Exploration of Wireless Payment Potential

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EMVCo Mission and Focus

EMVCo enables card-based payments to work seamlessly and securely worldwide.

Mission:
To facilitate the worldwide interoperability

- Specifications
- Approval and Evaluation
- EMVCo Marks
- Industry Engagement and Collaboration

EMV® Specifications: Supporting security, flexibility & innovation

When evaluating whether there's a role for EMVCo in wireless payments, we must consider our core objectives

EMV Specifications provide a common foundation for adopting technologies that are proven to increase security and fight fraud.

EMV Specifications support innovation and are flexible to accommodate the unique needs of different marketplaces.

EMV Specifications are widely used to create payment products and services that deliver trusted and convenient payments for merchants and consumers around the world.

Enabling payments through wireless technologies

Contactless and Near Field Communications (NFC) offered the possibility for EMV® Chip transactions beyond cards with mobiles and wearables.

Wireless technologies bring extra considerations into play for payments – new and innovative use cases beyond the physical POS.

Three key areas EMVCo is addressing:

The data that needs to be exchanged between the cardholder device and merchant system

Security considerations for such a payment

Some technology considerations for establishment of the wireless connection.

Why is UWB being explored to support payment transactions?

1

Fine Ranging Capabilities.
Enables use cases with real-time tracking of relative movement and position.

2

Technological capabilities
Millions of smart devices are being produced with in-built location precision technologies.

3

Market engagement
Continual desire for more convenient, innovative shopping experiences.

Opportunities of UWB

- **Location precision**
  - UWB can measure distance/location to just a few inches, compared to, for example, a few feet for Bluetooth
- **Availability**
  - UWB capability is already built into over 350 million smartphones and upcoming new models
- **Security**
  - UWB can harness the in-built chip security of a modern mobile device
- **Usability**
  - UWB on a mobile device can draw upon a host of data as well as real-time tracking of the relative movement and position to confirm an authentic ‘intent to pay’

