SIP-adus Activity Report

International Developments and Strategic International Cooperation

Cross-Ministerial Strategic Innovation Promotion Program

Innovation of Automated Driving for Universal Services

February 14, 2017

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Vice-Chair, SIP-adus International Cooperation Working Group/ ITS Japan

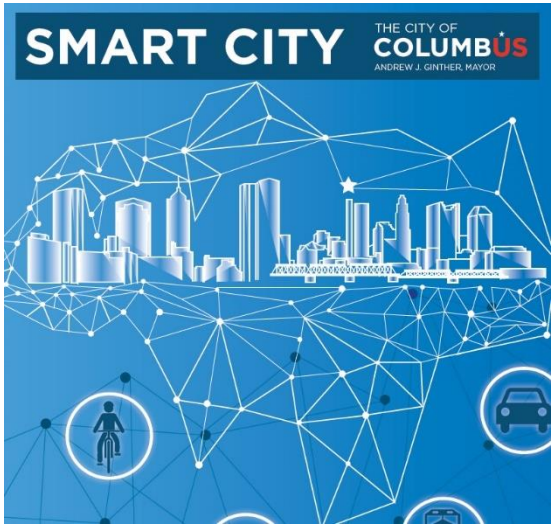
<Translated Version>

Topics

- International Developments toward Realization of Automated Driving
  - World Overview
  - Developments in Europe
  - Developments in the United States
- Strategic International Cooperation by SIP-adus

World Overview

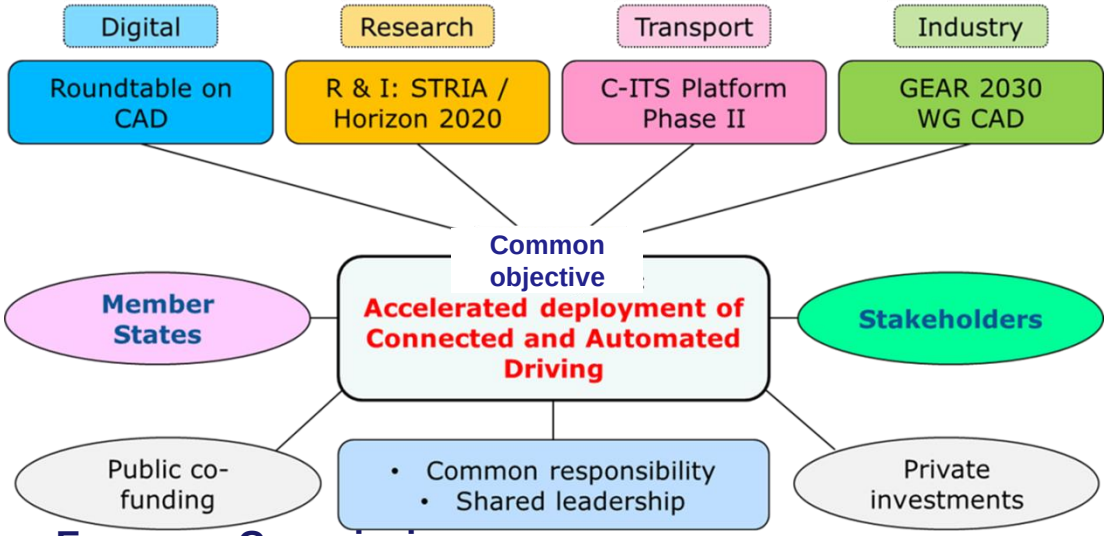
- **Rather than “realization of automated driving,” more and more discussion is focused on “how automated driving will be used in social and traffic reform.”**
  - Cooperative automated driving will be essential in building new traffic systems and social development.
  - Development into businesses that include the communications that supports cooperative automated driving is growing.
  - New projects are emerging as experimentation transitions into verification and development.
  - Discussion on the use of Shared Automated Vehicles (SAV) is progressing.



Source: Taken from the Internet

Developments in Europe

- **Adoption of the Declaration of Amsterdam by the EU's transport ministers' council**
  - An initiative through which EU member states will work together to build an integrated framework by 2019 for realizing cooperative automated driving
- **Launch of a comprehensive undertaking comprised of four mainstays from the Framework Project**
  - Digital: Linkage of communications and automobiles
  - Horizon 2020: R&D for STRIA, etc.
  - C-ITS Platform: Development of a transport system that includes field operation tests
  - GEAR 2030: Expanding the automotive industry
- **More active large-scale field operation tests on public roads**
  - C-ITS Pilot, Drive Sweden/Drive Me, UK Driverless cars, others



Source: European Commission

Road Map for C-ITS Deployment in 2019

- **Fusion of "Connected" and "Automated" through the implementation of various policies and measures**

CEF PILOTS/C-ROAS Platform

Connected

Launch of C-ITS Platform

Start of Oettinger's policy

Commitment from industry

C-ITS Phase 1 report

C-ITS Master Plan

C-ITS Phase 2 report

Day 1 Deployment

NL EU 2016 Declaration of Amsterdam

2014 2015 2016 2017 2018 2019…2025/30?

