Communication in Transport:

Connected Cars, C2X and The Internet of Things (IoT) - a global perspective.

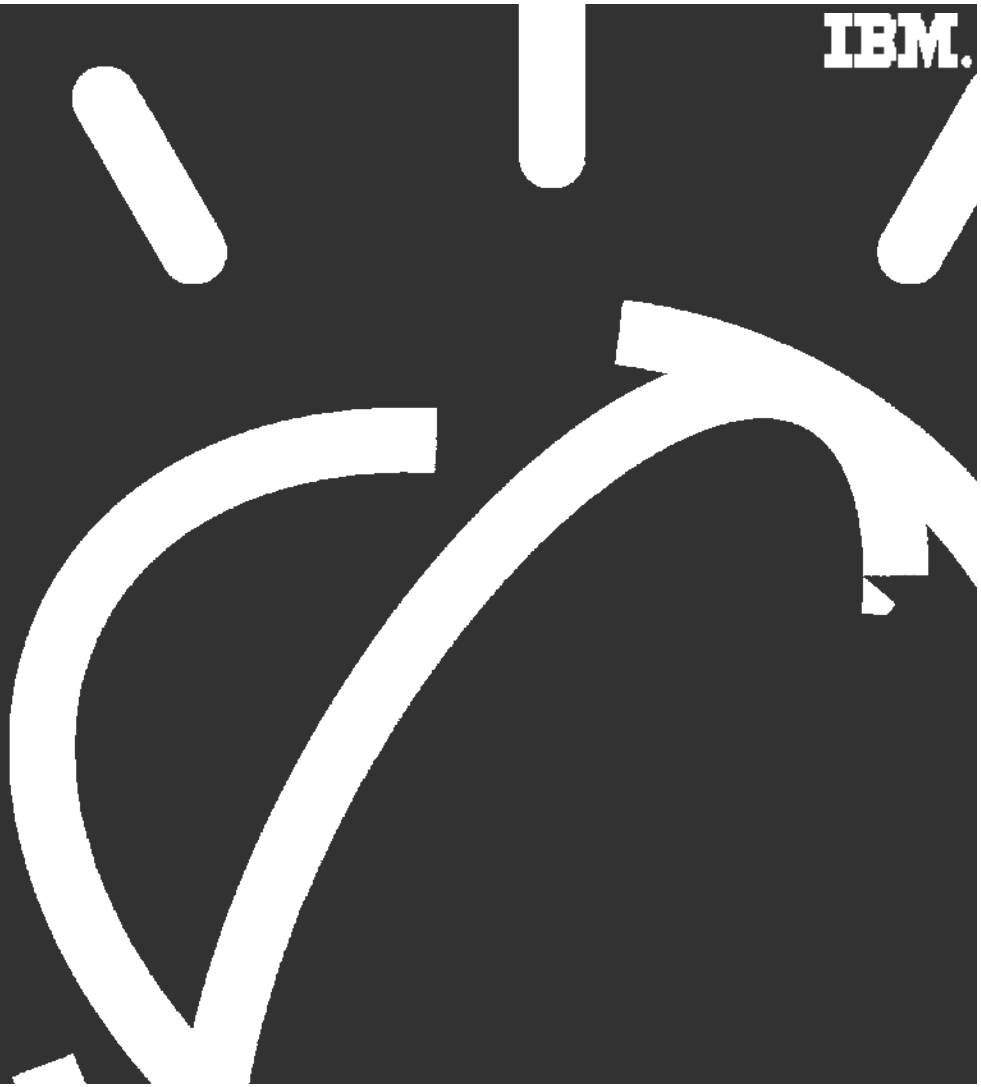
Watson IoT.

Eric-Mark Huitema

GM – T&T and Government

Created with input from NXP/Qualcomm and other IBM partners

IBM.



SAFE & SECURE COMMUNICATION IN TRANSPORT – 90% INNOVATION THROUGH INTERNET OF THINGS (IOT)

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IBM Watson

Seamlessly Connected Mobility Experience

One hour per day in the vehicle

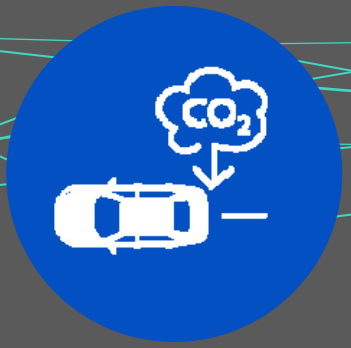
Enjoying Life

e-Call and Driver Assistance Towards Self-Driving

1.3M global road fatalities every year

Saving Lives

Energy Efficiency



US mandates 163 grams / mile and 54.5 MPG by 2025

Reducing PM10 / CO_2

CONSUMERS INCREASINGLY UTILIZE OTHER MEDIA IN THE VEHICLE.
CREATING LAWS PROHIBITING THEM IS NOT THE SOLUTION

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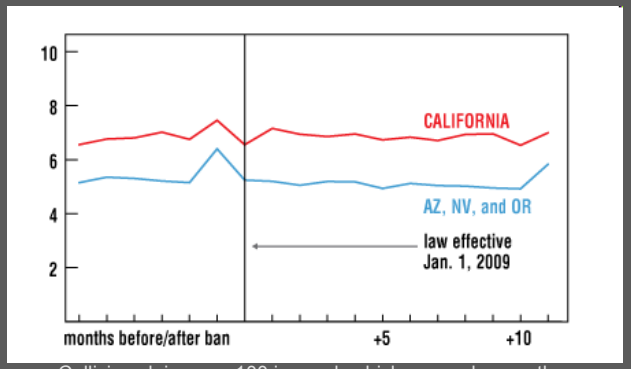
Interaction with phones and social media while in the vehicle is inevitable…

…the response, thus far, has been laws prohibiting the use of phones while driving…



Collision claims per 100 insured vehicle years, by month before and after texting law for all drivers