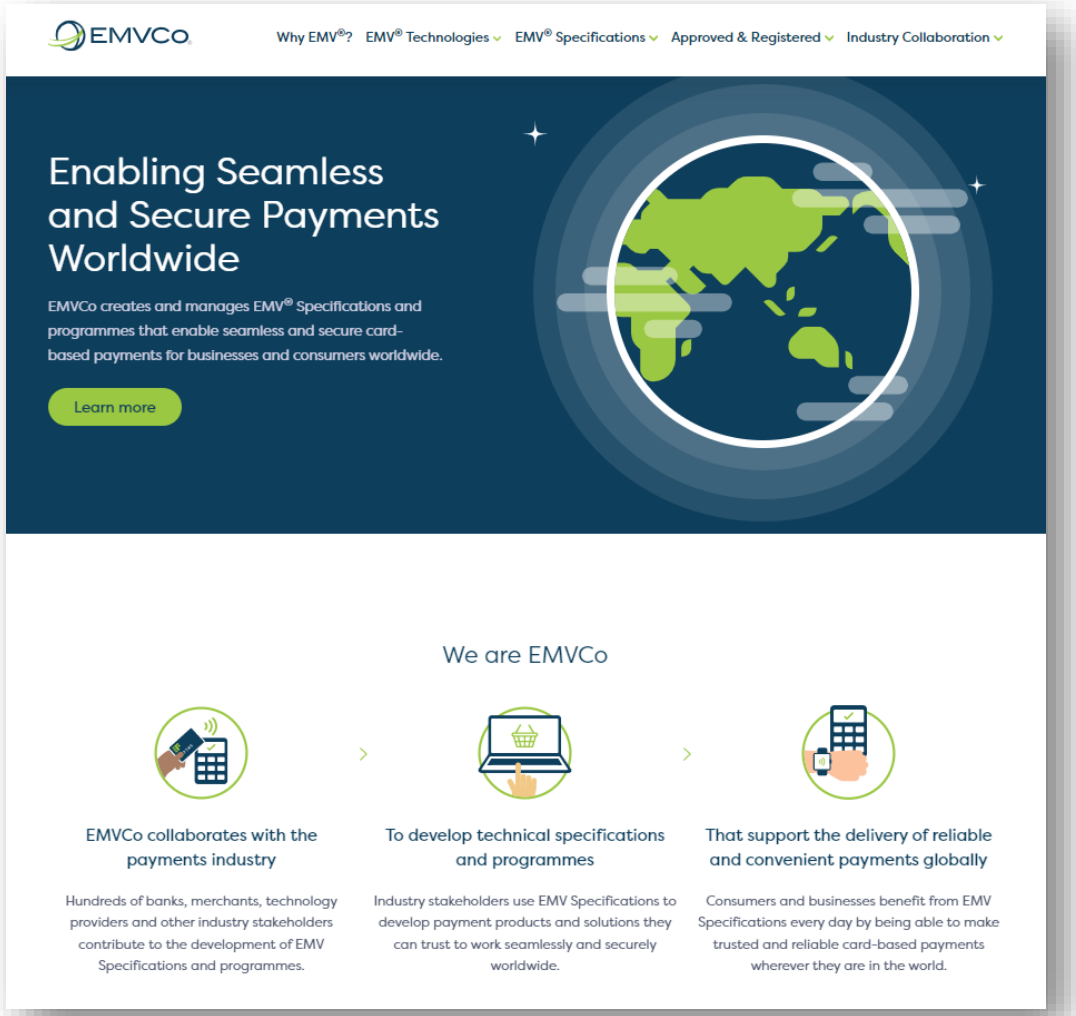
Enabling security and convenience

Key technical considerations for UWB payments:

- Availability
- Ease of use
- Functionality
- Interoperability
- Performance
- Security
- User Settings and Permissions

Further exploration and evaluation is being undertaken by EMVCo and its Associates, and through liaison with FiRa.

EMVCo Whitepaper in development for publication later this year.



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Secure Ultra-Wideband Can Ease Payment Transactions

FiRa Consortium, March 2023

Represented by Björn Scharfen with Infineon Technologies AG

Video

FiRa's Vision

Our **vision** is to transform the way we interact with our environment by enabling **precise location awareness** for people and devices.

FiRa Consortium Goals -
Foster a framework to facilitate broad adoption of UWB, its fine ranging & positioning capabilities

Spur Innovation

- Support **compelling use cases** across **broad business domains**
- Provide a unique opportunity to **explore** and **define use cases for UWB**

Ease Adoption

- Enable member companies to **work together** to deliver the building blocks, tools and technologies needed to **integrate UWB seamlessly**
- Foster a **robust UWB ecosystem** to enable **rapid** technology **deployment**

Support Interoperability

- Define and **drive specifications** to support **interoperability** between **UWB**-enabled **products**

Drive Collaboration and Certification

- **Liaise** with other **consortia and industry stakeholders**
- **Advocate** for **UWB** with **Government and Regulatory bodies** to drive fair **spectrum rulings** for UWB
- Offer **defined processes** for **devices conformity to FiRa requirements** and test specifications

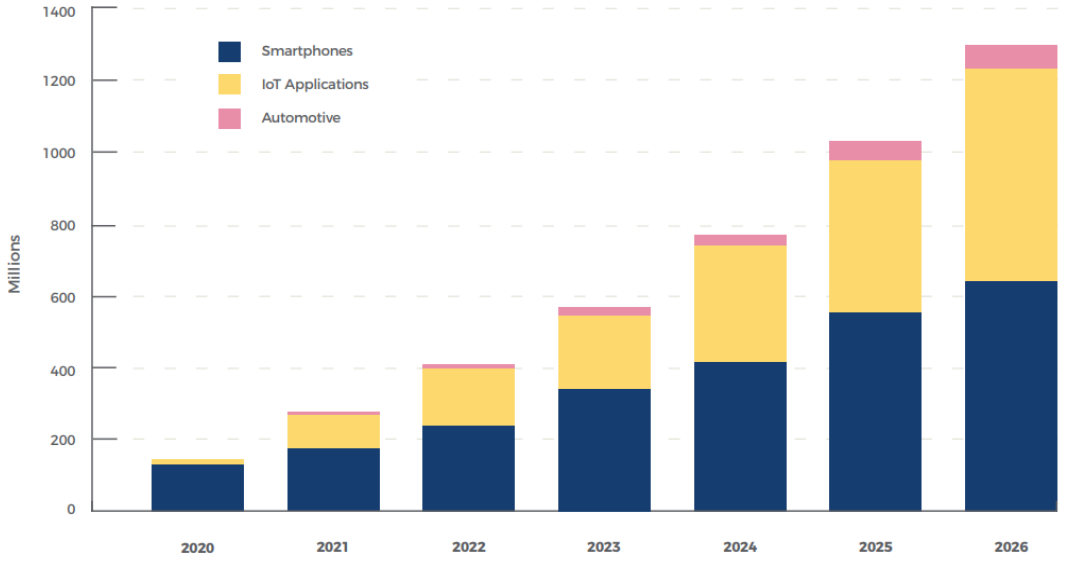
Within the FiRa Use-Cases, UWB Supported Payment Transactions Play an Important Role

