GUIDE TO FEDERAL INTELLIGENT TRANSPORTATION SYSTEM (ITS) RESEARCH

Including Connected Vehicles

U.S. Department of Transportation

Research and Innovative Technology Administration

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The U.S. Department of Transportation's (USDOT) Intelligent Transportation System (ITS) Program aims to bring connectivity to transportation through the use of advanced wireless technologies — powerful technologies that enable transformative change.

The vision of the ITS Program's research is of a national, multimodal surface transportation system of connected vehicles, infrastructure, and passengers' portable devices. This connected environment will leverage technology to maximize safety, mobility, and environmental performance. The environment will include cars, trucks, transit vehicles like buses, and even pedestrian cell phones.

In addition, the USDOT supports research that helps to expand deployment of traditional ITS technologies.

Connected Vehicle Research

A system of connected vehicles has the potential to transform the way we travel through the creation of a safe, interoperable wireless communications network. The technology will enable cars, trucks, buses, and other vehicles to "talk" to each other with in-vehicle or aftermarket devices that continuously share important safety, mobility, and environmental information. Connected vehicles can also use wireless communication to "talk" to traffic signals, work zones, toll booths, school zones, and other types of infrastructure.

The vehicle information communicated does not identify the driver or vehicle, and technical controls have been put in place to help prevent vehicle tracking and tampering with the system.

The vision for connected vehicle technologies is to transform surface transportation systems to create a future where:

- Highway crashes and their tragic consequences are significantly reduced
- Traffic managers have data to accurately assess transportation system performance and actively manage the system in real time, for optimal performance
- Travelers have continual access to accurate travel time information about mode choice and route options, and the potential environmental impacts of their choices
- Vehicles can talk to traffic signals to eliminate unnecessary stops and help drivers operate vehicles for optimal fuel efficiency.

The USDOT Research and Innovative Technology Administration's ITS Joint Program Office fosters the development and future deployment of connected vehicle technologies. The Department's research into connected vehicles focuses on the following areas:

- Connected Vehicle Applications
- Connected Vehicle Policy and Institutional Issues
- Connected Vehicle Technology.

Connected Vehicle Applications

Safety: Connected vehicle safety applications will enable drivers to have 360-degree awareness of potential hazards and crash situations—even those they cannot see. In-car warnings will alert drivers of imminent crash situations, such as merging trucks, cars on the driver's blind side, or when a vehicle ahead brakes suddenly.

- Vehicle-to-Vehicle (V2V) Communications for Safety is the wireless exchange of data among vehicles (including cars, trucks, transit vehicles, and motorcycles) traveling in the same vicinity.

Imagine if...

...your car could tell you that another vehicle you can't see is about to run a red light.

- Vehicle-to-Infrastructure (V2I) Communications for Safety is the wireless exchange of critical safety and operational data between vehicles and roadway infrastructure.

Imagine if...

...your car could tell you where to find an available parking space.

Mobility: Anonymous signals in vehicles will help generate new data about the way vehicles travel—information that transportation managers could then analyze to help make roads safer and less congested.

The same signals could also be shared among mobile devices and roadside sensors. This exciting new data-rich environment will be the genesis for a multitude of new mobility applications that will help to keep traffic flowing and make it easier for people to plan their travel experience.

- Data Capture and Management (DCM) is the creation and sharing of high-quality, real-time, multimodal transportation data, captured from connected vehicles, mobile devices, and infrastructure. The DCM program's vision is to improve the operation and management of our transportation system as well as available traveler information by providing integrated data from connected vehicles to researchers, application developers, and system operators.

Imagine if…

…you're able to build your own connected vehicle apps based on open data available to everyone.

- Dynamic Mobility Applications (DMA) are the next generation of applications that will support further transformations in mobility. These applications focus on innovative methods for operating existing transportation systems and on greater integration across modes (e.g., light vehicles, transit vehicles, and trucks).

