



US-Japan Collaboration on Probe Data



Ministry of Land, Infrastructure,
Transport and Tourism
Road Bureau



National Institute for
Land and Infrastructure
Management



U.S. Department of Transportation



Overview

- US-Japan ITS Task Force and Objectives
- Probe Data Research Purpose and Outcomes
- Probe Data Definition and Scope
- Comparison of US and Japan Probe Data
- Consolidated Applications
- Next Steps



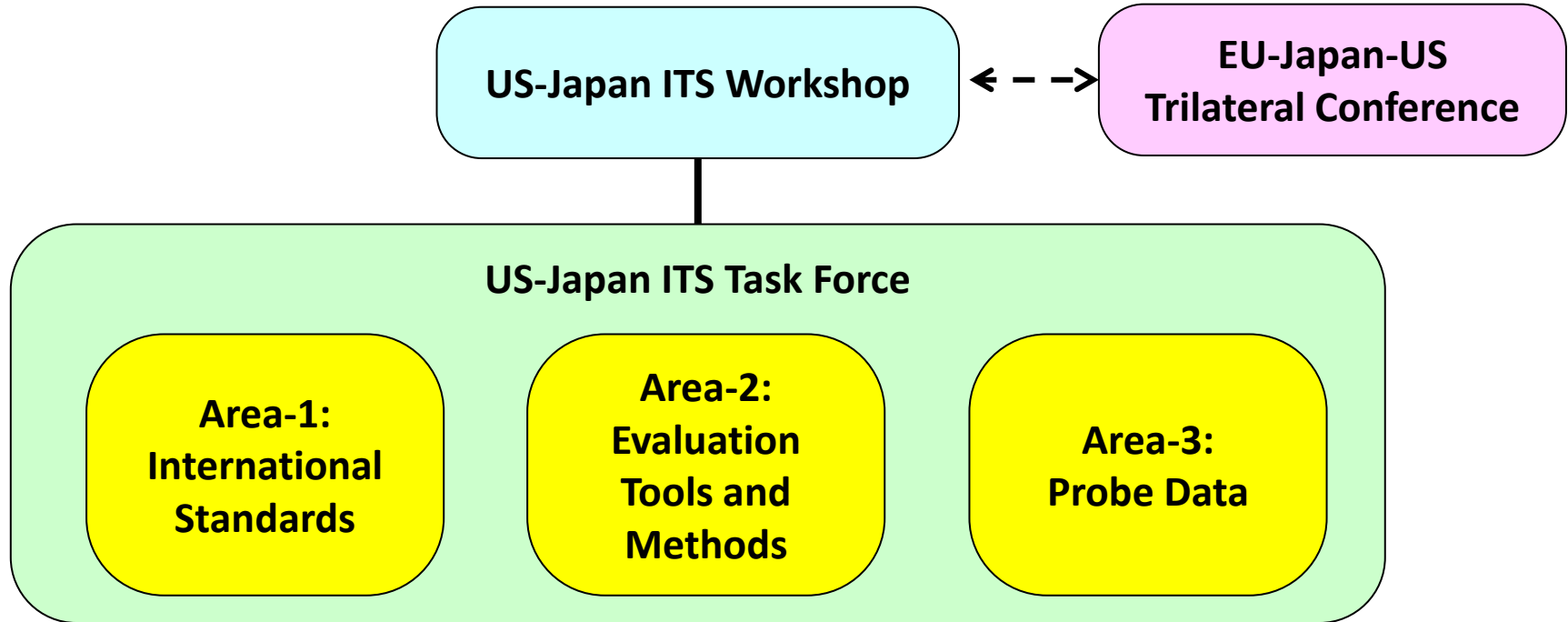
US-Japan ITS Task Force

Goal: Promote collaboration between U.S. Department of Transportation (USDOT) and Road Bureau of Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) in Intelligent Transportation Systems (ITS)

- Memorandum of Cooperation signed to enhance bi-lateral cooperation and further the development and implementation of global ITS activities for safer, more energy-efficient and environmentally-friendly surface transport



US-Japan ITS Task Force





US-Japan Collaboration Objectives

- Identify research and development areas that would benefit from joint development
- Share information on ongoing research and development projects, estimated benefits, research outcomes, and field demonstration results
- Inform stakeholders involved in the development of cooperative systems about continuing cooperation and progress between the countries and promote active participation and exchange among stakeholders by jointly organizing symposiums, seminars, and meetings
- Support development of global, open standards that ensure interoperability
 - Globally harmonized standards are essential to support and accelerate deployment and adoption of cooperative systems based on ITS technologies



Probe Data Research Purpose

- JOINTLY DEVELOP high-level definition of probe data (from light, transit, and freight vehicles) for purposes of this collaboration and IDENTIFY technologies and systems that deliver these data
- SHARE data and research findings, experiences, and lessons learned from development and deployment of probe-data enabled applications and probe data systems
- JOINTLY IDENTIFY applications that may be developed using probe data as defined by the US-Japan ITS Task Force



