

# Setting Deployers Up for Success

Using Technical Assistance Resources to  
Make a Better Business Case for  
Deployment, Improve Project Execution,  
and Accelerate ITS Deployment



# Today's Presenters



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U.S. Department of Transportation  
ITS Joint Program Office (JPO)

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# Instructions

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## Where are you located?

All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting in Interactivity to let participants vote for their favorites





# Where do you work?

---

State or  
Local DOT

MPO

Transit  
Agency

Consultant

Association

Academia

Other



# ITS Joint Program Office: Full ITS Lifecycle Leadership

## Identify Emerging Technologies



- Communications/Spectrum
- Climate Change and Environment
- Artificial Intelligence
- Blockchain & Quantum Computing
- Modeling and Simulation

## Coordinate and Lead Research



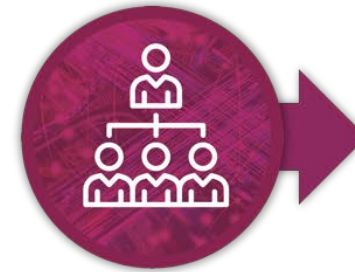
- V2X / Interoperable Connectivity
- Roadway Safety
- Automation
- Cybersecurity
- Data Access/Exchanges

## Demonstrate Value



- **ITS4US Deployments**
- **CV Pilots**
- **Benefit & Cost Data**
- ATTAIN & SMART Grants
- Intersection Safety Challenge
- Decision Support & Analytics

## Accelerate Implementation



- **Deployment Evaluation**
- **Professional Capacity Building**
- **Architecture & Standards**
- Communications & Outreach

## Leverage Knowledge



- Deployment Tracking
- **Smart Communities Resource Center**
- **Technical Assistance**
- **Cohort Support**
- **Knowledge Transfer**
- **Training**

# “Solving Problems Worth Solving”



**Safety**



**Mobility**



**Equity**



**Climate &  
Sustainability**





# Safety Challenges

- **118 people die** on our roadways daily.
  - Roughly **25% of traffic fatalities** and about 50% of all traffic injuries in the U.S. **occur at intersections.**
  - Roadway **pedestrian and cyclist fatalities** totaled 8,952 in 2022 (▲ 2.3% from 2021).
  - The overall fatality rate is **1.7 times higher in rural areas** than urban areas.



**IMAGINE A WORLD WHERE  
NO ONE DIES ON OUR ROADWAYS**

**IN 2021, 42,915 PEOPLE**  
LOST THEIR LIVES ON ROADWAYS  
ACROSS THE NATION.

THAT NUMBER OF PEOPLE  
COULD FILL THE AVERAGE  
**PROFESSIONAL  
BASEBALL STADIUM.**

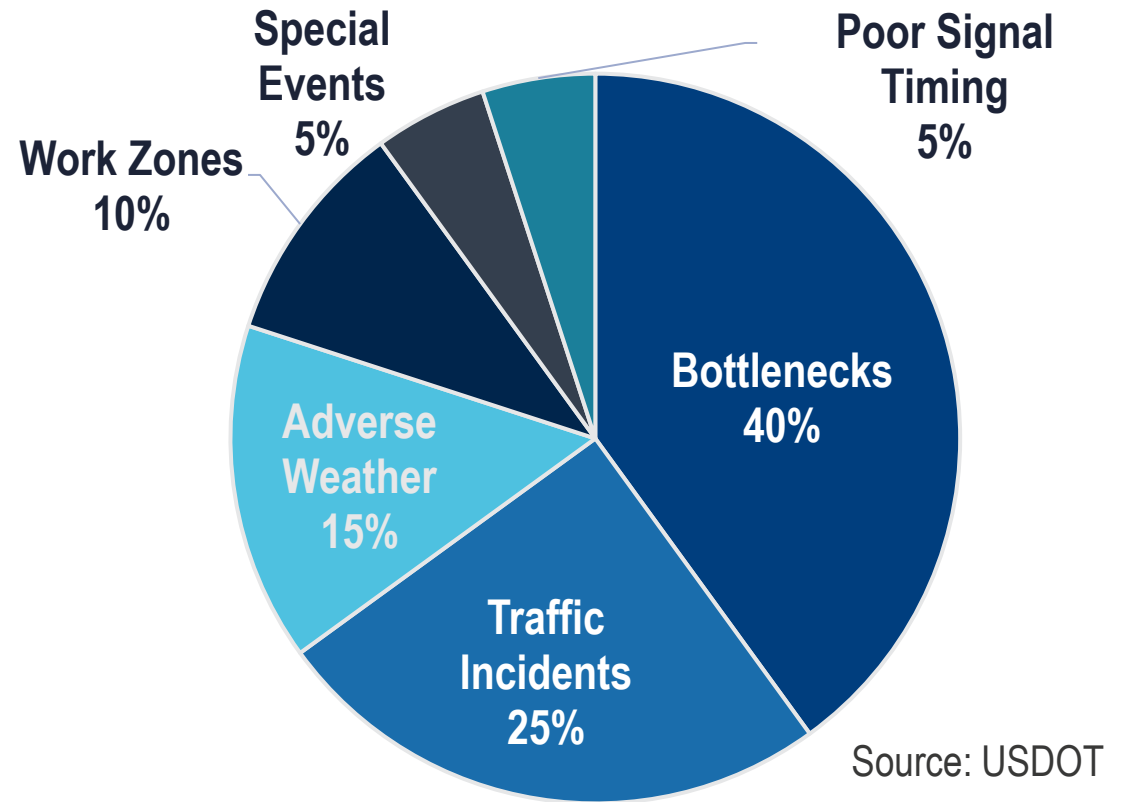
To learn more about the Safe System Approach, visit <https://www.transportation.gov/NRSS/SafeSystem>  
Note: Figure is an estimate of motor vehicle traffic fatalities in 2021: <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813283>

Source: USDOT



# Mobility Challenges

- In 2022, traffic congestion led to:
  - 51 hours lost (per typical driver) which cost the average driver \$869 in lost time (2022 INRIX Traffic Scorecard).
  - \$81 billion in economic cost to the country (2022 INRIX Traffic Scorecard).
- Mobility challenges often result in increased traffic crashes.



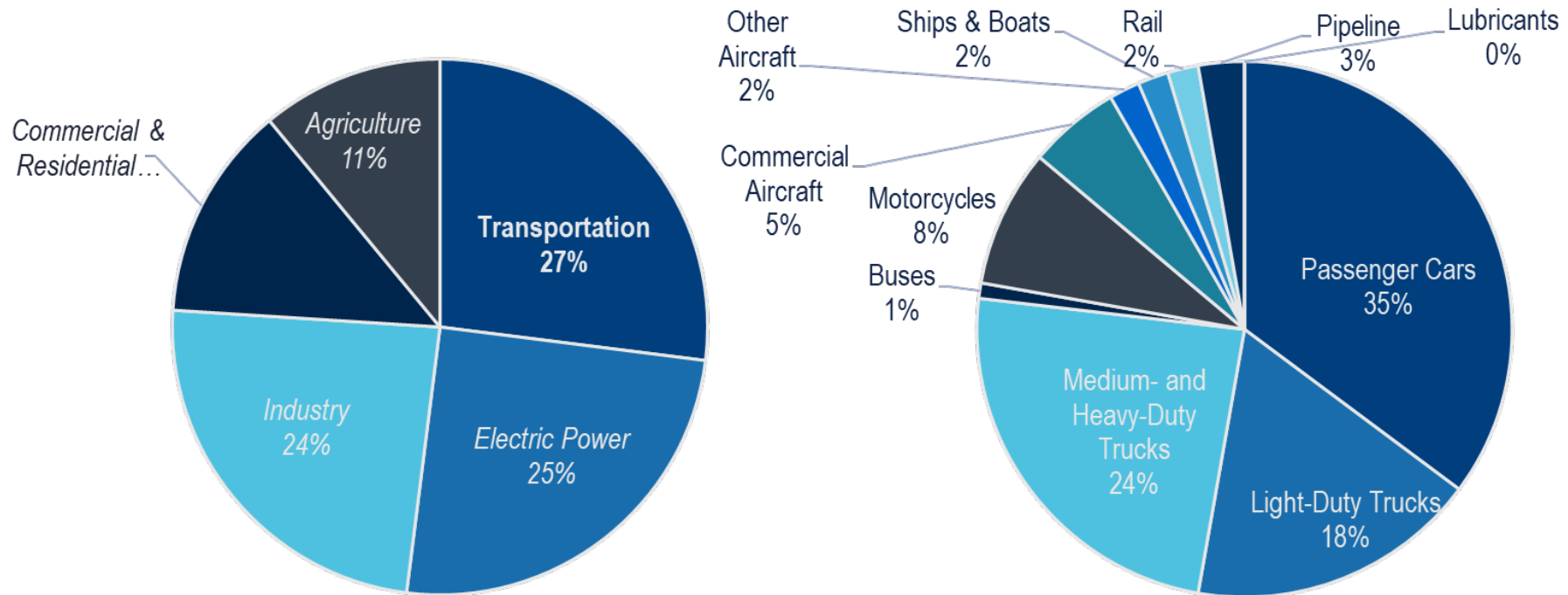
# Equity Challenges

- According to the National Household Travel survey, 25.5 million Americans have travel-limiting disabilities.
- Nearly 10% of households do not have access to a personal vehicle.
  - Lack of access to alternatives to personal vehicles can limit access to jobs, school, healthcare, and social services leading to higher rates of unemployment, poverty, chronic illness, and isolation.
- Roughly 25% of all transit stations in the U.S. were not accessible in FY2020.
- People who are American Indian and Alaska Native have roadway fatality rates more than double the national rate on a per population basis.

Source: USDOT



# Climate & Sustainability Challenges



Total U.S. Greenhouse Gas Emissions by Economic Sector in 2020 (left) and Transportation-Related GHG Emissions (right) - Source: EPA

# Intelligent Transportation Systems (ITS)

You can't build your way out of congestion

...

But you can better operate the transportation system to improve safety, reliability, and overall system efficiency



Source: iStock





# Example ITS Solutions

Traffic signal coordination

Transit signal priority

Congestion pricing

Managed lanes

Ridesharing programs

Electronic toll collection

Traveler information

Freight management

Parking management

Freeway management

Traffic incident management

Work zone management

Special event management

Road weather management

Integrated Corridor Management (ICM)

Active Transportation and Demand Management (ATDM)

Coordinated highway, transit, bicycle, and pedestrian operations

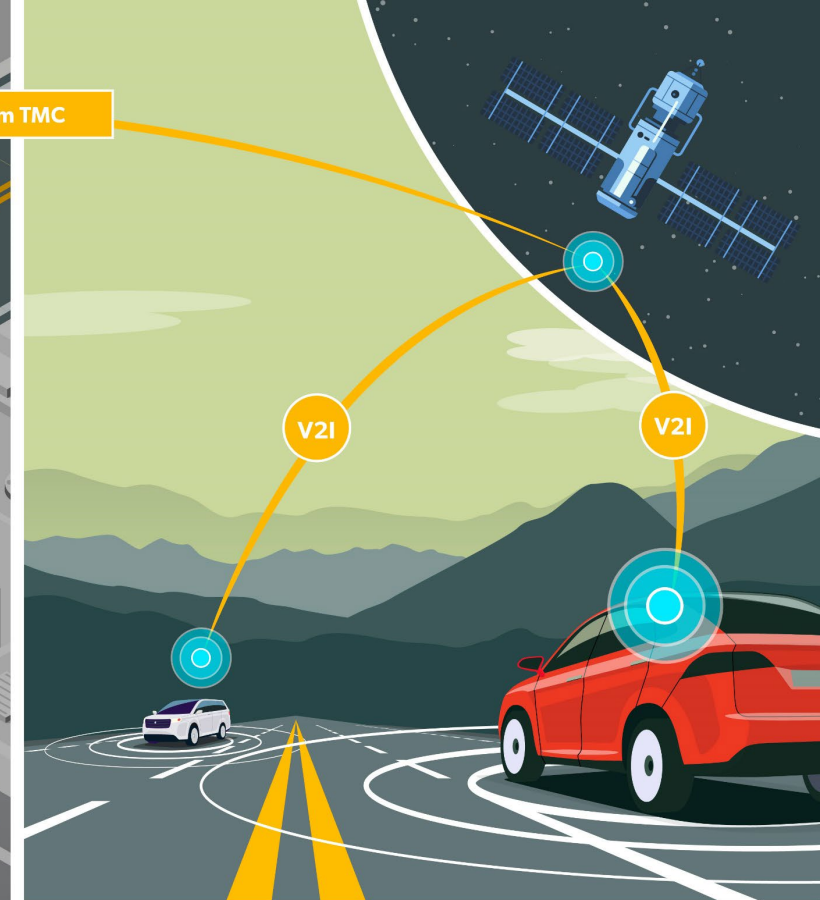
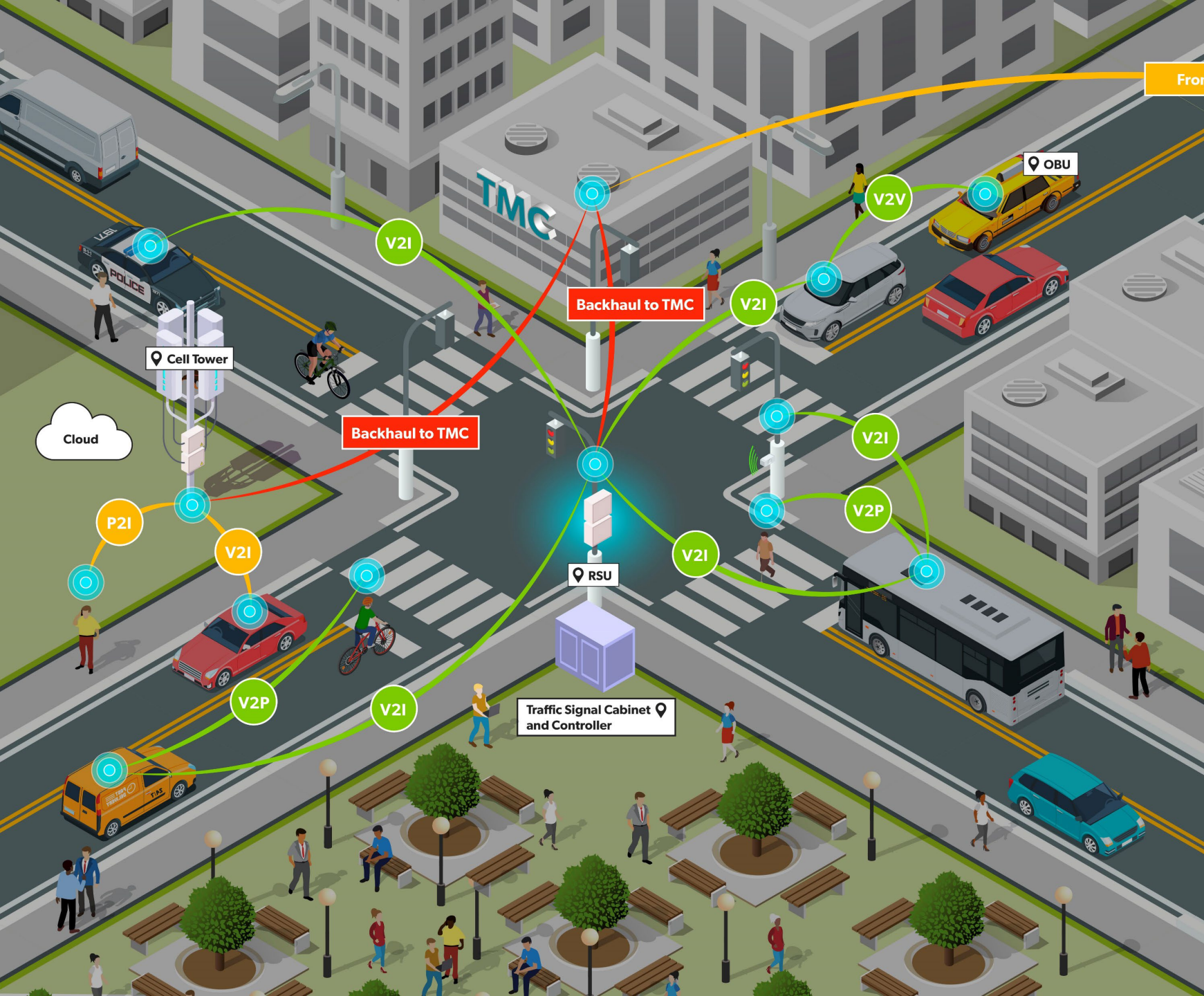




