goals for 2025.

Requirements Working Group (RWG)

The RWG examines new UWB use cases, proposes new UWB scenarios, and identifies the functional requirements for each.

2024 Achievements	2025 Priorities
• Approved Logical Access MRD • Restarted outreach to FIDo Alliance™ • Provided use case and feature list to the Board as input for the cooperation with omlox • Restructured High Accuracy Location Services MRD	• Update V1.1 of Untracked Navigation MRD • Finalize use case prioritization • Outreach to EMVCo

> Coordination and alignment between the different working groups has increased considerably. The RWG worked with TWG, SWG, and MWG on several topics in 2024 and we'll likely see more of that in the future.

Frank Dawidowsky
Sony

Sunil Jogi
NXP Semiconductors

Over the past year, the Technical Working Group (TWG), the Core Sub-Group (CSG), and the Framework and Profile Sub-Group (FPSG) have made significant strides in advancing the FiRa technical specifications. We deeply appreciate the efforts and contributions of Working Group and Sub-Group members, which continue to drive innovation and excellence within the FiRa Consortium. Looking ahead, we are excited to continue our work with new contributions to further enhance our technical specifications and support the evolving needs of the UWB ecosystem.

Brian Redding
Qualcomm Technologies, Inc.

Karthik Srinivasa Gopalan
Samsung R&D Institute
India – Bangalore

Technical Working Group (TWG)

The TWG develops all UWB-related technical specifications, ensuring a collaborative yet structured approach to technical discussions and decision-making. Sub-Groups are formed as needed to support the development of specific use cases.

2024 Achievements

- Released Core 3.0 Specifications successfully:
  - FiRa Physical Layer (PHY) Technical Specification
  - FiRa Medium Access Control (MAC) Technical Specification
  - FiRa UWB Command Interface (UCI) Technical Specification
  - FiRa Link Layer Technical Specification
- Improved/streamlined the structure of releases by including the SUS API as part of the core specification release
- Progressed in the formal naming and descriptions of FiRa Features
- Resumed control of the FiRa Architecture Specification, which includes content restructured from CSML, by the FPSG
- Developed a common glossary to be used for terms, acronyms, and abbreviations across specifications

2025 Priorities

- Continue to work on the FiRa Technical Requirements for new use cases
- Develop new Profile Specifications for the approved use cases
- Continue to work on enhancing the Core Technical Specifications to support new use cases and verticals
- Further develop the FiRa Architecture Specification to encompass both Core and Framework layer Feature architecture
- Standardize the development and tracking of technical requirements for use cases through Feature development
- Explore the development of a plug fest program through which implementers can test the interoperability of FiRa use cases

Core Sub-Group (CSG)

One of two permanent TWG Sub-Groups, the CSG develops and maintains the technical specifications that make up the UWB Subsystem: PHY, MAC, Link Layer (LL), and UWB Command Interface (UCI) technical specifications.

2024 Achievements

- Introduced two important features to enable advanced use cases:
  - Hybrid UWB scheduling (HUS)
  - Dedicated Data Transfer

  These features yield significant updates to the MAC and UCI specifications and the creation of a new specification, the FiRa Link Layer (LL) Technical Specification, to ensure efficient data transfer
- Made many improvements to the UCI specification for efficient support of advanced use cases beyond ranging only
- Introduced tagged requirements in PHY technical specification for easy tracking of requirements in the test specification, improving overall traceability
- Introduced the concept of “running feature CR” to capture all changes related to new features per specification and made it easier to understand the benefits of a specific feature

2025 Priorities

- Refine existing features and introduce limited new features, such as Uplink TDoA to support the Asset Tracking use case
- Investigate the transition towards tagged requirements for CSG core specifications

We thank all the CSG participants for the tremendous effort in completing the development of the Core Technical Specifications in time for the 3.0 release. We believe that the new Core Features will enable many new innovative use cases, and we look forward to another productive year of working together for even more exciting Core Features.

Rojan Chitrakar
Huawei Technologies

Guillaume Vivier
Qorvo, Inc.

We thank all the FPSG participants for their time and valuable input in reviewing and developing the FPSG specifications. Despite the challenges of restructuring and the necessity to streamline according to the significant updates of the Core documents, we are glad to see contributions to several profiles. Therefore, we look forward to releasing the specifications that have been in focus during 2024 and to start investigating new use cases and their impact on our specifications.

Dominic Pirker
Infineon Technologies

Anders Mellqvist
Sony Electronics

Framework & Profiles Sub-Group (FPSG)

As the other permanent TWG Sub-Group, the FPSG develops and maintains specifications and other documentation for the FiRa Framework and the FiRa Profiles based on technical requirements.