Imagine if…

…your car could suggest an alternative route due to an unseen traffic jam ahead.

Environment: Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices. For instance, informed travelers may decide to avoid congested routes, take alternate routes, use public transit, or reschedule their trip — all of which can make their trip more fuel-efficient and eco-friendly.

Applications for the Environment: Real-Time Information Synthesis (AERIS) is the "green" research component of the ITS Program. The AERIS program aims to assess how the suite of V2V and V2I connectivity and communications options and data may contribute to air quality improvements and greenhouse gas reductions, and then evaluate and quantify the magnitude of these improvements.

Imagine if…

…traffic signals could use real-time data to adjust traffic flow to minimize stops and starts and curb pollution.

Road Weather: Connected vehicle road weather applications will assess, forecast, and address the impacts that weather has on roads, vehicles, and travelers. Data from connected vehicles provide the opportunity to pinpoint where and how weather is affecting the roadways, thus leading to greater understanding of the scope of road treatments and mitigation strategies during inclement weather, greater quality of the information provided to drivers and travelers, and greater details for producing more targeted traffic management strategies.

Connected vehicle road weather strategies will build upon decision-support tools currently undergoing development, testing, and deployment, such as those being developed under the Road Weather Management Program (e.g., the Clarus Regional Demonstrations, Weather-Responsive Traffic Management, and the Maintenance Decision Support System).

Imagine if…

…a truck ahead could share information with your vehicle about an upcoming icy patch of road along your route.

Connected Vehicle Policy and Institutional Issues

The USDOT is also researching and analyzing the critical policy and institutional issues that may limit or challenge successful deployment of connected vehicle technologies. The research supports the development and comparison of effective policy options; the analysis will result in structured recommendations for policy and decision makers.

The research into connected vehicle policy is a collaborative effort among the Department, key industry stakeholders, vehicle manufacturers, state and local governments, representative associations, citizens, and others. Collectively, this group will structure and conduct a research agenda that weighs the benefits and risks and results in strong policy foundation for the successful deployment of connected vehicle technologies and applications.

Connected Vehicle Technology

The development and deployment of a fully connected transportation system that makes the most of multimodal, transformational applications requires a robust, underlying technological platform. The platform consists of well-defined technologies, interfaces, and processes that combine to ensure safe, stable, interoperable, reliable system operations, thereby minimizing risk and maximizing opportunities.

For the ITS Program and its partners to deliver such a platform, further research is needed in the creation of standards for interoperability, system security, strategies that address the complexity of human behavior and risks associated with the driver's workload, and processes that define how travelers and equipment become a certified part of the system.

Other technical research will also be pursued to identify and resolve technological limitations with positioning, scalability, and other technical issues.

ITS Short-Term Intermodal Research

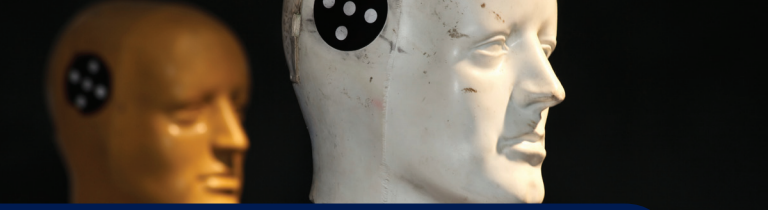
Although research in support of connected vehicles is a central part of the ITS Program, additional ITS research is being conducted that reinforces the overall vision of ITS. Specifically, a set of short-term intermodal research programs will further the USDOT's goal of leveraging technology to maximize safety, mobility, and environmental performance.

Three key short-term, intermodal ITS research programs include:

- **Active Traffic Demand Management (ATDM):** The dynamic management of travel demand, traffic demand, and traffic flow to allow transportation agencies to improve trip reliability, system productivity, and safety.

- **Intelligent and Efficient Border Crossings:** ITS applications that use variable toll pricing, advanced traveler information systems, electronic screening, and other technologies to improve safety and mobility, reduce emissions, and improve security at our nation's borders.