Vehicle to Everything (V2X) is the use of a **variety of wireless communications technologies** to enable vehicles to communicate with each other, with other road users, such as pedestrians and bicyclists, and infrastructure.







— V2X Communication Using the 5.9 GHz Safety Band (e.g., LTE-V2X Sidelink)  
— V2X Communication Outside the 5.9 GHz Safety Band (e.g., LTE Uu Link, Satellite)  
— Backhaul to TMC

**Abbreviations:**  
 V2X - Vehicle-to-Everything  
 V2V - Vehicle-to-Vehicle  
 V2P - Vehicle-to-Pedestrian/Bicyclist  
 V2I - Vehicle-to-Infrastructure  
 P2I - Pedestrian-to-Infrastructure  
 RSU - Roadside Unit  
 OBU - Vehicle On-board Unit  
 TMC - Traffic Management Center  
 LTE - Long-Term Evolution

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## What documents and tools does your agency/regional use to support ITS Planning?

All responses to your question will be shown here

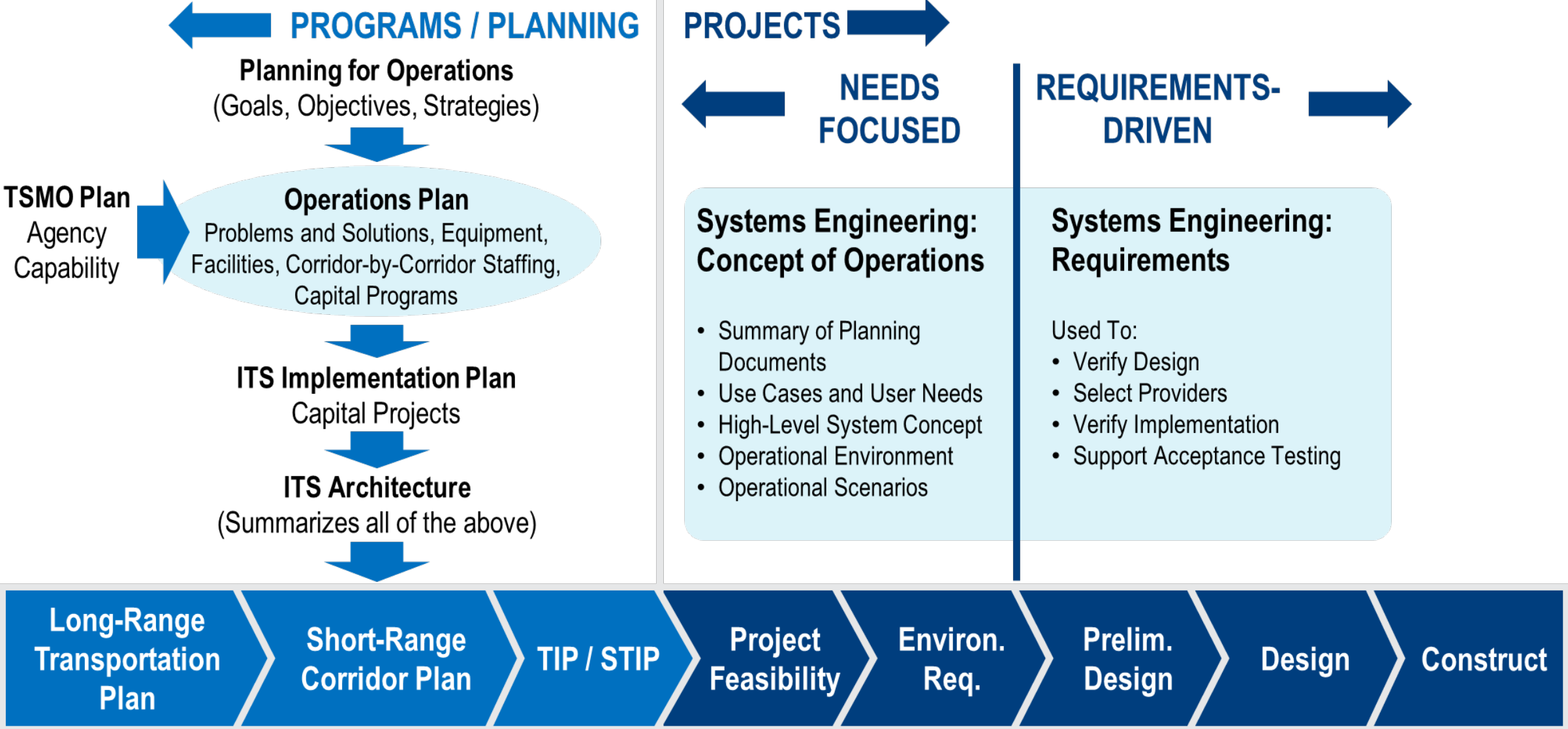
Each response can be up to 200 characters long

Turn on voting in Interactivity to let participants vote for their favorites

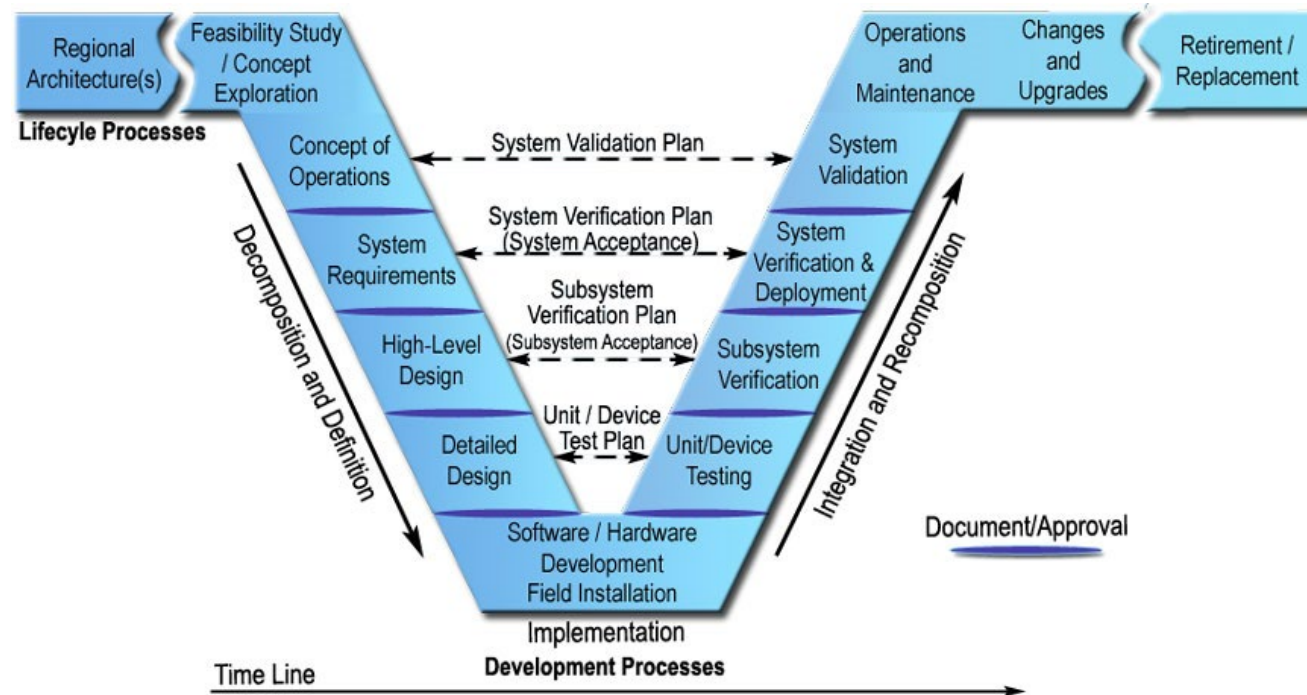




# Where Does ITS Fit into the Planning Process?



# ITS and Systems Engineering



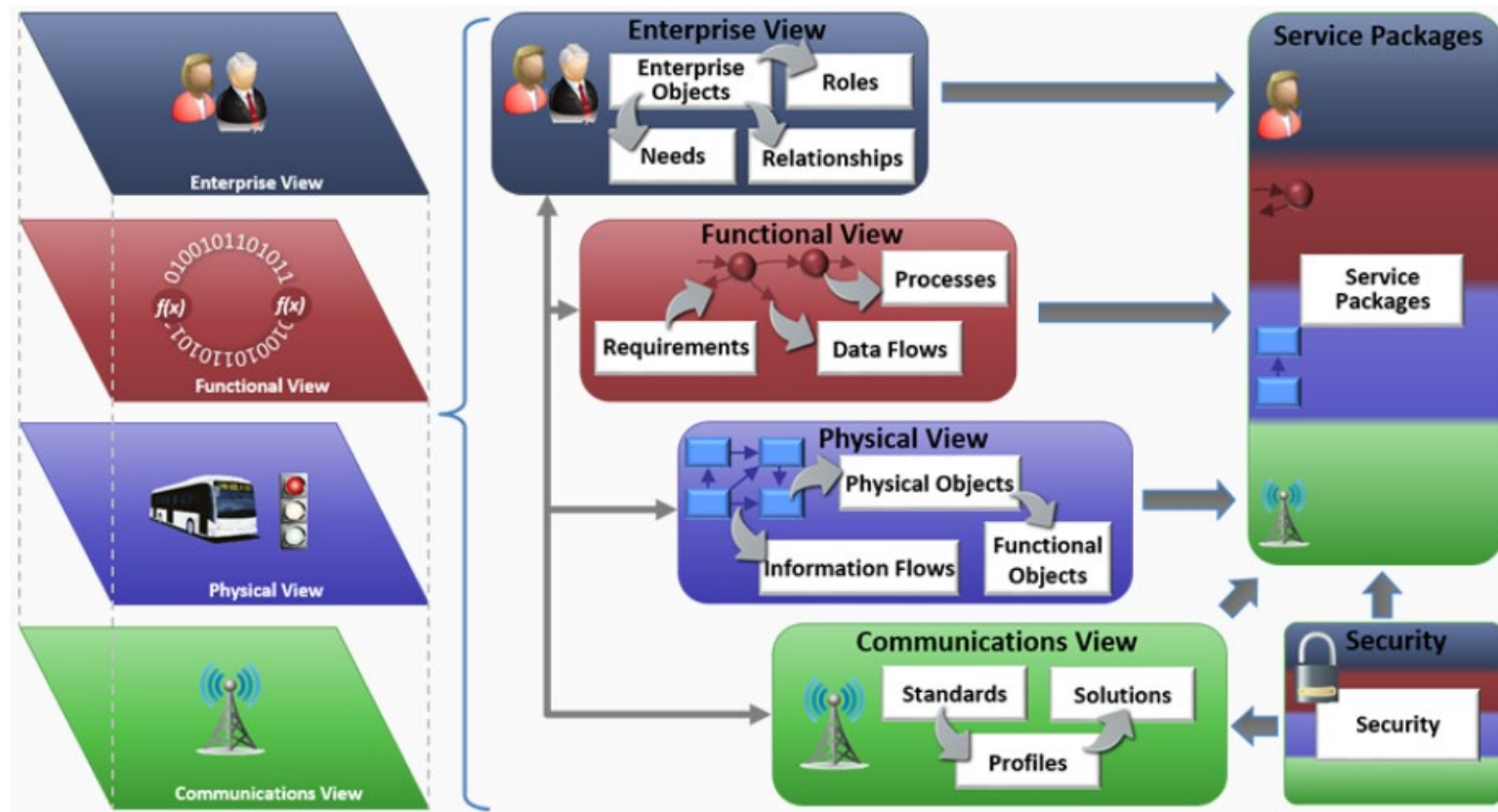
Systems Engineering benefits include:

