Wireless Trends in Automotive Market

Microwave & RF - 2012

Agenda

- 1- Introduction
- 2- Today Wireless applications in Automotive
  - MegaTrends
  - Examples
- 3- Future Trends
- 4- Continental Solutions & Portfolio

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1-Introduction

- **Some decades ago, Wireless was poorly present in Automotive:**

AM-FM (Broadcast Radio)

Access (InfraRed, Radio Frequency)

Immobiliser (Anti-theft/ Low Frequency communication)

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Today, this situation has changed significantly…

Automotive MegaTrends

Environment

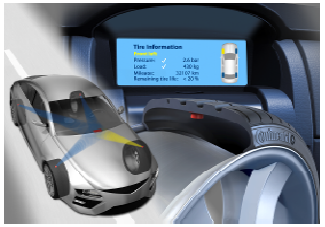
Safety

Information

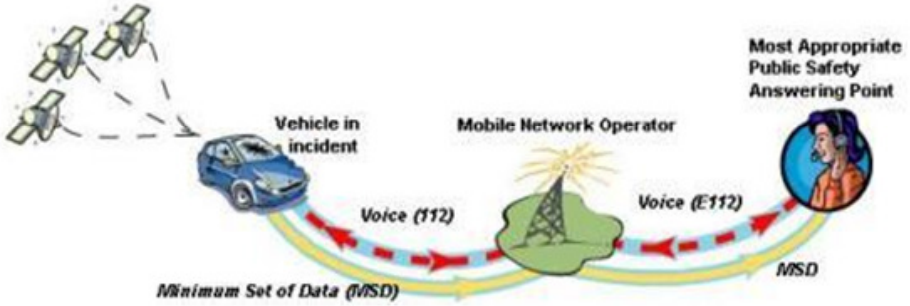
Affordable/ comfort Cars

How RF participates to these Today MegaTrends

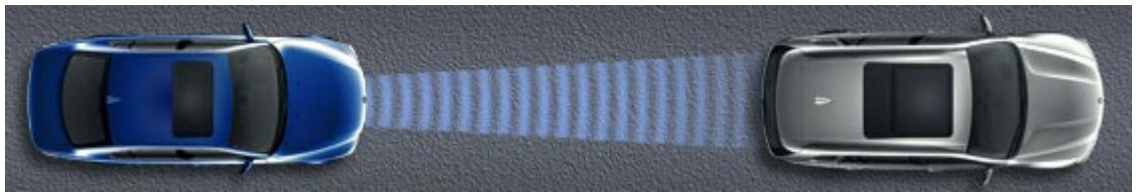
- Tire Pressure Monitoring System



- E-Call



- Radars/ speed adaption



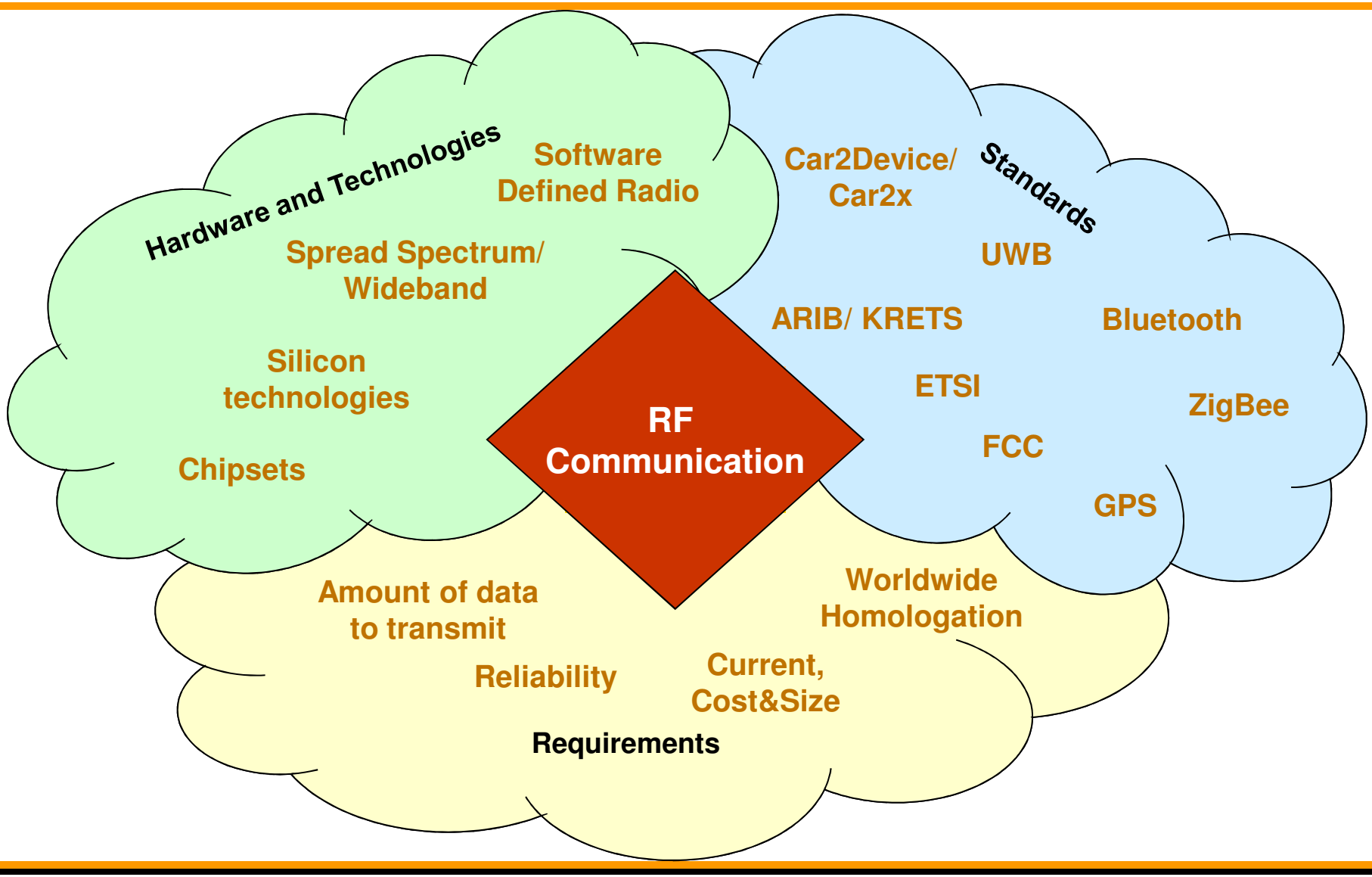
How RF participates to these Today MegaTrends

- Mobile Phones/ BlueTooth pairing
- Navigation
- Multimedia (AM-FM/ DAB/ DVB-T)

