



Knoxville

Regional ITS Architecture

Regional ITS Architecture Report

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LIST OF ACRONYMS

| | |
|--------|--|
| AASHTO | American Association of State Highway and Transportation Officials |
| AD | Archived Data |
| AMBER | America’s Missing: Broadcast Emergency Response |
| APTA | American Public Transportation Association |
| APTS | Advanced Public Transportation System |
| ASTM | American Society for Testing and Materials |
| ATIS | Advanced Traveler Information System |
| ATMS | Advanced Traffic Management System |
| AVL | Automated Vehicle Location |
| C2C | Center-to-Center |
| CCTV | Closed Circuit Television |
| CVISN | Commercial Vehicle Information Systems and Networks |
| CVO | Commercial Vehicle Operations |
| DMS | Dynamic Message Sign |
| DSRC | Dedicated Short Range Communication |
| EM | Emergency Management |
| EMA | Emergency Management Agency |
| EMS | Emergency Medical Services |
| EOC | Emergency Operations Center |
| ETHRA | East Tennessee Human Resource Agency |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Administration |
| HAR | Highway Advisory Radio |
| HAZMAT | Hazardous Materials |
| IEEE | Institute of Electrical and Electronics Engineers |
| ITE | Institute of Transportation Engineers |
| ITS | Intelligent Transportation System |
| IVR | Interactive Voice Response |
| KAT | Knoxville Area Transit |
| LRTP | Long-Range Transportation Plan |
| MC | Maintenance and Construction |
| MOU | Memorandum of Understanding |

LIST OF ACRONYMS

| | |
|------------|---|
| NEMA | National Electrical Manufacturers Association |
| NOAA | National Oceanic and Atmospheric Administration |
| NTCIP | National Transportation Communications for ITS Protocol |
| PSAP | Public Safety Answering Point |
| RDS | Radar Detection System |
| RTMS | Remote Traffic Microwave Sensor |
| RWIS | Road Weather Information System |
| SAE | Society of Automotive Engineers |
| SAFETEA-LU | Safe, Accountable, Flexible and Efficient Transportation Equity Act – A Legacy for Users |
| SDO | Standards Development Organization |
| TDOT | Tennessee Department of Transportation |
| TEA-21 | Transportation Equity Act for the 21st Century |
| TEMA | Tennessee Emergency Management Agency |
| TIP | Transportation Improvement Program |
| THP | Tennessee Highway Patrol |
| TITAN | Tennessee Integrated Traffic Analysis Network |
| TMC | Transportation Management Center |
| TOC | Traffic Operations Center |
| TPO | Transportation Planning Organization |
| TraCS | Traffic and Criminal Software |
| TSIS | TDOT SmartWay Information System |
| USDOT | United States Department of Transportation |
| VIVDS | Video Image Vehicle Detection Systems |

1. INTRODUCTION

1.1 Project Overview

The Knoxville Regional Intelligent Transportation System (ITS) Architecture was first developed in 2000 and was updated in 2003. Since that time the Knoxville Region has seen the implementation of a number of significant ITS programs and projects including the TDOT Knoxville SmartWay ITS which provides freeway management capabilities for a majority of the urban freeway system in Knoxville. Regional ITS architectures are living documents and need to be continuously updated in order for them to accurately reflect the ITS needs, plans, and visions within a region. In October 2011, the Knoxville Regional Transportation Planning Organization (TPO), in coordination with TDOT, began the update of the Knoxville Regional ITS Architecture with the goal of completing the update in 2012.

A regional ITS architecture provides a framework for implementing ITS projects, encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to projects, and allows for cohesive long-range planning among regional stakeholders. ITS architectures allow stakeholders to plan for what they want their system to look like in the long-term and then break out the system into smaller pieces that can be implemented as funding permits. A regional ITS architecture is also necessary to satisfy the ITS 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 project 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. In order to show this conformance, it is important that any region deploying ITS have an updated regional ITS architecture in place.

The Knoxville Regional ITS Architecture update includes the same geographic boundaries as the Knoxville Regional TPO as well as all of Anderson, Blount, Knox, Loudon and Sevier Counties. Connections that need to occur with other agencies outside of the geographic boundaries will be shown where appropriate and the Knoxville Regional ITS Architecture was closely coordinated with the Great Smoky Mountains ITS Architecture, which was completed in December 2007. In addition to the Regional ITS Architecture, 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 Knoxville Regional ITS Architecture and the ITS Deployment Plan were both developed with significant input from local, state, and federal officials. A series of four workshops were held to solicit input from stakeholders and ensure that the plans reflected the unique needs of the Region. Copies of the draft reports were provided to all stakeholders. The Regional ITS Architecture and the ITS Deployment Plan that were developed 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 Knoxville 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 Knoxville Regional ITS Architecture, and the key features and stakeholders in the Knoxville Region.

Section 2 – Regional ITS Architecture Development Process

This section provides an overview of the key steps involved in developing the ITS architecture for the Knoxville Region as well as an overview of the Turbo Architecture database and reports.

Section 3 – Regional Needs and Inventory

This section contains a summary of regional needs that are related to ITS for the Knoxville Region as well as a description of the stakeholders and ITS elements in the Region. Elements are grouped based on the owner, such as the City of Knoxville or the Knoxville Area Transit (KAT), and their current status is listed as either existing or planned in the Region.

Section 4 – Regional ITS Architecture

This section describes how the National ITS Architecture was customized to meet the ITS needs, plans, and visions for the Knoxville Region. The ITS service 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. Functional requirements and standards that apply to the Region, as indicated by the Regional ITS Architecture, are presented. Operational concepts identifying stakeholder roles and responsibilities have been prepared and potential agreements to support the sharing of data and resources have been identified.

Section 5 – Use and Maintenance of the Regional ITS Architecture

This section describes how the Regional ITS Architecture can be used to show architectural conformance of ITS projects in the planning or design phase. A process for maintaining the Regional ITS Architecture and submitting requested changes to the Regional ITS Architecture is also presented.

The Knoxville Regional ITS Architecture also contains six appendices:

- Appendix A – Service Package Definitions;
- Appendix B – Customized Service Packages;
- Appendix C – Element Functions;
- Appendix D – Stakeholder Roles and Responsibilities;
- Appendix E – Stakeholder Workshop Attendance; and
- Appendix F – Architecture Maintenance Documentation Form

1.3 Knoxville Region

1.3.1 Geographic Boundaries

The Knoxville Regional ITS Architecture geographic boundaries are comprised of the Knoxville Regional TPO planning area, which included all of Knox County and a portion of Anderson, Blount, Loudon, and Sevier Counties at the time the Knoxville Regional ITS Architecture was developed. In addition, the geographic boundaries also included the remaining portions of Anderson, Blount, Loudon, and Sevier Counties. The Knoxville

Regional ITS Architecture geographic boundaries for the Knoxville Region are shown in **Figure 1**.

When developing the stakeholder group, the project team coordinated with the Knoxville Regional TPO to invite the appropriate city, county, regional, state and federal agencies. Stakeholders included both local representatives as well as representatives from the FHWA Tennessee Division and TDOT Division Offices from Nashville including the Long-Range Planning Division, Multi-modal Planning Division, and the Office of Incident Management.

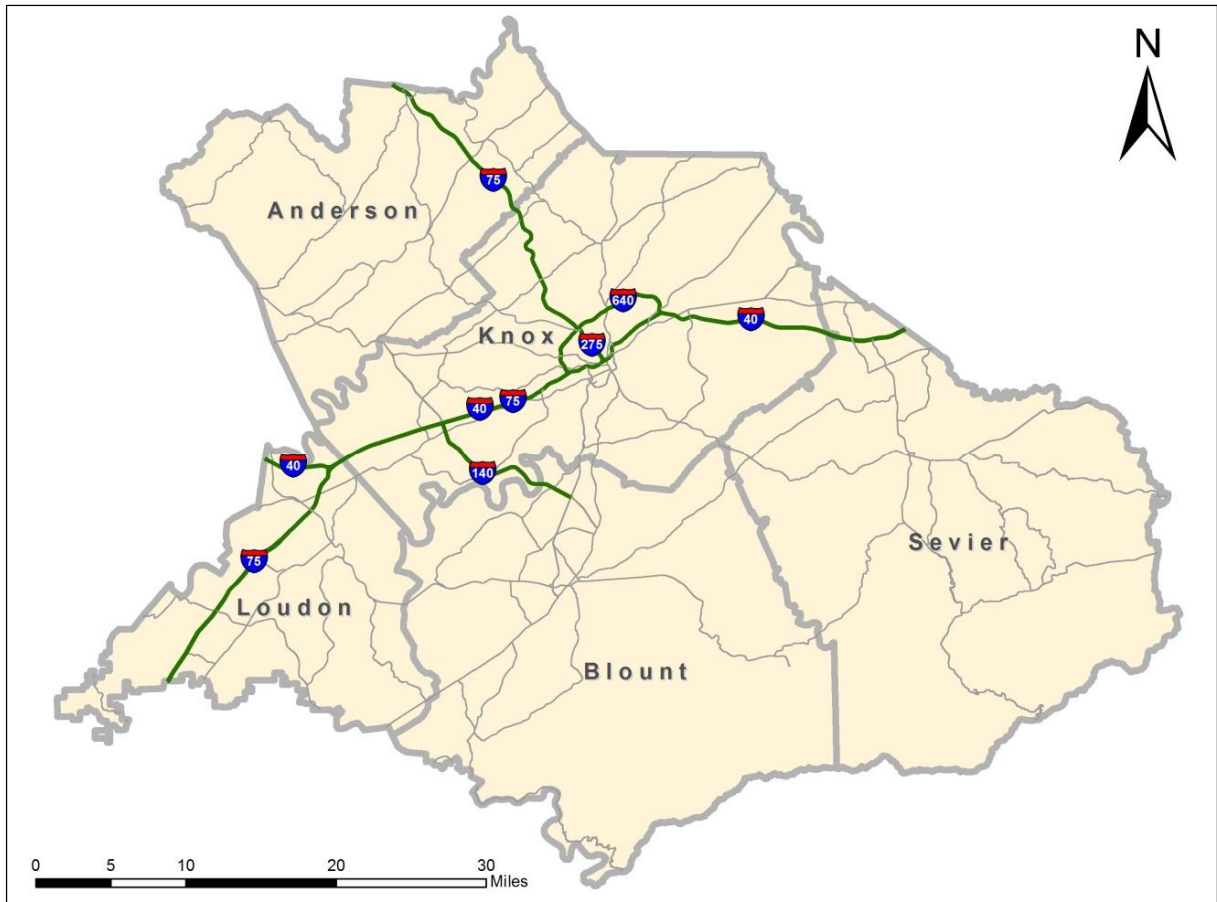


Figure 1 – Knoxville Regional ITS Architecture Geographic Boundaries

1.3.2 *Transportation Infrastructure*

The Knoxville Region is served by a number of significant State and Federal highways. The primary access control facilities include I-40, I-75, I-640, I-275, I-140, and US 129. There are presently no toll facilities operating or planned within the Knoxville Region.

I-40 serves as the primary east-west corridor in the Region and serves not only regional traffic but interstate traffic and commerce movement from the east coast in North Carolina to the west coast in California. I-75 is the primary north-south corridor for the region and also carries interstate traffic from Michigan to Florida.

Transit services are provided by the Knoxville Area Transit (KAT), East Tennessee Human Resource Agency (ETHRA), Knoxville-Knox County Community Action Committee, and Sevier County. Transit services for the University of Tennessee are also provided under contract to KAT. Bus service is the only type of transit service offered at the time of the Regional ITS Architecture and there were no current plans for streetcars or any type of light rail or commuter rail.

The McGhee Tyson Airport is the regional airport serving Knoxville and surrounding East Tennessee. The airport handles commercial airline, air cargo, military aviation and general aviation air traffic. Located 12 miles south of downtown Knoxville on US 129 (SR 115), the airport occupies more than 2,000 acres of land with space for additional air cargo facilities or economic development.

One of the primary special event generators in the Region is the University of Tennessee, which is located in downtown Knoxville. Student enrollment is almost 28,000 and approximately 10,000 faculty and staff members serve the University. Special events include football games at Neyland Stadium which has a capacity of 102,455 and basketball games at the Thompson-Boling Arena which has a capacity of 21,678. Transit service for the University of Tennessee is provided by the KAT as noted in the previous paragraph.

The Sevier Tourist Corridor to the east of the City of Knoxville draws a large amount of tourist traffic to a number of attractions. The Cities of Sevierville, Pigeon Forge, and Gatlinburg include numerous entertainment venues and activities, such as the Dollywood theme park. The corridor also serves as a gateway into the Great Smoky Mountains National Park. Congestion on the corridor is a major concern, especially on weekends throughout the summer and during the winter holiday period.

There are over 10,000 people employed at the Oak Ridge, Tennessee campuses of the Oak Ridge National Laboratory and the Y-12 National Security Complex. Traffic and congestion during the afternoon when many of the campus employees are leaving is challenge on the arterial streets.

1.3.3 *Knoxville Region ITS Initiatives and Activities*

The Knoxville Region has undertaken several deployments of ITS programs throughout the Region. These programs have come from multiple agencies and cover multiple transportation modes as well. Some multi-agency participation has been present on some of these ITS initiatives. The following are some of the larger ITS initiatives underway or existing within the Knoxville Region:

- **TDOT SmartWay ITS Program** – The TDOT SmartWay ITS Program has been operational since 2005 and provides coverage to approximately 45 miles of freeway. A majority of the urban freeway system in Knoxville is covered by SmartWay ITS. It

includes a Traffic Operations Center that is staffed every day of the year for 24 hours per day, freeway detection systems, CCTV cameras, dynamic messages signs, and highway advisory radios connected by a Gigabit Ethernet fiber optic communication network. TDOT does not currently include ramp metering or integration with adjacent local signal systems along parallel arterial networks but it has been considered and could possibly be added at some point in the future. The SmartWay TMC staff work closely with the TDOT HELP Service Patrol operators as well as public safety officials to manage incidents, special events, severe weather events, and construction closures. Information about traffic conditions, including travel times, is included on the dynamic message signs and highway advisory radio at the roadside as well as through the SmartWay website and 511 traveler information system to alert motorists as early as possible.

- **TDOT HELP Service Patrol** – The TDOT HELP Service Patrol Program has been in operation in the Knoxville Region since the year 2000. The HELP Service Patrol Program trucks patrol freeways including I-40, I-75, I-640, I-275 I-140, and US 129 (SR 115) to assist motorist with minor repairs such as flat tire changes, fuel, and push services to move disabled vehicles out of the through lanes. HELP operators also assist with traffic control and detours during major incidents. The service operates from 5:00 AM through 11:00 PM Monday through Friday, and on weekends from 7:00 AM until 9:00 PM.
- **511 Traveler Information Number** – TDOT currently operates a statewide traveler information number that provides real-time traveler information throughout the state. Information is put into 511 through the TDOT SmartWay Information System (TSIS), which is updated by the TDOT SmartWay TMC operators and the Tennessee Highway Patrol (THP) dispatchers. 511 information can also be accessed through a 511 website and several social media sites such as Twitter and Facebook.
- **TDOT Center-to Center (C2C) Communication** – The TDOT SmartWay communication backbone has facilitated C2C communication links between the TDOT TMC, the THP District 1 Headquarters, and the Knox County E-911 Emergency Management Center.
- **Knoxville Area Incident Management Task Force** – The Knoxville TPO and TDOT are leading an Incident Management Task Force that focuses on issues related to the management of crashes on freeways. The Task Force is made up of representatives from police and fire departments, emergency medical services, state and local transportation departments, towing and recovery companies, environmental agencies, and hazardous spill and containment companies. The Incident Management Task Force provides a forum for these agencies to review responses to incidents and promote better communication and cooperation. The group is meeting at regular intervals to discuss how incident management can be improved in the region, ensure continued coordination between agencies involved in incident management, and review responses to major incidents.
- **Local Traffic Operations Centers (TOCs) and Advanced Traffic Management Systems (ATMS)** – Several cities and counties in the Knoxville Region have implemented or are in the process of implementing TOCs and advanced traffic management systems for their arterial traffic signal systems. These include the City of Knoxville, City of Oak Ridge, combined systems for the Cities of Maryville-Alcoa, and Knox County. These TOCs are generally single workstations that allow some level of signal monitoring and control, however in some cases such as the City of Knoxville the TOC may be upgraded to include additional features in the future. Many of the other

cities and counties have implemented programs to coordinate traffic signal systems to improve efficiency of arterial operations.

- **Knoxville Area Transit** – KAT has extensively implemented ITS on their buses to improve operations and safety. KAT’s deployments include automated vehicle location (AVL), mobile data terminals (MDTs), electronic fare collection, on-board video surveillance and on-board alarm systems.

1.3.4 *Project Participants*

Due to the fact that ITS often transcends traditional transportation infrastructure, it is important to involve a wide range of local, state, and federal stakeholders in the ITS architecture development and visioning process. Input from these stakeholders is a critical part of defining the interfaces, integration needs, and overall vision for ITS in a region. In the Knoxville Region stakeholders that participated included not just representatives from transportation and public transit agencies, but also stakeholders that represented public safety and emergency management, the University of Tennessee, and the Oak Ridge National Laboratories.

Table 1 contains a listing of stakeholders in the Knoxville 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 notified when copies of reports were available for review on the project website to encourage their participation as much as possible. A complete listing of stakeholders invited to participate in the project and workshop attendance records is included in the stakeholder workshop attendance database in **Appendix E**.

1.3.5 *Project Timeframe*

The development of the Knoxville Regional ITS Architecture update focused on a 20 year timeframe, covering the period from 2012 through 2032. Stakeholders were asked to consider both existing and future ITS needs, plans, and potential projects for deployment over this 20 year timeframe when providing input into the Knoxville Regional ITS Architecture and Deployment Plan.

Table 1 – Knoxville Stakeholder Agencies and Contacts

| Stakeholder Agency | Address | Contact |
|--|---|-------------------|
| Blount County Emergency Management / Homeland Security | 341 Court Street Maryville, TN 37804 | Bart Stinnett |
| Cambridge Systematics, Inc. | 1265 Kensington Drive Knoxville, TN 37922 | Richard Margiotta |
| City of Alcoa Public Works and Engineering Department | 725 Universal Street Alcoa, TN 37701 | Andrew Sonner |
| City of Knoxville Engineering Department | 400 Main Street Knoxville, TN 37901 | Brent Johnson |
| City of Knoxville Engineering Department | 1400 Loraine Street Knoxville, TN 37921 | Stephen Millsaps |
| City of Knoxville Fire Department | 900 Hill Avenue, Suite 430 Knoxville, TN 37915 | Roger Byrd |
| City of Knoxville Fire Department | 900 Hill Avenue, Suite 430 Knoxville, TN 37915 | David Frazier |
| City of Knoxville Fire Department | 900 Hill Avenue, Suite 430 Knoxville, TN 37915 | Bobby Palmer |
| City of Knoxville Police Department | 800 Howard Baker Jr. Avenue Knoxville, TN 37915 | Ronald Green |
| City of Knoxville Public Works | 1400 Loraine Street Knoxville, TN 37921 | John Hunter |
| City of Maryville | 416 Broadway Ave Maryville, TN 37801 | Brian Boone |
| City of Maryville | 416 Broadway Ave Maryville, TN 37801 | Kevin Stoltenberg |
| City of Oak Ridge | 100 Woodbury Lane Oak Ridge, TN 37830 | Kathryn Baldwin |
| City of Oak Ridge | 100 Woodbury Lane Oak Ridge, TN 37830 | Steve Byrd |
| City of Oak Ridge | 100 Woodbury Lane Oak Ridge, TN 37830 | Jon Van Eek |
| City of Sevierville | PO Box 5500 Sevierville, TN 37864 | Byron Fortner |
| City of Sevierville | PO Box 5500 Sevierville, TN 37864 | Steve Hendrix |
| East Tennessee Human Resource Agency | 9111 Cross Park Drive Knoxville, TN 37932 | Brent Gagley |
| Federal Highway Administration | 404 BNA Drive Building 200, Suite 508 Nashville, TN 37217 | Victor Dang |
| Federal Highway Administration | 404 BNA Drive Building 200, Suite 508 Nashville, TN 37217 | Corbin Davis |
| Federal Highway Administration | 404 BNA Drive Building 200, Suite 508 Nashville, TN 37217 | Don Gedge |
| Federal Highway Administration | 404 BNA Drive Building 200, Suite 508 Nashville, TN 37217 | Pamela Heimsness |
| Knox County Engineer and Public Works | 205 West Baxter Avenue Knoxville, TN 37917 | Cindy Pionke |
| Knox County Engineer and Public Works | 205 West Baxter Avenue Knoxville, TN 37917 | John Sexton |

Table 1 – Knoxville Stakeholder Agencies and Contacts (continued)

| Stakeholder Agency | Address | Contact |
|--|---|----------------------|
| Knoxville Area Transit | 301 Church Avenue Knoxville, TN 37915 | Melissa Roberson |
| Knoxville-Knox County Emergency Management Agency | 605 Bernard Ave Knoxville, TN 37921 | Alan Lawson |
| Knoxville-Knox County Community Action Committee Transit | PO Box 51650 Knoxville, TN 37950 | Karen Estes |
| Knoxville Regional Transportation Planning Organization | 400 Main Street, Suite 403 Knoxville, TN 37902 | Nathan Benditz |
| Knoxville Regional Transportation Planning Organization | 400 Main Street, Suite 403 Knoxville, TN 37902 | Doug Burton |
| Knoxville Regional Transportation Planning Organization | 400 Main Street, Suite 403 Knoxville, TN 37902 | Mike Conger |
| Knoxville Regional Transportation Planning Organization | 400 Main Street, Suite 403 Knoxville, TN 37902 | Jeff Welch |
| Lakeway Area Metropolitan Transportation Planning Organization | PO Box 1499 Morristown, TN 37816 | Rich DesGroseilliers |
| Loudon County E-911 | 500 John Paris Drive Loudon, TN 37774 | Jennifer Estes |
| Oak Ridge National Laboratory Center for Transportation Analysis | 2370 Cherahala Blvd. Knoxville, TN 37932 | Diane Davidson |
| Rural Metro Fire Department | 10140 Gallows Point Drive Knoxville, TN 37931 | Chris McLain |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Mark Best |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Mark Dykes |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Christy Haynes |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Susan Johnson |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Andrew Padgett |
| TDOT – Region 1 | PO Box 58 Knoxville, TN 37901 | Nathan Vatter |
| TDOT Office of Incident Management | 6603 Centennial Blvd Nashville, TN 37243 | Frank Horne |
| TDOT – Long Range Planning | James K. Polk Bldg. Suite 900 505 Deaderick Street Nashville, TN 37243 | Mike Presley |
| TDOT – Division of Multimodal Transportation Resources | James K. Polk Bldg. Suite 1800 505 Deaderick Street Nashville, TN 37243 | Kwabena Aboagye |
| TDOT – Division of Multimodal Transportation Resources | James K. Polk Bldg. Suite 1800 505 Deaderick Street Nashville, TN 37243 | John Reed |
| Town of Farragut | 11408 Municipal Center Drive Farragut, TN 37934 | Chris Jenkins |

Table 1 – Knoxville Stakeholder Agencies and Contacts (continued)

| Stakeholder Agency | Address | Contact |
|-------------------------|--|------------------|
| University of Tennessee | 8912 Ripon Circle Knoxville, TN 37923 | Arun Chatterjee |
| University of Tennessee | 8912 Ripon Circle Knoxville, TN 37923 | Michael Ragsdale |
| CDM Smith Associates | 1100 Marion Street Knoxville, TN | John Gould |

2. REGIONAL ITS ARCHITECTURE UPDATE PROCESS

The update of the Regional ITS Architecture and Deployment Plan for the Knoxville 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 were made available to stakeholders for review and comment. Concurrent with the Regional ITS Architecture update, an ITS Master Plan for the Sevier County Tourist Corridor was also developed to address congestion issues associated with the corridor that includes Sevierville, Pigeon Forge, and Gatlinburg in Sevier County.

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

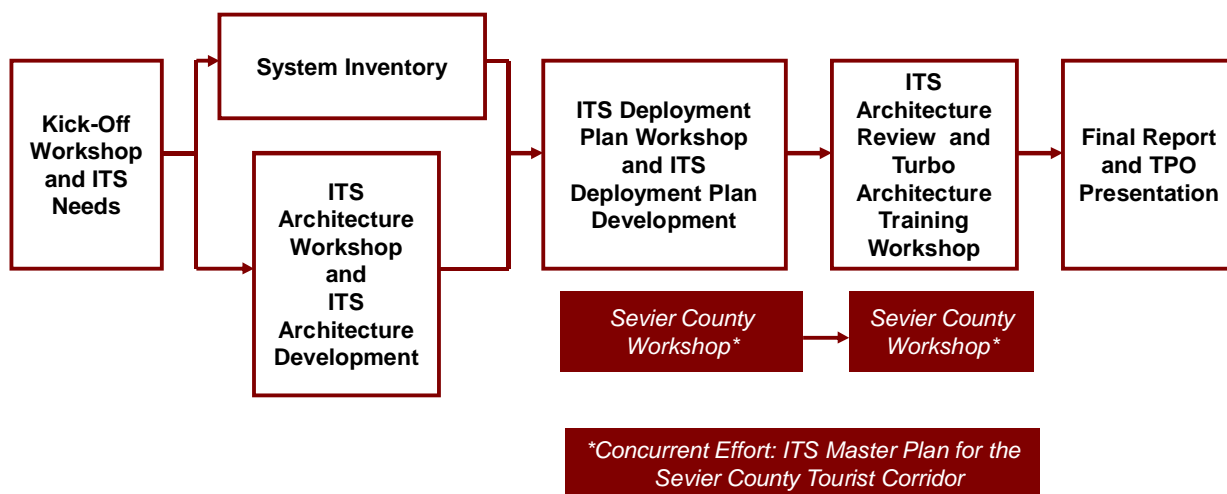


Figure 2 – Knoxville Regional ITS Architecture and Deployment Plan Development Process

2.1 Stakeholder Workshops

A total of four workshops with stakeholders over a period of eight months were held to update the Knoxville Regional ITS Architecture and Deployment Plan. These workshops included:

- Kick-Off Workshop;
- Regional ITS Architecture Development Workshop;
- ITS Deployment Plan Workshop;
- ITS Architecture Review and Turbo Architecture Training Workshop.

Key components of the process are described below:

Kick-Off Workshop and ITS Needs: A stakeholder group was identified that included representatives from regional transportation, public works, public safety, and emergency management agencies. The group was invited to the project Kick-Off Workshop where ITS needs for the Region were identified and dates for upcoming workshops agreed upon.

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. After the Kick-Off Workshop, follow-up calls and additional research was conducted to complete the system inventory.

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 Knoxville Regional ITS Architecture. Training on the National ITS Architecture was integrated into the workshop so that key elements of the architecture, such as service packages, could be explained prior to the selection and editing of these elements. Stakeholders reviewed the service packages that are currently available in the National ITS Architecture as well as those that were included in the 2003 Knoxville Regional ITS Architecture. A consensus was reached on which service packages to include in the 2012 update and then the selected service packages were customized for the Region.

The result of the Regional ITS Architecture Workshop was an ITS architecture for the Knoxville Region that included a system inventory, interconnect diagram, customized service 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.

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.

ITS Architecture Review and Turbo Architecture Training Workshop: A final 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 including the use and maintenance of the Regional ITS Architecture. Training on the use of the Turbo Architecture software was also provided to assist the Region with maintaining the Regional ITS Architecture.

Final Report: Comments on the Draft Regional ITS Architecture and Draft Regional ITS Deployment Plan were addressed and a Final Draft Regional ITS Architecture and Final Draft Regional ITS Deployment Plan were developed and sent to stakeholders for a second round of comments before the final reports were developed. In addition, an Executive Summary was also developed as well as a Turbo Architecture database. Project documents were made available to all stakeholders on the project website. Hard copies of the final documents as well as an electronic copy of the Turbo Architecture database for the Knoxville Region were also sent to representatives from the Knoxville Regional TPO, TDOT Long Range Planning Division, and the FHWA Tennessee Division Office.

2.2 Turbo Architecture

Turbo Architecture Version 7.0 was used to develop the Knoxville Regional ITS Architecture. Turbo Architecture is a software application that was developed by the United States Department of Transportation (USDOT) to be used as a tool for documenting and maintaining ITS architectures. Version 7.0 of Turbo Architecture was developed to support Version 7.0 of the National ITS Architecture. Use of the Turbo Architecture software in development of the regional ITS architectures is recommended by both the FHWA and the FTA.

In the Knoxville Region, the Turbo Architecture database that was developed was based on the ITS service packages which are provided in **Appendix B** of this report. The ITS service packages provide a graphical representation of the services stakeholders in the Region would like ITS to provide. In each service package the elements, such as a TMC or a CCTV camera, and the

data that is shared between them are shown. Turbo Architecture allows the Region to document all of the elements and data flows that exist or are planned in the Region. Turbo Architecture also allows the user to quickly access any standards that are associated with the data flows as well as generate reports and diagrams to assist in reviewing the data. Some examples of the useful reports and diagrams that may be generated using the Turbo Architecture software are included in **Table 2**.

Table 2 – Turbo Architecture Report and Diagrams

| Report or Diagram Name | Functions |
|--------------------------------|---|
| Stakeholder Report | Provides a description of the stakeholder and the associated elements for each stakeholder in the Regional ITS Architecture. |
| Inventory Report | Provides a description and status for each element in the Regional ITS Architecture. |
| Service Packages Report | Identifies each of the service packages selected for the Region and the elements associated with each service package. |
| Functional Requirements Report | Identifies the functions that each element provides. |
| Interconnect Report | Identifies for each element all of the other elements that are connected and the status of each connection. |
| Standards Activities Report | Identifies relevant standards associated with each of the data flows used in the Regional ITS Architecture. |
| Subsystem Diagram | Identifies the subsystems from the National ITS Architecture that are included in the Regional ITS Architecture. |
| Interconnect Diagrams | Identifies for each element all of the other elements that are connected and the status of each connection. The Interconnect Diagrams can be customized to show all elements in the Regional ITS Architecture or a single element can be selected so that only the connections it has with other elements are shown. Interconnect Diagrams can also be viewed by individual service packages to view all of the elements and connections in each service package. |
| Flow Diagrams | Flow Diagrams are similar to Interconnect Diagrams; however, the actual data flows that are part of each connection between elements are also shown. |

Turbo Architecture saves data in Microsoft Access compatible data files. Turbo Architecture files can be accessed using Microsoft Access, although use of Access will not provide nearly the same amount of capabilities as accessing the files using the Turbo Architecture software. Turbo Architecture is offered by the USDOT free of charge and they provide a link for downloading the software on the National ITS Architecture website. At the time this report was written that site was located at www.iteris.com/itsarch/.

3. REGIONAL NEEDS AND INVENTORY

3.1 Regional Needs

Regional needs that could be addressed by ITS were identified by stakeholders in the Knoxville Regional ITS Architecture workshops held on October 6, 2011 and further discussed in the workshops held over a two day period on November 30, 2011 and December 1, 2011. Stakeholders identified ITS needs for the Knoxville Region in the following areas that correspond to the service areas identified in the National ITS Architecture:

- Traffic Management;
- Emergency management;
- Maintenance and Construction Management
- Public Transportation Management;
- Traveler Information;
- Commercial Vehicle Operations; and
- Archived Data Management.

In Section 4.1.4 a list of regional needs is presented along with the ITS service packages that have been recommended for the Region to consider implementing or expanding (if the service package currently exists.) Some of the key needs that were specific to ITS and identified through the development of the Regional ITS Architecture are summarized below.

Regional Needs Summary

- Need to expand geographic coverage of the TDOT Regional SmartWay system and the HELP service patrol routes.
- Need to upgrade arterial signal systems and improve traffic signal coordination.
- Need to integrate and share information between the TDOT Region 1 SmartWay TMC and the municipal and county traffic operations centers.
- Need to integrate and share information between the TDOT Region 1 SmartWay TMC and the emergency management and public safety dispatching agencies.
- Need to improve information sharing between municipal/county traffic and emergency management centers.
- Need to expand use of existing information dissemination methods for traffic related information, such as the use of social media.
- Need to improve data collection and archiving of traffic information for performance measures.
- Need to expand ITS deployments on transit vehicles.
- Need to provide real-time transit information to users.
- Need to provide transit priority on key transit corridors.

3.2 Regional Inventory

The inventory and needs documented at the Kick-Off Workshop are the starting point for developing an ITS architecture for the Region. These ITS systems and components are used to customize the National ITS Architecture and create the Regional ITS Architecture for the Knoxville Region.

When developing customized elements, the stakeholder group agreed to create individual traffic, maintenance, and emergency management elements for the larger cities in the Region, including the City of Knoxville, City of Oak Ridge, City of Maryville, and the City of Sevierville. The City of Alcoa is developing a joint traffic management center with the City of Maryville so these two cities are often combined in the Regional ITS Architecture as the City of Alcoa/Maryville. The other smaller communities in the Region were documented as part of the municipal elements. 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 even if there are no specific plans for ITS implementation at this time.

3.2.1 Stakeholders

Each element included in the Knoxville Regional ITS Architecture is associated with a stakeholder agency. A listing of stakeholders as identified in the Knoxville Regional ITS Architecture can be found in **Table 3** along with a description of the stakeholder. Rather than individually documenting each of the smaller municipalities and in some cases the counties in the Region, a single stakeholder was created for municipal/county agencies which represents the cities, towns, and counties in those instances where they are not specifically called out in the Regional ITS Architecture.

Table 3 – Knoxville Region Stakeholder Descriptions

| Stakeholder | Stakeholder Description |
|------------------------------|---|
| Blount County | Municipal government for Blount County. Covers all county departments including those that deal with traffic and public safety. |
| City of Alcoa | Municipal government for the City of Alcoa. Covers all city departments including those that deal with traffic and public safety. |
| City of Gatlinburg | Municipal government for the City of Gatlinburg. Covers all city departments including those that deal with traffic and public safety. |
| City of Knoxville | Municipal government for the City of Knoxville. Covers all city departments including those that deal with traffic and public safety. |
| City of Lenoir City | Municipal government for the City of Lenoir City. Covers all city departments including those that deal with traffic and public safety. |
| City of Maryville | Municipal government for the City of Maryville. Covers all city departments including those that deal with traffic and public safety. |
| City of Maryville/Alcoa | Represents combined government for Maryville and Alcoa. These two cities will operate a joint traffic operations center and coordinate traffic signal timing across jurisdictional lines. |
| City of Oak Ridge | Municipal government for the City of Oak Ridge. Covers all city departments including those that deal with traffic and public safety. |
| City of Pigeon Forge | Municipal government for the City of Pigeon Forge. Covers all city departments including those that deal with traffic and public safety. |
| City of Sevierville | Municipal government for the City of Sevierville. Covers all city departments including those that deal with traffic and public safety. |
| Commercial Vehicle Operators | Operators of commercial vehicles. |
| ETHRA | The East Tennessee Human Resource Agency provides demand response transit service in the Region. |
| Financial Institution | Institution that handles exchange of money for transit electronic fare collection. |
| Gatlinburg Trolley System | Transit operator serving the City of Gatlinburg. |
| KAT | Knoxville Area Transit. Provides transit service in the Knoxville urban area. Includes fixed route and paratransit services. |
| Knox County | Municipal government for Knox County. Covers all county departments including those that deal with traffic and public safety. |
| Knox County CAC | Knox County Community Action Committee. Public agency serving the citizens of Knoxville and Knox County assistance for food, shelter, transportation, education, advocacy, training, case management and volunteer opportunities. |
| Knoxville Regional TPO | Transportation Planning Organization for the Knoxville Urban Area. Responsible for regional transportation planning. |
| Loudon County | Municipal government for Loudon County. Covers all county departments including those that deal with traffic and public safety. |
| Media | Local media outlets including television stations, newspapers, radio stations and their associated websites. |
| Municipal/County Government | Government for various municipalities and counties within the Region that are not specifically called out in the Regional ITS Architecture. Covers all departments including those that deal with traffic and public safety. |
| National Park Service | The National Park Service is a bureau of the U.S. Department of the Interior and is responsible for the operation of the National Park System. |
| NOAA | The National Oceanic and Atmospheric Administration gathers weather information and issues severe weather warnings. |

Table 3 – Knoxville Region Stakeholder Descriptions (continued)

| Stakeholder | Stakeholder Description |
|---|---|
| Other Agencies | Stakeholder group made up of a wide variety of agencies. The associated elements are groups of agencies or providers that do not have a primary stakeholder agency. |
| Pigeon Forge/Sevierville Fun Time Trolley | Provides transit service in Pigeon Forge and Sevierville. |
| Private Information Provider | Private sector business responsible for the gathering and distribution of traveler information. This service is typically provided on a subscription basis. |
| Private Service Provider | Private businesses providing a transportation related service. |
| Rail Operators | Companies that operate rail systems including the dispatch and control of trains and the maintenance and operations of railroad tracks. |
| Rural Metro | Contract provider of emergency medical and fire protection services. |
| Sevier County | Municipal government for Sevier County. Covers all county departments including those that deal with traffic and public safety. |
| System Users | All of the users of the transportation system. |
| TDOT | Tennessee Department of Transportation. Responsible for the construction, maintenance, and operation of state roadways in Tennessee. |
| TEMA | Tennessee Emergency Management Agency. Responsible for emergency operations during a disaster or large scale incident. |
| Tennessee Bureau of Investigation | Statewide law enforcement agency responsible for issuing statewide AMBER Alerts in Tennessee. |
| Tennessee Department of Health and Human Services | State department that manages funding for medical transportation services. |
| THP | Tennessee Highway Patrol. Responsible for the statewide enforcement of traffic safety laws as well as commercial vehicle regulations. |
| Town of Farragut | Municipal government for the Town of Farragut. Covers all departments including those that deal with traffic and public safety. |

3.2.2 ITS Elements

The ITS inventory is documented in the Regional ITS Architecture as elements. **Table 4** 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.

The naming convention used for elements in the Knoxville Regional ITS Architecture is consistent with the naming convention used in the Statewide ITS Architecture. This consistency provides seamless connections between the Regional and Statewide ITS Architecture.

Table 4 – Knoxville Region Inventory of ITS Elements

| Stakeholder | Element Name | Element Description | Status |
|--------------------|--|--|---------------|
| Blount County | Blount County E911 Dispatch | 911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. | Existing |
| | Blount County EMA | Emergency management agency for Blount County. Responsible for disaster planning for the County and operating the emergency operations center (EOC). | Existing |
| | Blount County EMA Website | Website for the Blount County EMA. | Existing |
| | Blount County Emergency Callout System | Automated system that can call phone numbers in a particular area with a recorded message. | Existing |
| | Blount County Emergency Communication System | Responsible for the dissemination of emergency information using the internet and other available dissemination methods. | Existing |
| | Blount County Fire Vehicles | Fire department vehicles for Blount County. | Existing |
| | Blount County Rescue Squad Vehicles | Vehicles for the Rescue Squad. | Existing |
| | Blount County Sheriff Vehicles | Vehicles for the Sheriff's Office. | Existing |
| | Blount County Traffic Signals | Traffic signals operated and maintained by Blount County. | Existing |
| City of Alcoa | City of Alcoa CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Alcoa DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Alcoa Emergency Dispatch | Emergency services dispatch for the City of Alcoa. | Existing |
| | City of Alcoa Fire Vehicles | Fire Department Vehicles for the City of Alcoa. | Existing |
| | City of Alcoa Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | City of Alcoa Police Vehicles | Police Department Vehicles for the City of Alcoa. | Existing |
| | City of Alcoa Traffic Signals | Traffic signal system operated and maintained by the City of Alcoa. The City currently has 14 signals operating on a closed loop and no signals with central control. Additional deployment is desired. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|--------------------|---|---|---------------|
| City of Gatlinburg | City of Gatlinburg CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Gatlinburg DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Gatlinburg Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Planned |
| City of Gatlinburg | City of Gatlinburg Emergency Dispatch | Emergency services dispatch for the City of Gatlinburg. | Existing |
| | City of Gatlinburg Fire Vehicles | Fire Department Vehicles for the City of Gatlinburg. | Existing |
| | City of Gatlinburg Police Vehicles | Police Department Vehicles for the City of Gatlinburg. | Existing |
| | City of Gatlinburg TOC | Traffic operations center for the City of Gatlinburg. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Planned |
| | City of Gatlinburg Traffic Signals | Traffic signal system operated and maintained by the City of Gatlinburg. The City has 12 signals and no communications to the signals. | Existing |
| City of Knoxville | City of Knoxville CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Knoxville DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Knoxville Engineer's Office | City Engineer's office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office. | Existing |
| | City of Knoxville Fire Vehicles | Vehicles used by the Knoxville Fire Department. | Existing |
| | City of Knoxville Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Planned |
| | City of Knoxville Flood Detection Equipment | Field equipment for the detection of water on the roadway in areas that are prone to flooding during heavy rain events. | Planned |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-----------------------|---|--|---------------|
| City of Knoxville | City of Knoxville Parking Enforcement | Agency responsible for the enforcement of parking regulations in the City of Knoxville. | Existing |
| | City of Knoxville Parking Management System | System for the monitoring and management of parking facilities in the City of Knoxville. A primary goal of the system is to support electronic collection of parking fees in addition to monitoring parking lot usage and providing information about real-time parking availability at both municipally owned and private parking facilities. | Planned |
| | City of Knoxville Police Vehicles | Vehicles used by the Knoxville Police Department. | Existing |
| | City of Knoxville Police Department | Police department for the City of Knoxville. The emergency dispatch functions for the Police Department are included in the Knox County E911 Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles. | Existing |
| | City of Knoxville Public Works Department | Department that oversees the maintenance of streets, sidewalks, and roadway right-of-way. | Existing |
| | City of Knoxville Public Works Department Vehicles | City of Knoxville vehicles used in maintenance operations. | Existing |
| | City of Knoxville Road Closure Equipment | Field equipment to automate the process of closing a segment of roadway during a flood event. | Planned |
| | City of Knoxville Social Media Accounts | Social media sites such as Facebook or Twitter that can support distribution of real-time traveler information. | Planned |
| | City of Knoxville Special Events Office | Office responsible for the permitting and coordination of special events held in the City of Knoxville. | Existing |
| | City of Knoxville Speed Monitoring Equipment | Field equipment used for monitoring roadway speeds. | Planned |
| City of Knoxville TOC | Traffic operations center for the City of Knoxville. Responsible for the operation of the traffic signal system and possible future operation of closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. TOC will likely be expanded from a single workstation to a larger space with multiple workstations and monitors. | Existing | |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|---------------------|--------------------------------------|--|---------------|
| City of Knoxville | City of Knoxville Traffic Signals | Traffic signal system operated and maintained by the City of Knoxville. The City is currently undergoing a traffic signal system upgrade study that may include improved communications, coordination, and central control of signals. | Existing |
| | City Parking Lot Operator | Operator of City of Knoxville parking facility. Responsible for the collection of data related to lot usage and input of that data into the Parking Management System. | Existing |
| | Parking Payment Card | Card for the payment of parking fees. | Planned |
| City of Lenoir City | City of Lenoir City CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Lenoir City Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Planned |
| | City of Lenoir City TOC | Traffic operations center for the City of Lenoir City. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Planned |
| City of Lenoir City | City of Lenoir City Traffic Signals | Traffic signal system operated and maintained by the City of Lenoir City. The City currently has 22 signals, 4 of which operate on a wireless closed loop system. No signals operate with central control. | Existing |
| City of Maryville | City of Maryville CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Maryville DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Maryville Emergency Dispatch | Emergency services dispatch for the City of Maryville. | Existing |
| | City of Maryville Fire Vehicles | Fire Department Vehicles for the City of Maryville. | Existing |
| | City of Maryville Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | City of Maryville Police Vehicles | Police Department Vehicles for the City of Maryville. | Existing |
| | City of Maryville Traffic Signals | Traffic signal system operated and maintained by the City of Maryville. The City currently has 43 traffic signals including 35 on a closed loop system. There are no signals with central control. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-------------------------|--|---|---------------|
| City of Maryville/Alcoa | City of Maryville/Alcoa TOC | Joint traffic operations center for the cities of Maryville and Alcoa. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Planned |
| City of Oak Ridge | City of Oak Ridge CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Oak Ridge DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Oak Ridge Emergency Dispatch | Emergency services dispatch for the City of Oak Ridge. | Planned |
| | City of Oak Ridge Field Equipment | Equipment used for the collection of vehicle probe data. | Planned |
| | City of Oak Ridge Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | City of Oak Ridge Police Department | Police department for the City of Oak Ridge. The emergency dispatch functions for the Police Department are included in the Anderson County E911 Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles. | Planned |
| | City of Oak Ridge Speed Monitoring Equipment | Field equipment used for monitoring roadway speeds. | Planned |
| City of Oak Ridge | City of Oak Ridge Traffic Signals | Traffic signal system operated and maintained by the City of Oak Ridge. The City has 43 signals including 25 on a closed loop system. | Existing |
| | City of Oak Ridge TOC | Traffic operations center for the City of Oak Ridge. Responsible for the operation of the traffic signal system and possible future operation of closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. TOC will likely be expanded from a single workstation to a larger space with multiple workstations and monitors. | Existing |
| City of Pigeon Forge | City of Pigeon Forge CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Pigeon Forge DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Pigeon Forge Emergency Dispatch | Emergency services dispatch for the City of Pigeon Forge. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|----------------------|--|---|---------------|
| City of Pigeon Forge | City of Pigeon Forge Fire Vehicles | Fire Department vehicles for the City of Pigeon Forge. | Existing |
| | City of Pigeon Forge Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | City of Pigeon Forge Police Vehicles | Police Department vehicles for the City of Pigeon Forge. | Existing |
| | City of Pigeon Forge TOC | Traffic operations center for the City of Pigeon Forge. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Existing |
| | City of Pigeon Forge Traffic Signals | Traffic signal system operated and maintained by the City of Pigeon Forge. The City has 23 signals including 13 with communications. | Existing |
| City of Sevierville | City of Sevierville CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | City of Sevierville DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | City of Sevierville Emergency Dispatch | Emergency services dispatch for the City of Sevierville. | Existing |
| | City of Sevierville Fire Vehicles | Fire Department vehicles for the City of Sevierville. | Existing |
| | City of Sevierville Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Planned |
| | City of Sevierville Police Vehicles | Police Department vehicles for the City of Sevierville. | Existing |
| | City of Sevierville TOC | Traffic operations center for the City of Sevierville. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Existing |
| | City of Sevierville Traffic Signals | Traffic signal system operated and maintained by the City of Sevierville. The City has 43 signals including 33 with communications. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|------------------------------|---|---|---------------|
| Commercial Vehicle Operators | Commercial Vehicles | Privately owned commercial vehicles traveling within the Region. | Existing |
| ETHRA | ETHRA Electronic Fare Payment Card | Fare payment card for ETHRA. | Planned |
| | ETHRA Transportation Data Archive | Data repository used to store ETHRA ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation. | Existing |
| | ETHRA Transportation Dispatch Center | Transit dispatch center responsible for the tracking, scheduling and dispatching of vehicles operated by ETHRA Transit. | Existing |
| | ETHRA Transportation IVR System | Telephone based communications system for communicating real-time traveler information to motorists. | Planned |
| | ETHRA Transportation Operations Facility CCTV Camera Surveillance | ETHRA closed circuit television camera surveillance at operations facilities. | Existing |
| | ETHRA Vehicles | Transit vehicles operated by ETHRA. | Existing |
| | ETHRA Website | Website for ETHRA. Includes information on transportation services and in the future it is envisioned that the website will have real-time information about regional transit services. | Existing |
| Financial Institution | Financial Service Provider | Service provider that handles exchange of money for electronic payment collection. This generic stakeholder could represent a variety of different institutions include banks, credit card companies, or private vendors. | Existing |
| Gatlinburg Trolley System | Gatlinburg Trolley System Dispatch | Transit dispatch for Gatlinburg Trolley System. | Existing |
| | Gatlinburg Trolley System Electronic Fare Payment Card | Fare payment card for the Gatlinburg Trolley System. | Planned |
| | Gatlinburg Trolley System Kiosks | Gatlinburg Trolley System kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards. | Planned |
| | Gatlinburg Trolley System Website | Website for the Gatlinburg Trolley System Website. Includes information on transit services and in the future it is envisioned that the website will have real-time information about regional transit services. | Existing |
| | Gatlinburg Trolley Vehicles | Transit vehicles operated by the Gatlinburg Trolley System. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|--------------------|--|--|---------------|
| KAT | KAT Electronic Fare Payment Card | Fare payment card for Knoxville Area Transit. | Planned |
| | KAT Fixed Route Vehicles | Fixed route vehicles operated by Knoxville Area Transit. KAT currently operates 86 fixed route buses. | Existing |
| | KAT Operations Facility CCTV Camera Surveillance | KAT closed circuit television camera surveillance at operations facilities. | Existing |
| | KAT Social Media Accounts | Social media sites such as Facebook or Twitter that can support distribution of real-time traveler information. | Existing |
| | KAT Transit Center CCTV Camera Surveillance | KAT closed circuit television camera surveillance at transit transfer centers or other transit facilities. | Existing |
| | KAT Transit Data Archive | Data repository used to store Knoxville Area Transit ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation. | Existing |
| | KAT Transit Dispatch Center | Transit dispatch for fixed route KAT vehicles. | Existing |
| | KAT Transit Kiosks | Knoxville Area Transit kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards. | Planned |
| | KAT Website | Website for KAT. Includes information on KAT services and in the future it is envisioned that the website will have real-time information about regional transit services. | Existing |
| | The Lift Dispatch Center | Dispatch center for KAT paratransit vehicles. | Existing |
| | The LIFT IVR System | Telephone based communications system for communicating real-time traveler information to motorists. | Existing |
| | The LIFT Paratransit Vehicles | Paratransit vehicles operated by Knoxville Area Transit. KAT currently operates 22 vehicles. | Existing |
| Knox County | Knox County CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | Knox County E911 Dispatch | 911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. | Existing |
| | Knox County EMA | Emergency management agency for Knox County. Responsible for disaster planning for the County and operating the emergency operations center (EOC). | Existing |
| | Knox County EMA Website | Website for the Knox County EMA. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|--------------------|--|--|---------------|
| Knox County | Knox County Emergency Callout System | Automated system that can call phone numbers in a particular area with a recorded message. | Existing |
| | Knox County Emergency Communication System | Responsible for the dissemination of emergency information using the internet and other available dissemination methods. | Existing |
| | Knox County Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | Knox County Sheriff Vehicles | Vehicles used by the Knox County Sheriff's Office. | Existing |
| | Knox County Speed Monitoring Equipment | Field equipment used for monitoring roadway speeds. | Planned |
| | Knox County Sheriff's Office | Law enforcement for Knox County. The emergency dispatch functions for the Police Department are included in the Knox County E911 Dispatch. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles. | Existing |
| | Knox County TOC | Traffic operations center for Knox County. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the County. | Existing |
| | Knox County Traffic Signals | Traffic signal system operated and maintained by Knox County. County currently operates 68 traffic signals with two additional signals planned. Plans are currently being developed to coordinate and have central control of approximately 45 signals. | Existing |
| Knox County CAC | Knox County CAC Electronic Fare Payment Card | Fare payment card for Knox County CAC Transit. | Planned |
| | Knox County CAC IVR System | Telephone based communications system for communicating real-time traveler information to motorists. | Existing |
| | Knox County CAC Transit Data Archive | Data repository used to store Knox County CAC Transit ridership statistics used by the National Transit Database, FTA, and TDOT Office of Public Transportation. | Existing |
| | Knox County CAC Transit Dispatch Center | Transit dispatch center responsible for the tracking, scheduling and dispatching of vehicles operated by Knox County CAC. | Existing |
| | Knox County CAC Transit Operations Facility CCTV Camera Surveillance | Knox County CAC Transit closed circuit television camera surveillance at operations facilities. | Existing |
| | Knox County CAC Vehicles | Transit vehicles operated by Knox County CAC. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-----------------------------|--|---|---------------|
| Knox County CAC | Knox County CAC Website | Website for Knox County CAC Transit. Includes information on transit services and in the future it is envisioned that the website will have real-time information about regional transit services. | Existing |
| Knoxville Regional TPO | Knoxville Regional TPO Data Archive | Archive of regional transportation data used in planning. | Existing |
| | Knoxville TPO SmartTrips | Carpool ride match service. | Planned |
| Loudon County | Loudon County E911 Dispatch | 911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. | Existing |
| | Loudon County EMA | Emergency management agency for Loudon County. Responsible for disaster planning for the County and operating the emergency operations center (EOC). | Existing |
| | Loudon County Fire and Rescue Vehicles | Fire and rescue vehicles for Loudon County. | Existing |
| | Loudon County Sheriff Vehicles | Sheriff vehicles for Loudon County. | Existing |
| Media | Local Print and Broadcast Media | Local media that provide traffic or incident information to the public. | Existing |
| Municipal/County Government | Municipal CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | Municipal DMS | Dynamic message signs for traffic information dissemination. | Planned |
| | Municipal Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Planned |
| | Municipal Public Safety Dispatch | Municipal emergency services dispatch. | Existing |
| | Municipal Public Safety Vehicles | Vehicles used by public safety in those municipalities for which individual elements were not established, including the County Sheriff's Office. | Existing |
| | Municipal TOC | Traffic operations centers responsible for the operation of municipal signal systems and any other municipal ITS infrastructure. | Planned |
| | Municipal Traffic Signals | Traffic signal system operated and maintained by the Municipality. | Existing |
| | Municipal/County Engineers Office | Municipal/County Engineer's office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office. | Planned |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-----------------------------|---|--|---------------|
| Municipal/County Government | Municipal/County Maintenance | Department that oversees the maintenance of streets, sidewalks, and roadway right-of-way. | Existing |
| | Municipal/County Maintenance Vehicles | Municipal/County vehicles used in maintenance operations. | Existing |
| | Municipal/County Portable DMS | Portable dynamic message sign used by the municipality/county for the dissemination of work zone information. | Planned |
| | Municipal/County RWIS | Municipal/County operated and maintained road weather information system equipment. | Planned |
| | Municipal/County Social Media Sites | Social media sites such as Facebook or Twitter that can support distribution of real-time traveler information. | Planned |
| | Municipal/County Website | Website containing information about maintenance and construction activities. | Existing |
| | Other County 911 Dispatch | 911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. | Existing |
| | Volunteer Fire Vehicles | Vehicles operated by the Volunteer Fire Departments. | Existing |
| National Park Service | Great Smoky Mountains National Park | Represents central headquarters of Great Smoky Mountains National Park that coordinates with other agencies in the Region. | Existing |
| NOAA | National Weather Service | Provides official US weather, marine, fire, and aviation forecasts, warnings, meteorological products, climate forecasts, and information about meteorology. | Existing |
| Other Agencies | Broadcast Media | Broadcast media outlets aiding in the distribution of real-time transit operations information. | Planned |
| | Other Maintenance and Construction Management | Additional maintenance and construction operations agencies with which information is shared for coordination in an emergency situation. | Existing |
| | Private Transportation Providers | Private providers of transportation services in the Region such as taxis and intercity bus service. | Existing |
| | Surrounding County Transit Agencies | Other nearby transit agencies. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|---|--|--|---------------|
| Pigeon Forge/Sevierville Fun Time Trolley | Pigeon Forge/Sevierville Fun Time Trolley Dispatch | Transit dispatch center for the Pigeon Forge Fun Time Trolley. | Existing |
| | Pigeon Forge/Sevierville Fun Time Trolley Electronic Fare Payment Card | Fare payment card for the Pigeon Forge Fun Time Trolley. | Planned |
| | Pigeon Forge/Sevierville Fun Time Trolley Kiosks | Pigeon Forge Fun Time Trolley kiosks for dissemination of transit traveler information. Kiosks can also be used for the purchase and recharging of electronic fare payment cards. | Planned |
| | Pigeon Forge/Sevierville Fun Time Trolley Vehicles | Transit vehicles operated by the Pigeon Forge Fun Time Trolley. | Existing |
| | Pigeon Forge/Sevierville Fun Time Trolley Website | Website for the Pigeon Forge Fun Time Trolley. Includes information on transit services and in the future it is envisioned that the website will have real-time information about regional transit services. | Existing |
| Private Information Provider | Private Sector Traveler Information Services | Traveler information service operated by a private entity. | Existing |
| Private Service Provider | Private Parking Lot Operator | Operator of non-municipal parking lot within the City of Knoxville. | Existing |
| | Private Subscription Data Service Provider | Subscription based traffic data collection and distribution service. | Existing |
| 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. | Existing |
| Rural Metro | Rural Metro Dispatch | Dispatch for Rural Metro emergency medical and/or fire protection services. | Existing |
| | Rural Metro EMS Vehicles | Emergency medical services vehicles operated by Rural Metro. | Existing |
| | Rural Metro Fire Vehicles | Fire vehicles operated by Rural Metro. | Existing |
| Sevier County | Sevier County E911 Dispatch | 911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders. For incidents in Pigeon Forge, Sevierville, and Gatlinburg the E911 center relays the emergency call to the appropriate City for local police and fire dispatch. | Existing |
| | Sevier County EMA | Emergency management agency for Sevier County. Responsible for disaster planning for the County and operating the emergency operations center (EOC). | Existing |
| | Sevier County EMS Vehicles | Emergency Medical Services Vehicles for Sevier County. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|--------------------|---|---|---------------|
| Sevier County | Sevier County Tourist Corridor Traveler Information Website | Website with consolidated traveler information for Sevier County. | Planned |
| System Users | Archive Data User | Users that request information from the data archive systems. | Existing |
| | Personal Computing Devices | Computing devices that travelers use to access public information. | Existing |
| | Private Traveler Vehicle | Private vehicles used by travelers. | Existing |
| | Traveler | Member of the traveling public. | Existing |
| | Vehicle Operator | Operators of commercial vehicles. | Existing |
| TDOT | Other TDOT Region Construction Office | Regional construction offices for other TDOT regions besides Region 1. | Existing |
| | Other TDOT Region Maintenance | Regional maintenance for other TDOT regions besides Region 1. | Existing |
| | TDOT CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. CCTV cameras are implemented as part of SmartWay KI-40, I-75, I-640, I-140, I-275, and the Alcoa Highway. Additional CCTV cameras will be deployed as part of future SmartWay expansion projects. | Existing |
| | TDOT District Maintenance | Office that handles most of the routine roadway maintenance and responds to incidents when services are requested by local emergency management. | Existing |
| | TDOT DMS | Dynamic message signs for traffic information dissemination. DMS are implemented as part of SmartWay I-40, I-75, I-640, I-140, I-275, and the Alcoa Highway. Additional DMS will be deployed as part of future SmartWay expansion projects. | Existing |
| | TDOT Emergency Services Coordinator | Coordinator responsible for managing the Tennessee Department of Transportation response in a large scale incident or disaster in which the Tennessee Emergency Management Agency (TEMA) activates the state emergency operations center (EOC). | Existing |
| | TDOT Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. Additional field sensors will be deployed as part of future SmartWay expansion projects. | Existing |
| | TDOT HAR | Highway advisory radio for traffic information dissemination. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-------------|--|--|----------|
| TDOT | TDOT HELP Vehicles | Roadway service patrol vehicles operated by TDOT. HELP vehicle patrols are operated on all routes where SmartWay technologies are implemented. | Existing |
| | TDOT Maintenance Headquarters | The Tennessee Department of Transportation maintenance headquarters. | Existing |
| | TDOT Maintenance Vehicles | The Tennessee Department of Transportation vehicles used in maintenance operations. | Existing |
| | TDOT Project Planning Division Archive | Data archive for the Project Planning Division. The Division is responsible for traffic data collection and analysis and includes the Short Range Planning Office. | Existing |
| | TDOT Public Information Office | Office responsible for the dissemination of traffic information to the media and the public. | Existing |
| | TDOT Ramp Metering Equipment | Roadway equipment used in the operation of a ramp metering system. Includes the signals and any other ITS equipment. | Planned |
| | TDOT Region 1 Construction Office | Office responsible for oversight of construction projects in Region 1. | Existing |
| | TDOT Region 1 Engineers Office | Region 1 Engineer's office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office. | Existing |
| | TDOT Region 1 HELP Dispatch | Roadway service patrol dispatch. Currently service is limited to the Knoxville area except in the case of a large scale incident. | Existing |
| | TDOT Region 1 Maintenance | Region 1 maintenance headquarters. Responsible for maintenance operations in the Region; however, most routine maintenance is handled by the District Maintenance Offices. There are several District Maintenance Offices within the Region. | Existing |
| | TDOT Region 1 TMC - Knoxville | Transportation management center for Region 1, located in Knoxville. Responsible for the operation of the ITS equipment located in Region 1. This includes the freeway management system in Knoxville as well as rural ITS deployments. The TMC is operated 24 hours per day, 7 days per week. | Existing |
| | TDOT Region 2 TMC - Chattanooga | Transportation management center for Region 2, located in Chattanooga. Responsible for the operation of the ITS equipment located in Region 2. This includes the freeway management system in Chattanooga as well as rural ITS deployments. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|-----------------------------------|---|---|----------|
| TDOT | TDOT Region 3 TMC - Nashville | Transportation management center for Region 3, located in Nashville. Responsible for the operation of the ITS equipment located in Region 3. This includes the freeway management system in Nashville as well as rural ITS deployments. | Existing |
| | TDOT Region 4 TMC - Memphis | Transportation management center for Region 4, located in Memphis. Responsible for the operation of the ITS equipment located in Region 4. This includes the freeway management system in Memphis as well as rural ITS deployments. | Existing |
| | TDOT Roadway Warning Equipment | Equipment associated with TDOT dynamic roadway warning system. | Planned |
| | TDOT RWIS Sensors | Road weather information system sensors to monitor weather conditions at the roadway. | Existing |
| | TDOT Smart Work Zone Equipment | Portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes portable closed circuit television (CCTV) cameras, vehicle detection, and dynamic message signs (DMS). | Existing |
| | TDOT SmartWay Information System (TSIS) | TSIS is a statewide roadway conditions database. Currently information can be entered by District and Regional maintenance personnel as well as staff at any of the traffic management centers (TMCs) and the Tennessee Highway Patrol (THP). TSIS feeds the Statewide 511 system and SmartWay website. | Existing |
| | TDOT SmartWay Website | Website providing road network conditions including incident and construction information and camera views. Much of the data for the website comes from TSIS. | Existing |
| | TDOT Variable Speed Limit Equipment | Signs and other equipment associated with TDOT variable speed limit applications. | Planned |
| | Tennessee 511 IVR | Tennessee 511 Interactive Voice Response. TDOT contracts the IVR operation to a vendor. The IVR accepts callers' requests and provides responses to specific traveler information needs. This is the customer interface component of the 511 phone system. | Existing |
| | Tennessee 511 System | 511 traveler information system central server. | Existing |
| Tennessee GoSmart Kiosks | Kiosks in rest areas that provide traveler information, including weather, road, and travel conditions. | Existing | |
| TEMA | TEMA | Tennessee Emergency Management Agency. Responsible for managing emergency operations during a disaster or large scale incident. | Existing |
| Tennessee Bureau of Investigation | Tennessee Bureau of Investigation | Responsible for issuing statewide America's Missing: Broadcast Emergency Response (AMBER) Alerts in Tennessee. | Existing |

Table 4 – Knoxville Region Inventory of ITS Elements (continued)

| Stakeholder | Element Name | Element Description | Status |
|---|--|--|---------------|
| Tennessee Department of Health and Human Services | Health and Human Services | Agency responsible for providing health related services including the subsidization of transportation to obtain medical services. | Existing |
| THP | THP CVO Enforcement | Tennessee Highway Patrol commercial vehicle inspection and enforcement. | Existing |
| | THP Dispatch | Tennessee Highway Patrol dispatch center. There are several THP dispatch centers around the state of Tennessee. | Existing |
| | THP Truck Weigh and Inspection Station | Commercial vehicle inspection station with the capability to weigh commercial vehicles and evaluate their credentials. | Existing |
| | THP Vehicles | Tennessee Highway Patrol vehicles. | Existing |
| | THP Weigh-in-Motion | Tennessee Highway Patrol facilities with the capability to weigh commercial vehicles while they are traveling at highway speeds. | Existing |
| | TITAN Database | Tennessee Integrated Traffic Analysis Network database. The Tennessee Department of Safety crash record database maintained by THP for the collection of crash record information. TITAN interfaces with the TraCS (Traffic and Criminal Software) system. | Existing |
| Town of Farragut | Town of Farragut CCTV Cameras | Closed circuit television cameras for traffic surveillance and incident management. | Planned |
| | Town of Farragut Field Sensors | Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops. | Existing |
| | Town of Farragut TOC | Traffic operations center for the Town of Farragut. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City. | Planned |
| | Town of Farragut Traffic Signals | Traffic signal system operated and maintained by the Town of Farragut. The Town operates 22 signals, 12 of which are part of one of 3 systems. The remaining 10 operate independently. 2 additional signals will be added to the system in 2012. | Existing |

4. REGIONAL ITS ARCHITECTURE

Upon completion of the system inventory, the next step in the development of the Regional ITS Architecture was to identify the ITS services that are important to the Knoxville Region. The National ITS Architecture has the following eight groups of ITS service areas:

- **Traffic Management** – includes the TDOT SmartWay TMC in Knoxville as well as other existing and future TOCs, detection systems, CCTV cameras, 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 CVISN efforts.
- **Traveler Information** – includes broadcast traveler information, traveler information kiosks, and highway advisory radio (HAR).
- **Archived Data Management** – includes electronic data management and archiving systems.
- **Vehicle Safety** – these systems were discussed, but at this time this service group is primarily a private sector initiative to incorporate technologies such as intersection collision avoidance and automated vehicle operation systems into vehicles.

Existing, planned, and future systems in the Region were considered in each of the service areas. Vehicle Safety was not included in the Knoxville Regional ITS Architecture because implementation of those service packages would primarily be by private sector automobile manufacturers and information service providers.

4.1 Service Packages

In the National ITS Architecture, services are referred to as service packages. Service packages can include several stakeholders and elements that work together to provide a service in the Region. Examples of service packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently a total of 97 service packages identified in the National ITS Architecture Version 7.0. A complete list of the National ITS Architecture service packages is included in **Appendix A**.

4.1.1 Overview of Service Package Structure

A service package is made up of elements and data flows. Each identified system or component in the Knoxville Regional ITS Architecture inventory, which is documented in the previous section, was mapped to a subsystem or terminator in the National ITS Architecture. Subsystems and terminators represent the various functional categories that define the role of an element in ITS and the regional architecture. The elements are connected together by architecture flows that document the existing and planned flow of information. **Figure 3** depicts a sample service package with each of the components identified. Additional explanation of the terminology used can be found after the figure.

