Data Sharing: View from the Metro Trenches

2017 Automated Vehicle Symposium

Thomas J. Bamonte (@TomBamonte)
North Central Texas Council of Governments

July 11, 2017
Metro Complexity: NCTCOG

230 member governments: big cities to small towns
80 jurisdictions w/traffic signals
16 counties with street/highway functions
Multiple local/state TMCs and 911 centers
Private managed lane operator
Regional tollway authority
State DOT
MPO with 511 system
Plus: airports, public transit, railroads, freight, TNCs....
Metro Complexity
Traffic Signal Data Sharing
Traffic Signal Data Sharing

Traffic Signal Data Expert

Car Company
Metro Simplicity: Feed Travel Navigation Services

2. Giving Waze Data
   a. Data Content

Waze asks that partners share the following data:

1. **Road closures** - both planned and in real-time
2. **Traffic incidents** - construction, crashes etc.
3. **Major traffic events (MTE)**
Metro Simplicity: Crowdsourcing

Reported: 38 minutes ago by Wazer
Giving Away Public Data: Value Proposition

Greater information reach
Cheaper
Data public by nature
Private sector: Big matching investments
Jumpstart new markets
Reevaluate value proposition when markets established
Contact Information

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Panasonic V2X Data Ecosystem

Existing Traffic Management Platform

DATA

Input sources
- Cameras
- Sensors
- Weather
- Etc...

Signage
- Traffic lights
- Emergency alert
- Community
- Etc...

Output sources
- V2I DATA
- RSU
- I2V DATA
- RSU
- I2V DATA
- V2I DATA
- V2V

Additional Connected Areas

CTMS

Additional Various Use Cases
- Crashes
- Road Closures
- Weather Conditions
- Potholes (Through Vehicle Sensors, i.e. suspension)
- Brake Warnings
- Infrastructure Diagnostics
- Parking Availability
- Incident Management
- Enhanced Maintenance Decision Support Systems
THE USDOT ITS JOINT PROGRAM OFFICE
VISION, MISSION, AND STRATEGIC PRIORITIES

- **Vision:** Transform the way society moves
- **Mission:** Conduct research, development, and education activities to facilitate the adoption of information and communication technology to enable society to move safely and efficiently
- **Strategic Priorities:**
  - Realizing connected vehicle implementation
  - Advancing vehicle automation
- **ITS JPO website and Strategic Plan:** [www.its.dot.gov](http://www.its.dot.gov)
ABOUT THE ITS JPO DATA PROGRAM

The ITS JPO Data Program is a multimodal effort to enhance how data is managed and used throughout the transportation ecosystem to support the next generation of ITS technologies.

We aim to establish a foundation for agility, data sharing, and privacy protection in the future transportation system – including connected and automated vehicles and smart communities – to maximize the societal benefits of these technologies.

ADVANCED ITS TECHNOLOGIES ARE INCREASINGLY:

• Data-intensive
• Internet-connected
• Developed iteratively
• Developed collaboratively
• Fundamentally changing consumer/citizen expectations.

In this paradigm, data is available on-demand for authorized users; new capabilities come faster, at lower cost; and services interconnect and interoperate dynamically via web services.
A FUNDAMENTAL IT PARADIGM SHIFT

• It’s more than “more data” – it’s a fundamental IT paradigm shift
• How do deployers get ready for this future while meeting near-term needs?
GET INVOLVED!

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Website: www.its.dot.gov
Evaluating driving automation technology

2017 Automated Vehicles Symposium
San Francisco, CA
July 11, 2017

David G. Kidd, Ph.D.
Senior Research Scientist
IIHS is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from crashes on the nation’s roads.

HLDI shares this mission by analyzing insurance data representing human and economic losses from crashes and other events related to vehicle ownership.

Both organizations are wholly supported by auto insurers.
Where are we?

