



# Annual Report 2023



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# Board Chair Message: 2023

## – Supporting UWB Implementation



**Clint Chaplin**

Senior Principal Standards Engineer, Samsung Research America

**As Chair of the FiRa® Consortium, I've had the privilege of witnessing the impactful contribution FiRa makes to the progress and implementation of UWB technology. Our members' shared knowledge, expertise, insights, and commitment consistently leave a lasting impression on me.**

I encourage you to peruse the 2023 Annual Report, as it provides insight into our commitment to UWB and the concurrent establishment of an open and interoperable ecosystem.

As highlighted in this 2023 Annual Report, FiRa has many achievements to rejoice in. A few highlights:

- Membership comprises 120 members hailing from 18 different countries around the globe.
- Release of FiRa 2.0 Core Technical and Test Specifications focused on three new use cases: Untracked Indoor Navigation, Find Someone/ Something, and Point-and-Trigger Control.
- Creation and Launch of the FiRa Certification Program 2.0. The certification can be done “à la carte,” opening the door for specific certifications for dedicated devices.
- Organizational changes: Creation of Technical Working Group sub-groups with the (1) Core Sub-Group (CSG) developing and maintaining PHY, MAC, LL, and UCI technical specifications and the (2) Framework & Profile Sub-Group (FPSG) developing the CSML,

BLE OOB, SUS API, and Profiles technical specifications.

- Approved five (5) new Validated Test Tools and one (1) new Authorized Test Lab used in the FiRa Certification Program, allowing members more flexibility in the testing and certification of products.
- Eight (8) additional devices (i.e., chipsets and modules) were FiRa Certified® in 2023, creating a platform for the growth and accelerated adoption of UWB.
- Formation of the Joint Ultra-Wideband MAC PHY Working Group (JUMPWG) to jointly develop and maintain UWB technology specifications used in the Car Connectivity Consortium (CCC) Digital Key.
- The development and release of numerous marketing materials including a whitepaper, three leaflets, three FiRa Presents videos, and a blog with several posted articles.
- Continuous updates to [our website](#) including a [Resource Hub](#) to house all our marketing materials, white papers, and technical documents, an updated FiRa News tab that's easier to navigate, a content refresh for our [Certification section](#), and much more.

This is a snapshot of FiRa's accomplishments over the past year.

Since the inception of FiRa four years ago, there has been a consistent surge of interest in UWB technology, coupled with a corresponding wave of innovation in the industry.

As we move into 2024, consumers are becoming more aware of UWB technology, spurred by its integration into smartphones from renowned manufacturers such as Apple, Google, Samsung, and Xiaomi. Additionally, the adoption of UWB in digital car keys by automobile manufacturers such as Audi, BMW, Ford, Genesis, Mercedes, Skoda, and Volkswagen has resulted in consumers experiencing the joy of effortless access facilitated by UWB.

We have also seen UWB usage expand in other consumer applications including device tracking, health monitoring, and various smart home devices. FiRa is developing consumer use cases such as Untracked Indoor Navigation, Find Someone/Something, and Point-and-Trigger Control. Likewise, there are industrial uses for UWB including Real-Time Location Services (RTLS), contact tracing, and enhanced facility management.

UWB's potential to revolutionize connectivity experiences across various aspects of daily life is boundless. While the signs of UWB's growth and adoption are encouraging, FiRa has diligently examined past technology adoption curves, drawing lessons from experiences with technologies like Wi-Fi and Bluetooth®. By learning from these insights, FiRa has continually refined its approach to ensure the widespread and seamless adoption of UWB.

The industry's challenge lies in expanding the adoption of UWB, unlocking a variety of untapped use cases waiting to benefit from its inclusion. Throughout 2023, FiRa has invested time in identifying pertinent ecosystems and establishing collaborative ventures with various consortia across key segments, including automotive, connected home, payment, and logical access. Positive outcomes from these efforts are anticipated soon.

Moving into 2024, FiRa has several clear objectives:

- Further develop our Core and Framework Technical Specifications to support new use cases
- Complete and release 2024 technical specifications to include the associated PHY/MAC certification and the associated analysis of security and performance requirements
- Foster collaboration and liaisons with organizations such as the CCC, Connectivity Standards Alliance, UWB Alliance, and Omlox
- Support the adoption of UWB by identifying new use cases, working with regulators to gain more favorable spectrum regulations, and evangelizing UWB and the importance of an open and interoperable ecosystem

Examples of new use cases expected to be supported by the 2024 Technical Specifications include:

- **Public Transport Fare Collection**
- **Tap-free Mobile Payment**
- **Asset Tracking**

As Chair of the Board, I urge our members to actively engage in FiRa's ongoing initiatives. Your involvement is the driving force propelling us forward, and on behalf of the FiRa Board, I extend our sincere appreciation. Additionally, I seize this opportunity to extend an invitation to other organizations to join our Consortium. This is your chance to contribute to our pioneering endeavors in UWB development and adoption, collaborate with fellow thought leaders to stay abreast of emerging trends, establish valuable industry connections, and deepen your understanding of UWB's transformative potential in enhancing connectivity experiences.

**In conclusion, I eagerly anticipate continuing my involvement with FiRa in 2024. We will vigilantly monitor the dynamics of our swiftly evolving industry and proactively tackle the opportunity of expanding UWB adoption. I look forward to collaborating with each of you on this exciting journey.**



# The UWB Revolution is Growing

Not too long ago, Bluetooth® and Wi-Fi were brand-new technologies that took some getting used to. Now they seem ubiquitous and we can't imagine life without them. Ultra-wideband (UWB) is the next technology on that list.

In recent years, UWB has become prevalent in the consumer, Internet of Things (IoT), and industrial markets as a short-range wireless communication tool with secure ranging and location capabilities with centimeter-level accuracy.

New product releases and new entrants into the UWB market show its potential and illustrate how the future of the technology is promising. Last year, 21% of smartphone shipments included UWB technology which included phones from Apple, Samsung, Google, and Xiaomi. By 2028, ABI Research expects that nearly half the smartphones shipped will include UWB.

According to the latest report published by tech research company ReportLinker in August this year, the global UWB market is expected to grow from \$1.55 billion in 2023 to \$3.45 billion by 2028, at a CAGR of 17.4%. As shown in the figure below, ABI Research forecasts that the global market of UWB-enabled device shipments will achieve a compound annual growth rate of 14% over the next five years – growing from 435 million units in 2023 to nearly 1.3 billion by 2028.

