



## ITS Archived Data User Service (ADUS) Safety Applications

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The Federal Highway Administration (FHWA) is currently sponsoring projects aimed at determining how data collected by the deployed Intelligent Transportation Systems (ITS) infrastructure can be used to improve safety on the nation's roadways. These research and development efforts include assessing the potential usage of ITS technologies to support innovative real-time ITS safety measures, developing "Safety Level" analysis methodologies that can quantify the roadway/facility hazardous conditions in real-time, and developing Archived Data User Service (ADUS) elements for safety oriented applications. The main objective of this project, which is part of the last group, was to provide to FHWA an overall evaluation of the progress being made on the development of the ITS ADUS standards, as well as to report on ITS data archiving-related projects and their impacts on safety applications.



### Methodology

In an attempt to understand how evolving standards and guidelines may

potentially affect current and future safety applications, this research reviewed the current state-of-the-art safety methodologies, focusing on the type of data required to develop such applications.

In general, these studies have as an objective, the real-time assessment of the likelihood of a crash occurring on a given segment of a freeway. Their methodologies take as input, real-time traffic information collected through roadside sensors, as well as other types of information. They produce traffic-related hazardous condition assessments, and attempt to reduce their impact by, for example, changing the speed limit on that segment of roadway. However, the development and testing of these applications rely on archived data, particularly traffic condition information, crash data, weather information, and roadway geometric characteristics. Therefore, the applications reviewed in the course of this research provide guidelines on what type of data, and at which spatial and temporal resolution, is needed to develop real-time safety models and applications. In the most demanding case, that data needs to be archived with a resolution of at least 20 seconds, for at least 30 minutes previous to a crash occurrence, not only for the day in which the crash occurs, but also for the same day of the week when no incident occurs, and for sensors upstream and downstream of the crash site.

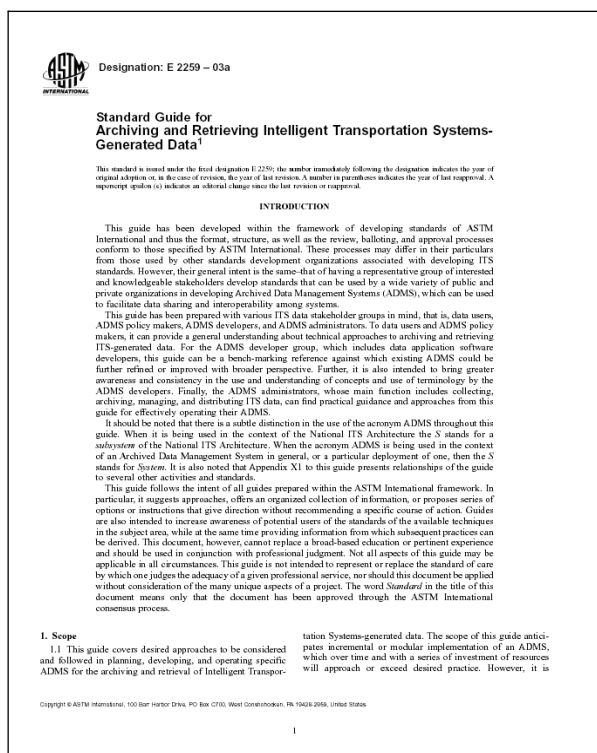
### Standards Development

The National ITS Architecture provides general guidelines regarding Archived

Data and other user services. The implementation of these services, however, requires normative procedures and specific guiding principles to assure compatibility and interoperability, which are usually achieved through the use of standards. In the case of ADUS, the development of the standards was assigned to the ASTM ADUS Subcommittee (ASTM E17.54) under the ASTM Committee on Vehicle - Pavement Systems (ASTM E17). As of July 2005, the ADUS Subcommittee has published one guideline –*the Standard Guide for Archiving and Retrieving Intelligent Transportation System-Generated Data* (ASTM E2259-03a)– and is working on two other standards –*the Standard Practice for Metadata to Support Archived Data Management Systems* and the *Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data*.

at the finest granularity provided by the sensors to make possible the calculation of the variability, and averages, of traffic parameters used as crash precursors during time intervals centered on the time of the crash. This fine resolution also permits in some cases (e.g., freeways) to determine the time of crash through the use of traffic flow theory methodologies.

- *Archive raw sensor data for at least a minimum period of time.* The raw sensor data should be archived for a minimal time allowing the collection of statistically significant safety data information. The development of safety applications requires the knowledge of traffic conditions at the location of a crash not only around the time of its occurrence, but also on the same day of the week, and at the same time of day when there were no accidents at that location. This requires a minimum archiving time that could extend for at least several months.
- *Archive spatial distribution of traffic information.* As in the case of temporal distribution of the traffic information, its spatial distribution also plays a key role in the development of safety applications, especially those geared towards real-time hazardous condition identification. Spatial distribution of the traffic information along the direction of travel allows the determination of this space-related variability of traffic parameters (e.g., speed differentials between consecutive detector stations) which are used by many safety applications as crash predictors.
- *Add provisions to archive new traffic parameters.* The standards should be able to archive new traffic parameters, such as travel time generated from pseudo probe-vehicles. The latest development of real-time safety applications was only possible due to the recent availability of high resolution (temporally and spatially) traffic parameters such as speed, volume, and density. New technologies (e.g., license-plate readers, new generation of inductive detectors, and the US DOT Vehicle-Infrastructure Integration initiative, VII) are being, or will be, deployed that supply other types of traffic information (e.g., travel time). In the past, these data were either not available or not very accurate. This type of information, once it becomes readily available, would play a very important role in the development of new safety applications.



## Recommendations

Based on the lessons learned from the review of state-of-the-art safety applications, and taking into account the current status of the ADUS standards, particularly the traffic monitoring standard, ORNL made several recommendations aimed at making this standard compatible with the development of future safety methodologies and applications. Those recommendations include:

- *Archive data at the finest possible resolution.* Traffic monitoring data should to be archived

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