- Washington, DC
- Arlington, VA
- Ruckersville, VA
Summary of technology effects on insurance claim frequency

Results pooled across automakers

-20%  -10%  0%  10%

-20%

forward collision warning  fcw with autobrake  adaptive headlights  lane departure warning  side-view assist (blind spot)

Collision  Property Damage Liability  Bodily Injury Liability
Challenges posed by existing driving automation
Challenges posed by existing driving automation
IIHS’s current stance on driving automation

- Manufacturers must take steps to ensure drivers use current driving automation systems as intended and remain engaged.
- Automated driving system limitations will curtail the potential benefits.
- System imperfections, limited use, and a mixed fleet will further limit the potential crash reduction.
- Consistent, reliable, and mandatory collection of publicly available information is necessary for evaluating the safety of driving automation systems.
More information and links to our YouTube channel and Twitter feed at iihs.org

David G. Kidd, Ph.D.
Senior Research Scientist
dkidd@iihs.org
BREAKOUT SESSION # 10

Data Sharing Models and Policy

Tuesday July 11, 2017

Room: Franciscan C&D

Organizers
Shawn Kimmel, Booz-Allen Hamilton
Anita Kim, U.S. DOT Volpe Center
Ginger Goodin, Texas Transportation Institute
Baruch Feigenbaum, Reason Foundation
Richard Mudge, Compass Transportation and Technology
Amitai Bin-Nun, Security America’s Future Energy
David Perlman, U.S. DOT Volpe Center
Carl Andersen, U.S. DOT Federal Highway Administration
Agenda

1:30 PM – 2:00 PM Introduction to Data Sharing Issues and Activities
2:00 PM – 3:15 PM Panel on Safety and Performance Data
3:15 PM – 3:30 PM Break
3:30 PM – 5:00 PM Panel on Operations and Infrastructure Data
5:00 PM – 5:30 PM Closing Discussion
1:30 PM – 2:00 PM Introduction to Data Sharing Issues and Activities

Overview of session goals and a brief background on data sharing models and policy to set the stage for the panels and technical discussions. This will include a review of the foremost data issues of 2017 and an update of certain federal efforts in the space:

• Steve Sill, US DOT ITS JPO, Standards and Architecture Program: Standards Roadmap activities as it relates to data, including a report out from the Monday auxiliary session on technical standards prioritization.

• Ariel Gold, US DOT ITS JPO Data Program: Existing and proposed efforts to support AV implementation through data management tools and guidelines.
2:00 PM – 3:30 PM Panel on Safety and Performance Data

This panel will explore issue with types of data that can improve overall transportation system safety and support safety assurance. Example types of data include: driving scenarios, event data recorders, lessons learned, aggregated safety performance data, test cases, and disengagement reports.

Panel:

Moderated by: Shawn Kimmel, Ph.D., Booz Allen Hamilton
Jim Adler, Vice President of Data, Toyota Research Institute
Bob Lange, Vice President of Vehicle Engineering, Exponent
David Kidd, Ph.D., Senior Research Scientist, Insurance Institute for Highway Safety
Jonathan Weinberger, Vice President of Innovation and Technology at the Auto Alliance, Automotive Information Sharing and Analysis Center (Auto-ISAC)
3:30 PM – 5:00 PM Panel on Operations and Infrastructure Data

This panel will explore the various local, state, federal, and international models for sharing data that can improve situational awareness, efficiency, and resource allocation for AVs and agencies alike. Example types of data include: work zones, signal phase and timing, road closures, weather, incidents, and traffic conditions.

