

VIII. INTELLIGENT TRANSPORTATION SYSTEM (ITS) TECHNOLOGY IN THE MERRIMACK VALLEY

Intelligent Transportation Systems (ITS) is comprised of a number of technologies, including information processing, communications, control, and electronics. When advanced technologies are applied in an area, better management of the transportation infrastructure can help save time, money and lives.

Since the adoption of the 2003 Regional Transportation Plan, the decision was made to include the Merrimack Valley region under the umbrella of the Boston ITS Architecture. ITS Architecture, as noted in the Final Report for the Regional ITS Architecture for Metropolitan Boston is ...”is a framework that defines the component systems and their interconnections, and that provides a tool for facilitating institutional relationships within a region.” Inclusion of the Merrimack Valley as well as the other MPO regions within the Boston Urban area was made in recognition of the strong transportation connections that these areas have to Boston via automobile and transit. For example, each of the interstate roadways in the Valley serve as important routes for commuter and freight travel between the Valley (and points beyond) and Boston. In addition over 2,800 people board MBTA Commuter Rail trains each workday with the overwhelming majority of them destined for the Boston area.

The MVPC staff works cooperatively with the FHWA and FTA, as well as MassHighway in order to bring the most comprehensive ITS strategies and planning to the Merrimack Valley region. Working in partnership with other local, regional, state and national agencies will insure better and safer travel in the Merrimack Valley region and for travelers and freight haulers that are traveling through the region. Table VIII-2 at the end of this section describes the ITS “Service Bundles” created in the architecture and outlines some of the options/benefits that would accrue through their implementation in the region.

ITS in Massachusetts

The MassHighway ITS Programs Unit is responsible for the design and deployment of the Massachusetts ITS Program. The Massachusetts ITS Program consists of three interdependent programs: Emergency Management, High Occupancy Vehicle (HOV) Lane Operations for the Southeast Expressway, and ITS. Each of these programs promotes the use of advanced technology to meet their goals.

Current Activities

The Central Artery/Third Harbor Tunnel project (CA/THT) includes many of the latest advances in ITS technology. ITS systems were integrated into the project from its earliest stages to the point where they constituted a sizable amount of the total project’s cost. Traffic using the highway system is monitored by one of the most advanced traffic management and emergency response systems ever assembled.

An ambitious Advanced Traveler Management Systems (ATMS) project is currently in place at the Regional Traffic Operations Center (RTOC) in South Boston, which was built in conjunction with the CA/THT project. The TMC’s purpose is to manage freeway traffic within the Boston metropolitan area with the primary goal of rapid incident detection,

response, and traveler notification. The principal components of the system consist of a highway surveillance system (26 closed circuit cameras, 63 inductive loop detectors for volume and speed measurements, and 23 microwave, radar or laser detectors), the communications link between the surveillance system and the operations center, computer and video systems which will provide data processing and evaluation, and 11 permanent variable message signs and 30 mobile signs for the control and management of traffic. Traffic conditions on live streaming video are now provided by some cameras located adjacent to the Central Artery and Turnpike highways in Boston and can be viewed not only by the operations center staff, but by everyone who visits the Massachusetts Turnpike's website.

One of the most successful deployments of ITS programs in the metropolitan Boston area and the Commonwealth outside of the Central Artery has been the SmarTraveler Advanced Traveler Information System (ATIS). SmarTraveler is a public/private partnership between the Massachusetts Highway Department and SmartRoute Systems, Inc. The system has a coverage area of approximately 1,400 square miles, 122 cities and towns, and 2.9 million drivers. It has a network of 500 mobile cellular phones, 150 radio probes, 65 cameras and 2 aircraft to monitor traffic operations in the metropolitan Boston area. Real-time traffic information is disseminated through three mass mediums: Audiotext (dialing *1 from a cellular phone), the Internet, and cable television. Access to images from four cameras in the downtown area and on Route 1 in Saugus is also available through a link to the MVPC website.

Another important ITS program deployed in the state in recent years is the electronic registration of commercial vehicles. Unlike private automobiles, motor carriers must register in every state in which they operate. It can be a complex and paper intensive process for both the carriers and the state vehicle registrars. The completely electronic registration is sponsored by the Delaware DOT, New Jersey DMV, New York State DOT, Pennsylvania DOT, and Massachusetts RMV.

ITS in the Merrimack Valley

Current Activities

Travelers through the Merrimack Valley region are currently benefiting from the merits of statewide and nationwide ITS programs that have been deployed. The traveler information services provided by SmarTraveler, which gives real-time information of traffic on the region's freeways, Interstate 495 (I-495) and Interstate 93 (I-93) and Interstate 95 (I-95), is one example of a statewide program. In addition, many automobile manufacturers include, as an option, an in-vehicle guidance system. In recent years, wireless communications companies have begun offering audible driving directions to motorists through their cell phones. This development will greatly accelerate the process of making this service more affordable and widely available to the average person. .