… study finds no reductions in crashes after laws take effect that ban texting

Among 18-25 year-olds, the group most likely to text

45% in states with bans

48% in states without bans

Source: Nuance Communication, 2008. Highway Loss Data Institute (HLDI), 2010

Finding a safe way to enable that interaction requires technology and connectivity solutions

WATSON and Cognitive interaction increases safety in the vehicle

- *Keeps the vehicle in an "ideal road position", **19% more** than manual dialing and **40% faster** to make a call.*
- ***Manually** selecting music on a MP3 player made the driver **50% more distracted** and doubled the amount of time to change lanes*

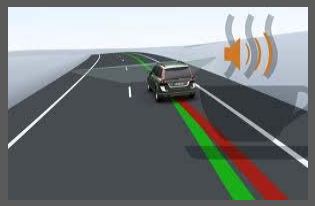
Heads-up display allows for 'eyes on the road' driving

- *Projected dashboard and navigation*
- *Sign-recognition*
- *"virtual" road edge and lane edge for bad weather conditions*
- *Night vision*

Driver focused clustering reduces the time needed to access and review information

- *Five way controllers on steering wheels*
- *Displays in visually 'friendly' areas*
- *Using color to convey functionality*

Attention monitoring systems improve driver alertness levels



Audio and visual warnings for:

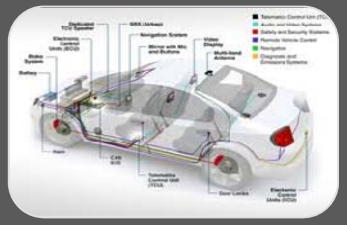
- *Lane departures*
- *Speed warnings*
- *Pedestrian crossing*
- *Collision warnings*

Source: Nuance Communication, 2008

Telematics will be deployed in different configurations, effecting how the vehicle is personalized

IBM.

Built In



- *Emergency assistance*
- *Vehicles health reporting*
- *Security and safety*
- *Battery management*
- *Autonomous / ADAS*
- *Cognitive Interactions voice and gesture*

Beamed In

- *Weather*
- *Traffic management*
- *Points of interest*
- *Business listings*
- *Video, Radio, VR*

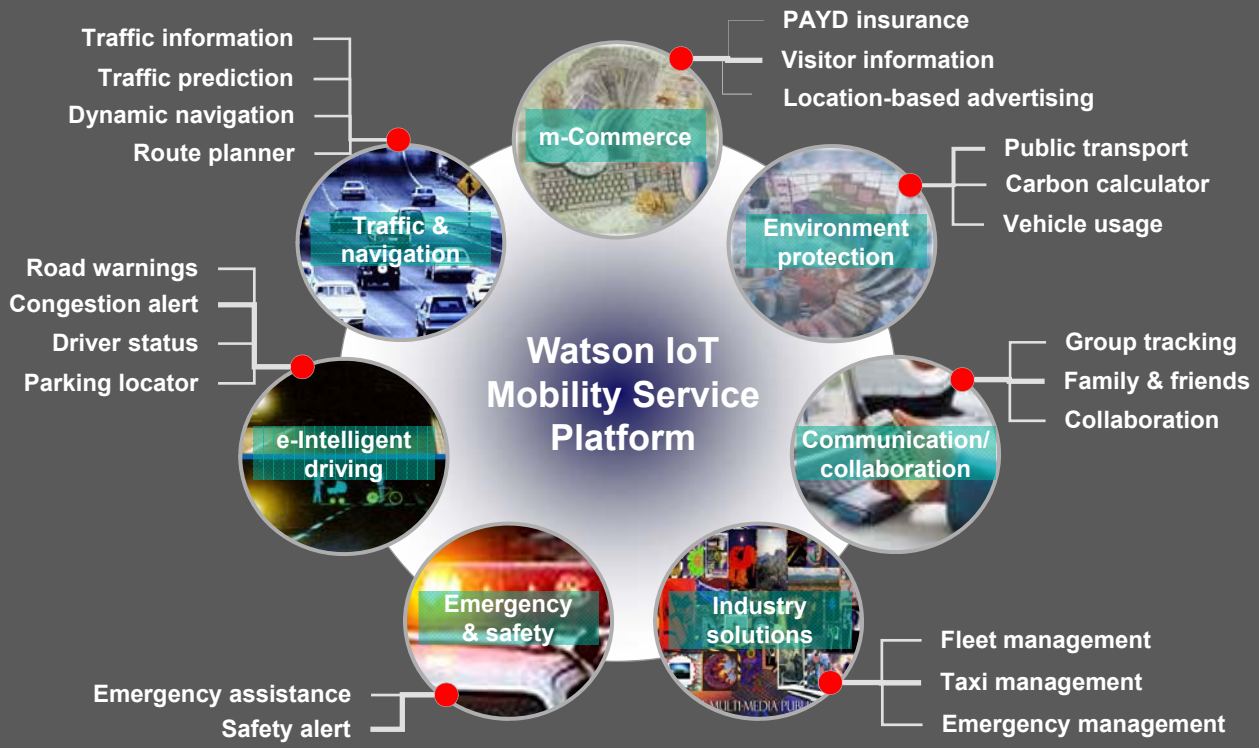
Brought In

- *Driving routes / navigation*
- *Music and video*
- *Calendar*
- *Social Media*
- *E-mail and SMS*

Hybrid models are emerging that require integration points…

depending on what the application is best suited for

New Watson IoT technology's enable many potential value-added services in Travel and Transportation



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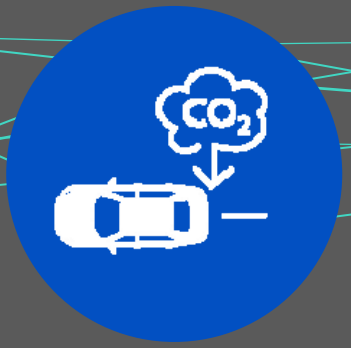


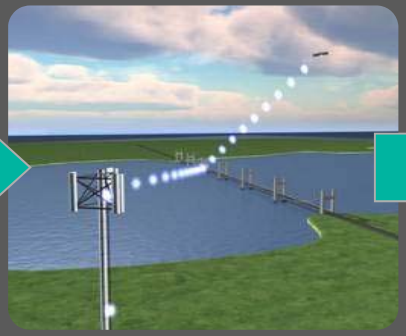
US mandates 163 grams / mile and 54.5 MPG by 2025

Reducing PM10 / CO_2

European/Russian legislation leads to e-Call
Mandatory 31 march 2018

IBM.

