Connected Car: Evolution or Revolution?

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Solutions & Services

WIND

Smartphone Connectivity

Smartphone As In-Car Service Portal

[Projection Mode]

Apps running on phone but projected on car

[Collaboration Mode]

Apps running on both phone and car

[Native Mode]

Apps running and showing on phone interacting with car

Smartphone Connectivity Options

CarPlay

- Projection mode
  - CarPlay on H/U
  - iOS app on phone
- Closed tech
  - Need Apple license
  - Apple watch

Android Auto

- Projection mode
  - Android app
- Closed and open
  - Need Google license
  - SDK open
  - Android wear

Other

- Projection mode
  - MirrorLink
  - SDL
  - HTTP
  - Miracast
- Various options
  - Consortium
  - Vendor
  - Open source

Proprietary

- Interoperable mode
  - Telematics app
  - OEM-specific app
- Various options
  - Work with CarPlay and Android Auto
  - Create own protocol

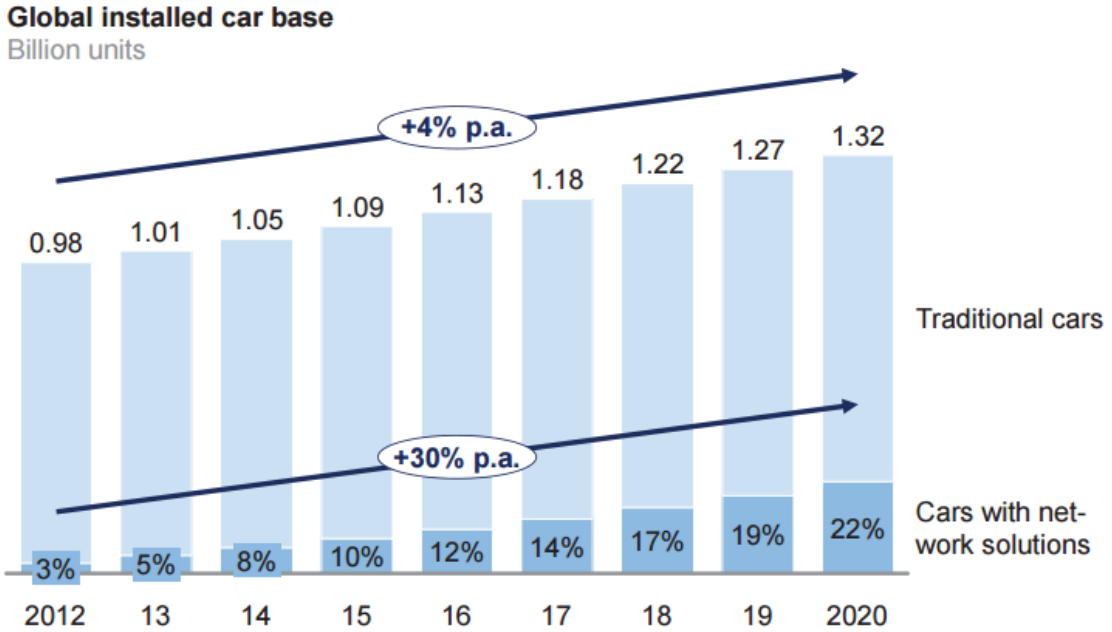
Telematics Service

Car Electronics or an Electronic Car?

- High-end cars contain more than 100 ECUs.
- 90% of all innovations are based on electronics.
- Over 35% of added value in a passenger car comes from electronics.
- Software is the major component in the car.

