



U.S. Department of Transportation
ITS Joint Program Office



ITS Standards Program 2002 Update

 **ITS 02**





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In 1998, Congress passed the Transportation Equity Act for the 21st Century (TEA-21) authorizing Federal surface transportation programs for highways, highway safety, and transit for 1998-2003. Included in TEA-21 is the Intelligent Transportation Systems (ITS) Program, the Federal program that supports research, development, and operational testing of ITS.



Section 5206 of TEA-21 mandates that the U.S. Department of Transportation (U.S. DOT) “develop, implement, and maintain a National Architecture and **supporting standards and protocols** to promote the widespread use of ITS technology, ensuring interoperability and efficiency to the maximum extent practicable.”



The ITS Standards Program was created to oversee the development of these standards and to encourage their widespread use among state and local public agencies as the National ITS Architecture is deployed in the coming years.



The United States Government does not endorse products or manufacturers. Trade or manufacturers’ names appear within only because they are considered essential to the objectives of this document.

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OVERVIEW

The ITS Standards Program was established to accelerate the development of standards for ITS equipment and devices. The objective was to bring greater interoperability and efficiency—across mode and across jurisdiction—to our surface transportation systems. Over the past six years, the Program has overseen the development of dozens of ITS standards and is now focusing on activities to increase standards-based ITS deployments at the state and local levels.

This *Program Update* summarizes the ITS Standards Program's accomplishments and progress over the past 36 months, with emphasis on activities in the 2002 time frame. The report includes:

- an overview explaining why the U.S. DOT is promoting the use of ITS standards,
- background on the ITS Standards Program and its major activity areas,
- highlights of the Program's key accomplishments, and
- a discussion of key activities planned for the upcoming fiscal year.

This report is available on the ITS Standards Web site at www.its-standards.net and the U.S. DOT's ITS Electronic Document Library (ITS EDL) at www.its.dot.gov/litsweb/welcome.htm. Instructions on how to obtain a hard copy of this report are available on the ITS Standards Web site.

Using ITS to Improve Transportation: Doing More with the Same

Transportation agencies across the country today face a common challenge: How can they do *more* with the *same*? How can agencies reduce roadway congestion, increase driver and passenger safety, and improve mobility across transportation modes, all without adding costly new infrastructure? Increasingly, agencies are turning to ITS to provide solutions to their most pressing transportation problems.

ITS allows agencies to mount a coordinated approach to managing their transportation systems. By providing real-time

transportation information, ITS helps managers take actions that increase the efficiency of their existing transportation network, in effect, allowing them to do *more* with the *same*.

As ITS becomes more widespread, agencies at all levels are recognizing the value that standards can bring to their ITS deployments. Standards help to maximize ITS investments because they allow devices to share data: in formats that are clearly understood; between ITS devices manufactured by different vendors; across different ITS applications;

and among transportation agencies located in different jurisdictions.

For its part, the ITS Standards Program is coordinating the development of open interface standards for ITS, along with a range of other activities (such as technical assistance, testing, and training) that support an overall effort to incorporate standards into existing and future ITS deployments.

Interoperability: The Primary Objective

The primary objective of the ITS Standards Program is to accelerate the deployment of **interoperable** ITS systems regionally and nationally, particularly those ITS applications that carry significant public benefit. The following example illustrates the importance of **interoperability** to Standards Program objectives:

In a typical office, PCs from multiple manufacturers freely exchange data across a network. PCs talk with one another, as well as with other devices—printers, scanners, and file and email servers—attached to the network.

Networked devices can exchange data with a branch office 3 blocks away or 3,000 miles away. In the networked environment, each device performs a unique function. The functionality of each device, however, is boosted by the ability to exchange data with other devices.

Put another way, it is the ability to exchange and interpret data among many different devices that provides such significant benefits to users along a computer network; the benefit is realized because each device can *interoperate* with other devices along the network. Bringing this level of interoperability to ITS is the primary objective of the Standards Program.

Interoperability in ITS devices will enable transportation agencies from different jurisdictions or different regions to

exchange and interpret transportation data. Interoperability also frees state and local agencies from having to use the same vendor for all their purchases. The only way of achieving such widespread interoperability is to rely on open interface standards—the type being developed and promoted by the ITS Standards Program.

Program Background and Organization

The ITS Standards Program is the U.S. DOT's primary vehicle for encouraging the use of open interface standards in publicly funded ITS deployments. It is an integral part of the DOT's overall effort to build safe, integrated, and interoperable transportation systems. In the six years since its inception, the Standards Program has grown into a robust and multifaceted program and is regarded as a leading source of ITS standards information and activity for both the domestic and international transportation communities.

The Program encompasses five key areas of standards activity: Development, Testing, Deployment, Technical Assistance, and Training and Outreach.

Initially, the Program identified 100 standards that should be given development priority. These standards were either essential for achieving device interoperability or were used in ITS applications

designated as the top priorities necessary to achieve national transportation objectives.

Over the past 24 months, the Program has migrated its focus from standards *development* to standards *deployment*, aggressively building up resources—technical assistance, training, and outreach programs—that help state and local deployers implement standards-based ITS. This evolution is essential, given that standards need to be evaluated in real transportation applications if they are to gain widespread use. By focusing on deployment strategies, the Program is building upon the intensive standards development activities that took place in preceding years.

