July 2025 | Prepared by: Athey Creek Consultants

ENTERPRISE

Intelligent Transportation Systems (ITS) Simple Innovations

ENTERPRISE TRANSPORTATION POOLED FUND STUDY TPF-5(490)

FINAL REPORT

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16. Abstract

Transportation agencies develop and use simple innovations for ITS technologies and processes. This may include repurposing a device or component, identifying a new use, or implementing a streamlined process. This project documented simple innovations for ITS technologies and practices. The project gathered information through a literature search as well as outreach with practitioners through meetings, conferences, and webinars. A total of 78 ITS simple innovations were documented as part of this project. Simple solutions were gathered from April through September 2024. For each ITS simple solution, the agency, a brief description, the source, year, innovation type, and transportation area were documented into a concise table. The intent was to provide ENTERPRISE members with a searchable and sortable table listing the simple solutions that the user could then easily link to additional information, if desired, by providing the source. The information gathered and documented for this project is included in a table format in this report and is also available on the ENTERPRISE ITS Simple Innovations project web page in a searchable and sortable format.

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The cover image is by PIRO from Pixabay.

Project Champion

Sinclair Stolle from the Iowa Department of Transportation (DOT) was the ENTERPRISE Project Champion for this effort. The Project Champion served as the overall lead for the project.

ENTERPRISE Members

The ENTERPRISE Board consists of a representative from each of the following member entities.

- Illinois DOT
- Iowa DOT
- Kansas DOT
- Michigan DOT
- Minnesota DOT
- Ontario Ministry of Transportation
- Texas DOT
- Wisconsin DOT

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List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADOT	Arizona Department of Transportation
ATMS	Advanced Transportation Management System
CAV	Connected and Automated Vehicle
CDOT	Colorado Department of Transportation
CTSO	Committee on Transportation System Operations
CPR	Customer Proactive Reporting
CV	Connected Vehicle
DMS	Dynamic Message Sign
DOT	Department of Transportation
ENTERPRISE	Evaluating New Technologies for Roads Program Initiatives in Safety and Efficiency
eSTORM	Electronic Signals and Traffic Operations Reponses Management
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FIRST	Freeway Incident Response Safety Team
FTE	Florida Turnpike Enterprise
GDOT	Georgia Department of Transportation
HAR	Highway Advisory Radio
HSR	Hard Shoulder Running
IDOT	Illinois Department of Transportation
IRIS	Intelligent Roadway Information Systems
IRU	Incident Response Unit
ITS	Intelligent Transportation Systems
Iowa DOT	Iowa Department of Transportation

KC Scout	Kansas City Scout
KDOT	Kansas Department of Transportation
MDOT	Michigan Department of Transportation
MDOT SHA	Maryland Department of Transportation State Highway Administration
MnDOT	Minnesota Department of Transportation
MoDOT	Missouri Department of Transportation
NCDOT	North Carolina Department of Transportation
NDDOT	North Dakota Department of Transportation
NJDOT	New Jersey Department of Transportation
NOCoE	National Operations Center of Excellence
ODOT	Ohio Department of Transportation
ODOT	Oklahoma Department of Transportation
ODOT	Oregon Department of Transportation
OS/OW	Oversize / Overweight
PennDOT	Pennsylvania Department of Transportation
RCRS	Road Condition Reporting System
RIDOT	Rhode Island Department of Transportation
ROLF	Regional Operations Leadership Forum
RTMC	Regional Transportation Management Center
RWIS	Road Weather Information System
SAFER	Situational Awareness for Emergency Response
SMART	Statewide Mobility Analytics in Real-Time
TIP	Traffic Infrastructure Process
TMC	Traffic Management Center
TSMO	Transportation Systems Management and Operations

TxDOT	Texas Department of Transportation
UDOT	Utah Department of Transportation
WisDOT	Wisconsin Department of Transportation
WSDOT	Washington State Department of Transportation
WYDOT	Wyoming Department of Transportation
WZDx	Work Zone Data Exchange

Chapter 1: Introduction

Transportation agencies develop and use simple innovations for Intelligent Transportation Systems (ITS) technologies and processes. This may include repurposing a device or component, identifying a new use, or implementing a streamlined process. Examples of ITS simple innovations include:

- Michigan Department of Transportation (MDOT) positioned a truck attenuator at locations where infrastructure was damaged until it could be repaired, to help reduce crashes.
- Illiniois Department of Transportation (IDOT) repurposed an over height detector to use as a counter for trucks.
- Iowa Department of Transportation (Iowa DOT) developed an automated process and tool for video requests (Iowa DOT Video Request Form).
- Kansas City Scout (KC Scout) uses Pothole Customer Proactive Reporting (CPR) for efficient pavement maintenance. A pothole is reported in Waze and the location is provided for the Department of Transportation (DOT) to fix.
- Wyoming DOT (WYDOT) has repurposed a signal trailer to create a portable Road Weather Information System (RWIS).

Transportation agencies can benefit from learning about other agencies' simple innovations so they may consider implementing similar approaches.

Project Purpose

Document simple innovations (e.g., repurposing a device or component, streamlining a process) for ITS technologies and practices.

1.1 Project Approach

This ENTERPRISE Pooled Fund Study project, ITS Simple Innovations, documented simple innovations for ITS technologies and practices. The project gathered examples of ITS simple innovations through a literature search as well as outreach with practitioners. The intent of the outreach was to learn of simple innovations that agencies have internally developed may not be formally documented.

After the information gathering was complete, each ITS simple innovation was summarized in a concise format. A searchable and sortable table listing the simple solution description, agency, transportation area, and source (if available) was created so users can discover innovations of interest and link to additional information.

1.2 Report Organization

This report includes the following sections.

- Chapter 2: Information Gathering and Documentation of ITS Simple Innovations – Describes the information gathering process conducted as well as what information was documented for each ITS simple innovation. Also noted is the number of innovations found by agency, year,

transportation area (e.g., arterial operations, freight operations), and innovation type (e.g., added feature, data integration).

- Chapter 3: ITS Simple Innovations by Type – Provides a listing of each ITS simple innovation gathered by innovation type.
- Chapter 4: Summary and Implementation Plan – Provides an overall project summary and suggested implementation of the results.
- Appendix: ITS Simple Innovations Table – Includes a table of all the ITS simple innovations documented for this project.

Chapter 2: Information Gathering and Documentation of ITS Simple Innovations

A total of 78 ITS simple innovations were documented as part of this project. Simple innovations were gathered from April through September 2024. The online search for examples of simple innovations included review of the National Operations Center of Excellence (NOCoE) Case Studies and Peer Exchanges, selected Federal Highway Administration (FHWA) Pooled Fund Studies reports, presentations from conferences, and state DOT websites. It is important to note that this project was not meant to be all inclusive, but to provide an initial list of ITS simple innovations that could continue to be added to and considered by members for implementation as more resources are reviewed in subsequent projects as approved by ENTERPRISE. In addition, ITS simple solutions were gathered during ENTERPRISE meetings as well as during member participation in American Association of State Highway and Transportation Officials (AASHTO) Committee on Transportation System Operations (CTSO) meetings.

For each ITS simple innovation identified, the following information was documented:

- ***Agency:*** Provides the transportation agency that conducted the innovation effort.
- ***ITS Innovation Brief Description:*** Briefly describe the innovation.
- ***Source:*** Provides a link to documentation if available.
- ***Year:*** Date of source documentation, not implementation.
- ***Innovation Type:*** Notes which innovation type the effort falls within.
    - Added Feature
    - Data Integration
    - Device
    - Guidance
    - Increased Data Use
    - Model Documents
    - Process
    - Product
    - Program
    - Real-Time Application
    - Repurposed Device
    - Software
    - System Deployment
    - Tool
    - Upgrade
- ***Transportation Area:*** Notes one of the following as its primary transportation area.
    - Arterial Operations
    - Communication Infrastructure
    - Connected Vehicle
    - Freight Operations
    - Incident Management
    - Maintenance
    - Planning
    - Road Weather Management
    - Safety
    - Security
    - Systems Engineering
    - Traffic Management
    - Traveler Information
    - Work Zone

Table 2.1 provides an example of the documentation summarized for one of the ITS simple innovations (Iowa Counties' Road Notifications Added as a Layer on the Iowa DOT 511 Website). The Appendix includes the information documented for all 78 ITS simple innovations by innovation type in a table format. The ENTERPRISE ITS Simple Innovations web page provides the information (listed above) for each innovation documented in a searchable and sortable format.