- **Commercial Vehicle Information Systems and Technologies (CVISN):** A collection of information systems and communications networks designed to improve the safety and productivity of motor carriers and their drivers and reduce regulatory and administrative costs for public and private-sector stakeholders through improved data sharing, electronic credentialing, and targeted automated screenings and enforcement of high-risk carriers at the roadside.



ITS Exploratory Research

The ITS Program recognizes that technology evolves rapidly and that the community is filled with new, creative ideas for approaches to connectivity, safety, mobility, and environmental mitigation. Thus, the vision of ITS Exploratory Research is to harness the creativity of a broad public audience to find innovative options and solutions for government.

Three activities comprise the Exploratory Research portfolio:

- **Technology Scan:** A series of forward-thinking research papers that examine evolving technologies with the potential to impact the development of connected vehicles
- **Innovation Challenges:** Competitions to engage a third party or parties in identifying innovative solutions for improving safety and efficiency on roads and highways, such as:
  - Connected Vehicle Technology Challenge 2011
  - The ITS Video Challenge 2011
- **Exploratory Research on Future Initiatives:** Research into new opportunities that offer the most viable potential for improving safety, mobility, environmental performance, and other functions that are a priority for the USDOT.

ITS Cross-Cutting Support

The ITS Program includes functions that ensure the effective and successful implementation and use of ITS. These cross-cutting programs are the mechanism through which the ITS Program directly gathers and assesses the data on ITS needs; they are also the ITS Program's mechanisms for ensuring that implementers understand both the value of and the uses for ITS technologies, systems, models, and strategies that are produced through the research initiatives. The USDOT provides resources for deployers through the ITS Standards program, ITS Professional Capacity Building program, and ITS Knowledge Resources website.

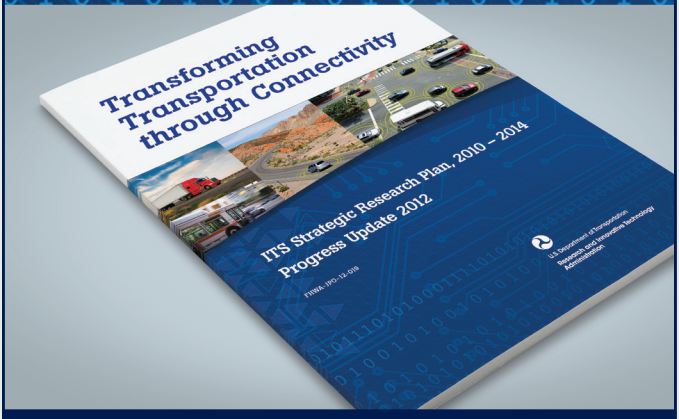
The ITS Program includes five cross-cutting programs in support of ITS modal research:

- National ITS Architecture
- ITS Professional Capacity Building
- ITS Evaluation
- International Collaboration on ITS Research
- ITS Outreach and Communications.

UPDATED

ITS Strategic Research Plan

Progress Update 2012



The updated *ITS Strategic Research Plan* gives you the latest information about all of the ITS related research at the U.S. Department of Transportation

Download your free copy of the plan at:

www.its.dot.gov/strategicplan

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ITS Research Results

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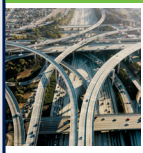



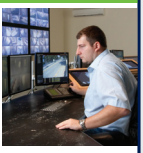

The new ITS Knowledge Resources database features data on:

- **The benefits of ITS technology for transportation operations**
- **Cost estimates for ITS deployment**
- **Lessons learned from today's ITS practitioners**
- **ITS deployment statistics from 108 metro areas in all 50 States**
- **Interactive maps to help locate deployment leaders in your State**

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Your search is over. Find the free data you need at:
www.itskr.its.dot.gov

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For more detailed information on the USDOT's ITS Program, including fact sheets, publications, and staff presentations, visit:

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