CAR Management Briefing Seminars

August 6th-9th, 2012

Deliverable B2

August 15th, 2012

Submitted to:
Michigan Department of Transportation
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Lansing, MI 48909

Submitted by:
Center for Automotive Research
3005 Boardwalk, Suite 200
Ann Arbor, MI 48108

CAR Management Briefing Seminars • August 6th–9th, 2012

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Connected Vehicles at the Crossroads

Monday 1:00 PM – 4:30 PM

With the federally-funded Connected Vehicle Safety Pilot well underway, both public and private sectors are moving ever closer to the National Highway Traffic Safety Administration's 2013 date for announcing its regulatory intent regarding vehicle-to-vehicle (V2V) active safety. For the first time in a coordinated effort--through "driver clinics"--the safety pilot already has exposed connected vehicle safety technology to members of the general driving population. In addition, through its model deployment component, the safety pilot soon will be gathering significant data on the performance of V2V safety systems from thousands of vehicles and drivers.

Despite this clear progress, calls to regulate against the potential for driver distraction from connected vehicle technology have continued, especially for those technologies that use cellular networks. For example, a 2011 National Transportation Safety Board report called for outright bans on the use of nearly all such technology in moving vehicles. Furthermore, in early 2012, NHTSA published its Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices. Thus, even as 2013 fast approaches, many challenges remain to be addressed. This session will examine the prospects for overcoming these challenges and enabling both public and private sector business models to proliferate.

Chair:

Richard Wallace, Director
Transportation Systems Analysis

Speakers:

James Wang, Deputy General Director of Mechanical and Systems Research Laboratories
Industrial Technology Research Institute

Kirk Steudle, P.E., State Transportation Director
Michigan Department of Transportation

Tim Johnson, Director, Crash Avoidance and Electronic Controls Research
National Highway Traffic Safety Administration

Marios Zenios, Head of Connectivity and Infotainment
Chrysler Group LLC

Frank Weith, General Manager Connected Services, Product Marketing and Strategy
Volkswagen Group of America, Inc.

Roger Berg, Vice President, Wireless Technologies, North America Research Lab
DENSO International America, Inc.

Tim Yerdon, Global Director, Innovation- Design, R&D
Visteon Corporation

Kevin Link, Senior Vice President
Hughes Telematics, Inc.

Center for Automotive Research 3005 Boardwalk, Suite 200, Ann Arbor, MI 48108
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MBS

2012 CAR Management Briefing Seminars

Maximizing Momentum

August 6–9, 2012

Grand Traverse Resort & Spa, Traverse City, Michigan USA

CAR
CENTER FOR AUTOMOTIVE RESEARCH

Connected Vehicles at the Crossroads

Monday, August 6, 2012

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CENTER FOR AUTOMOTIVE RESEARCH

Connected Vehicles at the Crossroads

CHAIR:

Richard Wallace

Director

Transportation Systems Analysis

Center for Automotive Research

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CENTER FOR AUTOMOTIVE RESEARCH

Highlights Since Last Year

- USDOT Vehicle-to-Vehicle Safety Pilot
  - Driver clinics completed in six locations, including Brooklyn, MI (at Michigan International Speedway)
  - Field test about to go live in Ann Arbor (more to come from our speakers)
- 2014 ITS World Congress
  - ITS Michigan and others making progress in preparing for Detroit to be the host city
  - 2012 version to be held in Vienna in October
- Connected and Autonomous
  - Progress made on bring these two technologies together

CAR-KPMG White Paper

Self-Driving Cars: The Next Revolution

CAR
CENTER FOR AUTOMOTIVE RESEARCH

Connected Vehicles at the Crossroads

James Wang

Deputy General Director

Mechanical and Systems Research Laboratories

Industrial Technology Research Institute

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Connected Vehicles at the Crossroads

Kirk Steudle, P.E.

State Transportation Director

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Connected Vehicles at the Crossroads

CHAIR

Richard Wallace – Center for Automotive Research

PANEL

Kirk Steudle, P.E. – Michigan Department of Transportation

Tim Johnson – National Highway Traffic Safety Administration

Marios Zenios – Chrysler Group LLC

Frank Weith – Volkswagen Group of America, Inc.

Roger Berg – DENSO International America, Inc.

Tim Yerdon – Visteon Corporation

Kevin Link – Hughes Telematics, Inc.

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The State of the Connected Vehicle

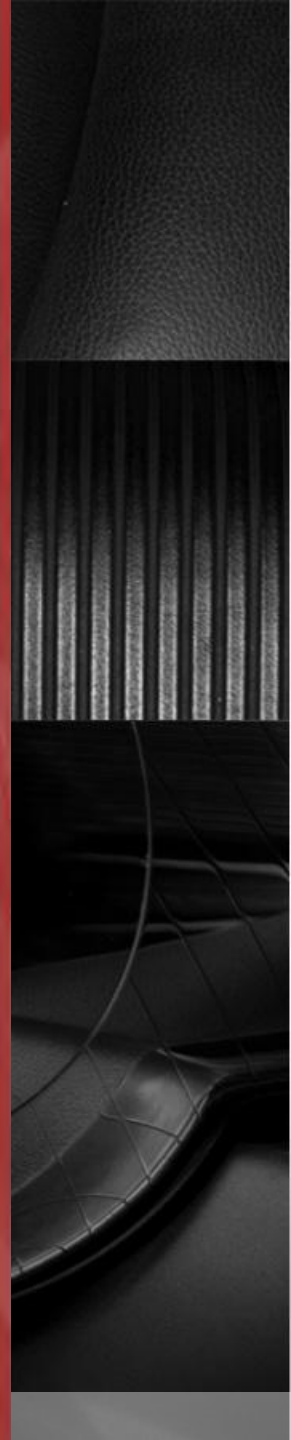
Management Briefing Seminar

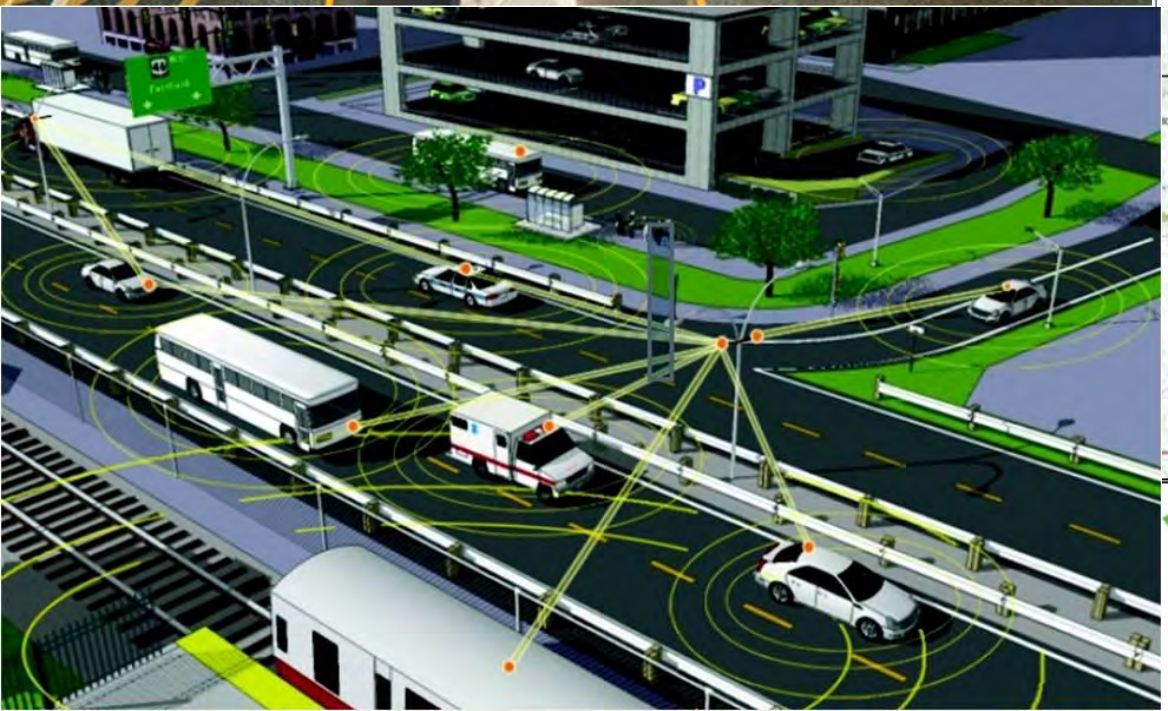
August 6, 2012

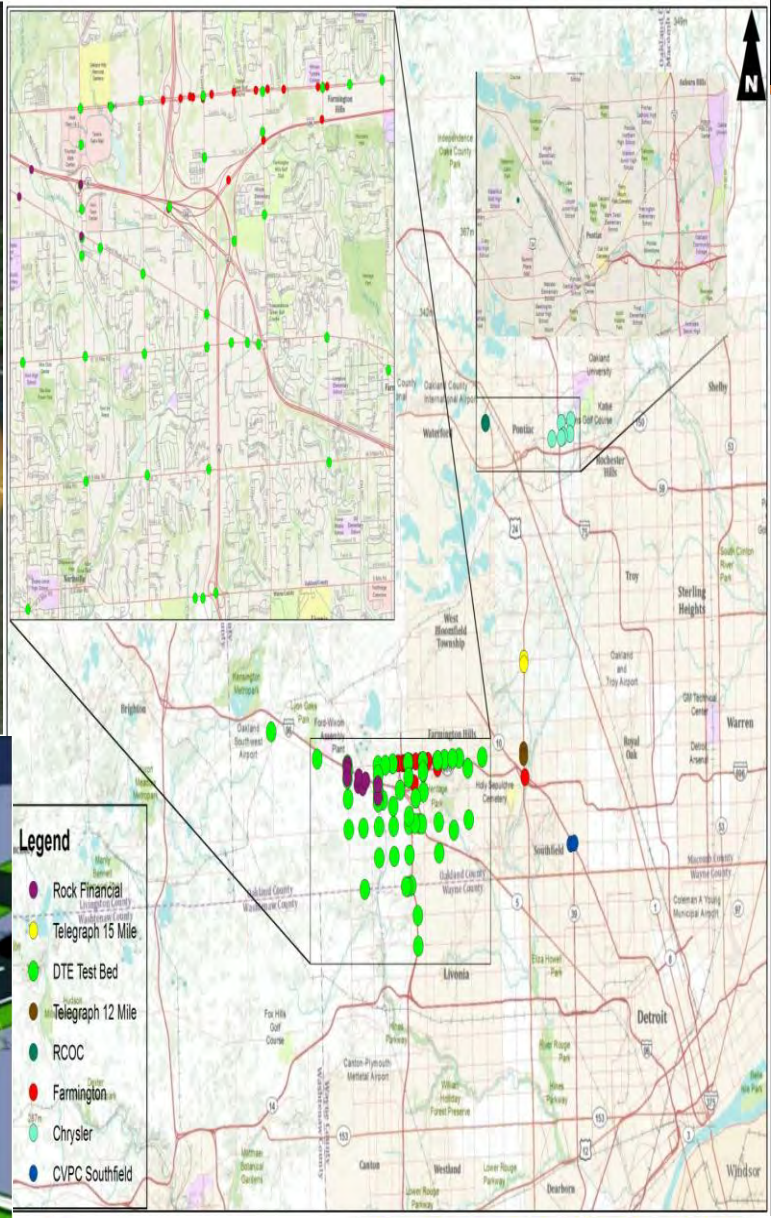
Kirk T. Steudle, P.E.

