基于UWB技术的智能汽车数字钥匙应用及优势

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UWB赋予智能设备全新的空间感知能力和应用场景

✓ 室内外定位

✓ 移动设备测距

✓ 实时快速

✓ 厘米级别精度
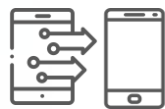
设备对设备
找朋友
数据交互
寻车定位

智能家居
无感门禁
设备控制

智能工厂
访问控制
工厂自动化

汽车
智能无感数字钥匙
安全精准定位

智能零售
室内定位导航
定向交互式广告
资产追踪
无感支付

智能标签
物体防丢定位
人员定位

NXP

UWB信号三大特征

短脉冲信号 2ns

高信噪比：
抗空间白噪声干扰
抗多径干扰

高带宽BW >500MHz
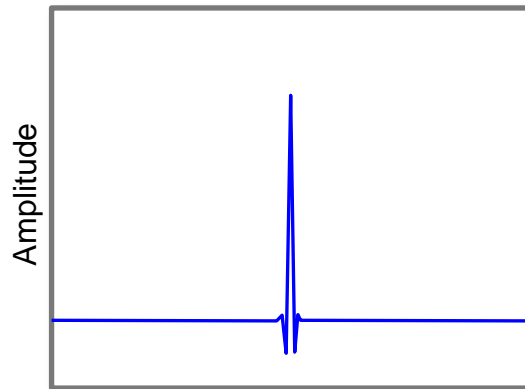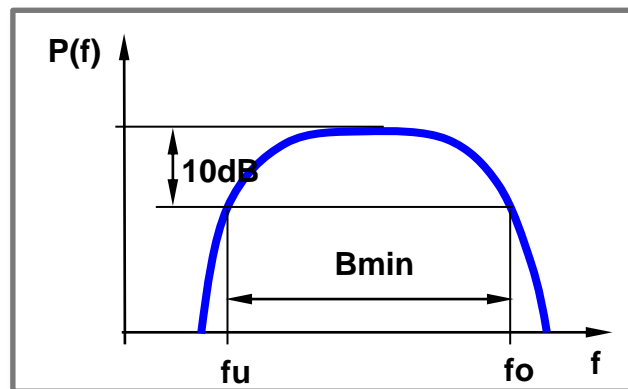
高带宽提供
高分辨率ToF飞行时间
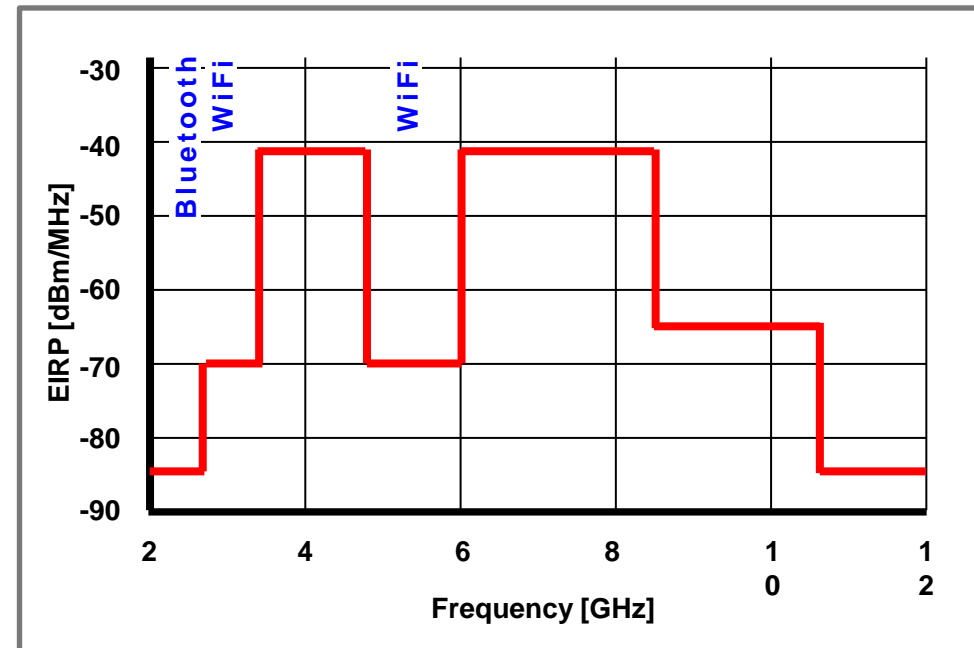
$$S_r > \frac{c_0}{2 * BWtx}$$