Panel:
Moderated by: Anita Kim, US DOT VOLPE
Shailen Bhatt, Executive Director, Colorado DOT
Scott Marler, Director of Traffic Operations, Iowa DOT
Monali Shah, Director of Intelligent Transportation, HERE (representing USA and EU efforts)
Sue Bai, Principal Engineer of Automobile Technology Research, Honda R&D Americas
Jun Shibata, Senior Researcher, Japan Digital Road Map Association
Thomas Bamonte, Program Manager for Automated Vehicles, North Central Texas Council of Governments
5:00 PM – 5:30 PM Closing Discussion

Moderated by: Baruch Feigenbaum, Ginger Goodin

The session will conclude with a round-up of major themes through an interactive discussion with the audience. The session organizers will capture take-away points and seek audience input on how to best to frame these points in conference proceedings. The discussion will explore how these issues relate to the practitioners, policy makers, industry representatives and others in the audience.
1. What are the most important types of data to share (near and far term)?
2. What benefits will data sharing enable, and what concerns must be addressed (proprietary, liability, privacy, and anti-trust issues)? What is the value exchange between sharing entities (“what’s in it for me?”)?
3. What data types, formats, and granularity are needed to achieve desired benefits? What data standardization or interoperability is needed to facilitate data sharing?
4. Who should store, maintain, access, and share data, and what policies are needed to support these efforts?
5. What can we learn from existing policy, sharing models and governance structures?
6. How can public agencies best prepare data infrastructure to be ready for AVs?
Enhancement of “Dynamic Map” as Common Platform

BS10: Data Sharing Models and Policy Automated Vehicles Symposium
San Francisco, July 11, 2017

Jun Shibata, Senior Researcher, JDRMA & Convenor, ISO TC204 WG3
Agenda

1. What is “Digital Infrastructure”? 
2. “Dynamic Map” in SIP-adus*
3. Usability of 3D map common platform data
4. FOT of SIP-adus
5. International Standardization Updates

*SIP-adus = Cross-Ministerial Strategic Innovation Promotion Program Innovation of Automated Driving for Universal Services
What is “Digital Infrastructure”?

*Digital representation of road environment required by ADS, C-ITS, and Advanced Road/Traffic Management Systems*

(ADS=Automated Driving Systems; C-ITS=Cooperative-ITS)

**Examples**

- ✓ Local Dynamic Map for C-ITS (SAFESPOT, EC)
- ✓ Dynamic eHorizon for ADS (Continental AG)
- ✓ Dynamic Map for ADS (SIP-adus, Japan)
**“Dynamic Map” in SIP-adus**

(1) Development and verification of automated driving systems

<table>
<thead>
<tr>
<th>Area of Competition</th>
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<tbody>
<tr>
<td>Dynamic Map</td>
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<td>Prediction based on ITS information</td>
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<td>Sensors</td>
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<th>Traffic environment</th>
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<td>Recognition</td>
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(5) System Security

(4) Driver Model

(3) International cooperation

(4) Development for next generation urban transport

(2) Basic technologies to reduce traffic fatalities and congestion
"Dynamic Map" Concept

Dynamic map is not only precise map database for automated vehicles but advanced traffic information database for every vehicle.

Under reassessment!

Input!

3D map common platform data (image, point-group, vector)

Link

HD map

Dynamic Info. (< 1 sec)
ITS anticipative Info. (V2V, V2P, traffic signal, etc.)

Semi-dynamic Info. (< 1 min)
Accident, Congestion, Local weather etc.

Semi-static info. (< 1 hour)
Traffic control, Road construction, Weather forecast, etc.

Static Info. (< 1 day)
Road shape, Topological data, etc.

Common (Basic) data
Additional data
Cooperative area
Competitive area

*Source: Mr. Seigo Kuzumaki, Program Director, SIP-adus, European conference on connected and automated driving (April 4, 2017)
Usability of 3D Map Common Platform Data (1)

✓ 3D map common platform data (image, point-group, and vector) is input to bottom layer (=high definition digital map) of Dynamic Map.
✓3D map common platform data is usable in various services as shared data:
✓infrastructure maintenance;
✓disaster prevention and mitigation.
The following conducted to confirm usability of 3D map common platform data:

- Investigation/analysis of data specification;
- Prototyping/evaluation of simulations for various use cases.
Example of road management (enquiry processing)

• In response to enquiry, necessary information can be searched to get detailed condition of road marking/feature.
• Information can be easily shared, updated, tabulated, analyzed, etc.