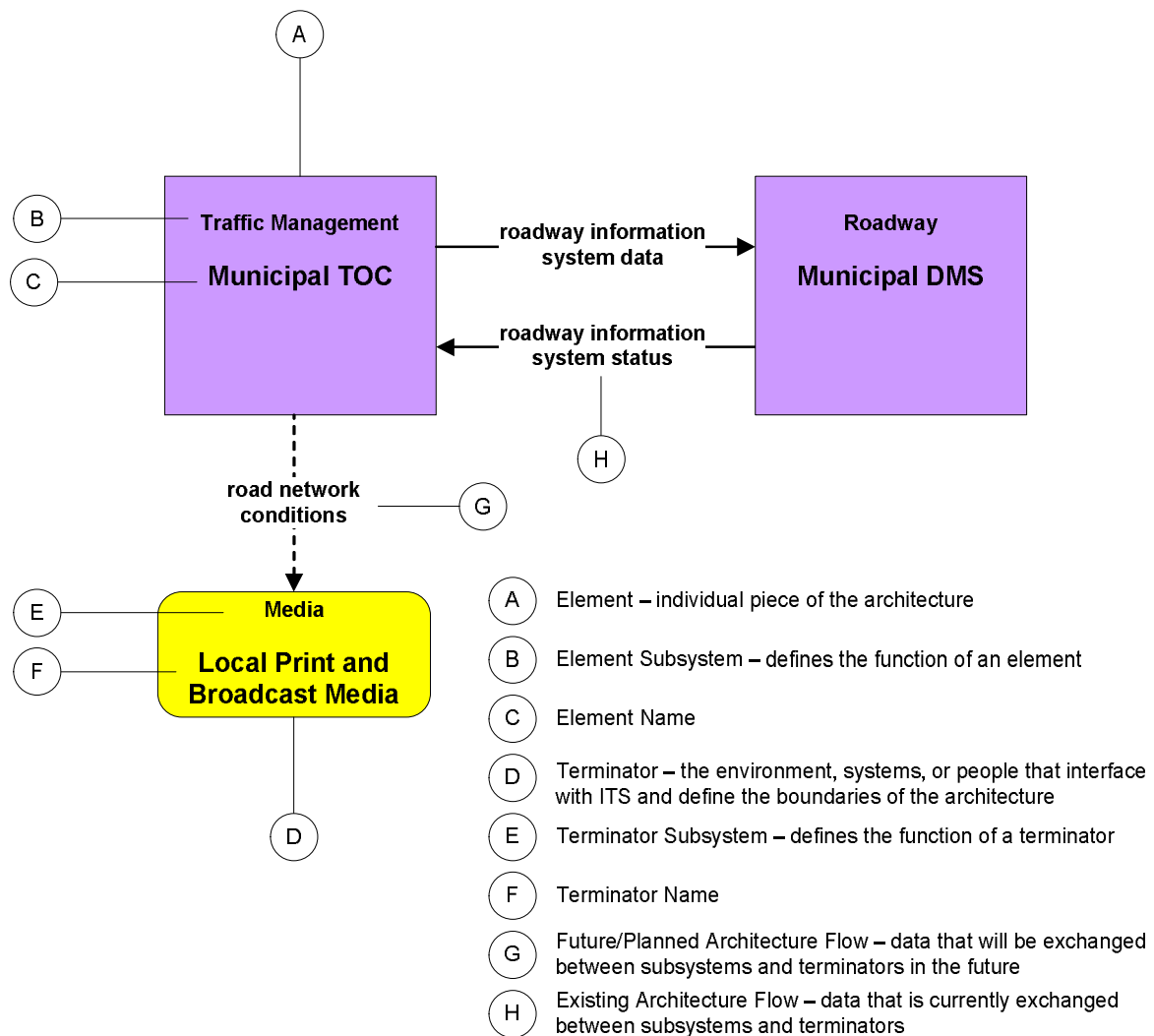


Figure 3 – Overview of Service Package Structure

Elements represent the ITS inventory for the Region. Both existing and planned elements have been included in the inventory and incorporated into the architecture through the development of the service package diagrams.

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 subsystems that represent a set of transportation functions (or processes). Each set of functions is grouped under one agency, jurisdiction, or location, and correspond to physical elements such as: traffic operations centers, traffic signals, or vehicles. Each element is assigned to one or more subsystems.

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 services, and information service providers.

Architecture Flows provide a standardized method for documenting the types of information that flow between elements. A flow can be shown as either existing or future/planned. Existing flows indicate a connection that has already been established to share at least a portion of the desired information but showing a flow as existing is not meant to imply that the function is complete. For example, the traffic information coordination flow between traffic management agencies includes the sharing of video images, incident information and other relevant data. The flow could be shown as existing to capture the sharing of video images while incident information is still a future desired expansion of functionality. Many of the architecture flows have associated technical specifications, known as standards, which define the format of the data being shared.

4.1.2 Selection and Prioritization of Regional Service Packages

In the Knoxville Region, the National ITS Architecture service packages were reviewed by the stakeholders and selected based on the relevance of the service that the service package could provide to the Region. Stakeholders selected 44 service packages for implementation in the Region. They are identified in **Table 5**. Stakeholders prioritized the selected service packages during the workshop, and the table organizes the service packages into service areas and priority groupings.

TDOT is leading a separate effort to develop and implement the CVISN program. CVISN addresses commercial vehicle operations, including ITS, on a statewide level and includes such applications as electronic clearance, safety enforcement, and registration. Unless a specific need was identified in the Knoxville Region that could be addressed locally, the commercial vehicle operations service packages were not selected and instead will be covered in the CVISN effort to ensure consistency.

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

Table 5 – Knoxville Region Service Package Prioritization by Functional Area

| High Priority Service Packages | Medium Priority Service Packages | Low Priority Service Packages |
|--|---|--|
| Traffic Management | | |
| ATMS01 Network Surveillance ATMS03 Surface Street Control ATMS06 Traffic Information Dissemination ATMS07 Regional Traffic Management ATMS08 Traffic Incident Management System | ATMS04 Freeway Control ATMS13 Standard Railroad Grade Crossing ATMS16 Parking Facility Management ATMS17 Regional Parking Management | ATMS19 Speed Monitoring ATMS21 Roadway Closure Management ATMS22 Variable Speed Limits ATMS24 Dynamic Roadway Warning |
| Emergency Management | | |
| EM01 Emergency Call-Taking and Dispatch EM02 Emergency Routing EM04 Roadway Service Patrols EM06 Wide-Area Alert | EM08 Disaster Response and Recovery EM09 Evacuation and Reentry Management EM10 Disaster Traveler Information | |
| Maintenance and Construction Management | | |
| MC03 Road Weather Data Collection MC04 Weather Information Processing and Distribution MC10 Maintenance and Construction Activity Coordination | MC01 Maintenance and Construction Vehicle and Equipment Tracking MC08 Work Zone Management MC09 Work Zone Safety Monitoring | MC12 Infrastructure Monitoring |
| Public Transportation Management | | |
| APTS01 Transit Vehicle Tracking APTS02 Transit Fixed-Route Operations APTS03 Demand Response Transit Operations APTS07 Multi-Modal Coordination APTS08 Transit Traveler Information APTS10 Transit Passenger Counting | APTS04 Transit Fare Collection Management APTS05 Transit Security APTS06 Transit Fleet Management APTS09 Transit Signal Priority | |
| Traveler Information | | |
| ATIS01 Broadcast Traveler Information ATIS02 Interactive Traveler Information ATIS08 Dynamic Ridesharing | | |
| Commercial Vehicle Operations | | |
| | CVO06 Weigh-in-Motion | |
| Archived Data Management | | |
| AD1 ITS Data Mart | AD2 ITS Data Warehouse AD3 ITS Virtual Data Warehouse | |

4.1.3 Customization of Regional Service Packages

The service packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Knoxville Region. Service packages represent a service that will be deployed as an integrated capability. Each service package is shown graphically with the service package name, local agencies involved, and desired data flows. The data flows are shown as either existing or planned/future. Data flows shown as existing indicate that in at least one location within the jurisdiction the connection exists. Data flows shown as existing should not be interpreted to mean that deployment of that service is complete as there are many cases where a data flow exists in a service but a need has been identified to expand the service to additional locations.

Figure 4 is an example of an Advanced Traffic Management System (ATMS) service package for traffic information dissemination that has been customized for the Region. This instance focuses on the activities of TDOT. The service package shows the existing distribution of traffic information from the TDOT Region 1 TMC to two emergency dispatch agencies and the media as well as in the future to transit management agencies and additional emergency dispatch agencies. Messages are also placed on DMS and HAR and entered into TSIS for inclusion on the SmartWay website and 511. Data flows between the subsystems indicate what information is being shared. The remainder of the service packages that were customized for the Knoxville Region are shown in **Appendix B**.

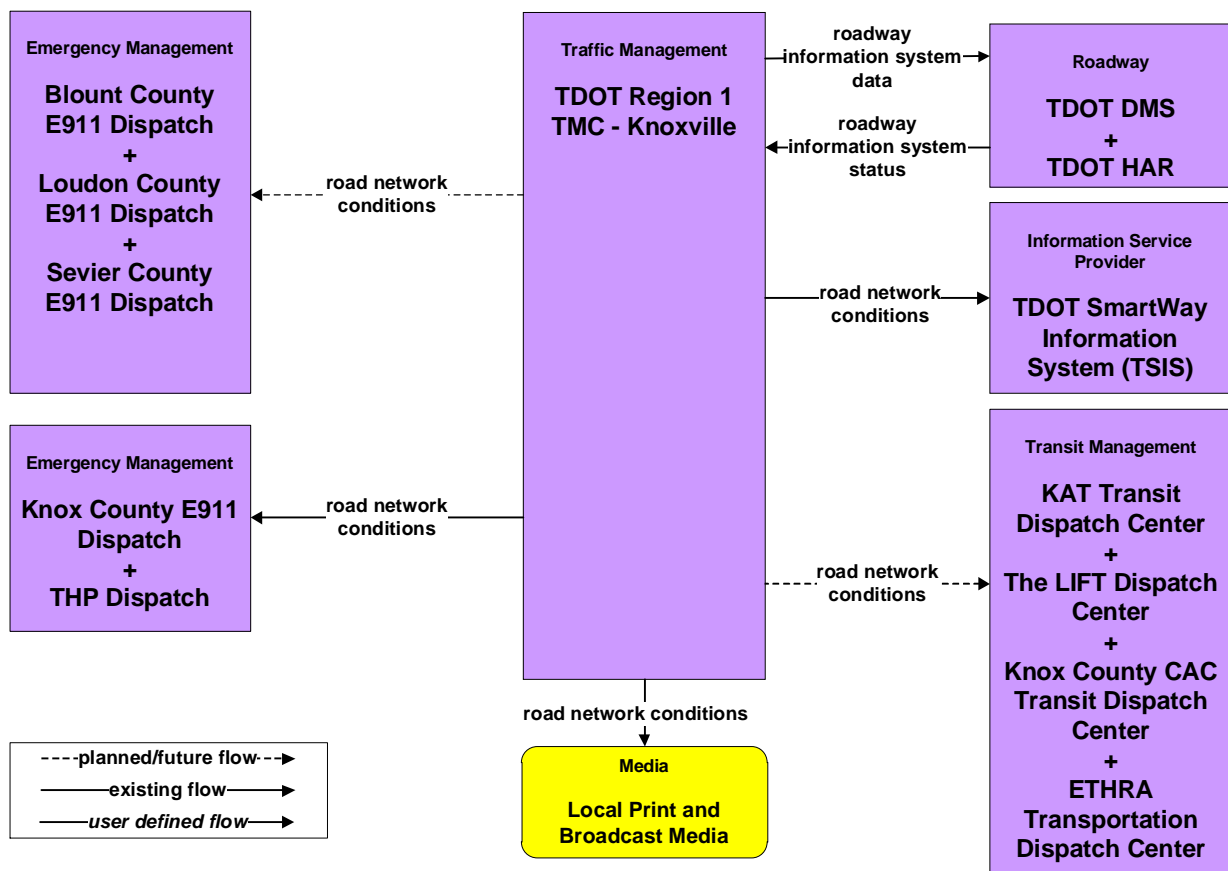


Figure 4 – Example Service Package Diagram: ATMS06 – Traffic Information Dissemination (TDOT Region 1 TMC)

4.1.4 Regional Needs and Corresponding Service Packages

Input received from stakeholders at the Knoxville Regional ITS Architecture workshops provided valuable input for the service package customization process. The needs identified in the ITS Architecture workshops are summarized in **Table 6**. The table also identifies which service package documents the particular ITS need.

Table 6 – Knoxville Regional ITS Needs and Corresponding Service Packages

| ITS Need | Service Package |
|---|--|
| Traffic Management and Traveler Information | |
| Need to expand geographic coverage of the TDOT Regional SmartWay system. | ATMS01 – Network Surveillance ATMS04 – Freeway Control ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System |
| Need to expand geographic coverage of the HELP Service Patrol Routes. | EM04 – Roadway Service Patrols |
| Need to integrate and share information between the TDOT Region 1 SmartWay TMC and the municipal and county traffic operations centers. | ATMS06 – Traffic Information Dissemination ATMS07 – Regional Traffic Management ATMS08 – Traffic Incident Management System |
| Need to upgrade arterial signal systems and improve traffic signal coordination. | ATMS03 – Surface Street Control ATMS07 – Regional Traffic Management |
| Need to add detection systems and CCTV cameras. | ATMS01 – Network Surveillance |
| Need to implement speed monitoring. | ATMS19 – Speed Monitoring |
| Need to obtain traffic flow data from rural areas. | ATMS01 – Network Surveillance ATMS07 – Regional Traffic Management |
| Need to coordinate between the Knoxville Region and other Regions to share information. | ATMS07 – Regional Traffic Management |
| Emergency Management | |
| Need to integrate and share information between the TDOT Region 1 SmartWay TMC and the emergency management and public safety dispatching agencies. | ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System EM06 – Wide Area Alerts EM08 – Disaster Response and Recover EM09 – Evacuation and Reentry Management EM10 – Disaster Traveler Information |
| Need to improve information sharing between municipal/county traffic and emergency management centers. | ATMS06 – Traffic Information Dissemination ATMS08 – Traffic Incident Management System EM06 – Wide Area Alerts EM08 – Disaster Response and Recover EM09 – Evacuation and Reentry Management EM10 – Disaster Traveler Information |
| Need MDTs and AVL on fire vehicles. | EM01 – Emergency Call-Taking and Dispatch EM02 – Emergency Routing |
| Need to add emergency vehicle signal preemption. | EM02 – Emergency Routing |
| Maintenance and Construction Management | |
| Need real-time weather information. | MC03 – Road Weather Data Collection |

**Table 6 – Knoxville Regional ITS Needs and Corresponding Service Packages
(continued)**

| ITS Need | Service Package |
|--|--|
| Public Transportation Management | |
| Need to provide transit priority on key transit corridors. | APTS09 – Transit Signal Priority |
| Need to expand ITS deployments on transit vehicles. | APTS01 – Transit Vehicle Tracking APTS04 – Transit Fare Collection Management APTS05 – Transit Security APTS10 – Transit Passenger Counting |
| Need to provide real-time transit information to users. | APTS01 – Transit Vehicle Tracking APTS07 – Transit Traveler Information |
| Need to provide transit priority on key transit corridors. | APTS09 – Transit Signal Priority |
| Need to implement a route planning system | APTS07 – Transit Traveler Information |
| Traveler Information | |
| Need to expand use of existing information dissemination methods for traffic related information, such as the use of social media. | ATIS01 – Broadcast Traveler Information ATIS02 – Interactive Traveler Information ATIS08 – Dynamic Ridesharing |
| Archived Data | |
| Need to improve data collection and archiving of traffic information for performance measures. | AD1 – ITS Data Mart AD2 – ITS Data Warehouse AD3 – ITS Virtual Data Warehouse |

4.2 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 ITS architecture is to identify the connectivity between transportation systems in the Knoxville Region. The system interconnect diagram shows the high-level relationships of the subsystems and terminators in the Knoxville Region and the associated local projects and systems. The customized service packages represent services that can be deployed as an integrated capability and the service package diagrams show the information flows between the subsystems and terminators that are most important to the operation of the service packages. How these systems interface with each other is an integral part of the overall ITS architecture.

4.2.1 Top Level Regional System Interconnect Diagram

A system interconnect diagram, or “sausage diagram”, shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the Knoxville Region based on the system inventory and information gathered from the stakeholders. **Figure 4** summarizes the existing and planned ITS elements for the Knoxville 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.

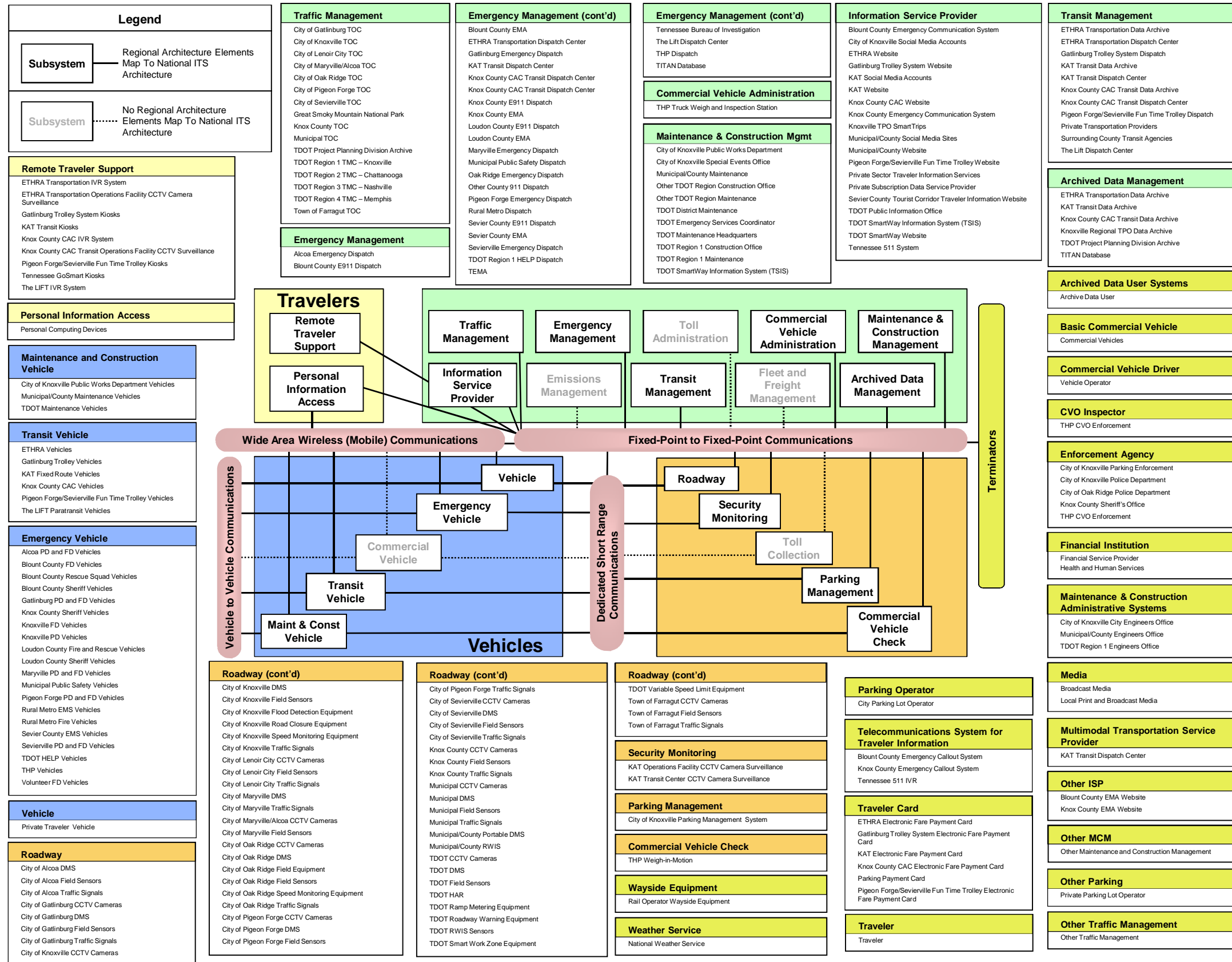


Figure 5 – Knoxville Regional System Interconnect Diagram

4.2.2 Element Connections

A number of different elements are identified as part of the Knoxville Regional ITS Architecture. These elements include transportation 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 Knoxville Regional 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 6** is an example of an interconnect diagram from the Turbo database output. This particular interconnect diagram is for the City of Knoxville Traffic Signals.

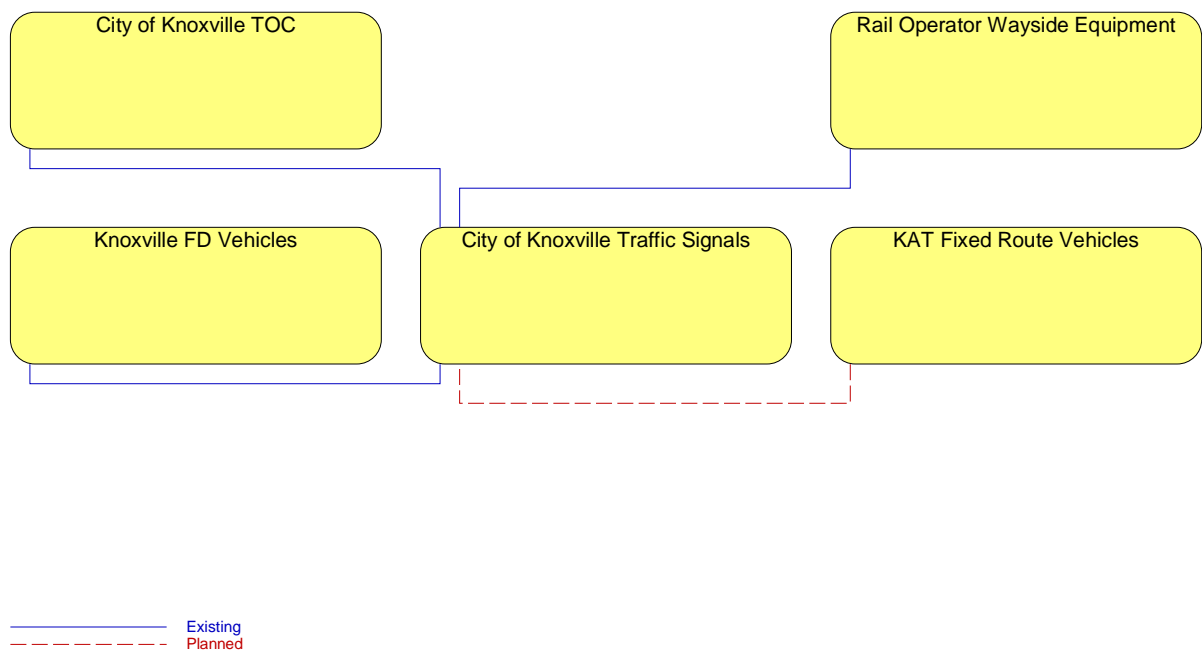


Figure 6 – Example Interconnect Diagram: City of Knoxville Traffic Signals

4.2.3 Data Flows Between Elements

In the service 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 service 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 service package. An example of a flow diagram that has been filtered for the ATMS01 – Network Surveillance service package for the City of Knoxville is shown in **Figure 7**.

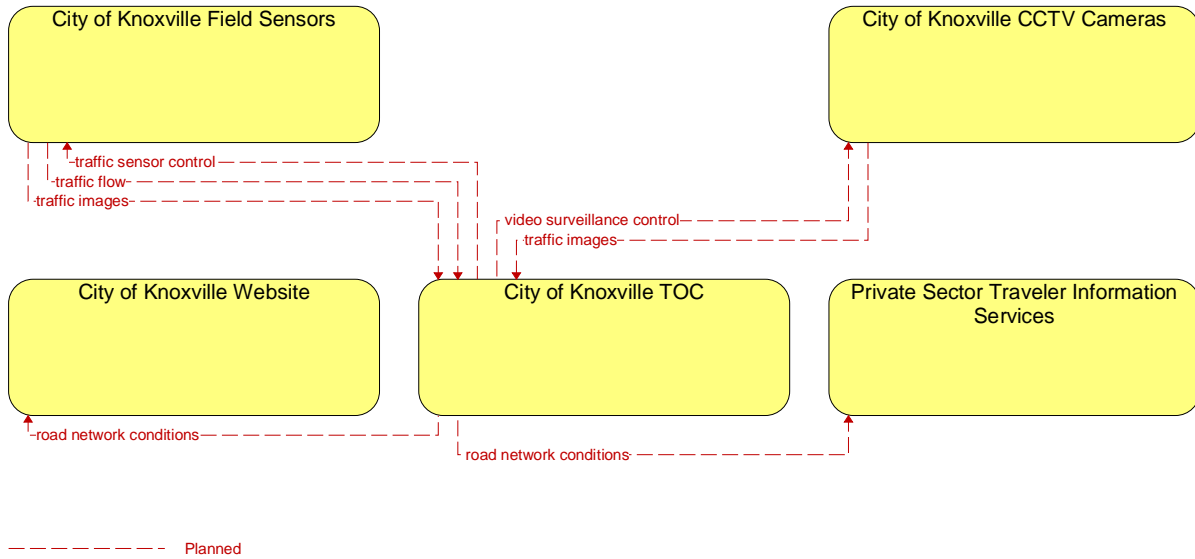


Figure 7 – Example Flow Diagram: ATMS01 – Network Surveillance

4.3 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 Knoxville 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 Knoxville Regional ITS Architecture, functional requirements have been identified at two levels. The customized ITS service packages, discussed previously in Section 4.1.3, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These service packages and data flows describe what ITS in the Knoxville Region has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the Knoxville 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.

Within the Turbo Architecture database developed for the Knoxville Regional ITS Architecture, all of the functional requirements provided by Turbo have been identified for each of the elements in the Regional ITS Architecture. These functional requirements should be reviewed during future project planning and design phases, and stakeholders should determine which of the functional requirements are existing, planned, or not planned. An example of the functional requirements from Turbo Architecture for the Knox County TOC and Knox County Traffic Signals has been included in **Figure 8** and **Figure 9**. For this example, the status of each functional requirement was identified and included.

| Functional Area | Number | Requirement | Status |
|----------------------------------|--------|--|-------------|
| Collect Traffic Surveillance | 1 | The center shall monitor, analyze, and store traffic sensor data (speed, volume, occupancy) collected from field elements under remote control of the center. | Planned |
| | 2 | The center shall monitor, analyze, and distribute traffic images from CCTV systems under remote control of the center. | Planned |
| | 3 | The center shall monitor, analyze, and store multimodal crossing and high occupancy vehicle (HOV) lane sensor data under remote control of the center. | Not Planned |
| | 4 | The center shall distribute road network conditions data (raw or processed) based on collected and analyzed traffic sensor and surveillance data to other centers. | Planned |
| | 5 | The center shall respond to control data from center personnel regarding sensor and surveillance data collection, analysis, storage, and distribution. | Planned |
| | 6 | The center shall maintain a database of surveillance equipment and sensors and associated data (including the roadway on which they are located, the type of data collected, and the ownership of each). | Planned |
| | 7 | The center shall support an interface with a map update provider, or other appropriate data sources, through which updates of digitized map data can be obtained and used as a background for traffic data). | Planned |
| TMC Incident Detection | 1 | The center shall receive inputs from the Alerting and Advisory System concerning the possibility or occurrence of severe weather, terrorist activity, or other major emergency, including information provided by the Emergency Alert System. | Planned |
| | 2 | The center shall collect and store traffic flow and image data from the field equipment to detect and verify incidents. | Planned |
| | 3 | The center shall receive inputs concerning upcoming events that would effect the traffic network from event promoters and traveler information service providers. | Planned |
| | 4 | The center shall exchange incident and threat information with emergency management centers as well as maintenance and construction centers; including notification of existence of incident and expected severity, location, time and nature of incident. | Planned |
| | 5 | The center shall support requests from emergency management centers and border inspection systems to remotely control sensor and surveillance equipment located in the field. | Planned |
| | 6 | The center shall provide road network conditions and traffic images to emergency management centers to support the detection, verification, and classification of incidents. | Planned |
| | 7 | The center shall provide video and traffic sensor control commands to the field equipment to detect and verify incidents. | Planned |
| TMC Regional Traffic Management | 1 | The center shall exchange traffic information with other traffic management centers including incident information, congestion data, traffic data, signal timing plans, and real-time signal control information. | Planned |
| | 2 | The center shall exchange traffic control information with other traffic management centers to support remote monitoring and control of traffic management devices (e.g. signs, sensors, signals, cameras, etc.). | Planned |
| TMC Signal Control | 1 | The center shall remotely control traffic signal controllers. | Planned |
| | 2 | pp | Planned |
| | 3 | The center shall collect traffic signal controller operational status and compare against the control information sent by the center. | Planned |
| | 4 | The center shall collect traffic signal controller fault data from the field. | Planned |
| | 5 | The center shall manage (define, store and modify) control plans to coordinate signalized intersections, to be engaged at the direction of center personnel or according to a daily schedule. | Planned |
| | 6 | The center shall implement control plans to coordinate signalized intersections based on data from sensors. | Planned |
| | 7 | The center shall manage boundaries of the control sections used within the signal system. | Planned |
| | 8 | The center shall maintain traffic signal coordination including synchronizing clocks throughout the system. | Planned |
| TMC Speed Monitoring and Warning | 1 | The center shall remotely control vehicle speed sensors typically placed in work zones; control parameters may include environmental and traffic conditions. | Planned |
| | 2 | The center shall collect operational status for the vehicle speed sensors; the status shall include logged information including measured speeds, warning messages displayed, and violation records. | Planned |
| | 3 | The center shall provide the capability to notify an enforcement agency when vehicle speeds in the work zone are in excess of the posted speed limit or are creating an unsafe condition based upon the current environmental or traffic conditions. | Planned |
| | 4 | The center shall collect fault data for the vehicle speed sensors for repair. | Planned |

Figure 8 – Knox County TOC Functional Requirements (Partial List)

| Functional Area | Number | Requirement | Status |
|--------------------------------|--------|---|-------------|
| Roadway Equipment Coordination | 1 | The field element shall include sensors that provide data and status information to other field element devices, without center control. | Planned |
| | 2 | The field element shall include sensors that receive configuration data from other field element devices, without center control. | Planned |
| | 3 | The field element shall include devices that provide data and status information to other field element devices without center control. | Planned |
| | 4 | The field element shall include devices that receive configuration data from other field element devices, without center control. | Planned |
| Roadway Signal Controls | 1 | The field element shall control traffic signals under center control. | Planned |
| | 2 | The field element shall respond to pedestrian crossing requests by accommodating the pedestrian crossing. | Existing |
| | 3 | The field element shall provide the capability to notify the traffic management center of pedestrian calls and pedestrian accommodations. | Planned |
| | 4 | The field element shall report the current signal control information to the center. | Planned |
| | 5 | The field element shall report current preemption status to the center. | Planned |
| | 6 | The field element shall return traffic signal controller operational status to the center. | Planned |
| | 7 | The field element shall return traffic signal controller fault data to the center. | Planned |
| | 8 | The field element shall report current transit priority status to the center. | Not Planned |
| Roadway Signal Preemption | 1 | The field element shall respond to signal preemption requests from emergency vehicles. | Planned |

Figure 9 – Knox County Traffic Signals Functional Requirements

4.4 Standards

Standards are an important tool that will allow efficient implementation of the elements in the Knoxville 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 7** identifies each of the ITS standards that could apply to the Knoxville Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 4.2.3 and shown in the service package diagrams in **Appendix B**.

While **Table 7** does not match the standards to specific architecture flows, that information is available through the National ITS Architecture website and Turbo Architecture. Since the website is updated more frequently than the software and links directly to additional information about the applicable standard, the website is the preferred method for determining which standards apply to a particular architecture flow. To locate this information do the following:

- Go to the main page of the National Architecture website at <http://www.iteris.com/itsarch/>;
- In the menu bar on the top select the tab for Physical Architecture;
- Select the Architecture Flows link embedded in the descriptive paragraph about the Physical Architecture;
- From the alphabetical list of flows that appears locate and select the desired flow;
- Architecture flows are often used between multiple subsystems so scrolling may be required to find the appropriate information associated with the particular use of the flow, in the descriptive information any applicable standards will be identified; and
- For additional information on the applicable standards the standard name is a link that when selected leads to a more detailed description of the standard.

Table 7 – Knoxville Region Applicable ITS Standards

| SDO | Document ID | Title | |
|-----------------|--------------------|---|---|
| AASHTO/ITE/NEMA | NTCIP 1102 | Octet Encoding Rules Base Protocol | |
| | NTCIP 1103 | Transportation Management Protocols | |
| | NTCIP 1104 | Center-to-Center Naming Convention Specification | |
| | NTCIP 1201 | Global Object Definitions | |
| | NTCIP 1202 | Object Definitions for Actuated Traffic Signal Controller Units | |
| | NTCIP 1203 | Object Definitions for Dynamic Message Signs (DMS) | |
| | NTCIP 1204 | Object Definitions for Environmental Sensor Stations | |
| | NTCIP 1205 | Object Definitions for Closed Circuit Television (CCTV) Camera Control | |
| | NTCIP 1206 | Object Definitions for Data Collection and Monitoring (DCM) Devices | |
| | NTCIP 1207 | Object Definitions for Ramp Meter Control Units | |
| | NTCIP 1208 | Object Definition for CCTV Camera Switching | |
| | NTCIP 1209 | Data Element Definitions for Transportation Sensor Systems | |
| | NTCIP 1210 | Field Management Stations – Part 1: Object Definitions for Signal System Masters | |
| | NTCIP 1211 | Object Definitions for Signal Control and Prioritization | |
| | NTCIP 1214 | Object Definitions for Conflict Monitor Unites (CMU) | |
| | 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 Transmission Control Protocol/Internet Protocol and Universal Datagram Protocol/Internet Protocol Transport Profile | |
| | NTCIP 2301 | Simple Transportation Management Framework 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 Extensible Markup Language (XML) Message Encoding and Transport in ITS Center-to-Center Communications | |
| | AASHTO/ITE | ITE TMDD | Traffic Management Data Dictionary and Message Sets for External TMC Communications (TMDD and MS/ETMCC) |
| | APTA | APTA TCIP-S-001 3.0.0 | Standard for Transit Communications Interface Profiles |
| ASTM | ASTM E2158-01 | Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band | |
| | ASTM E2213-03 | Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band DSRC Medium Access Control and Physical Layer Specifications | |

Table 7 – Knoxville Region Applicable ITS Standards (continued)

| SDO | Document ID | Title |
|------------------|--------------------|--|
| ASTM (continued) | ASTM E2468-05 | Standard Practice for Metadata to Support Archived Data Management Systems |
| | ASTM E2665-08 | Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data |
| IEEE | IEEE 1455-1999 | Standard Message Sets for Vehicle/Roadside Communications |
| | IEEE 1512-2006 | Standard for Common Incident Management Message Sets for use by Emergency Management Centers |
| | IEEE 1512.1-2006 | Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers |
| | IEEE 1512.2-2004 | Standard for Public Safety Traffic Management Message Sets for use by Emergency Management Centers |
| | IEEE 1512.3-2006 | Standard for Hazardous Material Incident Management Sets for Use by Emergency Management Centers |
| | IEEE 1570-2002 | Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection |
| | IEEE P1609.0 | Standard Wireless Access in Vehicular Environments (WAVE) – Architecture |
| | IEEE 1609.1 – 2006 | Standard for WAVE – Resource Manager |
| | IEEE 1609.2 – 2006 | Standard for WAVE – Security Services for Applications and Management Messages |
| | IEEE 1609.3 | Standard for WAVE – Networking Services |
| | IEEE 1609.4 – 2006 | Standard for WAVE – Multi-Channel Operation |
| | IEEE 1609.11 | Standard for Wireless Access in Vehicular Environments (WAVE) – Over-the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS) |
| | IEEE 802.11p | Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part II: Wireless LAN Medium Access Control and Physical Layer Specifications |
| | IEEE P1512.4 | Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers |
| SAE | SAE J2266 | Location Referencing Message Specification |
| | SAE J2354 | Message Set for Advanced Traveler Information System (ATIS) |
| | SAE J2540 | Messages for Handling Strings and Look-Up Tables in ATIS Standards |
| | SAE J2540/1 | Radio Data System Phrase Lists |
| | SAE J2540/2 | International Traveler Information Systems Phrase Lists |
| | SAE J2540/3 | National Names Phrase List |
| | SAE J2735 | Dedicated Short Range Communications (DSRC) Message Set Dictionary |

4.5 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:

- **Surface Street 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 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 and coordinating construction activities.
- **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.
- **Traveler Information** – The development of systems to provide static and real time transportation information to travelers.
- **Commercial Vehicle Operations** – The development of systems to facilitate the management of commercial vehicles (e.g., electronic clearance).
- **Archived Data Management** – The development of systems to collect transportation data for use in non-operational purposes (e.g., planning and research).

In **Appendix D**, the roles and responsibilities of key stakeholders are identified for a range of transportation services.

4.6 Potential Agreements

The Regional ITS Architecture for the Knoxville 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 Regional ITS Architecture, it is likely that 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 will also outline specific funding responsibilities, where appropriate and applicable.

Agreements should avoid being specific with regard to technology when possible. Technology is likely to change 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 types of information that need 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 but is not typically very detailed. MOUs often identify high-level goals and partnerships.
- *Interagency and Intergovernmental Agreements:* These agreements between public agencies can be used for operation, maintenance, or funding 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. Agency funding expectations or funding sources are also typically identified.

- *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 8 provides a list of existing and potential agreements for the Knoxville 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 8 – Knoxville Region Existing and Potential Agreements

| Status | Agreement and Agencies | Agreement Description |
|----------|---|--|
| Existing | Data Sharing and Usage (Public-Private) | Agreement to allow private sector media and information service providers to access and broadcast public sector transportation agency CCTV camera video feeds, real time traffic speed and volume data, and incident data. Agreements should specify the control priority to allow traffic agencies first priority to control cameras during incidents or other events. The ability of the traffic agency to deny access to video and data feeds if a situation warrants such action should also be part of the agreement. |
| Existing | Data Sharing and Usage (Public-Public) | Agreement to define the parameters, guidelines, and policies for inter-agency ITS data sharing between public sector agencies including CCTV camera feeds. Similar to data sharing and usage agreements for public-private agencies, the agency that owns the equipment should have first priority of the equipment and the ability to discontinue data sharing if a situation warrants such action. |
| Existing | Traffic Signal Timing Data Sharing and Usage | Agreement to define the parameters, guidelines, and policies for inter-agency traffic signal timing, including sharing of timing plans and joint operations of signals, between cities and counties. |
| Existing | Incident Data Sharing and Usage | Agreement to define the parameters, guidelines, and policies for inter-agency sharing of incident data between transportation and emergency management agencies in the Region. Incident information could be sent directly to computer-aided dispatch systems and include information on lane closures, travel delays, and weather. |

4.7 Phases of Implementation

The Knoxville Regional ITS Architecture will be implemented over time through a series of projects. Though TDOT has already made significant ITS deployments in the Region, for other 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 Knoxville Regional ITS Deployment Plan. These projects have been sequenced over a 20-year period, with projects identified for deployment in 5-, 10- and 20-year timeframes.

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

- ATMS01 – Network Surveillance;
- ATMS03 – Surface Street Control;
- ATMS06 – Traffic Information Dissemination;
- ATMS07 – Regional Traffic Management;
- ATMS08 – Traffic Incident Management System;
- EM01 – Emergency Call-Taking and Dispatch
- EM02 – Emergency Routing;
- APTS01 – Transit Vehicle Tracking;
- APTS02 – Transit Fixed-Route Operations;
- APTS03 – Demand Response Transit Operations
- APTS07 – Multi-Modal Coordination; and
- APTS08 – Transit Traveler Information.

5. USE AND MAINTENANCE OF THE REGIONAL ITS ARCHITECTURE

The Regional ITS Architecture developed for the Knoxville Region addresses the Region’s vision for ITS implementation at the time the plan was developed. With the growth of the Region, 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 Knoxville Regional ITS Architecture be updated periodically to remain a useful resource for the Region. As projects are developed and deployed it will be important that those projects either conform to the Regional ITS Architecture so that they are consistent with both the Region’s vision for ITS as well as the National standards described in the Regional ITS Architecture. In some cases if projects do not conform it may be necessary to modify the Regional ITS Architecture to reflect changes in the Region’s vision for ITS rather than modify the project. In this Section, a process for determining architecture conformity of projects is presented and a plan for how to maintain and update the Regional ITS Architecture is described.

5.1 Incorporation into the Regional Planning Process

Stakeholders invested a considerable amount of effort in the development of the Regional ITS Architecture and Regional ITS Deployment Plan for the Knoxville Region. The plans need to be incorporated into the regional planning process so that the ITS vision for the Region is considered when implementing ITS projects in the future, and to ensure that the Region remains eligible for federal funding. The FHWA and FTA require that any project that is implemented with federal funds conform to the Regional ITS Architecture. Many metropolitan or transportation planning organizations around the country now require that an agency certify that a project with ITS elements conforms to the Regional ITS Architecture before allowing the project to be included in the Transportation Improvement Program (TIP).

Stakeholders in the Knoxville Region agreed that as projects are submitted for inclusion in the TIP each project should be evaluated by the submitting agency to determine if the project includes any ITS elements. If the project contains any ITS elements, then the project needs to be reviewed to determine if the ITS elements in the project are in conformance with the Regional ITS Architecture. The submitting agency will perform this examination as part of the planning process using the procedure outlined in Section 5.2 and the Knoxville Regional TPO will review each project to confirm it does conform to the Regional ITS Architecture.

5.2 Process for Determining Architecture Conformity

The Knoxville Regional ITS Architecture documents the customized service packages that were developed as part of the ITS architecture process. To satisfy FHWA and FTA requirements and remain eligible to use Federal funds, a project must be accurately documented. The steps of the process are as follows:

- Identify the ITS components in the project;
- Identify the corresponding service packages(s) from the Regional ITS Architecture;
- Locate the component within the service 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; and
- Document any changes necessary to the Regional ITS Architecture or the project to ensure there is conformance.

The steps for determining ITS architecture conformity of a project are described in more detail below.

Step 1 – Identify the ITS Components

ITS components can be fairly apparent in an ITS focused project such as CCTV or DMS deployments, but could also be included in other types of projects where they are not as apparent. For example, an arterial widening project could include the installation of signal system interconnect, signal upgrades, and the incorporation of the signals in the project limits into a city’s closed loop signal system. These are all ITS functions and should be included in the ITS Architecture.

Step 2 – Identify the Corresponding Service Packages

If a project was included in the projects identified in the Knoxville Regional ITS Deployment Plan, then the applicable service package(s) for that project are identified in a column of the tables. However, ITS projects are not required to be included in the ITS Deployment Plan in order to be eligible for federal funding; therefore, service packages might need to be identified for projects that have not been covered in the ITS Deployment Plan. In that case, the service packages selected and customized for the Knoxville Region should be reviewed to determine if they adequately cover the project. Service packages selected for the Knoxville Region are identified in **Table 5** of this document and detailed service package definitions are located in **Appendix A**.

Step 3 – Identify the Component within the Service Package

The customized service packages for the Knoxville Region are located in **Appendix B**. Once the element is located within the appropriate service package the evaluator should determine if the element name used in the service package is accurate or if a change to the name is needed. For example, a planned element called the City of Sevierville TOC was included in the Knoxville Regional ITS Architecture. When this TOC is actually implemented it would not be unusual for the City to select a different name for the TOC. Such a name change should be documented using the process outlined in Section 5.4.

Step 4 – Evaluate the Connections and Flows

The connections and architecture flows documented in the service package diagrams were selected based on the information available at the time the Regional ITS Architecture was developed. As the projects are designed, decisions will be made on the system layout that might differ from what is shown in the service package. These changes in the project should be documented in the ITS service packages using the process outlined in Section 5.4.

Step 5 – Document Required Changes

If any changes are needed to accommodate the project under review, Section 5.4 describes how those changes should be documented. Any changes will be incorporated during the next Regional ITS Architecture update. Conformance will be accomplished by documenting how the service package(s) should be modified so that the connections and data flows are consistent with the project.

5.3 Maintenance Process

The Knoxville Regional TPO will be responsible for leading the process to update the Knoxville Regional ITS Architecture and Deployment Plan in coordination with the TDOT Long Range Planning Division. **Table 9** summarizes the maintenance process agreed upon by stakeholders in the Region.

Table 9 – Regional ITS Architecture and Deployment Plan Maintenance Summary

| Maintenance Details | Regional ITS Architecture | | Regional ITS Deployment Plan | |
|------------------------------|---|---|---|---|
| | Minor Update | Major Update | Minor Update | Major Update |
| Timeframe for Updates | As needed | Approximately every 4 years | Annually | Approximately every 4 years |
| Scope of Update | Review and update service packages to satisfy architecture compliance requirements of projects or to document other changes that impact the Regional ITS Architecture | Entire Regional ITS Architecture | Review and update project status and add or remove projects as needed | Entire Regional ITS Deployment Plan |
| Lead Agency | Knoxville Regional TPO | | Knoxville Regional TPO | |
| Participants | Stakeholders impacted by service package modifications | Entire stakeholder group | Entire stakeholder group | |
| Results | Service package or other change(s) documented for next complete update | Updated Regional ITS Architecture document, Appendices, and Turbo Architecture database | Updated project tables | Updated Regional ITS Deployment Plan document |

Stakeholders agreed that a full update of the Regional ITS Architecture and Deployment Plan should occur approximately every four years in the year preceding the Long Range Transportation Plan (LRTP) update. By completing a full update in the year prior to the LRTP update, stakeholders will be able to determine the ITS needs and projects that are most important to the Region and document those needs and projects for consideration when developing the LRTP. The Knoxville Regional TPO, in coordination with the TDOT Long Range Planning Division, will be responsible for completing the full updates. During the update process all of the stakeholder agencies that participated in the original development of the Regional ITS Architecture and Deployment Plan should be included as well as any other agencies in the Region that are deploying or may be impacted by ITS projects.

Minor changes to the Regional ITS Architecture should occur as needed between full updates of the plan. In Section 5.4 of this document the procedure for submitting a change to the Regional ITS Architecture is documented. Documentation of changes to the Regional ITS Architecture is

particularly important if a project is being deployed and requires a change to the Regional ITS Architecture in order to establish conformity.

5.4 Procedure for Submitting ITS Architecture Changes Between Major Updates

Updates to the Knoxville Regional ITS Architecture will occur on a regular basis as described in Section 5.3 to maintain the architecture as a useful planning tool. Between major plan updates smaller modifications will likely be required to accommodate ITS projects in the Region. Section 5.2 contains step by step guidance for determining whether or not a project requires architecture modifications to the Regional ITS Architecture.

For situations where a change is required, an Architecture Maintenance Documentation Form was developed and is included in **Appendix F**. This form should be completed and submitted to the architecture maintenance contact person identified on the form whenever a change to the Regional ITS Architecture is proposed. There are several key questions that need to be answered when completing the Architecture Maintenance Documentation Form including those described below.

Change Information: The type of change that is being requested can include an Administrative Change, Functional Change – Single Agency, Functional Change – Multiple Agency, or a Project Change. A description of each type of change is summarized below.

- **Administrative Change:** Basic changes that do not affect the structure of the ITS service packages in the Regional ITS Architecture. Examples include changes to stakeholder or element names, element status, or data flow status.
- **Functional Change – Single Agency:** Structural changes to the ITS service packages that impact only one agency in the Regional ITS Architecture. Examples include the addition of a new ITS service package or changes to data flow connections of an existing service package. The addition or change would only impact a single agency.
- **Functional Change – Multiple Agencies:** Structural changes to the ITS service packages that have the potential to impact multiple agencies in the Regional ITS Architecture. Examples include the addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes would impact multiple agencies and require coordination between the agencies.
- **Project Change:** Addition, modification, or removal of a project in the Regional ITS Deployment Plan.

Description of the requested change: A brief description of the type of change being requested should be included.

Service packages being impacted by the change: Each of the ITS service packages that are impacted by the proposed change should be listed on the ITS Architecture Maintenance Documentation Form. If the proposed change involves creating or modifying an ITS service package then the agency completing the ITS Architecture Maintenance Documentation Form is asked to include a sketch of the new or modified service package.

Impact of proposed change on other stakeholders: If the proposed change is expected to have any impact on other stakeholders in the Region, then those stakeholders should be listed on the ITS Architecture Maintenance Documentation Form. A description of any coordination that has occurred with other stakeholders that may be impacted by the change should be also included. Ideally all stakeholders that may be impacted by the change should be contacted and consensus

should be reached on any new or modified ITS service packages that will be included as part of the Regional ITS Architecture.

The Knoxville Regional TPO will review and accept the proposed changes and forward the form to the TDOT Long Range Planning Division for their records. When a major update is performed all of the documented changes should be incorporated into the Regional ITS Architecture.

APPENDIX A – MARKET PACKAGE DEFINITIONS

| Market Package | Market Package Name | Description |
|--|---|--|
| Traffic Management Service Area | | |
| ATMS01 | Network Surveillance | Includes traffic detectors, CCTV cameras, other surveillance equipment, supporting field equipment and fixed point to point communications to transmit the collected data back to a traffic management center. |
| ATMS02 | Traffic Probe Surveillance | Provides an alternative approach for surveillance of the roadway network. Probe vehicles are tracked, and the vehicle's position and speed information are utilized to determine road network conditions such as average speed and congestion conditions. |
| ATMS03 | Surface Street Control | Provides the central control and monitoring equipment, communication links and signal control equipment that support local street and/or arterial traffic management. This market package is consistent with typical urban traffic signal control systems. |
| ATMS04 | Traffic Metering | Provides central monitoring and control, communications, and field equipment that support metering of traffic. It supports the complete range of metering strategies including ramp, interchange, and mainline metering. |
| ATMS05 | HOV Lane Management | Manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. |
| ATMS06 | Traffic Information Dissemination | Provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. Information can include traffic and road conditions, closure and detour information, incident information, emergency alerts and driver advisories. |
| ATMS07 | Regional Traffic Management | Sharing of traffic information and control among traffic management centers to support a regional management strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. |
| ATMS08 | Traffic Incident Management System | Manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. This market package includes incident detection capabilities and coordination with other agencies. It supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel. |
| ATMS09 | Transportation Decision Support and Demand Management | Recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. |
| ATMS10 | Electronic Toll Collection | Provides toll operators with the ability to collect tolls electronically and detect and process violations. |
| ATMS11 | Emissions Monitoring and Management | Monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. |
| ATMS12 | Roadside Lighting System Control | Manages electrical lighting systems by monitoring operational conditions and using the lighting controls to vary the amount of light provided along the roadside. |
| ATMS13 | Standard Railroad Grade Crossing | Manages highway traffic at highway-rail intersections (HRIs) where rail operational speeds are less than 80 mph. |
| ATMS14 | Advanced Railroad Grade Crossing | Manages highway traffic at highway-rail intersections (HRIs) where operational speeds are greater than 80 mph. Augments Standard Railroad Grade Crossing market package with additional safety features to mitigate the risks associated with higher rail speeds. |
| ATMS15 | Railroad Operations Coordination | Provides an additional level of strategic coordination between freight rail operations and traffic management centers. Could include train schedules, maintenance schedules or any other anticipated HRI closures. |

| Market Package | Market Package Name | Description |
|--|--|--|
| Traffic Management Service Area (continued) | | |
| ATMS16 | Parking Facility Management | Provides enhanced monitoring and management of parking facilities. Market package assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. |
| ATMS17 | Regional Parking Management | Supports coordination between parking facilities to enable regional parking management strategies. |
| ATMS18 | Reversible Lane Management | Provides for the management of reversible lane facilities and includes the field equipment, physical lane access controls, and associated control electronics. |
| ATMS19 | Speed Warning and Enforcement | Monitors vehicle speeds and supports warning drivers when their speed is excessive. Also the service includes notifications to an enforcement agency to enforce the speed limit of the roadway. |
| ATMS20 | Drawbridge Management | Supports systems that manage drawbridges at rivers and canals and other multimodal crossings. Includes control devices as well as traveler information systems. |
| ATMS21 | Roadway Closure Management | Closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, or other situations. Market package covers general road closures applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other market packages. |
| ATMS22 | Variable Speed Limits | Sets variable speed limits along a roadway to create more uniform speeds, to promote safer driving during adverse conditions (such as fog), and/or to reduce air pollution. |
| ATMS23 | Dynamic Lane Management and Shoulder Use | Provides for active management of travel lanes along a roadway. This package includes the field equipment, physical overhead lane signs and associated control electronics that are used to manage and control specific lanes and/or the shoulders. |
| ATMS24 | Dynamic Roadway Warning | Includes systems that dynamically warn drivers approaching hazards on a roadway. Such hazards include roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway and any other transient event that can be sensed. |
| ATMS25 | VMT Road User Payment | Facilitates charging fees to roadway vehicle owners for using specific roadways with potentially differential payment rates based on time-of-day, which specific roadway is used, and class of vehicle. |
| ATMS26 | Mixed Use Warning System | Supports the sensing and warning systems used to interact with pedestrians, bicyclists, and other vehicles that operate on the main vehicle roadways, or on pathways which intersect the main vehicle roadways. |
| Emergency Management Service Area | | |
| EM01 | Emergency Call-Taking and Dispatch | Provides basic public safety call-taking and dispatch services. Includes emergency vehicle equipment, equipment used to receive and route emergency calls, wireless communications and coordination between emergency management agencies. |
| EM02 | Emergency Routing | Supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions and suggested routing information are provided to enhance emergency vehicle routing. Includes signal preemption and priority applications. |
| EM03 | Mayday and Alarms Support | Allows the user to initiate a request for emergency assistance and enables the emergency management subsystem to locate the user, gather information about the incident and determine the appropriate response. |
| EM04 | Roadway Service Patrols | Supports the roadway service patrol vehicles that aid motorists, offering rapid response to minor incidents (flat tire, crashes, out of gas) to minimize disruption to the traffic stream. This market package monitors service patrol vehicle locations and supports vehicle dispatch. |

| Market Package | Market Package Name | Description |
|---|---|---|
| Emergency Management Service Area (continued) | | |
| EM05 | Transportation Infrastructure Protection | Includes the monitoring of transportation infrastructure (e.g. bridges, tunnels and management centers) for potential threats using sensors, surveillance equipment, barriers and safeguard systems to preclude an incident, control access during and after an incident or mitigate the impact of an incident. Threats can be acts of nature, terrorist attacks or other incidents causing damage to the infrastructure. |
| EM06 | Wide-Area Alert | Uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather, civil emergencies or other situations that pose a threat to life and property. |
| EM07 | Early Warning System | Monitors and detects potential, looming and actual disasters including natural, technological and man-made disasters. |
| EM08 | Disaster Response and Recovery | Enhances the ability of the surface transportation system to respond to and recover from disasters. Supports coordination of emergency response plans, provides enhanced access to the scene and better information about the transportation system in the vicinity of the disaster, and maintains situation awareness. |
| EM09 | Evacuation and Reentry Management | Supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. This market package supports both anticipated, well-planned and orderly evacuations such as for a hurricane, as well as sudden evacuations with little or no time for preparation or public warning such as a terrorist act. Employs a number of strategies to maximize capacity along an evacuation route including coordination with transit. |
| EM10 | Disaster Traveler Information | Use of ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. |
| Maintenance and Construction Management Service Area | | |
| MC01 | Maintenance and Construction Vehicle and Equipment Tracking | Tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. |
| MC02 | Maintenance and Construction Vehicle Maintenance | Performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities. Includes on-board sensors capable of automatically performing diagnostics. |
| MC03 | Road Weather Data Collection | Collects current road weather conditions using data collected from environmental sensors deployed on and about the roadway. |
| MC04 | Weather Information Processing and Distribution | Processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators can make decisions on corrective actions to take. |
| MC05 | Roadway Automated Treatment | Automatically treats a roadway section based on environmental or atmospheric conditions. Includes the sensors that detect adverse conditions, automated treatment (such as anti-icing chemicals), and driver information systems. |
| MC06 | Winter Maintenance | Supports winter road maintenance. Monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities. |
| MC07 | Roadway Maintenance and Construction | Supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities. |
| MC08 | Work Zone Management | Directs activity in work zones, controlling traffic through portable dynamic message signs and informing other groups of activity for better coordination management. Also provides speed and delay information to motorists prior to the work zone. |

| Market Package | Market Package Name | Description |
|---|--|---|
| Maintenance and Construction Management Service Area (continued) | | |
| MC09 | Work Zone Safety Monitoring | Includes systems that improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. Detects vehicle intrusions in work zones and warns workers and drivers of safety hazards when encroachment occurs. |
| MC10 | Maintenance and Construction Activity Coordination | Supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations. (i.e., traffic management, transit, emergency management) |
| MC11 | Environmental Probe Surveillance | Collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. |
| MC12 | Infrastructure Monitoring | Monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure using both fixed and vehicle-based infrastructure monitoring sensors. Monitors vehicle probes used to determine current pavement conditions. |
| Public Transportation Service Area | | |
| APTS01 | Transit Vehicle Tracking | Monitors current transit vehicle location using an automated vehicle location system. Location data may be used to determine real time schedule adherence and update the transit system's schedule in real time. |
| APTS02 | Transit Fixed-Route Operations | Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for fixed-route and flexible-route transit services. |
| APTS03 | Demand Response Transit Operations | Performs vehicle routing and scheduling, as well as operator assignment and system monitoring for demand responsive transit services. |
| APTS04 | Transit Fare Collection Management | Manages transit fare collection on-board transit vehicles and at transit stops using electronic means. Allows the use of a traveler card or other electronic payment device. |
| APTS05 | Transit Security | Provides for the physical security of transit passengers and transit vehicle operators. Includes on-board security cameras and panic buttons. |
| APTS06 | Transit Fleet Management | Supports automatic transit maintenance scheduling and monitoring for both routine and corrective maintenance. |
| APTS07 | Multi-modal Coordination | Establishes two way communications between multiple transit and traffic agencies to improve service coordination. |
| APTS08 | Transit Traveler Information | Provides transit users at transit stops and on board transit vehicles with ready access to transit information. Services include stop annunciation, imminent arrival signs and real-time transit schedule displays. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package. |
| APTS09 | Transit Signal Priority | Determines the need for transit priority on routs and at certain intersections and requests transit vehicle priority at these locations to improve on-time performance of the transit system. |
| APTS10 | Transit Passenger Counting | Counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. |
| APTS11 | Multimodal Connection Protection | Supports the coordination of multimodal services to optimize the travel time of travelers as they move from mode to mode (or to different routes within a single mode). |
| Commercial Vehicle Operations Service Area | | |
| CVO01 | Carrier Operations and Fleet Administration | Provides the capabilities to manage a fleet of commercial vehicles. Vehicle routing and tracking as well as notification of emergency management of any troublesome route deviations (such as a HAZMAT vehicle) are part of this market package. |
| CVO02 | Freight Administration | Tracks the movement of cargo and monitors the cargo condition. |

| Market Package | Market Package Name | Description |
|---|---|---|
| Commercial Vehicle Operations Service Area (continued) | | |
| CVO03 | Electronic Clearance | Provides for automatic clearance at roadside check facilities. Allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and dedicated short range communications to the roadside. |
| CVO04 | CV Administrative Processes | Provides for electronic application, processing, fee collection, issuance and distribution of CVO credentials and tax filing. |
| CVO05 | International Border Electronic Clearance | Provides for automated clearance at international border crossings. |
| CVO06 | Weigh-In-Motion | Provides for high speed weigh-in-motion with or without automated vehicle identification capabilities. |
| CVO07 | Roadside CVO Safety | Provides for automated roadside safety monitoring and reporting. Automates commercial vehicle safety inspections at the roadside check facilities. |
| CVO08 | On-board CVO Safety | Provides for on-board commercial vehicle safety monitoring and reporting as well as roadside support for reading on-board safety data via tags. |
| CVO09 | CVO Fleet Maintenance | Supports maintenance of CVO fleet vehicles with on-board monitoring equipment and automated vehicle location capabilities. |
| CVO10 | HAZMAT Management | Integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. |
| CVO11 | Roadside HAZMAT Security Detection and Mitigation | Provides the capability to detect and classify security sensitive HAZMAT on commercial vehicles using roadside sensing and imaging technology. Credentials information can be accessed to verify if the commercial driver, vehicle and carrier are permitted to transport the identified HAZMAT. |
| CVO12 | CV Driver Security Authentication | Provides the ability for fleet and freight management to detect when an unauthorized commercial vehicle driver attempts to drive a vehicle based on stored identity information. If an unauthorized driver has been detected the commercial vehicle can be disabled. |
| CVO13 | Freight Assignment Tracking | Provides for the planning and tracking of the commercial vehicle, freight equipment and the commercial vehicle driver. |
| Traveler Information Service Area | | |
| ATIS01 | Broadcast Traveler Information | Collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures (radio, cell phones, etc.). |
| ATIS02 | Interactive Traveler Information | Provides tailored information in response to a traveler request. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. |
| ATIS03 | Autonomous Route Guidance | Using vehicle location and other information, this market package enables route planning and detailed route guidance based on static, stored information. |
| ATIS04 | Dynamic Route Guidance | Offers advanced route planning and guidance that is responsive to current conditions. |
| ATIS05 | ISP Based Trip Planning and Route Guidance | Offers the user pre-trip route planning and en-route guidance services. Routes may be based on static or real time network conditions. |
| ATIS06 | Transportation Operations Data Sharing | Collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes the information available to transportation system operators. |
| ATIS07 | Travel Services Information and Reservation | Provides travel information and reservation services to the user. |

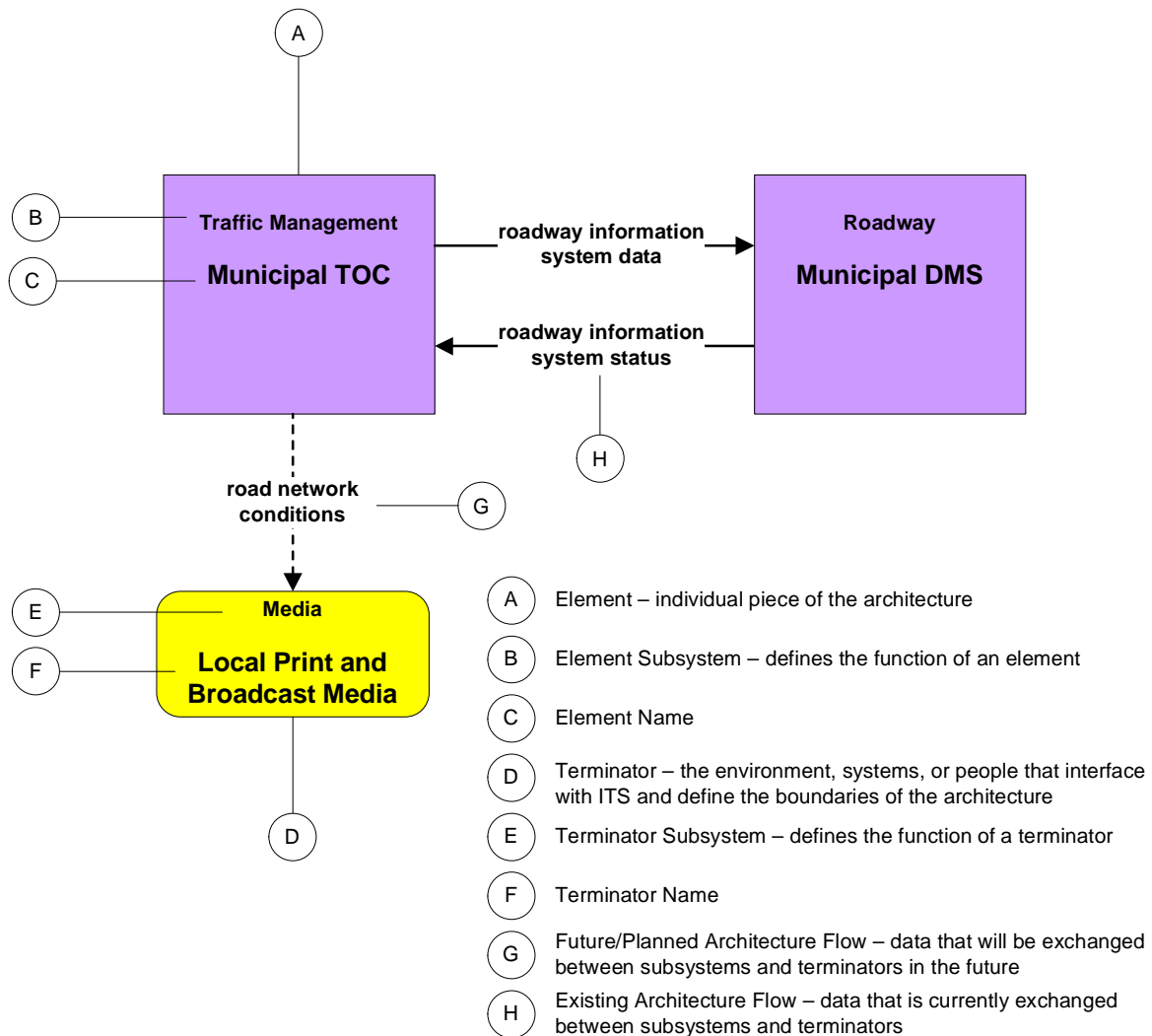
| Market Package | Market Package Name | Description |
|--|--|---|
| Traveler Information Service Area (continued) | | |
| ATIS08 | Dynamic Ridesharing | Provides dynamic ridesharing/ride matching services to travelers. |
| ATIS09 | In Vehicle Signing | Supports the distribution of traffic and travel advisory information to drivers through in-vehicle devices. |
| ATIS10 | Short Range Communications Traveler Information | Provides location-specific or situation-relevant information to travelers in vehicles using dedicated short range communications infrastructure supporting mobility applications for connected vehicles. |
| Archived Data Management Service Area | | |
| AD1 | ITS Data Mart | Provides a focused archive that houses data collected and owned by a single agency or other organization. Focused archive typically covers a single transportation mode and one jurisdiction. |
| AD2 | ITS Data Warehouse | Includes all the data collection and management capabilities of the ITS Data Mart. Adds the functionality to allow collection of data from multiple agencies and data sources across modal and jurisdictional boundaries. |
| AD3 | ITS Virtual Data Warehouse | Provides the same broad access to multimodal, multidimensional data from varied sources as in the ITS Data Warehouse Market Package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. |
| Vehicle Safety Service Area | | |
| AVSS01 | Vehicle Safety Monitoring | Diagnoses critical components of the vehicle and warns the driver of potential dangers. On-board sensors will determine the vehicle's condition, performance, and on-board safety data and display that information to the driver. |
| AVSS02 | Driver Safety Monitoring | Determines the driver's condition and warns the driver of potential dangers. On-board sensors will determine the driver's condition, performance, and on-board safety data and display that information to the driver. |
| AVSS03 | Longitudinal Safety Monitoring | Uses on-board safety sensors and collision sensors to monitor the areas in front of and behind the vehicle and present warnings to the driver about potential hazards. |
| AVSS04 | Lateral Safety Warning | Uses on-board safety sensors and collision sensors to monitor the areas to the sides of the vehicle and present warnings to the driver about potential hazards. |
| AVSS05 | Intersection Safety Warning | Determines the probability of a collision in an equipped intersection (either highway-highway or highway-rail) and provides timely warnings to drivers in response to hazardous conditions. Monitors in the roadway infrastructure assess vehicle locations and speeds near an intersection. Using this information, a warning is determined and communicated to the approaching vehicle using a short range communications system. Information can be provided to the driver through the ATIS09 – In-Vehicle Signing market package. |
| AVSS06 | Pre-Crash Restraint Deployment | Provides in-vehicle sensors to monitor the vehicle's local environment (lateral and longitudinal gaps, weather, and roadway conditions), determine collision probability, and deploy a pre-crash safety system. |
| AVSS07 | Driver Visibility Improvement | Enhances the driver visibility using an enhanced vision system. On-board display hardware is needed. |
| AVSS08 | Advanced Vehicle Longitudinal Control | Automates the speed and headway control functions on board the vehicle utilizing safety sensors and collision sensors combined with vehicle dynamics processing to control the throttle and brakes. Requires on-board sensors to measure longitudinal gaps and a processor for controlling the vehicle speed. |
| AVSS09 | Advanced Vehicle Lateral Control | Automates the steering control on board the vehicle utilizing safety sensors and collision sensors combined with vehicle dynamics processing to control the steering. Requires on-board sensors to measure lane position and lateral deviations and a processor for controlling the vehicle steering. |

| Market Package | Market Package Name | Description |
|--|------------------------------------|---|
| Vehicle Safety Service Area (continued) | | |
| AVSS10 | Intersection Collision Avoidance | Determines the probability of an intersection collision and provides timely warnings to approaching vehicles so that avoidance actions can be taken. This market package builds on the intersection collision warning infrastructure and in-vehicle equipment and adds equipment in the vehicle that can take control of the vehicle in emergency situations. |
| AVSS11 | Automated Vehicle Operations | Enables "hands-off" operation of the vehicle on the automated portion of the highway system. Implementation requires lateral lane holding, vehicle speed and steering control, and automated highway system check-in and check-out. |
| AVSS12 | Cooperative Vehicle Safety Systems | Enhances the on-board longitudinal and lateral warning stand-alone systems by exchanging messages wirelessly with other surrounding vehicles. Vehicles send out information concerning their location, speed, and direction to any surrounding vehicles. Special messages from approaching emergency vehicles may also be received and processed. |

