

## **ITS Standards Acquire A New Mission: Transitioning the ITS Standards Program to align with the USDOT's New ITS Research Initiatives**

After twelve years of research and technology transfer to the transportation community, Intelligent Transportation Systems (ITS) have emerged as a viable solution for addressing our nation's most vexing transportation problems. ITS offers state and local transportation agencies advanced technology measures to reduce traffic congestion, increase mobility, and increase roadway safety without having to spend large sums of money on new transportation infrastructure.

ITS standards have paralleled the development and deployment of ITS technologies and systems, providing state and local agencies a strategy and the means to tightly integrate their ITS devices. This standards-based integration helps to facilitate the exchange of transportation data as well as more easily accommodating equipment replacements, system upgrades, and system expansions.

Recently, the U.S. Department of Transportation's (USDOT) Intelligent Transportation Systems (ITS) program went through a significant restructuring to better reflect an ongoing recognition of the potential of ITS technologies to enhance the operation of America's transportation systems. The USDOT conducted a comprehensive review of the ITS program to determine its future direction and focus. As part of this review, the USDOT adopted a list of criteria it used to evaluate possible new initiatives. The criteria included an emphasis on identifiable outcomes, performance schedules, private sector partnerships and return on investment. Upon completion of the review, the USDOT chose nine major initiatives to comprise the centerpiece of the ITS

### **Initiatives**

- Integrated Corridor Management Systems
- Emergency Transportation Operations
- Clarus - Nationwide Surface Transportation Weather Observation System
- Vehicle Infrastructure Integration
- Universal Electronic Freight Manifest
- Integrated Vehicle Based Safety Systems
- Cooperative Intersection Collision Avoidance Systems
- Next Generation 9-1-1
- Mobility Services for All Americans

A description of the Initiatives program and each Initiative is found at [www.its.dot.gov/initiatives/initiatives.htm](http://www.its.dot.gov/initiatives/initiatives.htm).

program. These new initiatives were announced by Emil Frankel, Assistant Secretary of Transportation for Transportation Policy and Director of Intermodalism, at the 2004 ITS America Annual Meeting. This new generation of initiatives is aimed at improving transportation safety, relieving congestion and enhancing productivity. Toward the goal of defining major research projects that have a large impact enhancing transportation systems in the nation, these initiatives provide a means to introduce ITS standards to the user community. An opportunity is planned to test and implement ITS standards as part of the initiatives.

This article will describe the history and continuing importance of ITS standards, the partnerships that have made accomplishments to date possible, the transition that is refocusing how the ITS Standards Program supports USDOT's vision, and the commitment to the future of ITS standards development and deployment being made by USDOT.

## I. History of the ITS Standards Program

The USDOT initiated the ITS Standards Program in 1996 in response to a mandate in 1991's Intermodal Surface Transportation Equity Act (ISTEA), which stated:

*Standards – The Secretary shall develop and implement standards and protocols to promote the widespread use and evaluation of intelligent vehicle-highway systems technology as a component of the Nation's surface transportation systems. To the extent practicable, such standards and protocols shall promote compatibility among intelligent vehicle-highway systems technologies implemented throughout the States. In carrying out this subsection, the Secretary may use the services of such existing standards-setting organizations as the Secretary determines appropriate. (Section 6053(b))*

In 1998, this mandate was also included in the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21), recognizing the importance of ITS standards for implementing regional and project level ITS architectures.

### *ITS Standards are Defined*

In 1996, a variety of stakeholders (representatives of Standard Development Organizations (SDOs), employees of state and local agencies, industry experts, and members of the National ITS Architecture Team) convened to identify each ITS element for which a standard should be developed. One of their sources was the Standards Requirements Document developed by the Architecture Team as part of the National ITS Architecture. Initially, 80 standards were identified. With the growth in the National ITS Architecture, a total of 118 standards have been identified to support the communications interfaces of the National ITS Architecture.