Director

Michigan Department of Transportation







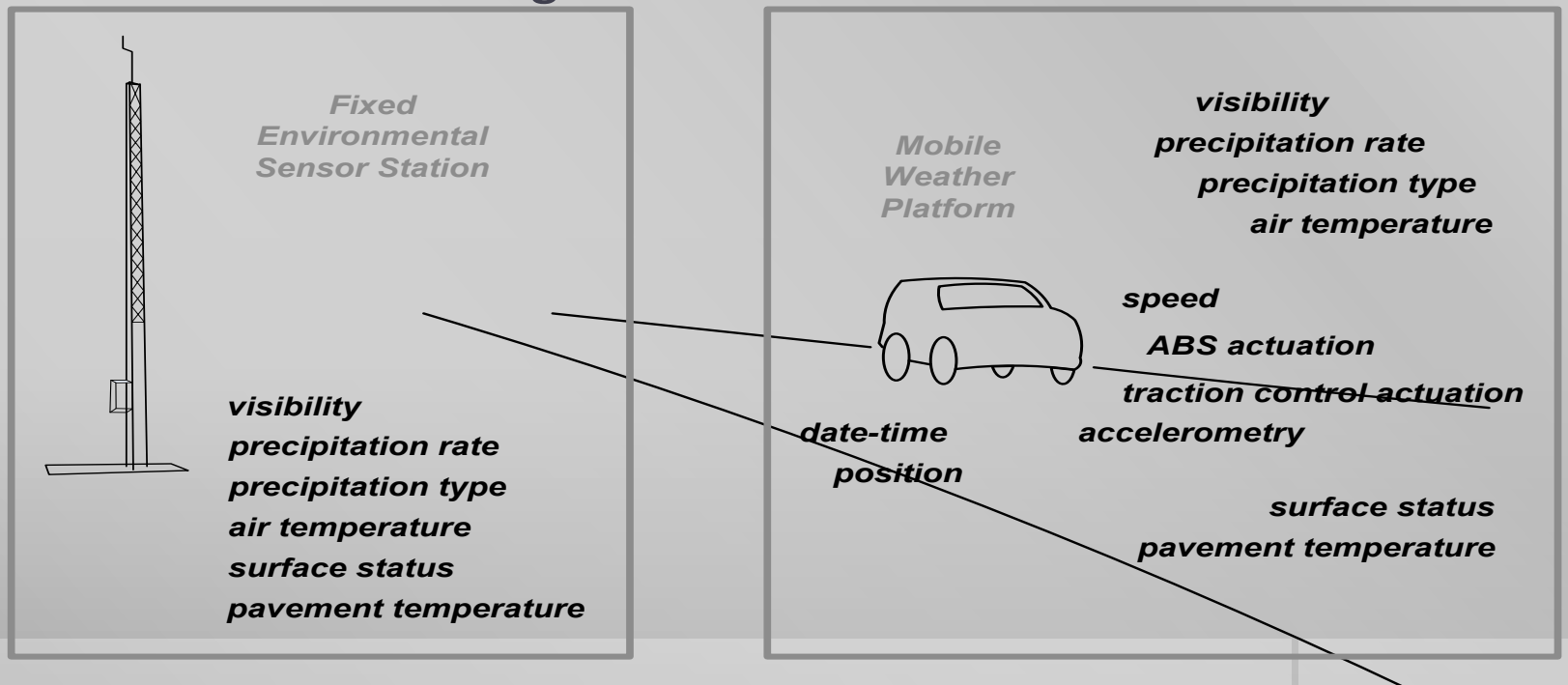
Connected Vehicles

MDOT

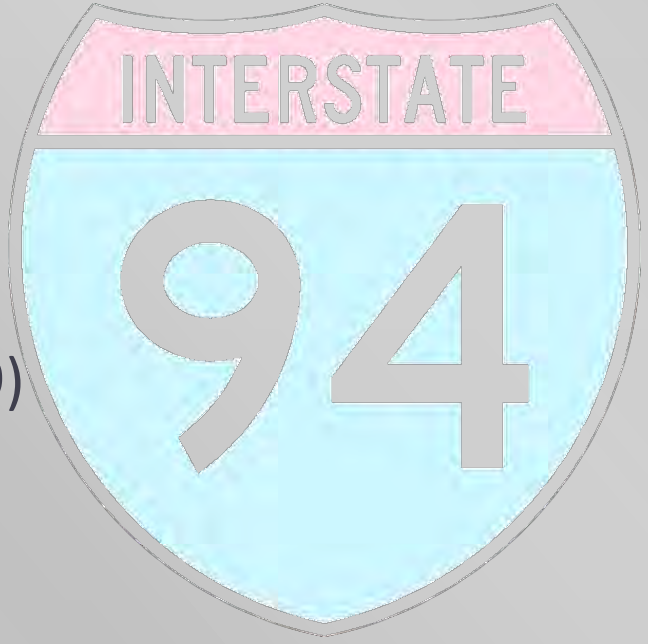
Safer. Smarter. Greener.

Ongoing Initiatives

- DUAP (Data Use and Analysis Program)
- VIDAS (Vehicle Information Data Acquisition System)
- Slippery Roads
- Road Weather Management



I-94 Truck Parking



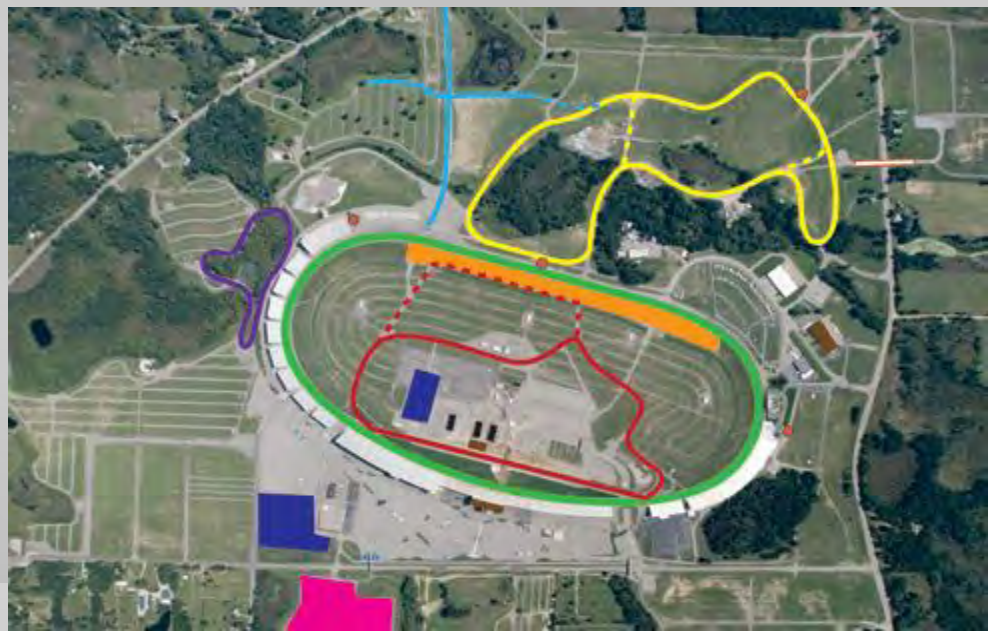
- I-94 from Indiana state line to Marshall (I-69)
- Federal grant through FHWA
  Truck Parking Facilities Program
- Monitors public and private truck facilities
- In addition to the value to the freight industry and truck drivers
- Real-world, sustainable deployment of to ensure safety of commercial vehicle operators
  - Infrastructure and vehicle-based

Program Research

- Ethical and Legal Issues Relating to Government Agencies and Intelligent Transportation Systems Data
- Public Perception of Connected Vehicles

Partnering

- Michigan Connected Vehicle Working Group
  - www.michigan.gov/cv
- Test Bed
- Cooperative Transportation Systems Pooled Fund Study
- Safety Pilot
- MIS



Looking Forward

Questions?

"Providing the highest quality integrated transportation services for economic benefit and improved quality of life."

Enhancing Safety Through Connected Vehicle Technology

Car Management Briefing Seminar, August 6, 2012

Tim Johnson

Director, Office of Crash Avoidance and Electronic Controls Research

National Highway Traffic Safety Administration

The Problem!

Safety

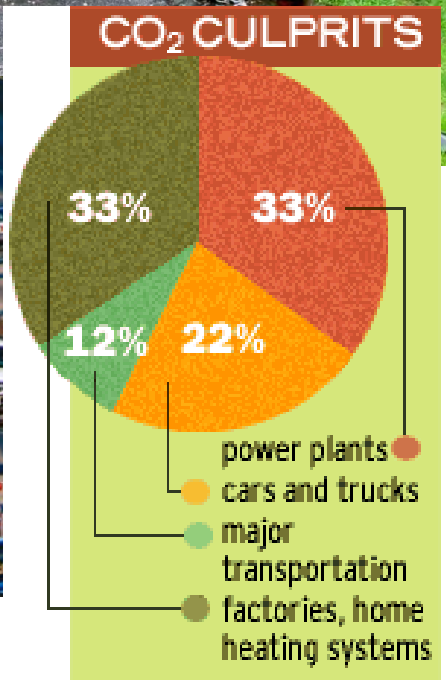
- 32,310 highway deaths in 2011
- 6,000,000+ crashes/year
- Leading cause of death for ages 4 - 34

Mobility

- 4.8 billion hours of travel delay*
- $101 billion - cost of urban congestion

Environment

- 1.9 billion gallons of wasted fuel



* Texas Transportation Institute; 2011 Urban Mobility Report

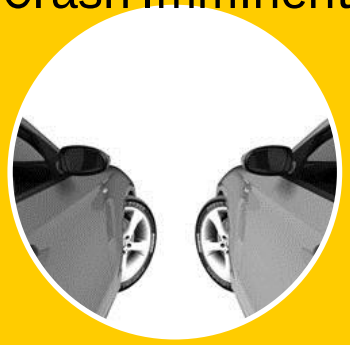
Potential “Connected” Solutions

Normal Driving

Automated Vehicles

(DSRC, Cellular)

Near Crash/ Crash Imminent



Connected Vehicles/V2V (DSRC)

Crash

Post Crash

Advanced ACN (Cellular)

Crash Timeline

Connected Vehicle Safety Program Partners and Contractors

Vehicle Manufacturers

BMW, GM, Volvo, Honda, Mercedes-Benz, Ford, Toyota, Daimler Trucks North America, Nissan, Freightliner, Volkswagen, Chrysler, Hyundai, Kia Motors

USDOT

U.S. Department of Transportation
Research and Innovative Technology Administration
NHTSA
U.S. Department of Transportation
Federal Motor Carrier Safety Administration
U.S. Department of Transportation
Federal Highway Administration
the VOLPE center
FTA

Academia

Driving Transportation with Technology
UCPTI
The University of Iowa
UMTRI
George Mason University
California PATH
Montana State University
Texas Transportation Institute
CVPC

Public Agencies

Washington State Department of Transportation
MDOT Michigan Department of Transportation
Oakland County Michigan
ADOT
State of Florida Department of Transportation
VDOT Virginia Department of Transportation
Minnesota Department of Transportation
Caltrans
Oak Ridge National Laboratory
MCDOT Maricopa County Department of Transportation
Right Road · Right Time · Right Cost
NYSDOT

Associations/Standards Developers

ATRI American Transportation Research Institute
ite
IEEE Advancing Technology for Humanity
APTA
ITS America
CVSA Commercial Vehicle Safety Alliance
AASHTO
SAE International

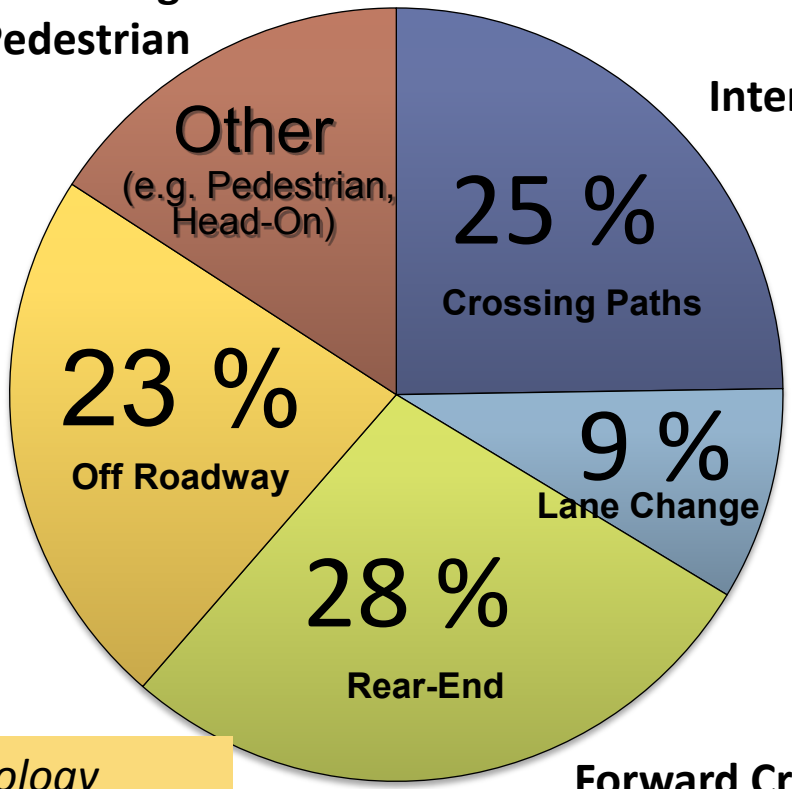
Industry

SiloSmashers
noblis For the best of reasons
Booz | Allen | Hamilton
Telcordia
Econolite Control Products, Inc.
Cambridge Systematics Transportation leadership you can trust.
SIEMENS
kapsch
Visteon
Delcan
Westat
Autotalks
DGE Inc.
Savari networks
DENSO
SAIC From Science to Solutions
MERITOR WABCO
DELPHI Automotive Systems
Cogenia Partners LLC
Mixon Hill
OmniAir
ARINC
ARADA Systems
MacroSys
Battelle The Business of Innovation
ITRI Industrial Technology Research Institute
CISCO
CohdaWireless Mobile Broadband

Potential for Vehicle-to-Vehicle (DSRC) Communication to Address Real World Crashes

Do Not Pass Warning
Vehicle-to-Pedestrian (future)

Intersection crash avoidance



<u>Crosscutting:</u>
Stability Control Loss Warning

Lane Change/Blind Spot Detection

Connected Vehicle Technology has the potential to address about 80% of vehicle crashes involving unimpaired drivers.