Five Key Areas of ITS Standards Activity

Development Activities

- Establish cooperative agreements between the Program and standards development organizations (SDOs) to accelerate the development of standards
- Fund technical support for standards development working groups
- Support the participation of representatives from public agencies in the standards development process

Testing Activities

- Measure the operation, correctness, and completeness of ITS standards in realistic transportation settings
- Measure the degree of interoperability of ITS systems
- Provide testing results and information about the performance of standards

Deployment Activities

- Provide tools that help state and local deployers implement standards-based ITS
- Provide platforms that allow state and local deployers to exchange ideas and to discuss standards deployment-related issues

Technical Assistance Activities

- Deliver a comprehensive program of technical assistance to state and local deployers
- Increase the knowledge base of state and local deployers on ITS standards evaluation, procurement, deployment, and maintenance issues

Training and Outreach Activities

- Develop materials and resources that promote the awareness and use of ITS standards
- Offer comprehensive technical training in various ITS standards at locations throughout the country

Highlights of Progress and Accomplishments

The following sections list the ITS Standards Program's accomplishments and progress over the past 18 months, focusing on activities that took place in the past year. Highlights are organized under the

Program's key activity areas: Standards Development, Standards Testing, Standards Deployment, Technical Assistance, and Training and Outreach.



STANDARDS DEVELOPMENT

Through the end of FY2002, the Standards Program completed the initial development of 73 of the top 100 standards identified by the transportation community as priorities for the deployment of key ITS applications. Of the 73 standards, 59 have been published (and are available for purchase) and 14 are in ballot. Of the 14 in ballot, 9 are approved and on their way to being published, and 5 are either being voted on by a committee or working group, or are undergoing other SDO procedures. The remaining standards are expected to be developed over the next 12-24 months.

The development of ITS standards, and advancing their availability for use by industry and by state and local agencies, is a critical Program activity. Standards offer the transportation community a choice between ITS based on proprietary, vendor-specific technologies and ITS based on open, industry-based, consensus standards. While the Program's focus is shifting to developing strategies to get standards deployed, working groups will continue to develop new standards. In fact, several standards working groups have begun to modify and improve some first-generation standards.

Developing Standards for Key Applications

Standards Development Organizations

ITS standards are developed in public-private partnerships between the ITS Standards Program (U.S. DOT) and the following standards development organizations (SDO):

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

Over the past year, the Program has focused on completing and promoting standards for a group of key ITS applications. These key ITS applications are:

- Traffic Signals:
 - Actuated Signal Controller
 - Field Management Stations
 - Advanced Transportation Controller
- Incident Management
- Center-to-Center Traffic Management
- Transit
- Dynamic Message Signs

- Advanced Traveler Information Systems
- Dedicated Short-Range Communications (DSRC) @ 5.9 GHz

These applications, taken collectively, offer a range of ITS services that greatly contribute to the overall safety and security of our nation's surface transportation systems. The use of standards will raise the level of interoperability that can be achieved among these various applications.

Win-Win Technology for Industry and Public Sector

DSRC is a communications approach that allows short-range communications between vehicles and roadside devices for a variety of transportation-related purposes, including intersection collision avoidance, transit or emergency-vehicle signal priority, electronic parking payments, electronic toll collection, and commercial vehicle clearance and safety inspections. DSRC enables roadside-to-vehicle and vehicle-to-vehicle communications at high data transfer rates.

Until recently, DSRC did not have a viable standard. Observers noted that DSRC could support dozens of ITS applications but the lack of a standard limited the market for DSRC-based ITS technologies. The ITS community and the Standards Program is pleased to report significant progress on the development of a DSRC standard.

In June 2002, the working group for DSRC at the 5.9 GHz frequency band approved a standard for the physical layer of the technology, that is, a standard for the electrical, mechanical, and transmission properties of the roadside and in-vehicle system components.

The standard, ASTM E2213-02, *Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems*, extends the IEEE 802.11a technology into DSRC applications. DSRC products based on 802.11a are expected to become available for widespread use in early 2004.

The DSRC standard was developed under the auspices of ASTM International with assistance from the ITS Standards Program. The development process itself was a model of a cooperative public-private collaboration. Dozens of state and local agencies, private companies, and industry consortia (see side bar) worked together to identify user requirements and to write the standard. Within ten months, the DSRC standard was written and ready for user comment.

The DSRC standard is a win-win technology solution for industry and the public sector. It is likely to spur application and product development in one of the most dynamic areas of ITS, while providing the foundation for increased interoperability among ITS devices used in public safety, traveler information, traffic management, and transit applications.

Accomplishments

- The DSRC standard was developed in an open and highly participatory process. Both industry and the public sector were squarely behind the standard.
- The standard can lead to greater levels of interoperability between key ITS applications involving public safety, traffic management, and emergency response.
- The standard benefits industry because companies can now manufacture devices that are compatible with the standards. Public agencies also benefit because they can introduce greater levels of interoperability and coordination to critical transportation functions, such as traffic and incident management, traveler information, and public safety.