Automated

Start of Digital

Start of GEAR 2030

5G Action Plan

CAV Road Map

Full Automation

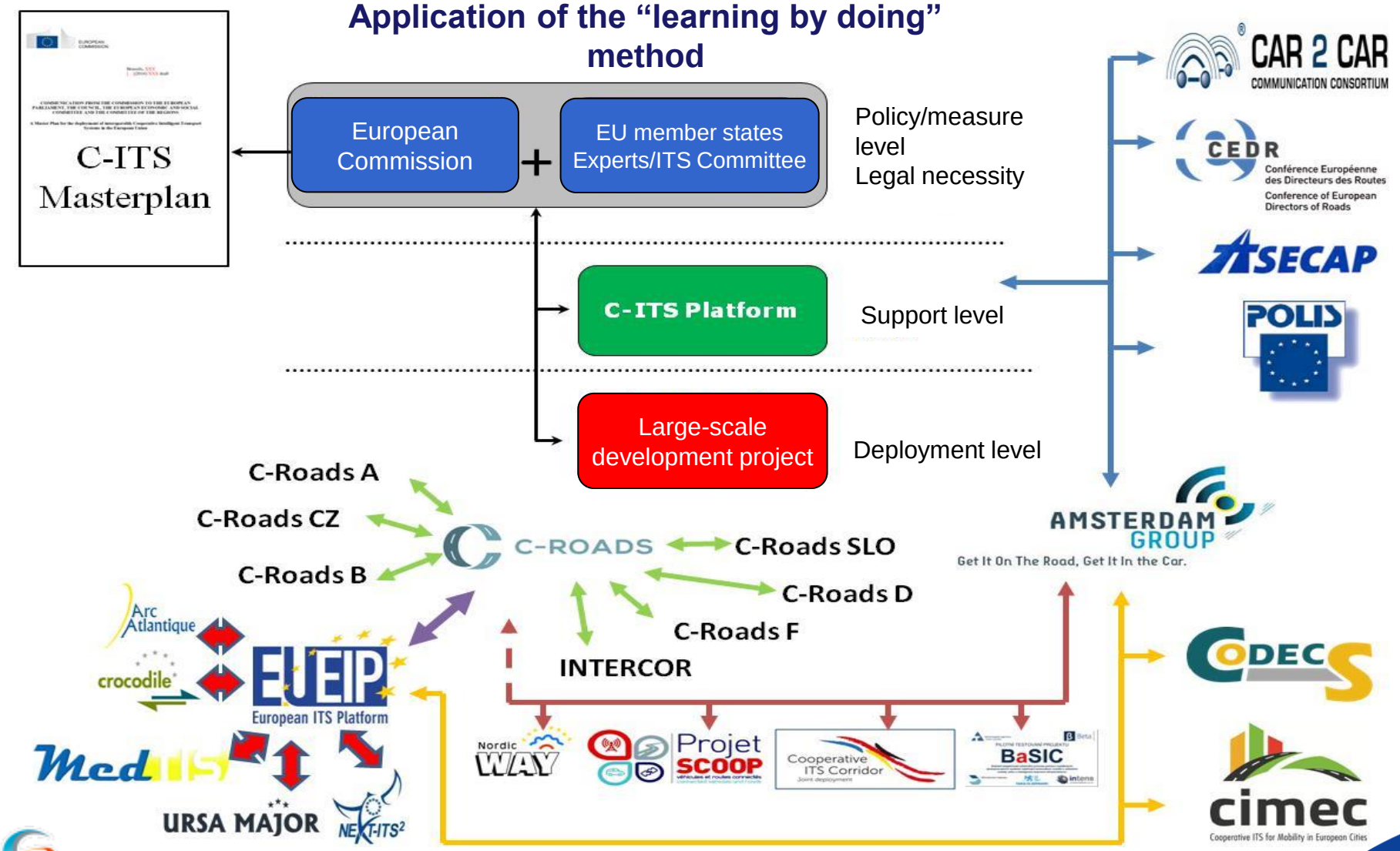
STRIA/H2020

Source: European Commission

CEF: Connecting Europe Facility

Organizational Structure for C-ITS Deployment

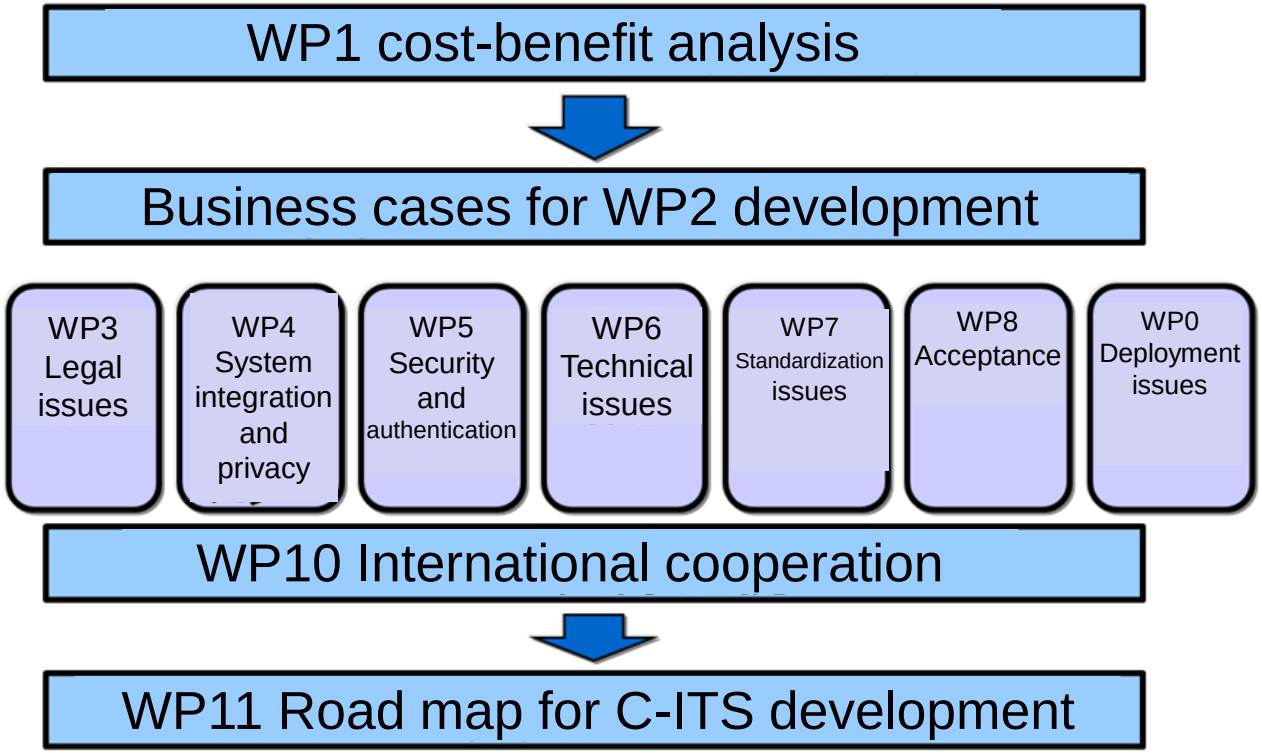
- **EC's 3-layer organization, Amsterdam Group, C-ROADS Platform**



Source: European Commission

C-ITS Platform　Phase 1

- Mission: To prepare a shared vision for C-ITS development
- Organization: Official Expert Group of the EC
  - DG MOVE is the chair and seven commissions are participants
    MOVE, CONNECT, GROWTH, RTD, JUST, JRC, EDPS
- Steps taken thus far:
  - Final report issued on January 21, 2016