ITS standards are used at the intersection between both similar and different types of ITS devices and components. The standards define how the components exchange information and work together to deliver the user services desired by state and local agencies from their defined systems. In 2000, an evaluation from the Transportation Research Board characterized what the combination of a regional ITS architecture and ITS standards achieve for an area:

*The architecture portrays the [envisioned and agreed upon] transportation system as sets of interconnected elements — [transportation management] centers, roadside devices, vehicles, and travelers. Data move through this web of interconnected elements; are analyzed and interpreted; and are acted upon to*

### **What Is an ITS Standard?**

ITS standards are communication protocols that define how ITS technologies, products, and components interconnect and interact within a transportation network. *ITS standards are not design standards; rather, they are open interface standards that establish communication rules for how ITS devices perform, how they connect, and how they exchange data.* The traveling public can benefit from ITS standards through products that will function consistently and reliably anywhere in the country. Agencies benefit through more competitive vendor relationships, leading to lower product costs. ITS standards also promote the creation of an innovative and competitive market for transportation services and products.

*control traffic flows, collect tolls, route emergency vehicles, report road and track conditions, and the like.*

Standards allow the “interconnections” to be open to all of the elements — open to any device, vehicle, center, or traveler to connect to and receive or transmit data to any other element in the system. Standards also define how the data is formatted so they are unambiguously recognized by all the other elements in the system.

### ***A Process for Developing ITS Standards is Established***

ITS standards go through an established and widely-used standards development process. Draft standards must be developed, the drafts must be balloted and amended as appropriate, and approved standards must be published. Once published, time is needed for the market to adopt standards. Manufacturers must incorporate the standards into the devices and systems and make the technology available; and users must be sufficiently comfortable with the standards to deploy standards-based devices and systems.

The process used to develop standards is a methodical series of steps, each involving discussion and consensus-building by a varied group of technical experts and hands-on deployers. This deliberate pace is necessary for the development of high-quality technical and functional standards, and has been in place for years preceding the development of ITS.

### ***A Partnership Is Created***

From its inception in 1996 to the present, the ITS Standards Program has had a primary focus on the development of *open, non-proprietary* communication standards and protocols that facilitate the integration of ITS devices and networks. To accomplish this challenging mission, the ITS Standards Program has collaborated with seven national SDOs to coordinate and accelerate the development of ITS Standards. Collaborating allows the ITS Standards Program to tap into existing standards development processes, thus eliminating the need to create new procedures. Collaborating also facilitates the engagement of industry experts who help inform the technical discussion of volunteer committees, of consultants who capture the working group’s intent when writing the standard, and of public sector transportation professionals who bring an invaluable perspective on real-world ITS implementations.

To create partnerships with the SDOs, the ITS Standards Program established cooperative agreements for the development of ITS standards and for the coordination of development activities across the SDOs. In addition to standards development, the SDOs have played an important role in helping to promote the use of standards, among both manufacturers and deployers. They provide an

#### **Standards Development Organizations**

- American Association of State Highway and Transportation Officials (AASHTO)
- American Public Transportation Association (APTA)
- American Society for Testing and Materials (ASTM)
- Institute of Electrical and Electronics Engineers (IEEE)
- Institute of Transportation Engineers (ITE)
- National Electrical Manufacturers Association (NEMA)
- Society of Automotive Engineers (SAE)

important network for the distribution of ITS standards information to state and local agencies and transportation professionals around the nation.

### ***The Current Program Achieves a Level of Success***

Standards vary in complexity and in the ease with which industry consensus can be reached. As of January 2005, nearly 75 standards have been published, with another 43 in various stages of the development process. In addition, updated versions of several published standards are also being developed.