APPENDIX B – CUSTOMIZED MARKET PACKAGES

APPENDIX B

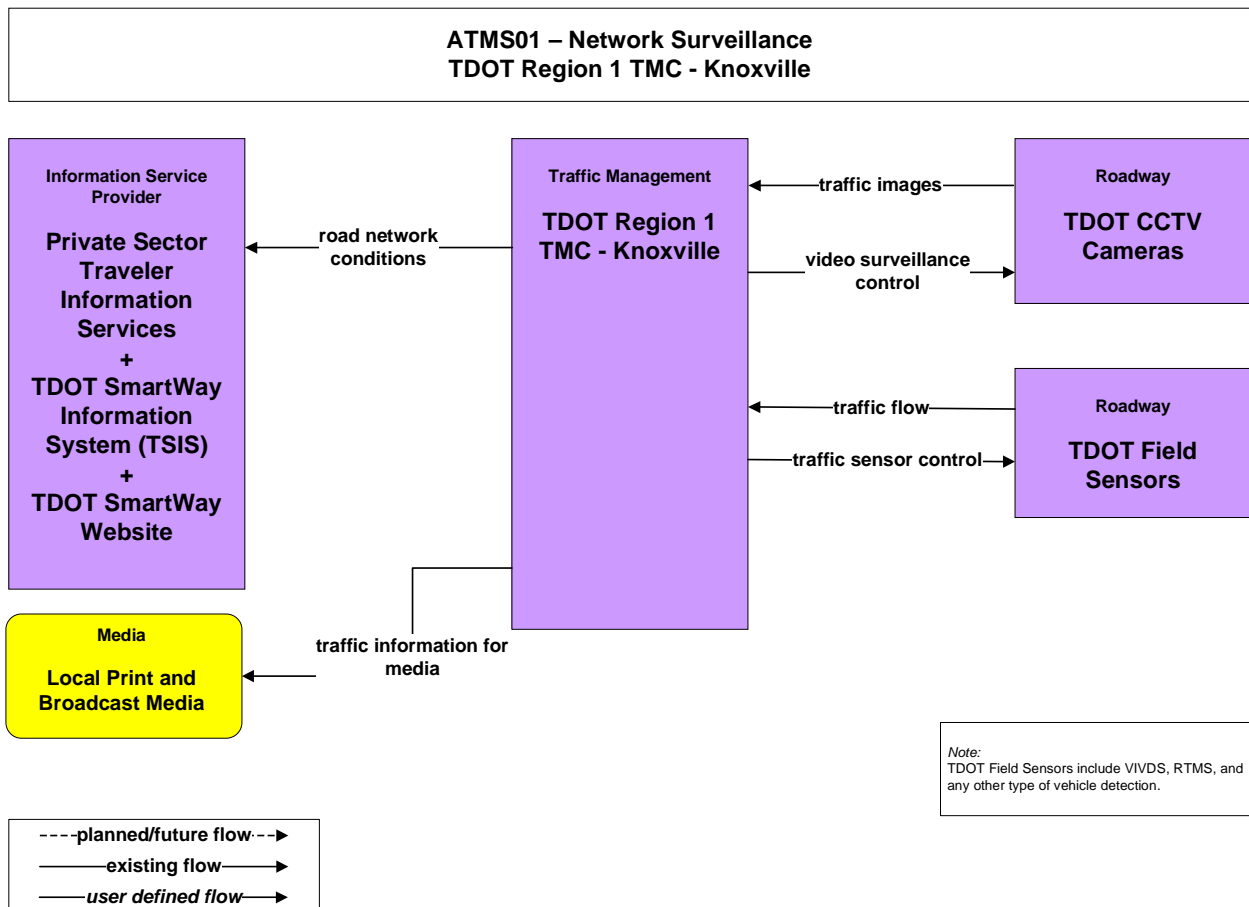
MARKET PACKAGE DIAGRAM COMPONENT AND TERMINOLOGY KEY



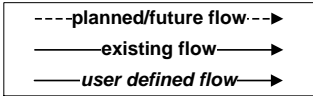
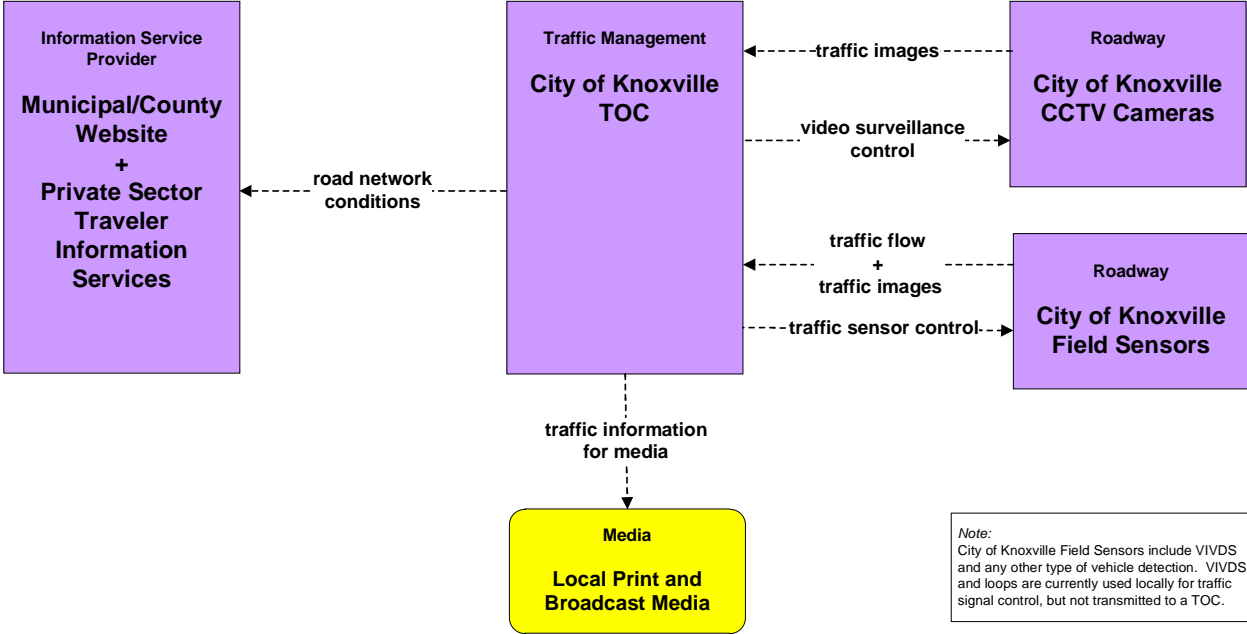
Knoxville Regional ITS Architecture Service Packages

| | |
|---|----|
| Traffic Management (ATMS)..... | 2 |
| Emergency Management (EM)..... | 33 |
| Maintenance and Construction Management (MC)..... | 48 |
| Public Transportation Management (APTS)..... | 55 |
| Traveler Information (ATIS)..... | 76 |
| Commercial Vehicle Operations (CVO)..... | 81 |
| Archived Data Management (AD)..... | 82 |

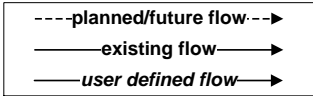
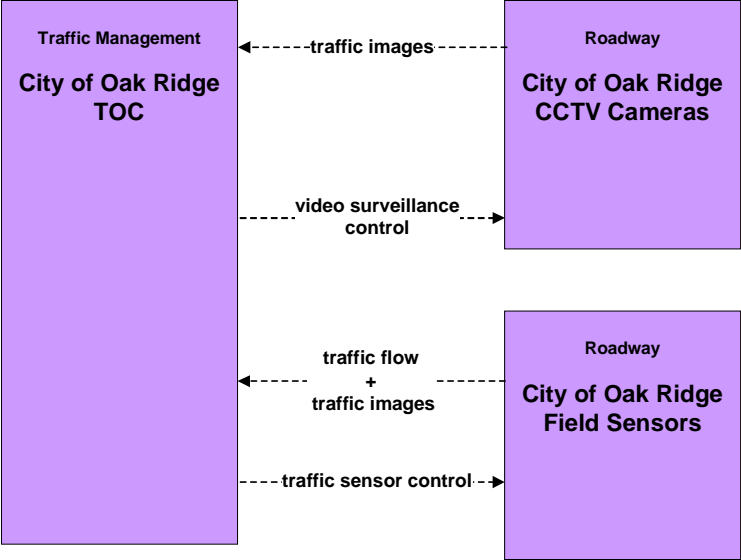
Advanced Traffic Management System



**ATMS01 – Network Surveillance
City of Knoxville**

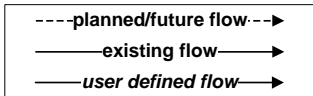
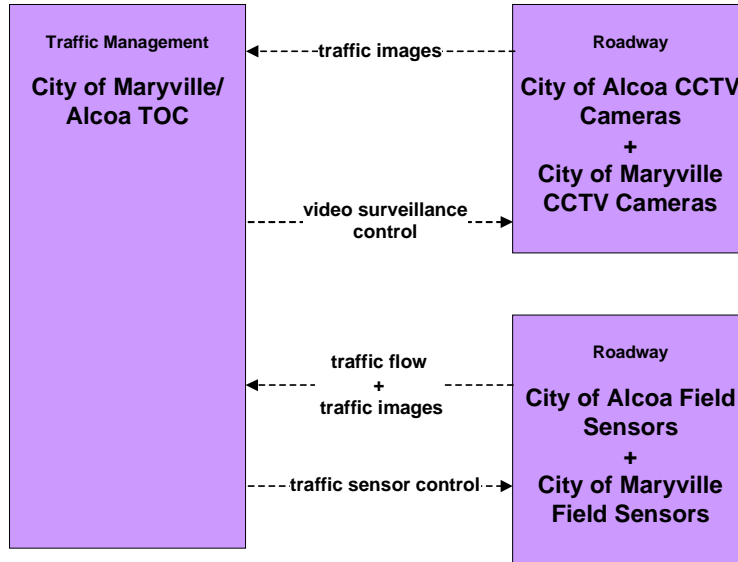


**ATMS01 – Network Surveillance
City of Oak Ridge**



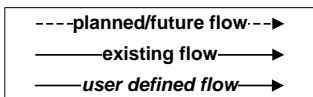
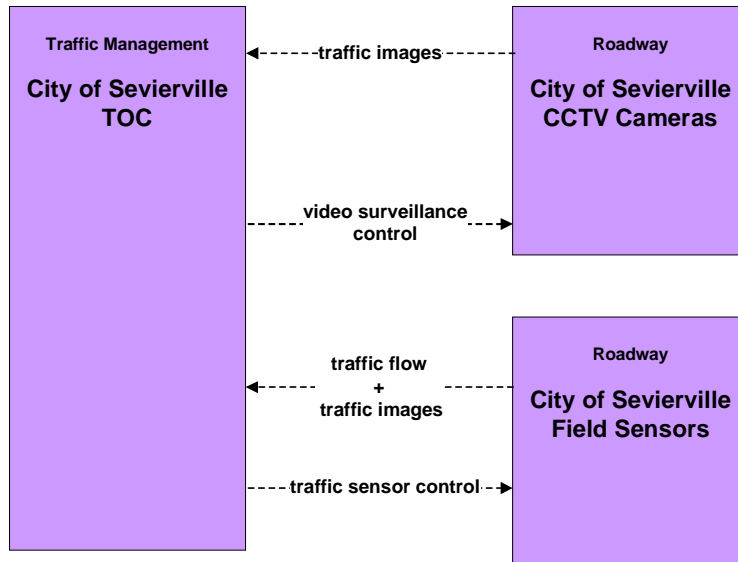
Note:
 City of Oak Ridge Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
City of Maryville/Alcoa**



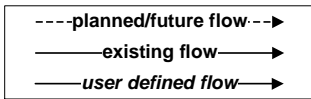
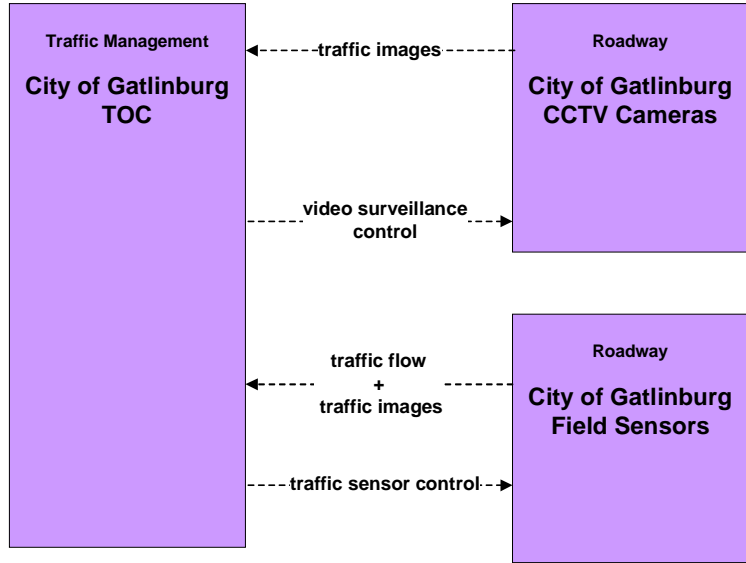
Note:
Cities of Maryville and Alcoa Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
City of Sevierville**



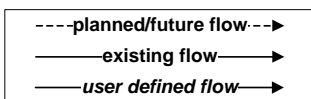
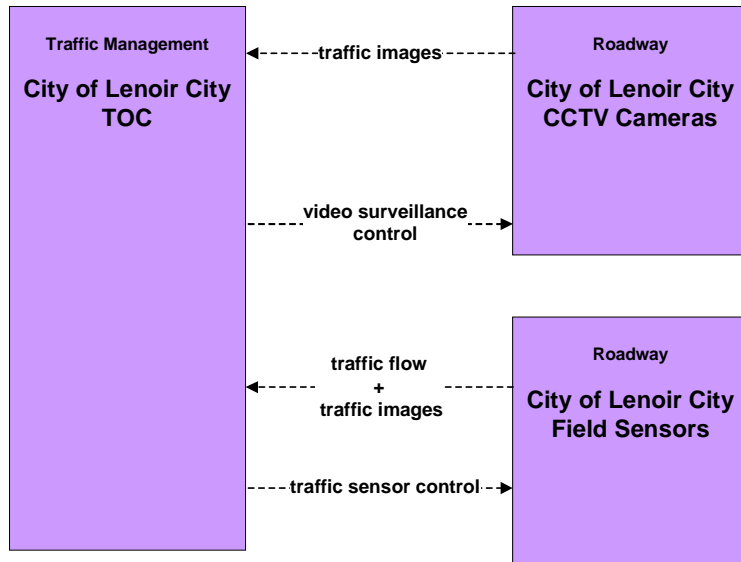
Note:
City of Sevierville Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
City of Gatlinburg**



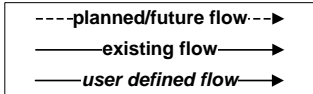
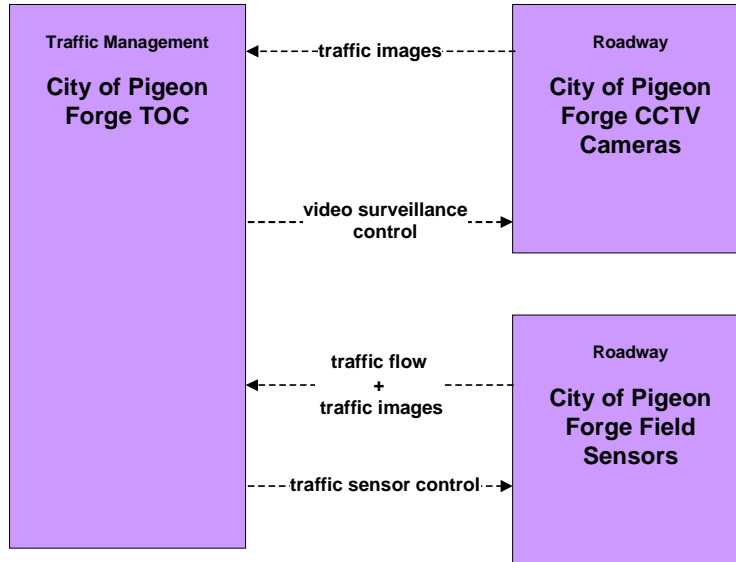
Note:
City of Gatlinburg Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
City of Lenoir City**



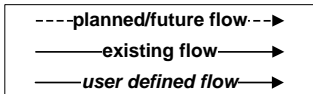
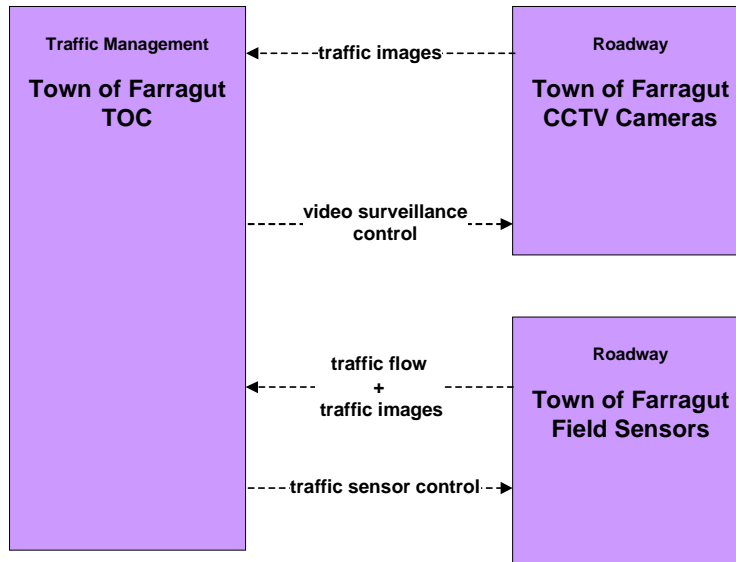
Note:
City of Lenoir City Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
City of Pigeon Forge**



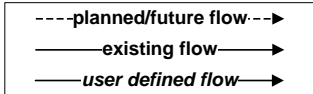
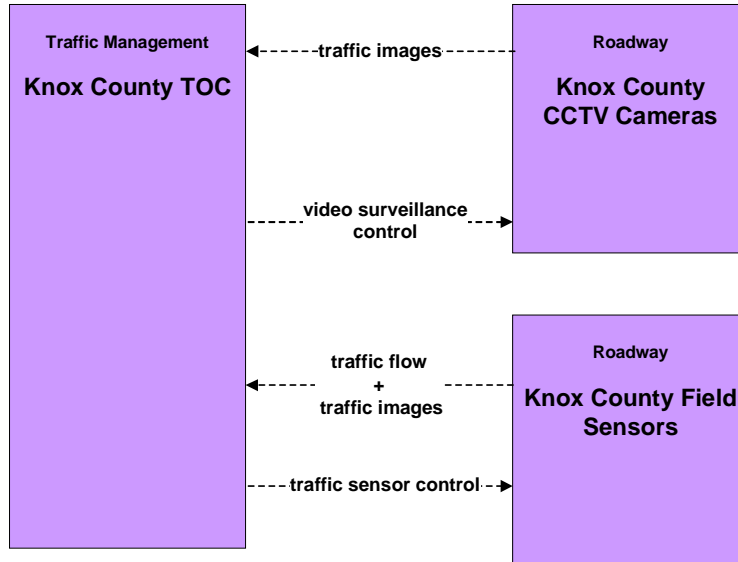
Note:
City of Pigeon Forge Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
Town of Farragut**



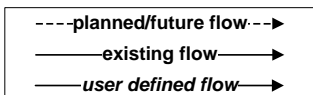
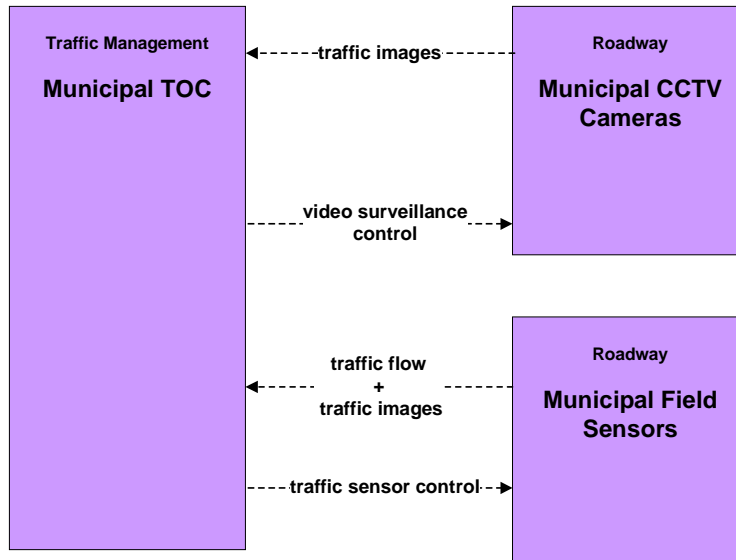
Note:
Town of Farragut Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
Knox County**



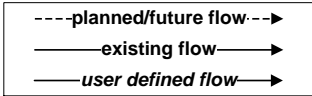
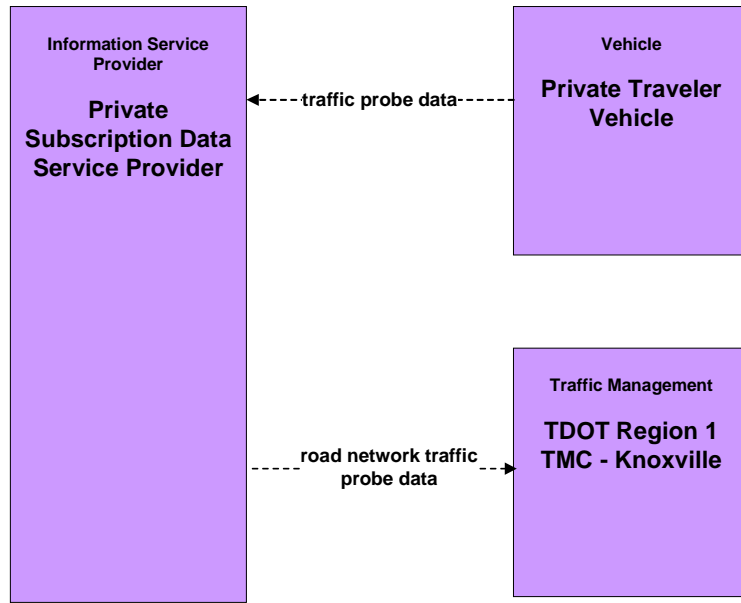
Note:
Knox County Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS01 – Network Surveillance
Municipal**



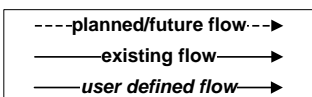
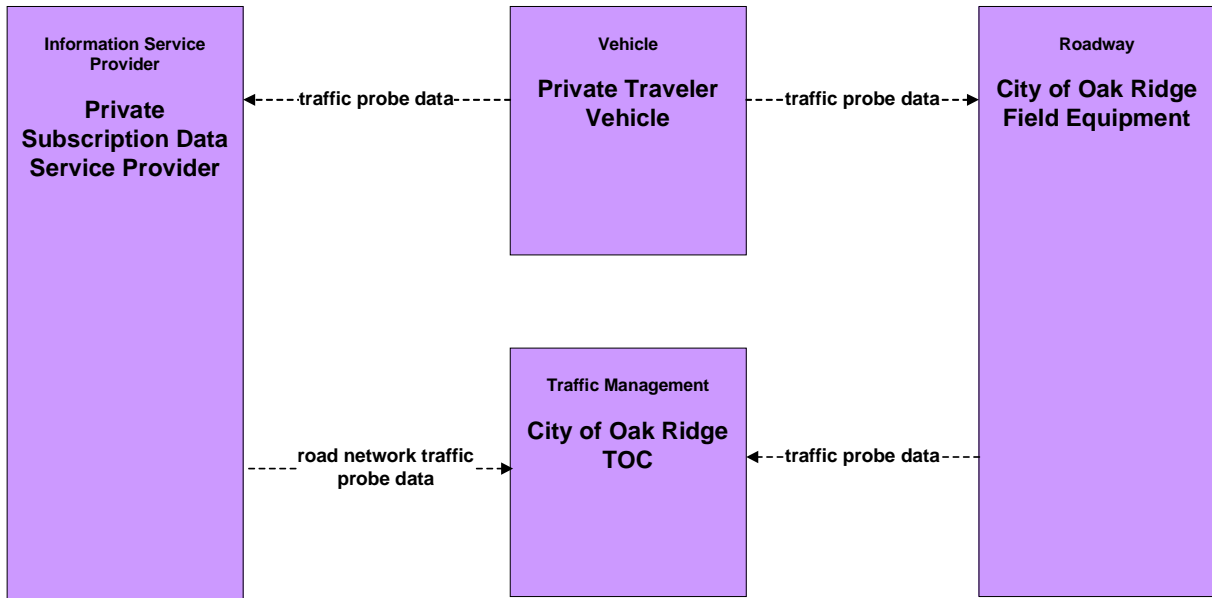
Note:
Municipal Field Sensors include VIVDS and any other type of vehicle detection. Detection data is currently used locally for traffic signal control, but not transmitted to a TOC.

**ATMS02 – Traffic Probe Surveillance
TDOT**



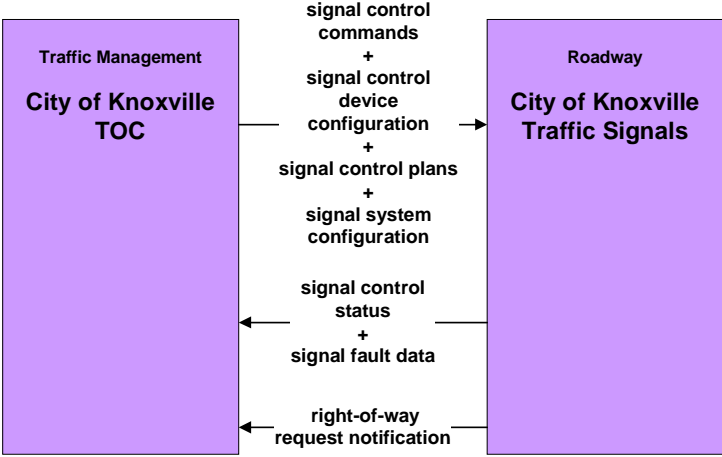
Note:
TDOT is currently undergoing a pilot program with INRIX to provide supplemental data for areas that are not instrumented.

**ATMS02 – Traffic Probe Surveillance
City of Oak Ridge**

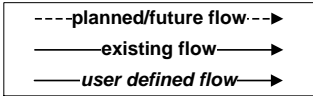


Note:
The City of Oak Ridge has a use for probe data but does not currently have a chosen method for collecting that data, so for flexibility both subscription services and an agency deployed equipment scenarios have been included.

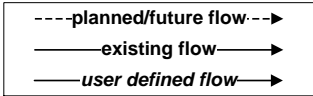
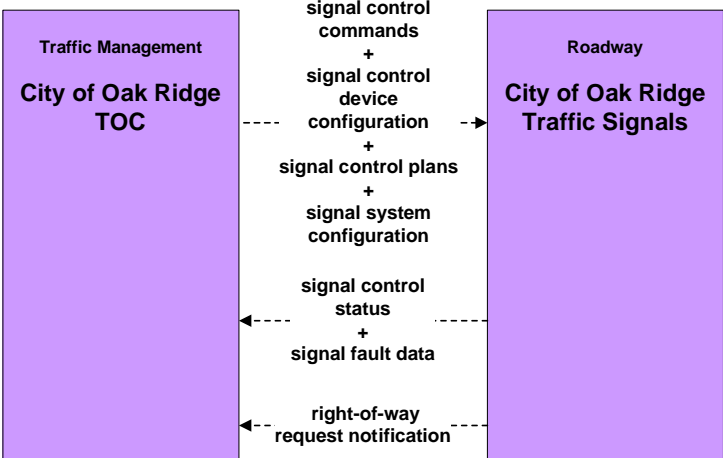
**ATMS03 – Surface Street Control
City of Knoxville**



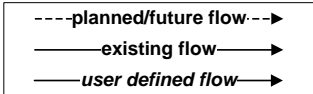
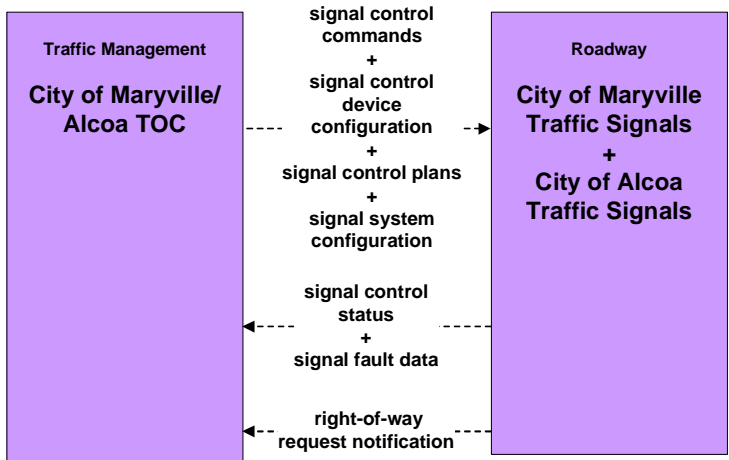
Note:
Emergency vehicle signal preemption is currently a limited deployment.



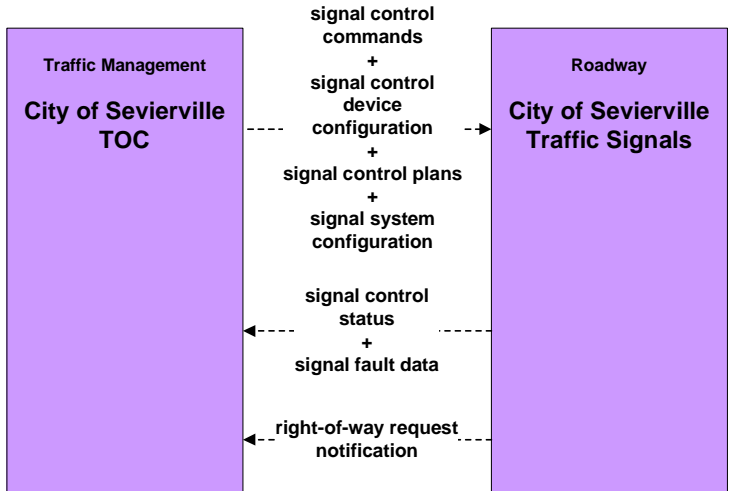
**ATMS03 – Surface Street Control
City of Oak Ridge**



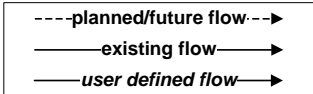
**ATMS03 – Surface Street Control
City of Maryville/Alcoa**



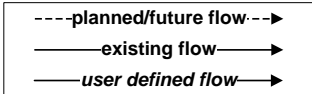
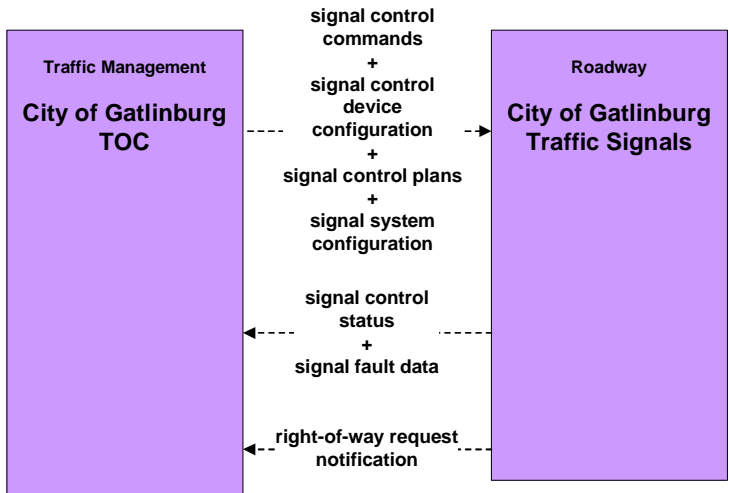
**ATMS03 – Surface Street Control
City of Sevierville**



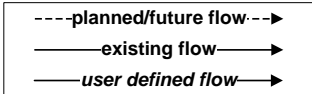
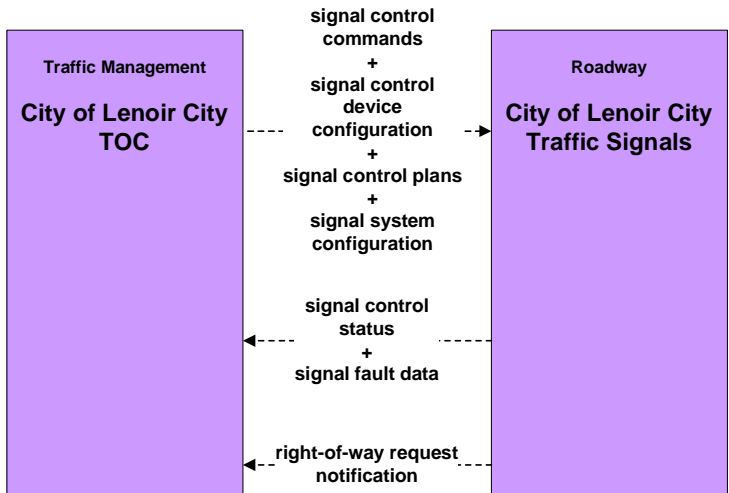
Note:
The City of Sevierville TOC may be established as a Joint TOC with the City of Pigeon Forge.



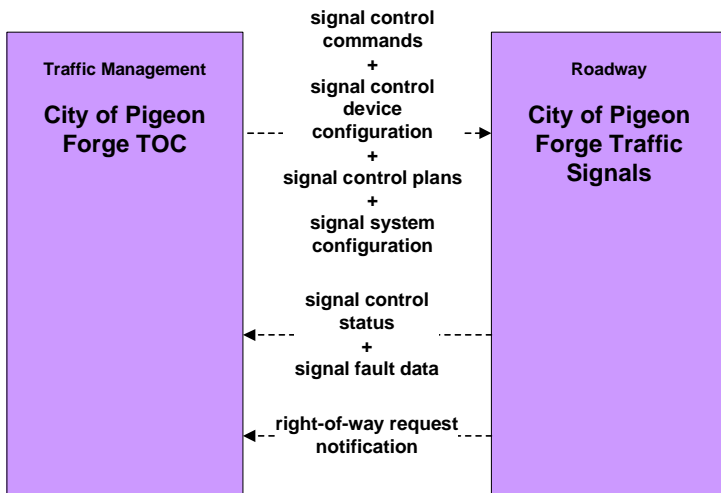
**ATMS03 – Surface Street Control
City of Gatlinburg**



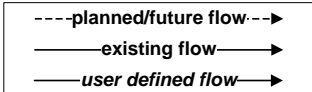
**ATMS03 – Surface Street Control
City of Lenoir City**



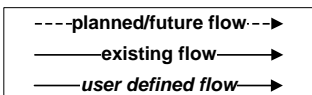
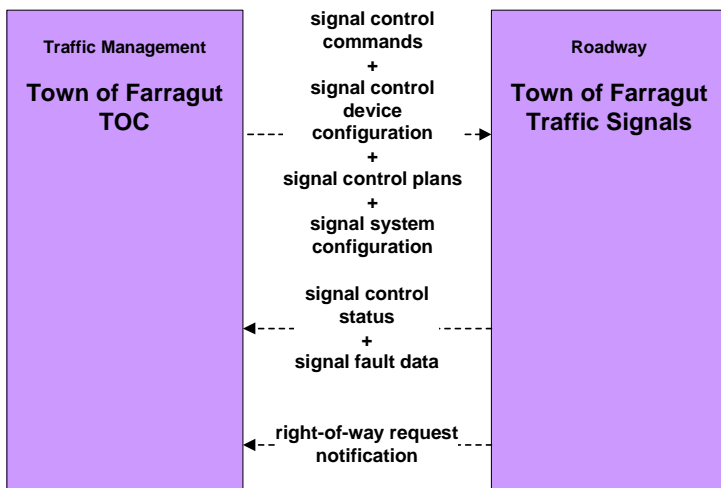
**ATMS03 – Surface Street Control
City of Pigeon Forge**



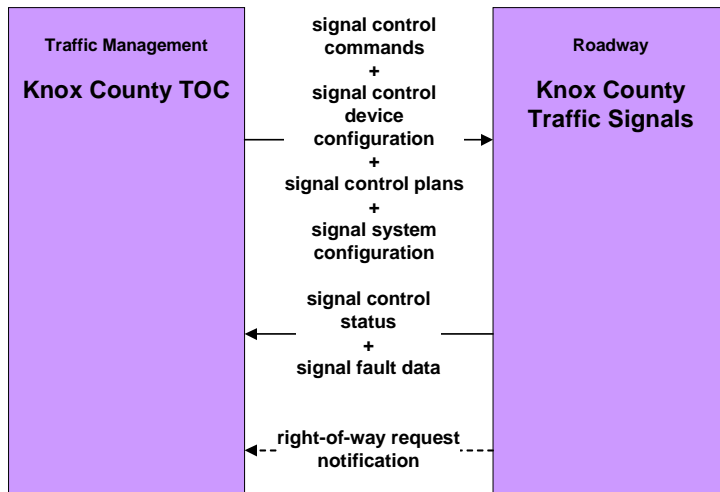
Note:
The City of Sevierville TOC may be established as a Joint TOC with the City of Pigeon Forge.



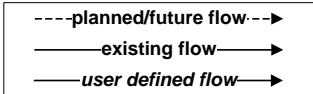
**ATMS03 – Surface Street Control
Town of Farragut**



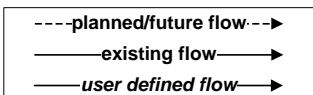
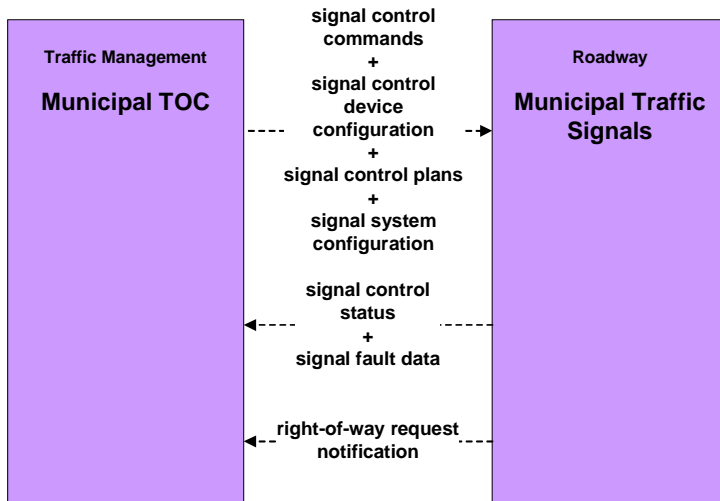
**ATMS03 – Surface Street Control
Knox County**



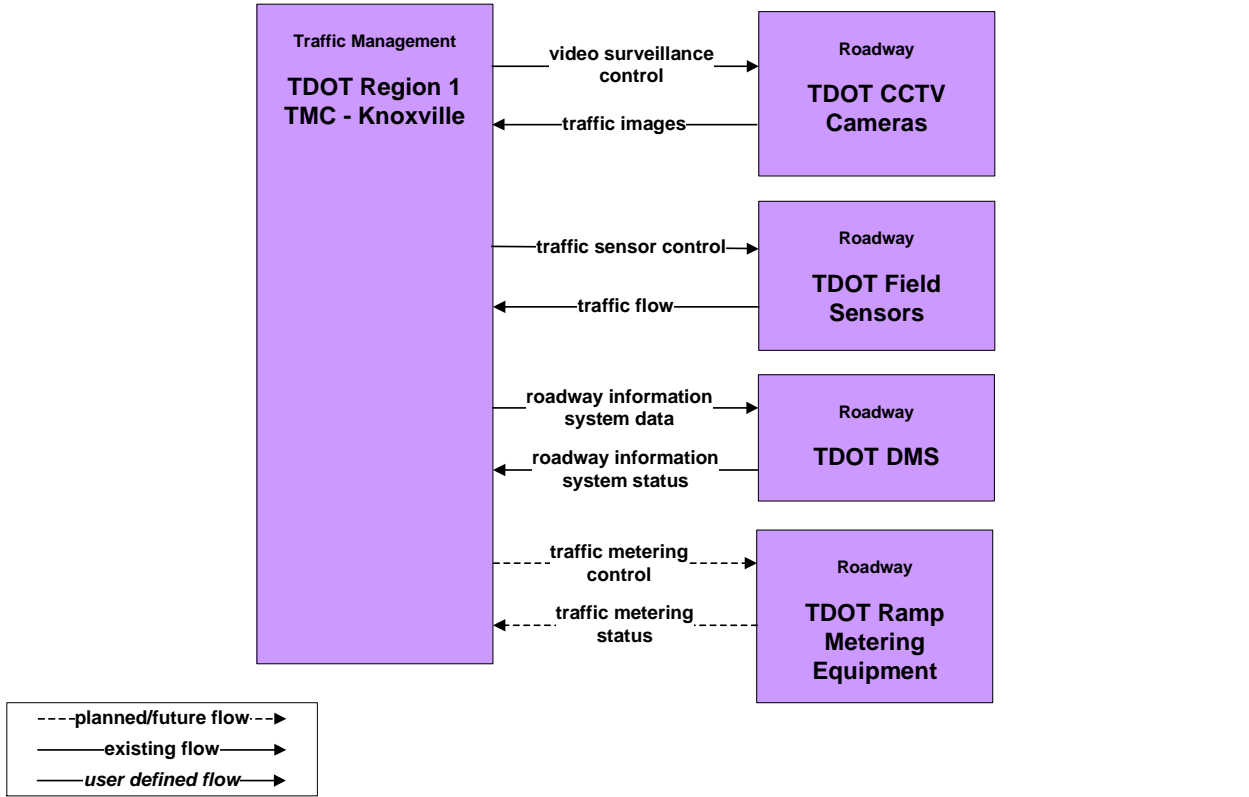
Note:
A limited number of traffic signal cabinets have phone drops to support signal control. Emergency vehicle preemption deployment is limited and occurs locally.



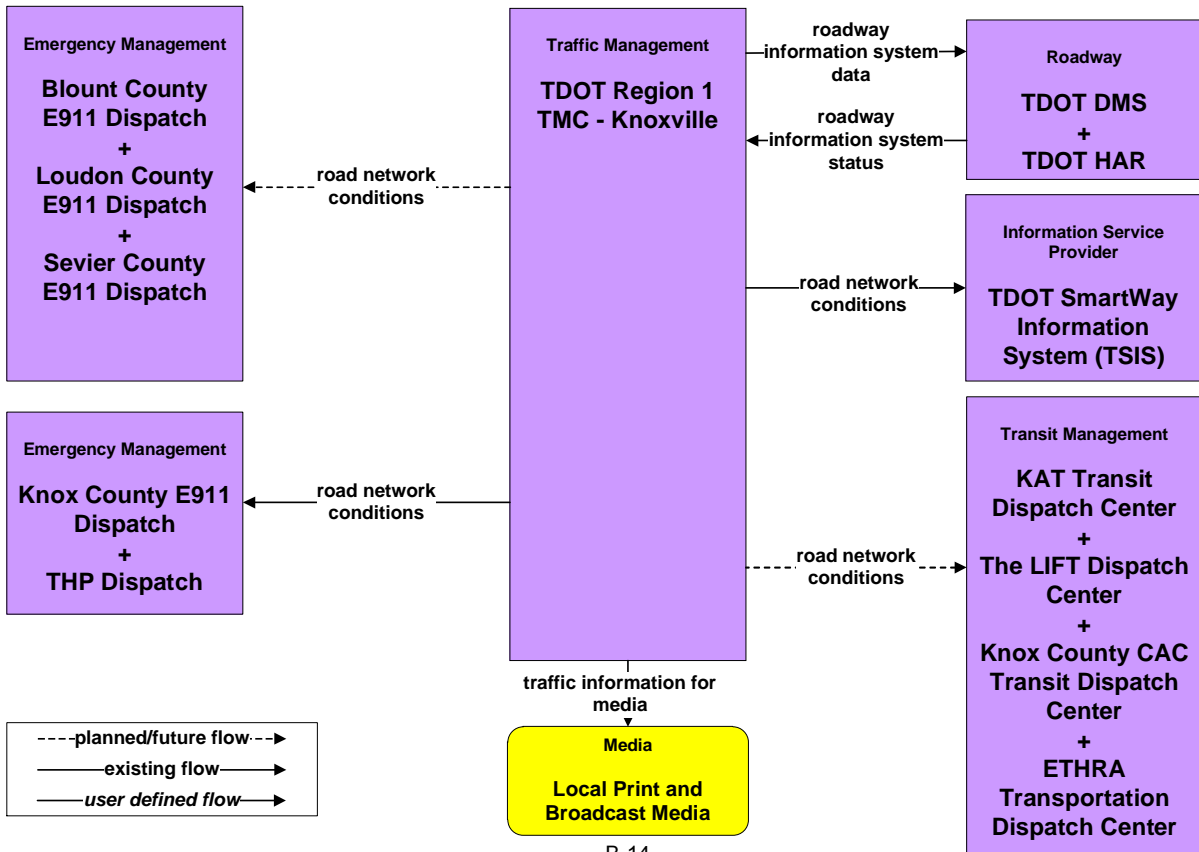
**ATMS03 – Surface Street Control
Municipal**



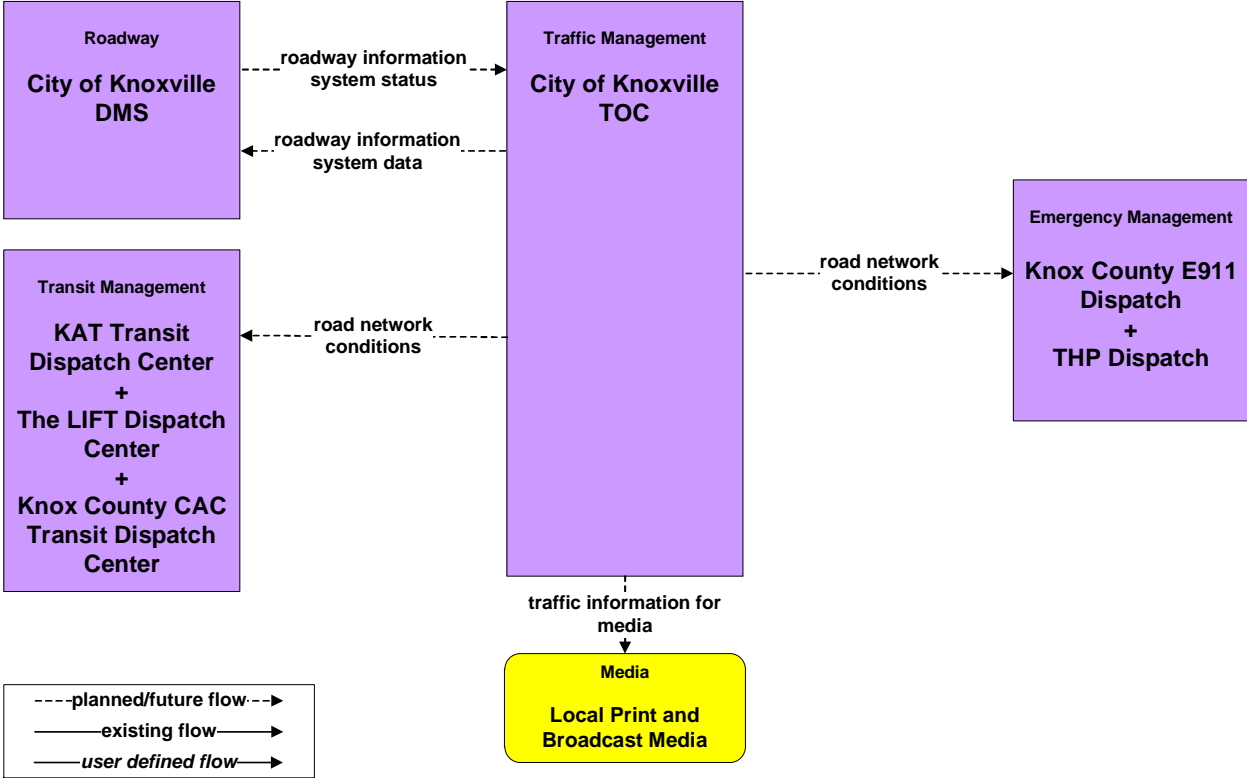
**ATMS04 – Freeway Control
 TDOT Region 1 TMC - Knoxville**



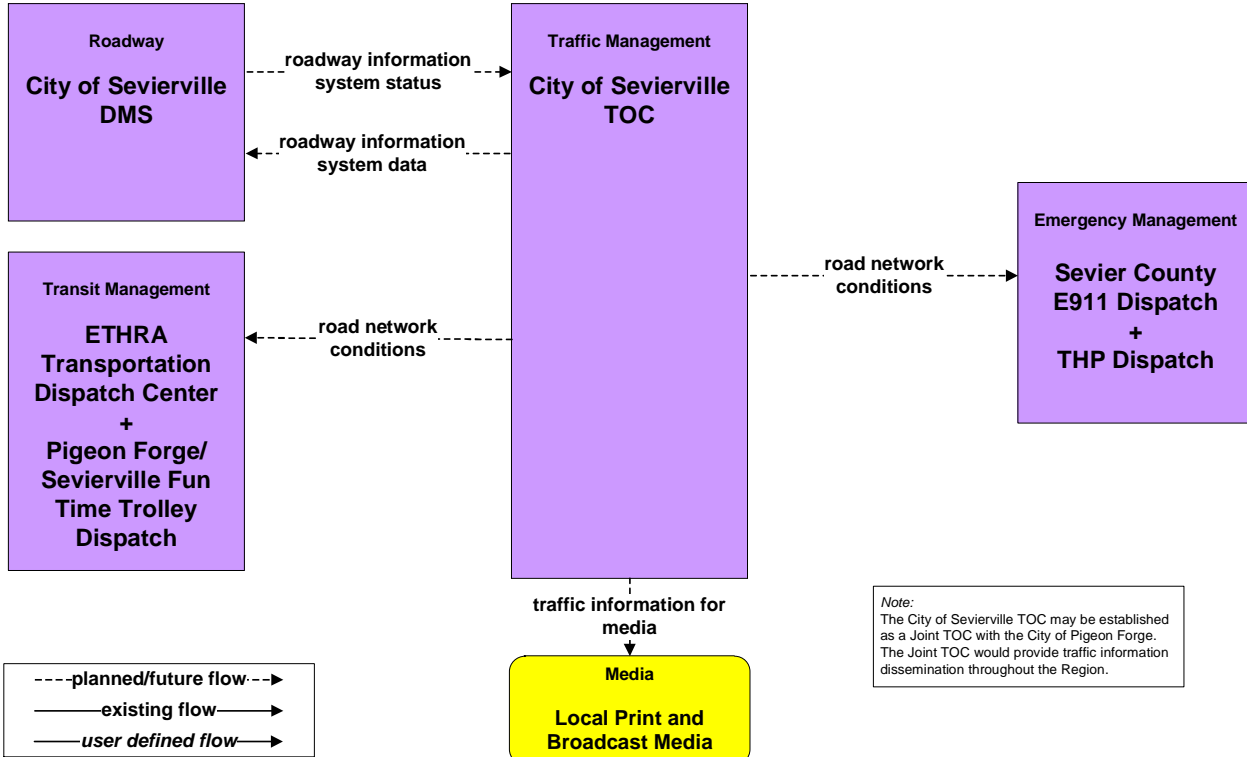
**ATMS06 – Traffic Information Dissemination
 TDOT Region 1 TMC - Knoxville**



**ATMS06 – Traffic Information Dissemination
City of Knoxville**

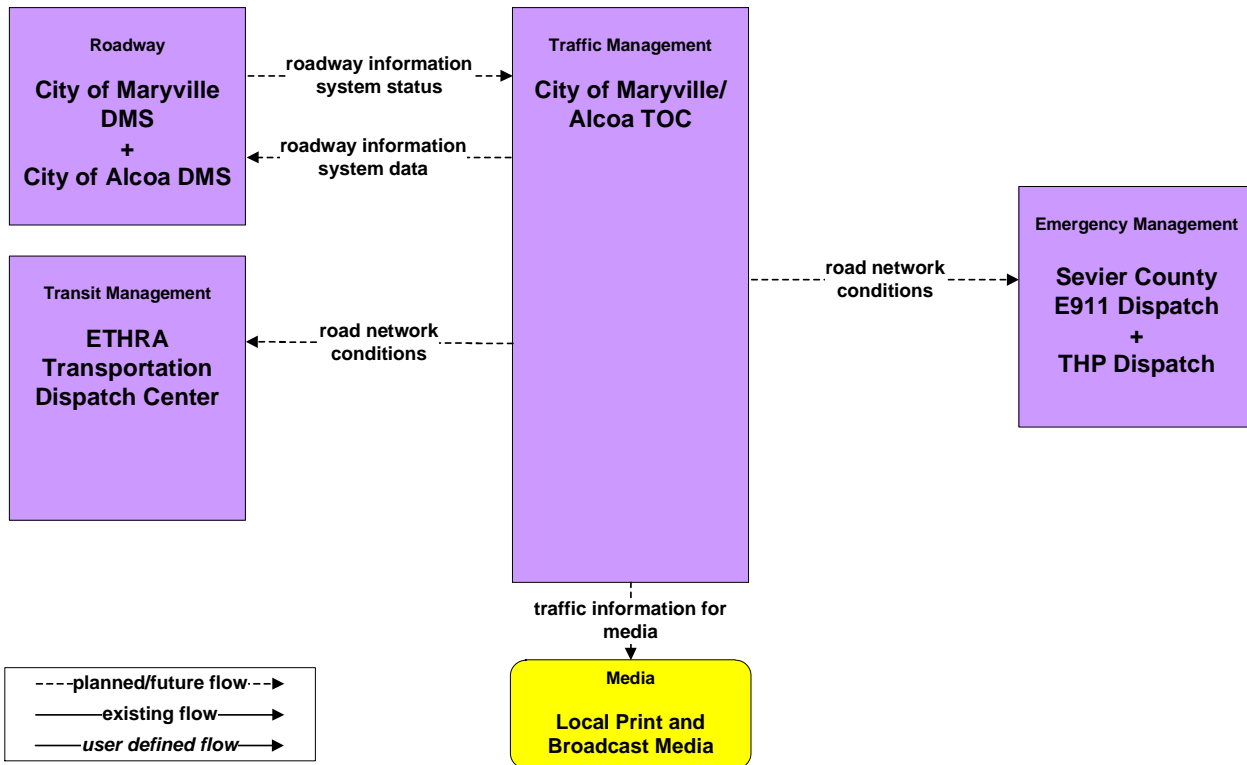


**ATMS06 – Traffic Information Dissemination
City of Sevierville**

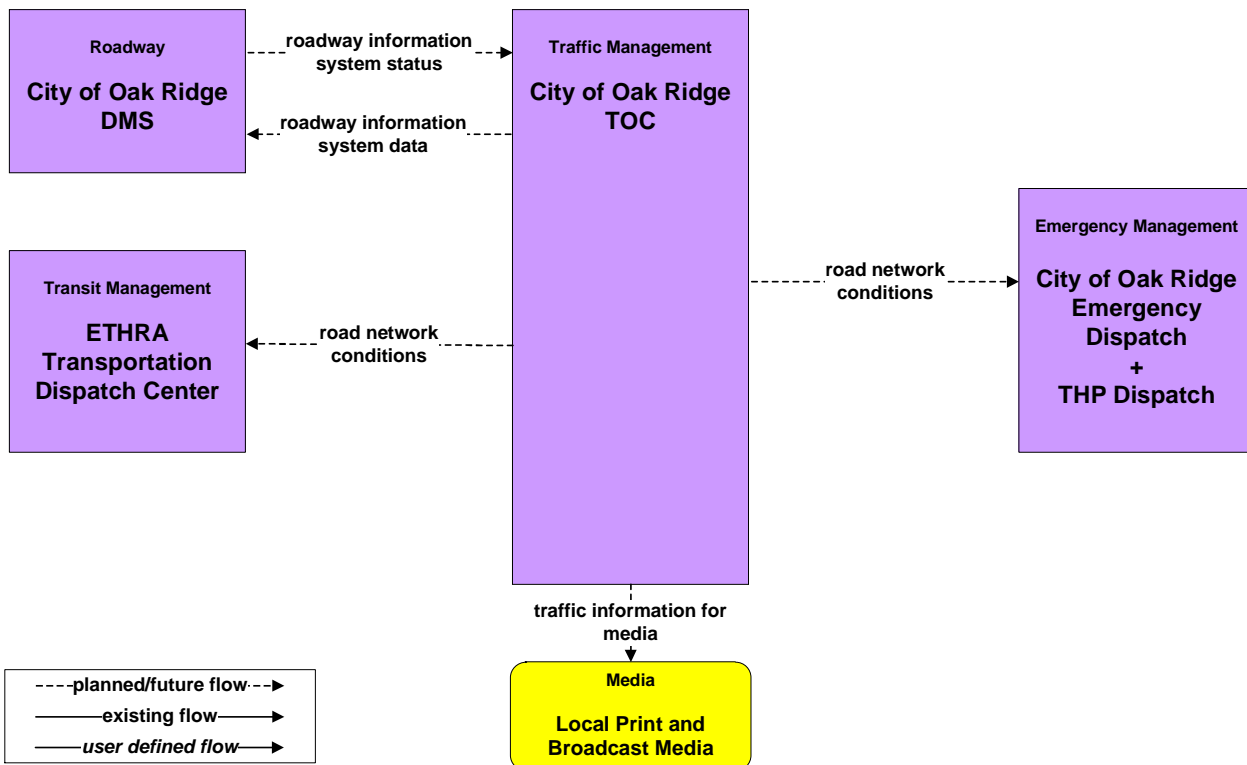


Note:
 The City of Sevierville TOC may be established as a Joint TOC with the City of Pigeon Forge. The Joint TOC would provide traffic information dissemination throughout the Region.

