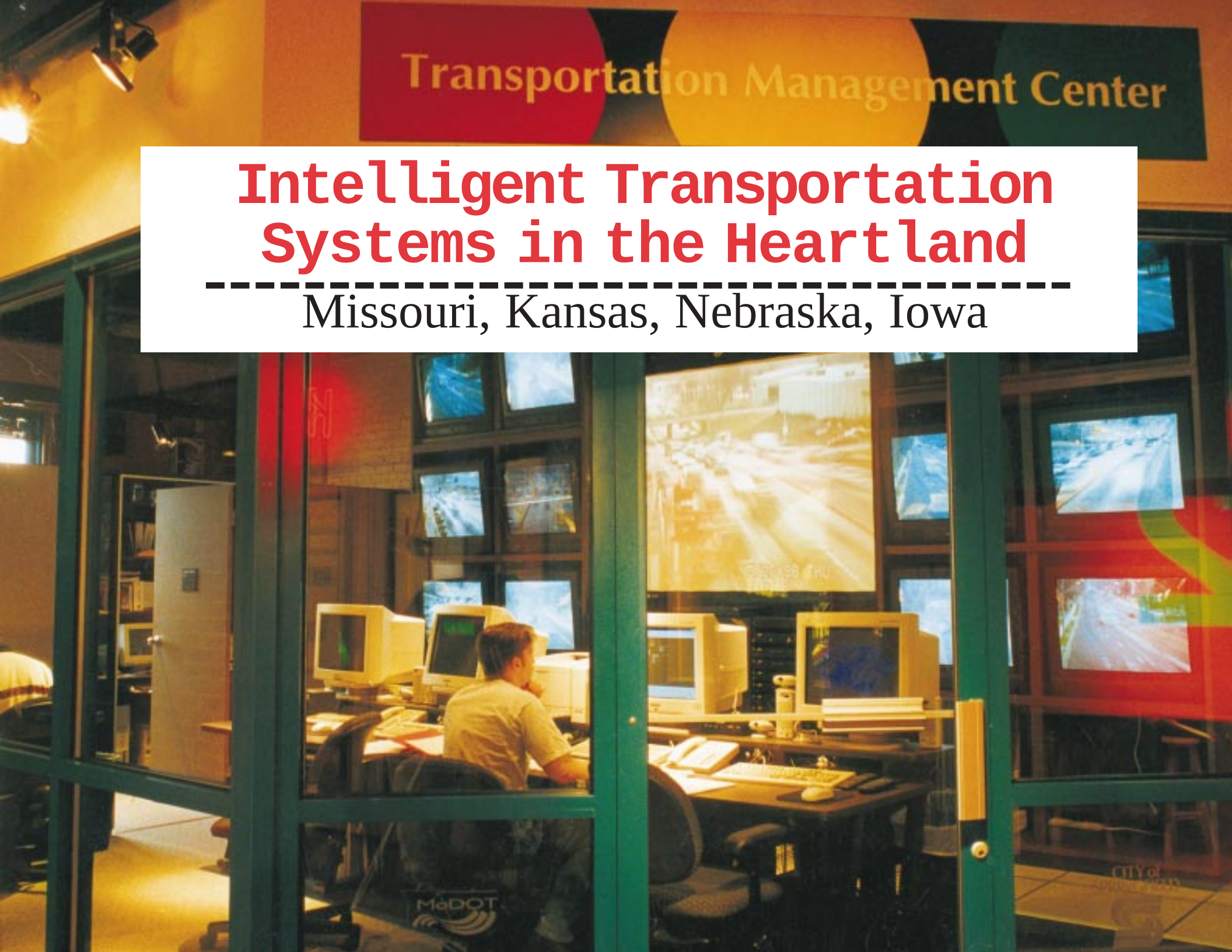


Intelligent Transportation Systems in the Heartland

Missouri, Kansas, Nebraska, Iowa

ITS in the Heartland

The Federal Highway Administration (FHWA) has identified a need for promotional materials to help educate transportation agencies, stakeholders and partners about the Intelligent Transportation System (ITS) program and benefits. This booklet highlights ITS programs and activities in four states in America's Heartland: Missouri, Iowa, Kansas and Nebraska. It is also intended to provide a better understanding of the wide variety of ITS programs and accomplishments achieved as a result of the ITS projects completed or underway in these states.