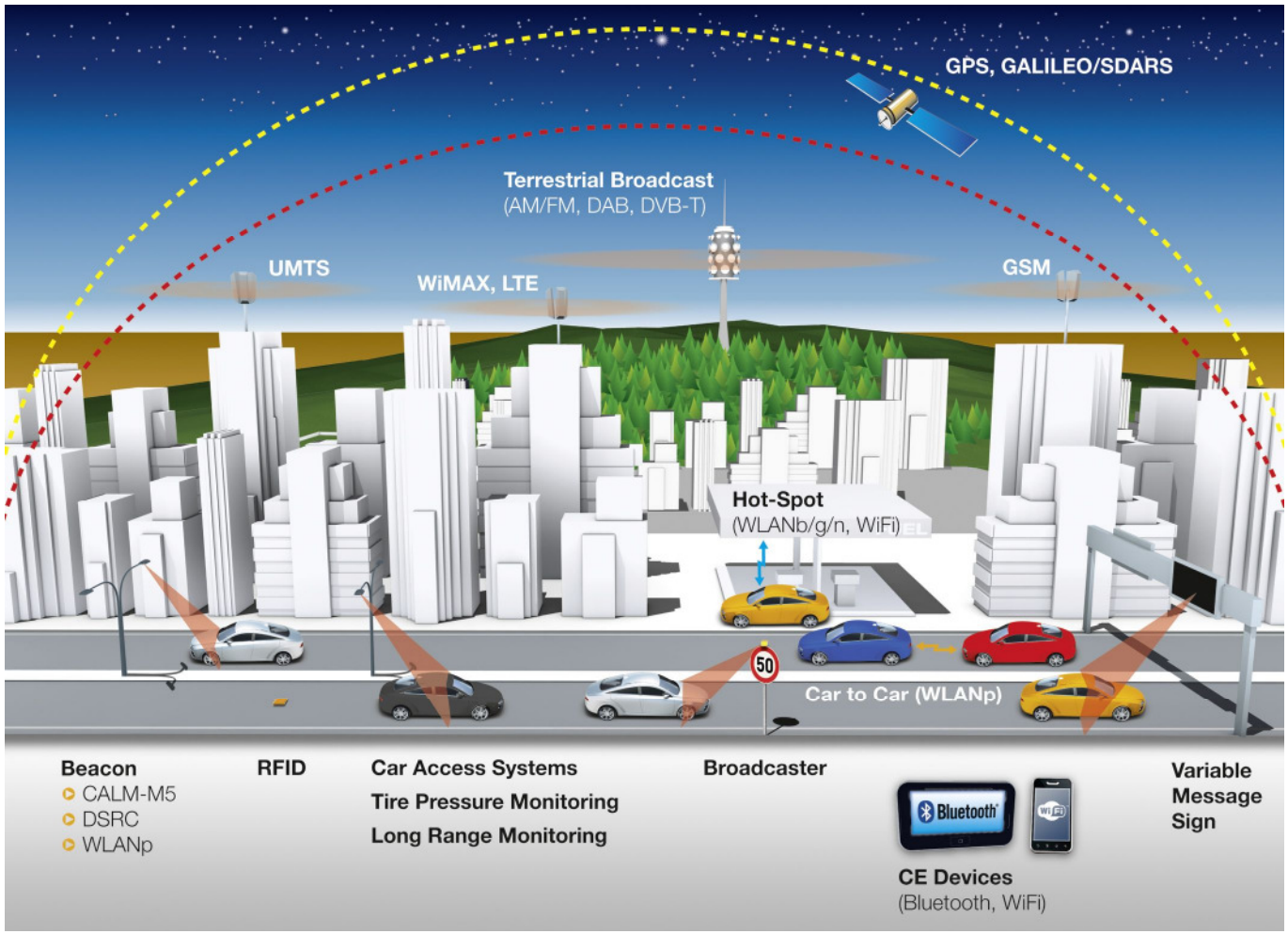
How RF participates to these Today MegaTrends

- Enhanced Access (PASE, long Range)
- Phone Charger
- Identification & security

Management of Wireless Communication Definition



As a summary, Wireless Services Today



As a summary, Wireless Services Today which help the MegaTrends

RF Services	Technologies / some examples of Frequencies
Mobile Phone	**2G / 3G / WiMax / LTE**
Satellite Radio	**SDARS (2,32-2,345 GHz) / DVB SH / digital S-band Satellite**
Long Range Services, *like: Heating, Car Check and Status Request*	**ISM Band (315 MHz / 433,92 MHz / 868 MHz / 915 MHz)**
Remote Keyless Entry	**ISM Band**
PASE // TPMS	**ISM Band + 125 KHz**
Car Sharing	**NFC – 13,56 MHz**
WLAN	**Wifi Standard IEEE 802.11 / 2,4 GHz & 5 GHz**
Digital Radio Broadcasting	**DAB / DMB / DVB** Band III (174–240 MHz) and L band (1452–1492 MHz
Bluetooth (Device pearing)	ISM band from 2400–2480 MHz)
Device Charger	**WPC (100-200 KHz)**
Fleet Management / Tolling	**Use GPS & GPRS informations**
Navigation / E-call	GPS-Galileo-Glonass(1575.42 MHz / …)
Analog Radio	**88 – 108 MHz**

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1 example: Tire Pressure Monitoring Systems (TPMS)

Environment

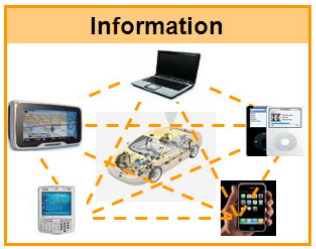
- Allows maximum opportunity for minimizing fuel consumption & $C0_2$ output
- Maximizes tire life
- Focus of legislation in Europe (Nov-2012) & South Korea (Jan-2013)