Forward Crash Warning
Emergency Brake Light Warning
Enhanced Automatic Braking (future)

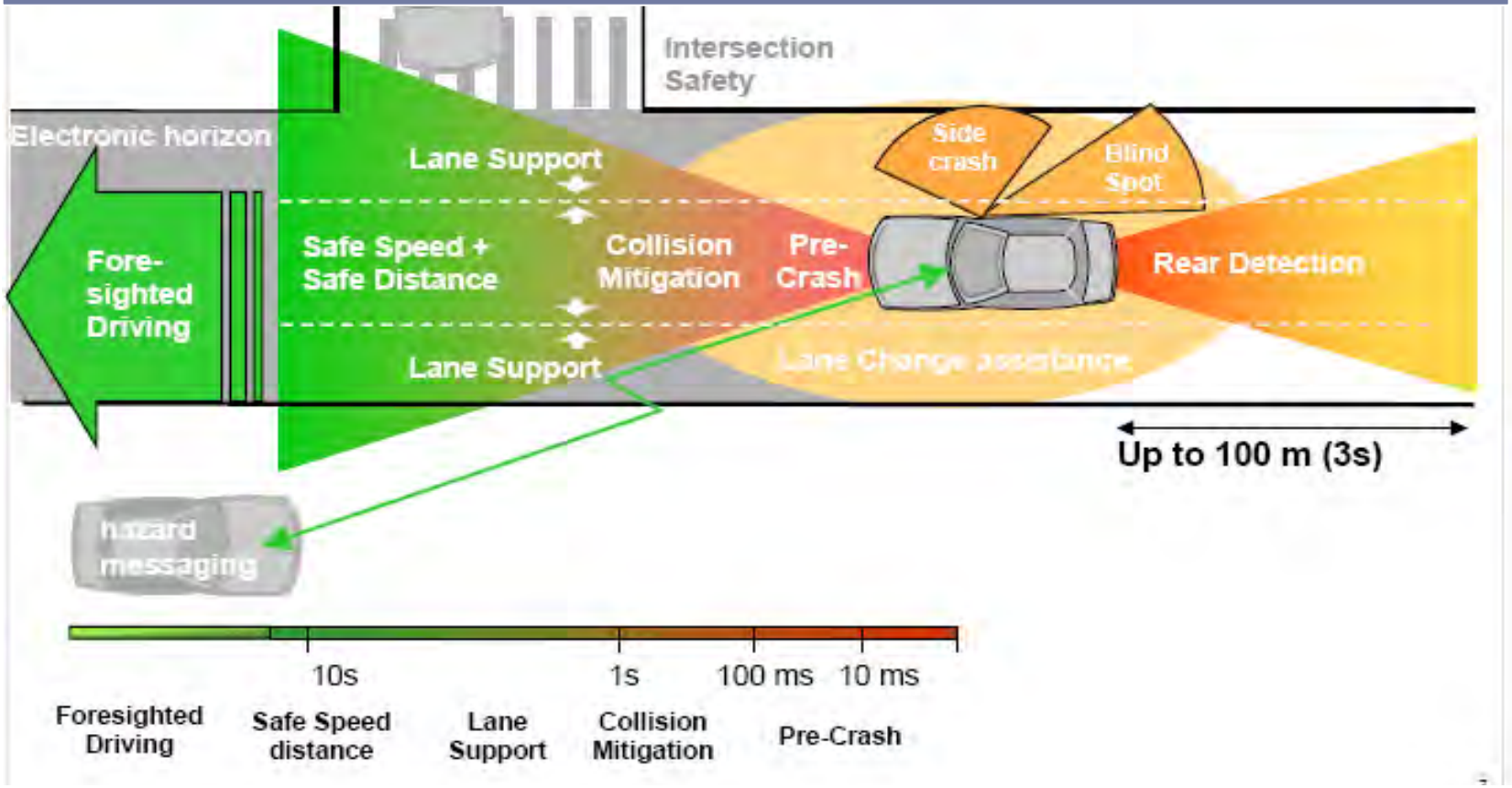
(Crash data: 2007 GES)

Connected Vehicle (DSRC) Technology for Safety

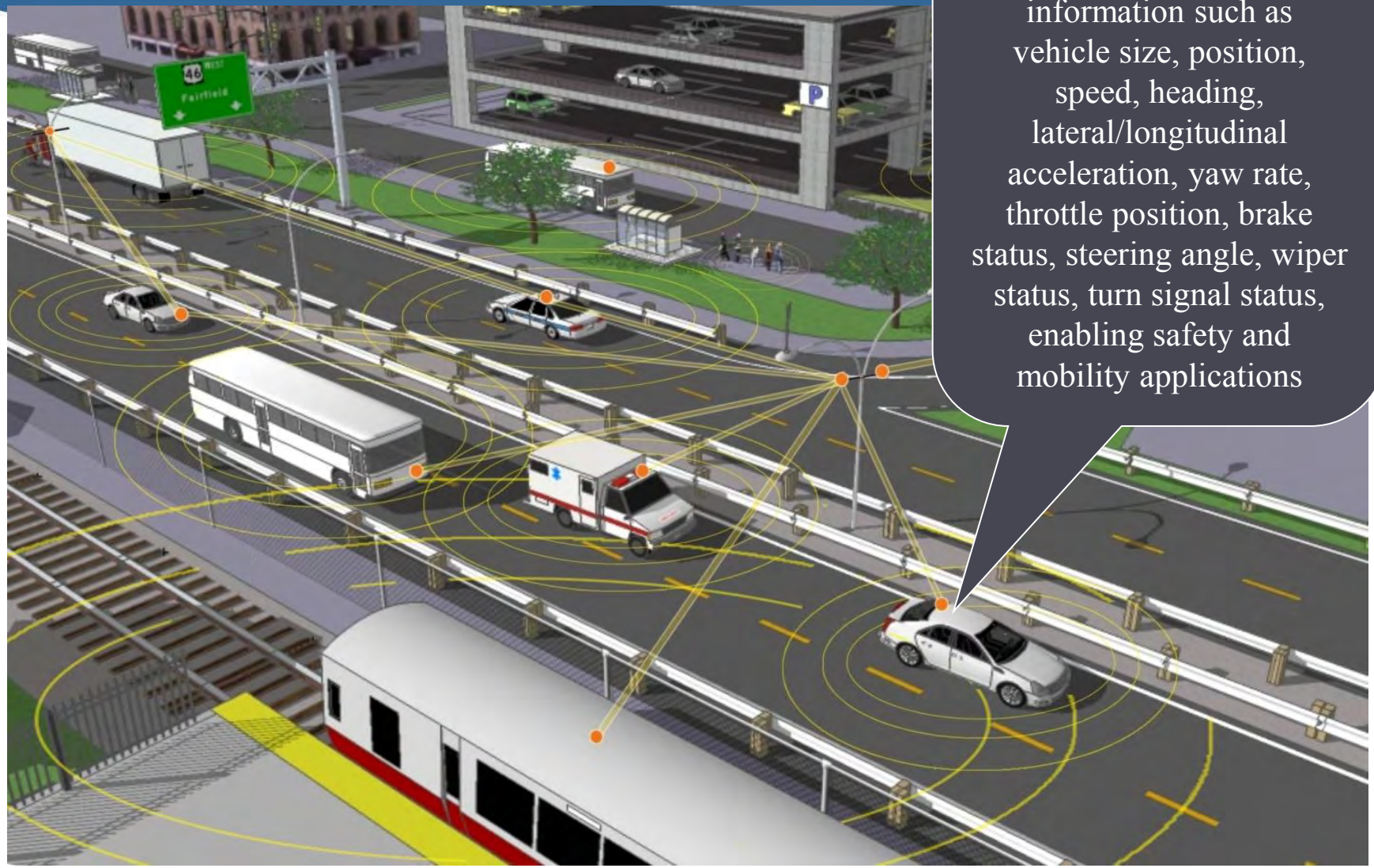
- **What it is**
  - WiFi radio technology (5.9 GHz) adapted for high speed environments
  - Inexpensive to produce in quantity
- **How the technology works**
  - Generates/receives messages at 10 times/second
    - Basic Safety Message (vehicle size, position, speed, heading, acceleration, brake system status)
  - Operating range of 300 meters
- **Benefits of the technology over in-vehicle sensor only systems**
  - Addresses More Crash Scenarios → Increased performance
  - Reduced Cost
  - Less False Alarms - communication around vehicles and blind intersections

The Vehicle That Doesn't Crash

Vehicle communication technology (DSRC) augments (or potentially replaces) onboard sensors (radars, camera, etc.) to form a comprehensive safety zone around a vehicle



Fully Connected Transportation



Vehicles "talk" to each other exchanging information such as vehicle size, position, speed, heading, lateral/longitudinal acceleration, yaw rate, throttle position, brake status, steering angle, wiper status, turn signal status, enabling safety and mobility applications

US DOT V2V Program

Track	Objectives	Lead
1 – Crash Scenarios	Develop a comprehensive Pre-Crash Scenario Framework for both light vehicles and heavy trucks.	NHTSA
2 – Interoperability	Ensure that V2V safety systems can successfully function across equipped vehicles regardless of make/model.	NHTSA
3 – Benefits Assessment	Benefits assessments for V2V safety applications	NHTSA
4 – Application Development	Develop applications for benefits assessment	NHTSA
5 – Human Factors/Driver Issues	Assess driver issues and develop effective driver-vehicle interfaces	NHTSA
6 – Policy	Develop policy recommendation to support V2V deployment.	NHTSA/RITA
7 -Commercial Vehicles	Identify and coordinate the commercial vehicle component of V2V safety applications.	NHTSA/FMCSA
8 – Transit Vehicles	Identify and coordinate the transit vehicle component of V2V safety applications.	FTA

TRANSIT

SAFETY

TRUCKS

POLICY

TESTING

SAFETYPILOT

www.its.dot.gov/safety_pilot

TRAFFIC SIGNALS

AFTERMARKET DEVICE

DATA

SECURITY

STANDARDS

Safety Pilot Model Deployment

Kickoff Soon!

Ann Arbor, MI

August 21, 2012

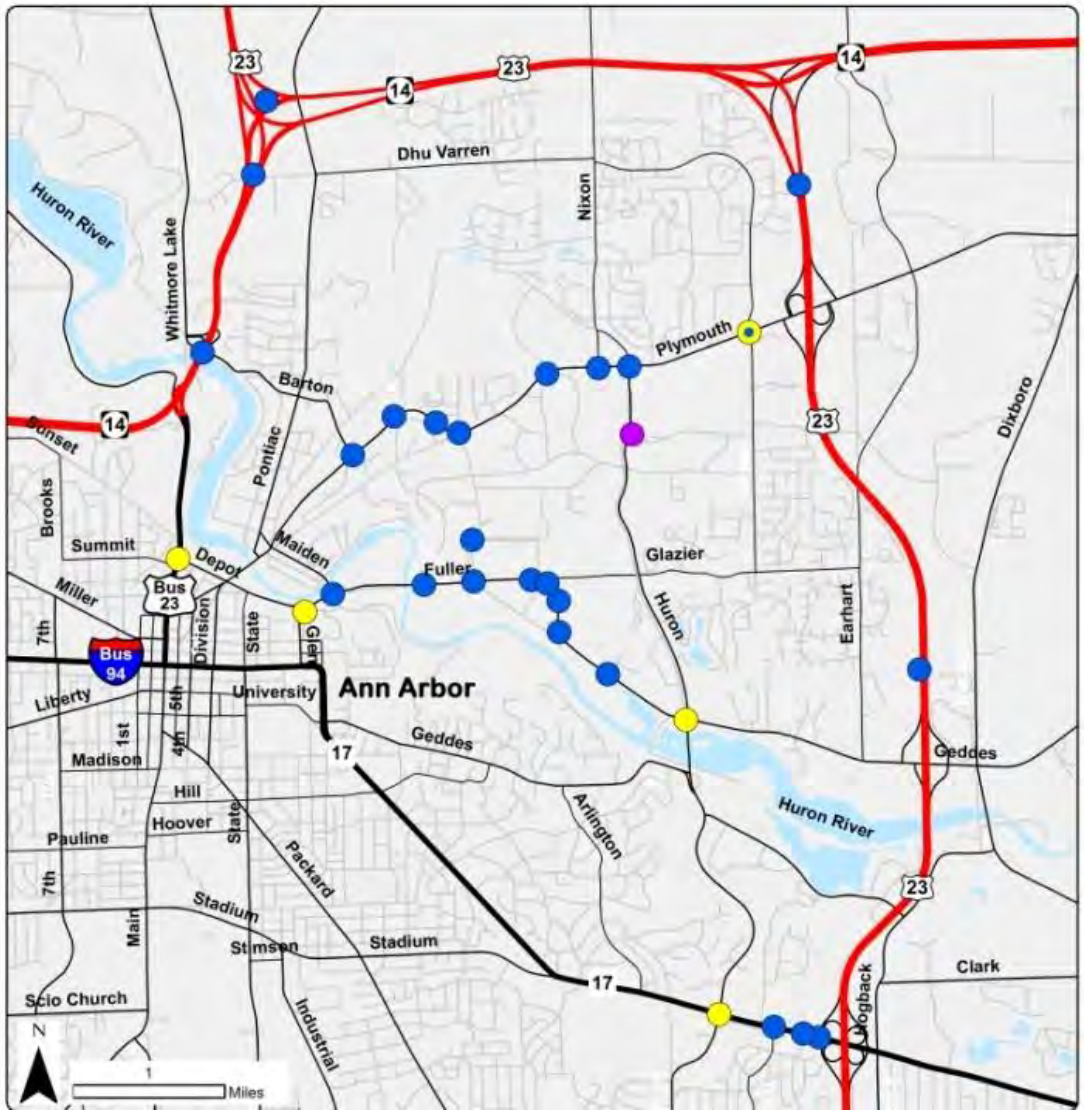
Safety Pilot Deployment Site

Key Site Elements:

