Michigan Department of Transportation
Regional ITS Architectures and Deployment Plans

SEMCOG

MDOT Metro Region and Portions of University

Final
Regional ITS Architecture

Prepared for:

MDOT

SEMCOG
Southeast Michigan Council of Governments

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CAMBRIDGE SYSTEMATICS

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TABLE OF CONTENTS

FINAL REGIONAL ITS ARCHITECTURE REPORT – SEMCOG

TABLE OF CONTENTS

FINAL REGIONAL ITS ARCHITECTURE REPORT – SEMCOG

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
AD	Archive Data
AHS	Automated Highway System
AMBER	America's Missing: Broadcast Emergency Response
APTA	American Public Transportation Association
APTS	Advance Public Transportation Systems
ASC	Actuated Traffic Signal Controller
ASTM	American Society for Testing and Materials
ATIS	Advance Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
AVSS	Advance Vehicle Safety Systems
AWOS	Automated Weather Observing System
CBP	U.S. Customs and Border Protection
CCTV	Closed Circuit Television
CJIC	Criminal Justice Information Center
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion Management Process
C-TPAT	Customs-Trade Partnership Against Terrorism
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DATEX-ASN	Data Exchange in Access Service Network (AP-DATEX)
DCM	Data Collection and Monitoring
DDOT	Detroit Department of Transportation
DMS	Dynamic Message Sign
DNR	Department of Natural Resources
DPW	Department of Public Works
DSRC	Dedicated Short Range Communication
DTC	Detroit Transportation Corporation

LIST OF ACRONYMS

DTW	Detroit Metropolitan Wayne County Airport
EM	Emergency Management
EMS	Emergency Management System
EOC	Emergency Operations Center
ESS	Environmental Sensor Station
FAST/NEXUS	Free and Secure Trade Program
FCP	Freeway Courtesy Patrol
FHWA	Federal Highway Administration
FMS	Field Management Stations
FTA	Federal Transit Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
HOV	High Occupancy Vehicle
HRI	Highway Rail Intersection
ICM	Integrated Corridor Management
IEEE	Institute of Electrical and Electronics Engineers
IFTA	International Fuel Tax Agreement
IMMS	Incident Management Message Sets
IPO	ITS Program Office
IRP	International Registration Plan
ISP	Information Service Provider
ITE	Institute of Transportation Engineers
IT IS	International Traveler Information Systems
ITS	Intelligent Transportation System
LRTP	Long Range Transportation Plan
MAC	Medium Access Control
MC	Maintenance and Construction
MDT	Mobile Data Terminal
MDOT	Michigan Department of Transportation
MIOC	Michigan Intelligence Operations Center

LIST OF ACRONYMS

MITSC	Michigan Intelligent Transportation Systems Center
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MS/ETMCC	Message Sets for External Traffic Management Center Communications
MSP	Michigan State Police
MTA	Mass Transportation Authority
MTO	Province of Ontario Ministry of Transportation
NEMA	National Emergency Management Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
NWS	National Weather Service
ODOT	Ohio Department of Transportation
PIP	Partner's in Protection
RCMC	Road Commission of Macomb County
RCOC	Road Commission for Oakland County
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible and Efficient Transportation Equity Act – A Legacy for Users
SCATS	Sydney Coordinated Adaptive Traffic System
SCCOTS	St. Clair County Transportation Study
SCP	Signal Control and Prioritization
SDO	Standards Development Organization
SEMCOG	Southeast Michigan Council of Governments
SEMSIM	Southeast Michigan Snow and Ice Management
SMART	Suburban Mobility Authority for Regional Transportation
SSRS	Single State Registration System
STMF	Simple Transportation Management Framework
TARTA	Toledo Area Regional Transit Authority
TCP/IP	Transmission Control Protocol/Internet Protocol
TEA-21	Transportation Equity Act for the 21st Century
TIA	Traffic Improvement Association

LIST OF ACRONYMS

TMACOG	Toledo Metropolitan Area Council of Governments
TMC	Transportation Management Center
TMDD	Traffic Management Data Dictionary
TOC	Traffic Operations Center
TSC	Transportation Service Centers
TSS	Transportation Sensor System
UDP/IP	User Datagram Protocol/Internet Protocol
UMTRI	University of Michigan Transportation Research Institute
USDOT	United States Department of Transportation
UTCS	Universal Time, Coordinated Synchronization
VII	Vehicle Infrastructure Integration
VIVDS	Vehicle Imaging Video Detection Systems
WATS	Washtenaw Area Transportation Study
XML	Extensible Mark-up Language

1 Introduction

1.1 Project Overview

Development of a regional intelligent transportation system (ITS) architecture is one of the most important steps in planning for and implementing ITS in a region. ITS architectures provide a framework for implementing ITS projects, encourage interoperability and resource sharing among agencies, identify applicable standards to apply to projects, and allow for cohesive long-range planning among regional stakeholders. The ITS architecture allows stakeholders to plan for what they want their system to look like in the long-term, and then break out the system into smaller, more modular pieces that can be implemented over time as funding permits.

ITS architectures satisfy the conformity requirements first established in the Transportation Equity Act for the 21st Century (TEA-21) highway bill and continued in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) bill passed in 2005. In response to Section 5206(e) of TEA-21, the Federal Highway Administration (FHWA) issued a final rule and the Federal Transit Administration (FTA) issued a final policy that required regions implementing any ITS projects using federal funds to have an ITS architecture in place by April 2005. After this date, any ITS projects must show conformance with their regional ITS architecture in order to be eligible for funding from FHWA or FTA. Regions that had not yet deployed ITS were given four years to develop an ITS architecture after their first ITS project proceeded to final design.

In July 2007, the Michigan Department of Transportation (MDOT) began an update of the Southeast Michigan Council of Governments (SEMCOG) Regional ITS Architecture. The Regional ITS Architecture has the same geographic boundaries of the SEMCOG Region and focuses on a 10-15 year vision of ITS for the Region. In addition, a separate ITS Deployment Plan was developed to identify and prioritize specific ITS projects recommended for the Region in order to implement the ITS architecture.

The update of the ITS Architecture and the development of the ITS Deployment Plan occurred with significant input from local, state, and federal officials. A series of workshops were held to solicit input from stakeholders and ensure that the plans reflected the unique needs of the Region. The draft reports are being provided to all stakeholders for comment. The Regional ITS Architecture and Deployment Plan will reflect an accurate snapshot of existing ITS deployments and future ITS plans in the Region. Needs and priorities of the Region will change over time and in order to remain effective this plan should be periodically reviewed and updated.

1.2 Document Overview

The SEMCOG Regional ITS Architecture report is organized into five key sections:

Section 1 – Introduction

This section provides an overview of the National ITS Architecture requirements, the SEMCOG Regional ITS Architecture, and the key features and stakeholders in the SEMCOG Region.

Section 2 – Regional ITS Architecture Development Process

An overview of the key steps involved in updating the ITS Architecture for the SEMCOG Region is provided in this section. It includes a discussion of stakeholder involvement, architecture workshops, and the architecture update process.

Section 3 – Customization of the National ITS Architecture for the SEMCOG Region

This section contains a summary of regional needs and details the customization of the National ITS Architecture to meet the ITS vision for the Region. The market packages that were selected for the Region are included in this section and interconnects are presented, including the "sausage diagram" showing the relationships of the key subsystems and elements in the Region.

Section 4 – Application of the Regional ITS Architecture

Functional requirements and standards that apply to the Region, as indicated by the Regional ITS Architecture, are presented in Section 4. Operational concepts identifying stakeholder roles and responsibilities have been prepared and potential agreements to support the sharing of data and resources will be identified.

Section 5 – Maintaining the Regional ITS Architecture

A use and maintenance plan will be developed for the SEMCOG Regional ITS Architecture and included in this section. The plan will outline the procedure for updating the ITS architecture over time.

The SEMCOG Regional ITS Architecture also contains five appendices:

- Appendix A – National ITS Architecture Market Package Definitions;
- Appendix B – Customized Market Packages;
- Appendix C – Element Functional Requirements;
- Appendix D – Stakeholder Database;
- Appendix E – Architecture Maintenance Documentation Form; and
- Appendix F – Response to FHWA and R.C. Ice Associates Comments.

1.3 Assessment

The SEMCOG Region ITS Architecture and Deployment Plan, has been assessed based on twelve items derived from both the April 8, 2001 USDOT ITS Architecture and Standards Conformity Rule/Policy and from the architecture development process described in the *Regional ITS Architecture Guidance Document*. A listing of these items is shown in **Table 1**.

Table 1 – Summary of Architecture Assessment Categories

Content Criteria	Architecture Implementation Criteria
1. Architecture Scope	8. Implementation Plan (use)
2. Stakeholder Identification	9. Maintenance Plan
3. System Inventory	10. Agreements
4. Needs and Services	11. Standards Identification
5. Operational Concept	12. Project Sequencing
6. Functional Requirements	
7. Interfaces/Flows	

1.4 The SEMCOG Region

1.4.1 Geographic Overview

The SEMCOG Region is defined by the boundaries of Ohio to the south, Lake Erie and Lake Huron to the east, and the MDOT Bay Region to the north. The SEMCOG Region as defined for the Regional ITS Architecture and Deployment Plan corresponds to the metropolitan planning area covered by SEMCOG which encompasses the MDOT Metro Region and a portion of the University Region. It is bounded to the west by the remainder of the University Region. As shown in **Figure 1,** the Region encompasses seven counties including Macomb, Oakland, Wayne, St. Clair, Monroe, Livingston, and Washtenaw.

The largest cities within the SEMCOG Region are Detroit, Warren, Sterling Heights, and Ann Arbor. Significant cities that are located just beyond the regional boundaries include Flint to the north, Lansing to the northwest, Toledo, Ohio to the south, and Windsor, Ontario, Canada to the east. This geographic location not only requires interregional coordination within Michigan, but partnerships across state lines and the national border. There are several other smaller communities that make up the Detroit Metro area and several transit authorities and public safety agencies are encompassed within the geographic boundaries of the Region. When developing the stakeholder group, the project team coordinated with MDOT and SEMCOG to invite the appropriate cities, counties, state and federal agencies, and area transit providers. **Table 2** in Section 1.4.4 identifies the stakeholders that have participated in the process to date.

When updating the architecture, a 20-year vision for ITS in the Region was documented. In the ITS Deployment Plan, the 20-year time frame was broken down into smaller time periods to prioritize and sequence the projects. The naming convention used for elements in the SEMCOG Regional ITS Architecture is consistent with the naming convention that is used in the Superior, Bay, Grand, North, and Southwest Regions and the Statewide ITS Architecture. There was also an effort to coordinate the naming conventions with the Toledo Metro Area Regional ITS Architecture where feasible. This consistency provides seamless connections to those other architectures without requiring that they be specifically called out. Statewide initiatives, such as statewide commercial vehicle operations and 511 traveler information service, are referenced in the Regional ITS Architecture, but will be addressed in further detail in the Statewide ITS Architecture.

1.4.2 Transportation Infrastructure

The Region is served by several State and Federal highways. As illustrated in **Figure 1**, the primary freeway facilities include I-75, I-94, I-69, I-96, I-275, I-696, US 23, and US 24. Additional primary state route facilities in the SEMCOG Region include M-10, M-14, M-39, and M-59.

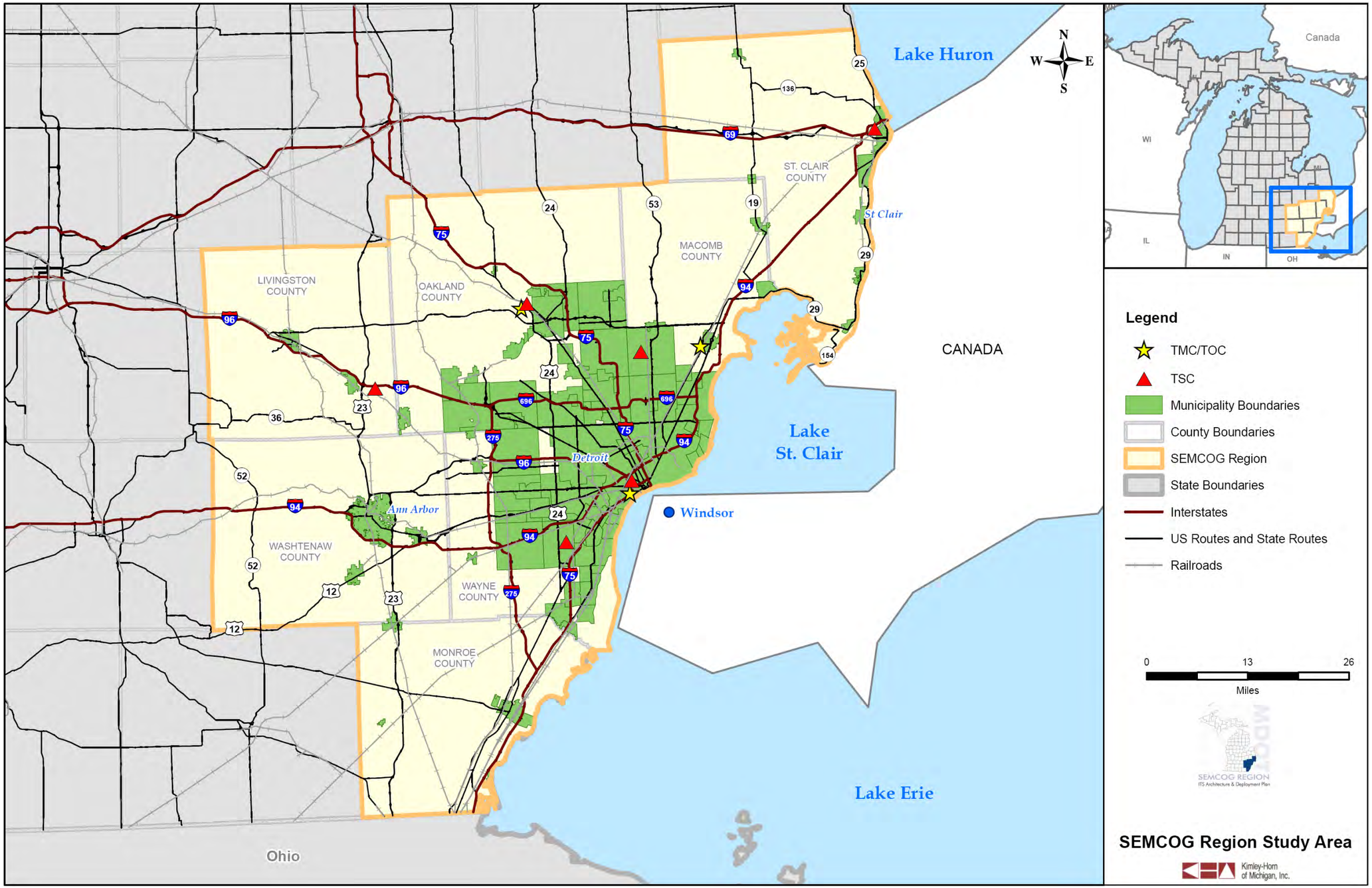
I-75 is a major north-south roadway that begins in Ft. Lauderdale, Florida and continues on to the Canadian border in Sault Ste Marie, Michigan where it terminates at Trans-Canada 17. In the SEMCOG Region, I-275 is a spur that diverges in Monroe County and running north where it merges with I-96 for a short period before ending at the junction with I-696. I-94 is the northernmost east-west interstate and runs from I-90 in Billings, Montana to Port Huron, Michigan where it ends at the U.S. side of the Blue Water Bridge. I-96 is located entirely within the state of Michigan and runs from Norton Shores on the western coast of the Lower Peninsula to I-75 near the Ambassador Bridge in Detroit. In the Detroit metro area, I-696 is a spur that connects I-96 on the west end with I-94 on the east. I-69 is connection from the Canadian border in Port Huron and runs through Lansing where it turns southwest and connects into Indianapolis, Indiana.

US 23 extends from Jacksonville, Florida to Mackinaw City, Michigan. In the SEMCOG Region, US 23 serves as a significant north-south connector from Toledo, Ohio through Ann Arbor to Flint. US 24 serves as both a north-south and east-west route across the United States linking I-75 in Clarkston, Michigan to I-70 in Minturn, Colorado. US 12 begins at the intersection of Michigan and Cass in downtown Detroit and extends 2500 miles to US 101 in Aberdeen, Washington. Certain segments of this corridor run concurrently with I-94 and I-90. In the SEMCOG Region, it diverges from I-94 just east of Ann Arbor and serves as a possible alternate route for the I-94 corridor.

Along with a focus on the roadway facilities, it is important to note the impact of border crossings on transportation in the SEMCOG Region. The Blue Water Bridge in Port Huron and the Ambassador Bridge and Detroit Windsor Tunnel located in Detroit can all have a direct impact on the operations of the roadway network and require close coordination with the other transportation agencies. These border crossings also introduce a level of security that is not an issue in most of the regions. The Superior Region must be concerned with security at the International Bridge in Sault Ste. Marie, but the volume of vehicles crossing in to the Upper Peninsula does not compare with the traffic handled by the three border crossings in the SEMCOG Region.

Transit Authorities also play a role in the transportation infrastructure of the SEMCOG Region. Not only is it important to recognize the local agency transit authorities within the region, but also with MTA in Genesee County that coordinates with several of these agencies. Whether they have a regional or local focus, most of the agencies are currently utilizing technology to improve operations and therefore need to be accurately captured in the regional architecture.

Figure 1 – SEMCOG Regional Boundaries



1.4.3 SEMCOG Regional ITS Plans

The existing Regional ITS Architecture for the SEMCOG Region was adopted in 2002 and was created based on Version 4.0 of the National Architecture and Version 2.0 of the Turbo Architecture software. This architecture has been referenced by several agencies to deploy multiple technology projects throughout the region. In 2007, SEMCOG and MDOT partnered to hire a consultant to oversee a major update to the existing regional architecture based on Version 6.0 of the National Architecture and Version 4.0 of Turbo Architecture.

It is important to recognize the initial deployment of ITS infrastructure in a region because as of April 2005, in order for a region to receive funding for ITS projects from the Highway Trust Fund, the United States Department of Transportation (USDOT) requires that the region have an ITS architecture developed. This requirement only applies to regions with existing deployed ITS infrastructure. For regions that do not have any ITS infrastructure deployed, the USDOT requires that they have an ITS architecture within four years of their first ITS project entering final design.

The SEMCOG Region met this requirement with its initial architecture. Examples of implementations in the Region include closed circuit television (CCTV) for surveillance, dynamic message signs (DMS), and interconnected signal systems. As the SEMCOG Region pursues funding opportunities for additional projects, it will be necessary to show that a project fits within the ITS architecture developed for the Region.

1.4.4 Stakeholders

Due to the fact that ITS often transcends traditional transportation infrastructure, it is important to involve non-traditional stakeholders in the architecture update and visioning process. Input from these stakeholders, both public and private, is a critical part of defining the interfaces, integration needs, and overall vision for ITS in a region.

Table 2 contains a listing of stakeholders in the SEMCOG Region who have participated in the project workshops or provided input to the study team as to the needs and issues that should be considered as part of the Regional ITS Architecture. Other stakeholders that were invited to participate but were not able to attend were provided minutes of workshops and copies of reports to encourage their participation as much as possible. **Appendix D** contains a copy of the stakeholder database and workshop attendance records.