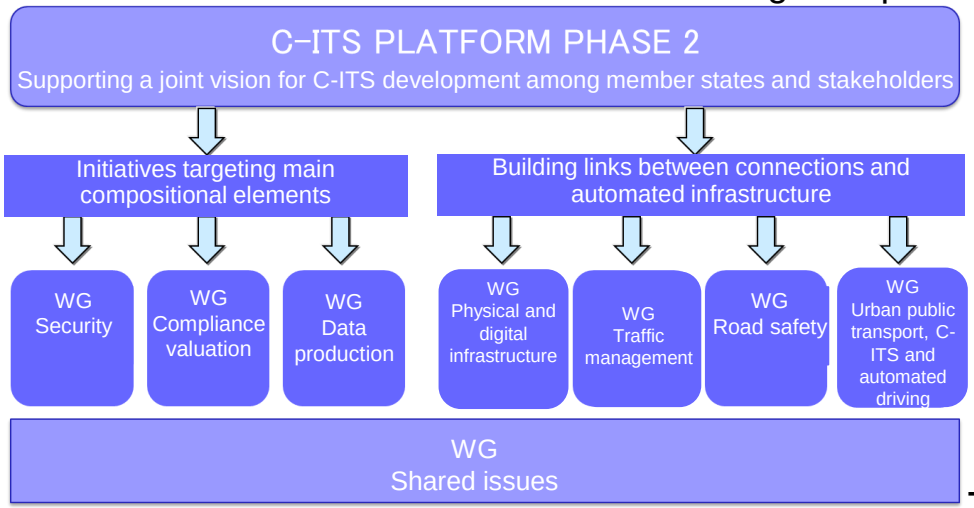
Source: European Commission

The EC's C-ITS Strategy

- **A European strategy for C-ITS as a milestone toward "Cooperative, Connected and Automated Mobility"**
  EU C-ITS Strategy Com (2016)766: Released on November 30, 2016
  - **Cooperative, connected, automated mobility**
    - ✓ Digitally connected cooperative mobility will greatly improve traffic safety, traffic efficiency, and driving comfort.
    - ✓ Safe and comprehensive connection among vehicles and with infrastructure and other road users is important.
  - **Priority challenges for C-ITS development in 2019**
    1. The C-ITS services to be provided
    2. C-ITS communication security
    3. Safety measures to protect privacy and data
    4. Communication technology and frequency: Hybrid communication method
    5. Interoperability at all levels
    6. Certification evaluation
    7. Legal framework
    8. International cooperation

- **C-ITS Platform Phase 2**
  - **Response to deployment-related challenges**

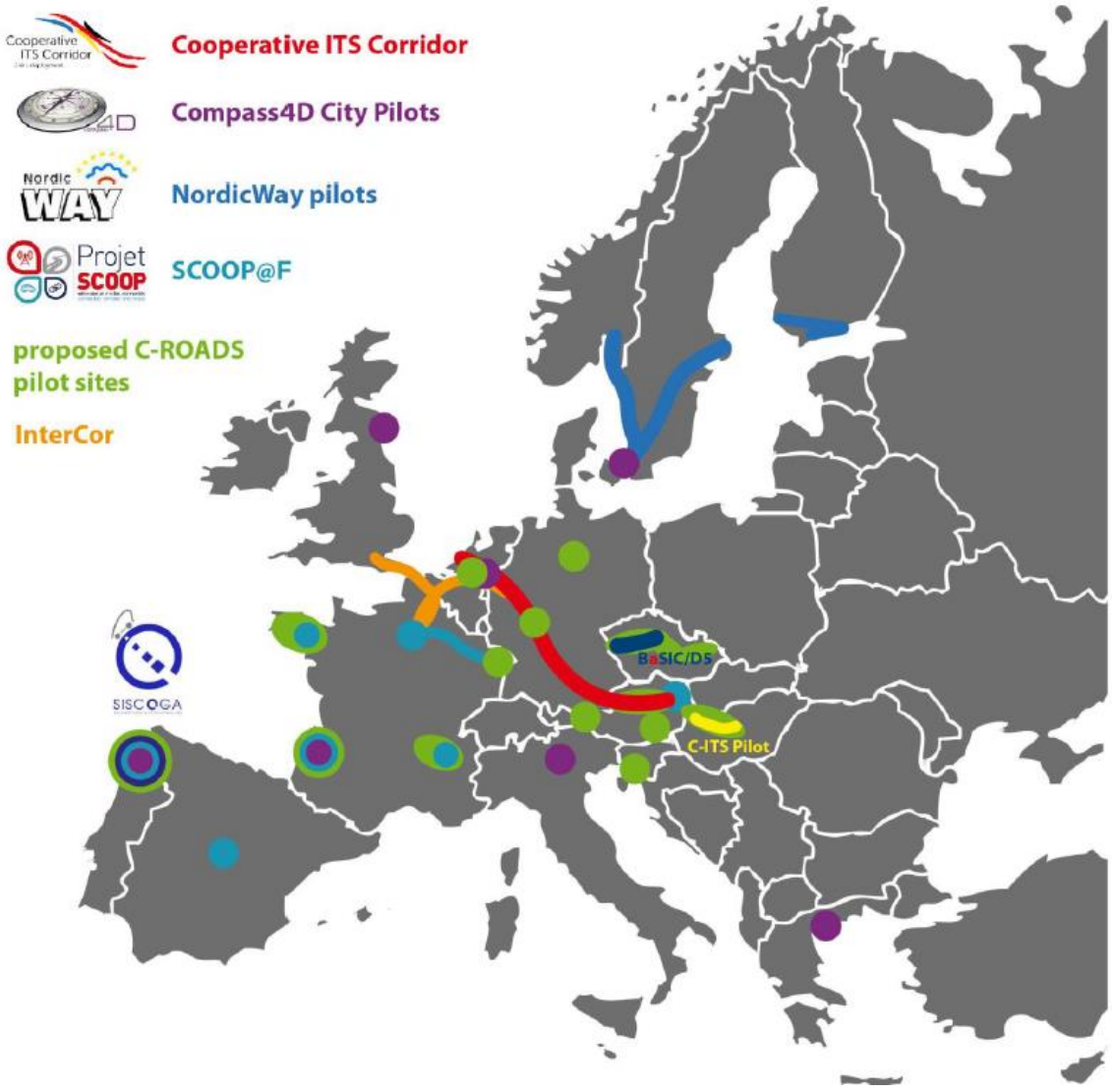
Structure of the C-ITS Platform Phase 2 Working Group