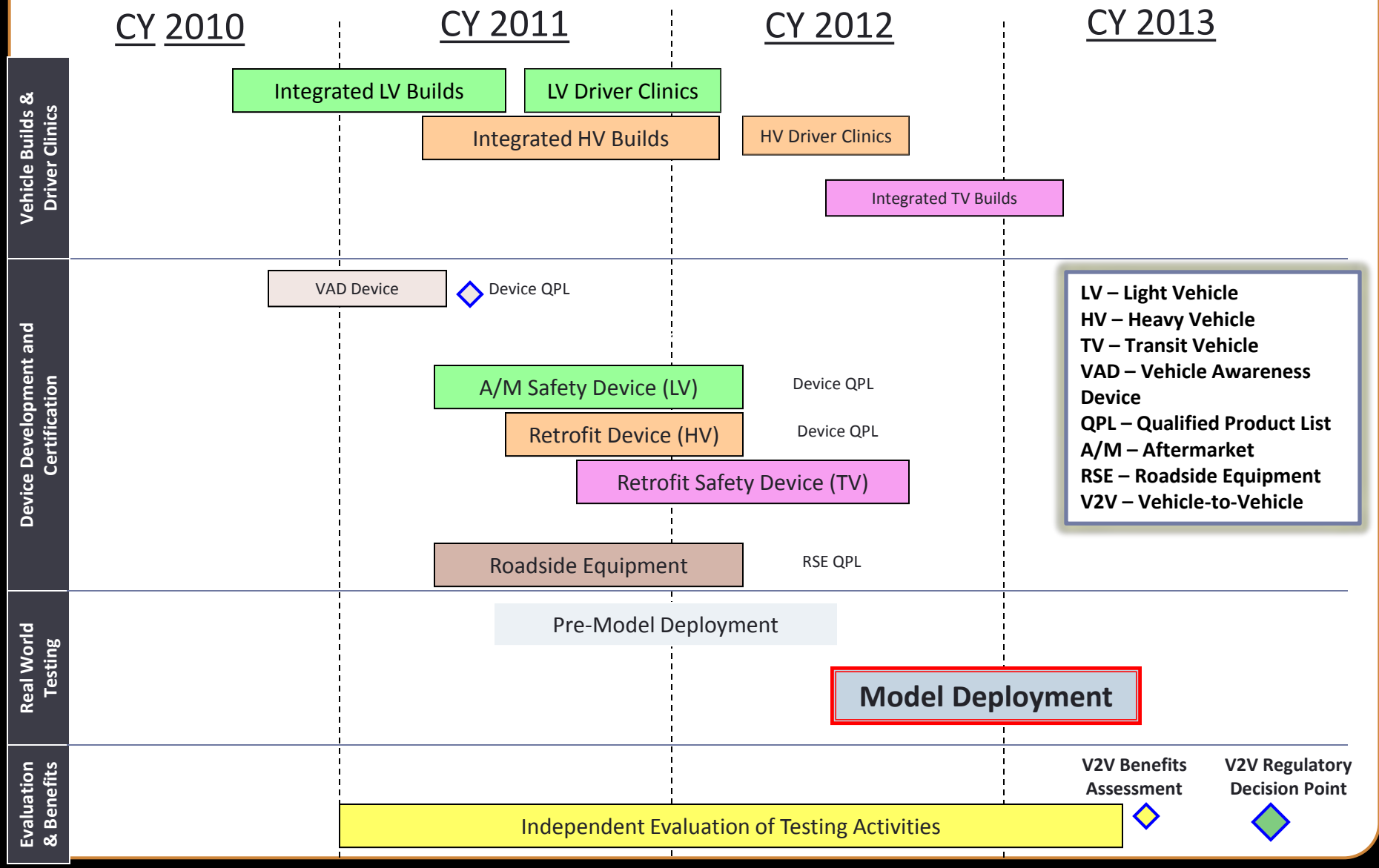
- 75 miles of instrumented roadway
  - 29 roadside units
- ~3000 vehicles
  - Cars, trucks, buses
  - Integrated, aftermarket, and retrofit
- -1 year of data collection

Also:

- Exercising security options
- Vetting device certification process



Connected Vehicles -Safety Pilot Roadmap



User Acceptance -- Driver Clinics

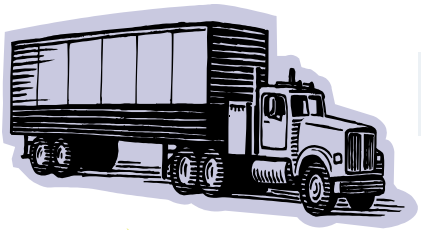
- **6 locations across the U.S. - began in August 2011**
- **100 drivers per location**
- **Experienced crash warnings**
  - Forward Crash Warning
  - Emergency Brake Light
  - Blind Spot Warning
  - Lane Change Warning
  - Intersection Assist
  - Do Not Pass Warning

- **Feedback from drivers was overwhelmingly positive**
  - ~90% of drivers expressed desire for such a system

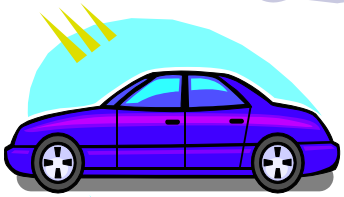
Safety Pilot Model Deployment

- Major road test and real world implementation involving:
  - Approximately 3000 vehicles
  - Multiple vehicle & device types
  - Roadside infrastructure
- Also to test:
  - Prototype security mechanisms
  - Device certification processes

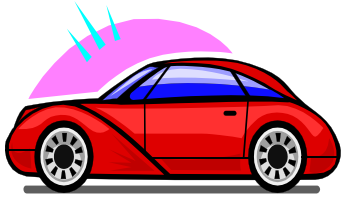
Integrated Vehicles



Trucks & Buses



Aftermarket Devices



Vehicle Awareness Devices

Roadside Infrastructure

Additional Systems Enhanced or Enabled by Connectivity (wireless communication)

- Automated Vehicles
- Advanced Automatic Collision Notification (AACN)

Automated Vehicles

- **Automation should be focused first on safety!**
- **Opportunity for enhancing safety**
  - Over 90 percent of crashes involve some type of driver error!
- **Automated driving concepts will likely need wireless communication technology**
- **NHTSA/US DOT research initiating**

Advanced Automatic Collision Notification - AACN

- **Concept**
  - Cellular-based system transmits onboard sensor data used in predicting crash severity and probability of severe injury
- **Areas of expected benefits**
  - Faster emergency response given earlier notification and knowledge of crash location
  - Improved pre-hospital response/care and hospital dispatch decisions given knowledge of crash severity/injury probability

Positive Future For Connectivity

- **DSRC technology rapidly maturing, several applications already developed and demonstrated**
- **NHTSA Decision on V2V (DSRC) in 2013 for Light Vehicles, 2014 decision for heavy vehicles**
- **Additional technologies and systems emerging using connectivity**
  - Automated vehicles
  - AACN

Connected Vehicles at the Crossroads

Intelligent Mobility in Taiwan

James H. Wang

Secretary General
Taiwan Automotive Research Consortium (TARC)

Deputy General Director
Mechanical &Systems Research Laboratories, Industrial Technology Research Institute (ITRI)

e-mail : jhywang@itri.org.tw

Intelligent Mobility in Taiwan

- Connected Transportation System
- Electrical and Traditional Vehicles
- Personal Mobility
- Innovative Technologies
- Taiwan as Ideal Demo Site and e-Supplier
- Collaboration and Partnership with USA

A highly connected transportation system in Taiwan

from mass transit to personal mobility

Highway ETC
(electronic toll collection)

Ownership
Vehicle per thousand persons
- **Car: 299**
- **Motorcycle : 653**

Vehicle density
- **166 cars per 1km road**
- **410 scooters per 1 km²**

Registered vehicle
- **7.09 millions cars**
- **15.17 millions scooters**

High speed rail
- **Total : 345 km**
- **Max speed : 300kph**

subway
- **Taipei & Kaohsiung**
- **Total : 152.7 km**

Toward a safe, clean, and smart mobility

Challenges

Transportation efficiency, safety and emission issues caused by :

- **High vehicle density**
- **Vehicle mix**
- **Urban mobility model**

The indigenous vehicle

- **Safety and comfort systems**
- **Green vehicle by electrification**

•Land Departure Warning System

Eagle View

•Blind Spot Monitoring system

MPV EV+

Think⁺ Car PC

Night vision

WAVE/DSRC

OAM&P for IVs

GCU

OAM&P : Operation Administration Maintenance & Provisioning

Innovation technologies

shaping the future vehicle

R&D 100 STUBA

Fire wall in nano scale to prevent internal short for Li ion battery

WSJ Technology Innovation Awards flexpeaker™

Flexible Speaker with low power consumption, light weight, free shape & size

R&D 100 *Spray IT*

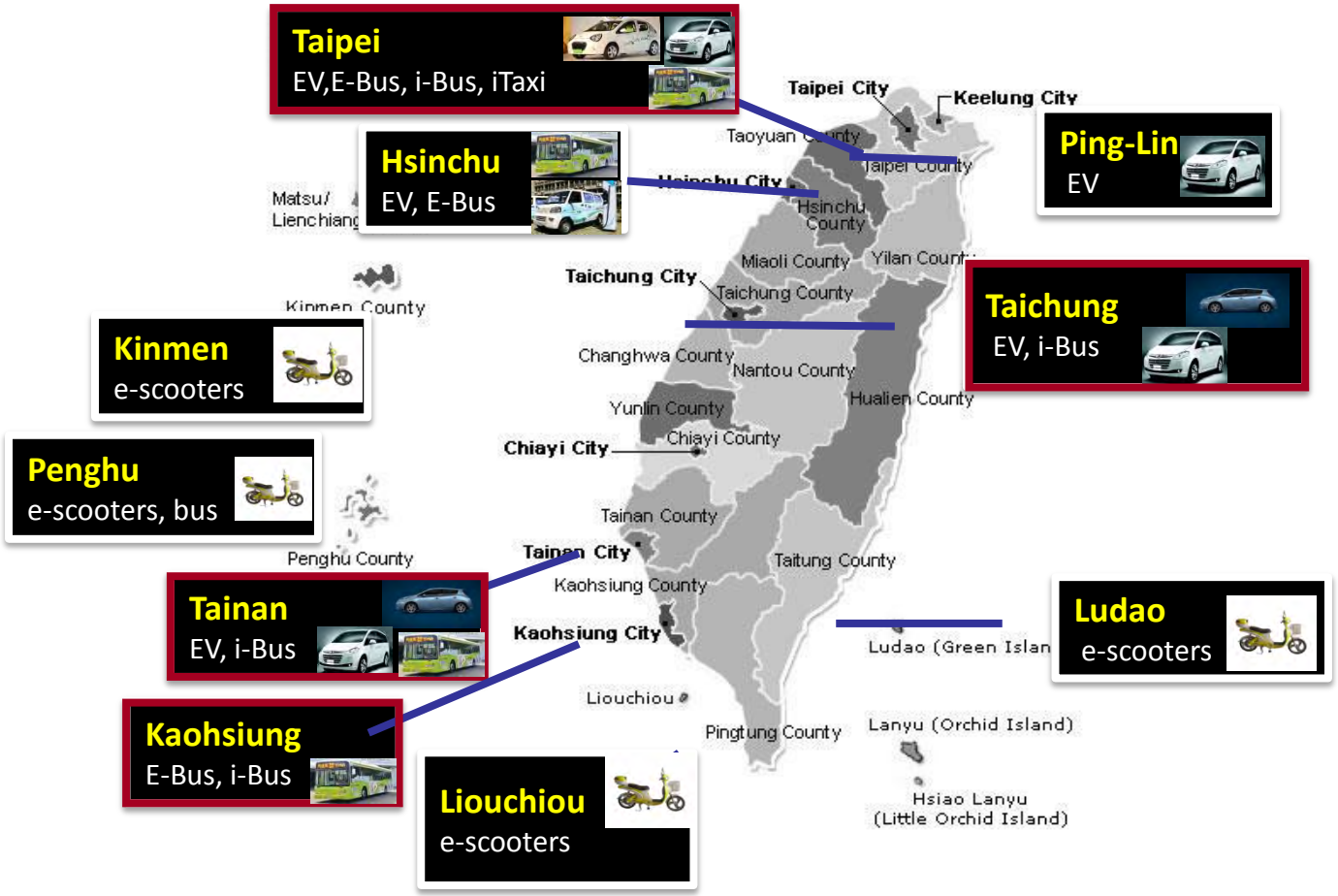
A cost-effective, highly stable and resistant to infrared radiant heat, environmentally-friendly.