Table 2 – SEMCOG Stakeholder Agencies and Contacts

Stakeholder Agency	Address	Contact
AAA Michigan	1 Auto Club Drive Dearborn, MI 48126	Robert Lariviere
Alcatel-Lucent	1439 Pintail Court Owosso, MI 48867	Mark Semans
Ann Arbor Transportation Authority	2700 South Industrial Hwy Ann Arbor, MI 48104	Janet Hallberg
Centra/Ambassador Bridge Corporation	P.O. Box 32666 Detroit, MI 48232	Skip McMahon
City of Ann Arbor	100 North Fifth Avenue Ann Arbor, MI 48104	Les Sipowski
City of Ann Arbor	100 North Fifth Avenue Ann Arbor, MI 48104	Pat Cawley
City of Detroit Department of Public Works	2633 Michigan Avenue Detroit, MI 48226	Sunny Jacob
City of Wayne	33701 Michigan Avenue Wayne, MI 48184	Bruce Wolfgram
City of Windsor	350 City Hall Square West Windsor, Ontario N9A 6S1	John Wolf
DDOT	1301 E. Warren Detroit, MI 48207	Wilfred Beal
Detroit Port Authority	8109 East Jefferson Avenue Detroit, MI 48214	Steven Olinek
Detroit Windsor Tunnel LLC	100 East Jefferson Detroit, MI 48226	Robert Howell
Detroit Windsor Tunnel LLC	100 East Jefferson Detroit, MI 48226	Jerry Prudden
FHWA – HAD MI	400 Seventh Street, SW Washington, DC 20590	Tim Crothers
FHWA – Michigan	315 West Allegan, Suite 201 Lansing, MI 48933	Morrie Hoevel
Genesee County Metropolitan Planning Commission	1101 Beach Street, RM 223 Flint, MI 48502	Sharon Gregory
Genesee County Metropolitan Planning Commission	1101 Beach Street, RM 223 Flint, MI 48502	Jason Nordberg
Hubbell, Roth & Clark, Inc.	PO Box 824 Bloomfield Hills, MI 48303-0824	Richard Beaubien
Hubbell, Roth & Clark, Inc.	PO Box 824 Bloomfield Hills, MI 48303-0824	Beata Lamparski
Kimley-Horn	7878 N 16th St Phoenix, AZ 85020	Stewart Allen
MDOT – Blue Water Bridge	1410 Elmwood Port Huron, MI 48060	Michael Szuch
MDOT – Blue Water Bridge	1410 Elmwood Port Huron, MI 48060	Meghan Vohs
MDOT – Brighton TSC	10321 East Grand River, Suite 500 Brighton, MI 48116	Wendy Ramirez
MDOT – Detroit TSC	1400 Howard Street Detroit, MI 48216	Rita Screws
MDOT – ITS Program Office	425 West Ottawa Street, Mail Code B235 Lansing, MI 48933	Greg Krueger

Table 2 – SEMCOG Stakeholder Agencies and Contacts

Stakeholder Agency	Address	Contact
MDOT – ITS Program Office	425 West Ottawa Street, Mail Code B235 Lansing, MI 48933	Collin Castle
MDOT – Metro Region	18101 West Nine Mile Road Southfield, MI 48116	Michele Mueller
MDOT – Metro Region	18101 West Nine Mile Road Southfield, MI 48116	Jim Schultz
MDOT – Metro Region	18101 West Nine Mile Road Southfield, MI 48116	Matt Smith
MDOT – Oakland TSC	2300 Dixie Highway, Suite 300 Waterford, MI 48328	Steve Stramsak
MDOT – Port Huron TSC	2127 11th Avenue Port Huron, MI 48060	Larry Young
MDOT – University Region	4701 West Michigan Avenue Jackson, MI 49201	Stephanie Palmer
MDOT – University Region	4701 West Michigan Avenue Jackson, MI	Jennifer Foley
Monroe County Road Commission	840 South Telegraph Road Monroe, MI 48161	Janeen Abar
ODOT District 2	317 East Poe Road Bowling Green, OH 43402	Michael Stormer
Road Commission for Oakland County	1200 North Telegraph, West 49 Pontiac, MI 48341	Dawn Bierlien
Road Commission for Oakland County	1200 North Telegraph, West 49 Pontiac, MI 48341	Danielle Deneau
Road Commission of Macomb County	117 South Groesbeck Highway Mount Clemens, MI 48043	Adam Merchant
Road Commission of Macomb County	117 South Groesbeck Highway Mt. Clemens, MI 48043	Russell Kudela
Road Commission of Macomb County	117 South Groesbeck Highway Mt. Clemens, MI 48043	Ken Webb
SEMCOG	535 Griswold Street, Suite 300 Detroit, MI 48226	Tom Bruff
SEMCOG	535 Griswold Street, Suite 300 Detroit, MI 48226	Wei Chen
SEMCOG	535 Griswold Street, Suite 300 Detroit, MI 48226	Sayeed Mallick
Suburban Mobility Authority for Regional Transportation (SMART)	660 Woodward Avenue, Suite 900 Detroit, MI 48226	Steve Brown
Suburban Mobility Authority for Regional Transportation (SMART)	2021 Barrett Street Troy, MI 48084	Steve Fern
University of Michigan Transportation Research Institute (UMTRI)	2901 Baxter Road Ann Arbor, MI 48109	Ralph Robinson
Washtenaw Area Transportation Study	705 North Zeeb Road Ann Arbor, MI 48103	Terri Blackmore
Washtenaw Area Transportation Study	705 North Zeeb Road Ann Arbor, MI 48103	Ryan Buck
Wayne County Airport Authority	Detroit/Wayne County Metropolitan Airport LC Smith Terminal - Mezzanine Level Detroit, MI 48242	Lynn Blumenberg

Table 2 – SEMCOG Stakeholder Agencies and Contacts

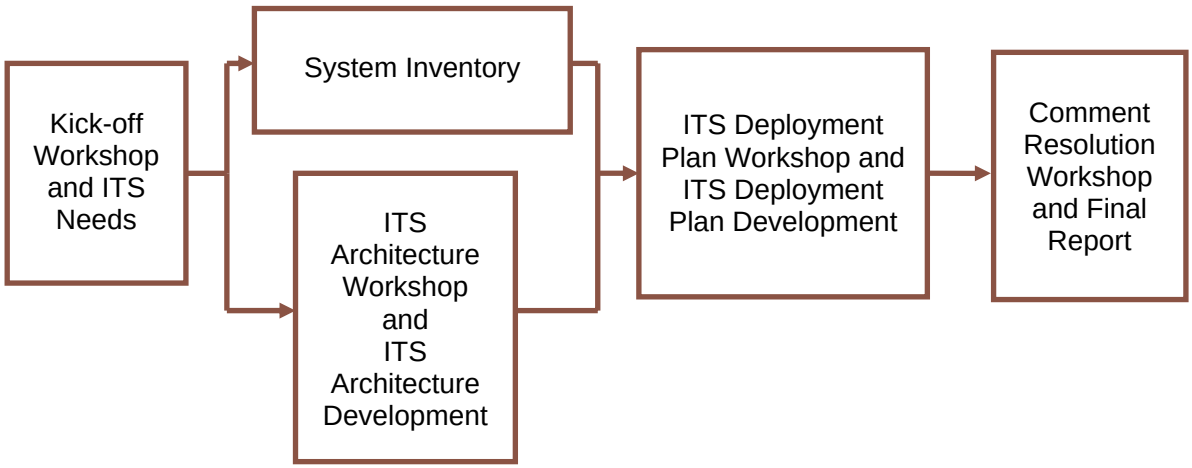
Stakeholder Agency	Address	Contact
Wayne County Detroit Metro A/P Communications	10250 Middle Belt Romulus, MI 48174	Jim Osborn
Wayne Police Department	33701 Michagan Avenue Wayne, MI 48184	John Williams
Wayne State University	2168 Engineering Building Detroit, MI 48201	Snehamay Khasnabis

2 Regional ITS Architecture Development Process

The update of the Regional ITS Architecture and Deployment Plan for the SEMCOG Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A series of four workshops were held with stakeholders to gather input, and draft documents will be made available to stakeholders for review and comment.

The process followed for the SEMCOG Region was designed to ensure that stakeholders could provide input and review for the update of the Region's ITS Architecture and development of the Deployment Plan. **Figure 2** illustrates the process followed.

Figure 2 – SEMCOG Regional ITS Architecture and Deployment Plan Development Process



A total of four workshops with stakeholders over a period of eleven months were used to update the SEMCOG Regional ITS Architecture and develop the Deployment Plan. These workshops included:

- Kick-Off Workshop, October 22, 2007;
- Regional ITS Architecture Development Workshop, February 13, 2008;
- ITS Deployment Plan Workshop, May 12, 2008; and
- Comment Resolution Workshop, October 7, 2008.

Key components of the process are described below:

Task 1 – Kick-Off Workshop and ITS Needs: A stakeholder group was identified that included representatives from regional transportation, transit, and emergency management agencies. The group was invited to the project Kick-Off Workshop where ITS needs for the Region were identified.

Task 2 – System Inventory: Collecting information for the system inventory began at the Kick-Off Workshop through discussions with the stakeholders to determine existing and planned ITS elements in the Region. Several existing documents were referenced after the Kick-Off Workshop, and follow-up calls were conducted with several local stakeholders to gather additional input.

Task 3 – ITS Architecture Workshop and ITS Architecture Development: The purpose of the Regional ITS Architecture Workshop was to review the system inventory with stakeholders and update the SEMCOG Regional ITS Architecture. Training on the National ITS Architecture was integrated into the workshop so that key elements of the architecture, such as market packages, could be explained prior to the selection and editing of these elements. The result of the Regional ITS Architecture Workshop was an ITS Architecture for the SEMCOG Region that included a system inventory,

interconnect diagrams, customized market packages, functional requirements, and relevant ITS standards. Following the workshop, a Draft Regional ITS Architecture document was prepared and sent to stakeholders for review and comment.

Task 4 – ITS Deployment Plan Workshop and ITS Deployment Plan Development: A draft project listing for the Region was presented to stakeholders at the Regional ITS Deployment Plan Workshop. Stakeholders were asked to provide input on the recommended projects, responsible agencies, associated costs, and deployment timeframe. Following the workshop, a Draft Regional ITS Deployment Plan document was prepared and sent to stakeholders for review and comment.

Task 5 – Comment Resolution Workshop and Final Report: A Comment Resolution Workshop was held with stakeholders to review the Draft Regional ITS Architecture and the Draft Regional ITS Deployment Plan. Next steps for the Region were also discussed. Comments were incorporated and the final Regional ITS Architecture was updated and the Regional ITS Deployment Plan was developed.

3 Customization of the National ITS Architecture for the SEMCOG Region

3.1 Systems Inventory

An important initial step in the architecture update process is to establish an inventory of existing ITS elements. At the Kick-Off Workshop and through subsequent discussions with agency representatives, SEMCOG Region stakeholders provided the team with information about existing and planned systems that would play a role in the Region's ITS Architecture.

The National ITS Architecture has eight groups of ITS service areas. Existing, planned, and future systems in the Region were identified in the following service areas:

- ***Traffic Management*** – includes the Michigan Intelligent Transportation Systems Center (MITSC) located in Detroit as well as other existing and future TMCs and traffic operations centers (TOCs), detection systems, closed circuit television (CCTV) cameras, fixed and portable dynamic message signs (DMS), and other related technologies.
- ***Emergency Management*** – includes emergency operations/management centers, improved information sharing among traffic and emergency services, automated vehicle location (AVL) on emergency vehicles, traffic signal preemption for emergency vehicles, and wide-area alerts.
- ***Maintenance and Construction Management*** – includes work zone management, roadway maintenance and construction information, and road weather detection systems.
- ***Public Transportation Management*** – includes transit and paratransit AVL, transit travel information systems, electronic fare collection, and transit security.
- ***Commercial Vehicle Operations*** – includes coordination with Commercial Vehicle Information Systems and Networks (CVISN) efforts, and hazardous material (HAZMAT) management.
- ***Traveler Information*** – includes broadcast traveler information such as 511, traveler information kiosks, and highway advisory radio (HAR).
- ***Archived Data Management*** – includes electronic data management and archiving systems.
- ***Vehicle Safety*** – includes collision avoidance and automated highway systems.

3.2 Regional Needs

Needs from the Region were identified by Stakeholders at the Kick-Off Workshop held in October of 2007. The needs identified provided guidance for determining which market packages should be included in the architecture. Stakeholders identified ITS needs for the SEMCOG Region in the following areas:

- Traffic management;
- Emergency management;
- Maintenance and construction management;
- Public transportation management;
- Commercial vehicle operations;
- Traveler information;
- Archived data management; and
- Advanced Vehicle Safety Systems.

Section 3.4.3 contains additional information about the specific needs identified and relates those needs to the market packages that document the corresponding ITS service.

3.3 Element Customization

The inventory and needs documented at the Kick-Off Workshop are the starting point for update of the ITS architecture for the SEMCOG Region. These ITS systems and components are used to customize the National ITS Architecture and update the architecture for the SEMCOG Region.

When developing customized elements, the stakeholder group agreed not to establish individual traffic, maintenance, and emergency management elements for individual cities within the SEMCOG Region. Detroit, Ann Arbor, the Road Commission for Oakland County (RCOC), the Road Commission of Macomb County (RCMC), and Wayne County were the only local agencies individually identified and documented. The smaller communities in the Region were documented as part of the local agency elements. During the update of the regional architecture, the stakeholders agreed to this collective grouping under Local Agencies. This documentation allows the communities to be included in the Regional ITS Architecture, and therefore eligible to use federal monies on potential future ITS deployments. As individual communities or counties deploy user services, the Architecture can be updated to uniquely capture those agencies.

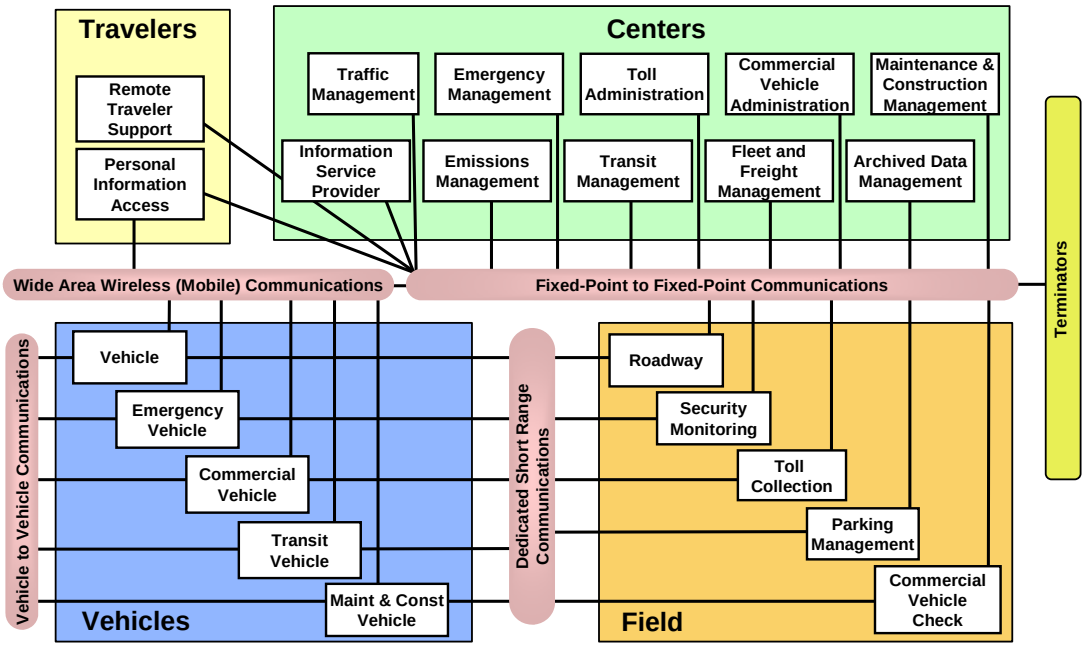
3.3.1 Subsystems and Terminators

Each identified system or component in the SEMCOG Regional ITS inventory was mapped to a subsystem or terminator in the National ITS Architecture. Subsystems and terminators are the entities that represent systems in ITS.

Subsystems are the highest level building blocks of the physical architecture, and the National ITS Architecture groups them into four major classes: Centers, Field, Vehicles, and Travelers. Each of these major classes includes various components that represent a set of transportation functions (or processes). Each set of functions is grouped under one agency, jurisdiction, or location, and corresponds to physical elements such as: traffic operations centers, traffic signals, or vehicles. **Figure 3** shows the National ITS Architecture subsystems. This figure, also known as the "sausage diagram," is a standard interconnect diagram, showing the relationships of the various subsystems within the architecture. A customized interconnect diagram for the SEMCOG Region is shown in **Figure 4** and **Figure 5**. Communication functions between the subsystems are represented in the ovals. Fixed-point to fixed-point communications include not only twisted pair and fiber optic technologies, but also wireless technologies such as microwave and spread spectrum.

Terminators are the people, systems, other facilities, and environmental conditions outside of ITS that need to communicate or interface with ITS subsystems. Terminators help define the boundaries of the National ITS Architecture as well as a regional system. Examples of terminators include: drivers, weather information providers, and information service providers.

Figure 3 – National ITS Architecture Physical Subsystem Interconnect Diagram



3.3.2 ITS Inventory by Stakeholder

Each stakeholder is associated with one or more systems or elements (subsystems and terminators) that make up the transportation system in the SEMCOG Region. A review of the existing regional architecture was performed once the updated list of stakeholders was developed. Any stakeholder that was no longer included in the regional architecture was either consolidated with similar stakeholders under a new stakeholder name or removed. **Table 3** shows the list of stakeholders that were simply removed from the regional architecture along with a comment where needed. Most of these were removed simply because they were not represented within any of the selected market packages.

A listing of stakeholders, as identified in the architecture, can be found in **Table 4.** A second column in the table lists stakeholders from the existing regional architecture that are now represented by the identified stakeholder. The table also includes a description of the stakeholder as it is defined in the regional architecture. For example, rather than individually documenting each of the smaller local agencies in the Region, a single stakeholder was named for local agencies, and represents the counties, cities, and towns not specifically called out in the architecture. **Table 5** sorts the inventory by stakeholder so that each stakeholder can easily identify and review all of the architecture elements associated with their agency. The table includes the status of the element. In many cases, an element classified as existing might still need to be enhanced to attain the service level desired by the Region.

Table 3 – Listing of Existing Stakeholders Omitted from Architecture Update

Stakeholder	Comment
AAA Michigan	If AAA is included, it will fall under the Other Agencies stakeholder, but at this time none of the market packages include AAA.
Canadian National Railroad	There were no market packages identified with any elements associated with this stakeholder.
Canadian portion of Blue Water Bridge Authority	There were no market packages identified with any elements associated with this stakeholder.
Commuter Express	There were no market packages identified with any elements associated with this stakeholder.
Detroit Port Authority	There were no market packages identified with any elements associated with this stakeholder.
Harson Island Bridge Authority	This was removed due to the estimated timeframe for implementation.
Other Airport Authorities	There were no market packages identified with any elements associated with this stakeholder.
SCCOTS	There were no market packages identified with any elements associated with this stakeholder.
TIA	There were no market packages identified with any elements associated with this stakeholder.
WATS	There were no market packages identified with any elements associated with this stakeholder.

Table 4 – Updated SEMCOG Region Stakeholder Names and Descriptions

Updated/New Stakeholder Name	Stakeholder Name in Existing Architecture	Stakeholder Description
Ann Arbor Transportation Authority	Ann Arbor Transportation Authority	Ann Arbor Transportation Authority is responsible for the local public transportation and associated facilities in the greater Ann Arbor-Ypsilanti Area
Blue Water Area Transit	Blue Water Area Transportation Commission	Blue Water Area Transit is responsible for the public transportation and facilities in the Port Huron and St. Clair County area
Centra Ambassador Bridge Corporation	Centra / Ambassador Bridge Corp	The Central Cartage/Ambassador Bridge Company is responsible for the maintenance and operations of the Ambassador Bridge with the help of the Canadian subsidiary, the Canadian Transit Company
City of Ann Arbor	City of Ann Arbor	City of Ann Arbor is responsible for designing and constructing, coordinating and inspecting utility and roadway, and optimizing traffic flow through the city
City of Detroit	City of Detroit	City of Detroit is responsible for maintenance of the roadway infrastructure and provide information for vehicle and pedestrians
City of Port Huron	City of Port Huron	City of Port Huron is responsible for maintenance of the roadway infrastructure and provide information for vehicle and pedestrians
Department of Homeland Security		Cabinet department of the Federal Government responsible for protecting the United States from terrorist attacks and responding to natural disasters.
Detroit and Canada Tunnel Corporation	Detroit & Canada Tunnel Corporation	Detroit and Canada Tunnel Corporation is responsible for the maintenance and operations of the Detroit Windsor Tunnel. It is helped by their subsidiary in the City of Windsor in Canada.
Detroit Department of Transportation (DDOT)	City of Detroit DOT DDOT-MDOT-SMART-DTC	DDOT responsible for the public transportation services and facilities in Southeastern Michigan.
DNR		Michigan Department of Natural Resources is responsible for the operations and maintenance of all Parks and Recreation facilities including infrastructure components on those properties. DNR utilizes some technologies to provide information to visitors at Parks and Recreation facilities.