FHWA extends special thanks to the following organizations for their assistance in the production of this publication:

Missouri Department of Transportation

Kansas Department of Transportation

Iowa Department of Transportation

Nebraska Department of Roads

University of Missouri

Iowa State University/Center for Transportation Research and Education

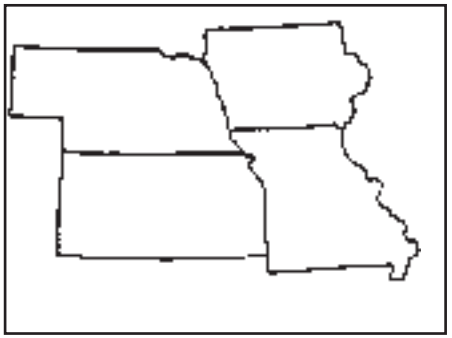
University of Nebraska

Lincoln University

ITS Heartland

Intelligent Transportation Systems

Mission Statement: *To improve the quality of life for those transportation users who live and invest in America's Heartland Region through advanced transportation technologies and communications.*



ITS Heartland Chapter

This proposed ITS America chapter is intended to facilitate information sharing for ITS projects and activities and to showcase ITS applications in four heartland states, Missouri, Iowa, Kansas and Nebraska. To date, all four State Departments of Transportation, along with major Universities in each state, and the Federal Highway Administration have been involved and are working together to develop the organization. Potential benefits of membership in the chapter include information exchange, educational opportunities, project coordination, creation of public-private partnerships, access to future customers and research sharing. The ITS Heartland chapter plans to hold an annual meeting to allow members to discuss ITS issues, learn about activities in other states and have vendors showcase new products.

MISSOURI

Springfield

Southwest Missouri is a hot spot of ITS technology! With the state's first urban city/state ITS partnership and one of the first six rural operational test projects in the United States, the Missouri Department of Transportation (MoDOT's) Springfield-Branson region is becoming nationally and internationally recognized as an ITS trendsetter.

The Springfield Transportation Management Information Center coordinates traffic flow throughout the metropolitan area and is located in the Discovery Center, a hands-on museum for children and their families.

Missouri's first urban ITS system

The Springfield-based urban ITS project operates through a transportation partnership between MoDOT and the city of Springfield. Working together to focus on common problems and creatively combine resources that best serve the public is the whole idea behind the ITS partnership.

The ITS network carries information to and from city and state traffic detectors, cameras mounted at major intersections, signal cabinets and the computers that run the system. The brain of the operation is the Transportation Management Center, at which information is received and interpreted by professionals.

Traffic information is routed to the users in the Springfield area by way of camera feeds to a local govenment television station. Soon, interactive kiosks will also carry the information, as will the city's internet web page. The program's future lies in expanding the fiber optic network and the number of cameras to better cover the entire metropolitan area.

The Branson Travel and Recreation Information Program logo is seen advertising all rural ITS programs in the Branson region.

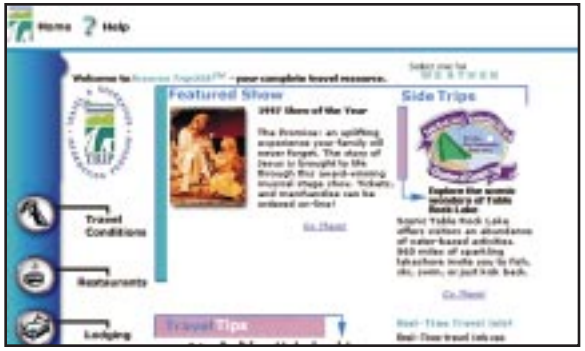
Branson

Tap into TRIP

June 1, 1998 marked the ribbon cutting of the Branson/Tri-Lakes area's rural ITS operation, called Branson TRIP (Travel and Recreation Information Program). The program is designed to give residents and visitors to this popular Ozark Mountain village instant information on weather and traffic conditions. Traffic in the Branson area is legendary; TRIP gives people a way to be a part of the excitement or avoid inevitable traffic tie-ups, at their discretion.

TRIP links information from microwave traffic detectors, cameras, weather stations and pavement sensors to a central Traffic Management Center (TMC). The TMC then sends the information in a user-friendly form to interactive kiosks, changeable message signs, Traveler Information Radio, and an internet website (**www.branson.tripusa.com**).

Vistors can learn how to access TRIP information by watching The Vacation Channel, a popular cable television network featuring Branson/Tri-Lakes traveler information, or tuning in to TRIP radio (1610 AM) or



The Branson Travel and Recreation web site provides up-to-the-minute information about weather, construction and traffic congestion in the Branson region.

Branson's Hometown Radio (106.3 FM). People are using the TRIP website to tap into travel information before they ever leave home.

The TRIP program is truly a partnership with represention by the Federal Highway Administration, MoDOT and many private partners who have also contributed services.

A changeable message sign alerts travelers to anticipate construction delays near Branson.

What does this mean for me?

Sometimes you'll want to be right in the middle of the traffic because it's fun and exciting. But when you need to avoid delays on your way to a show, TRIP will help you. TRIP uses ITS technology to provide you with up-to-the-minute traffic reports, road conditions, weather data, alternate route information and more.

