

Dynamic Mobility Applications Policy Analysis

Policy and Institutional Issues for Enabling Advanced Traveler Information Services (EnableATIS)

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16. Abstract This report documents policy considerations for Enabling Advanced Traveler Information Services, or EnableATIS. EnableATIS is the traveler information element of the Dynamic Mobility Applications program, and it provides a framework to develop multi-source, multimodal data into new advanced traveler information applications and strategies. The policy team has documented four policy issues for EnableATIS, none of them high-priority. In conclusion, the policy team finds that additional policy research, outreach, and other steps may be needed, including investigation of public-private partnerships to broaden the reach and improve the effectiveness of ATIS implementation. In summary, the four issues and recommended next steps include: <ul style="list-style-type: none"> • Inequitable distribution of ATIS and other connected vehicle functionality may need to be evaluated for the level of potential impact on underserved populations. • Driver distraction—an issue shared by many connected vehicle applications—is among the central concerns of connected vehicle policy research. Analysis is currently under way by USDOT and industry experts. • Data integration may result from market forces or from standards development organizations becoming involved in the ATIS application market. The USDOT may choose to provide support if the private sector is motivated to work with public agencies. • Similarly, tools for providing ATIS data to transportation management centers may evolve if private-sector stakeholders are motivated to work with USDOT towards greater system-wide efficiency and effectiveness. <p>Based on the results of this analysis, the policy team does not foresee a need for any new policies to be enacted or any major issues that will stand in the way of successful private sector ATIS development.</p>					
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Table of Contents

Executive Summary	1
DYNAMIC MOBILITY APPLICATIONS PROGRAM	1
PURPOSE OF THIS REPORT: DOCUMENT ENABLEATIS POLICY ISSUES	2
POLICY ISSUES THAT COULD AFFECT THE SUCCESS OF AN ATIS MARKET	2
CONCLUSIONS AND NEXT STEPS.....	4
Chapter 1 Introduction	6
DYNAMIC MOBILITY APPLICATIONS	6
POLICY CONSIDERATIONS FOR NEW CONNECTED VEHICLE TECHNOLOGIES	7
Chapter 2 Description of EnableATIS	8
Chapter 3 Policy Analysis Approach for Analyzing New Connected Vehicle Applications	10
Chapter 4 Policy Analysis Results on EnableATIS Applications	13
ATIS AVAILABILITY AND SOCIAL EQUITY (MEDIUM PRIORITY).....	13
POTENTIAL DRIVER DISTRACTION (MEDIUM PRIORITY)	14
DATA INTEGRATION (LOW PRIORITY).....	15
FOSTER TOOLS FOR TRANSPORTATION SYSTEMS MANAGEMENT (LOW PRIORITY).....	16
Chapter 5 Conclusion	18
APPENDIX A. Source Materials	19
APPENDIX B. List of Acronyms	20

List of Tables

Table 4-1. EnableATIS Policy Issues	13
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List of Figures

Figure 3-1. EnableATIS Policy Analysis Process	10
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Executive Summary

Dynamic Mobility Applications Program

The Dynamic Mobility Applications (DMA) Program is prototyping applications that are anticipated to be transformative to public sector transportation system management and modal integration. This technical research is a part of the U.S. Department of Transportation's (USDOT) research into new technologies supporting the emergence of an intelligent and connected vehicle (CV) environment.¹

The objective of the DMA research is to foster the release of high-value, open-source applications that use synthesized, multisource Intelligent Transportation Systems (ITS) data to transform surface transportation management and information. The DMA Program research is also focused on developing tools (for instance, an open source portal), metrics, and concepts to support additional application development.

The Intelligent Transportation Systems Program's role within the USDOT is to facilitate high-risk/high-reward research in cooperation with industry and academia to meet transportation needs. Investments in new research are based on policy analysis that determines that the technology concepts meet the following threshold criteria:

- They advance the state-of-the-practice and, if successful, will deliver transformational transportation benefits to the Nation.
- They are unlikely to be pursued in industry given the nature of the risks compared to the required investment.
- The advancements are desired by stakeholders, who will champion the transfer of results into use.
- The advancements are significant enough to take precedence over other investment choices.

A decision to pursue research is followed by the development of prototypes and demonstration and testing under real-world conditions. Successful results advance the process of transferring new technologies into market adoption and use. They set the stage for planning and preparing for technology implementation, operations and maintenance, and, eventually, upgrades and evolution. Throughout this technology life cycle, policy and institutional issues can often become the major stumbling blocks to realizing success.

¹ A Connected Vehicle Environment is defined as: "A connected, data-rich travel environment. The network captures real-time data from equipment located on-board vehicles (automobiles, trucks, and buses) and within the infrastructure. The data are transmitted wirelessly and are used by transportation managers in a wide range of dynamic, multi-modal applications to manage the transportation system for optimum performance." http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm accessed 7/1/14.