频谱功率密度 < -41.3 dBm/MHz EIRP
频段范围: 3.1 - 10.6 GHz

UWB 提供更安全和实时稳定的定位服务

参数		BLE 5.x HADM (飞行时间& 相位偏移测距)	UWB (飞行时间)
测距时间		50ms~100ms	2ms
最大定位范围		5~10m	<30m
信息安全防护等级 （防中继攻击/定位数据加密）		中等	高
测距精度	空旷环境	20cm	10cm
	复杂多径环境 （车内，停车库）	2m~5m	30cm
平均测距功耗		1mJ	40uJ
传统LF/RF 取代性		取代可能性较小	可取代
拓展应用		数据通讯	短距雷达（脚踢传感器，呼吸检测等） 数据通讯

智能汽车数字钥匙 – 市场及技术演进

NXP继续引领市场的发展

汽车门禁技术演化*   市场份额*
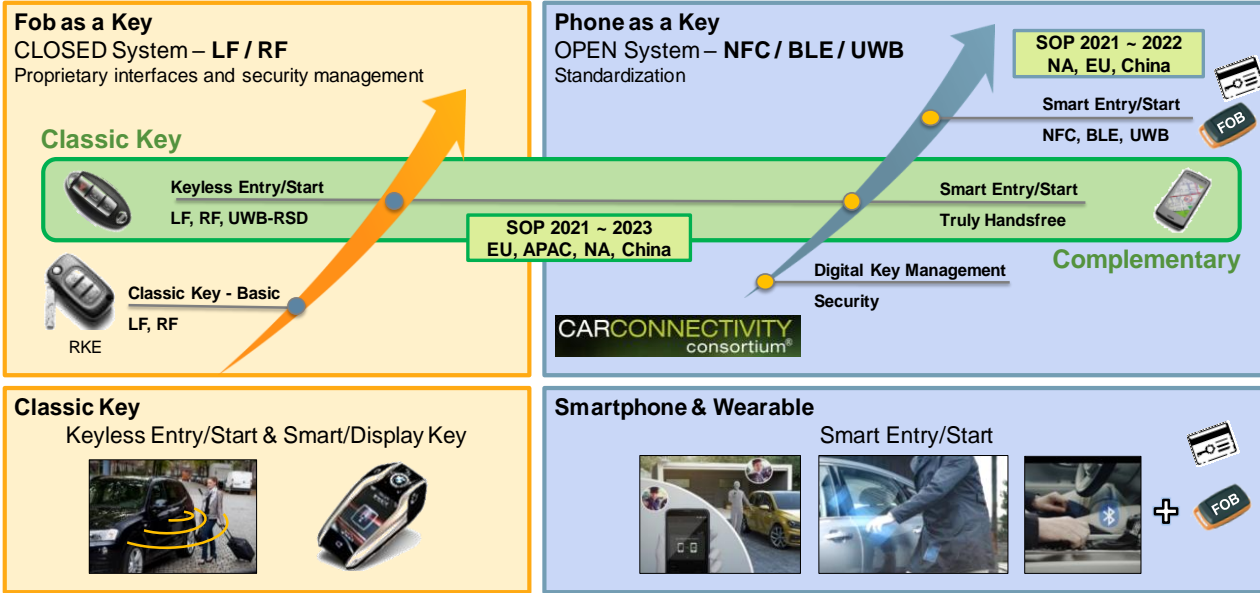
- 技术走向从传统钥匙走向数字化虚拟钥匙
- 宝马和蔚来相继宣布了2021/22年首辆基于UWB技术的数字钥匙的车型
- 最近三星宣布了和宝马、奥迪、现代、福特的新的基于UWB技术的合作