Incident → **Automated eCall** → **Rescue centre** → **Ambulance**



eCall technology can save thousands of lives each year, reducing the emergency services reaction time by 50% rural and 40% in urban areas

This technology will also assist in solving other treats to drivers like:
Car theft, robbery, hijacking and kidnapping by vehicle tracking.

eCall Status, cellular in band modem and third party 3G/4G implementations in the market

IBM.

•**Specification approved standardization**
- Pan European eCall Operating Requirements
- Minimum Set of Data (MSD)
- Application Requirements
- The "Third Party eCall" already implemented
- the eCall discriminator ('eCall flag') agreed
- Safe automatic call also when driver is unconscious
- Verification via voice link
- Use of eCall flags to distinguish automated/ manual calls)

•Positive response on eCall Public consultation strongly supports eCall introduction

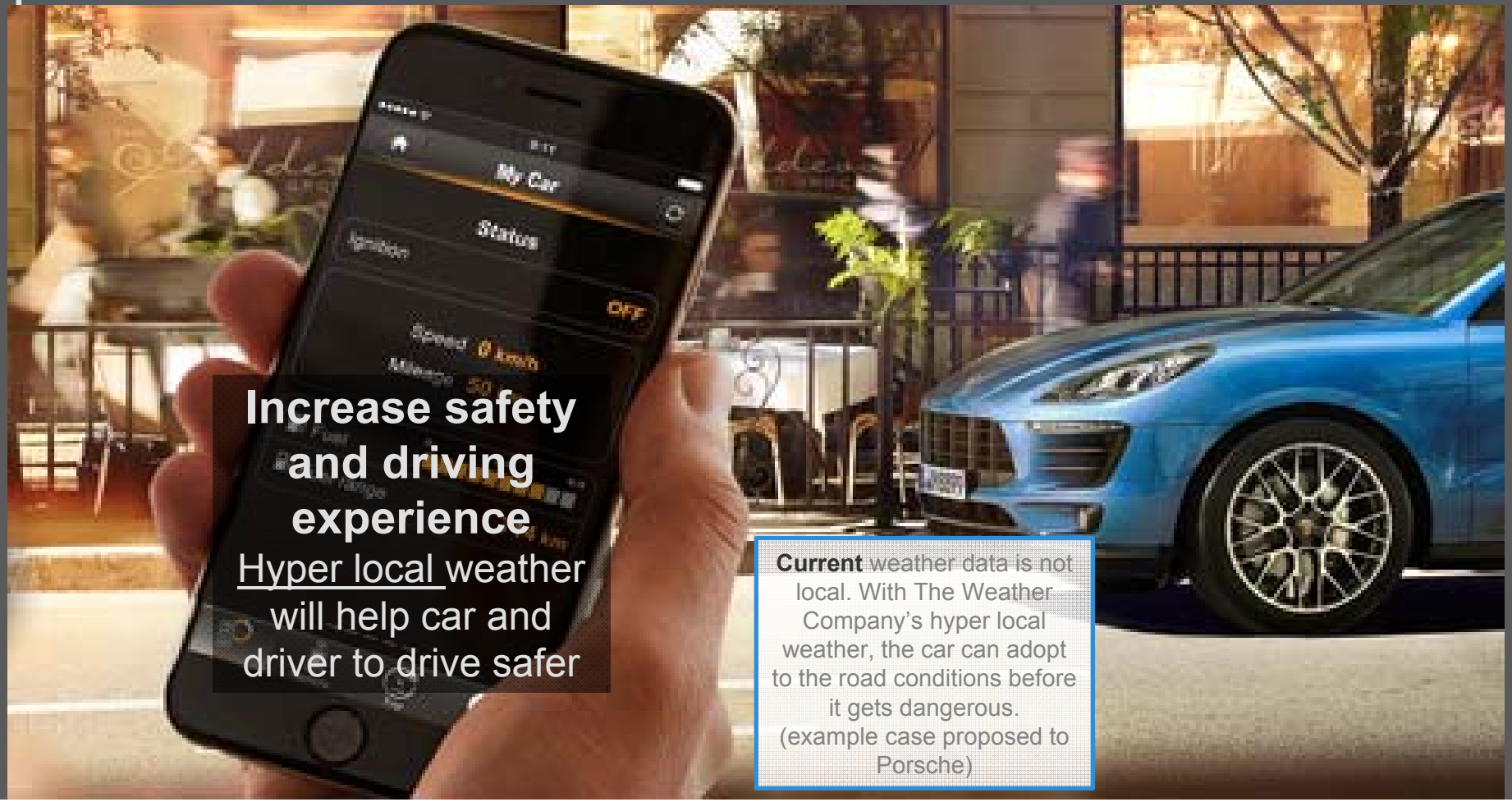
•**EU** mandatory introduction march 31, 2018 for all new type approvals. Legislation approved

•**Russia** adopted eCall already, based on extra insurance fee for cars not equipped

•eCall service shall comply with privacy and data protection recommendations provided by art. 29 WP

• 20 Member and 3 Associated States have signed
  - More countries have announced their signature
  - Commitment from the automotive ACEA and telecom industry (GSM Association Europe)
  - 120+ other organizations have signed as well, representing all the stakeholders involved

