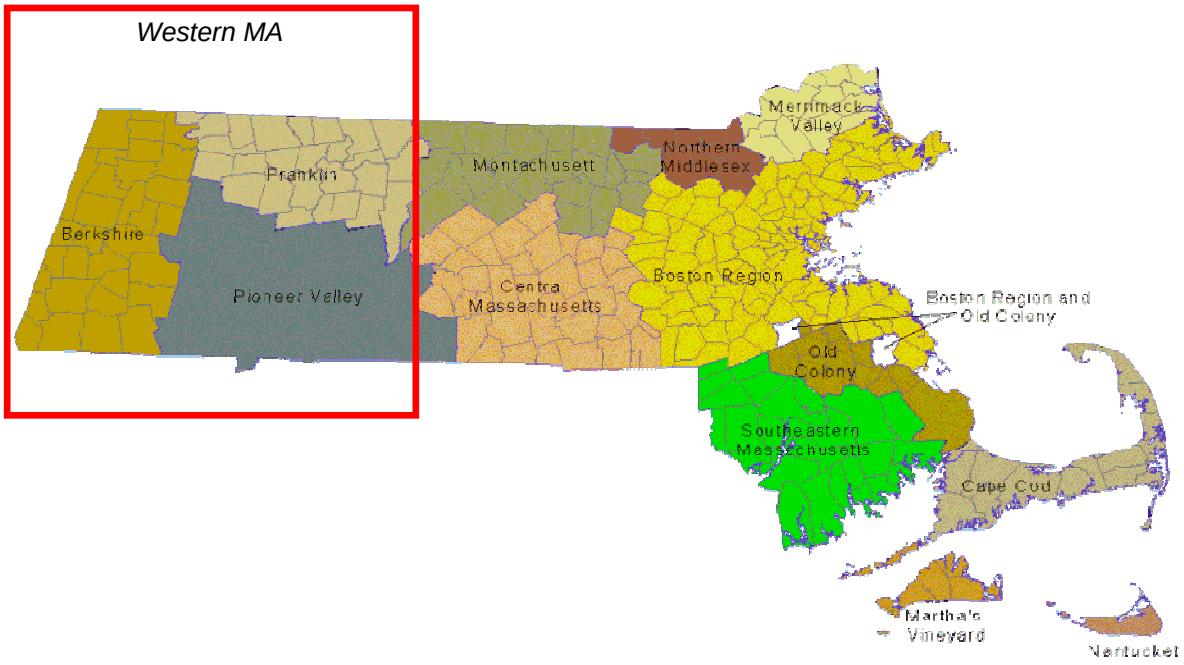
Commonwealth of Massachusetts

REGIONAL ITS ARCHITECTURE FOR WESTERN MASSACHUSETTS



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IMPLEMENTATION PLAN

MARCH 2005

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16. Abstract

The Commonwealth of Massachusetts, through the Executive Office of Transportation (EOT), has undertaken the development of a Regional Intelligent Transportation Systems Architecture for Western Massachusetts.

The final piece of the architecture development process was the development of the Implementation Plan, which provides a strategy for achieving the integrated transportation system envisioned by the architecture. The Implementation Plan addresses the planned components of the architecture, identifying a series of initiatives that can be undertaken to implement these components. Also included is a plan for maintaining the architecture and ensuring consistency between the architecture and projects with ITS components.

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1. INTRODUCTION

Intelligent Transportation Systems (ITS) are applications of advanced technology in the field of transportation, with the goals of increasing operational efficiency and capacity, improving safety, reducing environmental costs, and enhancing personal mobility. Successful ITS deployment requires an approach to planning, implementation, and operations that emphasizes collaboration between relevant entities and compatibility of individual systems. At the core of this process is an architecture that guides the coordination and integration of individual ITS deployment projects. This ITS architecture is a framework that defines the component systems and their interconnections, and that provides a tool for facilitating institutional relationships within a region.

The Commonwealth of Massachusetts, through the Executive Office of Transportation (EOT), has undertaken the development of a Regional Intelligent Transportation Systems Architecture for Western Massachusetts. The Office of Transportation Planning (OTP) has led a project team consisting of IBI Group in association with ConSysTec Corporation and Rizzo Associates. The consultant team also included an advisory panel consisting of James McGrail, Esq. of Nora Burke and Co., Paula Okunieff of Systems & Solutions, Inc., and Dr. Joseph Sussman of the Massachusetts Institute of Technology.

Key transportation agencies and other stakeholders in the region provided extensive input in the process, with many serving on a Guidance Committee. Their involvement included participating in meetings and workshops and reviewing project deliverables. Out of this process, with the help of these stakeholders, came an architecture that represents a vision of an integrated transportation system for the Metropolitan Boston region and the interagency relationships needed to support it.

1.1 Architecture Development Process

This Implementation Plan is one of the final steps in the regional ITS architecture development process, as illustrated in Exhibit 1-1. This section provides a review of this process.

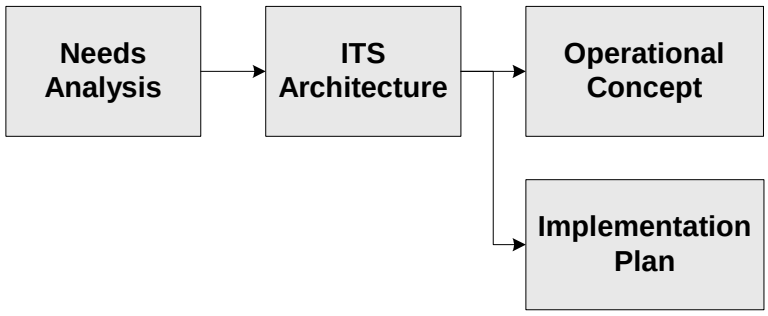

Exhibit 1-1: Architecture Development Process

The first step of this process was the ***Needs Analysis***, which identifies the ITS-related projects and needs of the operating and planning agencies in the region. This analysis served as the basis for the development of the functional requirements of the ITS Architecture and its component systems, developed in the following step. This approach ensured that the systems and technologies recommended for implementation, as well as the architecture that provides a framework for these systems, were consistent with the needs and goals of the region. Documentation from the region, including Regional Transportation Plans (RTPs) and Transportation Improvement Programs (TIPs), was reviewed as part of the needs analysis. Further information was obtained at the initial meeting of the Guidance Committee and through a series of follow-up meetings with various groups of stakeholders.

The next step in the process was the development of the ***ITS Architecture***, which defines the existing and planned component systems and the interfaces among them. As with the needs analysis, stakeholder involvement was critical to this step of the process. An initial draft of the architecture was developed from an inventory of ITS elements identified in the needs analysis and from stakeholder input at an architecture development workshop. Refinements to the architecture were made following stakeholder review, including a review meeting with the Guidance Committee. Final refinements to the architecture were made once the architecture process was completed, allowing the architecture to reflect all of the comments received.

The next two steps resulted in documents derived directly from the ITS architecture. The first was the development of the ***Operational Concept***, which addresses the institutional relationships that must be established in order to address the interagency interfaces defined in the architecture. The purpose of the Operational Concept is to define the roles and responsibilities of the stakeholders in the operation of the component systems of the architecture. The Operational Concept details requirements for each of the interagency interfaces in the architecture. These requirements address the information to be exchanged and the roles of the interfacing agencies. The Operational Concept also addresses the need for operational agreements among agencies that share interfaces.

The final piece of the architecture development process was the development of the ***Implementation Plan***, which provides a strategy for achieving the integrated transportation system envisioned by the architecture. The Implementation Plan addresses the planned components of the architecture, identifying a series of initiatives that can be undertaken to implement these components. Also included in this step was the development of a plan for maintaining the architecture and ensuring consistency between the architecture and projects with ITS components.

