UWB雷达汽车应用UWB RADAR FOR AUTOMOTIVE APPLICATIONS

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资深市场经理

2022年12月

SECURE CONNECTIONS FOR A SMARTER WORLD

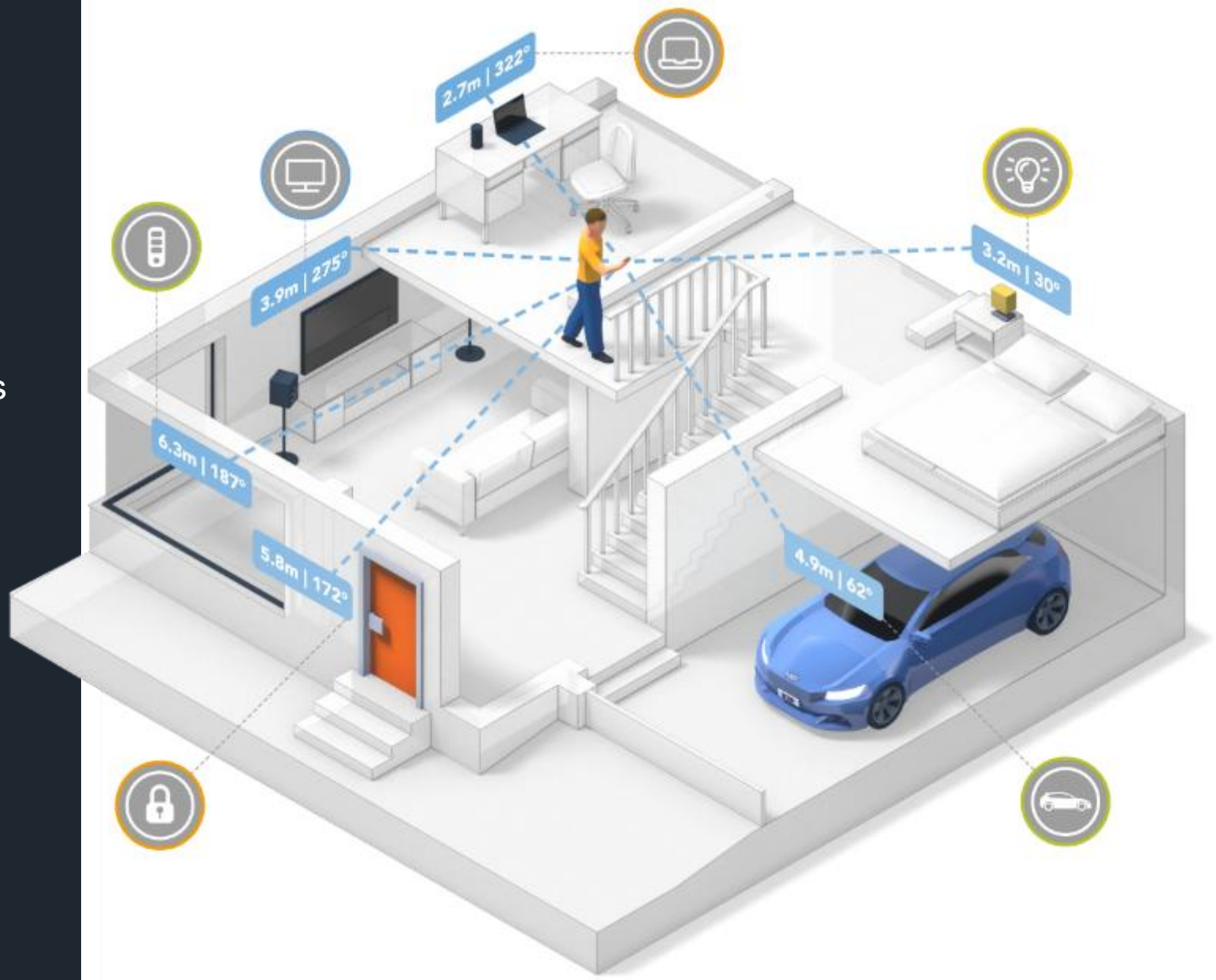
PUBLIC

ULTRA-WIDEBAND (UWB): PROVIDING A SOLUTION TO AN UNRESOLVED PROBLEM

Accurate positioning information of objects in real-time

Position granularity enables new use cases

Point-to-point communication



WHAT IS UWB?

Ultra-Wideband (UWB) transceivers send and receive short signal pulses (~2ns) at bandwidth of over **500 MHz** at very **low power spectral density**