- Better system documentation
- Higher level of user engagement
- System functionality that meets user needs
- Potential for shorter project cycles
- Systems that can evolve with a minimum of redesign and cost
- Higher level of system reuse
- More predictable outcomes from projects

# ITS Architecture (ARC-IT)

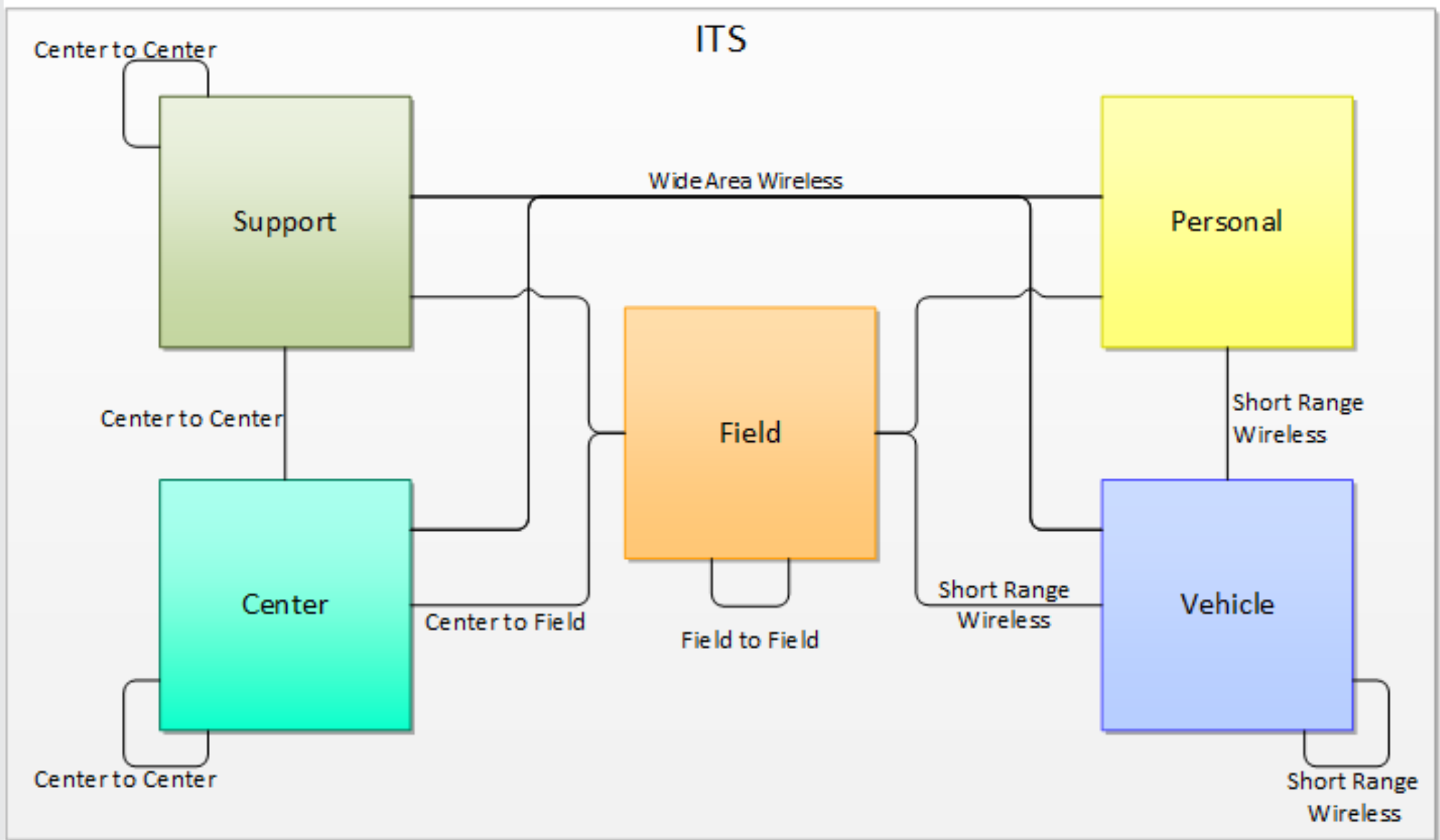


[www.arc-it.net](http://www.arc-it.net)



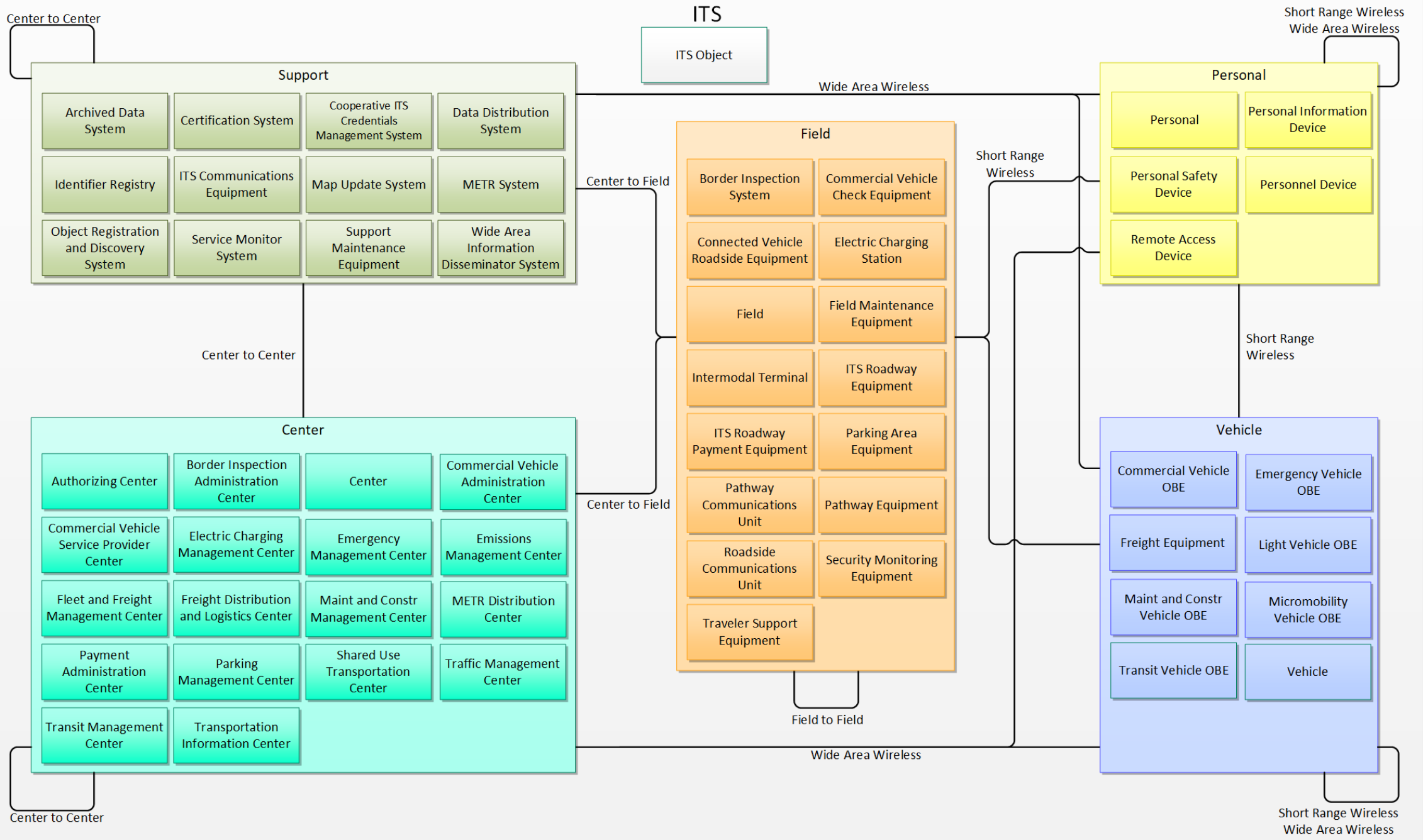
Source: USDOT





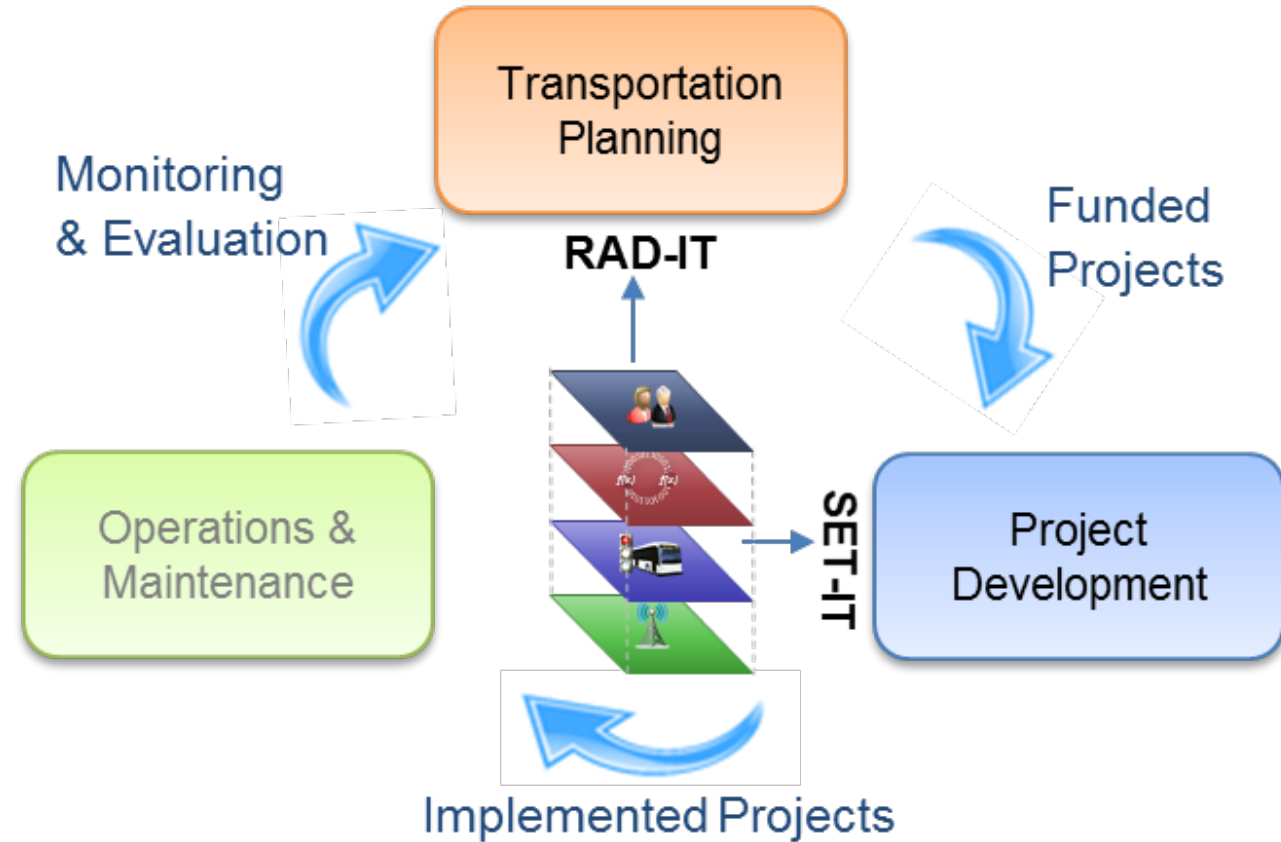
Layer 0: Classes and Primary Interconnects			
6	Physical View	Apr 28, 2019	NAT





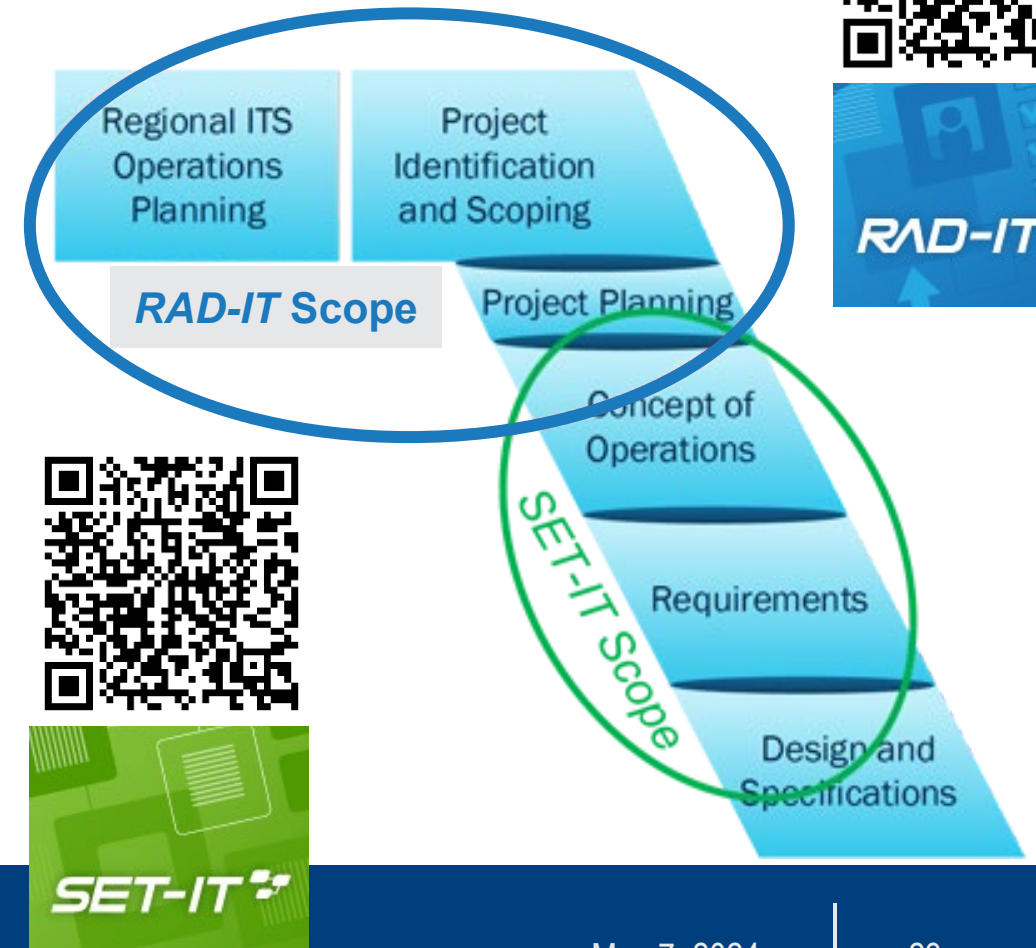
# How are the Reference Architecture and Tools used?