Car sensors in Watson IoT platform with V2X for Aquaplaning prediction



The Weather Company: Sensor Data combined with Watson IoT

26 Billion daily forecasts / visits for **2.2 billion** weather forecast locations

Daily Data from **50 Million** mobile devices: location & pressure

Atmospheric data from **50,000** flights per day

250,000 worldwide weather stations

100TB of data per day

1000+ radar locations

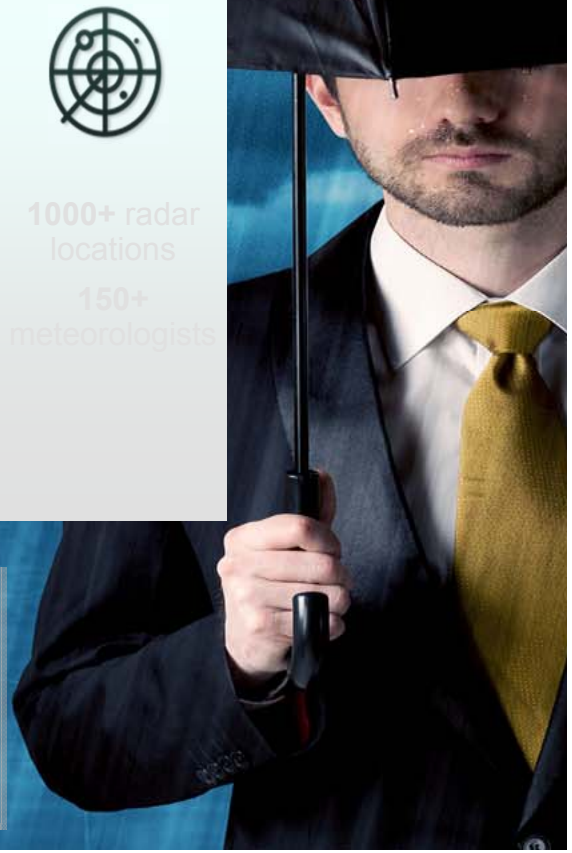
150+ meteorologists

The Weather Channel

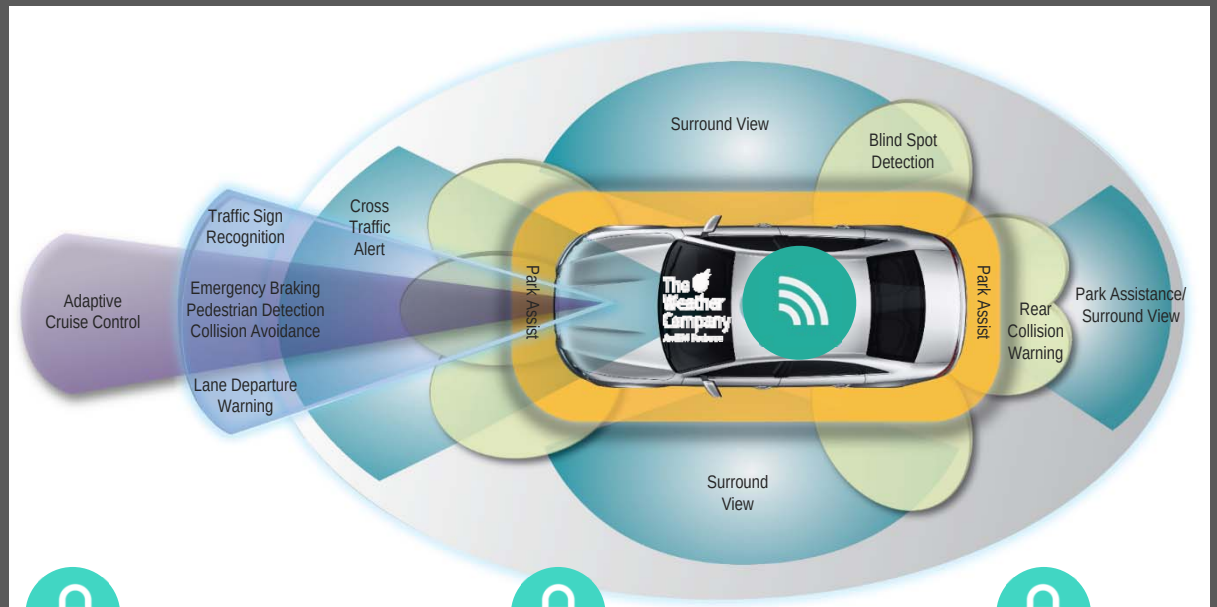
The Weather Company
An IBM Business

ForecastWatch.com:

"TWC gives the most accurate weather prediction for the last 7 years (2010 - 2016) across all regions and timeframes after analyzing 142 Million forecasts from 11 different providers "



ENABLING THE SECURE CONNECTED CAR



SENSE	Secure Network	THINK	Secure Network	ACT	IoT / BIG DATA
Radar Vision Secure V2X		Processing Sensor Fusion Security		Powertrain Chassis Braking	Digital Networking Infrastructure Security

EXTENDING SENSING BEYOND THE VEHICLE & LINE OF SIGHT

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Motorcycle approaching / „do not pass!“

Roadworks beyond line-of-sight

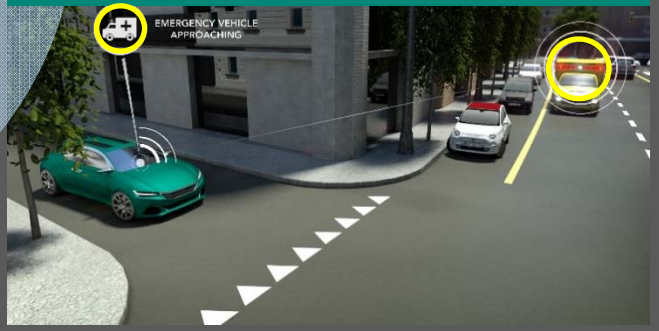
802.11p required for Safety-critical V2X features:

