



Photo Source: USDOT

UNITED STATES – JAPAN – EUROPEAN UNION PROBE DATA

Probe Data Collaborative Research

Probe data supports innovative applications that will improve roadway operations, planning, and maintenance, and keep travelers informed of travel conditions. The private sector has already made significant strides in the capture and use of probe data. The U.S. Department of Transportation (USDOT); the Road Bureau of the Ministry of Land, Infrastructure, Transport and Tourism of Japan (MLIT); and the European Commission (EC) aim to advance the public sector in deploying cooperative systems and in capturing, managing, and using probe data in the management of transportation systems. The EC joined the effort in 2014, and the three regions are building on work completed to date. The Trilateral Probe Data Working Group has:

- Developed a high-level definition of probe data to help define the scope of the project and to identify technologies and systems that deliver these data
- Shared data and research findings, experiences, and lessons learned from development and deployment of probe-data-enabled applications and probe data systems
- Identified applications that may be developed using probe data as defined by the working group.

Probe Data Project Scope

This effort defines probe data as data generated by vehicles about their current position, motion, and time stamp. Probe data may also include additional data elements provided by vehicles, including traction information, brake status, hard braking, flat tire, activation of emergency lights, anti-lock brake status, air bag deployment status, windshield wiper status, and ambient temperature. Vehicle probe data may be generated by devices integrated into the vehicle itself, either as original or aftermarket equipment, or provided by nomadic devices brought into the vehicles, such as smart phones. This effort focuses only on public-sector applications that can be developed using anonymous probe data as defined above.

Comparison of Probe Data

The task force summarized and compared probe data and probe data systems against a common set of characteristics. A strong private sector role in probe data exists in all three regions, and the task force included private-sector probe data and probe data systems in the comparison. However, this effort focuses on public-sector applications of probe data, centered primarily on the data elements defined in the Society of Automotive Engineers (SAE) J2735 Basic Safety and Probe messages in the United States and ITS SPOT data in Japan, and the Cooperative Awareness Message (CAM) in Europe. This comparison was used to better define commonalities for application development in the next phase of the project.

Collaborative Research

The U.S., Japan, and Europe have a long history of sharing information on ITS activities. These efforts include both bilateral and trilateral relationships. International coordination is underway in several areas, including:

1. International Standards
2. Evaluation Tools and Methods
3. Probe Data
4. Automation in Road Transportation.

The Probe Data Working Group includes representation from the USDOT, MLIT, and EC.

Research Outcomes

The Working Group envisions significant benefits through the trilateral probe data collaborative research effort. The expected research outcomes include:

- Promotion of probe data research and development through the mutual exchange of information on advanced approaches to probe data
- Reduced costs for research, development, and testing of applications through shared experiences and collaborative/coordinated research
- Global marketability of products due to consistency and compatibility of data, probe systems, technology, and practices, and harmonization of data standards
- Availability of effective strategies that improve roadway operations, planning, and maintenance; provide better traveler information than currently available; and mitigate negative environmental impacts.

Probe-Data-Enabled Applications

The Trilateral Probe Data Working Group identified 19 probe-data-enabled applications that were classified as high priority. The task force then narrowed this list using prioritization criteria such as near-term deployment readiness, public-sector application, expressway/freeway application relevance, and promotion of international standards harmonization. Three applications were selected for further collaborative research:

- Traffic Management Measures Estimation Application
- Dynamic Speed Harmonization (SPD-HARM) Application
- Enhanced Maintenance Decision Support System Application.

Probe Data Findings

While there are some unique challenges associated with each of the three applications, most of the challenges have been found to apply to multiple applications. The cross-cutting challenges include:

- Security requirements and solutions
- Privacy policies and requirements, including anonymous data collection and voluntary “opt-in” applications and services
- Data ownership and usage, including data rights, licensing, role of open versus proprietary data, and data protection

- Data quality and metadata, including requirements for supporting various applications, quality checking, and metadata to add value and promote reuse of the data
- Information exchange standards
- Device and application certification and compliance testing
- Mobile wireless data communications options
- Acquisition, storage, and distribution of probe data
- Public and private sector roles, including establishing benefits and costs, cost effectiveness, funding models, and public-private data sharing.

Next Steps

The planned next steps for future collaboration on probe data include:

- Examine regional approaches for addressing the identified cross-cutting issues
- Incorporate findings from the U.S. Safety Pilot field trial
- Agree on an international definition for probe data and common performance metrics
- Develop common international methods and techniques for sharing and reusing research data
- Conduct further research on high-priority application challenges.

Speed Harmonization

Dynamic Speed Harmonization application aims to maximize throughput and reduce crashes by harmonizing speeds. Speed Harmonization uses vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications to detect impending congestion and generate target speed recommendations.



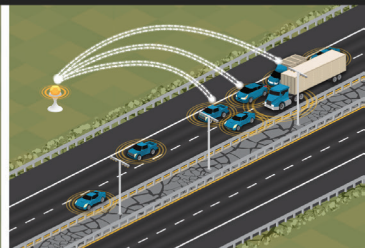
1. Vehicles slowing down due to crash (or at recurrent or non-recurrent congestion locations) broadcast speed, position, etc.



2. Traffic Management Center (TMC) identifies impending congestion from broadcast vehicle data and identifies speed harmonization plan for upstream vehicles



3. TMC sends appropriate target speed recommendations to upstream vehicles via Road-side Unit (RSU)



4. Upstream vehicles implement recommended speeds



U.S. Department of Transportation



National Institute for
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