- Focuses on “what must be done” not “how it will be done”
- Regional ITS architecture supports major steps:
  - Planning
  - Programming
  - Development
  - Implementation



# Regional ITS Architectures

- **Regional architectures** are structured descriptions of services provided, relationships required, and items to be deployed, operated, maintained and managed.
- Regional ITS Architectures help jumpstart the SE process supported by two tools:
  - RAD-IT – Regional Architecture Design for Intelligent Transportation
  - SET-IT – System Engineering Tool for Intelligent Transportation



# ITS Technical Assistance Resources

- ITS Deployment Evaluation Resources
- Smart Community Resource Center (SCRC)
  - ITS and Safety
  - Interoperable Connectivity (V2X)
  - Systems Engineering
- ITS Trainings and Other Technical Assistance Resources
- DOT Navigator and Federal Grants for ITS





# ITS Deployment Evaluation



[www.itskrs.its.dot.gov](http://www.itskrs.its.dot.gov)

**Focused  
ITS Benefit  
and Cost  
Data**

The screenshot shows the website's main navigation bar with links for Benefit Data, Cost Data, Deployment Statistics, Decision Support, Success Strategies, and Help. The main heading is "ITS Deployment Evaluation" with the subtitle "Providing decision support data for effective Intelligent Transportation Systems (ITS) decision-making." Below this is a search bar labeled "Search Benefit and Cost Data" with a "SEARCH" button. A secondary search option "Or search using the interactive map" is also present. The navigation bar below the search bar includes icons for Benefit Data, Cost Data, Deployment Statistics, Decision Support, Success Strategies, and Help. The "New Featured Content" section includes three items: "NEW ITS Benefits and Costs Map" (highlighted with a red box), "NEW Pedestrian Safety Data Story" (with a bar chart), and "NEW Interactive Visualization" (with a map of the US).

**Global  
Keyword  
Search**

**Searchable ITS  
Benefits and  
Costs Map**

**Decision  
Support  
Resources**

Source: USDOT

# Example ITS Benefits

Dynamic ramp metering strategies designed to actively counter developing bottlenecks can reduce vehicle delay up to 48 percent.

Experience using real-time traffic data to improve ramp metering and mainline performance on Highway-100 in Minneapolis, Minnesota.

A Variable Speed Limit System on I-95 in Virginia Reduced Fatal and Serious Crashes by 13 Percent.

A Nine-Month Before and After State Study Showed That Variable Speed Limit System Increased Safety on a Freeway in Virginia During Congested Conditions.

A Queue Warning System Installed near Downtown Minneapolis Was Found to Reduce Crashes by 56 Percent and Near Crashes by 69 Percent after Two Years.

Safety Evaluation of Minnesota's Queue Warning System Implemented on Interstate-94.

Truck-mounted radar speed signs were effective in reducing traffic speeds by 5 to 23 percent versus reductions of 4 to 8 percent in work zones without them.

Evaluation of the use of radar speed displays for mobile maintenance operations at four sites in Oregon.

Maryland switches to all electronic tolling on certain bridges and estimates that drivers in the state will collectively save \$1.0 million per year in fuel costs.

A newspaper reporter highlights the benefits of all electronic tolling in Maryland.

# Example ITS System Cost Entry

United States Department of Transportation | Office of the Assistant Secretary for Research and Technology

**ITS DEPLOYMENT EVALUATION**  
Intelligent Transportation Systems Joint Program Office

Benefit Data Cost Data Deployment Statistics Decision Support Success Strategies Help

Home / Costs /

**Total System Cost for Maryland's Dual Mode DSRC/C-V2X Infrastructure-to-Vehicle (I2V) Pedestrian System, Including One-Year Maintenance, Reported as \$84,000 for One Intersection.**

Maryland DOT Piloted Connected Vehicle Technologies Using Dual Mode Roadside Unit with DSRC and C-V2X for A Pedestrian Collision Warning System at One Intersection.

**MD 214 Pedestrian I2V Deployment**

**Source Date:** 06/05/2023  
**Publisher:** Maryland DOT  
**URL:** <https://cav.mdot.maryland.gov/wp-content/uploads/2023/06/MDOT-SHA-MD-214-Projec...>

**System Cost**  
Prototype V2X Dual-Mode Node: \$84,000

**Taxonomy (ARC-IT) Vehicle Safety »**  
Vulnerable Road User Safety (VS12)

**Connected Vehicle Categories**  
Infrastructure-to-vehicle

**Made Public Date:** 09/29/2023  
**Identifier:** 2023-SC00542

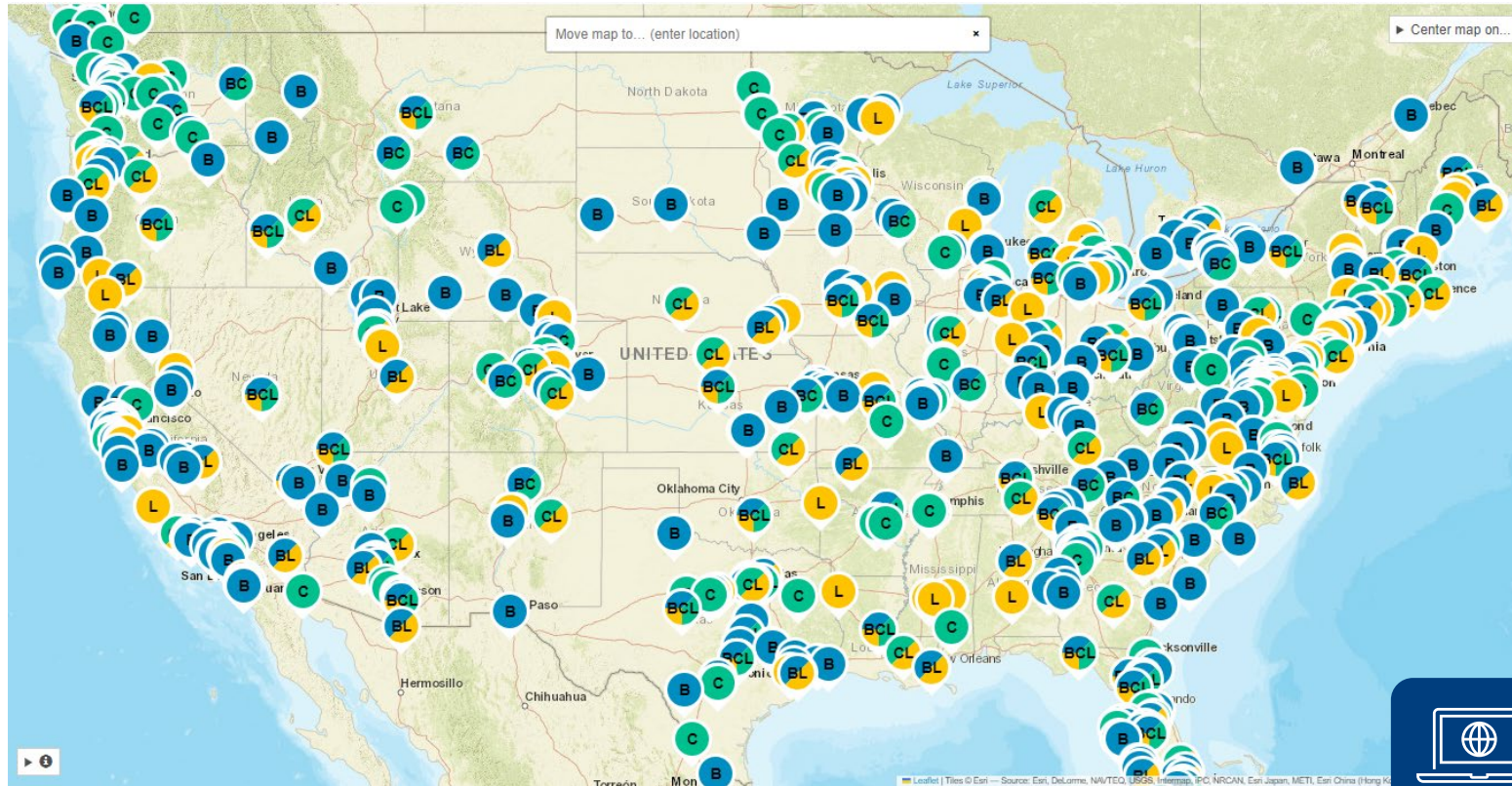
Prince George&#039;s County: Maryland, United States

Infrastructure-to-Vehicle (I2V) systems are recognized for their ability to facilitate connected vehicle communications as part of the broader connected and automated vehicle ecosystem. The way I2V works is by exchanging information in real-time from infrastructure to the technology that is embedded inside a vehicle. Communication can take place either via (i) Dedicated Short Range Communication (DSRC), which is a radio wave that transmits data directly with a low latency from one

Item	Cost
Vendor (RSU, sensors, system + maintenance for 12 months, and install staff time)	\$50,000
MDOT State Highway Administration (SHA) project management and installation staff time	\$20,000
MDOT SHA Engineering Design	\$7,500
MDOT SHA Offices review, approval, and install (mixed staff and consultant support)	\$6,500
<b>Total rounded cost</b>	<b>\$84,000</b>



# ITS Benefits, Costs, and Lessons Learned



Search by:

- Keyword
- ITS Topic
- Goal Area
- CV Benefits/Costs
- Result Type (Modeled or Deployed)



[www.itskrs.its.dot.gov/its-map](http://www.itskrs.its.dot.gov/its-map)



# Other Resources to Help with Evaluation

- ITS Executive Briefings
- ITS Deployment Case Studies
- Infographics
- Data Visualizations
- Deployment Data
- ROI Guide and Use Cases

## Case Studies

### IMPROVING WORK ZONE SAFETY WITH INTRUSION ALARMS

**IN THIS CASE STUDY YOU WILL LEARN:**

1. What some emerging strategies that transportation agencies use in work zones are.
2. How work zone intrusion alarm (WZA) technology helps enable work zone safety.
3. How Tennessee, California, and Oregon evaluated existing WZA technologies and used their results to offer recommendations to other State DOTs.

**Safety in Work Zones**

Work zones present many challenges, both for drivers and road management. Sudden stops, mandatory merging, and uneven road surfaces are a major cause of congestion, delays, and crashes [1]. Depending on severity, work zone crashes can incur significant costs from associated fatalities, injuries, property damage, and operational disruptions. Despite the potential hazards, there is a growing need for work zone activities due to aging infrastructure as well as severe weather events.

Effective work zone management strategies and technologies are necessary to ensure motorist, construction, and maintenance worker safety, reduce congestion, and maintain accessibility for work zone impact areas. The operational and safety benefits of effective work zone management are significant, especially in roadway networks with rapidly changing traffic conditions and already congested corridors.

In response to growing work zone safety concerns, transportation agencies across the country are using Intelligent Transportation Systems (ITS) to make traveling through and around work zones safer and more efficient. These technologies include portable variable speed limit systems (PVSL) [4, 5], automated flagger assistance devices (AFAD) [6], work zone intrusion alarms (WZA) [7-9], virtual reality [10], internet of things (IoT) and artificial intelligence (AI) [11, 12], and connected smart work zones [13-15]. Depending on the nature and constraints of a given work zone, different combinations of safety technologies can be used to improve overall safety. This case study introduces various emerging work zone technologies, with an emphasis on WZA that detect intruding vehicles and alert workers. This case study also highlights safety outcomes, costs, and lessons learned from three states—Tennessee, California, and Oregon—that are early adopters of WZA technologies.

## Executive Briefings

### ITS Deployment Evaluation Executive Briefing

**Highlights**

- The USDOT's National Roadway Safety Strategy outlines the Safe System Approach with the purpose of reaching the goal of zero roadway fatalities.
- ITS technologies have the capabilities to address the objectives and purpose of the Safe System Approach.
- Federal Transit Administration (FTA) developed an enhanced version of the Transit Safety Retrofits Package (TRP) system.