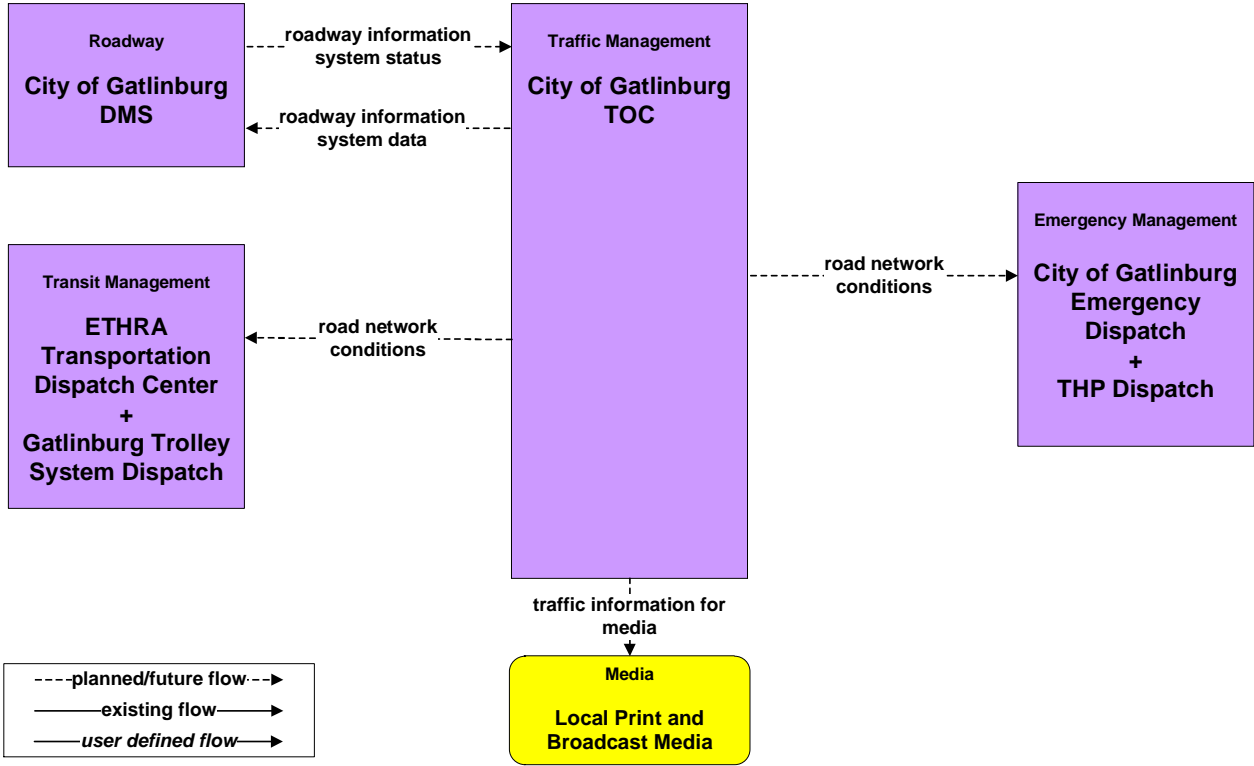
**ATMS06 – Traffic Information Dissemination
City of Maryville/Alcoa**



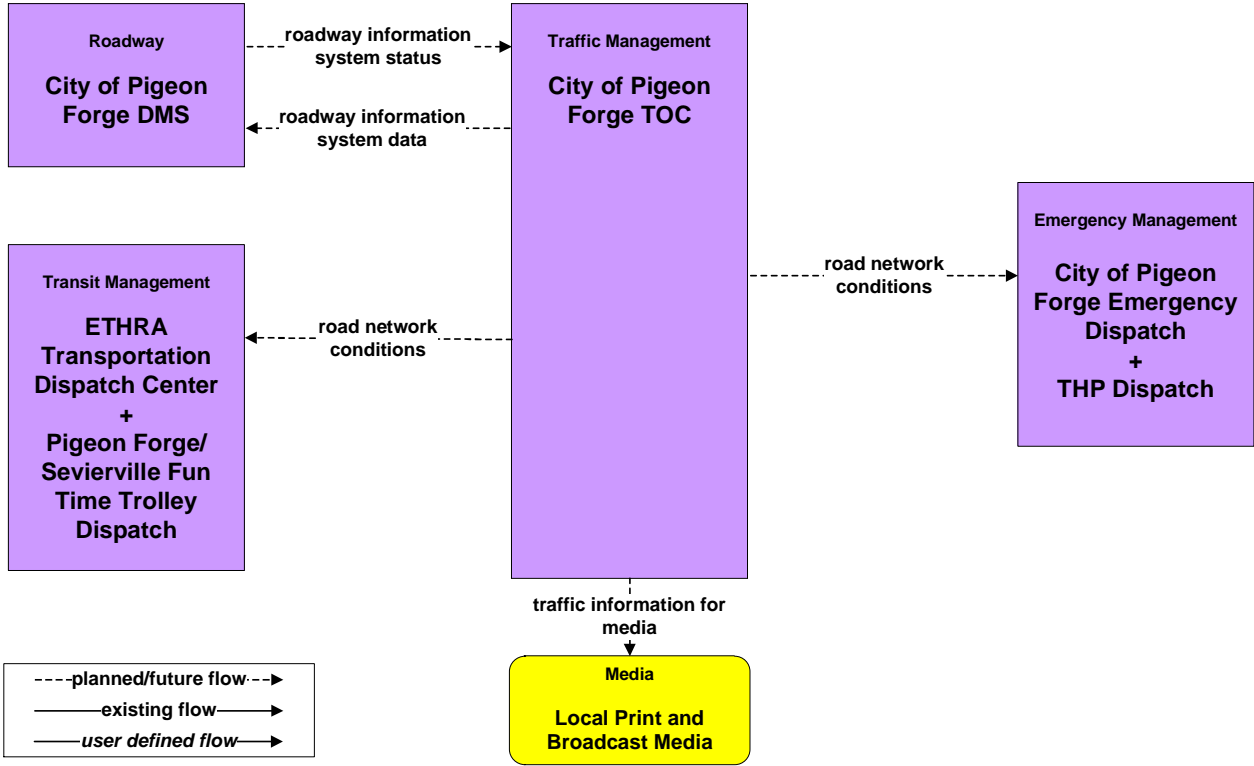
**ATMS06 – Traffic Information Dissemination
City of Oak Ridge**



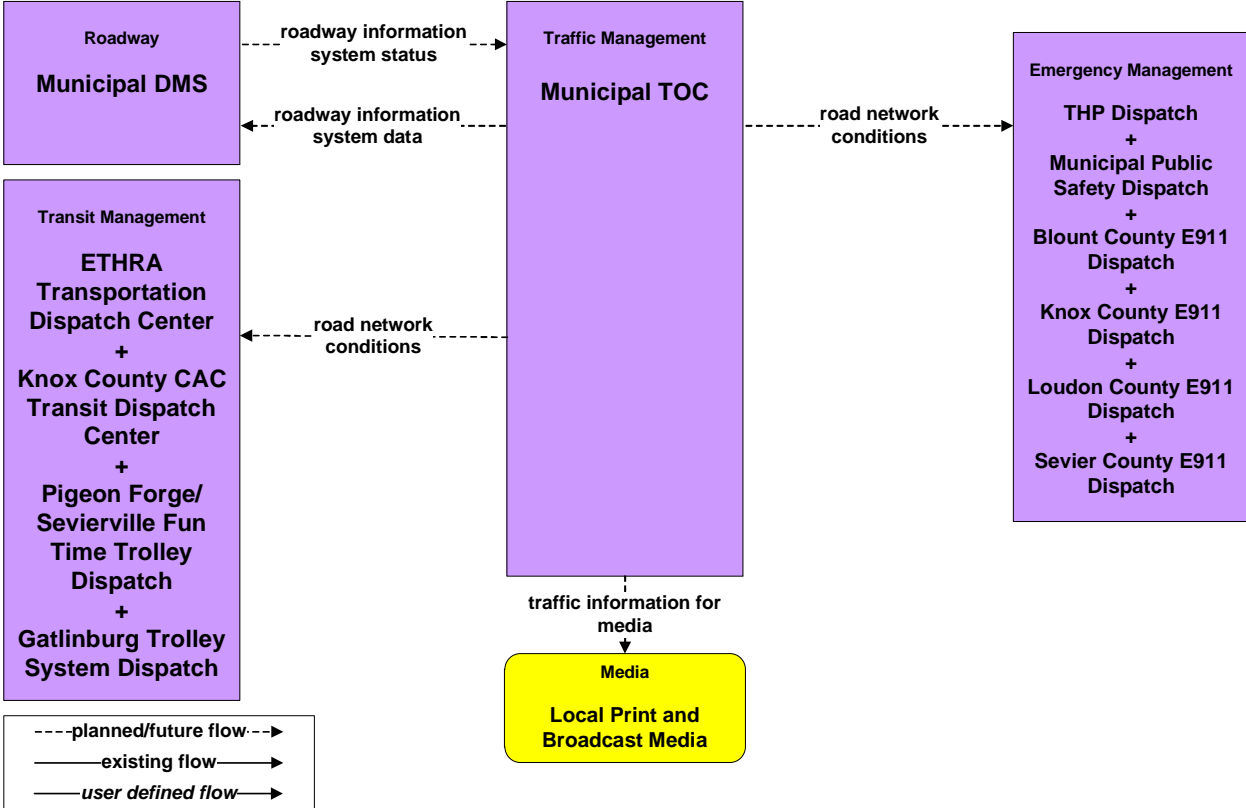
**ATMS06 – Traffic Information Dissemination
City of Gatlinburg**



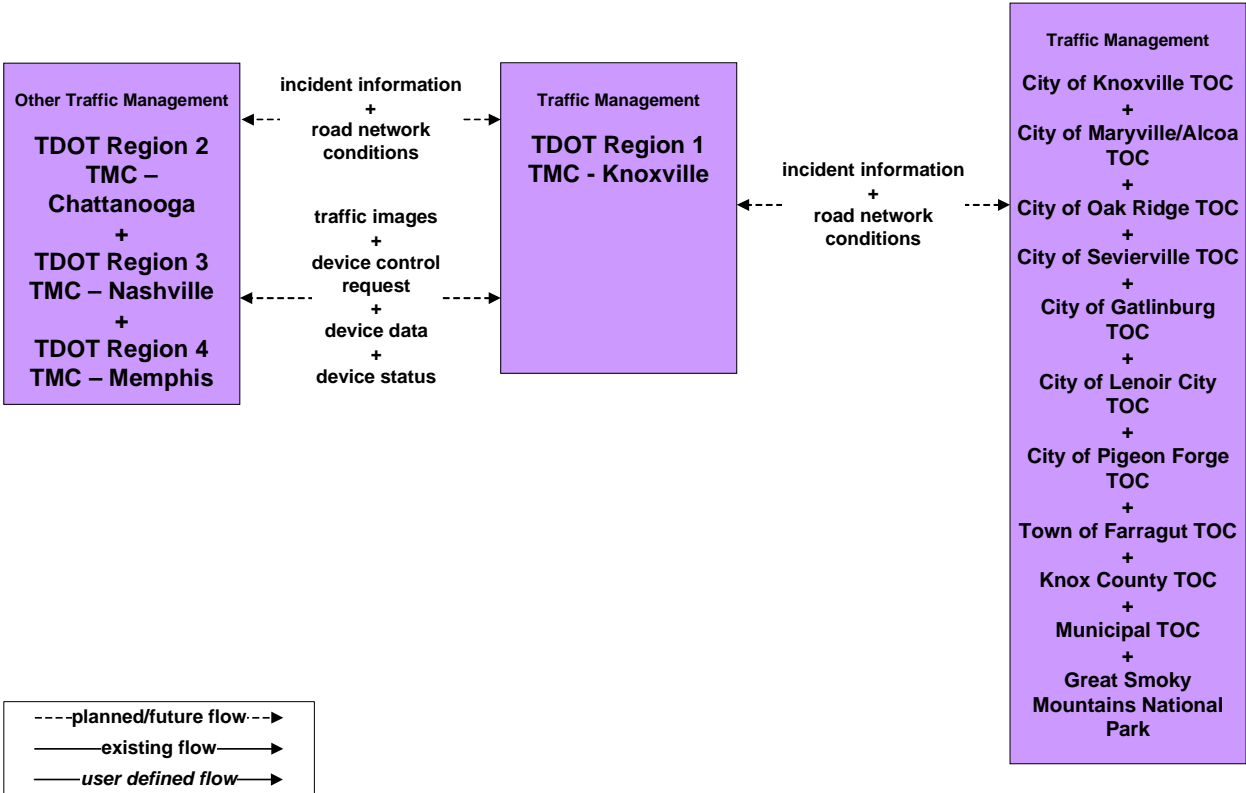
**ATMS06 – Traffic Information Dissemination
City of Pigeon Forge**



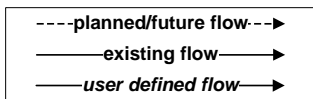
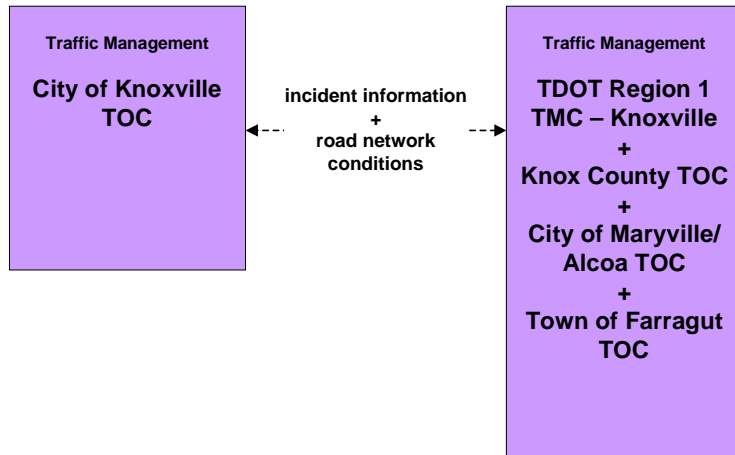
**ATMS06 – Traffic Information Dissemination
Municipal**



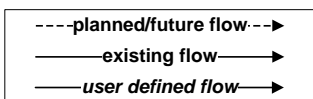
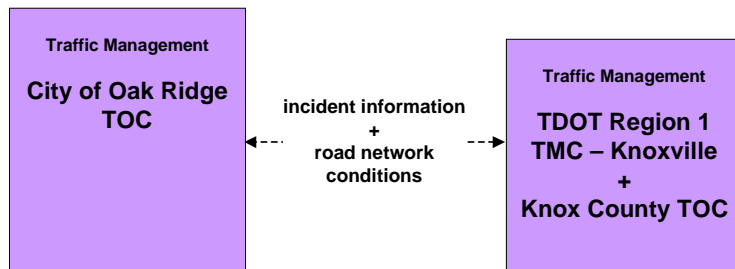
**ATMS07 - Regional Traffic Management
TDOT Region 1 TMC - Knoxville**



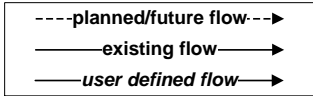
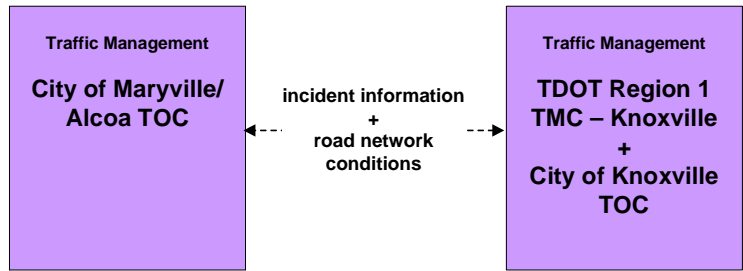
**ATMS07 – Regional Traffic Management
City of Knoxville**



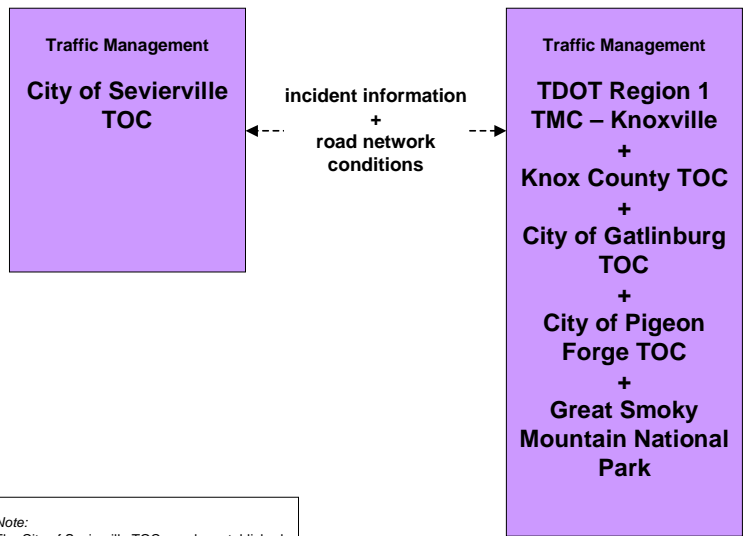
**ATMS07 – Regional Traffic Management
City of Oak Ridge**



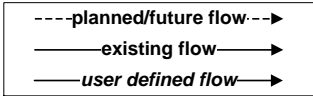
**ATMS07 – Regional Traffic Management
City of Maryville/Alcoa**



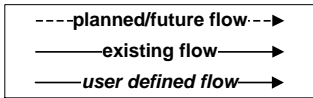
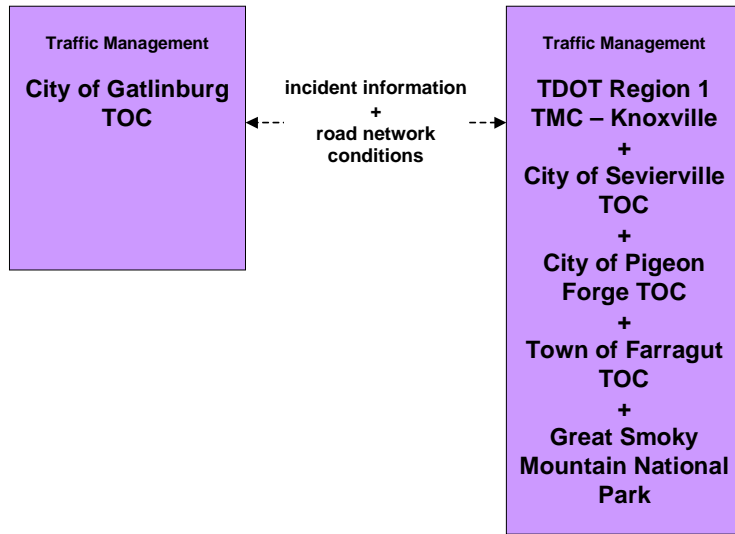
**ATMS07 – Regional Traffic Management
City of Sevierville**



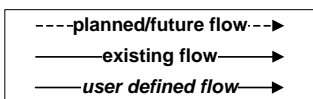
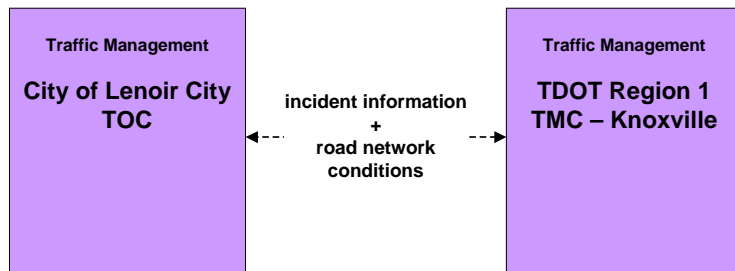
Note:
 The City of Sevierville TOC may be established as a Joint TOC with the City of Pigeon Forge.



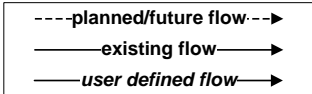
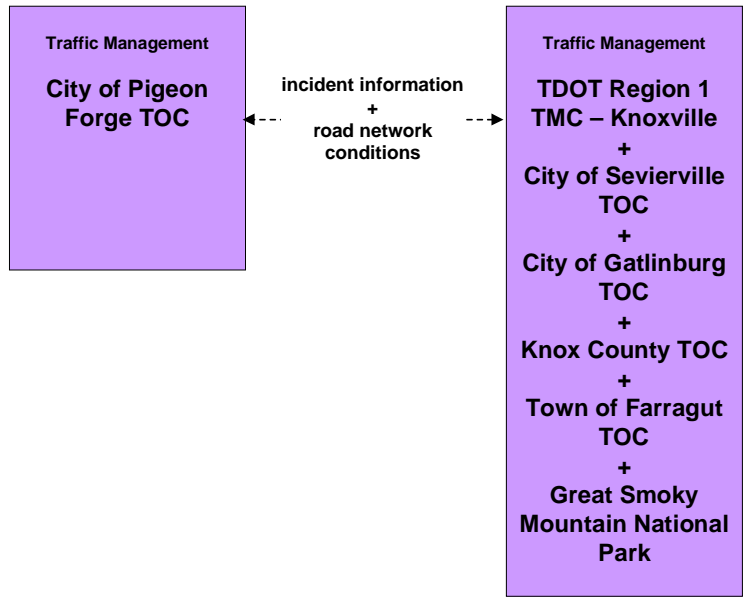
**ATMS07 – Regional Traffic Management
City of Gatlinburg**



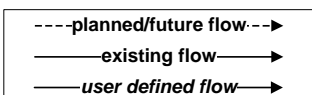
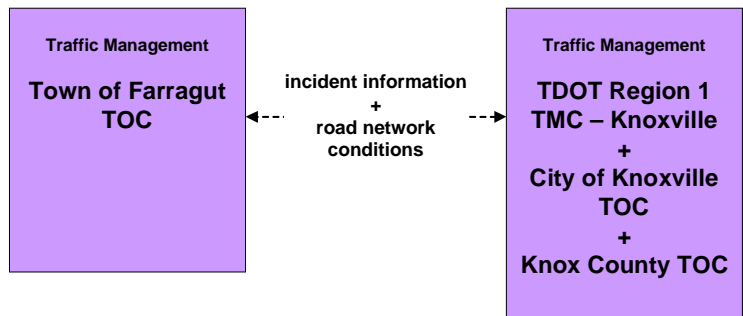
**ATMS07 – Regional Traffic Management
City of Lenoir City**



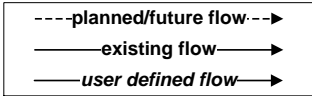
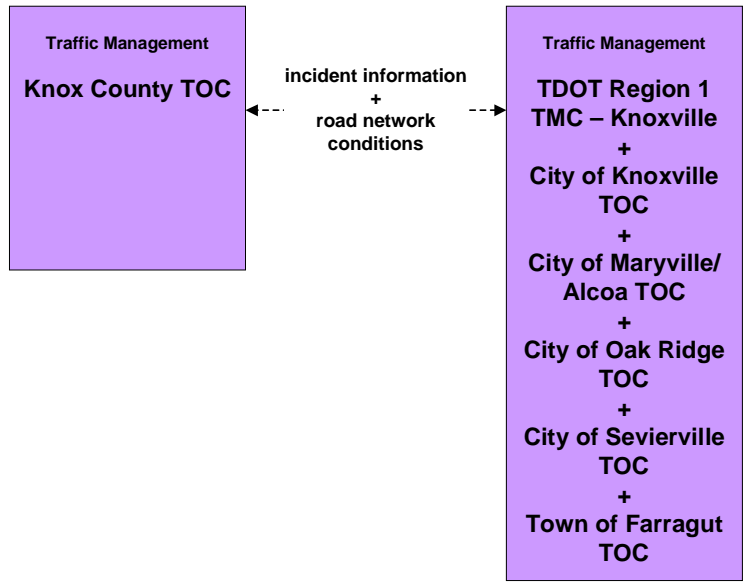
**ATMS07 – Regional Traffic Management
City of Pigeon Forge**



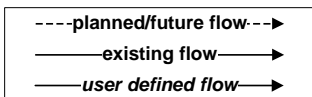
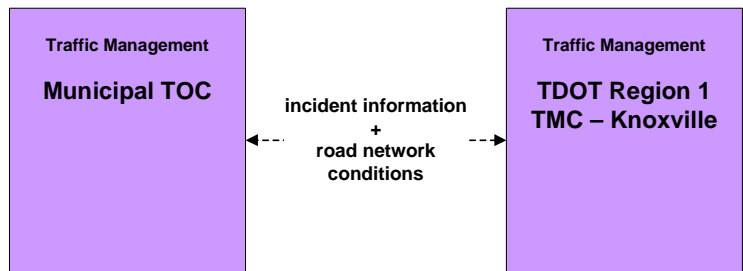
**ATMS07 – Regional Traffic Management
Town of Farragut**



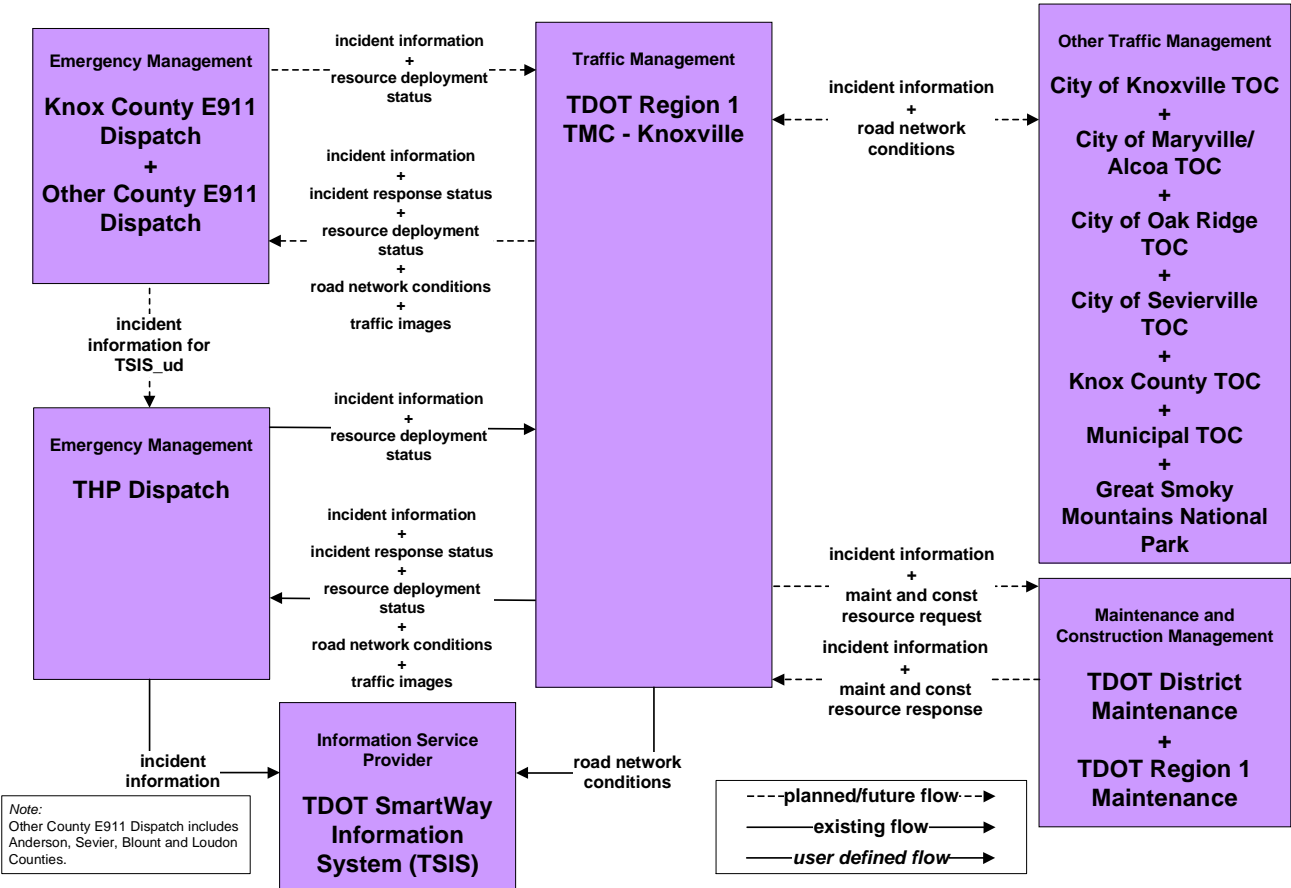
**ATMS07 – Regional Traffic Management
Knox County**



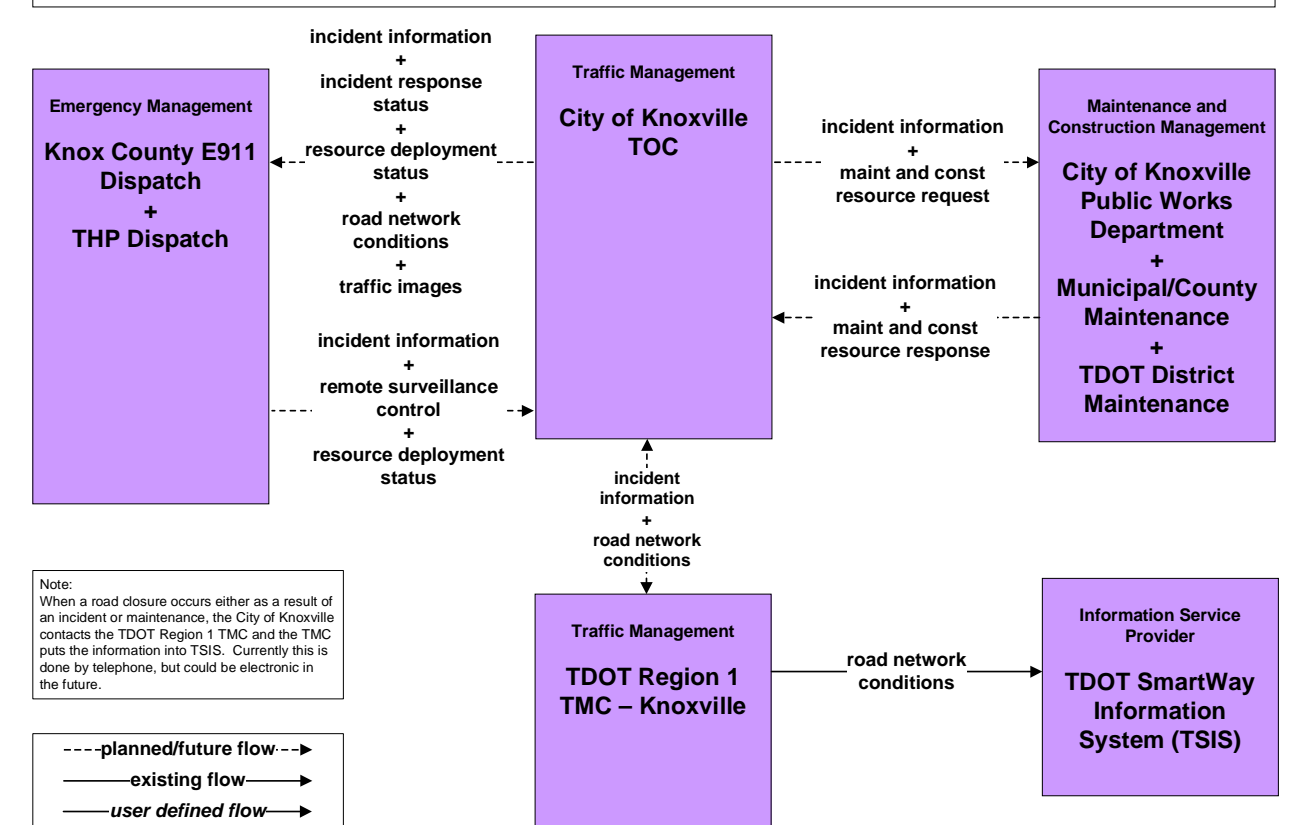
**ATMS07 – Regional Traffic Management
Municipal**



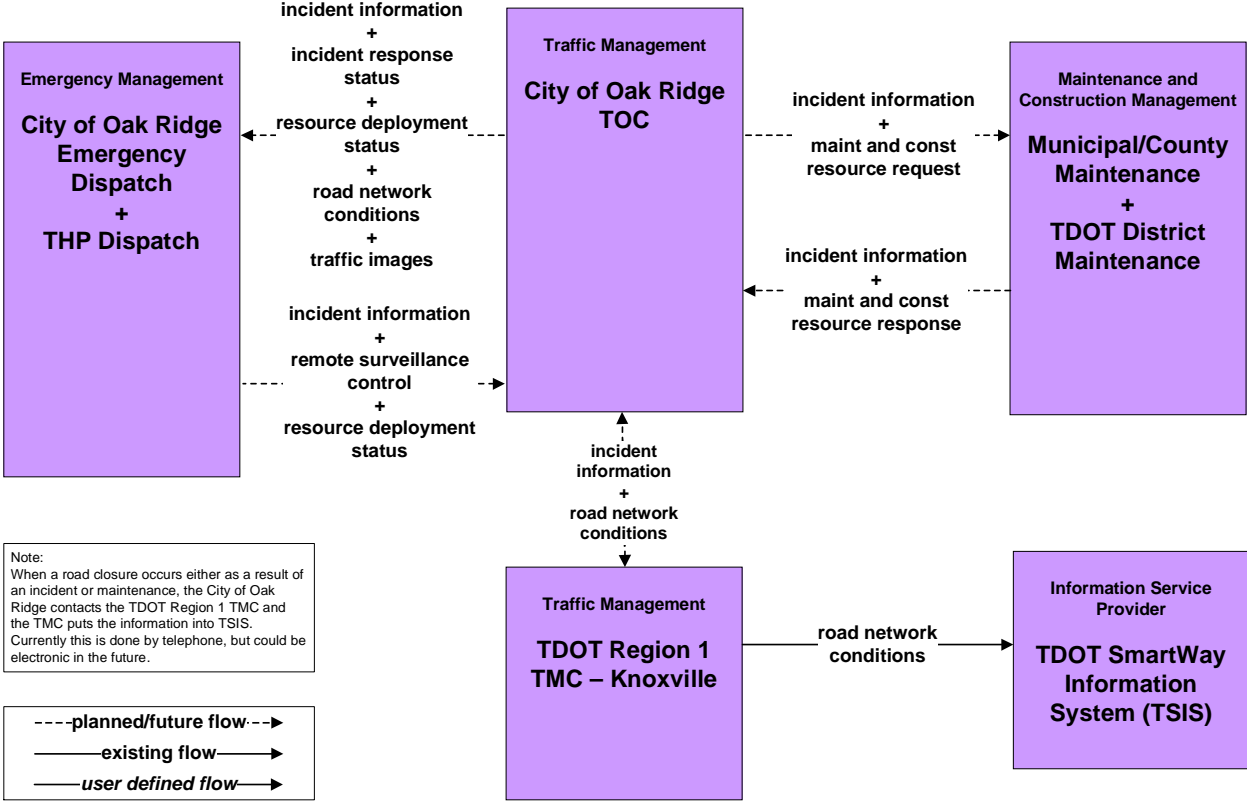
**ATMS08 - Traffic Incident Management System
TDOT Region 1 TMC - Knoxville**



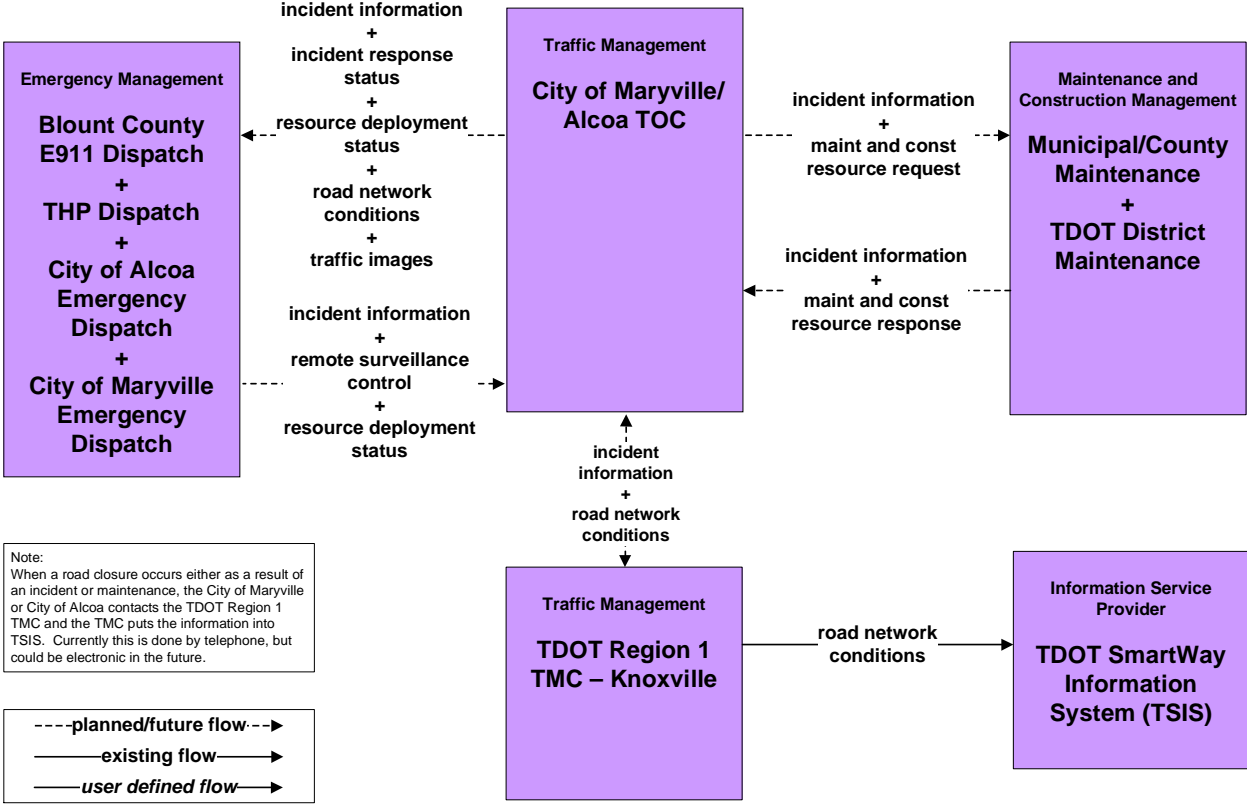
**ATMS08 - Traffic Incident Management System
City of Knoxville**



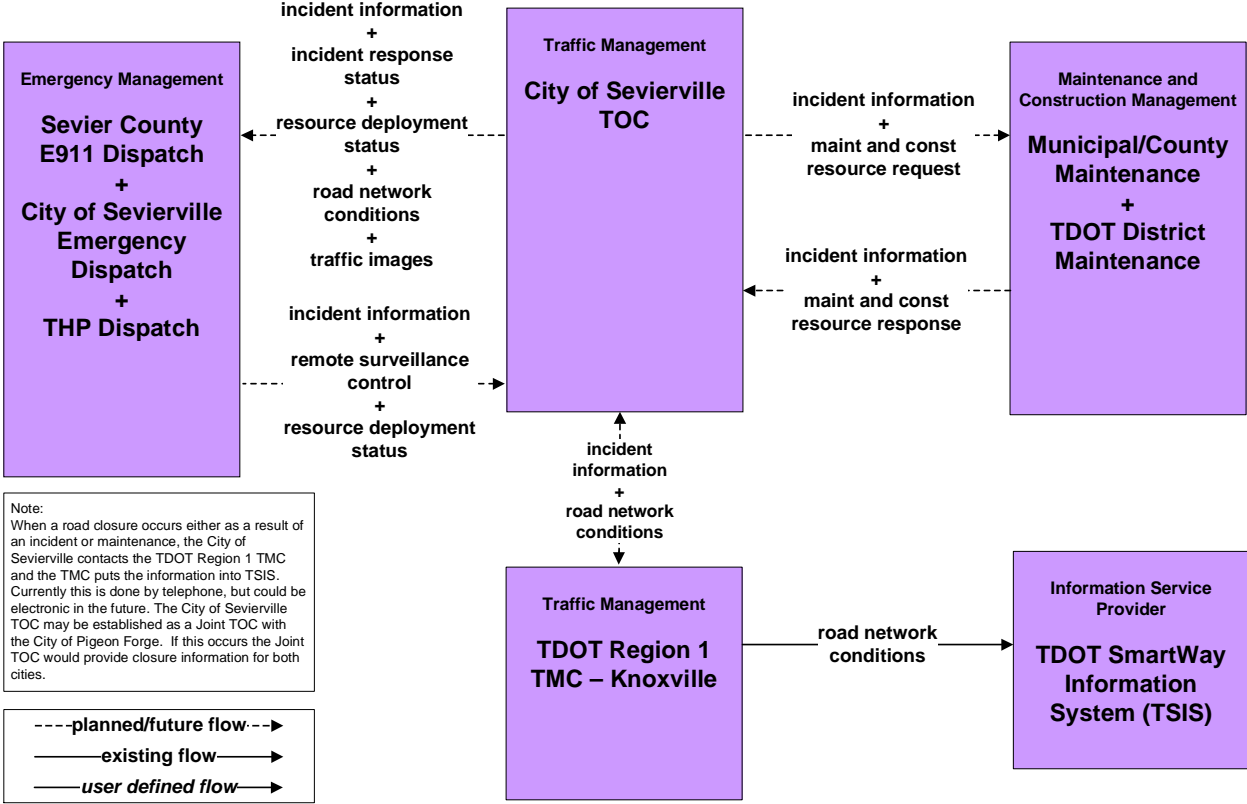
**ATMS08 - Traffic Incident Management System
City of Oak Ridge**



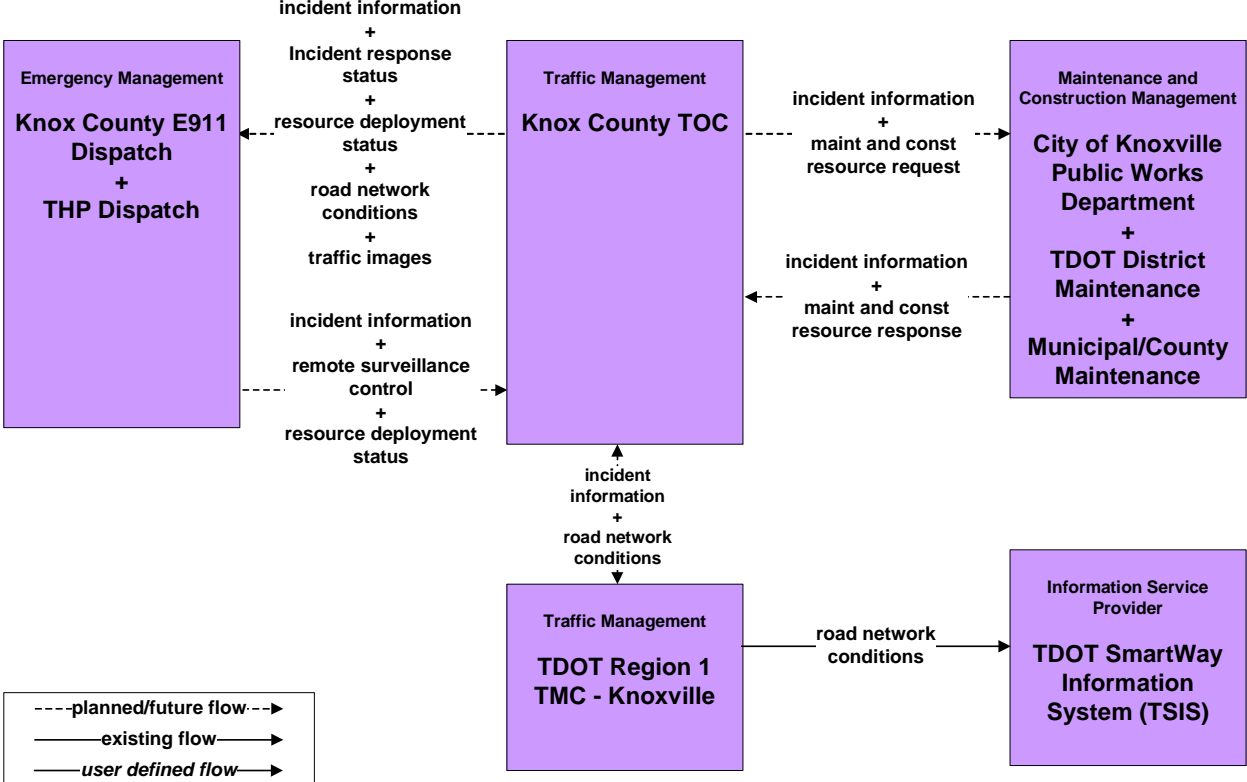
**ATMS08 - Traffic Incident Management System
City of Maryville/Alcoa**



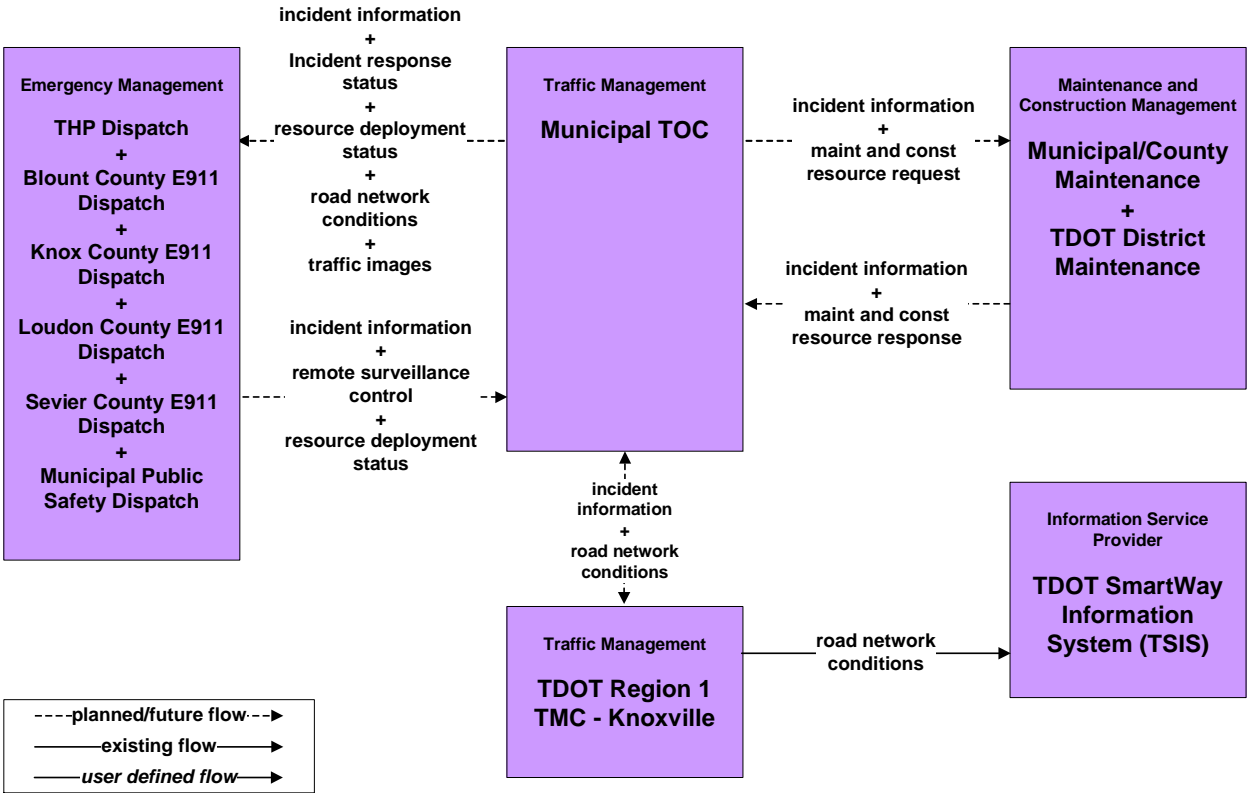
**ATMS08 - Traffic Incident Management System
City of Sevierville**



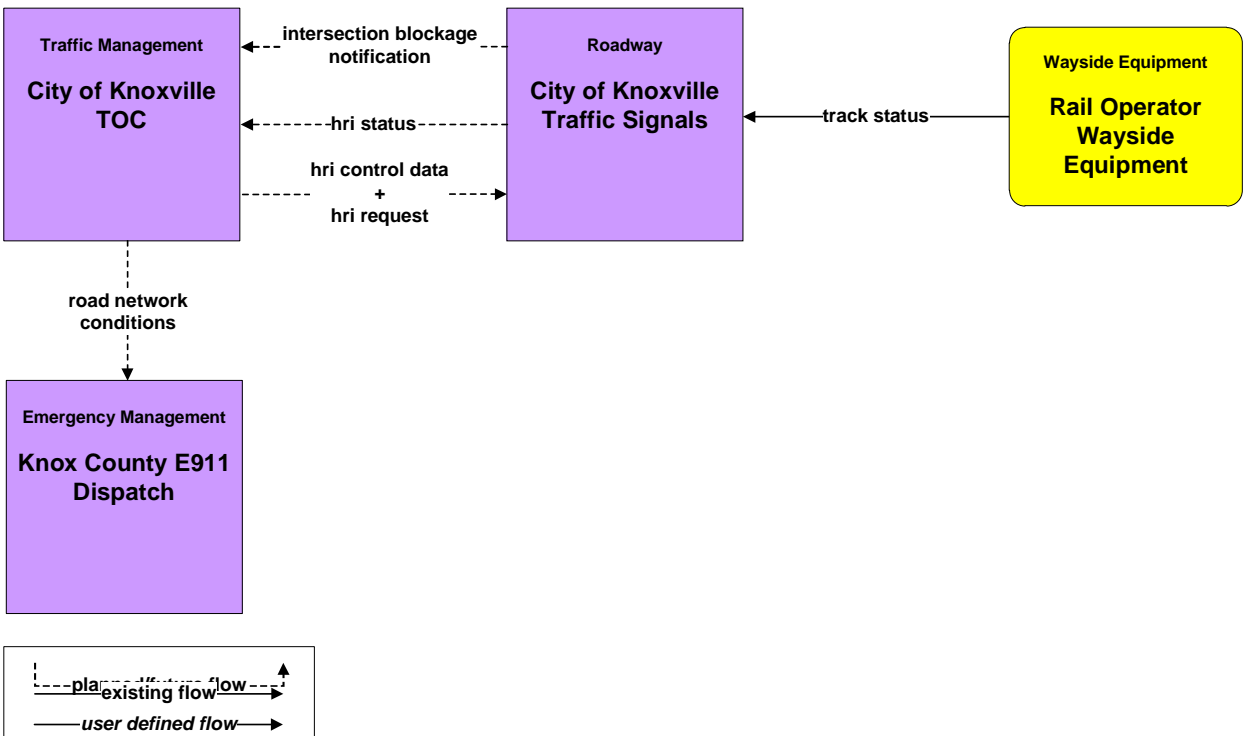
**ATMS08 - Traffic Incident Management System
Knox County**



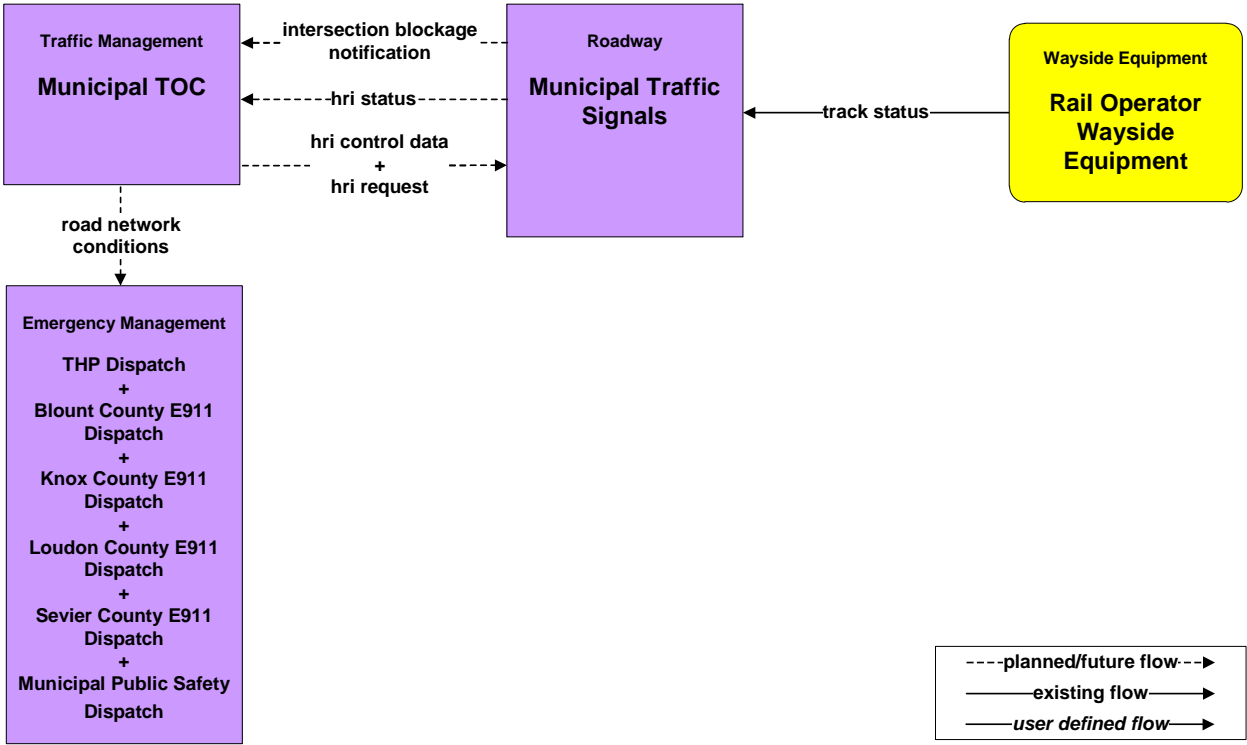
**ATMS08 - Traffic Incident Management System
Municipal TOC**



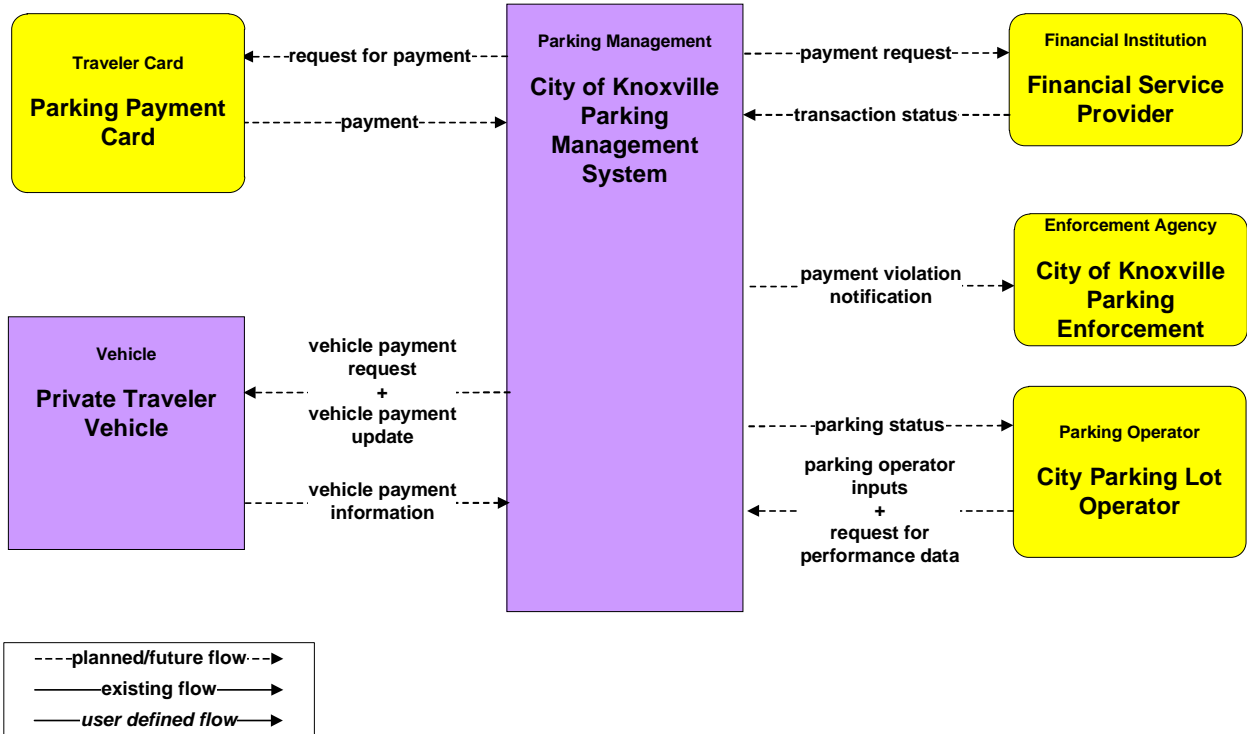
**ATMS13 – Standard Railroad Grade Crossing
City of Knoxville**



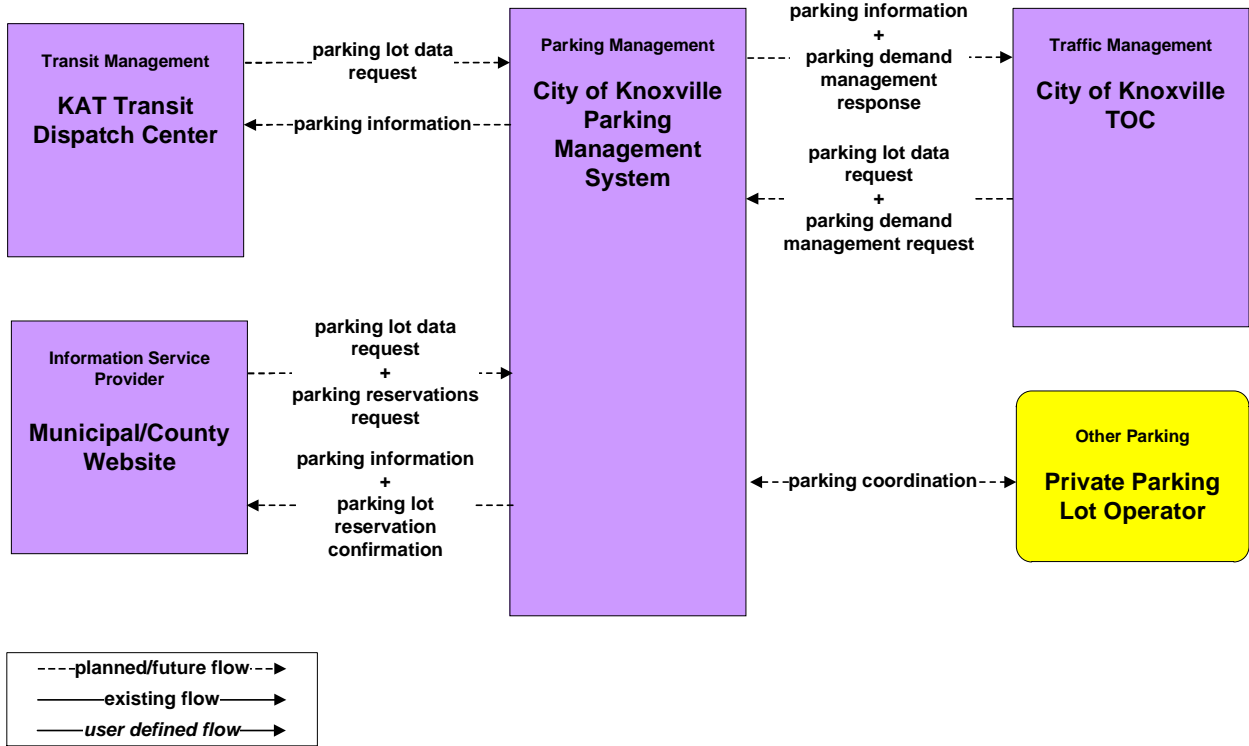
**ATMS13 – Standard Railroad Grade Crossing
Municipal**



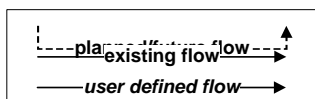
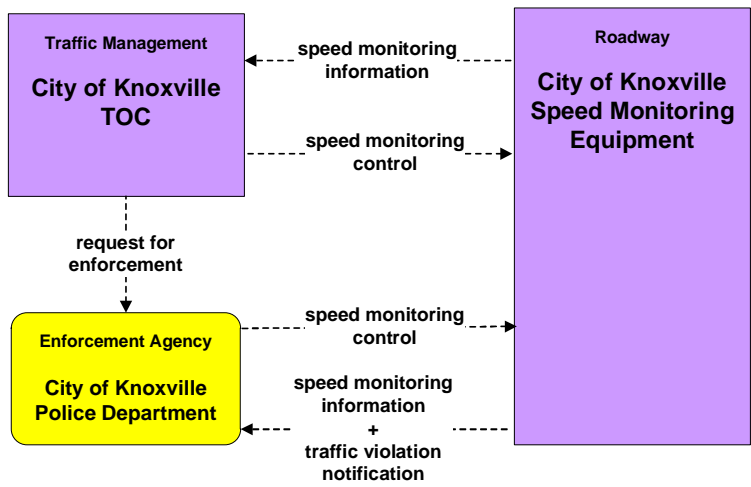
**ATMS16 – Parking Facility Management
City of Knoxville**



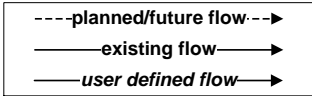
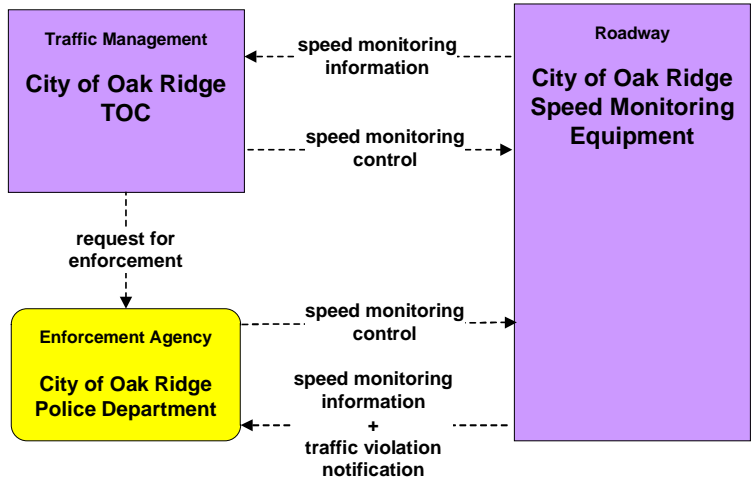
**ATMS17 – Regional Parking Management
City of Knoxville**



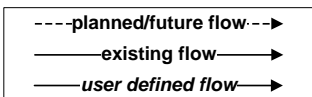
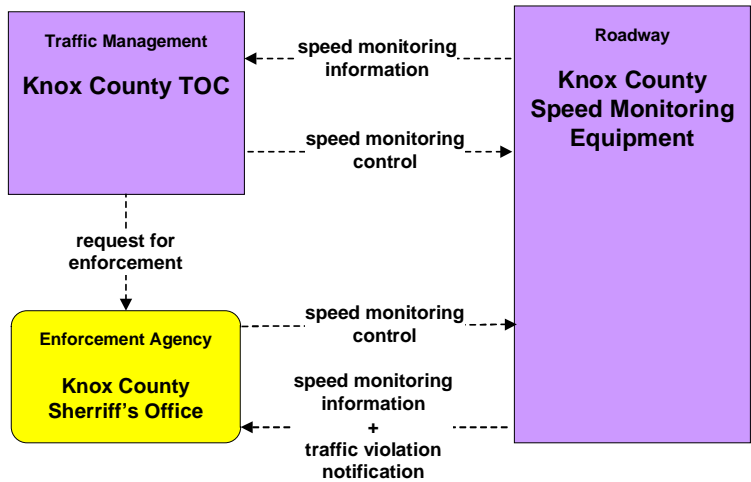
**ATMS19 – Speed Monitoring
City of Knoxville**



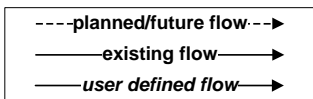
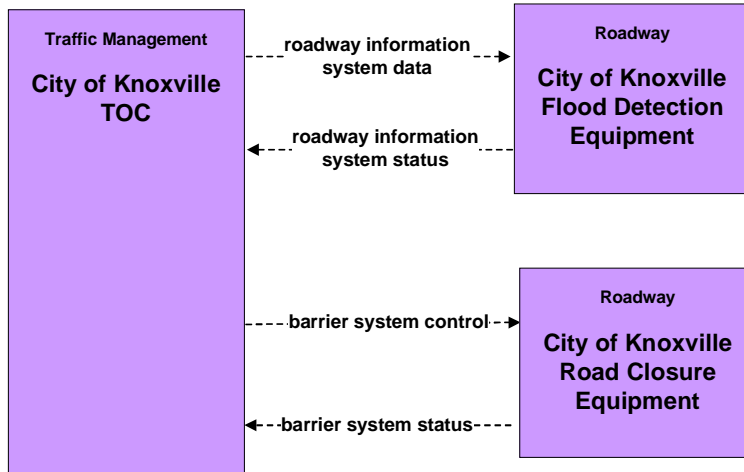
**ATMS19 – Speed Monitoring
City of Oak Ridge**



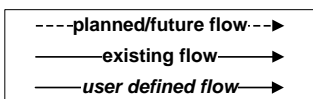
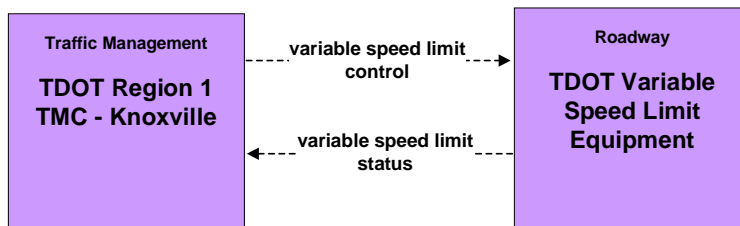
**ATMS19 – Speed Monitoring
Knox County**



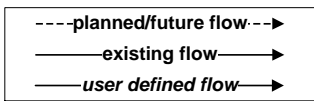
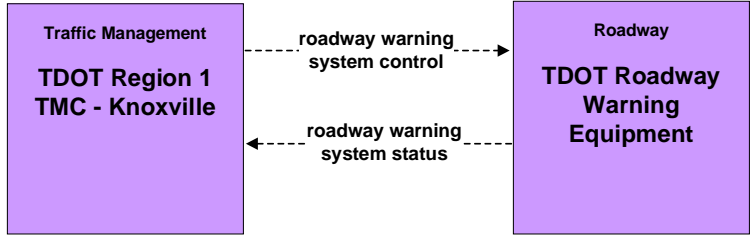
**ATMS21 – Roadway Closure Management
City of Knoxville**



**ATMS22 – Variable Speed Limits
TDOT**

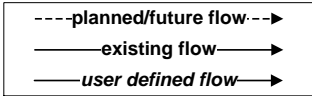
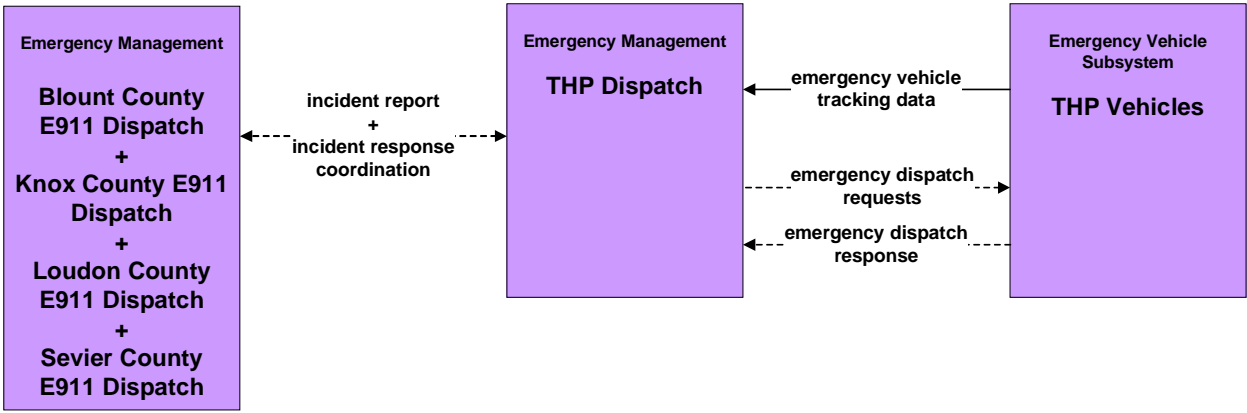


ATMS24 – Dynamic Roadway Warning
TDOT

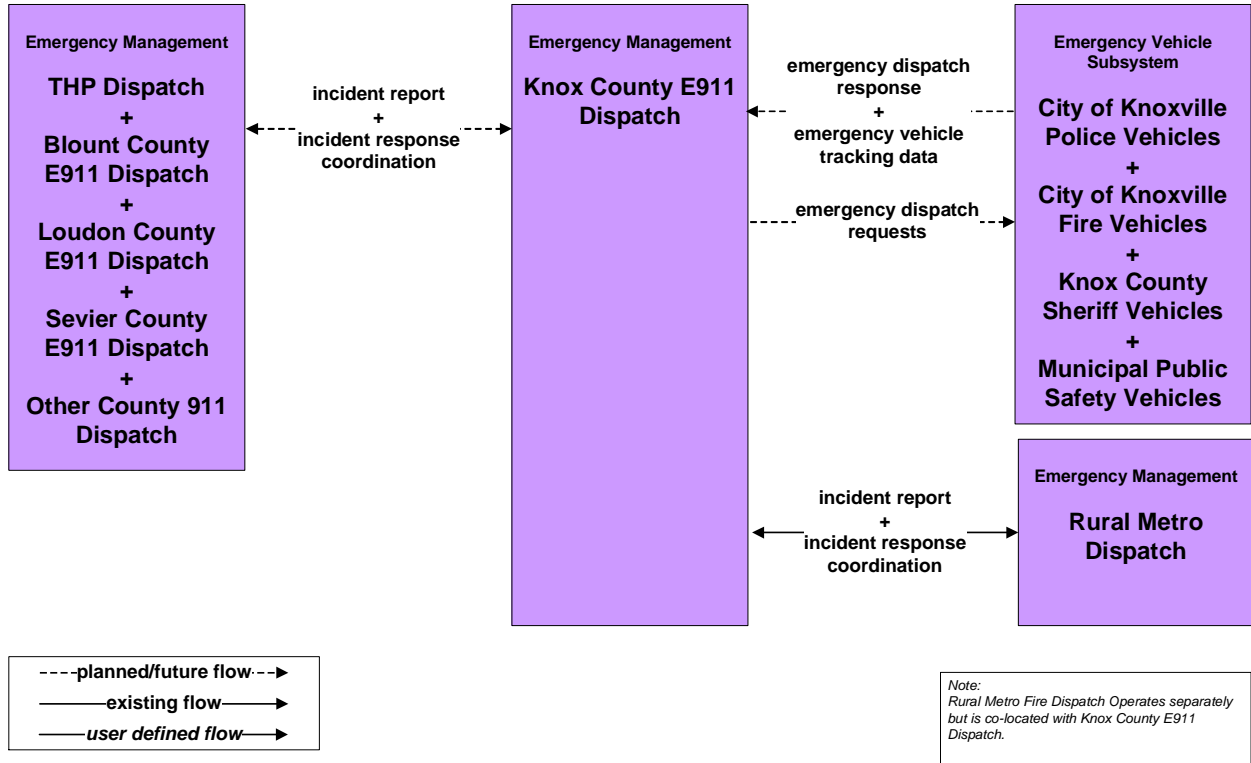


Emergency Management

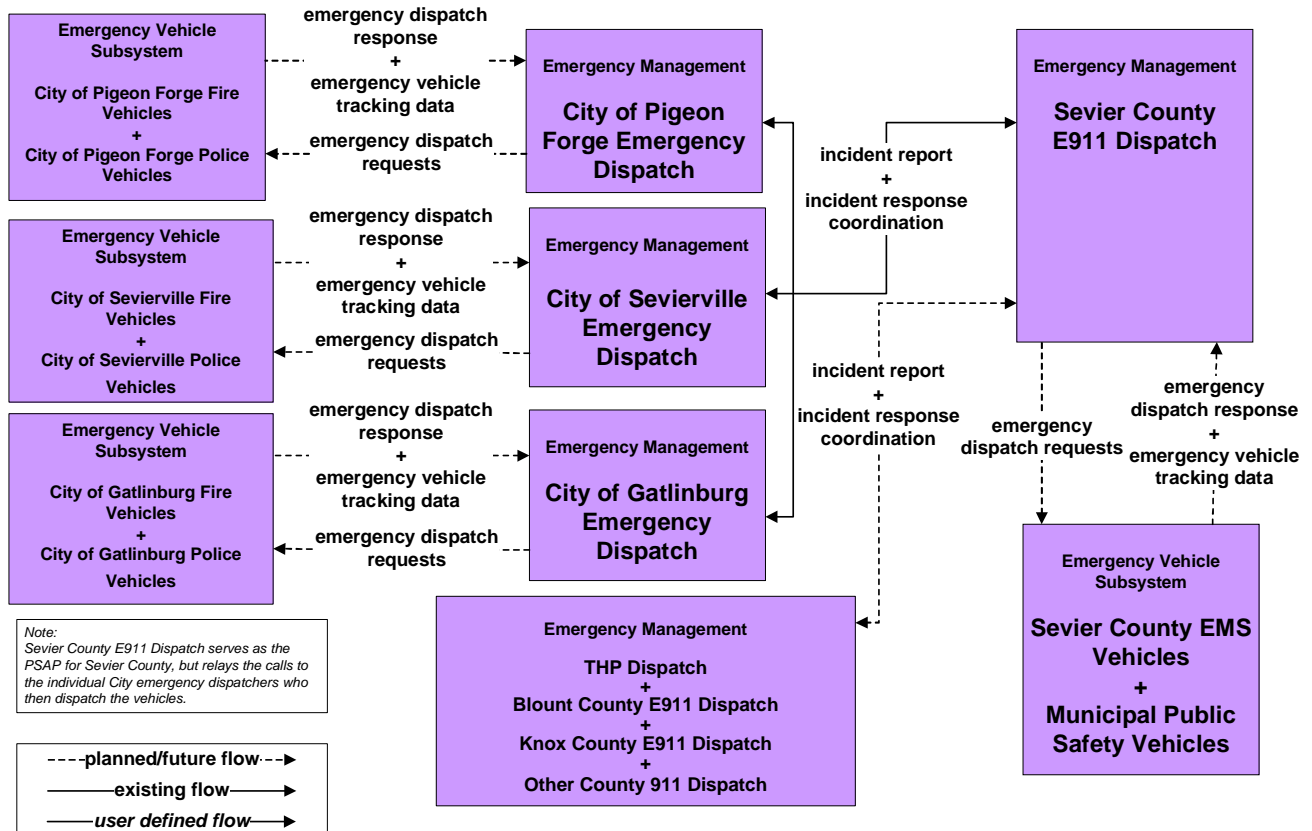
**EM01 - Emergency Call-Taking and Dispatch
Tennessee Highway Patrol**