DSRC Process Participants

Automakers / OEMs (Original Equipment Manufacturer)

- Daimler-Chrysler
- Delphi
- General Motors
- Visteon

Stakeholder Groups

- Association of American Railroads
- American Association of State Highway and Transportation Officials
- American Public Transportation Association
- Commercial vehicle operations interests
- International Bridge, Tunnel and Turnpike Association
- I-95 Corridor Coalition

Government

- Federal Communications Commission
- Federal Highway Administration
- Federal Railroad Administration
- Federal Transit Administration
- State and local public agencies

Equipment Manufacturers

- 3M
- ARINC
- Mark IV
- Motorola
- Sirit
- Sumitomo
- Texas Instruments
- Transcore

Consortia / Others

- Automotive Manufacturers' Industry-Collaboration
- Institute of Electrical and Electronics Engineers 802.11 Wi-Fi Committee
- Orthogonal Frequency Division Multiplexing Forum
- Wireless Ethernet Compatibility Alliance

A Major Step Forward

"This [the DSRC standard] is a major development and clearly a success story in terms of standards development effort and industry participation."

--Paul Najarian, Director of Telecommunications, ITS America

FTA and APTA Efforts to Raise Standards Awareness

Over the past 36 months, the Federal Transit Administration (FTA) and the American Public Transportation Association (APTA) have partnered to increase industry awareness of transit standards and to spearhead the deployment of Transit Communications Interface Profiles (TCIP) data and message standards. To that end, APTA initiated an assessment of the current set of data and message standards available through the National Transportation Communications for ITS Protocol (NTCIP) and the Institute of Transportation Engineers (ITE). The purpose of the assessment was to determine the types of activities that would help to foster implementation of systems based on these standards.

A report detailing the conclusions of the assessment was issued in July 2002 and included the following recommendations:

- The continued use and deployment of TCIP standards should be encouraged as the preferred industry standards for transit ITS data elements and message sets.
- The next phase of TCIP, which includes the development of dialogs (sequences of messages related to specific functions), offers significant advantages to the transit industry and should continue to be developed.
- Outreach and education activities should continue in close coordination with the APTA TCIP review panel.

TCIP Placed on Secure Deployment Track

Transit Communications Interface Profiles (TCIP) are a consensus-based suite of ITS standards that can help a transit agency exchange data more easily—both between different departments within the transit agency and among regional transportation agencies and traffic management centers. TCIP 1, the initial development phase of TCIP, established the overall technical foundation and framework for the TCIP suite of standards and included the completion of eight data dictionaries for the business areas of transit. The current development phase of TCIP includes the creation of message sets and dialogues.

The development of TCIP standards was sponsored and coordinated by the ITE and funded by the U.S. DOT's ITS Joint Program Office and the FTA. During the past fiscal year, efforts have focused on identifying a path that will lead to TCIP

field deployments. To this end, the FTA has asked APTA to oversee the completion of TCIP dialogues and to work with transit agencies to identify potential early TCIP deployers. APTA, because of its close association with both transit agencies and the transit industry, was considered an appropriate and effective forum for developing and deploying TCIP.

Accomplishments

- The TCIP suite of standards is maturing and will soon be a viable technical option for transit agencies wishing to deploy open, standards-based ITS. The designation of APTA as the coordinating force behind TCIP development, deployment, and maintenance efforts will help deliver a usable standard to the transit community in the shortest period of time.
- Most of the essential TCIP data and message standards have been published and awareness training has been initiated.
- Development activities continued on other standards. The vehicle area network standard is migrating to a higher bandwidth, higher speed network based on the SAE J1939 standard. This enhanced standard will allow agencies to process more complex data at higher speeds. The FTA plans to raise the awareness-level of J1939 among agencies when all modifications have been made to the standard.



Testing builds confidence in ITS standards by providing valuable information to potential deployers about the reliability, interoperability, functionality, and performance of standards in real-world transportation settings. The Standards Program views testing as a means of keeping the transportation community informed about the development and functionality of standards, and about issues that agencies might encounter when deploying standards. The Battelle Memorial Institute of Columbus, Ohio, coordinates, performs, and documents testing activities for the Standards Program.

DMS and ESS Standards Tested

The Standards Program tested NTCIP standards for Dynamic Message Signs (DMS) and Environmental Sensor Stations (ESS) in March 2000 and May 2001, respectively. The DMS test took place at the Illinois State Toll Highway Authority (ISTHA); the ESS test was conducted in Minneapolis/St. Paul in conjunction with the Minnesota Department of Transportation (Mn/DOT). The highlights of the tests follow:

■ DMS Standards Test

- The test showed that the DMS standard (NTCIP 1203), and supporting standards, enabled the implementation of functional standards-based ITS systems.
- The DMS standard was thought to provide increased levels of device interoperability, at a level much greater than what would have been available through proprietary systems.

■ ESS Standards Test

- The test showed that the ESS standard (NTCIP 1204), and supporting global standard NTCIP 1201, are relatively mature, enabling Mn/DOT and the manufacturer of the ESS equipment to create and deploy a fully functional and compliant NTCIP ESS subsystem implementation.
- The use of NTCIP standards to implement and deploy the ESS subsystems tested in Minnesota has established the foundation for an operational environment in which ESS subsystems from different vendors are interoperable when built according to the NTCIP ESS standard.

The full results of both the DMS and ESS tests are available on www.its-standards.net.