- 智能化手机车钥匙是大的市场趋势
- CCC被业界默认为行业标准

来自恩智浦基于全球市场研究的预测

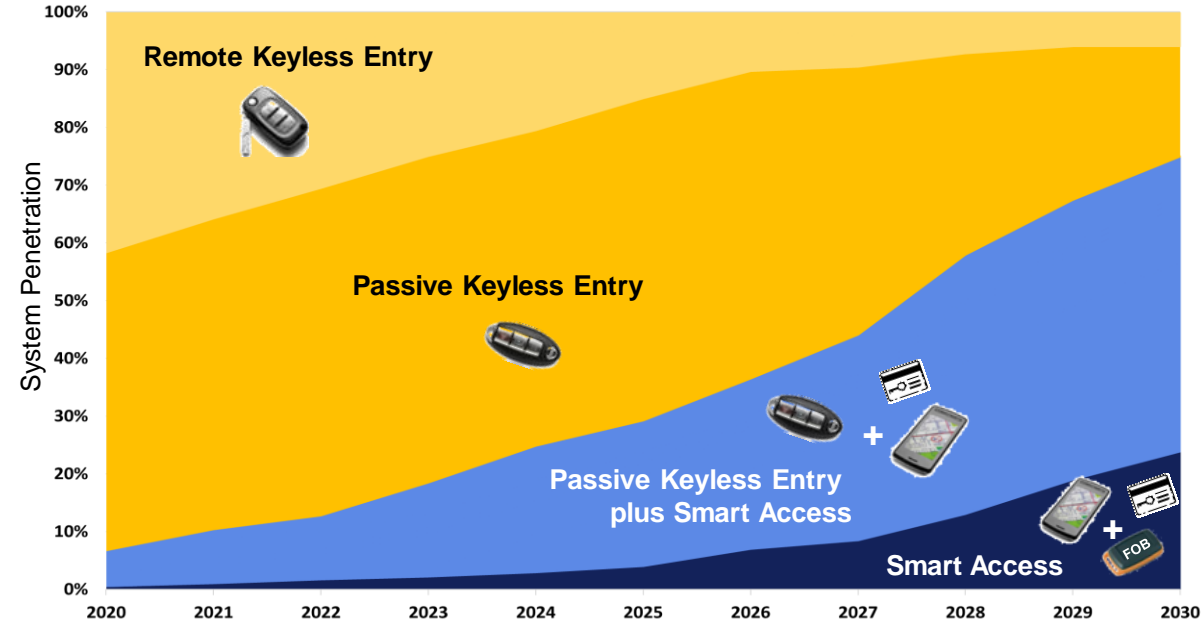# CCC标准进展

CARCONNECTIVITY consortium®

Rel 1

NFC with car OEM applet

SE

Phase 1 applet

NFC

Deployed

Rel 2

NFC with standardized applet

SE

Phase 2 applet

NFC

Standard finalized

Backwards compatible

Rel 3

UWB secure ranging
NFC still mandatory

UWB

SE

Phase 3 applet

NFC
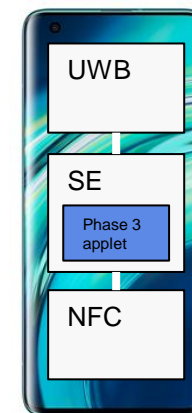
Standard finalized, in IP review period
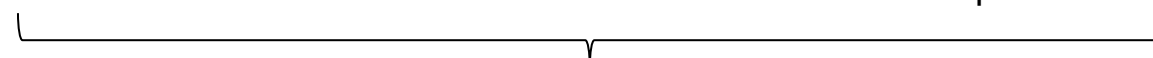
Certification scheme being defined