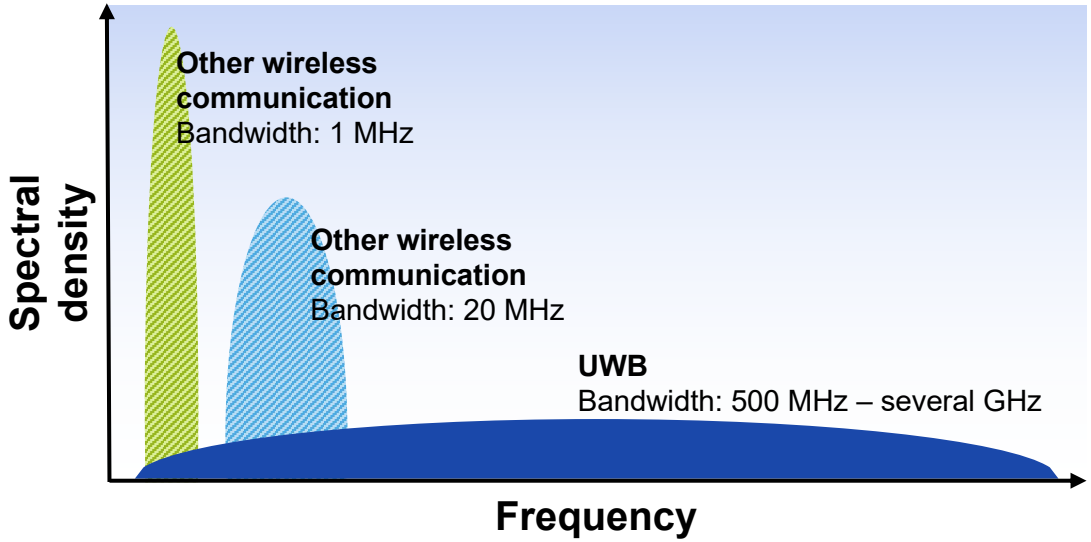
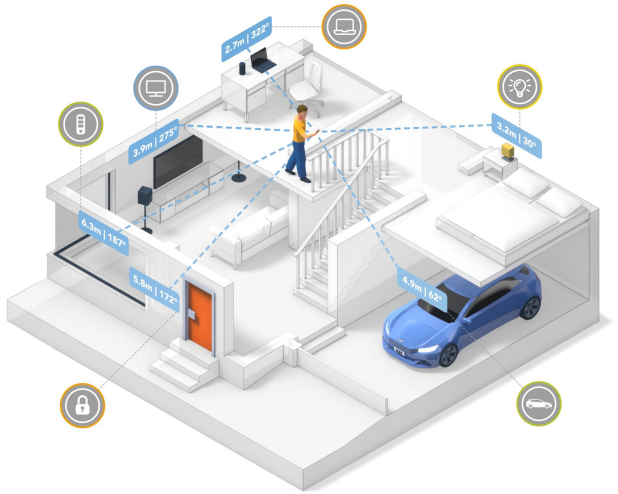


Fig. 1: Spectral density for UWB and narrowband



- **Accurate** and **robust** positioning information of objects
- Position granularity enables new use cases (Secure Access, Indoor Navigation and Tracking, Payment,…)
- **Secure** distance estimation due to time-of-flight (ToF) measurements and enhanced PHY level security in 802.15.4z

