THE ITS DATAHUB
SAFETY PILOT MODEL DEPLOYMENT DATA

Photo Source: U.S. DOT

The Safety Pilot Model Deployment (SPMD) program was sponsored by the U.S. Department of Transportation (U.S. DOT) National Highway Traffic Safety Administration, Intelligent Transportation Systems Joint Program Office, Federal Highway Administration, Federal Motor Carrier Safety Administration, and Federal Transit Administration. The SPMD program was a research initiative featuring real- world implementation of connected vehicle safety technologies, applications, and systems in everyday vehicles and multimodal driving conditions. The objectives of the SPMD program were to:

- Demonstrate connected vehicle technologies in a real-world, multimodal environment
- Determine driver acceptance and adoption of vehicle-based safety systems
- Evaluate the feasibility, scalability, security, and interoperability of dedicated short-range communications (DSRC) technology
- Assess options to accelerate safety benefits.

Two months of SPMD data are now available for consumption and use via the ITS DataHub (https://its.dot.gov/data/). The ITS DataHub serves as the U.S. DOT's central repository for connected vehicle data for researchers and application developers. It provides users with the ability to download connected vehicle data and appropriate documentation, create research projects, collaborate with other users, and comment on hosted data sets.

SPMD Program Overview

The SPMD program was a comprehensive data collection effort under real-world conditions, with multimodal traffic and vehicles equipped with vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication devices. These vehicles used DSRC to communicate Basic Safety Messages (BSMs) containing vehicle operation information, such as speed, location, and direction, at a frequency of 10 messages per second.

The SPMD was held in Ann Arbor, Michigan (see Figure 1), starting in August 2012. The deployment covered over 73 lane-miles and included approximately 3,000 onboard vehicle equipment and 30 roadside equipment (RSE). A majority of the RSEs were placed at signalized intersections, while others were strategically installed to support other applications such as curve speed warnings. The vehicles were equipped with one of the following four types of devices to enable V2V and V2I communications:

1. Integrated safety devices (67 vehicles)
2. Aftermarket safety devices (300 vehicles)
3. Retrofit safety devices (19 vehicles)
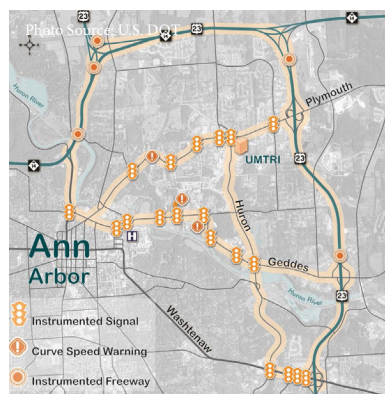4. Vehicle awareness devices (2,450 vehicles).

Figure 1. Safety Pilot Model Deployment Site Plan, Ann Arbor, MI

Safety Pilot Data Available on the ITS DataHub

The ITS DataHub houses two months of data from the SPMD program. The SPMD data sets contain sanitized mobility data elements collected from about 3,000 vehicles, equipped withconnected vehicle technologies, traversing Ann Arbor, Michigan. These hyper-frequent, hyper- local naturalistic driving data will be a valuable resource for researchers and application developers to support the development of the next generation of transportation solutions.

The six SPMD data sets located on the ITS DataHub include:

- The DAS1 data set contains four text-based data files from vehicles equipped by the University of Michigan Transportation Research Institute (UMTRI), providing vehicle kinematic and geospatial information and trip summaries.
- The DAS2 data set contains three text-based vehicle operation data files from vehicles equipped by the Crash Avoidance Metrics Partnership (CAMP), providing similar data to the DAS1 data set.
- The BSM data set contains 15 files, each containing vehicle attributes (e.g., location, speed, and heading), in addition to a file with other attributes (e.g., brake application, status of wipers).
- The RSE data set contains 13 files of messages transmitted or received by RSEs, including BSMs, signal phase and timing (SPaT) messages, and traveler information messages (TIMs).
- The weather data set consists of corresponding weather information from the National Oceanic and Atmospheric Administration's National Climatic Data Center.
- The network data set consists of two CSV files that contain traffic count data from Ann Arbor.