CCC手机与汽车的兼容性测试
UWB 测距 –基于802.15.4Z HRP制式的测距
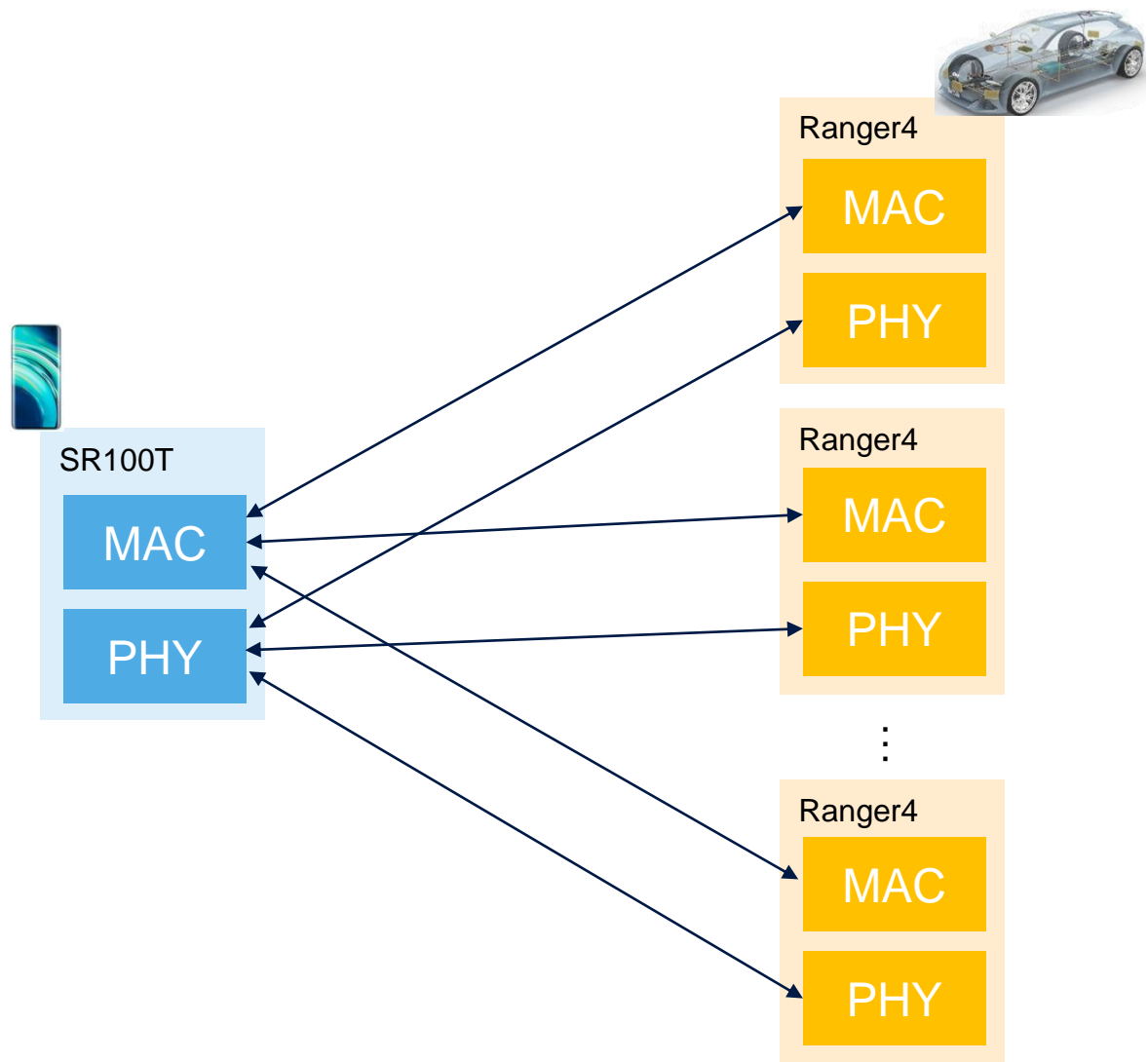