Intelligent Transportation Systems- *Model Deployment Initiative*

The Model Deployment Initiative
Technology-Based Transportation Solutions

In Autumn 1996, former Secretary of Transportation Federico Peña announced that Phoenix, San Antonio, Seattle and the New York City metropolitan areas were chosen to showcase deployments of intelligent transportation systems (ITS). The program, called the Model Deployment Initiative, marks a significant step in Intelligent Transportation Infrastructure (ITI) across the United States. The Model Deployment Initiative calls for public and private sector partners to develop and integrate intelligent transportation systems technology to reduce travel times, improve emergency response and provide travel information to the public.

Traffic in the United States has increased 30 percent in the past ten years, and the number of cars on the road is projected to increase by 50 percent in the next decade. Congestion causes Americans to lose two billion hours a year tied up in traffic. The same congestion costs businesses $40 billion each year as they transport goods. Intelligent Transportation System tools offer promise to address the nation's traffic problems using, for example, advanced communication technology to identify traffic incidents, quickly respond and alert the public to delays.

Intelligent transportation systems offer a dramatic shift in our thinking about how we use and manage our nation's transportation systems. The potential is great. For example, for the cost of approximately eight miles of urban freeway or about $300 million, a metropolitan area the size of Washington D.C. could start from scratch to completely implement an intelligent transportation infrastructure. Most urban areas already have some elements in place, so actual implementation costs would be significantly less.

But, as is the case with any emerging technology, pieces of systems have evolved independently. We are now challenged to integrate these pieces to fully realize the potential of ITS, so that the whole can become greater than the sum of its parts.

The Model Deployment Initiative provides real-life examples of technology's potential in metropolitan areas across the country. Investments from public and private sector partners will integrate existing ITS elements in the four sites as part of a national showcase.

The model deployment sites will illustrate how technology can improve transportation in metropolitan areas. An evaluation of the model deployment projects in Phoenix, San Antonio, Seattle and the New York City metropolitan area will document lessons learned. Other metropolitan areas can apply evaluation results to guide their efforts to integrate technology into their regional transportation systems.

The MDI will integrate transportation by linking existing systems that monitor transportation. Technology will allow transportation agencies to share real-time information on congestion and other problems effecting the overall system. Each of the four MDI sites addresses the challenges of developing an Intelligent Transportation Infrastructure in different ways but are ultimately focused on the common vision of more efficient transportation systems and better transportation information. In this way, all system users can make smarter choices about how to use and manage our transportation systems.

MDI PROJECT COMPONENTS

Transit Management

Advanced vehicle location systems on transit vehicles improve their on-time performance and provide real-time information on bus schedule status.

Freeway Management

Real-time information highlights problem areas for transportation agencies to notify response teams and divert traffic.

Traffic Signal Control

Real-time traffic information can enhance signal timing to better manage traffic demands.

Railroad Grade Crossings

Automated safety systems warn drivers of crossing hazards and provide advance notice of approaching trains.

Emergency Management Services

Emergency vehicles respond more efficiently by avoiding traffic problems.

Incident Management

Surveillance systems help local agencies respond to incidents rapidly and effectively.

Electronic Toll Collection

Electronic readers keep traffic flowing at toll plazas and reduce operating costs for toll agencies.

Electronic Fare Payment

Smart Card technology reduces costs and is convenient to travelers because one card can be used for parking and transit.

Regional Multimodal Traveler Information

Real-time information enables the public to make informed transportation choices.

Phoenix

Create a regional intermodal transportation system through public and private partnerships for advanced technology and information sharing.

Tactics

Integrating transportation
Enhancing traffic management

Once a small town in the heart of Arizona's Sonoran desert, nearly 3 million people now live in the 23 communities that make up the "Valley of the Sun." Widespread residential and industrial expansion has increased demand on the Valley's transportation system. Transportation agencies are responding by expanding surface streets, building new freeways and seeking additional ways to improve traffic conditions.

AZTech is a partnership of public agencies and private companies administering a $7.5 million federal grant of a $35 million program for Intelligent Transportation Systems (ITS). AZTech is deploying technology to improve the quality of life in the Phoenix metropolitan area by reducing travel time and improving traveler safety. AZTech's selection by the U.S. Department of Transportation for model deployment of ITS provides a national showcase for using technology to address transportation needs.