From 1996 until 2002, the focus of the ITS Standards Program was to identify and develop ITS standards. In 2002, the program expanded its focus to include deployment activities as the program reached an important milestone. Enough standards had been developed to allow for the completion of the first application area of standards, dynamic message signs (DMS). The necessary suite of standards and protocols that apply to how message signs send and receive information, and structure the information were completed. This entire suite of DMS-related standards could now be used by manufacturers for device development and by deployers to create interoperable DMS systems. The necessary standards for environmental sensor stations (ESS) have also been developed, creating a second complete suite for standards-based deployment.

With these accomplishments, the ITS Standards Program has transitioned from a program that facilitates standards development to one that is fully supporting USDOT's efforts to increase ITS deployments. The ITS Standards Program increased its emphasis on deployment of standards-based applications, while continuing its work on standards development. The USDOT field offices play an important role in delivering standards deployment. Field office representatives provide technical assistance to state and local agencies by working day-to-day with the end user community. The representatives assist in making users aware of benefits and cost, they review ITS project details and provide technical assistance as needed. Additional programmatic elements designed to assist deployers have also been developed:

- Development of a comprehensive training and education program with training courses and application workshops to help deployers apply ITS standards. In 2003, approximately 1,100 individuals attended 81 classes around the Nation.
- Establishment of a standards technical assistance program for deployers and for procurement support known as the USDOT Field Support Team.
- Design and development of the *Spec Wizard*, an important tool for deployers in creating procurement specifications for DMS, ESS and Actuated Traffic Signal Controller applications.
- A series of *Standards Advisories* to keep deployers, manufacturers, standards developers, and the transportation community up-to-date on the development and use of the ITS standards. ([www.standards.its.dot.gov](http://www.standards.its.dot.gov))

- A website that houses the majority of ITS standards resources for easy access and easy updates.

As requirements for regional and jurisdictional cooperation continue to expand to address high impact transportation issues such as security, large event coordination, evacuations, everyday congestion, and safety, the importance of integrating ITS through open ITS standards becomes paramount.

## **II. ITS Standards Program in Transition**

Building on the success of the past eight years, further work in both development and deployment of ITS standards is required. Presently, the ITS Standards Program faces a new challenge — how to align these important activities with USDOT’s new ITS research initiatives.

### ***Laying a Strategic Foundation for the Future***

In Fall 2003, a planning group comprised of standards developers and users assembled to discuss the strategic direction of the ITS Standards Program, in much the same way experts gathered in 1996 to lay the foundation for the ITS Standards Program. This planning group was comprised of professionals from both the public and private sector and was representative of the wide breadth of transportation professionals dedicated to creating interoperable ITS systems.<sup>1</sup>

The purpose of the group’s convening was to prioritize the continued work and investment in ITS standards and to identify activities that would further the development of the standards and increase their use in real-world deployments. Using the vision of moving toward increased deployment, the group constructed a strategic direction within 90 days, encapsulated in a draft document for use by the SDOs and the ITS Standards Program.

### ***Linking the ITS Standards Program Direction to the New Research Initiatives***

The outcomes of the strategic planning effort have created an important foundation for use in the planning and design of the new research initiatives in that:

- The grouping and prioritization of the standards facilitates the design for how the various standards can and will support the new research initiatives. The program plans for the major initiatives will incorporate the various activities related to these supporting standards.
- One outcome, a recommendation of process and procedure improvements that would streamline the development process, will be of critical importance in 2005 as many of the prioritized ITS standards need to be completed to support of the new initiatives.

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<sup>1</sup> It is important to note that participants in this planning group had been involved primarily in the development of a category of standards known as National Transportation Communications for ITS Protocols (NTCIP). These standards apply to transportation devices such as traffic signals, variable message signs, or transportation management centers.

- These streamlined processes also provide a way for the ITS Standards Program to ensure that any new standards beyond 2004 will be developed and delivered in an efficient and cost-effective manner.
- The identification of lifecycle resources, from development to deployment, was critical to the design of the initiatives. It meant that in designing the initiatives, the investments in resources were identified from a lifecycle perspective, thereby ensuring the inclusion of standards development, technical support, testing, tools, documentation, training, SDO management, vendor support, and program costs.