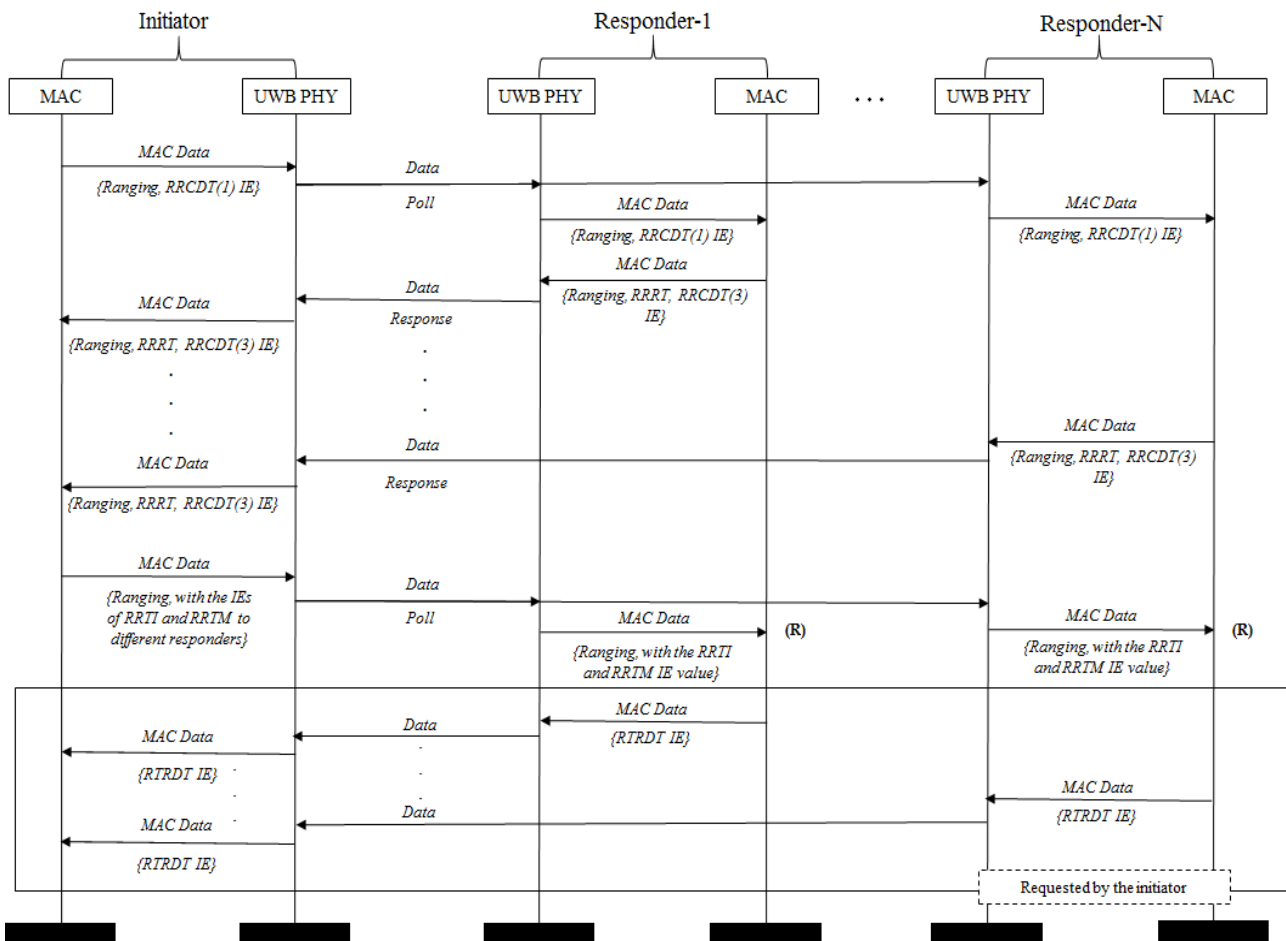
标准是一切互联技术的前提