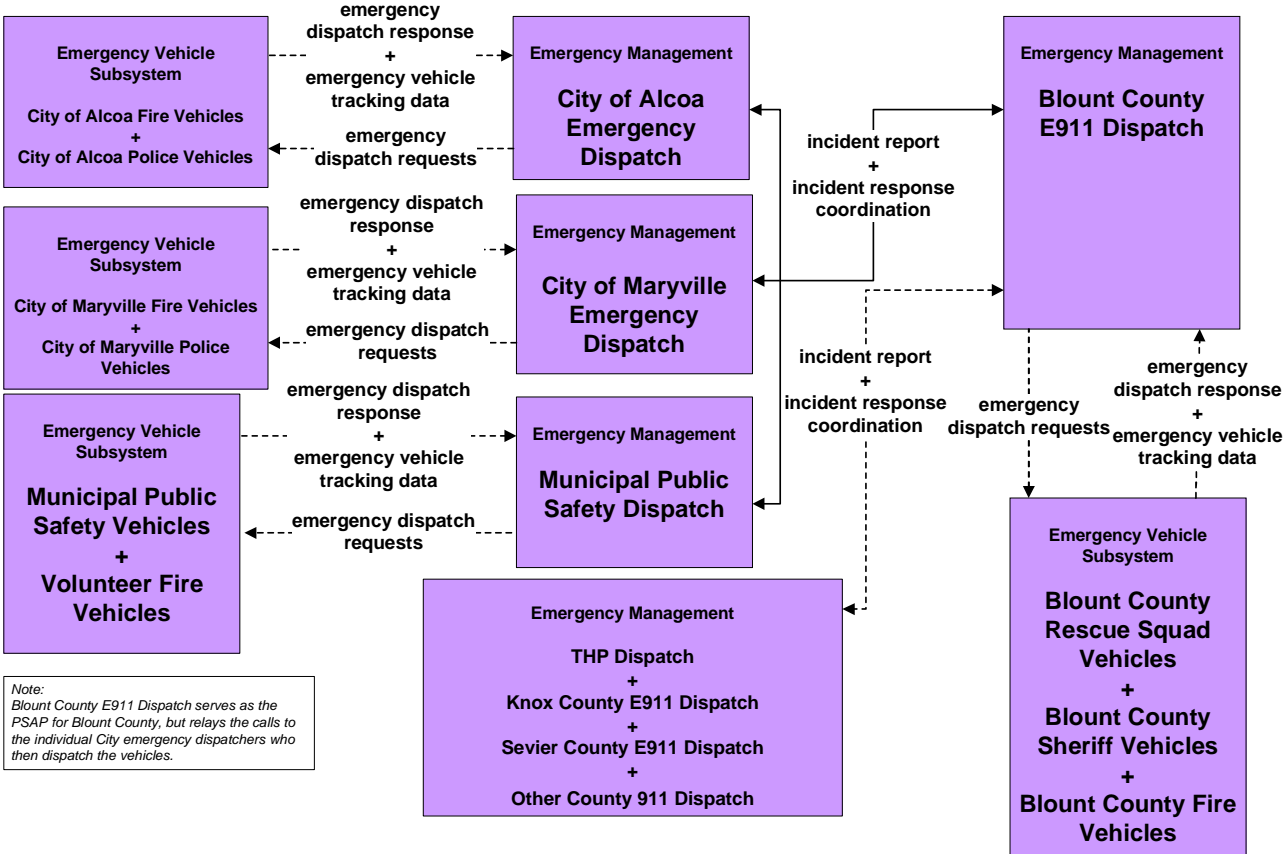
**EM01 - Emergency Call-Taking and Dispatch
Knox County E911 Dispatch**



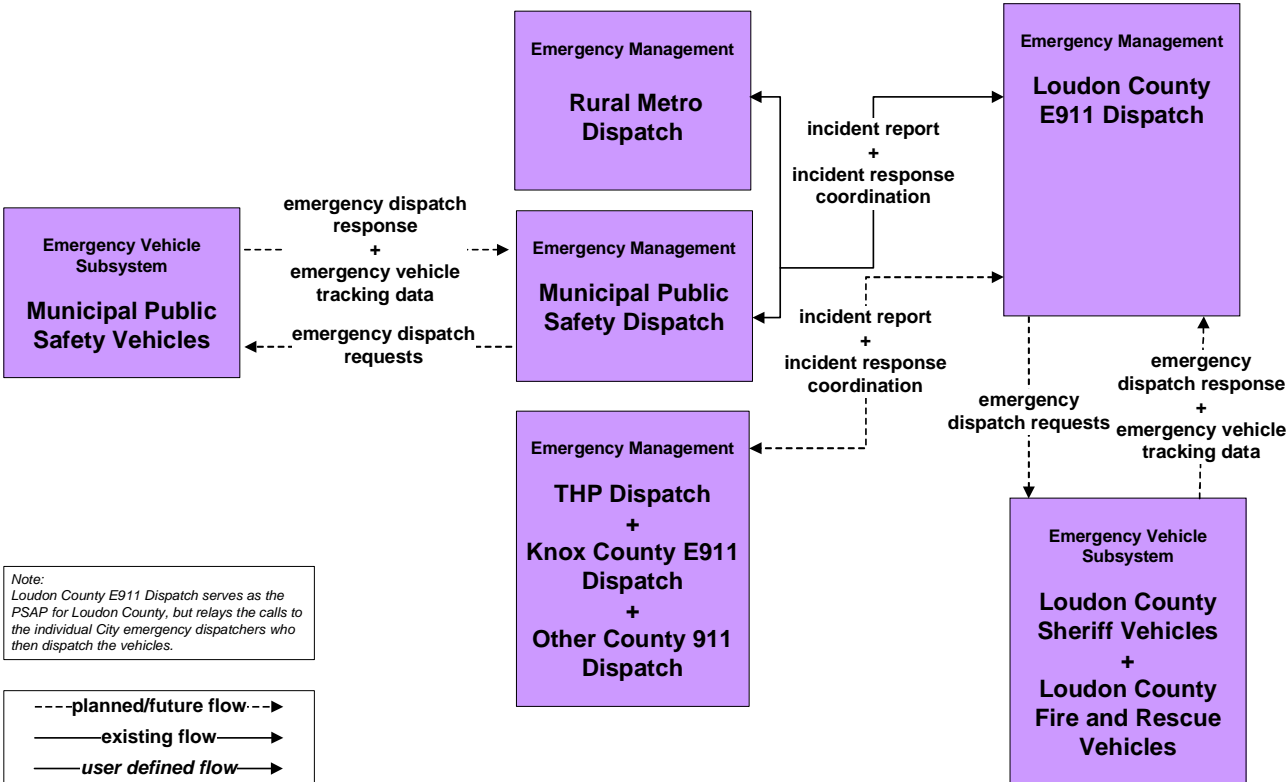
**EM01 - Emergency Call-Taking and Dispatch
Sevier County E911 Dispatch**



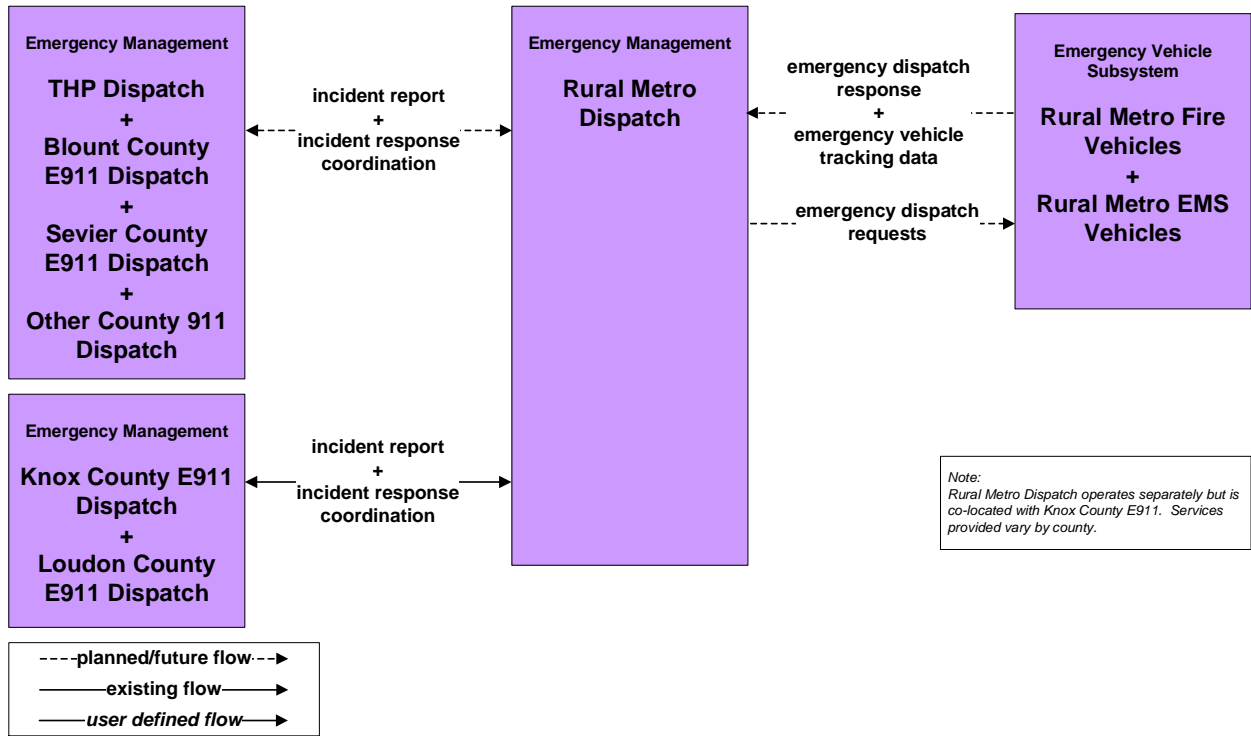
**EM01 - Emergency Call-Taking and Dispatch
Blount County E911 Dispatch**



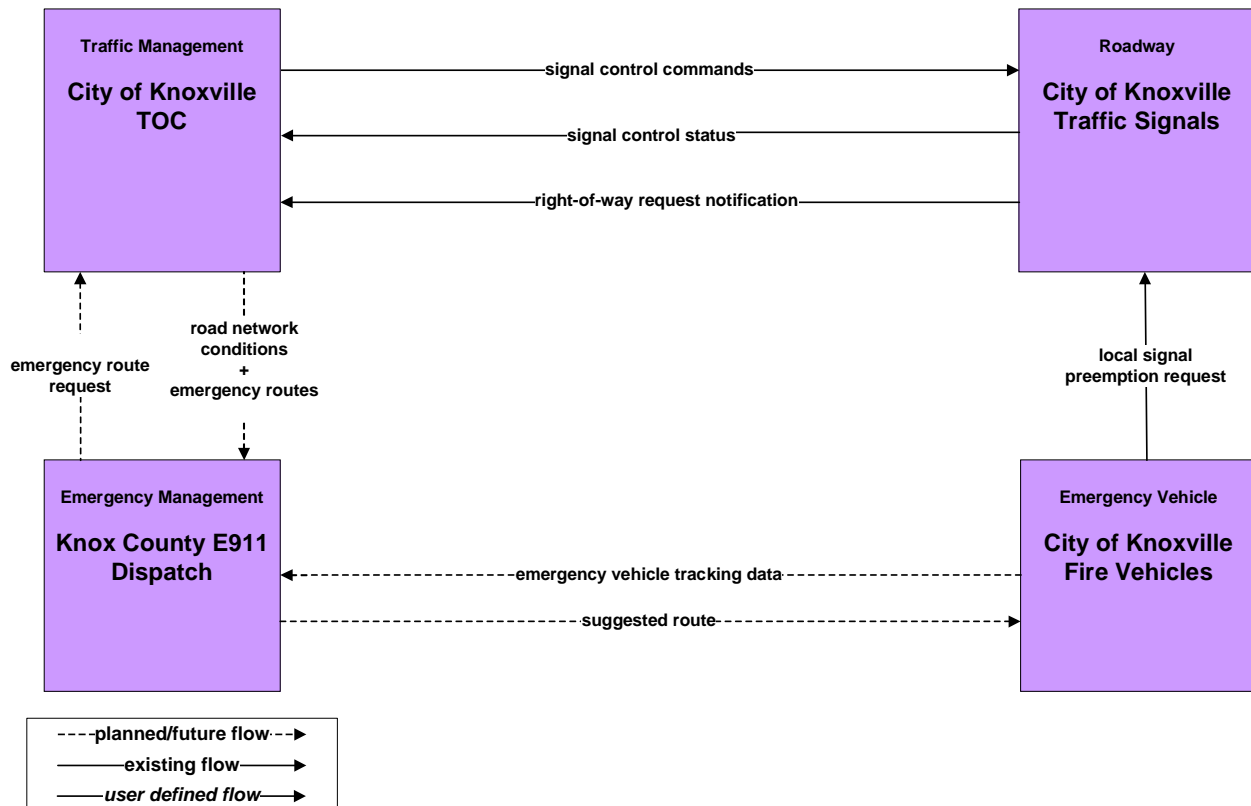
**EM01 - Emergency Call-Taking and Dispatch
Loudon County E911 Dispatch**



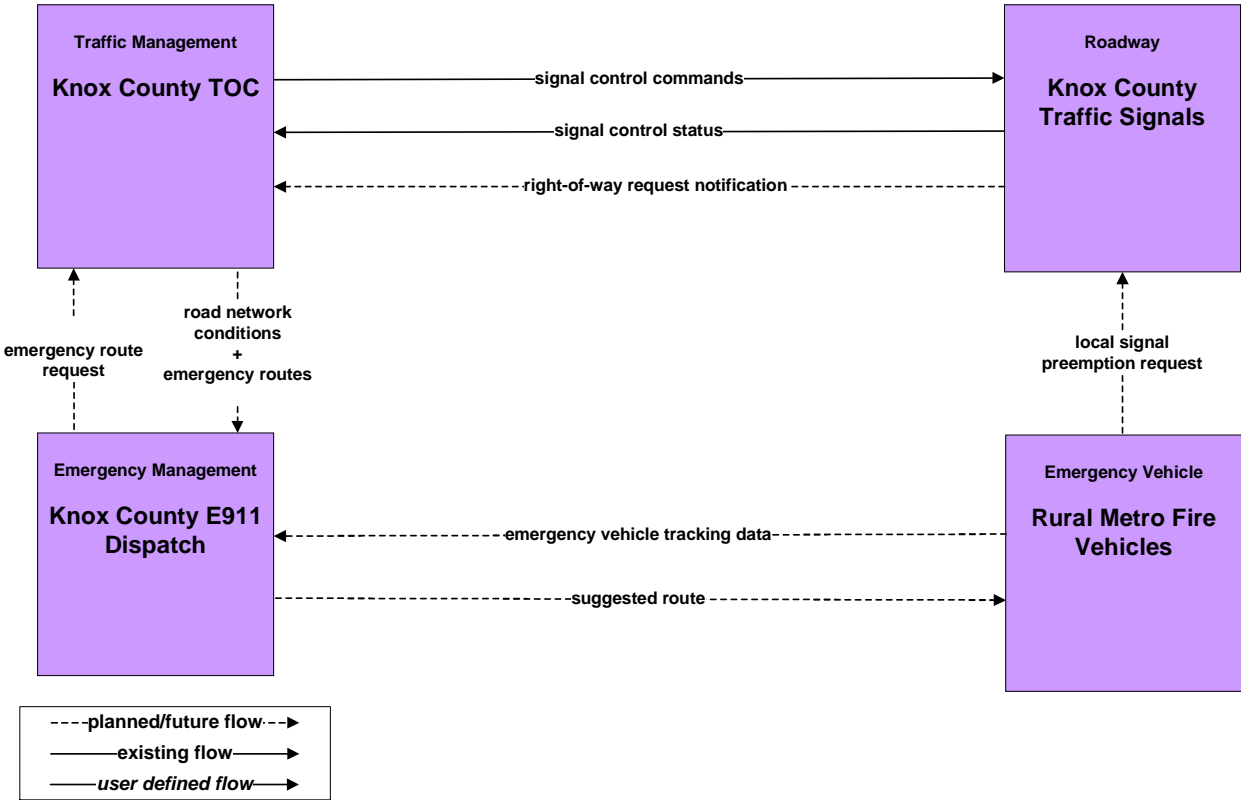
**EM01 - Emergency Call-Taking and Dispatch
Rural Metro Dispatch**



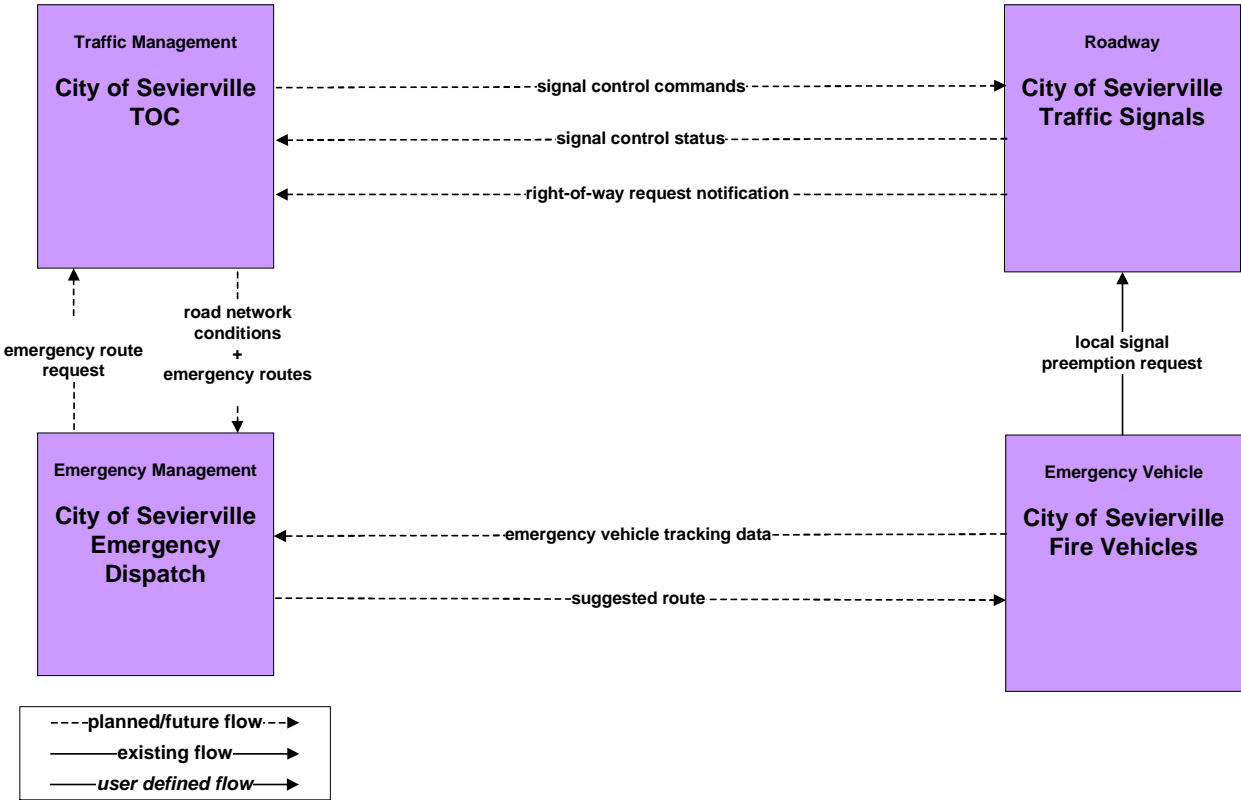
**EM02 – Emergency Routing
City of Knoxville**



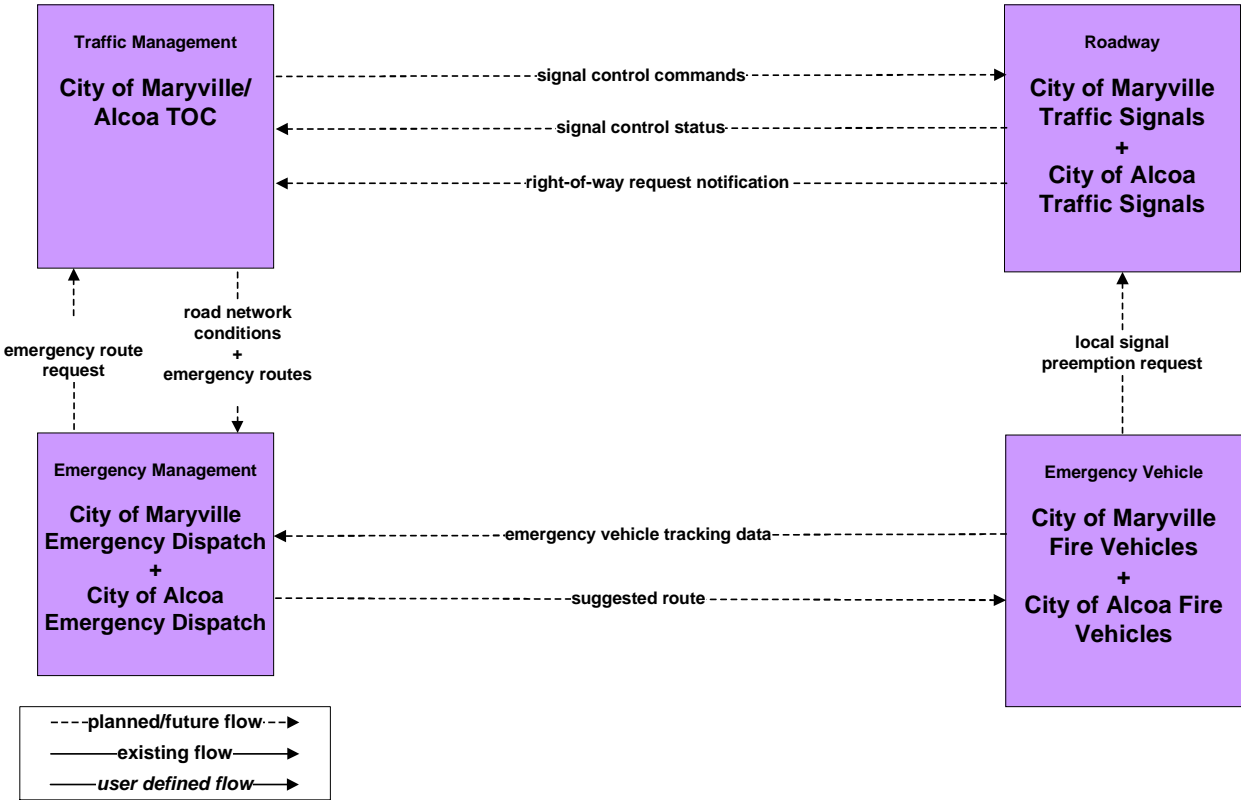
**EM02 – Emergency Routing
Knox County**



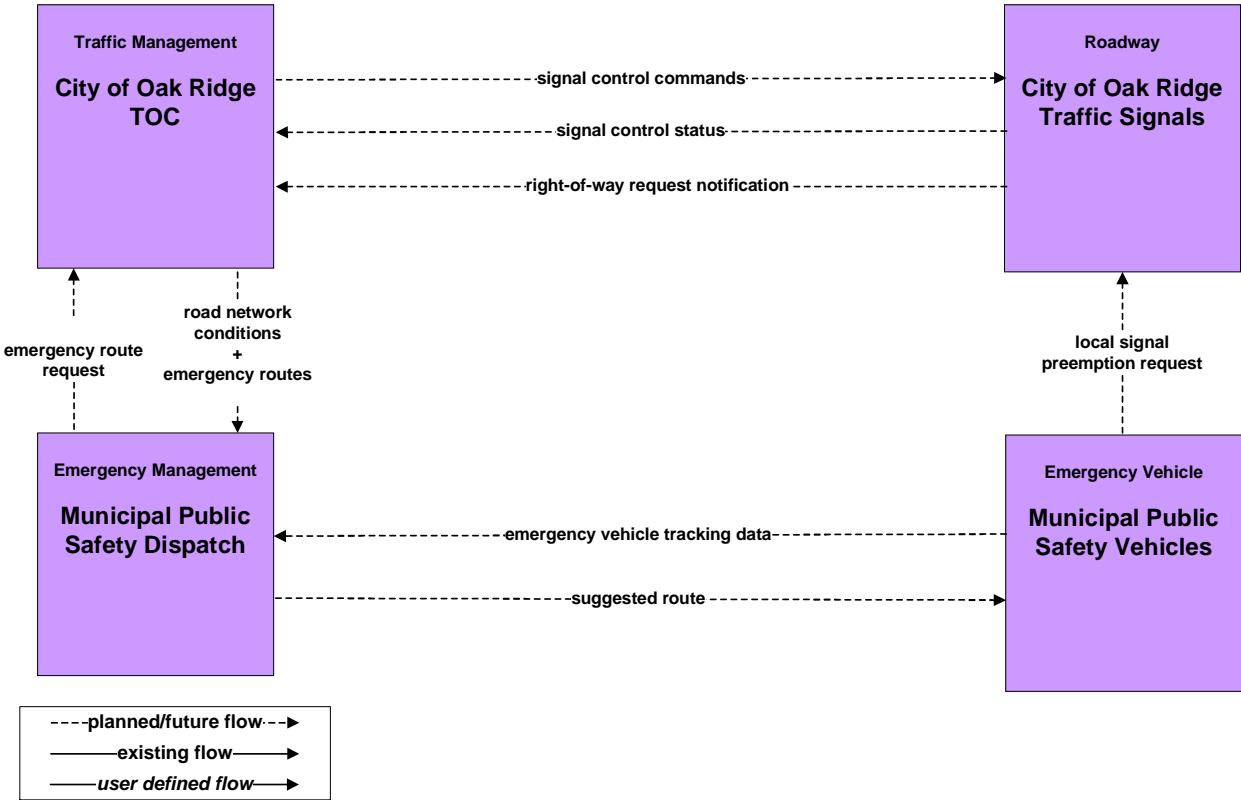
**EM02 – Emergency Routing
City of Sevierville**



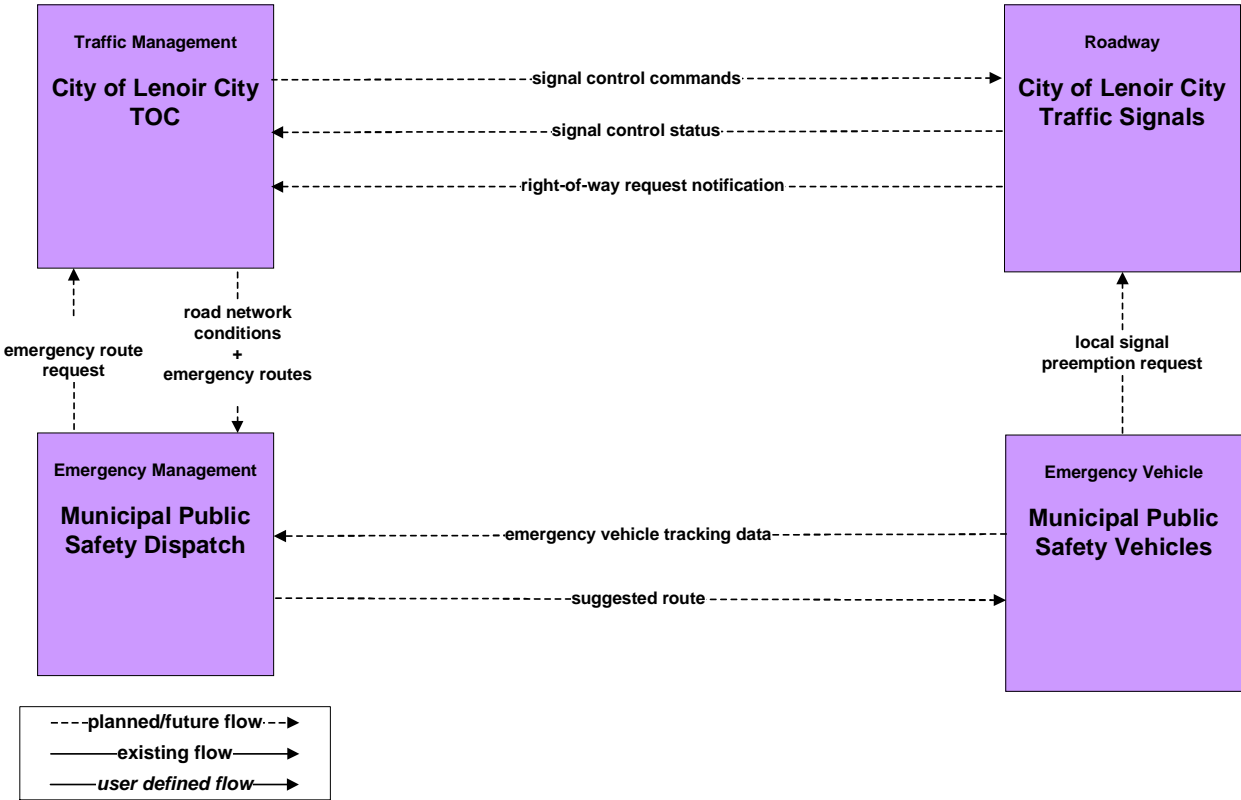
**EM02 – Emergency Routing
City of Maryville/Alcoa**



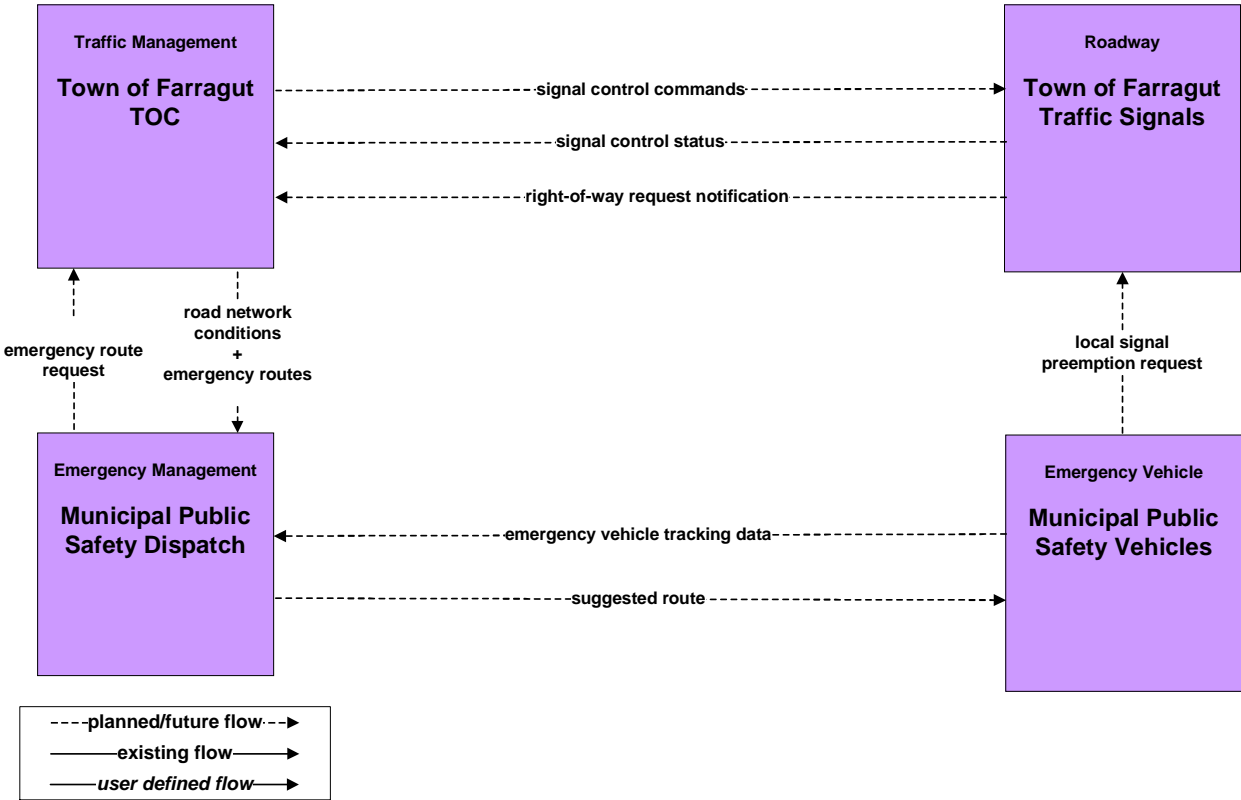
**EM02 – Emergency Routing
City of Oak Ridge**



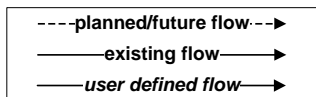
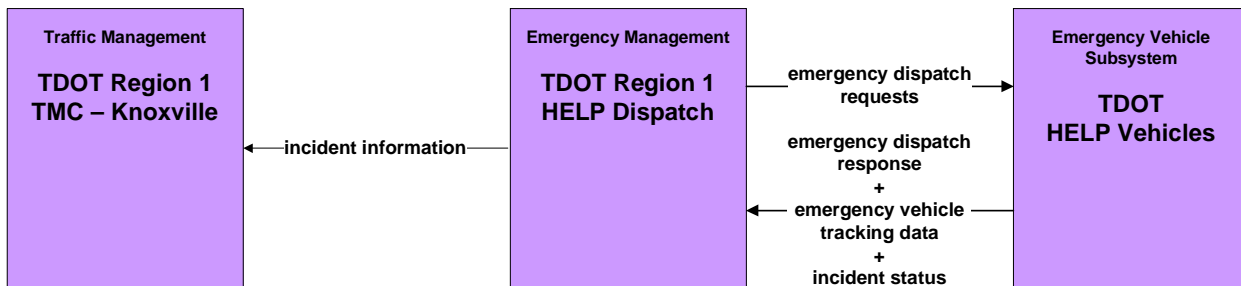
**EM02 – Emergency Routing
City of Lenoir City**



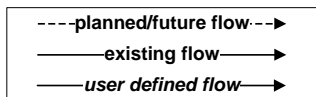
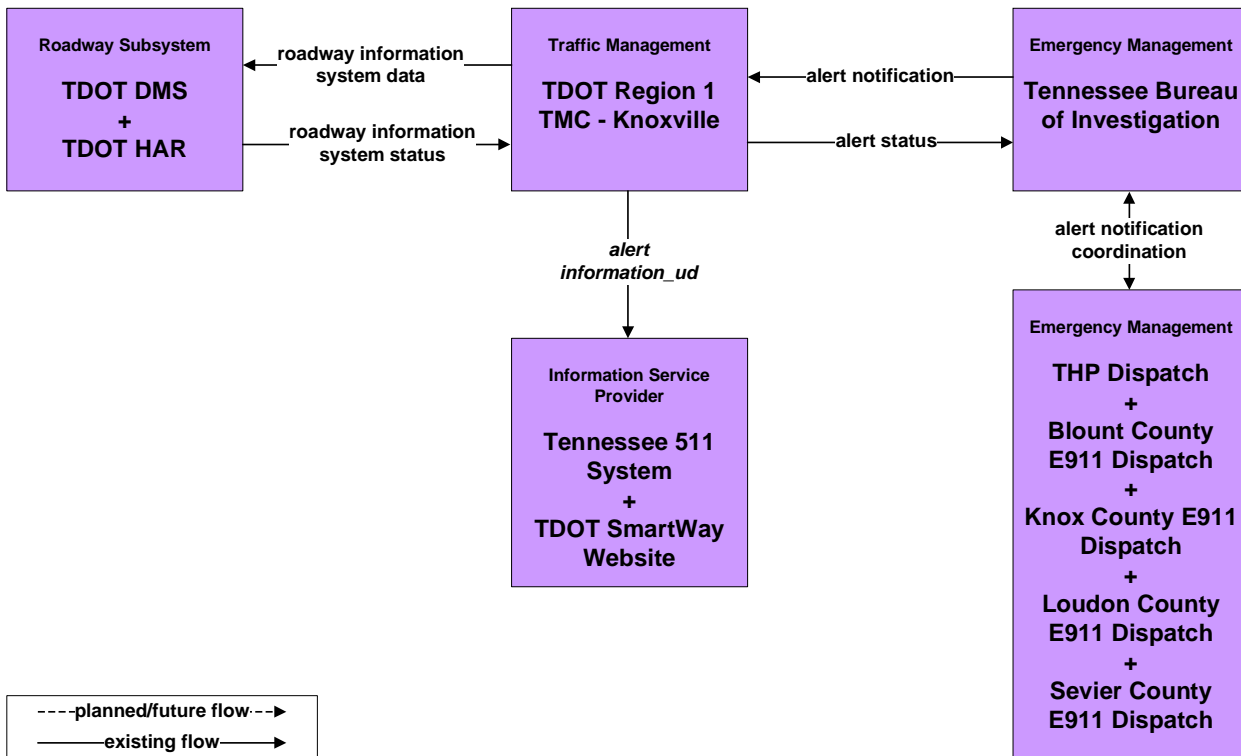
**EM02 – Emergency Routing
Town of Farragut**

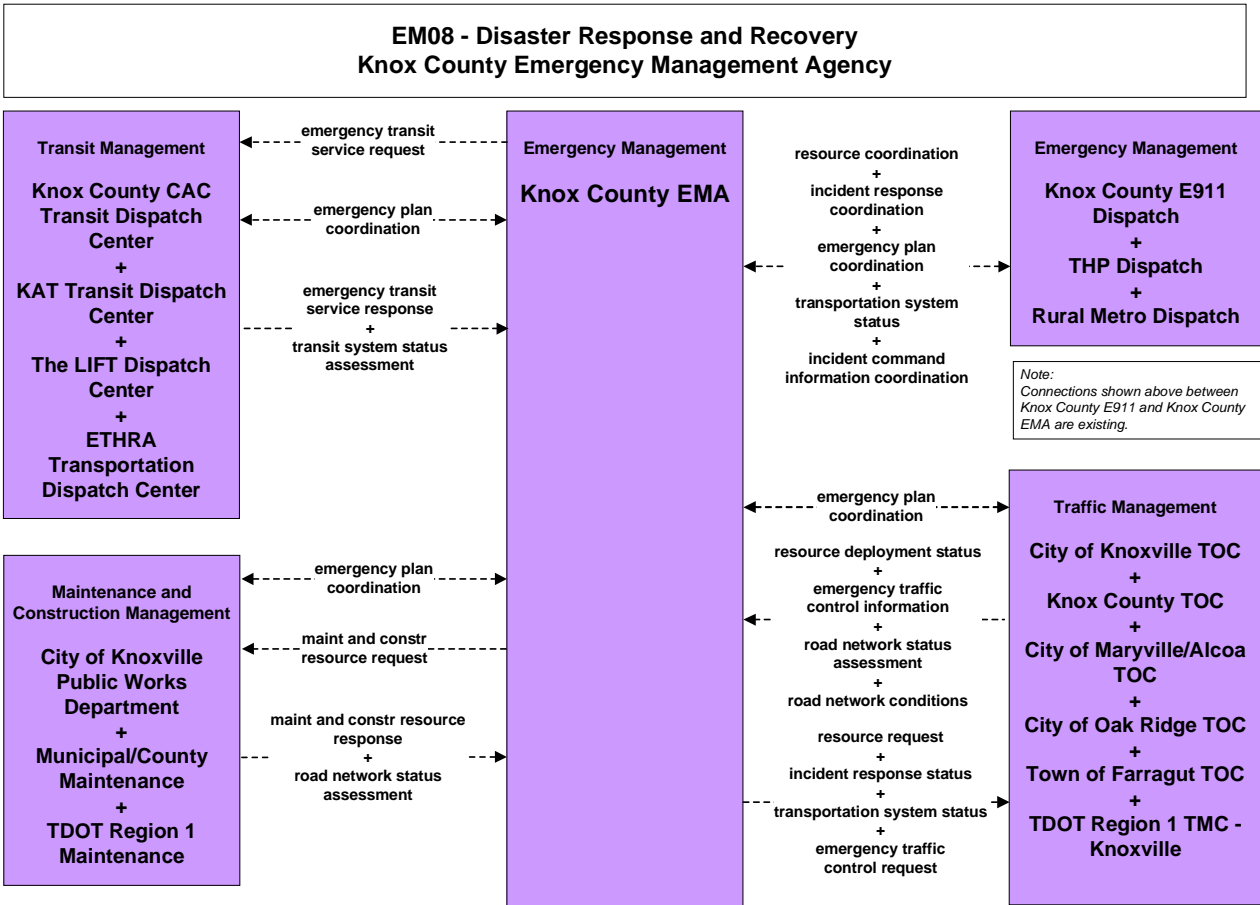
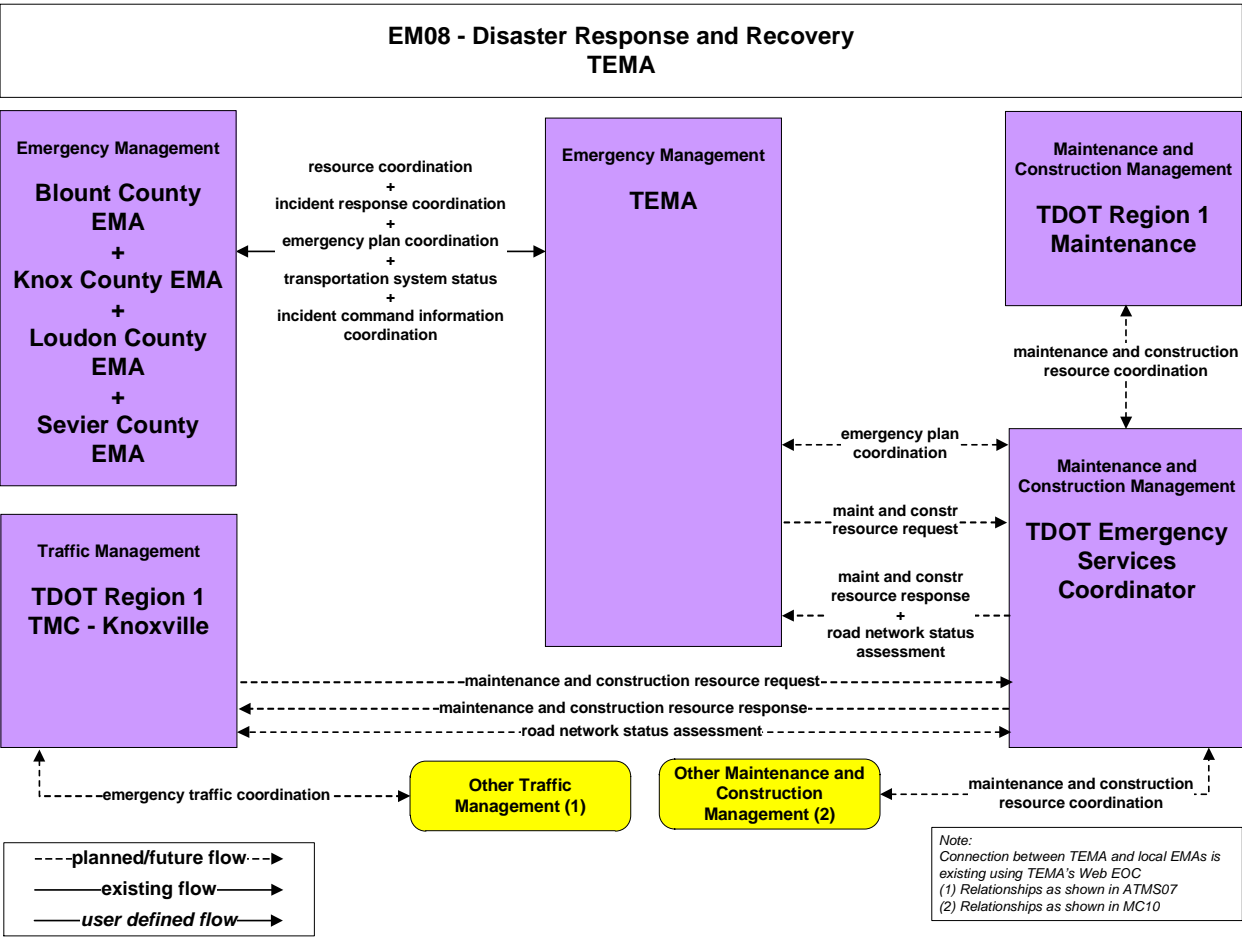


**EM04 – Roadway Service Patrols
HELP**

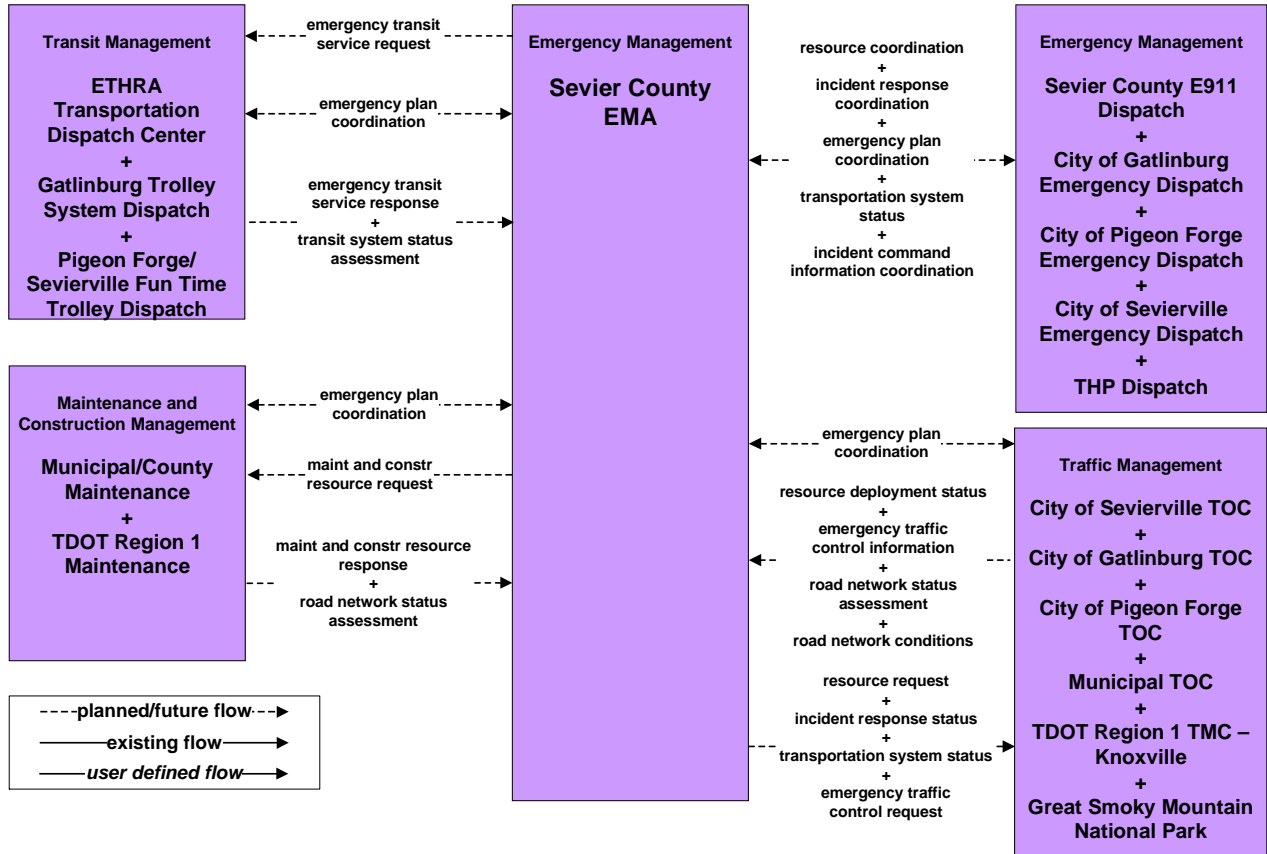


**EM06 - Wide-Area Alert
Tennessee AMBER and BLUE Alerts**

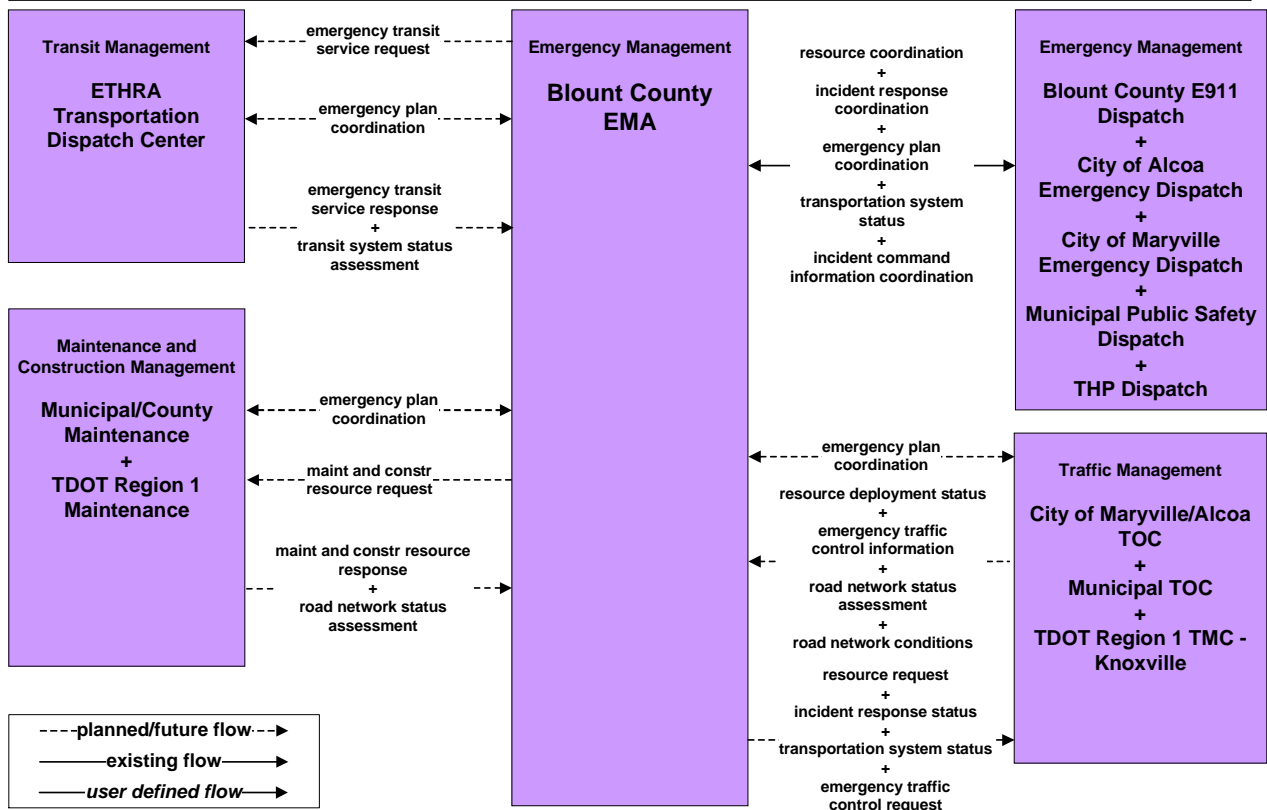




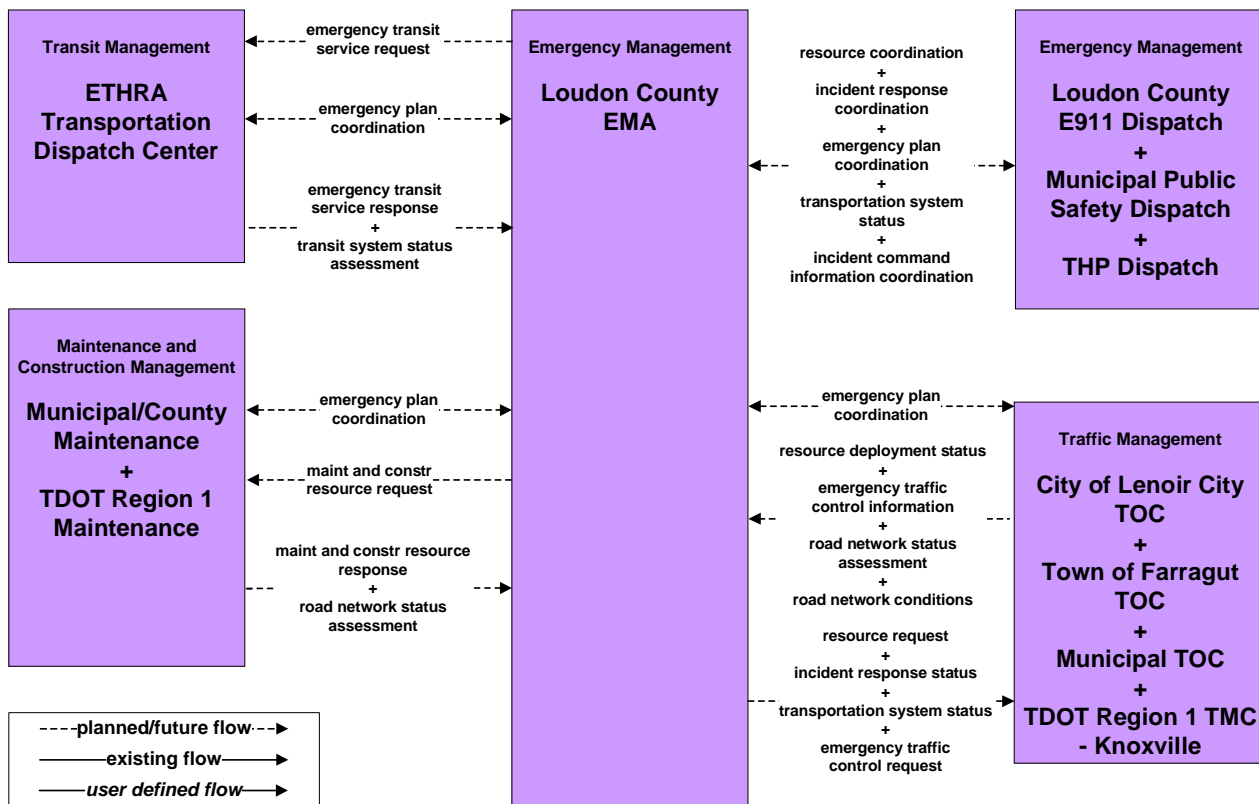
**EM08 - Disaster Response and Recovery
Sevier County Emergency Management Agency**



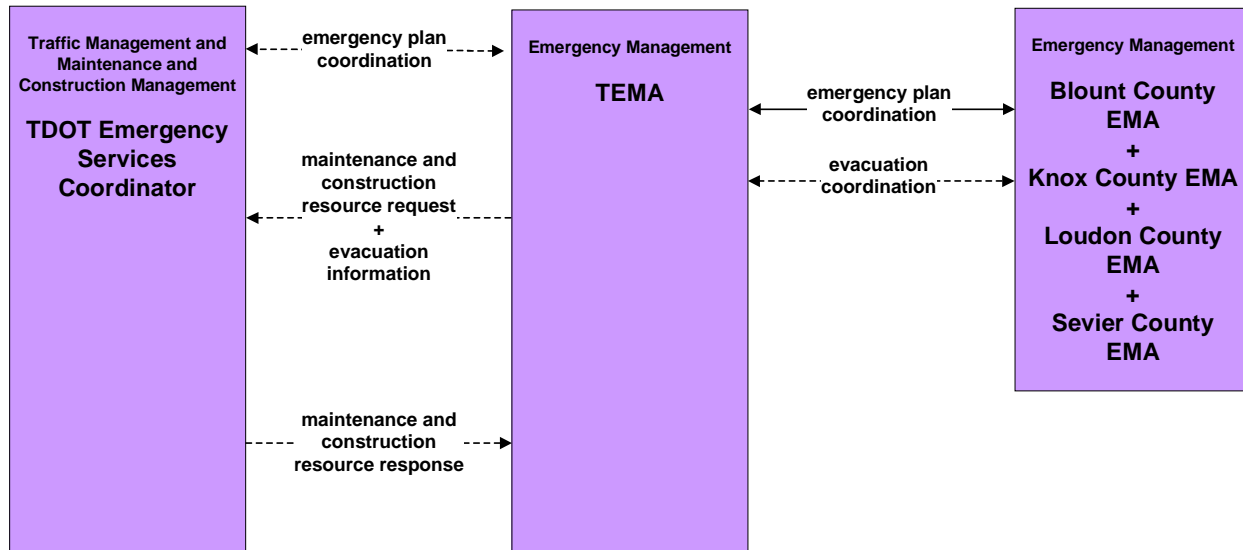
**EM08 - Disaster Response and Recovery
Blount County Emergency Management Agency**



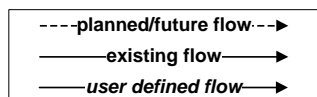
**EM08 - Disaster Response and Recovery
Loudon County Emergency Management Agency**



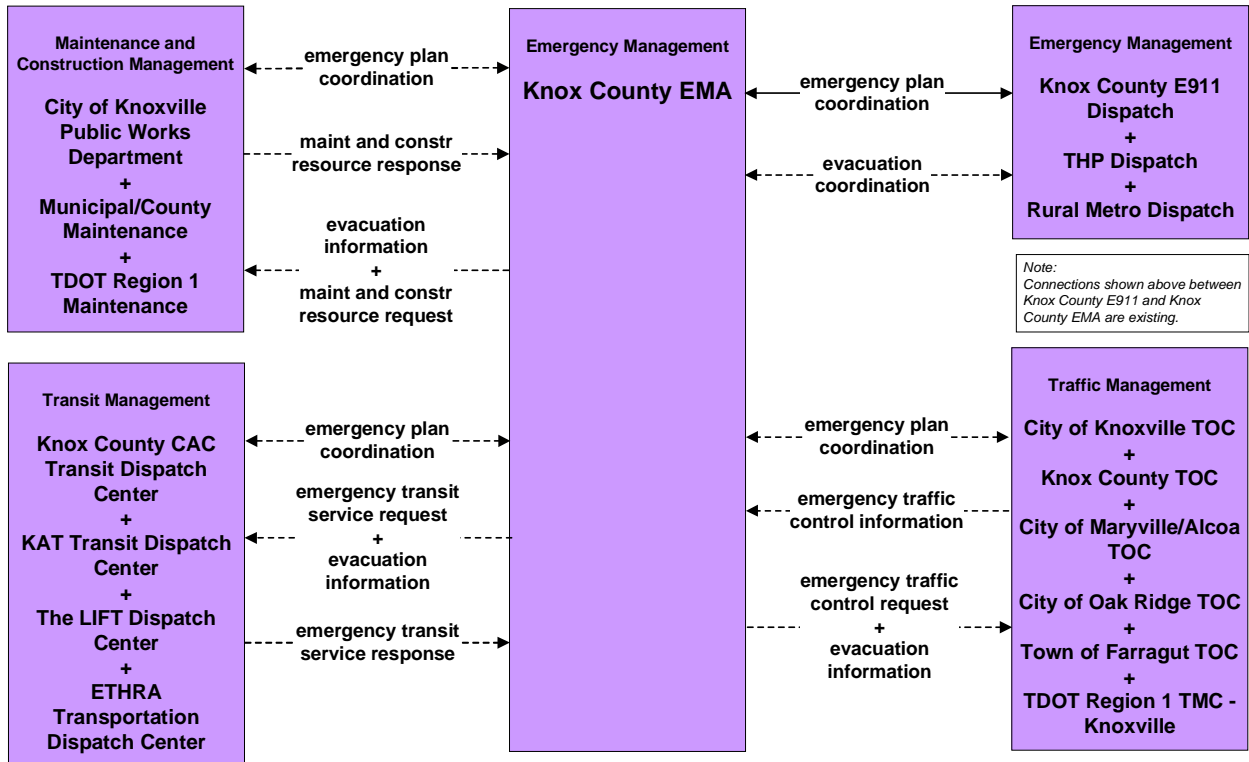
**EM09 - Evacuation and Reentry Management
TEMA**



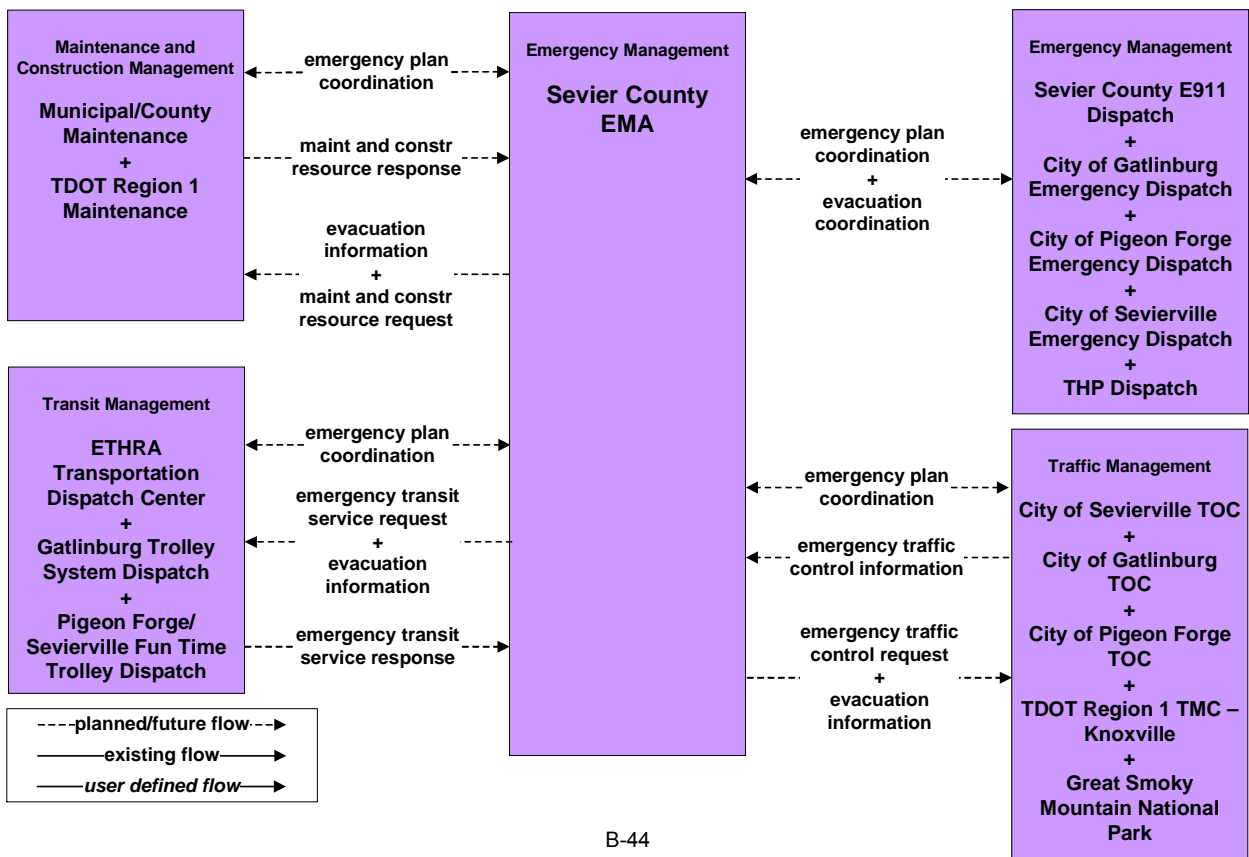
*Note:
Connection between TEMA and local EMAs is existing using TEMA's Web EOC*