SMART CITIES & MOBILITY		SMART BUILDING & INDUSTRIAL		SMART RETAIL		SMART HOME & CONSUMER	
Indoor Navigation	V2X* and Autonomous Driving	Social Distancing	Asset Tracking	**Tap-Free Mobile Payment**	Targeted Marketing	Point and Trigger Controller App	Gesture-Based Control
Vehicle Digital Key (Standardized by CCC)	Ticket Validation (Public Transport Services)	Controlled Access	Find Equipment	Unmanned Store Access	Drone-Controlled Delivery	Residential Access Control	VR Gaming and Group Play
Rider Identification (Private Transport Services)	Reserved Seat Validation	Physical Access Control	Patient Tracking	Foot Traffic and Shopping Behavior Analytics	**In-Vehicle Payment**	Easy (Logical) Access to Personal Devices	Find Someone/ Something Nearby
Transportation Sharing (Find a Bike or Scooter Nearby)	**Transportation Fare Payment**	Indoor Navigation	Teleconference System	Exhibition Attendee Management		AR Gaming	Presence-Based Device Activation
Ride Sharing (Precise Positioning)	eID Validation in Crowded Environments	Employee Gathering in Emergencies	Proximity-Based Patient Data Sharing			**Smart Home based Payment (Smart Speaker, TV,..)**	
Driverless Valet Parking and Pick-Up	**Access + Payment for Parking / Toll**						

Use cases linked to Payment

UWB Will Play a Crucial Role in IoT and Automotive Applications Including Financial Transactions

Opportunities for Ultra-Wideband (UWB)[1]



Market developments

- In 2021, ~300m pcs have been shipped primarily in smartphone applications
- By 2025[2] >1 billion devices are expected to be shipped

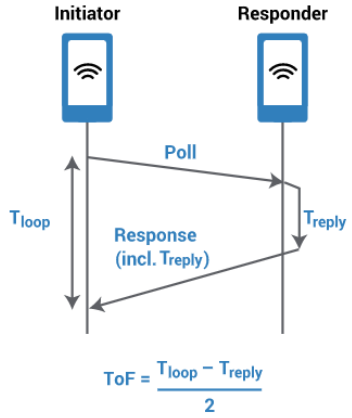
Market Trends

- UWB ranging enhances the convenience, system security & performance in many IoT applications
- UWB enables new use cases and is often used jointly with Bluetooth and NFC
- UWB is already widely used for car access using key fobs, smartphones or wearables
- Consumer electronics (TV, laptops, audio equipment) will show the largest market growth until 2025[3]
- UWB will enhance touchless payment and transit through secure ranging
- UWB is based on IEEE 802.15 and adopted by many standardization bodies such as FiRa, CCC, CSA,....

Sources:
1) FiRa publication: Unleashing the Potential of UWB, August 2022, ABI Research
2) https://www.allaboutcircuits.com/uploads/articles/UWBWP.pdf
3) https://www.marketsandmarkets.com/Market-Reports/indoor-location-market-989.html?gclid=EAIaIQobChMIutrnsoSw9wIVl21vBB3KNw-mEAAYASAAEgLoIPD_BwE

How Does UWB Work and What Are the Advantages?

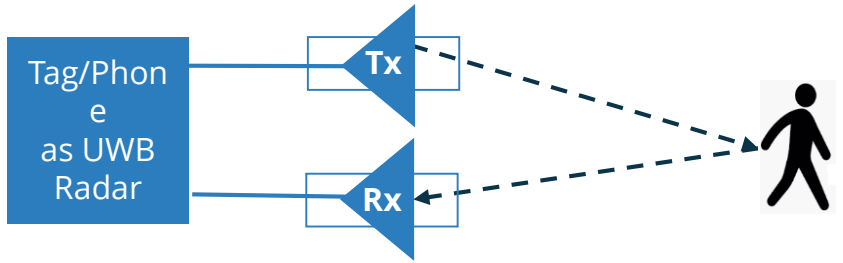
UWB Ranging (Two Device Interaction)