TRIP is as high tech, accurate and reliable as the reporting systems used by emergency and weather professionals. But TRIP makes this information available free of charge, 24 hours a day . . . and, best of all, in a user-friendly way.

Branson and the Tri-Lakes area are still the place to come for old-fashioned fun and family entertainment; but now we're using advanced fiber optics and high tech transmission systems to help tap into what's here.

Static signs like this alert motorists that they are in a zone patrolled by Motorist Assist.

The St. Louis Intelligent Transportation System

Like many other regions across our nation, the St. Louis area faces a growing congestion problem. Growth in traffic volumes in the region is far outpacing new road construction. The result? More vehicles trying to squeeze into less space. Adding lanes and building highways has traditionally been the remedy for congestion, but the St. Louis area, like most other metropolitan areas, is finding that cost, space and environmental concerns are limiting the ability to build new roadways. A key to accommodating these growing travel trends is to maximize the efficiency of the existing road system using Intelligent Transportation Systems.

New reference markers help dispatchers locate distressed motorists who are calling for assistance from cellular phones, and increase the accuracy of police and traffic reports.

I-70 Mississippi River crossing - St. Louis

In 1993, the St. Louis Regional Incident Management Coalition first came together to deal with the issue of increased congestion. With guidance from the Coalition, an ITS early deployment study was completed in 1994, and a Strategic Deployment plan was included as part of the final report. St. Louis immediately began implementing the incident management elements of ITS.

Major program components include incident management training for the 51 Interstate-bordering municipalities, push bumper installation, cellular call-in system, improved reference markers and an expansion of the Motorist Assist program.

The highway system in the St. Louis metropolitan area is unique because the city and county of St. Louis essentially compose an island bounded by the Mississippi, Missouri and Meramec rivers. To get in and out of the region, motorists must cross a river. Recognizing this fact, the first travel advisory components, including electronic message boards, closed ciruit television cameras and roadway sensors, will be installed to provide coverage of major river crossings as well as Interstate to Interstate interchanges. By focusing first on these areas, motorists will see the

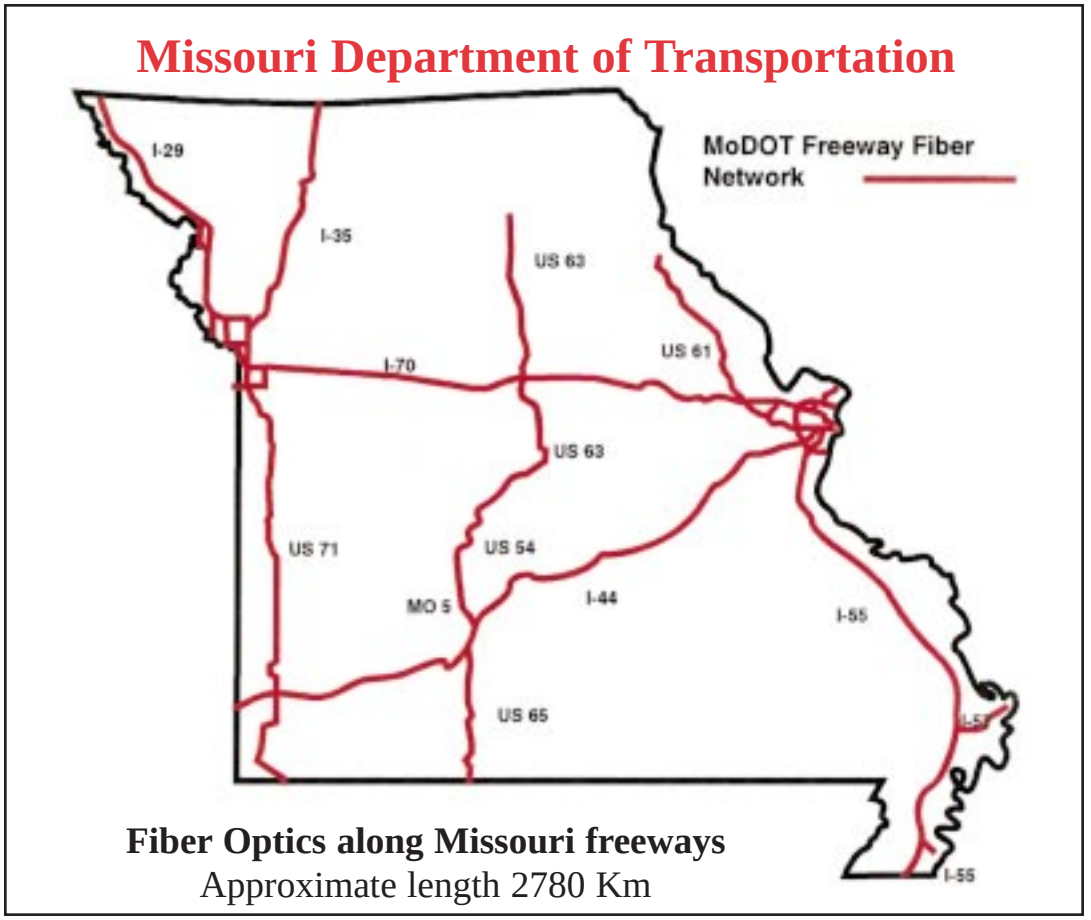
Ramp metering improves the flow of traffic on heavily congested highways.

biggest bang for their ITS buck. Future phases will provide additional traveler advisory components at other high volume traffic areas and improved management of the system.