SLIM

A light weight, high torque density thin motor

Test bed and pilot projects
intelligent and electric vehicle

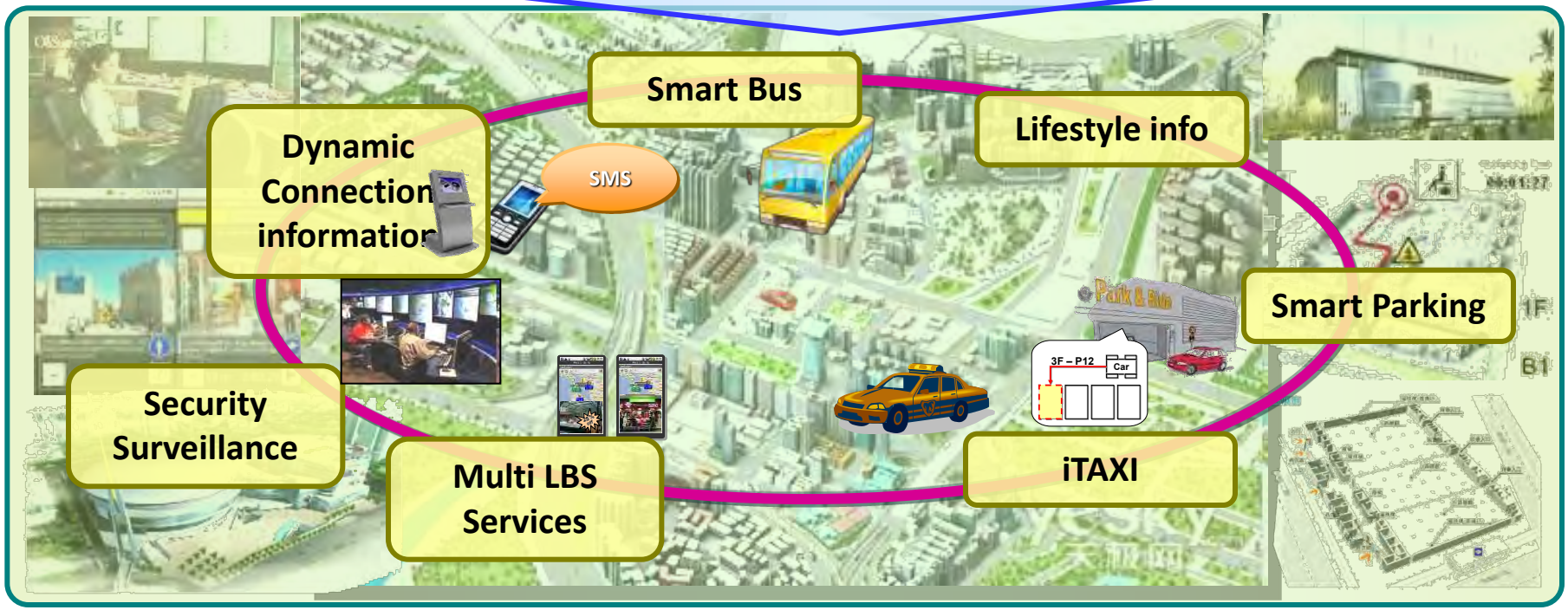
- Taiwan as a field trial and realization site of advanced vehicle systems and services
- Supported by well-established S&T Infrastructure, industry cluster, and joint-development of R&D organizations



Test bed and pilot projects
vehicle communication and service

Field trial projects

- Smart Bus
- iTAXI
- Smart Parking
- Pedestrian indoor navigation



Partner of US DOT's test and trial

- **Crash avoidance metric partners vehicle-to-vehicle communications interoperability test [USDOT, GM, Ford, … 2010.07.24 ~2011.06.03]**
- **US DOT Connected Vehicle Safety Pilot HIA (Here I Am) project (2010.09.23 ~2011.05.26)**
- **US DOT Connected Vehicle Safety Pilot RSE (Road Side Equipment) project (4/28)**
- **US DOT Test Bed HIA Set-up project (2011.07.06~2011.11.16)**

Final Remarks

- **The highly urbanized and mixed transportation system in Taiwan presents challenges and opportunities for clean, safe and smart mobility.**

- **Through collaboration and innovation, many advanced technologies and viable solutions are implemented in various pilot projects.**

- **We invite you to visit us and be our partners in R&D, Product Dev, and Demo programs.**

Contact James Wang at jhywang@itri.org.tw

VOLKSWAGEN
GROUP OF AMERICA

VOLKSWAGEN GROUP

The Evolution Of Connectivity Technologies



Frank C. Weith

General Manager, Connected Services

VWoA Connected Services, VW Product Marketing and Strategy

GLOBAL RESEARCH AND DEVELOPMENT PROGRAM

TE VGC

VOLKSWAGEN

ERL

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VTT VOLKSWAGEN Group Technical Representative Tokyo

VOLKSWAGEN

GROUP OF AMERICA

GLOBAL RESEARCH AND DEVELOPMENT PROGRAM

TE VGC
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Worldwide Collaboration

- Knowledge network
- Teamwork of experts worldwide
- Driving innovations
- Comparison of concepts
- Best solutions in car

VTT VOLKSWAGEN Group Technical Representative Tokyo



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FUTURE CHALLENGE:
INTELLIGENT AND EFFICIENT MOBILITY SOLUTIONS

- Individual customer requirements
- Income polarisation
- Demographic change

- Urbanisation
- Increasing traffic load
- Seamless mobility

Society

Mobility

Energy

Safety

- Climate change
- CO_2
- Peak of oil

- Increasing vehicle number
- Legal requirements
- New markets

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GROUP OF AMERICA

ULTIMATE GOAL:
AUTONOMOUS DRIVING (CORE TECHNOLOGIES)

Driver Assistance Systems

Connected Car

Human Machine Interface

eMobility Development

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DRIVER ASSISTANCE SYSTEMS

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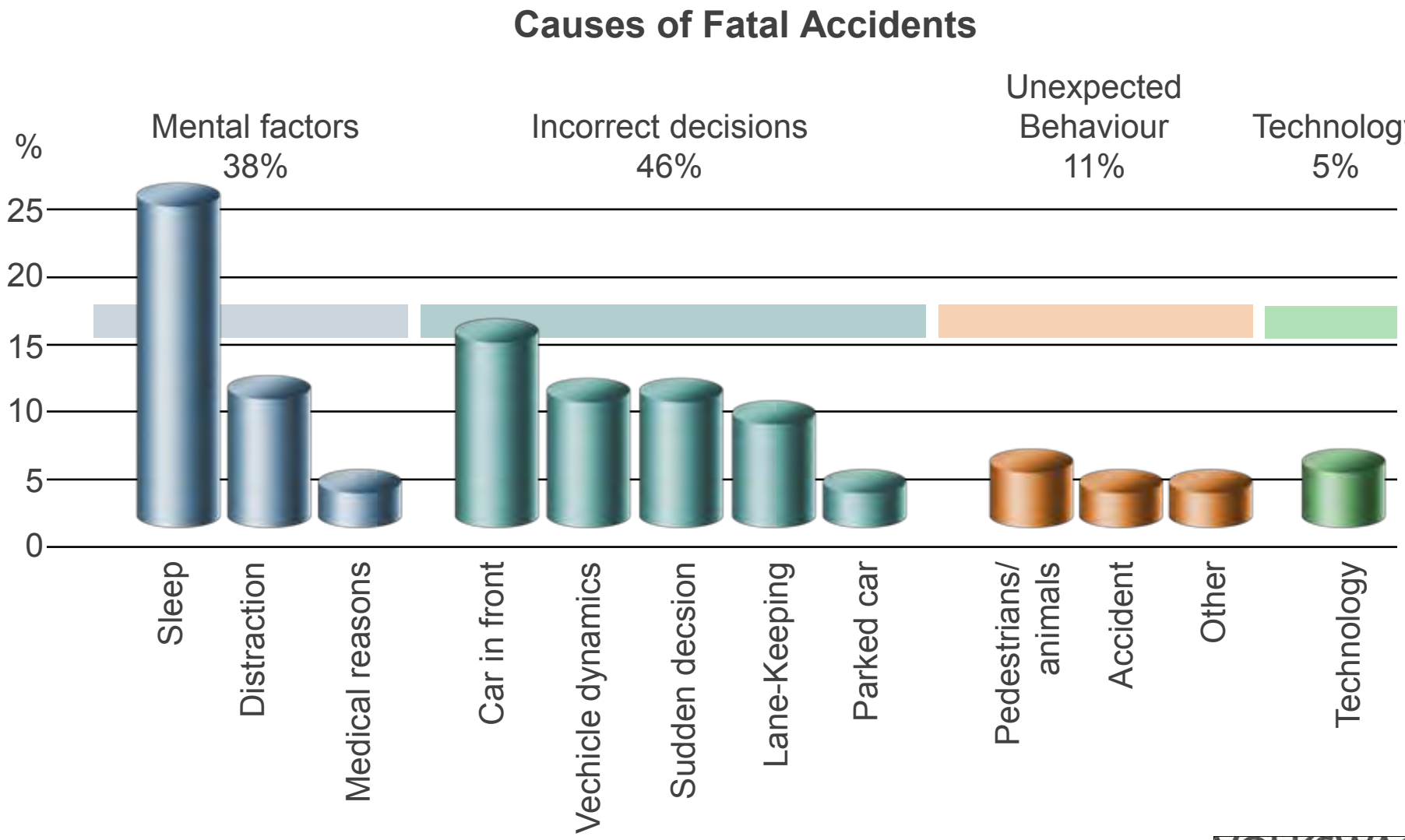
THE DRIVER AS UNCERTAINTY FACTOR CAUSES OF FATAL ACCIDENTS



Quelle: GdV, VW Unfallforschung

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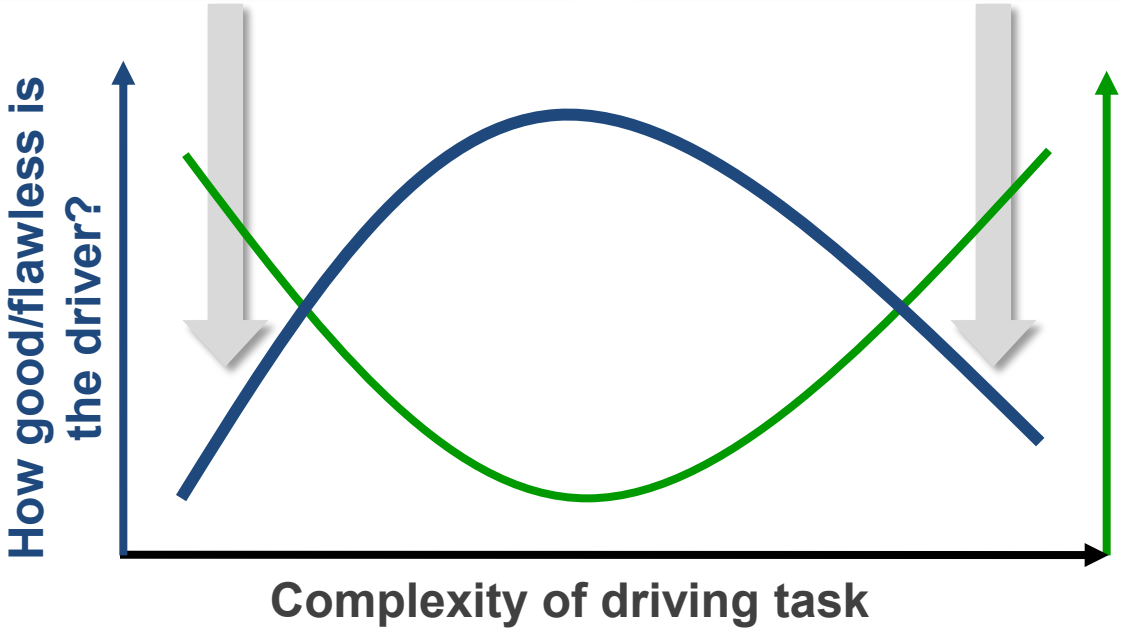
INCREASING NEED FOR SAFETY AND MEET CUSTOMER DEMANDS

Supporting the driver when he/she is in need of assistance

Under-challenging the driver
- Simple, monotonous driving tasks
- E.g.long distance trips, traffic jams

Over-challenging the driver
- Complex driving tasks
- E.g.entering a motorway, turning at intersections etc.

Autopilot



Safety Angel

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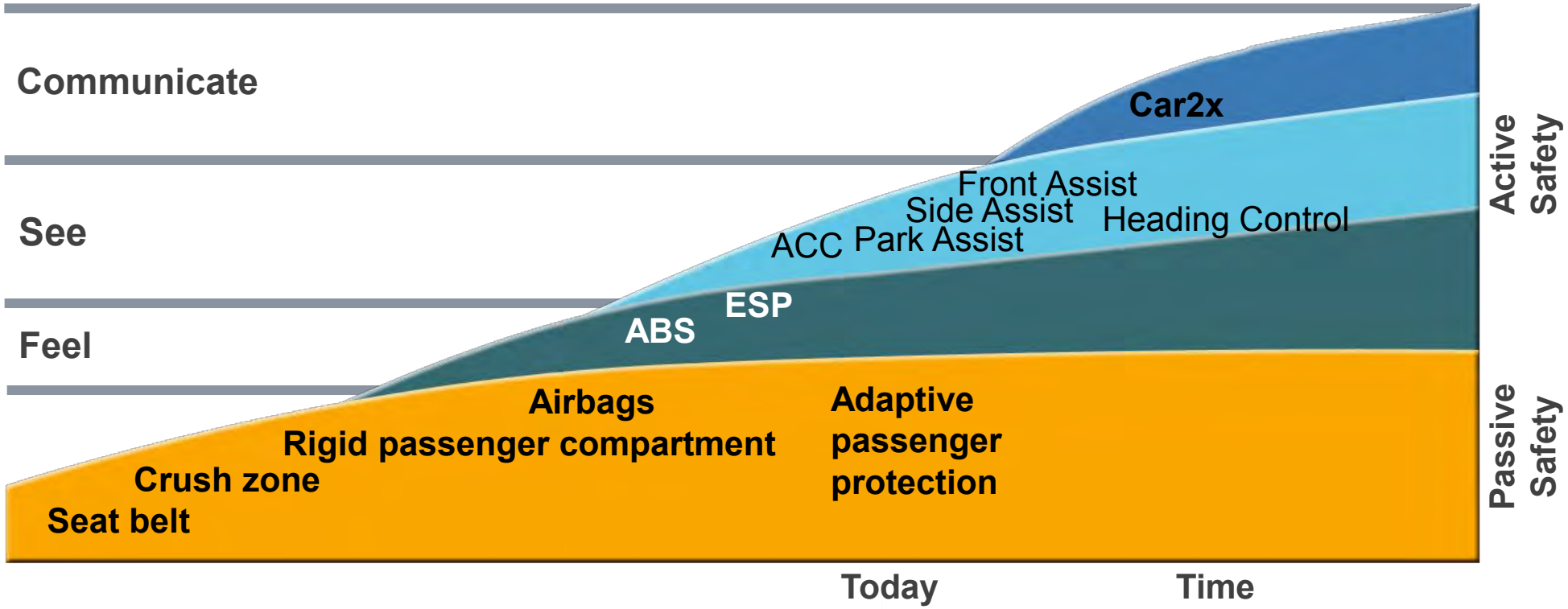
VEHICLE SAFETY – POTENTIAL FOR PROTECTION