⇒ Improves efficiency and quality of work

3D map Common platform data (image, point group)

⇒ Management of prepared data are improved.

Example of power-related facility management (1)

Point-group data on utility poles, etc. from MMS (example)

Modeling of electrical-pole data (example)

Grasping information on bending of utility poles

- Maintenance work can be conducted efficiently based on information on bending of utility poles.

- Equipment that is unsafe or requires renewal can be identified quickly to improve equipment safety.

Grasping information on ground clearance of crossing cables

- Maintenance work can be conducted efficiently based on information on ground clearance of electrical cables.

- Road-crossing cables and entrance wires with insufficient clearance can be grasped.

Example of power-related facility management (2)

Increase efficiency and quality management of utility poles and wires

Prototyping Simulations (1)

Examination of special purpose vehicles

Management of areas around emergency delivery routes

Information management using plotted data
- Name of pedestrian overpass
- Period of installation
- Inspection results etc.

Confirmation of height of pedestrian overpass

Location and condition

Fig. Photo of local condition

H = approx. 11m

Fig. Point-group data

Prototyping Simulations (2)

Road disaster-prevention inspection

Grasping the quantity of earth and sand in landslide accidents

- Unevenness in the road surface and road slope can be confirmed.
- Slope with a height of up to about 15m can be grasped using a cross-section view.

Prototyping Simulations (3)

Inspection of river levees

Survey of conditions in river channels

Prototyping Simulations (4)

Support for surveys of areas prone to flooding

Confirmed usability of 3D map common platform data in infrastructure maintenance and disaster prevention and mitigation as shared data.

Future Perspective

✓ Infrastructure maintenance
  ✓ To clarify advantages for road authority and facility company
  ✓ To promote use of 3D map common platform data as shared data

✓ Disaster prevention and mitigation
  ✓ 3D map common platform data can be applied in demonstration projects ranging from disaster simulations to full-fledged disaster response

FOT of SIP-adus

✓ FOT Period: autumn 2017 ~ beginning of 2019

✓ FOT Test site
  ✓ Arterial roads in Tokyo
  ✓ 300 km of expressway
  ✓ New test facility for ADS at JARI (Japan Automotive Research Institute)

✓ ADS Level 2 on highway by 2020

Purpose
1. To activate R&D
2. To prove each elemental technology
3. To enhance international cooperation and harmonization
4. To build social acceptance

*Source: Mr. Seigo Kuzumaki, Program Director, SIP-adus, European conference on connected and automated driving (April 4, 2017)
“Dynamic Map” FOT

Dynamic Map FOT is:

- To validate 3D high-resolution digital map data;
- To validate data collection and distribution method;
- To verify the utility of semi dynamic information.

✓ The map data is provided by SIP-adus

*Source: Mr. Seigo Kuzumaki, Program Director, SIP-adus, European conference on connected and automated driving (April 4, 2017)
New Proposal of DI for ADS

✓ PWI 22726 approved in April 2017
  (PWI = Preliminary Work Item)
✓ Title: Dynamic events and map database specifications for applications of ADS, C-ITS, and advanced road/traffic management systems
International Standardization Updates (2)

New Proposal of DI for ADS

✓ To standardize static, semi-static, and semi-dynamic map data elements and their logical data model used in maps for ADS, C-ITS, and advanced road/traffic management systems

✓ Targeting international standard
✓ Publication expected in 2020
International Standardization Updates (3)

New Proposal of DI for ADS
FYR: Full Set of WG3 Work Items (as of June 2017)

under development—in red (with target year); published—in black (with publication year)

NP 17572-4: Lane-level LR (2018); DIS 17572-2: Pre-coded LR (2017)
PWI 22726: Dynamic Events and Map DB Specifications for APs of ADS, C-ITS, and AR/TMS (2020)