Table 4 – Updated SEMCOG Region Stakeholder Names and Descriptions

Updated/New Stakeholder Name	Stakeholder Name in Existing Architecture	Stakeholder Description
Financial Institution		Handles exchange of money for transit electronic fare collection.
Flint-Mass Transportation Authority	Flint-Mass Transit Authority	Transit provider that operates fixed route and paratransit in and near Genesee County.
Local Agency	City of Detroit DTC City of Detroit Fire Department City of Detroit Police Department City of Detroit Municipal Parking Dept. County Emergency Mgmt in SE MI Livingston County Detroit Edison Macomb County Macomb County Sheriff Dept. Monroe County Oakland County Oakland County Cities Oakland County Sheriff Other 911 EM Stakeholders Other City Dept. of Public Works Other Fire Departments Other Police Departments Other Transit SEMSIM Partners St. Clair County Sheriff Dept. University of Michigan Washtenaw County Sheriff Dept. Wayne County Sheriff Dept.	Local government for all cities and municipalities within the Region that are not specifically called out. Covers all city departments including those that deal with traffic and public safety.
Livingston County Road Commission	Livingston County Road Commission	Livingston County Road Commission is responsible for the construction and maintenance of countywide roads. They are contracted to maintain state and federal highways throughout the county.
MDOT	MDOT MDOT/Port Huron DDOT-MDOT-SMART-DTC	Michigan Department of Transportation is responsible for planning, design, construction, maintenance, and operation for all aspects of a comprehensive integrated transportation system in the State of Michigan.
Media	Media	Local media outlets. This can include television stations, newspapers, radio stations and their associated websites.
Province of Ontario Ministry of Transportation (MTO)	Ministry of Transport Ontario Ontario Ministry of Highways	The Ontario Ministry of Transportation is responsible for the construction, operations, and maintenance of highways, bridges, transit systems, airports, railroads and ports within the province of Ontario.
Monroe County Road Commission	Monroe County Road Commission	Monroe County Road Commission is responsible for the construction and maintenance of countywide roads. They are contracted to maintain state and federal highways throughout the county
MSP	MSP	Michigan State Police. State law enforcement agency that enforces traffic safety laws as well as commercial vehicle regulations.
NOAA		National Oceanic and Atmospheric Administration, agency that gathers weather information and issues severe weather warnings.
Nokia		A cell phone company.
Ohio Department of Transportation (ODOT)	Ohio DOT/ TMACOG	Includes Ohio Department of Transportation (ODOT) Central Office and District 2 (which serves Fulton, Henry, Lucas, Ottawa, Sandusky, Seneca, Williams, and Wood Counties). Responsible for planning, designing, and maintaining state and interstate highways

Table 4 – Updated SEMCOG Region Stakeholder Names and Descriptions

Updated/New Stakeholder Name	Stakeholder Name in Existing Architecture	Stakeholder Description
Other Agencies	Wayne County Detroit Stadium Authority	This stakeholder represents a wide variety of agencies. The associated elements are groups of agencies or providers that do not have a primary stakeholder agency.
Other Elements		Other elements include potential obstacles, roadway environment and other vehicles.
Private Information Service Provider	Private Service Provider Telematics Provider Traveler Information Providers	Private sector business responsible for the gathering and distribution of traveler information. This service is typically provided on a subscription basis.
Private Operators		Private Operators manage privately owned resources that interconnect with public sector elements and sub-systems of the Regional Architecture.
Private Transportation Providers	Private Providers	Private transportation service providers such as taxis and shuttle services.
Province of Ontario Ministry of Transportation (MTO)	Transit Windsor	Emergency or traffic management agencies in other states or countries adjacent to Michigan. In the SEMCOG Region this includes Ohio and Ontario, Canada.
Rail Operators		Companies that operate trains and/or are responsible for the maintenance and operations of railroad tracks.
RCMC	RCMC	Road Commission of Macomb County is responsible for providing public road system, except for State Highways, outside incorporated cities and villages. They are contracted to maintain the county's State trunklines as well as those in cities and townships
RCOC	RCOC	Road Commission for Oakland County is responsible for the construction and maintenance of countywide roads, including townships. They are contracted to maintain state highways and provide some road services for cities and villages.
Regional Demand Response Transit Providers		Transit providers within the SEMCOG Region aside from SMART, DDOT, and Blue Water Area Transit that provide demand response services.
SEMCOG	SEMCOG	SEMCOG supports local government planning on regional issues in the areas of transportation, environment, community and economic development, and education.
St. Clair County Road Commission	St. Clair County Road Commission	St. Clair County Road Commission is responsible for the construction and maintenance of countywide roads. They are contracted to maintain state and federal highways throughout the county.
Suburban Mobility Authority for Regional Transportation (SMART)	SMART; DDOT-MDOT-SMART-DTC	SMART is a public transit services with facilities serving southeastern Michigan. It serves Wayne, Oakland, and Macomb counties. It has the third highest ridership within Michigan.
System Users	Travelers	All of the users of the transportation system.
US Customs and Border Protection	US Customs	The office is also responsible for regulating and facilitating international trade and enforcing U.S. trade laws within the Detroit Metro area and the surrounding towns and cities.
Washtenaw County Road Commission	Washtenaw County Road Commission	The Washtenaw County Road Commission is responsible for the construction and maintenance of countywide roads. They are contracted to maintain state and federal highways throughout the county.
Wayne County Airport Authority		Wayne County Airport Authority is responsible for the management and operations of Detroit Metropolitan Wayne County Airport, including construction and repair.
Wayne County Department of Public Services	Wayne County Dept. of Public Services Wayne County	Wayne County Department of Public Services is committed to maintaining and improving Wayne County multi-billion dollar inventory of roads, buildings, and land for the benefit of the public.

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Ann Arbor Transportation Authority	Ann Arbor Transportation Authority Archive	The transit data archive for the Ann Arbor Transportation Authority. Used by FTA and MDOT.	Planned
	Ann Arbor Transportation Authority CCTV Surveillance	CCTV surveillance at the Blue Water Area Transit Dispatch Center.	Planned
	Ann Arbor Transportation Authority Dispatch Center	Provides local public transportation and associated facilities in the greater Ann Arbor-Ypsilanti Area	Existing
	Ann Arbor Transportation Authority Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Ann Arbor Transportation Authority Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	Ann Arbor Transportation Authority Vehicles	Transit Vehicles owned by Ann Arbor Transportation Authority Transit	Existing
	Ann Arbor Transportation Authority Website	Website with information about fares and schedules.	Existing
Blue Water Area Transit	Blue Water Area Transit CCTV Surveillance	CCTV surveillance at the Blue Water Area Transit Dispatch Center.	Planned
	Blue Water Area Transit Center	Provides public transportation in Port Huron and St. Clair County.	Existing
	Blue Water Area Transit Data Archive	The transit data archive for Blue Water Area Transit. Used by FTA and MDOT.	Existing
	Blue Water Area Transit Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Blue Water Area Transit Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	Blue Water Area Transit Vehicles	Transit Vehicles owned by Blue Water Area Transit	Existing
	Blue Water Area Transit Website	Website with information about fares and schedules.	Existing
Centra Ambassador Bridge Corporation	Ambassador Bridge Authority	Oversees the movement of people and goods across the Ambassador Bridge.	Existing
	Ambassador Bridge CCTV Cameras	Closed circuit television cameras operated by the Centra Ambassador Bridge Corporation for traffic condition monitoring and management of incidents.	Existing
	Ambassador Bridge DMS	Dynamic message signs operated by a local agency to provide information to drivers such as lane closures due to a crash or from the weather.	Existing
	Ambassador Bridge Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as VIVDS, RTMS and any other type of vehicle detection.	Existing
	Ambassador Bridge Operations Center	Operations Center responsible for bridge system operations at the Ambassador Bridge.	Existing
	Ambassador Bridge Security Monitoring Field Equipment	Roadside equipment located on the Ambassador Bridge routes that is used for monitoring key infrastructure elements from damage or attacks. These elements include structures such as bridges or dams.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Centra Ambassador Bridge Corporation (continued)	Ambassador Bridge Toll Plazas	Toll collection location for use of the Detroit Windsor Tunnel.	Planned
	Ambassador Bridge Website	Provides information about the history of the bridge, the fare schedule, and provides up-to-date traveler information. The website also provides the current bridge conditions as well as monthly travel statistics.	Existing
City of Ann Arbor	City of Ann Arbor Field Sensors	Roadway equipment on local routes used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system and collected by the City of Ann Arbor TOC.	Existing
	City of Ann Arbor TOC	City of Ann Arbor Traffic Operations Center responsible for municipal signal system operations.	Existing
	City of Ann Arbor Traffic Signals	Multiple traffic signals interconnected and operated by the City of Ann Arbor.	Existing
City of Detroit	City of Detroit CCTV Cameras	Roadside equipment on local routes used for traffic condition monitoring and management of incidents and collected by the City of Detroit TOC.	Existing
	City of Detroit DPW	Department of Public Works run by the City of Detroit	Planned
	City of Detroit DPW	Department of Public Works run by the City of Detroit	Planned
	City of Detroit DTC People Mover CCTV Surveillance	CCTV surveillance at the City of Detroit DTC People Mover Dispatch Center.	Planned
	City of Detroit DTC People Mover Data Archive	The transit data archive for the City of Detroit DTC People Mover. Used by FTA and MDOT.	Existing
	City of Detroit DTC People Mover Dispatch Center	Detroit People Mover is a safe, reliable, efficient, and accessible rail transportation operating to enhance the unencumbered pedestrians or vehicle travel through the central business district of Detroit.	Existing
	City of Detroit DTC People Mover Dispatch Center	Detroit People Mover is a safe, reliable, efficient, and accessible rail transportation operating to enhance the unencumbered pedestrians or vehicle travel through the central business district of Detroit.	Existing
	City of Detroit DTC People Mover Dispatch Center	Detroit People Mover is a safe, reliable, efficient, and accessible rail transportation operating to enhance the unencumbered pedestrians or vehicle travel through the central business district of Detroit.	Existing
	City of Detroit DTC People Mover Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	City of Detroit DTC People Mover Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	City of Detroit DTC People Mover Vehicle	Transit Vehicles owned by City of Detroit DTC People Mover	Existing
	City of Detroit DTC People Mover Website	Website with information about fares and schedules.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
City of Detroit (continued)	City of Detroit Field Sensors	Roadway equipment on local routes used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system and collected by the City of Detroit TOC.	Planned
	City of Detroit Municipal Parking Department	System operated by City of Detroit Municipal Parking Department that monitors available vehicle parking at key parking facilities.	Planned
	City of Detroit TOC	City of Detroit Traffic Operations Center responsible for municipal signal system operations.	Existing
	City of Detroit Traffic Signals	Multiple traffic signals interconnected and operated by the City of Detroit.	Existing
	City of Detroit Website	Website for City of Detroit	Planned
City of Port Huron	City of Port Huron Drawbridge Management Center	Management of the waterways used by boats and ferries and the roadways used by vehicles.	Planned
	City of Port Huron TOC	City of Port Huron Traffic Operations Center responsible for municipal signal system operations.	Planned
Department of Homeland Security	Department of Homeland Security	Cabinet department of the Federal Government responsible for protecting the United States from terrorist attacks and responding to natural disasters.	Existing
Detroit and Canada Tunnel Corporation	Detroit Windsor Tunnel DMS	Dynamic message signs operated by a local agency to provide information to drivers such as lane closures due to a crash or from the weather.	Existing
	Detroit Windsor Tunnel Security Monitoring Field Equipment	Roadside equipment located on Detroit Windsor Tunnel routes that is used for monitoring key infrastructure elements from damage or attacks. These elements include structures such as bridges or dams.	Existing
	Detroit Windsor Tunnel TOC	Traffic Operations Center responsible for tunnel system operations at the Detroit Windsor Tunnel.	Existing
	Detroit Windsor Tunnel Toll Plazas	Toll collection location for use of the Detroit Windsor Tunnel.	Planned
Detroit Department of Transportation (DDOT)	DDOT Center CCTV Surveillance	CCTV surveillance at the DDOT Transit Dispatch Center.	Planned
	DDOT Data Archive	The transit data archive for DDOT. Used by FTA and MDOT.	Existing
	DDOT Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	DDOT Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	DDOT Transit Dispatch Center	Provides public transportation services and facilities in the greater Detroit area.	Existing
	DDOT Vehicles	Transit Vehicles owned by DDOT Transit	Existing
	DDOT Website	Website with information about fares and schedules.	Existing
DNR	DNR Weather Stations	Department of Natural Resources field equipment that collects weather data such as temperature and visibility	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Financial Institution	Financial Service Provider	Handles exchange of money for transit electronic payment collection.	Planned
	Service Agency	Agency responsible for payment of transit fares for medical transportation as part of government subsidized medical care. This includes Medicare, and VA programs.	Existing
Flint-Mass Transportation Authority	Flint MTA Control Center	Flint-Mass Transportation Authority (Flint MTA) - Transit dispatch center responsible for the tracking, scheduling and dispatching of fixed route and paratransit vehicles operated by Flint-Mass Transportation Authority.	Existing
Livingston County Road Commission	Livingston County Intermodal Transportation Facility	The Livingston County Intermodal Transportation facility is responsible for the public transportation and associated facilities in the Livingston County Area.	Planned
	Livingston County TOC	Livingston County Traffic Operations Center responsible for municipal signal system operations.	Planned
	Livingston County Traffic Signals	Multiple traffic signals interconnected and operated by Livingston County Road Commission.	Existing
	Livingston County Transit CCTV Surveillance	CCTV surveillance at the Livingston County Intermodal Transportation Facility.	Planned
	Livingston County Transit Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Livingston County Transit Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	Livingston County Transit Vehicles	Transit Vehicles owned by Livingston County Transit	Planned
	Livingston County Transit Website	Website with information about fares and schedules.	Planned
Local Agency	County 911 Dispatch	Central Dispatch is responsible for the dispatch of all public safety vehicles (police and fire). After hours Central Dispatch will also dispatch the Street Department on-call emergency responder.	Existing
	County Road Commission	Duties include road and bridge construction and maintenance, snow removal and salting, surface treatments, street lane painting and markings, controlling roadside vegetation and mowing, gravel road grading, and roadside ditch and drain maintenance.	Existing
	County Road Commission Maintenance Vehicles	County Road Commission vehicles used in maintenance operations.	Existing
	Lake Erie Transportation Commission CCTV Surveillance	CCTV surveillance at the Lake Erie Transportation Commission Dispatch Center.	Planned
	Lake Erie Transportation Commission Data Archive	The transit data archive for the Lake Erie Transportation Commission. Used by FTA and MDOT.	Planned
	Lake Erie Transportation Commission Dispatch Center	The Lake Erie Transportation Commission is responsible for the public transportation and associated facilities in the Monroe County Area.	Existing
	Lake Erie Transportation Commission Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Lake Erie Transportation Commission Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Local Agency (continued)	Lake Erie Transportation Commission Vehicles	Transit Vehicles owned by Lake Erie Transportation Commission	Planned
	Lake Erie Transportation Commission Website	Website with information about fares and schedules.	Planned
	Local Agency 911 Dispatch	Answers all 911 calls made from within the local area and then forwards the call to the appropriate dispatcher.	Planned
	Local Agency Anti-Icing Field Equipment	Roadside equipment located along routes maintained by local agencies that collects weather data such as temperature and visibility.	Planned
	Local Agency CCTV Cameras	Closed circuit television cameras operated by the Local Agency TOC for traffic condition monitoring and management of incidents.	Planned
	Local Agency DMS	Dynamic message signs operated by a local agency to provide information to drivers such as lane closures due to a crash or from the weather.	Planned
	Local Agency DPW	Department of Public Works run by individual local agencies.	Existing
	Local Agency Emergency Operations Center (EOC)	Central command and control facility responsible for carrying out the principles of emergency preparedness and emergency management, or disaster management functions at a strategic level in an emergency situation.	Planned
	Local Agency Equipment Repair	Local repair facilities (garages) for maintenance and construction vehicles	Planned
	Local Agency Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as VIVDS, RTMS or traditional loops.	Planned
	Local Agency Maintenance Garages	Local garages used in maintenance operations.	Planned
	Local Agency Maintenance Vehicles	Local Agency vehicles used in maintenance operations.	Existing
	Local Agency Public Safety Vehicles	Local law enforcement, fire and EMS vehicles. Includes the ITS equipment installed on the cruisers (AVL, MDTs, etc.).	Existing
	Local Agency Ridesharing Program	System used for matching riders with similar origins and destinations to promote carpooling.	Planned
	Local Agency Smart Work Zone Equipment	Work zone monitoring and alerting equipment owned by Local Agencies.	Planned
	Local Agency TOC	Local Traffic Operations Center responsible for municipal signal system operations.	Planned
	Local Agency Traffic Signals	Multiple traffic signals interconnected and operated by a Local Agency. Local Agencies include Ferndale, Pontiac, Holly, Royal Oak, and Dearborn.	Existing
	Local Agency Website	Website for the Local Agencies	Planned
	Local Agency Work Zone Safety Monitoring Equipment	Portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes CCTV, vehicle detection, and/or DMS.	Planned
	Maintenance and Construction Field Personnel	The individuals working at the maintenance or construction site.	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Local Agency (continued)	Railroad Blockage Notification System	System shares highway-rail intersection (HRI) status for at-grade crossings with users through traveler information tools.	Planned
	SEMSIM	Southeast Michigan Snow and Ice Management (SEMSIM) - complex AVL system utilizing radio system to provide communication between vehicles and computer terminals (partners include: RCOC, RCMC, City of Detroit, SMART, Wayne County Department of Public Services)	Existing
	University of Michigan Parking and Transportation Service CCTV Surveillance	CCTV surveillance at the University of Michigan Parking and Transportation Service Dispatch Center.	Planned
	University of Michigan Parking and Transportation Services Data Archive	The transit data archive for the University of Michigan Parking and Transportation Services. Used by FTA and MDOT.	Planned
	University of Michigan Parking and Transportation Services Dispatch Center	The University of Michigan Parking and Transportation Services is responsible for public transportation facilities in the surrounding campuses of the University of Michigan	Existing
	University of Michigan Parking and Transportation Services Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	University of Michigan Parking and Transportation Services Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	University of Michigan Parking and Transportation Services Vehicles	Transit Vehicles owned by University of Michigan Parking & Transportation Services	Existing
	University of Michigan Parking and Transportation Services Website	Website with information about fares and schedules.	Existing
	Wayne County Detroit Stadium	System operated by Wayne County Detroit Stadium Authority that monitors available vehicle parking at key parking facilities.	Planned
MDOT	MDOT Anti-Icing Field Equipment	Roadside equipment located along MDOT routes that collects weather data such as temperature and visibility.	Planned
	MDOT ATMS	Statewide software that provides access to the state and local owned ITS field equipment. Examples of access provide view and control of CCTV cameras and posting messages on DMS.	Planned
	MDOT Bay Region TMC	MDOT traffic management center located in the Bay Region.	Planned
	MDOT Blue Water Bridge	The MDOT Blue Water Bridge Authority is responsible for the construction, maintenance, and operation of roadways on the Blue Water Bridge.	Existing
	MDOT Blue Water Bridge DMS	Dynamic message signs operated by a local agency to provide information to drivers such as lane closures due to a crash or from the weather.	Existing
	MDOT Blue Water Bridge HAR	Highway advisory radio operated by the MDOT Blue Water Bridge TOC to get information to drivers.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
MDOT (continued)	MDOT Blue Water Bridge Security Monitoring Field Equipment	Roadside equipment located on MDOT Blue Water Bridge routes that is used for monitoring key infrastructure elements from damage or attacks. These elements include structures such as bridges or dams.	Existing
	MDOT Blue Water Bridge TOC	MDOT Blue Water Bridge Traffic Operations Center responsible for municipal signal system operations.	Existing
	MDOT Blue Water Bridge Toll Plazas	Toll collection location for use of the Blue Water Bridge	Existing
	MDOT Blue Water Bridge Website	Website with information about fares and schedules.	Existing
	MDOT CCTV Cameras	Roadside equipment located on local roadways used for traffic condition monitoring and management of incidents.	Existing
	MDOT Commercial Vehicle Permitting System	MDOT system for tracking and monitoring oversize and overweight permits for commercial vehicles.	Planned
	MDOT Data Archive	Archive that contains historical traffic data such as volume and speed information.	Existing
	MDOT Data Warehouse	Archive that contains historical traffic data such as volume and speed information.	Existing
	MDOT DMS	Roadside equipment on MDOT routes used to share traveler information with motorists through dynamic messaging.	Existing
	MDOT Drawbridge Control Equipment	The physical equipment used to control the actual lifting of the bridge.	Existing
	MDOT Drawbridge Management Center	Management of the waterways used by boats and ferries and the roadways used by vehicles.	Existing
	MDOT Drawbridge Notification Equipment	The physical equipment used to warn drivers of drawbridge and the actual lifting of the bridge.	Existing
	MDOT ESS	Environmental sensor stations located on MDOT routes that collect information about the roadways such as temperature and moisture levels.	Planned
	MDOT Field Sensors	Roadway equipment located on MDOT roadways used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system and collected by the TOC. MDOT field sensors include VIVDS and any other vehicle detection.	Existing
	MDOT Freeway Courtesy Patrol Dispatch	Provides efficient use of resources to assist motorists in need on MDOT facilities.	Existing
	MDOT Freeway Courtesy Patrol Vehicles	Fully equipped vehicles that provide motorist assistance to vehicles in need on MDOT facilities.	Existing
	MDOT HAR	Highway advisory radio allows roadway conditions, incidents, etc. to be broadcast to travelers.	Existing
	MDOT Highway Toll Plazas	Fee collection locations on the MDOT trunklines toll routes.	Planned
	MDOT Maintenance Garages	Michigan Department of Transportation garages used in maintenance operations.	Existing
	MDOT Maintenance Vehicles	Michigan Department of Transportation vehicles used in maintenance operations.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
MDOT (continued)	MDOT Metro Region Equipment Repair	Repair facilities (garages) for maintenance and construction vehicles within the Michigan Department of Transportation's Metro Region.	Existing
	MDOT Metro Region Offices and TSCs	MDOT field office that oversees road construction and maintenance on MDOT facilities. Most maintenance and snow removal in this region is achieved through contract agencies.	Existing
	MDOT MI Drive Website	Website for Michigan Department of Transportation	Existing
	MDOT MITSC	MDOT MITS Center is located in Detroit	Existing
	MDOT North Region TMC	MDOT traffic management center located in the North Region.	Planned
	MDOT Office of Communications	Michigan Department of Transportation responsible for the dissemination of traffic information to the media and public.	Existing
	MDOT Planning Division Data Warehouse	Archive that contains historical traffic data such as volume and speed information.	Existing
	MDOT Port Huron TOC	Transportation operations center located in the SEMCOG Region for the City of Port Huron. The TOC will operate signals within the County from the center.	Planned
	MDOT Portable CCTV Cameras	Portable roadside equipment located on local roadways used for traffic condition monitoring and management of incidents.	Existing
	MDOT Roadside Equipment for AHS	Equipment located along MDOT routes that allows communication between roadside devices and vehicles.	Planned
	MDOT Roadside Intersection Collision Avoidance Equipment	Equipment located along MDOT routes that communicate between multiple roadside devices and vehicles to alert of unsafe travel conditions or conditions conducive to crashes.	Planned
	MDOT Roadside Signing Equipment	Equipment located along MDOT routes that provide data through dynamic messaging or in-vehicle messaging.	Planned
	MDOT Security Monitoring Field Equipment	Roadside equipment located on MDOT routes that is used for monitoring key infrastructure elements from damage or attacks. These elements include structures such as bridges or dams.	Existing
	MDOT Smart Work Zone Equipment	Work zone monitoring and alerting equipment owned by MDOT.	Planned
	MDOT Statewide TMC - Lansing	MDOT traffic management center located in Lansing.	Planned
	MDOT Superior Region TMC	MDOT traffic management center located in the Superior Region.	Planned
	MDOT Toll Authority	Division of MDOT responsible for the oversight and management of toll routes operated on the state trunklines.	Planned
	MDOT Traffic Signals	Multiple traffic signals interconnected and operated by MDOT.	Existing
	MDOT Traveler Information Database	MDOT maintained database for collecting and disseminating road condition data about construction and maintenance activities, incidents, and special events.	Planned
	MDOT Traveler Information Kiosks	Interactive kiosks that provides users the ability to request and received transportation information.	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
MDOT (continued)	MDOT University Region TSCs	MDOT field office that oversees road construction and maintenance on MDOT facilities. Most maintenance and snow removal in this region is achieved through contract agencies.	Existing
	MDOT Weigh-in-Motion	In-road equipment that monitors vehicle weights	Existing
	MDOT West Michigan TMC	MDOT traffic management center located in Grand Rapids.	Existing
	MDOT Work Zone Safety Monitoring Equipment	Portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes CCTV, vehicle detection, and/or DMS.	Planned
	Michigan 511 System	511 Traveler information system central server.	Planned
	Michigan 511 Voice Response System	Michigan 511 Interactive Voice Response system. This is the customer interface component of the 511 system.	Planned
Media	Local Print and Broadcast Media	Local media that provide traffic or incident information to the public.	Existing
Monroe County Road Commission	Monroe County CCTV Cameras	Roadside equipment on local routes used for traffic condition monitoring and management of incidents and collected by the Monroe County Road Commission TOC.	Planned
	Monroe County Field Sensors	Roadway equipment on local routes used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system and collected by the Monroe County Road Commission TOC.	Planned
	Monroe County TOC	Monroe County Road Commission Traffic Operations Center responsible for municipal signal system operations.	Existing
	Monroe County Traffic Signals	Multiple traffic signals interconnected and operated by Monroe County Road Commission.	Existing
MSP	CJIC Database	Criminal Justice Information Center Database stores criminal justice data and can be accessed by multiple agencies.	Existing
	MIOC	The Michigan Intelligence Operations Center 24-hours a day statewide information sharing among local, state and federal public safety agencies	Existing
	MSP 911 Regional Dispatch Center	Answers all 911 calls made from within the area and then forwards the call to the appropriate dispatcher.	Existing
	MSP Commercial Vehicle Enforcement	Division of the MSP responsible for monitoring and enforcing weight restrictions on commercial vehicles operated on state trunklines.	Planned
	MSP Headquarters - East Lansing	Michigan State Police headquarters that oversees operations of MSP.	Existing
	MSP Motor Carrier Division	Responsible for monitoring commercial vehicle regulations on MDOT routes.	Existing
	MSP Motor Carrier Division Enforcement	Responsible for enforcing commercial vehicle regulations on MDOT routes.	Existing
	MSP Office of Highway Safety Planning	Manages crash data for MDOT routes.	Existing
	MSP Vehicles	Public Safety vehicles owned and operated by Michigan State Police. Includes the ITS equipment installed on the cruisers (AVL, MDTs, etc.).	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
MSP (continued)	MSP Winter Travel Advisory Website	Traveler Information website operated by Michigan State Police for dissemination of winter weather advisories	Existing
	MSP Winter Travel Toll Free Number	Toll-free number operated by the Michigan State Police that provides travel information to the public.	Existing
NOAA	National Weather Service	Provides official US weather, marine, fire and aviation forecasts, warnings, meteorological products, climate forecasts, and information about meteorology.	Existing
Nokia	Nokia	Private cell phone provider that collects and disseminates traffic information	Planned
Ohio Department of Transportation (ODOT)	ODOT District 2 Maintenance Garages	Dispatch function for ODOT maintenance, construction and snow and ice removal vehicles. ODOT District 2 maintains all freeways in their district. State routes within city limits are maintained by cities. Outside city limits ODOT maintains state routes.	Existing
	ODOT District 2 Office	Primary traffic management location for ODOT-managed roads in District 2.	Existing
	ODOT Toledo Freeway Management Center	Control system to manage lane restrictions, closures, future ramp meters, incidents; includes web page for providing information about road work and snow. Also will dispatch the freeway service patrol.	Planned
Other Agencies	Contractor Smart Work Zone Equipment	Work zone monitoring and alerting equipment owned by a contractor.	Planned
	C-TPAT	C-TPAT - Customs-Trade Partnership Against Terrorism is a joint government-business initiative to build cooperative relationships that strengthen overall supply chain and border security	Existing
	Detroit Edison Emergency Operations Center	Central command and control facility responsible for carrying out the principles of emergency preparedness and emergency management, or disaster management functions at a strategic level in an emergency situation.	Existing
	FAST	FAST - The Free and Secure Trade program is a joint Canadian-United Stated initiative involving the Canada Border Services Agency and the US Customs and Border Protection (CBP)	Existing
	IFTA	IFTA - International Fuel Tax Agreement is an agreement between member jurisdictions to simplify the reporting of motor fuel use tax	Planned
	IRP	IRP - International Registration Plan is a federally encouraged program to facilitate commercial vehicle registration and operation among states and Canadian jurisdictions.	Planned
	Multimodal Service Provider	Agency that offers services across multiple transportation modes.	Planned
	NEXUS	NEXUS - a joint Canada-United Stated program designed to let pre-approved travelers cross between Canada and United States more quickly	Existing
	PIP	PIP - Partner's in Protection is a multi-disciplinary partnership whose initiative is to reduce the risk of fire losses and to enhance safety in the wild land urban interface	Existing
	Private Concierge Providers	Private entities that provides customized services to the traveler. This service is usually subscription based (such as On star).	Planned
	SSRS	SSRS - Single State Registration System is a program in which for-hire carriers of passengers or property file their US DOT authority and proof of insurance with the base state in which the carrier has its principal place of business	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Other Agencies (continued)	Traffic.com	Private vendor providing real-time incident and flow information	Existing
	US Coast Guard	Military unit responsible for maritime and coastal patrol.	Existing
	Work Zone vendor	Private vendor providing real-time work zone system information	Existing
Other Elements	AWOS Weather Stations	Automated Weather Observation Stations located at airports.	Existing
	Potential Obstacles	Obstacles that could interfere with the safe operation of vehicles.	Existing
	Roadway Environment	All objects and conditions in the vicinity of the traveler that can affect the operations of the traveler.	Existing
Other States and Countries	Canadian Border Services Agency	Canadian Border Services Agency is responsible for regulating and facilitating international trade and enforcing Canadian trade laws as well as the protection and safety of Canadians citizens and businesses	Existing
	Canadian National Railroad Operations Center	Canada's largest freight railroad, provides transportation and intermodal services throughout North America	Planned
	City of Toledo Maintenance Dispatch	Dispatch of maintenance vehicles for street cleaning, snow and ice removal, leaf collection, and pothole repair. Primarily through Div. of Streets, Bridges and Harbor; also through citizen hotline CLIC City Line Information Center. All major vehicle repairs done at Service Building #1, the Main Garage. Spielbusch facility services light vehicles. Imlay Street facility only services fire vehicles. Weather info from AccuWeather and subscription to NOAA.	Existing
	City of Toledo Traffic Signal System	Arterial signal system with 540 signals. UTCS (UTC Synchronization) pretimed system across 1/2 the city. EAGLE system communicating with 100+ signals. Centralized control, Econolite controllers, more being added. They are NTCIP compliant and expandable -- can be controlled from the traffic signal shop -- multiplexer at Erie Street Building. Plans for more multiplexers at other locations. Four locations where signals are within 200' of railroad crossings.	Existing
	Lucas County Emergency Operations Center	The Lucas County Emergency Services Building houses City of Toledo 911 call takers and dispatchers, amateur radio emergency services (ARES), and weapons of mass destruction group (Lucas County WMD/Terrorism Advisory Team).	Existing
	Lucas County Public Safety Dispatch	County sheriff dispatch.	Existing
	Lucas County Traffic Signal System	County has 28 signals. Most signals are more than a mile apart. Two signals are tied to an ODOT system at McCord & Spring Valley and McCord & North Mall. Also, three signals are interconnected adjoining a shopping center.	Existing
	TARTA	Toledo Area Regional Transit Authority (TARTA)	Existing
Private Information Service Provider	Private Sector ISP	Private entities that collect and disseminate traffic information.	Existing
	Private Sector Traveler Information Services	Website sponsored by a private entity. Often this information is provided through a subscription.	Existing
Private Operators	Private Fleet Operations	Private companies that proactively manage and operate their fleet routing. Includes reactions to incidents and possible delays.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Private Transportation Providers	Private Transportation Providers	Private providers of transportation services in the Region such as taxis and intercity bus services.	Existing
Province of Ontario Ministry of Transportation (MTO)	City of Windsor TOC	The City of Windsor TOC is responsible for the construction, maintenance, and operation of roadways in the City of Windsor, Canada.	Existing
	MTO	Agency in charge of transportation concerns, issues, and development in Ontario, Canada.	Existing
	MTO Website	Provides information about the history of the ministry, traveler's information, and provides an up-to-date road conditions. The website also provides additional information concerning fines and truck and bus information as well as event and travel statistics.	Existing
	Transit Windsor	The Transit Windsor is responsible for the public transportation and associated facilities in the City of Windsor and surrounding area. Also operates transit services across the border into Detroit.	Planned
Rail Operators	Rail Operator Wayside Equipment	Equipment located along the tracks including railroad crossing gates, bells, and lights as well as the interface to the traffic signal controller indicating the presence of a train.	Planned
RCMC	RCMC CCTV Cameras	Roadside equipment on local routes used for traffic condition monitoring and management of incidents and collected by the RCMC TOC.	Existing
	RCMC Data Archive	Archive that contains historical traffic data such as volume and occupancy	Existing
	RCMC Field Sensors	Roadway equipment on local routes used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system and collected by the RCMC TOC.	Existing
	RCMC TOC	RCMC Traffic Operations Center responsible for municipal signal system operations.	Existing
	RCMC Traffic Signals	Multiple traffic signals interconnected and operated by RCMC.	Existing
	RCMC Website	Website for RCMC	Existing
RCOC	RCOC CCTV Cameras	Roadside equipment on local routes used for traffic condition monitoring and management of incidents and collected by the RCOC TOC.	Existing
	RCOC Data Archive	Archive that contains historical traffic data such as volume and occupancy	Existing
	RCOC Field Sensors	Roadway equipment used to detect vehicle volumes and/or occupancy. This information is used in the operation of the traffic signal system (SCATS) and collected by the RCOC TOC.	Existing
	RCOC TOC	RCOC Traffic Operations Center responsible for municipal signal system operations.	Existing
	RCOC Traffic Signals	Multiple traffic signals interconnected and operated by RCOC.	Existing
	RCOC Website	Website for RCOC	Existing
Regional Demand Response Transit Providers	Regional Demand Response Transit Providers CCTV Surveillance	CCTV surveillance at the Blue Water Area Transit Dispatch Center.	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Regional Demand Response Transit Providers (continued)	Regional Demand Response Transit Providers Data Archive	The transit data archive for the Regional Demand Responsive Transit Providers Data Archive. Used by FTA and MDOT Office of Public Transportation	Planned
	Regional Demand Response Transit Providers Dispatch Center	Transit dispatch center responsible for the tracking, scheduling, and dispatching of demand response vehicles operated by Regional Demand Response Transit Providers.	Planned
	Regional Demand Response Transit Providers Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Regional Demand Response Transit Providers Vehicle	Transit Vehicles owned by the regional demand responsive transit providers.	Planned
	Regional Demand Response Transit Providers Website	Website with information about fares and schedules. At this time the website is static.	Planned
SEMCOG	SEMCOG Data Warehouse	Archive that contains historical traffic data such as volume, speed information, incident, travel time, and traffic signal inventory.	Existing
St. Clair County Road Commission	St. Clair County Drawbridge Management Center	Management of the waterways used by boats and ferries and the roadways used by vehicles.	Planned
	St. Clair County TOC	St. Clair County Traffic Operations Center responsible for municipal signal system operations.	Existing
	St. Clair County Traffic Signals	Multiple traffic signals interconnected and operated by St. Clair County Road Commission.	Existing
	St. Clair County Transit Center	Provides public transportation in St. Clair County.	Existing
Suburban Mobility Authority for Regional Transportation (SMART)	SMART Center CCTV Surveillance	CCTV surveillance at the SMART Central Dispatch Center.	Planned
	SMART Center Customer Kiosks	Kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards.	Planned
	SMART Central Dispatch Archive	The transit data archive for SMART. Used by FTA and MDOT.	Existing
	SMART Central Dispatch Center	Suburban Mobility Authority for Regional Transportation (SMART) - Provides transportation services and facilities for Macomb, Oakland, Wayne, and Monroe Counties including service between the suburbs and Detroit and suburbs to suburbs.	Existing
	SMART Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	SMART Transit Vehicles	Transit Vehicles owned by SMART Transit	Existing
	SMART Website	Website with information about fares and schedules.	Existing
System Users	Archived Data Users	Those who request information from the data archive systems	Existing
	Commercial Vehicle Driver	The operator of the commercial vehicle.	Planned
	Commercial Vehicles	Privately owned commercial vehicles that travel throughout the Region. Included in the architecture to cover HAZMAT incident reporting.	Existing