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BUILDING BLOCKS OF TECHNOLOGIES

Driving at the limits of physics

- Vehicle dynamics
- Track coordination

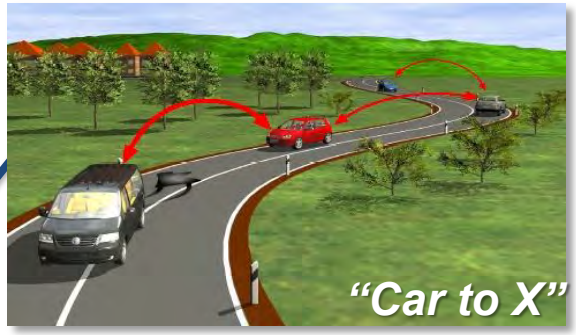
Driving in unknown terrain

- Recognition of environment
- Locating
- Trajectory

Driving according to traffic regulations

- Driving strategy
- Complex environment

- Drifting algortithm
- High speed



- Expanding the horizon
- Predict danger

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AUTONOMOUS DRIVING: INTEGRATION OF THE BUILDING BLOCKS (2010)

- Driving strategy
- Complex environment
- Vehicle dynamics
- Track coordination
- Drifting algorithm
- High speed
- Recognition of environment
- Locating
- Trajectory

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CONNECTED CAR

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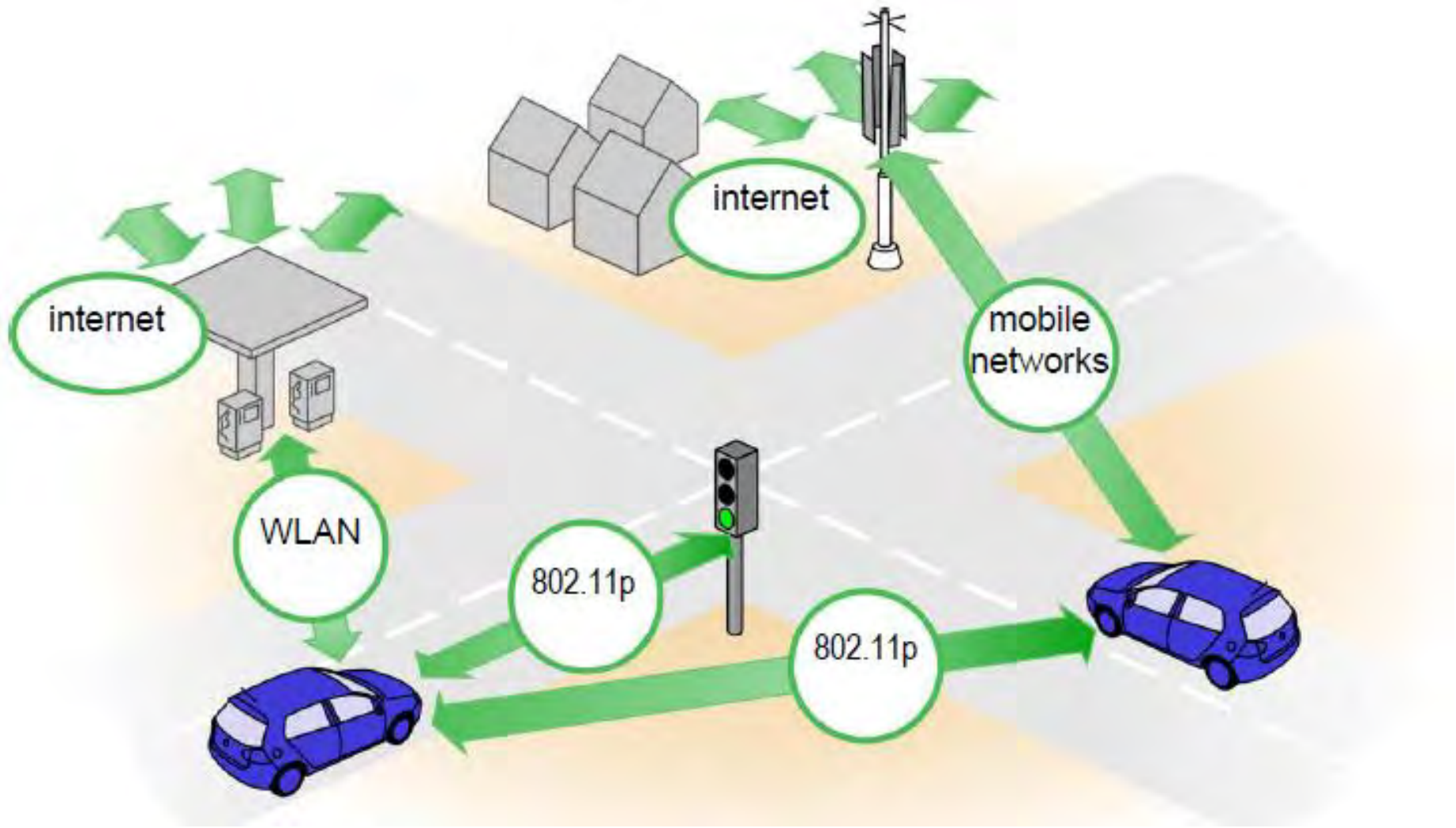
CONNECTIVITY VISION – HETEROGENEOUS NETWORKS



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CONNECTIVITY VISION – INTEGRATING SERVICES WITH ADAS

Safety and Services

Information Services

wallstreet®
NASDAQ
The Weather Channel
NEWS

Smart Phones

Bluetooth

Emergency Services

Safety & Security
HUGHES TELEMATICS

Navigation

traffic.com
Predictive Navigation
Google earth

Entertainment

YouTube Broadcast Yourself™
facebook
PANDORA internet radio
SLACKER
GAMETAP
SIRIUS SATELLITE RADIO
HD Radio Digital AM & FM
hulu

Integration Enablers

V2I

Connectivity Module

V2V

Driver Assist

Street Sign Recognition

Lane Departure Warning

Follow-to-Stop

Emergency Braking

Heading Control Assist

Park Distance Control

Active Cruise Control

Driver Alertness

Optical Park Distance Control

Heading Control Assist

Accident Avoidance

Park Steering Assistance

Side Assist/Blind Spot Detection

Distance Braking Control

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CONNECTIVITY DRIVER – IMPROVING TRAFFIC SAFETY

Safety and Security / Emergency Response

In-car warning from infrastructure (V2I)

Poor visibility (V2V)

Navigation / Alternate Routes

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CONNECTIVITY DRIVER – INTEGRATION OF ONLINE SERVICES

Traffic Information

Fuel Prices

Time Tables

Restaurants and Hotels

Tourist Information

Current Events

Right Information, Right Time to make the Right Decision

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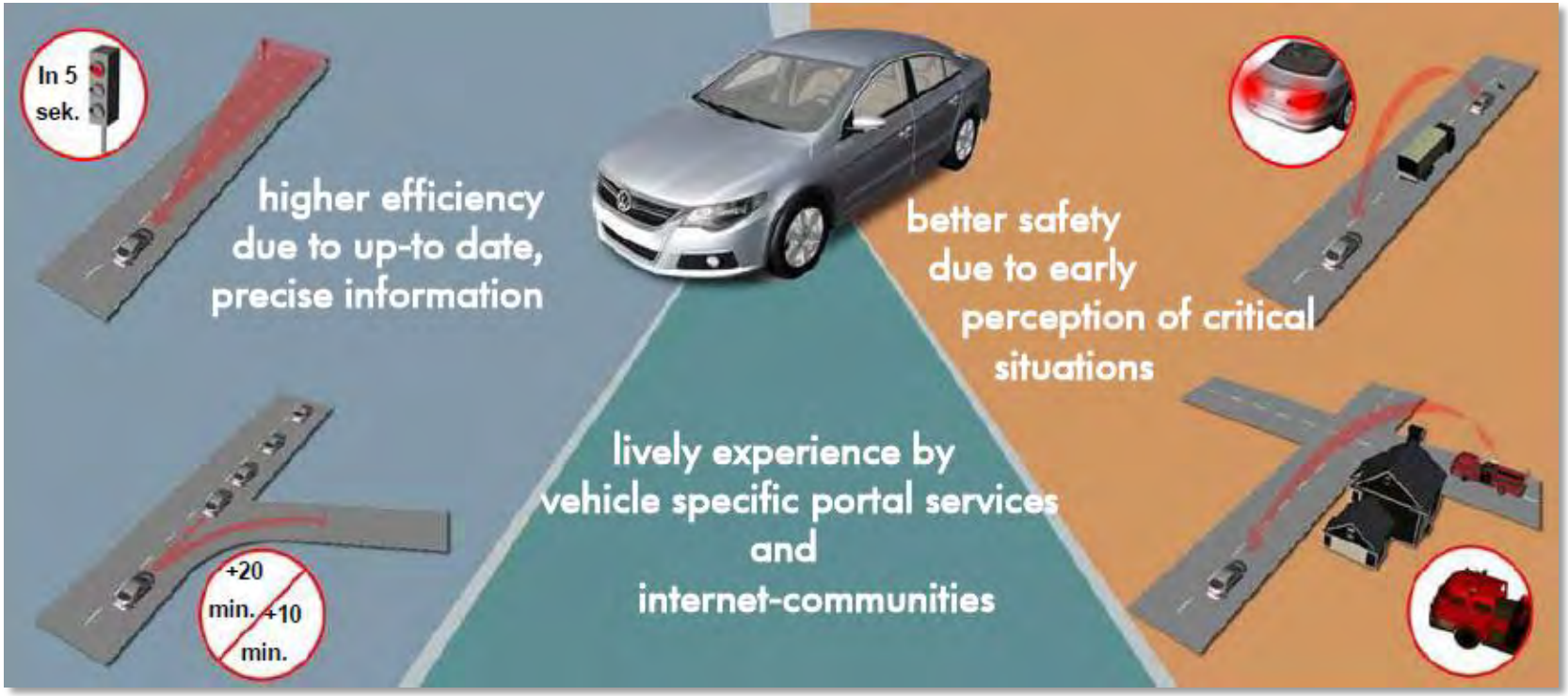
CONNECTIVITY ENABLER – CAR-TO-CAR (V2V) FUTURE APPLICATION



Integrated Solution:

- Driver Assist Systems could enhance passenger safety at or near the incident sight
- Traffic Incidents could be fed directly into Streaming Traffic data to improve accuracy
- Very short latency (<50ms) for allowing quicker responses

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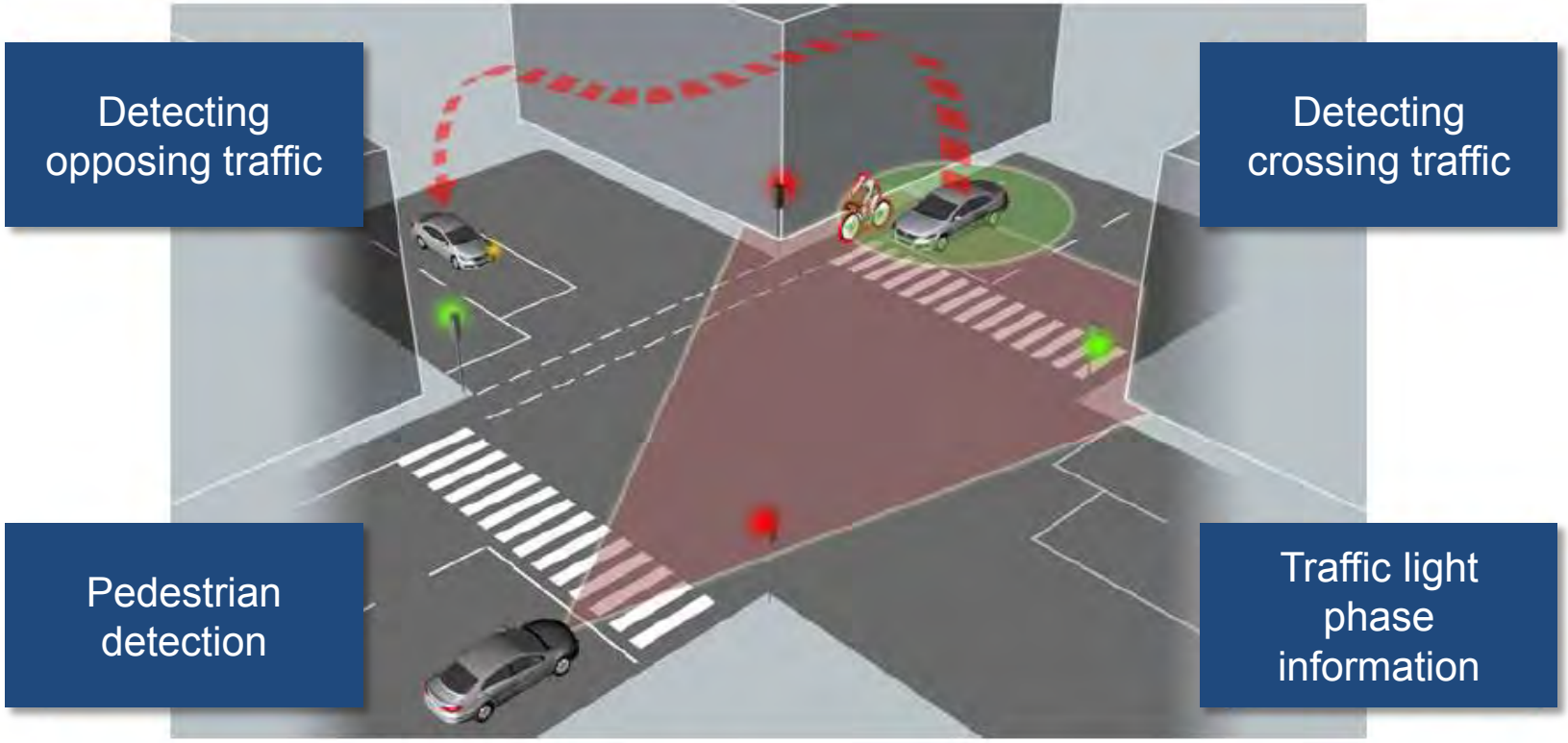
CONNECTIVITY ENABLER – CAR-TO-INFRASTRUCTURE (V2I) FUTURE APPLICATION