Testing Integrated into Development Process

Testing is critical to the development of well-functioning standards. Over the past 12 months, the Standards Program has worked with SDOs to insure that testing activities are fully integrated into the standards development process. The Standards Program has also sought the involvement of state and local agencies in the development of standards, working with early adopters and deployers of standards to test standards in real-world

transportation settings. One early deployer, the Virginia Department of Transportation (VDOT), is deploying variable message signs that use Version 2 of the DMS standard. The Standards Program, through Battelle, is preparing to document how Version 2 and supporting standards perform. The Program will make these results available to the transportation community so others can benefit from VDOT's efforts.

The Program is actively seeking the involvement of other state and local agencies to be early standards deployers. The participation of agencies in the testing process is invaluable as it helps to

improve overall quality while creating a knowledge base of how standards operate in a real-world transportation environment.

Complying with NTCIP Standards

Testing whether a manufacturer's equipment meets, or conforms to, NTCIP standards has been problematic for both vendors and deployers. This is because no independent and objective criteria exist for measuring a device's conformance to standards. To address this, AASHTO, ITE, and NEMA formed the Testing and Conformity Assessment (TCA) Working Group in December 2001 to establish testing and conformance assessment procedures for

NTCIP standards. The TCA is developing a template for NTCIP roadside device testing procedures that can be used by agencies and vendors during key stages of the implementation and systems acceptance phases of deploying NTCIP-based devices. These procedures are designed to provide guidance to both manufacturers and agencies to help them determine if devices conform to NTCIP standards.

Accomplishments

- The DMS and ESS test results are leading to better performing standards by providing an operational baseline for how each standard functions in actual transportation deployments. These findings have provided standards developers with information and guidance on areas of the standards that need improvement or reengineering.
- The test results for DMS and ESS standards provided the transportation community with a reasonable assurance that using the two standards can result in a successful operational ITS deployment. Further, the test results, along with a detailed technical analysis of the center-to-device (DMS and ESS) interfaces, clearly indicated that the use of the ESS or the DMS standards would result in a significant step toward device interoperability.
- The testing of standards is being done in partnership among SDOs, U.S. DOT, and public agencies. Collectively, these efforts lead to quality standards that can be used with confidence by the industry and by state and local agencies. Efforts to develop conformance testing procedures are also underway and promise to lead to a smoother procurement process for state and local agencies.



The Standards Program recognizes that working with ITS standards can be challenging, even for experienced project managers. And though the Program offers comprehensive training, deployers often need immediate, hands-on support to tackle complex standards issues. The Program provides such assistance through the ITS Standards Field Support Team (FST). The FST consists of public-and private-sector ITS consultants who are available—free of charge—to support agencies on a wide range of ITS standards-related issues.

Common Issues that Agencies Have Sought Help on from the Field Support Team

- Understanding standards
- Developing strategies to migrate from proprietary to standards-based systems
- Writing/reviewing specifications that reference ITS standards

Standards Field Support Team Takes Off

The ITS Standards Field Support Team was launched in April 2002 and now serves as the Program's primary mechanism for delivering ITS standards technical assistance to public agencies.

In general, an agency seeking assistance from the FST contacts a Federal Highway Administration (FHWA) Field Office (Division Office or Resource Center). The ITS Specialist at the Field Office makes an initial assessment of the agency's request and recommends a course of action. In some cases, the ITS Specialist may be capable of providing technical assistance; in other cases, the ITS Specialist will forward the case to the FST. In all cases, the Program attempts to provide the best possible technical assistance, which includes assessing who is best suited to provide the services.

Some examples of the types of services provided by the FST are:

- Assessment of existing state and local deployments and plans.
- Guidance and assistance in the development of project specifications.
- Review of existing contracts and specifications.
- Assistance identifying appropriate contracting and procurement mechanisms.
- Assistance developing testing plans.
- Evaluation of systems for compliance to contracts and conformance to specifications.

More information about the Field Support Team is available at www.its-standards.net/Documents/FSTflyer.pdf

The FST was initially promoted through email lists and posts on the Standards Forum, in sessions at the 2002 ITS America Annual Meeting, on the Standards Program Web site, and through word of mouth of FHWA Resource Center and Division Office ITS Specialists. The FST has handled 13 requests for assistance since April 2002, with most of the requests related to writing or reviewing standards-based specifications.

Accomplishments

- The Program has established a framework for delivering technical assistance—one that can be aggressively marketed to state and local deployers. This outreach effort will increase the awareness of the FST and lead more agencies to seek technical assistance. In the long-term, the FST can help to increase the overall number of standards-based deployments across the country, incrementally increasing the level of ITS interoperability at the same time.

TRAINING AND OUTREACH

Training and outreach help to build demand for ITS standards: training gives transportation professionals a means to increase their knowledge of standards and their skills for deploying standards-based ITS; outreach helps keep the resources offered by the Standards Program at the front and center of agencies' ITS activities. Both activities build deployer confidence in standards and increase the likelihood that state and local agencies will choose to implement standards-based ITS.

Standards Training for all Experience Levels

The Standards Program has a wide range of training courses delivered by the Program's training partners. The following is an update on Program training activities that have taken place over the past 24 months:

■ **ITE** delivers standards training courses on behalf of the Standards Program at sites throughout the country. In the past 12 months, courses addressed the training and professional development needs of a broad range of ITS standards users—from professionals who were newcomers to standards to experienced project managers and systems engineers with extensive experience working with standards. The chart below provides a breakdown of training activities that took place in Fiscal Year 2002. A listing of current courses is available at www.ite.org.