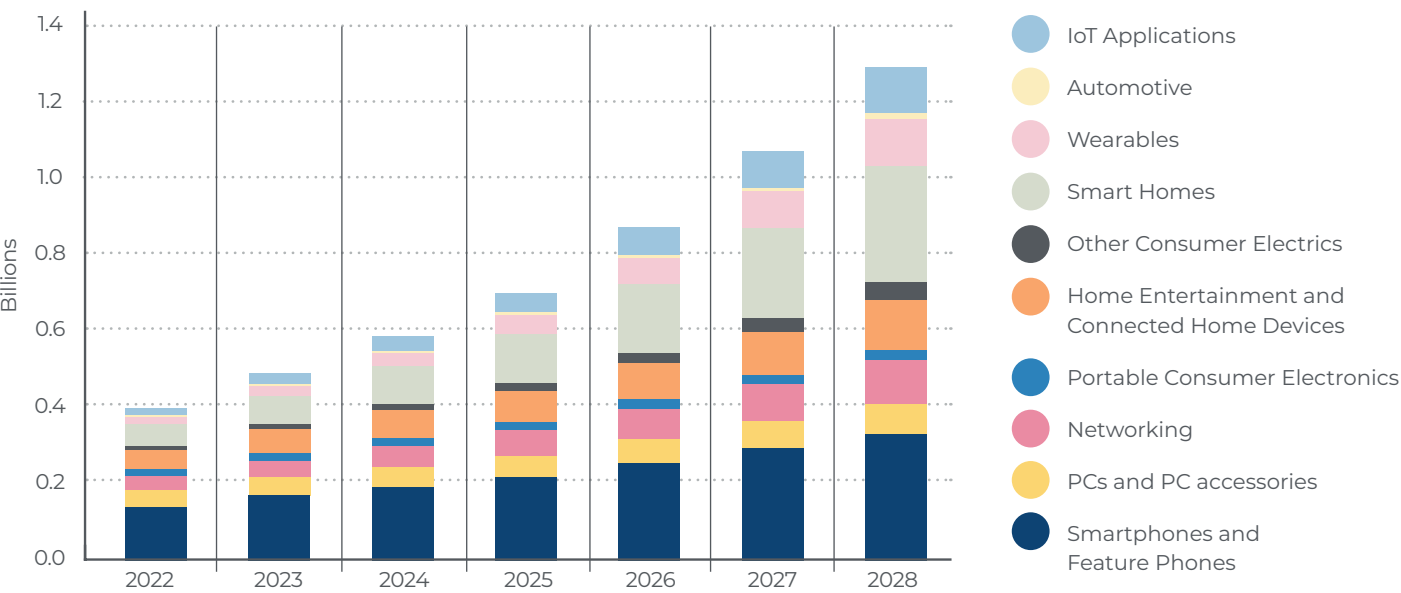


Figure 1 UWB-Enabled Device Shipments World Markets: 2022 to 2028  
(Source: ABI Research)



Chipset vendors, both large and small, are realizing the opportunity UWB can bring. The market has especially piqued the interest of Chinese chipset vendors and startups such as FiRa members Chipsbank, Mauna Kea Semiconductors (MKsemi), Osemitec, Tsingol, and Ultraception, among others. In 2023, NXP partnered with a German startup LaterationXYZ to make UWB ranging even more precise by achieving a remarkable millimeter-level accuracy in everyday conditions. The work of all these newcomers and seasoned companies is opening up a new world of possibilities for UWB applications and FiRa is more than thrilled to continue to help blaze a trail with this technology.



# FiRa 2.0: Everyday Possibilities Using UWB

Exploring and expanding technology is crucial to making daily UWB-enabled applications a reality. This is why FiRa makes developing use cases a priority.

Identifying new experiences that benefit users helps to drive rapid and widespread adoption of UWB across multiple markets and applications, and is imperative to the growth of UWB technology.

To help launch our FiRa 2.0 Core Technical and Test Specifications and FiRa Certification Program 2.0, we focused on the following use cases (with corresponding collateral listed below each use case):



## Find Someone/Find Something

For those with UWB-enabled smart devices, locating lost items has gotten easier with the Find Someone/Find Something use case. Whether it's a rideshare driver trying to find you or locating a lost bag, nothing offers the precision and real-time experience like UWB.

UWB has a wider bandwidth than other wireless technologies and can more accurately find someone whether or not the area is crowded or cluttered. And since UWB has update rates of up to 1000 times per second and can be faster than satellite navigation, you can find someone in real-time. The technology can also help users locate items with centimeter-level accuracy since it can send up to one billion pulses per second, about one per nanosecond. This level of accuracy is unmatched by any other wireless technology.

When technology companies harness FiRa's specifications and take advantage of its certification program, they can develop interoperable UWB-enabled products. This can result in new devices designed to find items and people, as well as integrate UWB technology into our everyday lives.



