Designing Smart Car Access Systems with NXP Solutions (BLE, UWB, SE and NFC)

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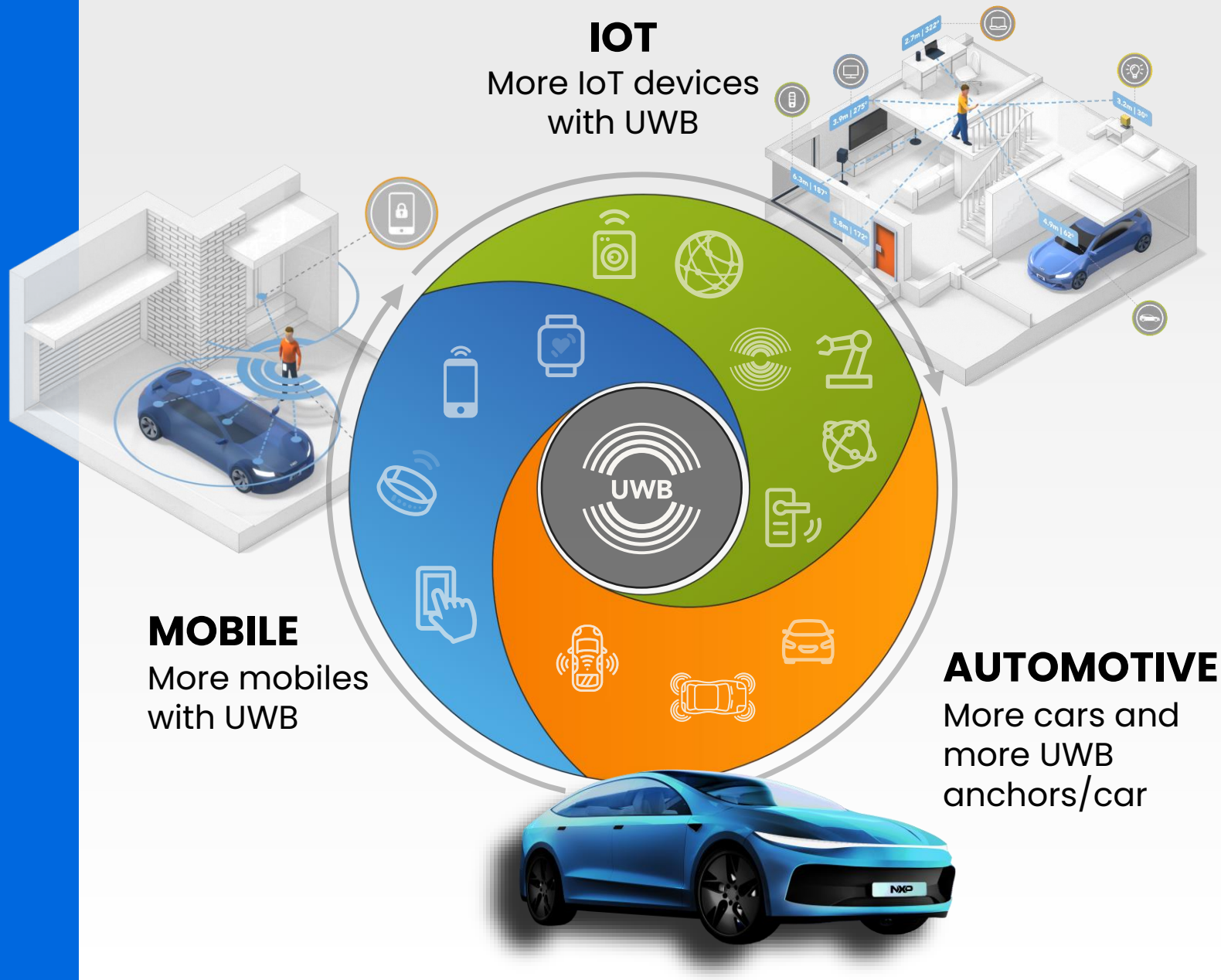
UWB technology