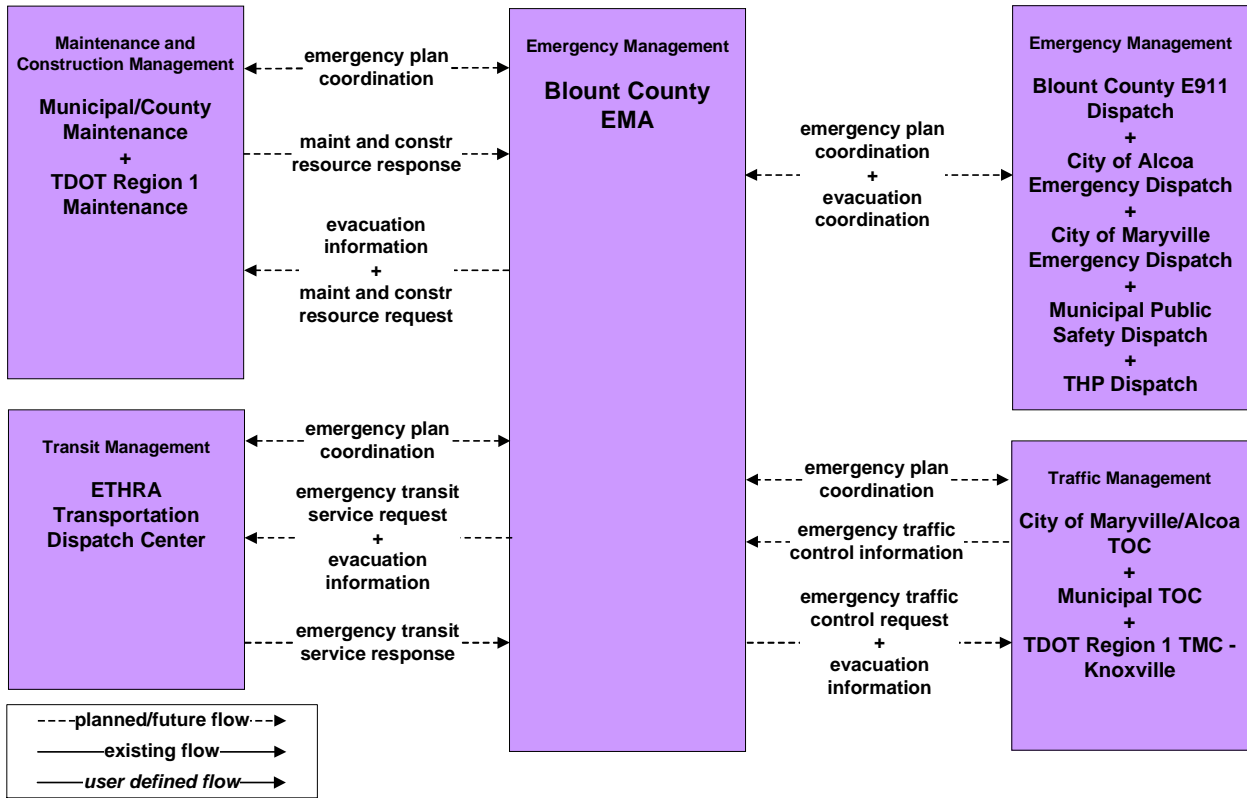
**EM09 - Evacuation and Reentry Management
Knox County Emergency Management Agency**



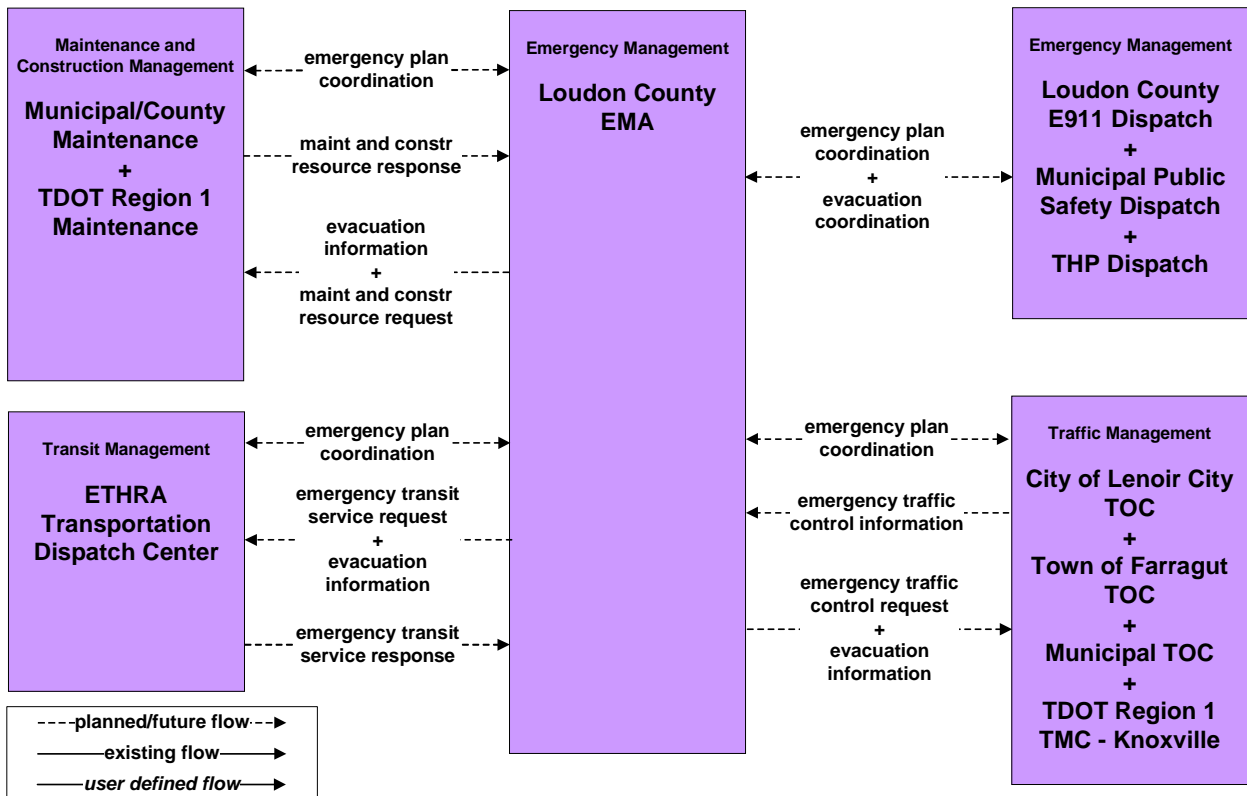
**EM09 - Evacuation and Reentry Management
Sevier County Emergency Management Agency**



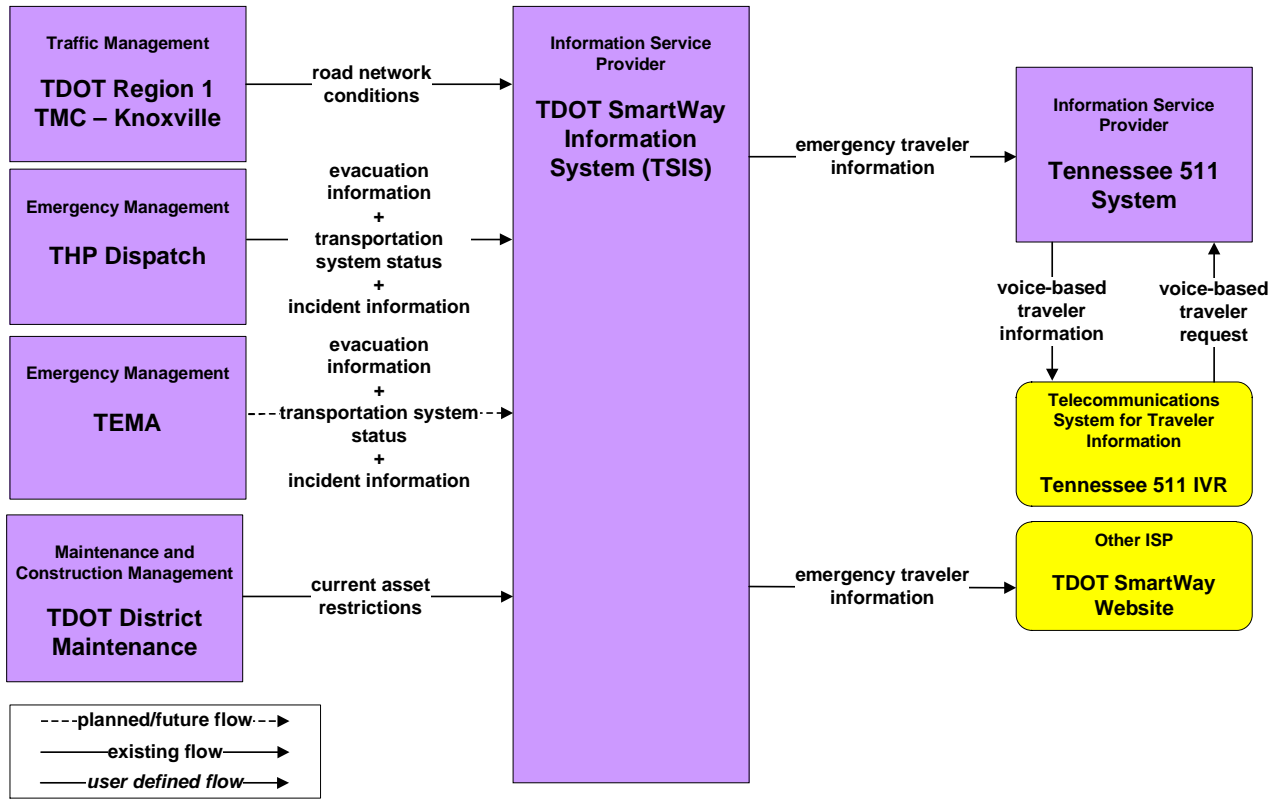
**EM09 - Evacuation and Reentry Management
Blount County Emergency Management Agency**



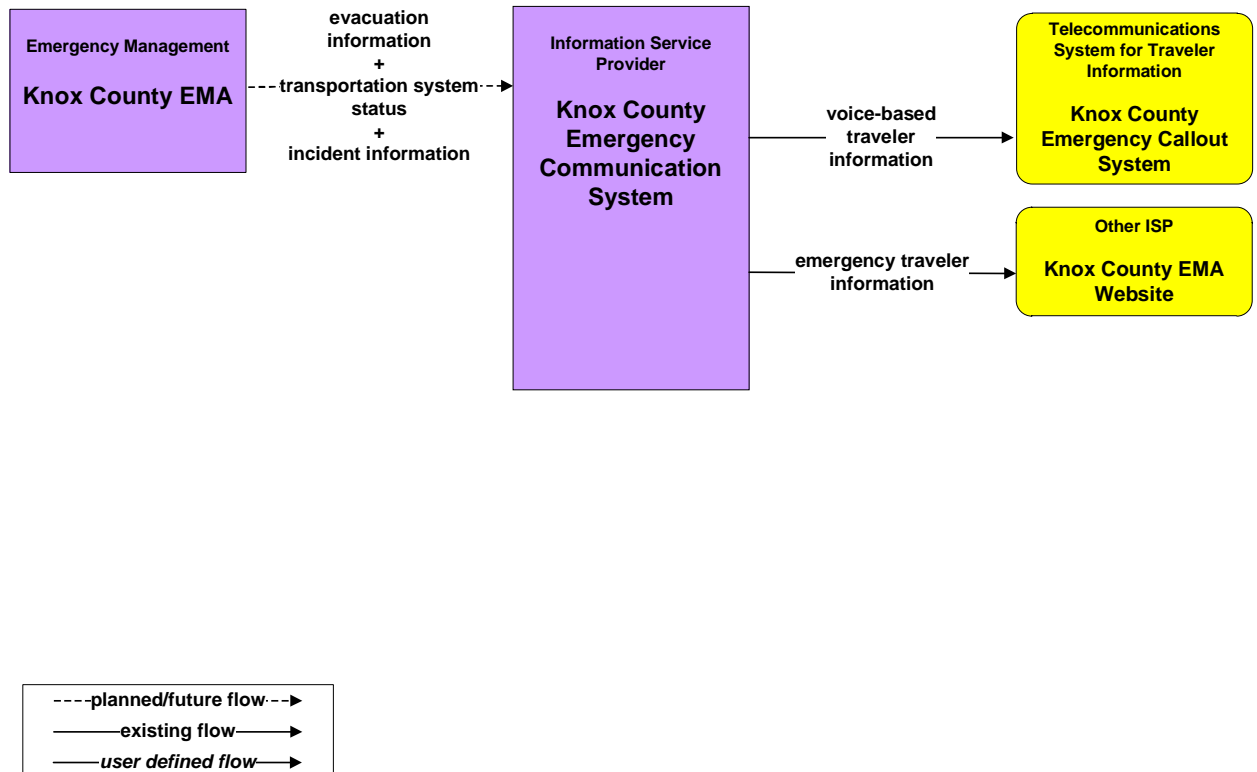
**EM09 - Evacuation and Reentry Management
Loudon County Emergency Management Agency**



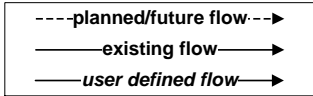
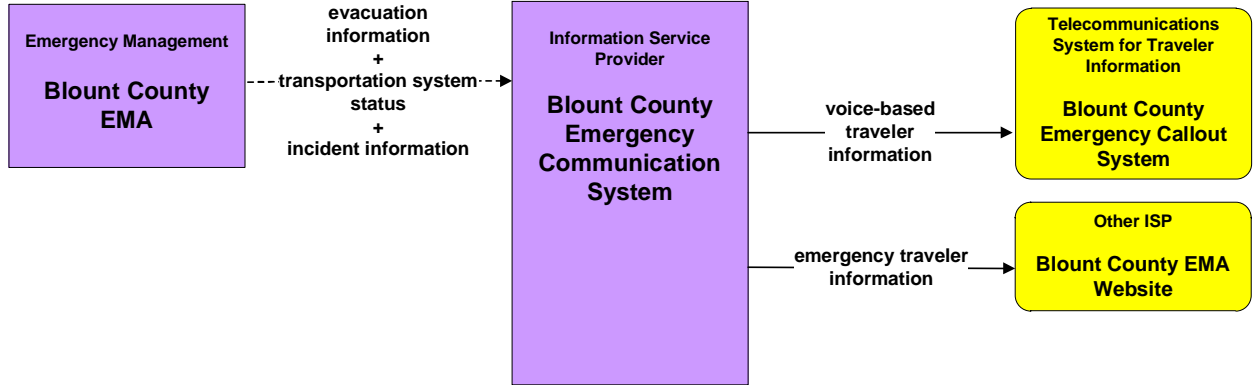
**EM10 – Disaster Traveler Information
Tennessee 511 and TSIS**



**EM10 – Disaster Traveler Information
Knox County**

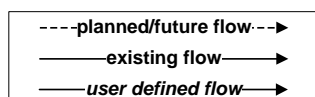


**EM10 – Disaster Traveler Information
Blount County**

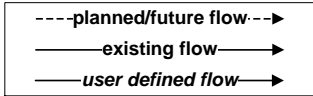


Maintenance and Construction Management

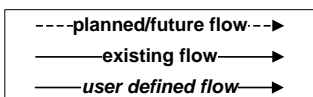
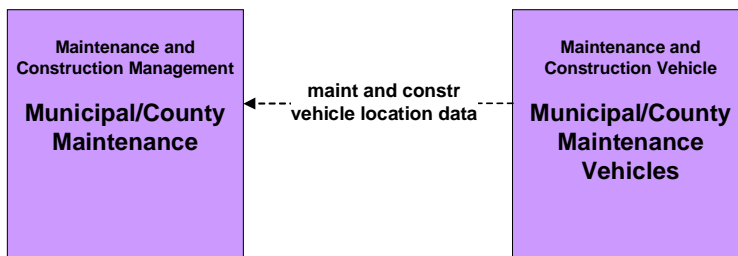
MC01 – Maintenance and Construction Vehicle and Equipment Tracking
TDOT District Maintenance



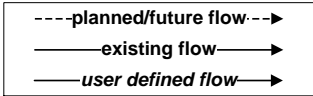
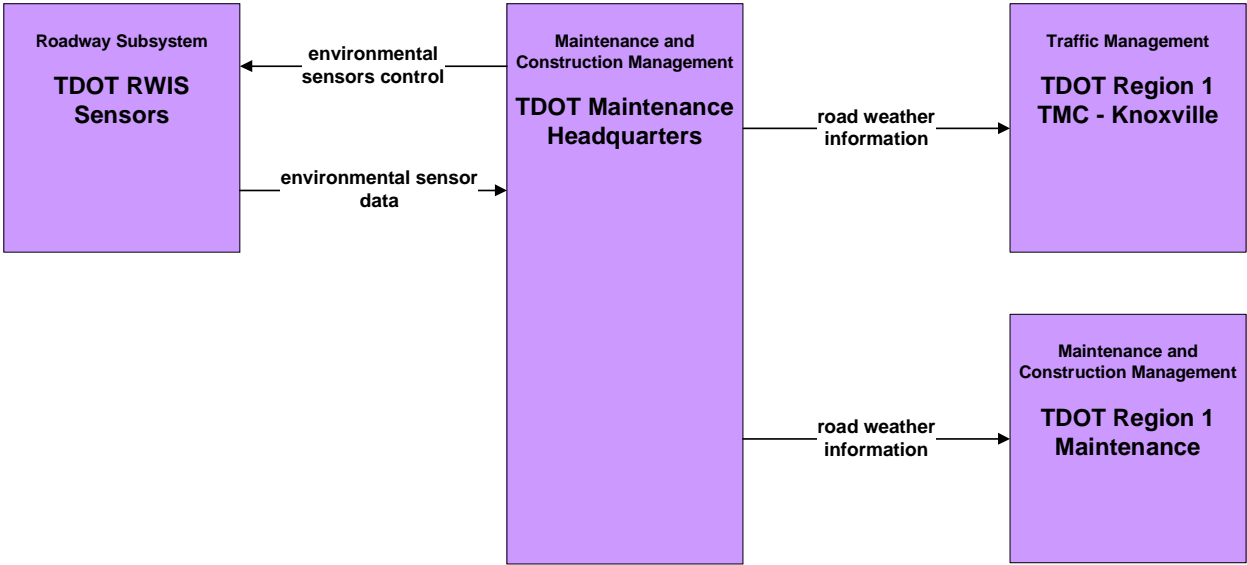
**MC01 – Maintenance and Construction Vehicle and Equipment Tracking
City of Knoxville**



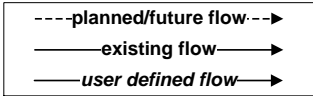
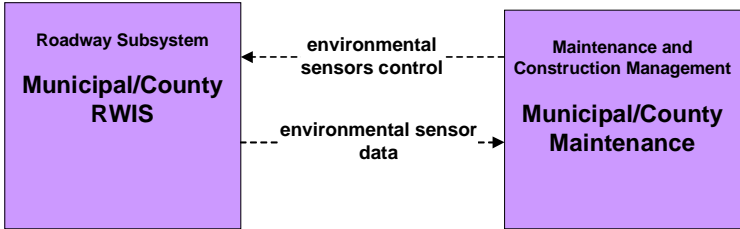
**MC01 – Maintenance and Construction Vehicle and Equipment Tracking
Municipal/County**



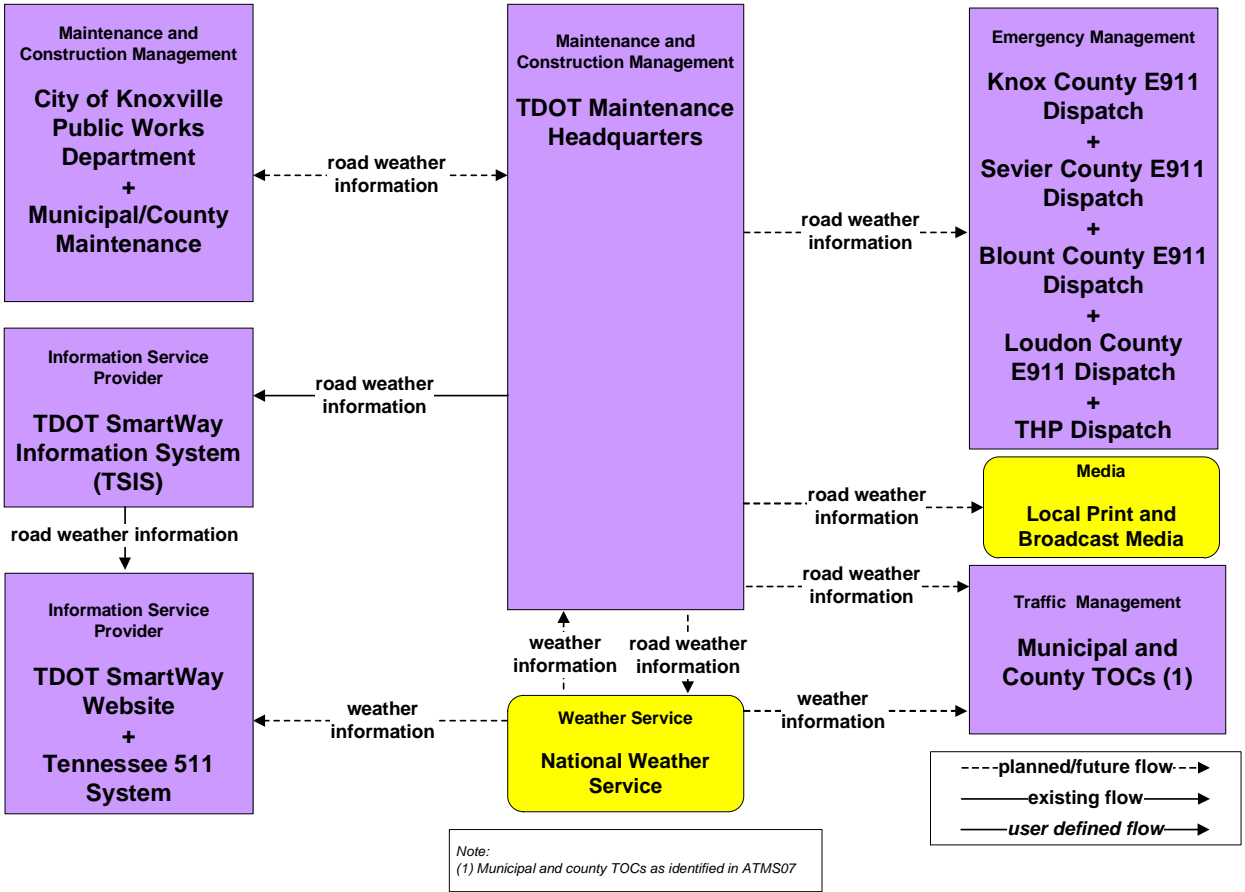
**MC03 – Road Weather Data Collection
TDOT RWIS**



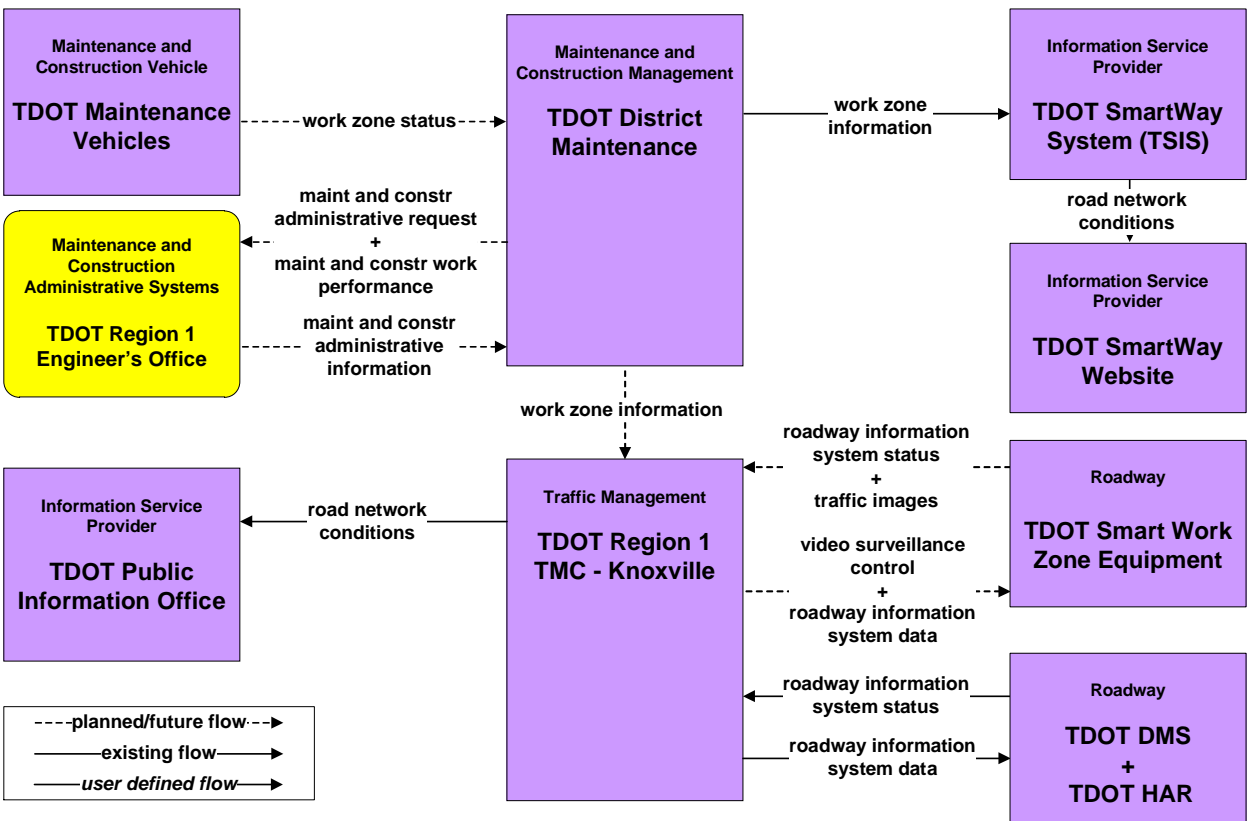
**MC03 – Road Weather Data Collection
Municipal/County**



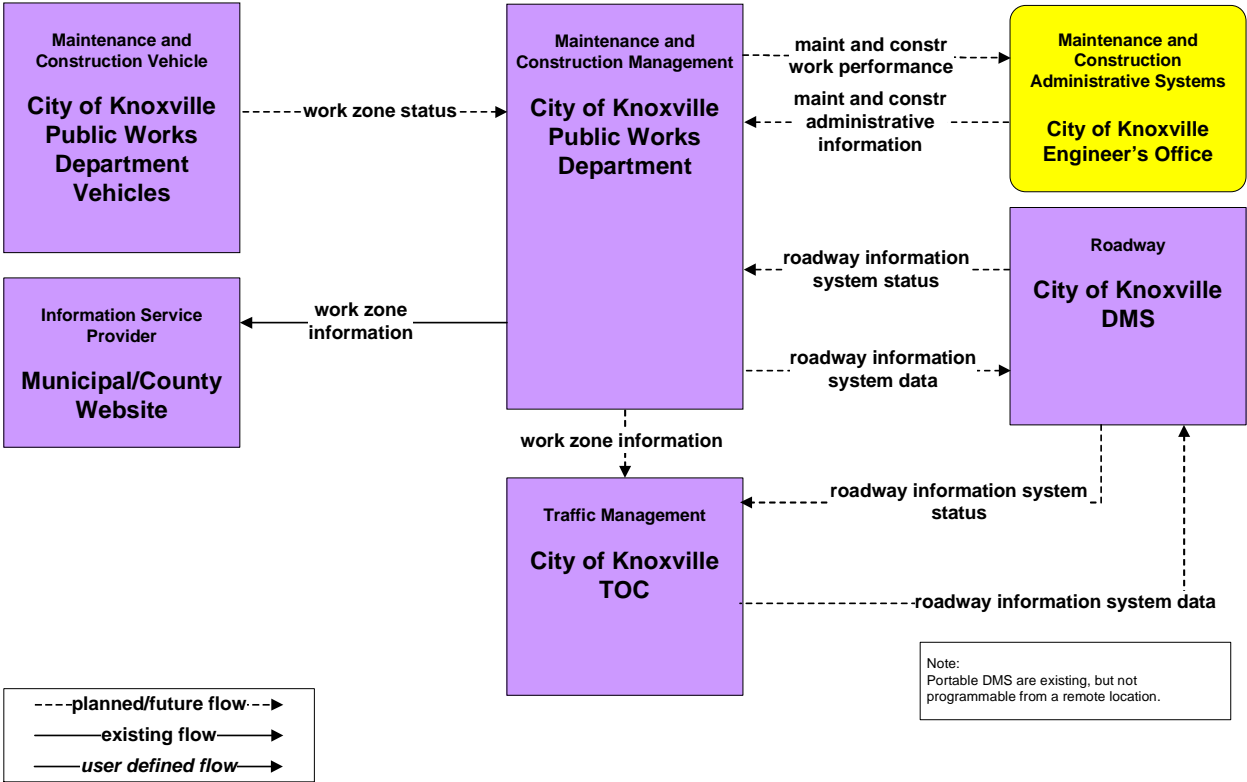
**MC04 – Weather Information Processing and Distribution
TDOT Maintenance Headquarters**



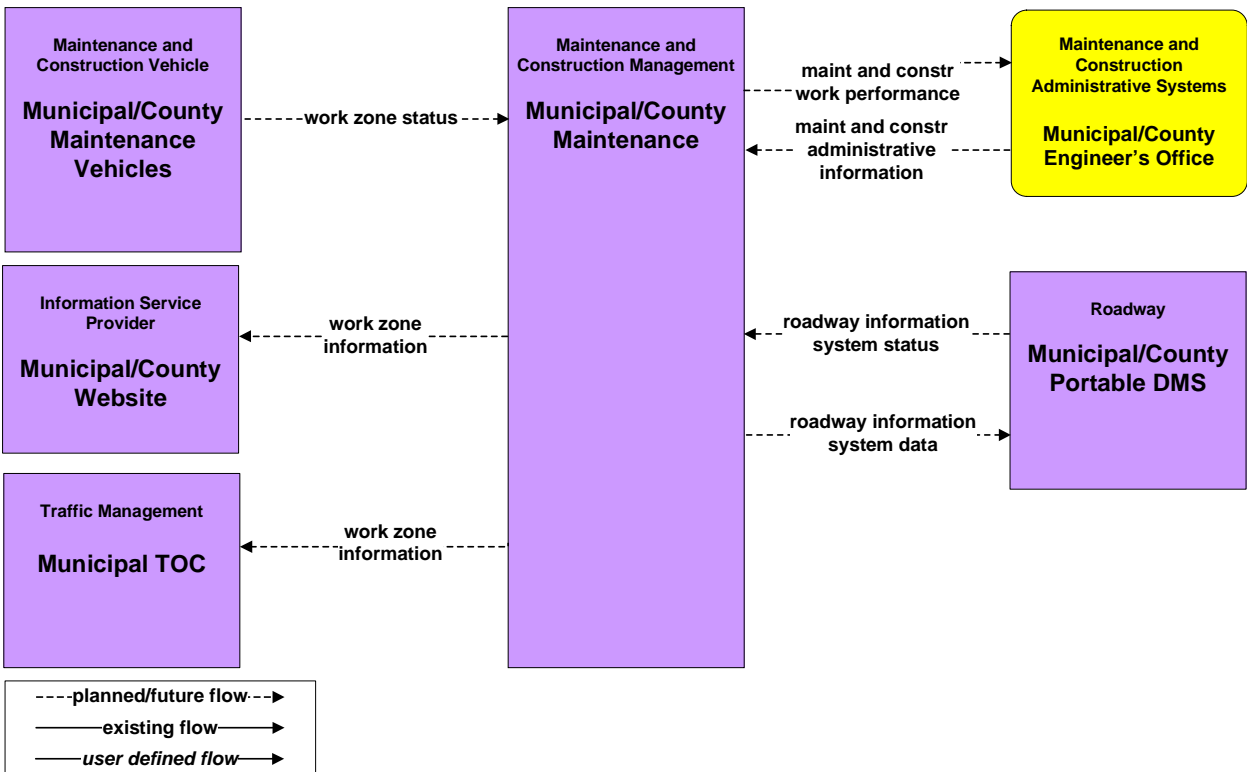
**MC08 – Work Zone Management
TDOT District Maintenance**



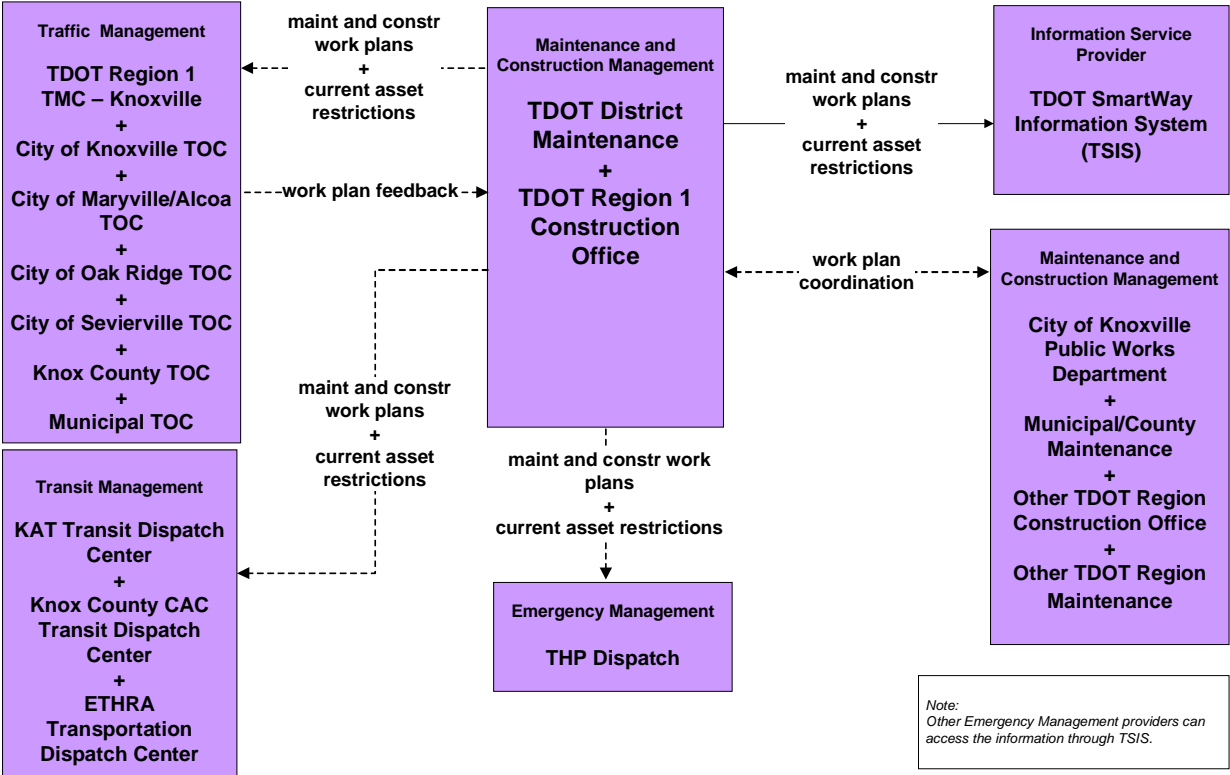
**MC08 – Work Zone Management
City of Knoxville**



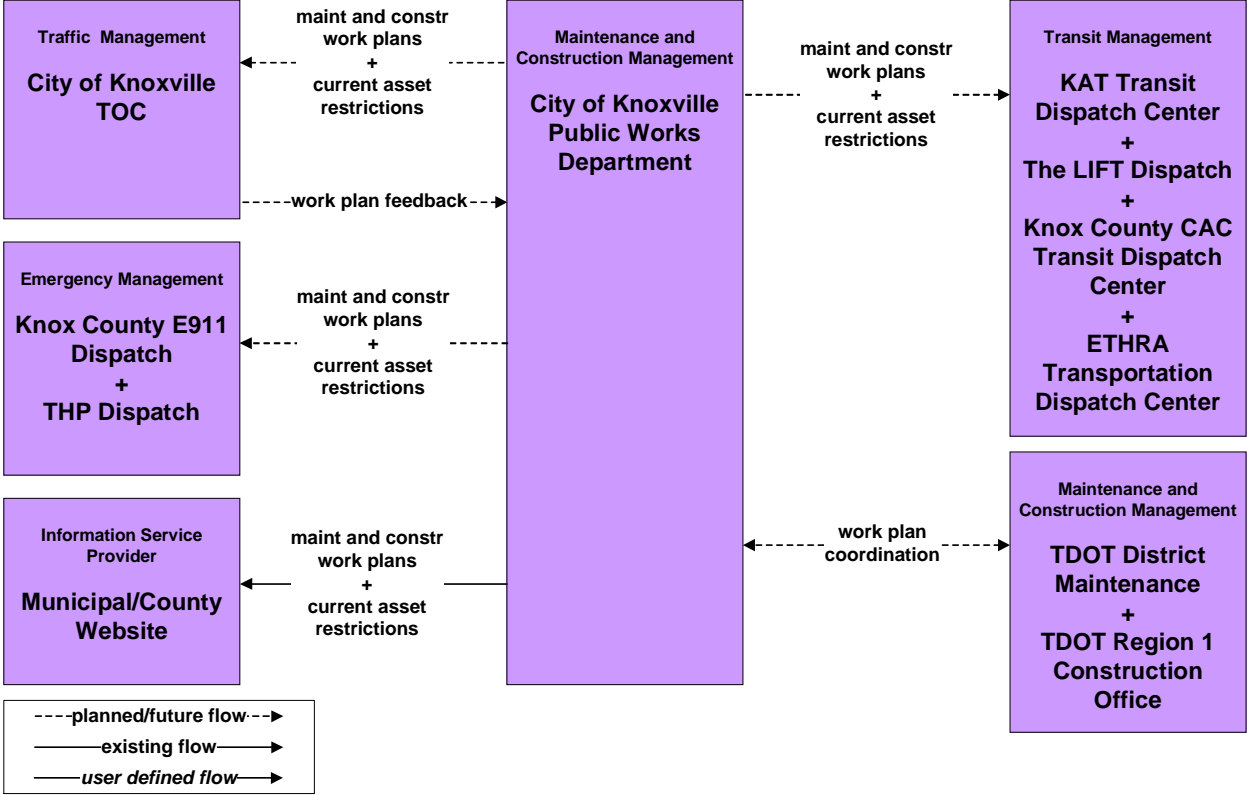
**MC08 – Work Zone Management
Municipal/County**



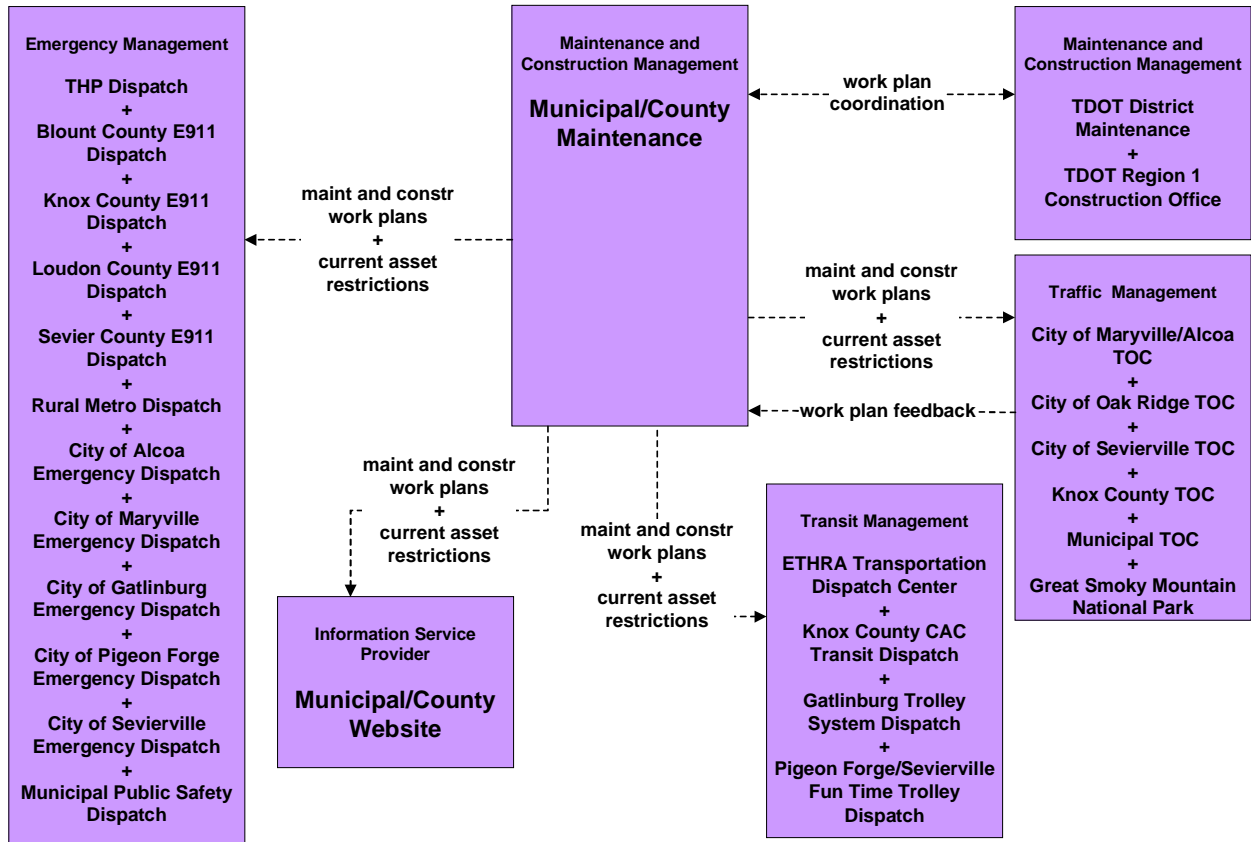
**MC10 – Maintenance and Construction Activity Coordination
TDOT**



**MC10 – Maintenance and Construction Activity Coordination
City of Knoxville**

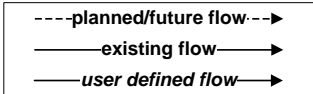
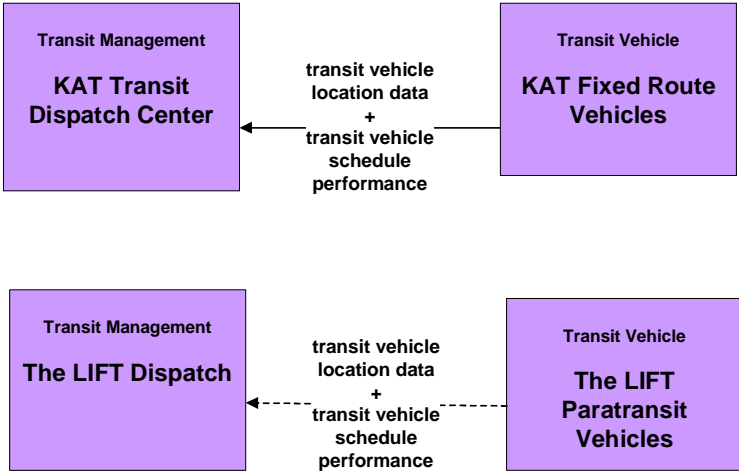


**MC10 – Maintenance and Construction Activity Coordination
Municipal/County Maintenance**

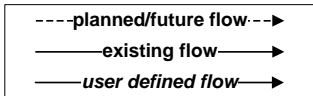
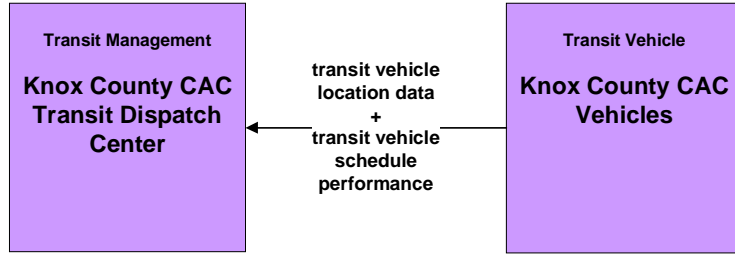


Advanced Public Transportation Systems

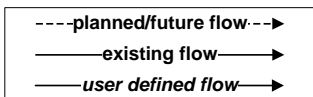
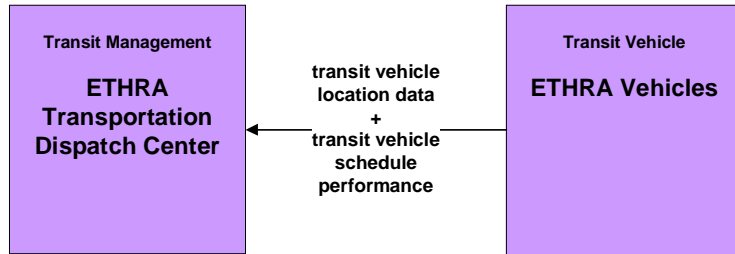
**APTS01 – Transit Vehicle Tracking
Knoxville Area Transit**



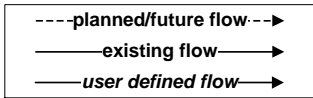
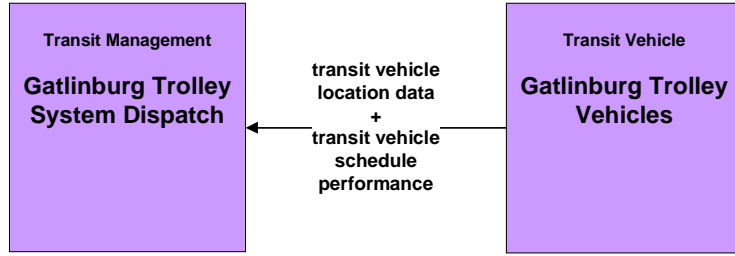
**APTS01 – Transit Vehicle Tracking
Knox County CAC Transit**



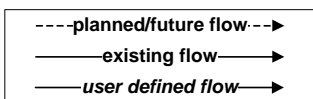
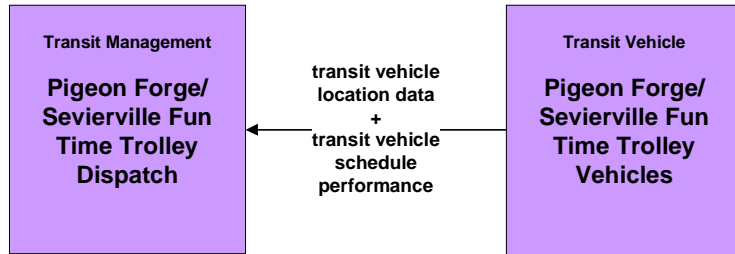
**APTS01 – Transit Vehicle Tracking
ETHRA Transportation**



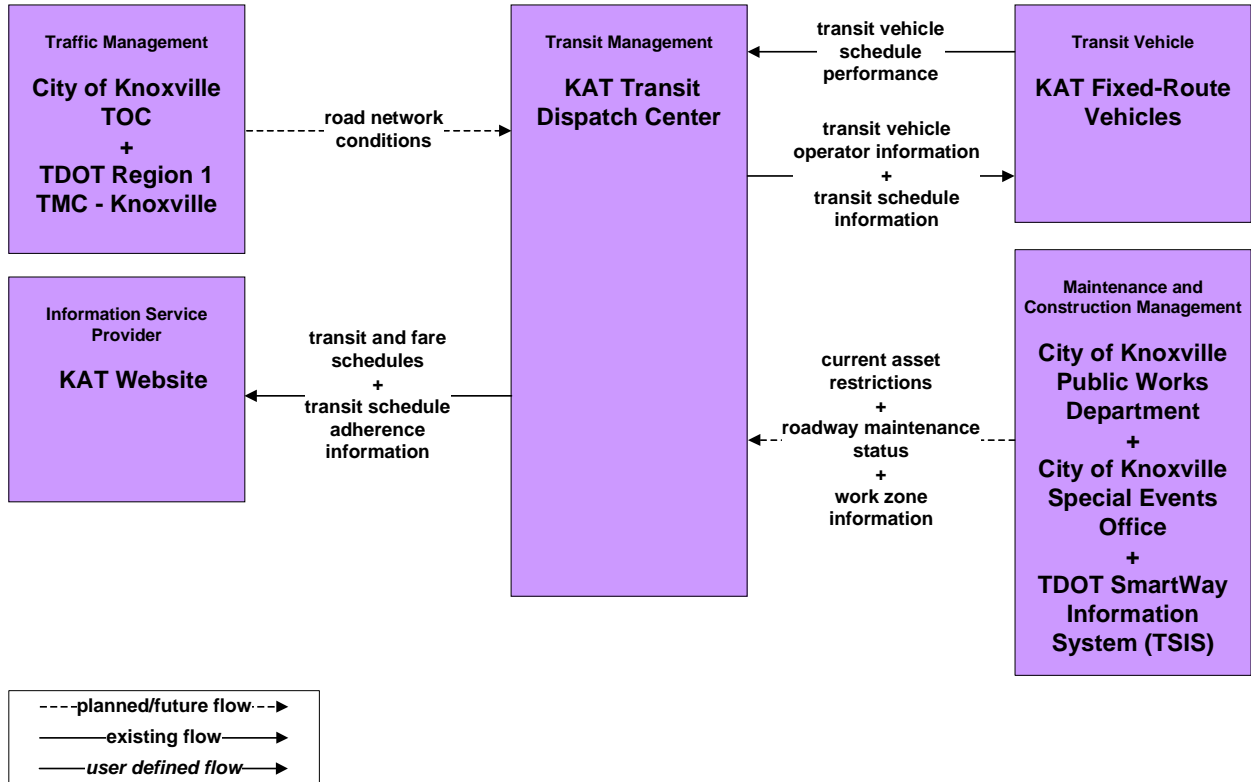
**APTS01 – Transit Vehicle Tracking
Gatlinburg Trolley System**



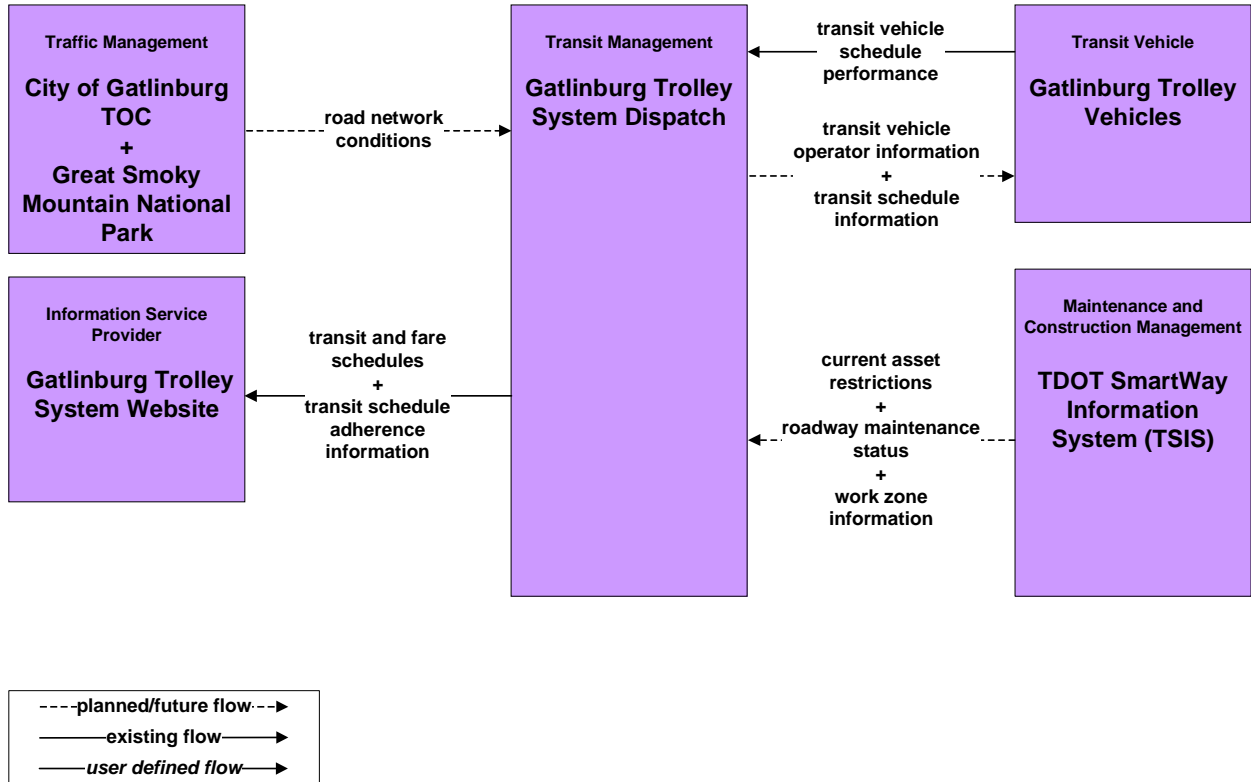
**APTS01 – Transit Vehicle Tracking
Pigeon Forge/Sevierville Fun Time Trolley**



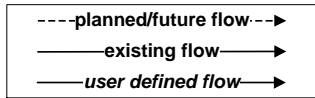
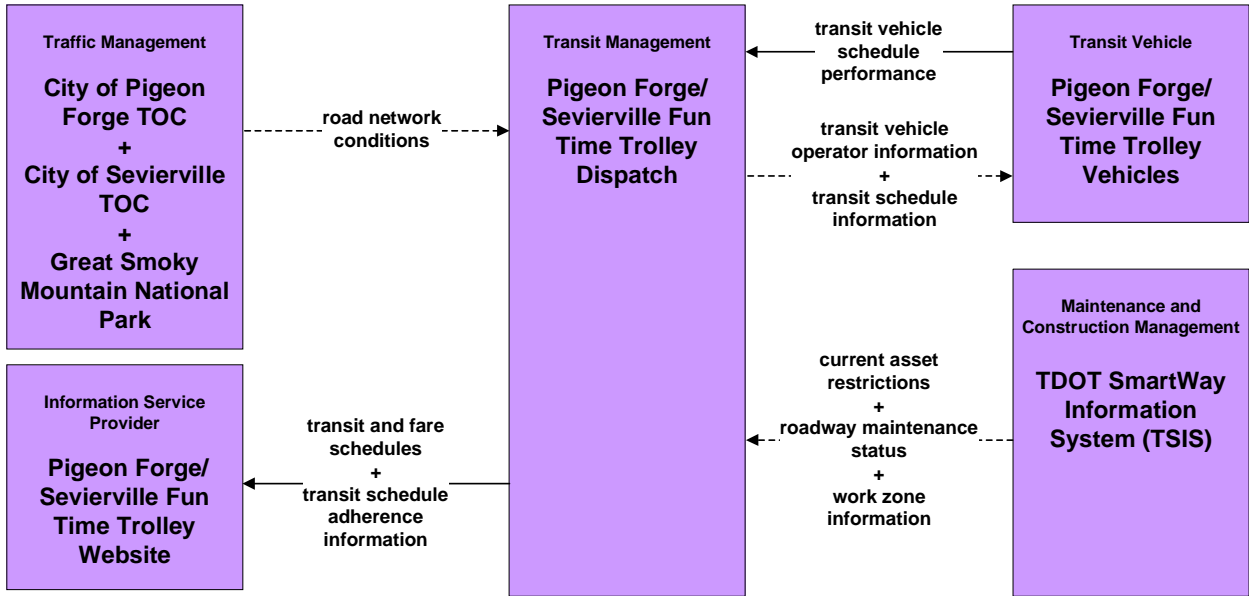
**APTS02 – Transit Fixed-Route Operations
Knoxville Area Transit**



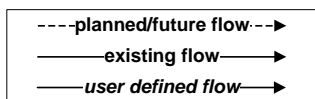
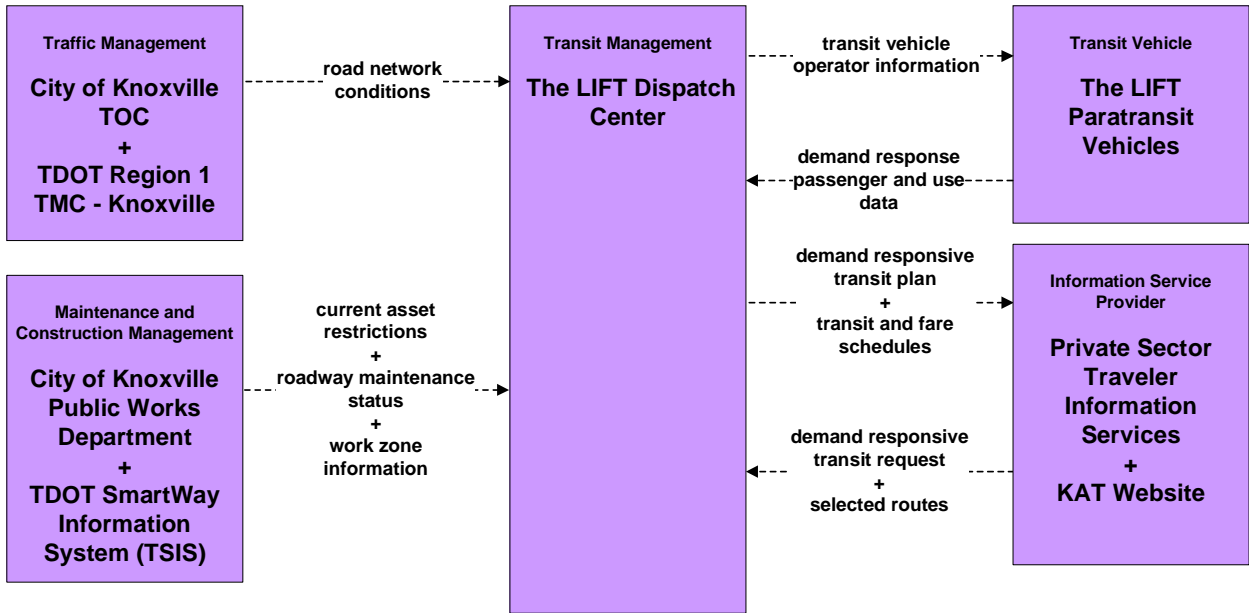
**APTS02 – Transit Fixed-Route Operations
Gatlinburg Trolley System**



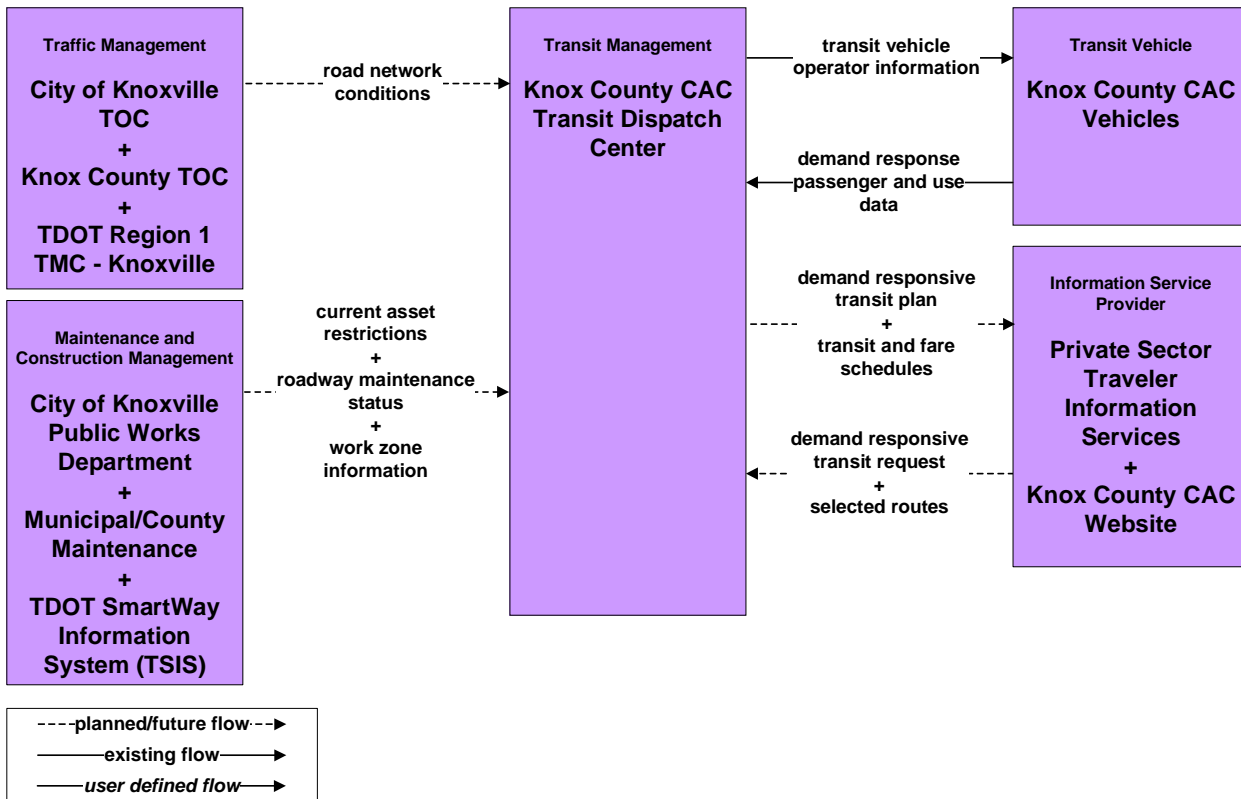
**APTS02 – Transit Fixed-Route Operations
Pigeon Forge/Sevierville Fun Time Trolley**



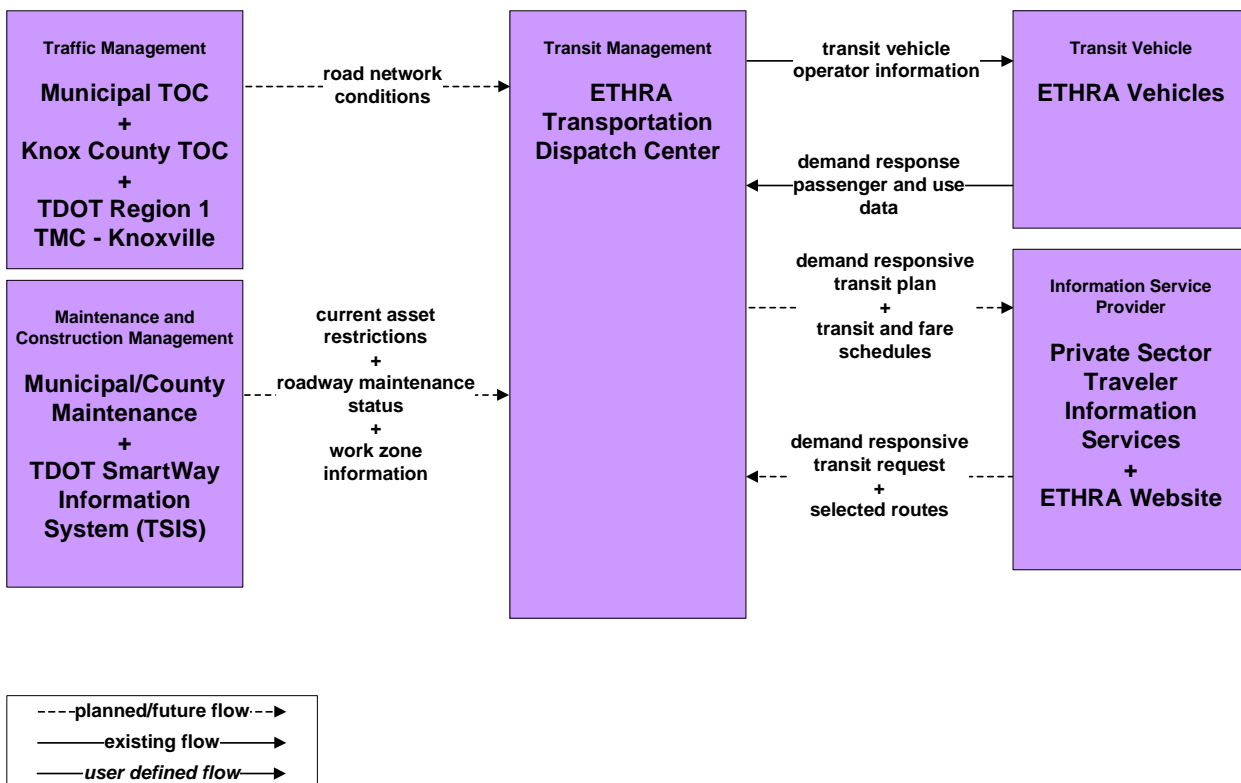
**APTS03 – Demand Response Transit Operations
Knoxville Area Transit**



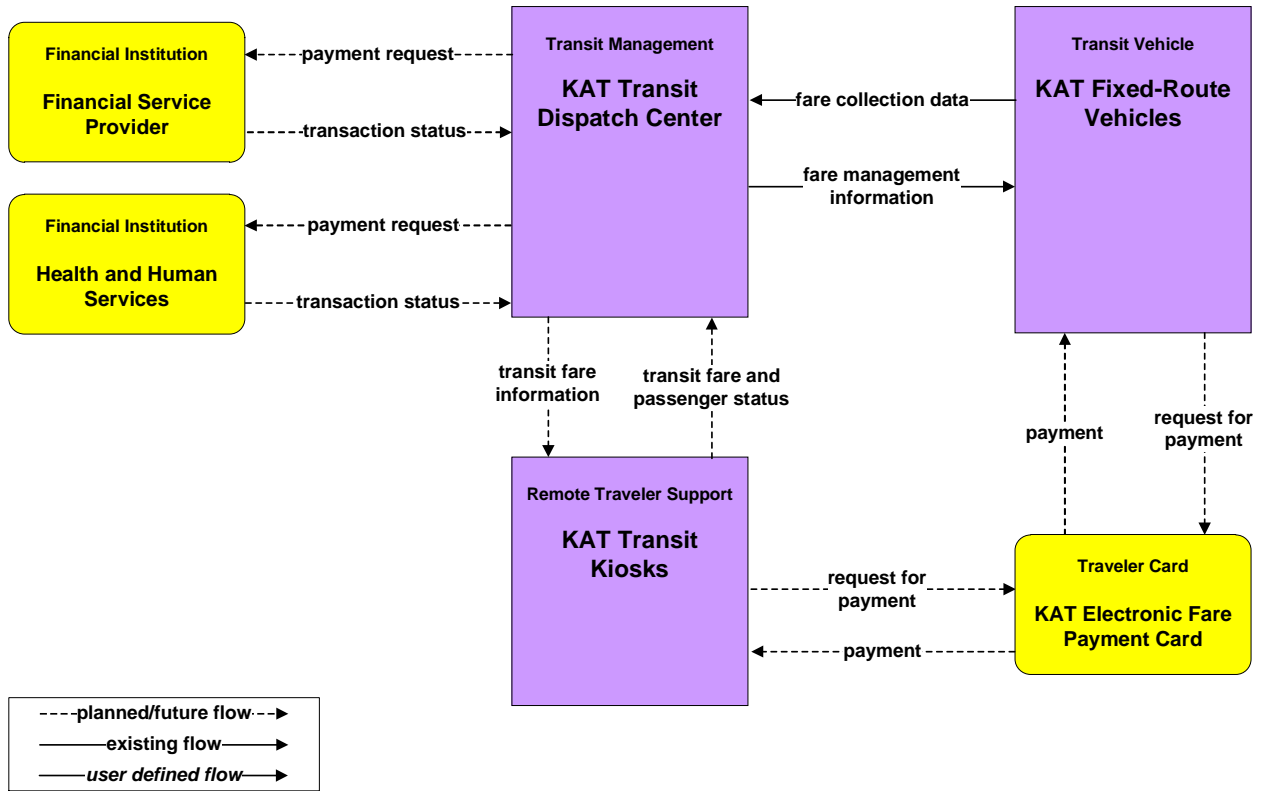
**APTS03 – Demand Response Transit Operations
Knox County CAC Transit**