Ultra-Wideband

- Time of Flight (ToF) measurements
- 2 ns impulses
- Channel bandwidth of 500 MHz
- Frequency band 5-10 GHz

UWB Sensing (Single Device Involved)*



- Presence Detection (user awareness, security)
- Touchless Gesture Recognition (smart home, payment)
- Vital Signs (respiration rate)

High precision
High reliability

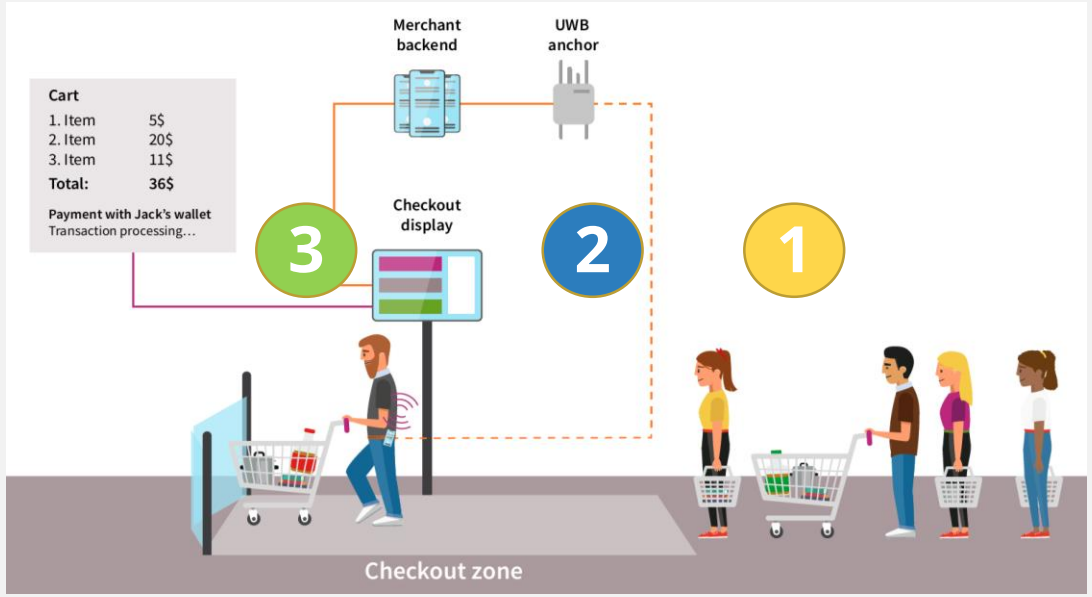
Directional location information

Low latency

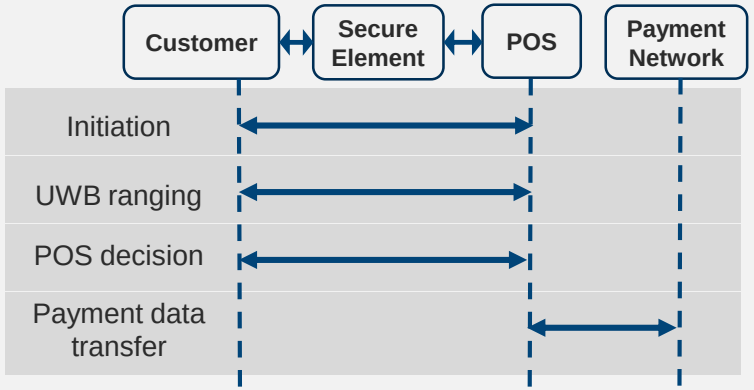
Built-in security

* Not yet part of the FiRa specification but already demonstrated in cars or notebooks

UWB in Payment May Ease and Accelerate the Checkout Process With a Smartphone or a Wearable without Compromising Security