Low Latency, Secure
&
Beyond-line-of-sight

Providing additional safety data earlier than any other sensor can „see“

Platooning / cooperative driving
5m gap @ 80km/h based on 802.11p low latency

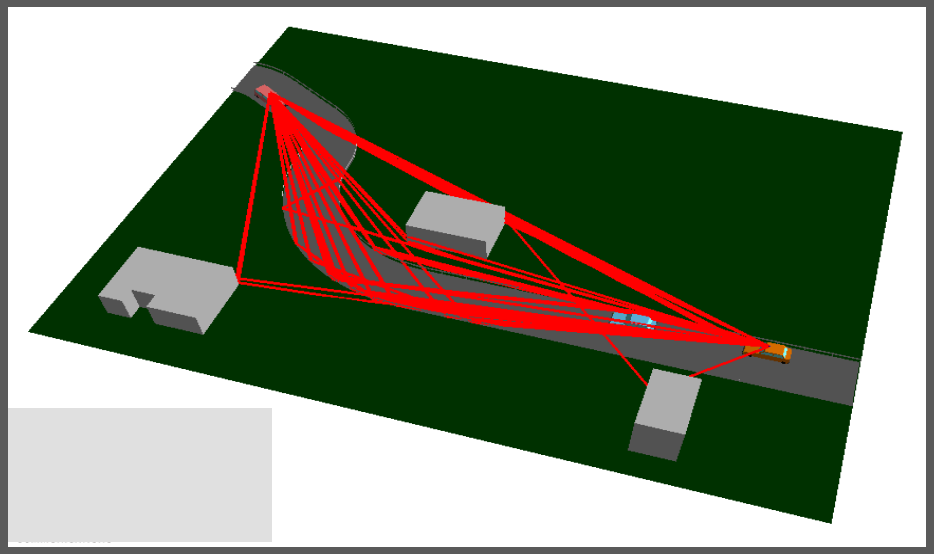
Emergency vehicle around corner

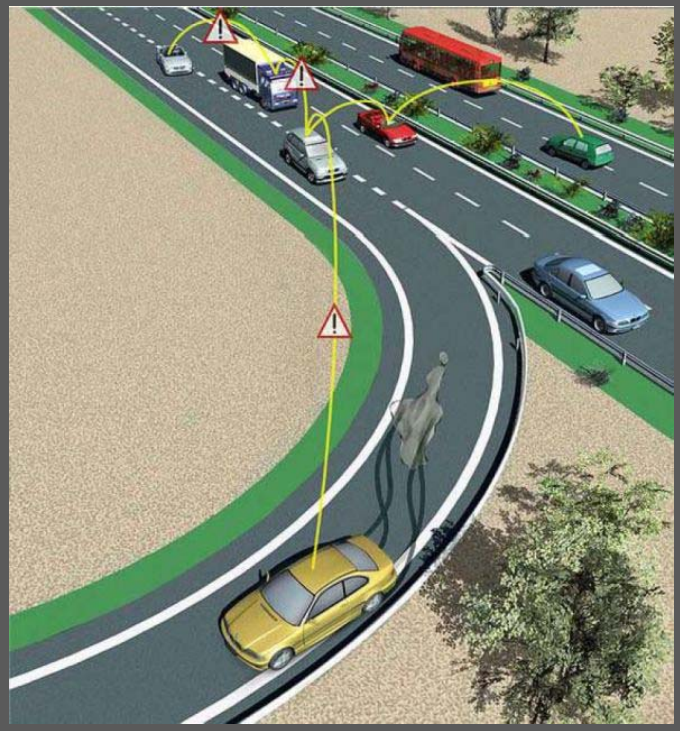


CAR-TO-CAR AND CAR-TO-INFRASTRUCTURE COMMUNICATION

A paradigm shift in mobility

Solutions to **avoid accidents, improve traffic flow** and **enable autonomous driving**





Automotive communication standard IEEE802.11p is derived from IEEE802.11a/g (today's WiFi standard in computing)

V2X COMMUNICATION – IEEE 802.11P

Dedicated Short Range Communication (DSRC) between cars, roadside infrastructure etc

– 'WiFi-like link' upgraded for high speed automotive: IEEE 802.11**p**
– Optimized for mobile conditions, including multi-path reflection situations
– Dedicated reserved frequency band at 5.9 GHz (several 10 MHz channels)
– Typical 500-1500 meter range
– Can 'look around corners' thanks to reflections

Does not rule out other communication channels (cellular 4G and LTE 14+ => 5G)

– 802.11p focuses on short range low latency, complementing the long range / more latency cellular network
– Autonomous driving capacity requirements need more than DSRC can offer in current standard
– Different use cases, different requirements => Consumer Value added services
– On the edge computing (Watson IOT) with cellular networks
– Connected value added services

V2X GLOBAL TEST BEDS

Singapore LTA "faster"
Smart Mobility Test Bed

Smart Port Hamburg

Connected Trucks in UAE

V2X in China with SAIC / Tongji university

German automotive cooperation "HERE -

"Transportation Cloud"