■ **Transit Standards Consortium (TSC)** provides training on selected transit ITS standards. In the past 12 months, the TSC created a series of transit standards technical training courses that were co-sponsored by the FTA and the ITS Standards Program. Courses were designed to bring together appropriate stakeholders, to build professional capacity, and to increase state and local deployers' confidence using ITS standards.

The first courses were presented to transit professionals in March, April, and June of 2002. The courses, entitled "Incorporating TCIP into Existing Systems and Transit Vehicle Area Networks," dealt with all aspects of transit standards, from basic content to the procurement of transit equipment compatible with the standards. Additional courses are planned that

ITE Training Activities—Fiscal Year 2002

Course Name	Total No. of Attendees
ITS Standards Overview	779
Center-to-Center	506
Dynamic Message Signs	415
Actuated Signal Control/Advanced Transportation Controller	510
Total Number of Students Trained	1,062
Total Number of Courses Presented	88

will deal with ways to increase transit market share and how to address technical questions raised as a result

■ **Application Area Workshops** are intensive two-day workshops designed to help state and local agencies learn how to develop standards-based procurement specifications and identify and manage risks associated with various procurement contract types. Agencies also learn how to access the many resources offered by the Standard Program, specifically the ITS Standards Field Support Team. The first two workshops were held in Springfield, Illinois and Baton Rouge, Louisiana in August and September 2002. In all, thirty-eight individuals attended the first two DMS workshops and feedback from attendees was positive, with most participants responding that the workshop met their expecta-

of implementing TCIP standards. Information about the TSC is available at www.tsconsortium.org.

tions. The Program held DMS workshops in other locations in early FY2003, including Virginia, Pennsylvania, and Florida. Workshops for other ITS applications are being considered and will likely use the same format as the DMS workshop.

All of these training resources have been designed to demystify the technical and institutional complexities of standards, raise the deployer's confidence level in procuring and deploying standards-based devices, build an understanding of the benefits of standards among those in decision-making roles, and generate demand for standards-based goods and services from the ground up (i.e., from state and local deployers).

Accomplishments

- The Program has developed a wide range of training and educational offerings. Training courses are well attended and geographically distributed.
- Training courses and application area workshops provide deployers with information and tools that they can apply immediately to their ITS efforts. These resources also help agencies build staff knowledge and capacity in the area of ITS and standards, which can help facilitate agencies' standards efforts in the future.



The Standards Program is evolving from a *development* into a *deployment* program by focusing on resources and tools that support standards deployment. The Program recognizes that the demand for standards-based ITS is most sustainable when it comes from the ground up—from state and local agencies that understand the benefits of using standards-based ITS. To this end, the Program has developed a broad range of deployment tools to help build confidence in the use of standards, which is expected to lead to greater demand for standards-based ITS and a growing network of interoperable ITS throughout the nation.

Standards: The Key to Long-term Viability of ITS

The ITS industry is in the early stages of standardization. The Standards Program expects that standards will bring the same benefits to ITS that they have brought to other industries:

- Greater competition among vendors, leading to lower product costs for state agencies deploying ITS
- Interoperability between diverse systems, which enables like, and different, ITS components to connect more easily, resulting in greater integration between transportation modes
- Better-known technology path, which allows for incremental system upgrades and facilitates long-term system planning. Several state DOTs have already reported lower product costs that they attribute to the use of standards-based ITS. For example, DOTs in Arizona and Minnesota have seen the price for their dynamic message signs drop by 35% and 15%, respectively. Washington State DOT reports that the cost of its environmental sensor stations has dropped by almost 50% since they migrated to NTCIP standards. Early deployers of ITS standards are beginning to see returns on their investments.

New and Upgraded Deployment Tools

The ITS Standards Web site contains resources and tools that can help deployers learn about and implement standards-based ITS. Among the areas covered on the Web site are general information about ITS standards, testing information, standards development information, deployment contacts, training, and deployment assistance. The Web site can be found at www.its-standards.net.

For many agencies, deployment tools and resources are the most relevant to their daily activities. Included among the Web site's deployment resources are the Standards Applications Packages for Environmental Sensor Stations (ESS) and Dynamic Message Signs (DMS), which contain both overview information for those new to standards, as well as more detailed technical materials. Packages also include information about the Standards Field Support Team for agencies needing more in-depth assistance with standards-related issues. The Standards Contacts Database, a searchable database of standards deployers, is another resource available on the Web site and reflects a new generation of interactive Web site tools rolled out over the past 12 months.

Accomplishments

- The popularity of the Web site has grown slowly but steadily in each successive year since its launch in 1997. The Web site averages 1,600 hits every day, approximately 48,000 hits a month.
- The Program upgraded its Web site to bring it into compliance with the provisions of Section 508. (Section 508 of the Rehabilitation Act requires that Federal agencies' electronic and information technology be accessible to people with disabilities.)
- The Contacts Database has emerged as a powerful deployment tool—one that is widely and easily accessible, promotes the sharing of information among peers, and helps to expand the community of standards users. The Contacts Database was also the Program's first tool to deliver deployment information through interactive Web-based features, and is expected to generate more online efforts.
- The Program distributed more than 3,000 DMS Application Packages since August 2000 and more than 2,000 ESS Application Packages since December 2001. The DMS and ESS Application Packages are also distributed as a supplement to training materials that individuals receive at ITE standards training sessions.