The total ITS package in the St. Louis region will provide a three-pronged tool to fight traffic congestion. First, ITS provides real-time traffic information to motorists and emergency services. Second, ITS provides incident management response and clearance capabilities. Third, ITS brings together key community partners who work together to ensure that the travel advisory and incident management components best serve the region. This combination of powerful community partnerships and ITS technologies will help alleviate and accommodate the region's growing travel trends.

Partnership and innovative finance for communication needs

Communication is a vital component of any Intelligent Transportation System infrastructure. MoDOT recognized this requirement early in the planning process for the development of the statewide ITS initiative. It was also recognized that public-private partnerships would play an important role. In 1994, through an open solicitation process, MoDOT selected Digital Teleport, Inc. to work with them in the development of a 2780 kilometer (1726 mile) statewide fiber optic communication network. The value of this fiber optic system was recognized under the FHWA's Innovative Finance Program in 1995 and MoDOT was given a $30 million soft match credit. This credit is being utilized to leverage and extend funding for ITS related projects.



Fiber Optics along Missouri freeways
Approximate length 2780 Km

MISSOURI/KANSAS

A major urban ITS project underway is Kansas City SCOUT - an extensive freeway management system for the Kansas City metropolitan area.

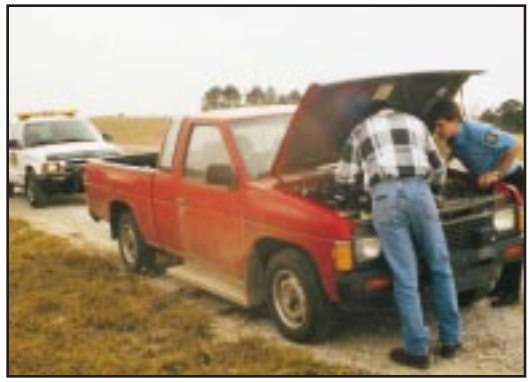
The Kansas and Missouri Departments of Transportation are sharing the costs of the system's design, construction, operation and maintenance, as well as the Traffic Operations Center.

The project's foundation can be traced to the Intermodal Surface Transportation Efficiency Act of 1991, which called for the development of transportation management systems. Under the leadership of the Mid-America Regional Council (MARC), the Congestion Management Focus Group was founded in 1992 to define what congestion means to our customers.

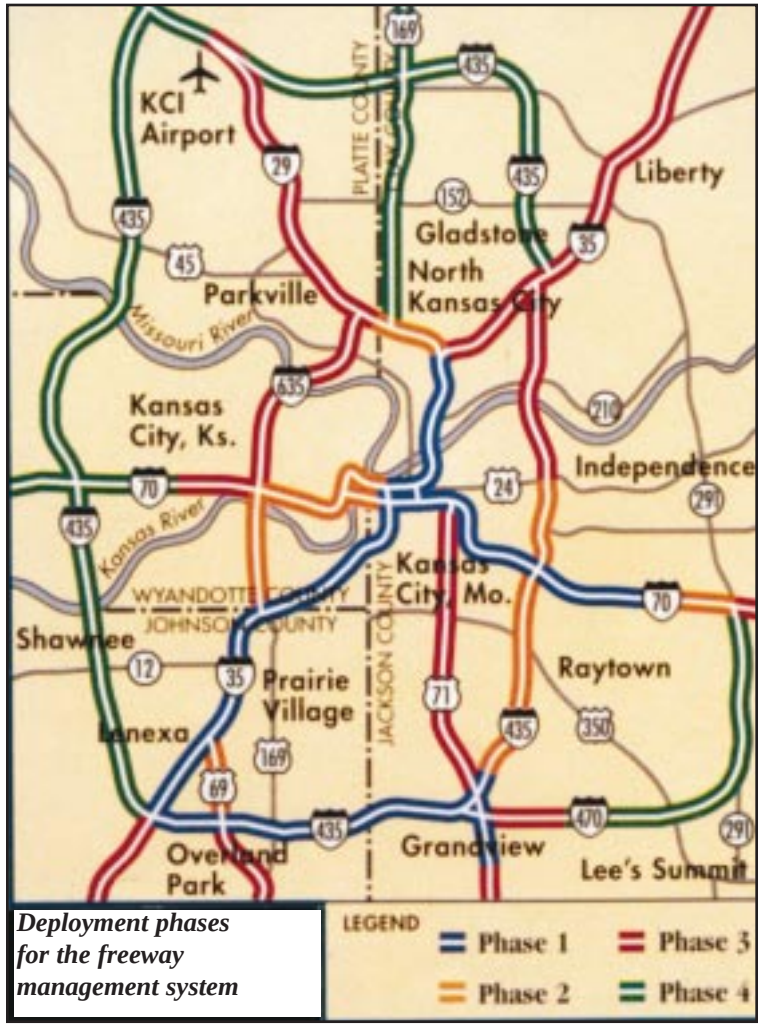
In 1995, KDOT and MoDOT joined with the HNTB consulting firm to produce the ITS Early Deployment Study for the Kansas City Bi-State Area. This study lays out a four-phase ITS implementation plan for the metropolitan area over the next 20 to 25 years. The state agencies and MARC agreed to move forward with the study's first phase, which involves management for the most congested 80 kilometers (50 miles) of freeway in the Kansas City area.