Map Center
- Data collection
- Data editing

Service Center

Vehicle ITS Station


Server application

Navi application

C-ITS application

ISO 24099: Navigation Data Delivery (2011)

ISO 17267: API (2009)

ISO 14296: C-ITS (2016)

TS 17931: LDM (2013)

NP/CD 20524-1: Geographic Data Files 5.1 Part 1(2018)
NP 20524-2: Geographic Data Files 5.1 Part 2(2019)

TS 20452: Physical Storage Format (2007)
FYR: DRM Prime Database
Shared database used by public & private organizations

46 supporting bodies.
(as of April 2014)
FYR: Structure of DRM Prime Database

Basic road network data
- Roads of the prefectural level and higher (expressways, national highways, and prefectural highways), other roads at least 5.5 meters in width, etc.

Supplemental road network data
- Roads at least 3.0 meters in width, other than basic roads

Cartographic background data
- Rivers, administrative boundaries, railroads, facilities, place names, etc.

All data
- Combining all basic road data, supplemental road data, and background data
**FYR: Advanced DRM DB (1)**

**Advanced DRM DB**

“Transfer Node” from/to the conventional road map database

**Conventional DRM DB**

Scale 1:2,500 – 1:25,000

Approx. 300m prior to and after an intersection

**Scale 1:500 – 1:1,000**

Precision 25cm – 1m

Stop line

Intersection node with traffic control table

Entrance / exit node

Representative node (Table of traffic regulation)

"Transfer Node" from/to the conventional road map database

Ordinary DRM

Node Link Node Node Node Link

Enhanced DRM

Node Link Node Node Node Link

Stop line

3D Position (x, y, z)

Scale 1:500 – 1:1,000

Precision 25cm – 1m

21st ITS World Congress, Detroit, 7-11 September 2014
The database is compiled into the “DRM Standard Format 21”, which is based on ISO 14825 (Geographic Data Files 5.0).

Engineering drawings from road authorities, including fundamental geospatial data of roads.
Any questions?

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U.S. DOT Automation Program:
Standards Planning for Automation Stakeholder Workshop

July 10, 2017

Kevin Dopart, Steve Sill
ITS Joint Program Office, OST-R
U.S. Department of Transportation
Overview of Automation Standards Roadmap Project and US DOT Automation & Architecture Programs

Agenda

- USDOT Automation Program Overview
- USDOT ITS Architecture and Standards Program Overview
- Standards Planning for Automation Project Overview
  - Outcomes, goals, and key considerations
  - Research tracks, timeline, and key activities
- Goals for Workshop
- AVS2017 Standards Activity Highlights
ITS JPO Automation Program

Technical Research
- Assessing Applications for Improving System Safety
- Developing Impacts Assessment
- Evaluating New Data Collection & Sharing Models

Program and Policy Support
- Strategic Planning and Roadmap Development
- Modal Policy Support and Coordination

Stakeholder Engagement
- Supporting Professional Capacity Building Efforts
- Facilitating International Coordination
- Low-speed Automated Shuttle Information Sharing Working Group
ITS Architecture, Standards and Harmonization (ASH) Programs

- **Program Manager** – Steve Sill

- **Program Description** – *Architecture* provides a framework to guide planning and interoperable deployment of ITS and identifies interfaces for standardization. *Standards* define interfaces within architectures to enable required interoperability and support efficient deployment. *International Harmonization* seeks to leverage global resources and expertise to (1) maximize commonality of ITS deployments, (2) share labor resources and (3) access best-available expertise in order to facilitate ITS deployment and efficient markets.