www.cesaer.org/content/assets/docs/Docs_2012/Deans_Convention_KIT_Becker_v5.pdf

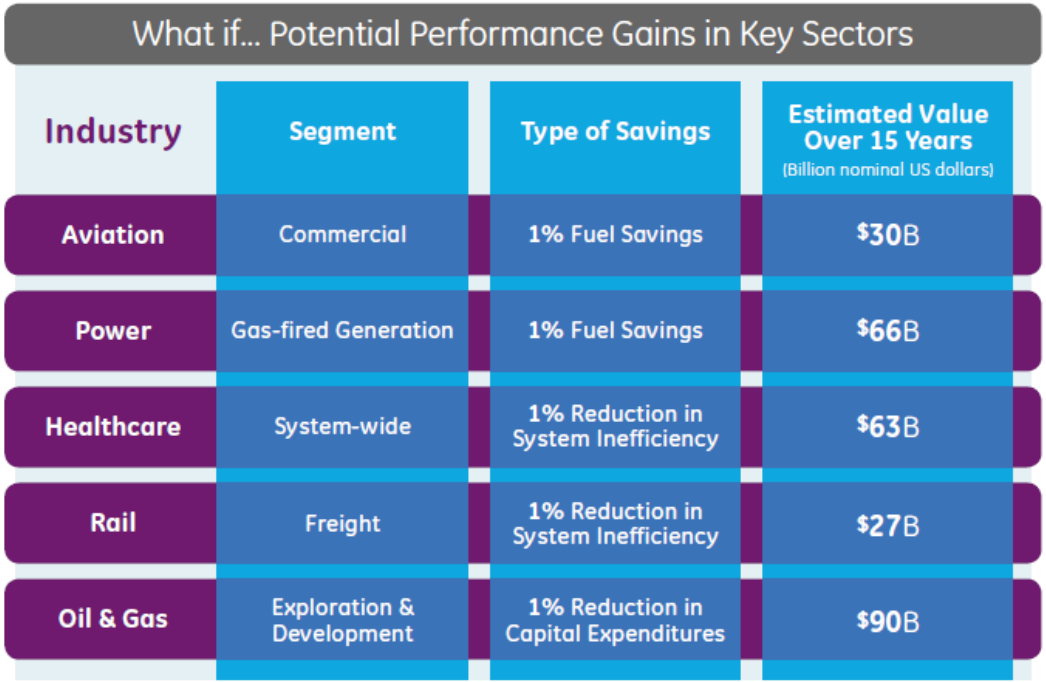
Connected Car Trends



SOURCE: Carpark; McKinsey

www.mckinsey.de/sites/mck_files/files/mck_the_road_to_2020_and_beyond.pdf

The Power of 1%



What if... Potential Performance Gains in Key Sectors

Industry	Segment	Type of Savings	Estimated Value Over 15 Years (Billion nominal US dollars)
Aviation	Commercial	1% Fuel Savings	$30B
Power	Gas-fired Generation	1% Fuel Savings	$66B
Healthcare	System-wide	1% Reduction in System Inefficiency	$63B
Rail	Freight	1% Reduction in System Inefficiency	$27B
Oil & Gas	Exploration & Development	1% Reduction in Capital Expenditures	$90B

Source: Industrial Internet report of GE, Nov 26, 2012

What Is a Connected Car?

Why Connected Car?

- Efficiency
  - Reduced congestion (fewer traffic jams, less waiting at intersections and traffic lights)
  - Higher fuel efficiency (due to synchronized traffic flow)
  - Productivity gain (1–2 hours per day for other use)
- Rich infotainment experience
  - People are used to smartphones and tablets
  - Seamless usage scenarios in the car are expected

Why Connected Car?

- Safety and security
  - eCall
  - Telematics services
- Cost reduction
  - Display audio offloading multimedia features to smartphone
  - Remote OTA device management and updates to reduce maintenance cost

Big Data and the Car

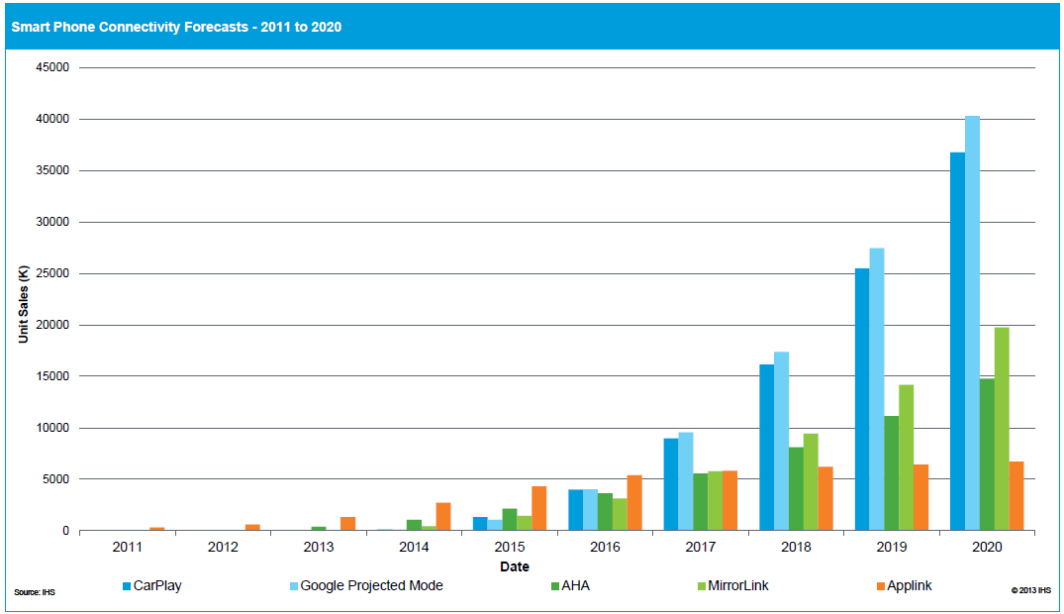
	Current Status	Future Expectations
Volume & Velocity	• 480TB collected in 2013 (total market) • 15MB/sec (total market)	• 11.1PB collected in 2020 (total market) • 350MB/second (total market)
Variety & Veracity	• Diagnostics & Location • Data is not diverse enough to ensure full reliability – decisions are unsure	• Diagnostics, Location, UX/Features, ADAS/Autonomy • Data is commodity, reliability is high, but costly
Value	• Value of Data: $245 million in 2013 • Telematics Revenue: $3.1 billion in 2013 • SW Warranty Cost: $12.3 billion in 2010	• Value of Data: **$14.5 billion in 2020** • Telematics Revenue: $16 billion in 2020 • SW Warranty Cost: **$100 billion in 2020**
Challenges Source: HIS 2014	• Technology & Infrastructure is building out • Defining the strategy and Big Data roles • Building optimized architecture • Gaining end-user support, opt-in • Privacy: Who owns data, pipe, security?	• Millions of data points/sec, millions of cars • Roles defined clearly, partnerships formed • Big Data in the Car creates value, revenue • End-user opt-in in exchange for services • Ownership & analytics solutions in place