Integrating Transportation

Operations centers for the state, county, local cities, transit and emergency services are connected to monitor traffic conditions. Advanced communication technology link these centers to coordinate traffic signals and manage incidents. When an accident shuts down part of a freeway or surface street, the traffic centers notify response teams and ease traffic congestion by diverting traffic to other routes.

A network of road sensors, electronic signs, cameras, computers, communication equipment and people provide the backbone for ITS in the Valley. Advanced technology on 42 miles of freeway and 150 miles of surface streets in the Phoenix metropolitan area detect congestion, identify incidents, notify response teams of accidents and suggest alternate routes for drivers.

Enhancing Traffic Management

AZTech uses technology to improve traffic conditions on 150 miles of eight major surface streets that cross jurisdictional boundaries. Referred to as "smart corridors," they serve as alternate routes when accidents or heavy delays force traffic to exit freeways. Traffic sensors and upgraded traffic signals allow cities to better handle increased traffic levels. Electronic signs alert drivers to delays, suggest alternate routes and divert traffic between smart corridors and freeways.

Improving Transit

Global positioning systems locate over 85 buses as they travel their routes. Dispatchers receive updates on traffic conditions and route status to determine if buses are on schedule. Electronic messages at transit centers and bus stops inform riders of the location of their bus. An Internet site and kiosks at transit centers also provide riders with information on bus routes, schedules, traffic conditions and tourist attractions.

Informing Travelers

A regional traveler information system provides up-to-the-minute traffic information through one of the first privatized traveler information systems in the country. Several companies have partnered with AZTech to offer traffic information through a variety of products and services in the Phoenix metropolitan area.

Kiosks provide traffic updates and tourist information at malls, business centers, bus terminals and other locations in the Valley. Travelers also can view current traffic

conditions on a cable television traffic channel and the Internet in the comfort of their own home or office.

Travelers can purchase computerized devices and services to receive personalized traffic reports. Services on pagers, e-mail and radio devices warn drivers of traffic problems along their commute. Hand-held computers help residents and visitors travel the Valley by providing turn-by-turn directions, highlighting points of interest and showing locations of various services.

Summary

AZTech's efforts culminate when the technology comes on-line during the summer of 1998. Better traveler information, more accurate transit operations and integrated transportation systems improve the commute for the millions of residents and visitors traveling the Valley of the Sun. The Phoenix metropolitan area provides a real-life showcase of how technology can improve overall quality of life and sets a world wide standard of excellence for deploying intelligent transportation systems.

New York

The New York/New Jersey/Connecticut Metropolitan Model Deployment Initiative

The New York/New Jersey/Connecticut iTravel MDI is centered in an area with a population of over 18 million people, the highest population density, the most complex transportation network, and the most active public transportation system in the United States. The region includes New York City, Long Island, the Lower Hudson Valley, Southwest Connecticut, Northern New Jersey, and Central New Jersey. Over one hundred different transportation service providers operate and maintain the region's transportation network.

Because congestion is a daily fact of life here, travelers are offered numerous transportation mode choices. But so many systems can easily lead to confusion when traveling in the three-state region. Questions like, "What is the best route to take?" Can have different answers, depending on which mode is selected -- subway, bus or automobile. The answers to most questions depend on the time of day and the direction of travel. How can a traveler avoid the frustration of contacting every agency to determine schedules, routes, and connections when traveling from Point A to Point B?

Enter the NY/NJ/CT iTravel Metropolitan MDI project, offering region-wide, real-time transportation information. iTravel links information from various transit agencies systems with the regional information backbone. The regional information backbone is the basis for the other iTravel elements: a Traveler Information Center (TIC) system providing basic traffic and transit information, a regional Transit Itinerary Planning System (TRIPS) offering route guidance combined with real-time transit impacts, and the Personalized Traveler System (PTS) providing customized and pro-active travel information to the subscribers. The target date for the iTravel system is late 1998.