2024 Achievements

- Worked towards restructuring the CSML and Bluetooth® LE OOB Specifications into three new specifications with a clearer structure that is better suited for FiRa members to use as a foundation for the development of new FiRa Profiles
- Improved and extended Framework documents to match the FiRa Core Specifications
  - Untracked Navigation, Logical Access, and Public Transport Fare Collection profiles were discussed and improved with the goal to release them in 2025
- Updated the SUS API 2.0 Technical Specification to match the FiRa Core 2.0 release

2025 Priorities

- Target finalization and release of three new Framework Specifications:
  - Transport and Messages Technical Specification (TAM)
  - Secure Communication Technical Specification (SCOM)
- Release profile documents for:
  - Untracked Navigation
  - Logical Access
  - Public Transport Fare Collection
- Focus on new use cases and their associated profiles once the above documents are completed

Compliance and Certification Working Group (CCWG)

The CCWG develops UWB test specifications, policies, and processes relating to product certification, and oversees the activities of Authorized Test Labs (ATLs).

2024 Achievements	2025 Priorities
• Launched FiRa Core 3.0 Certification enabling the following new features: ◦ Hybrid UWB Scheduling (HUS) ◦ Dedicated Data Transfer, including MAC Data Transfer and Link Layer Data Transfer using one of the following modes: • Bypass • Connection-Less or • Connection-Oriented ◦ CCC Digital Key UWB	• Maintain Core Certification Program for upcoming features • Develop a framework/ profile certification strategy • Engage with external organization on UWB certification support

The addition of the 3.0 Features to the Certification Program completes the FiRa work to enable UWB-based fare collection and UWB-based payment and opens the door for other use cases. FiRa's Core Certification Program 3.0 also enables certification for the CCC Digital Key UWB feature for the automotive industry.

Michael Stark
NXP Semiconductors

Jieun Keum
Samsung Electronics

Launching the Certification Program for FiRa 3.0 is a huge leap for this ecosystem. New features provide vast opportunities for users. We are looking forward to seeing FiRa 3.0 Certified Devices on the market.

Jacek Hryszkiewicz
FiRa Consortium

Marketing Working Group (MWG)

The MWG manages the Consortium's brand, supports go-to-market tactics, strategy, and promotion, and guides the Consortium's external efforts to further the adoption of UWB-based solutions.

> In 2024, UWB technology gained momentum with more deployments taking shape. FiRa's MWG has adapted by launching a technological deployment section on our website, promoting member milestones, and providing resources for new use cases. As UWB progresses, we're committed to advocating for the technology and supporting our members through continued outreach and education.

Benjamin Guilloud
Qorvo, Inc.

2024 Achievements	2025 Priorities
• Launched the Devices and Dev Tools website section to promote technological deployment • Participated in four external events • Organized and supported member and non-member demonstrations at the Osaka Showcase Session • Developed and published various marketing collateral such as blog articles, a leaflet, and a new FiRa flyer • Monitored and set digital marketing KPI goals including SEO monitoring • Established new internal tools such as project management, generative AI, etc.	• Continue to promote technological deployment with current and potential members • Improve overall membership benefits • Continue to foster strong marketing connections with organizational liaisons • Accurately and quantitatively identify UWB market demand trends and ecosystem growth • Maintain FiRa as the thought leader in the UWB ecosystem • Continue to support FiRa use cases and other activities with relevant marketing collateral and media outreach • Continue to track metrics to measure and analyze the success of MWG endeavors

Regulatory Working Group (ReWG)

The ReWG provides technical insights on UWB's coexistence with other wireless formats and advises on topics relating to spectrum and regulatory issues.

2024 Achievements

- Worked with the European Commission's decision to adopt EU-wide UWB rules
- Supported an update of the UWB regulations in the U.S. with interference studies performed with an external partner and confirmed that UWB is a good neighbor (no interference)
- Interfaced with China MIIT to provide industry feedback on its proposed new Chinese UWB regulations, which have since been published
- Worked with European regulators to study improved access rules to the 8.5 - 10.6 GHz frequency range for UWB
- Established UWB industry alignment facilitated by the UWB Alliance to develop the request for UWB regulations updates in the U.S.
- Engaged with regulators to support UWB interests in the 6G spectrum in preparation for and during WRC-23
- Raised awareness about UWB with U.S. government entities to ensure support and coexistence with UWB, including the FCC, NTIA, NASA, and FAA

2025 Priorities

- Publish a UWB socio-economic study performed by an external partner
- Work with European regulators to study improved access rules to the 8.5 - 10.6 GHz frequency band
- Establish UWB industry alignment for NSS discussion and prepare for the modernization of UWB regulations in the U.S.
- Engage in World Radio Conference 2027 preparations

> The FiRa Regulatory Working Group continues to engage with regulators around the world to ensure the success of FiRa Certified UWB technology.

Josef Preishuber-Pflügl
NXP Semiconductors

Tobias Vieracker
Apple, Inc.

2024 has been a busy year to set the foundation for FiRa's commitment to delivering the security level required by the market. With the establishment of the Security Incident Response Process, we adhere to our responsibility. Analyzing the Physical Access use case sets the foundation for the next step, defining the security targets for the components our specifications define. With this, we are now positioned to develop protection profiles that enable the security certification of products and components.

The establishment of a new PHY Layer Security Tiger Team was and is an important step to analyze the physical UWB interface and identify the mechanisms and parameters to develop an evaluation methodology that allows customers to trust in the security levels claimed by FiRa Certified products and trust in the ranging results provided by FiRa certified products.