Thus, identification of, and research into, the policy issues and practical options and solutions is an important step that raises the assurance that the Federal investment will result in adoption and use by agencies, organizations, the private sector, and travelers. It is an iterative process with the technical research teams—identification of policy challenges early in the development stage can change the nature of technical decisions; envisioning and addressing policy challenges throughout the life cycle supports preparation for robust technology transfer to the market.

Purpose of this Report: Document EnableATIS Policy Issues

The Connected Vehicle Mobility Policy team (herein, policy team) developed this report to document policy considerations for Enabling Advanced Traveler Information Services, or EnableATIS. EnableATIS is the traveler information element of the DMA program, and it provides a framework to develop multisource, multimodal data into new advanced traveler information applications and strategies.

In the case of EnableATIS, USDOT is not developing or field testing specific ATIS applications, but instead determining how best to support market development of ATIS data and services without direct Federal involvement. Thus, the policy analysis focused on two sets of issues:

1. Issues that could significantly impede successful independent expansion of an innovative market for ATIS applications.
2. Issues that could curb the potential of ATIS data to contribute substantially towards an overall connected environment for vehicles and travelers.

The analysis was based on the policy team's review of a wide range of materials that included:

- The EnableATIS Operational Concept (ConOps)
- The Connected Vehicle Reference Implementation Architecture (CVRIA) diagrams for EnableATIS
- Discussions with the technical team overseeing the EnableATIS program and a review of the prototype documents, and
- Industry best practices and standards in information technology, security and privacy, and data exchange

As policy or institutional issues emerged during the review, they were categorized as high, medium, or low priority. No high priority issues were identified in the analysis.

Policy Issues That Could Affect the Success of an ATIS Market

The policy team identified three issues that represent important challenges but for which there are identified paths to resolution:

- ATIS Availability and Social Equity. ATIS infrastructure expansion may be limited or nonexistent in rural areas, due to relatively high costs and low profitability stemming from the greater distances to cover and smaller populations served. Traveler information is available on major highways in most rural areas, so any lack of coverage will more likely be found on secondary roads. Some urban areas could also experience coverage gaps, as the private sector is likely to concentrate its resources where financial return is greatest.

With the expected National Highway Traffic Safety Administration (NHTSA) requirement to equip all newly manufactured vehicles with connected vehicle broadcast capability, *de facto* connected vehicle environments may provide data availability between vehicles in areas that would otherwise be underserved. But rural areas still will likely have fewer road side equipment (RSE) and data will not be made available to passing vehicles as in metropolitan areas with presumably more extensive RSE networks. However, if USDOT anticipates a social equity gap, it can work with state and local partners to determine whether ATIS is a high-priority service for rural areas and identify essential elements needed to support expansion into rural areas. Cost estimates and innovative funding could be explored for the most critical infrastructure.

- Potential Driver Distraction. Driver distraction and workload management is a widely recognized concern and will require a multi-faceted solution. Visual displays communicating connected vehicle messages, including ATIS-related messages, have the potential to distract drivers and seriously compromise safety. This issue affects many connected vehicle applications, and not just EnableATIS.

Both NHTSA and automakers have been working to find ways to reduce both distraction and workload in the driving environment. NHTSA will continue to address distracted driving challenges by promoting human factors research and may ultimately consider rulemaking or guidance in the future on use of visual displays in vehicles.

- Data Integration. In the absence of open-data standards for connected vehicle applications, private sector ATIS technology is developing on multiple platforms that are not interoperable. While a single data standard may eventually dominate as a result of user preferences, there is no guarantee that such a standard would increase integration or interoperability. In the meantime, substantial private resources may be focused on perfecting individual, non-interoperable systems instead of on building the system as a whole.

USDOT may choose to pursue private-public collaboration to investigate and pursue unified standards. It is currently supporting a Data Capture and Management (DCM) program that is advancing the practice of big data analytics and promoting data integration across all connected vehicle applications. USDOT's Connected Vehicle Reference Implementation Architecture (CVRIA) initiative is analyzing which interfaces in the connected vehicle environment would deliver the most benefits from standardization. The plan that will identify these critical interfaces and propose and prioritize standards development will be available in 2014 for stakeholder review. It is anticipated that data standards—especially those where interoperability is critical—may be included in the priorities.

Also, with more data available in a connected vehicle environment, there is the possibility of shared data collection for widespread distribution and use. Integrating data collection

efforts could facilitate the creation of a single source to multiple public and private agencies for multiple applications.