### ***The Deployment of ITS Standards and the ITS Initiatives***

The initiatives provide the ITS Standards Program with an exciting new opportunity. The initiatives allow the USDOT to demonstrate the value of the inclusion of standards as a part of ITS systems that are solving problems. This level of demonstration will provide deployers with evidence—and a greater level of confidence—of how standards work as part of larger systems and will help mitigate some of the risk in deployment.

Four of the new ITS initiatives will utilize ITS standards as a part of their research and demonstration activities. See the text box below for a high level illustration of their associated ITS standards. As an example, the Clarus initiative will provide a regional demonstration of collecting weather data by implementing the Environmental Sensing Station standard. The use of ITS standards aids in the deployment of nationally interoperable ITS systems and services.

The completion of ITS standards currently under development remains a priority USDOT activity, as the USDOT has now become a customer for many of the prioritized standards starting as early as 2006.

### ***USDOT's Commitment to Crosscutting Standards***

While USDOT's primary focus is on standards that will support the initiatives, it is recognized that there are other ITS standards that have wide applicability across ITS deployments. As a result, the ITS Standards Program has created a small program to fund and monitor the completion of these crosscutting standards. As an example, the National Transportation Communications for ITS Protocol (NTCIP), a joint standards project of AASHTO, NEMA and ITE, is completing several communication profile standards in support of ITS deployments. In addition, ASTM is completing two standard specifications, one for metadata content for ITS generated data and a second for archiving ITS related traffic monitoring data. These and other crosscutting standards will continue to receive USDOT support as these standards remain important to deployers around the nation.

**Summary: ITS Standards in Support of the ITS Initiatives**

**Initiative:** **Integrated Corridor Management**  
**Standards:** Traffic Management Systems Standards  
Center-to-Center Communications Standards  
Advanced Traveler Information Systems Standards  
ITS Field Device Standards  
Transit Communication Interface Protocols (TCIP) Dialogues  
National Transportation Communications for ITS Protocols (NTCIP) Profiles

**Initiative:** **Emergency Transportation Operations**  
**Standards:** Incident Management Standards  
Center-to-Center Communications Standards  
Advanced Traveler Information Systems Standards  
NTCIP Transportation Sensor System Standard  
NTCIP Profiles

**Initiative:** **Clarus—Nationwide Surface Transportation Weather Observing & Forecasting System**  
**Standards:** Environmental Sensing Station Standards  
Center-to-Center Communications Standards  
Advanced Traveler Information Standards  
Dedicated Short Range Communications Standards  
NTCIP Profiles

**Initiative:** **Vehicle Infrastructure Integration**  
**Standards:** Dedicated Short Range Communications Standards

### III. Moving Forward in Support of the ITS Vision

As the new research initiatives move from concept to implementation, USDOT is concerned with how the broader transportation community understands the transition of the ITS Standards Program. There are some important points to make:

***The USDOT is committed to ITS.*** Some initial reaction from the transportation community reflected a concern that this transition was an end to the program — *it is not*. It is a renewed commitment by USDOT to build upon the accomplishments of the past eight years. It is expected that these new initiatives will result in an increase in state and local agencies around the nation deploying ITS, and an increase in the use of ITS to solve transportation problems.

***Standards can play a critical role in the initiatives' success.*** The success of many of the 2004 initiatives is dependent on deployment of diverse transportation systems that are integrated and have the ability to share data and information. All along, facilitating systems integration to promote data sharing and communications has been the focus of the ITS Standards Program. As USDOT is committed to the success of the initiatives, it is also committed to the goal of incorporating relevant standards into the initiatives.