**Vision Zero and ITS**

**Introduction**

In the United States, more than 370,000 people lost their lives in transportation accidents from 2011-2020, including more than 350,000 on U.S. roads [1]. Safety is among the top priorities of the U.S. Department of Transportation (USDOT) and reducing these numbers is of critical importance.

The 2022 USDOT's National Roadway Safety Strategy (NRSS) outlines the Safe System Approach as the guiding paradigm to reduce serious injuries and deaths on our Nation's highways, roads, and streets. The Safe System Approach works by building and reinforcing multiple layers of protection to prevent crashes from happening and mitigate the harm caused to those involved when crashes do occur. Those layers of protection include [2]:

- **Safer People** - Motivating all drivers and road users to practice safe and responsible behavior on our roads.
- **Safer Vehicles** - Deploying available vehicle safety technologies to help minimize crashes and their potential harm.
- **Safer Speeds** - Encouraging all roadway users to drive at safe speeds through education, enforcement, and roadway design.
- **Safer Roads** - Implementing safer roadway environments to assist in the safety of drivers and road users on our highways, roads, and streets.
- **Post-Crash Care** - Providing quick access to medical care and safer environments for first responders in order to increase the survivability of crashes and reduce secondary crash vulnerability.

## Infographics

### ITS for Highway Safety

The total number of estimated highway fatalities increased by 15% on rural interstates and 11% on urban interstates from 2020 to 2021, as reported by the National Highway Traffic Safety Administration (NHTSA).<sup>1</sup>

**Rural Interstate Fatalities ↑ 15%**      **Urban Interstate Fatalities ↑ 11%**

Advancements in making roadways safer with Intelligent Transportation Systems (ITS) are a key part of achieving USDOT's vision of zero deaths and serious injuries on the Nation's roads.<sup>2</sup> This document provides examples of ITS technologies deployed to improve highway safety. The featured benefits are based on past evaluations of ITS projects contained in the ITS Databases at: [www.itsknowledgecenter.com/its-databases](http://www.itsknowledgecenter.com/its-databases).

**Dynamic Shoulder Lane in Michigan**  
Deployment of an Active Traffic Management (ATM) system with a dynamic shoulder lane in Ann Arbor reduced crashes by 17% and yielded a benefit-cost ratio of up to 3.01.

**Integrated Corridor Management in New York**  
Niagara Falls metro region that included dynamic traveler information, freeway incident detection, service patrol, ramp metering, variable speed limits, queue warnings, and variable toll pricing was estimated to prevent \$2.7 million in crash costs in a simulation study.

**Variable Speed Limit in Ohio**  
A before-after study of the I-90 corridor in Lake County showed that crashes during snow events declined 42% after seasonal Variable Speed Limit corridor implementation.

**Queue Warning System in Minnesota**  
In the Twin Cities, a queue warning system resulted in a 22% decrease in crashes and a 54% decrease in near crashes. The system seeks to prevent rear-end collisions by using intelligent lane control signals spaced every half-mile over every lane to warn motorists upstream.

**Integrated Corridor Management in Iowa**  
Integrated Corridor Management in the Des Moines metropolitan area aimed to balance highway capacity improvements and roadway operations. It was estimated to reduce crash frequency by 10% and peak period vehicle hours traveled by 28%.

1. NHTSA, Early Estimates of Motor Vehicle Traffic Fatalities and Fatality Rate by Sub-Corridor in 2021  
2. USDOT, National Roadway Safety Strategy

## ROI Sample Use Cases

### A Guide for Leveraging ITS Evaluation Tools for Benefit-Cost Analysis (BCA) and Return-on-Investment (ROI)

**Background**

Across the United States, state and local agencies have established Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSMO) programs that are deploying operational strategies to improve safety, enhance mobility, reduce emissions (and fuel use), improve agency efficiency, increase productivity, and improve customer satisfaction.

While these advanced technology and operational strategies have shown significant value, conveying the business case for ITS and TSMO continues to be a challenge. For many decision makers there continues to be a tendency to address transportation problems by funding major capital projects, such as widening lanes or building new interchanges and roads, to address transportation challenges. The benefits of traditional road capacity improvement projects come with high costs. Moving forward, most agencies acknowledge that they cannot build their way out of congestion. Faced with limited financial resources and increasing demands for transportation improvements from the public and politicians, many agencies are turning to strategies that focus on ways to better operate and manage the transportation system.

Decision makers are increasingly seeking data-driven approaches to better understand their return-on-investment (ROI). ITS and TSMO projects are being assessed and evaluated against traditional road capacity projects. While research has shown that TSMO strategies typically have much higher returns than traditional roadway projects, agencies still struggle to demonstrate the benefits of these strategies.

**The Purpose of this Guide**

This document serves as a guide to state and local agencies, as well as industry professionals, for leveraging the ITS Joint Program Office's (JPO) ITS Deployment Evaluation Databases for the purpose of analyzing ITS benefit-costs. The purpose of this guide is to convey a high-level methodology that agencies can tailor for their own projects. Examples are also provided to convey how analysis results can be shared with a variety of stakeholders to gain support, commitment, and excitement for the deployment.

The Guide is accompanied by Use Cases that demonstrate how the methodology can be applied for a range of ITS and TSMO strategies, including Adaptive Traffic Signals, Curve Speed Warning, Managed Lanes, Smart Work Zone Technologies, and Transit Signal Priority. The Use Cases are examples leveraging existing resources against hypothetical agencies. **Applying the methodology should not simply use the results from the use cases, instead they should apply the methodology to their own specific projects.**

**USDOT's ITS Benefit & Cost Resources**

The ITS industry has a rich history of collecting benefits and cost data, encouraging agencies to evaluate and document the performance and value being provided by their ITS deployments. The United States Department of Transportation (USDOT) has been capturing these data in the ITS Evaluation Benefits & Costs Database.

**Figure 1. ITS Benefits Database**

## ITS Deployment Data

### 2020 ITS Deployment Tracking Survey

Freeway, arterial, and transit agencies in large and medium-sized metropolitan areas across the US are surveyed about their ITS deployment.

**Freeway Survey Response Rate**

- 73% (101 Freeway Agencies)

**ITS Safety Systems**

The number of surveyed freeway agencies deploying ITS safety systems increased from 76 percent in 2016 to 85 percent in 2020.

The two most commonly used safety systems saw significant increases from 2016. Use of **queue warning systems** increased from 38 percent in 2016 to 47 percent in 2020, and **over-height warning systems** increased from 37 percent to 45 percent.

**Work Zone Technologies**

The number of surveyed freeway agencies deploying work zone technologies increased from 73 percent in 2016 to 82 percent in 2020.

In 2020, nearly two-thirds of freeway agencies deploy **portable CCTV**, up from 56 percent in 2016. Deployment of queue detection and alert systems also increased significantly since 2016 (from 34 percent to 47 percent).

**ITS Safety Systems Data:**

- Queue warning: 47%
- Over-height warning: 45%
- Wrong way detection: 39%
- Dynamic curve warning: 30%
- Reference location signs: 29%
- Dynamic speed limits: 24%
- Lane use control: 20%
- Auto/manual gates: 16%
- Downhill truck speed warning: 9%
- Wireless truck inspection: 7%
- Portable CCTV: 85%
- Queue detection & alert system: 47%
- Travel time system: 42%
- Portable traffic monitoring devices: 36%
- Route guidance around work zones: 25%
- Variable speed limit: 16%
- Portable DMAS (other): 13%
- Dynamic lane merge system: 10%
- Temporary ramp metering: 8%
- Intrusion alarm: 7%
- Speed display: 7%
- Feedback (other): 7%

## Interactive Data Visualizations

### TIMELINE OF SELECTED WORK ZONE SAFETY DEPLOYMENTS

Timeline showing deployment of various work zone safety technologies from 2016 to 2020. Technologies include Queue Warning, Dynamic Lane Merge, Incident Management, Variable Speed Limits, Adaptive Information, Moving Traffic Information, Performance Management, Work Zone Warning, and Controlled Work Zones.

# Smart Community Resource Center (SCRC)

- Online resource supporting information sharing and technical assistance related to ITS and Smart Community deployments.
- The site will evolve over time to continue being a source of current information, data and tools to support ITS investments.



Source: USDOT

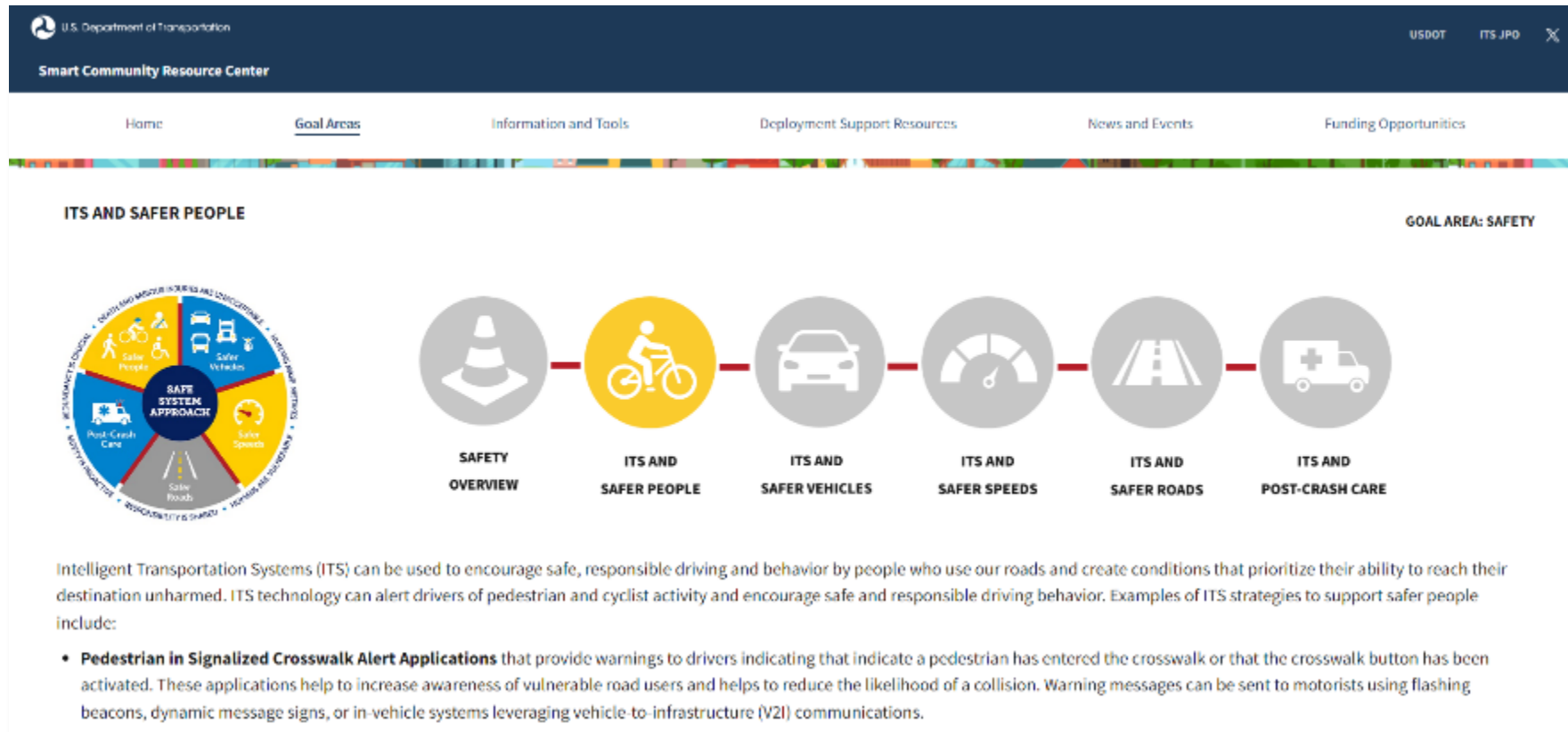
# SCRC – Moving Forward

- **Goal Areas**
  - **Safety**, Equity, Climate and Sustainability
- **Technology Areas**
  - **Interoperable Connectivity (V2X)**, Vehicle Automation, Transit Innovation, ITS and Complete Streets, Innovative Aviation (UAS), TSMO, Smart Grid and Vehicle Electrification, and Freight Operations
- **Crosscutting and Enabling Areas**
  - Operations Planning, **Systems Engineering**, ITS Architecture and Standards, Performance Measurement and Evaluation, Artificial Intelligence (AI), Cybersecurity, Data Management





# SCRC: Safety Page




The screenshot shows the SCRC website interface. At the top, it identifies the U.S. Department of Transportation and the Smart Community Resource Center. A navigation bar includes links for Home, Goal Areas, Information and Tools, Deployment Support Resources, News and Events, and Funding Opportunities. The main content area is titled "ITS AND SAFER PEOPLE" and includes a "GOAL AREA: SAFETY" label. A circular diagram on the left illustrates the "SAFE SYSTEM APPROACH" with four quadrants: Safer People, Safer Vehicles, Safer Speeds, and Safer Roads. Below this is a horizontal flow of six icons representing: SAFETY OVERVIEW, ITS AND SAFER PEOPLE, ITS AND SAFER VEHICLES, ITS AND SAFER SPEEDS, ITS AND SAFER ROADS, and ITS AND POST-CRASH CARE. A text block explains that ITS can encourage safe driving and behavior, and provides an example of Pedestrian in Signalized Crosswalk Alert Applications.