- **Accuracy**
- **Robustness**
- **Range**
- **Security**
- **Real-time**

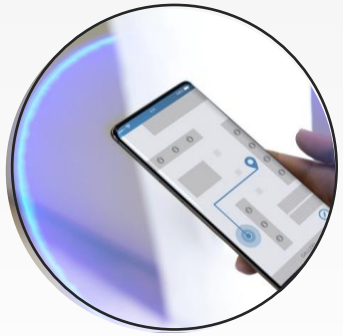


Large number of use cases in broader ecosystem

*Source: ABI Research

More than 1B UWB-enabled devices by 2023*

Apple: UWB technology from iPhone 11 onwards, AirTag, Homepod Mini, Apple Watch.



Samsung: UWB in flagship devices since Galaxy Note 20 Ultra and Z Fold 2.

First OEMS as BMW, Genesis, NIO, BYD released digital key enablement with UWB.

Today's edge devices are sensor-packed

PEDOMETER
Count steps/movement

BIOMETRIC SENSORS

ACCELEROMETER
Movement in any linear direction

GYROSCOPE
Rotation

AMBIENT LIGHT SENSOR
Adjust brightness

MAGNETOMETER
Compass functionality

PROXIMITY SENSOR
Control touchscreen display

GPS
Determine outdoor location

ULTRA-WIDEBAND
Localization

ENVIRONMENTAL SENSORS
Detect temperature, humidity, heat losses

MICROPHONE

NFC

TOUCHSCREEN SENSORS

First wave of mobile centric use cases rolled out

The adoption opportunities in IoT are vast

POINT TO SHARE

ITEM TRACKING

INDOOR NAVIGATION & GUIDES

PAYMENTS (PILOT)

01

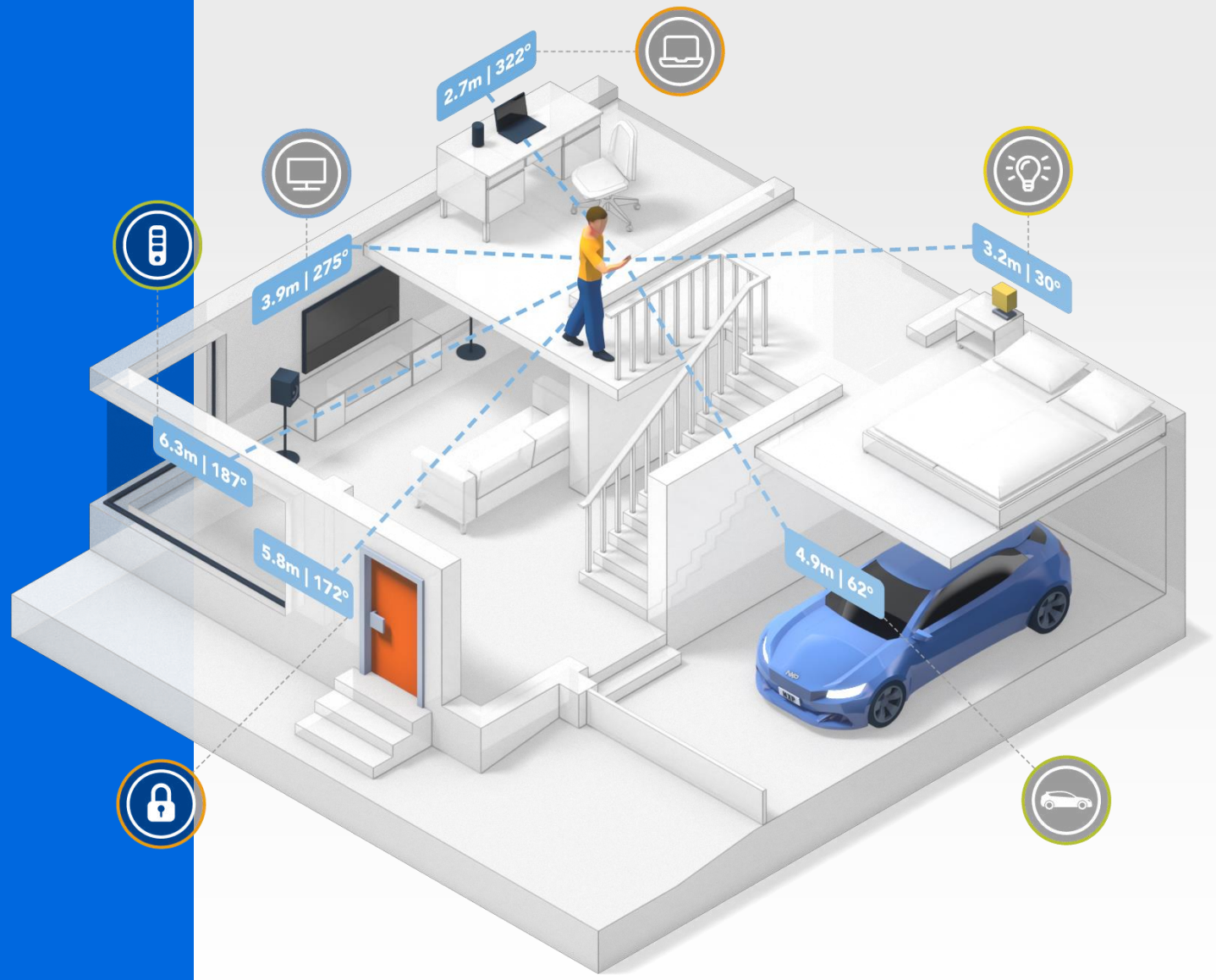
Why Ultra-Wideband?