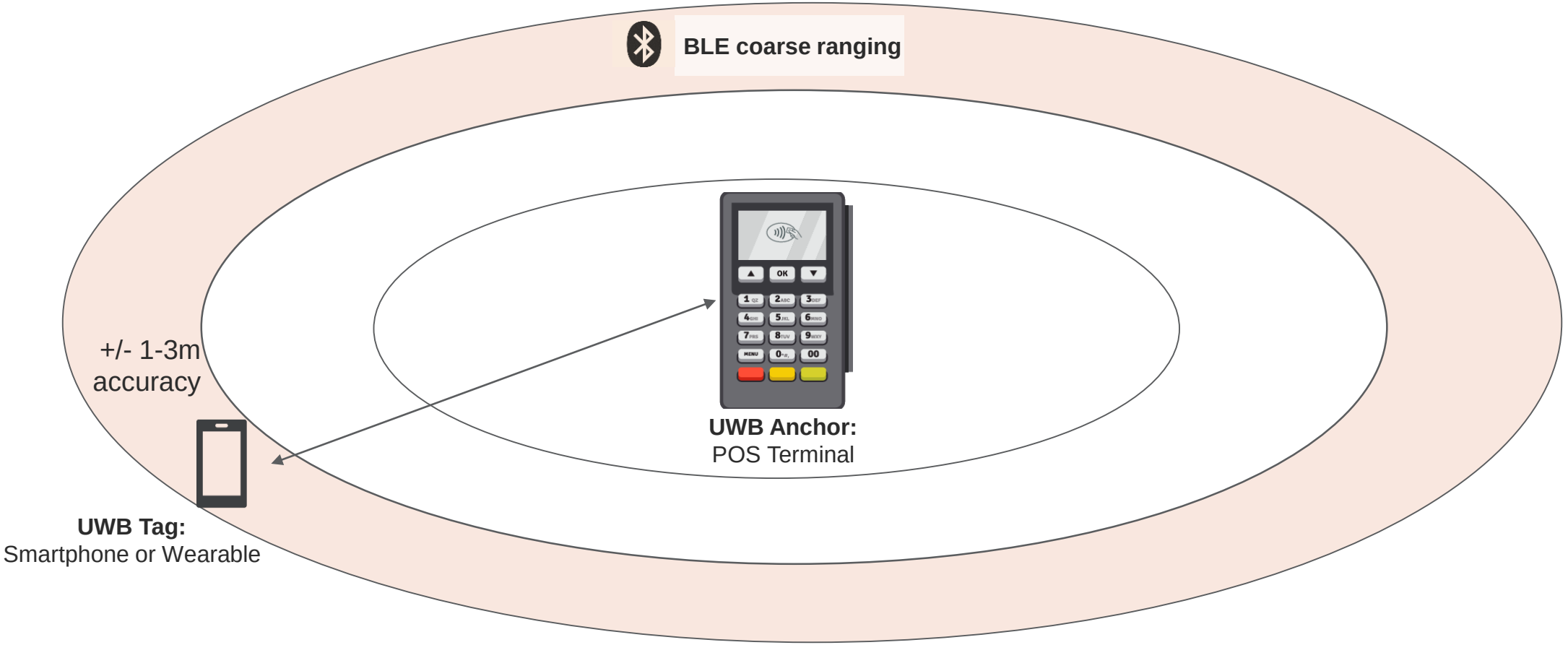


1. Bluetooth (BLE) coarse ranging starts while approaching the checkout zone
2. **Checkout Zone:** The customer payment device and POS terminal authenticates via UWB (1st factor)
3. **Payment Zone:** The customer shows the intention to pay (2nd factor):
   a) The customer opens a payment application on the device and confirms the payment (click/gesture)
   b) The customer walks into a designated payment zone which triggers the transaction