The $40 million iTravel MDI partnership is funded by local public and private partners and the federally funded MDI Program. Public sector responsibilities are coordinated through TRANSCOM, a coalition of fifteen highway, transit, and public safety agencies. Private sector activities are coordinated through a prime contractor, NEC Joint Venture (a joint venture of TransCore and PB Farradyne).

Key Program Elements

TRANSCOM's **Regional Architecture** is the multimodal information backbone. The Regional Architecture ensures coordination and integration of advanced transportation management and information systems that are being implemented by the 15 member agencies. iTravel will also bring information from various transit agency systems by linking data interfaces to the TRANSCOM Regional Architecture. TRANSCOM's Regional Architecture combines regional information on incident, weather, special events, construction activities, and real-time transportation information. This information serves as the basis for the other iTravel elements.

iTravel will enable the dissemination of real-time information from the Regional Architecture to the general public through the **iTravel Traveler Information Center (TIC)**. All of the multimodal information that is contained in the Regional Architecture will be available to the general public through the TIC via telephone and the internet free of charge to the users of this system.

The iTravel subscription-based, proactive and customized **Personalized Traveler System (PTS)** will be targeted to commuters, who will proactively receive incident, special event, real-time or construction activity messages via telephone, email, fax, call-in or pager. A subscriber to this system will initially complete a traveler profile specifying the times of travel, the preferred route(s) along the commute, payment options, and the selected means to be contacted. The traveler will be contacted if the profile travel route(s) are impacted prior to and during the travel times specified in the travel. The traveler does not need to seek out this information. The information is proactively provided to the traveler.

The regional iTravel **Transit Itinerary Planning System (TRIPS)** is aimed at providing transit route guidance, schedule, rate, and real-time transit information free of charge to the users of the system. The TRIPS information can be accessed through the telephone and the internet. A user of the TRIPS system will specify the desired time of travel, origin and destination points, and the criteria on which to base the trip (for example: shortest walk, least expensive, or shortest travel time to name a few criteria). TRIPS will, for the three-state region, identify a trip that addresses the information provided by the user. TRIPS will also notify the user if there are any known impacts to travel along the itinerary plan provided. TRIPS will also be made available to various kiosk programs throughout the region.

Summary

The iTravel integrated traveler information system throughout the NY/NJ/CT Metropolitan Region will make access to travel information easy and more readily available, and make each agency's participation as easy as possible. Soon travel throughout the three-state region will be without mystery to travelers into and throughout the region.

San Antonio

Texas Department of Transportation San Antonio District

Going where your imagination takes you has just become easier . . . thanks to several new TransGuide technologies. TransGuide, an Intelligent Transportation System, was designed by the San Antonio District of the Texas Department of Transportation. TransGuide increases highway safety and efficiency by notifying drivers ahead of time of incidents along the highway.

Project History

The system went on line in July 1995 along 26 miles of highway in San Antonio and will eventually cover 191 miles of state highway. The system is already demonstrating a 15 percent decrease in the number of overall traffic accidents and a 20 percent decrease in

the emergency response time according to the Texas Transportation Institute. TransGuide has successfully warned drivers in advance of seasonal freeway conditions such as flooding on frontage roads, ice on bridges and mainlanes, and Ozone Action days. Partners in the TransGuide project include TxDOT, the City of San Antonio (police/fire/EMS/traffic), VIA Metropolitan Transit and military hospitals.

TransGuide utilizes fiber optics, sensors, and video cameras to detect changes in traffic flow and alert operators in the TransGuide Operations Center. Changes are made to the lane control signals, and information is displayed on overhead variable message signs within 15 seconds. Operators use remote cameras to identify the type of incident and dispatch the appropriate help within two minutes. TransGuide was the first system of its kind to respond to traffic incidents with preprogrammed scenarios - a process adapted from NASA's space program. Live traffic video and real-time traffic information are distributed to the local media via a low-power television station.

Model Deployment Initiative

The $13.5 million Model Deployment Initiative project in San Antonio includes the following programs:

The Emergency Medical Services (EMS) Management System permits two-way video teleconferencing between emergency medical personnel in a hospital and paramedics in an ambulance en route to the hospital. Video cameras, microphones and computers placed inside ambulances and at hospitals allow for the two-way communication. LifeLink transfers vital statistics data from the ambulance to the hospital. Trauma center physicians are able to determine the types of injuries involved in an incident and route patients to the appropriate facilities. This is the first time traffic management system capabilities have been used in this capacity.