汽车数字钥匙服务

CCC PHY and MAC

FiRa PHY and MAC
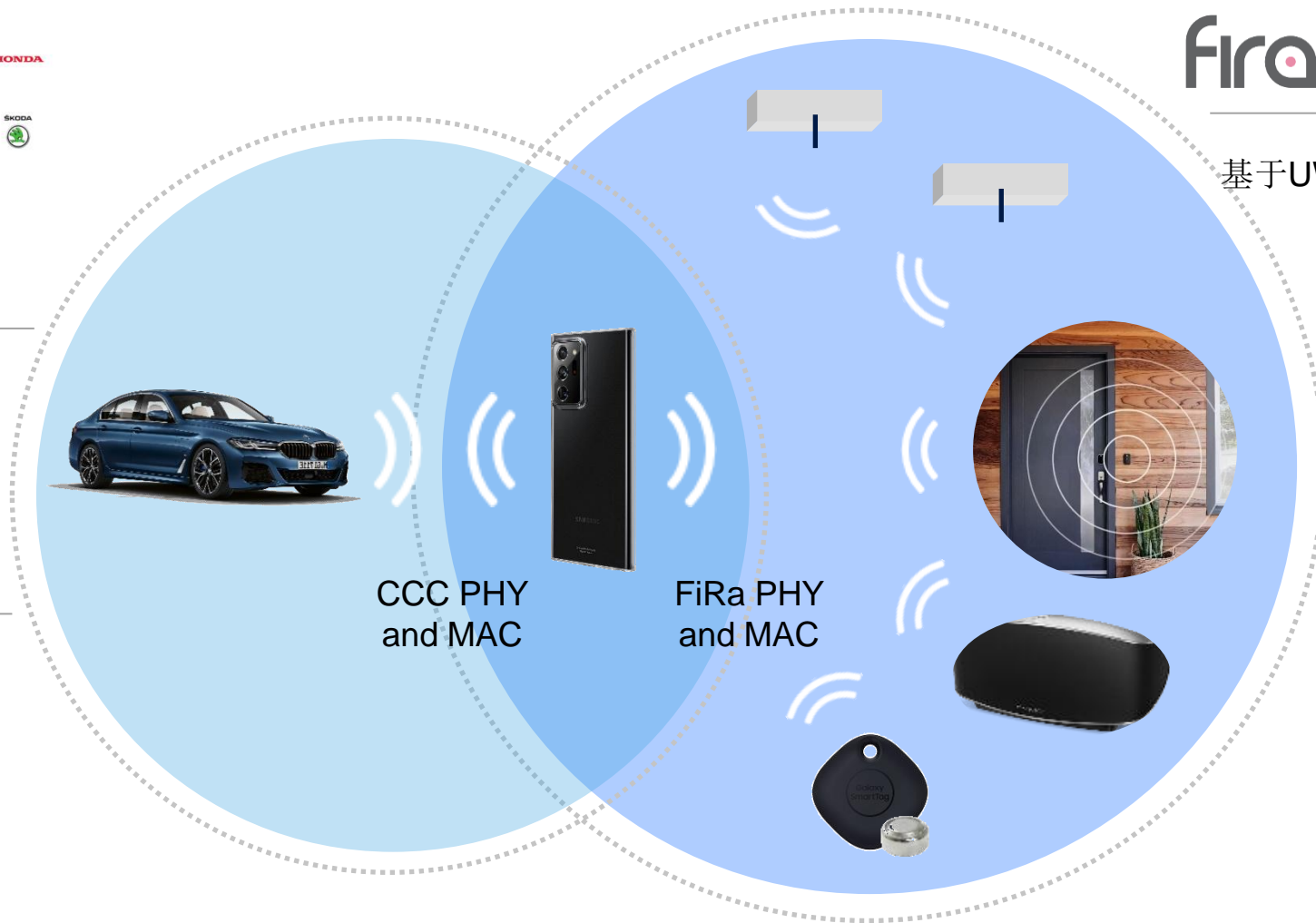
基于UWB的IoT应用服务

基于UWB的新型智能化汽车进入方案
提供全新的用户体验

稳定的定位
适用手机任意姿态，角度和摆放的位置

更安全
信息安全
财物安全

更远的探测距离
更为人性化的迎宾距离
轨迹追踪：个性化的设置

更多位置服务
远程遥控

NXP——汽车无感安全进入系统的领导者

广泛的软硬件产品系列及系统方案

传统车辆进入技术

依赖于低频和射频RFID
优越的低频抗干扰及覆盖距离
双IMMO通道及模式