Table 2.1 Example of Information Documented for each ITS Simple Innovation

Agency	Iowa DOT
ITS Innovation Brief Description	**Iowa DOT: Iowa Counties' Road Notifications Added as a Layer on the Iowa DOT 511 Website** In June 2024, a request from the Governor of Iowa via the Iowa DOT Executive Director was issued to find a way to display county road closures on the DOT 511 Site. The County Engineers Service Bureau already provided an Iowa 511 County Map. The information from the Iowa 511 County Map was launched as a new layer on the Iowa DOT 511 website on July 1 and on the mobile app July 9 with implementation from the Iowa's traveler information consultant.
Source	AASHTO CTSO (Community of Practice Traveler Information Working Group 7.7.24, Meeting)
Year	2024
Innovation Type	Data Integration
Transportation Area	Traveler Information

Number of ITS Simple Innovations by Agency

A total of 30 different agencies were found that provided an ITS simple innovation. Iowa DOT provided 11 innovations while only one innovation was documented for many other agencies. See Table 2.2.

Table 2.2 Number of ITS Simple Innovations by Agency

Agency	# of Innovations
Arizona DOT (ADOT)	5
Caltrans	1
Colorado DOT (CDOT)	2
ENTERPRISE	4
Florida DOT (FDOT)	1
Florida Turnpike Enterprise (FTE)	1
Frisco, TX	1
Georgia DOT (GDOT)	3

Agency	# of Innovations
Illinois DOT (IDOT)	2
Iowa DOT (Iowa DOT)	11
Kansas DOT (KDOT)	2
Kansas City Scout (KC Scout)	1
Maryland DOT State Highway Association (MDOT SHA)	1
Michigan DOT (MDOT)	2
Minnesota DOT (MnDOT)	7
Missouri DOT (MoDOT)	2
New Jersey DOT (NJDOT)	2
North Carolina DOT (NCDOT)	5
North Dakota DOT (NDDOT)	2
Ohio DOT (ODOT)	3
Oklahoma DOT (ODOT)	1
Oregon DOT (ODOT)	1
Pennsylvania DOT (PennDOT)	5
Rhode Island DOT (RIDOT)	1
Texas DOT (TxDOT)	1
Utah DOT (UDOT)	5
Washington State DOT (WSDOT)	2
Wisconsin DOT (WisDOT)	2
Wyoming DOT (WYDOT)	2

Number of ITS Simple Innovations by Year

ITS simple innovations focused mostly on innovations from 2019 – 2024 with 71 examples. A few examples were included prior to 2019 (7 examples). In addition, there was also one relevant report noted from 1997: Technology in Rural Transportation Simple Solutions that includes more than 50 simple solutions that 14 were selected for further investigation in the report. See Table 2.3.

Table 2.3 Number of ITS Simple Innovations by Year

Year	# of Innovations
2011	1
2017	2
2018	3

Year	# of Innovations
2019	11
2020	5
2021	10
2022	2
2023	17
2024	27

Number of ITS Simple Innovations by Transportation Area

There were 14 transportation areas (e.g., arterial operations, communication infrastructure) used to categorize the ITS simple innovations found. Traffic management and traveler information provided the most examples while road weather management and planning had the fewest examples. See Table 2.4.

Table 2.4 Number of ITS Simple Innovations by Transportation Area

Transportation Area	# of Innovations
Arterial Operations	8
Communication Infrastructure	6
Connected Vehicle	3
Freight Operations	3
Incident Management	6
Maintenance	7
Planning	2
Road Weather Management	1
Safety	1
Security	4
System Engineering	3
Traffic Management	15
Traveler Information	14
Work Zone	5

Number of ITS Simple Innovations Documented by Innovation Type

There were 15 innovation types used to categorize the innovations found. Tools, processes, and added features provided the most examples while upgrades, program, and increased data use have the fewest examples. See Table 2.5.

Table 2.5 Number of ITS Simple Innovations by Innovation Type

Innovation Type	# of Innovations
Added Feature	10
Data Integration	8
Device	4
Guidance	8
Increased Data Use	2
Model Documents	3
Process	9
Product	2
Program	2
Real-Time Application	3
Repurposed Device	7
Software	3
System Deployment	3
Tool	13
Upgrade	1

Chapter 3: ITS Simple Innovations by Type

This section provides a listing of the 78 ITS simple innovations found by innovation type.

- Added Feature
- Data Integration
- Device
- Guidance
- Increased Data Use
- Model Documents
- Process
- Product
- Program
- Real-Time Application
- Repurposed Device
- Software
- System Deployment
- Tool
- Upgrade

Also included for most innovation types is one complete example of a documented simple innovation. The Appendix includes additional information documented for each innovation in a table format and the ENTERPRISE ITS Simple Solutions web page provides the innovations in a searchable and sortable format.

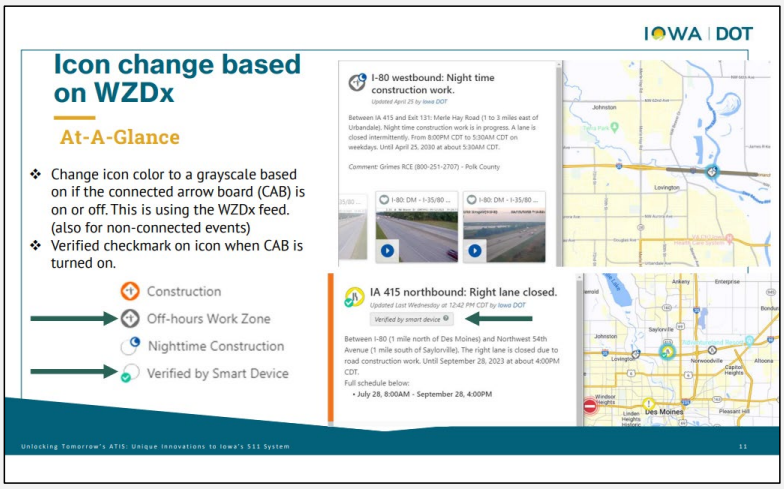
3.1 Added Feature

There were ten innovations categorized under Added Feature. Many of the innovations documented include an added feature to a DOT's traveler information system. See Table 3.1. Following the table additional information is provided for one of the innovations. See Figure 3.1.

Table 3.1 ITS Simple Innovations – Added Feature

#	Added Feature Innovation
1	NCDOT: In-Cab Slowdown and Congestion Alerts to Truckers Using Drivewyze
2	CDOT: Taxation Valuations for Heavy Equipment Added to OS/OW Permitting Tool to Replace Manual Process
3	WYDOT: Citizens Submit an Image from WYDOT's Mobile App
4	NCDOT: In-House Solution to Communicate Road Closures with Waze
5	Iowa DOT: Location of Electric Vehicle Charge Stations
6	Iowa DOT: Traveler Information Icon Color Change Based on Work Zone Data Exchange (WZDx)
7	Iowa DOT: Mashup Up Traveler Information Data to Tell a Story
8	KDOT: New, Innovative Methods of Traveler Information Data-Sharing
9	KDOT: New 511 Feature to Track and Display Oversized Loads
10	ODOT (Oregon): Local Road Report Entry into the Statewide Traveler Information System

Iowa DOT: Traveler Information Icon Color Change Based on WZDx



Source: Iowa DOT – April 30, 2024 ITS Heartland Presentation

Iowa DOT uses connected arrow boards to automatically report when lane closures are in effect in work zones (which is also an indication when workers are present). The ***connected arrow board indication is used to update the WZDx feed*** and ***Iowa DOT'S traveler information system uses this information to update the icon color displayed on the 511 website*** based on if the connected arrow board is on or off. A verified checkmark is displayed when the connected arrow board is turned on.

Figure 3.1 Example - Added Feature ITS Simple Innovation

3.2 Data Integration

Data integration innovations included two maintenance related projects on integrating real-time arrow board status information and one construction related project on integrating projects into a traffic information website. See Table 3.2 for the eight projects found related to data integration. See Figure 3.2 for additional information provided for one of the data integration examples.

Table 3.2 ITS Simple Innovation – Data Integration

#	Data Integration Innovation
1	PennDOT: Combined Situational Data Sources to Delineate When Incidents Truly Occurred
2	ADOT: Statewide Mobility Analytics in Real-Time (SMART) Tool for Better Freeway Performance
3	ODOT (Oklahoma): Integrated Construction Projects into the Traffic Information Website
4	Iowa DOT: Real-Time Arrow Board Status Information
5	MnDOT: Real-Time Arrow Board Status Information
6	PennDOT: Integrating Standard Work Zone Equipment Through its Advanced Transportation Management System (ATMS)
7	Iowa DOT: Iowa Counties Road Notifications Added as a Layer on the Iowa DOT 511 Website
8	Iowa DOT: Waze Reports Added as a Layer on the Iowa DOT 511 Website

MnDOT: Real-Time Arrow Board Status Information

In 2018, MnDOT conducted a one-year pilot project through a contract with a vendor (Street Smart) that installed a monitoring device on 20 arrow boards that provided arrow board status information (e.g. right arrow on, left arrow on) to the vendor's server. ***The arrow board status information from the server was integrated with MnDOT's ATMS and then their Road Condition Reporting System (RCRS).***

Source: ENTERPRISE: Real-Time Integration of Arrow Board Messages into Traveler Information Systems Evaluation - Phase 3

Photo Credit: Athey Creek

Figure 3.2 Example – Data Integration Simple Innovation

3.3 Device

There were four innovations found related to the device category. Two of the innovations included roadway debris removal devices mounted to safety service patrol vehicles. Table 3.3 provides a list of the four innovations found. Figure 3.3 includes additional information on the MoDOT: Roadway Debris Removal Devices effort.

