Erfolgreiche Innovationen für das vernetzte Fahrzeug: Kompatibilität, Virtual Prototyping & Sicherheit gegen Manipulation

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VP Strategy, New Business, R&D - NXP Semiconductors
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NXP Semiconductors

High Performance Mixed Signal and Standard Product solutions that leverage our leading RF, Analog, Power Management, Interface, Security and Digital Processing expertise

- **Employee base:**
  - ~ 25,000 employees in more than 25 countries
  - R&D in Europe, US, and Asia
  - Manufacturing in Asia and Europe

- **Net sales:** $4.4 B in 2010, > 60% in Asia Pacific

- #5 in Global Automotive Semiconductors
  - #3 in China
  - #1 in Car Infotainment
  - #1 in In Vehicle Networks
  - #1 in Car Access & Immobilization
Global Trends - Challenges for Society

- Growing need for environmental care
- Shift of economic balance among regions
- Shortening of natural resources
- Desire for individualization (lifestyle)
- Increased Safety & Convenience
  - Growing demand for safety and security
  - Growing need for environmental care
  - Shift of demographic balance among regions
- CO₂ reduction
- Connected Mobility
- Increasing Mobility

90% of all automotive innovations are enabled by electronics, making semiconductors a critical success factor!

Some examples...
NXP Connects the Car
NXP provides all electrical interfaces to, from, and within the vehicle

Telematics/Car ITS

Car Entertainment

Car Access & Remote Car Management

In Vehicle Networks

Air

Inside Car

NXP

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In Vehicle Networks – Growing Market

Transmission speed

< 20kbit/s  <1 Mbit/s  <10 Mbit/s  <100 Mbit/s

CAN

FlexRay

ETHERNET

New car platforms have >100 CAN/LIN/FlexRay nodes

Growth Drivers:
• More cars
• More electronic units in cars
• (Hybrid)-electrical driving
• In-car information exchange

Key Requirements:
• Failure tolerant data transmission
• Automotive Quality
• Robustness (ESD & EMC, varying ext. components)
• Low energy consumption
Product Validation - Bus Performance
“Real OEM Network Topologies, Comparison with System Simulations”

- Concrete Network Topology based on standardized ECUs
  - Wiring harness 1:1 comparable real use case
- Real-time measurements of signal integrity across entire network
  - Variation of population options (e.g., chokes)
  - Variation of bus termination
- Analysis of system response on bus faults
  - Open/Shorted bus wires
- Comparison of measurements with system simulations

Test - Topology
NXP connects the car!
Cars ... People ... Infrastructure

802.11p
LF, UHF

Cellular

NFC

Cellular
Secure Telematics
The core of connected Mobility
Automotive Semiconductor solutions ...

to fulfill the rising demand for connected mobility – location-based services

Location-based services

... to find and reserve your closest battery charging spot or car sharing opportunity

... for eCall

... and many more use cases
Automotive Semiconductor solutions …

to fulfill the rising demand for connected mobility – secure payment

2 billion people travel with NXP MIFARE™

Smooth and secure payment, no matter which type of transport

Deutsche Bahn and NXP Continue Cooperation on "Touch&Travel"

Telematics
NFC
Authentication
Automotive Semiconductor solutions …

to fulfill the rising demand for connected mobility – road pricing / traffic management

Flexible road pricing concepts and traffic management based on GPS

The Netherlands: IBM &NXP conduct joint field trial testing GPS-based kilometer pricing

Singapore: Strong involvement in Next Gen. Roadpricing Trials
Automotive Semiconductor solutions …
to fulfill the rising demand for connected mobility – remote car management

Remote car management: car finder, vehicle status & maintenance, battery health, remote route planning, fleet management . . .

Two-way RF Telematics Authentication

The Key to Injecting New Life into the Automotive Industry

Published Tue, Jul 12th, 2011 | Justin Fritz
Smart and connected car keys

Keys have evolved from single-function devices (immobilizer) to complex communication systems with various communication interfaces.

- **NFC**: 13.56 mhz
- **2-way RF**: 434 mhz
- **Immobilizer**: 125 mhz
Automotive Semiconductor solutions …

to fulfill the rising demand for connected mobility - personalization

Personalizing your car settings

NFC Authentication

NXP and Continental Demonstrate the World's First Concept Car Embedding NFC
Automotive Semiconductor solutions …

to fulfill the rising demand for connected mobility – car-to-x communication

C2X for hazard warnings and smooth traffic flow

802.11p via Software-defined Radio Telematics Authentication
Car-to-X Communication: Use Cases

**Emergency Vehicle Warning**

**Seeing Around Corners**

**Hazard Warning**

**Live Demo: Transparent Truck**

**May 2011 in Eindhoven**
Key challenges in car-to-x communication

- Ability to „see“ through objects
- Reliable reception quality around high-rise buildings & fast-moving objects
- Cost-efficiency to enable mass deployment
- Low power-consumption

First automotive-ready C2X platform

Test at 90 km/h highway: conventional WiFi fails with fast-moving vehicles

- Conventional WiFi radios don‘t meet requirements of harsh traffic environments and can‘t achieve automotive-level reliability:
  - Dedicated IEEE802.11p implementation required
  - NXP technology selected for simTD field trial starting spring 2012
But Connected Mobility . . .

. . . requires secure protection against manipulation, hacking, fraud, and counterfeiting
Automotive integrity & security issues…

Increasingly connected and open car…
- Brings with it one of the banes of the Internet: hacking.
- IVN security is a precondition to Car2X (ITS) communications.

(H) EV
- Regular connection to the Grid at many charging facilities.
  - Secure billing and battery swapping.

Manipulation
- Easy access to IVN (via OBD)….
  - Immobilizer reflashing
  - Car key replication
  - Feature activation, etc.

Counterfeiting
- Counterfeiting is not a cottage Industry!
  - Counterfeiters don't have to cover R&D, marketing, and advertising costs.
  - Parts are looking good but performing bad.

resulting in safety risks, environmental pollution, financial damage to car owners and car makers.
... Are now a reality...

"Researchers Show How a Car's Electronics Can Be Taken Over Remotely"
By John Markoff, published on March 9, 2011

"Vehicle odometer fraud jeopardizes safety...and pocketbooks"
published on April 19, 2011

"Counterfeit auto parts flood China's aftermarket"
Namrita Chow, Shanghai on February 10, 2011
NXP’s security solutions for vehicles

- Secure access to in-vehicle networks
- Secure financial transactions (e.g. eVehicles)
- Privacy protection in tracking applications
- Vehicle identification in traffic and fleet management applications (electronic chassis number, license plate)
- Remote software upgrades
- Theft protection for vehicle parts
- Prevention of tuning and manipulation
- Device protection (authentication) against cloning or counterfeiting
- Secure data container (black box, e.g. DER)
- Secure feature activation
Conclusion

Future vehicles are enabled by semiconductors

- Key innovation areas are efficient In-Vehicle Networks and Connected Mobility
- 90% of automotive innovations are electronics-based
- Examples for recent semiconductor-based innovation:
  - Telematics & Car-to-X Communication
  - Smart and Connected Car Keys
  - Automotive Ethernet
  - CAN-FD (flexible datarate) and Partial Networking
- ....... and all need to achieve automotive grade Quality & Robustness

Furthermore: Connecting the car to the outside world also means: powerful security systems need to be in place!

What it takes to securely connect the car . . .
- Strong technology base and deep application insights from various disciplines – telematics, identification, broadcast reception, in-vehicle networking
- Strong support link with eco-system (government, legislation, universities)
Thank you!