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
System Users (continued)	Other Vehicle	Vehicles outside of the control of the driver.	Existing
	Private Provider Vehicle Detection	Vehicle detection sponsored by a private entity	Existing
	Private Travelers Personal Computing Devices	Computing devices that travelers use to access public information.	Planned
	Private Vehicles	Vehicles operated by the public.	Planned
	Special Event	Special events in the SEMCOG Region including Detroit-Wayne County Stadium Authority, DTE Energy Music Theatre, and The Palace.	Existing
	Traveler	Individual operating a vehicle on roadways within the region	Existing
	Traveler Card	Medium for collection of transit fares electronically.	Planned
US Customs and Border Protection	US Customs and Border Protection	US Customs and Border Protection is responsible for regulating and facilitating international trade and enforcing U.S. trade laws as well as the protection and safety of American citizens and businesses	Existing
	US Customs and Border Protection Website	US Custom and Border Protection website providing information on customs and immigration, monthly traffic statistics, traffic trends, and toll rates.	Existing
Washtenaw County Road Commission	Washtenaw County TOC	Washtenaw County Traffic Operations Center consists of a central server that can operate local systems.	Existing
	Washtenaw County Traffic Signals	Multiple traffic signals interconnected and operated by Washtenaw County Road Commission.	Existing
Wayne County Airport Authority	Detroit Metro Wayne County Airport (DTW)	Detroit Metropolitan Wayne County Airport, Detroit Michigan. The Wayne County Airport Authority is responsible for the management and operation of the airfield and airport facilities.	Planned
	Detroit Metro Wayne County Airport Security Monitoring Field Equipment	Detroit Metro Wayne County Airport - Roadside equipment located on Detroit Metro Wayne County Airport routes that is used for monitoring key infrastructure elements from damage or attacks.	Existing
	Detroit Metro Wayne County Airport Vehicle Parking Management System	System operated by Wayne County Airport Authority that monitors available vehicle parking at key parking facilities.	Planned
	DTW Airport Detection (Detroit Metro Wayne County Airport)	Detroit Metro Wayne County Airport - roadway equipment on routes used to detect vehicle volumes and/or speeds.	Planned
	DTW Airport DMS (Detroit Metro Wayne County Airport)	Detroit Metro Wayne County Airport - Dynamic message signs operated by a local agency to provide information to drivers such as lane closures due to a crash or from the weather.	Planned
	DTW Airport Traveler Information Website	Detroit Metro Wayne County Airport – web site that links the users to multiple data sources for weather, traffic, and flight information.	Existing
	DTW Airport Operations Center (Detroit Metro Wayne County Airport)	Detroit Metro Wayne County Airport central command and control facility responsible for airport operations.	Planned

Table 5 – SEMCOG Region Inventory of ITS Elements

Stakeholder Name	Element Name	Element Description	Status
Wayne County Department of Public Services	Wayne County TOC	Wayne County Traffic Operations Center responsible for municipal signal system operations.	Planned
	Wayne County Traffic Signals	Multiple traffic signals interconnected and operated by Wayne County Department of Public Services.	Planned
	Wayne County Transit Center	Provides public transportation in Wayne County	Existing
	Wayne County Website	Website for Wayne County	Planned

3.3.3 Top Level Regional System Interconnect Diagram

A system interconnect diagram, or "sausage diagram" (shown previously in **Figure 3**), shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the SEMCOG Region based on the system inventory and information gathered from the stakeholders. **Figure 4** and **Figure 5** summarize the existing and planned ITS elements for the SEMCOG Region in the context of a physical interconnect. Subsystems and elements specific to the Region are called out in the boxes surrounding the main interconnect diagram, and these are color-coded to the subsystem with which they are associated.

Figure 4 – SEMCOG Regional System Interconnect Diagram

Kimley-Horn of Michigan, Inc.

Legend

- **Subsystem** — Regional Architecture Elements Map To National ITS Architecture
- **Subsystem** ····· No Regional Architecture Elements Map To National ITS Architecture

Information Service Provider

- 3rd Party End of Queue Detection
- Ambassador Bridge Website
- Ann Arbor Transportation Authority Website
- Blue Water Area Transit Website
- City of Detroit DTC People Mover Website
- City of Detroit Website
- DDOT Website
- Lake Erie Transportation Commission Website
- Livingston County Transit Website
- Local Agency Ridesharing Program
- Local Agency Website
- MDOT Blue Water Bridge Website
- MDOT MI Drive Website
- MDOT Office of Communications
- MDOT Traveler Information Database
- Michigan 511 System
- MSP Winter Travel Advisory Website
- MSP Winter Travel Toll Free Number
- MTO Ontario Website
- Private Sector Traveler Information Services
- RCMC Website
- RCOC Website
- Regional Demand Response Providers Website
- SMART Website
- University of Michigan Parking & Transportation Services Website
- US Customs and Border Protection Website
- Wayne County Website

Roadway Subsystem

- Ambassador Bridge CCTV Cameras
- Ambassador Bridge DMS
- Ambassador Bridge Field Sensors
- AWOS Weather Stations
- City of Ann Arbor Field Sensors
- City of Ann Arbor Traffic Signals
- City of Detroit CCTV Cameras
- City of Detroit Field Sensors
- City of Detroit Traffic Signals
- Contractor Smart Work Zone Equipment
- Detroit Windsor Tunnel DMS
- DNR Weather Stations
- DTW Airport Detection
- DTW Airport DMS
- DTW Airport Operations Center
- Local Agency Anti-Icing Field Equipment
- Local Agency CCTV Cameras
- Local Agency DMS
- Local Agency Field Sensors
- Local Agency Traffic Signals
- Local Agency Work Zone Safety Monitoring Equipment
- Monroe County CCTV Cameras
- Monroe County Field Sensors
- Monroe County Traffic Signals
- MDOT Anti-Icing Field Equipment

Traffic Management

- Ambassador Bridge Operations Center
- City of Ann Arbor TOC
- City of Detroit TOC
- City of Port Huron Drawbridge Management Center
- City of Port Huron TOC
- City of Toledo Traffic Signal System
- City of Windsor TOC
- Detroit Windsor Tunnel TOC
- DTW Airport Operations Center
- Local Agency TOC
- Lucas County Traffic Signal System
- MDOT Bay Region TMC
- MDOT Blue Water Bridge TOC
- MDOT (Detroit) Drawbridge Management Center
- MDOT Metro Region TSC
- MDOT MITSC
- MDOT North Region TMC
- MDOT (Port Huron) Drawbridge Management Center
- MDOT Port Huron TOC

Traffic Management (cont.)