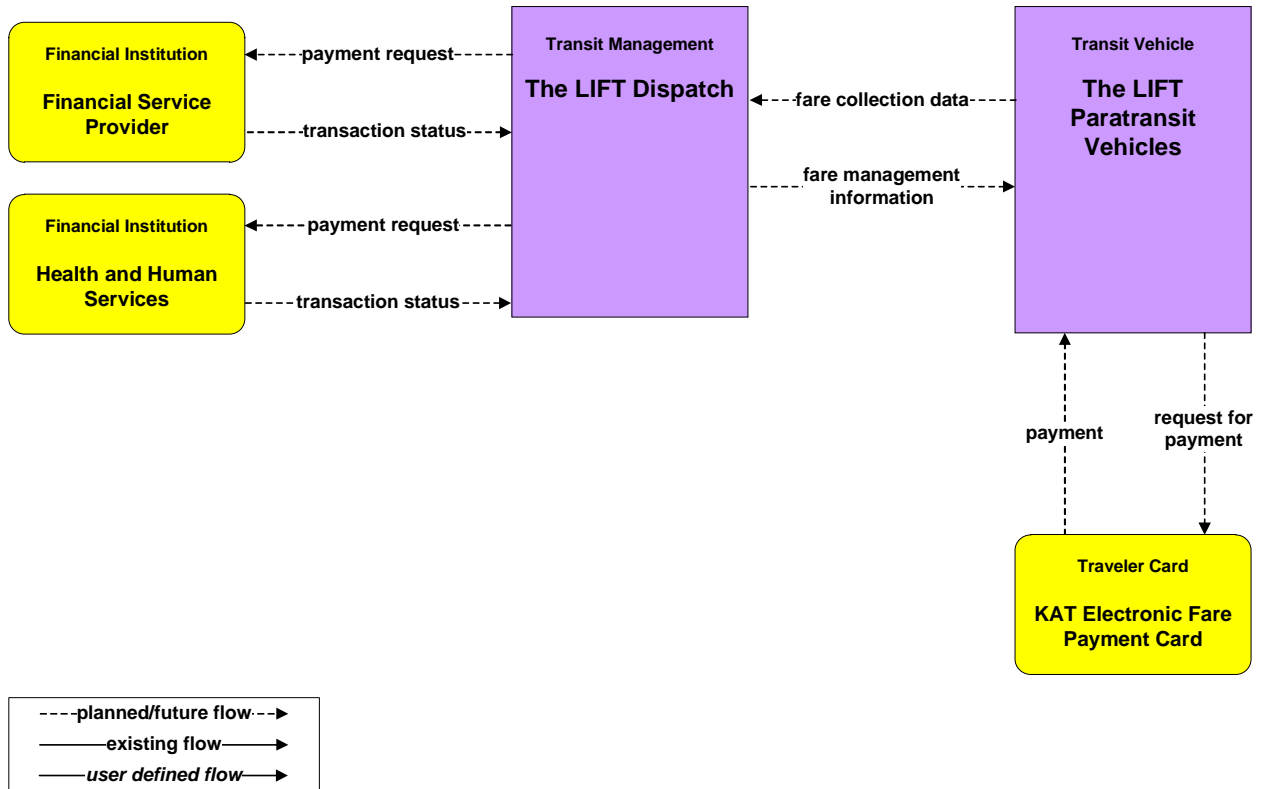
**APTS03 – Demand Response Transit Operations
ETHRA Transportation**



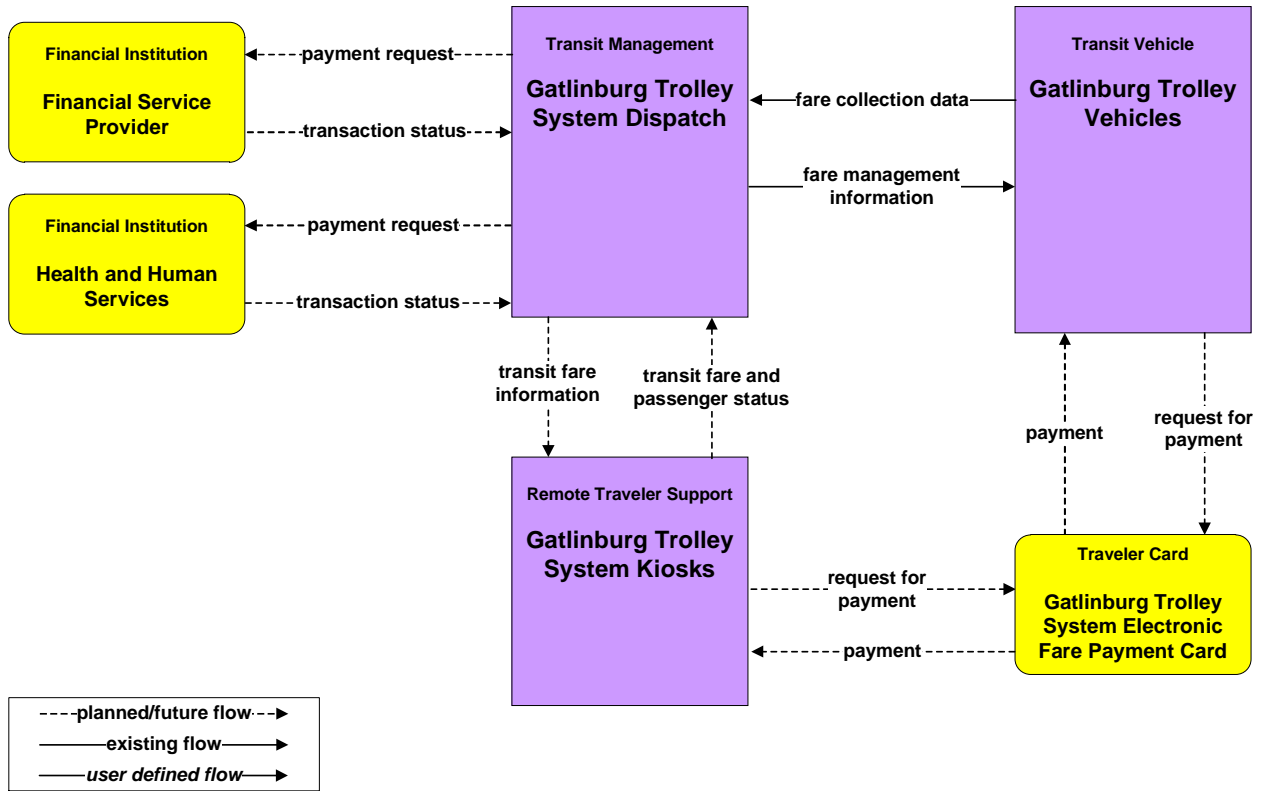
**APTS04 – Transit Fare Collection Management
Knoxville Area Transit**



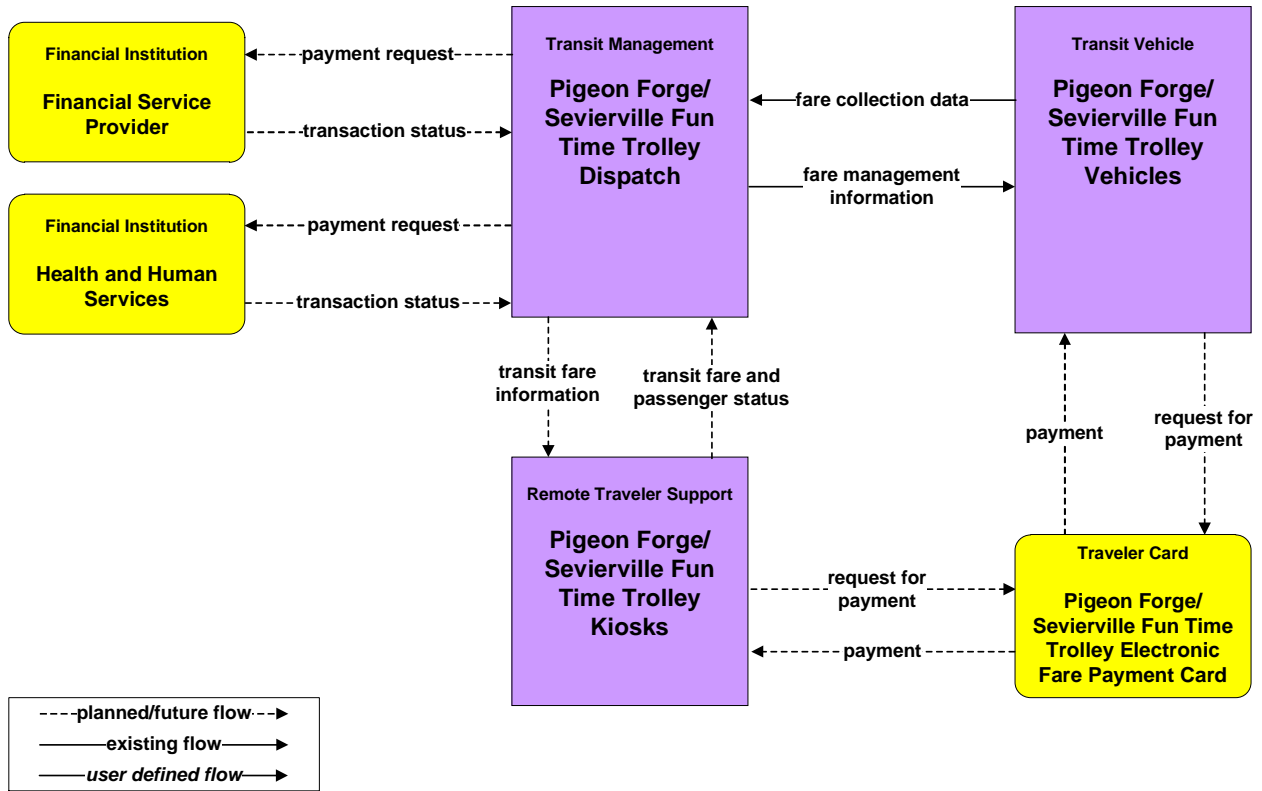
**APTS04 – Transit Fare Collection Management
Knoxville Area Transit**



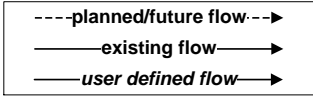
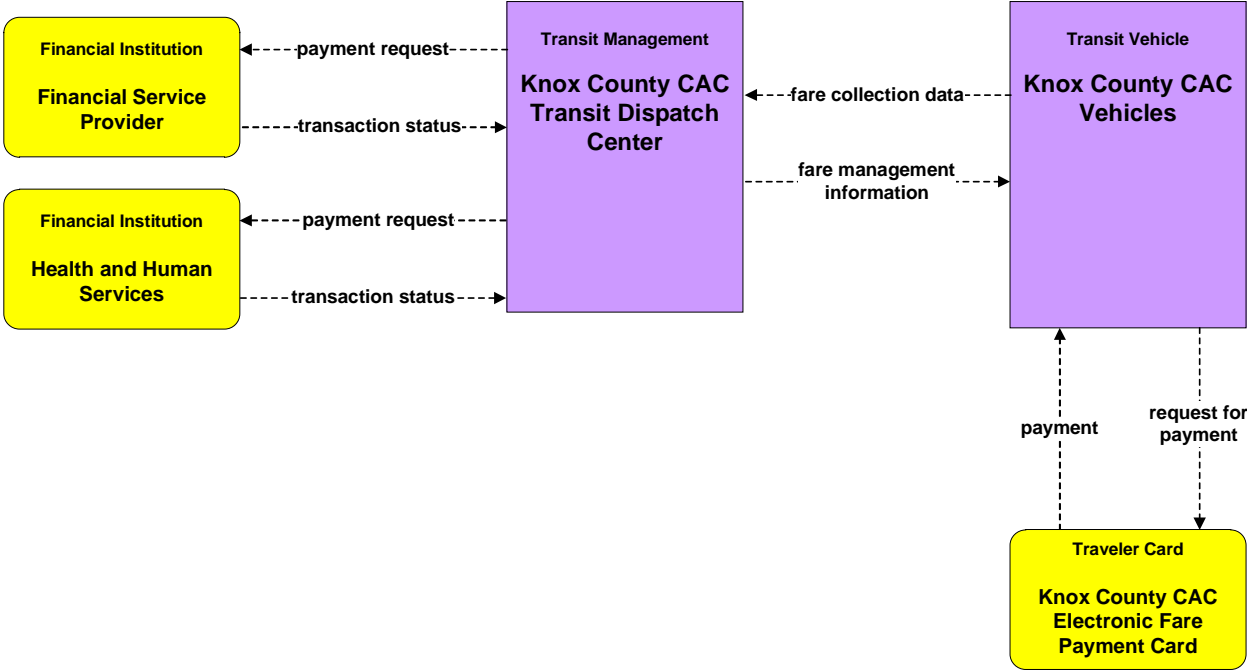
**APTS04 – Transit Fare Collection Management
Gatlinburg Trolley System**



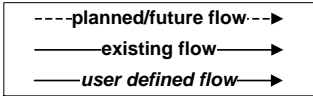
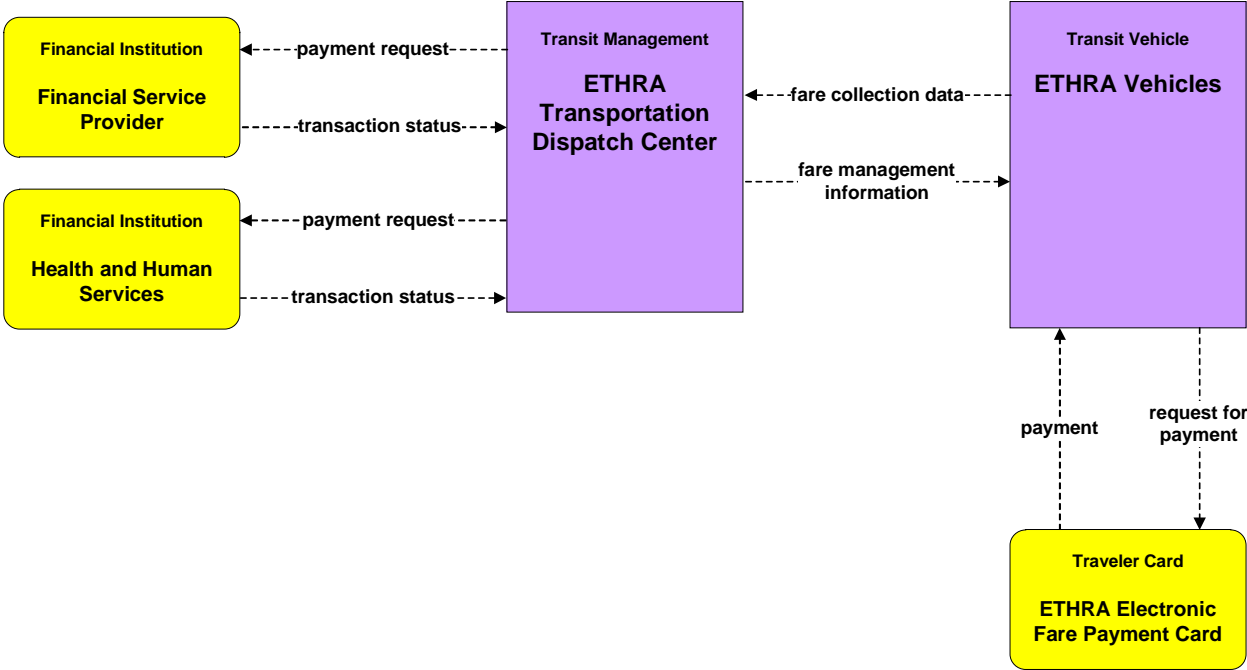
**APTS04 – Transit Fare Collection Management
Pigeon Forge/Sevierville Fun Time Trolley**



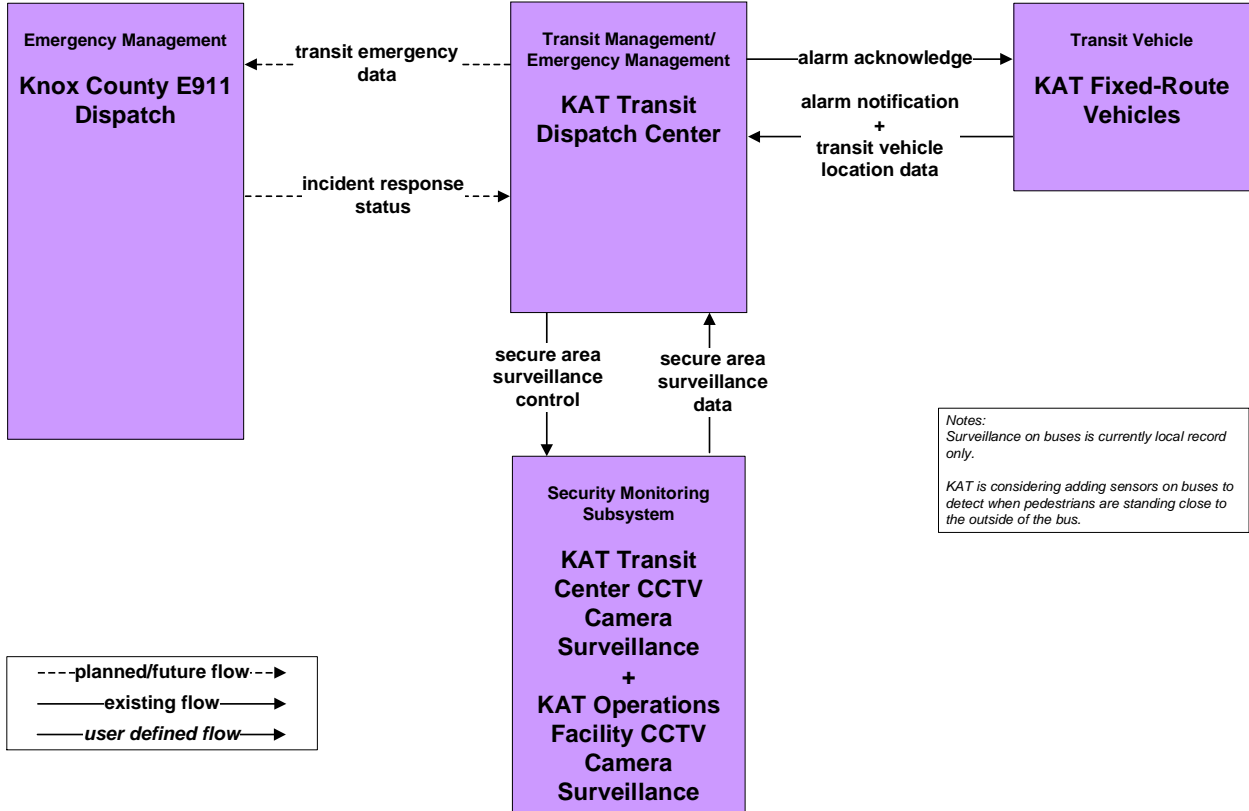
**APTS04 – Transit Fare Collection Management
Knox County CAC Transit**



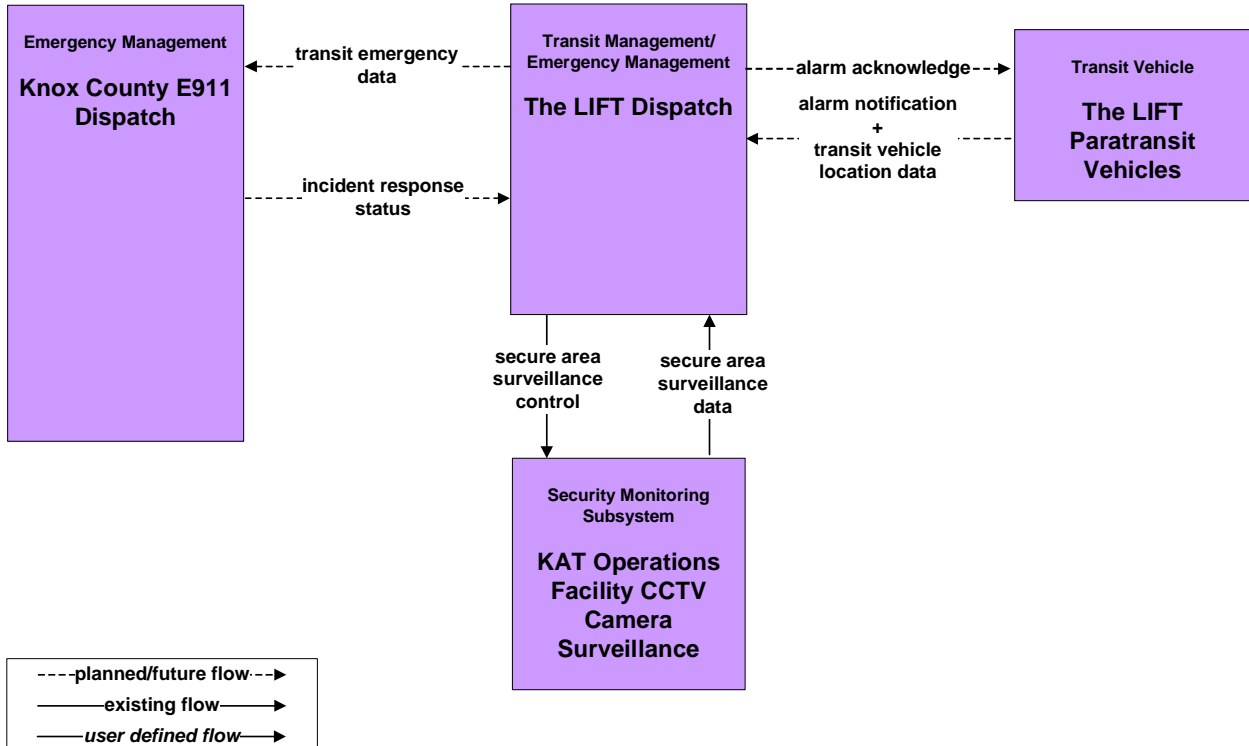
**APTS04 – Transit Fare Collection Management
ETHRA Transportation**



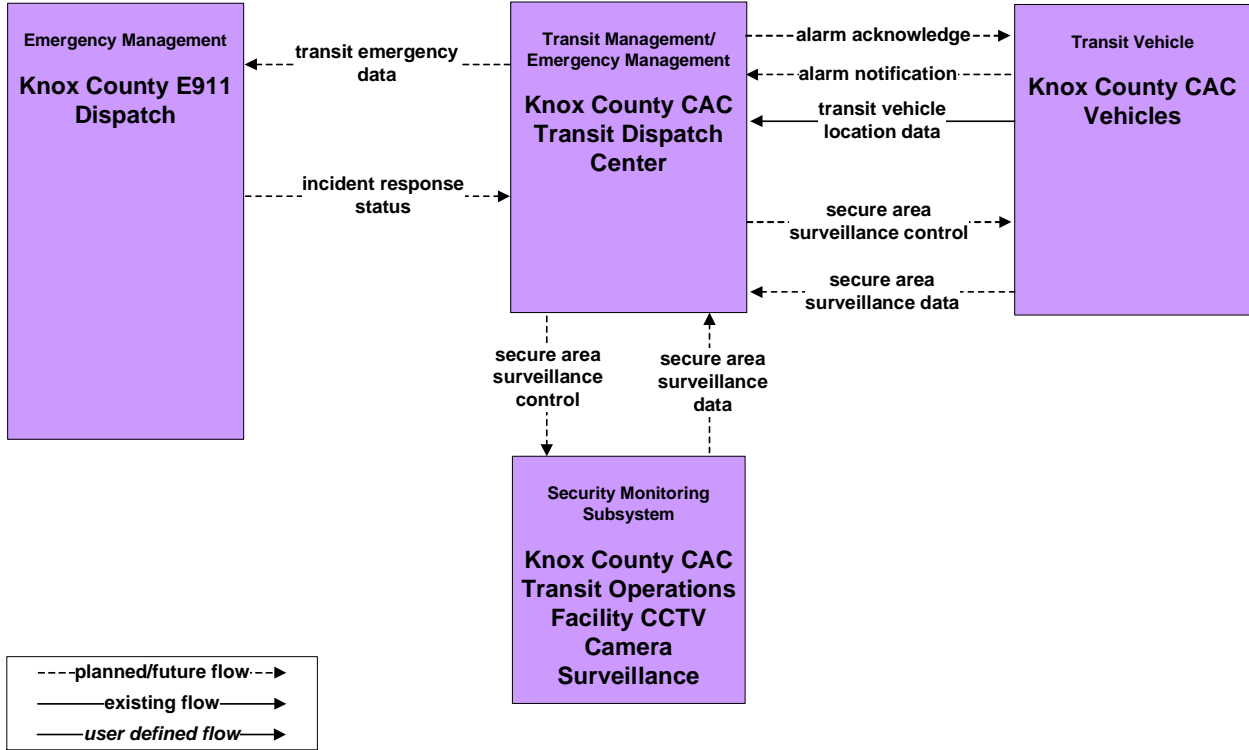
**APTS05 – Transit Security
Knoxville Area Transit**



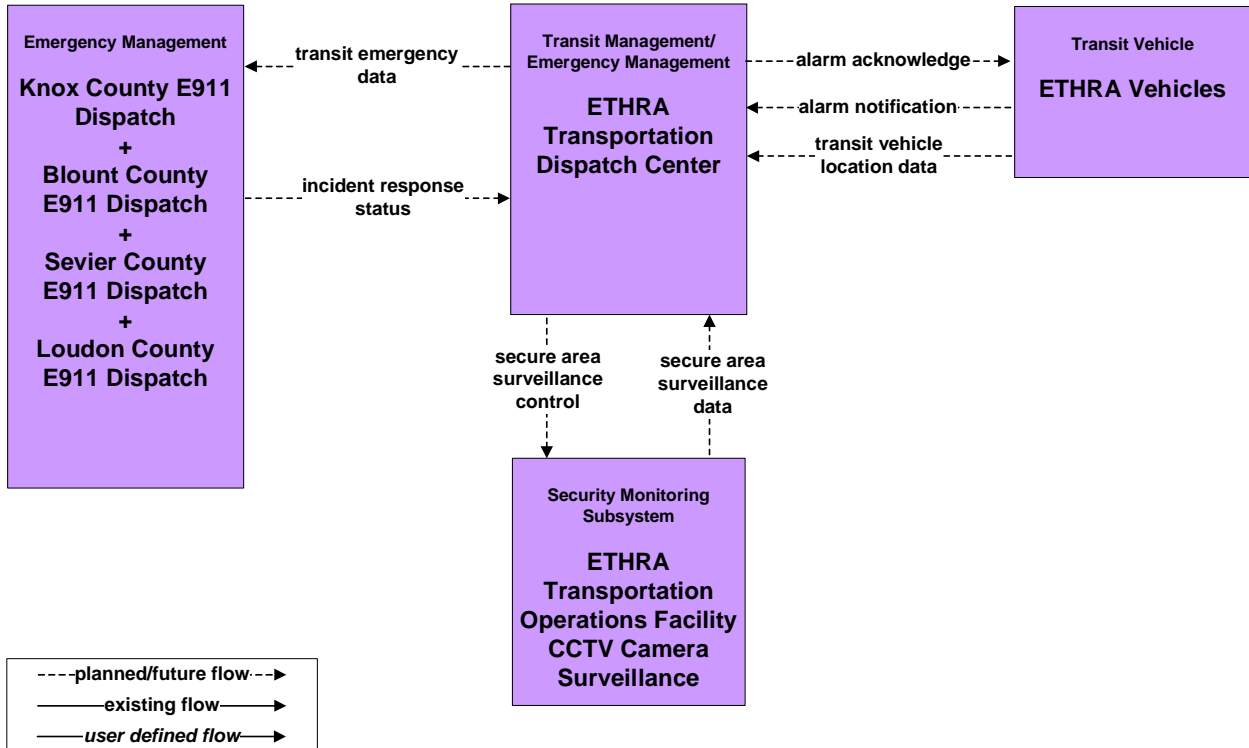
**APTS05 – Transit Security
Knoxville Area Transit**



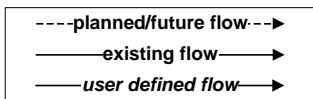
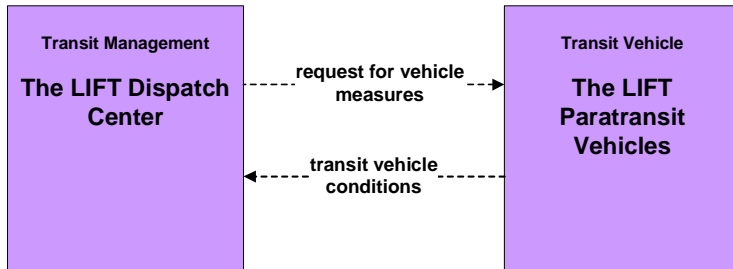
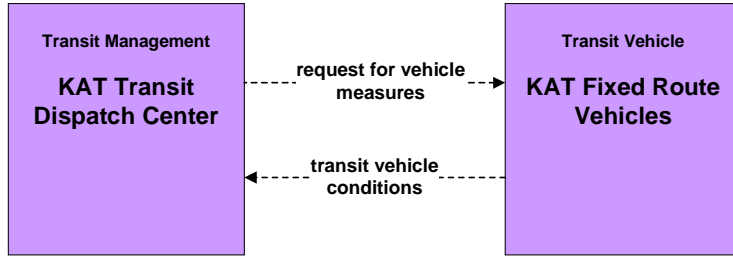
**APTS05 – Transit Security
Knox County CAC Transit**



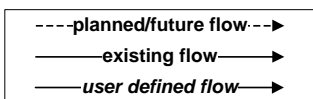
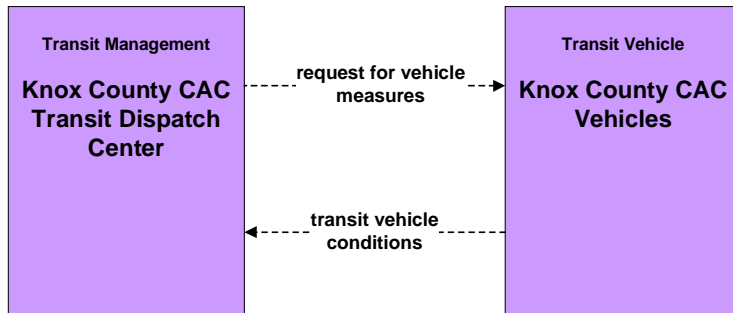
**APTS05 – Transit Security
ETHRA Transportation**



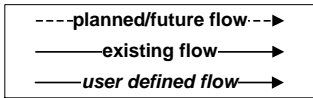
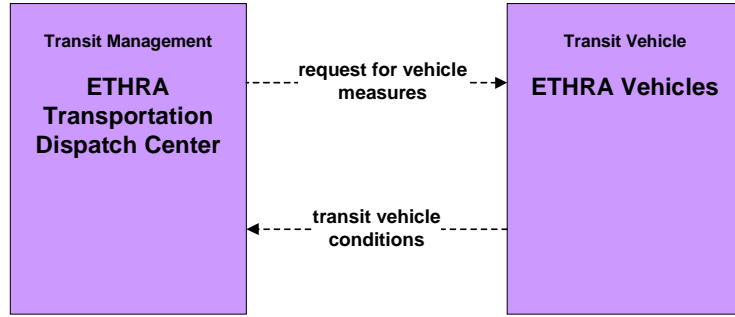
**APTS06 – Transit Fleet Management
Knoxville Area Transit**



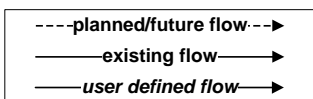
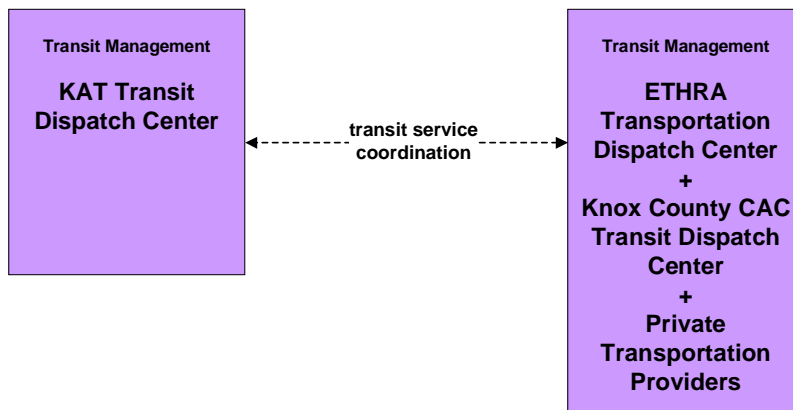
**APTS06 – Transit Fleet Management
Knox County CAC Transit**



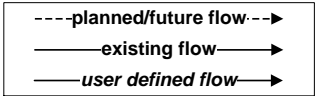
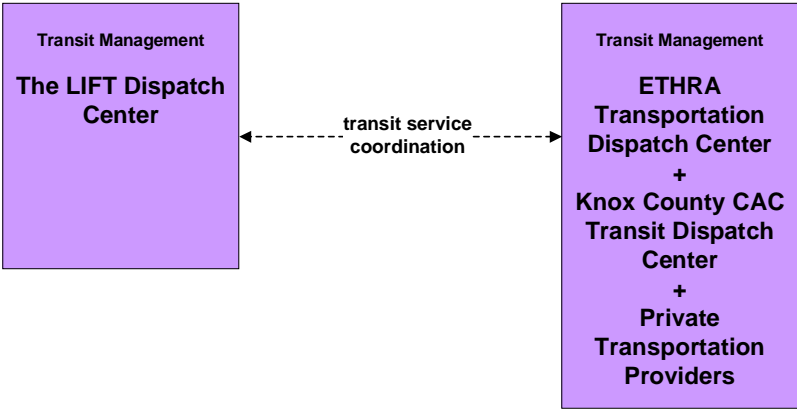
**APTS06 – Transit Fleet Management
ETHRA Transportation**



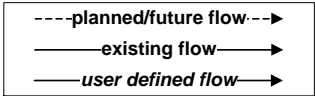
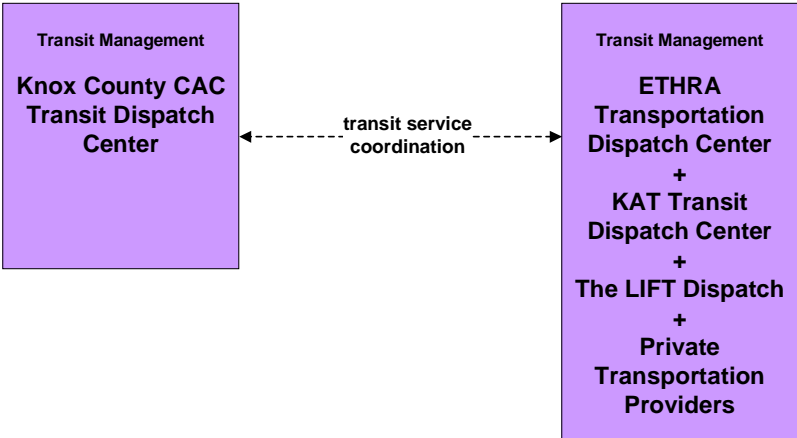
**APTS07 – Multi-modal Coordination
Knoxville Area Transit**



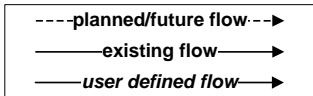
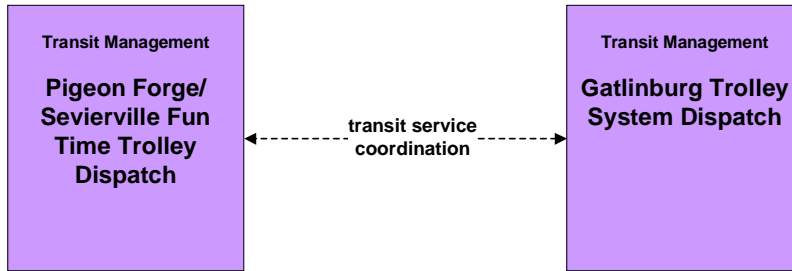
**APTS07 – Multi-modal Coordination
Knoxville Area Transit**



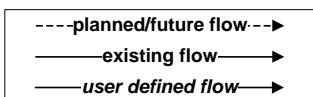
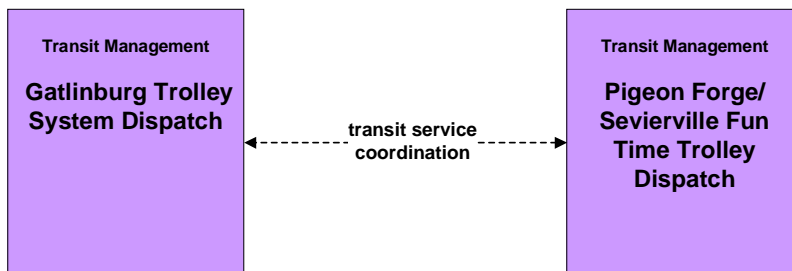
**APTS07 – Multi-modal Coordination
Knox County CAC Transit**



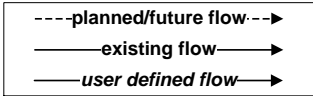
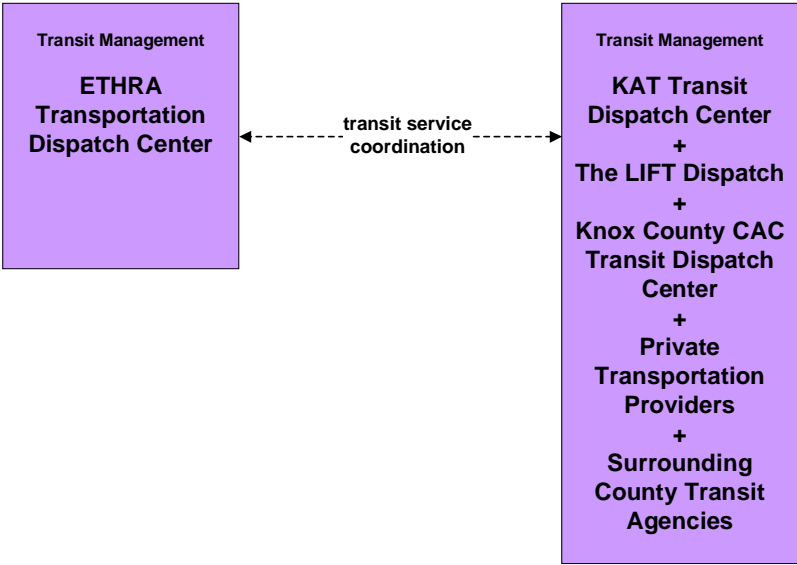
APTS07 – Multi-modal Coordination
Pigeon Forge/Sevierville Fun Time Trolley



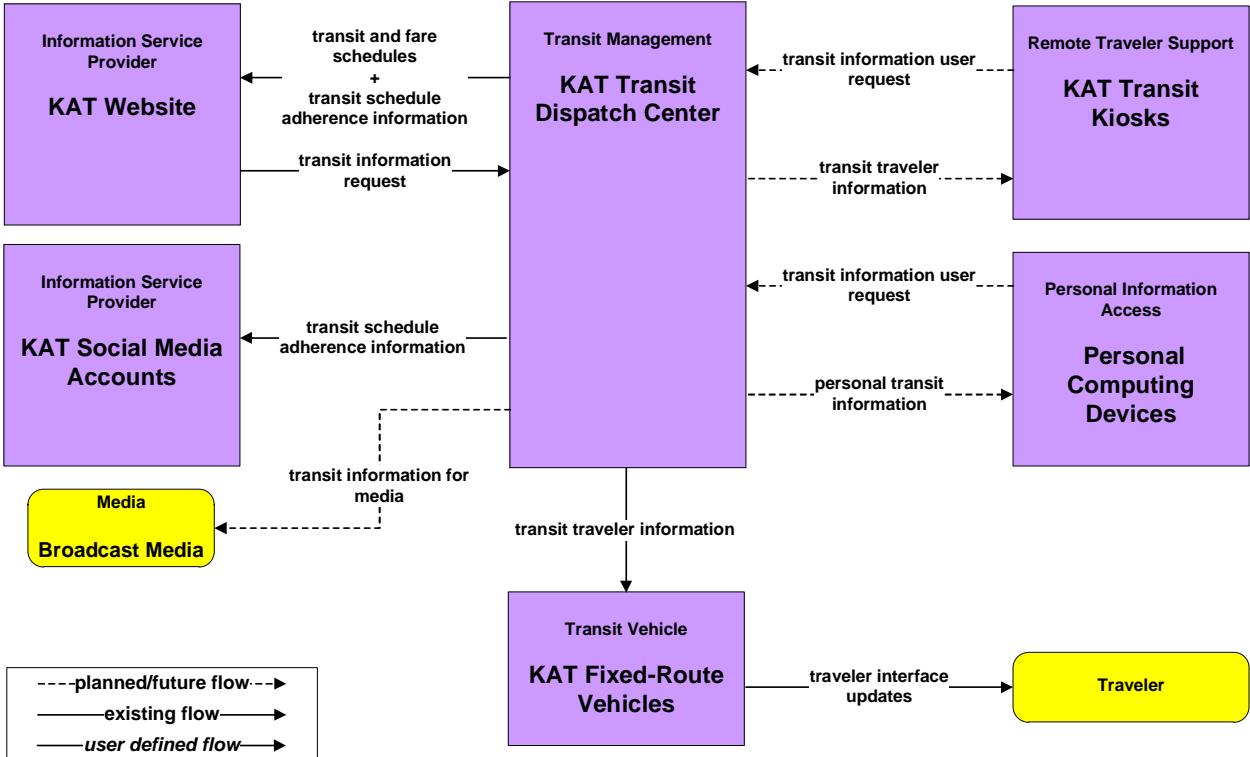
APTS07 – Multi-modal Coordination
Gatlinburg Trolley



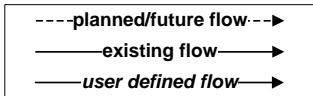
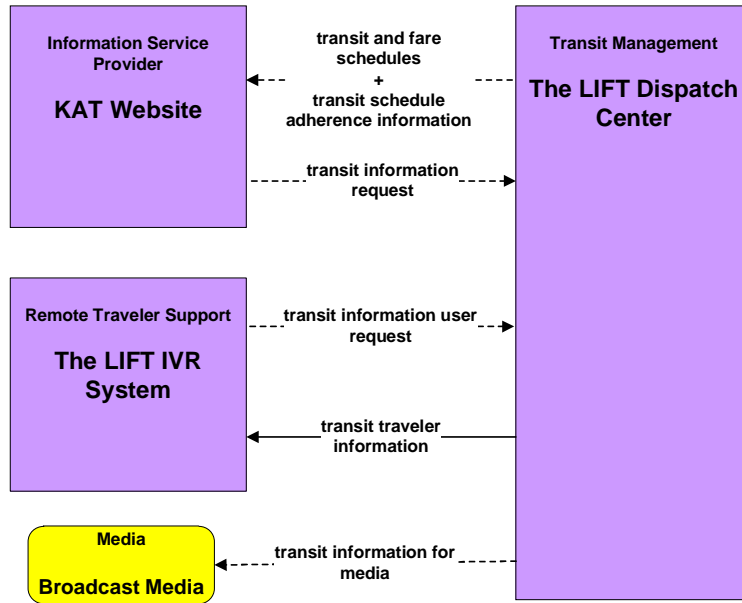
**APTS07 – Multi-modal Coordination
ETHRA Transportation**



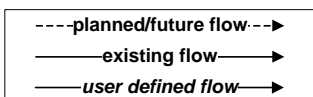
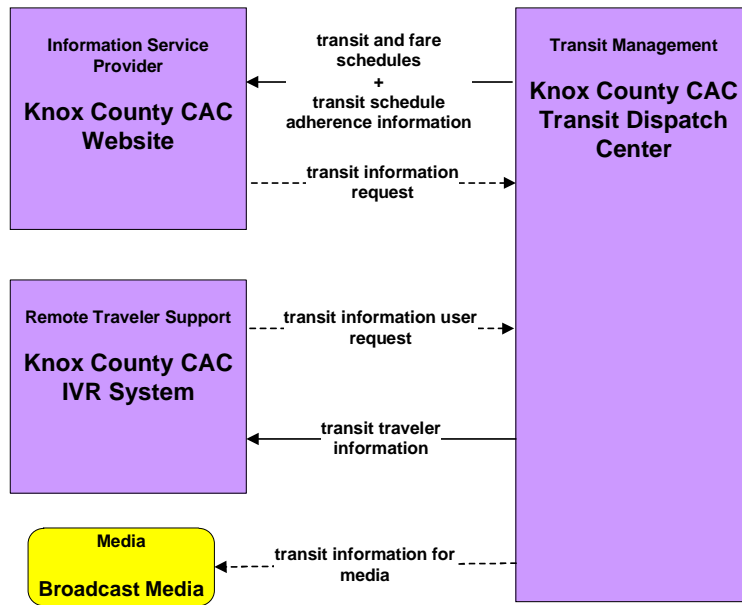
**APTS08 – Transit Traveler Information
Knoxville Area Transit**



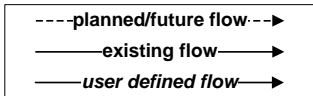
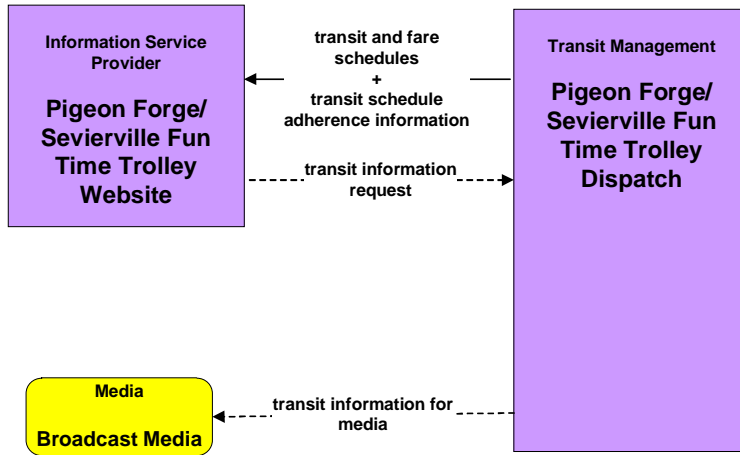
**APTS08 – Transit Traveler Information
Knoxville Area Transit**



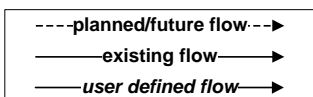
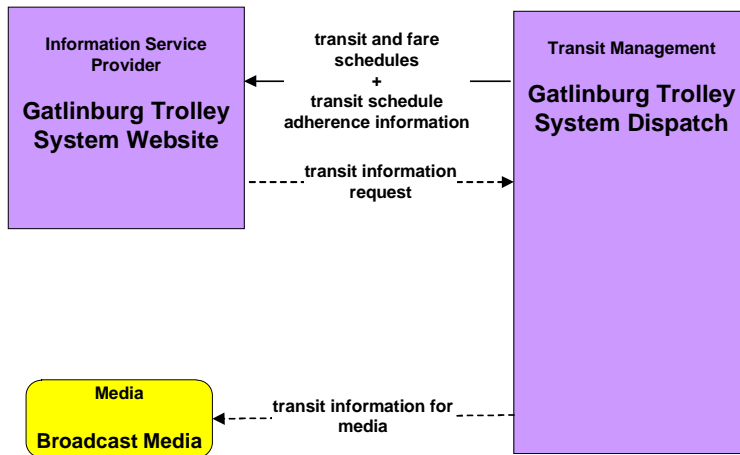
**APTS08 – Transit Traveler Information
Knox County CAC Transit**



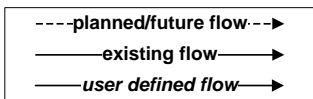
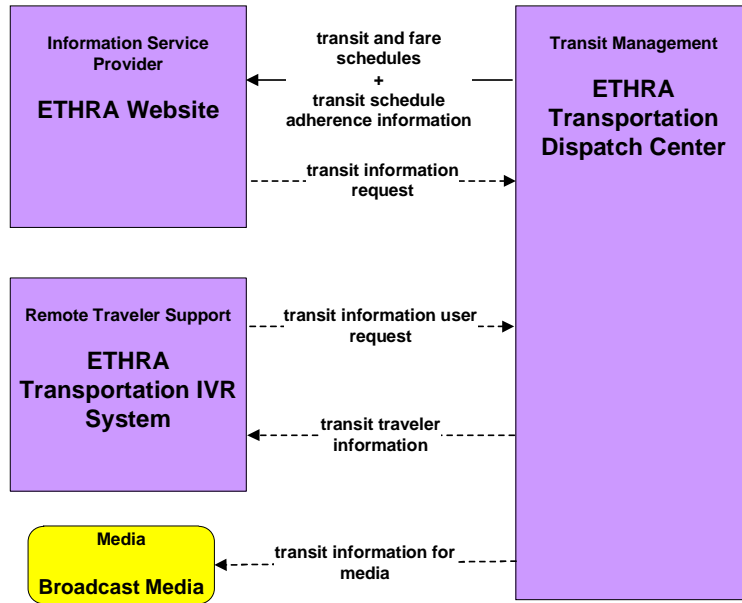
**APTS08 – Transit Traveler Information
Pigeon Forge/Sevierville Fun Time Trolley**



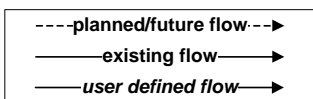
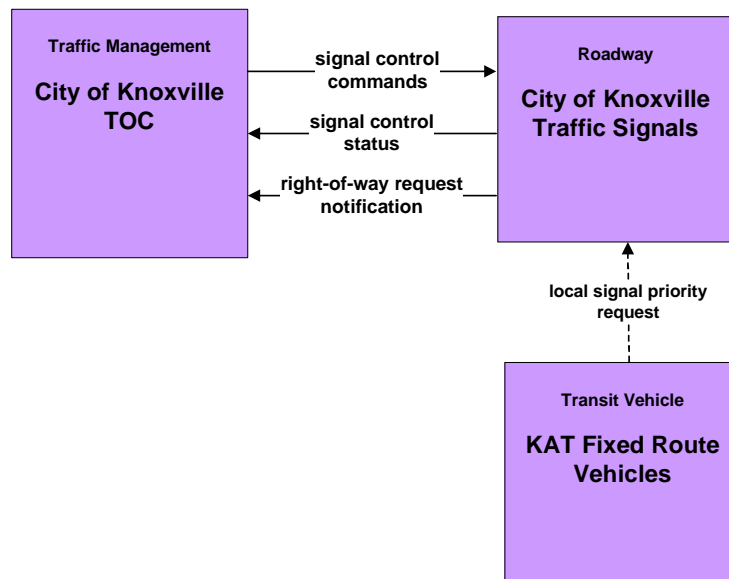
**APTS08 – Transit Traveler Information
Gatlinburg Trolley**



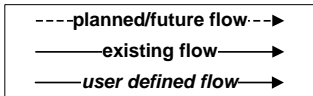
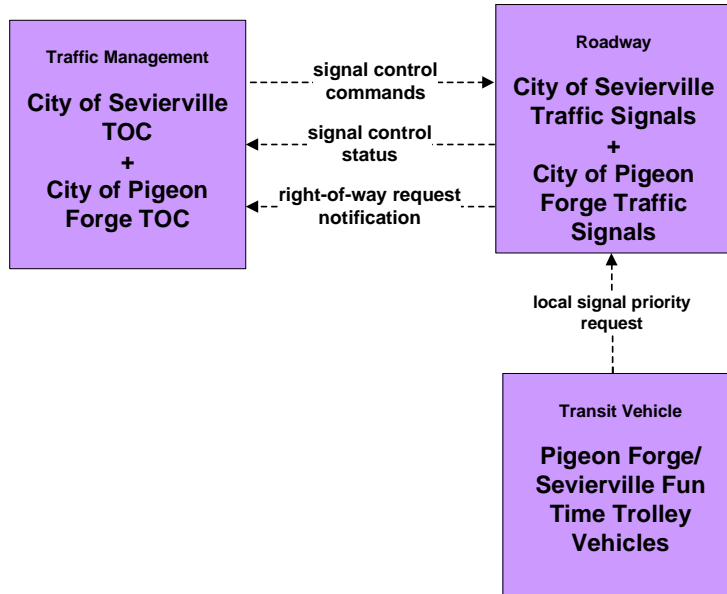
**APTS08 – Transit Traveler Information
ETHRA Transportation**



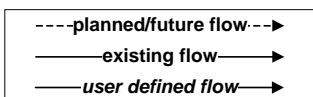
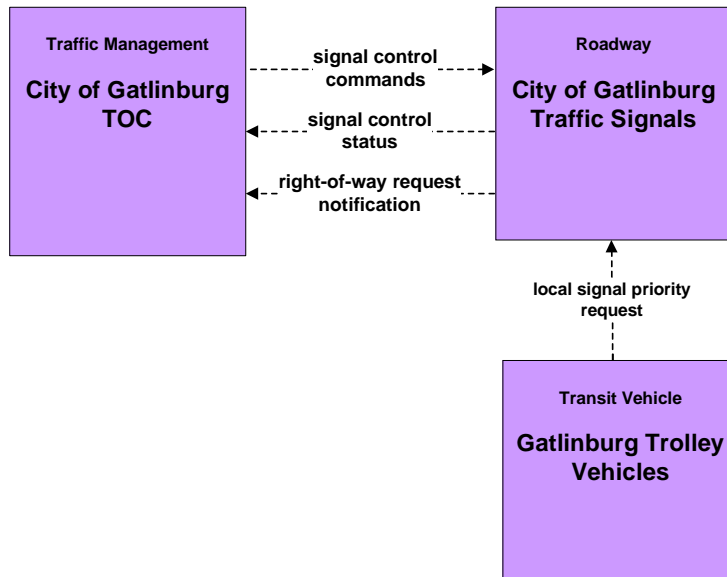
**APTS09 – Transit Signal Priority
Knoxville Area Transit**



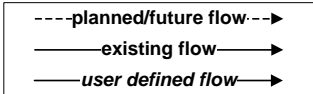
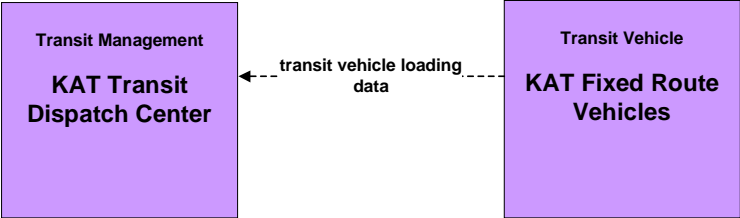
**APTS09 – Transit Signal Priority
Pigeon Forge/Sevierville Fun Time Trolley**



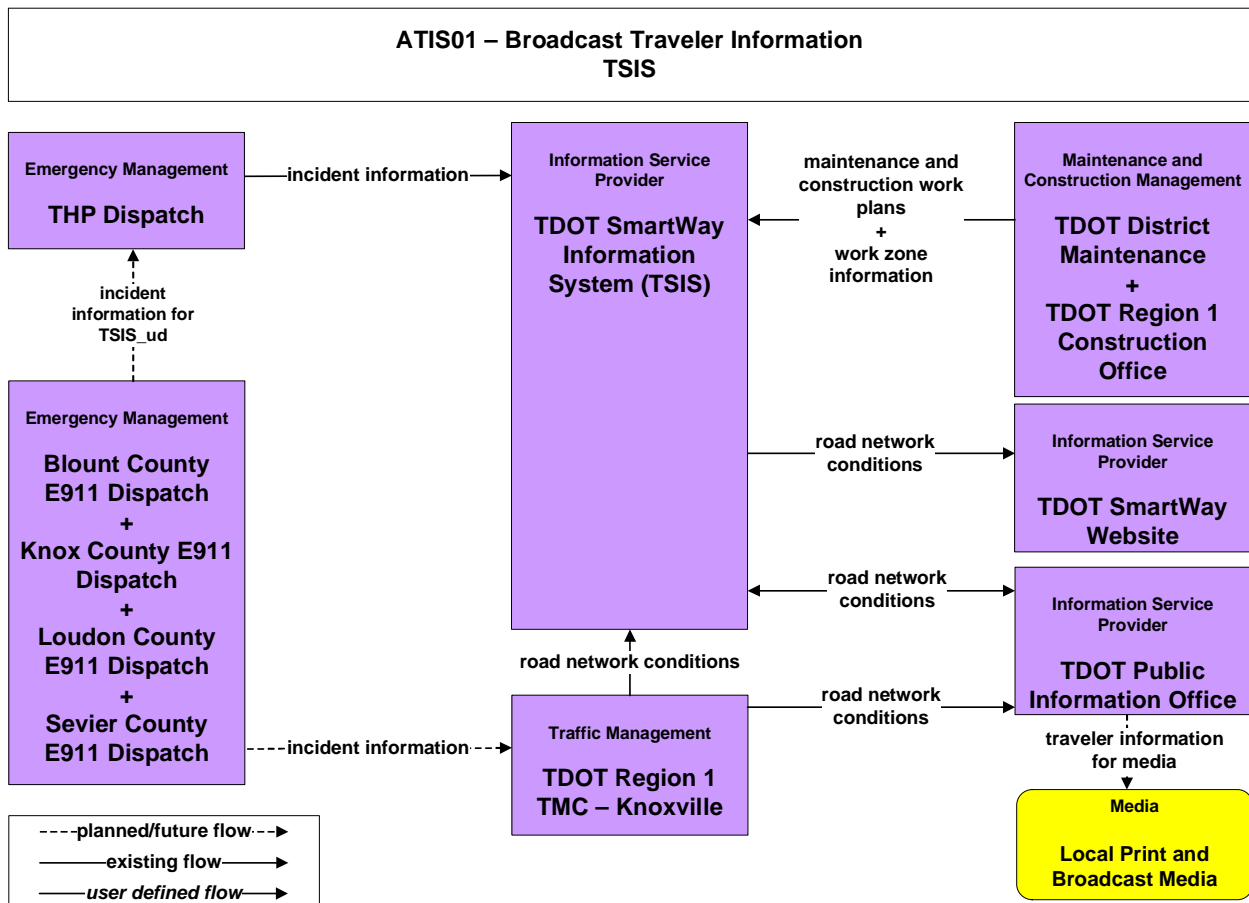
**APTS09 – Transit Signal Priority
Gatlinburg Trolley**



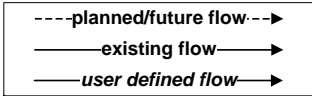
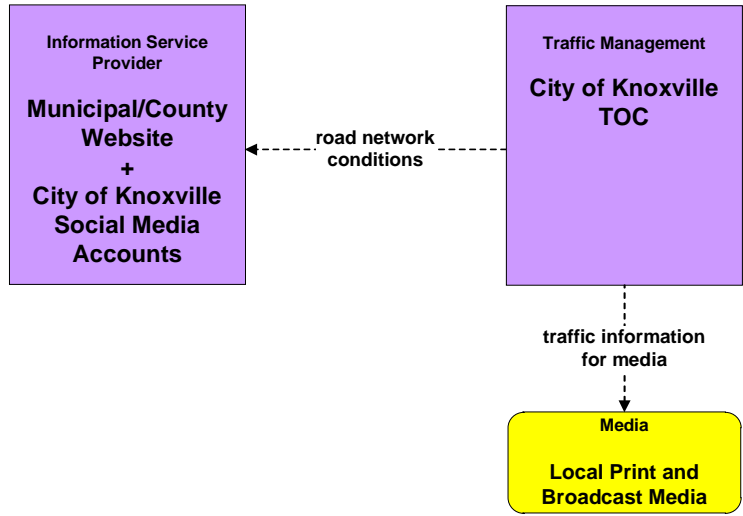
**APTS10 – Transit Passenger Counting
Knoxville Area Transit**



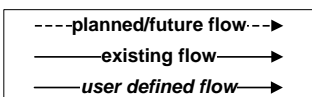
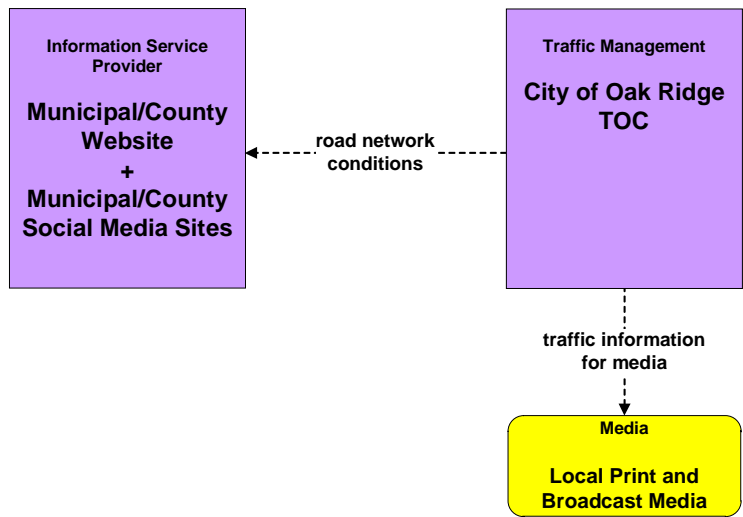
Advanced Traveler Information System



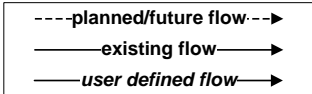
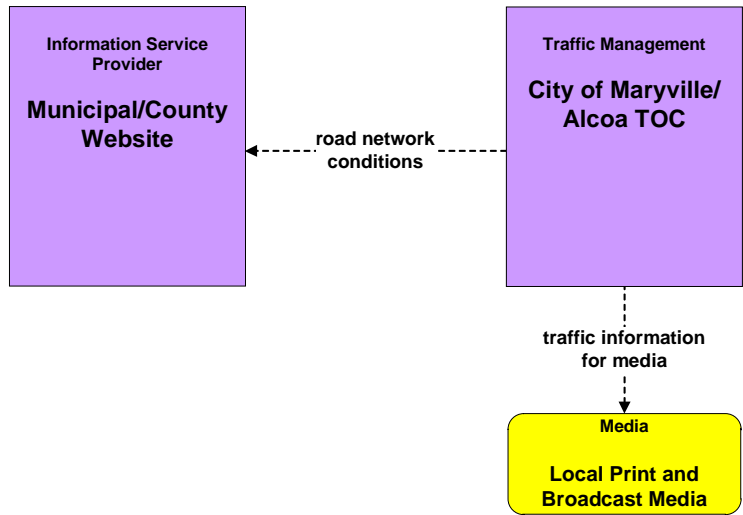
**ATIS01 – Broadcast Traveler Information
City of Knoxville**



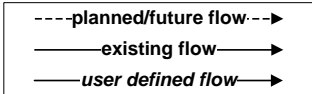
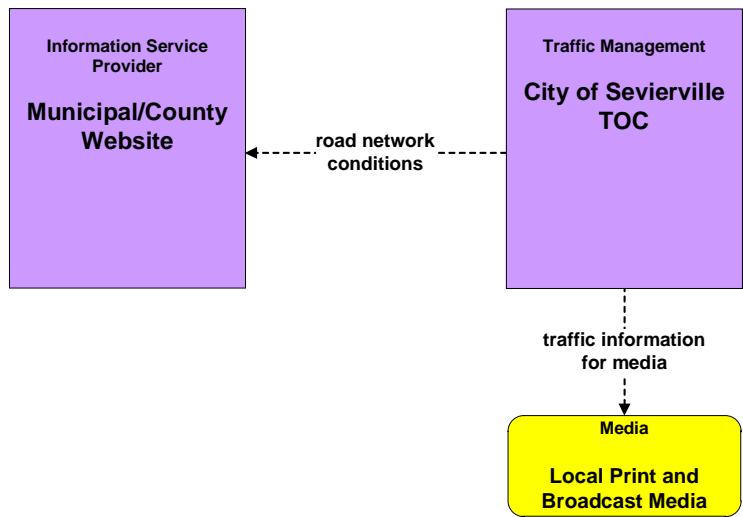
**ATIS01 – Broadcast Traveler Information
City of Oak Ridge**



**ATIS01 – Broadcast Traveler Information
City of Maryville/Alcoa**

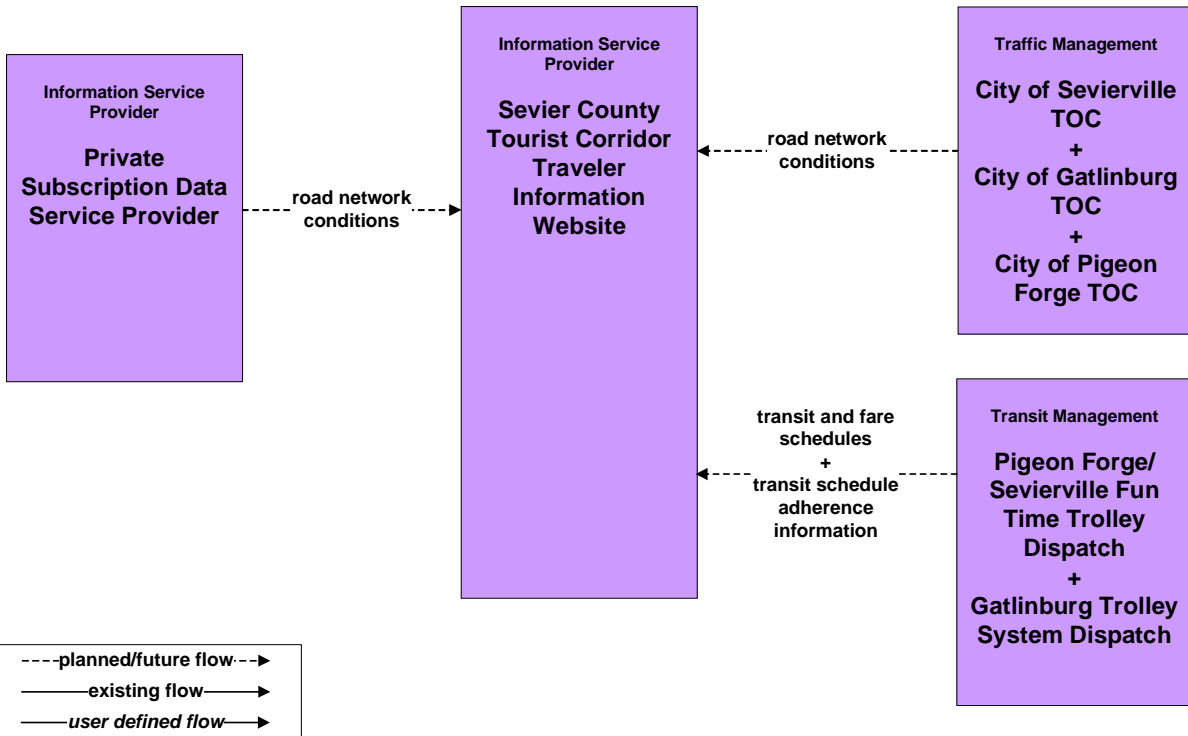


**ATIS01 – Broadcast Traveler Information
City of Sevierville**

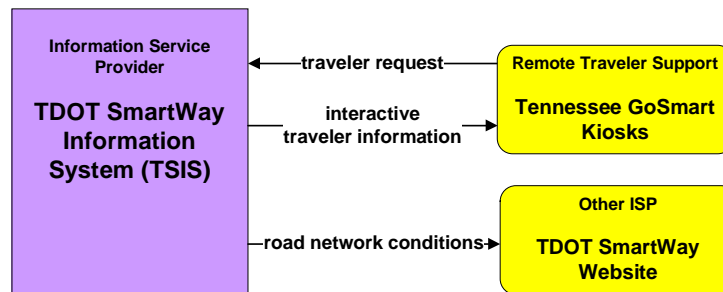


Note:
The City of Sevierville TOC may be established as a Joint TOC with the City of Pigeon Forge.