Safety

- Avoidance of roadside breakdowns and risk of road congestion
- Focus of legislation in US (Oct-2005)
- Future possibilities to link tire information into the Chassis & Powertrain systems for optimized vehicle control

Information

- Provides accurate tire data to the driver
- Additional functions like “Filling Assistant”, “$C0_2$ Assistant”, “Load Detection” etc., simplify & encourage better tire management

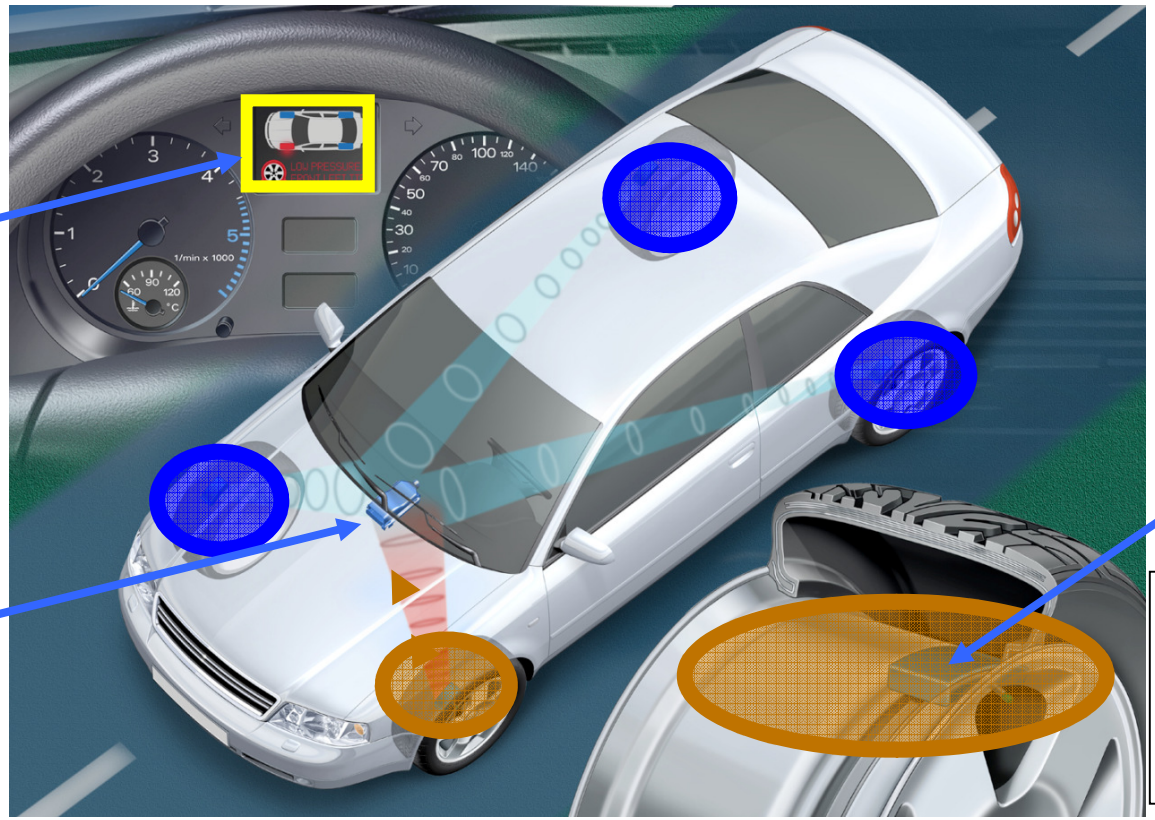


Affordable Cars

- Tire Information System sensors available for all vehicle & rim sizes
- Scalable solution to meet functional needs of all vehicle platforms

TPMS: how does it work ?

HMI
(Human Machine Interface)



Wheel Unit

RF Receiver

Data: 98bits
DR: 9.6 kbits/s
Pwr: -20dBm
Autonomy: 10 years

RF band (ISM): 315MHz/433.92MHz

TPMS: a market driven by regulations

United States – Regulation from 2005

FMVSS 138 mandates TIS equipment for new vehicles starting from October 1st 2005

Russia – Regulation from 2016

2010/706 mandates the carryover of UN EC-R 64 for new vehicle models of M1 & N1 vehicle categories starting in 01.01.2016.