Interactive touch screen traveler information kiosks are placed at key tourist points in the city as part of the **Traveler Information Kiosk** program. At the touch of a screen, travelers in the Alamo City will be able to access real-time traffic information, bus and airport information, weather reports and points of interest (such as tourist spots and restaurant locations).

In-Vehicle Navigation Units provide drivers with real-time traffic conditions and incident information, vehicle location, and information on regional points of interest. After a driver enters a desired destination, the navigational unit calculates a route that is the quickest, simplest (fewest turns) or has the least number of freeways. The navigational unit communicates the routes and other information using a map-and-guide display and voice prompting.

Sensor tags placed inside the windshields of vehicles as part of the Real-Time Travel Information Tag program allow TransGuide to gather average travel speeds in the city. The sensors transmit a signal to antennas placed along highways and roads to determine average traffic flow.

The **Real-time Area wide Travel Database** is a database of all travel speeds in San Antonio based upon TransGuide traffic data, reports of traffic accidents from the San Antonio Police Department, lane closure information, real-time travel tag information, GPS and theoretical data. The information is used for the in-vehicle navigation and kiosk programs.

The **Railroad Grade Crossing Safety System** alerts motorists to potential railroad operations delays near freeway exits. Doppler radar speed sensors and acoustic sensors detect the presence and characteristics of trains operating in affected areas. The time and duration of train delays is supplied to vehicles equipped with in-vehicle navigation units.

As part of the **Bus Incident Monitoring System**, cameras located inside VIA Metropolitan Transit buses are monitored as a security measure for transit users.

The **Traffic Signal Integration** progam integrates TransGuide technology with the City of San Antonio traffic signal system to provide real-time TransGuide information to the city system. This allows for coordinated signal routing for emergency vehicles.

An assertive, proactive **Public Information Campaign** includes continued public outreach efforts through tours, speeches, brochures, videos, community involvement, active program participation (such as the travel tag volunteer program) and partnering.

Summary

Southwest Research Institute was awarded an $8.5 million contract as systems integrator for many of these new technologies in San Antonio. The projects play a key role in helping TransGuide maintain its objectives to reduce congestion and enhance emergency care response time . . . helping to improve the quality of life.

Seattle

The Path to Intelligent Travel

The Puget Sound region's stunning natural beauty, culture and civic spirit feed a thriving economic community--its growth driven by aerospace, technology, and burgeoning international trade. Puget Sound's population is projected to increase 50 percent from 1990 to 2020 — with most of this growth outside Seattle, the region's largest city. This growth has put particular strain on the region's transportation infrastructure--the region's current tax base cannot accommodate its forecasted transportation capacity needs.

Smart Trek, the Puget Sound area's $17.9 million Model Deployment Initiative demonstration project, is poised to increase the performance and efficiency of the area's roadways and transportation systems to meet growth demands. Under the MDI Project, 25 Northwest public agencies and private companies are directing 29 projects designed to build upon the region's significant investment in ITS infrastructure.

Information You Can Use

Everyone wants good traffic information, but some of it can be vague, untimely, or unreliable. Smart Trek technologies offer real-time information that is easier to understand and use. Smart Trek partner, Microsoft, has introduced the "Sidewalk," on-line entertainment guide with real-time customized traffic information and travel times for alternate routes. Other web applications, including updated traffic flow maps, and a variety of hand-held systems are planned to translate traffic and transit information into usable messages. A cable television program provides up to the minute glimpses of key travel corridors along with average speeds. Expanded use of variable message signs and Highway Advisory Radio systems will help complete a system of information sources available throughout the region.

Transit at Your Fingertips

Wouldn't you like to know whether your bus is going to be on time, before you leave to catch it? Smart Trek will provide this information over the Internet and at major transit centers in the Puget Sound region. Real time transit arrival information will be available on desktop or laptop computers, along with route, schedule, ridematch and trip planning information. TransitWatch provides expected bus arrival and departure times at the SeaTac, Bellevue and Northgate Transit Centers.