Table 3.3 ITS Simple Innovations – Device

#	Device Innovation
1	MoDOT: Mobile Pothole Patcher
2	MnDOT: Roadway Debris Removal Devices on Freeway Incident Response Safety Team (FIRST) Vehicles
3	MoDOT: Roadway Debris Removal Devices
4	WisDOT: Fleet of Temporary ITS Devices for Construction Projects

MoDOT: Roadway Debris Removal Devices

MoDOT has deployed two different off-the-shelf, low cost, debris removal devices on vehicles to enhance safety by providing the ability to move debris out of the roadway without drivers having to get out of the truck on a roadway.

Source: MoDOT

Figure 3.3 Example – Device Simple Innovation

3.4 Guidance

There were eight innovations found related to guidance. See Table 3.4. Figure 3.4 includes additional information on the IDOT: Visual Guide to Illustrate What is and is Not a Divisible Freight Load effort.

Table 3.4 ITS Simple Innovations – Guidance

#	Guidance Innovation
1	UDOT: Small Wireless Facilities Mounting Installation Guidelines
2	IDOT: Visual Guide to Illustrate What is and is Not a Divisible Freight Load
3	ENTERPRISE: Criteria, Decision Factors, and Tools to Evolve, Phase Out, or Eliminate ITS Devices and Systems
4	PennDOT: The 5 R's of ITS Device Maintenance
5	CDOT: Label Junction Boxes "No Copper" to Deter Intrusions
6	UDOT: Replace Copper Wire with Aluminum Wire to Deter Intrusions
7	UDOT: Manage Access to ITS Enclosures with Electronic Key/Lock Systems
8	WSDOT: Locate ITS Enclosures in Highly Visible Areas to Deter Intrusions

IDOT: Visual Guide to Illustrate What is and is Not a Divisible Freight Load

IDOT has developed a ***guide to help enforcement and truckers understand what is and is not considered a divisible freight load*** to support consistency in enforcement and to help truckers avoid violation and unnecessary stops.

Source: Illinois Transportation Automated Permits

Figure 3.4 Example – Guidance Simple Innovation

3.5 Increased Data Use

Table 3.5 includes the two increased data innovations documented as part of this project.

Table 3.5 ITS Simple Innovations – Increase Data Use

#	Guidance Innovation
1	NJDOT: Field Detection Devices Phased Out with Arterial Probe Speed Data Use
2	ODOT (Ohio): Floating Car Method Reduced with Arterial Probe Speed Data Use

3.6 Model Documents

There were three innovative model documents found in the information gathering for this project. Two of the projects are from previous ENTERPRISE efforts. See Table 3.6 for the list of all three model documents. Figure 3.5 includes additional information on the MnDOT Model System Engineering Documents for Six ITS Applications project.

Table 3.6 ITS Simple Innovations – Model Documents

#	Guidance Innovation
1	ENTERPRISE: Model System Engineering Documents for Real-Time Arrow Board Status Information
2	ENTERPRISE: Model System Engineering Documents for ATMS
3	MnDOT: Model System Engineering Documents for Six ITS Applications

MnDOT: Model System Engineering Documents for Six ITS Applications

MnDOT completed systems engineering documents for six ITS applications (dynamic message signs, video, traffic detection, communications and radio, flood warning, and ramp metering) for use in future project planning and implementation to ensure compliance of 23 CFR 940 and to address Connected and Automated Vehicle (CAV) readiness for Minnesota.

Source: Systems Engineering for ITS and CAV Readiness

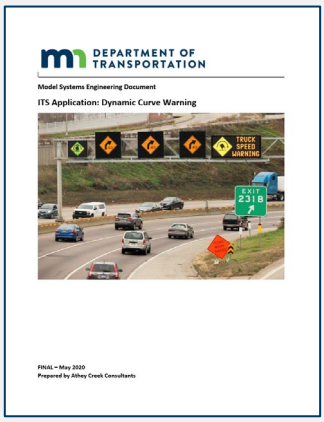


Figure 3.5 Example – Model Documents Simple Innovation

3.7 Process

Table 3.7 includes the nine process-related ITS simple solutions gathered for this project. Figure 3.6 includes additional information on the GDOT: Updated Signal Timing and Traffic Management Center (TMC) Control to Manage Pedestrians at an Intersection, Reducing Officers Needed project.

Table 3.7 ITS Simple Innovations – Process

#	Process Innovation
1	GDOT: Updated Signal Timing and TMC Control to Manage Pedestrians at an Intersection, Reducing Officers Needed
2	GDOT: More Proactive Arterial Management Using Probe Data
3	GDOT: Probe Data Providing Data-Driven Approach to Identify Congestion Reduction Projects
4	NCDOT: Probe Data Providing Data-Driven Approach to Identify Congestion Reduction Projects
5	ODOT (Ohio): Revised Process for Speed Studies Using Arterial Probe Data

#	Process Innovation
6	PennDOT: Arterial Probe Data has Improved Signal Prioritization
7	NCDOT: Probe Data to Identify Systems to be Retimed
8	MnDOT: Freeway Closure Plans for Full Road Closures
9	ENTERPRISE: Framework to Provide Consistent Update to Mapping/Navigation Companies

GDOT: Updated Signal Timing and TMC Control to Manage Pedestrians at an Intersection, Reducing Officers Needed

A new GDOT ITS deployment included programming for time-of-day pedestrian scrambles, designed for all-way pedestrian crossings during heavy volume times that could be controlled directly from the GDOT TMC. With each signal synchronized to "walk" for an extended period, open intersections were flooded with moving pedestrians when foot traffic was at its peak. The scrambles also allowed vehicles to pass through intersections easily during the "don't walk" phase, as pedestrians were forced to only cross during the scrambles which minimized vehicle/pedestrian conflicts and congestion. In the past, most intersections with heavy pedestrian crossings required at least six officers to manage the crowd and vehicles. With the updated signal timing and TMC control, an intersection can be managed by two officers.

Source: NOCoE – 2017 Super Bowl Operations

Figure 3.6 Example – Process Simple Innovation

3.8 Product

There were two simple innovations found related to products. This included work zone smart vests in Missouri and Minnesota. See Table 3.8. Figure 3.7 provided additional information on the MDOT: Work Zone Smart Vests to Change the Speed Limited Posted project.

Table 3.8 ITS Simple Innovations – Product

#	Product Innovation
1	MDOT: Work Zone Smart Vests to Change the Speed Limit Posted
2	MnDOT: Work Zone Smart Vests for Worker Presence

MDOT: Work Zone Smart Vests to Change the Speed Limit Posted

Michigan DOT tested two VerMac Smart Vests in a work zone as well as 12 additional modified sensors containing the same technology. The presence of one worker (or multiple workers) wearing a Smart Vest prototype sensor was used to automatically change the speed limit posted on the digital speed limit sign in the segment that the worker was present.

Source: ENTERPRISE: State of the Art Roadway Sensors – Phase 2

Figure 3.7 Example – Product Simple Innovation

3.9 Program

Two efforts were documented related to the program category. See Table 3.9. Additional information is provided in Figure 3.8 on the WSDOT: Expedited Approval Program for Low-Cost ITS Projects effort.

Table 3.9 ITS Simple Innovations – Program

#	Program Innovation
1	ADOT: Incident Response Unit Program (IRU) Program to Restore Traffic Flow Quickly and Safely
2	WSDOT: Expedited Approval Program for Low-Cost ITS Projects

WSDOT: Expedited Approval Program for Low-Cost ITS Projects

WSDOT has developed a program that expedites the approval and systems engineering for low-cost ITS projects (less than $250,000). Candidate projects are presented to a committee and if the benefits are clear and address a known issue and the cost is below the threshold, they may be approved without further planning. This was discussed during a ROLF.

Source: Regional Operations Leadership Form (ROLF) - 2019

Figure 3.8 Example – Program Simple Innovation

3.10 Real-Time Application

Table 3.10 provides a list of three real-time application-related innovations found. Figure 3.9 includes additional details on the MDOT SHA: HAAS Alerts project.