1.2 Development of the Implementation Plan

This document presents a strategy for implementing the systems defined in the Regional ITS Architecture for Western Massachusetts. This strategy is developed directly from preceding steps in the architecture development process, as illustrated in Exhibit 1-2.

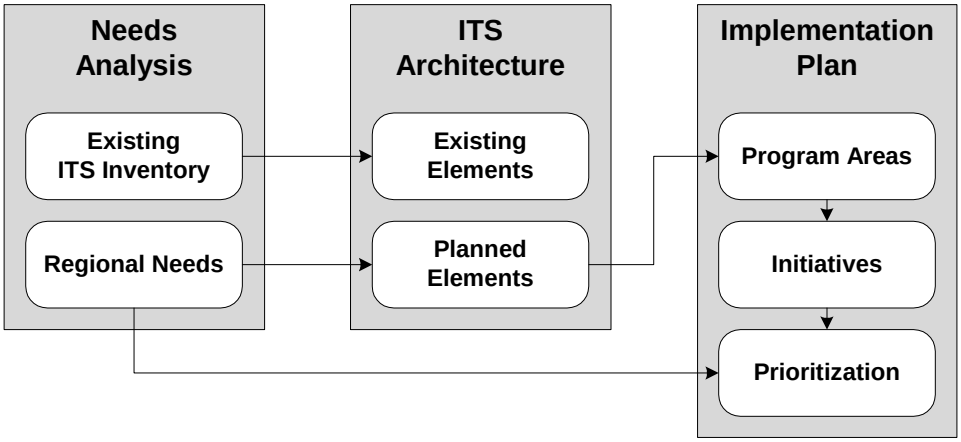

Exhibit 1-2: Implementation Plan Development Process

The architecture identifies a large number of ITS elements for the region, classified as either "existing" or "planned." Elements classified as "existing" are those that are already implemented or those that are far enough along in the design stage that the interfaces are already determined. These elements, identified in the ITS inventory from the needs analysis, therefore are not addressed in the Implementation Plan.

The elements that must be considered in the Implementation Plan are those classified as "planned," i.e. those that have not yet been designed or implemented but that are envisioned to be implemented within a ten-year horizon. These elements were identified based on the outcome of the Needs Analysis and the input from stakeholders during the architecture workshop. In addition to the planned ITS elements, there are planned interfaces that must be considered. For example, a planned interface between two existing control centers must be included in the Implementation Plan, even though it is not associated with a planned element in the inventory.

In developing the Implementation Plan, the planned elements identified are considered both by function and by stakeholder. Considered functionally, the planned elements are grouped into ***program areas*** that encompass elements that address a specific functional need. Each program area represents a general area for investment identified through the architecture development process.

Within each of the program areas, a series of ***initiatives*** is defined, representing a means of implementing the elements with that program area. Each initiative may encompass a number of planned elements that are recommended for simultaneous implementation. Although a single stakeholder will lead some initiatives, many initiatives will require the participation of two or more agencies.

As an example, consider the interface between a MassHighway District Office and MassHighway maintenance vehicles. The information flows between these entities include maintenance and construction dispatch data, location data, and status data. These interfaces can be grouped under a single initiative, namely "MassHighway CAD/AVL," as each of these information flows would likely be implemented as part of a single CAD/AVL deployment. These interfaces would also fall under a broader program area, namely "CAD/AVL for Maintenance Vehicles," that would also include CAD/AVL projects for maintenance vehicles at other agencies, such as local cities and towns. As the example illustrates, the program area defines the functional area recommended for implementation, namely CAD/AVL for Maintenance and Construction, while the initiative defines a specific deployment.

Finally, the Implementation Plan also considers prioritization of the identified initiatives, identifying candidates for short-term and long-term implementation. This prioritization is based on the needs analysis, the input received from the stakeholders throughout the architecture development process, and interdependencies among the initiatives.

Through this process, a comprehensive list of program areas and initiatives has been developed that encompasses all of the planned elements from the architecture. The remainder of this document is organized as follows:

- Section 2 presents the program areas and initiatives of the Implementation Plan, grouped by function.
- Section 3 presents the strategy for implementation, considering the prioritization of the initiatives identified in Section 2.

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2. PROGRAM AREAS AND INITIATIVES

This section presents a set of program areas, along with a recommended set of initiatives to be implemented within each program area. Each program area represents a general area of investment that is needed for implementation of the architecture.

Presented within each program area is a series of initiatives that provide a method of implementing that portion of the architecture. Some of the initiatives are currently planned initiatives that were identified in the development of the architecture. The others are recommendations for initiatives that address the needs identified in the development process. The initiatives defined in this section are not the only means by which the architecture can be implemented, however. Instead, this plan provides one method of grouping the planned elements of the architecture into initiatives that together address the needs and planned components from the architecture.

Each of the initiatives presented indicates the stakeholders that are involved. While many initiatives involve only a single stakeholder, in some cases an initiative requires participation from multiple agencies. Furthermore, some initiatives are listed for a collective group of stakeholders, such as Regional Transit Authorities. These initiatives are not necessarily meant to cover multiple agencies or to consist of a one-time deployment. Instead, each represents an initiative that can be implemented multiple times within the region and on any scale, from single-agency to multi-agency to region-wide implementation.

The subsections below present the program areas and initiatives arranged by function, based on the service areas or high-level grouping of market packages defined in the National ITS Architecture. The program areas are presented under the following functional groupings:

- Traffic Management
  - Roadway Management
  - Parking Management
- Maintenance and Construction Management
- Public Transportation
  - Transit Management
  - Electronic Fare Payment
- Traveler Information
- Emergency Management
- Archived Data Management

In addition, there are a number of program areas that cut across multiple functions and thus do not fall under a single classification. These multi-function programs are presented in Section 2.1.

2.1 Multi-Function Program Areas

Presented in this section are the program areas that cut across multiple functional areas, and therefore cannot be classified under a single function. These program areas consist of those that provide or support more than one function, such as both traffic management and transit management.

2.1.1 INFORMATION SHARING (EVENTS)

This program area covers the sharing of event information among the various operations centers in the region. This addresses the center-to-center interfaces for event data that are shown in the architecture between these elements, including both roadway and transit control centers. The functional areas covered by this program area are Traffic Management, Maintenance and Construction Management, Public Transportation, and Traveler Information.

The interfaces covered by this program area can be implemented through an event reporting system, as recommended through the architecture development process. The following initiative addresses this program area.

Event Reporting System

This initiative will develop an event reporting system for exchanging of event information. This system, envisioned to be an expansion of the pilot system for Pioneer Valley developed by MassHighway, is an Internet-based tool that serves as a centralized repository for information on events affecting the transportation network. Participating agencies can enter information about events within their jurisdiction and can view information entered by other agencies, thus providing a central system for information exchange. The participating agencies are the following:

- *Roadway Agencies:*
  - Massachusetts Highway Department (MassHighway)
  - Massachusetts Turnpike Authority (MassPike)
  - City of Springfield
  - City of Pittsfield
  - Town of Greenfield
  - Local Cities/Towns
- *Transit Agencies:*
  - Berkshire Regional Transit Authority (BRTA)
  - Franklin Regional Transit Authority (FRTA)
  - Greenfield-Montague Transportation Area (GMTA)
  - Pioneer Valley Transit Authority (PVTA)
  - Local Transit
  - Private Ground Transportation Providers
  - Local/Regional School Districts
  - Amtrak
- *Emergency Management Agencies:*
  - Local City/Town/County Public Safety
  - Massachusetts Emergency Management Agency (MEMA)
  - State Police

Examples of information to be exchanged include real-time information on incidents and delays, as well as planned events such as construction, road closures, or traffic-generating special events. While emergency management agencies are included in the list of participants, the system to be developed in this program area is only meant for the exchange of information for traffic and transit management purposes. Emergency management coordination is addressed by an extension of this system, as described in Section 2.8.1.