LARGE NUMBER OF USE CASES IN BROADER ECOSYSTEM

HANDS-FREE PAYMENT

INDOOR NAVIGATION

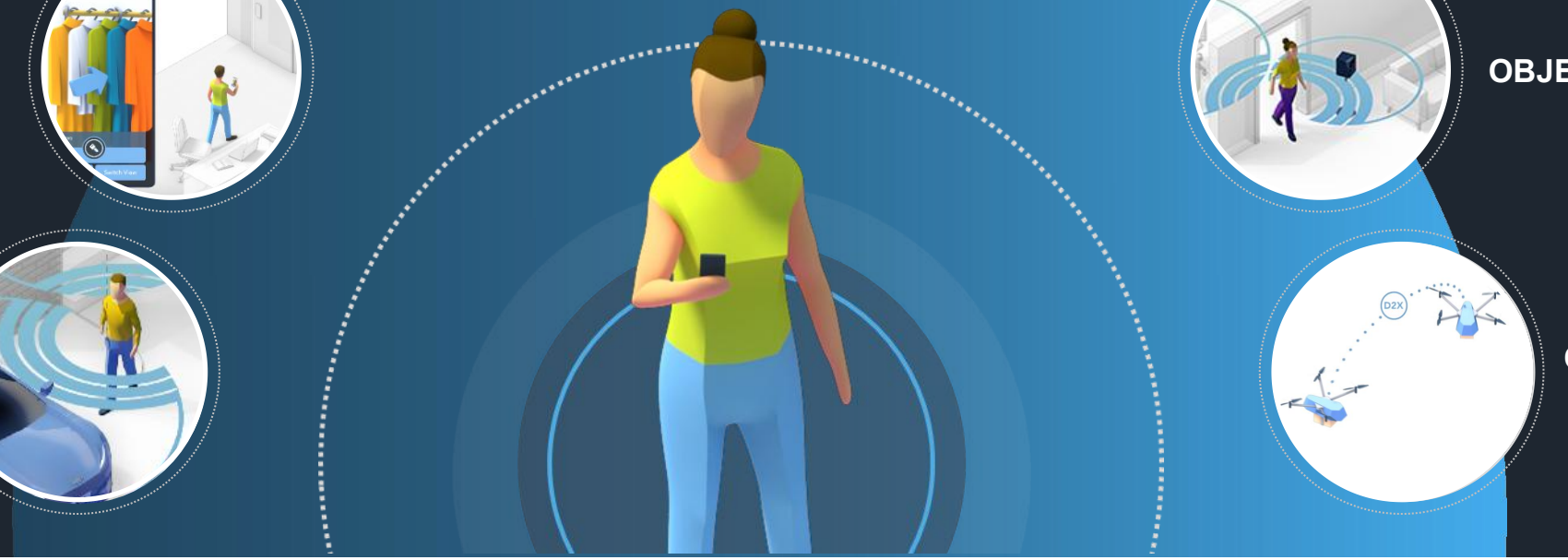
SMART BUILDING ACCESS

ITEM TRACKING

OBJECT DETECTION

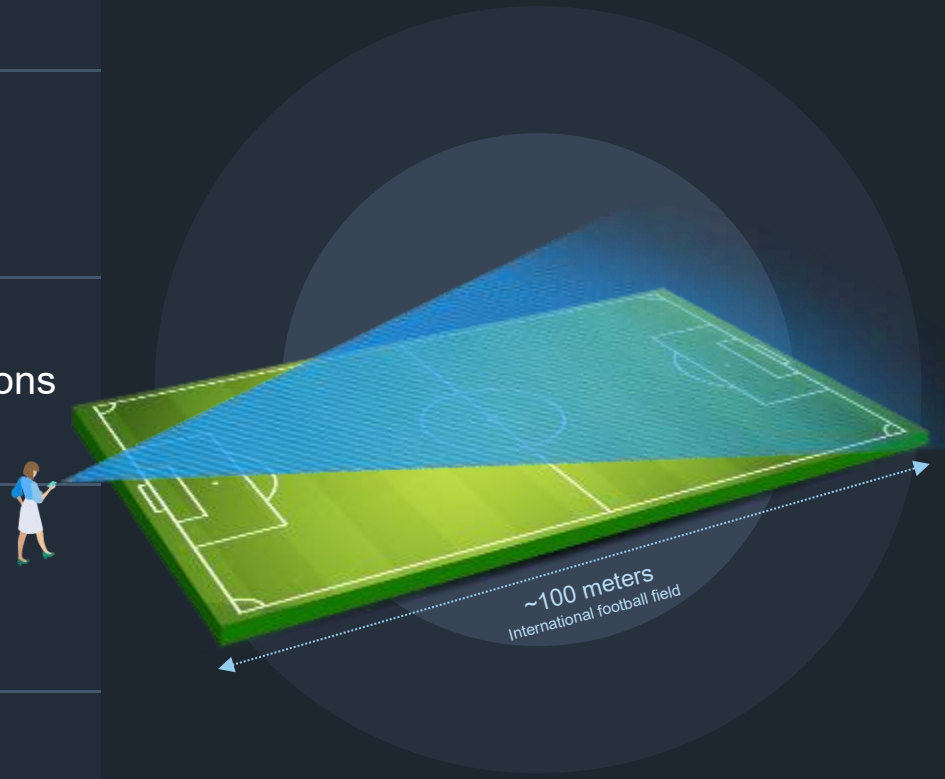
SMART CAR ACCESS

OBJECT-TO-OBJECT DETECTION



UWB: UNMATCHED TECHNICAL ATTRIBUTES FOR SECURE RANGING

Accuracy	+/- 10 cm distance +/- 3° of angle
Robustness	Strong in multipath environment 2ns radio pulses on 500MHz bandwidth
Range	100 meters of range under Line-of-Sight conditions
Security	Cryptographically protected ToF measurement
Real-time	Measurements in <10ms



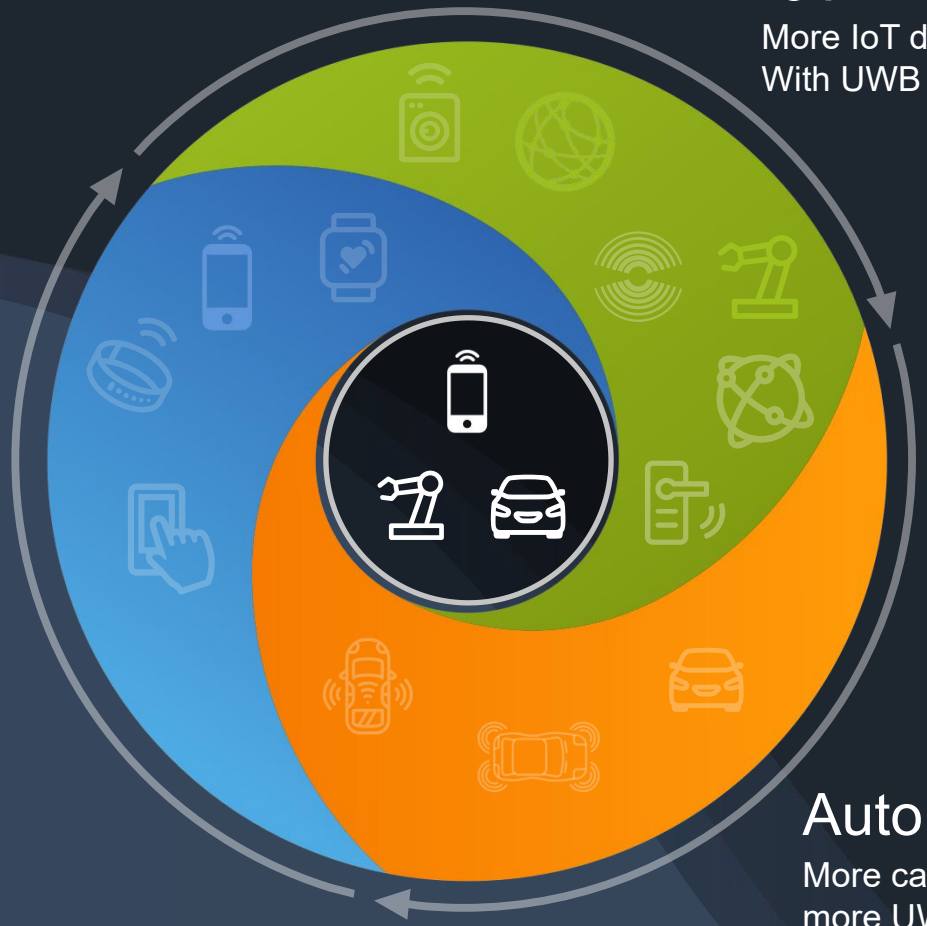
Source: FiRa™ Consortium, IEEE 802.15.4z-2020

UWB ECOSYSTEM WILL DEVELOP FAST

IoT
More IoT devices
With UWB

Mobile
More mobiles
with UWB

Automotive
More cars and
more UWB anchors/car



UWB INSTALLED BASE

CUMULATIVE
UWB DEVICES

2025
≥ 3B smart devices

2023
>10M cars

2022
>100M IoT devices

2021
> 400M mobiles devices

Source: ABI 2019

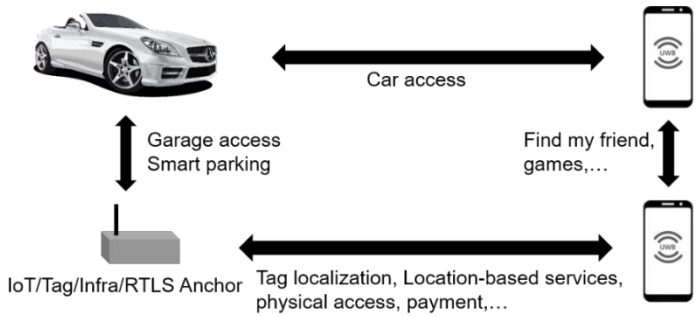
LAYING THE FOUNDATIONS FOR A LARGE UWB ECOSYSTEM

BY STRONG OEM ENGAGEMENTS & ECOSYSTEM PUSH THROUGH CCC & FIRA STANDARDIZATION

CAR OEM ENGAGEMENTS

Arrival Limited, Audi, BMW, Buick, Citroën, DS, FCA, Ford, GM, Honda, Hyundai, Jaguar Land Rover Ltd, Mercedes-Benz, Nissan Motor Corporation, PSA, Peugeot, Renault, Seat, Škoda, Subaru, Suzuki, Toyota, Volkswagen, Volvo, Zhejiang Geely Holding Group