The policy team identified one additional policy concern that will not stop ATIS from evolving, but nevertheless presents a long-term challenge to the effectiveness of both regional ATIS and larger mobility management:

- Fostering Tools for Transportation Systems Management. ATIS application development is being led by the private sector, focused primarily on consumer ATIS applications that benefit individual end users. As a result, the development of tools for use by public sector transportation management entities such as Transportation Management Centers may be overlooked due to their near-term, high investment costs and long-term return on investment and potentially low revenues.

The policy team has identified potential initiatives that could help spur the development of ATIS tools and data sources despite the relative lack of conventional business models. These include working with stakeholders to develop public-private partnership models, and continuing to sponsor research into tools that would exploit big data analytics and data integration for transportation systems management.

Conclusions and Next Steps

With this report, the policy team has documented policy issues and strategic decisions that have been made regarding USDOT support for private sector ATIS development. The issues typically fall into four categories:

- *High priority* issues need immediate attention and resolution as they may present obstacles to deployment.
- *Medium priority* issues have potentially serious consequences but clear, if challenging, paths or options for resolution. These should be addressed prior to technology transfer.
- *Low priority* issues have policy implications but also have solutions underway or are relatively straightforward as they represent best practices in use today and are available to implement before ATIS applications are introduced to the marketplace.
- *Emerging* issues are issues that have some probability of creating barriers to deployment over time, as ATIS implementations grow in complexity or geographic coverage.

Three medium-priority and one low-priority policy issues emerged and have been documented in this report. No major challenges appeared during analysis that were perceived to present obstacles to market adoption and use for EnableATIS.

It is expected that this report will support a dialogue with stakeholders. Stakeholders may comment on:

- Any additional policy or institutional issues that may present challenges to successful emergence of ATIS technology and practice, which are not documented but for which new or additional research and analysis is recommended.

- Whether policy options identified for resolution of the issues are appropriate.

Finally, it should be noted that data privacy and security have been raised as key policy concerns for all of the dynamic mobility applications. Research is ongoing in this area to develop options to address these new applications as well as to standardize security for future applications that have yet to emerge. To develop optional approaches for security and privacy, analysis using National Institute of Standards and Technology (NIST) standards (Special Publication 800-53² Rev 4) is underway to assess any policy or institutional challenges³. Where ATIS is by its very nature a service application that consumers choose to opt-in for its use, the private sector is expected to play a major role in setting privacy and data access policies.

² <http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-53r4.pdf>

³ USDOT research and analysis results are made available through the ITS Joint Programs Office website at www.its.dot.gov.

Chapter 1 Introduction

This report documents policy considerations for Enabling Advanced Traveler Information Services, or EnableATIS. The EnableATIS program is funding projects that aim to support the market in developing a system for integrating multisource, multimodal data into new advanced traveler information applications and strategies.

EnableATIS is one of several mobility applications that the Intelligent Transportation Systems Joint Program Office (ITS JPO) of the U.S. Department of Transportation (USDOT) and its partners are prototyping as part of its Connected Vehicle Program. The ITS JPO is advancing new connected vehicle technologies through innovative research, and the EnableATIS next generation traveler information technologies are being studied through two university exploratory research projects.

Dynamic Mobility Applications

In the future, cars, trucks, buses, roads, and smartphones will talk to each other. They will share valuable safety, mobility, and environmental information over a wireless communications network that is already transforming our transportation system as we know it. This system of connected vehicles, mobile devices, and roads will provide a wealth of transportation data, from which innovative applications will be built. These applications will make travel not only safer, but more efficient and greener.

The USDOT's Dynamic Mobility Applications program is exploring these possibilities, specifically focusing on reducing delays and congestion and thus significantly improving mobility. The following six mobility application bundles are being prototyped to make this possible:

- *Enabling Advanced Traveler Information Systems (EnableATIS)* provides a framework to develop multisource, multimodal data into new advanced traveler information applications and strategies.
- *Freight Advanced Traveler Information System (FRATIS)* provides freight-specific route guidance and optimizes drayage operations so that load movements are coordinated between freight facilities to reduce empty-load trips.
- *Integrated Dynamic Transit Operations (IDTO)* facilitates passenger connection protection, provides dynamic scheduling, dispatching, and routing of transit vehicles, and promotes dynamic ridesharing.
- *Intelligent Network Flow Optimization (INFLO)* aims to optimize network flow on freeway and arterials by: informing motorists of existing and impending queues and bottlenecks; providing target speeds by location and lane; and allowing the capability to form ad hoc vehicle platoons of uniform speed.
- *Multi-Modal Intelligent Traffic Signal Systems (MMITSS)* is a comprehensive traffic signal system for use on complex arterial networks that include passenger vehicles, transit, freight, and emergency vehicles, as well as pedestrians.

- *Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)* involves advanced vehicle-to-vehicle safety messaging over dedicated short-range communications (DSRC) to improve the safety of emergency responders and travelers.