Franz-Josef Bruecklmayr
Infineon Technologies

Olivier Van Nieuwenhuyze
ST Microelectronics

Security Working Group (SWG)

The SWG develops and maintains a security requirements roadmap used in the development of FiRa technical and test specifications.

2024 Achievements	2025 Priorities

• Rolled out a Security Incident Response Process
• Extended the CCC liaison agreement to cover the security of the UWB module
• Established PHY Layer Security Tiger Team
• Evolved the Physical Access Control threat model into security requirements of security components
• Added security considerations to the MRD template
	• Establish security certification schemes for UWBS and Secure Element:
	  ◦ Develop protection profiles
	  ◦ Establish a certification and accreditation body
	• Provide security evaluation methodology for UWB interface so FiRa Security Certification can deliver an assurance level for secure ranging requested by the market
	• Define methodology to track and evolve security requirements from market requirements to component specifications and certification

Working Group Steering Committee (WGSC)

The WGSC facilitates inter-working group communication and coordination and is responsible for specification release plans and specification program management.

2024 Achievements	2025 Priorities
• Completed several steps towards standardizing the look and feel of FiRa specifications, including the development of a common glossary for FiRa-defined terms and standardizing document references • Further refined the specification program management processes, including improved management of use cases, features, and profiles • Completed a Memorandum of Understanding with GlobalPlatform, the initial step in establishing a liaison agreement	• Finalize refinements to specification program management processes • Develop a style guide and improve consistency in the look and feel of all FiRa specifications • Initiate transition to a text-based publishing platform

The Working Group Steering Committee is committed to fostering seamless communication and collaboration across all working groups. By ensuring consistency and quality in processes and outputs, we drive the timely delivery of high-standard specifications, features, and profiles to market. Our goal is to continuously optimize and uphold excellence in every aspect of our collective work.

Annette Mahoney
FiRa Consortium

Milestones 2024

FiRa 2024 Technical and Ecosystem Building Milestones

Jan

23rd

NXP Trimension NCJ29D5 Chipset Certified

Feb

26th

“FiRa Consortium Insights on Use Cases,” STA Identity & Payments Summit, Bjoern Scharfen, Infineon

29th

Maxscend MXD2710 Chipset Certified

Mar

19th

“UWB Explained and How it Impacts Access Control and the Security Industry,” ISC West, Sanjit Bardhan, HID

21st

Published Fira 2023 Annual Report

May

1st

NewRadioTech NRT82885 Chipset Certified

6th

GiantSemi GT1500 Chipset Certified

20-24th

11th Hybrid FiRa Consortium Test Event, Comarch

Apr

10th

NXP Trimension NCJ29D5 Chipset Certified

29th

Expiration of the FiRa 1.0 Certification Program

Jul

8-10th

13th Hybrid FiRa Consortium Test Event, Comarch

19th

Security Incident Reporting page goes live

22-26th

12th Hybrid FiRa Consortium Test Event, LitePoint

30th

Chipsbank CBU5000V210 Chipset Certified

Sept

2-6th

14th Hybrid FiRa Consortium Test Event, TTA

3rd

Collaboration with the Connectivity Standards Alliance announced

12th

SUS API and USB VCOM updates to the Technical and Test Specifications

13th

Pinpoint CEO Marko Rößler speaks at LEGIC Connect24

24th

Tap-free Payments leaflet

27th

Pinpoint COO Dr. Thomas Graichen speaks at InnoTrans24

Oct

1st

UWB Devices & Dev Tools web section goes live

10th

Apple paper: Secure Ranging with IEEE 802.15.4z HRP UWB FiRa PHY was identified as robust against Ghost Peak

23rd

Osaka Plenary Demos: Sharp, Pinpoint, and JCB

Nov

4-6th

15th Hybrid FiRa Consortium Test Event, Comarch

Dec

12th

FiRa 3.0 Webinar

Join FiRa

Join FiRa – Where UWB Innovation Meets Opportunity

Become a FiRa Member

FiRa invites you to unlock the full potential of membership. With a diverse community of global members spanning various industries, FiRa provides exclusive access to industry leaders, cutting-edge insights, and essential resources to keep pace with emerging trends. Members benefit from invaluable networking opportunities to fuel professional growth and development.

As part of the FiRa Consortium, you can harness the power of UWB technology to elevate your brand by:

- Leading the charge in wireless innovation
- Discovering new market possibilities
- Accelerating product development and time-to-market
- Simplifying product sales through an open and interoperable ecosystem

Join FiRa today to gain the expertise and connections needed to leverage UWB technology and seize the opportunities ahead.

Learn more about FiRa membership.

We'd like to learn more about your company's interest in becoming a FiRa member. Please answer this short survey.

Collaborate with FiRa

One of FiRa Consortium's key goals is to "foster a robust UWB ecosystem to accelerate technology deployment." The most effective way to achieve this is through genuine industry collaboration. If your organization is committed to strengthening the UWB ecosystem and seeks to partner with us, there's a place for you at FiRa.

To explore how your company can collaborate with FiRa, please contact us at: **admin@firaconsortium.org**.

The Power to Be Precise

January 2025