Leaflet

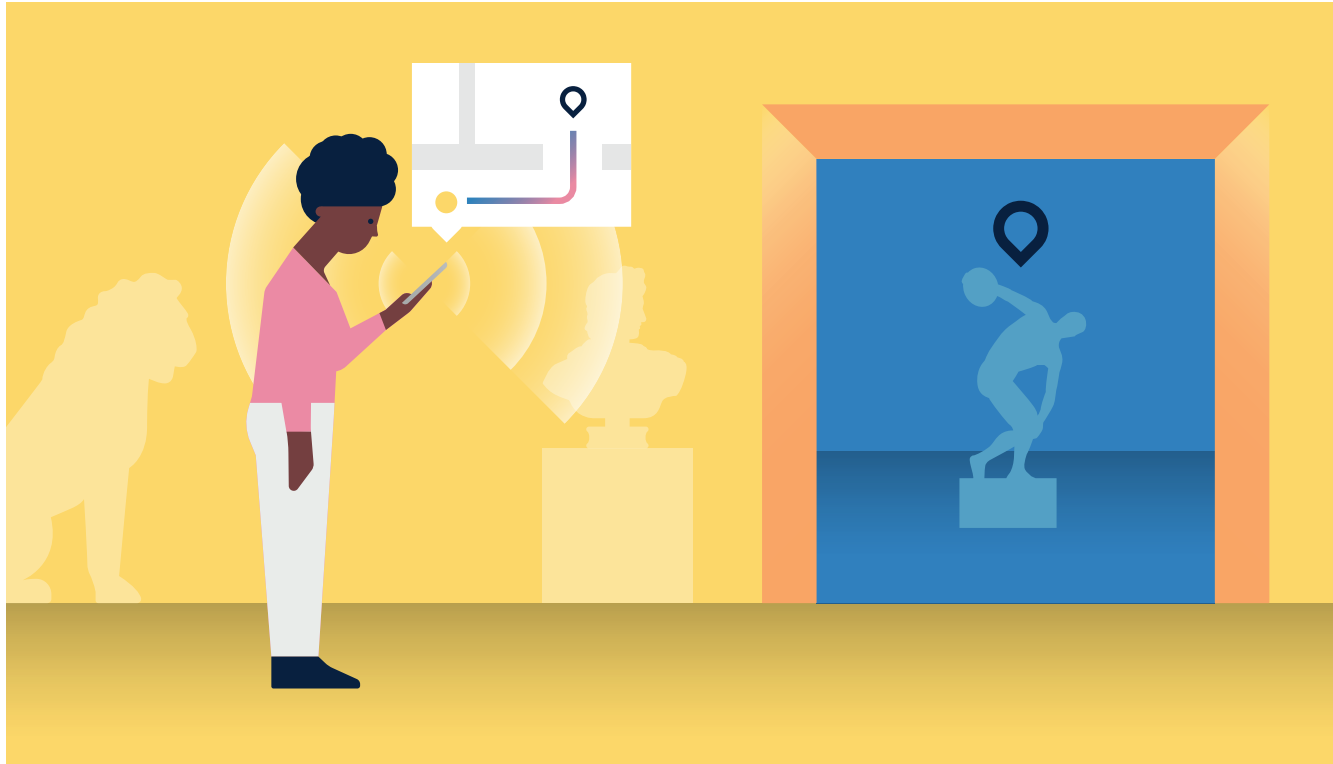


Video



Blog





### Untracked Indoor Navigation

UWB-enabled devices are continuing to make life easier. Wouldn't it be nice to be in a mall, airport, or museum and be able to see exactly where you are on a map on your phone? Or be seen more easily in a busy area by a rideshare driver?

To make accurate indoor navigation a reality, FiRa Consortium is currently developing UWB untracked indoor navigation, a significant new technology that goes beyond the limits of existing indoor navigation techniques in accuracy, scalability, and privacy.

In addition, UWB-based untracked indoor navigation offers a higher level of security. In an era where personal information such as location is considered of utmost importance, having a location technology that is – as the name suggests – untracked is a significant improvement. Future use cases are virtually endless. It uses Downlink Time Difference of Arrival (DL-TDoA) which is when a user's device overhears the messages sent by surrounding UWB anchors to estimate location. FiRa is helping to define the potential of UWB indoor untracked navigation to include use in smart cities, office and commercial buildings, industrial and healthcare facilities, retail stores, and homes.



Leaflet



Video



Blog

### Point-and-Trigger Control

The FiRa Consortium is taking the concept of smart technology to the next level with the Point-and-Trigger Control use case. Point-and-trigger control lets users point their personal UWB-enabled devices, such as a smartphone or a smartwatch, toward another UWB-enabled device to trigger commands.

This intuitive gesture, without having to launch applications on personal devices, streamlines the control of various UWB-enabled home-connected devices, such as smart TVs, thermostats, light bulbs, and speakers. As more and more home entertainment devices and electronic appliances are becoming wirelessly connected, it is essential that everyone in the household is empowered to access and control them.

Smart home applications are at an exciting tipping point when it comes to UWB. Having UWB technology in our smartphones and smartwatches is just the first step. We're well on our way to being able to control our home electronics and systems with a simple touch or voice command to our personal devices. The future of point-and-trigger control is just around the corner.



Leaflet



Video



Blog





# Beyond FiRa 2.0: Where UWB is Going

The more our members delve into the possibilities of UWB-enabled technology, the more likely they are to find additional use cases.

Here are a few FiRa is developing in the coming year to help broaden UWB-related applications:



## Redefining Asset Tracking with UWB

Asset management, monitoring, and tracking play a crucial part in most industries from factories to warehouses, hospitals, or even farms. Understanding the utilization or behavior of the key assets in a facility provides a differentiating factor to improve its operational efficiency, potentially yielding dramatic savings, enhancing loss prevention, and providing an overall better service or product. The key is to accurately obtain the continuous, dynamic locations of all assets that matter to each industry. And what better technology than UWB to provide these locations?

For these reasons, many members at the FiRa Consortium are defining new UWB-based solutions that can provide input location information to track valuable assets in numerous industries. These solutions use the Uplink Time-Difference of Arrival (UL-TDoA) localization technique, which enables an anchor infrastructure deployed at the facility to continuously estimate the positions of wireless tags attached to the mobile assets that matter. These solutions are accurate, flexible, and versatile, enabling you to easily track large numbers of assets at the update rates you need.



Leaflet



Blog





## Public Transport Fare Collection

Public transport is an integral part of the mobility landscape of most metropolitan areas and with sustainability in focus, its importance is predicted to increase even further over the coming years. The fare collection in public transport has evolved over time from coins, tokens, and paper tickets to the current contactless solutions that have proven extremely successful around the world.

In an exciting next step, the FiRa Consortium is preparing a FiRa Profile for public transport that will give the public transport industry the possibility to transition to UWB-based touchless fare collection, bringing advantages to both users and public transport operators. Transport riders no longer need to search for their ticket or worry about how to use smartphones to scan or tap apps to enter, which is especially useful if you push a pram, use a wheelchair, or carry heavy luggage. On the other hand, public transport operators will benefit from a solution that is interoperable with legacy systems and that helps them maintain a high and steady flow of passengers with minimal risk for disruptions even in rush hours.