- **Program 5-year Vision towards strategic priorities** – Enable efficient, interoperable, secure and cost-effective ITS infrastructure, connected vehicle and automated vehicle deployments across North America.
Automation Standards Planning Project: Planned Outcomes

Vision

• Help advance a vision for automation standards needs
• Identify areas where USDOT leadership may be needed to help advance our agenda, for example within standards development organizations:
  • Programmatic leadership
  • Funding options

Roadmap

• Inform the selection and prioritization of technical standardization activity undertaken
• Create an action plan around standards development
Project Goals

Identify time-phased standardization needs for AVs
- For example, performance standards (often proprietary), testing & certification (one-time certification), design standards (HMI, failure modes), software reliability, etc.

Develop a framework to enable analysis
- To inform the selection and prioritization of standardization work, funded by the JPO and other USDOT sources, needed to support the development, testing, and deployment of vehicle automation. (In the form of a roadmap)

Assess impact on existing or planned ITS standards
- Engage with key Standards Development Organizations (SDOs) to understand current baseline of activity

“Standards required to ensure the safe and non-disruptive operation of vehicles on roadways”
Timing of standards development is crucial

- Too soon, it can stifle research; too late, then the opportunity is lost
- Creating a roadmap early will inform Automation Program research

Harmonization also a critical component

- Similarity of goals worldwide
- Allow manufacturers to pursue one-time-certification

New challenges associated with AI

- Complex system of systems with many layers of software
- Testing will likely require extensive monitored real-world and simulated operations

http://www.complex.com/sports/2013/12/25/craziest-russian-dash-cam-gifs/
Project Research Tracks

Technology Areas
- Software
- Systems Engineering
- Communications
- PNT
- Mapping
- Sensing
- Infrastructure
- Human Factors

Standards Areas
- Communications
- Functional / Performance
- Software
- Security
- Design
- Test Target
- Environmental
- Maintenance

Application Issues
Develop list of use cases and consider modal efforts:
- Federal AV Policy
- FHWA CACC Scenarios
- NHTSA Pre-crash Scenarios
- FMVSS review

AV Standards Issues Analysis
Project Timeline and Milestones

- **2016**
  - Establish Landscape
    - Assess AV technology development
    - Survey existing standards activity
    - Ensure consistency with FAVP

- **2017**
  - Stakeholder Engagement
    - Engage public, private, international stakeholders

- **Sept. 2017**
  - Roadmap
    - Identify and prioritize AV standards needed
    - Produce Roadmap for the Automation Program
Stakeholder Engagement Activities

**Spring 2017**
- **Raise Awareness, Establish Key POCs**
  - Raise awareness of project (TRB 2016, AVS 2016)*
  - Establish US DOT modal POCs

**Summer 2017**
- **Targeted Stakeholder Outreach**
  - Conduct stakeholder workshop at AVS2017*
  - Interview modal administrations and share project findings at inter-modal coordination meetings
- **Develop Roadmap**
  - Analyze stakeholder feedback and technology-standards issues
  - Solicit modal administration feedback
  - Develop roadmap and make publicly available*  

*Indicates high relevance to external stakeholders
Prioritization Approach for Roadmap

Step 1: Identify & Organize Issues

From 3 research tracks, identify and define key standards topics. Organize into categories. Outputs include:

- List of standards topics
- List of existing standards and ongoing activities

Step 2: Prioritize standards topics

Assess importance based on criteria:
- Support for implementations
- Timing and necessity
- Safety criticality
- Benefits

Step 3: Standards topics deep dive

For high priority standards:
- Define functionality needed
- Identify maturity of existing standards or ongoing activities
- Identify potential public and private sector activities, roles, and timing

Roadmap
- Needs
- Timing
- Roles

Stakeholder Input
Workshop Goals

▪ What are emerging data standards needs, and which are most important?
  □ implementations they support
  □ timing and necessity
  □ enabling benefits
▪ What functionality is needed from data standards?
▪ What data-related SDO activities and planned activities are relevant?
▪ Where mandatory technical standards are desirable (e.g., providing industry with clarity or certainty that lower risks), and where voluntary standards are more effective?
Discussion/Questions?

Thank You!

www.standards.its.dot.gov
www.its.dot.gov/connected_vehicle/international_research.htm