UWB: Providing a solution to an unresolved problem

Secure ranging provides spatial awareness

Relative positioning information of objects in real-time

Position granularity enables new use cases



UWB: Unmatched technical attributes for secure ranging

ACCURACY
+/- 10 cm distance
+/- 3° of angle

ROBUSTNESS
Strong multipath environment performance

RANGE
100 meters of range under line-of-sight conditions

SECURITY
Every position measurement is essentially protected with a unique cryptographic key

REAL-TIME
Minimum latency: measurements in <10ms

01

Smart car access

Handsfree mobile 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®

Secure car access
Market & technology evolution towards smart access

Fob as a key

Closed system:

- Proprietary interfaces & security
- Key fob used with one vehicle

Classic Car Access

Phone, wearable as a key

Standardized/open system:

- Phone used with multiple vehicles
- Vehicles used with multiple phones

Smart Car Access

- Technology transition from classic to smart access
- Change from “closed” to “standardized/open” system enables new use cases
- NXP drives standardization to grant broad adaptation (CCC, FiRa, IEEE)
- UWB-enabled mobile devices are spreading

CAR ACCESS TECHNOLOGY EVOLUTION

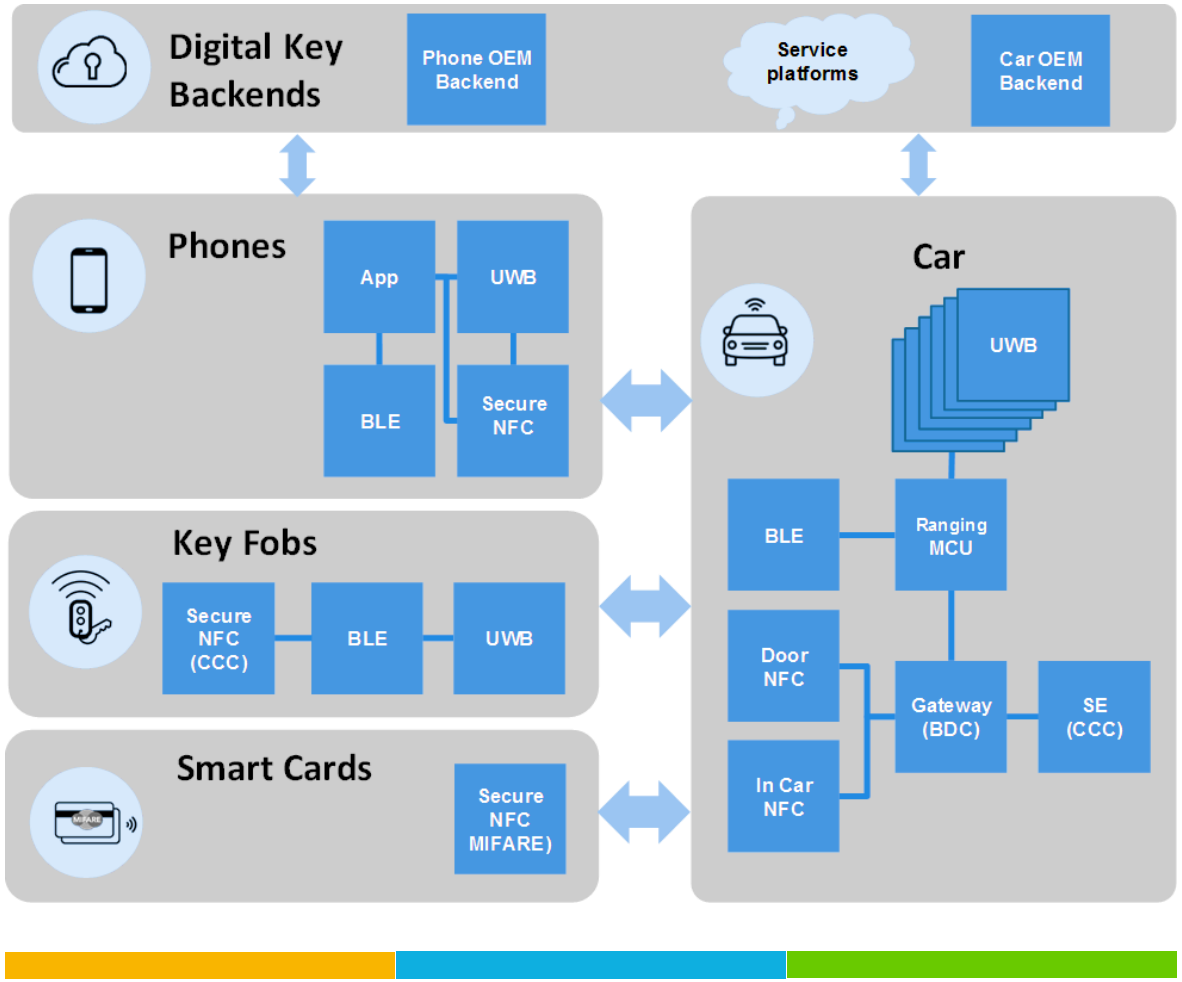
SMART ACCESS FEATURES

Smart access – high-level architecture

NXP provides all required components

Product and system performance leadership

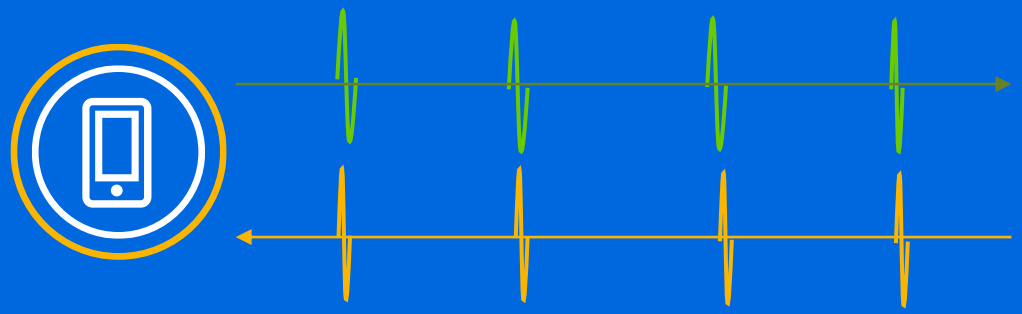
Accelerate the market with complete system offer in HW and SW



