ITS AND COMMUNICATIONS
Service Layer Brochure

Intelligent Transportation Systems (ITS) are critical to the successful achievement of the ALDOT TSMO vision. ITS supports safe, reliable, and optimized management and operations of the transportation system and provides the foundation required to implement other service layers. This Service Layer Brochure provides a brief introduction to ITS and communications; provides examples of ITS and communication deployments; and speaks to the benefits of a robust ITS and communication system.

Without the installation of ITS and communication devices in the transportation network, the remainder of the Service Layers would not function at all, or would have dramatically lower benefits. The benefits of Traffic Signal Management and a Regional Traffic Signal Operations Program are greatly increased with the ability to remotely monitor and adjust signal timing. Traffic Management Centers and Traveler Information are more efficient when real time data is able to be sent to the end user. And Traffic Incident Management and Work Zone Management provide safer conditions when conditions are able to be observed at a moments notice.

> FHWA defines ITS as **"electronics, communications, or information processing** used singly or in combination to improve the **efficiency of safety** of a surface transportation system."

Communication is key!

ITS devices transport data over a communications network typically comprised of a number of different communication types. Communication mediums include legacy copper, fiber optic cable, wireless radios, and cellular. Copper is no longer installed to support ITS deployments, however, copper networks still remain in some locations where infrastructure has not been upgraded. Together, the ITS and communications infrastructure support the advanced communications-based information and electronic technologies to deliver a safe, reliable, and sustainable transportation environment.
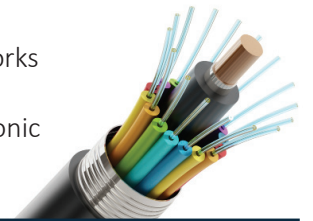
Method	Fiber Optic	Wireless Radio	Cellular Radio
Medium	fiber optic glass	wireless	wireless
Benefits	high quality reliable	bypass physical barriers	direct connection to central hub
Disadvantages	costly to build	physical connection still required	susceptible to outages; bandwidth limitations
Best Use	corridors network backbone	last mile fiber gaps	utility dense environment

Examples of ITS Deployments

Closed-Circuit Television (CCTV) Cameras

Used to verify safety hazards, traffic incidents, congestion, device functionality, and operational characteristics of the roadway. CCTV Cameras provides engineers with the information needed to adjust signal timing remotely, saving time and money.

Flow Meters

Used to control the pace of traffic entering a controlled access facility so that merging happens more efficiently. Also helps control the volume of vehicles entering the facility, thereby increasing the minimum operating speed.

Road Weather Information System (RWIS)

Used to obtain road-weather related information such as temperature, wind, humidity, ice conditions, etc. Provides information to end users and increases the safety of the roadway network.

Connected Vehicle Deployments

Dedicated Short Range Communications (DSRC) radios and 5G Road Side Units (RSU) radios are being deployed to communicate traffic information with vehicles. These radios provide the connected vehicles with a wealth of information about the operating characteristics of the roadway network including: signal information; emergency vehicle preemption information; and roadway conditions.

Detection

Used primarily to detect and obtain count, speed, classification, and other information about vehicles, pedestrians, and cyclists. Detection systems are critical to providing performance metrics for the roadway network such as arrival on green percentages, congestion levels, travel times, and incidents.
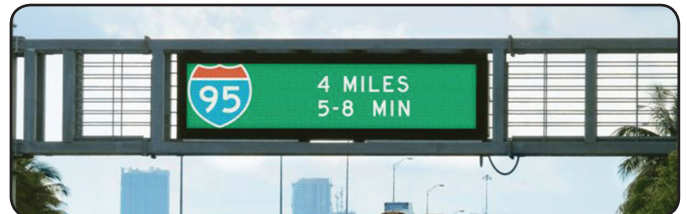
Dynamic Message Signs (DMS)

Used to communicate near real-time traveler information to drivers along interstates and freeways. Types of information inlcude work zone locations, crashes, and weather.

Warning Systems

Can be of various types and typically detect an unwanted behavior, i.e. wrong-way driver, and warn the driver of the unsafe conditions.

From top: CCTV camera, Ramp flow meter, Road Weather Information System, Dynamic message sign, Warning system technology
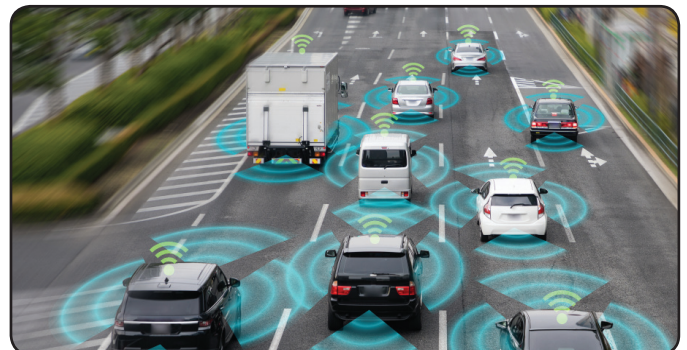
The Benefits of ITS and Communications