INTEROPERABILITY BY STANDARDIZATION



MOBILE OEM ENGAGEMENTS

HUAWEI, SAMSUNG, Apple, oppo, vivo, Google, mi, SONY, SHARP, LG, lenovo

CARCONNECTIVITY consortium®

- Interoperability for Car Access Use Cases
- >120 members incl. Auto/Mobile OEMs
- NFC Access and digital key management finalized
- Handsfree car access mandates UWB, BLE & NFC

fira | The Power to Be Precise

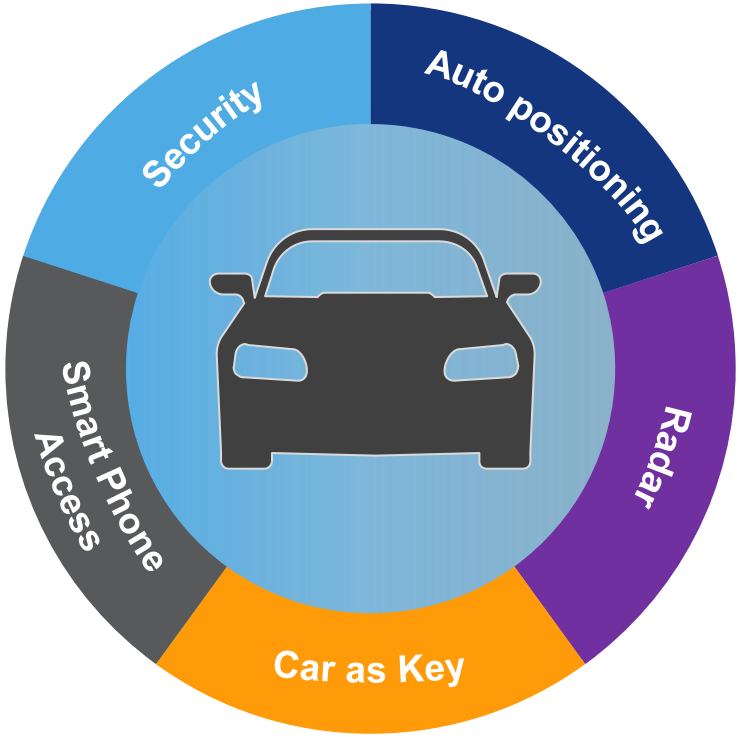
- Interoperability in non-car access market (Mobile/IOT)
- Founded by NXP/Samsung/HID
- > 100 members

SMART CAR ACCESS: CATALYST FOR FIRST ADOPTION WAVE

- Resistant to relay station attacks
- Robust in every environment
- Precise key localization
- Complete freedom of movement
- Multiple Digital Key use-cases

CARCONNECTIVITY consortium®

COMPELLING AUTO UWB OPPORTUNITIES



Security & Smart Access
- Protection against Relay Station Attack
- Truly handsfree access

Car positioning
- Automated parking (AVP)
- Automated EV charging
- Find-my-car

Car as key
- Garage-door / parking lot access
- Drive through payment

Radar
- **Kick sensor (trunk access)**
- **In-cabin passenger detection**

UWB AUTOMOTIVE SHORT RANGE RADAR APPLICATIONS

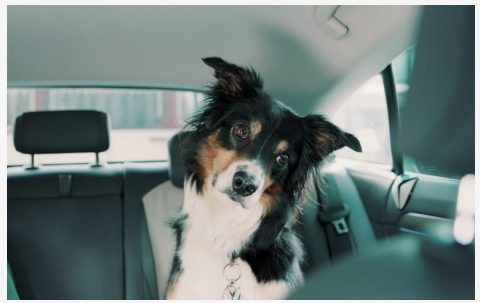
UWB radar allows to reliably detect in-cabin passenger presence and to monitor vital signs such as the respiration rate.

A **child presence detection** system aims to avoid hot-car deaths of unattended children – soon to be a mandatory feature according to the EURO NCAP roadmap.

HIGH MOTION SENSITIVITY
UNMATCHED ACCURACY WITH UWB

ROBUST LOW POWER LIFE SIGN DETECTION
THROUGH LOW CARRIER FREQUENCY AND HIGH RELATIVE BANDWITH

REDUCED SYSTEM COST
COST EFFICIENT IC SOLUTION



Life Sign Detection

Driver Monitoring

Seat Occupancy Detection

KEY FACTS – PEDIATRIC VEHICULAR HEATSTROKE (PVH)

- USA: approx. 40 children die inside hot vehicles every year
  - Trend not improving since beginning of recording (1998)
- Young children are most vulnerable: >50% of deaths are children under the age of 2
- 40% of reported PVH deaths occur at an outside temperature of below 30°C
- Main circumstances
  - Forgotten ~52%
  - Knowingly Left ~20%
  - Child Gained Access ~26%
- Key drivers for child presence detection:
  - Hot cars act (US Legislation)
  - NCAP Requirement (Direct Sensing 2025)

UWB AUTOMOTIVE SHORT RANGE RADAR APPLICATIONS

Leveraging UWB's unique radar capabilities allows to reliably detect in-car passenger presence and monitor passenger's vital signs such as the respiration rate.

A child presence detection system known as Rear Occupant Alert (ROA) aims to avoid hot-car deaths of unattended children – soon to be a mandatory feature according to the EURO NCAP roadmap.