All of these components will be integrated with a fiber-optic communications system that feeds information to trained transportation managers housed at the Traffic Operations Center. The managers will use this data to help keep metropolitan freeways flowing smoothly through better incident and congestion management.

The technologies to be used include closed-circuit television (CCTV), variable message signs (VMS), highway advisory radio (HAR) and vehicle detection equipment. In addition, ramp metering is being considered along Phase I corridors.



Motorist Assist vehicles patrol the Kansas City metropolitan area to keep the roadway clear of stalled vehicles.



Deployment phases for the freeway management system

KANSAS

Kansas highway patrol Automatic Vehicle Location (AVL) System equipment.

Kansas Highway Patrol AVL System

The Kansas Highway Patrol has introduced an Automatic Vehicle Location (AVL) system for 60 of their patrol cars in northeast Kansas. The AVL system makes the deployment of personnel more efficient, streamlines dispatch operations, enhances officer safety, and increases the accuracy of crash location identification.

The global positioning system (GPS) is utilized to identify the latitude and longitude of the patrol car. This information is transmitted to the communications center via the existing 800 Mhz radio system. A patrol car's location is updated automatically and sent to the dispatcher every two minutes. Troopers can also update their position and call-status at any time by pressing one of the eight available status buttons located near the radio console in the patrol car. Additionally there is a "pursuit" status mode available that the trooper can activate in a pursuit situation. This important officer-safety feature accelerates the automatic position update rate to once every seven seconds, allowing`the dispatcher to more closely monitor the pursuit's location, direction of travel, and easily send assistance to intercept locations.

Position locations are accurate to within 100 meters in the normal operation mode. However, using a process known as "selective differential," accuracy is increased to within 10 meters. Utilizing latitude and longitude coordinates, this increased accuracy is important in the identification and future analysis of crash locations.

The Kansas Highway Patrol plans to equip all of its patrol cars, approximately 500 vehicles, with the AVL system, making it the first state patrol in the country to do so.

When in pursuit, the location of this cruiser is updated every seven seconds with a positional accuracy of ten meters.

At-grade railroad crossings present a host of safety and routing concerns.

Like all cities, Wichita must balance maintenance activities with traveler needs.

The completion of the Kellogg (US 54) Flyover will provide much-needed capacity for this vital route through Wichita.

Wichita - Department of Public Works

Currently, the city of Wichita is developing a strategic plan for the development of Intelligent Transportation Systems technologies within the Wichita-Sedgwick County Metropolitan Area. The Early Deployment Plan will serve as a reference for the incorporation of ITS applications in future regional transportation improvement programs and projects. Overall, the Early Deployment Plan will identify the ITS user services that are the most beneficial for the city, and define the technologies that are appropriate for providing these services.

Within the Wichita Metropolitan Area, the major roadway system consists of Interstates, expressways and turnpikes, state and U.S. highways, as well as numerous arterial streets. As traffic volumes continue to rise along these corridors, traffic congestion and delays are also increasing. With the current system, the city of Wichita experiences traffic problems resulting from limited east-west corridors, limited access across floodways and rivers, and numerous at-grade railroad crossings along the arterial streets. Based on the preliminary studies, the major areas of focus within the Early Deployment Plan include updating the computerized traffic control system, enhancing traffic progression with improved communications and traffic monitoring, developing a county-wide incident and emergency vehicle management plan, and diminishing the traffic congestion associated with roadway-rail intersections.

Dedicated K-TAG lane on the Kansas turnpike

K-TAG Electronic Toll Collection Transponder

Teamed together with other Capital Improvement Projects, like the Kellogg (US-54) Flyover, ITS technologies can help the city of Wichita reach the goal of providing a cost-effective and efficient transportation network which promotes safety, convenience, and aesthics for the total community.