From 01.01.2016 all vehicles of categories which are voluntarily equipped with TPMS must be type approval according to ECE 64

South Korea – Regulation from 2013

TIS to be installed on passenger vehicles and vehicles of GVW 3.5 tons or less. From 1st January 2013 for new models and 1st January 2015 for existing models

European Union – Regulation from 2012

EC661-2009 mandates TIS equipment starting from Nov. 1st 2012 for new type approved vehicles and for all new vehicles starting from Nov. 1st 2014

+ TPMS will be tested as part of the new EU standardized plan for Vehicle Periodical inspection

Indonesia, Israel, Malaysia, Philippines, Turkey

Require European Whole Vehicle Type approval for vehicles imported from Europe. As a consequence, for those vehicles they will require aTPMS type approval according to ECE 64 and ECE 121 from 01.11.2012 for new types and 01.11.2014 for new vehicles

Example of useful function

Smart Phone example

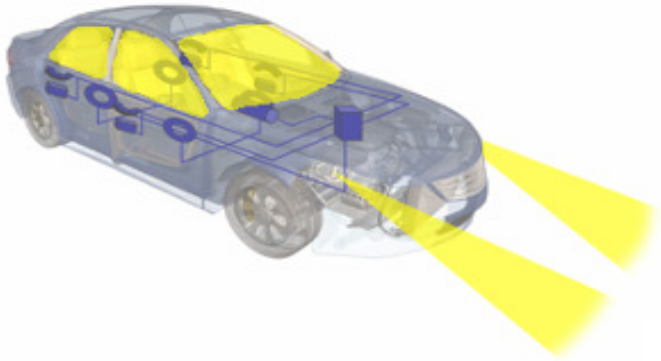
Filling assistant provides the recommended inflation pressure

Feedback provided during the filling action

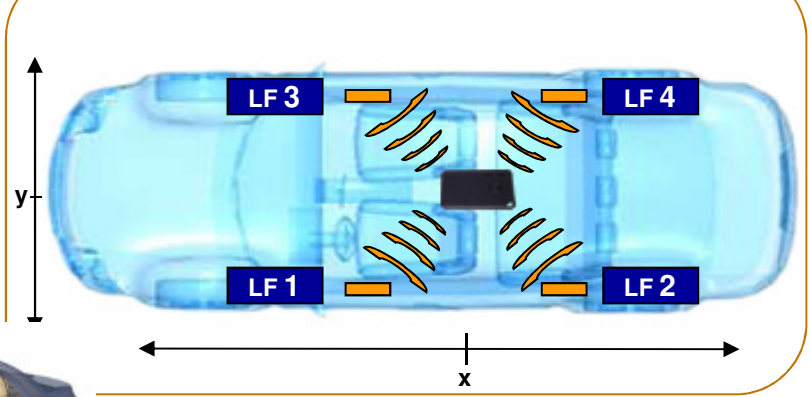
Target pressure reached, filling action completed