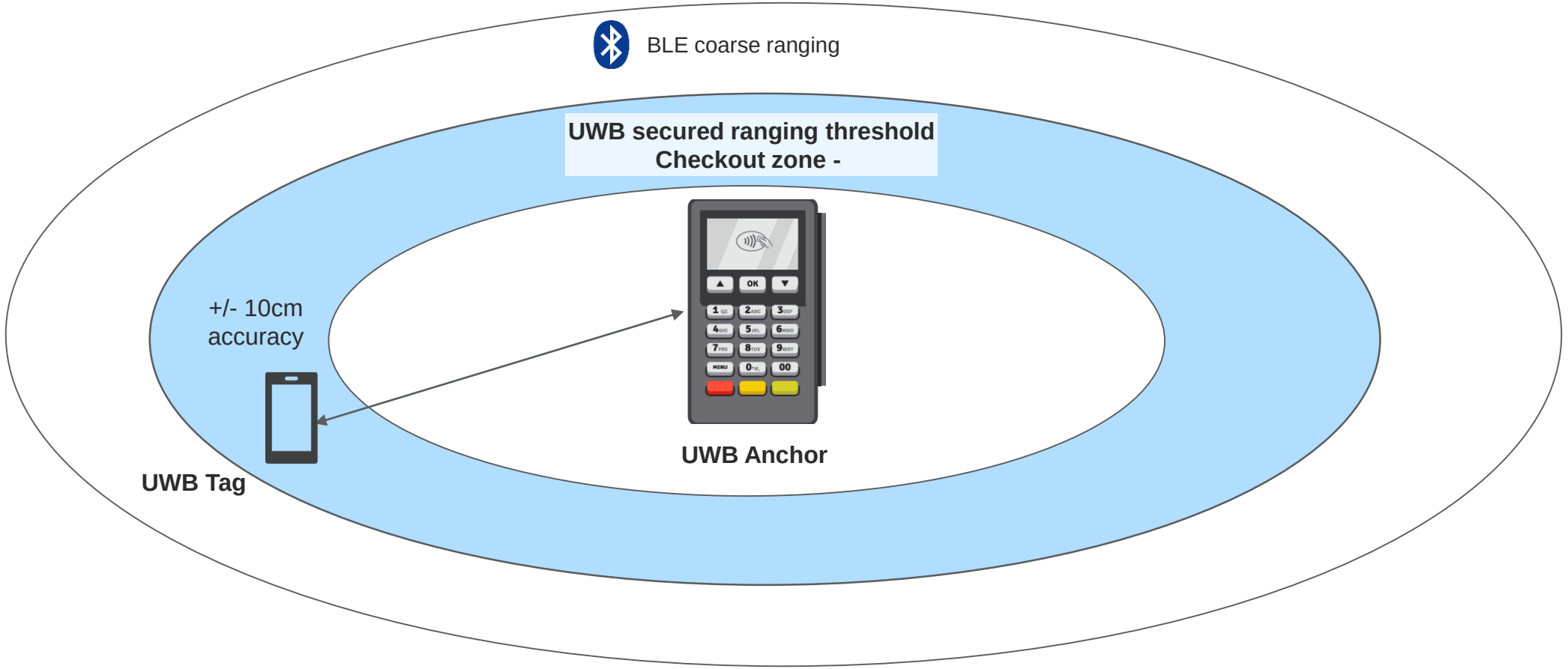
- **Secure ranging and authentication** is done through UWB, supported by a **hardware-based secure element**
- Once the **payment network approves** the **transaction**, the **payment data** transfer is started through the **POS terminal**