BMW i8 Cognitive Car Watson IOT

Singapore NTU / NXP
Smart Mobility Test Bed

V2X – DRIVING GLOBAL DEPLOYMENT OF ENHANCED ROAD SAFETY

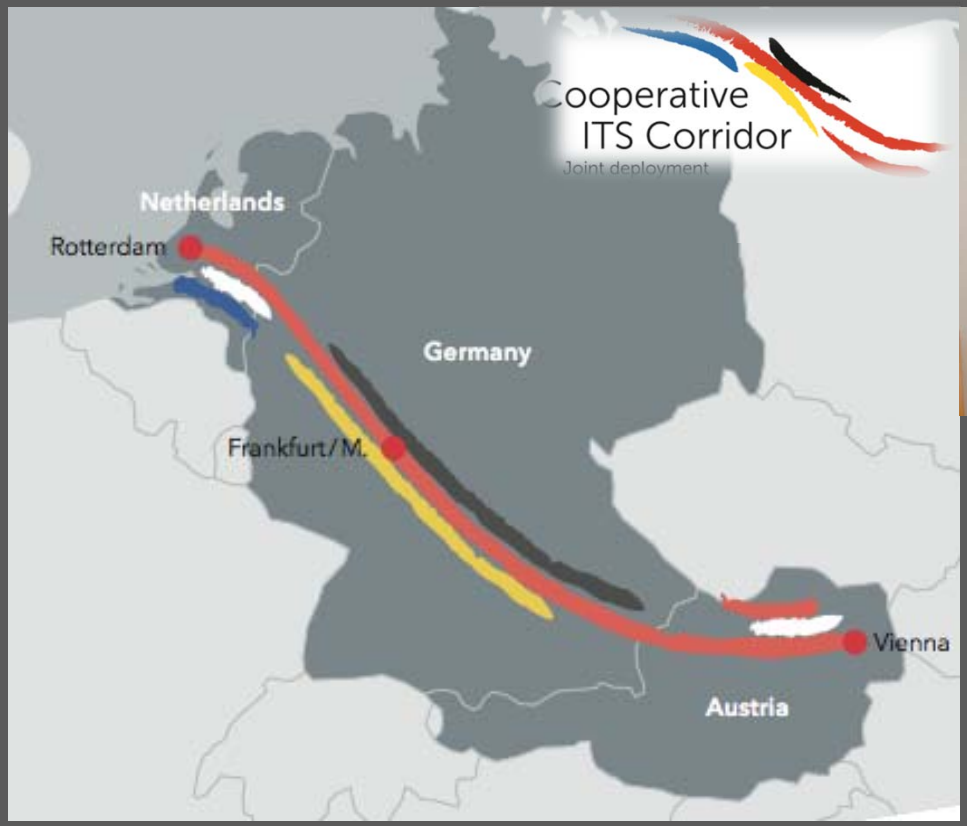
Europe

- Car2Car Consortium prepares deployment 2019 onwards
- Connect Motorcycle Consortium starts 2020
- EU issued final framework for Cooperative-ITS
- Declaration of Amsterdam
- Cooperative ITS corridor deployment started
- EU truck platooning challenge (DAF, Volvo, Scania, Daimler)

Asia

- China: DSRC under evaluation, many trials
- Japan/Toyota: V2X (760MHz Japan standard)
  safety package launched already 2015
- Singapore: ERPII award for 2018 deployment
- Korea: Plan to mandate from 2020, C-ITS deployment from 2018 onwards

DEPLOYMENT IN EUROPE: COOPERATIVE ITS CORRIDOR



MOU between The Netherlands, Germany and Austria to deploy cooperative mobility on this corridor to improve traffic safety and reduce congestion

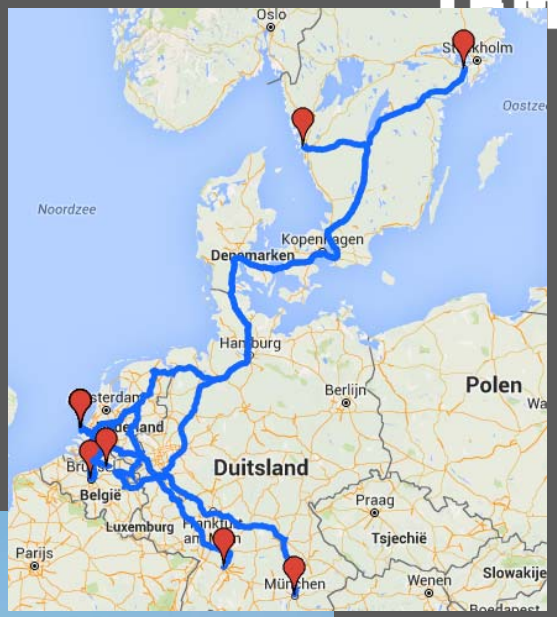
TRUCK PLATOONING

Declaration of Amsterdam

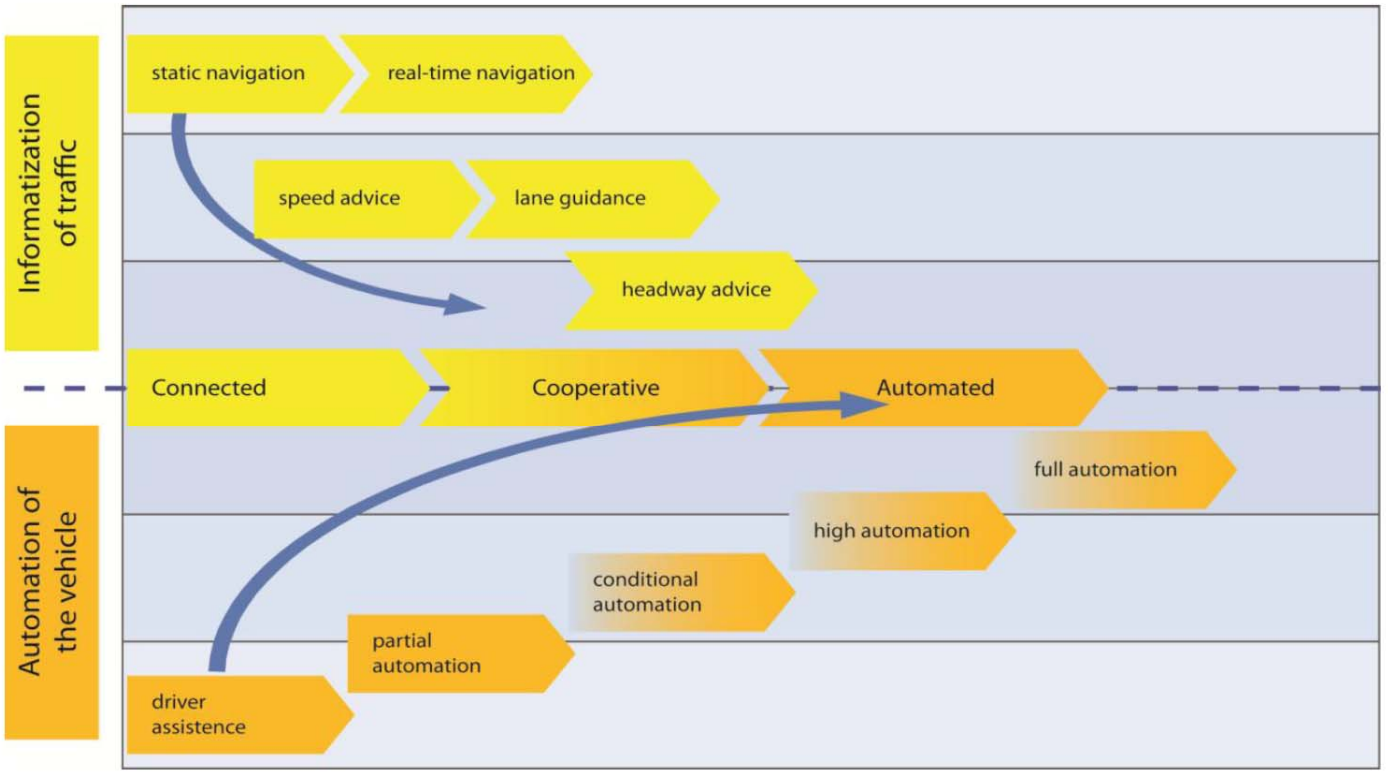
Cooperation in the field of connected and automated driving