U.S. Department of Transportation  
Smart Community Resource Center

USDOT ITS JPO

Home Goal Areas Information and Tools Deployment Support Resources News and Events Funding Opportunities

ITS AND SAFER PEOPLE GOAL AREA: SAFETY



SAFETY OVERVIEW

ITS AND SAFER PEOPLE

ITS AND SAFER VEHICLES

ITS AND SAFER SPEEDS

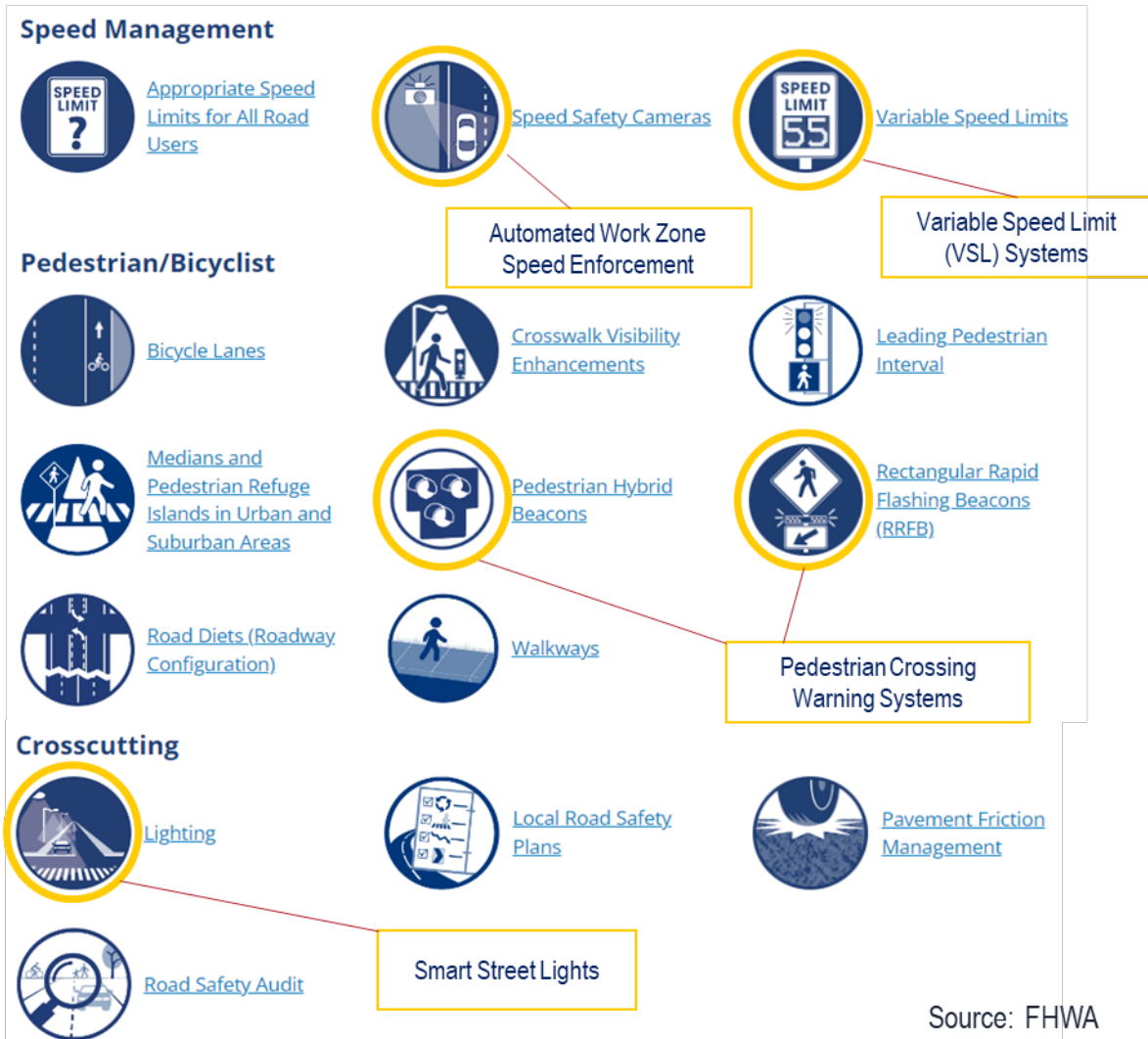
ITS AND SAFER ROADS

ITS AND POST-CRASH CARE

Intelligent Transportation Systems (ITS) can be used to encourage safe, responsible driving and behavior by people who use our roads and create conditions that prioritize their ability to reach their destination unharmed. ITS technology can alert drivers of pedestrian and cyclist activity and encourage safe and responsible driving behavior. Examples of ITS strategies to support safer people include:

- **Pedestrian in Signalized Crosswalk Alert Applications** that provide warnings to drivers indicating that indicate a pedestrian has entered the crosswalk or that the crosswalk button has been activated. These applications help to increase awareness of vulnerable road users and helps to reduce the likelihood of a collision. Warning messages can be sent to motorists using flashing beacons, dynamic message signs, or in-vehicle systems leveraging vehicle-to-infrastructure (V2I) communications.





### Roadway Departure



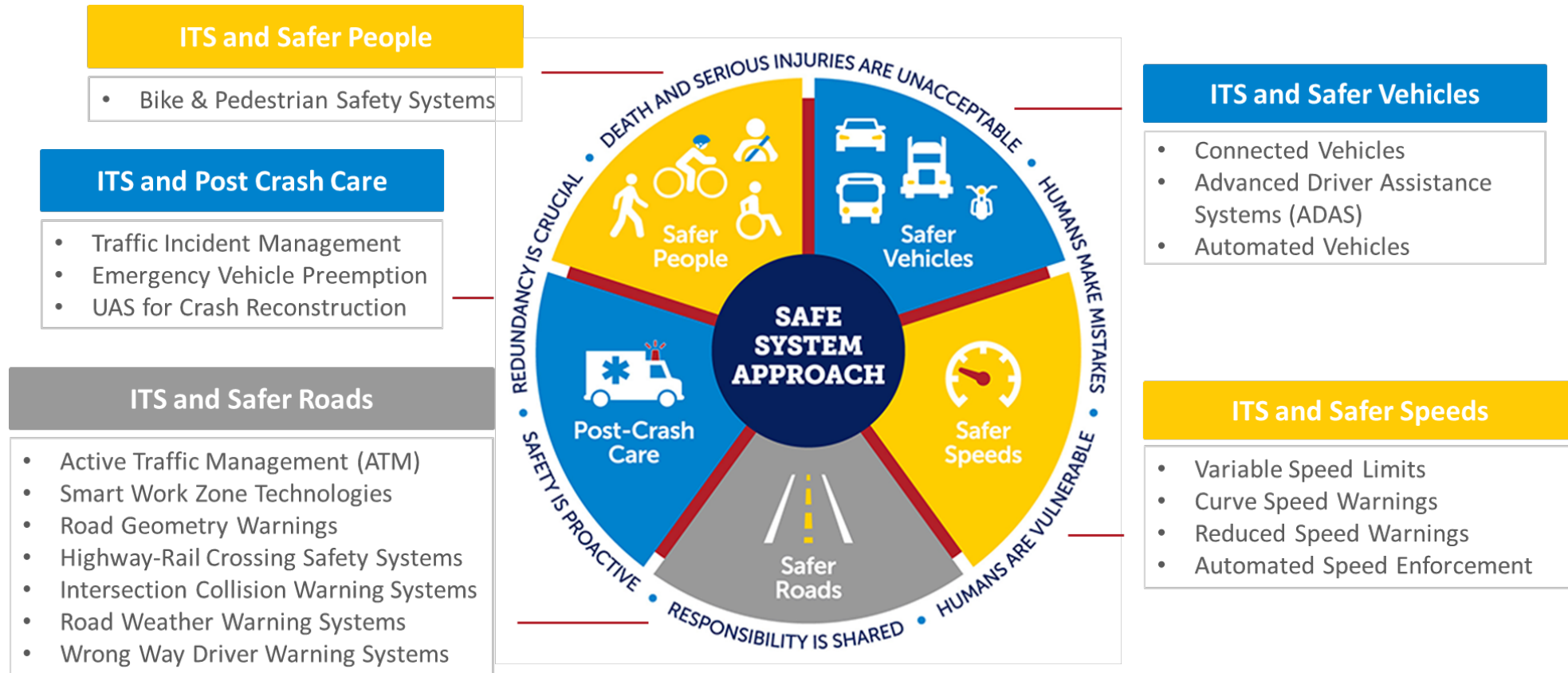
### Intersections



**...There are a variety of other ITS Strategies that can enhance safety**

<https://highways.dot.gov/safety/proven-safety-countermeasures>

# ITS and the Safe System Approach (SSA)



# ITS and Safety Micro-Learning Videos

Short, compact e-learning modules designed to increase awareness

- **Video 1:** ITS and the Safe System Approach
- **Video 2:** ITS and Safer Speeds
- **Video 3:** ITS and Safer Roads
- **Video 4:** ITS and Safer Vehicles
- **Video 5:** ITS and Safer People
- **Video 6:** ITS and Post-Crash Care



Source: USDOT



# SCRC: Interoperable Connectivity (V2X) Page

U.S. Department of Transportation  
Smart Community Resource Center

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## INTEROPERABLE CONNECTIVITY RESOURCES

Vehicle to everything (V2X) is the use of a variety of interoperable wireless communications technologies between vehicles and physical transportation infrastructure as well as pedestrians, bicyclists, and other vulnerable road users. When integrated into a vehicle (cars, buses, trucks, bicycles, motorcycles, etc.) or into infrastructure, these solutions can deliver significant safety improvements and help communities move toward the goal of zero roadway fatalities. These technologies also offer the potential to enhance mobility and reduce transportation's impact on the environment. V2X applications are being implemented and showing benefits.

**DRAFT NATIONAL V2X DEPLOYMENT PLAN**

The Draft National V2X Deployment Plan presents a plan to accelerate the deployment of vehicle-to-everything (V2X). The plan sets the USDOT's vision, goals, and milestones, and issues a call to action for stakeholders, including the USDOT, public agencies, and the private sector.

**CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM**

The USDOT's Connected Vehicle Deployment Program spurred innovation among early adopters of connected vehicle application concepts, using best available and emerging technologies. Three CV Pilot deployment sites integrated V2X research concepts into practical and effective elements, and enhanced existing operational capabilities. Access resources on the program website.

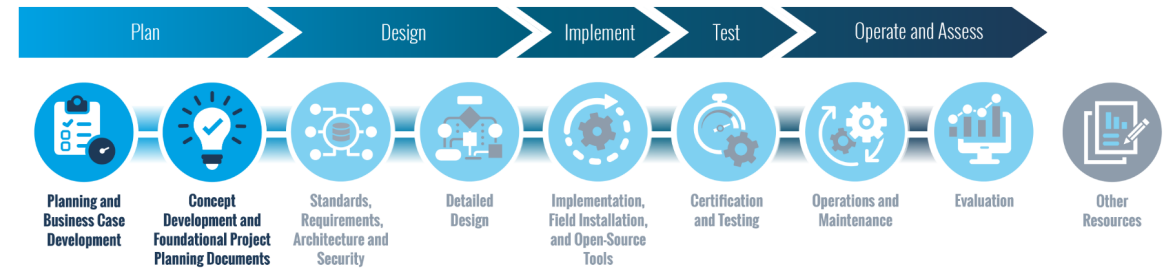
**CONNECTED INTERSECTIONS IMPLEMENTATION GUIDE**

The CTI 4501: Connected Intersections Implementation Guide defines the key capabilities and interfaces a connected intersection must support to ensure interoperability for state and local infrastructure owner/operators. A connected intersection is defined as an infrastructure system that broadcasts signal, phase and timing (SPAT), mapping information and position correction data to vehicles.

**ITS BENEFITS, COSTS, AND LESSONS LEARNED MAP**

Access the ITS Benefits, Costs, and Lessons Learned Map to learn about V2X and other ITS benefits, costs, and lessons learned. This fully searchable feature allows users to see where ITS technologies have been successfully deployed and evaluated in states, cities, regions, or neighboring communities - or even around the world.

## Over 100 Resources + Open-Source Tools



### CONCEPT DEVELOPMENT AND FOUNDATIONAL PROJECT PLANNING DOCUMENTS

Successful interoperable connectivity projects address real-world challenges. This section includes resources that can be used to develop successful interoperable connectivity concepts for smart communities. It also includes example foundational project planning documents including Data Management and Privacy Plans, Safety Management Plans, and other relevant project planning documents.