Standards Forum Builds a Community of Standards Users

The ITS Standards Forum is an on-line community of individuals interested in exchanging questions, ideas, and resources related to ITS standards. The Forum functions as a Internet bulletin board and attracts professionals of all experience levels—from those just beginning to learn about ITS standards to those who have had substantial experience using standards and ITS deployments.

The Forum's underlying operating principle is that individuals of all experience levels contribute to the quality of the Forum's discussion in their own unique way. Questions and comments about testing, procuring, and deploying standards-based ITS are common themes on the Forum. The Standards Forum is hosted by the ITS Cooperative Deployment Network (ICDN) and is moderated by ITS professionals. The Forum is located at www.nawgits.com/stdsforum.

Accomplishments

- The Standards Forum is becoming an increasingly popular method of obtaining standards information. By any measure, the Forum has been a success: from the range of the audiences it serves (see graph at right) to the growth in the number of subscribers—from 65 subscribers in its first month to more than 1,200 at the end of September 2002, an increase of 20 times the original number.

What's Being Discussed on the Standards Forum (Popular Recent Discussions)

"NTCIP Novice"—Discussion about the resources available for those new to working with NTCIP standards.

"NTCIP 1209"—Discussion on how to deploy the standard NTCIP 1209 Objects for Transportation Sensor Stations.

"Standards and Legacy Systems"—Discussion about how to integrate legacy ITS systems with systems based on ITS standards.

Procurement and Specification Development

The NTCIP SpecWizard is software that helps deployers write NTCIP-based specifications for DMS, Actuated Traffic Signal Controllers, and ESS. The software walks deployers through a series of questions about various aspects and characteristics of their project and then generates a text file listing NTCIP requirements that deployers can then integrate into their specifications.

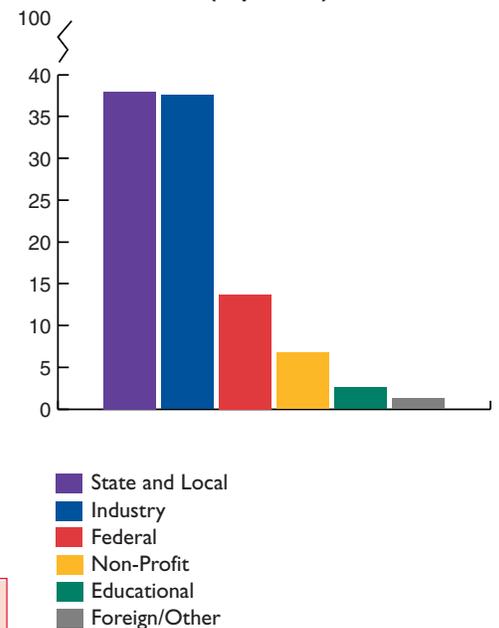
The FHWA completed the acquisition of the SpecWizard software package from Iteris, Inc. in 2002, giving the Standards Program full control over product development and distribution, as well as future product upgrades and design enhancements. SpecWizard is available to state and local deployers on the McTrans (Center for Microcomputers in Transportation) Web site at <http://mctrans.ce.ufl.edu>.

In addition to SpecWizard, the Standards Program developed the DMS Procurement Guide, a sample specification for DMS that agencies can use to help integrate NTCIP requirements and language into their ITS specifications. The Guide is available on the Program's Web site.

Accomplishments

- In SpecWizard, the Program now owns a deployment tool that it can upgrade periodically to accommodate changes in standards technology.
- SpecWizard can help standardize how agencies call out ITS standards requirements in their specifications, making it easier for vendors to respond to specifications. Greater consistency in how standards are referenced in specifications could potentially reduce the upfront development time and costs associated with deploying standards-based ITS.
- The Program delivered on a commitment to state and local deployers, who had identified a DMS sample specification as one of their greatest deployment needs.

Breakdown of Standards Forum Subscribers
(in percent)





DYNAMIC MESSAGE SIGNS: A SUCCESS STORY

Dynamic message signs (DMS) are a common component of our nation's transportation system. Agencies across the country use message signs to inform travelers of traffic and weather conditions, and to steer them away from accidents and highway emergencies. Given their popularity, it is likely that many agencies were introduced to ITS when they installed their first dynamic message sign.

Because of this popularity, and their usefulness in managing traffic, the development of DMS standards was an early focus of the Standards Program. The story of how the Program developed, tested, and then promoted DMS standards reinforces the connection between key Standards Program activities and their ability to generate favorable outcomes and results. The Standards Program expects the path it used to develop DMS standards and increase standards-based DMS deployments can be repeated for other ITS standards applications.

DMS NTCIP 1203

Version 1 vs. Version 2: What are the Primary Differences?

Version 1 of the NTCIP DMS standard (NTCIP 1203) allows a base level of interoperability, enabling NTCIP-based devices to be integrated into a single system with less effort and cost than without standardized communications and data. Many common features of message signs are supported through these standards.