Table 3.10 ITS Simple Innovations – Real-Time Application

#	Real-Time Application Innovation
1	ADOT: Disseminate Roadway Conditions (Speed Differentials) Through a Cell Phone App Using V2X Technology
2	FTE: Real-Time Safety Alerts Using Smartphone Sensors
3	MDOT SHA: HAAS Alerts

MDOT SHA: HAAS Alerts

This project involved the installation or use of existing in-vehicle units for 200 MDOT SHA vehicles that could send real-time digital alerts to motorists over third-party platforms (e.g., Waze) as well as through connected vehicle applications, when responders and roadway crews are on scene and en-route. This effort aligns with the 2021-2025 MDOT SHA CAV Implementation Plan and general TSMO Plan strategies.

Source: NOCoE – HAAS Alert in Maryland

Figure 3.9 Example – Real-Time Application Simple Innovation

3.11 Repurposed Device

Another ITS simple innovation category included how agencies repurposed a device. There were seven different efforts documented. See Table 3.11. Additional information is provided for the WYDOT: Signal Trailer Repurposed to Create a Portable RWIS in Figure 3.10.

Table 3.11 ITS Simple Innovations – Repurposed Device

#	Repurposed Device Innovation
1	MDOT: Truck Attenuator Positioned a Truck Where Infrastructure Was Damaged to Reduce Crashes
2	WYDOT: Signal Trailer Repurposed to Create a Portable RWIS
3	Iowa DOT: Dynamic Message Sign (DMS) Parts Near End of Life Used to Extend Life of DMS in Critical Locations
4	PennDOT: Converting HAR Signs to Inform Motorists of 511 Phone
5	IDOT: Over Height Detector Repurposed as a Truck Counter
6	RIDOT: Reused Tolling Structures for other Uses (traffic counts, speeds)
7	ODOT (Ohio): Repurposing Highway Advisory Radio (HAR)

WYDOT: Signal Trailer Repurposed to Create a Portable RWIS

WYDOT repurposed a signal trailer to create a portable RWIS. The photo shows a trailer without the tower fully extended. With the tower extended the anemometer is anywhere from 20-23’ in the air.

Source: NOCoE – Road Weather Roundtables February 7-8, 2023 Webinar

Photo Credit: WYDOT

Figure 3.10 Example – Repurposed Device Simple Innovation

3.12 Software

Three software ITS innovative solutions were documented as listed in Table 3.12. Figure 3.11 provides additional information on the software innovation for Frisco, TX: Next-Generation Traffic Incident Management SAFER Platform.

Table 3.12 ITS Simple Innovations – Software

#	Software Innovation
1	Frisco, TX: Next-Generation Traffic Incident Management Situational Awareness for Emergency Response (SAFER) Platform
2	MnDOT: IRIS Open Source ATMS Software Implementation
3	NDDOT: Legacy ATMS Replaced with IRIS (Open Source ATMS Software)

Frisco, TX: Next-Generation Traffic Incident Management SAFER Platform

The City of Frisco, Texas designed an in-house platform, called SAFER, to provide their local firefighters, EMTs, and police officers immediate access to real-time information while responding to emergencies.

Source: Next-Generation Traffic Incident Management

Figure 3.11 Example – Software Simple Innovation

3.13 System Deployment

System deployment innovations included three examples as provided in Table 3.13. Figure 3.12 includes additional details on the ADOT: Early Warning Dust Detection Warning System project.

Table 3.13 ITS Simple Innovations – System Deployment

#	System Deployment Innovation
1	Iowa DOT: Adaptive Signal Control Technology to Change Traffic Patterns
2	ADOT: Early Warning Dust Detection Warning System
3	NJDOT: Hard Shoulder Running to Eliminate Back Ups and Enhance Safety

ADOT: Early Warning Dust Detection Warning System

With an overall goal to enhance awareness, mitigate traffic delays, and reduce crashes due to low visibility dust events, ADOT deployed an early warning dust detection warning system along a 10-mile segment of I-10 near Eloy, Arizona that uses remote sensing equipment to automatically control speed limits during periods of low visibility.

Source: NOCoE – ADOT Dust Detection and Warning System

Figure 3.12 Example – System Deployment Simple Innovation

3.14 Tool

There were several tools found through the information gathering conducted as part of this project. A total of 14 innovations were identified related to the Tool category. See Table 3.14. Following the table, additional information is provided in Figure 3.13 for one of the tool projects.

Table 3.14 ITS Simple Innovations – Tool

#	Tool Innovation
1	UDOT: Balance Sheet for Tracking Communications Infrastructure-Related Resource Trades
2	ADOT: Online State-Owned Fiber Optic Conduit Routes Map
3	Caltrans: Online Map of Proposed Transportation Projects to Coordinate Broadband Facilities
4	TxDOT: Real Property Asset Online Map of Small Cell Leases
5	UDOT: Online Map of Existing and Planned Fiber
6	NCDOT: Regional Transportation Management Center (RTMC) and First Responders Streaming Using Microsoft Teams to Stream Video and Live Chat
7	Iowa DOT: Incident Management Plans Accessible Online
8	NDDOT: Drones Use for Better Vantage Point
9	KC Scout: Waze Pothole Reports used by the DOT to Identify the Location to Fix
10	WisDOT: Transportation Systems Management and Operations (TSMO)-Traffic Infrastructure Process (TIP) to Review and Assess the TSMO Infrastructure System
11	Iowa DOT: DMS Placement Scoring Matrix
12	FDOT: Electronic Signals and Traffic Operations Reponses Management (eSTORM) System
13	Iowa DOT: Automated Video Request Tool

TxDOT: Real Property Asset Online Map of Small Cell Leases

TxDOT maintains a public website, TxDOT Real Property Map, that displays locations of small cell leases as a layer on the property assets map.

Source: Real-Property Asset Map

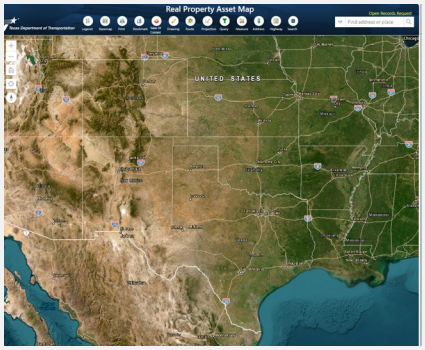


Figure 3.13 Example – Tool Simple Innovation

3.15 Upgrade

Table 3.15 includes one example of an upgrade-related ITS simple innovation. Figure 3.14 provides additional details on this project, MnDOT: Upgrade Still Images to Streaming Video.

Table 3.15 ITS Simple Innovations – Upgrade

#	Upgrade Innovation
1	MnDOT: Upgrade Still Images to Streaming Video

MnDOT: Upgrade Still Images to Streaming Video

MnDOT researched streaming video practices to assist in upgrading still images to streaming video. Streaming video provides more context and visual information on traffic and road conditions for many different user groups.

Source: MnDOT Streaming Video Summary of Practices and Requirements

Figure 3.14 Example – Upgrade Simple Innovation

Chapter 4: Summary and Implementation Plan

This section provides an overall summary of the ITS Simple Innovations project completed by ENTERPRISE and a suggested implementation plan.

4.1 Summary

Transportation agencies develop and use simple innovations for ITS technologies and processes. This may include repurposing a device or component, identifying a new use, or implementing a streamlined process.

This project documented simple innovations for ITS technologies and practices. The project gathered information through a literature search as well as outreach with practitioners through meetings, conferences, and webinars.

A total of 78 ITS Simple Innovations were documented as part of this project. Simple solutions were gathered from April through September 2024. Each ITS simple solution identified the agency, a brief description, the source, year, innovation type, and transportation area and documented the information into a concise table. The intent was to provide simple innovations that ENTERPRISE members could consider for implementation and could easily link to additional information, if desired, by providing the source.

The information gathered and documented for this project is included in a table format in Appendix A. The table is also available on the ENTERPRISE ITS Simple Innovations project web page in a searchable and sortable format at: https://enterprise.prog.org/projects/its-simple-innovations/

4.2 Implementation Plan

This research resulted in one key resource that ENTERPRISE members can use to learn of ITS simple innovations in other transportation agencies. The resource includes 78 ITS technologies and practices that are included in Appendix A and as a searchable and sortable table on the ENTERPRISE website at: https://enterprise.prog.org/projects/its-simple-innovations/.

Transportation agencies can implement the results of this research in several ways. Implementation steps could include the following actions:

1. Distribute the report to ITS staff at ENTERPRISE agencies as well as to staff in the following transportation areas that simple innovations were identified as part of this project.
    - Arterial Operations
    - Communication Infrastructure
    - Connected Vehicle
    - Freight Operations
    - Incident Management

- Maintenance
- Planning
- Road Weather Management
- Safety
- Security
- System Engineering
- Traffic Management
- Traveler Information
- Work Zone

2. Review the ITS simple innovations documented in this report to identify what innovations may be of interest to your agency.
3. ENTERPRISE has approved a second phase to this project that will begin in Summer/Fall of 2025 that will continue to add efforts to the ITS simple innovations list but will also identify implementation projects and explore the next steps for selected implementation in ENTERPRISE member agencies.