The USDOT's Connected Vehicle Mobility Policy team is performing the analysis needed to document policy and institutional issues and recommend options for resolution for each of these bundles in separate reports.

Policy Considerations for New Connected Vehicle Technologies

Throughout the process of developing new connected vehicle technology, various policy or institutional issues can become stumbling blocks. Examples include changes brought about by an application and its operations that could possibly affect established norms for liability; governance; interoperability of hardware, software, and data; and other issues that may preclude adoption and use by industry.

Policy analysis is an iterative process that proceeds in concert with research and development. Hence, identification of policy challenges early in the development stage can change the nature of technical decisions. Envisioning policy challenges throughout the life cycle enables smooth technology transfer and system deployment.

This remainder of this report is structured as follows:

- Chapter 2 Description of EnableATIS
- Chapter 3 Policy Analysis Approach for Analyzing New Connected Vehicle Applications
- Chapter 4 Policy Analysis Results on EnableATIS Applications
- Chapter 5 Conclusion
- Appendix A Source Materials
- Appendix B List of Acronyms

Chapter 2 Description of EnableATIS

The concept of Advanced Traveler Information Systems (ATIS) is that data from a wide range of sources can be integrated in the cloud, aggregated by various entities, and served out to travelers for individualized trip planning and improved mobility. The private sector is highly engaged in this area, and applications performing some data integration and traveler assistance are already available on web and smartphone platforms. Technology in this area is evolving rapidly, creating new opportunities for data aggregation and delivery.

Stakeholders have stated a preference to allow the market to develop these services without direct involvement of USDOT. As a result, EnableATIS is unique among the Dynamic Mobility Applications in that the government is providing support to the marketplace for application development—i.e., *enabling* development of Advanced Traveler Information Systems—rather than developing the foundation applications. The essential components of an ATIS are:

- Multimodal, end-to-end trip planning for travelers, combining data on traveler preferences with current traffic condition data and real-time modal options.
- Congestion prediction and management, combining data from modal detectors and requests from travelers.
- Increased collection, fusion, and sharing of data provided by both travelers and system management entities, aggregated and then served back to travelers and system managers.
- Common infrastructure and message standards for probe data to allow for integrated source data to be distributed out to multiple public and private sector entities.

The USDOT EnableATIS program is supporting private sector development of innovative ATIS components and data capture in five ways:

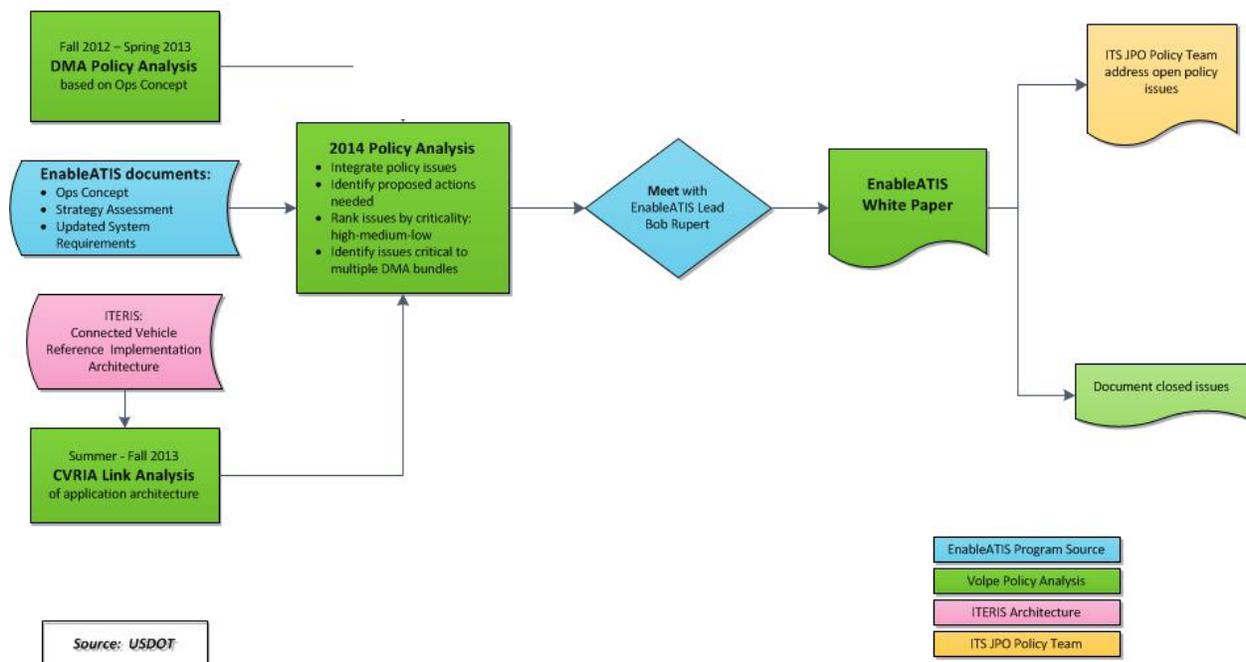
1. The program is sponsoring basic research into advanced technology and innovative uses of the data. Two projects are researching technology that can learn and infer individual traveler decision making. The prototypes use GPS, accelerometer readings, and map data to observe an individual's travel patterns in order to anticipate and provide targeted travel information when needed. One of the projects is pilot-testing a tool synched to a vehicle's controller area network (CAN) bus and sending data to cloud-based storage over 4G.
2. The program is taking a lead in convening stakeholders, developing coalitions, and creating a shared vision for ATIS.
3. The USDOT, through its knowledge of other connected vehicle applications in development, recognizes that ATIS data sources have the potential to be a significant positive resource for the wider connected vehicle environment. Thus it is stewarding development of data standards, as innovations move into practice.
4. USDOT can be a voice for equity of access to innovative traveler information services.
5. Finally, USDOT is well-positioned to provide guidance to state and local transportation agencies for successful public-private partnering.