Kansas Turnpike Authority Electronic Toll Collection System

The Kansas Turnpike Authority (KTA), which operates 378 kilometers (236 miles) of roadway from Kansas City to the state line south of Wichita, uses an Electronic Toll Collection (ETC) system called K-TAG. The K-TAG system consists of an electronic tag that mounts on the inside of the vehicle windshield, and overhead readers at toll plazas. When you enter the turnpike through a specially marked K-TAG lane, a radio signal is emitted from the overhead antenna that records the entry information into the tag. When you exit through another K-TAG lane, a radio signal is emitted from the overhead reader to read the tag and charge your K-TAG account the appropriate fare. This is all done without having to stop.

This system reduces vehicle delay and increases the KTA's operating efficiency by reducing the personnel needed for toll collection. A lane at both the exit and entrance of most turnpike interchanges is dedicated for K-TAG use only, with multi-use lanes (K-TAG and cash) present at all interchanges. Vehicles are allowed to go through the K-TAG lane at 32 km/h (20 mph). Each K-TAG lane is equipped with vehicle classification and axle-counting equipment, which allows the same K-TAG to be used on different vehicles. If you are driving a passenger car, you are considered a Class 2 vehicle. If that same car were pulling a boat, it would be considered a Class 3 vehicle. The number of axles on each vehicle determines the class.

Billing is administered through one of two programs. The K-TAG II program charges $1 per month for the use of each tag, but gives users a 10% discount on tolls. The K-TAG II program allows users to pay a $5 per year fee for the use of one or two tags with no discounts on tolls.

The Kansas Turnpike Authority has issued 90,000 K-TAGs since the inception of the program in October of 1995. In 1997, the number of users on the turnpike was 27,577,000. Of the vehicles travelling the turnpike, 33% were using the K-TAG electronic toll collection system.

NEBRASKA

Motorist assistance

Stalled vehicles

The Nebraska State Patrol (NSP) has assumed the lead in bringing motorist assistance to freeway users in the Omaha-Council Bluffs metro area. Bolstered by consumer research that indicated that 83% of the drivers in the metro area wanted some type of motorist assistance patrol, NSP went into partnership with AAA- Nebraska, the Cornhusker Motor Club, the Nebraska Department of Roads (NDOR), Aliant Cellular, the city of Omaha, the Nebraska Highway Safety Office, the Iowa Department of Transportation, the Iowa State Patrol, and the Metropolitan Area Planning Agency.

Motorist assist vehicle

Metro Area Motorist Assist operates two vans which patrol twice daily for four hours, each staffed by State Patrol-trained volunteers. Metro Area Motorist Assist provides a variety of services including minor servicing of disabled vehicles, jump starting and providing advice and directions.

Omaha Area Interstate 80/480/680 Reference Makers

One of the on-going benefits of Omaha's Early Deployment Plan has been the continuation of the Omaha ITS Subcommittee, a group that includes transportation and law enforcement decision makers from many jurisdictions. As a result of the work of the Omaha ITS Subcommittee, the Nebraska Department of Roads has installed improved reference markers in the median of Omaha area freeways. The new markers display both direction and more precise (0.2 mile) location information. This is a big help to motorists who report accidents and to responders alike.

Omaha metro-area freeway reference marker

Digital camera accident investigation

The University of Nebraska College of Civil Engineering and the Omaha Police Department (OPD) have collaborated in the development of a system that employs the use of a digital camera in capturing accident data in lieu of the labor and time intensive methods currently in use. Digital camera accident investigators from the Omaha Police Department are shown using a digital camera and standard measuring at an accident scene. Advantages include faster and more reliable accident scene data and the ability to transport data digitally to the Omaha Police Department for analysis. University and OPD officals hope that there might be a market for the Digital Accident Investigation process.

Digital camera accident investigation test site

Intersection signal pre-emption device

Rescue vehicle equipped with signal pre-emption srobe

Emergency responder traffic light pre-emption

The Omaha Fire Department and the Omaha Public Works Department have cooperated in the installation of stobe light activated traffic light pre-emption technology at key intersections. Omaha rescue squads can now transport patients more safely. With the flick of the stobe light switch, responders can change traffic signals to green lights, significantly reducing the chances of collisions at intersections.

Freeway traffic surveillance cameras

Omaha television station WOWT has installed traffic surveillance cameras at key locations throughout the Omaha Metropolitan Area. In return for being allowed to use Interstate highway right-of-way, WOWT provides NDOR District 2 Headquarters with a direct television feed at no cost. NDOR District 2 Engineer, John Jacobsen, a member of the Omaha ITS Subcommittee, now has an additional freeway management tool and WOWT regularly broadcasts real-time traffic information throughout the Omaha metro area. This is a win/win arrangement for everyone.