- INTEROPERABLE CONNECTIVITY: DEPLOYMENT CONCEPTS AND APPLICATIONS
- INTEROPERABLE CONNECTIVITY: CONCEPT OF OPERATIONS (CONOPS)
- INTEROPERABLE CONNECTIVITY: SAFETY MANAGEMENT
- INTEROPERABLE CONNECTIVITY: DATA MANAGEMENT



# Systems Engineering for ITS



[www.arc-it.net](http://www.arc-it.net)

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Systems Engineering for ITS **SE ITS**

ABOUT VIEWS RESOURCES GLOSSARY CONTACT

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## Systems Engineering for ITS

Access to the Systems Engineering for ITS content is available through the following views:

- [Introduction](#)
- [Process](#)
- [Deliverable](#)
- [Examples](#)
- [Document](#)
- [PDF](#)

# Trainings & Other Technical Assistance Resources

- In-Person Trainings
  - Foundational V2X Training (+ future V2X trainings)
  - Systems Engineering
  - Crowdsourcing for Operations
- Web-based Trainings
  - [ITS: What, Why, and How](#)
  - [Improving Highway Safety with ITS](#)
  - [Systems Engineering Fundamentals for ITS](#)
  - ITS Cybersecurity (coming soon)
  - Various ITS Standards Trainings
- Cohorts (Accelerating V2X Cohort) and Peer Exchanges



# ITS Grants, Challenges, & Deployment Programs



**ATTAIN**



**V2X Accelerator**

# Annual Federal ITS Grants

Grant	Description	Annual Funding
<a href="#"><u>Strengthening Mobility and Revolutionizing Transportation (SMART)</u></a>	Provides grants to eligible public sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems in order to improve transportation efficiency and safety.	\$100 million appropriated annually for fiscal years 2022-2026
<a href="#"><u>Advanced Transportation Technology and Innovation (ATTAIN)</u></a>	Provides funding to deploy, install, and operate advanced transportation technologies to improve safety, mobility, efficiency, system performance, intermodal connectivity, and infrastructure return on investment.	\$60 million annually
<a href="#"><u>Safe Streets for All (SS4A)</u></a>	Focuses on comprehensive safety action planning and implementing those <a href="#"><u>plans</u></a> and is inclusive of all types of roadway safety interventions across the Safe System Approach (SSA).	\$1 billion/year over 5 years





# DOT Navigator

## Focus on Helping to Develop Strong Discretionary Grant Applications



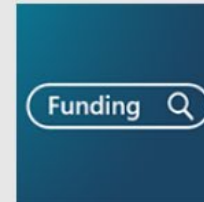
<https://www.transportation.gov/dot-navigator>

### What Do You Want to Do?



#### PREPARE A SUCCESSFUL GRANT APPLICATION

Get planning tips, checklists, and information on applying for federal grants



#### FIND FUNDING OPPORTUNITIES

Search grant opportunities to meet your community's transportation needs



#### GET TECHNICAL ASSISTANCE RESOURCES

Find resources to get funding and build capacity to do transportation projects



#### LEARN ABOUT FUNDING AND MATCH

Learn about USDOT grant funding, including match requirements and flexibilities



#### ACCESS DATA AND MAPPING TOOLS

Access data and mapping tools to help write a strong grant application

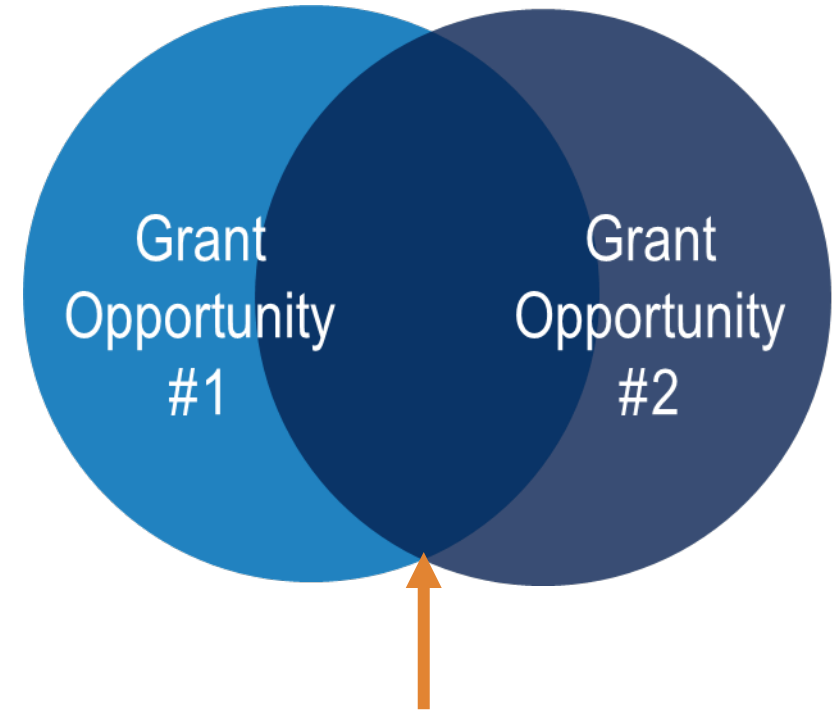


#### LEARN ABOUT THE BIPARTISAN INFRASTRUCTURE LAW

Get information to help access BIL funding programs

# Reminder: Go for the Grant (or Other Funding Opportunity)

- When opportunities come, try for the funding opportunity. Even if you don't win, you'll have a good foundation for future opportunities.
- Many opportunities are similar enough that parts of previous applications can be repurposed.
- Be “shelf ready” for future opportunities.



E.g., Opportunity for application re-purposing

# For More Information



## J.D. Schneeberger

Program Manager, ITS Professional Capacity Building  
Intelligent Transportation Systems (ITS) Joint Program Office (JPO)

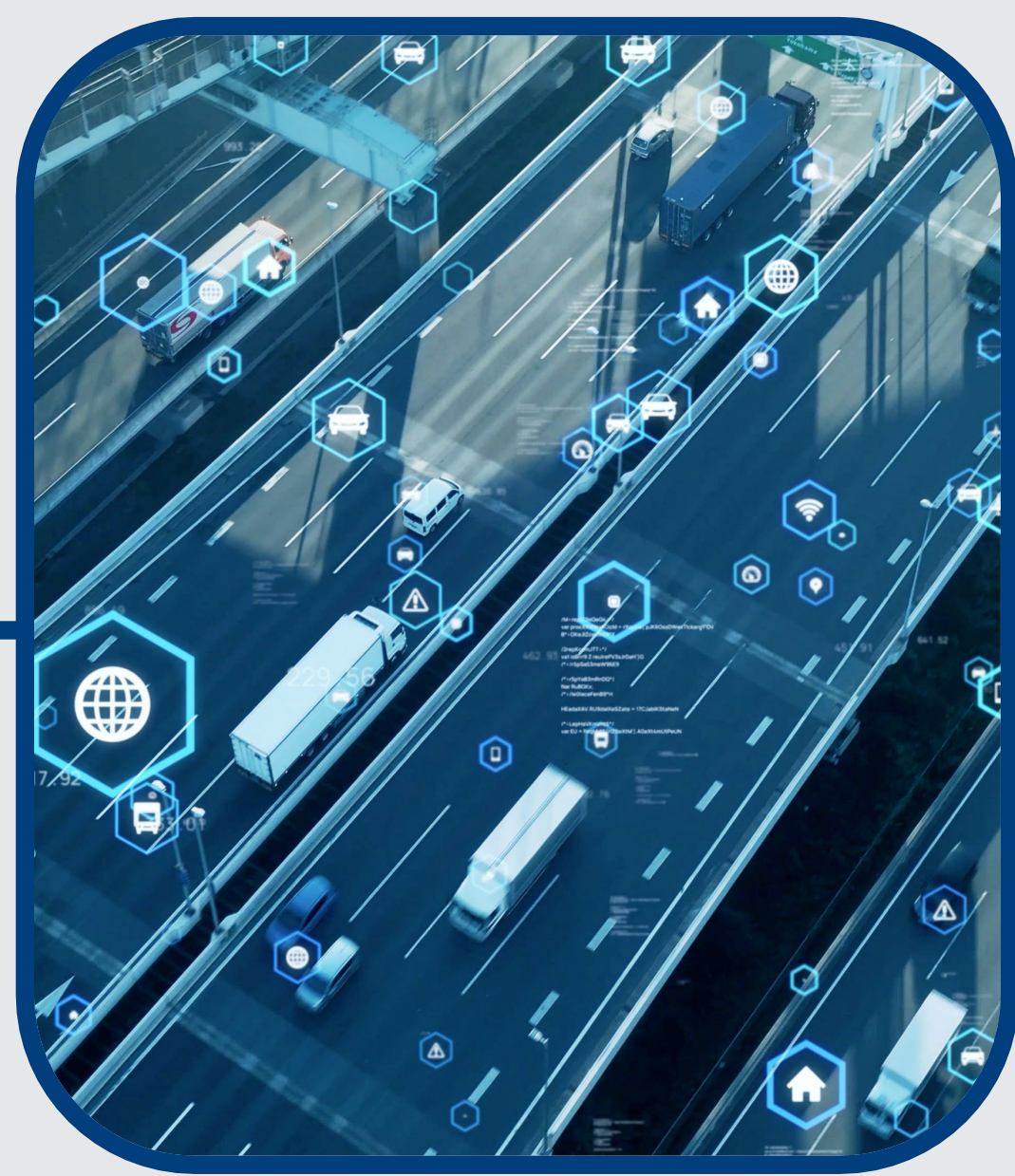
[john.schneeberger@dot.gov](mailto:john.schneeberger@dot.gov)

[www.its.dot.gov/pcb](http://www.its.dot.gov/pcb) and [www.its.dot.gov/scrc/#/](http://www.its.dot.gov/scrc/#/)



# ITS JPO Deployment Programs

Highlights and Resources from  
Connected Vehicle Pilots and  
ITS for Underserved Communities (ITS4US)





# Elina Zlotchenko

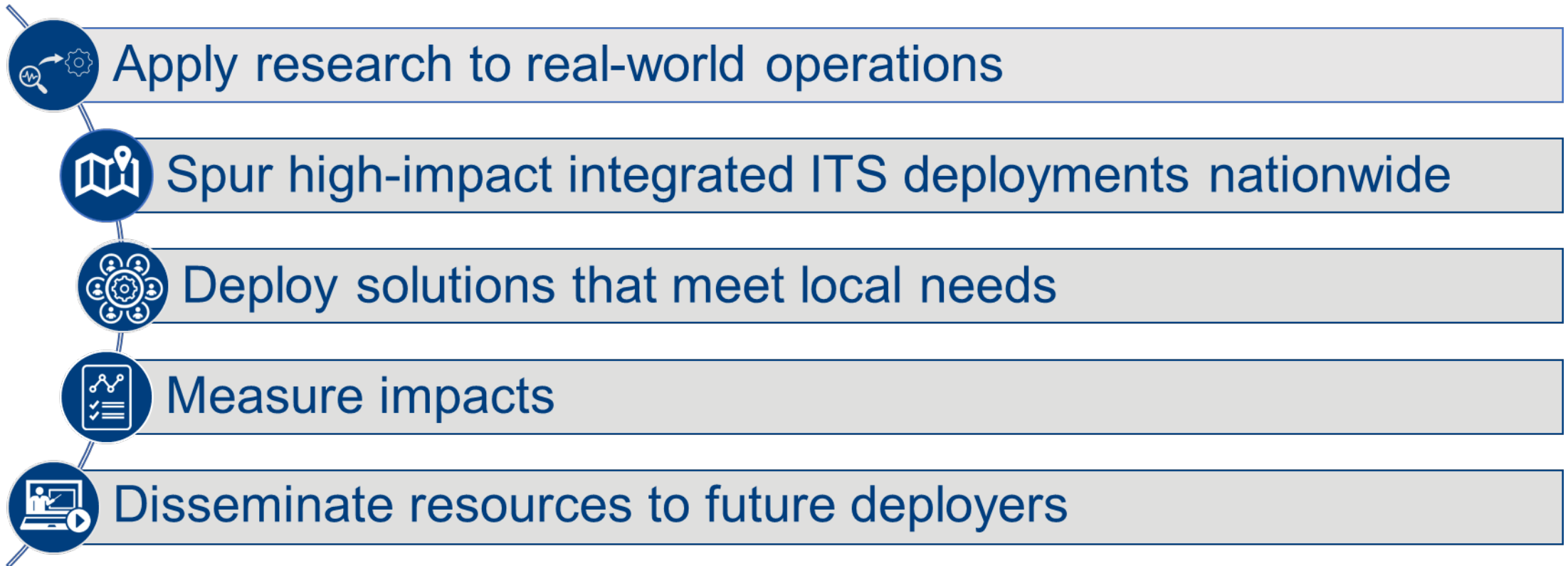
Program Manager, ITS4US

U.S. Department of Transportation

Intelligent Transportation Systems (ITS) Joint Program  
Office (JPO)

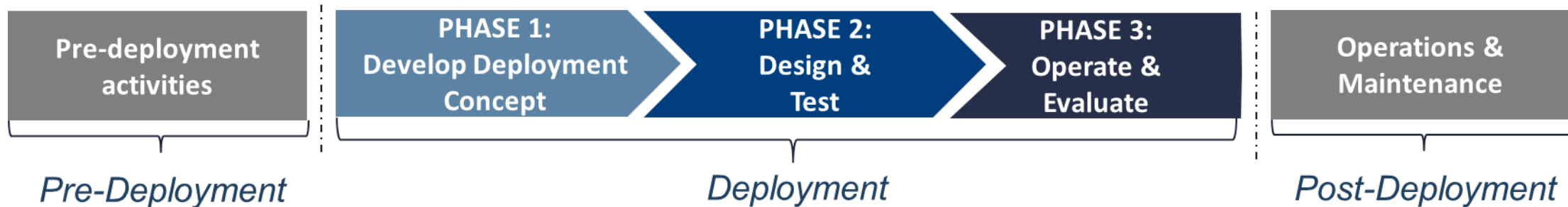


# JPO Deployment Program Fundamental Elements



# ITSJPO Deployment Program Design

- Multiple awards supports diversity in geography and technology implementation
- Phased design with decision gates ensures successful deployments
- Collaborative design fosters cooperation between deployment sites



# Deployment Benefits and Potential Measures

## CV Pilots (Results)

- Reduced red-light running by 41%. (NYC)
- Reduced travel-time index by 30%. (Tampa)
- Reduced fuel consumption of idling trucks by over 46 gallons per closure. (Wyoming)
- 83% of pedestrians using the mobile crossing app felt safer. (NYC)

## ITS4US (Anticipated Benefits)

- Save ~2 hours/day for dispatch team. Save ~2 days/month for accounting team. (HIRT)
- Improved access to new destination types. (GDOT)
- Increased availability of detailed, vetted sidewalk data in OpenStreetMap. (UW)
- $\geq 90\%$  of users can book a pick-up time within 30 minutes of request. (NFTA)





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## What performance measures does your agency typically use for ITS projects?