14-15 April 2016

nl 2016



DEPLOYMENT IN EUROPE: **DECLARATION OF AMSTERDAM**



Connected, cooperative and automated driving developments should come together to harvest societal benefits.

V2X – DRIVING GLOBAL DEPLOYMENT OF ENHANCED ROAD SAFETY

USA

- V2X Notice of Proposed Rule Making released end 2016 preparing Mandate of 802.11p
  - DSRC compliant technology at 5.9GHz
  - PKI / SCMS based security
  - Proposed Schedule:
    2021 50% of new cars need to have DSRC
    2022 75%
    2023 100%
- General Motors' Cadillac already shipping, ahead of US mandate
- US DOT / Smart City Challenge Partnership (IBM + NXP)

U.S. Department of Transportation
National Highway Traffic Safety Administration

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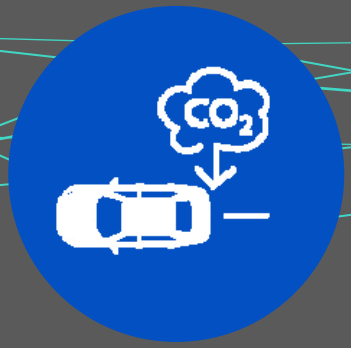

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Reducing PM10 / CO_2

Combining Watson IoT and The Weather Company in an autonomous driving bus: OLLI

The ridership revolution with Customers:

- **Cognitive Interaction with Watson IoT on a self driving 3D printed vehicle**
- **Anticipating on weather alerts, social media, restaurant reviews etc.**
- **Operational in Washington DC, Berlin and many more places in 2017**

https://www.youtube.com/watch?v=9joEsWiYFEI

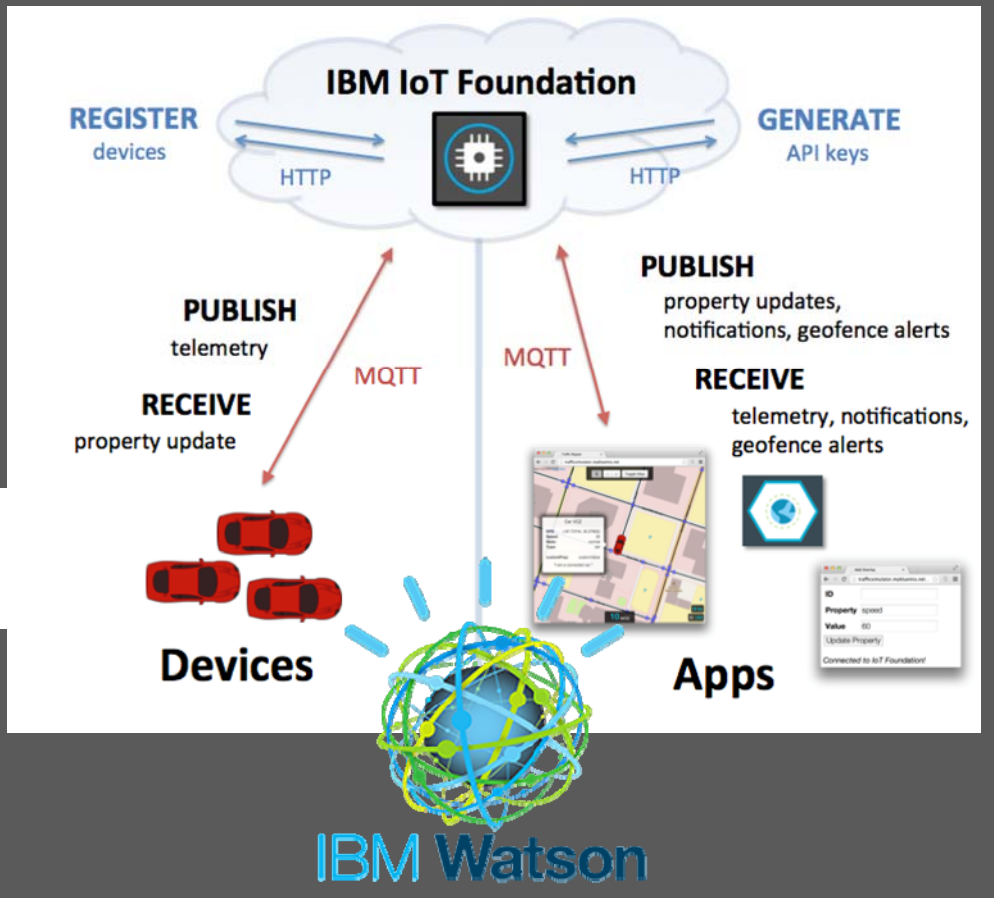
THE US WILL MANDATE V2X TECHNOLOGY WITHIN 5 YEARS

U.S. Secretary of Transportation, Anthony Foxx

Cadillac to Introduce Advanced 'Intelligent and Connected' Vehicle Technologies on Select 2017 Models