Shortening Emergency Response

The advantage of wireless technology, mobility, has made it impossible to locate wireless 9-1-1 calls until now. Smart Trek will introduce an enhanced 9-1-1 system that supports the introduction of Mayday devices from two companies. These devices send location information to response centers, helping speed emergency response time and save lives. Smart Trek will also install Global Positioning System equipment in incident response vehicles to monitor their location and assist with dispatching.

Managing Traffic

The systems to manage freeway and arterial traffic will greatly expand under Smart Trek, gathering congestion and accident information from North Seattle to Tacoma, from the Ferry System to Bellevue. Smart Trek will integrate arterial and highway data so traffic control systems can adjust to different congestion levels while providing local control to each jurisdiction.

Congestion on airport approach roads and queues at select ferry terminals will be monitored and broadcast to travelers through a variety of radio channels, variable message signs and within terminal areas.

Smart Trek is helping travelers make informed choices as they plan and make trips in the Seattle region. It is also improving traffic and transit management systems to increase the safe and efficient usage of roads and transit. In the long run, it will help the Puget Sound area plan intelligently and realistically for the next 20 years of growth and prosperity.

ITS
Fast Facts

1. The United States has 60,000 buses for public transit. Approximately 11,000 now or will soon have AVL devices that enable control centers to ascertain their location, monitor their movement, and adjust schedules.
- *U.S. Department of Transportation*

2. A highway accident increases the risk of an additional accident by 6 times, according to a study of accident statistics on several California highways and expressways. Cities that monitor roads are able to remove stalled vehicles 50 percent faster. An incident-management system that costs $600,000 to operate can generate $1.4 million in benefits annually.
- *U.S. Department of Transportation*

3. Freeway management systems: shrink travel time by 20 - 48 percent; increase travel speed by 16 - 62 percent; and increase freeway capacity by 17 - 25 percent.
- *U.S. Department of Transportation*

4. Electronic fare-payment systems: increase fare collection 3 - 30 percent; and slash data-collection costs by $1.5 - $5 million.
- *U.S. Department of Transportation*

5. Traffic-signal systems: decrease travel time by 8 - 15 percent increase travel speed by 14 - 22 percent; and shorten travel delays by 17 - 37 percent.
- *U.S. Department of Transportation*

ITS: Merging the Transportation and Communications Revolutions

Intelligent Transportation systems, or ITS, applies scientific and engineering advances in communications, computer and information systems to surface transportation.

Over the past several years, government-sponsored research and testing has refined these earlier advances into ITS applications. This has set the stage for delivering the benefits of ITS to the public. Thousands of businesses acrossthe nation, from Fortune 500 companies to entrepreneurs, are supporting this important step by offering an increasing number of products and services.

Now when they travel, Americans use or benefit from: in-vehicle mayday and navigation systems, real-time traffic information delivered on the Internet, road-weather information systems, electronic toll collection, computer-aided dispatch systems for transit vehicles, sensors at highway/rail crossings and variable message signs along the highways.

Simply put, ITS helps people access real-time information on transportation conditions to make the right decisions, whether you are a transportation engineer managing a far-reaching traffic signal system, a commuter deciding on the least-congested route home or a bus driver keeping the bus on schedule.

Already more than 400 ITS projects are under way in communities throughout the United States. "The four Model Deployment Initiative sites are showing there is a bridge from earlier research to practical applications that people can experience today. Their efforts to integrate ITS technologies will point the way for other cities and areas hoping to realize the important benefits of ITS," said ITS America President James Costantino.

*For further ITS-related information, see **Access ITS America, http://www.itsa.org***.

This brochure is a collaborative effort of the Federal Highway Administration, the Federal Transit Administration and the four regions selected by the United States Department of Transportation to showcase integrated intelligent transportation solutions. Technical assistance from ITS America has been greatly appreciated.

These projects will lay the groundwork for further investment in technology-based transportation solutions and demonstrate the benefits of intelligent transportation infrastructure to national and local decision-makers and the traveling public.

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