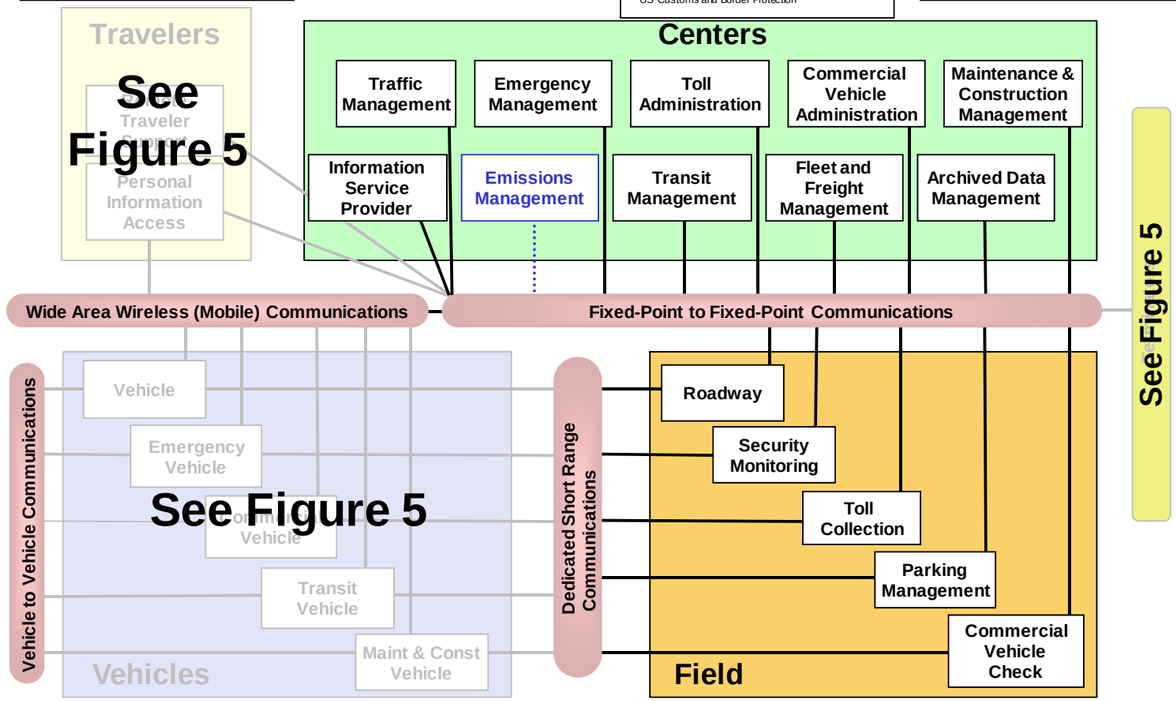
- MDOT Statewide TMC – Lansing
- MDOT Superior Region TMC
- MDOT University Region TSC
- MDOT West Michigan TMC
- MTO
- Monroe County TOC
- ODOT District 2 Office
- ODOT Toledo Freeway Management Center
- RCOC TOC
- RCMC TOC
- St. Clair County Drawbridge Management Center
- St. Clair County TOC
- Washtenaw County TOC
- Wayne County TOC

Emergency Management

- Ambassador Bridge Operations Center
- City of Toledo Public Safety Dispatch
- County 911 Dispatch
- Department of Homeland Security
- Detroit Edison Emergency Operations Center
- Detroit Windsor Tunnel TOC
- DTW Airport Operations Center
- Local Agency 911 Dispatch
- Local Emergency Operations Center
- Lucas County Emergency Operations Center
- Lucas County Public Safety Dispatch
- MDOT Blue Water Bridge TOC
- MDOT Freeway Courtesy Patrol Dispatch
- MIOC
- MSP 911 Regional Dispatch Center
- MSP Headquarters – East Lansing
- MSP Office of Highway Safety Planning
- Private Concierge Providers
- US Coast Guard
- US Customs and Border Protection

Transit Management

- Ann Arbor Transportation Authority Dispatch Center
- Blue Water Area Transit Dispatch Center
- City of Detroit DTC People Mover Dispatch Center
- DDOT Transit Dispatch Center
- DTW Airport Operations Center
- Flint MTA Control Center
- Lake Erie Transportation Commission Dispatch Center
- Livingston County Intermodal Transportation Facility
- MTO
- Private Transportation Providers
- Regional Demand Response Transit Providers Dispatch Center
- SMART Central Dispatch Center
- SMART Dispatch Center
- St. Clair County Transit Center
- TARTA
- University of Michigan Parking & Transportation Services Dispatch Center
- Wayne County Transit Center



Toll Administration

- Ambassador Bridger Operations Center
- Detroit Windsor Tunnel TOC
- MDOT Blue Water Bridge TOC

Commercial Vehicle Administration

- MDOT Commercial Vehicle Permitting System
- MSP Motor Carrier Division
- FAST
- NEXUS

Fleet and Freight Management

- Private Fleet Operations

Maintenance & Construction Mgmt

- Ambassador Bridge
- Blue Water Bridge Authority
- City of Detroit DPW
- City of Toledo Maintenance Dispatch
- County Road Commission
- Local Agency DPW
- MDOT Metro Region TSC
- MDOT University Region TSC
- MTO
- ODOT District 2 Maintenance Garages
- RCOC TOC
- RCMC TOC
- SEMSIM

Archived Data Management

- Ann Arbor Transportation Authority Archive
- Blue Water Area Transit Data Archive
- City of Detroit DTC People Mover Data Archive
- CJIC Database
- DDOT Data Archive
- Lake Erie Transportation Commission Data Archive
- MDOT Data Warehouse
- MDOT Planning Division Data Warehouse
- RCOC Data Archive
- RCMC Data Archive
- Regional Demand Response Transit Providers Data Archive
- SEMCOG Data Warehouse
- SMART Central Dispatch Archive
- University of Michigan Parking & Transportation Services Data Archive

Roadway Subsystem (cont.)

- MDOT Blue Water Bridge DMS
- MDOT Blue Water Bridge HAR
- MDOT CCTV Cameras
- MDOT DMS
- MDOT Drawbridge Control Equipment
- MDOT Drawbridge Notification Equipment
- MDOT ESS
- MDOT Field Sensors
- MDOT HAR
- MDOT Portable CCTV Cameras
- MDOT Roadside Equipment for AHS
- MDOT Roadside Intersection Collision Avoidance Equipment
- MDOT Roadside Signing Equipment
- MDOT Smart Work Zone Equipment

Roadway Subsystem (cont.)

- MDOT Traffic Signals
- MDOT Work Zone Safety Monitoring Equipment
- NWS Weather Stations
- Private Provider Vehicle Detection
- Railroad Blockage Notification System
- RCMC CCTV Cameras
- RCMC Field Sensors
- RCMC Traffic Signals
- RCOC CCTV Cameras
- RCOC Field Sensors
- RCOC Traffic Signals
- St. Clair County Traffic Signals
- Washtenaw County Traffic Signals
- Wayne County Traffic Signals

Security Monitoring Subsystem

- Ambassador Bridge Security Monitoring Field Equipment
- Ann Arbor Transportation Authority CCTV Surveillance
- Blue Water Area Transit CCTV Surveillance
- City of Detroit DTC People Mover CCTV Surveillance
- DDOT Center CCTV Surveillance
- Detroit Metro Wayne County Airport Security Monitoring Field Equipment
- Detroit Windsor Tunnel Security Monitoring Field Equipment
- Lake Erie Transportation Commission CCTV Surveillance
- Livingston County Transit CCTV Surveillance
- MDOT Blue Water Bridge Security Monitoring Field Equipment
- MDOT Security Monitoring Field Equipment

Security Monitoring Subsystem (cont.)

- Regional Demand Response Transit Providers Transit Center CCTV Surveillance
- SMART Center CCTV Surveillance
- University of Michigan Parking & Transportation Services CCTV Surveillance

Toll Collection

- Ambassador Bridge Toll Plazas
- Blue Water Bridge Toll Plazas
- Detroit Windsor Tunnel Toll Plazas

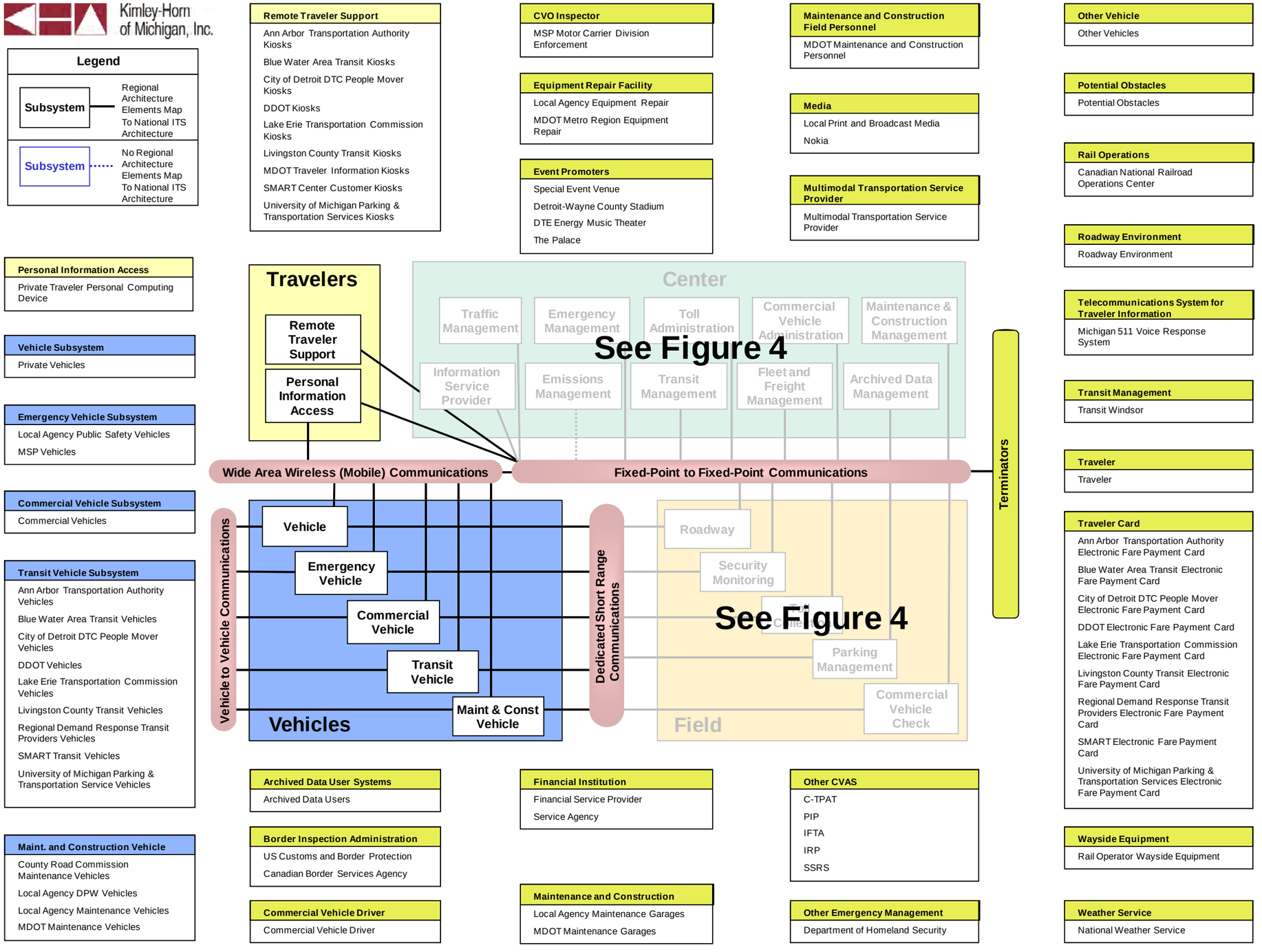
Parking Management

- City of Detroit Municipal Parking Department
- Detroit Metro Wayne County Airport Vehicle Parking Management System
- Wayne County Detroit Stadium Authority

Commercial Vehicle Check

- Ambassador Bridge Operations Center
- Detroit Windsor Tunnel TOC
- MDOT Blue Water Bridge TOC
- MDOT Weigh-in-Motion

Figure 5 – SEMCOG Regional System Interconnect Diagram



3.4 Market Packages

Upon completion of the system inventory, the next step in the update of the architecture was to identify the transportation services that are important to the SEMCOG Region. In the National ITS Architecture, services are referred to as market packages. Market packages can include several stakeholders and elements that work together to provide a service in the Region. Examples of market packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently a total of 91 market packages identified in the National ITS Architecture Version 6.0. **Appendix A** provides definitions for each of the National ITS Architecture market packages.

The market packages are grouped together into eight ITS service areas: Traffic Management, Emergency Management, Maintenance and Construction Management, Public Transportation Management, Commercial Vehicle Operations, Traveler Information, Archived Data Management, and Vehicle Safety.

3.4.1 Selection and Prioritization of Regional Market Packages

In the SEMCOG Region, the National ITS Architecture market packages were reviewed by the stakeholders and selected based on the relevance of the service that the market package could provide to the Region. Fifty-one market packages were selected for implementation in the Region. They are identified in **Table 6**. The selected market packages were then prioritized based on need and do not necessarily represent the timeframe for funding of these deployments. The table organizes the market packages into service areas and priority groupings. These priorities can also be affected by several other factors such as existing infrastructure, dependency on other systems, and the maturity of the technology associated with the market package.

After selecting the market packages that were applicable for the Region, stakeholders reviewed each market package and the elements that could be included to customize it for the Region. This customization is discussed further in the following section.

Table 6 – SEMCOG Region Market Package Prioritization by Functional Area

High Priority (0-3 yrs) Market Packages	Medium Priority (4-8 yrs) Market Packages	Low Priority (>8 yrs) Market Packages	Non-selected Market Packages
Traffic Management			
ATMS01 Network Surveillance ATMS03 Surface Street Control ATMS06 Traffic Information Dissemination ATMS07 Regional Traffic Control ATMS08 Traffic Incident Management System ATMS10 Electronic Toll Collection	ATMS16 Parking Facility Management ATMS20 Drawbridge Management	ATMS02 Probe Surveillance ATMS13 Standard Railroad Grade Crossing ATMS15 Railroad Operations Coordination	ATMS04 Freeway Control ATMS05 HOV Lane Management ATMS09 Traffic Forecast and Demand Management ATMS11 Emissions Monitoring and Management ATMS12 Roadside Lighting System Control ATMS14 Advance Railroad Grade Crossing ATMS17 Regional Parking Management ATMS18 Reversible Lane Management ATMS19 Speed Monitoring ATMS21 Roadway Closure Management
Emergency Management			
EM01 Emergency Call-Taking and Dispatch EM02 Emergency Routing EM04 Roadway Service Patrols EM06 Wide-Area Alert	EM03 Mayday and Alarm Support EM05 Transportation Infrastructure Protection EM08 Disaster Response and Recovery	EM09 Evacuation and Reentry Management EM10 Disaster Traveler Information	EM07 Early Warning System
Maintenance and Construction Management			
MC01 Maintenance and Construction Vehicle and Equipment Tracking MC06 Winter Maintenance MC08 Work Zone Management	MC03 Road Weather Data Collection MC04 Weather Information Processing and Distribution MC07 Roadway Maintenance and Construction MC09 Work Zone Safety Monitoring	MC02 Maintenance and Construction Vehicle Maintenance MC05 Roadway Automated Treatment MC10 Maintenance and Construction Activity Coordination	MC11 Environmental Probe Surveillance MC12 Infrastructure Monitoring
Public Transportation Management			
APTS01 Transit Vehicle Tracking APTS02 Transit Fixed-Route Operations APTS03 Demand Response Transit Operations APTS05 Transit Security	APTS04 Transit Passenger and Fare Management APTS08 Transit Traveler Information APTS10 Transit Passenger Counting	APTS06 Transit Maintenance APTS07 Multi-modal Coordination APTS09 Transit Signal Priority	
Commercial Vehicle Operations			
CVO05 International Border Electronic Clearance CVO06 Weigh-in-Motion	CVO04 Administrative Processes CVO10 HAZMAT Management		CVO01 Fleet Administration CVO02 Freight Administration CVO03 Electronic Clearance CVO07 Roadside CVO Safety CVO08 On-board CVO and Freight Safety and Security CVO09 CVO Fleet Maintenance CVO11 Roadside HAZMAT Security Detection and Mitigation CVO12 CV Driver Security Authentication CVO13 Freight Assignment Tracking

Table 6 – SEMCOG Region Market Package Prioritization by Functional Area

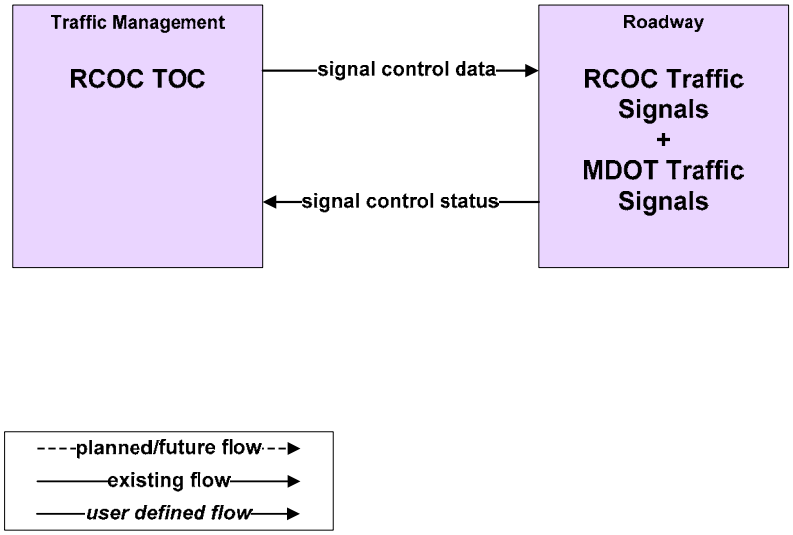
High Priority (0-3 yrs) Market Packages	Medium Priority (4-8 yrs) Market Packages	Low Priority (>8 yrs) Market Packages	Non-selected Market Packages
Traveler Information			
ATIS01 Broadcast Traveler Information	ATIS02 Interactive Traveler Information ATIS04 Dynamic Route Guidance	ATIS08 Dynamic Ridesharing ATIS09 In Vehicle Signing	ATSI03 Autonomous Route Guidance ATIS05 ISP Based Trip Planning and Route Guidance ATIS06 Transportation Operations Data Sharing ATIS07 Yellow Pages and Reservations ATIS10 VII Traveler Information
Archived Data Management			
	AD1 ITS Data Mart AD3 ITS Virtual Data Warehouse		AD2 ITS Data Warehouse
Advanced Vehicle Safety			
	AVSS10 Intersection Collision Avoidance	AVSS11 Automated Highway System	AVSS01 Vehicle Safety Monitoring AVSS02 Driver Safety Monitoring AVSS03 Longitudinal Safety Warning AVSS04 Lateral Safety Warning AVSS05 Intersection Safety Warning AVSS06 Pre-Crash Restraint Deployment AVSS07 Driver Visibility Improvement AVSS08 Advance Vehicle Longitudinal Control AVSS09 Advance Vehicle Lateral Control AVSS12 Cooperative Vehicle Safety Systems

3.4.2 Customized Market Packages

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the SEMCOG Region. Each market package is shown graphically with the market package name, local agencies involved and desired data flows included. Market packages represent a service that will be deployed as an integrated capability.

Figure 6 is an example of an ATMS market package for Surface Street Control that has been customized for the Region. This market package shows the two subsystems Traffic Management and Roadway, and the associated entities (RCOC TOC and RCOC Traffic Signals and MDOT Traffic Signals) for surface street control in the Region. Data flows between the subsystems indicate what information is being shared. The remainder of the market packages that were customized for the SEMCOG Region is shown in **Appendix B**.

Figure 6 – Example Market Package Diagram: ATMS03 – Surface Street Control



3.4.3 Regional ITS Needs and Customized Market Packages

Input received from stakeholders at the Architecture Workshop provided valuable input for the market package customization process. The specific needs identified are included in **Table 7**. The table also identifies which market package documents the particular ITS need. There was one institutional need, requiring policy or organization decisions that cannot be addressed with a technological solution or a market package. It was the need for a privacy policy statement to address who can access specific data. While the architecture itself cannot provide a solution for this need, it is important to document these need so it can be referenced as probe data and similar projects are designed and deployed.