Source: European Commission

Field Operational Test Projects in Europe

C-ROADS Pilot sites and Deployment Initiatives



Source: European Commission

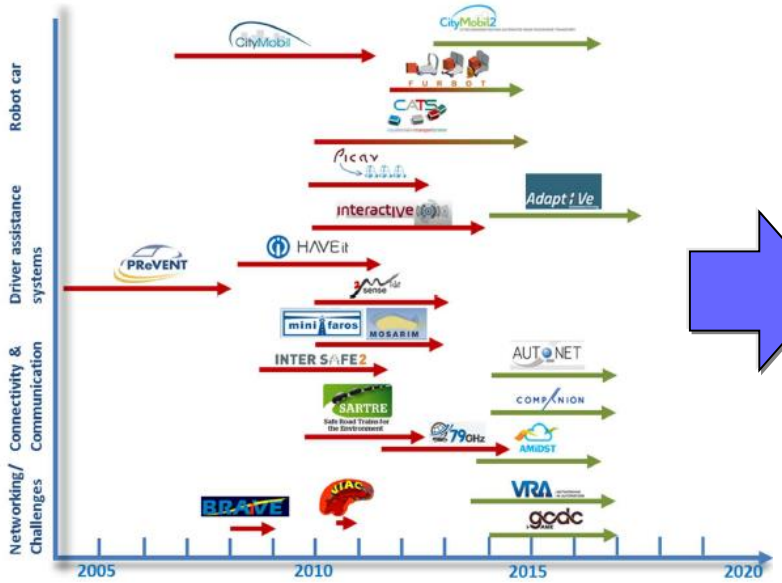
CAD Projects since FP7

- **New projects have emerged from Horizon 2020.**

FP1..... → 7

1988 ..... 2006 2007-2013

Horizon 2020



CARTRE
SCOUT

Cooperation support

National projects

MAVEN
ADAS & ME
VI-DAS
AUTOPILOT
AutoMate

Research and innovation

PEGASUS

Source: European Commission

CAD: Connected Automated Driving

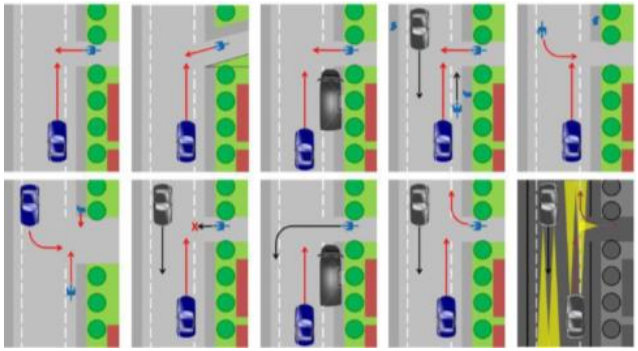
Issues Remaining from FP7: Roadworthiness Testing and Certification

- **Roadworthiness testing: Testing to confirm suitability for d public roads**
  - **Roadworthiness testing being considered in participating countr**
    - ✓ Each country's responsibility for application of the law
    - ✓ Relaxation of laws concerning automated driving
      - UK, Germany, France, Sweden, Austria Greece, the Netherlands, Spain, etc.
    - ✓ Two approaches
      - Code of Practice: Establishment of guidelines and implementation of best actions (UK)
      - Tests in test areas: Special permission by authorizing bodies

1. Override
2. Braking-related functions
3. Lane-change functions
4. Adaptation to laws, signs

Can the vehicle recognize traffic restrictions and signs?

- **Certification**
  - **Cannot be handled with existing legal system**
    - ✓ Driving responsibility for SAE Level 3 and above rests with "the car"
  - **The desired certification system**
    - ✓ What can be done, and in what environments?
    - ✓ What functions will be tested?
    - ✓ Under what road environments will evaluation take place?
    - ✓ Confirmation of communication with other road users

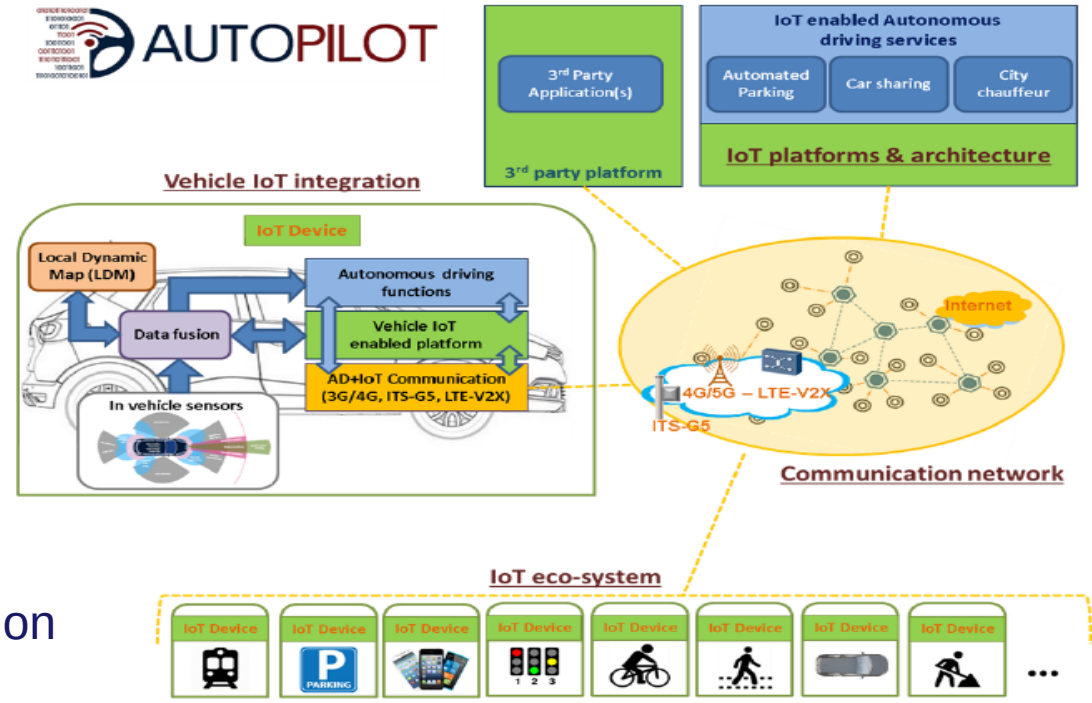


What test conditions are appropriate?