Becoming more familiar with ITS and the potential for its application in the Merrimack Valley continues to be an important ongoing activity for MPO staff. MVPC staff continues to solicit ITS project updates from MPOs throughout the state and attempted to keep apprised of the constantly evolving opportunities for the application of ITS in the Merrimack Valley.

Route 125 and Route 110 Signal Coordination

Under the 2003 Regional Transportation Plan, MVPC staff suggested to FHWA the implementation of an ITS system that would help alleviate congestion on the state highways that parallel the region's freeways, I-93 and I-495, during periods of over-saturated traffic flow. The system, as envisioned, would help keep traffic moving on the parallel two-lane, state highways, including Routes 110 and Route 125, by providing a special coordinated signal timing plan on these highways that favors the through traffic.

Under the 2005-6 Unified Planning Work Program, staff collected data on the various types of traffic signal equipment that was in place on Routes 110 and 125 to determine how easily they could be linked to together within the framework of the ITS Architecture. This analysis revealed that many of the signals along both corridors were outdated and/or could not conform to the architecture. Rather than undertaking a large scale project to upgrade/replace these signals and link them, it was determined by staff that a more cost effective albeit slower, way to achieve this goal would be to target these signals for improvement in connection with other roadway improvement or intersection projects.

Route 28 Signal Coordination

During 2006, MVPC was approached by an official from the Town of Salem, NH requesting Merrimack Valley MPO cooperation in implementing an ITS proposals that calls for the coordination of traffic signals along Route 28 in Salem and in northern Methuen. This project was being developed by the Town of Salem to reduce the anticipated congestion that will be generated during the widening of I-93 between Salem and Manchester, NH. As proposed, the project calls for the signals at the Route 28/Route 213 interchange and at the Village Mall to be incorporated into a coordinated signal system that would extend north to the intersection of Route 28 with Rockingham Park Boulevard.

This project would help the region address a number of issues already identified in this document. Crash data from the Route 28/ Route 213 interchange and at the Rosewood Avenue / Route 28 intersection show that safety problems exist at both locations. Many of these crashes are likely the result of the traffic congestion that occurs at both locations. The section of Route 28 north of Route 213 has also been identified as a congested corridor.

Future Activities

In the near term, a tremendous opportunity will be presented to expand ITS in the Valley. The Merrimack Valley MPO has endorsed the recommendations to add a travel lane in each directions on I-93 based on the recommendations made in the I-93 Corridor Study. This project will allow the latest ITS technology to be incorporated on the busiest roadway in the region.

MassHighway has also embarked upon a study of the I-495 Corridor in the Valley. This study will identify ITS technologies and approaches that can be incorporated into the recommended improvements for the corridor.

Recommendations:

- Work with the Towns of Methuen and Salem, NH to develop and implement signal coordination project on Route 28 Corridor;
- Expand SmarTraveler coverage of Merrimack Valley Region to include cameras on interstate roadways in the region.
- Ensure that projects developed from the I-495 and I-93 Corridor studies are fully integrated into the Boston Metropolitan Regional Architecture.

Merrimack Valley Regional Transit Authority (MVRTA)

As is the case with many mass transit properties throughout the country, the MVRTA is currently leading the region in the integration of ITS into its operation. Already in the business of “operating” a transportation system, the MVRTA has been able to incorporate ITS applications in a much quicker fashion.

Projects already undertaken or completed by the MVRTA are shown below in Table VIII-1.

**Table VIII-1
ITS Applications Implemented by the MVRTA**

Project	Project Description
Talking Bus	Electronic announcement system for stops and timepoints along fixed-routes (internal and external). Can also make special announcements. Manually operated by the driver. All 12 1996 coaches are equipped with this feature.
Talking Bus w/GPS	MVRTA has outfitted 30 buses with global positioning systems (GPS), integrated w/Talking Bus, for automated electronic announcements of bus route stops and timepoints.
Electronic Destination Signs	Outfitted all fixed route buses with external front and side signs and with internal electronic destination signs, integrated w/Talking Bus, for automated display of route stops and timepoints.
Paratransit Scheduling Software	Geographically based system used in the Access to Jobs program. Coordinator is able to pinpoint client locations (home, work, training, etc...), child care locations (if needed) and identify the most efficient and effective transportation services to be accessed.
Electronic Fareboxes	Has fitted all fixed route buses and commuter fleet with new electronic fareboxes with electronic payment system compatibility.
Safety/Security Cameras	Each fixed route bus and commuter coach is equipped with 3 interior and 3 exterior digital color cameras. All Paratransit vehicles are equipped with 3 exterior and 2 interior color cameras. All cameras record to a hard drive and can provide playback in streaming video
Radios and Automatic Vehicle Location	All vehicles equipped with 100-watt radios that include GPS and AVL devices. Dispatchers can track any vehicle at any time and can access a vehicle's maintenance history at any time.