Table 7 – Regional ITS Needs and Corresponding Market Packages

ITS Need	Market Package	
Traffic Management Needs		
Need comprehensive communications network	ATMS01	ATIS01
	ATMS06	ATIS02
	ATMS07	
Need surveillance and FCP on all freeways	ATMS01	EM04
	ATMS02	
Need coordinating signal systems	ATMS03	ATMS07
Need special events planning	ATMS08	ATMS16
Need to identify ICM corridors	ATMS01	APTS08
	ATMS02	EM02
	ATMS06	EM04
	ATMS07	MC03
	ATMS08	MC04
	ATIS01	MC06
	APTS01	MC07
	APTS02	MC10
	APTS07	
Need real-time delay information within University and Metro Regions	ATMS01	ATMS06
	ATMS02	ATIS01
Need alternate route advisory for emergency Incident Management	ATMS08	ATIS09
	ATIS04	
Need better data collection	ATMS01	MC03
	ATMS02	
Need cameras to monitor highly traveled freeways	ATMS01	
Need parking management for downtown Detroit	ATMS16	
Emergency Management		
Need method for increasing safety due to deer crashes in Livingston	ATMS01	ATMS06
Maintenance and Construction Management		
Need access to SEMSIM data – Counties	MC06	
Public Transportation Management		
Need signal priority	ATMS03	APTS09
Traveler Information		
Need to share data from DTW Airport	ATMS06	ATMS16
	ATMS07	APTS07
Archive Data Management		
Need ability to archive speed and weather data	AD1	AD3

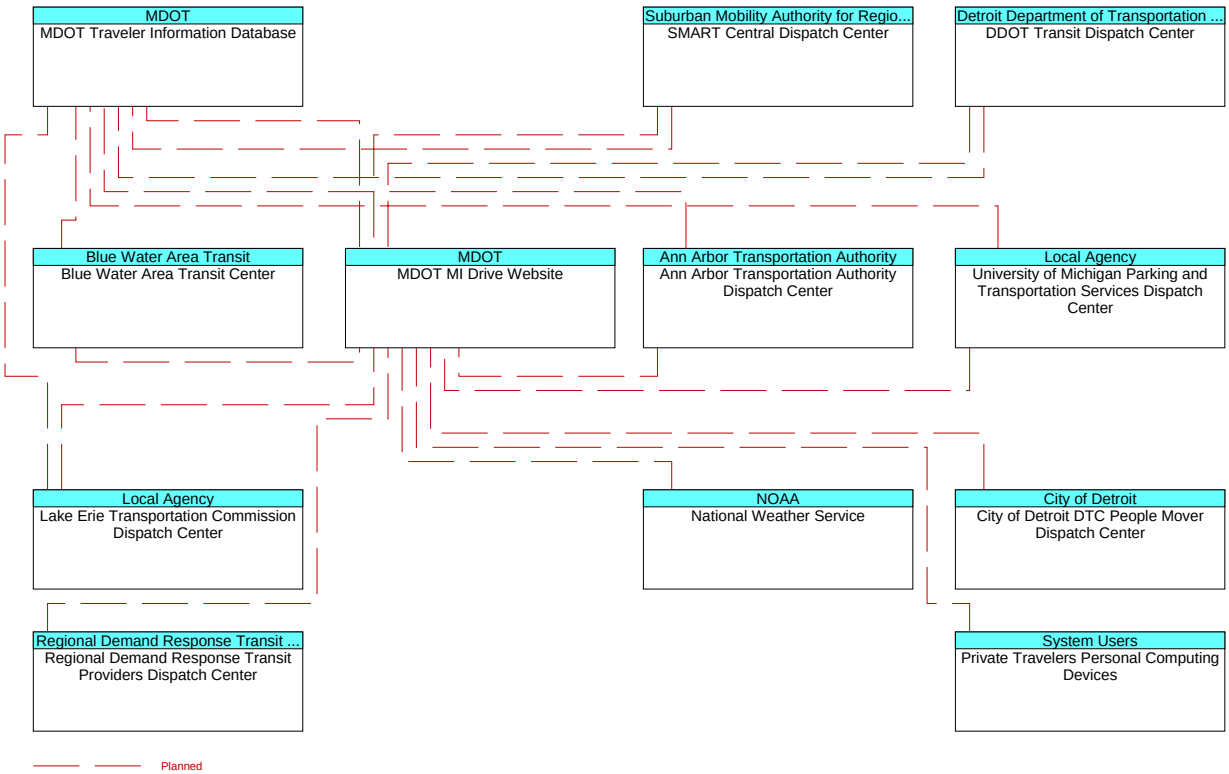
3.5 Architecture Interfaces

While it is important to identify the various systems and stakeholders that are part of a regional ITS, a primary purpose of the architecture is to identify the connectivity between transportation systems in the SEMCOG Region. The system interconnect diagram shown previously in **Figure 6** showed the high-level relationships of the subsystems and terminators in the SEMCOG Region and the associated local projects and systems. The customized market packages represent services that can be deployed as an integrated capability and the market package diagrams show the information flows between the subsystems and terminators that are most important to the operation of the market packages. How these systems interface with each other is an integral part of the overall ITS architecture.

3.5.1 Element Connections

There are a variety of different elements identified as part of the SEMCOG Regional ITS Architecture. These elements include traffic management centers, transit vehicles, dispatch systems, emergency management agencies, media outlets, and others—essentially, all of the existing and planned physical components that contribute to the regional ITS. Interfaces have been identified for each element in the SEMCOG Region ITS Architecture and each element has been mapped to those other elements with which it must interface. The Turbo Architecture software can generate interconnect diagrams for each element in the Region that show which elements are connected to one another. **Figure 7** is an example of a context style interconnect diagram from the Turbo database output. This particular interconnect diagram is for the MDOT MI Drive Web Site and is called a context diagram because it shows every element in the architecture that connect with the web site.

Figure 7 – Example Interconnect Diagram: MDOT MI Drive



3.5.2 Data Flows Between Elements

In the market package diagrams, flows between the subsystems and terminators define the specific information (data) that is exchanged between the elements and the direction of the exchange. The data flows could be requests for information, alerts and messages, status requests, broadcast advisories, event messages, confirmations, electronic credentials, and other key information requirements. Turbo Architecture can be used to output flow diagrams and can be filtered by market package for ease of interpretation; however, it is important to remember that custom data flows will not show up in diagrams that are filtered by market package. An example of a flow diagram for the RCOC TOC that has been filtered for RCOC Field Sensors is shown in **Figure 8**.

The flow diagrams can vary greatly in complexity and, in turn, legibility. **Figure 9** shows a more complex flow diagram for ATMS06 – Traffic Information Dissemination – RCOC TOC.

Figure 8 – Example Flow Diagram: ATMS03 – RCOC TOC

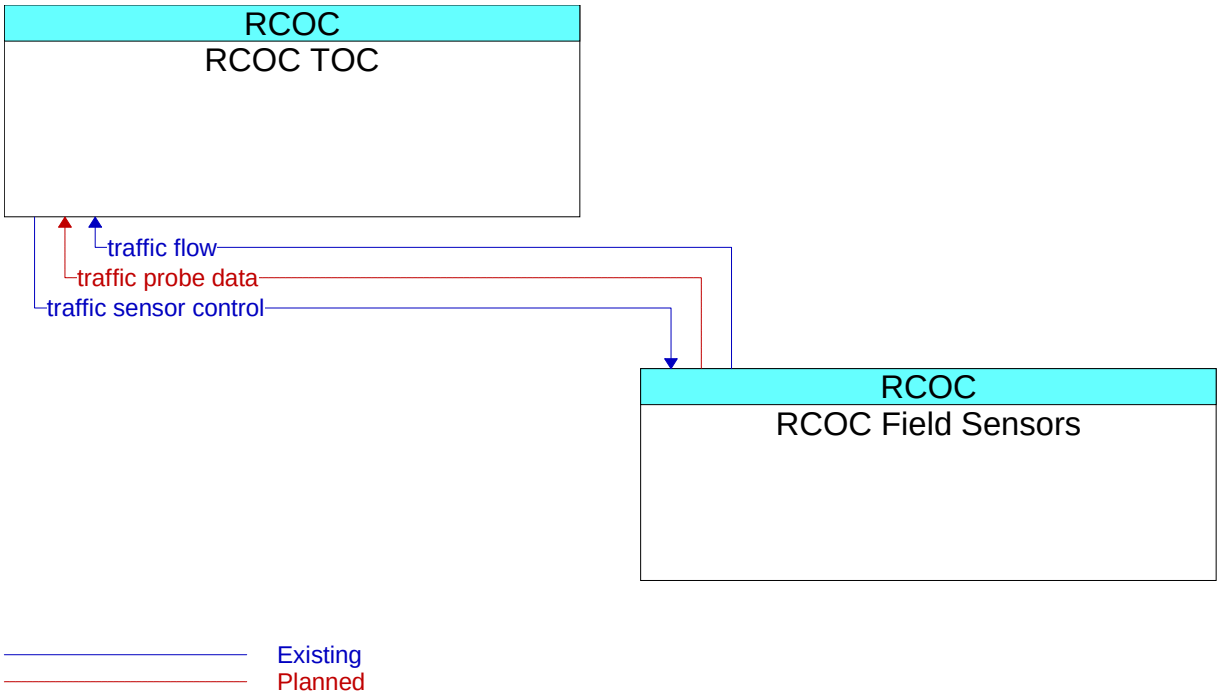
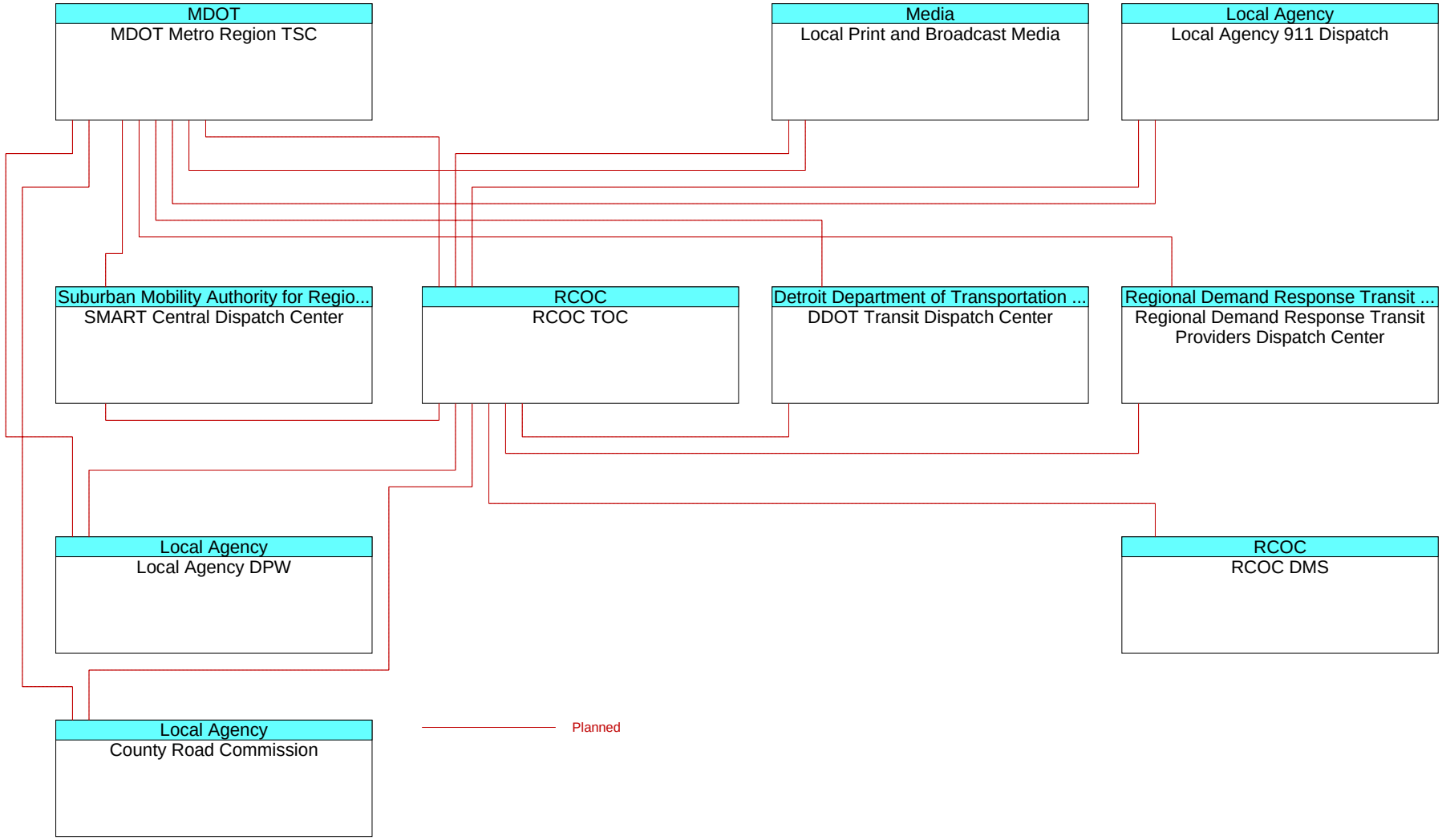


Figure 9 – Example Flow Diagram: ATMS06 – Traffic Information Dissemination, RCOC TOC



In addition to market package style flow diagrams, Turbo Architecture has the ability to create flow diagrams that show only the connections between two or three specific elements or context diagrams that show all of the flows that involve an element. Filtering the diagrams to generate specific scenarios can be very useful during the project implementation process. For example, **Figure 10** shows the flows between the MDOT MITSC and the MTO (Province of Ontario Ministry of Transportation). While this is a portion of the planned interactions, it could also be useful to use a context diagram for the element, as shown in **Figure 11** to view all of the other interactions so that the project can be designed with the future in mind. Context style flow diagrams can get very large and complicated for elements with lots of connections such as a TMC.

Figure 10 – Example Two Element Flow Diagram

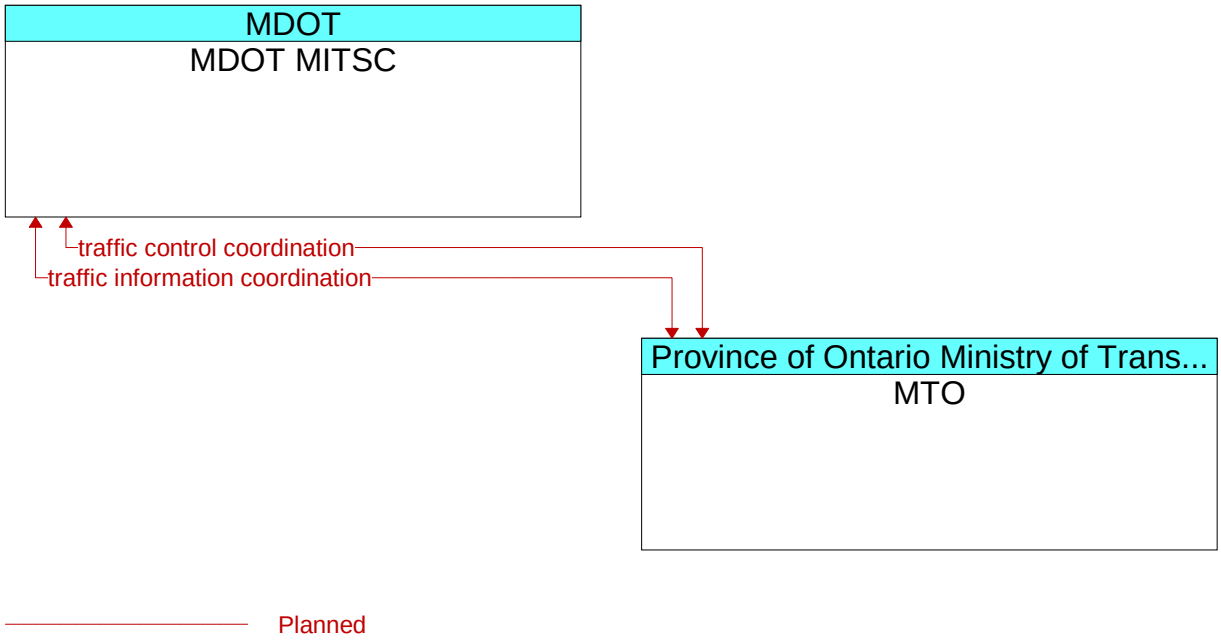
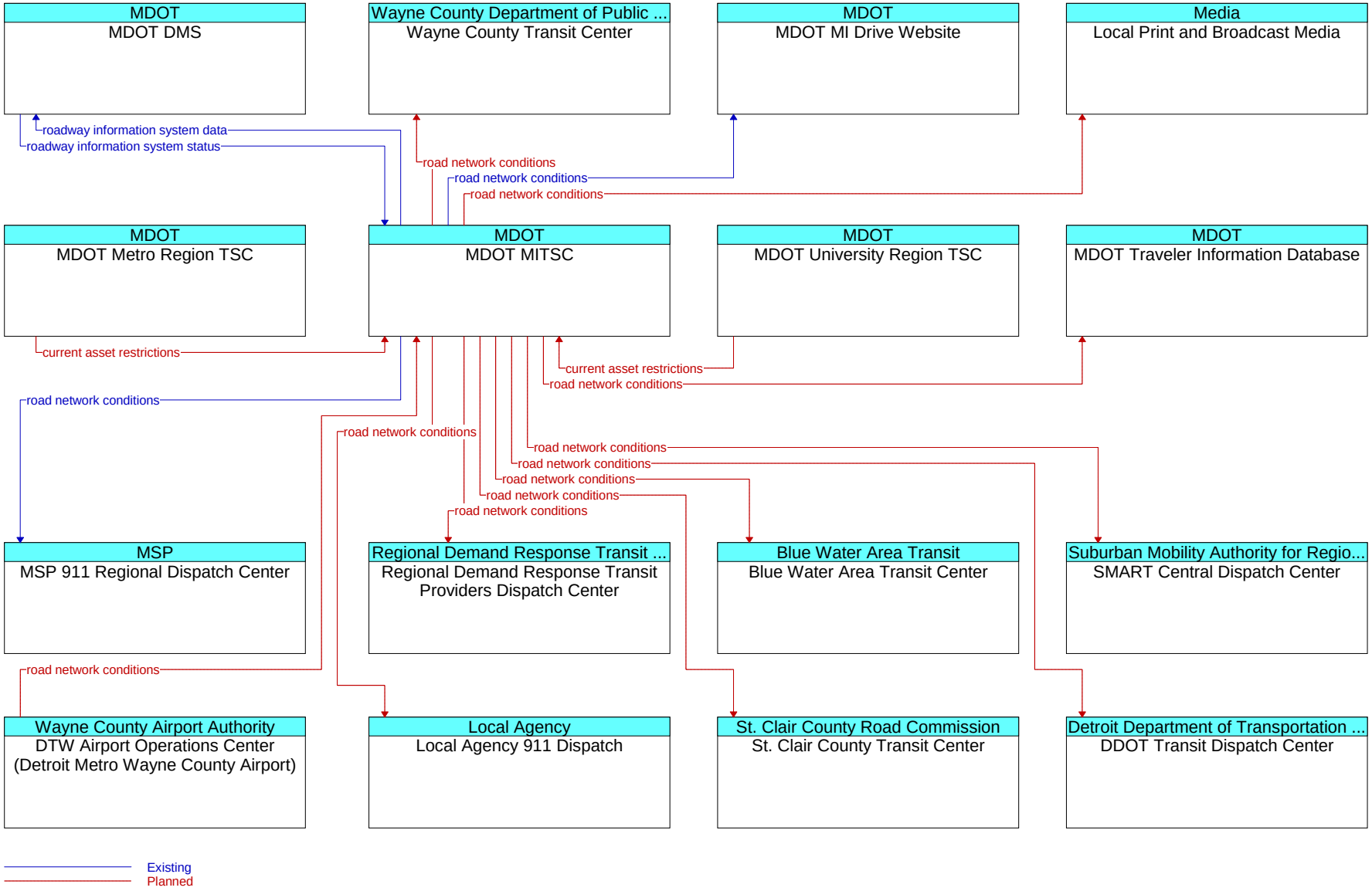


Figure 11 – Example Context Flow Diagram: MDOT MITSC



4 Application of the Regional ITS Architecture

Once a region has identified the desired components of ITS for their area and established which agencies and systems need to be connected, the structure of the National ITS Architecture assists with the region's planning and implementation. This section addresses the application of the Regional ITS Architecture in the SEMCOG Region. The National ITS Architecture provides recommendations for standards and functional requirements that should be considered when implementing ITS elements. In addition, the operational concept was updated for the Region to document the roles and responsibilities of stakeholders in the operation of the regional ITS. The implementation of ITS in the SEMCOG Region will likely require interagency agreements. Potential agreements will be identified based on the desired data flows identified in the SEMCOG Region. The update of the ITS Architecture and the development of the ITS Deployment Plan, completed as part of this process, will be incorporated into the existing planning process for the Region to ensure that the maximum benefit is realized from the development effort.

4.1 Functional Requirements

Functions are a description of what the system has to do. In the National ITS Architecture, functions are defined at several different levels, ranging from general subsystem descriptions through somewhat more specific equipment package descriptions to process specifications that include substantial detail. Guidance from the USDOT on developing a Regional ITS Architecture recommends that each Region determine the level of detail of the functional requirements for their Region. In the SEMCOG Region, it is recommended that the development of detailed functional requirements such as the "shall" statements included in process specifications for a system be developed at the project level. These detailed "shall" statements identify all functions that a project or system needs to perform.

For the SEMCOG Regional ITS Architecture, functional requirements have been identified at two levels. The customized market packages, discussed previously in Section 3.4.2, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These market packages and data flows describe what systems in the SEMCOG Region have to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the SEMCOG Region are described in terms of functions that each element in the architecture performs or will perform in the future. **Appendix C** contains a table that summarizes the functions by element.

4.2 Standards

Standards are an important tool that will allow efficient implementation of the elements in the SEMCOG Regional ITS Architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT's ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards development to facilitate successful ITS deployment in the United States. **Table 8** identifies each of the ITS standards that could apply to the SEMCOG Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 3.5.2.