Other applications which add comfort & help to sell Cars

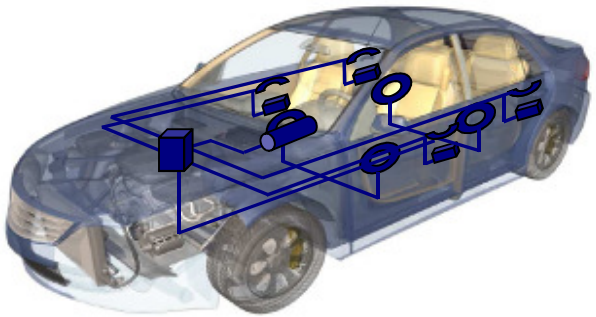
PASE: New Functions & Technologies

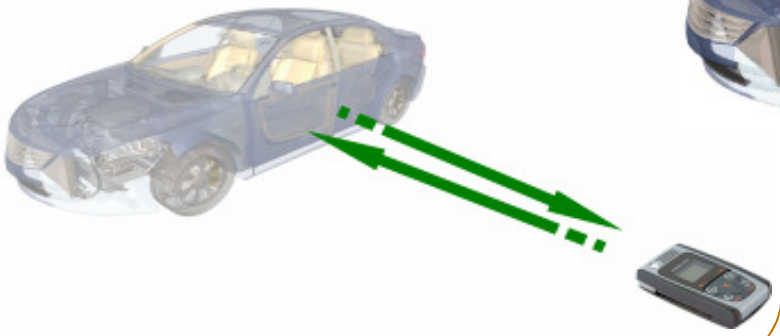


Welcome Lighting

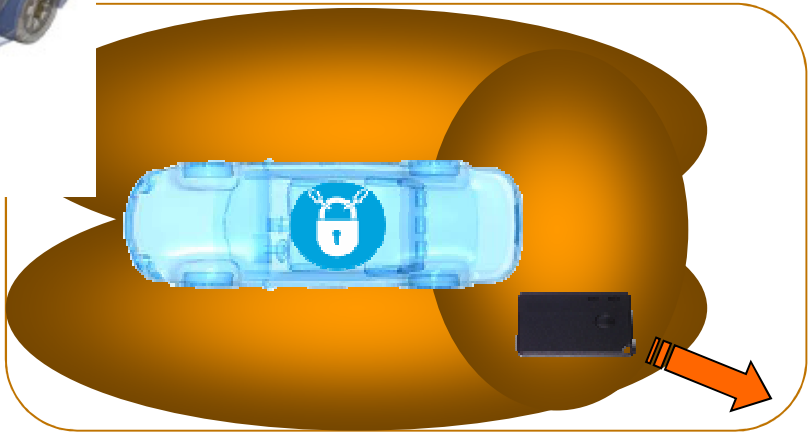


Door Secure Loc





Bi-Directional Communication



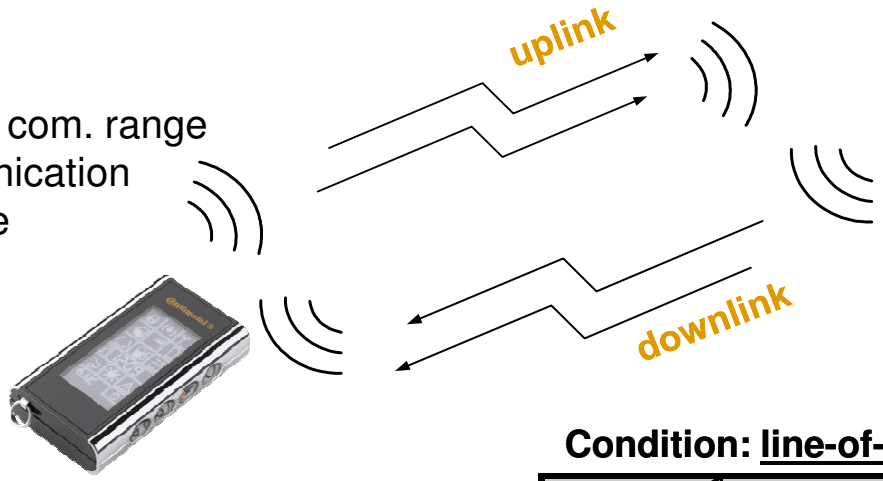
Walk Away Locking

Other applications which add comfort & help to sell Cars

Long Range System

TARGETS:

- maximum world wide com. range
- bi-directional communication
- multi channel capable
- ultra narrow band



FUNCTIONS (examples):

- access control
- car check, status feedback
- alarm on key
- heat or air condition control
- remote start etc.