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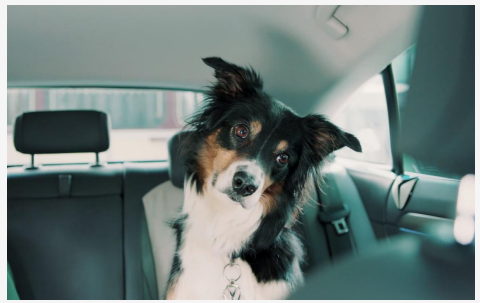

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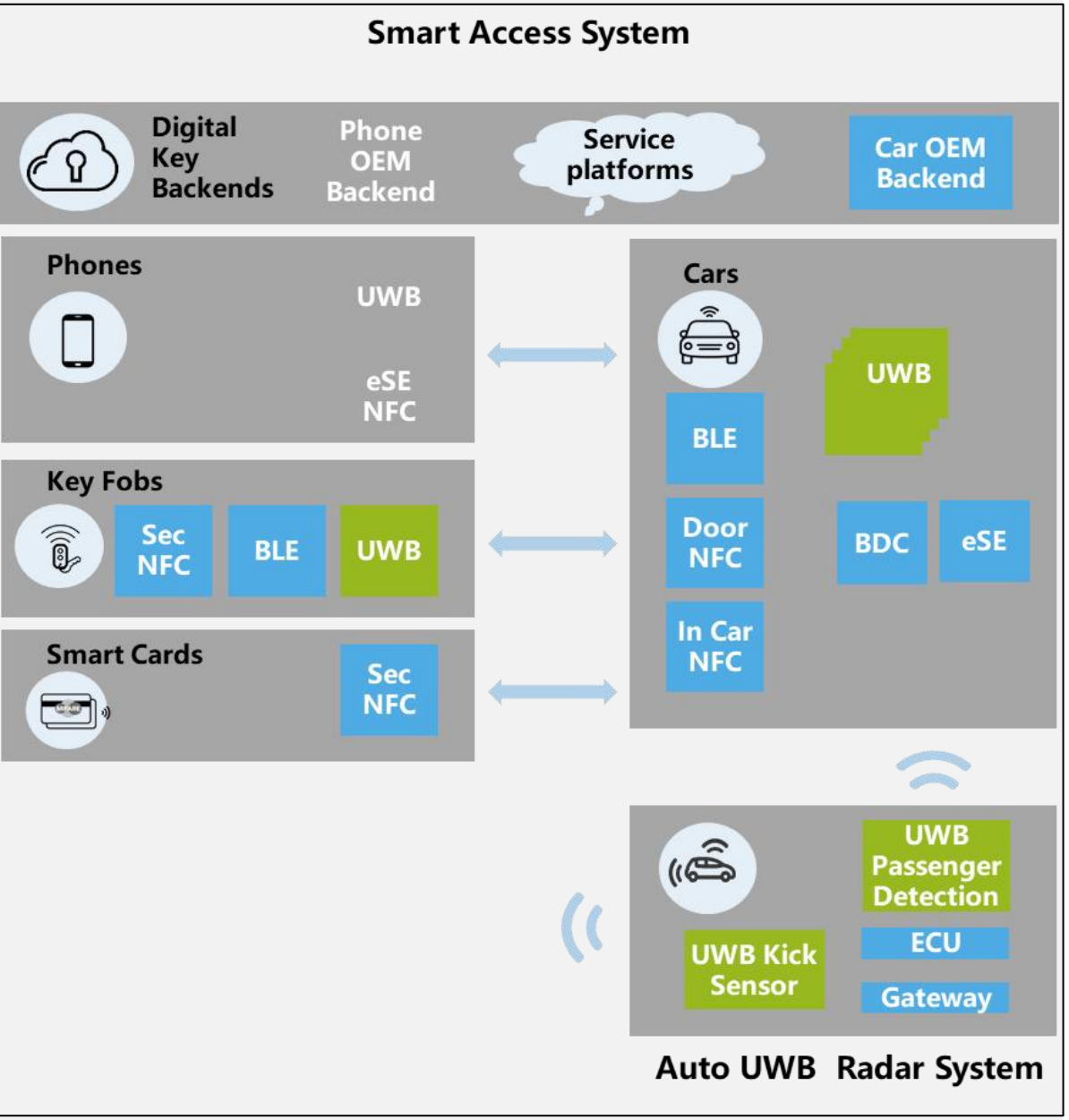
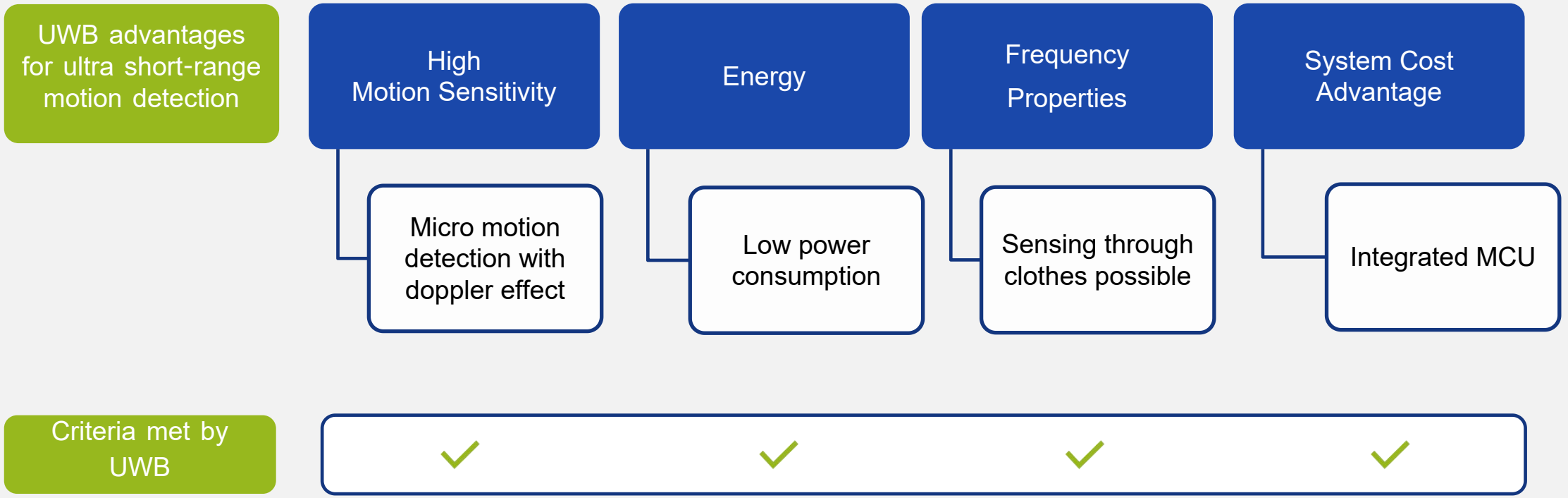