Table 8 – SEMCOG Region Applicable ITS Standards

Standards Development Organization	Document ID	Title
AASHTO/ITE	ITE TMDD 2.1	Traffic Management Data Dictionary and Message Sets for External TMC Communication (TMDD and MS/ETMCC)
AASHTO/ITE/NEMA	NTCIP 1102	Octet Encoding Rules Base Protocol
	NTCIP 1103	Transportation Management Protocols
	NTCIP 1104	Center-to-Center Naming Convention Specification
	NTCIP 2101	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile
	NTCIP 2102	Point to Multi-Point Protocol Using Frequency Shift Keying Modem Subnetwork Profile
	NTCIP 2103	Point-to-Point Protocol Over RS-232 Subnetwork Profile
	NTCIP 2104	Ethernet Subnetwork Profile
	NTCIP 2201	Transportation Transport Profile
	NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile
	NTCIP 2301	STMF Application Profile
	NTCIP 2302	Trivial File Transfer Protocol Application Profile
	NTCIP 2303	File Transfer Protocol Application Profile
	NTCIP 2304	Application Profile for DATEX-ASN (AP-DATEX)
	NTCIP 2306	Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications
	NTCIP 1201	Global Object Definitions
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units
	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)
	NTCIP 1204	Object Definitions for Environmental Sensor Stations (ESS)
	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control
	NTCIP 1206	Object Definitions for Data Collection and Monitoring (DCM) Devices
	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching
	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)
	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters
	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)
APTA	APTA TCIP-S-001 3.0.0	Standard for Transit Communications Interface Profiles
ASTM	ASTM E2468-05	Standard Practice for Metadata to Support Archived Data Management Systems
	ASTM WK7604	Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data
	ASTM E-2213-03	Standard Specification for Telecommunications and Information Exchange between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communication (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications
IEEE	IEEE 1455-1999	Standard for Message Sets for Vehicle/Roadside Communications
	IEEE 1570-2002	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection

Table 8 – SEMCOG Region Applicable ITS Standards

Standards Development Organization	Document ID	Title
IEEE (continued)	IEEE 1512.1-2006	Standard for Traffic Incident Management Message Sets for Use by EOCs
	IEEE 1512.2-2004	Standard for Public Safety Traffic Incident Management Message Sets (IMMS) for use by EOCs
	IEEE 1512.3-2006	Standard for Hazardous Material IMMS for use by EOCs
	IEEE 1512-2006	Standard for Common IMMS for use by EOCs
	IEEE 1609.1-2006	Resource Manager for DSRC 5.9 GHz
	IEEE 1609.2-2006	Application Services (Layers 6,7) for DSRC 5.9 GHz
	IEEE 1609.4-2006	Medium Access Control (MAC) Extension and the MAC Extension Management Entity for DSRC 5.9 GHz
	IEEE P1609.3	Networking Services
	IEEE P802.11p	Standard Specification for Telecommunications and Information Exchange Between Local and Metropolitan Area Networks – Wireless LAN Medium Access Control (MAC) and Physical Layer Specifications
	IEEE P1512.4	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers
SAE	SAE J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary
	SAE J2266	Location Referencing Message Specification
	SAE J2313	On-Board Land Vehicle Mayday Reporting Interface
	SAE J2354	Message Set for Advanced Traveler Information System (ATIS)
	SAE J2369	Standard for ATIS Message Sets Delivered Over
	SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards
	SAE J2540-1	Radio Data System Phrase Lists
	SAE J2540-2	ITIS (International Traveler Information Systems) Phrase Lists
	SAE J2540-3	National Names Phrase List

4.3 Operational Concepts

An operational concept documents each stakeholder's current and future roles and responsibilities across a range of transportation services, as grouped in the Operational Concepts section of Turbo Architecture, in the operation of the regional ITS. The services covered are:

- ***Arterial Management*** – The development of signal systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor, an area, or multiple jurisdictions.
- ***Freeway Management*** – The development of systems to monitor freeway (or tollway) traffic flow and roadway conditions, and provide strategies such as ramp metering or lane access control to improve the flow of traffic on the freeway. Includes systems to provide information to travelers on the roadway.
- ***Incident Management*** – The development of systems to provide rapid and effective response to incidents. Includes systems to detect and verify incidents, along with coordinated agency response to the incidents.
- ***Emergency Management*** – The development of systems to provide emergency call taking, public safety dispatch, and emergency operations center operations.
- ***Maintenance and Construction Management*** – The development of systems to manage the maintenance of roadways in the Region, including winter snow and ice clearance. Includes the managing of construction operations.
- ***Transit Management*** – The development of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both pre-trip and during the trip.
- ***Electronic Payment*** – The development of electronic fare payment systems for use by transit and other agencies (e.g., parking).
- ***Commercial Vehicle Operations*** – The development of systems to facilitate the management of commercial vehicles (e.g., electronic clearance).
- ***Traveler Information*** – The development of systems to provide static and real time transportation information to travelers.
- ***Archived Data Management*** – The development of systems to collect transportation data for use in non-operational purposes (e.g., planning and research).
- ***Advanced Vehicle Safety*** – The development of systems to support private sector vehicle safety initiatives (e.g., intersection collision avoidance).

Table 9 identifies the roles and responsibilities of key stakeholders for a range of transportation services.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Arterial Management	City of Ann Arbor	Operate traffic signal systems on local routes.
		Operate network surveillance equipment including CCTV cameras and field sensors on local routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.
		Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with private rail operators.
		Provide traffic signal preemption for emergency vehicles.
	City of Detroit	Operate traffic signal systems on local routes.
		Operate network surveillance equipment including CCTV cameras and field sensors on local routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.
		Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with private rail operators.
		Provide traffic signal preemption for emergency vehicles.
	City of Port Huron	Operate traffic signal systems on local routes.
		Operate network surveillance equipment including CCTV cameras and field sensors on local routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.
		Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with private rail operators.
		Provide traffic signal preemption for emergency vehicles.
	Local Agency	Operate traffic signal systems on local routes.
		Operate network surveillance equipment including CCTV cameras and field sensors on local routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Arterial Management (continued)	Local Agency (continued)	Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with private rail operators.
		Provide traffic signal preemption for emergency vehicles.
	MDOT	Operate and maintain traffic signal systems on MDOT routes not managed by local agencies.
		Operate network surveillance equipment including CCTV cameras and field sensors on MDOT routes not managed by local agencies to facilitate traffic signal operations.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with local agency TOCs and other MDOT TMCs.
		Provide traffic signal preemption for emergency vehicles.
	Province of Ontario Ministry of Transportation (MTO)	Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with local agency TOCs and other MDOT TMCs.
	RCMC	Operate traffic signal systems within the County.
		Operate network surveillance equipment including CCTV cameras and field sensors on local and state routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.
		Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with Private Rail Operators.
		Provide traffic signal preemption for emergency vehicles.
	RCOC	Operate traffic signal systems within the County.
		Operate network surveillance equipment including CCTV cameras and field sensors on local and state routes to facilitate traffic signal operations.
		Provide traffic information reports to regional information service providers.
		Provide traffic information to regional agencies including transit, emergency management, maintenance and construction, and the media.
		Coordinate traffic information and control with MDOT MITSC.
		Coordinate traffic information with other local agencies.
		Coordinate HRI signal adjustments with Private Rail Operators.
		Provide traffic signal preemption for emergency vehicles.
Freeway Management	Centra Ambassador Bridge Corporation	Operate network surveillance equipment including CCTV cameras and field sensors, as well as DMS, to convey traffic information on Ambassador Bridge and surrounding routes.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Freeway Management (continued)	Centra Ambassador Bridge Corporation (continued)	Provide traffic information to regional information service providers.
		Coordinate traffic information and traffic control with other MDOT MITSC.
	Detroit and Canada Tunnel Corporation	Operate network surveillance equipment including CCTV cameras and field sensors, as well as DMS, to convey traffic information within Tunnel and surrounding routes.
		Provide traffic information to regional information service providers.
		Coordinate traffic information and traffic control with other MDOT MITSC.
	MDOT	Operate network surveillance equipment including CCTV cameras and field sensors, as well as DMS, to convey traffic information on MDOT highway routes.
		Provide traffic information to regional information service providers.
		Provide traffic information to regional transportation agencies and the general public through traffic information devices (primarily DMS).
		Coordinate traffic information and traffic control with other MDOT TMCs.
		Provides video images to a large number of road and law enforcement agencies through a secure web access.
	Nokia	Provide traffic information to regional information service providers.
		Coordinate traffic information and traffic control with other MDOT MITSC.
	Ohio Department of Transportation (ODOT)	Provide traffic information to regional information service providers.
		Coordinate traffic information and traffic control with other MDOT TMCs.
	Province of Ontario Ministry of Transportation (MTO)	Provide traffic information to regional information service providers.
		Coordinate traffic information and traffic control with other MDOT MITSC.
	RCMC	Operate network surveillance equipment including CCTV cameras and field sensors, as well as DMS, to convey traffic information on county routes.
		Provide traffic information to regional information service providers.
		Provide traffic information to regional transportation agencies and the general public through traffic information devices (primarily DMS).
		Coordinate traffic information and traffic control with MDOT MITSC.
	RCOC	Operate network surveillance equipment including CCTV cameras and field sensors to convey traffic information on county routes.
		Provide traffic information to regional information service providers.
		Provide traffic information to regional transportation agencies and the general public through traffic information devices (primarily web site).
		Coordinate traffic information and traffic control with MDOT MITSC.
Incident Management (Traffic)	Local Agency	Perform network surveillance for detection and verification of incidents on local routes.
		Provide incident information to regional emergency responders, including the MSP and MDOT.
		Coordinate maintenance resources for incident response with SEMCOG Region TSCs and Local Agencies.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Incident Management (Traffic) (continued)	MDOT	Perform network surveillance for detection and verification of incidents on MDOT routes.
		Provide incident information to travelers via traffic information devices on highways (e.g. MDOT DMS).
	MDOT (continued)	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Coordinate maintenance resources for incident response with MDOT TSC Construction and Maintenance Operations.
		Responsible for the development, coordination, and execution of special traffic management strategies during an evacuation.
	Monroe County Road Commission	Perform network surveillance for detection and verification of incidents within the County
		Provide incident information to regional emergency responders, including the MSP and MDOT.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Coordinate maintenance resources for incident response with SEMCOG Region TSCs and other local agencies.
	Ohio Department of Transportation (ODOT)	Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Coordinate maintenance resources for incident response with MDOT TSC Construction and Maintenance Operations.
	RCMC	Perform network surveillance for detection and verification of incidents within the County
		Provide incident information to regional emergency responders, including the MSP and MDOT.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Coordinate maintenance resources for incident response with SEMCOG Region TSCs and other local agencies.
	RCOC	Provide incident information to regional emergency responders, including the MSP and MDOT.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Coordinate maintenance resources for incident response with SEMCOG Region TSCs and other local agencies.
Incident Management (Emergency)	Local Agency	Receive emergency calls for incidents on local routes.
		Dispatch the local agency emergency vehicles to incidents, including the local agency Police, Fire, and EMS/Rescue.
		Coordinate public safety resources for incident response on local routes.
		Coordinate incident response with other public safety agencies (fire, EMS, ambulance, etc.).
		Perform incident detection and verification on local routes and provide this information to the Local Agency TOC.
	MSP	Receive emergency calls for incidents on local routes.
		Dispatch MSP vehicles for incidents on highways.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Incident Management (Emergency) (continued)	MSP (continued)	Dispatch the local agency emergency vehicles to incidents, including the local agency Police, Fire, and EMS/Rescue in areas where MSP has primary 911 call-taking responsibilities.
		Coordinate incident response with other public safety agencies (local police, fire, EMS, sheriff) as well as MDOT.
		Coordinate public safety resources for incident response on local routes.
		Perform incident detection and verification for the highways within the region and provide this information to traffic and other public safety agencies.
Emergency Management	Local Agency	Participate in the incident response, coordination, and reporting.
		Dispatch local agency fire/EMS/police vehicles.
		Receive AMBER Alert and other wide area alert information from MSP.
		Respond to transit emergencies/alarms on-board transit vehicles or at the transit facilities of local transit agencies.
	MIOC	Participate in the incident response, coordination, and reporting.
	MSP	Dispatch MSP vehicles to incidents within their jurisdiction.
		Dispatch Local Agency emergency vehicles to incidents in areas where MSP has primary 911 call-taking responsibilities.
		Receive AMBER Alert and other Wide Area Alert information from MSP Headquarters.
		Receive early warning information and threat information from the NWS and Local Agencies.
		Coordinate with regional emergency management providers, maintenance and construction providers, and regional traffic management providers for emergency plans and evacuation and reentry plans.
		Provide regional traffic, transit, emergency management, and maintenance operations with disaster information to disseminate to the traveling public.
		Provide security monitoring of critical infrastructure for MDOT.
	RCOC	Video link with traffic images with Oakland County EM
Maintenance and Construction Management	DNR	Collect weather data from field devices.
	Local Agency	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
		Receive requests for maintenance resources for incident response from regional emergency management agencies.
		Supports coordinated response to incidents.
		Responsible for the tracking and dispatch of MDOT maintenance vehicles.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Maintenance and Construction Management (continued)	MDOT	Receive vehicle maintenance conditions from MDOT maintenance and construction vehicle and coordinate fleet management with the MDOT equipment repair facility.
		Collect road weather information with MDOT equipment and distribute it to regional traffic, maintenance, and transit agencies.
		Provide maintenance of state highways within the region, including pavement maintenance, winter maintenance, and construction activities.
		Manage work zones on all MDOT maintenance and construction activities, as well as monitor work zone safety with MDOT field devices and vehicles.
		Coordinate maintenance and construction activities with other regional maintenance and construction agencies.
		Distribute maintenance and construction plans and work zone information to regional information service providers, regional traffic operations, transit operations, emergency operations, rail operations, and the media.
		Perform maintenance of ITS field equipment owned by MDOT.
		Coordinate snow removal resources with other regional maintenance providers.
	Monroe County Road Commission	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
	NOAA	Collect weather data from field devices.
	RCMC	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
	RCOC	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from agency vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Maintenance and Construction Management (continued)	St. Clair County Road Commission	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
	Washtenaw County Road Commission	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
	Wayne County Department of Public Services	Receive a request for maintenance resources for incident response from regional emergency management agencies.
		Coordinate maintenance resources for incidents with other regional maintenance providers.
		Receive vehicle location information from local agency DPW vehicles.
		Dispatch local agency maintenance vehicles.
		Provide maintenance of local routes and MDOT facilities (per contract), including pavement maintenance, construction activities, and snow removal.
Transit Management	Ann Arbor Transportation Authority	Provide fixed route bus service for the Ann Arbor Transportation Authority's service area.
		Provide demand response transit service for the Ann Arbor Transportation Authority's service area.
		Track and evaluate schedule performance on all Ann Arbor Transportation Authority fixed route and demand response vehicles.
		Provide transit schedule and fare information to the Ann Arbor Transportation Authority website and private sector traveler information service providers.
		Provide a demand response transit plan from the agency website.
		Provide transit passenger electronic fare payment on all Ann Arbor Transportation Authority fixed route and demand response transit vehicles.
		Provide transit security on all transit vehicles and at transit terminals through silent alarms and surveillance systems.
		Provide automated transit maintenance scheduling through automated vehicle conditions reports on all Ann Arbor Transportation Authority fixed route and demand response vehicles.
		Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Transit Management (continued)	Ann Arbor Transportation Authority (continued)	Provide transit traveler information to the agency website and local private sector traveler information services in addition to making it available on transit information kiosks.
		Coordinate emergency plans with the local public safety agency and provide emergency transit services for evacuations, fires, and disasters (including re-entry)
		Collect and archive transit data from Ann Arbor Transportation Authority transit operations.
	Blue Water Area Transit	Provide fixed route bus service for the Blue Water Area Authority's service area.
		Provide demand response transit service for the Blue Water Area Authority's service area.
		Track and evaluate schedule performance on all Blue Water Area Authority fixed route and demand response vehicles.
		Provide transit schedule and fare information to the Blue Water Area Authority website and private sector traveler information service providers.
		Provide a demand response transit plan from the agency website.
		Provide transit passenger electronic fare payment on all Blue Water Area Authority fixed route and demand response transit vehicles.
		Provide transit security on all transit vehicles and at transit terminals through silent alarms and surveillance systems.
		Provide automated transit maintenance scheduling through automated vehicle conditions reports on all Blue Water Area Authority fixed route and demand response vehicles.
		Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.
		Provide transit traveler information to the agency website and local private sector traveler information services in addition to making it available on transit information kiosks.
		Coordinate emergency plans with the local public safety agency and provide emergency transit services for evacuations, fires, and disasters (including re-entry)
		Collect and archive transit data from Blue Water Area Authority transit operations.
	Detroit Department of Transportation (DDOT)	Provide fixed route bus service for DDOT's service area.
		Provide demand response transit service for the DDOT service area.
		Track and evaluate schedule performance on all DDOT fixed route and demand response vehicles.
		Provide transit schedule and fare information to the DDOT website and private sector traveler information service providers.
		Provide a demand response transit plan from the agency website.
		Provide transit passenger electronic fare payment on all DDOT fixed route and demand response transit vehicles.
		Provide transit security on all transit vehicles and at transit terminals through silent alarms and surveillance systems.
		Provide automated transit maintenance scheduling through automated vehicle conditions reports on all DDOT fixed route and demand response vehicles.
		Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Transit Management (continued)	Detroit Department of Transportation (DDOT) (continued)	Provide transit traveler information to the agency website and local private sector traveler information services in addition to making it available on transit information kiosks.
		Coordinate emergency plans with the local public safety agency and provide emergency transit services for evacuations, fires, and disasters (including re-entry)
		Collect and archive transit data from DDOT transit operations.
	Flint-Mass Transportation Authority	Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.
	Regional Demand Response Transit Providers	Provide demand response transit service for the Regional Demand Response Transit Providers.
		Track and evaluate schedule performance on all Regional Demand Response Transit Providers' transit vehicles.
		Provide transit schedule and fare information to the Regional Demand Response Transit Providers website and private sector traveler information service providers.
		Provide a demand response transit plan for the agency website.
		Provide transit passenger electronic fare payment on all Regional Demand Response Transit Providers' transit vehicles.
		Provide transit security on all transit vehicles and at transit terminals through silent alarms and surveillance systems.
		Provide automated transit maintenance scheduling through automated vehicle conditions reports on all Regional Demand Response Transit Providers' demand response vehicles.
		Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.
		Coordinate emergency plans with the local public safety agency and provide emergency transit services for evacuations, fires, and disasters (including re-entry)
		Collect and archive transit data from Regional Demand Response Transit Providers transit operations.
	Suburban Mobility Authority for Regional Transportation (SMART)	Provide fixed route bus service for SMART's service area.
		Provide demand response transit service for the SMART service area.
		Track and evaluate schedule performance on all SMART fixed route and demand response vehicles.
		Provide transit schedule and fare information to the SMART website and private sector traveler information service providers.
		Provide a demand response transit plan from the agency website.
		Provide transit passenger electronic fare payment on all SMART fixed route and demand response transit vehicles.
		Provide transit security on all transit vehicles and at transit terminals through silent alarms and surveillance systems.
		Provide automated transit maintenance scheduling through automated vehicle conditions reports on all SMART fixed route and demand response vehicles.
		Coordinate transit service with other regional transit providers as well as regional intermodal terminals and the regional airport.
		Provide transit traveler information to the agency website and local private sector traveler information services in addition to making it available on transit information kiosks.

Table 9 – SEMCOG Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Transit Management (continued)	Suburban Mobility Authority for Regional Transportation (SMART) (continued)	Coordinate emergency plans with the local public safety agency and provide emergency transit services for evacuations, fires, and disasters (including re-entry)
		Collect and archive transit data from SMART transit operations.
Commercial Vehicle Operations	MDOT	Provide route restriction information to private fleet systems.
		Provide automated weigh-in-motion inspections for private fleet operations.
		Provide permit information to regional emergency management providers and regional enforcement agencies.
	MSP	Provide enforcement of permits for overheight/overweight or HAZMAT commercial vehicles.
		Provide first response to commercial vehicle incidents and coordinate for HAZMAT conditions/clean-up.
Traveler Information	Local Agency	Collect traffic information (road network conditions), work zone information, travel times, and weather information.
		Coordinate and share traveler information with all other traveler information providers within the region.
	MDOT	Collection, processing, storage, and broadcast dissemination of traffic, transit, maintenance and construction, and weather information to travelers via the 511 Traveler Information System and MI Drive website.
		Provide traveler information to private travelers through in vehicle, personal computing devices or kiosks upon request.
		Provide traveler information to the media.
	MSP	Collect traffic information (road network conditions), work zone information, travel times, and weather information.
Archived Data Management	MDOT	Collect and archive asset status information from all MDOT maintenance offices and MDOT asset management systems.
		Collect and archive traffic information from regional traffic management providers and centers, emergency information from MSP and Local Agency Police, and transit information from regional transit agencies for planning purposes.
		Coordinate with MDOT Transportation Planning Division.
	MSP	Collect and archive asset status information from all MDOT maintenance offices and MDOT asset management systems.
	SEMCOG	Collect and archive traffic information from regional traffic management providers and centers, emergency information from MSP and Local Agency Police, and transit information from regional transit agencies for planning purposes.
		Coordinate with MDOT Transportation Planning Division.
		Collect and archive emergency and incident information from MSP and the region's emergency responders.