This system will provide multiple ways for each agency to interface with the system. For agencies with central control center software, the system will support an automated interface with the agency, allowing event information to be sent directly to the system from the control center's central software. For agencies that have yet to implement central operations software, the event reporting system can also be used as a stand-alone system, with information entered by an operator through a web-based interface.

In addition to being used for information sharing among the participating agencies, the system will also serve as tool for information dissemination by allowing other users to view information entered into the system. These other users can include emergency management agencies, private information service providers, or even the public. The system can also serve as a source of data for the planned 511 Travel Information System, as described in Section 2.7.1.

2.1.2 INFORMATION SHARING (VIDEO)

This program area covers the sharing of video data between the various operations centers in the region. This addresses the center-to-center interfaces for video data that are shown in the architecture between roadway control centers. The functional areas covered by this program area are Traffic Management, Maintenance and Construction Management, Public Transportation, and Traveler Information.

The interfaces covered by this program area can be implemented through a Video Integration System (VIS). The following initiative addresses this program area.

Video Integration System

This initiative will develop a system for exchanging of video data. The VIS is an interagency video distribution system, allowing the sharing of real-time video feeds among participating agencies. The primary participating agencies are those with video capabilities, including:

- MassHighway
- MassPike
- Local Cities/Towns (as applicable)
- Private Information Service Providers
- State Police

Other agencies, however, such as transit and other emergency management agencies, can also be included as recipients of the video data. This will support coordination among operations centers within the region, allowing one center to view the CCTV images from other participating agencies. As MassHighway and the State Police have already established video sharing in the Boston area through the Massachusetts Interagency Video Information System (MIVIS), the VIS initiative could be developed as an expansion of MIVIS. Alternatively, a separate system for the region could be developed that allows exchange only among the relevant regional partners.

The system will also provide travel information functions, allowing video to be distributed to private information service providers or publicly available websites, such as the planned 511 Travel Information System website, as described in Section 2.7.1. The system to be developed through this initiative is only meant for the exchange of video for traffic and transit management purposes. Emergency management coordination is addressed by an extension of this system, as described in Section 2.8.1.

2.2 Traffic Management: Roadway Management

2.2.1 ROADWAY MONITORING

This program area covers improvements to the traffic monitoring capabilities of the region's agencies with traffic management functions. This addresses planned elements in the architecture relating to field surveillance, additional deployments of field equipment and control centers, and the interfaces of field equipment with the appropriate control center.

This program area addresses the need for traffic data through two means: deployment of devices for monitoring traffic conditions on roadways, and obtaining traffic data through probe surveillance. The following initiatives fall under this program area:

Traffic Monitoring Deployment (Local Cities/Towns, including Springfield, Pittsfield, and Greenfield)

This initiative covers the further deployment of devices for monitoring traffic conditions on city and town roads. This will include placement of vehicle detectors and roadside CCTV cameras, as well as devices for monitoring roadway conditions such as weather sensors. This field equipment will be connected to local control centers, where it will provide data to control center operators. The initiative will cover the installation of these devices, establishment of control centers in municipalities where they are not currently present, and implementation of a communications link with the appropriate control center.

Traffic Monitoring Deployment (MassHighway)

This initiative covers the further deployment of devices for monitoring traffic conditions on roadways operated by MassHighway. This will include placement of vehicle detectors and roadside CCTV cameras. This field equipment will be connected to the MassHighway District Traffic Operations Center (DTOC) at District 2, as well as to the statewide Traffic Operations Center (TOC) where it will be integrated into the TOC central software. The initiative will cover the installation of these devices along with the communications link to the DTOC and TOC.

Traffic Monitoring Deployment (Private Information Service Providers)

This initiative covers private-sector deployment of field equipment for traffic monitoring. This equipment, including vehicle detectors and roadside CCTV cameras, will be linked to centers operated by private travel information service providers. The initiative will cover the installation of this equipment, communications links with the private operations center, and communications links from the private operations center to relevant public-sector operations centers.

Traffic Monitoring Deployment (Regional Travel Information Services)

This initiative covers additional deployment of field equipment for traffic monitoring by Regional Travel Information Services, such as UMass RTIC. This equipment, primarily vehicle detectors, will be linked to centers operated by these service providers. The initiative will cover the installation of this equipment and communications links with the relevant operations centers.

Highway Probe Surveillance (MassHighway, MassPike, Regional Travel Information Services)

This initiative makes use of existing and planned vehicle identification systems to produce travel time data for operations and planning purposes. The prime implementing agencies will be those managing highway operations, namely MassHighway and the Turnpike Authority, but others such as the Regional Traveler Information Center (RTIC) will also have use for this data. This initiative will make use of probe information from systems that provide vehicle identification, including Electronic Toll Collection (ETC) systems and Automatic Vehicle Location (AVL) systems. Either through ETC roadside readers or through AVL data provided by fleet operators, the agencies will obtain travel time information for roadways under their jurisdiction.

Roadway Weather Monitoring Deployment (MassHighway)

This initiative covers the additional deployment of devices for monitoring roadway weather conditions on roadways operated by MassHighway. This will include placement of weather stations and other environmental sensors, such as icing detectors. This field equipment will be connected to the MassHighway District Traffic Operations Center (DTOC), as well as to the statewide Traffic Operations Center (TOC) where it will be integrated into the TOC central software. The initiative will cover the installation of these devices along with the communications link to the DTOC and TOC.

2.2.2 ROADWAY CONTROL

This program area covers improvements to traffic control capabilities for agencies with traffic management functions. This addresses planned elements in the architecture relating to information dissemination, as well as the interfaces of this equipment with the appropriate control center. The program area includes installation and expansion of centralized signal control systems as well as further deployment of field equipment.

Centralized Signal Control (Local Cities/Towns, including Pittsfield and Greenfield)

This initiative covers the integration of existing and new traffic signals into a centralized signal control system for a city or town. This would allow coordination of signals and adjustments to signal timings to be made in real-time from a centralized location. In addition to upgrades and further deployment of field equipment, this initiative also covers additional communication infrastructure to support the signal system.

Expansion of Centralized Signal Control (MassHighway)

This initiative builds on the existing interface between MassHighway District offices and MassHighway traffic signals by expanding the scope of existing closed-loop signal systems. This initiative increases the number of intersections tied into the system at the district office, thereby expanding coverage and facilitating signal coordination within the region. In addition to upgrades and further deployment of field equipment, this initiative also covers additional communication infrastructure to support the expanded system.

Expansion of Centralized Signal Control (City of Springfield)

This initiative builds on the existing interface between the City of Springfield DPW and city traffic signals by expanding the scope of existing closed-loop signal systems. This initiative increases the number of intersections tied into the system at the DPW, thereby expanding coverage and facilitating signal coordination within the town. In addition to upgrades and further deployment of field equipment, this initiative also covers additional communication infrastructure to support the expanded system.

Variable Message Sign Deployment (Local Cities/Towns, including Springfield, Pittsfield, and Greenfield)

This initiative comprises the deployment of Variable Message Signs (VMSs) on roadways operated by local cities and towns. These VMSs will be controlled from local control centers, allowing real-time information to be disseminated to drivers on city and town roads. This information can include traffic conditions, routing information, and parking space availability. These signs will require a communications interface with local control centers.

Expansion of Variable Message Sign Deployment (MassHighway, MassPike)

This initiative comprises the deployment of additional Variable Message Signs on roadways operated by MassHighway and the Turnpike Authority. Like those already deployed in the region, these VMSs will be controlled from the operating agency's control center. In addition to upgrades and further deployment of field equipment, this initiative also covers additional communication infrastructure to support the system expansion.