UWB RADAR ENHANCING SMART ACCESS SYSTEM

- Passenger Detection
  - Life sign detection
  - Driver monitoring
  - Seat occupancy detection
- Kick Sensor (trunk access)

- Use of UWB anchors for smart access and Radar

UWB RADAR VALUE PROPOSITION



UNIQUE PROPERTIES OF UWB RADAR

Accuracy

- UWB radar delivers highly accurate readings for location, distance, and velocity
- Able to detect even very small movements, including the chest of an infant rising when it breathes
- UWB radar proven technology for search-and-rescue teams and healthcare (vital sign monitoring)

Robustness

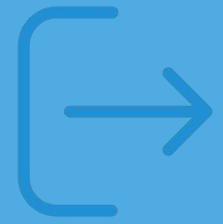
- UWB radar works at low frequencies (in the 6 to 8 GHz range)
- Penetrates well solid material found inside of a car such as car seats and blankets
- Thus, UWB can scan beyond the rear seat into the cargo space or trunk

Cost-efficiency

- Low carrier frequencies
- Multifunctional UWB anchors supporting smart access and radar

UWB Radar
IoT Use Cases

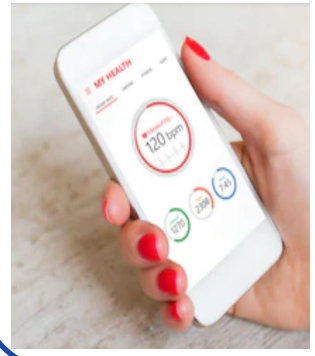
SECURE CONNECTIONS
FOR A SMARTER WORLD



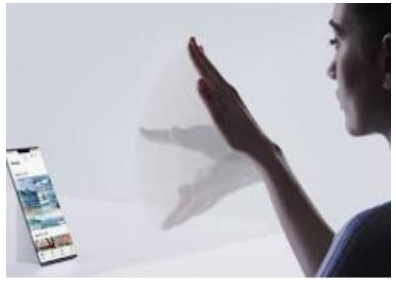
UWB RADAR IOT MARKET: USE CASES

Presence detection

Vital Signs monitoring (Breathing)



Hand gesture recognition for human-machine interaction



Proximity sensing for bezel-less displays

Back pocket detection for enhanced RF performance

VR Safety alert

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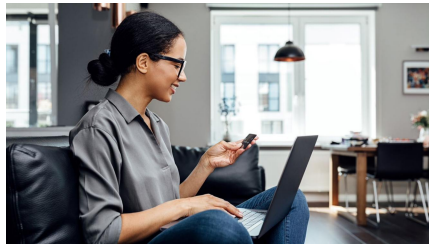

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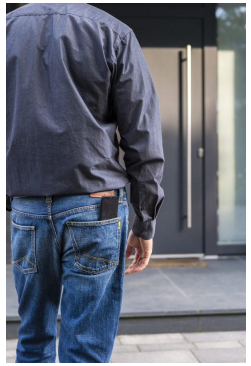
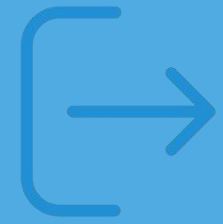