Overall, this project documented 78 ITS simple innovations from 30 different transportation agencies. Some of these innovations may not have been documented previously or were documented within another report effort. The intent is that the simple solutions identified will be of interest to ENTERPRISE members to consider for implementation in their agency.

Appendix
ITS Simple Innovations Table

ITS Simple Innovations

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Colorado DOT (CDOT)	**CDOT: Taxation Valuations for Heavy Equipment Added to Oversize/Overweight (OS/OW) Permitting Tool to Replace Manual Process** CDOT is developing functionality in its OS/OW permitting tool to maintain taxation valuations for heavy equipment that are used in Specific Ownership Tax. The tool will serve not only permits but also counties that title and register the heavy equipment. It replaces cumbersome manual processes.	CDOT	2024	Added Feature	Freight Operations
Iowa DOT	**Iowa DOT: Location of Electric Vehicle Charge Stations** Electric vehicle charge station locations near a user's searched route are provided. The locations are also provided as a layer on the Iowa DOT traveler information map. The data is provided by the National Renewable Energy Library that provides an open-source Application Programming Interface (API).	2024 ITS Heartland - Unlocking Tomorrow's ATIS: Unique Innovations to Iowa's 511 System	2024	Added Feature	Traveler Information
Iowa DOT	**Iowa DOT: Mashup Up Traveler Information Data to Tell a Story** Iowa DOT uses mashup data on the map (e.g., construction, winter) to help tell a traffic story so users can make better decisions.	2024 ITS Heartland - Unlocking Tomorrow's ATIS: Unique Innovations to Iowa's 511 System	2024	Added Feature	Traveler Information
Iowa DOT	**Iowa DOT: Traveler Information Icon Color Change Based on Work Zone Data Exchange (WZDx)** Iowa DOT uses connected arrow boards to automatically report when lane closures are in effect in work zones (which is also an indication when workers are present). The connected arrow board indication is used to update the WZDx feed and Iowa DOT'S traveler information system which uses this information to update the icon color that is displayed on the Iowa DOT 511 website based on if the connected arrow board is on or off. There	2024 ITS Heartland - Unlocking Tomorrow's ATIS: Unique Innovations to Iowa's 511 System	2024	Added Feature	Traveler Information

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	is a verified checkmark when the connected arrow board is turned on.				
Kansas DOT (KDOT)	**KDOT: New, Innovative Methods of Traveler Information Data-Sharing** KDOT created new, innovative methods of data-sharing (CarPlay/Android Auto Integration and Alexa Home Speaker Integration, public incident reporting by voice and One Touch, roadway weather data-sharing, etc.) through traveler information dissemination mechanisms (e.g., KanDrive mobile app).	2024 ITS Heartland - Kandrive.gov	2024	Added Feature	Traveler Information
Kansas DOT (KDOT)	**KDOT: New 511 Feature to Track and Display Oversized Loads** KDOT is adding a feature to their 511 traveler information system that is tied to their oversize/overweight system to track and display oversized loads. It is used to notify law enforcement and motorists.	KDOT (ENTERPRISE Oct 2024 Board Meeting)	2024	Added Feature	Traveler Information
North Carolina DOT (NCDOT)	**NCDOT: In-Cab Slowdown and Congestion Alerts to Truckers** Using Drivewyze In 2021, there were 15,557 commercial motor vehicles involved in crashes in North Carolina. There are many locations where Dynamic Message Signs (DMS) are not available to inform motorist of traffic anomalies. NCDOT contracted with INRIX to provide dynamic slow traffic alerts to trucks using Drivewyze, that provides in-cab communications to commercial vehicles via electronic logging devices.	National Operations Center of Excellence - Alerting Commercial Motor Vehicles	2023	Added Feature	Freight Operations
North Carolina DOT (NCDOT)	**NCDOT: In-House Solution to Communicate Road Closures with Waze** NCDOT modified their traveler information management system for Waze to read and accept closure data. Waze users are now automatically routed around closed roads, removing any distraction to the driver that would occur when looking for an alternate route.	National Operations Center of Excellence - NCDOT & Waze Automated Road Closures	2023	Added Feature	Traveler Information

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Oregon DOT (ODOT)	**ODOT: Local Road Report Entry into the Statewide Traveler Information System** ODOT maintains and operates a statewide traveler information system called TripCheck. Local agencies can request access to enter construction, road conditions, and weather hazards into TripCheck Local Entry (TLE). Events entered into TLE appear on the statewide TripCheck traveler information website and are published by the TripCheck data portal.	Minnesota DOT Local Road Research Board: Using Apps to Notify the Public of Local Road and Bridge Closures	2024	Added Feature	Traveler Information
Wyoming DOT (WYDOT)	**WYDOT: Citizens Submit an Image from WYDOT's Mobile App** WYDOT's mobile app for traveler information provides citizens with the ability to submit an image when they are not driving. Citizens are required to use location services when submitting photos in order for WYDOT to verify each submittal with the location, date, and time using photo metadata. The ability for citizens to submit photos in a rural environment is helpful, however in an urban environment it may clutter the map and be a burden for staff to validate the increased number of photos received.	North/West Passage 14.4 DOT Traveler Information Crowdsourcing Practices	2020	Added Feature	Traveler Information
Arizona DOT (ADOT)	**ADOT: Statewide Mobility Analytics in Real-Time (SMART) Tool for Better Freeway Performance** ADOT partnered with the University of Arizona to develop the SMART tool, which integrates data from INRIX, loop detectors, and controller event-based data to provide a comprehensive operations analysis suite. The benefits this project brings include not only better freeway performance for the public, but it balances the ramp performance to better meet the needs of local agencies.	National Operations Center of Excellence - Leveraging High-Resolution Event-Based Data for Ramp Metering Improvement Name of Organizations	2023	Data Integration	Traffic Management
Iowa DOT	**Iowa DOT: Real-Time Arrow Board Status Information** In 2019, the Iowa DOT had access to 5 equipped arrow boards	ENTERPRISE: Real-Time Integration of Arrow Board	2020	Data Integration	Work Zone

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	with reporting capabilities (Street Smart, iCone, Ver-Mac) to provide real-time arrow board status information to the vendor's server.	Messages into Traveler Information Systems Evaluation - Phase 3			
Minnesota DOT (MnDOT)	**MnDOT: Real-Time Arrow Board Status Information** In 2018, MnDOT conducted a one year pilot project through a contract with a vendor (Street Smart) that installed a monitoring device on 20 arrow boards that provided arrow board status information (e.g., right arrow on, left arrow on) to the vendor's server. The arrow board status information from the server was then integrated with MnDOT's Advanced Traffic Management System (ATMS) and then their Road Condition Reporting System (RCRS).	ENTERPRISE: Real-Time Integration of Arrow Board Messages into Traveler Information Systems Evaluation - Phase 3	2020	Data Integration	Work Zone
Oklahoma DOT (ODOT)	**ODOT: Integrated Construction Projects into the Traffic Information Website** ODOT developed OKTraffic.org for all traffic related information including the base map layer, Google and Waze traffic data, National Oceanic and Atmospheric Administration (NOAA) weather data, web cameras, Dynamic Message Signs (DMS), and sensor cameras. Integrated construction projects provide the exact project location for construction projects and better inform travelers of expected slowdowns, changing traffic conditions, and construction zones.	National Operations Center of Excellence - Oklahoma Construction App	2023	Data Integration	Traveler Information
Pennsylvania DOT (PennDOT)	**PennDOT: Integrating Standard Work Zone Equipment Through its Advanced Traffic Management System (ATMS)** Standard work zone equipment is integrated with the ATMS system through several efforts including speed management (Variable Speed Limits (VSL) for both dynamic and static displays of speed limit), ramp metering (a pilot deployment within a work zone that can deploy both static and dynamic ramp metering),	National Operations Center of Excellence - PennDOTs Integrated Smart Work Zone Initiative	2021	Data Integration	Work Zone