These activities provide insights and assistance to the market from multiple avenues. As the connected vehicle environment grows, USDOT expects to continue to support the market and the development and widespread use of advanced traveler information applications.

Chapter 3 Policy Analysis Approach for Analyzing New Connected Vehicle Applications

The policy analysis for this report was conducted in the steps outlined in this section and illustrated in Figure 3-1.

Figure 3-1. EnableATIS Policy Analysis Process



1. **Review Operations Concept:** The Volpe Center policy team reviewed the original Operations Concept for EnableATIS. The team documented potential policy issues at each stage of the development and deployment process, identified known policy options and solutions, and recommended areas for further investigation. The final Operations Concept was also reviewed to see if new policy issues had emerged, and to see if identified issues were still present or had been resolved.
2. **Review Connected Vehicle Reference Implementation Architecture:** The policy team conducted a detailed analysis of the Connected Vehicle Reference Implementation Architecture.⁴ The CVRIA provides a set of system architecture viewpoints that describe the functional, physical, and logical interfaces; enterprise relationships; and communications dependencies for each technology and

⁴ <http://www.standards.its.dot.gov/DevelopmentActivities/CVReference> accessed April 2014.

application within the connected vehicle environment. These viewpoints serve as a common reference to help identify and prioritize standards development and to support policy considerations for the connected vehicle environment.

The policy team used the CVRIA viewpoints to identify both the entities sharing data in each application, and the specific data elements being transmitted. By doing so, the team was able to surface potential issues for EnableATIS.

3. Integrate Results: Having completed the Operational Concepts analysis and the CVRIA analysis, the policy team undertook a process of integrating the results of those two efforts. This was important because the Operational Concepts analysis tended to focus on broader issues, while the CVRIA analysis in many cases identified issues that related to specific types of data being exchanged between specific entities within a given application. Integrating the results from both analyses enabled the policy team to develop a complete picture of all the potential issues for the EnableATIS bundle.
4. Review New Materials: Additional materials for EnableATIS were reviewed and assessed against the results of the first level analysis. An updated Operational Concept was reviewed, along with a Market Readiness Assessment and the proceedings from a Strategy Assessment meeting.
5. Eliminate Non-Policy Challenges: After integrating the results of the two efforts, the policy team identified and eliminated any issue that was purely technical or logistical in nature and therefore did not have direct policy impacts. For example, the issue of malicious hacking of hardware or software is not included in the analysis because it is a common issue in today's world, there are technological solutions to addressing the problem, and market forces will determine the cost tradeoff between greater security and an appropriate level of acceptable risk. Levels of security may be highly variable for each DMA and within each DMA bundle. Similarly, institutional issues such as data storage policies, governance policies, and access policies will be determined at the user level. If any of these has a potential impact on the trust or security of the connected vehicle environment, the issue was added to the prioritized list and discussed in this document.
6. Prioritize Policy Issues: The team assigned a priority to each of the remaining issues on the following basis:
 - a. *High priority* issues need immediate attention and resolution as they may obstruct deployment.
 - b. *Medium priority* issues have potentially serious consequences but clear, if challenging, paths to resolution. These should be resolved prior to technology transfer.
 - c. *Low priority issues* have policy implications but also have solutions underway. These solutions can likely be implemented before ATIS applications are introduced to the marketplace.
 - d. *Emerging* issues have some probability of obstructing deployment over time, as ATIS implementations grow in complexity or geographic coverage.
7. Identify Issues Common to Other DMA Bundles: The team differentiated between policy issues that were unique to a single DMA bundle, and issues common to multiple DMA bundles. Issues common to multiple DMA bundles may need to be resolved at the level of the DMA program or the Connected Vehicle program (e.g., privacy policy), rather than within the individual bundle development efforts.
8. Meet with Technical Team: After completing the preceding steps, the policy team summarized the policy issues and discussed them with the EnableATIS technical lead. This provided the

technical lead the opportunity to agree or disagree about the veracity and priority of each issue, and to provide more information on each issue—information the policy team used to refine the policy analysis and conclusions.