Integrated Solution:

- Driver Assist Systems could enhance passenger safety by responding to infrastructure
- Eliminate running of Red Lights, no Turn on Red, Stop signs, etc…

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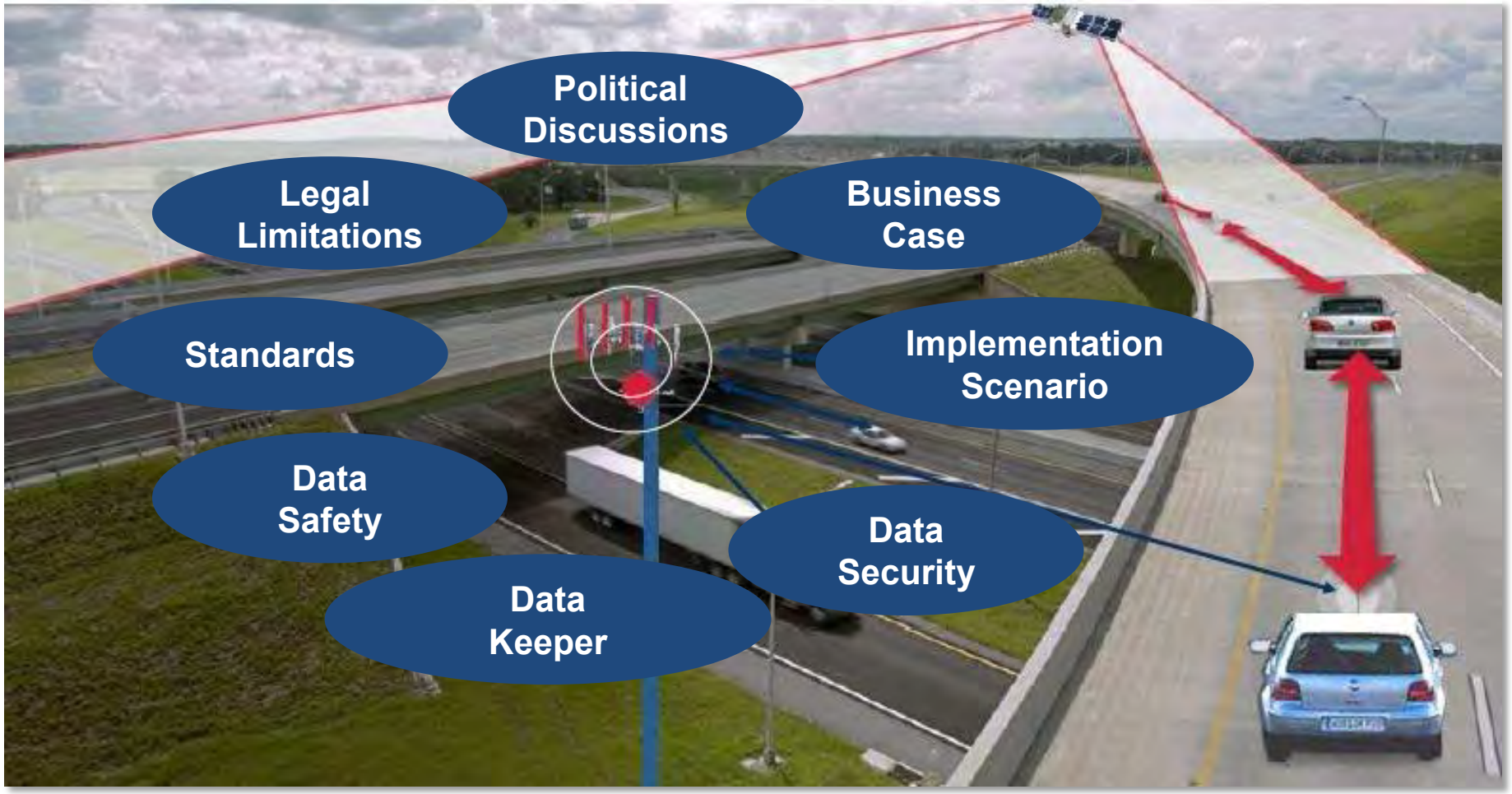
VEHICLE CONNECTIVITY CHALLENGES



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V2X ROLE OUT CHALLENGES – POLICY ISSUES

- Surveillance Society – “Big Brother”
- Vehicle as an Open Platform and Vehicle Data Access
- State/Local Jurisdictions Rule on DSRC
- DSRC by Google or Verizon
- V2V-Only Mandate

Concerns relating to:

- Privacy / Security
- Governance and Rules
- Customer Acceptance
- Liability
- IP (Intellectual Property)
- Business Strategy

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V2X CRITICAL ELEMENTS FOR DEFINING SUCCESS

Driver Assessment Clinics

- Gage **Customer Acceptance** in live driving scenarios
- Record **GPS/DSRC performance** in various driving environments
- Over **700 Naive Drivers in 6 US cities** evaluated

Model Deployment

- Nearly **3000 V2V capable vehicles**:
  - 64 Integrated + Aftermarket Safety + Vehicle Awareness Devices
- **Develop Minimum Performance Standards**

Advanced Application Development

- **Characterize V2V capabilities**
  - **Forward Collision Avoidance** (V2V+Radar vs. V2V Only)
  - Influence **Test Procedures**
  - **Intersection Movement Assist***

Interoperability

- DSRC Communication **Channel Congestion Control** (200+ Movable Units)
- Scalability Testing
- Security Credential Management System Development

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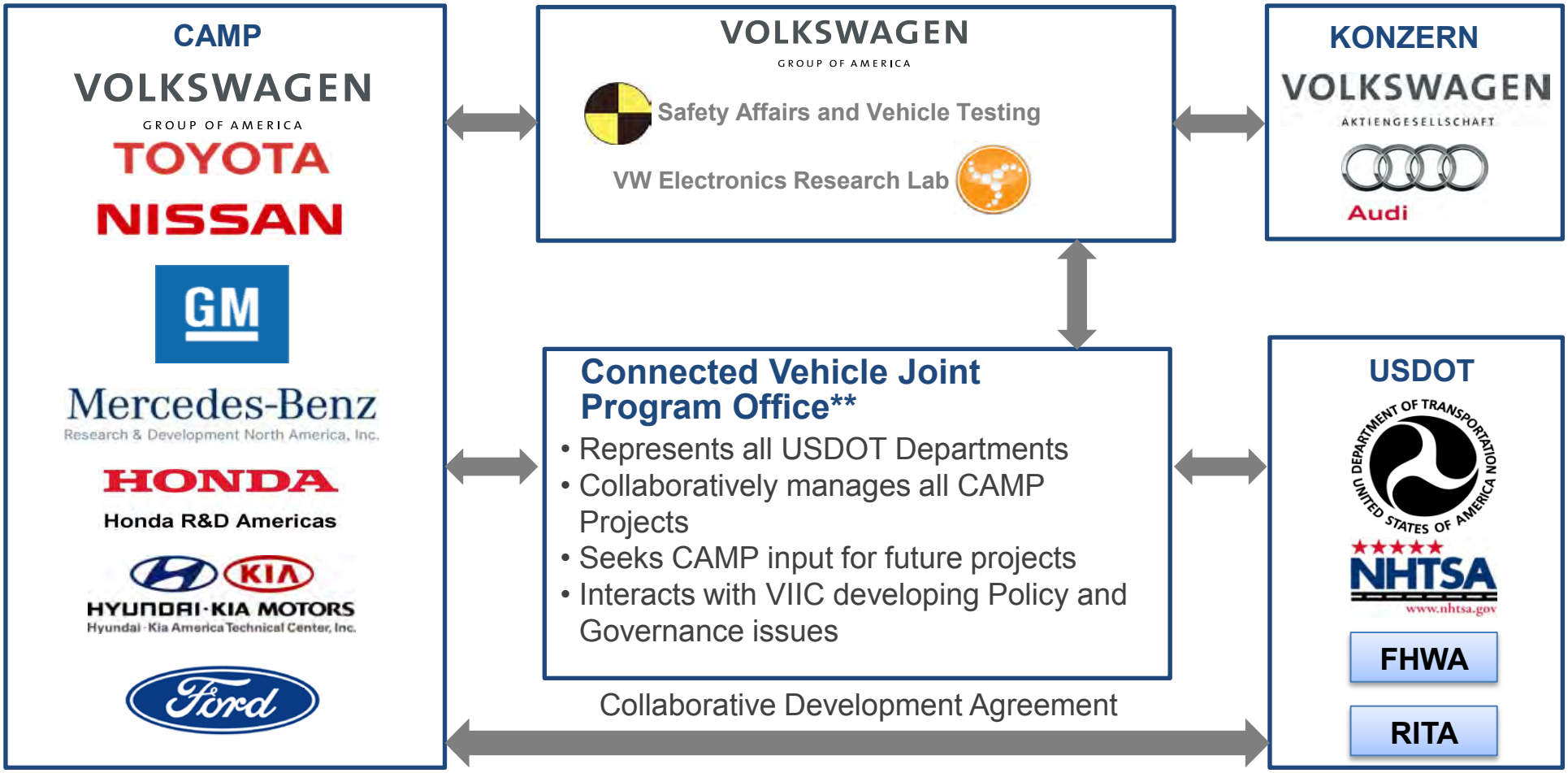
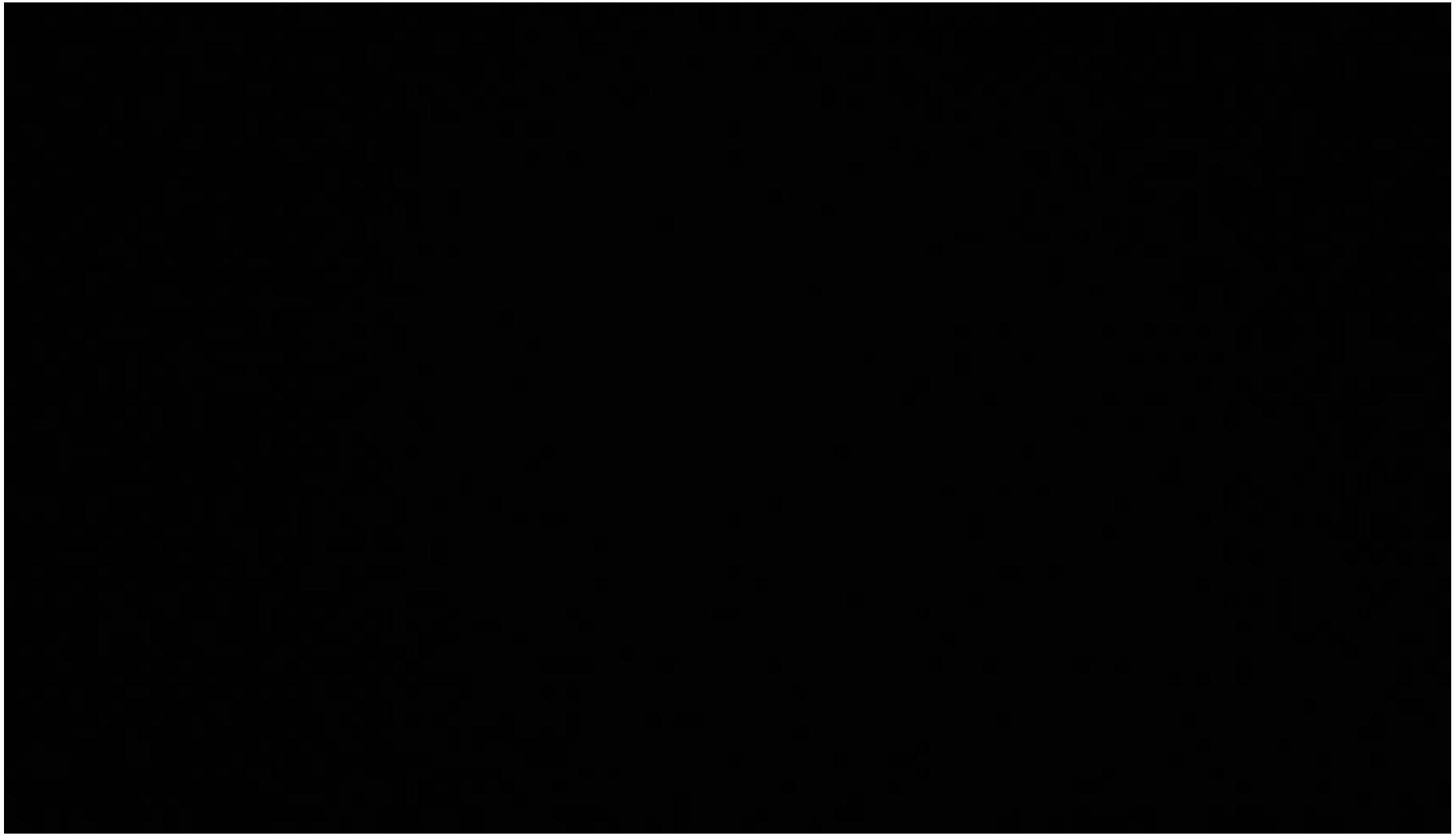
USDOT – CAMP – VWGOA ORGANIZATION