Source: ITS World Congress 2017

AUTOPILOT

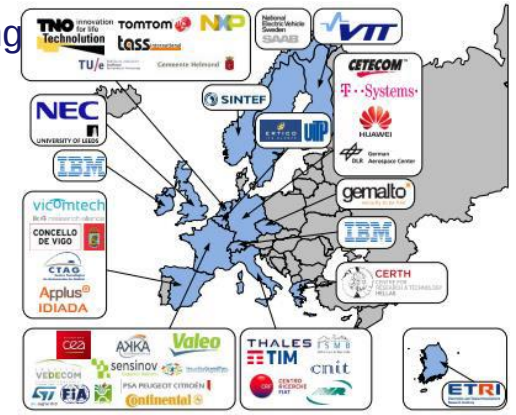
- **“Development of IoT-architectures and platforms” that take automated driving to the next dimension**
  - **Use cases**
    1. City driving
    2. Expressways
    3. Automated parking
    4. Convoy traveling
  - **Challenges**
    - ✓ Definition and deployment of IoT-architecture for AD
    - ✓ Development of business models and services
    - ✓ Contribution to standardization



- **Funding: 20,000,000 euros**
- **Promoting organization: ERTICO**
- **Participating organizations: 43 organizations**

Development is taking place in:

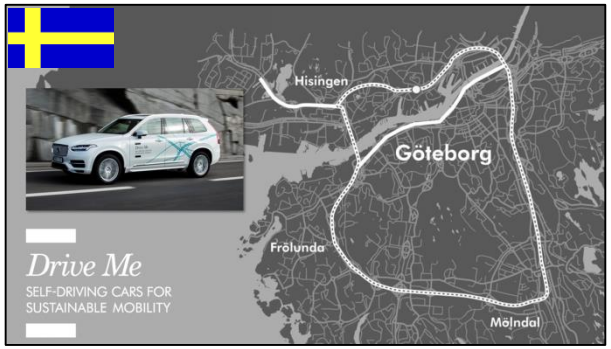
- The Netherlands
- Finland
- France
- Italy
- Spain



Source: VRA

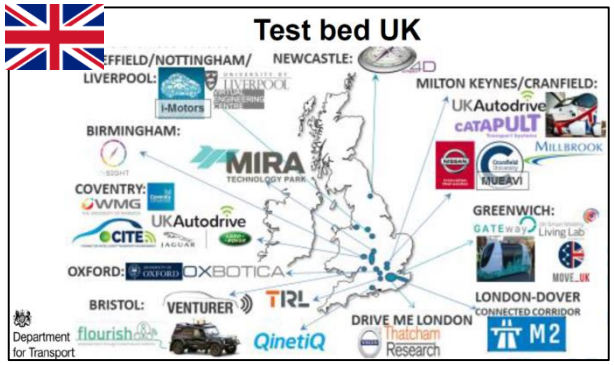
Initiatives of Individual European Countries

- **Projects continue to expand and evolve in each country.**



Sweden

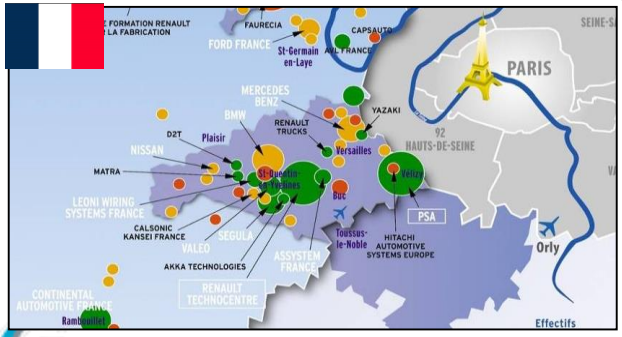
Finland



UK

Germany

France



The Netherlands

Commercial vehicle road train Human driver in lead truck	Like an airplane: cruise mostly by autopilot Temporary autonomy	Automated Robo-Taxi Full autonomy
		

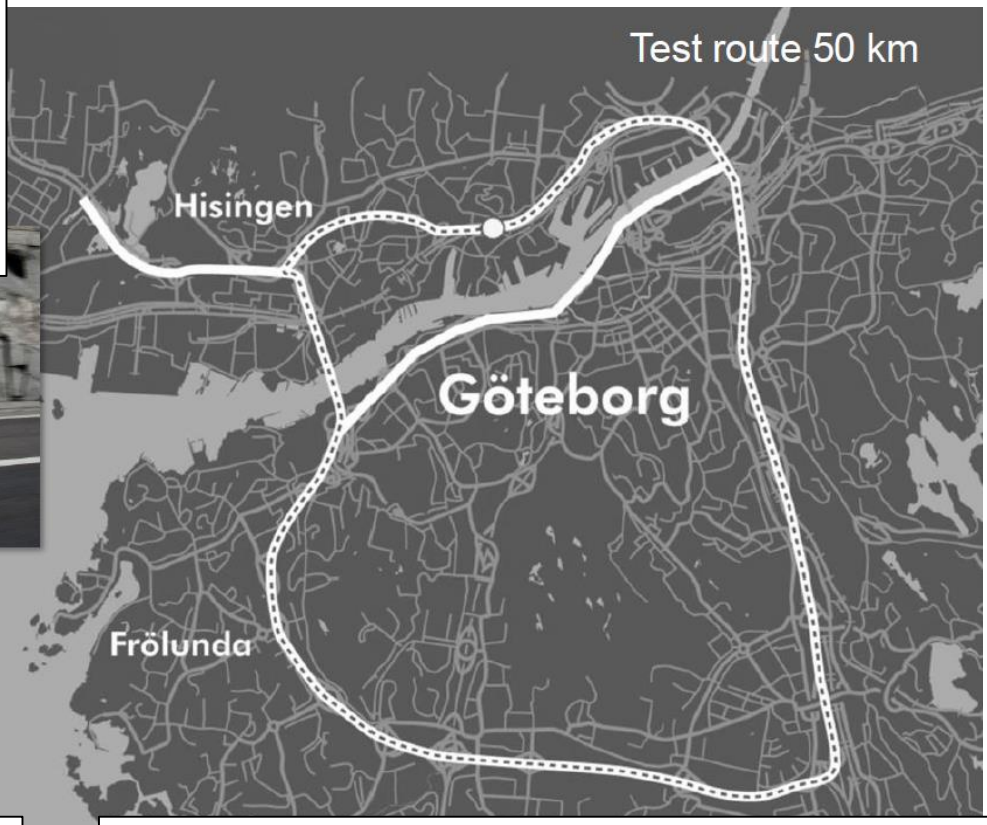
Source: Project websites

Drive Sweden Update: Drive Me

Drive Me test conditions

Function
- Advanced automated driving that satisfies demands (L4)
- Allowance of secondary tasks
- Approved roads only
- Some limitations due to weather conditions

Drive Me
SELF-DRIVING CARS FOR SUSTAINABLE MOBILITY



Test road environment
- No oncoming vehicles or intersections on same road surface
- Pedestrians and bicycles are blocked out
- No signals
- Maximum speed: 70 to 80 km/h

Anticipated results
- Effect on safety, traffic efficiency, and the environment
- Infrastructure, laws
- Appropriate traffic environments and use cases
- Users' expectations
- Relationship between nearby road users and self-driving cars

Source: Drive Me website

PEGASUS Project

Project outline

- Period: January 2016 to June 2019 (42 months)
- Contracted organizations: OEM (Audi, BMW, Daimler, Opel, VW), tier-one suppliers, research institutes, SMEs, science institutes, etc.
- Funds: Approx. 34,500,000 euros; subsidies: 16,300,000 euros

PEGASUS

Project purpose

What level of performance is expected in self-driving cars?
How can the achievement of demanded performance be confirmed?