2.3 Traffic Management: Parking Management

2.3.1 ETC INTEGRATION FOR PARKING

This program area covers acceptance of Electronic Toll Collection transponders at parking facilities within the region. This addresses the interfaces in the architecture between the MassPike FAST LANE transponders and various parking facilities and parking management systems.

Agencies with parking facilities that have plans to support ETC payment include BRTA, PVTA, and Local Cities and Towns. Due to the means by which the transponders are read, the use of the regional electronic collection transponders is limited to parking lots and garages with controlled entry and exit points. This implementation allows parking fees to be deducted from the user's account balance. In addition to acceptance of the transponders at parking facilities, the system will also support reconciliation of accounts between each parking facility operator and the MassPike, who operates the current electronic toll collection program.

ETC Integration at Parking Facilities (BRTA)

This initiative introduces acceptance of ETC transponders at parking facilities operated by BRTA. In addition to acceptance of the transponders at parking facilities, the system will also support reconciliation of accounts between BRTA and the MassPike.

ETC Integration at Parking Facilities (PVTA)

This initiative introduces acceptance of ETC transponders at parking facilities operated by PVTA. In addition to acceptance of the transponders at parking facilities, the system will also support reconciliation of accounts between PVTA and the MassPike.

ETC Integration at Parking Facilities (Local Cities/Towns)

This initiative introduces acceptance of ETC transponders at parking facilities operated by local cities and towns. In addition to acceptance of the transponders at parking facilities, the system will support reconciliation of accounts between local parking facility operators and the MassPike.

2.3.2 REGIONAL FARE CARD INTEGRATION FOR PARKING

This program area covers acceptance of the planned Regional Fare Card, discussed in Section 2.6, at parking facilities operated by agencies within the region. This addresses the interfaces in the architecture between the Regional Fare Card and the various parking facilities and parking management systems.

Agencies with parking facilities that have plans to support payment via the Regional Fare Card include BRTA, PVTA, UMass, and Local Cities and Towns. This program area can cover metered parking as well as ticketed parking lots and garages, allowing parking fees to be deducted from the balance on a patron's Fare Card. In addition to acceptance of the new media at meters and parking facilities, the systems will also support reconciliation of accounts between the parking operators and the Regional Fare Card agency.

Regional Fare Card Integration at Parking Facilities (BRTA)

This initiative introduces acceptance of the planned Regional Fare Card at parking facilities operated by BRTA. In addition to acceptance of the new fare media, the system will also support reconciliation of accounts between BRTA and the Regional Fare Card agency.

Regional Fare Card Integration at Parking Facilities (PVTA)

This initiative introduces acceptance of the planned Regional Fare Card at parking facilities operated by PVTA. In addition to acceptance of the new fare media, the system will also support reconciliation of accounts between PVTA and the Regional Fare Card agency.

Regional Fare Card Integration at Parking Facilities (UMass)

This initiative provides for acceptance of the planned Regional Fare Card at UMass parking facilities. In addition to acceptance of the new fare media, the system will support reconciliation of accounts between UMass and the MassPike.

Regional Fare Card Integration at Parking Facilities (Local Cities/Towns)

This initiative introduces acceptance of the planned Regional Fare Card at parking facilities operated by local cities and towns. This can include metered parking as well as ticketed parking lots and garages. In addition to acceptance of the new media at meters and parking facilities, the system will support reconciliation of accounts between the local parking operators and the Regional Fare Card agency.

2.4 Maintenance and Construction Management

2.4.1 CAD/AVL FOR MAINTENANCE MANAGEMENT

This program area covers the provision of Computer-Aided Dispatching/Automatic Vehicle Location (CAD/AVL) systems for managing maintenance vehicles. This addresses the planned interfaces in the architecture between control centers and maintenance vehicles, such as those of MassHighway and local cities and towns.

The systems to be implemented under this program area allow a control center to track its vehicles in real-time and to dispatch those vehicles in the most efficient manner. This program requires equipment in each vehicle to be tracked, as well as a central system at the dispatch center to receive and manage the tracking information.

CAD/AVL for Maintenance Vehicles (Local Cities/Towns)

This initiative provides CAD/AVL systems for managing city and town maintenance vehicles. This initiative will require equipment in each vehicle to be tracked, as well as a central system at the local dispatch center to receive and manage the tracking information.

CAD/AVL for Maintenance Vehicles (MassHighway)

This initiative provides a CAD/AVL system for managing MassHighway maintenance vehicles. Similar to the system in place for tracking the CaresVan roadway service patrol vehicles and snowplow contractors, this system will require equipment in each vehicle to be tracked, as well as central systems at the MassHighway District TOC and statewide TOC to receive and manage the tracking information.

CAD/AVL for Maintenance Vehicles (MassPike)

This initiative provides a CAD/AVL system for managing MassPike maintenance vehicles. This system will require equipment in each vehicle to be tracked, as well as a central system at the operations depots to receive and manage the tracking information.

2.5 Public Transportation: Transit Management

2.5.1 CAD/AVL FOR TRANSIT

This program area covers the provision of CAD/AVL systems for managing transit vehicles. This addresses the planned interfaces in the architecture between transit control centers and transit vehicles for agencies such as the Regional Transit Authorities and local transit services.

The systems to be implemented under this program area allow a dispatch center to track its vehicles in real-time and to manage its fleet more efficiently. This will be applicable to both fixed-route and paratransit operations centers. For fixed-route services, real-time tracking allows more efficient fleet management and allows the provision of real-time service status to passengers both pre-trip and en-route. For paratransit services, it allows more efficient dispatching and faster response time. This information is also used to provide real-time service status to passengers both pre-trip and en-route. The systems will require equipment in each vehicle to be tracked, as well as a central system at the dispatch center to receive and manage the tracking information. For the traveler information component, this system will also include a means for disseminating this information, such as electronic signs at shuttle stops or a websites with real-time information.

CAD/AVL for Transit Vehicles (BRTA)

This initiative provides a CAD/AVL system for managing BRTA transit vehicles, allowing the BRTA dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at the dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (FRTA)

This initiative provides a CAD/AVL system for managing FRTA transit vehicles, allowing the FRTA dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at the dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (GMTA)

This initiative provides a CAD/AVL system for managing GMTA transit vehicles, allowing the GMTA dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at the dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (PVTA)

This initiative provides a CAD/AVL system for managing PVTA transit vehicles, allowing the PVTA dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at the dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (Local Transit)

This initiative provides a CAD/AVL system for managing vehicles of “local transit” operators. In the architecture, this “local transit” entity represents non-RTA transit operators, such as city/town shuttles for elderly residents. This initiative will require equipment in each vehicle to be tracked, a central system at the local dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (Private Ground Transportation Providers)

This initiative establishes a CAD/AVL system for managing transit vehicles operated by private transit providers, allowing a transit dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at each dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

CAD/AVL for Transit Vehicles (Local/Regional School Districts)

This initiative establishes a CAD/AVL system for managing vehicles operated by Local/Regional School Districts, allowing the dispatch center to track its vehicles in real-time. This initiative will require equipment in each vehicle to be tracked, a central system at each dispatch center to receive and manage the tracking information, and a means for disseminating this information to the public.

2.5.2 TRAFFIC SIGNAL PRIORITY

This program area covers signal priority for buses operated by transit agencies within the study area. This addresses the planned interfaces between transit vehicles and traffic signal systems shown in the architecture.

The systems to be implemented under this program area require coordination between the relevant agency and the cities or towns in which signal priority will be requested for buses. Requests for traffic signal priority will be made to the traffic signal system controlled by the local city/town. This will occur either locally at the signal controller or through a request to the central system, if the signal is part of such a system. Depending on the type of system used, the system may include elements on the buses to identify them to the signal system, elements on the controller hardware in the field, elements in the central signal system, and the network infrastructure to support communications between these system elements.