- Optimize the use of existing facilities and infrastructure
- Maximize performance of the system
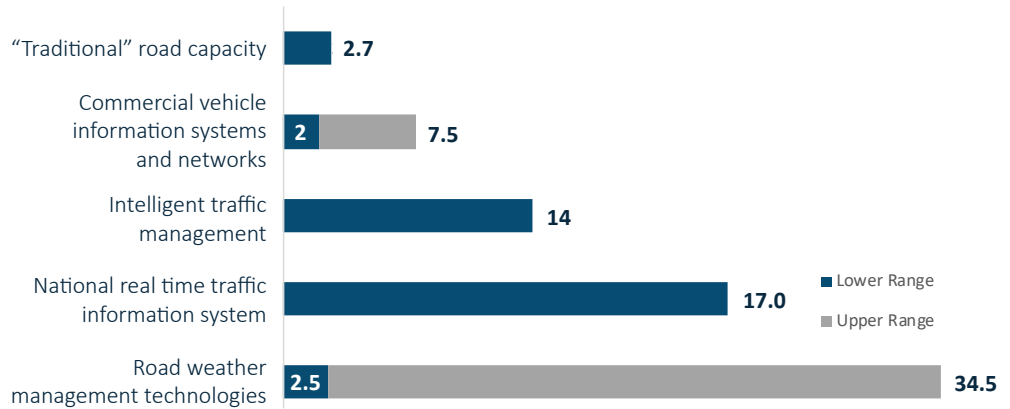- Target solutions to congestion causes
- Complements capacity expansion projects

An innovative and technology based approach is essential in a time when vehicle miles traveled (VMT) in Alabama are increasing faster than resources for funding can provide additional lane miles. This disparity negatively impacts safety and mobility of the overall transportation system as congestion increases are further compounded. The ITS and communications service layer provides the backbone for a technology based approach as it provides the network and communication to implement the technology based solutions. Without this critical service layer, the remainder are far less valuable and in some cases, impossible to implement.

ITS deployment strategies have demonstrated performance success in making safer and more efficient use of existing infrastructure and doing more with less financial investment.

Typical ITS deployment strategies have been found to have benefit versus investment ratios of up to 34.5 while traditional capacity expansion, i.e. roadway widening, only offers about 3 times the benefit versus the investment.

TSMO Strategy/ITS Deployment Benefit: Cost Ratio Ranges

Strategy	Value
"Traditional" road capacity	2.7
Commercial vehicle information systems and networks	2 / 7.5
Intelligent traffic management	14
National real time traffic information system	17.0
Road weather management technologies	2.5 / 34.5

Legend: ■ Lower Range ■ Upper Range

SOURCE: Intelligent transportation systems. Capitol Research. Council of State Governments, April 2010: Transport for London, 2007; Intelligent transportation system benefits, costs, deployment, and lessons learned desk reference: 2011 update, US Department of Transportation, September 2011; Urban mobility plan, Seattle Department of Transportation, January 2008; McKinsey Global Institute analysis

Enhanced Capabilities with ITS

- Detect and inform users of incidents, adverse weather, and other hazardous conditions

- Improve situational awareness and more effectively manage traffic incidents

- Improve travel time reliability and increase overall efficiency of the transportation system

- Provide real-time traffic conditions to all users

- Proactively alert users of congestion, infrastructure issues, or incidents rather than reacting to citizen calls and complaints

- Integrate and/or automate existing processes to more efficiently utilize ALDOT resources

- Provide advanced network connectivity throughout the state

The ITS and Communications Service Layer is critical as this infrastructure supports and provides the **raw data and situation awareness** that many other services rely on.

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Existing Conditions

ALDOT's existing ITS and communications infrastructure includes fiber optic communications, CCTV cameras, DMS, portable changeable message signs (CMS), microwave vehicle detection system (MVDS) devices, Bluetooth vehicle detection devices, dedicated short-range communication (DSRC) radios, a highway advisory radio (HAR) system, a fog warning system, traffic signal control systems, tunnel control systems, and RWIS. Over the last several years, ALDOT has completed several ITS and communications projects and is working on others, including:

- 511 Traveler Information Program

- Smart Parking Applications

- Just-In-Time Delivery Corridors

- Road Weather Decision Support Systems

- Emergency Transportation Operations

- Smart Work Zones
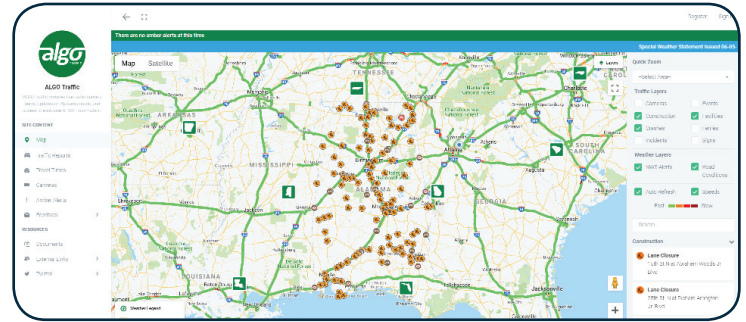
ALGO Traffic: ALDOT

Other Service Layer Brochures

The information contained in this brochure only highlights the benefits of ITS and Communication technologies. ITS and Communication technologies provide the network for the TSMO plan to operate within. Without it, the remainder of the plan will not provide the benefits described within the remaining service layer brochures. Likewise, without the remainder of the TSMO plan, the ITS and Communications technology does not provide the benefits described above. The ALDOT Statewide TSMO plan functions like a mesh; each individual piece is woven together to form a larger structure of interdependence and support. In order to understand the full breadth of what the ALDOT Statewide TSMO plan has to offer, review the other Service Layer Brochures.

ITS and Communications

Traffic Signal Management

Traffic Management Centers

Emergency Transportation Operations

Traveler Information

Traffic Incident Management

Work Zone Management

Active Transportation and Demand Management

Connected and Automated Vehicles