Scenario analysis and quality measures	Implementation process	Testing	Result reflection and embedding
What human and technical capabilities are needed in applications?	What tools, methods, and procedures are required?	What will be tested in laboratories, simulations, test courses, and roads?	Is the concept sustainable?

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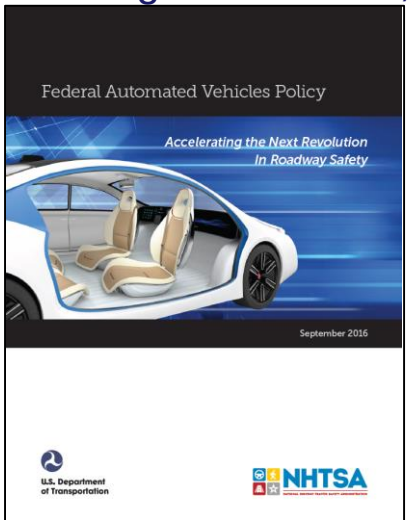
Source: PEGASUS website

Developments in the United States

- **The US Department of Transportation (USDOT) announced guidelines and usage instructions (under state governments) concerning safety standards and evaluation of automated vehicles (motor vehicle safety standards).**
  - Federal Automated Vehicles Policy* (FAV Policy)
- **Presentation of a proposal requiring the installation of cooperative system communication devices (V2V) into compact cars.**
  - Notice of Proposed Rule Making (NPRM): Available for public comment for 90 days from December 12, 2016
- **Promotion of large-scale field operation tests for deployment of a cooperative system in three regions.**
  - Connected Vehicle Pilot (New York City, Tampa/Florida, Wyoming/I-80)
- **Launch of a project for innovative community development using cooperative automated driving.**
  - Smart Cities Challenge: Columbus, Ohio



FAV Policy

SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE	J3016™	SEP2016
	Issued 2014-01 Revised 2016-09	
	Superseding J3016 JAN2014	

(R) Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles

Level	Name	Narrative definition	DDT: Sustained lateral and longitudinal vehicle motion control	DDT: OEDR	DDT fallback	ODD
Driver performs part or all of the *DDT*						
0	No Driving Automation	The performance by the *driver* of the entire *DDT*, even when enhanced by *active safety systems*.	Driver	Driver	Driver	n/a
1	Driver Assistance	The *sustained* and *ODD*-specific execution by a *driving automation system* of either the *lateral* or the *longitudinal vehicle motion control* subtask of the DDT (but not both simultaneously) with the expectation that the *driver* performs the remainder of the *DDT*.	Driver and System	Driver	Driver	Limited
2	Partial Driving Automation	The *sustained* and *ODD*-specific execution by a *driving automation system* of both the *lateral* and *longitudinal vehicle motion control* subtasks of the *DDT* with the expectation that the *driver* completes the *OEDR* subtask and *supervises* the *driving automation system*.	**System**	Driver	Driver	Limited
ADS ("*System*") performs the entire *DDT* (while engaged)						
3	Conditional Driving Automation	The *sustained* and *ODD*-specific performance by an *ADS* of the entire DDT with the expectation that the *DDT fallback-ready user* is *receptive* to *ADS*-issued *requests to intervene*, as well as to *DDT performance-relevant system failures* in other *vehicle* systems, and will respond appropriately.	System	**System**	*Fallback-ready user (becomes the driver during fallback)*	Limited
4	High Driving Automation	The *sustained* and *ODD*-specific performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	System	System	**System**	Limited
5	Full Driving Automation	The *sustained* and unconditional (i.e., not *ODD*-specific) performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	System	System	System	**Unlimited**

*The NHTSA has adopted SAE's revised levels for automation for defining driving automation.

Source: USDOT

Development of Automated Driving Projects

- **Building "Smart Cities" and "new traffic systems" from CAV**

Autonomous Vehicles

Strategic plan 2015-2019
- Realizing CV Implementation
- Advance Automation

State-led projects
- Mcity: Michigan
- GoMentum Station: California
- Expansion to other states