Traffic Signal Priority (BRTA)

This initiative introduces signal priority for buses operated by the BRTA. This will require coordination with the City of Pittsfield and any other cities or towns in which signal priority will be requested for BRTA buses. Requests for traffic signal priority will be made to the traffic signal system controlled by the city/town.

Traffic Signal Priority (FRTA)

This initiative introduces signal priority for buses operated by the FRTA. This will require coordination with the Town of Greenfield and any other cities or towns in which signal priority will be requested for FRTA buses. Requests for traffic signal priority will be made to the traffic signal system controlled by the city/town.

Traffic Signal Priority (GMTA)

This initiative introduces signal priority for buses operated by the GMTA. This will require coordination with the Town of Greenfield and any other cities or towns in which signal priority will be requested for GMTA buses. Requests for traffic signal priority will be made to the traffic signal system controlled by the city/town.

Traffic Signal Priority (PVTA)

This initiative introduces signal priority for buses operated by the PVTA. This will require coordination with the City of Springfield and any other cities or towns in which signal priority will

be requested for PVTA buses. Requests for traffic signal priority will be made to the traffic signal system controlled by the city/town.

Traffic Signal Priority (Local Transit)

This initiative introduces signal priority for vehicles operated by "local transit" services. In the architecture, this "local transit" entity represents non-RTA transit operators, such as city/town shuttles for elderly residents. This will require coordination between the transit operator and MassHighway or the cities or towns in which signal priority will be requested for buses. Requests for traffic signal priority will be made to the traffic signal system controlled by MassHighway or a local city/town.

2.6 Public Transportation: Electronic Fare Payment

2.6.1 REGIONAL FARE CARD

This program area covers regional implementation of electronic fare payment for transit. The plan for EFP in the region is based around a Regional Fare Card that is interoperable among the various transit agencies. This fare card is further envisioned to be compatible with the regional fare card initiatives in other regions of the state, allowing the same card to be used on other RTA services across the state. As a lead implementing agency has not been identified, for the purposes of the architecture the regional fare card will be considered as a separate entity managed by a generic "Regional Fare Card agency."

This program area addresses the planned interfaces in the architecture between the Regional Fare Card and services operated by RTAs and other transit providers. The systems to be implemented under this program area will allow fares on these services to be deducted from the balance carried on the Fare Card. In addition to acceptance of the new media aboard the vehicles, the system will also support reconciliation of accounts between the transit operator and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (BRTA)

This initiative introduces acceptance of the planned Regional Fare Card on transit services operated by BRTA. In addition to acceptance of the new media aboard the buses, the system will support reconciliation of accounts between BRTA and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (FRTA)

This initiative introduces acceptance of the planned Regional Fare Card on transit services operated by FRTA. In addition to acceptance of the new media aboard the buses, the system will support reconciliation of accounts between FRTA and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (GMTA)

This initiative introduces acceptance of the planned Regional Fare Card on transit services operated by GMTA. In addition to acceptance of the new media aboard the buses, the system will support reconciliation of accounts between GMTA and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (PVTA)

This initiative introduces acceptance of the planned Regional Fare Card on transit services operated by PVTA. In addition to acceptance of the new media aboard the buses, the system will support reconciliation of accounts between PVTA and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (Local Transit)

This initiative introduces acceptance of the planned Regional Fare Card on local transit services. In addition to acceptance of the new media aboard the transit vehicles, the system will support reconciliation of accounts between the transit operator and the Regional Fare Card agency.

Regional Fare Card Integration for Transit Vehicles (Private Ground Transportation Providers)

This initiative introduces acceptance of the planned Regional Fare Card on private bus and shuttle services. In addition to acceptance of the new media aboard the vehicles, the system will support reconciliation of accounts between the private operator and the Regional Fare Card agency.

2.7 Traveler Information

2.7.1 REGIONAL TRAVEL INFORMATION

This program area covers the deployment of a regional travel information system, including a telephone-based system as well as other systems (e.g., websites, kiosks) covering the region's roadways and transit services. This program covers the regional implementation of the planned statewide 511 Travel Information System. This addresses the planned Travel Information Interactive Telephone System in the architecture, as well as its interfaces with MassHighway and Private Information Service Provider Operations Centers. The following initiative addresses this program area.

511 Travel Information System

This initiative covers the deployment of a public travel information system, covering the roadways and transit services in the region. The system will provide travel information consolidated from the various roadway and transit agencies in the region. A travel information website will supplement the information provided over the phone-based system. The proposed event reporting system, described in Section 2.1.1, can serve as a source of data for this system, allowing event information to be collected from the various participating agencies for dissemination to the public via the telephone system and the associated website.

The participating agencies are the following:

- *Roadway Agencies:*
  - Massachusetts Highway Department (MassHighway)
  - Massachusetts Turnpike Authority (MassPike)
  - City of Springfield
  - City of Pittsfield
  - Town of Greenfield
  - Local Cities/Towns
- *Transit Agencies:*
  - Berkshire Regional Transit Authority (BRTA)
  - Franklin Regional Transit Authority (FRTA)
  - Greenfield-Montague Transportation Area (GMTA)
  - Pioneer Valley Transit Authority (PVTA)
  - Local Transit
  - Private Ground Transportation Providers

Although the lead agency for implementation will be MassHighway, all roadway and transit agencies in the region can provide information for dissemination through the system to be implemented under this program area. Examples of information to be provided include real-time

information on incidents and delays, as well as planned events such as construction, road closures, or traffic-generating special events.

2.7.2 AGENCY-SPECIFIC TRAVEL INFORMATION

This program area covers the development or expansion of travel information systems specific to particular roadway and transit agencies. This addresses planned components in the architecture relating to travel information dissemination, such as information kiosks and websites, as well as their interfaces with the appropriate travel information system.

The systems to be implemented under this program area consist of central information systems that serve as an agency's travel information repository, as well as the elements allowing dissemination of information to the public.

Travel Information Website (Local Cities/Towns)

This initiative establishes travel information websites for local cities/towns, covering the roadways under their jurisdiction. The websites can provide information, such as traffic advisories and CCTV images, from local TMCs as well as from statewide and regional control centers. The server for this website will obtain information from the central systems at the TMC for dissemination to the public via the internet.

Travel Information Kiosks (MassPike)

This initiative comprises the deployment of Travel Information Kiosks at service areas along the MassPike. The kiosks will provide travel information such as traffic conditions and weather advisories, as well as tourism information. These kiosks will require connections to central servers at the Turnpike Authority where the information will reside.

2.8 Emergency Management

2.8.1 EMERGENCY MANAGEMENT COORDINATION

This program area covers the extension of the Event Reporting and Video Integration Systems to support emergency management functions for the transportation systems in the region. This covers the planned center-to-center interfaces among emergency operations centers, as well as interfaces between emergency management and traffic/transit management centers. The following initiative addresses this program area.

Emergency Management Network

This initiative extends the functionality of the Event Reporting and Video Integration Systems to support emergency management functions. The participating agencies are those with roadway, transit, or emergency management functions, including the following:

- *Roadway Agencies:*
  - Massachusetts Highway Department (MassHighway)
  - Massachusetts Turnpike Authority (MassPike)
  - City of Springfield
  - City of Pittsfield
  - Town of Greenfield
  - Local Cities/Towns

- *Transit Agencies:*
  - Berkshire Regional Transit Authority (BRTA)
  - Franklin Regional Transit Authority (FRTA)
  - Greenfield-Montague Transportation Area (GMTA)
  - Pioneer Valley Transit Authority (PVTA)
  - Local Transit
  - Private Ground Transportation Providers
  - Local/Regional School Districts
  - Amtrak
- *Emergency Management Agencies:*
  - Local City/Town/County Public Safety
  - Massachusetts Emergency Management Agency (MEMA)
  - State Police

In emergency management, coordination among agencies may often require the transmission of sensitive or privileged information. This includes information that must remain restricted due to security concerns and that must be managed more securely. This initiative addresses this need by adding a secure layer to these systems, allowing sensitive information to be accessible only to users with appropriate privileges. Once a user's identification is established (e.g. through password or other means of verification), each user will be able to view information appropriate for his/her access level.