9. Document Results: This report includes the results of that analysis and identifies issues that have been resolved and concerns that are recommended for additional USDOT research.

Chapter 4 Policy Analysis Results on EnableATIS Applications

This chapter describes the policy issues identified for the EnableATIS bundle. Because USDOT is not developing or field-testing ATIS applications itself, the analysis focused on issues that could significantly facilitate or impede successful expansion of an innovative market for such applications. The analysis also highlighted issues that could limit the potential of ATIS for vehicles and travelers within the overall connected vehicle environment.

As table 4-1 below illustrates, the policy team did not identify any high-priority policy issues for EnableATIS. The team identified two medium-priority issues, and two low-priority issues. In the following descriptions, the policy team notes whether the analysis to date has identified options for resolving the issues, or whether further analysis may be needed as part of the Federal role in supporting EnableATIS implementation.

Table 4-1. EnableATIS Policy Issues

Issue	Priority	Common to Other DMA Bundles?
ATIS Availability and Social Equity	Medium	Yes
Potential Driver Distraction	Medium	Yes
Data Integration	Medium	Yes
Foster Tools for Transportation Systems Management	Low	No

ATIS Availability and Social Equity (Medium Priority)

The Challenge: While highways in rural areas may be covered, ATIS infrastructure expansion may be limited or nonexistent on secondary rural roads and in some areas altogether, due to relatively high costs and low profitability stemming from the greater distances to cover and the smaller populations served. Additionally, many rural areas do not have the required cellular communications infrastructure in place to support ATIS or other connected vehicle applications, adding to the initial cost of site placement and limiting return on investment. Some urban areas could also experience coverage gaps, as the private sector concentrates its resources in areas where the financial return is greatest and/or fastest. The policy concern for ATIS applications is whether these challenges create an equity imbalance whereby some sections of the U.S. population have access to ATIS while others do not. However, NHTSA is expected to require all newly manufactured vehicles to have broadcast capability (including, but potentially not limited to, the capability to broadcast Basic Safety Messages). One result may be proliferation of traveler data in otherwise underserved areas, as messaging will not be dependent totally

on the presence of roadside infrastructure. In cases where road side infrastructure is required, rural areas are likely to have less equipment installed, thereby potentially limiting ATIS coverage.

Recommended Actions: If USDOT finds that a social inequity is emerging, two options present themselves:

- Analyze the impact of EnableATIS for rural areas. Identifying the essential data elements to support ATIS functionality in rural areas would be the basis for the analysis. Further inputs for analysis would be the identification of barriers to deployment. While targeted Federal funding is not identified for connected vehicle technologies at this time, a needs inventory would help states with rural areas prioritize high priority deployment sites and justify planning for those projects that alleviate any social equity imbalance for ATIS.
- Develop cost estimates to allow State and local rural agencies to determine whether and how the critical ATIS infrastructure aligns with their future investment plans. Additionally, USDOT can develop case studies on public private partnerships that have successfully brought ITS services to rural areas without significant public sector funding. These models may help attract private sector interest in underserved areas.

Potential Driver Distraction (Medium Priority)

The Challenge: Visual devices displaying connected vehicle messaging, including ATIS-related messages, have the potential to distract drivers and compromise safety. ATIS messages, due to their role in helping avoid congestion, may be especially alluring to drivers making decisions about route selection while traveling at high speeds.

This challenge is not unique to ATIS and, in fact, already exists as automobiles are increasingly using touchscreen driver interfaces both to manage vehicle systems (such as sound system and temperature controls) and to provide information regarding engine function and vehicle location. At this time, NHTSA guidelines on distracted driving are the primary source of information and guidance on in-vehicle systems. NHTSA continues to promote safe driving practices, and collects data on driver distraction-related crashes to better inform decision making in this area.

In addition to these known concerns, the probable near-term rapid expansion of connected vehicle communications technologies will bring additional data—and associated potentially-distracting information—into vehicles. The market will likely continue to introduce these technologies at a rapid pace, potentially exacerbating a serious public safety hazard.