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	and traveler information (work zone travel time, use field detectors and/or probe data to provide queue related messaging, and Integrated Corridor Management).				
Pennsylvania DOT (PennDOT)	**PennDOT: Combined Situational Data Sources to Delineate When Incidents Truly Occurred** PennDOT had a need for better data aggregation and analysis to support decision making. In 2015, PennDOT started an initiative to audit the readily available DOT and vendor data resources that related to Transportation Systems Management and Operations (TSMO). PennDOT combined situational data sources to more accurately delineate when incidents truly occurred, how long it took them to be cleared, and what their overall impact on traffic was.	National Operations Center of Excellence - TSMO Performance Program and Traffic Operations Analytics Tool	2021	Data Integration	Traffic Management
Iowa DOT	**Iowa DOT: Iowa Counties' Road Notifications Added as a Layer on the Iowa DOT 511 Website** In June 2024, a request from the Governor of Iowa via the Iowa DOT Executive Director was issued to find a way to display county road closures on the DOT 511 Site. The County Engineers Service Bureau already provide an Iowa 511 County Map. The information from the Iowa 511 County Map was launched as a new layer on the Iowa DOT 511 website on July 1 and on the mobile app July 9 with implementation from the Iowa's traveler information consultant.	AASHTO Committee on Transportation System Operations (Community of Practice Traveler Information Working Group July 7, 2024 Meeting)	2024	Data Integration	Traveler Information
Iowa DOT	**Iowa DOT: Waze Reports Added as a Layer on the Iowa DOT 511 Website** Waze reports on Iowa DOT's traveler information website are labeled as citizen updates, reported by Waze, on their own layer and in the map legend. Waze has been a valuable resource to Iowa DOT for both traveler information and operations in more	North/West Passage 14.4 DOT Traveler Information Crowdsourcing Practices	2020	Data Integration	Traveler Information

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	populated areas, but may not be as valuable in less populated areas with fewer Waze reports.				
Minnesota DOT (MnDOT)	**MnDOT: Roadway Debris Removal Devices on Freeway Incident Response Safety Team (FIRST) Vehicles** MnDOT is testing and evaluating three different off-the-shelf, low cost, debris removal devices on FIRST vehicles to determine the applicability of expanding to the metro area and greater Minnesota. The use of the debris removal device will enhance safety by providing the ability to move debris out of the roadway without having to get out of the truck on a roadway.	MnDOT	2024	Device	Maintenance
Missouri DOT (MoDOT)	**MoDOT: Roadway Debris Removal Devices** MoDOT has deployed 2 different off-the-shelf, low cost, debris removal devices on vehicles to enhance safety by providing the ability to move debris out of the roadway without having to get out of the truck on a roadway.	Missouri DOT	2024	Device	Maintenance
Missouri DOT (MoDOT)	**MoDOT: Mobile Pothole Patcher** This method of road resurfacing involves a fresh layer of asphalt being applied in order to restore its structural integrity as well as extending its life cycle. It is also the method that takes the shortest time to complete.	The Pothole Patcher	2018	Device	Maintenance
Wisconsin DOT (WisDOT)	**WisDOT: Fleet of Temporary Intelligent Transportation System (ITS) Devices for Construction Projects** WisDOT is building a fleet of temporary ITS devices (e.g., cameras, DMS) by purchasing devices for construction projects and reusing them on future projects. WisDOT supplies the devices to the construction contractor for deployment and operation during construction.	ENTERPRISE: Evolving and Phasing Out Legacy ITS Devices and Systems	2019	Device	Traffic Management

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Colorado DOT (CDOT)	**CDOT: Label Junction Boxes "No Copper" to Deter Intrusions** To deter junction box intrusions, CDOT adds labeling/markings at junction boxes indicating “no copper” is present.	ENTERPRISE: Best Practices for Physical Security of ITS Field Enclosures	2024	Guidance	Security
ENTERPRISE	**ENTERPRISE: Criteria, Decision Factors, and Tools to Evolve, Phase Out, or Eliminate Intelligent Transportation System (ITS) Devices and Systems** A series of criteria, decision factors, and tools for agencies to use when considering how to evolve, phase out, or eliminate ITS devices and systems. Organized by 10 types of ITS systems and devices.	ENTERPRISE: Evolving and Phasing out Legacy ITS Devices and Systems Final Report	2019	Guidance	Maintenance
Illinois DOT (IDOT)	**IDOT: Visual Guide to Illustrate What Is and Is Not a Divisible Freight Load** IDOT has developed a visual guide (Guidelines for Overweight Permit Movements and Divisibility) to help enforcement and truckers understand what is and is not considered a divisible freight load to support consistency in enforcement and to help truckers avoid violations and unnecessary stops.	Illinois Transportation Automated Permits	2024	Guidance	Freight Operations
Pennsylvania DOT (PennDOT)	**PennDOT: The 5 Rs of ITS Device Maintenance** PennDOT developed a document that provides general guidance for repairing, refurbishing, replacing, relocating, and removing ITS devices (Five Rs).	ENTERPRISE: Evolving and Phasing out Legacy ITS Devices and Systems Final Report	2019	Guidance	Maintenance
Utah DOT (UDOT)	**UDOT: Manage Access to Intelligent Transportation System (ITS) Enclosures with Electronic Key/Lock Systems** Electronic key/lock systems can offer an effective approach for managing access to ITS enclosures. Electronic locks are installed on all ITS cabinets and signal cabinets.	ENTERPRISE: Best Practices for Physical Security of ITS Field Enclosures	2024	Guidance	Security
Utah DOT (UDOT)	**UDOT: Replace Copper Wire with Aluminum Wire to Deter Intrusions**	ENTERPRISE: Best Practices for Physical	2024	Guidance	Security

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	Replacing copper wiring with aluminum wiring for long runs and only using copper between the disconnect and the device is an emerging strategy UDOT uses that shows early success for deterring intrusions.	Security of ITS Field Enclosures			
Utah DOT (UDOT)	**UDOT: Small Wireless Facilities Mounting Installations Guidelines** Guidelines, including construction drawings showing allowable small wireless facilities mounting locations on multiple types of UDOT poles, indicate the conditions in which co-location on UDOT structures is not allowed.	Small Wireless Facilities Installation Guidelines	2019	Guidance	Communications Infrastructure
Washington DOT (WSDOT)	**WSDOT: Locate Intelligent Transportation System (ITS) Enclosures in Highly Visible Areas to Deter Intrusions** WSDOT locates cabinets and shelters in highly visible areas to deter unauthorized access and increase the likelihood of unlawful activities being reported**.**	ENTERPRISE: Best Practices for Physical Security of ITS Field Enclosures	2024	Guidance	Security
New Jersey DOT (NJDOT)	**NJDOT: Field Detection Devices Phased Out with Arterial Probe Speed Data Use** Use of arterial probe speed data has reduced NJDOT's use of field detection devices.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Increased Data Use	Traffic Management
Ohio DOT (ODOT)	**ODOT: Floating Car Method Reduced with Arterial Probe Speed Data Use** ODOT has achieved savings (and is obtaining better data) for travel time studies and signal timing contracts, as less time and effort is dedicated to the floating car method for these studies.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Increased Data Use	Traffic Management

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
ENTERPRISE	**ENTERPRISE: Model System Engineering Documents for Advanced Traffic Management System (ATMS)** ENTERPRISE members collaboratively developed a set of common needs, concepts, and requirements to serve as model systems engineering documents. The resulting document was not intended to be inclusive of all possible ATMS capabilities, but rather a baseline of common capabilities to be used by the member agencies to support their systems engineering process and ATMS procurement.	ENTERPRISE: Model ATMS Concept of Operations and Requirements	2017	Model Documents	Systems Engineering
ENTERPRISE	**ENTERPRISE: Model System Engineering Documents for Real-Time Arrow Board Status Information** ENTERPRISE developed 'model' systems engineering documents (Concept of Operations and Requirements) that ENTERPRISE agencies could use when implementing solutions to integrate active work zone notifications into current traveler information dissemination systems.	ENTERPRISE: Real-Time Integration of Arrow Board Messages into Traveler Information Systems - Phase 1	2017	Model Documents	Systems Engineering
Minnesota DOT (MnDOT)	**MnDOT: Model System Engineering Documents for Six Intelligent Transportation System (ITS) Applications** MnDOT completed systems engineering documents for six ITS applications (dynamic message signs, video, traffic detection, communications and radio, flood warning, and ramp metering) for use in future project planning and implementation to ensure compliance of 23 CFR 940 and to address Connected and Automated Vehicle (CAV) readiness for Minnesota.	Systems Engineering for ITS and CAV Readiness	2019	Model Documents	Systems Engineering
ENTERPRISE	**ENTERPRISE: Framework to Provide Consistent Update to Mapping/Navigation Companies** Developed a framework to assist departments of transportation as they provide map updates to select mapping/navigation companies.	ENTERPRISE: Establishing a Framework for Communicating Map Updates to Mapping Companies	2022	Process	Traveler Information