Version 2 of the DMS standard offers additional features, including graphics and dial-up capabilities. Version 2 also supports a higher level of device interoperability and incorporates a requirements traceability matrix, an element of the standard that defines and maps functional requirements to the standard. The matrix will make it easier for state and local deployers and their consultants to develop procurement specifications and to conduct acceptance testing.

Cooperative Effort to Develop DMS Standards

DMS standards are found within a family of standards known as NTCIP standards. NTCIP standards define protocols and profiles that are open, consensus-based data communications standards. When used for the remote control of roadside and other transportation management devices, NTCIP standards can help achieve interoperability between ITS devices.

The development of DMS standards represents a public-private partnership success story. The ITS Standards Program, together with a joint committee comprised of AASHTO, ITE, and NEMA published the NTCIP family of ITS standards in 2000. At that point, state and local

agencies had the choice of purchasing message signs based on open standards.

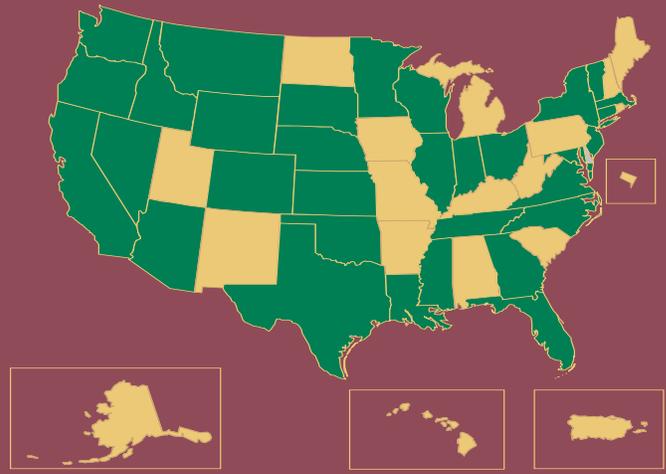
As with all standards, the underlying technology is evolutionary; each upgraded version of the standard addresses known issues found in previous versions, as well as adds new features and functionality. The joint NTCIP working group continues to review and revise NTCIP standards. In fact, Version 2 of the DMS standard (NTCIP 1203 Object Definitions for Dynamic Message Signs) is expected to be released in fall 2003.

DMS Standards Undergo Testing

The ITS Standards Program documents and distributes test results about the performance of ITS standards in real-world deployments. In the case of DMS standards, Battelle tested the performance of the standards in conjunction with the Illinois State Toll Highway Authority (ISTHA). The tests concluded that the DMS standards were relatively mature, showing that the standards allowed two vendors to deploy fully functional systems of NTCIP-based message signs. Further, with some excep-

tions (as noted in the test report), the tests showed that both systems had the potential to be fully interoperable. These test findings, which are available on the Standards Web site, provide valuable information about potential deployment issues to agencies considering standards-based message signs. It should be noted that the Virginia Department of Transportation and Battelle are currently preparing to test Version 2 of the DMS standard for message signs deployed along Virginia highways.

DMS Standard Usage by State - 2002



LEGEND

-  DMS Standard Referenced in Procurement Specification
-  No DMS Procurement Underway/DMS Standard Not Referenced in Specification

These test results will be added to an information database about how the newest version of the DMS standard performs in real-world settings.

Standards Program Offers Tools to Deploy DMS Standards

The Standards Program is geared to help agencies deploy standards-based ITS. The Program provides a wide range of informational materials, educational resources and training opportunities, and hands-on technical assistance (all of which are described in the previous three sections of this report). Many of these resources were initially developed to guide targeted DMS deployments. The Program plans to modify these resources to support deployment efforts for other ITS applications, while continuing to improve and expand DMS-related resources as needed.

Use of DMS Standards Increases

The use of standards-based DMS is steadily increasing across the nation. Over the past 18 months, 90% of all DMS specifications written by state and local agencies have referenced DMS standards. The status of DMS standards activity is shown on the U.S. map above. The map shows that the majority of states use or are planning to use standards-based DMS:

- States shown in green developed DMS procurement specifications that included requirements for using open ITS standards. The level to which NTCIP standards were directly referenced in specifications varies, but all green states did require vendors to provide DMS standards-based message signs.

- States shown in gold did not have any active DMS procurement underway, or had produced message sign procurements that did not reference NTCIP standards.

The map does not show the rate of increase in the use of the DMS standard. When the Standards Program first began, most deployers were not considering standards-based DMS (and were therefore considering proprietary technologies) or were unaware that a standard existed for DMS. Efforts by the Standards Program to provide outreach, training, and technical assistance specific to DMS have had a substantial impact on agencies' decisions to use the standard.

Putting it All Together

The number of standards-based DMS deployments has increased over the past 12 months. Part of the increase is attributable to agency champions—those dedicated individuals in state and local agencies who understand the value of standards-based systems to their organization. The efforts of the ITS Standards Program have also encouraged the use of DMS standards. State and local agencies now have access to open DMS standards, as well as other ITS standards. Many agencies are taking advantage of the resources that the Program offers.



As stated earlier, the ITS Standards Program was established to accelerate the development of ITS standards for the purpose of achieving greater interoperability within our surface transportation systems. Over the past six years, the Program has made significant headway in reaching this objective, supporting and overseeing the development of dozens of ITS standards. As the Program moves forward, it will focus on activities that are intended to increase standards-based ITS deployments at the state and local level. The following are some key Program activities planned for the next 12-24 months.