The initiative also extends the event reporting system, described in Section 2.1.1, to support new categories and protocols for information exchange. This includes incident information essential for emergency response (e.g. nature of event or threat, severity, etc.) as well as response information (e.g. units dispatched, response plans, route diversions, etc.). The initiative also includes the development of tools for evacuation planning and management, allowing a coordinated response in case of local or regional evacuations.

2.8.2 CAD/AVL FOR EMERGENCY MANAGEMENT

This program area provides Computer-Aided Dispatching/Automatic Vehicle Location systems for managing emergency vehicles. This addresses the planned interfaces in the architecture between emergency dispatch centers and emergency vehicles. The following initiative addresses this program area.

CAD/AVL for Emergency Vehicles (City/Town/County Public Safety)

This initiative provides a CAD/AVL system for managing emergency vehicles. This system will allow a local or regional emergency dispatch center to track its vehicles in real-time and to dispatch those vehicles in the most efficient manner. This initiative will require equipment in each vehicle to be tracked, as well as a central system at the dispatch center to receive and manage the tracking information.

2.8.3 TRAFFIC SIGNAL PREEMPTION

This program area covers signal preemption or priority for emergency vehicles. This addresses the planned interfaces between emergency vehicles and traffic signal systems shown in the architecture. This program area consists of this single initiative, detailed below.

Traffic Signal Preemption (City/Town/County Public Safety)

This initiative introduces signal priority on vehicles operated by City/Town/County Public Safety departments. This will require coordination between the relevant department and the agencies

operating traffic signals, namely local cities/towns. Requests for traffic signal preemption will be made to the traffic signal system. This will occur either locally at the signal controller or through a request to the central system, if the signal is part of such a system. Depending on the type of system used, the system may include elements on the vehicles to identify them to the signal system, elements on the controller hardware in the field, elements in the central signal system, and the network infrastructure to support communications between these system elements.

2.8.4 TRANSIT SAFETY

This program area covers the deployment of emergency call boxes at transit facilities. This addresses the planned emergency call box elements in the architecture, as well as the interfaces with the emergency call centers. The following initiative addresses this program area.

Emergency Call Boxes (BRTA, FRTA, GMTA, PVTA, Local Transit, Private Ground Transportation Providers)

This initiative comprises the deployment of emergency call boxes at transit facilities. Locations for deployment will include bus stops, terminals, and parking facilities. These call boxes will allow a voice connection to security personnel either at transit control centers or at relevant police dispatch centers. They will also support silent alarms, alerting security personnel to a problem without the need for voice communications. This initiative will require a communications interface between the call boxes and the dispatch center.

2.9 Archived Data Management

2.9.1 PLANNING DATA ARCHIVE COORDINATION

This program area covers the development of interfaces among the planning data archives held by transportation agencies in the region. This addresses the planned interfaces between the Office of Transportation Planning (OTP) archive and the other databases in the region. The following initiative addresses this program area.

Planning Data Archive

This initiative consists of the development of a system for coordinating the planning data archives for the transportation agencies in the region. The system will provide access to the planning data collected by roadway and transit agencies, the Regional Planning Agencies, and the Registry of Motor Vehicles. As envisioned by the architecture, OTP will serve as the regional archived data management system hub, holding information managed by OTP as well as providing a portal to the information held by other agencies. This initiative will require interfaces between OTP and each of the other participating agencies' databases. This will provide OTP with access to data held by the other agencies, and will provide the other agencies with access to data held by OTP. Moreover, this will also provide participating agencies with access to each others' data, allowing one RPA, for example, to access data held by an adjacent RPA through the system maintained by OTP.

3. IMPLEMENTATION STRATEGY

When implemented, the initiatives identified in the previous section will provide the integrated transportation system envisioned by the Regional ITS Architecture. However, due to limitations in resources and time, it is not possible to implement of all of these initiatives immediately. Therefore, this section recommends a strategy for the implementation of these initiatives, taking into account existing agency initiatives and program areas, regional needs, and potential for successful implementation.

Many initiatives in this plan, however, are identified for implementation by a single agency. For example, there are a number of initiatives that can be implemented independently by a local city or town, such as CAD/AVL for emergency vehicles, CAD/AVL for maintenance vehicles, or variable message signs. As these initiatives are independent of any other agency or organization, this implementation strategy does not address them. Prioritization of these initiatives will be the responsibility of the implementing agency, as only that agency will be able to determine how these initiatives fit into its overall capital and operational planning strategies.

Therefore, this strategy only addresses initiatives that require the participation of multiple agencies or organizations. For the purposes of this plan, the multi-agency initiatives have been sorted into two categories: “near-term” and “future.” The determination of which group an initiative falls into is based on a number of factors. The primary source is the Needs Analysis, in which specific initiatives were identified by agencies as high priority and in which a number of critical needs and themes were identified. In addition, initiatives of clear relevance to specific needs identified in the needs analysis were also given priority. However, in addition to an initiative’s priority and relevance, dependencies between initiatives must also be considered. For example, an initiative that has others dependent on its completion should be elevated in priority to avoid delays to these other initiatives.

The recommended “near-term” multi-agency initiatives are the following:

- Event Reporting System
- Video Integration System
- 511 Travel Information System
- Planning Data Archive

These include initiatives that are currently under development, as well as ones that are not ongoing but are seen as critical for the region. Specific considerations for each of the initiatives are discussed below:

- The ***Event Reporting System*** initiative has been identified for near-term implementation as it addresses interagency coordination, a key need identified through the architecture development process. In addition, as the system serves as a centralized information repository, it will be a source of data for other initiatives, such as the planned 511 Travel Information System and the planned Emergency Management Network. Implementation of this initiative, either as an expansion of the existing pilot system or as an independent effort, is therefore key to moving ahead with these other initiatives.

- The ***Video Integration System*** initiative addresses the need for interagency coordination by allowing the sharing of video images among agencies. The initiative also supports emergency management, which was identified as another regional need. This system can provide a source of data for the proposed 511 Travel Information website and the planned Emergency Management Network. Implementation of this system, either as an expansion of MIVIS or as an independent initiative, will support the development of these other important initiatives.

- The ***511 Travel Information System*** initiative is currently under development. This initiative also addresses the need for travel information, another need identified through the architecture development process.

- The ***Planning Data Archive*** initiative was identified for near-term implementation because it addresses the need for coordination of ITS data for planning purposes. During the architecture development process, regional planning stakeholders indicated that data being collected for operational purposes would have significant value for planning purposes, but that this data was not currently being utilized.

The remaining multi-agency initiatives are identified as future initiatives and are presented in Exhibit 3-1. As discussed previously, the determination of the initiatives as "future" rather than "near-term" is based primarily on the needs analysis. Therefore, if the needs of the region change, the classification of the initiatives should be reconsidered. For example, if a regional transit agency identifies a crucial need for traffic signal priority at a particular intersection, this initiative could be implemented in the near-term, as it does not depend on the completion of any other initiatives. If other initiatives are related, however, these should be considered. For example, if an RTA wishes to move integration of the Regional Fare Card to the near-term, coordination with similar initiatives by other RTAs will be a factor.

As Exhibit 3-1 shows, there are a number of initiatives that are shared by many agencies, such as the signal priority and Regional Fare Card integration initiatives. Although not required, coordinated implementation of initiatives across these agencies is recommended, since the agencies involved, as well as the public, would benefit from the coordinated approach and broad-based deployment.