***The SDO partnership remains a critical piece of the future success of ITS standards.*** The role of the SDO partners remains a critical aspect to meeting the goals of the initiatives. It has been a mutually beneficial partnership to date. The SDOs are a key component in helping to identify deployers' needs that are not being addressed by the ITS Standards Program and to advise accordingly. SDOs also act in the important role of liaison with industry – both to assess the industry perspective as well as to access the necessary expertise during the standards development process. Importantly, having industry representatives as participants in the standards development process results in more robust standards. Additionally, experience has shown that having a broad representation of users and industry representatives tends to result in a more widespread and quicker adoption of standards.

As the ITS program has evolved the role of the SDOs has also evolved. While still involved in standards development, their role has expanded to include standards maintenance, outreach, education and training regarding the use of ITS standards.

***The 2004 initiatives require current standards, but others may be needed.*** New initiatives beyond 2004 may give rise to the need for new standards. As the initiatives are in their formative stage, it is anticipated that the standards currently developed are satisfactory in terms of functionality. However, that may change, at which point the Initiative leaders and the ITS Standards Program Manager will work together to identify needed standards. As in the past, technology advancement requires that the ITS Standards Program remain vigilant about meeting the evolving needs of the transportation community.

***The USDOT will continue supporting international standards.*** The USDOT will continue to support ITS standards-related activities in the international arena through participation in the International Organization for Standardization (ISO) and the Asia-Pacific Economic Cooperation (APEC).

USDOT's ITS Joint Program Office has been involved in the activities of ISO Technical Committee 204 (ITS), also known as TC204, since that committee's inception in 1992. During the lifetime of TC204, USDOT has supported the TC204 Secretariat as the administrative "infrastructure" of TC204, with the expectation that the private sector would build on this foundation and participate in the specific technical activities of the working groups. Of the 12 active working groups where standards development work is performed, USDOT has supported technical activities in six of these working groups. The USDOT participates in selected areas because the U.S. benefits from the technical contributions made by other countries and because common international standards can promote trade by eliminating technical barriers.

Established in 1989, APEC is the primary regional vehicle for promoting open trade and practical economic growth. APEC Working Groups are made up of experts from each APEC Member Economy and work in specific sectors (e.g. Transportation) as directed by APEC economic leaders, ministers, and senior officials. As one of 11 working groups under APEC, the Transportation Working Group (TPTWG) aims to achieve liberalization of transportation services and works to enhance the safety of APEC transport systems in order to encourage economic development in the Asia-Pacific region. The TPTWG fosters economic development in the Asia-Pacific region through recommendations to increase efficiency, sustainability and safety of the regional transportation system. The ITS Experts Group is the TPTWG's focal point for ITS. As directed in a joint statement from the 2002 Ministerial Meeting, the ITS Experts Group's Action Plan addresses ITS interoperability and standards requirements. As stated in the Action Plan, the goal of the ITS Expert Group is to save lives, time, money and the environment through the realization of intelligent transport systems.

***The ultimate goal remains the same.*** The USDOT has expended considerable resources to facilitate the development and deployment of ITS standards in order to provide a test bed to prove the standards, and provide insight to enhance the standards' content, quality, and development process. This action is consistent with the government's undertaking of the risks and challenges that are beyond the capacity of state and local governments, or the private sector. The USDOT understands that ultimately, if standards are well received by the user community, market forces have an opportunity to play a major role in the evolution and maintenance of standards. Thus, the ITS Standards Program remains in place as part of the USDOT's ITS program to ensure that the original goals of development and deployment of integrated ITS solutions throughout the nation are met.

For additional information with respect to the ITS Standards Program contact the Program Manager, Lee Simmons, at 202-366-8048 or [Lee.Simmons@fhwa.dot.gov](mailto:Lee.Simmons@fhwa.dot.gov). For additional information with respect to ITS standards deployment, contact Tom Stout at 202-366-6054 or [Tom.Stout@fhwa.dot.gov](mailto:Tom.Stout@fhwa.dot.gov).