Whitepaper

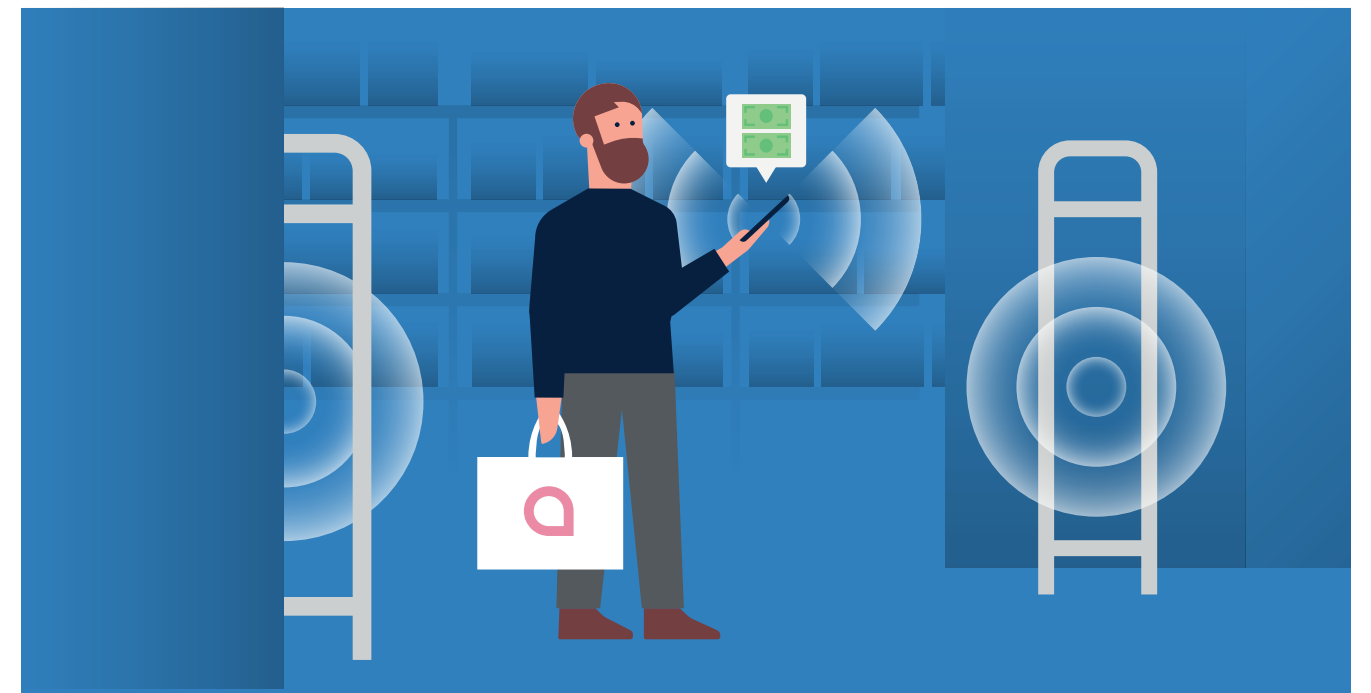
## Tap-Free Mobile Payment

New connectivity technologies and mobile devices are helping to make payment transactions smarter and more convenient. Especially in crowded areas such as retail stores, restaurants, or stadiums, the shopping experience needs to become more intuitive, flexible, and more satisfying without compromising security. The FiRa Consortium has defined several payment-related use cases using secured UWB-based localization.

With tap-free mobile payments, UWB-enabled smartphones and wearables support the underlying financial process. Using a UWB device, a person's identity can be confirmed in order to grant access to unmanned stores or stadiums. This authentication may also be needed to authorize a payment transaction.

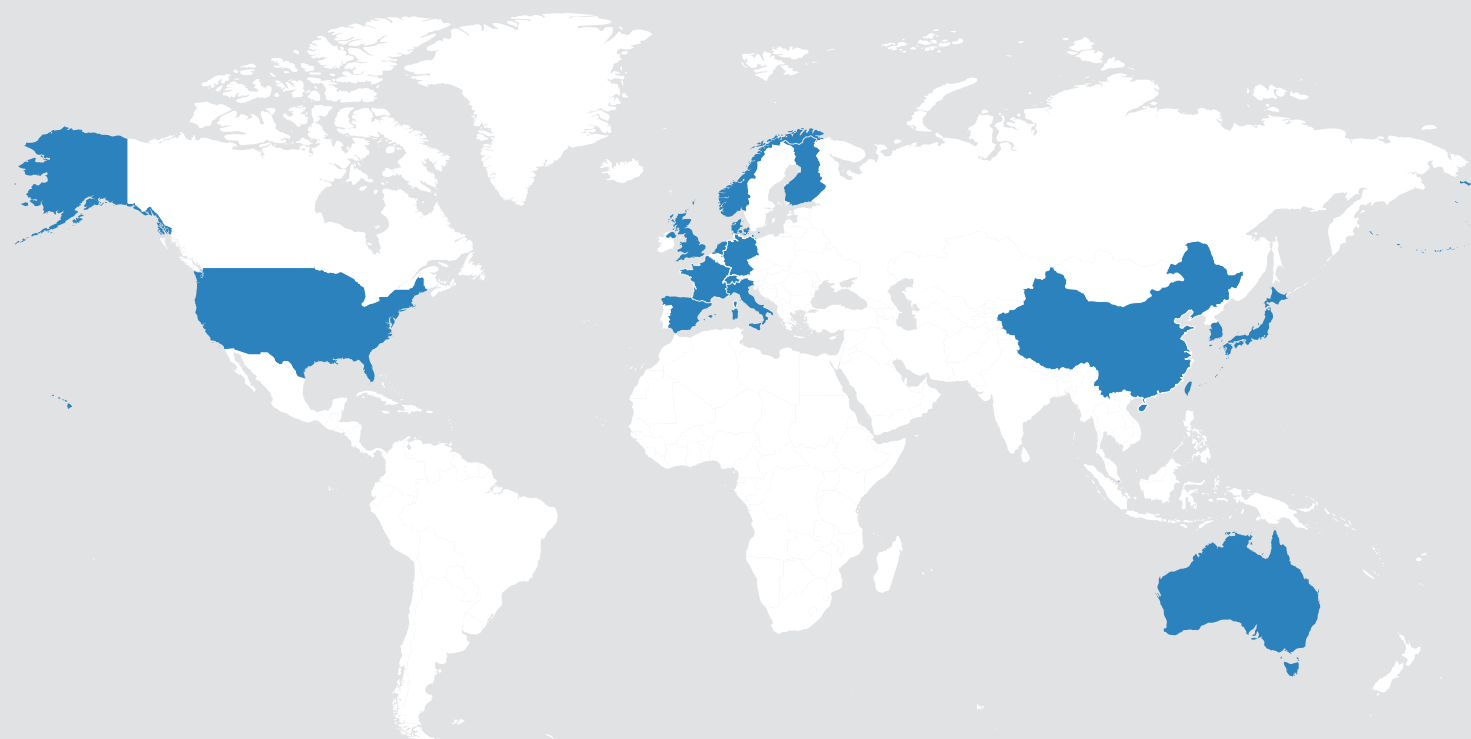
UWB could also be used to determine the exact location in a checkout area (factor 1) of a retail store to support two-factor authentication. The shopper confirms the purchase through a gesture (factor 2), and the transaction will be performed, and the receipt can then be transferred to the mobile device.

UWB provides centimeter-level accuracy by using Time of Flight (ToF) technology and also comprises security mechanisms such as a Dynamic STS against relay attacks as well as the use of a hardware-based Secure Element which greatly supports payment use cases. Combining UWB with other technologies such as Bluetooth® can streamline processes, ease customer adoption of new use cases, and provide interoperability with legacy systems.