Exhibit 3-1: Future Multi-Agency Initiatives

Functional Area	Initiative (*and Lead Agency*)
Traffic Management: Roadway	▪ Highway Probe Surveillance (MassHighway, MassPike, Regional Travel Information Services)
Traffic Management: Parking	▪ ETC Integration at Parking Facilities (BRTA) ▪ ETC Integration at Parking Facilities (PVTA) ▪ ETC Integration at Parking Facilities (Local Cities/Towns) ▪ Regional Fare Card Integration at Parking Facilities (BRTA) ▪ Regional Fare Card Integration at Parking Facilities (PVTA) ▪ Regional Fare Card Integration at Parking Facilities (UMass) ▪ Regional Fare Card Integration at Parking Facilities (Local Cities/Towns)
Public Transportation: Transit Management	▪ Traffic Signal Priority (BRTA) ▪ Traffic Signal Priority (FRTA) ▪ Traffic Signal Priority (GMTA) ▪ Traffic Signal Priority (PVTA) ▪ Traffic Signal Priority (Local Transit)
Public Transportation: Fare Payment	▪ Regional Fare Card Integration for Transit Vehicles (BRTA) ▪ Regional Fare Card Integration for Transit Vehicles (FRTA) ▪ Regional Fare Card Integration for Transit Vehicles (GMTA) ▪ Regional Fare Card Integration for Transit Vehicles (PVTA) ▪ Regional Fare Card Integration for Transit Vehicles (Local Transit) ▪ Regional Fare Card Integration for Transit Vehicles (Private Ground Transportation Providers)
Emergency Management	▪ Emergency Management Network ▪ Traffic Signal Preemption (City/Town/County Public Safety)

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4. ARCHITECTURE CONSISTENCY AND MAINTENANCE

The Implementation Plan discussed in the preceding section outlines a strategy for implementation of the ITS components contained in the architecture. However, it is recognized that in order for ITS implementation to be successful, ITS must be integrated into the mainstream transportation planning process. This section addresses two separate but related issues. The first is ensuring that when projects are developed, any ITS elements are consistent with the architecture. The second is maintaining the architecture so that it remains relevant and useful to stakeholders in the region. Both of these are valuable exercises, and both are also the subject of the federal rules and policies governing metropolitan planning.

As it did for the development of the architecture, the Office of Transportation Planning will take responsibility for the oversight of the architecture for Western Massachusetts. This approach recognizes the complexity of coordinating planning across three local planning regions. To be successful, this approach will require ongoing information exchange and collaboration among the stakeholders in this region.

This section outlines the approach by which OTP plans – in collaboration with stakeholders in the region – to address the federal consistency and maintenance requirements. This approach recognizes the importance of integrating ITS planning into the mainstream regional transportation planning process. Therefore, ensuring consistency between projects with ITS elements and the architecture is based on the MPO-oriented capital programming process, and maintaining the Regional ITS Architecture is designed to be responsive to updates of the long-term regional transportation plans and other planning activities. The following sections present the proposed approach.

4.1 Architecture Consistency

The United States Department of Transportation is responsible for ensuring that federal transportation dollars are used in a manner that is consistent with federal laws and regulations, including the Clean Air Act, the Americans with Disabilities Act, and others. As stated in the 2001 FHWA Rule and FTA Policy:

> "The final design of all ITS projects funded with highways trust funds shall accommodate the interface requirements and information exchanges as specified in the regional ITS architecture. If the final design of the ITS project is inconsistent with the regional ITS architecture, then the regional ITS architecture shall be updated."[1]

As with the other federal requirements, this ITS consistency policy means that if agencies seeking federal funds want to avoid costly delays during the approval and funding process, they need to be sure that the consistency requirement has been met. The objective of the policy is to help an agency at the earliest stage possible to realize the opportunities for collaboration with other stakeholders, to take advantage of synergies with projects under development at other agencies, and to avoid conflicts or duplication of effort.

The federal regulations also require that all ITS projects be based on a systems engineering analysis at a scale commensurate with the project scope, meaning that the more complex the project, the more complex the analysis. Such an analysis is typical of any transportation engineering project involving the application of advanced technology. While the architecture has relevance throughout the project development process, the discussion in this section focuses on the initial review for architecture consistency in the early stages of the process.

[1] Federal Highway Administration "Intelligent Transportation System Architecture and Standards; Final Rule" and Federal Transit Administration "National ITS Architecture Policy on Transit Projects; Notice" in Federal Register volume 66 number 5, Monday, January 8, 2001.

Since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, transportation planning has been driven by a set of rules governing metropolitan and statewide transportation planning. The path that leads from a project concept to federal approval and funding goes first through the regional planning process and then through the federal approval process. The former involves all of the work that leads up to submission of a project to a Metropolitan Planning Organization; the latter begins with the adoption by that MPO of a fiscally-constrained, prioritized set of projects known as a Transportation Improvement Program (TIP), and concludes with federal approval of the state TIP (STIP), which is an aggregation of TIPs from around the state, as shown in Exhibit 4-1. The process for addressing consistency with the Regional ITS Architecture is designed to fit into this existing transportation planning process. As such, this approach relies on existing collaborative relationships between each MPO and its local planning partners.

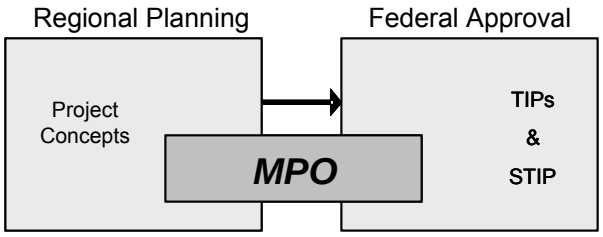

Exhibit 4-1: Project Planning Process

4.1.1 FEDERAL APPROVAL PROCESS

Because the rule/policy driving this process is focused on the final approval granted by FHWA and FTA, the description of the process begins with the federal approval phase. During the federal approval phase, each MPO submits its TIP to the state. In Massachusetts, the State Transportation Improvement Program (STIP) is an aggregation of the TIPs from around the state and the Executive Office of Transportation is responsible for submitting the STIP for approval by FHWA and FTA. The approach to addressing the consistency requirement that was developed by the Guidance Committee and Project Team was designed to fit into this process. As the discussion of the regional planning process explains, a project with ITS elements should not reach the TIP unless consistency has been addressed. As a result of addressing the issue before projects reach the TIP, each TIP that is submitted to EOT – and by extension the STIP – should be ready for federal approval with respect to the consistency issue.

4.1.2 REGIONAL PLANNING PROCESS

The regional planning process begins with project concepts. By the end of this stage, when the TIP is being developed, each MPO needs to be certain that the consistency requirement has been addressed for all projects that have ITS elements. Each MPO, therefore, will work with its planning partners during the regional planning process, when concepts are being developed for eventual inclusion in the TIP, to ensure that the consistency issue is addressed. It should be noted that the planning process that currently exists already emphasizes collaboration among the different entities involved, which is the intent of the architecture consistency policy.

As planning practices vary by region, differences are expected among the MPOs in Massachusetts but in general it is expected that the focus will be on whichever agency or entity assumes responsibility for a project concept's development. The role of "project proponent" is often assumed by a Regional Transit Authority or MassHighway District office, which often facilitate the development of a concept. Consultants and contractors, who often provide extensive technical assistance, could also occupy this niche on behalf of their client, as could the individual municipalities that often champion specific projects. Regardless of who acts as the project

proponent, however, the MPO will want to know if a project that has ITS elements is consistent with the architecture. Based on input from MPO participants in each region, it is anticipated that this will be handled through the project submission forms employed by each MPO. These forms, which document many project attributes, vary among the MPOs. By adding architecture consistency as an additional attribute, the MPOs can ensure that the consistency requirement is addressed within existing planning practices.