Condition: line-of-sight

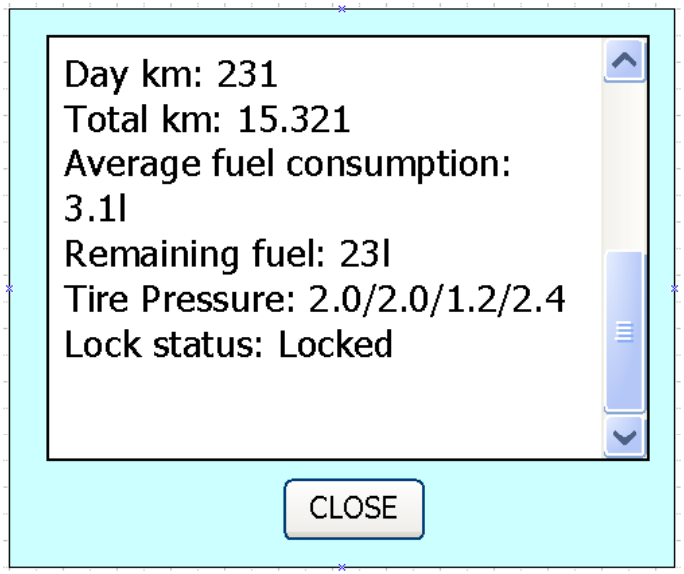
	Europe	US	Japan	Korea	China
Minimum Range Target	600 m	600 m	100 m	75 m	150 m
Typical Range Target	~2 km	~2 km	~400 m	~300 m	~700 m

Other applications which add comfort & help to sell Cars

NFC Interface becomes an integral part of our future Identification Devices

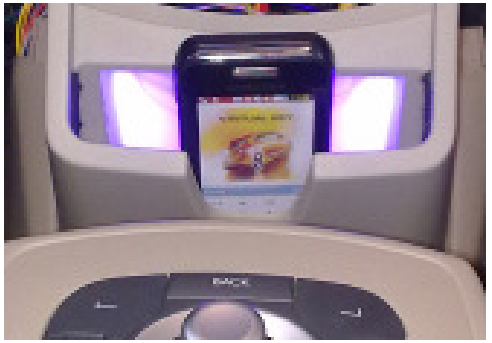
Applications:

- → Gateway Key
- → Vehicle configuration/ option release
- → Cell Phone based Car Finder



Other applications which add comfort & help to sell Cars

WPC (Wireless Power Charger)



Use cases

- Start authentication
- User profile reading (car personalization)
- Automatic WLAN pairing
- Wireless charging
- Back-Up Ecall

Other applications which add comfort & help to sell Cars

- Lower costs
- Improved performance
- Reduced complexity
- Best scalability

TODAY

RF is introduced at very large scale in Automotive world.

It participates to Today Automotive MegaTrends and is now mandatory to give added value to sell cars, from safety reason to comfort.

Continental is a key player to propose solutions on the markets, and works closely with OEMs to introduce all these new technologies.

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In future, Automobile Market will have to face the following issues

- End of Petrol
- Increase of Cars from 1 billion → … several billions
- Actual MegaTrends will stay

How RF will help to these future Challenges

End of Petrol

➔Need of New Infrastructure (called SMART GRID)
like BETTER PLACE, based on Navigation System, long range communication & Secured Wireless Payment)

➔Wireless Car Charging

In future, Automobile Market will have to face the following issues

Increase of Cars
1 billion (BRIC) →

- Traffic Jam
- Security

- Sharing development & Increase in the development of Multi modal system
- **ADAS**
- C2X with Applications

ADAS: Advanced Driver Assistance System

CC: Cruise Control
ACC: Adaptive Cruise Control
LDW: Lane Departure Warning
GPS
Parking assistance
Driver wake up system
Night visibility
E-call, etc…..

In future, Automobile Market will have to face the following issues

Increase of Cars
1 billion → ?

- Traffic Jam
- Security

- Sharing development & Increase in the development of Multi modal system
- ADAS
- **C2x with applications**

Automatic vehicle from 1 point to another point

Association of small vehicles which can go from 1 address to another (and form a kind of parametric bus) & bi mode car

All these solutions will rely on RF Solutions linked Automatisation of the road (C2x)

Intelligent Crossway
Real time traffic adaptation
Telematic signalisation

In future, Automobile Market will have to face the following issues

Actual MegaTrends will stay

➔ CO2 emission reduction
New generation of TPMS
Sensors network for data optimisation

➔ Your home in your car

Your home in your car
➔ Trend for being Always Connected

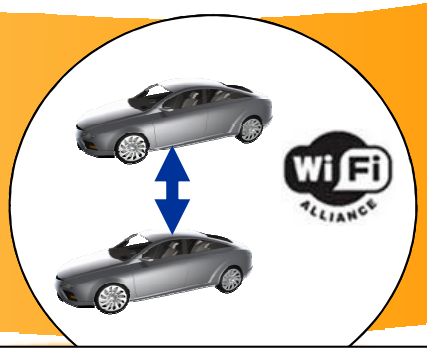
Device Connectivity

Office & E-Mail

Web Services

MegaTrend:

Always connected



C2X Functions

TOMORROW

RF domain will be a key technology to answer future automotive challenges.