Car As a Sensor Platform

- Position, weather, street view, speed, number of passengers, road condition, etc.
- Value of data
  - Efficient and safe driving
  - CRM for value-added services
  - Cost saving for vehicle maintenance
  - Improved product engineering
- Collaboration between OEM/Tier1, infrastructure, cloud and development community

The Players

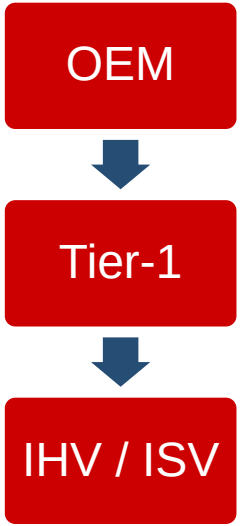
- OEMs and Tier 1s
- Semiconductor companies
- Software companies
- Developer community
- Apple
  - CarPlay and Apple car?
- Google
  - Android Auto and autonomous driving technology

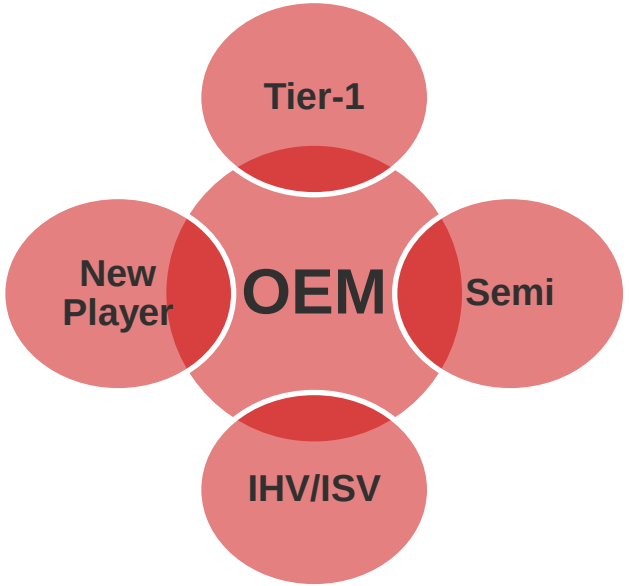


Source: IHS

How to Deal with an Unpredictable Future

- ADAS and autonomous strategy for the connected car
- New power dynamics
- Software competency
- Data is power
- IoT and cloud strategy
- Adaptability/agility





Technology Trends

- Platform technologies and developer ecosystem
  - Connectivity (CarPlay, Android Auto, CarLife, MirrorLink, etc.)
  - Android Embedded or GENIVI
  - HTML5 Web run time
  - AUTOSAR/microkernel for sensors
- Device management and over-the-air update
- Big data and analytics
- Safety and security
  - Certification

Simplified Network Topology for the Internet of Things

SENSORS/ ACTUATORS	DEVICES/ MACHINES	GATEWAYS	NETWORKS	CLOUDS
Resource-constrained: ▪ Low power ▪ Small footprint			▪ On-premise ▪ Enterprise ▪ Carrier	▪ Public ▪ Private ▪ Hybrid ▪ Embedded ▪ Combat

Wind River Helix: System-Level Solutions for the Internet of Things

Intelligent Connected Devices	Failsafe Networking Environments	Data & App Management
Safe & Secure Operating Systems	Infrastructure Platforms	Edge Management
Real-Time Virtualization	Orchestration	API Management
Connectivity Agents	Network Services	Analytics

Product Lifecycle	System Simulation	IoT App Development Tools

DEVICES

NETWORKS

CLOUDS

Wind River Portfolio Applied to IoT Topology

SENSORS/ ACTUATORS

- VxWorks, Microkernel Profile
- Wind River Simics*
- IoT Application Development Tools*

*Apply at every node of the topology

DEVICES/ MACHINES

VxWorks

- Technology and Market Profiles

Wind River Linux

- Technology and Market Profiles

Certification Products

ARP w/ McAfee: Lake Havasu City

GATEWAYS

Wind River Intelligent Device Platform XT

- IoT Application Development Tools
- ARP w/ Intel and McAfee: Moon Island

NETWORKS

- Wind River Titanium Server
- Titanium Cloud Partner Ecosystem
- OpenStack
- Carrier Grade Telco Management
- Carrier Grade Linux
- Accelerated VSwitch

CLOUDS

- Wind River Edge Management System
- Mashery API Management

Thank You

www.auto.windriver.com