UWB in Payment Use Cases - The “Tap Free Mobile Payment” Experience



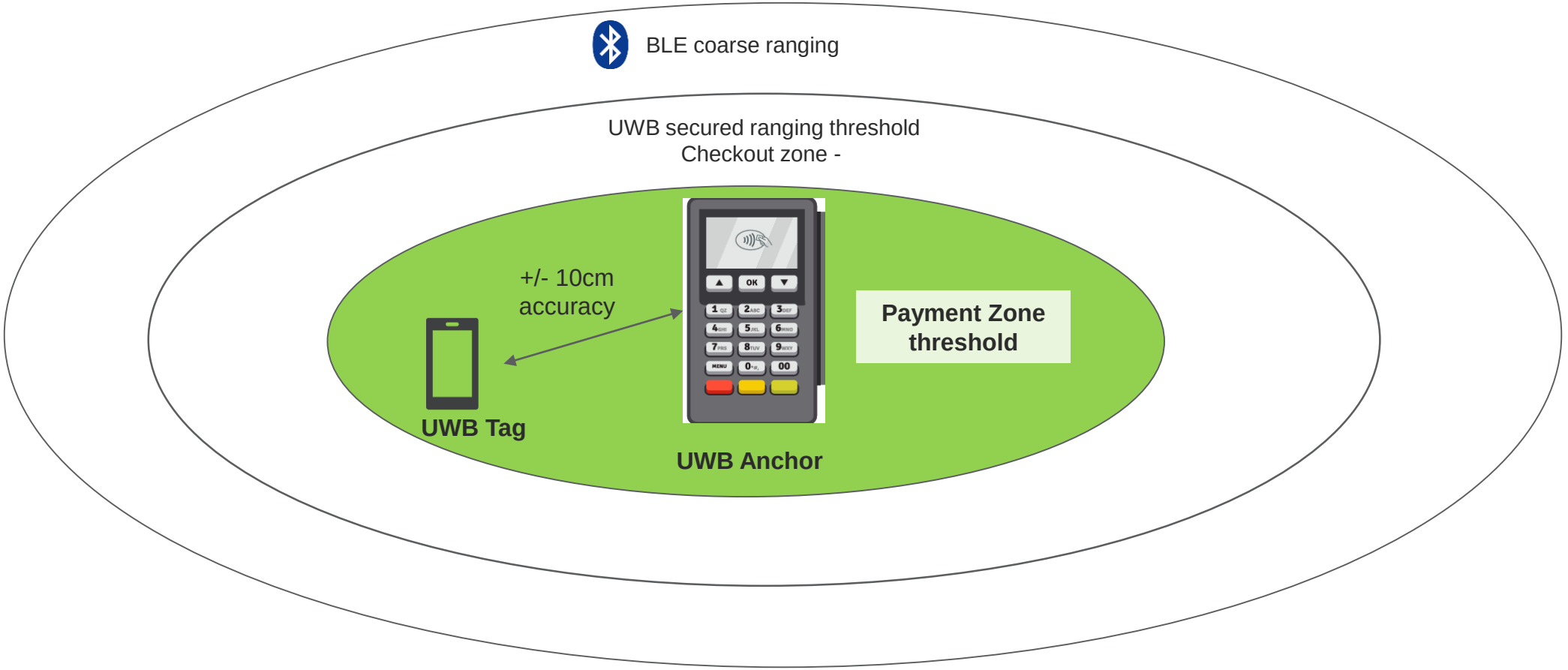
Once the phone approaches the POS, Bluetooth Low Energy (BLE) based coarse ranging starts to estimate the distance and prepares the device with all necessary information

UWB in Payment Use Cases - The “Tap Free Mobile Payment” Experience



On a predefined threshold, a UWB secured ranging session is initiated between tag and anchor

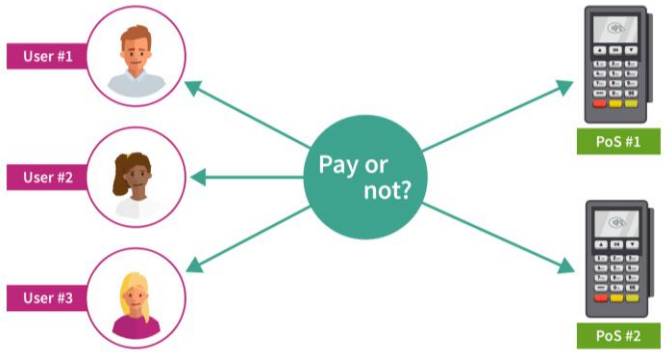
UWB in Payment Use Cases - The “Tap Free Mobile Payment” Experience



When crossing the payment zone threshold, the payment transaction will be initiated and executed either through UWB or via the out of band channel (BLE)

UWB Supported Tap Free Mobile Payment – Potential Challenges

User Selection

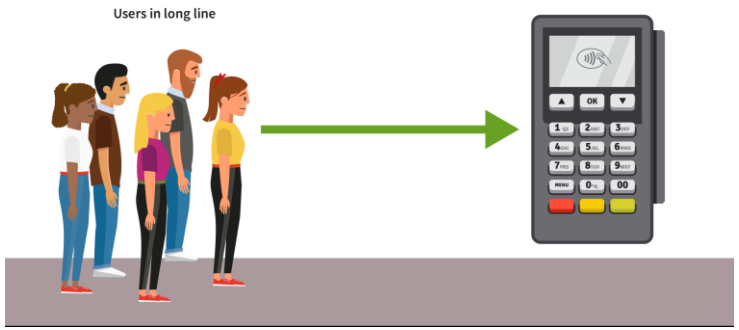


› Secure and reliable detection of the customer's intention to pay
› Establishment of the correctly assigned connection