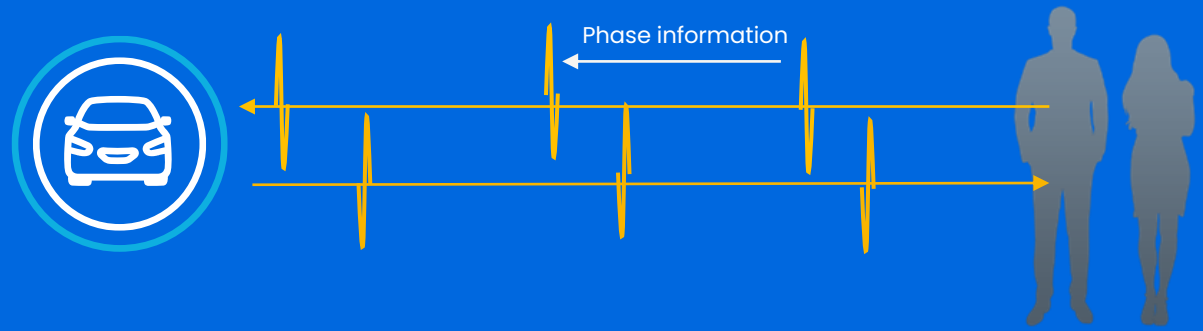

UWB ranging
UWB radar
CHILD
DETECTED

A single IC that can do both: secure ranging & radar

IC in secure ranging mode



IC in pulse-radar mode



UWB transceivers send and receive short signal pulses (~2ns)

Bandwidth of over 500 MHz enabling Time-of-flight (ToF) measurements between two devices