Promoting the Services Offered by the ITS Standards Field Support Team

The Standards Program will heavily promote the technical assistance services offered by the FST team. New FST outreach materials will be developed to explain the structure of the technical assistance program and the types of services the FST can offer to state and local agencies.

Encouraging Early Deployers of Standards

The Program will be proactive in identifying those agencies and leading-edge project managers who are already, or planning to be, early deployers of ITS standards. Early deployers will receive focused technical assistance from the Standards Program as they move down the path of deploying standards and proving them in real-world deployments. The Program is particularly interested in working with those state and local deployers who are implementing projects in the key ITS application areas (page 4).



Defining Standards Testing Needs

The Standards Program believes that testing promotes earlier, broader, and more confident use of ITS standards. Over the next 12 months, the Program plans to work closely with state and local agencies, and with industry, to

determine the types of testing processes—such as acceptance and conformity testing—that will be most valuable to the community.

Maintaining ITS Standards

The Standards Program plans to work with SDO partners to develop and implement a maintenance program for standards that have been approved and published. The goal of a maintenance program is to ensure that standards are kept current; that known issues with standards are addressed in subsequent versions of the standards; and that new

functions made available through advances in technology are incorporated into standards. The Program believes that such a maintenance program is essential if the user community is to have confidence in the quality and usability of ITS standards.

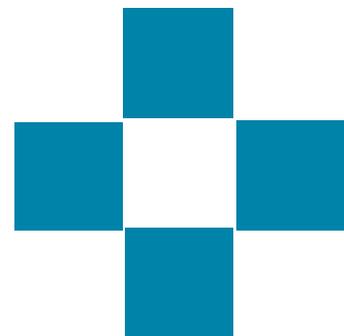
Standards Training Helps Build Professional Capacity

The ITS Standards Program will continue to offer a range of training opportunities for state and local deployers through the standards training program administered by ITE, and through other venues, such as Application Area Workshops.

In order to maximize the benefits of training, it is important to time new training offerings with the availability of viable standards. The Program will introduce training courses only when the standards used in a given ITS application reach a certain level of technical maturity.

This will help to ensure that individuals who commit their time to training have access to standards that can function in real-world deployments.

Training courses are listed on the Standards Web site at www.its-standards.net/train.htm.



Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials www.aashto.org
ANSI	American National Standards Institute www.ansi.org
APTA	American Public Transportation Association www.apta.com
ASTM	ASTM International www.astm.org
DMS	Dynamic Message Signs
DSRC	Dedicated Short-Range Communications
ESS	Environmental Sensor Stations
FHWA	Federal Highway Administration www.fhwa.dot.gov
FST	ITS Standards Program Field Support Team
FTA	Federal Transit Administration www.fta.dot.gov
IEEE	Institute of Electrical and Electronics Engineers www.ieee.org
ITE	Institute of Transportation Engineers www.ite.org
ITS	Intelligent Transportation Systems
ITS America	Intelligent Transportation Society of America www.itsa.org
JPO	ITS Joint Program Office, U.S. DOT www.its.dot.gov
NEMA	National Electrical Manufacturers Association www.nema.org
NTCIP	National Transportation Communications for ITS Protocol www.ntcip.org
SAE	Society of Automotive Engineers www.sae.org
SDO	standards development organization
TCIP	Transit Communications Interface Profiles www.tcip.org
TEA-21	Transportation Equity Act for the 21st Century www.fhwa.dot.gov/tea21
TSC	Transit Standards Consortium www.tsconsortium.org
U.S. DOT	United States Department of Transportation www.dot.gov

Web Sites for ITS and ITS Standards Information and Resources

ITS Standards Program www.its-standards.net

United States Department of Transportation (U.S. DOT) www.dot.gov

U.S. DOT ITS Web site www.its.dot.gov

U.S. DOT ITS Electronic Document Library (EDL) www.its.dot.gov/itsweb/welcome.htm

ITS Standards Forum www.nawgits.com/stdsforum

ITS Standards Field Support Team www.its-standards.net/Documents/FSTflyer.pdf

ITS Peer-to-Peer Program www.its.dot.gov/peer/peer.htm

ITS Professional Capacity Building Program (PCB) www.pcb.its.dot.gov

Architecture and Standards Conformity Rule www.its.dot.gov/aconform/aconform.htm

Federal Transit Administration (FTA) www.fta.dot.gov

Web Sites for Standards Development Organizations

American Association of State Highway and Transportation Officials (AASHTO) www.aashto.org

American National Standards Institute (ANSI) www.ansi.org

American Public Transportation Association (APTA) www.apta.com

ASTM International (ASTM) www.astm.org

Institute of Electrical and Electronics Engineers (IEEE) www.ieee.org

Institute of Transportation Engineers (ITE) www.ite.org

Intelligent Transportation Society of America (ITS America) www.itsa.org

National Electrical Manufacturers Association (NEMA) www.nema.org

National Transportation Communications for ITS Protocol (NTCIP) www.ntcip.org

Society of Automotive Engineers (SAE) www.sae.org

Additional links available at: www.its-standards.net/S_links.htm

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