VR safety alert

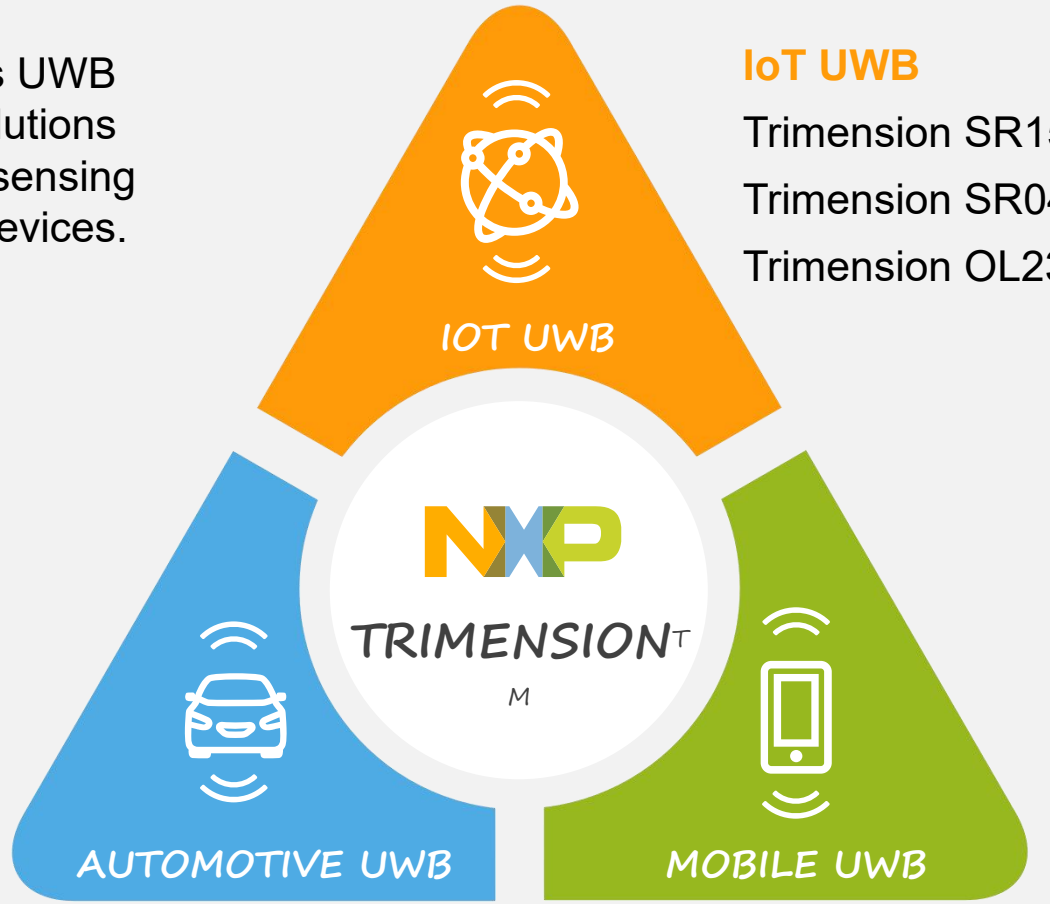
NXP UWB Solutions

SECURE CONNECTIONS
FOR A SMARTER WORLD



NXP TRIMENSION:
DRIVING INNOVATION AT THE INTERSECTION OF KEY VERTICALS

NXP Trimension™ represents NXP's UWB portfolio, a rich collection of UWB solutions that enable secure fine ranging and sensing across automotive, mobile and IoT devices.