** This group/program was formerly known as Intellidrive

USDOT: United States Department of Transportation FHWA: Federal Highways Administration CAMP: Crash Avoidance Metrics Partnership
NHTSA: National Highway Traffic Safety Administration RITA: Research and Innovative Technology Administration

THE CONNECTED CAR IN A CONNECTED WORLD



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HUMAN MACHINE INTERFACE

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HMI INFOTAINMENT EVOLUTION – WHO'S THE COMPETITION?

HMI Driving Innovative In-Vehicle Solutions

Increase Safety By:

- Integrating Content
- Integrating Features
  - Voice
  - Touch pad
- Reducing Distraction

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eMOBILITY DEVELOPMENT

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CONNECTIVITY RELIEVING RANGE ANXIETY

Golf blue-e-motion

Vehicle Data	
Vehicle weight	1545 kg*
* 205 kg more than Golf Blue Motion TDI with DSG	
Dimensions L/ B/ H	4199/ 1786/ 1480 mm
Gearbox	EQ 210 (1-Gang-Getriebe)
Maximum speed	135 km/h
Acceleration (0-100)	11,8 s
elektr. Driving range	up to 150 kilometer

Power Train	
E-motor	85 kW / 115 PS
battery	26,5 kWh (Li-Ion)
voltage	324 V
torque	270 Nm

Seamless Integration of Connectivity is Critical for BEVs

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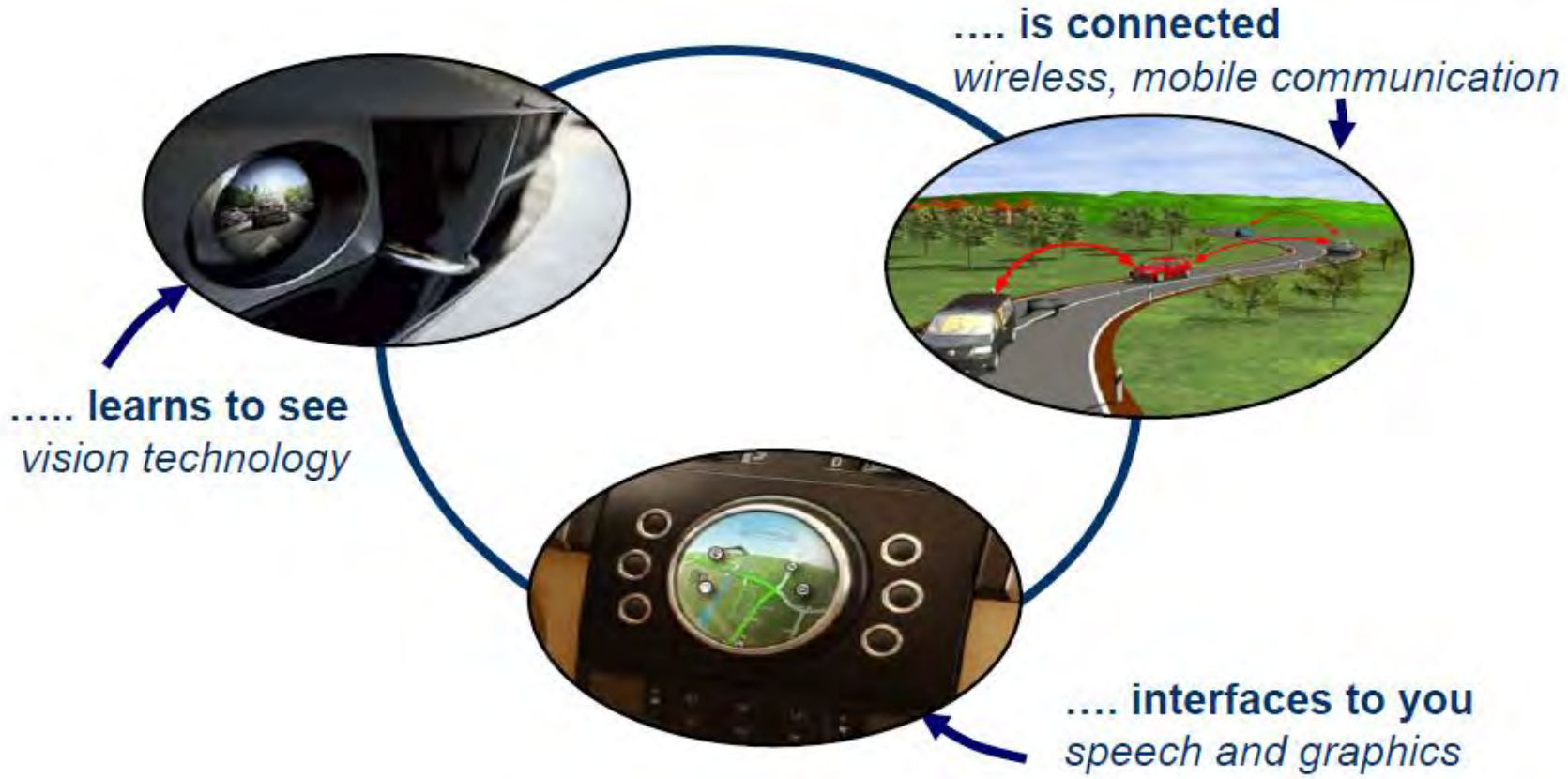
THE CAR OF THE FUTURE…



…seamlessly integrated systems

…continuously evolving towards Autonomy

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Thank you for your attention!



Connected Vehicles: Driving the User Experience

Timothy J. Yerdon
Innovation | Design | R&D

Agenda

- Visteon today
- Why the world of automotive is changing
- Designing for the user experience
- Questions to consider for the future

Visteon Today

Visteon Overview

- Leading provider of value-added components/systems to a broad range of global vehicle manufacturers
- Employees:
  - 22,000 consolidated
  - 37,000 including joint ventures
- 120 facilities in 28 countries*
- 2011 revenue:
  - $8.1 billion consolidated
  - $12.0 billion including joint ventures and discontinued operations

Product Line Portfolio	2011 Sales
 **Climate** • HVAC Systems • Compressor • Powertrain Cooling • Fluid Transport	**$4.0 Billion**
 **Electronics** • Audio and Infotainment • Information and Controls • Vehicle Electronics	**$1.3 Billion**
 **Interiors** • Cockpit Modules • Consoles • Door Trim • Instrument Panels	**$2.3 Billion**

** Includes joint ventures.*

Visteon's Competitive Advantage

Presence in Emerging Markets

Automotive Intellect

Talented People

Solid Customer Base

Strong Supplier Partnerships

Leading Quality Metrics

Effective Cost Controls

Joint Venture Relationships

Global Footprint

Focused Product Strategy

Leading Innovative Technologies

A Strong Global Presence

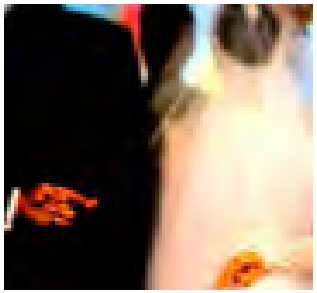
Connected Vehicle Collaboration Partners

Visteon®

Agenda

- Visteon today
- Why the world of automotive is changing
- Designing for the user experience
- Questions to consider for the future

A Changing Society: Megatrends



Individualization

Female Shift

Health & Well-Being

New Ecology

Connectivity

Silver Revolution

Globalization

Education

New Work

Mobility

Source: Visteon Corporate Innovation & Zukunftsinstitut

Deciphering the Trends: What's Important for Automotive?

- **Connectivity** is not just for electronics….it's a lifestyle!

- "Smart **Mobility**"
  - Time and energy management
  - CAFE regulations = weight / CO_2 reductions
  - Different vehicle use cases = zipcar, Car2Go, OnStar, vehicle / ride sharing
  - Seamless connectivity = infotainment, V2X communications, traffic and parking management
  - Autonomous and semi-autonomous driving

Agenda

- Visteon today
- Why the world of automotive is changing
- Designing for the user experience
- Questions to consider for the future

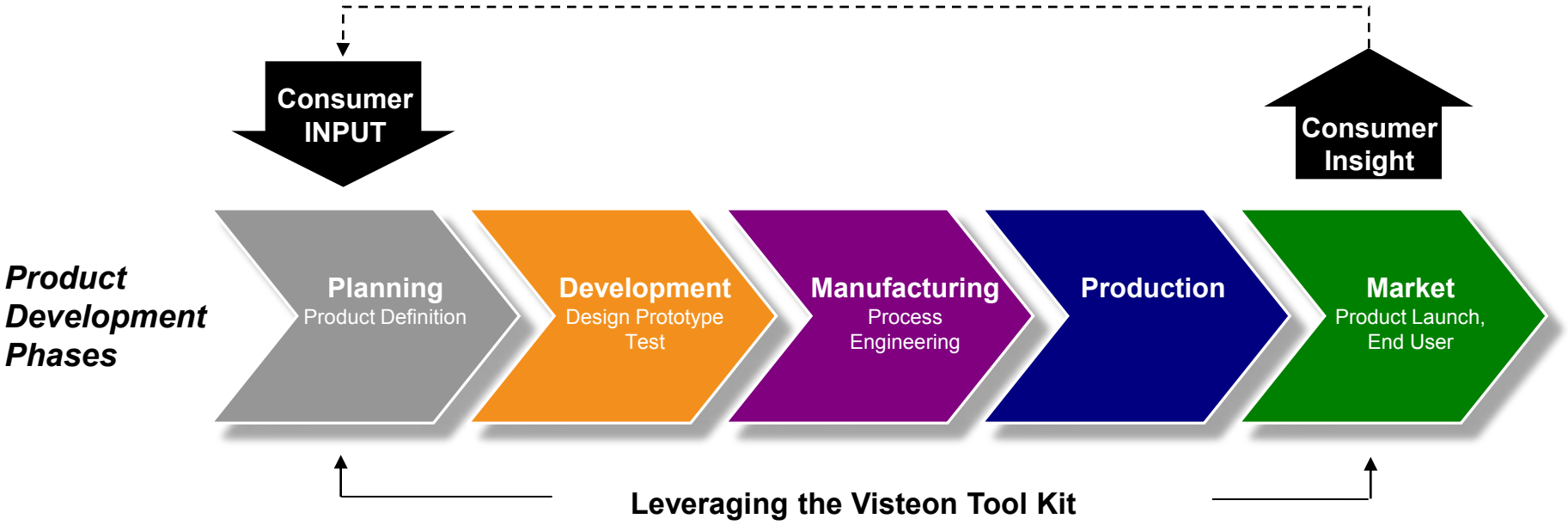
Why do we need to consider the user experience?

Companies that focused on the **customer experience**, **OUTPERFORMED** the S&P 500, by 10 to 1.

10:1

– BusinessWeek

Focus on Upstream Customer Engagement



Visteon Tool Kit

CRAFTSMANSHIP

Prioritization and prediction of product elements and design execution

EXPERIENTIAL PRODUCT MODEL

Consumer-defined attributes captures the ideal user experience

FUTURE WEB

An innovation process to visualize the future

CONSUMERS

Identifying their motivating factors to develop products which exceed expectations

USABILITY

Creating a more intuitive experience for drivers and their vehicle's electronics

VEHICLES AND SEGMENTS

Understanding the elements which ignite passion and desire for a particular vehicle

Product Model: My Ideal Electronics Experience

Key Questions to Consider

safe:	Are users able to interact with the system while driving?
simple:	Are users able to understand the system's display and content organization?
accessible:	Are users able to easily interact with the system's functionality?
accurate:	Does the system provide understandable feedback and behave according to users' expectations?
personal:	Are users able to easily customize options and integrate external devices?
engaging:	Are users intrigued by the system and is it intuitive?

Vision. Translated.

Bringing real-world answers to conceptual questions

Making quality tangible

Finding and deploying the right technology


Visteon®