Probe Data Research Outcomes

- Promote probe data research and development in both the U.S. and Japan 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
- Expedited or immediate transferability of lessons learned from the Japanese experience in the US and vice versa
- Increased understanding and quantification of prospective benefits of deployments similar to Japan's ITS Spot for sharing with domestic public and private sector partners (e.g., original equipment manufacturers) in the US
- Global marketability of products due to consistency and compatibility of data, probe systems, technology, and practices, and harmonization of data standards
- Sustained global competitiveness for auto manufacturers and device makers
- Availability of effective strategies that improve roadway operations, planning, and maintenance, provide better traveler information than what is currently available, and mitigate negative environmental impacts

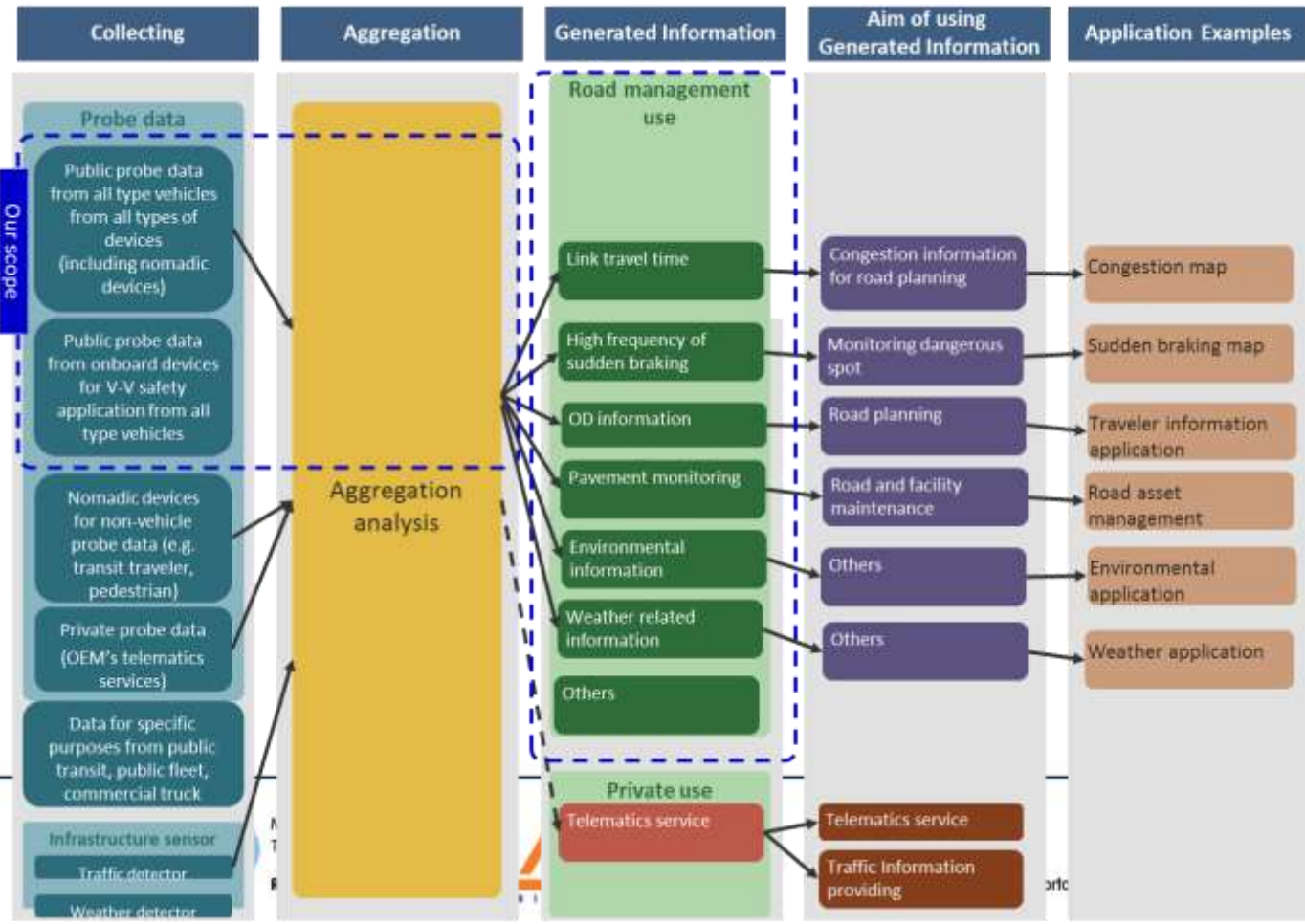


Probe Data Definition

- Defined as data generated by vehicles (light, transit, and freight vehicles)
 - May be generated by devices integrated with vehicles' computers, or nomadic devices brought in to vehicles
- Basic data elements: current position, motion, time stamp
- Additional data elements, if vehicle has the intelligence to detect: traction information, brake status, hard braking, flat tire, activation of emergency lights, anti-lock brake status, air bag deployment status, windshield wiper status
- Does not include data derived outside of the vehicle, even if aggregated from data generated by vehicles
 - E.g., travel times derived from position and motion data are not classified as probe data
- Capable of being transmitted at various frequencies
 - every 10th of second, every 1 minute, whenever a vehicle enters a roadside Dedicated Short Range Communication (DSRC) communication area, whenever an event is triggered
- Capable of being transmitted using a range of wireless communication technologies (e.g., DSRC, cellular, Wi-Fi, WiMAX, etc.)