Infrastructure Costs

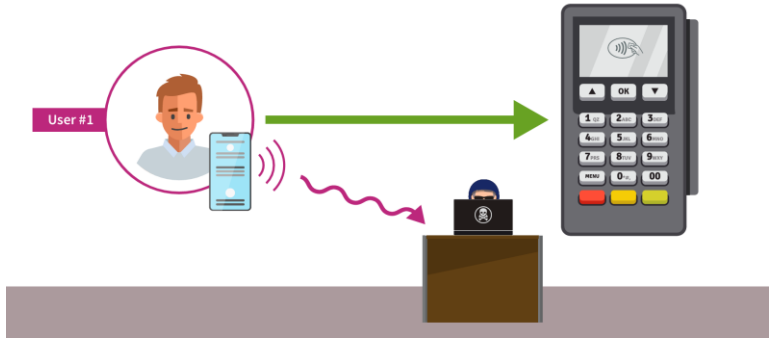
› Optimize infrastructure costs while upgrading to UWB based payment
› Trend towards Mobile Phones to be used as a POS terminal

User Experience



› No wireless collisions between user and POS terminal
› Well defined use cases across the ecosystem to optimize the user experience

Security Attacks



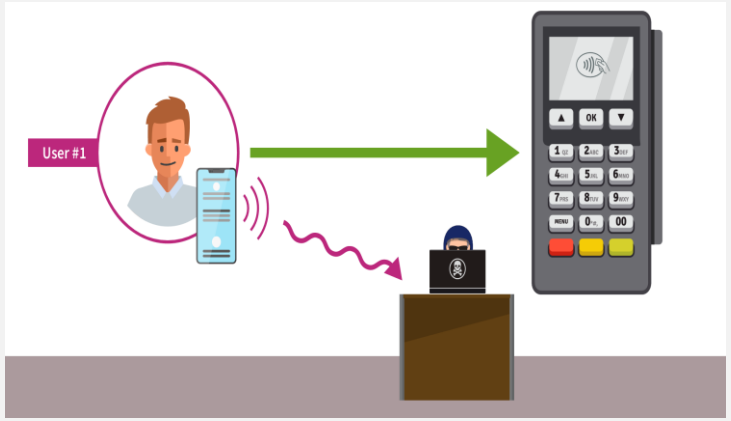
› Security attacks (MITM, relay attack,…) to be considered
› Security measures incl. Secure Elements to be installed

FiRa Integrated Various Security Measures Into Their Specifications and Continuously Enhances Implementations for UWB

Potential attack scenarios for UWB implementations:

Attack scenarios (e.g. Cicada) try to influence incoming signals and may cause incorrect distance measurements.

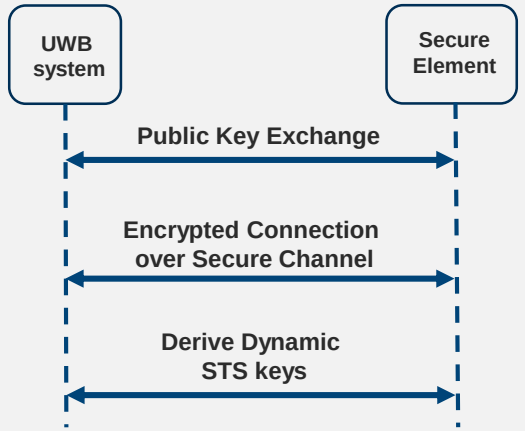
The attackers try to overlap a signal or detect and replace parts of the signal.



Source: FiRa Public Security Whitepaper 08/22. www.firaconsortium.org

FiRa describes and supports various security measures within UWB systems, including HW Secure Element

- Scrambled Time Stamp (STS) sequence in the UWB hardware
- Secure UWB Service (SUS) specifies a secure authentication within the UWB system (Dynamic STS)
- STS generation, encryption & synchronization in the UWB system



FiRa established a Security Working Group in 2022

Evaluate security requirements and derive security certification requirements for each use case	Consult other working groups	Define security measures for FiRa specification releases	Check and evaluate actual and potential future attack scenarios	Consult liaisons with UWB related bodies and ecosystems (e.g. EMVCo)

Conclusions

Ultra-Wideband is already widely used in smartphones and automotive applications and the market is quickly growing into many IoT applications

Thanks to the underlying ToF technology, Ultra-Wideband will significantly enhance the user convenience by creating spatial awareness and providing secure ranging and sensing

The built-in security measures make Ultra-Wideband very attractive for security critical applications such as payment and transit

FiRa and its members from across the ecosystem are committed to constantly enhance Ultra-Wideband implementations

FiRa has developed many security features for Ultra-Wideband and adapts them to changing requirements by jointly working with the respective partner (e.g. EMVCo) and relevant bodies


THANKS
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