IoT UWB

Trimension SR150

Trimension SR040

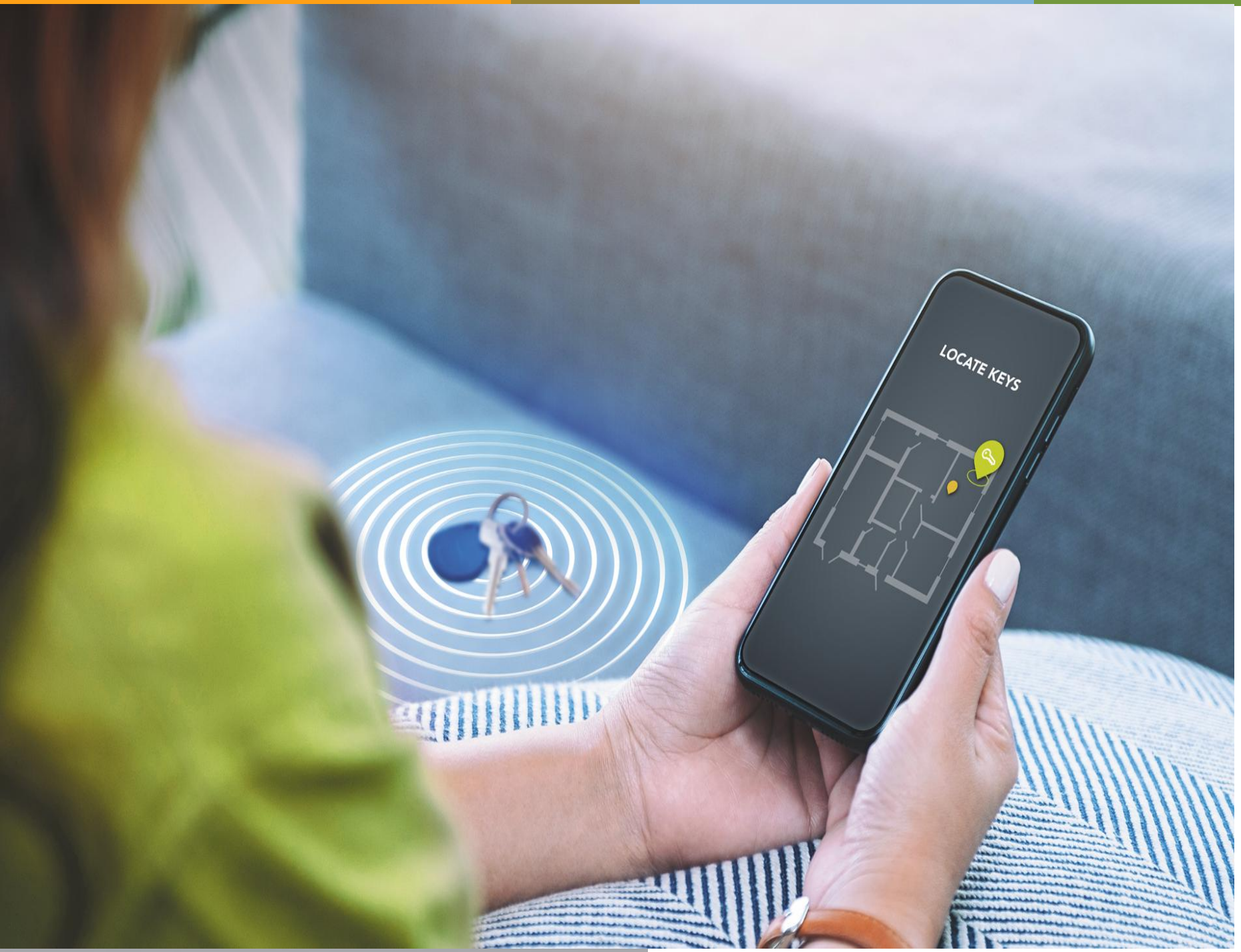
Trimension OL23D0

Auto UWB

Trimension NCJ29D5

Mobile UWB

Trimension SR100T



We recommend the following UWB technical session

TECHNOLOGY SHOWROOM

JOURNEYS BY DESIRED ENGAGEMENT

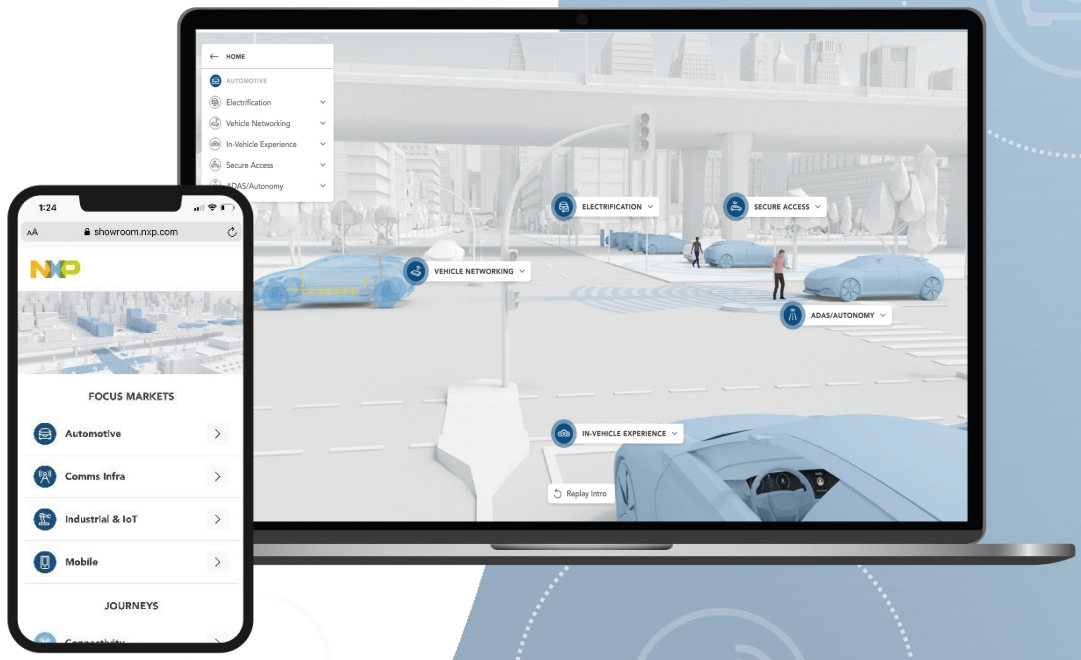
Self-guided tour
Live-streaming at set times
Guided tours

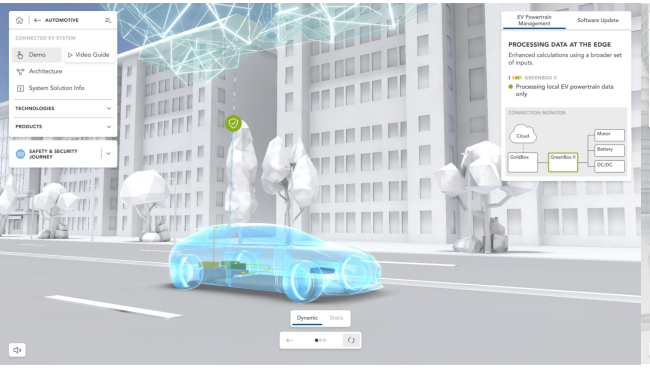
60+ VIRTUAL DEMOS

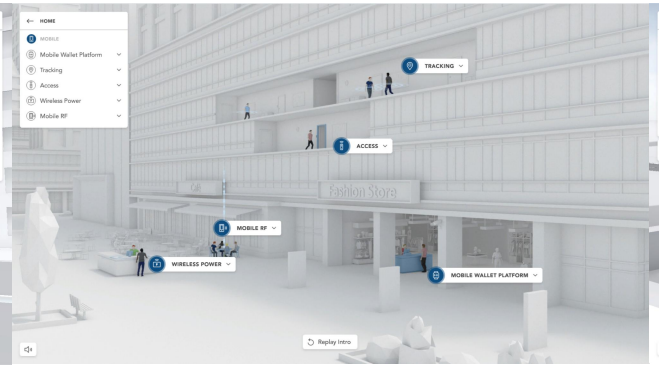
Focus on system solutions
Set up along NXP verticals

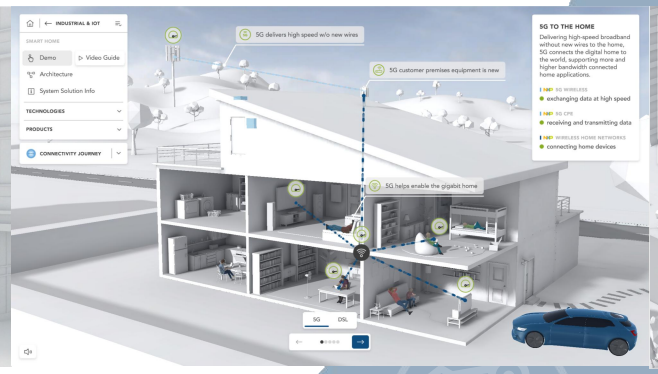
JOURNEYS BY DESIRED FOCUS

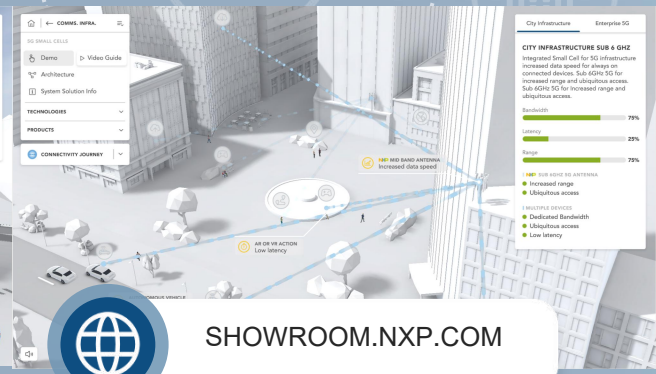
Low Power Innovations
Advanced Analog
Connectivity
Edge & AI/ML
Safety & Security











SHOWROOM.NXP.COM

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Q&A