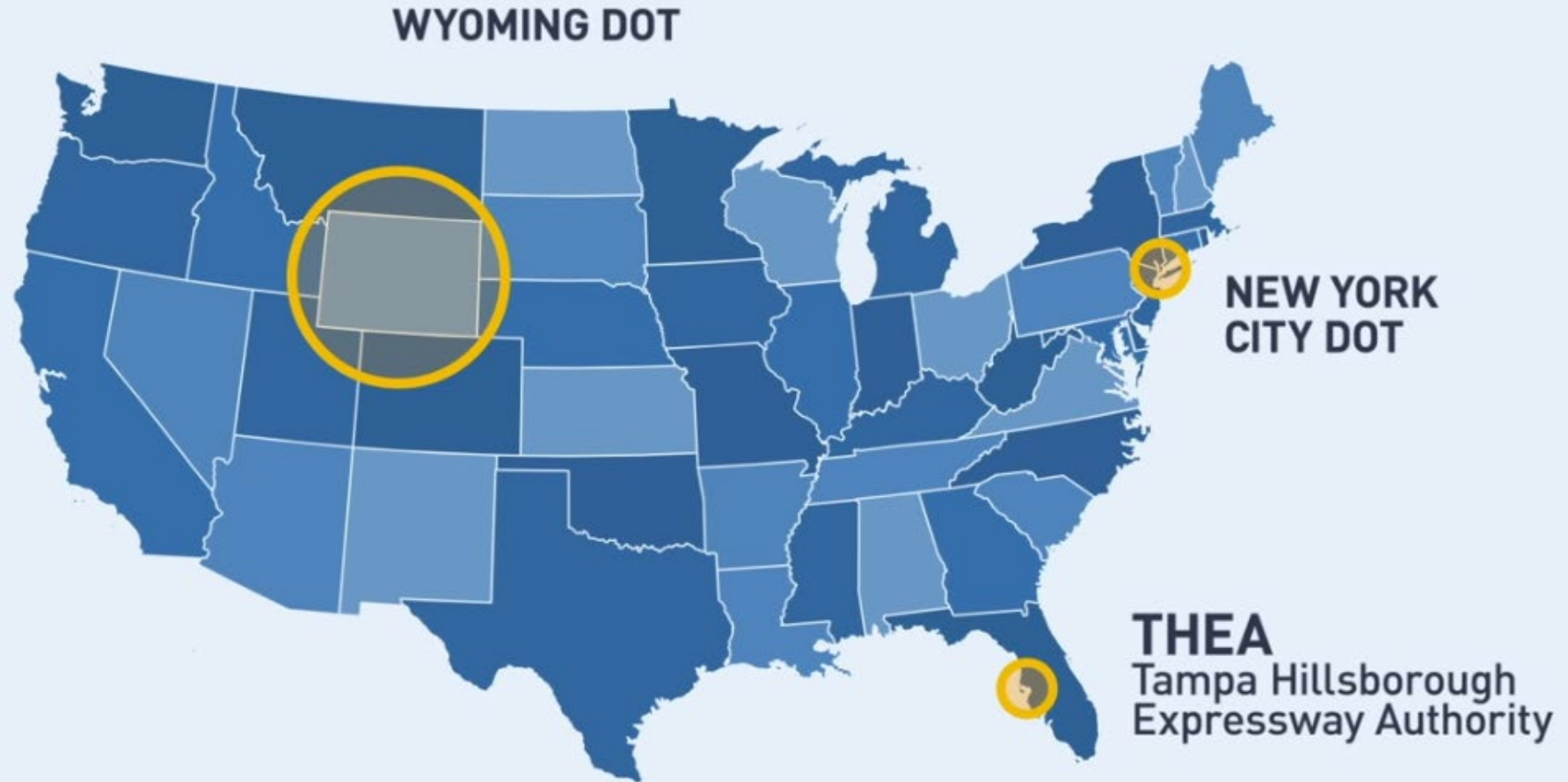
All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting in Interactivity to let participants vote for their favorites



# CV Pilots Deployment Program



# WYDOT CV Pilot



- I-80 in Wyoming
- CV Applications Deployed:
  - Forward Collision Warning
  - I2V Situational Awareness
  - Work Zone Warnings
  - Spot Weather Impact Warnings
  - Distress Notifications





# THEA CV Pilot



- Selmon Reversible Express Lanes in Tampa, Florida
- CV Applications Deployed:
  - Wrong Way Entry (WWE)
  - Pedestrian Collision Warning (PCW)
  - Transit Signal Priority (TSP)
  - 6 additional applications





# NYCDOT CV Pilot




- New York City, NY
- CV Applications Deployed:
  - Speed Compliance
  - Mobile Accessible Pedestrian Signal System
  - Oversize Vehicle Compliance
  - 12 additional applications




# ITS4US Deployment Program

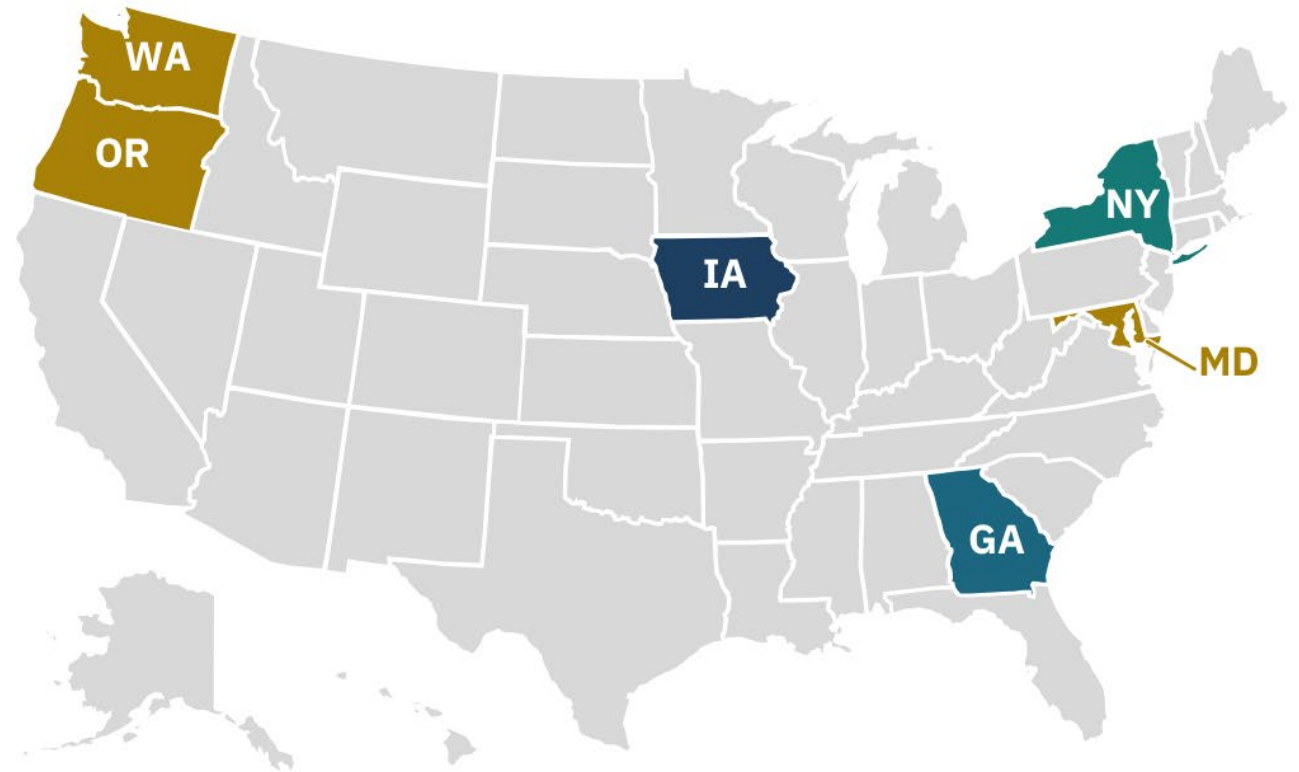


 **Heart of Iowa Regional Transit Agency (HIRTA) – Dallas County, IA**  
Integrated health appointment and mobility service system

 **Georgia Department of Transportation (GDOT) – Gwinnett County, GA**  
Safe trips in a connected transportation network

 **University of Washington (UW) – OR, WA, MD**  
Data and software promoting equitable travel opportunities

 **Niagara Frontier Transportation Authority (NFTA) – Buffalo, NY**  
Personalized, multi-modal trip planning, on-demand transportation and wayfinding



# Health Connector for the Most Vulnerable



- Dallas County, Iowa
- Key Technologies:
  - Trip planning, booking and management
  - Middleware for coordination with healthcare providers and Medicaid brokers
  - Information and wayfinding





# Buffalo All Access



- Buffalo, NY
- Key Technologies:
  - Indoor/Outdoor Wayfinding
  - Smart Signalized Intersections
  - On-Demand Shuttles, including autonomous
  - Door-to-Door travel planning app (Buffalo All Access App)



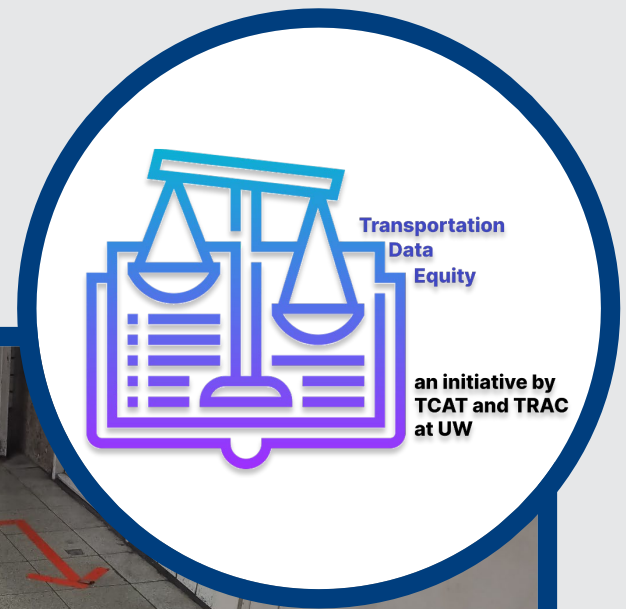


# Safe Trips in a Connected Transportation Network (ST-CTN)

- Gwinnett County, GA
- Key Technologies:
  - Connected Vehicle Messaging
  - Transit Signal Priority
  - Machine Learning
  - Predictive Analytics
  - Mobile Application (G-MAP)



# Transportation Data Equity Initiative



- King & Snohomish County, WA
- Multnomah & Columbia County, OR
- Harford & Baltimore County, MD
- Key Technologies:
  - Data Standards (OpenSidewalks, GTFS-Flex, GTFS-Pathways)
  - Data Collection Open-Source
  - Data Sharing System



# Key Lessons Learned

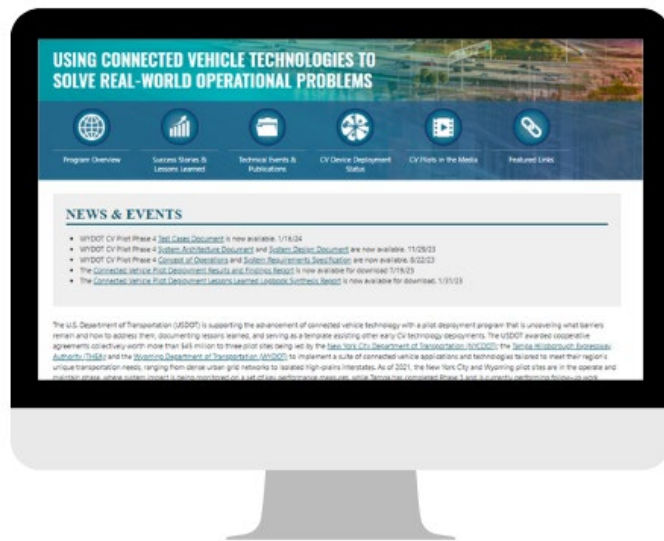


1. Identify the challenges facing your community and incorporate them into long range planning.
2. Prepare for challenges in deploying maturing technologies.
3. Use non-technical language and tailor your materials to the stakeholders.
4. Leverage existing relationships and networks.
5. Engage early and often in the design/planning process.





# CV Pilot Resources for Deployers



 <https://www.its.dot.gov/pilots/>

**CV Pilots Program**  
Kate Hartman  
Program Manager, CV Pilots  
USDOT ITS JPO  
[Kate.Hartman@dot.gov](mailto:Kate.Hartman@dot.gov)



# ITS4US Resources for Deployers



[www.its.dot.gov/its4us](http://www.its.dot.gov/its4us)



## ITS4US Program

Elina Zlotchenko

Program Manager, ITS4US  
USDOT ITS JPO

[Elina.Zlotchenko@dot.gov](mailto:Elina.Zlotchenko@dot.gov)



## GDOT (ITS4US)

<https://georgia-map.com/>

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Kofi Wakhisi, Co-Project Management Lead  
[kwakhisi@atlantaregional.org](mailto:kwakhisi@atlantaregional.org)

## HIRTA (ITS4US)

<https://transithealthconnector.org/>

Brooke Ramsey, Project Management Lead  
[BRamsey@ridehirta.com](mailto:BRamsey@ridehirta.com)

## NFTA (ITS4US)

<https://bnmc.org/allaccess>

Robert Jones, Concept Deployment Lead  
[robert.jones@nfta.com](mailto:robert.jones@nfta.com)

Kelly Dixon, Project Management Lead  
[kdixon@gbnrtc.org](mailto:kdixon@gbnrtc.org)

## UW (ITS4US)

<https://transitequity.cs.washington.edu/>

Anat Caspi, Deployment Development Lead  
[caspian@cs.washington.edu](mailto:caspian@cs.washington.edu)

Join at [menti.com](https://menti.com) | use code **6785 4133**

## What resources do you wish you had to launch your own ITS deployment?

All responses to your question will be shown here

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## Q&A



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