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Georgia DOT (GDOT)	**GDOT: More Proactive Arterial Management Using Probe Data** The probe speed data has allowed GDOT to be more proactive with arterial management as there is more coverage of speed data, compared to physical field detection devices.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Process	Arterial Operations
Georgia DOT (GDOT)	**GDOT: Probe Data Providing Data-Driven Approach to Identify Congestion Reduction Projects** Use of arterial probe speed data has provided GDOT with a more data-driven approach to identify congestion reduction projects.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Process	Arterial Operations
Georgia DOT (GDOT)	**GDOT: Updated Signal Timing and Traffic Management Center (TMC) Control to Manage Pedestrians at an Intersection, Reducing Officers Needed** A new GDOT Intelligent Transportation System (ITS) deployment included programming for time-of-day pedestrian scrambles designed for all-way pedestrian crossings during heavy volume times that could be controlled directly from the GDOT TMC. In the past, most intersections required at least six officers to manage the crowd and vehicles; now an intersection can be managed by two officers.	National Operations Center of Excellence-2017 Super Bowl Operations	2020	Process	Arterial Operations
Minnesota DOT (MnDOT)	**MnDOT: Freeway Closure Plans for Full Road Closures** MnDOT developed 525 freeway closures for the metro freeway system to be used during major incidents to help coordinate incident response by MnDOT and determine traffic control needs for a full road closure.	MnDOT Freeway Closure Plans	2011	Process	Incident Management
North Carolina DOT (NCDOT)	**NCDOT: Probe Data Providing Data-Driven Approach to Identify Congestion Reduction Projects** Use of arterial probe speed data has provided NCDOT with a data-driven approach for selecting which corridors to retime each year as opposed to previously a very subjective process.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Process	Arterial Operations

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
North Carolina DOT (NCDOT)	**NCDOT: Probe Data to Identify Systems to be Retimed** NCDOT leverages probe data to improve the ability to identify the systems that need to be retimed. Availability of data more frequently improves monitoring and the identification of inefficiencies. This provides a mechanism to aggregate system performance metrics to near-real-time identification of inefficient systems, moving towards true active management on arterial networks.	National Operations Center of Excellence - Data to Drive Decisions	2023	Process	Arterial Operations
Ohio DOT (ODOT)	**ODOT: Revised Process for Speed Studies Using Arterial Probe Data** ODOT revised their speed limit study tool (due to the pandemic) and is using it to understand actual speeds in the field from arterial probe data rather than physically driving to sites to conduct speed studies.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Process	Arterial Operations
Pennsylvania DOT (PennDOT)	**PennDOT: Arterial Probe Data has Improved Signal Prioritization** Arterial probe speed data for PennDOT has provided the ability to evaluate the impacts and benefits over a longer period of time to assist in signal prioritization.	ENTERPRISE Synthesis of Probe Speed Data for Arterial Operations	2021	Process	Arterial Operations
Michigan DOT (MDOT)	**MDOT: Work Zone Smart Vests to Change the Speed Limit Posted** MDOT tested two VerMac Smart Vests in a work zone as well as 12 additional modified sensors containing the same technology. The presence of one worker (or multiple workers) wearing a Smart Vest prototype sensor was used to automatically change the speed limit posted on the digital speed limit sign in the segment that the worker was present.	ENTERPRISE: State of the Art Roadway Sensors – Phase 2	2024	Product	Work Zone
Minnesota DOT (MnDOT)	**MnDOT: Work Zone Smart Vests for Worker Presence**	ENTERPRISE: State of the Art Roadway Sensors – Phase 2	2024	Product	Work Zone

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	A contractor in Minnesota initiated a test of the wearable vest for worker presence. An initial test is being conducted with four wearable vest sensors being used in an active work zone, which are supporting the testing of different types of applications in a virtual environment. Data from the sensors are being provided via a Work Zone Data Exchange (WZDx) feed to Waze but not to MnDOT.				
Arizona DOT (ADOT)	**ADOT: Incident Response Unit Program (IRU) Program to Restore Traffic Flow Quickly and Safely** The ADOT IRU program provides a multi-jurisdictional and coordinated strategy to detect, respond to, and clear traffic incidents so that traffic flow can be restored quickly and safely. Since the inception of the IRU program, reduction of response time to incidents has led to less traffic delay, congestion, and air quality issues. The IRU program also saved overtime hours for maintenance crew staff, which resulted in cost savings that could be returned to highway maintenance programs.	National Operations Center of Excellence - Incident Response Unit Cost Savings	2023	Program	Incident Management
Washington DOT (WSDOT)	**WSDOT: Expedited Approval Program for Low-Cost Intelligent Transportation System (ITS) Projects** WSDOT has developed a program that expedites the approval and systems engineering for low-cost ITS projects (less than $250,000). Candidate projects are presented to a committee and if the benefits are clear, the project addresses a known issue, and the cost is below the threshold, the project may be approved without further planning.	WSDOT (Regional Operations Leadership Forum (ROLF) - 2019)	2018	Program	Planning

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Arizona DOT (ADOT)	**ADOT: Disseminate Roadway Conditions (Speed Differentials) Through a Cell Phone App Using Vehicle-to-Everything (V2X) Technology** Speed differentials from non-recurring incidents, congestion, or work zones can cause crashes into the back-of-queue. This project identifies a solution that provides timely and accurate information regarding roadway conditions while minimizing costs and utilizes V2X technology to disseminate safety notifications through a cell phone app and a cloud-based edge computer that compliments existing methods.	National Operations Center of Excellence - Applying Emerging Technologies to the ADOT Traveler Information Program	2023	Real-Time Application	Connected Vehicle
Florida Turnpike Enterprise (FTE)	**FTE: Real-Time Safety Alerts Using Smartphone Sensors** FTE leaders wanted to capitalize on research that has proven that smartphone sensors could be utilized to provide a surrogate for Connected Vehicle (CV) basic safety message (BSM) data. Through this project the team generated multiple successful safety and mobility-centric applications that can provide near real-time alerts to safety conditions along any roadway where adequate cellular coverage exists.	National Operations Center of Excellence - SmartPhone as a CV Sensor	2023	Real-Time Application	Connected Vehicle
Maryland DOT State Highway Administration (MDOT SHA)	**MDOT SHA: HAAS Alerts** This project involved the installation or use of existing in-vehicle units for 200 MDOT SHA vehicles that could send real-time digital alerts to motorists over third-party platforms (e.g., Waze) as well as through connected vehicle applications, when responders and roadway crews are on scene and en route.	National Operations Center of Excellence - HAAS Alert in Maryland	2023	Real-Time Application	Connected Vehicle
Illinois DOT (IDOT)	**IDOT: Over Height Detector Repurposed as a Truck Counter** IDOT repurposed an over height detector to use as a counter for trucks.	IDOT (ENTERPRISE Sept 2023 Board Meeting)	2023	Repurposed Device	Traffic Management
Iowa DOT	**Iowa DOT: Dynamic Message Sign (DMS) Parts Near End of Life Used to Extend Life of DMS in Critical Locations**	ENTERPRISE: Evolving and Phasing	2019	Repurposed Device	Traffic Management

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
	Parts from DMS near their end of life are used to extend the life of DMS in critical locations.	Out Legacy ITS Devices and Systems			
Michigan DOT (MDOT)	**MDOT: Truck Attenuator Positioned a Truck Where Infrastructure Was Damaged to Reduce Crashes** Positioned a truck attenuator at locations where infrastructure was damaged until it could be repaired, to help reduce crashes.	Michigan DOT (ENTERPRISE Sept 2023 Board Meeting)	2023	Repurposed Device	Maintenance
Ohio DOT (ODOT)	**ODOT: Repurposing Highway Advisory Radio (HAR)** ODOT is phasing out non-critical HAR locations and is no longer deploying new HAR sites. ODOT is removing beacons from signs but leaving static signs in place, so motorists can tune into the broadcast if they desire. Salvageable parts are being used to support higher-priority HAR sites.	ENTERPRISE: Evolving and Phasing Out Legacy ITS Devices and Systems	2019	Repurposed Device	Traveler Information
Pennsylvania DOT (PennDOT)	**PennDOT: Converting Highway Advisory Radio (HAR) Signs to Inform Motorists of 511 Phone** PennDOT is no longer installing new HAR sites and is converting in-place HAR signs to inform motorists of conditions being reported on 511 phone. During the transition, PennDOT is reusing components from non-operational HAR devices to extend the life of other in-place devices.	ENTERPRISE: Evolving and Phasing Out Legacy ITS Devices and Systems	2019	Repurposed Device	Traffic Management
Rhode Island DOT (RIDOT)	**RIDOT: Reused Tolling Structures** In Rhode Island, tolling operations have transitioned to a contractor. Rhode Island DOT has reused tolling structures for other uses (e.g., counting traffic, speeds).	AASHTO Committee on Transportation System Operations (CTSO Working Group July 8, 2024 Meeting)	2024	Repurposed Device	Traffic Management
Wyoming DOT (WYDOT)	**WYDOT: Signal Trailer Repurposed to Create a Portable Road Weather Information System (RWIS)** WYDOT repurposed a signal trailer to create a portable RWIS.	National Operations Center of Excellence (Road Weather	2023	Repurposed Device	Road Weather Management