智能车辆进入技术

UWB/BLE/NFC/SE
UWB MAC测距固件,安全及数字钥匙管理应用,
NFC生态环境

市场验证的系统

驱动行业标准 (IEEE, CCC, FiRa)
解决兼容性问题（手机,汽车,车钥匙,智能卡,云端）
快速的市场反应
汽车级

Digital Key

Business Private Leisure
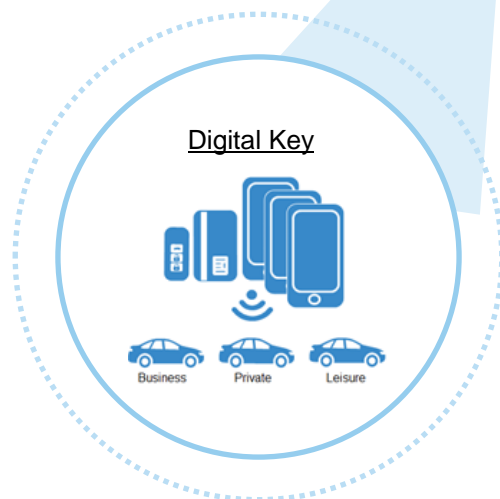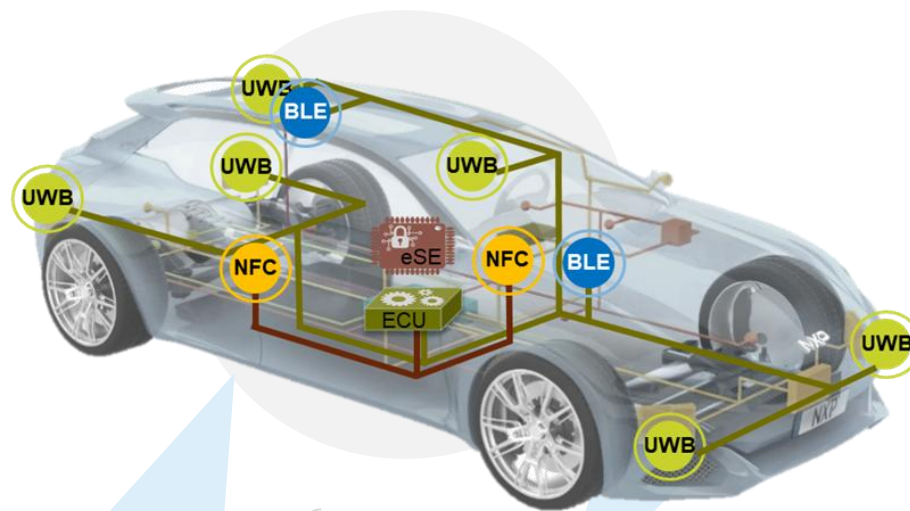
安全定位	UWB
数据连接	BLE
近场及低电量备份通讯	NFC
数字钥匙管理	eSE