Source: MVRTA

As a part of the 2006-2007 UPWP and future work programs, the MVPC will assist the MVRTA in assessing the further integration of electronic payment systems, automated vehicle location technology, an internet-based trip planner for the fixed route system, real-time travel information services, and other transit related ITS applications.

Table VIII-2 – Description of ITS Service Bundles and Their Potential Application to the Merrimack Valley MPO

ITS User Service Bundles	ITS User Services	ITS Applications (non-inclusive)	Potential Examples for Implementation in the Merrimack Valley Region
(1) Travel and Traffic Management	(1) En-Route Driver Information	• Variable message signs.	• To warn of upcoming incidents on I-93, I-95, I-495 and Route 213, and/or provide alternate routes (as part of a freeway management system, such as the Boston RTOC).
	(2) Route Guidance		
	(3) Traveler Services	• Coordinated signal systems on arterials to manage freeway access.	• To remotely operate systems to regulate freeway access and congestion after an incident on I-93 (which will be part of a freeway management system, such as the Boston RTOC).
	(4) Traffic Control	• Ramp metering systems.	• To reconcile fluctuating flows of traffic on I-93 during the A.M. and P.M. peak periods.
	(5) Incident Management	• Signal pre-emption devices.	• For rapid response of emergency vehicles through the region's signalized arterials.
	(6) Emissions Testing and	• Signal coordination systems for special events.	• To allow for smooth traffic flows after a commuter rail train arrives at a commuter rail station (e.g. Andover).
	(7) Travel Demand		
	(8) Pre-Trip Travel Information		
	(9) Ride Matching and	• Remotely adjustable or adaptive signal systems in response to incidents or congestion.	• For use at congested I-495 interchanges, relieving traffic back-ups from vehicles exiting the highway.
	(10) Highway Rail Intersection	• Photo enforcement systems at railroad grade crossings. • Integrated traffic control and railway grade crossing systems. • Grade crossing detection systems. • Internet site with real time information.	• Video surveillance equipment located at problematic grade crossings in region, for enforcement purposes. • To ensure continued flow of cross-traffic as train passes. • To warn train operator of vehicles on the track at a grade crossing (i.e. Ballardvale). • Merrimack Valley Transportation Happenings & Options World Wide Web site and SmartTraveler.
(2) Public Transportation Management	(1) Public Transportation	• Automated vehicle location (AVL) devices.	• Installed on MVRTA transit buses to improve monitoring of on-time performance and efficiency.
	(2) En-Route Transit		
	(3) Personalized Public Transit	• Computer aided dispatching.	• To enable efficient dispatching of the demand response transit fleet to meet demand.
	(4) Public Travel Security	• En-route information systems.	• Information kiosks located at MVRTA transit stations with real time bus route information.
(3) Electronic Payment	(1) Electronic Payment Services	• Smart card payment systems.	• Now available on MVRTA fixed route buses and commuter coaches
		• Smart farebox systems. • Transponder based toll collection systems.	• Now available on MVRTA fixed route buses and commuter coaches • No foreseeable application in the region.
(4) Emergency Management	(1) Emergency Notification and	• GIS based 911 systems.	• Ability to map exact location of call and offer guidance.
	(2) Emergency Vehicle	• On-board GPS systems (public vehicles). • Automated or manual emergency notification systems.	• Now available on all MVRTA fixed route buses. • A system providing immediate notification of an incident or request for assistance (i.e. disorderly public transit passenger).
(5) Commercial Vehicle Operations	(1) Commercial Vehicle	• Commercial vehicle electronic registration.	• Streamlining of credentials administration of motor carriers to allow more efficient interstate travel, such as between New Hampshire and Massachusetts on I-93 and I-95.
	(2) Automated Roadside		
	(3) On-board Safety Monitoring		
	(4) Commercial Vehicle		
	(5) Hazardous Materials	• Automated vehicle location (AVL) devices.	• Ability of carriers to track commercial vehicles in their own fleet.
	(6) Commercial Fleet	• Weight-in-motion sensors.	• Can be used in concert with or in place of weigh stations by state police on I-95, I-93, and I-95.
(6) Advanced Vehicle Safety Systems	(1) Longitudinal Collision	• In-vehicle lateral and longitudinal collision warning devices that alert the driver.	• In development by automobile manufacturers and train systems manufacturers.
	(2) Lateral Collision Avoidance		
	(3) Intersection Collision		
	(4) Vision Enhancement for		
	(5) Safety Readiness		
	(6) Pre-Crash Restraint	• Infrared night vision device that provides a clear view of the roadway in absence of adequate light.	• In development by automobile manufacturers.
	(7) Automated Vehicle	• Automated highway systems.	• In long-term research and development.
(7) Information Management	(1) Archived Data Function	• N.A.	• N.A.