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
		Roundtables Feb 7-8, 2023 webinar)			
City of Frisco, Texas (TX)	**Frisco, TX: Next-Generation Traffic Incident Management Situational Awareness For Emergency Response (SAFER) Platform** The City of Frisco, TX designed an in-house platform, called SAFER, to provide their local firefighters, EMTs, and police officers immediate access to real-time information while responding to emergencies.	Next-Generation Traffic Incident Management	2024	Software	Incident Management
Minnesota DOT (MnDOT)	**MnDOT: Intelligent Roadway Information System (IRIS) Open Source Advanced Transportation Management System (ATMS) Software Implementation** MnDOT developed IRIS (open source ATMS) with in-house staff in the late 1990s. Other agencies were also able to utilize and implement IRIS (e.g., Wyoming, Nebraska, Indiana, Caltrans, Chandler AZ, Bloomington MN, Scott County MN, and the Mall of America in Bloomington, MN).	North/West Passage 13.2 Operations Task Force - Year 6: IRIS Open Source Software Webinar	2019	Software	Traffic Management
North Dakota DOT (NDDOT)	**NDDOT: Legacy Advanced Transportation Management System (ATMS) Replaced with Intelligent Roadway Information System (IRIS) Open Source ATMS Software** Replaced a legacy ATMS with IRIS in North Dakota.	2024 ITS Heartland - Rapid ATMS Deployment: Success and Lessons Learned	2024	Software	Traffic Management
Arizona DOT (ADOT)	**ADOT: Early Warning Dust Detection Warning System** With an overall goal is to enhance awareness, mitigate traffic delays, and reduce crashes due to low visibility dust events, ADOT deployed an early warning dust detection warning system along a 10-mile segment of I-10 near Eloy, Arizona that uses remote sensing equipment to automatically control speed limits during periods of low visibility.	National Operations Center of Excellence - ADOT Dust Detection and Warning System	2023	System Deployment	Safety

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Iowa DOT	**Iowa DOT: Adaptive Signal Control Technology (ASCT) to Change Traffic Patterns** Iowa DOT is using Adaptive Signal Control Technology to adapt to changing traffic patterns to optimize traffic flow and help with traffic variability.	2024 ITS Heartland - Adapting to Construction with ASCT	2024	System Deployment	Arterial Operations
New Jersey DOT (NJDOT)	**NJDOT: Hard Shoulder Running (HSR) to Eliminate Back Ups and Enhance Safety** US Route 1 is a highly congested state arterial where there is often queuing for two miles where the highway narrows from three to two lanes causing travel delays and creating the potential for accidents. NJDOT drew upon their successful deployment of HSR for a solution. Intelligent Transportation System (ITS) and community outreach allowed for easy implementation, eliminating back-ups and enhancing safety.	National Operations Center of Excellence - Route 1, Forrestal Rd. to Wynwood Dr./Whispering Woods Blvd. ITS Improvements Project	2022	System Deployment	Traffic Management
Arizona DOT (ADOT)	**ADOT: Online State-Owned Fiber Optic Conduit Routes Map** ADOT maintains an online map of state-owned fiber optic conduit routes. The map includes in-place and under construction conduit. The map is linked from the ADOT Broadband Office web page. The ADOT Broadband Office has a goal to reduce barriers and maximize resource sharing and ITS opportunities, to expand broadband development.	State-Owned Fiber Optic Conduit Routes	2024	Tool	Communications Infrastructure
California DOT (Caltrans)	**Caltrans: Online Map of Proposed Transportation Projects to Coordinate Broadband Facilities** Caltrans maintains an online map of proposed transportation projects on the State Highway System for broadband providers to view upcoming projects and coordinate with Caltrans to install broadband facilities when road construction is occurring.	Caltrans Broadband Partnership Opportunity Map	2024	Tool	Communications Infrastructure

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Florida DOT (FDOT)	**FDOT: Electronic Signals and Traffic Operations Reponses Management (eSTORM) System** For the 2020 hurricane season, District 3 developed the eSTORM system which included adding traffic signal status fields with pictures to already in place databases, enhancing the mobile app to input data directly into the database through drop-down menus, and upgrading efforts for traffic control and detours through connected portable traffic signals, cameras, and changeable message signs which communicate with the D3 Regional Transportation Management Center (RTMC). As a result, eSTORM is now a statewide storm management tool.	National Operations Center of Excellence - eSTORM	2023	Tool	Traffic Management
Iowa DOT	**Iowa DOT: Dynamic Message Sign (DMS) Placement Scoring Matrix** In 2018, Iowa DOT completed a DMS inventory using a scoring matrix to identify priorities for existing and proposed DMS sites.	ENTERPRISE: Evolving and Phasing Out Legacy ITS Devices and Systems	2018	Tool	Traffic Management
Iowa DOT	**Iowa DOT: Automated Video Request Tool** Iowa DOT developed an automated process and tool for video requests.	Iowa DOT (ENTERPRISE Sept 2023 Board Meeting)	2023	Tool	Traffic Management
Iowa DOT	**Iowa DOT: Incident Management Plans Accessible Online** Iowa DOT creates pre-planned alternate routes and maintains a web-based display of Traffic Incident Management Plans and Alternate Route plans used when major incidents require a freeway or highway closure.	Iowa DOT Incident Management Plans	2024	Tool	Incident Management
Kansas City (KC) Scout	**KC Scout: Waze Pothole Reports used by the DOT to Identify the Location to Fix** Pothole Customer Proactive Reporting (CPR) for Efficient Pavement Maintenance - Waze pothole reported data provides the location of a pothole for the DOT to fix.	KC Scout (ENTERPRISE Sept 2023 Board Meeting)	2023	Tool	Maintenance

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
North Carolina DOT (NCDOT)	**NCDOT: Regional Traffic Management Center (RTMC) and First Responders Streaming Using Microsoft Teams to Stream Video and Live Chat** Microsoft Teams provided a platform for streaming video with live chat between first responders and the RTMC staff who operate the cameras. Daily Microsoft Teams meetings were set up to provide situational awareness and an improved communication strategy for key parties during construction.	National Operations Center of Excellence - NCDOT Teams for TIM	2023	Tool	Incident Management
North Dakota DOT (NDDOT)	**NDDOT: Drones Use for Better Vantage Point** A major benefit to using drones is being able to obtain a significantly better vantage point (i.e., "birds eye view") while keeping employees away from dangerous conditions such as severe weather, flooded roads, slides, and confined spaces.	ENTERPRISE: Novel Uses of UAS in ITS	2024	Tool	Incident Management
Texas DOT (TxDOT)	**TxDOT: Real Property Asset Online Map of Small Cell Leases** TxDOT maintains a public website, TxDOT Real Property Map, that displays locations of small cell leases as a layer on the property assets map.	Real Property Asset Map	2024	Tool	Communications Infrastructure
Utah DOT (UDOT)	**UDOT: Balance Sheet for Tracking Communications Infrastructure-Related Resource Trades** UDOT created and maintains a balance sheet for tracking communications infrastructure-related resource trades involving UDOT and private sector companies. Resource exchanges may or may not be in the location of the negotiated installation and are tracked over time.	ENTERPRISE: Evolving and Phasing out Legacy ITS Devices and Systems Final Report	2019	Tool	Communications Infrastructure
Utah DOT (UDOT)	**UDOT: Online Map of Existing and Planned Fiber** Online fiber map displays conduit size, location, length, owner, planned fiber lines, and splice details, and is used by UDOT and its partners for planning, locations, and trouble-shooting.	UDOT Fiber	2024	Tool	Communications Infrastructure

Agency	ITS Innovation Brief Description	Source	Year	Innovation Type	Transportation Area
Wisconsin DOT (WisDOT)	**WisDOT: Transportation Systems Management and Operations Traffic Infrastructure Process (TSMO-TIP) to Review and Assess the TSMO Infrastructure System** TSMO-TIP is WisDOT's process to review and assess WisDOT's TSMO infrastructure system. It includes a flowchart and a web-based application that consists of a Needs Analysis Tool and a Benefits Tool to prioritize TSMO investment priorities.	TSMO-TIP	2019	Tool	Planning
Minnesota DOT (MnDOT)	**MnDOT: Upgrade Still Images to Streaming Video** MnDOT researched streaming video practices to assist in upgrading still images to streaming video. Streaming video provides more context and visual information on traffic and road conditions for many different user groups.	MnDOT Streaming Video Summary of Practices and Requirements	2021	Upgrade	Traveler Information
FHWA	**FHWA: Technology in Rural Transportation "Simple Solutions"** More than 50 simple solutions (proven, cost-effective, low-tech) are identified. Fourteen were selected for further investigation.	Technology in Rural Transportation "Simple Solutions"	1997		