Super Cruise and V2V technologies slated for production in about two years

The world's first V2X in series-produced vehicles



Connected cars will be differentiated through business models that sustain new value streams

An IoT platform for growth includes:

Use Case Portfolio

- Designed to enable a nearly limitless set of potential use cases through V2x data interchange
- Enable use cases rapidly through a powerful recipe-based interface
- Contains sophisticated automotive use case solutions such as Advanced Driver Assistance Services (ADAS) and multi-layered, mapping technology that supports multiple vendors providing real time for autonomous driving

Vehicle to Cloud IoT Platform

- Deployed through cloud, hybrid cloud or as an on-premises solution
- Built on open standards supporting a range of industry protocols and integration with third party services
- A rich set of advanced analytical tools to handle data streaming, modeling, reporting along with image and natural language processing

Technology Infrastructure

- Secure two-way vehicle communications through a hybrid cloud that scales to tens of millions of vehicles across the globe
- Globally distributed cloud data centers that can be in compliance with consumer privacy laws that vary internationally
- Priced per vehicle to alleviate large up-front costs

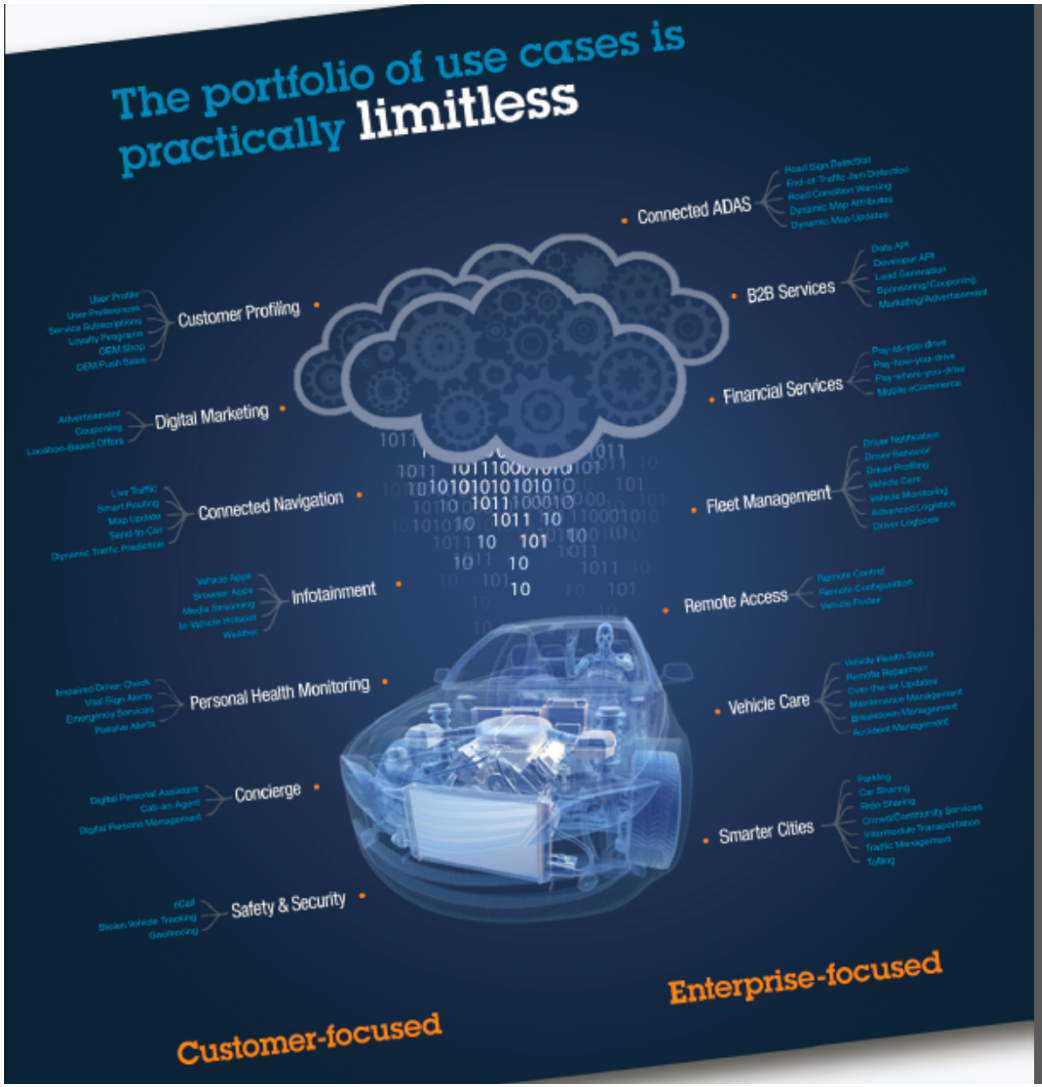
By 2020, the connected car will be the

#1 connected application*

200 million cars will be connected in 2015 and fully packed with sensor technologies**

By 2020, connected vehicles will produce

350 MB of data per second***



Connectivity is enabling the Watson IoT use cases and solutions

Solutions need to be:

- Customer focused
- Enterprise focused

Driving real benefits for the users!

Offering **Limitless opportunities** for implementation.

Thank you !

Let’s work together to make Transportation Smarter

IBM.