# FiRa Welcomes Members from Around the Globe



## APAC

Australia  
China  
Hong Kong  
Japan  
Korea  
Singapore  
Taiwan

## Europe

Denmark  
Finland  
France  
Germany  
Italy  
Netherlands  
Norway  
Spain  
Switzerland  
United Kingdom

## North America

United States

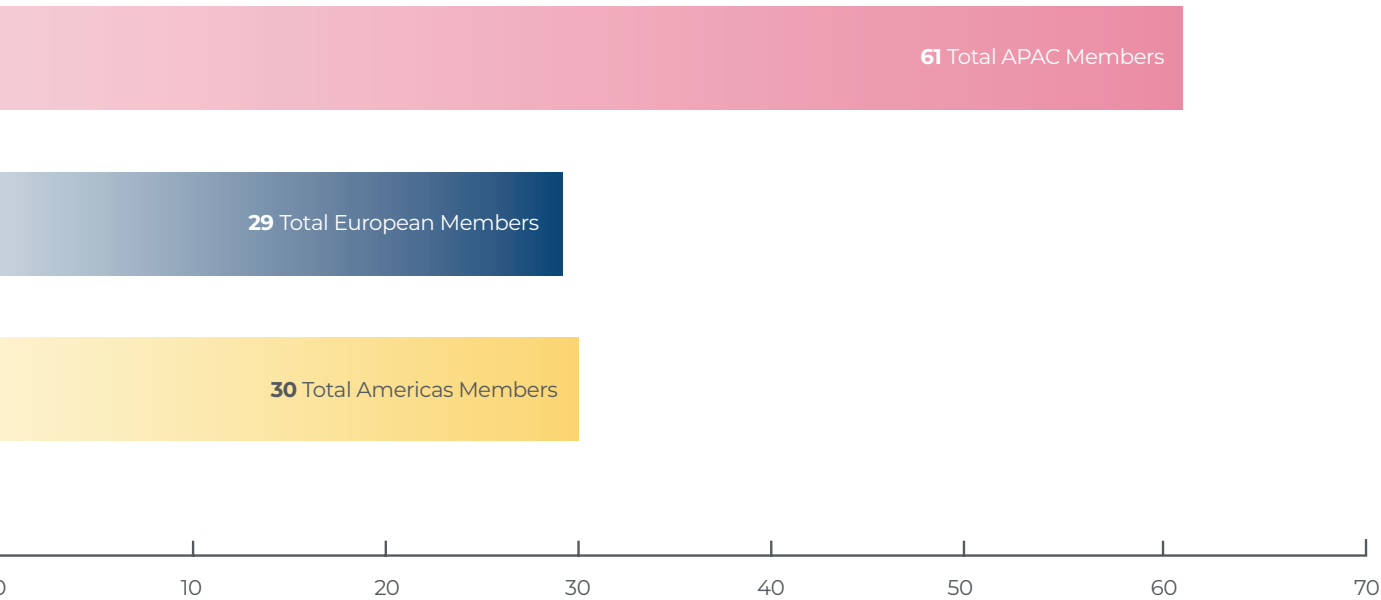
## Our Members: Facts and Figures

The FiRa Consortium was established four years ago with a handful of members from six countries. Today, we have 120 members from 18 countries who come from various disciplines and multiple sectors. FiRa continues to advance and thrive thanks to the expertise and engagement of thought leaders worldwide.

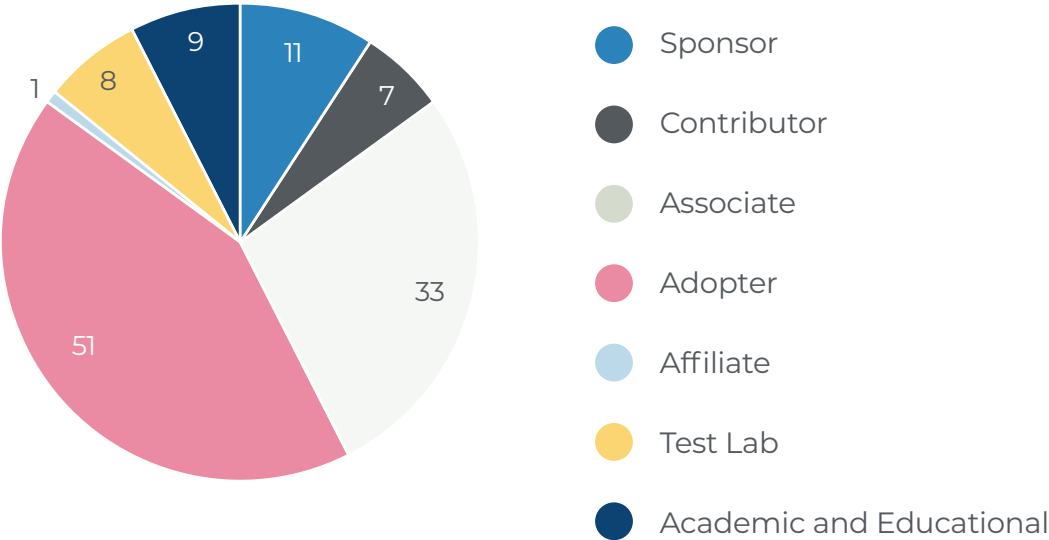
FiRa members collaborate to expand the benefits that UWB brings by:

- Promoting an open and interoperable UWB ecosystem
- Offering products and solutions that are instrumental to this ecosystem
- Bringing cutting-edge products to the market faster
- Developing unique opportunities to evangelize the uses for and benefits of UWB

You'll find our FiRa members in three regions:



The FiRa memberships spans all membership levels.



FiRa Fast Facts

- As FiRa’s membership continues to develop and evolve, FiRa has become an established UWB industry consortium.
- Our membership includes:**
- Major mobile and consumer electronics manufacturers such as Apple, Cisco Systems, Google, Huawei, LG Electronics, Samsung, and Sony
  - Leading global semiconductor manufacturers including Infineon, Intel, NXP Semiconductors, Qorvo, Qualcomm Technologies, Inc., and STMicroelectronics
  - Three global smartphone manufacturers – Apple, Google, and Samsung – are on the FiRa Board
  - We now work with nine Authorized Test Laboratories – Allion, CAIT, DT&C, Eurofins, HCT, SGS, SRTC, TA Technology, and TTA
  - Our Academic and Educational Members include ETH Zurich, HTW Dresden, North China University of Technology, and Yale University

Our Members

Sponsor Members

FiRa’s top-tier Sponsor members are long-time leaders in technology and innovation and comprise the FiRa Board. This is a diverse group of organizations with a singular focus on the need to establish a strong, sustainable ecosystem to support emerging applications that utilize UWB technology.