SECURE DISTANCE ESTIMATION

UWB transceiver in radar mode

ToF of reflected signal used for distance measurement and phase information

SUB CENTIMETER MOTION DETECTION

Secure car access evolution
from smart access to multi-purpose platform

HANDS-FREE SMART ACCESS

UWB ranging – CCC Digital Key compliant

NEXT GENERATION SA + CHILD PRESENCE DETECTION

Combining UWB ranging and UWB short-range radar

MULTI-PURPOSE PLATFORM

Multiple UWB use cases avoid redundant systems and reduce overall cost

Classic car access approach

- Proprietary technology/specification
- Dedicated system with no re-use

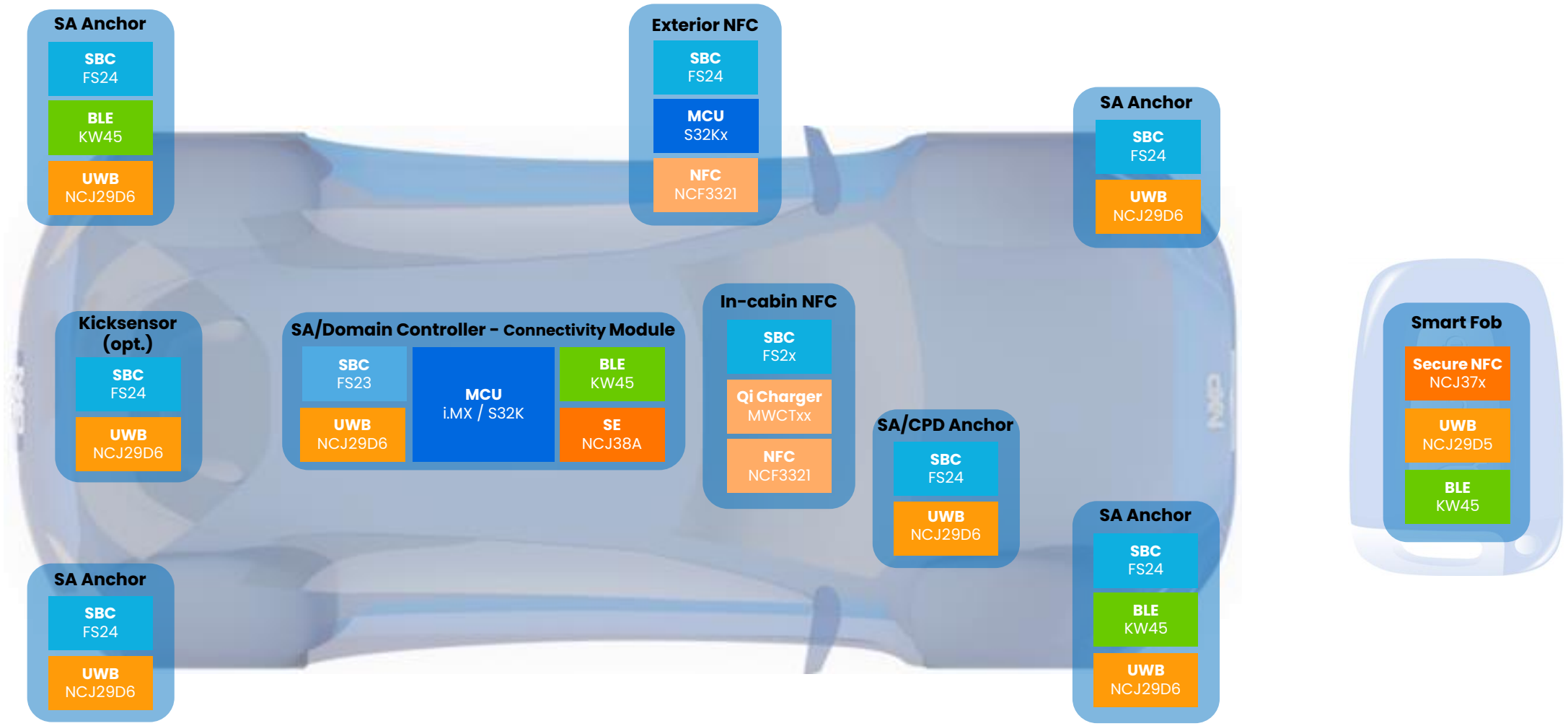
To unleash the full potential of the UWB technology

- Early integration in new car architectures
- Cooperation across teams beyond car access (e.g. interior sensing)

Smart access – NXP portfolio

SA…Smart Access

CPD…Child Presence Detection



UWB	BLE	NFC/Qi Charger	Secure Elem. (SE)	SBC	MCU
NCJ29D5 NCJ29D6	KW45	NCF3321 MWCTxx	NCJ38A NCJ37x	FS23 FS24	S32Kx