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Many vehicles were equipped with additional data acquisition systems (DAS) with internal logging capability, and some DAS logged video data (both internal and external to the vehicle) and audio recordings (primarily of safety alerts and warnings).

SPMD Data Available in the ITS DataHub

The SPMD data available are the text-based (non-video, non- audio) data. These data are accompanied by a downloadable data dictionary and metadata document that provides information to support its use. The ITS DataHub SPMD data environment includes six data sets:

- Two driving data sets, consisting of data acquired using two types of DAS—DAS1 and DAS2
- One BSM data set, consisting of data generated by equipped vehicles
- One RSE data set, consisting of BSMs received by RSEs and signal timing and curve speed warning messages transmitted by RSEs
- One weather data set, consisting of weather information for the time periods corresponding to data collection.
- One network data set containing traffic count data from Ann Arbor.

Each data set includes multiple data files. For instance, the BSM data set includes 15 files with information such as vehicle position and speed, brake system data, and summaries for each completed trip.

To protect the SPMD participants' identities, all the data elements that included personally identifiable information were removed. Data elements that could be paired with other publicly available data were also deleted. Additionally, since vehicle trajectories could potentially reveal the identity of participants, a sanitization algorithm was developed to truncate these trajectories to mask trip origins and destinations.

Value of the SPMD Data Collection

The collected data has significant research value by providing connected vehicle information that is hyper-frequent and hyper-local. It contains contextual mobility and environmental data to further describe the conditions under which these data were collected, including traffic flow information, traffic signal operation, and weather. Some examples of research topics that could use this data include:

- Uncovering safety hot spots in Ann Arbor
- Developing algorithms to estimate travel time throughout the Ann Arbor region
- Evaluating vehicle performance with lane-level precision.

These data will support continued advancements in the connected vehicle domain, as well as the development of applications to improve transportation operation and maintenance.

Data Graph Tool for SPMD Data

ITS DataHub includes the Data Graph tool as an alternative method to view the data and select subsets of the SPMD data environment. Graph nodes present the number of records and the volume of data by hour for each day. Registered users are able to add data subset files corresponding to selected graph nodes to their download cart. A new download process eliminates waiting for a custom download; a link is emailed to the user when the data file has been produced and is ready to send.
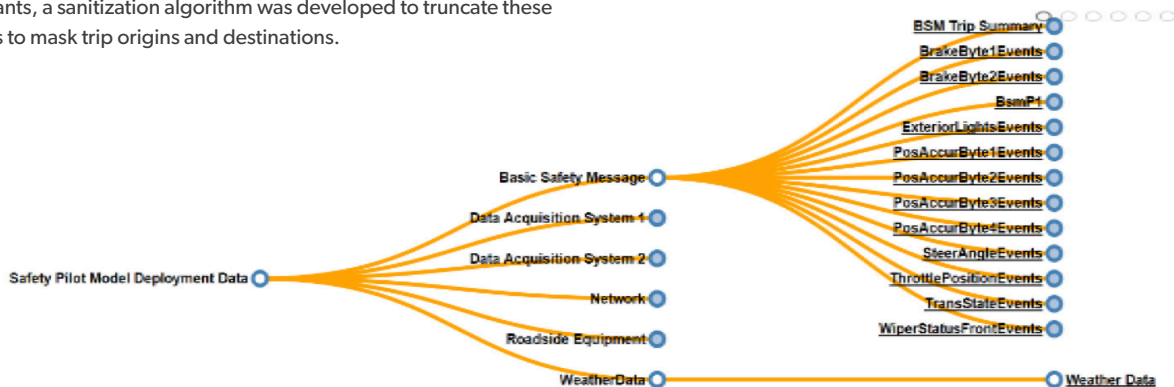

Figure 2. Data Graph Tool for SPMD Data

For more information, visit
https://www.its.dot.gov/research_areas/data_access/index.htm

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