Contributor Members

FiRa’s Contributor members offer significant technical and market knowledge to the creation of technical specifications that result in an interoperable ecosystem.



Get a more complete view of FiRa’s membership roster at: <https://firaconsortium.org/about/members>.



# Our Structure and Strengths

## Partnerships, Specifications, and Expansion

In our journey toward redefining interaction paradigms, 2023 was marked by significant strides and strategic collaborations at FiRa Consortium. Our commitment to revolutionizing the way we engage with our environment through precise location awareness has seen notable achievements and pivotal enhancements in our operational structure.

- 1

**Successful Release of Version 2.0 of Core Technical and Test Specifications:**

FiRa achieved a significant milestone with the successful launch of v2.0 of the Core Technical and Test Specifications. This release marks a leap forward, supporting three exciting new use cases: Untracked Indoor Navigation, Find Someone/Something, and Point-and-Trigger Control for smart home devices.
- 2

**Updated Certification Program 2.0 Released:**

FiRa announced the expanded Certification Program 2.0 that empowers FiRa members to develop UWB-enabled products, supports new use cases, and propels the adoption of UWB technology. The updated program includes a focus on feature sets which are represented by a combination of a feature component and one or more devices.
- 3

**Partnership with Car Connectivity Consortium (CCC):**

FiRa has forged a strategic alliance with the CCC to confirm that as UWB technical specifications evolve, this partnership will ensure the seamless interoperability and scalability of cutting-edge UWB technology developed for the CCC Digital Key. This collaboration aims to encourage wider adoption of UWB technology, enabling secure and accurate ranging for vehicle access, thereby expanding its applicability across the automotive landscape.

4

### Augmented Organizational Structure:

We have expanded our organizational framework by introducing two new sub-groups under the Technical Working Group, each with a focused mission aimed at accelerating development activities and expediting the deployment of use cases into the market.

- **Core Sub-Group:** Concentrating on the development and refinement of features within the technical specifications implemented on the UWB Subsystem (UWBS), this group focuses on core specifications such as PHY, MAC, LL, and UCI.
- **Framework & Profiles Sub-Group:** This group is dedicated to developing technical framework specifications that operate outside the UWBS. It focuses on high-level operating systems and critical frameworks necessary for implementing diverse use cases. Additionally, it defines use case implementation through the leveraging of core features and framework specifications.

5

### Team Expansion:

To further empower our endeavors, we've augmented our team, welcoming Annette Mahoney as the Specification Program Manager (SPM) and Chairperson of the Working Group Steering Committee. The Marketing Working Group also welcomed a new addition, Amy Neale as Marketing Manager. Additionally, the onboarding of Technical Editors strengthens our capacity for robust specification development.

6

### Standardization Initiatives:

Instituting an annual cadence for new core specification releases reinforces our commitment to regular advancements. Furthermore, a comprehensive process refinement initiative has been launched, aiming to meticulously document and clarify phase activities and gates, ensuring streamlined operations.





## Goals for 2024:

Looking ahead, our ambitions for 2024 stand on the foundation of our accomplishments:

- **Accelerate UWB Use Case Deployment:** We aim to expedite the deployment of UWB use cases into the market, driving innovation and real-world applications.
- **Expand Partnerships:** Strengthening ties with other standards organizations is pivotal to fostering a robust UWB ecosystem, promoting collaboration and cross-industry innovation.
- **Continued Process Refinement:** The ongoing documentation and refinement project will persist, ensuring efficiency and clarity across all operational facets.
- **Enhance Working Group Communication:** Strengthening communication channels between Working Groups remains a priority, fostering synergy and collaboration for collective success.

As we stride into the future, these objectives will guide us toward further advancements and unparalleled achievements in our pursuit of transforming the realm of precise location awareness.





# Our Working Groups: Priorities and Achievements

Here at FiRa, our Working Groups are the fuel that keep us moving forward. Throughout 2023, the FiRa Consortium Working Groups have made considerable contributions toward furthering the development of UWB. Here are some of the Working Groups’ major achievements for the year, as well as a look at their priorities for 2024.



## REQUIREMENTS WORKING GROUP (RWG)

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

2023 Achievements	2024 Priorities
Introduced, discussed, and approved several new UWB use cases and applications with supporting requirement documents to enhance the FiRa ecosystem	Review and prioritize use cases yearly based on market demand and ecosystem growth; with inputs from the FiRa Marketing Working Group (MWG)
Prioritized the use cases for specification development based on inputs from Working Group members	Strengthen and extend liaisons with industry standards organizations to collaborate on the joint development of new UWB use cases and applications with the coexistence of existing use cases to further drive ecosystem adoption
Initiated discussions with several industry standards organizations to collaborate on the joint development of UWB use cases and applications	Continue to collaborate with the FiRa Technical Working Group (TWG) and Compliance and Certification Working Group (CCWG) to release the new use cases
Elected Sunil Jogi with NXP to fill the vacant RWG co-chair seat	



*“Adoption of new technologies, such as UWB, is driven by improved user experiences. The RWG is dedicated to exploring and specifying the use case requirements to enable these to improve user experiences with seamless coexistence and robust interoperability through FiRa standards.”*

**David Fernandez** (Qorvo, Inc.)  
**Sunil Jogi** (NXP Semiconductors)  
Co-chairs

# TECHNICAL WORKING GROUP (TWG)

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

2023 Achievements	2024 Priorities
Successfully released 2.0 Core Technical and Test Specifications. <ul style="list-style-type: none"><li>• FiRa Physical Layer (PHY) Technical Specification</li><li>• FiRa Medium Access Control (MAC) Technical Specification</li><li>• FiRa UWB Command Interface (UCI) Technical Specification</li></ul>	Release the next Core and Framework Technical Specifications supporting additional use cases and specification maintenance
Reorganized the Technical Working Group by replacing the use-case-focused Task Groups with Specification-focused Sub-Groups	Release additional profile specifications and maintenance of the FiRa Physical Access Control System (PACS) Profile Technical Specification
	Develop Technical Requirements for new Use Case and Marketing Requirements approved by the Requirements Working Group (RWG)