Convergence of ecosystems

Home to vehicle

User to vehicle

Vehicle to infrastructure

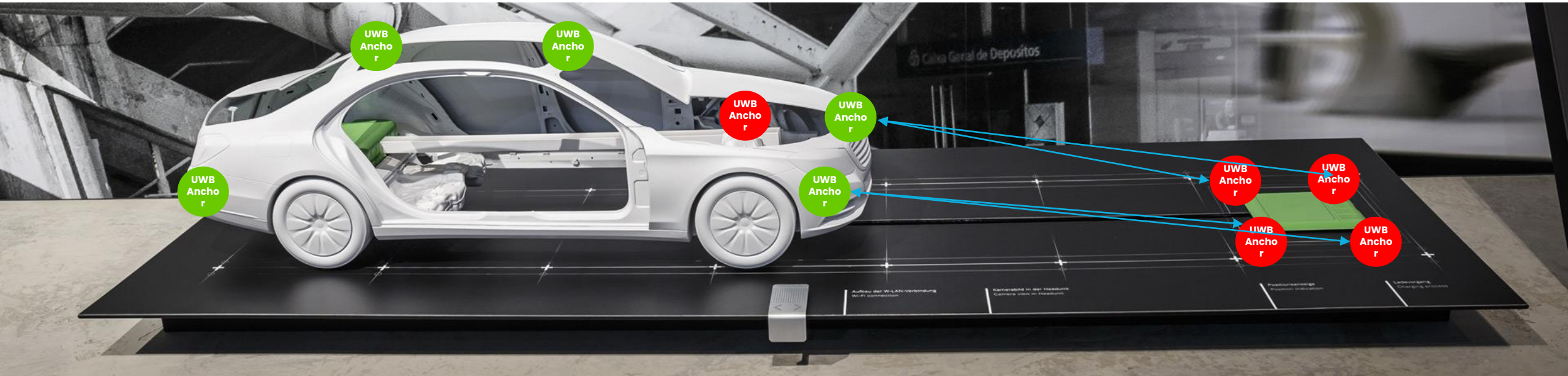
Automatic EV charging

- Comfort charging for EVs and PHEVs
  - Premium OEMs
  - Mass market (Home & public charging)
- Charging of autonomous vehicles
  - Robotaxis
- Industrial and heavy-duty vehicles
  - Automated container terminals
  - Urban logistics, Electric trucks/buses

High-level concept

Guidance to charging station or park automatically
UWB localization

Reuse SA multipurpose system for long distance



Automatic EV charging

- Comfort charging for EVs and PHEVs
  - Premium OEMs
  - Mass market (Home & public charging)
- Charging of autonomous vehicles
  - Robotaxis
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High-level concept

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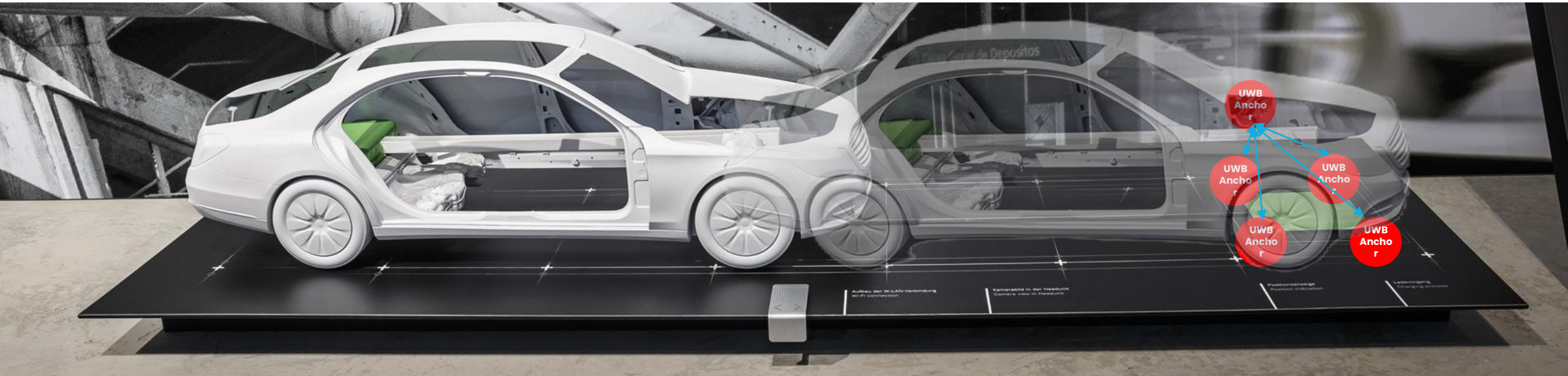
Additional UWB anchor for last centimeter positioning

Optional: UWB radar to detect life sign/movement



One chip to cover many functions

- CAR ACCESS
- CLIMATE CONTROL
- CHILD PRESCENCE DETECTION
- SEATBELT REMINDER
- ITEM TRACKING
- GESTURE RECOGNITION
- INTRUSION ALERT
- VALET PARKING
- GAP FILLING RADAR
- KICK-SENSING
- AUTOMATED ELECTRICAL VEHICLE CHARGING