4.4 Potential Agreements

The Regional ITS Architecture for the SEMCOG Region has identified many agency interfaces, information exchanges, and integration strategies that would be needed to provide the ITS services and systems identified by the stakeholders in the Region. Interfaces and data flows among public and private entities in the Region will require agreements among agencies that establish parameters for sharing agency information to support traffic management, incident management, provide traveler information, and perform other functions identified in the Regional ITS Architecture.

With the implementation of ITS technologies, integrating systems from one or more agencies, and the anticipated level of information exchange identified in the architecture, formal agreements between agencies will be needed in the future. These agreements, while perhaps not requiring a financial commitment from agencies in the Region, should outline specific roles, responsibilities, data exchanges, levels of authority, and other facets of regional operations. Some agreements also will outline specific funding responsibilities, where appropriate and applicable.

Agreements should avoid being specific with regards to technology when possible. Technology is likely to change rapidly and changes to technology could require an update of the agreement if the agreement was not technology neutral. Focus of the agreement should be on the responsibilities of the agencies and the high level information that needs to be exchanged. Depending on the type of agreement being used, agencies should be prepared for the process to complete an agreement to take several months to years. Agencies must first reach consensus on what should be in an agreement and then proceed through the approval process. The approval process for formal agreements varies by agency and can often be quite lengthy, so it is recommended that agencies plan ahead to ensure that the agreement does not delay the project.

When implementing an agreement for ITS, it is recommended that as a first step any existing agreements are reviewed to determine whether they can be amended or modified to include the additional requirements that will come with deploying a system. If there are no existing agreements that can be modified or used for ITS implementation, then a new agreement will need to be developed. The formality and type of agreement used is a key consideration. If the arrangement will be in effect for an extended duration or involve any sort of long term maintenance, then written agreements should be used. Often during long term operations, staff may change and a verbal agreement between agency representatives may be forgotten by new staff.

Common agreement types and potential applications include:

- **Handshake Agreement:** Handshake agreements are often used in the early stage of a project. This type of informal agreement depends very much on relationships between agencies and may not be appropriate for long term operations where staff is likely to change.
- **Memorandum of Understanding (MOU):** A MOU demonstrates general consensus or willingness to participate as part of a particular project but is not typically very detailed.
- **Interagency and Intergovernmental Agreements:** These agreements between public agencies can be used for operation, maintenance, or funding of its projects and systems. They can include documentation on the responsibility of each agency, functions they will provide, and liability.
- **Funding Agreements:** Funding agreements document the funding arrangements for ITS projects. At a minimum, funding agreements include a detailed scope, services to be performed, and a detailed project budget.

- **Master Agreements:** Master agreements include standard contract language for an agency and serve as the main agreement between two entities which guides all business transactions. Use of a master agreement can allow an agency to do business with another agency or private entity without having to go through the often lengthy development of a formal agreement each time.

Table 10 provides a list of existing and potential agreements for the SEMCOG Region based on the interfaces identified in the Regional ITS Architecture. It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations.

Table 10 – SEMCOG Region Potential Agreements

Status	Agreement and Agencies	Agreement Description
Future	**Joint Operations/Shared Control Agreements (Public-Public or Public-Private)**	These agreements would allow joint operations or control of certain systems and equipment. The agreement should define such items as hours of operation and time of day/day of week when shared control would take effect, circumstances, or incidents when shared control would take effect, notification procedures between the agencies agreeing to share control arrangements, overriding capabilities of owning agency, etc. Private agencies, such as information service providers that provide traffic reports, could also be part of this agreement.
Future	**Data Sharing and Usage (Public-Public)**	These agreements would define the parameters, guidelines, and policies for inter- and intra-agency ITS data sharing. This data sharing would support regional activities related to traffic management, incident management, traveler information, and other functions. The terms of this agreement should generally address such items as types of data and information to be shared, how the information will be used (traffic incident information to be shared, displayed on web site for travel information, distributed to private media, etc.), and parameters for data format, quality, security.
Future	**Data Sharing and Usage (Public-Private)**	These agreements would define the parameters, guidelines, and policies for private sector (such as the media or other information service providers) use of ITS data. This type of agreement is recommended to define terms of use for broadcasting public-agency information regarding traffic conditions, closures, restrictions, as well as video images. Agreements can also include requirements for the media to 'source' the information (i.e., using the providing agency's logo on all video images broadcast.
Future	**Mutual Aid Agreements (Public-Public)**	Mutual aid agreements often exist as either formal or informal arrangements. They are a routine practice among many public safety and emergency services agencies. Formal mutual aid agreements will become more important as agencies integrate systems and capabilities, particularly automated dispatch and notification. Formalized agreements should be considered as ITS or other electronic data sharing systems are implemented in the Region.

Table 11 – Existing Agreements

Status	Agreement Name	Lead Agency	Partnering Agencies
Planned	I-96 ITS Brighton DMS and Camera Access	MDOT	Livingston County Dispatch

4.5 Phases of Implementation

The Regional ITS Architecture will be implemented over time through a series of projects led by both public sector and private sector agencies. Key foundation systems will need to be implemented in order to support other systems that have been identified in the Regional ITS Architecture. The deployment of all of the systems required to achieve the final Regional ITS Architecture build out will occur over many years.

A sequence of projects and their respective time frames have been identified in the SEMCOG Regional ITS Deployment Plan. These projects have been sequenced over a 10 to 15-year period, with projects identified for deployment in the short term (0 to 3 years), medium term (4 to 8 years), and long term (greater than 8 years). These projects are provided in Table 57, Table 58, and Table 59. Individual projects can be found in the Deployment Plan.

Some of the key market package areas that will provide the functions for the foundation systems in the SEMCOG Region are listed below. Projects associated with these and other market packages identified for the Region have been included in the SEMCOG Regional ITS Deployment Plan.

- Network Surveillance;
- Emergency Management;
- Maintenance and Construction Vehicle Tracking;
- Weather Information Processing and Distribution;
- Surface Street Control;
- Traffic Information Dissemination; and
- Vehicle Tracking.

4.6 Incorporation into the Regional Planning Process

As an MPO, SEMCOG is responsible for coordinating transportation planning and programming activities among the variety of transportation agencies and stakeholders involved in Southeastern Michigan. To date, SEMCOG has been active in the development and administration of the region's ITS Architecture and has been involved in ITS on a variety of levels including its sponsorship of a traffic operations committee; its role in the development of the Regional Concept of Traffic Operations; and its role as a broker of CMAQ funds in the region, which often are used to fund ITS and operations projects. The purpose of this section is to discuss how this update of the regional ITS architecture and the strategic deployment plan can be integrated into the standard processes of the MPO. Even within the one element of transportation, SEMCOG has to balance an approach that can address several facets including public transportation, commercial vehicle operations, freeway and arterial operations, and ITS solutions. This section will present a methodology that integrates the development and maintenance of the regional ITS architecture and deployment plan with the other transportation planning responsibilities of SEMCOG.

SEMCOG revises the Congestion Management Process (CMP) and the Long Range Transportation Plan (LRTP) concurrently every four years. Since these documents are developed in tandem, the recommendations and projects that result are aligned when the documents are

adopted. The regional ITS architecture and deployment plan is referenced during the development of these documents. The ITS architecture and deployment plan analyze specific technology-based projects to address identified regional needs. The LRTP integrates the ITS projects with other non-technology-based solutions into a regional plan for addressing transportation needs.

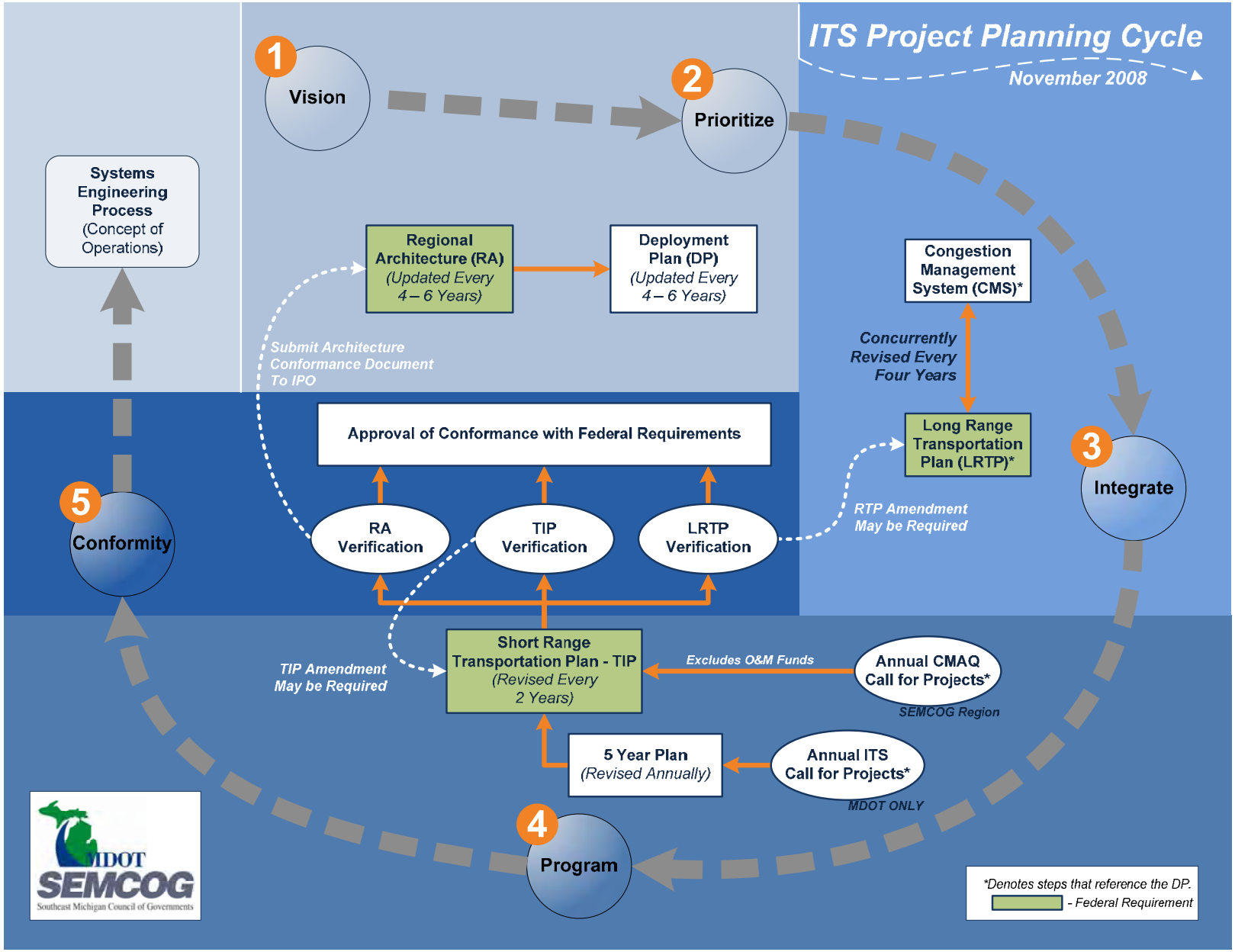
Based on the LRTP and the CMP, SEMCOG can begin to program specific projects. ITS projects can be added to the long- and short-range plans as part of the typical planning process. SEMCOG stakeholders participate in two ITS call for project requests on an annual basis. Other funding sources also can be used, including the Congestion Mitigation and Air Quality (CMAQ) call for projects and the MDOT ITS Program Office (IPO) call for projects. Projects identified through these two efforts are combined and included as part of the list of projects that make up the short-range plan or Transportation Improvement Program (TIP), which is revised every two years based on feedback from the MPO and MDOT.

The CMAQ call for projects covers all of SEMCOG and ranks projects primarily based on their estimated impact on reducing pollutants and improving the air quality for the region. Each call for projects solicits proposed projects including the project description, estimated costs, and evaluated impact on pollutants and air quality. To aid in ranking these projects, SEMCOG has developed a scoring matrix for evaluating the anticipated impacts of the proposed projects. The highest ranked project in each of the eight federal-aid committee areas is awarded funding. Remaining projects are ranked regionally. These projects are awarded funding until funds are exhausted.

The MDOT IPO call for projects is distributed to each of the MDOT regions. The Metro and University Regions must each submit their prioritized list of projects. Each region prioritizes projects based on local needs and benefits to the overall network. Once compiled, all of the regions' lists of projects are combined and prioritized based on statewide need. This resulting statewide list of ITS projects then is integrated with other transportation projects into MDOT's Five-Year Plan. This plan is an integrated program that includes highways, bridges, public transit, rail, aviation, marine, and non-motorized transportation. The Multi-Modal Program focuses largely on continued safe and secure operation of the existing transportation system through routine maintenance, capital replacement and rehabilitation, and preservation of existing service levels. The highway portion is a rolling program; each year, a new fifth year is added and program/project adjustments are made to other years.

Figure 12 is a depiction of the processes described above. MPOs are required to meet multiple Federal Regulations in order to receive federal funding for their transportation programs. Developing and maintaining a Regional ITS Architecture is one of these requirements. The development of a deployment plan is not required, but has been recognized as a beneficial process for sequencing the deployment of ITS projects. These two plans are more easily integrated in the overall planning process when they occur early on.

Figure 12 – ITS Project Planning Cycle



5 Use and Maintenance Plan for the Regional ITS Architecture

The ITS Architecture update and the Deployment Plan for the SEMCOG Region address the Region's vision for ITS implementation at the time the plan was completed. Stakeholders invested a considerable amount of effort in the update of the Regional ITS Architecture and the development of the Regional ITS Deployment Plan. As the Region grows, needs will change, and, as technology progresses, new ITS opportunities will arise. Shifts in regional needs and focus as well as changes in the National ITS Architecture will necessitate that the SEMCOG Regional ITS Architecture be updated to remain a useful resource for the Region.

The following section outlines how the Region and its stakeholders can work with the MDOT ITS Program Office and SEMCOG to ensure projects are in conformity and also provide updates as ITS evolves in the region.

5.1 Process for Determining Architecture Conformity

The SEMCOG Regional ITS Architecture and Deployment Plan documents the customized market packages that were updated as part of the ITS architecture process. To satisfy federal requirements and remain eligible to use federal funds, a project must be accurately documented. To document the conformity of an ITS project with the regional architecture, MDOT's ITS Program Office will coordinate with SEMCOG on the implementation of a regional architecture conformance form to guide project managers through the process. The project managers will be able to coordinate with the ITS Program Office, SEMCOG, and regional contact for additional assistance and guidance. The steps of the process are as follows:

- Identify the ITS components in the project;
- Identify the corresponding market packages(s) from the Regional ITS Architecture;
- Locate the component within the market package;
- Compare the connections to other agencies or elements documented in the ITS architecture as well as the information flows between them to the connections that will be part of the project;
- Assess the use of relevant standards; and
- Document any changes necessary to the ITS Architecture or the project to ensure there is conformance.

Identifying the ITS Components

ITS components can be fairly apparent in an ITS focused project such as CCTV camera or DMS deployments, but also could be included in other types of projects. For example, an arterial widening project could include the installation of signal system interconnect, signal upgrades, and the incorporation of the signals located within the project limits into a transportation agency's signal system. These are all ITS deployments and should be part of the regional ITS architecture.

Identifying the Corresponding Market Packages

If a project was included in the Deployment Plan, then the applicable market package(s) for that project are identified in a column. ITS projects are not required to be included in the ITS Deployment Plan in order to be eligible for federal funding; therefore, market packages might need to be identified without the assistance of an ITS Deployment Plan. In that case, the market packages selected and customized for the SEMCOG Region are identified in **Table 6** of this document; detailed market package definitions are located in **Appendix A**; and customized market packages for the Region are included in **Appendix B**.

Identifying the Component within the Market Package

The customized market packages for the SEMCOG Region are located in **Appendix B**. Once the element is located on the market package, the evaluator may determine that the element name should be modified. For example, an element called the MDOT MITSC was included in the architecture, but at the time of deployment, MDOT may decide to call the center by a new name once the location is finalized. This name change should be documented using the process outlined in Section 1.3.

Evaluating the Connections and Flows

The connections and architecture flows documented in the market package diagrams were selected based on the information available at the time the plan was updated. As the projects are designed, decisions will be made on the system layout that might differ from what is shown in the market package. These changes in the project should be documented in the ITS market packages using the process outlined in Section 1.3.

Relevant Standards

ITS Standards are documented guidelines or rules specifying the interconnections among elements and the characteristics of technologies and products to be used in ITS installations. Standards describe in detail what types of interfaces should exist between ITS components and how the components will exchange information and work together to deliver certain user services. The SEMCOG Regional ITS Architecture highlights the relevant standards based on the region's needs. These standards should be reviewed as part of this conformity exercise. Where standards can be utilized, they should be noted. Where standards are not or could not be utilized, an explanation of why, also should be noted. The Standards identified based on the SEMCOG Regional ITS Architecture are presented in **Section 4.2** and **Table 8**.

Documenting Required Changes

If any changes are needed to accommodate the project under review, Section 1.3 describes how those changes should be documented. Any changes will be incorporated during the next architecture update. Conformance will be accomplished by documenting how the market package(s) should be modified so that the connections and data flows are consistent with the project.

5.2 Maintenance Process

MDOT's ITS Program Office will work closely with SEMCOG to lead the maintenance of the SEMCOG Regional ITS Architecture and Deployment Plan in coordination with the regional contact. Maintenance includes modifications to the plan as well as completes updates. **Table 12** summarizes the maintenance process agreed upon by stakeholders in the Region.

Table 12 – Regional ITS Architecture and Deployment Plan Maintenance Summary

Maintenance Details	Regional ITS Architecture		Regional ITS Deployment Plan	
	Modification	**Complete Update**	**Modification**	**Complete Update**
Timeframe for Updates	As needed	Every 5-7 years	As needed	Every 5-7 years
Scope of Update	Update market packages to satisfy architecture conformance requirements of projects or to document other changes that impact the ITS Architecture	Entire ITS Architecture	Update project status and add or remove projects as needed	Entire ITS Deployment Plan
Lead Agency	MDOT ITS Program Office/SEMCOG*		MDOT ITS Program Office/SEMCOG*	
Participants	Stakeholders impacted by market package modifications	Entire stakeholder group	Entire stakeholder group	
Results	Market package or other change(s) documented for next complete update	Updated SEMCOG Regional ITS Architecture document, Appendices, and Turbo Architecture database	Updated project tables	Updated SEMCOG Regional ITS Deployment Plan document

** Transit related projects will be supported by MDOT's Bureau of Passenger Transportation*

Modifications to the Regional ITS Architecture and Deployment Plan will often be necessitated by ITS projects that are receiving federal funding but do not conform to the Regional ITS Architecture. MDOT's ITS Program Office will take the lead in working with agencies that receive federal funding for ITS projects and will keep a record of any changes that are needed to the Regional ITS Architecture. Complete updates to the Regional ITS Architecture will occur approximately every five to seven years and will be led by the MDOT ITS Program Office with support from the SEMCOG Region and other key stakeholders. The entire stakeholder group that was engaged to update this revision of the Regional ITS Architecture will be reconvened for the complete updates.

5.3 Procedure for Submitting ITS Architecture Changes between Scheduled Updates

Updates to the SEMCOG Regional ITS Architecture will occur on a regular basis as described in **Section 1.2** to maintain the architecture as a useful planning tool. Between complete plan updates, smaller modifications will likely be required to accommodate ITS projects in the Region. **Section 1.1** contains step by step guidance for determining whether or not a project requires architecture modifications.

For situations where a change is required, an ITS Architecture Conformance and Maintenance Documentation Form was developed and is included in **Appendix E**. This form should be completed and submitted to the MDOT ITS Program Office and SEMCOG whenever a change to

the Regional ITS Architecture or Deployment Plan is proposed. Please note that MDOT's Bureau of Passenger Transportation also should be copied if the project has a transit related component.

The Maintenance Documentation form identifies three levels of modifications. They include:

- Level 1 – Basic changes that do not affect the structure of the architecture.
  Examples include: Changes to stakeholder or element name, element status, or data flow status.
- Level 2 – Structural changes that impact only one agency.
  Examples include: Addition of a new market package or modifications to an existing market package that affects only one agency.
- Level 3 – Structural changes that have the potential to impact multiple agencies.
  Examples include: Addition of a new market package or modifications to an existing market package that involves multiple agencies or incorporation of a new stakeholder into the architecture.

While documenting the proposed change, the project manager completing the change form should coordinate with any of the other agencies that may be impacted by the modification. This communication between agencies will simplify the process of performing a complete plan update. MDOT's ITS Program Office and SEMCOG will review and accept the proposed changes. When a complete update is performed by MDOT's ITS Program Office and SEMCOG, all of the documented changes will be incorporated into the regional ITS architecture. **Figure 13** graphically illustrates this process.

Figure 13 – Process for Documenting Architecture Performance