Connected Automated Vehicle (CAV)
480 billion yen in 10 years

FHWA initiative guidelines → AASHTO

Connected Vehicles

CV Pilot Program: 5-billion-yen project
- NYC, Tampa, Wyoming

Beyond Traffic 2045
TRENDS AND CHOICES

Smart City
$40 million

ATCMTD
$60 million

MOD
$8 million

SIP

Source: USDOT website

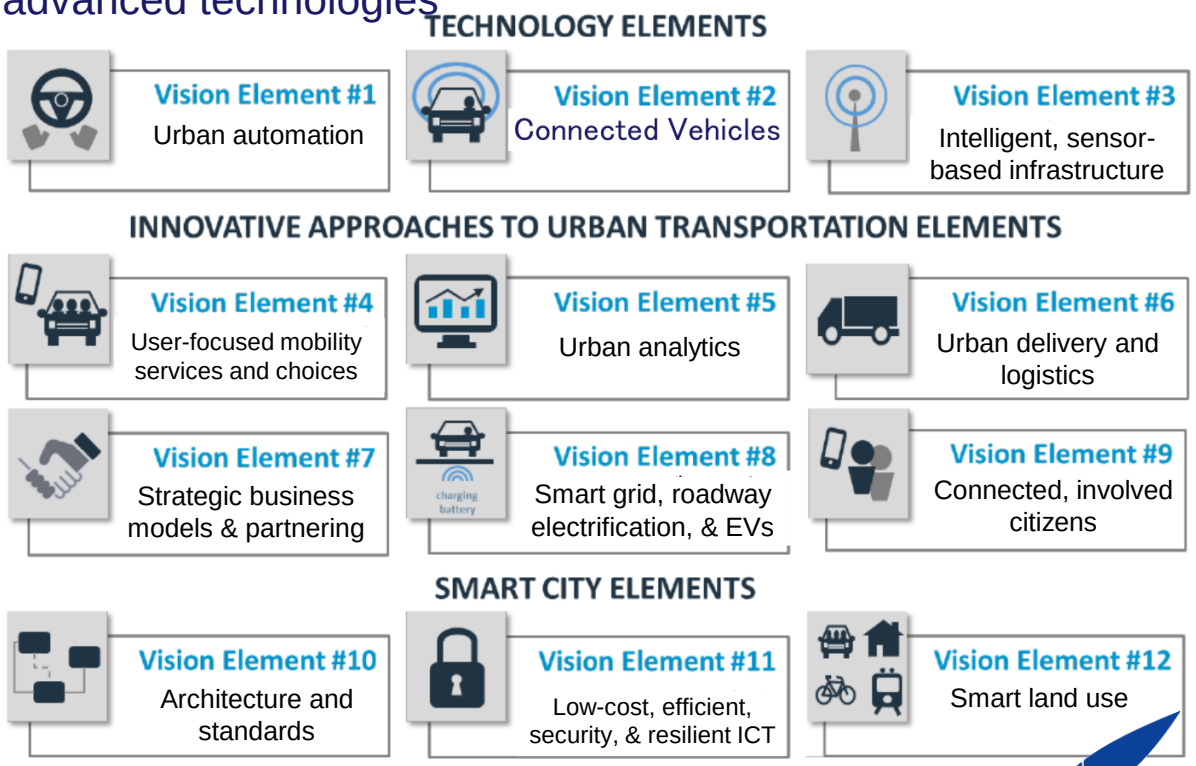
Smart Cities Challenge

Aims

- To recruit ideas for innovative solutions to the problems cities face
- To apply applications using advanced data and ITS technology
  - ✓ Improving traffic congestion
  - ✓ Ensuring traveler safety
  - ✓ Protecting the environment
  - ✓ Responding to environmental change
  - ✓ Connecting cities without advanced technologies
  - ✓ Stimulating the economy

Funding

- USDOT: $40 million
- Partner support: $140 million



Source: USDOT website

Smart Cities Challenge: Columbus Ohio

Implementation of two projects for automated driving

- Convoy driving of driver assistance-type trucks using signals that give priority to freight traffic on arterial roads
- First mile/last mile service using shared low-speed electric autonomous vehicles

Source: USDOT, State of Ohio

Fast Act: ATCMTD

Advanced Transportation and Congestion Management Technologies Deployment Program

- **Development of cutting-edge traffic technologies to reduce congestion and improve traffic system safety**
  - **Maximum of $60 million between 2016 and 2020**

Grantees (FY2016)	Federal Funding
City and County of Denver, CO	$6.0 M
Los Angeles County Metropolitan Transportation Authority, CA	$3.0 M
City of Los Angeles, CA	$3.0 M
City of Marysville, OH	$6.0 M
Niagara Frontier Transportation Authority, NY	$7.8 M
City of Pittsburgh, PA	$10.9 M
City and County of San Francisco, CA	$11.0 M
Texas Department of Transportation (Houston, TX)	$8.9 M
Total	**$56.6 M**

Source: USDOT

MOBILITY ON DEMAND（MOD）

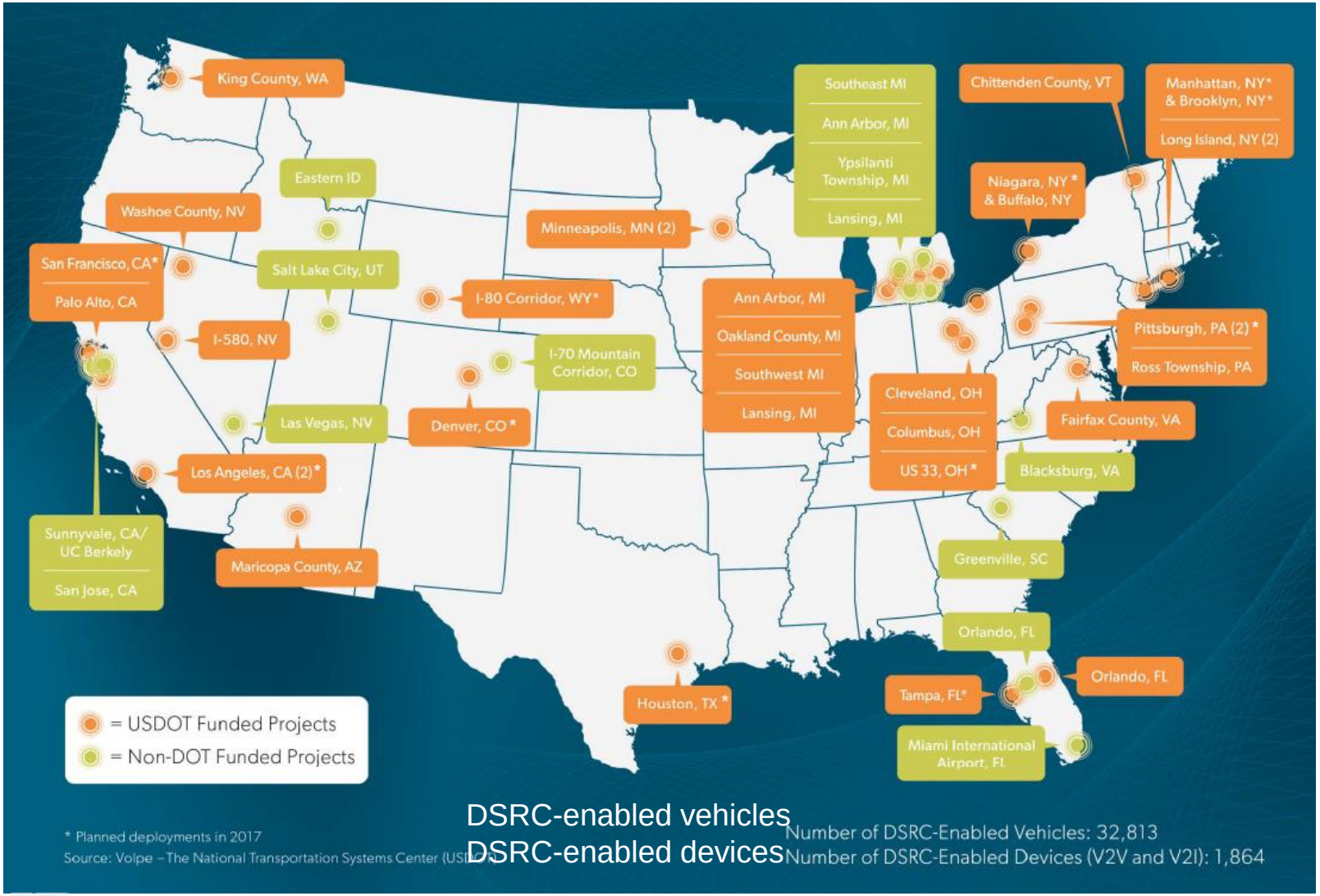
- **Eleven projects built on public-private-sector partnerships**
  - **$8 million in support** for regional societies to incorporate the latest technologies into the nation's public transportation systems and make them more effective, efficient, and equal