CARCONNECTIVITY consortium®

NXP——汽车无感安全进入系统的领导者
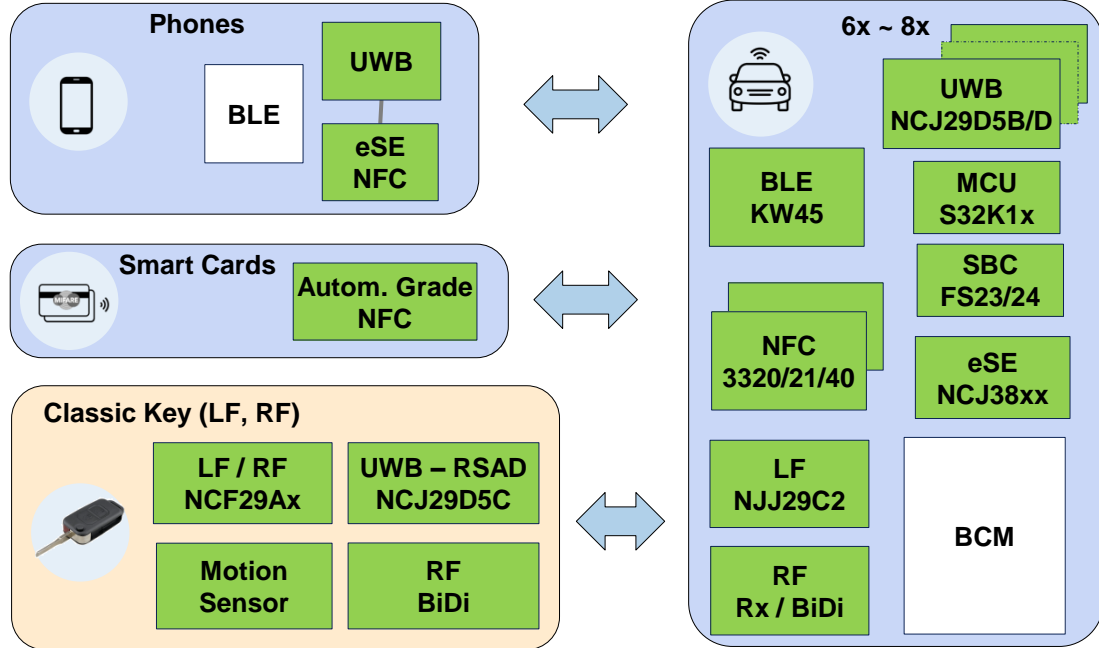
智能汽车系统钥匙

→ **硬件**: 所有的无线技术 UWB, BT, NFC, SE

→ **软件**: UWB MAC, E2E security, SE applets and BT SDK

→ **验证**: CCC R2/R3, phone/smartcard interoperability
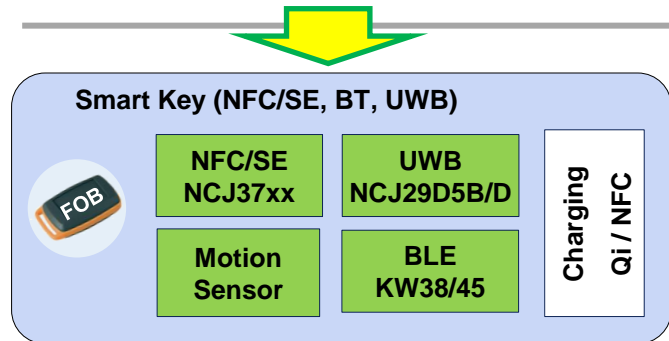
传统钥匙(LF/RF)替代研究

智能钥匙(NFC/BT/UWB)

→ **电池寿命的挑战**: 蓝牙广播间隔, 用户使用习惯的profile定义

更多可能的应用场景

短距雷达– 舱内人员体征监控, 脚踢传感器等

自主泊车– 为L4级别的AVP系统提供高精度定位

汽车无线充电– 充电线圈自动定位系统

免下车支付– 基于精确位置的支付服务

NXP UWB Solutions

Trimension^{TM} family

SECURE CONNECTIONS
FOR A SMARTER WORLD

NCJ29D5 FAMILY KEY FEATURES
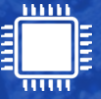
NCJ29D5
KEY FEATURES

- Interoperability granted for Smart Access
- Highest localization resolution
- Lowest system cost
- Improved pwr management
- High band operation
- ARM Cortex
- Integrated security
- ±10 cm range accuracy
- IEEE 802.15.4 forward and backward compatible

- Providing best-in-class RF security with an NXP-enhanced version of UWB, designed for Smart Access, RSD and IOT

- Application specific firmware & demo code:
  - NCJ29D5C (Ranger4.1) for RSD-only optimization (Eco Mini mode)
  - NCJ29D5B (Ranger4.2) for Smart Access (High-performance mode)
  - NCJ29D5D (Ranger4 MAC) for Smart Access (High-performance mode) CCC MAC SW stack included
  - Upgradeability due to same HW

NXP

NCJ29D5

NXP TRIMENSION

NXP's Trimension^{TM} family captures one of the world's most comprehensive secure UWB portfolio, spanning best-in-class security, automotive and mobile architectures for real-time, precise, localization capabilities across market applications.

Trimension^{TM}		
IoT UWB	**Mobile UWB**	**Auto UWB**
Trimension SR150 / Trimension SR040	Trimension SR100T	Trimension NCJ29D5B/C/D

IoT UWB — Trimension SR150
- Dual-RX for AoA functionality
- 3D AoA possible
- Connected to EdgeLock SE for Secure Ranging Use Cases
- RTOS and Linux SW Solution for IoT integration
- In accordance with FiRa
- Arm® Cortex®-based

IoT UWB — Trimension SR040
- Specialized part for battery-operated use cases
- On-chip prohram memory, for download-free booting
- Optimized low-power modes
- Integrated Tx/Rx switch
- Arm® Cortex®-based

Mobile UWB — Trimension SR100T
- Connected to SE SN100 Family for Secure Ranging Use Cases
- Android SW Solution for Mobile Integration

Auto UWB — Trimension NCJ29D5B/C/D
- Interoperability granted for smart car access
- Highest localization resolution
- Lowest system cost
- Integrated power management
- High band operation from 6.0-8.5 GHz
- Arm® Cortex®-based
- On-chip support for a wide range of cryptographic operations

All solutions are IEEE 802.15.4 forward and backward compatible.

THANK YOU.

TOGETHER, WE'RE NOT JUST ADVANCING TECHNOLOGY, WE'RE ADVANCING SOCIETY.

NXP | SECURE CONNECTIONS FOR A SMARTER WORLD

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