Recommended Actions: USDOT and its partners will continue to address the challenges of distracted driving. NHTSA's research on distracted driving⁵ will continue to inform the DMA program and any EnableATIS applications that are developed in the marketplace. As new technologies emerge offering in-vehicle services, NHTSA and the auto industry are working together to ensure that driver distractions and workload do not increase.

⁵ Guidelines and other studies can be accessed at this link:

<http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+DOT+Releases+Guidelines+to+Minimize+In-Vehicle+Distractions>.

Data Integration (Medium Priority)

The Challenge: In the absence of open-data standards for connected vehicle applications, private sector ATIS technology is currently developing on multiple platforms that are not interoperable. This is also true of new dashboard applications, in which developers are creating customized application platforms for each vehicle brand they serve. For example, online music streaming services are currently creating brand-specific integrations for multiple major car manufacturers, as well as integrations for aftermarket manufacturers.⁶

While open-data standards have promoted innovation and creativity, the success of data standardization purely as a result of market forces has been mixed over the years. Some standards may succeed for reasons other than absolute quality and efficiency. Success in the marketplace does not necessarily lead to a standard that increases integration or interoperability.

Although technologies advancing with multiple standards lack interoperability, they have provided many public benefits, notably in the case of smartphone applications, where developers create parallel apps for the most popular smartphone platforms. The existence of multiple platforms provides a palette of choices for purchasers. On the other hand, evolution of a central standard might free up creative energy to pursue new innovations (versus redeveloping existing apps for alternate operating systems).

Also, with more data available in a connected vehicle environment, there is the possibility of shared data collection for widespread distribution and use. Integrating data collection efforts could facilitate the creation of a single source to multiple public and private agencies for multiple applications.

Recommended Actions: The absence of a single central standard does not necessarily put the EnableATIS concept at risk—hence the rating of “low” priority. Notably, an ATIS market is succeeding in today’s marketplace with a minimum of public sector standards. However, as technology connectivity allows for ever-greater integration, standards play an important role in enabling wider access. Several actions can be considered to facilitate increased interoperability and integration that would improve the overall quality and access of traveler information:

- Pursue a minimum number of enabling data standards based on the criteria of interoperability and access to serve public mobility needs. The USDOT has an ITS Standards program that works collaboratively with industry and stakeholders to develop consensus-based standards through standards development organizations. Through the FHWA rule/FTA policy on the National ITS Architecture, the USDOT could require some of these standards if they prove beneficial. The CVRIA⁷ initiative is using a first set of connected vehicle architecture views from which interfaces can be identified to determine their importance as candidates for standardization. The process for identifying and prioritizing these candidate interfaces has been described⁸ and will result in a draft plan in the summer/fall of 2014.
- Advance the state of practice in big data analytics and promote the use of connected vehicle data. The USDOT is supporting a Data Capture and Management program that is researching new methodologies in support of public sector management needs. The outcome of that effort is expected to facilitate data integration across connected vehicle applications including EnableATIS. As part of

⁶ “Viewpoint: Apps for connected cars? Your mileage may vary,” in Telematics Update, accessed April 7, 2014. <http://analysis.telematicsupdate.com/infotainment/viewpoint-apps-connected-cars-your-mileage-may-vary>

⁷ See: <http://www.standards.its.dot.gov/DevelopmentActivities/CVReference> for details.

⁸ http://www.standards.its.dot.gov/content/documents/V2x_standardization_plan.pdf accessed April 2014

the DCM program, USDOT will seek to identify public needs for data integration, see where potential gaps may be, and identify potential barriers to be resolved. Additionally, through its work in the Southeast Michigan test bed⁹, the ITS JPO is working on leading-edge techniques for data translation into common formats.

USDOT can also conduct research into the options around an information broker for the collection and distribution of connected vehicle data. USDOT and private industry could work together in better understanding the options around the “collect once and distribute” model to advance the state of the practice for ATIS.

Foster Tools for Transportation Systems Management (Low Priority)

The Challenge: ATIS application development is being led by the private sector, focused primarily on consumer ATIS applications that benefit individual end users. As a result, development of tools for use by public-sector transportation-management entities such as Transportation Management Centers (TMCs) may be overlooked due to their near-term, high investment costs and longer-term and potentially low revenues.

To deliver on its full potential, the connected vehicle environment requires comprehensive, multisource, multimodal, and trusted data from which to enable a multitude of traveler information services. In the private sector, large data aggregation companies are best positioned to develop such data sources. Such companies will naturally focus on data streams with clear market demands and clear profitability. This is the case today for aggregators who sell traffic data to navigation and mapping providers who, in turn, offer the information as a free service to consumers as a way of enhancing their products or services (e.g., traffic data provided in Google Maps).