*“The last year has seen an incredible amount of effort in developing new features and functionality in the Core specifications that culminated in the 2.0 Core release. In addition, we saw the need to re-organize the TWG to provide more focus on the Framework and Profile specifications without disrupting our goal of annual releases of the Core specifications. As a result, we disbanded the use-case-focused task groups and replaced them with the specification-focused sub-groups to give each group of specifications dedicated time to plan, develop, and maintain their respective specifications. The previous work of the task groups in developing the technical requirements has transitioned to the TWG. We look forward to seeing substantial progress in developing both the Core, Framework, and Profile specifications and realizing end-to-end interoperability for the FiRa use cases over the coming year.”*

**Brian Redding** (Qualcomm Technologies, Inc.)  
**Karthik Srinivasa Gopalan** (Samsung R&D Institute India - Bangalore)  
Co-chairs

# COMPLIANCE & 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).

2023 Achievements	2024 Priorities
Launched the Certification Program 2.0 enabling certification for: <ul style="list-style-type: none"><li>• Two-Way Ranging Time-schedule-based</li><li>• Two-Way Ranging Contention-based</li><li>• One-Way Ranging Downlink Time Difference of Arrival (OWR DL-TDoA)</li><li>• One-Way Ranging Angle of Arrival measurement (OWR AoA)</li><li>• Dynamic and provisioned STS</li></ul>	Focus on FiRa Core Certification release support for the upcoming version
Updated the certification program and certified product listing webpage for Certification Program 2.0 release.	Develop core features selection and certification launch plan for the next release
Validation of 4 PHY, 2 MAC and 2 IOP test tools for Certification Program 2.0 release	Create Framework/Profile certification strategy
Selected 2 Reference Devices for IOP testing	Support UWB PHY and MAC certification f or Digital Key Specifications of CCC
	Support MWG efforts to promote certified devices



*“Creation of a strong and complete FiRa ecosystem requires the contributions of many stakeholders. It is essential for people in this team to represent chip and device manufacturers, test tool vendors, and test labs.”*

**Jacek Hryszkiewicz**  
Certification Program Manager



*“The Core Certification release v1.0 was well-received in the marketplace. In October 2023, we released Certification Program 2.0, which includes additional functionality to the FiRa PHY and MAC to enable further FiRa-defined use cases.”*

**Jieun Keum** (Samsung Electronics)  
**Michael Stark** (NXP Semiconductors)  
Co-chairs





# 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 adoption of UWB-based solutions.

2023 Achievements	2024 Priorities
Supported the release of the FiRa 2.0 Core Technical and Test Specifications	Make FiRa implementation easier and faster for device-makers
Provided Statement of Use materials to the U.S. Patent and Trademark Office to support the registration of FiRa trademarks in the U.S.	Enhance deployment and adoption through the promotion of the FiRa ecosystem of devices
Developed a new Resource Hub for the FiRa website with associated materials to support market education around UWB and its use cases	Accurately and quantitatively identify UWB market demand trends and ecosystem growth
Extended FiRa's marketing reach by hiring a full-time marketing manager to focus on FiRa marketing efforts	Enhance the attractiveness of the FiRa brand to end-consumers and maintain FiRa as the leading brand in the UWB ecosystem
Created FiRa branded logos for Validated Test Tools and Authorized Test Labs	Continue to support FiRa use cases and other activities with relevant marketing collateral and media outreach
Improved internal Consortium communication capabilities for promotion	Track metrics to measure and analyze the success of MWG endeavors
Added multiple collateral: blog, whitepaper, leaflets, and videos	Launch a Devices and Development Tools section on the FiRa website



*“2023 saw significant growth for UWB technology in actual deployments. In turn, FiRa’s MWG has strengthened and evolved this past year to support this growth with additional materials supporting new use cases, multiple improvements of FiRa branding, a new blog, and more. As the UWB disruption continues to develop, so will our evangelism and advocacy for the technology and our members.”*

**Benjamin Guilloud** (Qorvo, Inc.)  
Chair

# 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.

2023 Achievements	2024 Priorities
Contacted regulators to ensure UWB interests were heard in the discussions for 6G spectrum	Work with European regulators to look again at access to the spectrum in 8.5 - 10.6 GHz
CEPT Report 84 published to request that the EU Commission include fixed outdoor and enhanced indoor usage in its decision on UWB	Work with UWB Alliance and other industry stakeholders to submit a request for UWB regulations update in the USA
Supported the request for an update of the UWB regulations in the USA with interference studies performed with external partners	Ensure UWB is included in studies following the World Radio Conference 2023
Interfaced with China MIIT to provide industry feedback on its proposed UWB regulatory update	



*“The FiRa Regulatory Working Group continues to engage with regulators around the world to ensure the success of FiRa-certified UWB technology.”*

**Dries Neiryndck** (Qorvo, Inc.)  
**Josef Preishuber-Pflügl** (NXP Semiconductors)  
Co-chairs

# SECURITY WORKING GROUP (SWG)

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

2023 Achievements	2024 Priorities
Defined the security incident response process	Roll out of security incident response process
Defined the threat model for the Physical Access Control Profile	Establish security certification schemes for UWBS and Secure Element <ul style="list-style-type: none"><li>Develop Protection Profiles</li><li>Establish Certification Body/Certification &amp; Accreditation Body</li></ul>
Analyzed the Ghost Peak attack	Analyze security requirements of supported use cases and define security targets for the components specified by FiRa
	Enhance PHY layer test cases



*“The SWG analyzes the security requirements for the use cases to be addressed, derives security mechanisms to be specified, and provides guidance on the security level the involved components need to provide.”*

**Franz-Josef Bruecklmayr** (Infineon)  
**Olivier Van Nieuwenhuyze** (ST Microelectronics)  
Co-chairs



Learn more about FiRa’s [Structure and Working Groups](#).

# 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.

2023 Achievements	2024 Priorities
Hired a Specification Program Manager	Clarify and bolster the management of use cases
Set a regular cadence for new specification releases	Complete the process refinement project
Onboarded Technical Editors so we may redirect contributor efforts into specification development	Increase and standardize communications between Working Groups
Initiated a process refinement project, documenting and clarifying phase activities and gates	Standardize templates and tools across Working Groups