Probe Data Scope





Comparison of US and Japan Probe Data

Data Elements	US		Japan - ITS Spot
	J2735 BSM Part 1	J2735 Probe Data	
Position (Longitude, Latitude, Elevation)	✓	✓	✓
GPS Position Accuracy	✓	✓	
Speed	✓	✓	✓
Acceleration (Longitudinal, Lateral)	✓	✓	✓
Vehicle Yaw Rate	✓	✓	✓
Heading/Direction	✓	✓	✓
Vehicle Length, Width	✓	✓	
Roadway Type			✓
Time Stamp	✓	✓	✓
Vehicle Subsystem Status (brake, traction control, stability control, ABS, brake boost, auxiliary brake)	✓	✓	

- Data elements are nearly the same, differences relate to the message protocol: data generation frequency, storage, and transmission
- SAE J2735 Probe Data Message includes additional data elements



Applications of Interest to the US

- Mobility Application Bundles:
 - Multi-modal Intelligent Traffic Signal System (M-ISIG)
 - Freight Advanced Traveler Information System (FRATIS)
 - Transit Dynamic Operations (IDTO)
 - Incident Management / Emergency Response (R.E.S.C.U.M.E.)
 - Intelligent Network (Freeway/Arterial) Flow Optimization (INFLO)
 - Traveler Information (EnableATIS)



Applications of Interest to the US (cont.)

- Environmental Transformative Concepts:
 - Eco-Signal Operations
 - Eco-Lanes
 - Dynamic Low Emission Zones
- Road Weather Management Applications:
 - Connected Vehicle Information for the Everyday Driver
 - Connected Vehicle Information for Freight-haulers and Truckers
 - Connected Vehicle Information for Emergency Medical Services (EMS)
 - Connected Vehicle Information for Road Maintenance Community



Applications of Interest to Japan

- Applications Making Use of Probe Data in Road Administration
 - Advanced travel speed survey
 - Determining road traffic conditions (zone travel time)
 - Quantification of effects in post evaluation (reduction of travel time, etc.)
 - Support for confirming passability (impassable zones)
- Current Research
 - Identifying potential accident-prone locations
 - Determining route data (origin-destination data)
 - Determining detour routes



Applications of Interest to Japan (cont.)

- Possibilities for the Future Research
 - Advanced congestion length survey
 - Advanced origin-destination survey
 - Identifying congestion-prone locations
 - Determining traffic conditions on community roads
 - Support for detection of obstacles or stopped vehicles on roads
 - Support for monitoring passage of special vehicles and vehicles loaded with hazardous substances
 - Determining vehicle passage during snowfall
 - Determining road surface freezing
 - Diagnosis of pavement deterioration, inspection of auxiliary structures, and investigation of road surface deterioration and subsidence, etc.
 - More detailed congestion information



Consolidated List of Applications

ID	Application	US	Japan
1	Estimate traffic management measures (e.g., travel time, speed, delay)	✓	✓
2	Identify bottleneck locations	✓	✓
3	Identify accident-prone locations		✓
4	Determine road closures/detour routes (at the time of disaster)		✓
5	Detect stopped vehicles or obstacles on the roads	✓	✓
6	Identify duration of congestion	✓	✓
7	Determine pavement traction conditions	✓	✓
8	Identify HazMat vehicles		✓
9	Incident management/Emergency response	✓	
10	Route guidance	✓	



Consolidated List of Applications (cont.)

ID	Application	US	Japan
11	Traveler information	✓	
12	Intelligent signal systems	✓	
13	Freight operations	✓	✓
14	Transit operations	✓	
15	Intelligent network (freeway/arterial) flow optimization	✓	
16	Eco-Signal Operations	✓	
17	Eco-Lanes	✓	
18	Dynamic Low Emissions Zone	✓	
19	Road and infrastructure deterioration diagnosis		✓



Next Steps

- Finalize report by September 2013
 - Assess technical feasibility of applications of interest to both USDOT and MLIT
 - Prioritize applications for further research and development OR deployment
 - Identify need for common probe data formats and need for new or enhanced standards to facilitate interoperability
 - Identify next steps for further collaboration, including joint research demonstration
- Present findings from final report at the ITS World Congress in Tokyo in October 2013
- Encourage international participation in joint research collaboration