Freeway surveillance camera and antenna at intersection

Freeway surveillance feed in District 2 office

Rest area / I-80 westbound at Kearney

Traveler information kiosk

Information kiosks

The Nebraska Department of Roads Maintenance Division took the lead in providing I-80 motorists with information kiosks at Nebraska's already user-friendly Interstate Highway rest areas. Travelers moving across the Cornhusker State can now obtain real-time weather information provided by Data Transmission Network at more than 20 rest areas strategically placed across Nebraska's 739 kilometers (459 miles) of Interstate 80.

Variable message signs

The Nebraska Department of Roads believes in the value of variable message signs for communicating information to drivers. NDOR is incorporating VMS into Omaha-area freeway plans and has identified key metropolitan locations for sign placement. The sign advises drivers that the Downtown Lincoln UNL exit is ahead. VMS is also used for incident management and special events such as Omaha's NCAA College World Series and Cornhusker football games when 76,000 Big Red fans descend upon Lincoln's Memorial Stadium, Tom Osborne's Field.

Variable message sign on I-80

West Center off-ramp variable message sign

Weigh-in-Motion

Nebraska is home to some of the nation's largest trucking companies and advanced commercial vehicles. Operation technologies are a natural fit on the state's 739 kilometers of mainline Interstate 80. The North Platte weigh-in-motion (WIM) facility opened in 1998 and has received high marks from truck drivers, law enforcement officers and state officals. With a 97% accuracy rate, North Platte's WIM allows Nebraska's Carrier Enforcement Officers to concentrate on other duties. Dangerous back-ups have been cut down and highway safety for everybody has improved. Nebraska is part of a multi-state consortium that is also weighing the pros and cons of electronic CVO credentialing. The future has arrived!

North Platte I-80 mainline WIM sensors

North Platte weigh-in-motion facility

IOWA

Concept vehicle

Using input from everyone from equipment operators to vendors, the Iowa Department of Transportation and two other states set out to build a "dream" snowplow to improve the safety, efficiency and quality of snow and ice fighting efforts. The result was the "concept vehicle" -a standard-issue truck outfitted with ITS technology and other state-of-the-art safety and information components.

Data such as the friction coefficient and air/pavement temperature is displayed on a readout in the cab to help drivers make decisions about plowing and spreading material. The data is also recorded and downloaded at the shop (it will eventually be transmitted directly) to provide guidance on optimizing roadway treatments and addressing problem spots. This information can also be transmitted to Interstate rest areas, traffic management centers or ITS service centers to help motorists make better travel decisions.

Developed by transportation department personnel from Iowa, Michigan and Minnesota (each state built its own prototype), along with staff from Iowa State University's Center for Transportation Research and Education (CTRE), the concept vehicle will become increasingly "smart." For instance, the sensors will eventually drive the truck's blades and spreader. In addition, the data gathered will be used to reduce crashes related to wintertime conditions. Once prototype testing is complete, fleet production will begin in each state.

Iowa Department of Transportation's "concept" winter maintenance vehicle.

Bar coding/magnetic strip on driver licenses aid in data capture by law enforcement officials.

National Model project

The National Model for the State Application of Data Collection and Management Technology to Improve Highway Safety is a program for sharing information, resources and technologies to improve highway safety. The National Model is a consortium effort. The initial members include: the Iowa DOT Motor Vehicle Division; the Iowa Department of Public Safety, Iowa State Patrol; and the Federal Highway Administration. The Iowa DOT and the FHWA are the lead organizations in this effort.

Key components of the National Model Project are to identify technologies that support its goals, demonstrate those that are in place in Iowa and fill "gaps" by developing those that are not yet available in the Iowa technology environment. Key ITS projects include: bar coded International Registration Plan cab cards, mobile digital radios, bar code readers, the Officer Information Manager TM, driver license bar coding/magnetic strip, FHWA Inspection Selection System and PC Miler™, and Global Positioning System applications for dispatch and vehicle crash location.

The expected benefits of the National Model are improved data acquisition for roadway incidents, leveraging proven technology for law enforcement, streamlining the communication of safety information to key stakeholders, and extending the use of this information for short- and long-range safety and law enforcement programs.

FORETELL™

FORETELL is a project led by the Iowa DOT designed to implement a commercially viable, self-sustaining integrated Intelligent Weather and Transportation System.