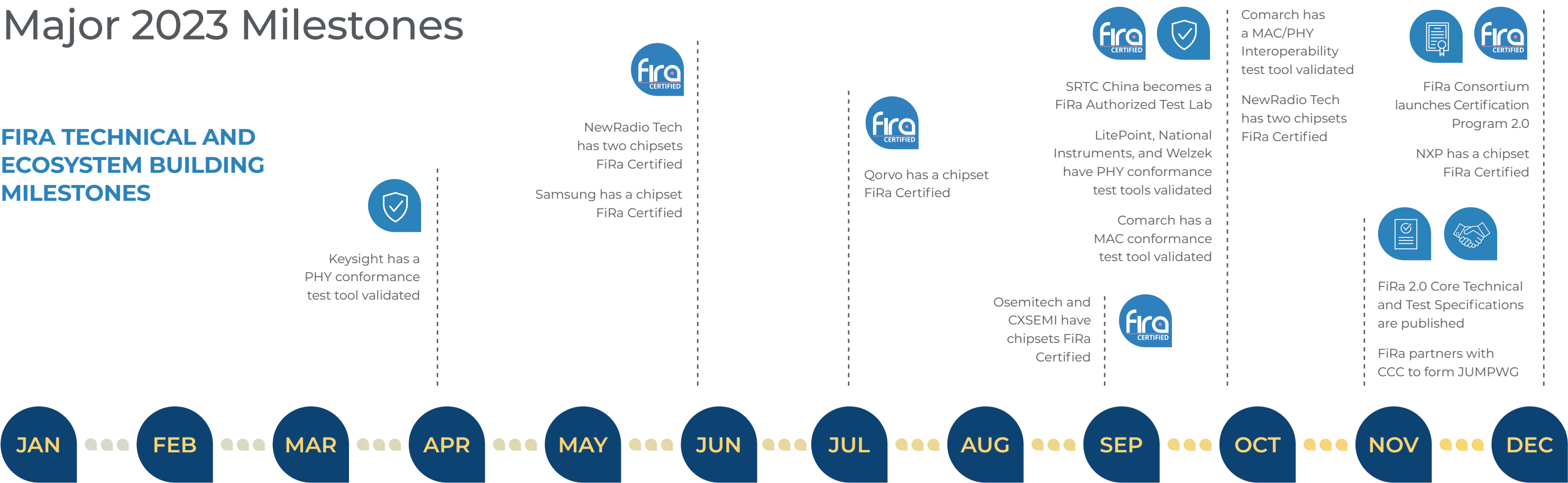
*“Since stepping into FiRa, the experience has been an incredible journey filled with innovation and collaboration. I have grown to deeply respect and appreciate the dedication and expertise of this remarkable team. As the Specification Program Manager, I’m honored to drive the development of cutting-edge technical specifications, contributing to FiRa’s dedication to redefining technological frontiers.”*

**Annette Mahoney** (FiRa Consortium)  
Specification Program Manager  
Chair of the WGSC



# Major 2023 Milestones

## FIRA TECHNICAL AND ECOSYSTEM BUILDING MILESTONES



## FIRA EVANGELIZATION MILESTONES





# Join FiRa Now!

FiRa invites you to experience the benefits of membership firsthand. With 120 global members representing industries across multiple market segments, FiRa offers its members access to thought leaders, expertise to strengthen knowledge, resources to stay current with the latest trends, and networking for professional development and growth.

The FiRa Consortium enables its members to maximize the benefits of UWB technology for their brand:

- Demonstrating leadership in wireless innovation
- Exploring new market opportunities
- Getting innovative products to market faster
- Selling products and solutions more easily because they are part of an open and interoperable ecosystem

Gain the connections and knowledge you need to leverage UWB and be ready to take advantage of the opportunities that lie ahead.

## Joining is easy!

1. Choose the membership level that is right for your organization
2. Review the FiRa Governing Documents
3. Complete and submit the Membership Application
4. Get involved!

Learn more about FiRa membership here:  
<https://www.firaconsortium.org/membership/information>





# Glossary

Term	Definition
Bluetooth® Low Energy (BLE)	Bluetooth radio communication technology for very low-power operations, based on Bluetooth SIG specifications.
Car Connectivity Consortium (CCC)	An organization that brings automotive and consumer technology industries together to future-proof vehicle access using smart devices.
CEPT Report 84	The European Conference of Postal and Telecommunications Administrations Report that addresses the use of frequency bands 6-8.5 GHz for new UWB applications.
China Ministry of Industry and Information Technology (MIIT)	Responsible for regulation and policies related to the Internet, wireless, broadcasting, communications, production of electronic and information goods, software industry, and more.
Common Service Management Layer (CSML)	A FiRa-defined framework protocol that provides a profile application programming interface (API) to support various use case verticals.
Compound Annual Growth (CAGR)	Measures a product's/investment's annual growth rate over time, taking into account the compounding of the rate.
Scrambled Timestamp Sequence (STS)	A MAC feature that uses cryptographic materials to generate Scrambled Timestamp Sequences (STS) to mitigate replay attacks.
Ghost Peak Attack	Practical distance reduction attacks against high-rate pulse repetition frequency (HRP) UWB ranging.
Interoperability (IOP) Testing	Testing functionality between two or more systems using standards on which those systems are based.
Link Layer	The FiRa protocol layer handles data transfers between devices.

Term	Definition
Medium Access Control (MAC)	An IEEE 802.15.4 defined and FiRa-enhanced protocol layer to provide channel access and link management between devices.
Out-of-Band (OOB)	Discovery mechanisms used for devices pairing process, which leverage radio signals out of the UWB spectrum bands.
Physical Access Control System (PACS)	May use key fobs, swipe cards, and personal identification numbers (PINs) to verify authorization for entry, rather than traditional physical keys.
Physical Layer (PHY)	Defines the physical and electrical characteristics of the communications network.
Secure Element	High-security assurance, tamper-resistant discrete hardware on which sensitive key derivation can take place.
Secure UWB Service (SUS) Application Programming Interface (API)	The FiRa specification that defines the secure interface between the host and the secure element, and the secure interface between the UWB subsystem and the secure element.
Time of Flight (ToF)	The duration it takes for a signal to travel from one point to another.
Two-Way Ranging (TWR)	The distance measurement method that's based on ToF, as a result of bidirectional communication between two devices.
Uplink Time Difference of Arrival (UL-TDoA)	Uses time difference of arrival of signals sent by devices to anchors which allow anchors to determine the device's position.
UWB Command Interface (UCI)	The FiRa-defined interface specification between the UWB Subsystem and the host.
UWB Subsystem (UWBS)	The subsystem that implements the Core specifications (PHY, MAC, Link Layer, and UCI).



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# About FiRa Consortium

The FiRa Consortium is a member-driven organization dedicated to transforming the way we interact with our environment by enabling precise location awareness for people and devices using the secured fine ranging and positioning capabilities of ultra-wideband (UWB) technology. FiRa does this by driving the development of technical specifications and certification, advocating for effective regulations and by defining a broad set of use cases for UWB. To learn more about UWB and the FiRa Consortium, visit [www.firaconsortium.org](http://www.firaconsortium.org).

March 2024

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