Continental is already working on all technologies described above (advanced development, patents, …)

and is ready to invent our future…

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Strong Divisions and Business Units

Continental Corporation

Automotive Group

Chassis & Safety

- Electronic Brake Systems
- Hydraulic Brake Systems
- Sensorics
- Passive Safety & Advanced Driver Assistance Systems (PSAD)

Powertrain

- Engine Systems
- Transmissions
- Hybrid & Electric Vehicle
- Sensors & Actuators
- Fuel Supply

Interior

- Instrumentation & Driver HMI
- Infotainment & Connectivity
- Body & Security
- Commercial Vehicles & Aftermarket

Rubber Group

Tires

- PLT, Original Equipment
- PLT, Repl. Business, EMEA
- PLT, Repl. Business, The Americas
- PLT, Repl. Business, Asia Pacific
- Commercial Vehicle Tires
- Two Wheel Tires

ContiTech

- Air Spring Systems
- Benecke-Kaliko Group
- Conveyor Belt Group
- Elastomer Coatings
- Fluid Technology
- Power Transmission Group
- Vibration Control
- Other Operations

Division Interior
Product Overview

Instrumentation & Driver HMI

- Instrument clusters
- Secondary displays
- Head-up displays
- Climate controls
- Haptic controls
  - Faceplates
  - Central input devices
  - Roof controls
- Integrated centerstacks
- Cockpit modules

Infotainment & Connectivity

- Radios
- Connected radio & entry navigation
- Multimedia systems
- Embedded telematics
- Device connectivity
- Software & special solutions

Body & Security

- Body control modules
- Access control systems
- Door systems
- Seat comfort systems
- Power closures
- Tire information systems
- Gateways
- Energy management
- Exterior light control units
- Intelligent antenna modules

Commercial Vehicles & Aftermarket

- Tachographs, telematics & services
- Visual & haptic HMI
- Powertrain control
- Chassis-, body & transmission electronics
- Wear parts, spare parts & services for the independent aftermarket
- Original equipment services

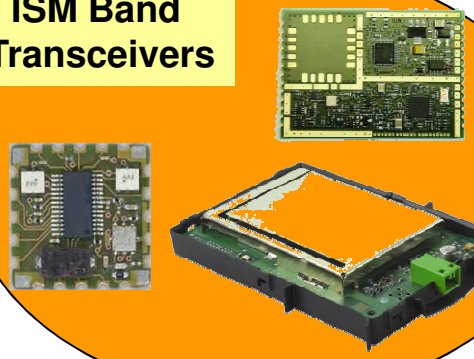
Today's Wireless Product Portfolio Continental

Remote Keyless Entry, PASE

Telematics & Connectivity

Tire Pressure Monitoring

ISM Band Transceivers



Infotainment, Multimedia, Radio

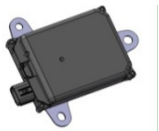
CES : An original approach to apply Continental Standard Solutions to other markets

Continental standard products & functions

Control access, identification

Tire pressure monitoring

Wireless communication, Radar



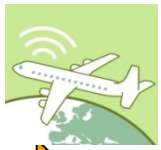
Technology

Market

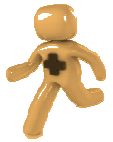
Application

Continental Engineering Services

Reduce size for integration in new supports (watch, bracelet,…)



Wireless Network Sensors in Aeronautics

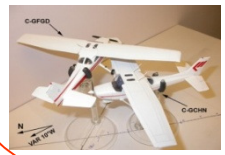


In medecine for patient identification and treatment

Adapt product for new environment

In Aeronautics

Add functions



Anti-collision avoidance for aicraft

In car rental with mobile

Thank you for your attention.