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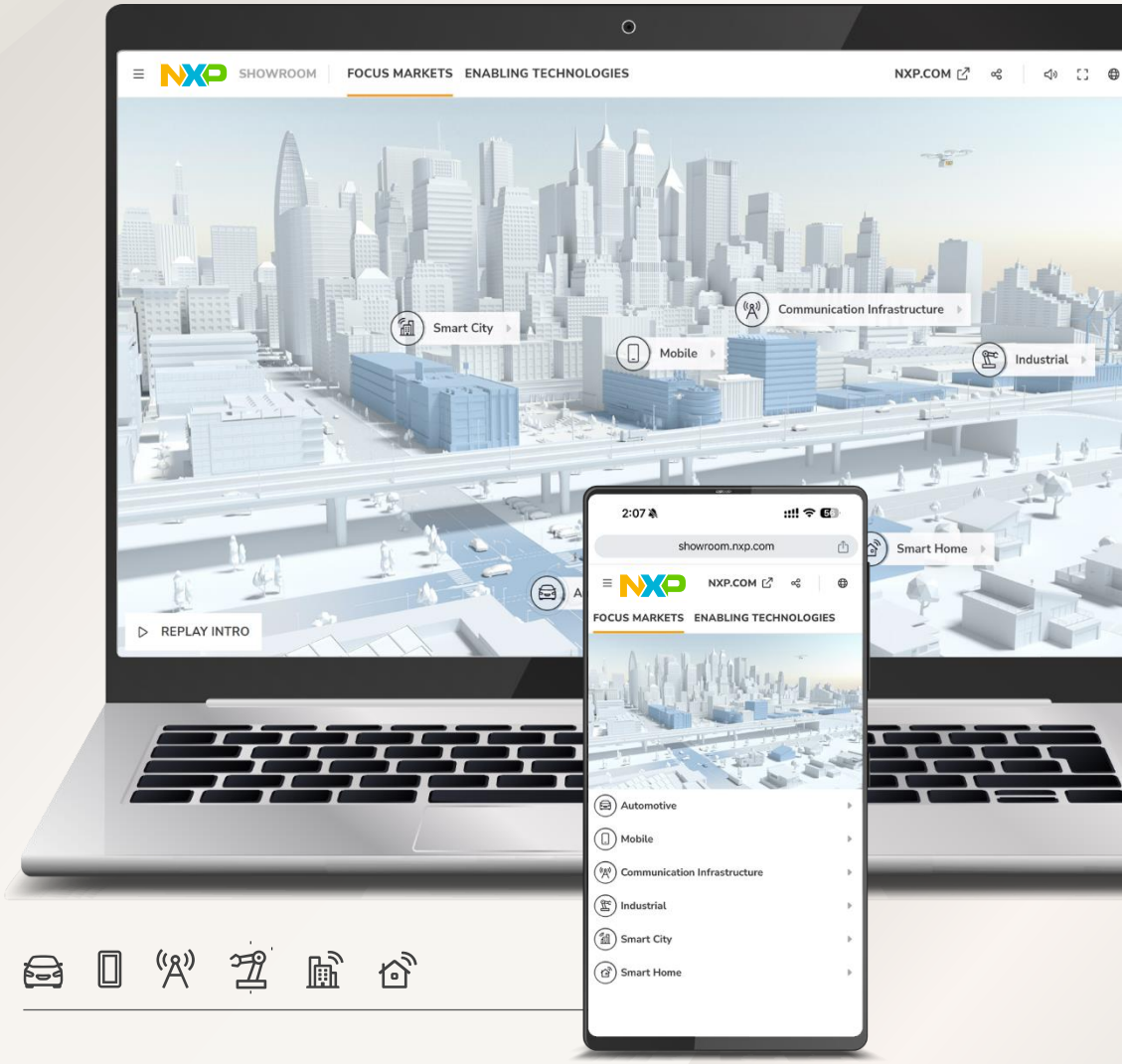

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