○ Regional Transportation Authority (Pima County, AZ)	○ Los Angeles County Metropolitan Transportation Authority
○ Valley Metro Rail (Phoenix, AZ)	○ Tri-County Metropolitan Transportation District of Oregon
○ City of Palo Alto, CA	○ Dallas Area Rapid Transit
○ Chicago Transit Authority	○ Vermont Agency of Transportation
○ San Francisco Bay Area Rapid Transit	○ Pierce Transit
○ Pinellas Suncoast Transit Authority (Pinellas County, FL)	

Source: USDOT

Projects throughout the US

- **Taking pilot projects to all parts of the nation**



Source: USDOT

Advisory Committee on Automation in Transportation (ACAT)

- **An advisory committee on automated driving that was established through public invitation**
  - The committee presents recommendations on social changes that make use of automated driving, policy evaluations, and other matters to concerned secretaries from a cross-modal perspective that includes ITS, robotics, consolidation of freight transport, next-generation technologies in air traffic control, and development of advanced transport technologies.
  - First meeting held on January 16, 2017 (a US national holiday)
    - ✓ Discussion covered the purpose of the committee, participants' aspirations, etc.
  - Program Director: Two co-program directors
    - ✓ Mary Barra: General Motors, Chairman and CEO
    - ✓ Eric Garcetti: Mayor of Los Angeles, CA

Events during the meeting's three hours can be viewed on the DOT website.

Source: USDOT

International Cooperation Activities in FY2016

Taking international cooperation to a new realm

ITS WC Melbourne Oct. 10 - 14 ☆

Transport Research Arena 2016 Apr. 18-21 ☆ Warsaw, Poland

ITS E annual plenary meeting Jun. 6-9 ☆ Glasgow, Scotland

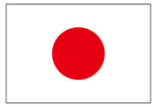
Grand Cooperative Driving Challenge May 28-29 ★ Helmond Netherlands

European automated driving experts meeting Apr. 3-5 ★

IT'S A annual plenary meeting Jun. 12-15 ☆ San Jose, CA

AVS#5 ★ Jul. 19-22

TRB Jan. 9-12 ★



Workshop Tokyo Nov. 15-17 ★

ITS Promotion Forum Feb. 14 ★

JAIA networking event #1☆ Jul. 8

ACEA networking event #1☆ Oct. 27

JAIA networking event #2☆ Jan.18

EU networking event #1☆ Feb. 17

Standardization meeting

Concord, USA Apr. 25-29 ☆

Auckland, New Zealand Oct. 2-7 ☆

SIP-adus Workshop 2016 Program

- **Execution of SIP-adus large-scale field operation tests and the third SIP-adus R&D report session as a special theme**

	November 15 (Tue)	November 16 (Wed)	November 17 (Fri) (SIP-adus Members Subcommittees)
AM	9:00～10:15 Opening ceremony, organizer and guest remarks	9:00～10:30 SIP-adus Report Session	Subcommittees 9:00～12:00 Breakout Workshop-1
	10:30～12:30 Special session Regional Activities and FOTs	10:45～12:30 Impact Assessment	
	Display of technologies resulting from SIP-adus research		
PM	13:30～15:00 Dynamic Map	13:30～15:15 Next Generation Transport	13:00～15:00 Breakout Workshop-2
	15:20～16:35 Connected Vehicles		
	16:50～18:05 Security	15:30～17:30 Human Factors	15:30～17:00 Breakout Workshop plenary meeting
	Preparatory meeting for the Breakout Workshop		17:00～17:30 Closing, organizer remarks

Main sessions

Reinforcing Communication by Upgrading the SIP-adus Website

Aims

- To provide information on research achievements and activities in a timely manner
- To strengthen global communication by enhancing the English website
- To promote the diffusion of information via social networking services (SNS) by providing a share button

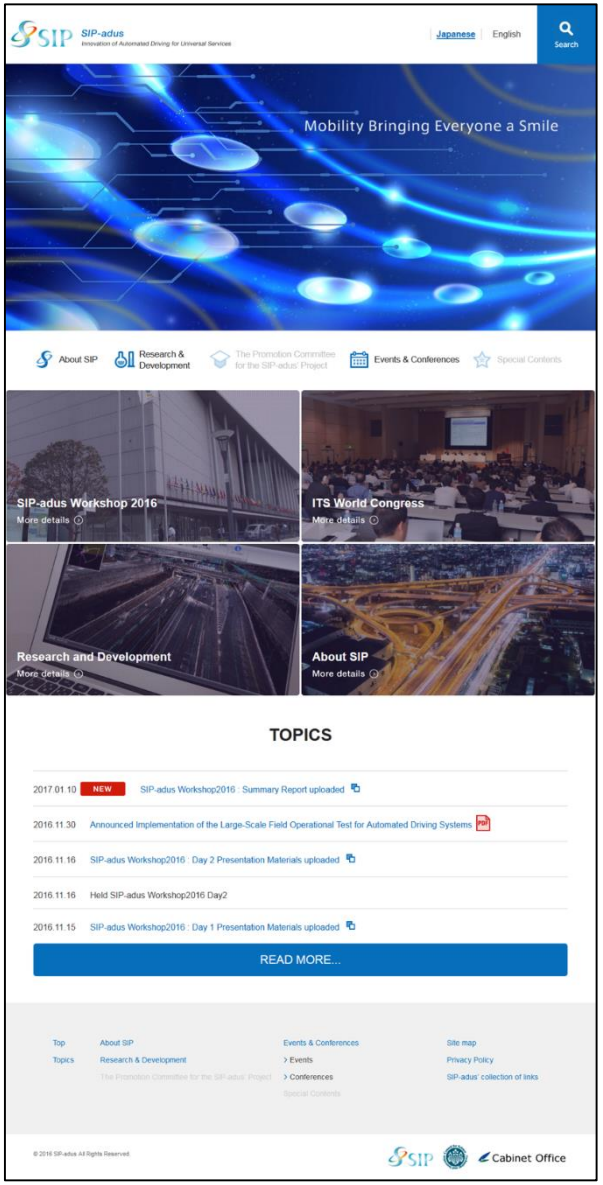
Results

- Transformation into an easy-to-use website with a linear design that facilitates information searchers and smartphone capability
- Better inflow via Facebook and other SNS and higher revisit rate

Japanese: http://www.sip-adus.jp/

English: http://en.sip-adus.jp/

Site prepared by: QUALLIA



PC

Smartphone

Achievements of the SIP-adus Workshop 2016

- **SIP-adus Workshop: Participation of 33 speakers from 11 nations**
  - **Presentations, displays, and other items and information are provided on the website.**

Japanese: http://www.sip-dus.jp/evt/workshop2016/
English: http://en.sip-adus.jp/evt/workshop2016/

END