In this context, it is necessary to differentiate roadway and transit projects, because the paths through which they reach the MPO are different in some respects. Transit projects are developed and eventually submitted by transit authorities in the region. Each transit authority develops a list of capital projects, which depend on funds over which the MPO has authority. For all kinds of projects but especially for major projects, the authorities tend to work closely with the Federal Transit Administration, and proposals are often scrutinized closely for various policy issues before they reach the TIP. In most cases, therefore, the authority acts as a project proponent. When projects are submitted for inclusion in the TIP, regardless of scope or funding type, the transit authority, as project proponent, will document whether or not the project has ITS elements and, if it does, that the transit authority affirms that they are consistent with the architecture.

In contrast, aside from major highway improvements, roadway projects tend to begin with an advocate such as a city or town within the region proposing an idea to the appropriate MassHighway District office. In general, therefore, the Districts will serve as the project proponent for most roadway projects from the region that will eventually reach the TIP. When roadway projects are submitted for inclusion in the TIP, the District, as the project proponent, will document whether or not each project has ITS elements and, if it does, will affirm that they are consistent with the architecture.

For roadway projects, there is another piece of the regional planning process that happens to benefit the consistency requirement. A Project Initiation Form (PIF), required of all project concepts, is often drafted by the project advocate and completed by the District, which then submits each PIF to a statewide Project Review Committee. This creates an additional opportunity to ensure that the project proponent has examined the project for consistency with the architecture.

The two-stage architecture consistency process is illustrated in Exhibit 4-2.

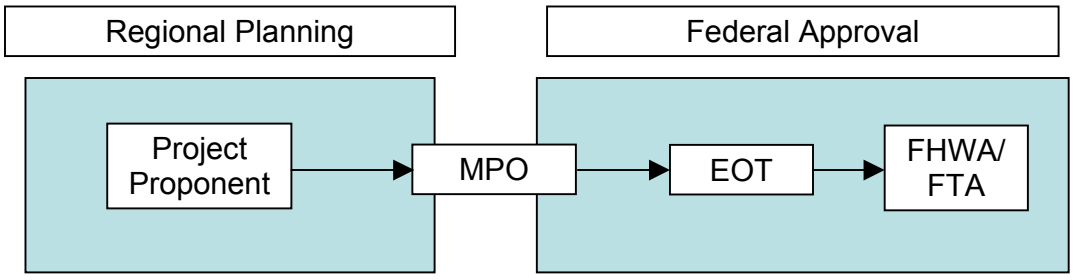

Exhibit 4-2: Regional Planning and Federal Approval Process

In addition to this initial review in the early stages of the project development process, consistency with the architecture must be revisited as a project develops further in order to ensure that it has not been affected by changes to the scope of the project. Moreover, as a project progresses into the design stage, it must undergo a systems engineering analysis, as is typical of ITS projects and as is required by the federal Rule and Policy.

A note about the term "consistency":

Because of the superficial similarity to air quality conformity, it is important to clarify the differences between the terms consistency and conformity. Whereas air quality goals are definitive and fixed,

the Regional ITS Architecture is a dynamic product of the transportation planning process. The goal of air quality conformity is, in large part, to filter out detrimental projects; the intent of the ITS consistency policy is to ensure that when actual projects are developed and become candidates for federal funding, the technical and institutional aspects are consistent with the architecture. A project may prompt a modification to the architecture, as discussed in Section 4.2.2, or may be revised to be consistent with the architecture. As such, demonstrating consistency places a great emphasis on considering the relationship between a project and the architecture as early and as often as possible.

4.2 Architecture Maintenance

Comparable to a Regional Transportation Plan (RTP), the Regional ITS Architecture is a vision of the future transportation system, documented at one point in time. The architecture, like an RTP, reflects the current situation and documents planned changes or investments. However, in order to remain relevant, the architecture has to be maintained. As regional needs evolve, as planned elements are deployed, and as other changes occur, the architecture must be updated to reflect those developments. Maintenance of the architecture is also motivated by federal requirements that require consistency between all federally funded projects with ITS elements and the Regional ITS Architecture.

This section describes how the architecture will be maintained so that it remains relevant to the transportation system and useful to planners and operators. The maintenance strategy relies on two elements. The first is a formal periodic update at the same frequency as the RTPs, which are currently on a three-year update cycle. However, since the RTPs will provide valuable input to the architecture, the architecture update process will be staggered to occur after the RTP update. The second is interim architecture modifications that may occur at any point in the update cycle, outside of the formal update process. This two-pronged approach will have the added benefit of sustaining an ongoing region-wide dialogue about ITS.

The Office of Transportation Planning, which has led the initial development of the Regional ITS Architecture, will be responsible for the maintenance of the architecture. However, other stakeholders will be involved, as they have been throughout the development process. The maintenance strategy describes who will be involved and what responsibilities transportation stakeholders in the region should assume.

4.2.1 PERIODIC ARCHITECTURE UPDATES

Under this strategy, the Regional ITS Architecture will be formally revisited on the same cycle as the Regional Transportation Plan updates (currently every three years), with timing that allows the architecture update to take a revised RTP into consideration. In this way, it is expected that the revised architecture can incorporate new ideas and/or projects that are included in an updated RTP.

The Office of Transportation Planning will initiate the Regional ITS Architecture update process with a request for information from stakeholders in the region regarding new ITS-related projects, initiatives, or needs. OTP will also gather information from the stakeholders in order to evaluate the status of the architecture's implementation, identifying, for example, ITS elements or interfaces that have evolved from "planned" to "existing" or that are no longer relevant and should be removed.

Based on the information gathered through this process, OTP will generate a draft list of architecture modifications and distribute it to the stakeholders for review. OTP can then call a stakeholder meeting for the region to review the draft list. This meeting can also provide an opportunity to discuss emerging ITS issues. After the stakeholder review of the draft list, OTP will make any modifications necessary and release the updated architecture.

4.2.2 INTERIM ARCHITECTURE MODIFICATIONS

Just as project developments necessitate TIP amendments, it is anticipated that some modifications to the architecture will be needed during the interval between the periodic updates. Therefore, on the basis of project developments or other circumstances that require modifications, the project proponent will be responsible for drafting an architecture modification proposal and submitting it to OTP. The proposal will then be circulated to affected stakeholders for their review. It is expected that most architecture modifications, whether periodic or interim, will involve adding new ideas, dimensions, or stakeholders to existing market packages, interfaces, or functions.

4.2.3 SUMMARY

This maintenance strategy is meant to accomplish several objectives. First, it ensures that the architecture will remain current and will reflect the most recent Regional Transportation Plans. Second, it allows the architecture to be responsive to changes between updates. And third, it helps facilitate an ongoing dialogue about ITS and the implementation of the architecture. Through the interim modifications and the periodic updates, this strategy should help to integrate ITS into the mainstream transportation planning process.

5. CONCLUSION

This Implementation Plan outlines a strategy for achieving the integrated transportation system envisioned by the Western Massachusetts Regional ITS Architecture. The strategy consists of a number of program areas for ITS investment, a series of initiatives within each program area, recommendations for prioritization of these projects, and a plan for maintaining the architecture. It is important to note that the strategy recommended is a direct outcome of the architecture development process, which originates with an analysis of the needs of the region and its stakeholders, and which relies on stakeholder input throughout the entire process.

It is also important to note that the plan presented is not the only means by which the architecture can be implemented. While some of the projects in the plan are currently being designed and implemented, others are recommendations for addressing the needs and planned components identified in the architecture development process. The architecture is meant to be a living document that is updated on a recurring basis to reflect the changing needs and priorities of the region. Therefore, as the region's needs and the architecture change, the priorities of the various initiatives will change as well. For this reason, continued involvement of all the stakeholders in the region is essential in maintaining the Regional ITS Architecture and its recommendations and priorities.