However, there are no obvious business models for developing ATIS-sourced data—for example, vehicle location and movement data—for use by other DMAs or TMCs. Thus private sector development in this area is not certain to occur. Private-sector provision of products and services for transportation system management is also limited (in comparison to the consumer end-user market) by higher costs of entry, a comparatively small market, lack of resources on the part of potential customers, and barriers to market entry due to public-sector contracting processes. Ongoing USDOT research may be able to identify potential public-private partnership models and other ways to induce the private sector to build a data environment that supports integrated, system-wide transportation management.

Recommended Actions: Public agencies will likely continue providing certain types of ATIS data, such as traffic and road data, from existing publicly-owned sensors and cameras. Additionally, probe data will be regarded and used as an adequate substitution in some areas as available. The policy team has identified four potential initiatives regarding the development of ATIS tools and data sources, despite the relative lack of conventional business models:

- Describe a range of potential public-private partnership models, based on findings from ongoing connected vehicle market research. Research should include data elements with and without obvious revenue streams.

⁹ http://www.its.dot.gov/testbed/testbed_SEmichigan.htm. Accessed April 2014.

- Engage stakeholders (particularly data aggregators) in the development of partnership models to understand which models are most likely to be viable in terms of attracting private-sector interest and sustained involvement.
- Research case studies on transportation management coalitions that have pooled resources to determine the impact on market demand and provision of services. Provide guidance to other jurisdictions for developing data-sharing agreements among agencies and potential funding sources.
- Continue to sponsor research into tools that would exploit big data analytics and data integration for transportation systems management.

Chapter 5 Conclusion

The policy team has documented four policy issues for EnableATIS, none of them high-priority. In conclusion, the policy team finds that additional policy research, outreach, and other steps may be needed, including investigation of public-private partnerships to broaden the reach and improve the effectiveness of ATIS implementation. In summary, the four issues and recommended next steps include:

- Inequitable distribution of ATIS and other connected vehicle functionality may need to be evaluated to determine the level of potential impact on underserved populations.
- Driver distraction—an issue shared by many connected vehicle applications—is among the central concerns of connected vehicle policy research. Analysis is currently under way by USDOT and industry experts.
- Data integration may spontaneously result from market forces or may result if existing standards development organizations involve themselves in the ATIS application market. The USDOT may choose to provide support if the private sector is motivated to work with public agencies.
- Similarly, tools for providing ATIS data to transportation management centers may evolve if private-sector stakeholders are motivated to work with USDOT towards greater system-wide efficiency and effectiveness.

It is expected that this report will support a dialogue with stakeholders. Stakeholders may comment on:

- Any additional policy or institutional issues that may present challenges to successful emergence of ATIS technology and practice that are not documented but for which new or additional research and analysis is recommended.
- Whether policy options identified for resolution of the issues are appropriate.

Based on the results of this analysis, the policy team does not foresee a need for any new policies to be enacted or any major issues that will stand in the way of successful private sector ATIS development.

APPENDIX A. Source Materials

In conducting this analysis, the policy team used the following documents and information sources about EnableATIS:

1. *Vision and Operational Concept for Enabling Advanced Traveler Information Services, Operational Concept (EnableATIS). Final Report. May 13, 2012.*
Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Kimley-Horn and Associates, Inc.
2. *Vision and Operational Concept for Enabling Advanced Traveler Information Services, Market Readiness Assessment. Final Report. May 22, 2012.*
Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Kimley-Horn and Associates, Inc.
3. *Policy Analysis for the Connected Vehicle Dynamic Mobility Applications. Draft Report. April 12, 2013.*
Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Volpe National Transportation Systems Center.
4. *EnableATIS Connected Vehicle Reference Implementation Architecture physical viewpoints*, at: <http://www.iteris.com/cvria/html/applications/applications.html>
Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Iteris.
5. *EnableATIS Strategy Assessment. Version 1.0. February 25, 2014.*
Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Noblis, Inc.

APPENDIX B. List of Acronyms

ATIS	Advanced Traveler Information Systems
BSM	Basic Safety Message
CAN	Controller Area Network
ConOps	Operational Concept
CV	Connected Vehicles
CVRIA	Connected Vehicle Reference Implementation Architecture
DCM	Data Capture and Management
DMA	Dynamic Mobility Applications
DSRC	Dedicated Short-Range Communications
EnableATIS	Enabling Advanced Traveler Information Systems
FRATIS	Freight Advanced Traveler Information System
IDTO	Integrated Dynamic Transit Operations
INFLO	Intelligent Network Flow Optimization
ITS	Intelligent Transportation Systems
JPO	Joint Program Office
MMITSS	Multi-Modal Intelligent Traffic Signal Systems
NHTSA	National Highway Traffic Safety Administration
R.E.S.C.U.M.E	Response, Emergency Staging and Communications, Uniform Management, and Evacuation
TMC	Transportation Management Center
USDOT	United States Department of Transportation

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