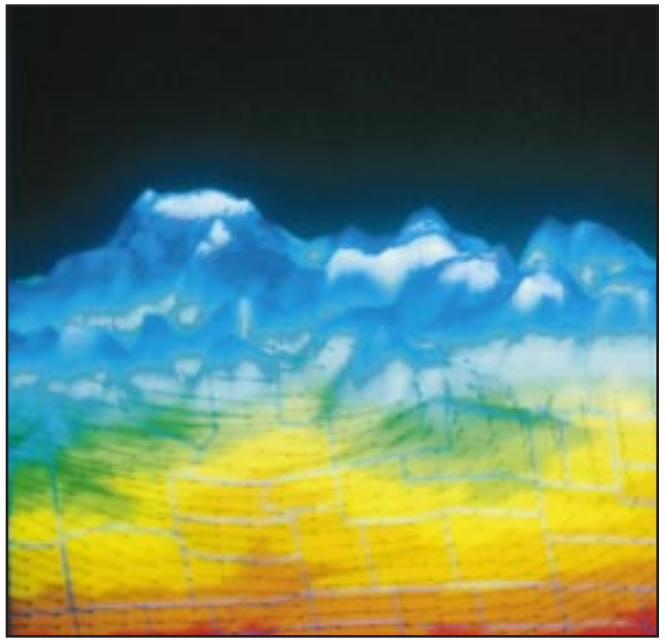
The Iowa DOT has made major investments in Road/Weather Information Systems (RWIS). It has equipped 36 rest areas with real-time weather information systems, has led the ITS Program and is active in the road-weather AURORA pool fund study.

FORETELL will roll-out first in Ontario and five 'pilot' states, including Iowa and Missouri.

The FORETELL private sector lead is Castle Rock, which will handle data collection, fusion, and delivery to multiple customers, including local, regional and state transportation agencies, school districts, commercial vehicle operators and travelers.

FORETELL is designed to increase traveler safety, security and mobility. It will also lead to improved DOT maintenance and operational efficiencies, environmental conservation and increased economic vitality of communities most typically affected by major weather incidents. FORETELL will use available weather data sources, models and infrastructure to:

- provide weather nowcasts and forecasts
- establish rural ITS Service Centers capable of data fusion and real-time road condition prediction; and
- disseminate 'baseline' free-at-point-of-use safety information and added-value tailored information services to travelers, DOT maintenance personnel and others.



FORETELL captures and integrates all available weather data and displays it in finer levels of forecast detail than currently available, down eventually to hourly and 1-5 meter resolution.

The highway advisory radio and flashing light are powered by a portable array of photovoltaic cells.

"Smart" work zones

ITS technologies may soon improve Interstate reconstruction work zone safety for motorists and work crews alike. When road work reduces the number of lanes available for travel, the potential for severe rear-end crashes is created. In the past, traffic surveillance personnel traveled up and down a construction route looking for traffic problems. When necessary, they activated a warning message on the changeable message sign.

But a "smart" work zone tested in 1997 by the Iowa DOT helps prevent crashes by automatically "smoothing out" the flow of traffic. In real-time, and without human intervention, the system monitors approaching traffic speeds and volumes, senses backups as they develop, and responds by activating traffic warning devices and alerting personnel.

The data is also recorded and analyzed for use in recommending practices to improve merge area design, and to help develop criteria for determining when travelers should be encouraged to use alternate routes. Further testing and modification may lead to larger scale implementation in the future.

Iowa DOT web site - interstate construction information.

Iowa Department of Transportation web site

Pulling in the latest road, weather and transit information from a variety of sources, and offering them to the public at the touch of a key - that's the function of the two "hot linked" web sites operated by the Iowa Department of Transportation and Iowa State University's Center for Transportation Research and Education.

One of the newest additions to the web site last winter was real time pavement and weather data from the Roadway Weather Information System. The Iowa DOT has been a leader in the use of RWIS which, through a system of sensors, and computer hardware and software, detects and transmits everything from air temperature and wind speed to the presence of moisture on the pavement and the "strength" of the anti-icing chemical which has been applied.

The ultimate goal of the web site is to increase safety for motorists and road workers, and to help motorists save time by alerting them to possible delays. The web sites are located on : **"http://www.state.ia.us/government/dot/"** and **"http://metro.ctre.iastate.edu/"**

GPS used in transit system

In a true “swords to plowshares” activity, a city/county alliance in Cedar Rapids, Iowa, has been working with Rockwell International to convert its military Global Positioning System (GPS) program for use with the area’s transit system.

To aid with scheduling and dispatching, the GPS units pinpoint within 0.9 to 1.5 meters 0 (3 to 5 feet) the real time location of para-transit and fixed route vehicles. They also monitor oil pressure, engine temperature, etc. to help determine how efficiently a vehicle is performing. This also makes it possible to take vehicles out of service before they break down and cause thousands of dollars of repair bills. GPS units have also been installed on a police squad car and a fire department support vehicle.

Future plans call for using GPS to monitor the efficiency of buses using ethanol injection units (for emission reduction) and Driver Max™ units (for acceleration and deceleration control). The information obtained through GPS may eventually be posted on the Iowa Department of Transportation web site.

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