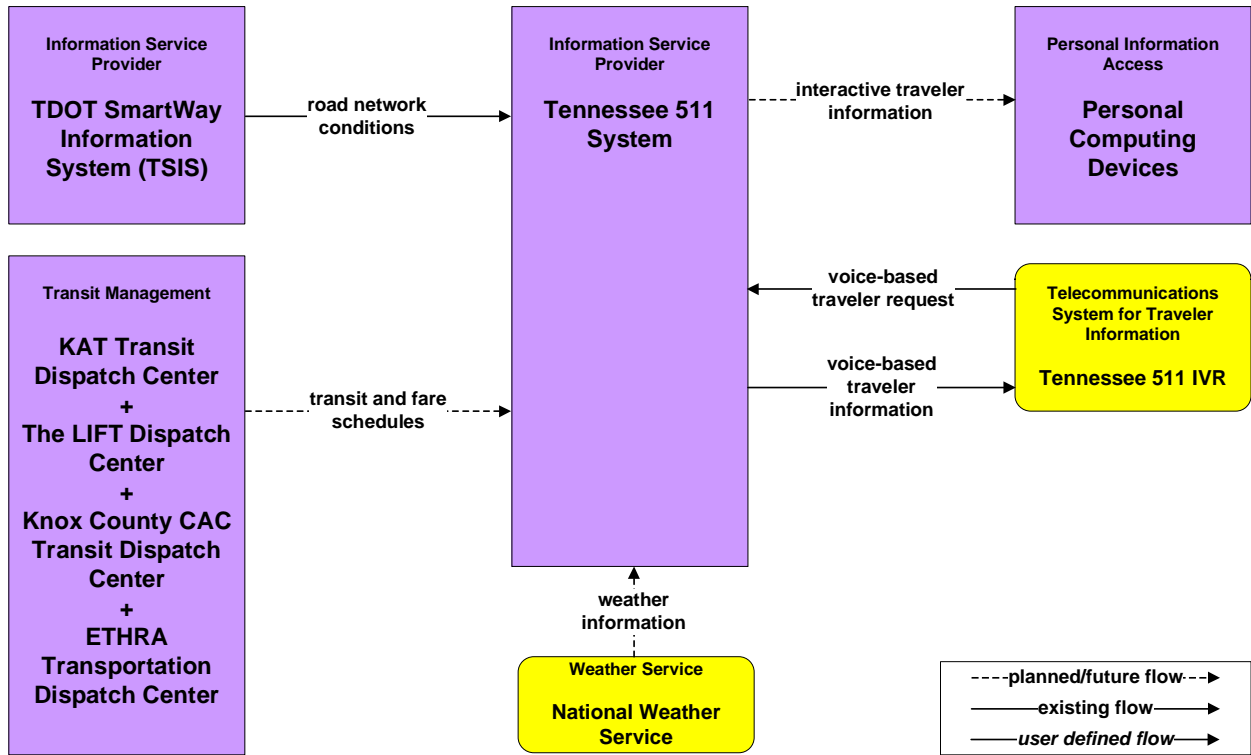
**ATIS01 – Broadcast Traveler Information
 Combined Sevier County Tourist Corridor Traveler Information System**



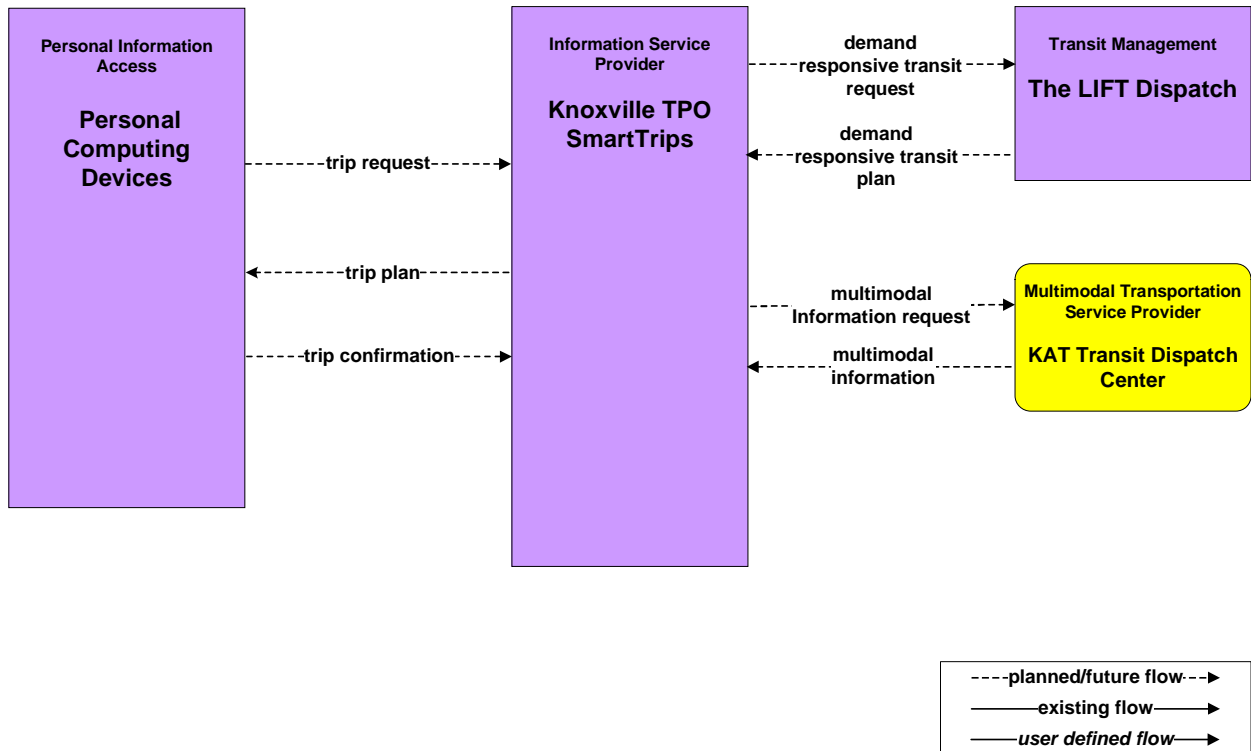
**ATIS02 – Interactive Traveler Information
 Tennessee GoSmart Kiosks and TDOT SmartWay Website**



**ATIS02 – Interactive Traveler Information
Tennessee 511**

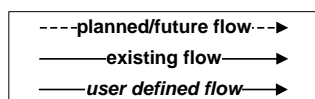
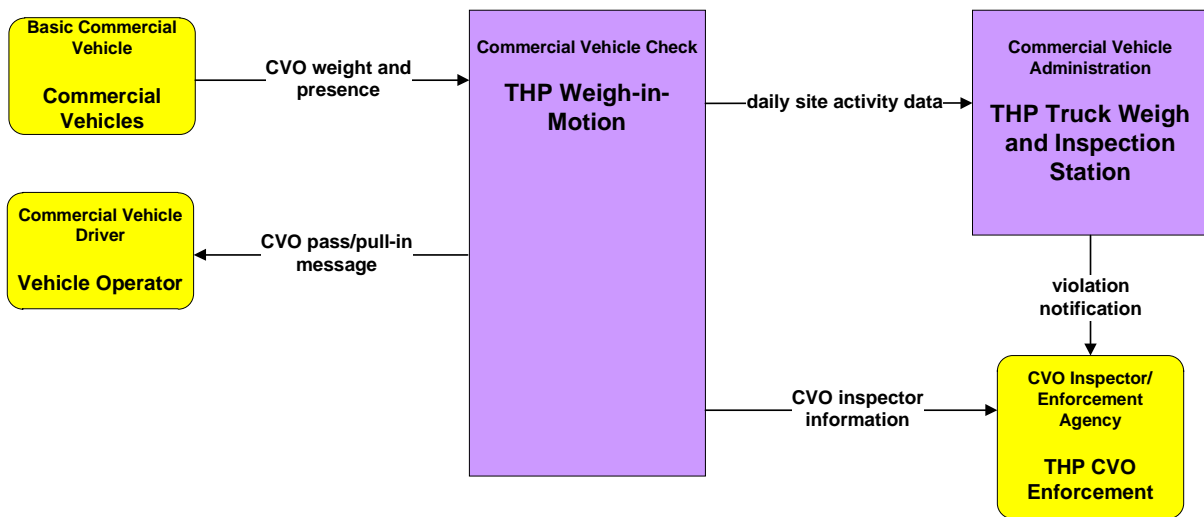


**ATIS08 – Dynamic Ridesharing
Knoxville TPO SmartTrips**



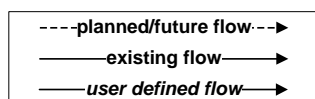
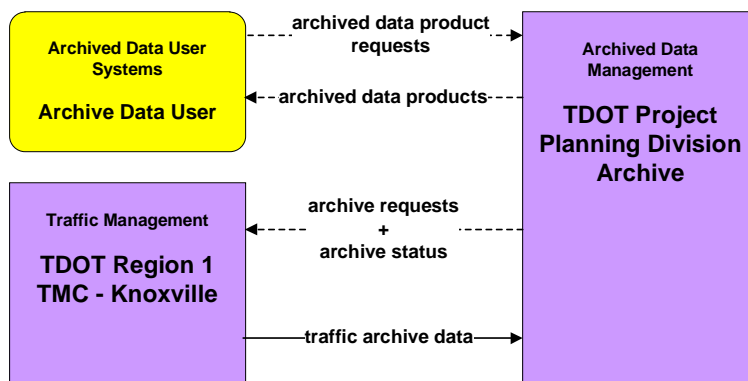
Commercial Vehicle Operations

**CVO06 – Weigh-in-Motion
THP Weigh and Inspection Station**

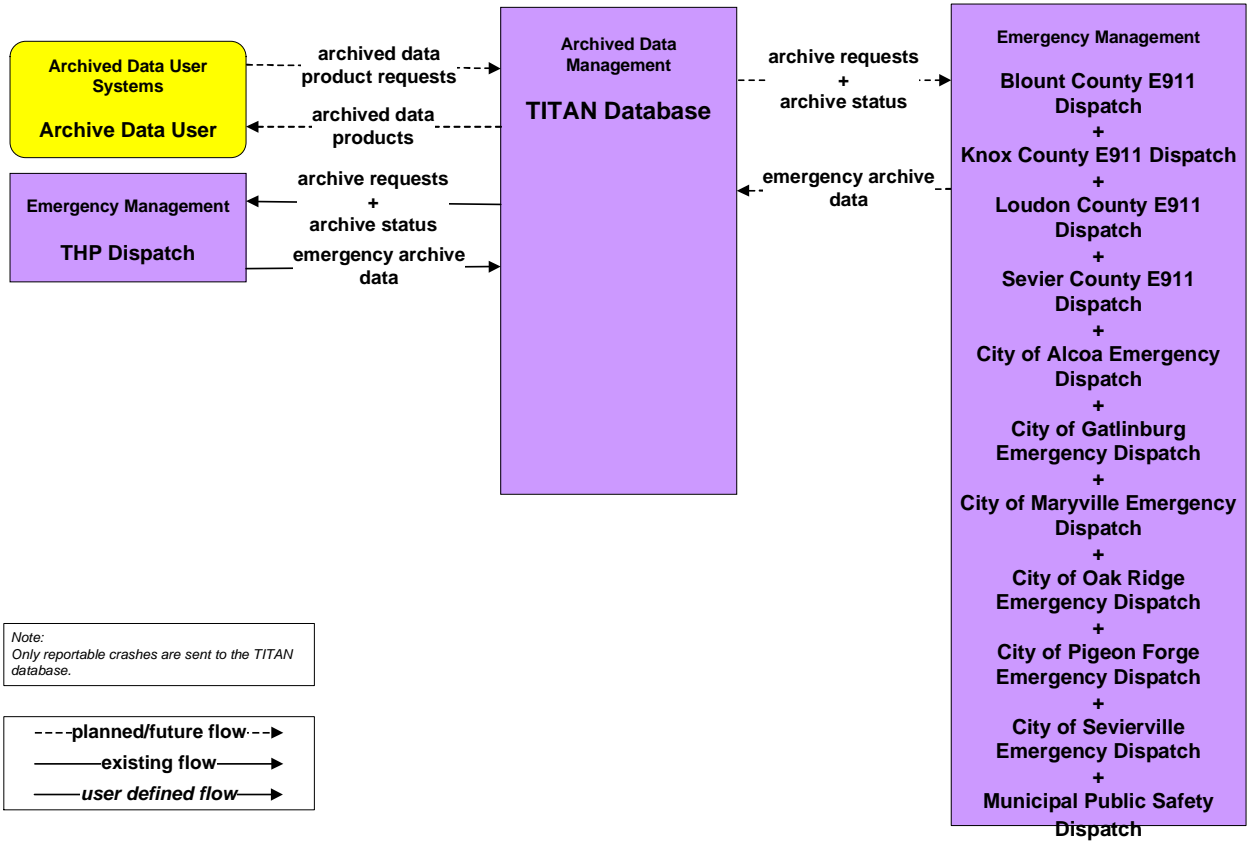


Archived Data

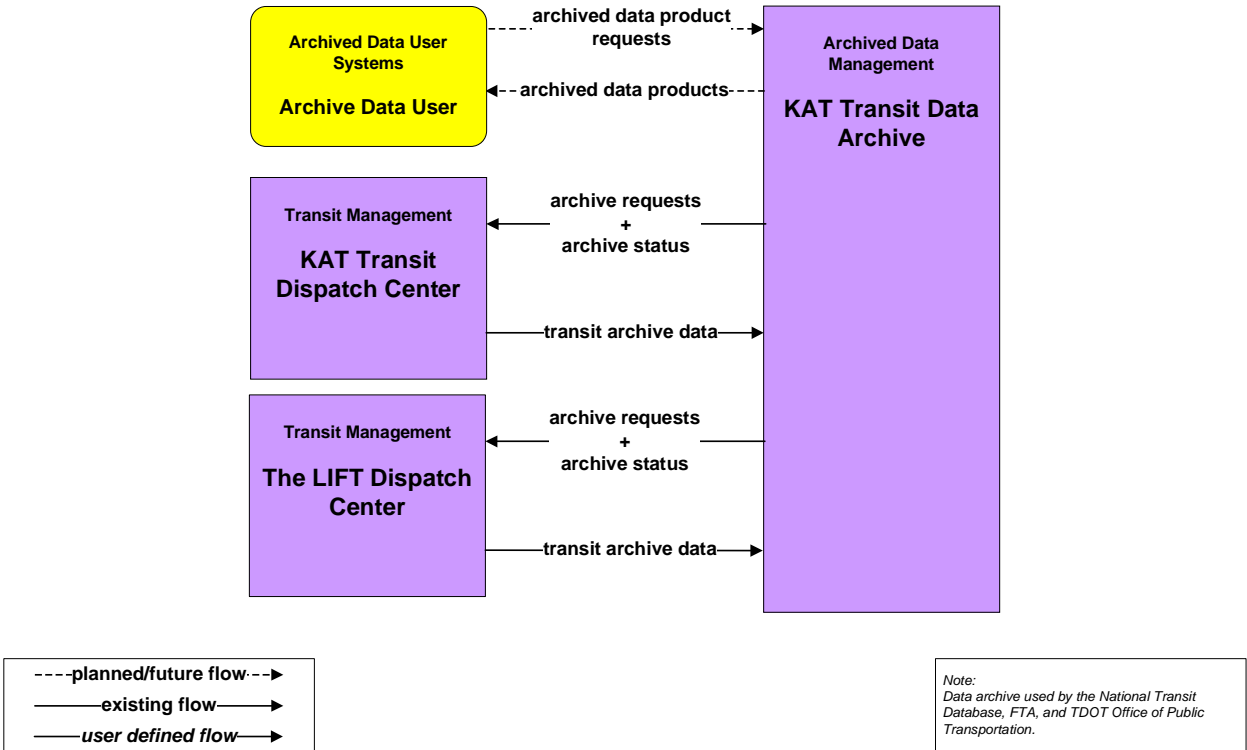
AD1 – ITS Data Mart
TDOT



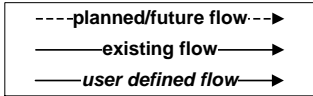
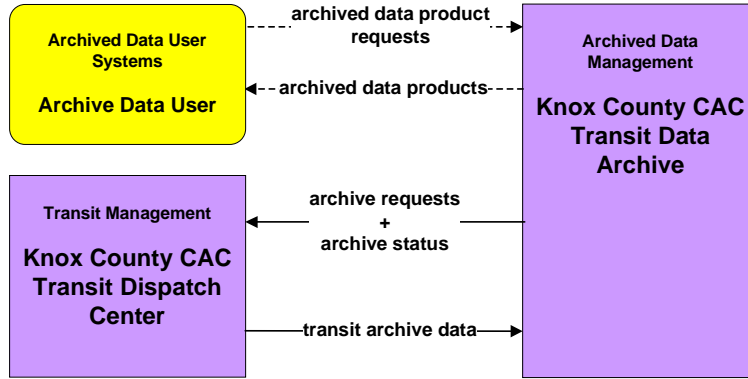
**AD1 – ITS Data Mart
TITAN**



**AD1 – ITS Data Mart
Knoxville Area Transit**

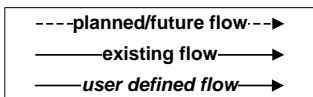
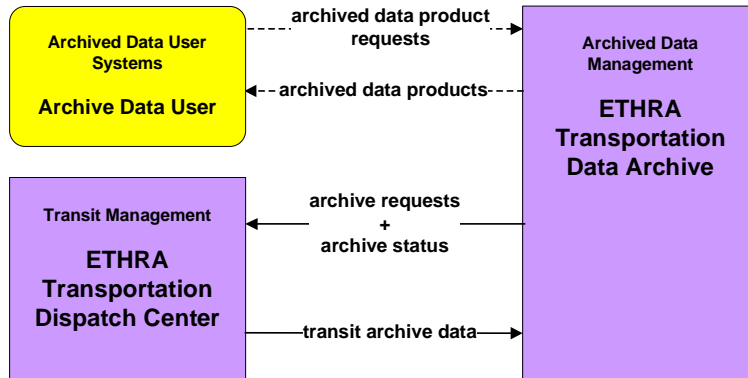


**AD1 – ITS Data Mart
Knox County CAC Transit**



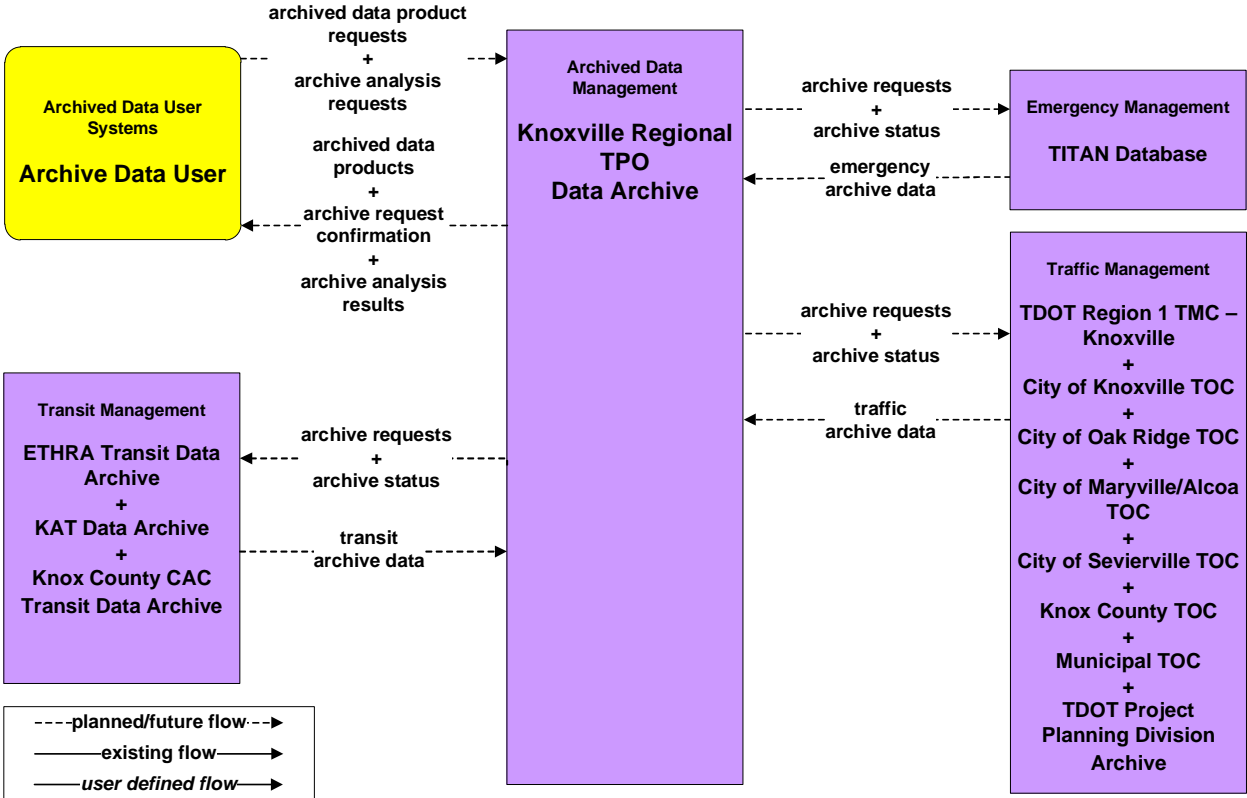
*Note:
Data archive used by the National Transit Database, FTA, and TDOT Office of Public Transportation.*

**AD1 – ITS Data Mart
ETHRA Transportation**

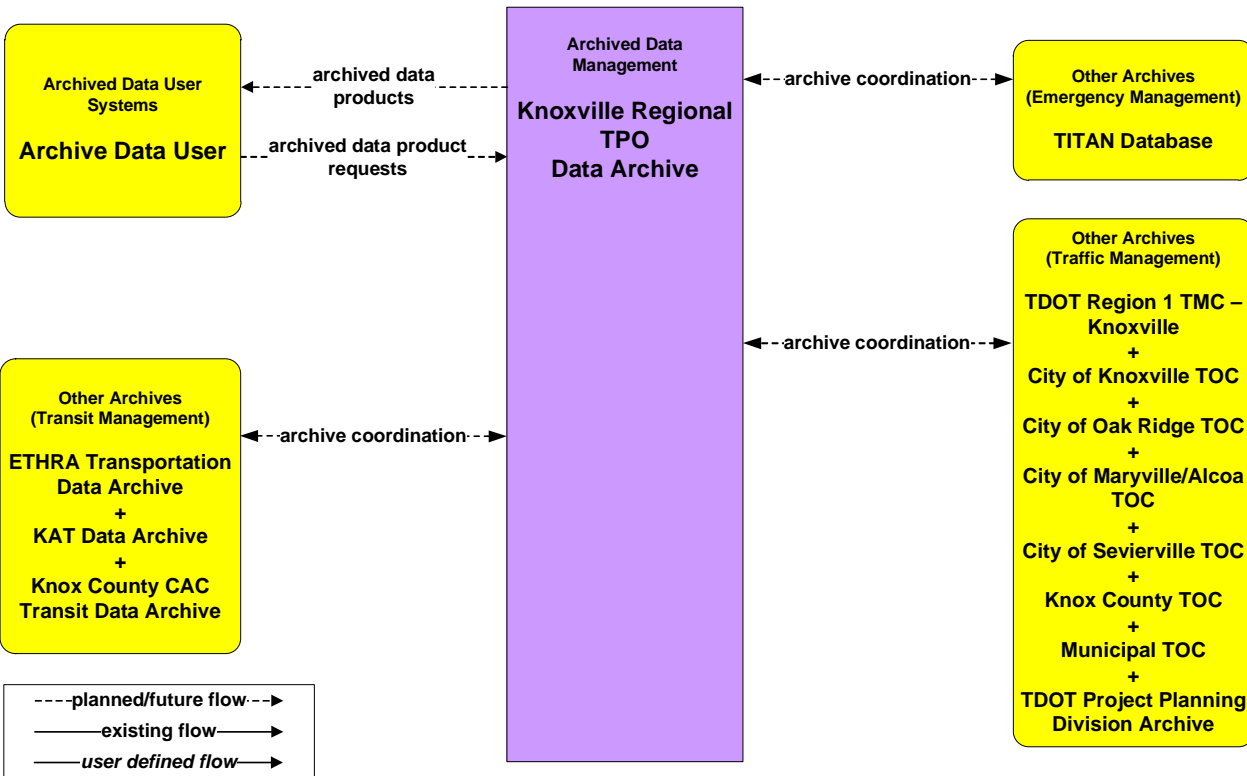


*Note:
Data archive used by the National Transit Database, FTA, and TDOT Office of Public Transportation.*

**AD2 – ITS Data Warehouse
Knoxville Regional TPO**



**AD3 – ITS Virtual Data Warehouse
Knoxville Regional TPO**



APPENDIX C – ELEMENT FUNCTIONS

| Element Name | Functional Area |
|--|---|
| Blount County E911 Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Data Collection |
| Blount County EMA | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Blount County Emergency Communication System | Traveler Telephone Information |
| | ISP Emergency Traveler Information |
| Blount County FD Vehicles | On-board EV En Route Support |
| Blount County Rescue Squad Vehicles | On-board EV En Route Support |
| Blount County Sheriff Vehicles | On-board EV En Route Support |
| City of Alcoa CCTV Cameras | Roadway Basic Surveillance |
| City of Alcoa DMS | Roadway Traffic Information Dissemination |
| City of Alcoa Emergency Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Emergency Routing |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| City of Alcoa FD Vehicles | On-Board EV En Route Support |
| City of Alcoa Field Sensors | Roadway Basic Surveillance |
| City of Alcoa PD Vehicles | On-Board EV En Route Support |
| City of Alcoa Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| City Of Gatlinburg CCTV Cameras | Roadway Basic Surveillance |
| City Of Gatlinburg DMS | Roadway Traffic Information Dissemination |
| City of Gatlinburg Emergency Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Data Collection |
| City of Gatlinburg FD Vehicles | On-board EV En Route Support |
| City Of Gatlinburg Field Sensors | Roadway Basic Surveillance |

| Element Name | Functional Area |
|--|--|
| City of Gatlinburg PD Vehicles | On-board EV En Route Support |
| City Of Gatlinburg TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| | TMC Multimodal Coordination |
| City of Gatlinburg Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Priority |
| | Roadway Equipment Coordination |
| City of Knoxville CCTV Cameras | Roadway Basic Surveillance |
| City of Knoxville DMS | Roadway Traffic Information Dissemination |
| | Roadway Work Zone Traffic Control |
| City of Knoxville FD Vehicles | On-board EV En Route Support |
| City of Knoxville Field Sensors | Roadway Basic Surveillance |
| City of Knoxville Flood Detection Equipment | Roadway Basic Surveillance |
| City of Knoxville Flood Detection Equipment | Roadway Equipment Coordination |
| | Field Barrier System Control |
| City of Knoxville Parking Management System | Parking Management |
| | Parking Electronic Payment |
| | Parking Coordination |
| City of Knoxville PD Vehicles | On-board EV En Route Support |
| City of Knoxville Public Works Department | MCM Vehicle Tracking |
| | MCM Environmental Information Processing |
| | MCM Incident Management |
| | MCM Roadway Maintenance And Construction |
| | MCM Work Zone Management |
| | MCM Work Activity Coordination |
| City of Knoxville Public Works Department Vehicles | MCV Vehicle Location Tracking |
| City of Knoxville Road Closure Equipment | Roadway Equipment Coordination |
| | Field Barrier System Control |
| City of Knoxville Social Media Accounts | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| City of Knoxville Speed Monitoring Equipment | Roadway Equipment Coordination |
| | Roadway Speed Monitoring and Warning |

| Element Name | Functional Area |
|-------------------------------------|--|
| City of Knoxville TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | TMC Environmental Monitoring |
| | HRI Traffic Management |
| | TMC Speed Monitoring and Warning |
| | Barrier System Management |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | TMC Multimodal Coordination |
| | Traffic Data Collection |
| City of Knoxville Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Priority |
| | Roadway Signal Preemption |
| | Standard Rail Crossing |
| | Roadway Equipment Coordination |
| City of Knoxville Website | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| City of Lenoir City CCTV Cameras | Roadway Basic Surveillance |
| City of Lenoir City Field Sensors | Roadway Basic Surveillance |
| City of Lenoir City TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| City of Lenoir City TOC | TMC Regional Traffic Management |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| City of Lenoir City Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| City of Maryville CCTV Cameras | Roadway Basic Surveillance |
| City of Maryville DMS | Roadway Traffic Information Dissemination |

| Element Name | Functional Area |
|--|--|
| City of Maryville Emergency Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Emergency Routing |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Data Collection |
| City of Maryville FD Vehicles | On-board EV En Route Support |
| City of Maryville Field Sensors | Roadway Basic Surveillance |
| City of Maryville PD Vehicles | On-board EV En Route Support |
| City of Maryville Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| City of Maryville/Alcoa TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| City of Oak Ridge CCTV Cameras | Roadway Basic Surveillance |
| City of Oak Ridge DMS | Roadway Traffic Information Dissemination |
| City of Oak Ridge Emergency Dispatch | Incident Command |
| | Emergency Response Management |
| | Emergency Data Collection |
| City of Oak Ridge Field Equipment | Roadway Probe Data Communications |
| City of Oak Ridge Field Sensors | Roadway Basic Surveillance |
| City of Oak Ridge Speed Monitoring Equipment | Roadway Speed Monitoring and Warning |

| Element Name | Functional Area |
|---|--|
| City of Oak Ridge TOC | Collect Traffic Surveillance |
| | TMC Probe Information Collection |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | TMC Speed Monitoring and Warning |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| | City of Oak Ridge Traffic Signals |
| Roadway Signal Preemption | |
| Roadway Equipment Coordination | |
| City of Pigeon Forge CCTV Cameras | Roadway Basic Surveillance |
| City of Pigeon Forge DMS | Roadway Traffic Information Dissemination |
| City of Pigeon Forge Emergency Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| City of Pigeon Forge FD Vehicles | On-board EV En Route Support |
| City of Pigeon Forge Field Sensors | Roadway Basic Surveillance |
| City of Pigeon Forge PD Vehicles | On-board EV En Route Support |
| City of Pigeon Forge TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| | TMC Multimodal Coordination |
| City of Pigeon Forge Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Priority |
| | Roadway Equipment Coordination |

| Element Name | Functional Area |
|--|--|
| City of Sevierville CCTV Cameras | Roadway Basic Surveillance |
| City of Sevierville DMS | Roadway Traffic Information Dissemination |
| City of Sevierville Emergency Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Emergency Routing |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Data Collection |
| City of Pigeon Forge FD Vehicles | On-board EV En Route Support |
| City of Sevierville Field Sensors | Roadway Basic Surveillance |
| City of Pigeon Forge PD Vehicles | On-board EV En Route Support |
| City of Sevierville TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | TMC Multimodal Coordination |
| | Traffic Data Collection |
| City of Sevierville Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Priority |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| ETHRA Transportation Data Archive | ITS Data Repository |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| | Transit Data Collection |

| Element Name | Functional Area |
|---|---|
| ETHRA Transportation Dispatch Center | Center Secure Area Surveillance |
| | Center Secure Area Sensor Management |
| | Center Secure Area Alarm Support |
| | Transit Center Vehicle Tracking |
| | Transit Center Paratransit Operation |
| | Transit Center Fare Management |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| ETHRA Transportation Dispatch Center | Transit Vehicle Operator Assignment |
| | Transit Garage Maintenance |
| | Transit Vehicle Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| | Transit Data Collection |
| ETHRA Transportation IVR System | Remote Transit Information Services |
| ETHRA Transportation Operations Facility CCTV Camera Surveillance | Traveler Secure Area Surveillance |
| | Traveler Secure Area Sensor Monitoring |
| | Remote Traveler Security |
| ETHRA Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| | On-board Paratransit Operations |
| | On-board Transit Fare Management |
| | On-board Transit Security |
| | On-board Maintenance |
| ETHRA Website | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| Gatlinburg Trolley System Dispatch | Transit Center Vehicle Tracking |
| | Transit Center Fixed-Route Operations |
| | Transit Center Fare Management |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| Gatlinburg Trolley System Kiosks | Remote Transit Fare Management |

| Element Name | Functional Area |
|--|---------------------------------------|
| Gatlinburg Trolley System Website | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| Gatlinburg Trolley Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| | On-board Transit Fare Management |
| | On-board Transit Signal Priority |
| Great Smoky Mountain National Park | TMC Regional Traffic Management |
| KAT Fixed Route Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| KAT Fixed Route Vehicles | On-board Transit Fare Management |
| | On-board Passenger Counting |
| | On-board Transit Security |
| | On-board Maintenance |
| | On-board Transit Signal Priority |
| | On-board Transit Information Services |
| KAT Operations Facility CCTV Camera Surveillance | Field Secure Area Sensor Monitoring |
| | Field Secure Area Surveillance |
| KAT Social Media Accounts | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| KAT Transit Center CCTV Camera Surveillance | Field Secure Area Sensor Monitoring |
| | Field Secure Area Surveillance |
| KAT Transit Data Archive | ITS Data Repository |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| | Transit Data Collection |

| Element Name | Functional Area |
|---|---|
| KAT Transit Dispatch Center | Center Secure Area Surveillance |
| | Center Secure Area Sensor Management |
| | Center Secure Area Alarm Support |
| | Transit Center Vehicle Tracking |
| | Transit Center Fixed-Route Operations |
| | Transit Center Fare Management |
| | Transit Center Passenger Counting |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| | Transit Garage Maintenance |
| | Transit Vehicle Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| | Transit Data Collection |
| KAT Transit Kiosks | Remote Transit Information Services |
| | Remote Transit Fare Management |
| KAT Website | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| Knox County CAC IVR System | Remote Transit Information Services |
| Knox County CAC Transit Data Archive | ITS Data Repository |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| | Transit Data Collection |
| Knox County CAC Transit Dispatch Center | Center Secure Area Surveillance |
| | Center Secure Area Sensor Management |

| Element Name | Functional Area |
|---|--|
| Knox County CAC Transit Dispatch Center | Center Secure Area Alarm Support |
| | Transit Center Vehicle Tracking |
| | Transit Center Paratransit Operations |
| | Transit Center Fare Management |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| | Transit Garage Maintenance |
| | Transit Vehicle Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| | Transit Data Collection |
| | Knox County CAC Transit Operations Facility CCTV Camera Surveillance |
| Traveler Secure Area Sensor Monitoring | |
| Remote Traveler Security | |
| Knox County CAC Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| | On-board Paratransit Operations |
| | On-board Transit Fare Management |
| | On-board Transit Security |
| | On-board Maintenance |
| Knox County CAC Website | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| Knox County CCTV Cameras | Roadway Basic Surveillance |
| Knox County E911 Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Emergency Routing |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Environmental Monitoring |
| | Emergency Data Collection |

| Element Name | Functional Area |
|--|--|
| Knox County EMA | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Knox County Emergency Communication System | ISP Traveler Data Collection |
| | Traveler Telephone Information |
| | ISP Emergency Traveler Information |
| Knox County Field Sensors | Roadway Basic Surveillance |
| | Roadway Equipment Coordination |
| Knox County Sheriff Vehicles | On-board EV En Route Support |
| Knox County Speed Monitoring Equipment | Roadway Speed Monitoring and Warning |
| Knox County TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Regional Traffic Management |
| Knox County TOC | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | TMC Environmental Monitoring |
| | TMC Speed Monitoring and Warning |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| Knox County Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| Knoxville Regional TPO Data Archive | ITS Data Repository |
| | Traffic and Roadside Data Archival |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| Knoxville TPO SmartTrips | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| | Infrastructure Provided Dynamic Ridesharing |

| Element Name | Functional Area |
|--|---|
| Loudon County E911 Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Early Warning System |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Environmental Monitoring |
| | Emergency Data Collection |
| Loudon County EMA | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Loudon County Fire and Rescue Vehicles | On-board EV En Route Support |
| Loudon County Sheriff Vehicles | On-board EV En Route Support |
| Municipal CCTV Cameras | Roadway Basic Surveillance |
| Municipal DMS | Roadway Traffic Information Dissemination |
| Municipal Field Sensors | Roadway Basic Surveillance |
| | Roadway Equipment Coordination |
| Municipal Public Safety Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Emergency Routing |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Data Collection |
| Municipal Public Safety Vehicles | On-board EV En Route Support |

| Element Name | Functional Area |
|---------------------------------------|--|
| Municipal TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | TMC Environmental Monitoring |
| | HRI Traffic Management |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| | Municipal Traffic Signals |
| Standard Rail Crossing | |
| Roadway Equipment Coordination | |
| Municipal/County Maintenance | MCM Vehicle Tracking |
| | MCM Environmental Information Collection |
| | MCM Environmental Information Processing |
| | MCM Incident Management |
| | MCM Roadway Maintenance And Construction |
| | MCM Work Zone Management |
| | MCM Work Activity Coordination |
| Municipal/County Maintenance Vehicles | MCV Vehicle Location Tracking |
| | MCV Work Zone Support |
| Municipal/County Portable DMS | Roadway Work Zone Traffic Control |
| Municipal/County RWIS | Roadway Environmental Monitoring |
| Municipal/County Social Media Sites | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| Municipal/County Website | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| Other County 911 Dispatch | Emergency Call-Taking |
| Other County 911 Dispatch | Emergency Dispatch |
| | Incident Command |
| | Emergency Response Management |

| Element Name | Functional Area |
|--|--|
| Other TDOT Region Construction Office | MCM Work Activity Coordination |
| Other TDOT Region Maintenance | MCM Work Activity Coordination |
| Personal Computing Devices | Personal Interactive Information Reception |
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| Pigeon Forge/Sevierville Fun Time Trolley Dispatch | Transit Center Vehicle Tracking |
| | Transit Center Fixed-Route Operations |
| | Transit Center Fare Management |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| Pigeon Forge/Sevierville Fun Time Trolley Kiosks | Remote Transit Fare Management |
| Pigeon Forge/Sevierville Fun Time Trolley Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| | On-board Transit Fare Management |
| | On-board Transit Signal Priority |
| Pigeon Forge/Sevierville Fun Time Trolley Website | ISP Traveler Data Collection |
| | Infrastructure Provided Trip Planning |
| Private Subscription Data Service Provider | ISP Traveler Data Collection |
| | ISP Probe Information Collection |
| | Basic Information Broadcast |
| Private Transportation Providers | Transit Center Multi-Modal Coordination |
| Private Traveler Vehicle | Vehicle Location Determination |
| | Vehicle Toll/Parking Interface |
| | Vehicle Traffic Probe Support |
| Rural Metro Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Rural Metro EMS Vehicles | On-board EV En Route Support |

| Element Name | Functional Area |
|---|---|
| Rural Metro Fire Vehicles | On-board EV En Route Support |
| Sevier County E911 Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| Sevier County E911 Dispatch | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Environmental Monitoring |
| | Emergency Data Collection |
| Sevier County EMA | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Sevier County EMS Vehicles | On-board EV En Route Support |
| Sevier County Tourist Corridor Traveler Information Website | ISP Traveler Data Collection |
| | Basic Information Broadcast |
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| Surrounding County Transit Agencies | Transit Center Multi-Modal Coordination |
| TDOT CCTV Cameras | Roadway Basic Surveillance |
| TDOT District Maintenance | MCM Vehicle Tracking |
| | MCM Incident Management |
| | MCM Work Zone Management |
| | MCM Work Activity Coordination |
| TDOT DMS | Roadway Traffic Information Dissemination |
| | Roadway Work Zone Traffic Control |
| TDOT Emergency Services Coordinator | MCM Incident Management |
| | MCM Roadway Maintenance and Construction |
| TDOT Field Sensors | Roadway Basic Surveillance |
| | Roadway Equipment Coordination |
| TDOT HAR | Roadway Traffic Information Dissemination |
| | Roadway Work Zone Traffic Control |

| Element Name | Functional Area |
|--|--|
| TDOT HELP Vehicles | On-board EV En Route Support |
| | On-board EV Incident Management Communication |
| TDOT Maintenance Headquarters | MCM Environmental Information Collection |
| | MCM Environmental Information Processing |
| TDOT Maintenance Vehicles | MCV Vehicle Location Tracking |
| | MCV Work Zone Support |
| TDOT Project Planning Division Archive | ITS Data Repository |
| | Traffic and Roadside Data Archival |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| | Traffic Data Collection |
| TDOT Public Information Office | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| TDOT Ramp Metering Equipment | Roadway Traffic Metering |
| | Roadway Equipment Coordination |
| TDOT Region 1 Construction Office | MCM Work Activity Coordination |
| TDOT Region 1 HELP Dispatch | Service Patrol Management |
| TDOT Region 1 Maintenance | MCM Environmental Information Collection |
| | MCM Incident Management |
| | MCM Roadway Maintenance and Construction |
| TDOT Region 1 TMC - Knoxville | TMC Roadway Warning |
| | TMC Variable Speed Limits |
| | Collect Traffic Surveillance |
| | TMC Probe Information Collection |
| | TMC Traffic Metering |
| | TMC Traffic Information Dissemination |
| | TMC Regional Traffic Management |
| | TMC Incident Detection |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | TMC Environmental Monitoring |
| | Traffic Equipment Maintenance |
| | TMC Work Zone Traffic Management |
| | Traffic Data Collection |
| TDOT Region 2 TMC - Chattanooga | TMC Regional Traffic Management |
| TDOT Region 3 TMC - Nashville | TMC Regional Traffic Management |
| TDOT Region 4 TMC - Memphis | TMC Regional Traffic Management |

| Element Name | Functional Area |
|---|--|
| TDOT Roadway Warning Equipment | Roadway Basic Surveillance |
| | Roadway Warning |
| | Roadway Equipment Coordination |
| TDOT RWIS Sensors | Roadway Environmental Monitoring |
| TDOT Smart Work Zone Equipment | Roadway Work Zone Traffic Control |
| TDOT SmartWay Information System (TSIS) | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| | ISP Traveler Information Alerts |
| | Interactive Infrastructure Information |
| | ISP Emergency Traveler Information |
| | MCM Environmental Information Processing |
| | MCM Incident Management |
| | MCM Work Zone Management |
| | MCM Work Activity Coordination |
| TDOT SmartWay Website | ISP Traveler Data Collection |
| | Basic Information Broadcast |
| | ISP Traveler Information Alerts |
| | Interactive Infrastructure Information |
| TDOT SmartWay Website | ISP Emergency Traveler Information |
| TDOT Variable Speed Limit Equipment | Roadway Variable Speed Limits |
| | Roadway Equipment Coordination |
| TEMA | Incident Command |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| Tennessee 511 System | ISP Traveler Data Collection |
| | ISP Traveler Information Alerts |
| | Interactive Infrastructure Information |
| | Traveler Telephone Information |
| | ISP Emergency Traveler Information |
| Tennessee Bureau of Investigation | Emergency Early Warning System |
| Tennessee GoSmart Kiosks | Remote Interactive Information Reception |

| Element Name | Functional Area |
|-------------------------------|---|
| The Lift Dispatch Center | Center Secure Area Surveillance |
| | Center Secure Area Sensor Management |
| | Center Secure Area Alarm Support |
| | Transit Center Vehicle Tracking |
| | Transit Center Paratransit Operations |
| | Transit Center Fare Management |
| | Transit Center Security |
| | Transit Vehicle Operator Assignment |
| | Transit Garage Maintenance |
| | Transit Vehicle Assignment |
| | Transit Center Information Services |
| | Transit Center Multi-Modal Coordination |
| | Transit Evacuation Support |
| | Transit Data Collection |
| The LIFT IVR System | Remote Transit Information Services |
| The LIFT Paratransit Vehicles | On-board Transit Trip Monitoring |
| | On-board Schedule Management |
| | On-board Paratransit Operations |
| | On-board Transit Fare Management |
| | On-board Transit Security |
| | On-board Maintenance |
| THP Dispatch | Emergency Call-Taking |
| | Emergency Dispatch |
| | Incident Command |
| | Emergency Early Warning System |
| | Emergency Response Management |
| | Emergency Evacuation Support |
| | Emergency Environmental Monitoring |
| | Emergency Data Collection |
| THP Vehicles | On-board EV En Route Support |
| THP Weigh-in-Motion | Roadside WIM |
| TITAN Database | ITS Data Repository |
| | Traffic and Roadside Data Archival |
| | Government Reporting Systems Support |
| | On-Line Analysis and Mining |
| | Virtual Data Warehouse Services |
| | Emergency Data Collection |

| Element Name | Functional Area |
|----------------------------------|--|
| Town of Farragut CCTV Cameras | Roadway Basic Surveillance |
| Town of Farragut Field Sensors | Roadway Basic Surveillance |
| | Roadway Equipment Coordination |
| Town of Farragut TOC | Collect Traffic Surveillance |
| | TMC Signal Control |
| | TMC Traffic Metering |
| | TMC Regional Traffic Management |
| | TMC Incident Dispatch Coordination/Communication |
| | TMC Evacuation Support |
| | Traffic Equipment Maintenance |
| Town of Farragut Traffic Signals | Roadway Signal Controls |
| | Roadway Signal Preemption |
| | Roadway Equipment Coordination |
| Volunteer FD Vehicles | On-board EV En Route Support |

APPENDIX D – STAKEHOLDER ROLES AND RESPONSIBILITIES

| Transportation Service | Stakeholder | Roles/Responsibilities |
|---|-------------------------------------|---|
| Surface Street Management | City of Alcoa and City of Maryville | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | | Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway. |
| | City of Gatlinburg | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | City of Knoxville | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | | Provide traffic signal priority for transit vehicles. |
| | | Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway. |
| | City of Lenoir City | Operate and maintain traffic signal systems within the City. |
| Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. | | |
| Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. | | |
| Provide traffic signal preemption for emergency vehicles. | | |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|---|----------------------|---|
| Surface Street Management (Continued) | City of Oak Ridge | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | | Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway. |
| | City of Pigeon Forge | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | City of Sevierville | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | | Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway. |
| | Knox County | Operate and maintain traffic signal systems within the County. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the County to facilitate traffic signal operations. |
| Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. | | |
| Provide traffic signal preemption for emergency vehicles. | | |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|---|-------------------------------------|---|
| Surface Street Management (Continued) | Municipal Government | Operate and maintain traffic signal systems within the municipality. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the municipality to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| | | Provide traffic signal preemption for emergency vehicles. |
| | | Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway. |
| | Town of Farragut | Operate and maintain traffic signal systems within the City. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations. |
| | | Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests. |
| Provide traffic signal preemption for emergency vehicles. | | |
| Freeway Management | TDOT | Operate DMS and HAR to distribute traffic information and roadway conditions to travelers on the roadway. |
| | | Operate network surveillance equipment including CCTV cameras and vehicle detection on state roadways. |
| | | Remotely operate ramp metering systems to manage the use of freeways. |
| Incident Management (Traffic) | City of Alcoa and City of Maryville | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |
| | City of Knoxville | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|---|----------------------|---|
| Incident Management (Traffic) (Continued) | City of Oak Ridge | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |
| | City of Sevierville | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |
| | Knox County | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |
| | Municipal Government | Remotely control traffic and video sensors to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management. |
| | | Coordinate maintenance resources for incident response. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|--|----------------------------------|---|
| Incident Management (Traffic) (Continued) | TDOT | Remotely control traffic and video sensors from the SmartWay TMC to support incident detection and verification. |
| | | Responsible for the dissemination of traffic related data to other centers and the media. |
| | | Operate DMS and HAR to distribute incident information to travelers on the roadway. |
| | | Responsible for coordination with other TOCs and emergency management agencies for coordinated incident management. |
| | | Responsible for the development, coordination, and execution of special traffic management strategies during an evacuation. |
| Incident Management (Emergency) | Alcoa Emergency Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the Maryville/Alcoa TOC, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Blount County E911 Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the Maryville/Alcoa TOC, any other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Knox County E911 Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the City of Knoxville TOC, Knox County TOC, any other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Loudon County E911 Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Maryville Emergency Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the Maryville/Alcoa TOC, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Municipal Public Safety Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | Oak Ridge Emergency Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the City of Oak Ridge TOC, and the TDOT SmartWay Center in Knoxville for incidents on state facilities |
| | Sevier County E911 Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with emergency dispatch agencies, the City of Sevierville TOC, any other municipal TOCs, and the TDOT SmartWay Center in Knoxville for incidents on state facilities |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|--|-------------------------------|---|
| Incident Management (Emergency) (Continued) | Other County E911 Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with other public safety and traffic management agencies as well as the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| | THP Dispatch | Dispatch public safety vehicles to incidents. |
| | | Coordinate incident response with other public safety and traffic management agencies as well as the TDOT SmartWay Center in Knoxville for incidents on state facilities. |
| Emergency Management | Alcoa Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Blount County EMA | Operates the EOC for Blount County in the event of a disaster or other large-scale emergency situation. |
| | | Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County. |
| | | Lead regional efforts for emergency planning to support large-scale incidents and disasters. |
| | | Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Blount County E911 Dispatch | Responsible for emergency call-taking for Blount County as the 911 PSAP. Relays dispatch to city run local dispatch for Alcoa, Maryville, and several other municipalities within the County. |
| | | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Gatlinburg Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. | | |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|----------------------------------|------------------------------|--|
| Emergency Management (Continued) | Knox County EMA | Operates the EOC for Knox County in the event of a disaster or other large-scale emergency situation. |
| | | Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County. |
| | | Lead regional efforts for emergency planning to support large-scale incidents and disasters. |
| | | Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Knox County E911 Dispatch | Responsible for emergency call-taking for Knox County as the 911 PSAP. |
| | | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Loudon County EMA | Operates the EOC for Loudon County in the event of a disaster or other large-scale emergency situation. |
| | | Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County. |
| | | Lead regional efforts for emergency planning to support large-scale incidents and disasters. |
| | | Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Loudon County E-911 Dispatch | Responsible for emergency call-taking for Loudon County as the 911 PSAP. Relays dispatch to local dispatch Rural Metro and several municipalities within the County. |
| | | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|----------------------------------|---------------------------------|---|
| Emergency Management (Continued) | Maryville Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Municipal Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Pigeon Forge Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Rural Metro Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Sevier County EMA | Operates the EOC for Sevier County in the event of a disaster or other large-scale emergency situation. |
| | | Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County. |
| | | Lead regional efforts for emergency planning to support large-scale incidents and disasters. |
| | | Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|----------------------------------|-----------------------------------|--|
| Emergency Management (Continued) | Sevier County E911 Dispatch | Responsible for emergency call-taking for Sevier County as the 911 PSAP. Relays dispatch to city run local dispatch for Pigeon Forge, Sevierville, and Gatlinburg. |
| | | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Sevierville Emergency Dispatch | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | TEMA | Operates the EOC for the State of Tennessee in the event of a disaster or other large-scale emergency situation. |
| | | Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the State. |
| | | Responsible for coordination with adjacent states, including the State of Georgia, as needed to support emergency management. |
| | | Lead statewide efforts for emergency planning to support large-scale incidents and disasters. |
| | | Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | THP | Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status. |
| | | Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident. |
| | | Participate in regional emergency planning to support large-scale incidents and disasters. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Tennessee Bureau of Investigation | Responsible for the initiation of AMBER Alerts. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|--|---|--|
| Maintenance and Construction Management | City of Knoxville Public Works Department | Responsible for the tracking and dispatch of maintenance vehicles. |
| | | Supports coordinated response to incidents. |
| | | Supports work zone activities including the dissemination of work zone information through portable DMS and sharing of information with other groups. |
| | | Disseminates work zone activity schedules and current asset restrictions to other agencies. |
| | Municipal/County Maintenance | Responsible for the tracking and dispatch of maintenance vehicles. |
| | | Supports coordinated response to incidents. |
| | | Monitors environmental sensors and distributes information about road weather conditions. |
| | | Supports work zone activities including the dissemination of work zone information through portable DMS and sharing of information with other groups. |
| | | Disseminates work zone activity schedules and current asset restrictions to other agencies. |
| | TDOT | Monitors environmental sensors and distributes information about road weather conditions. |
| | | Responsible for the tracking and dispatch of maintenance vehicles. |
| | | Supports coordinated response to incidents. |
| | | Supports work zone activities including the dissemination of work zone information through portable DMS, HAR, and sharing of information with other groups. |
| | | Responsible for entering and updating work zone information in TSIS. |
| | | Disseminates work activity schedules and current asset restrictions to other agencies. |
| Operates work zone traffic control equipment including portable surveillance equipment, DMS, and HAR transmitters. | | |
| Transit Management | ETHRA Transportation | Operates demand response transit services from a central dispatch facility responsible for tracking vehicle location and status. |
| | | Provide transit passenger electronic fare payment. |
| | | Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems. |
| | | Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|--------------------------------|---------------------------|--|
| Transit Management (Continued) | Gatlinburg Trolley System | Operates fixed route services from central dispatch facilities responsible for tracking their location and status. |
| | | Provide transit passenger electronic fare payment. |
| | | Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems. |
| | | Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Knox County CAC Transit | Operates demand response transit services from a central dispatch facility responsible for tracking vehicle location and status. |
| | | Provide transit passenger electronic fare payment. |
| | | Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems. |
| | | Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| | Knoxville Area Transit | Operates fixed route and paratransit services from central dispatch facilities responsible for tracking their location and status. |
| | | Provide transit passenger electronic fare payment. |
| | | Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems. |
| | | Coordinate with the TOC on transit signal priority. |
| | | Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 system. |
| | | Operate real-time arrival information boards at transit stops and at transfer stations. |
| | | Operate on-board systems to provide next stop annunciation. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|--------------------------------|--------------------------------------|---|
| Transit Management (Continued) | Pigeon Forge Fun Time Trolley System | Operates fixed route services from central dispatch facilities responsible for tracking their location and status. |
| | | Provide transit passenger electronic fare payment. |
| | | Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems. |
| | | Provide transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 Traveler Information System. |
| | | Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation. |
| Traveler Information | City of Alcoa and City of Maryville | Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information. |
| | | Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts. |
| | City of Knoxville | Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information. |
| | | Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts. |
| | City of Oak Ridge | Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information. |
| | | Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts. |
| | City of Sevierville | Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information. |
| | | Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts. |
| | TDOT | Collection, processing, storage, and broadcast dissemination of traffic, transit, maintenance and construction, event and weather information to travelers via the SmartWay Website and the Tennessee 511 system. |
| | | Provide transportation information to travelers via traveler information kiosks. |
| | | Provide transportation network condition data to private sector information service providers. |

| Transportation Service | Stakeholder | Roles/Responsibilities |
|-------------------------------|------------------------|--|
| Commercial Vehicle Operations | THP | Operate weigh-in-motion commercial vehicle inspection station. |
| | | Enforce commercial vehicle regulations in the State of Tennessee. |
| Archived Data Management | ETHRA | Collect and maintain transit archive data. |
| | Knox County CAC | Collect and maintain transit archive data. |
| | Knoxville Area Transit | Collect and maintain transit archive data. |
| | Knoxville Regional TPO | Collect and maintain data from regional traffic, transit, and emergency management agencies. |
| | TDOT | Collect and maintain traffic archive data. |
| | THP | Collect and maintain crash record information from regional emergency management agencies. |

APPENDIX E – STAKEHOLDER DATABASE

Knoxville Regional ITS Architecture Stakeholder Workshop Attendance

| Organization | Invitees | | Workshop Attendance | | | |
|---|------------|-----------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshop |
| Blount County E-911 | Jeff | Caylor | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Blount County Emergency Management/Homeland Security | Bart | Stinnett | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cambridge Systematics, Inc. | Richard | Margiotta | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| City of Alcoa Public Works and Engineering Department | Andrew | Sonner | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| City of Alcoa Public Works and Engineering Department | Kenny | Wiggins | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Gatlinburg | Cindy | Ogle | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Gatlinburg | Larry | Henderson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Gatlinburg Mass Transit | Buddy | Parton | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Engineering Department | Stephen | Millsaps | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Engineering Department | Brent | Johnson | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Fire Department | David | Frazier | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Fire Department | Stan | Sharp | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Fire Department | Bobby | Palmer | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| City of Knoxville Fire Department | Roger | Byrd | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshp |
|---|------------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| City of Knoxville Police Department | Darrell | DeBusk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Police Department | David | Rausch | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Police Department | Ronald | Green | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Public Works | Ernie | Pierce | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Knoxville Public Works | John | Hunter | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Lenoir City | Leslie | Johnson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Maryville | Brian | Boone | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| City of Maryville Engineering and Public Works Department | Kevin | Stoltenberg | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| City of Oak Ridge Community Development Director | Kathryn | Baldwin | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Oak Ridge Electric Department | Jon | Van Eek | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| City of Oak Ridge Public Works Department | Steve | Byrd | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| City of Oak Ridge Public Works Department | Gary | Cinder | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Pigeon Forge | Earlene | Teaster | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Pigeon Forge Fun Time Trolley | Scott | Marine | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Pigeon Forge Public Works | Mark | Miller | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Sevierville | Steve | Hendrix | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| City of Sevierville | Bryon | Fortner | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| East Tennessee Development District | Don | Brown | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshp |
|---|------------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| East Tennessee Human Resource Agency (ETHRA) | Brent | Gagley | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| East Tennessee Human Resource Agency (ETHRA) Public Transit | Mike | Patterson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| East Tennessee Human Resource Agency (ETHRA) Public Transit | Gary | Holiway | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Federal Highway Administration | Victor | Dang | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Federal Highway Administration | Corbin | Davis | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Federal Highway Administration | Don | Gedge | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Federal Transit Administration | Elizabeth | Martin | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FHWA Tennessee Division | Pamela | Heimsness | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Knox County Department of Engineering and Public Works | John | Sexton | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knox County E-911 | Melissa | Weaver | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knox County Engineering and Public Works | Dwight | Van de Vate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knox County Engineering and Public Works | Cindy | Pionke | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Knox County Sheriff Department | Bernie | Lyon | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knox County Sheriff Department | Ron | Chamberlain | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knox County Sheriff Department | JJ | Jones | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knoxville Area Transit (KAT) | Melissa | Roberson | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knoxville Area Transit (KAT) | Cindy | McGinnis | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshp |
|--|------------|-----------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Knoxville Commuter Pool | Ted | Newsom | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knoxville Regional Transportation Planning Organization | Doug | Burton | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knoxville Regional Transportation Planning Organization | Mike | Conger | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knoxville Regional Transportation Planning Organization | Jeff | Welch | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Knoxville Regional Transportation Planning Organization | Nathan | Benditz | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knoxville-Knox County Community Action Committee | Barbara | Monty | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Knoxville-Knox County Community Action Committee Transit | Karen | Estes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Knoxville-Knox County Emergency Management Agency | Alan | Lawson | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Knoxville-Knox County Metropolitan Planning Commission | Mark | Donaldson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lakeway Area Metropolitan Transportation Planning Organization | Rich | DesGroseilliers | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lenoir City Utilities Board | Doug | Moats | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Loudon County Economic Development Agency | Pat | Phillips | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Loudon County Emergency Managemeent Agency | Daryl | Smith | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Loundon County E-911 | Jennifer | Estes | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Metropolitan Knoxville Airport Authority | Blake | Sartin | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshop |
|---|------------|-----------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Oak Ridge National Laboratory Center for Transportation Analysis | Diane | Davidson | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Rural Metro | John | Brinkley | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Rural Metro | Chris | McLain | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Sevier County | Greg | Patterson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sevier County E-911 | Judy | Tucker | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sevier County Emergency Management Agency | John | Mathews | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Mark | Dykes | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Nathan | Vatter | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| TDOT | Mark | Nagi | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Amanda | Snowden | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Charlotte | Davis | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Jerry | Roache | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT | Christy | Haynes | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| TDOT | Dean | Roberts | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Division of Multimodal Transportation Resources | Kwabena | Aboagye | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Division of Multimodal Transportation Resources | Sherri | Carroll | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Division of Multimodal Transportation Resources | John | Reed | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshp |
|-------------------------------------|------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| TDOT - Long Range Planning | Angie | Midgett | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Long Range Planning | Mike | Presley | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Long Range Planning Division | Terry | Gladden | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Region 1 | Steve | Borden | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Region 1 | David | Wortham | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT - Region 1 | Mark | Best | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| TDOT Long Range Planning Division | Tanisha | Hall | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT Office of Incident Management | Frank | Horne | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TDOT Region 1 IT | Susan | Johnson | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| TDOT Region 1 Traffic | Andrew | Padgett | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Tennessee Highway Patrol | Dennis | Murray | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Tennessee Highway Patrol | Ron | McDonald | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Tennessee Highway Patrol | Cheryl | Sanders | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Tennessee Motor Truck Association | Dave | Huneryager | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Tennessee Motor Truck Association | Edmond | Sorrell | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Towing | Rick | Carnes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Town of Farragut | Chris | Jenkins | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Town of Farragut | Darryl | Smith | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| University of Tennessee | Michael | Ragsdale | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Organization | First Name | Last Name | Kick-Off | ITS Architecture | ITS Deployment Plan | Final Workshp |
|--|------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| University of Tennessee | Arun | Chatterjee | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| University of Tennessee Parking and Transit Services | Mark | Hairr | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wilbur Smith Associates | Bob | Bowers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wilbur Smith Associates | John | Gould | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**APPENDIX F – ARCHITECTURE MAINTENANCE DOCUMENTATION
FORM**

Knoxville

Regional ITS Architecture

ITS Architecture Maintenance Documentation Form



Please complete the following form to document changes to the 2012 Knoxville Regional ITS Architecture. Forms should be submitted to the Knoxville Regional Transportation Planning Organization (TPO) for review and acceptance. All accepted changes will be kept on file by the TPO and will be incorporated into the Knoxville Regional ITS Architecture during the next scheduled update.

Contact Information

| | |
|-----------------------|--|
| Agency | |
| Agency Contact Person | |
| Street Address | |
| City | |
| State, Zip Code | |
| Telephone | |
| Fax | |
| E-Mail | |

Change Information

Please indicate the type of change to the Regional ITS Architecture or Deployment Plan:

- Administrative Change: Basic changes that do not affect the structure of the ITS market packages in the Regional ITS Architecture.
Examples include: Changes to stakeholder or element name, element status, or data flow status.
- Functional Change – Single Agency: Structural changes to the ITS market packages that impact only one agency in the Regional ITS Architecture.
Examples include: Addition of a new ITS market package or changes to data flow connections of an existing ITS market package. The addition or changes would only impact a single agency.
- Functional Change – Multiple Agencies: Structural changes to the ITS market packages that have the potential to impact multiple agencies in the Regional ITS Architecture.
Examples include: Addition of a new ITS market package or changes to data flow connections of an existing ITS market package. The addition or changes would impact multiple agencies and require coordination between the agencies.
- Project Change: Addition, modification, or removal of a project in the Regional ITS Deployment Plan.
- Other: _____

Submittal

Please submit ITS Architecture Maintenance Documentation form to:

Knoxville Regional Transportation Planning Organization
 400 Main Street, Suite 403
 Knoxville, TN 37902
 Phone: 865-215-2500

Form Submittal Date: _____

Knoxville

Regional ITS Architecture

ITS Architecture Maintenance Documentation Form



| | |
|---|---|
| <p>Question 1 Describe the requested change to the Regional ITS Architecture or Deployment Plan.</p> | <p><i>Example: City A is planning to deploy CCTV cameras for network surveillance on arterial streets. In the Regional ITS Architecture, the City A Traffic Operations Center (TOC) is shown as the only center controlling the CCTV cameras. The City A TOC is now planning to provide images and control of the CCTV cameras to the City A Police Department for use during incidents.</i></p> |
| <p>Question 2 Are any of the Regional ITS Architecture market packages impacted by the proposed change?</p> | <p><input type="checkbox"/> Yes: Please complete Questions 2A and 2B <input type="checkbox"/> No: Please proceed to Question 3 <input type="checkbox"/> Unknown: Please coordinate with the Knoxville TPO to determine impacts of the change to the Regional ITS Architecture</p> |
| <p>Question 2A List all of the ITS market packages impacted by the proposed change.</p> | <p><i>Example: ATMS08 – Traffic Incident Management System ATMS01 – Network Surveillance</i></p> |
| <p>Question 2B Include a copy of the ITS market packages impacted by the proposed change and mark any proposed modifications to the ITS market packages. Add any additional notes on proposed changes in this section.</p> | <p><i>Example: A sketch of the ATMS08 – Traffic Incident Management System market package diagram for City A is attached. Changes have been marked by hand to indicate the new data connections that will be established to allow the City A TOC to send traffic images to the City A Police Department and for the City A Police Department to control the CCTV cameras. The deployment of the CCTV cameras will also result in several of the data flows in ATMS01 – Network Surveillance being changed from planned to existing. These have also been marked on the market package diagram. (Note: The ITS market package diagrams can be found in Appendix B of the Regional ITS Architecture.)</i></p> |
| <p>Question 3 Does the proposed change impact any stakeholder agencies other than the agency completing this form?</p> | <p><input type="checkbox"/> Yes: Please complete Questions 3A and 3B <input type="checkbox"/> No: Form is complete <input type="checkbox"/> Unknown: Please coordinate with the Knoxville TPO to determine impacts of change to other agencies in the Regional ITS Architecture</p> |
| <p>Question 3A Identify the stakeholder agencies impacted by the change and a contact person for each agency.</p> | <p><i>Example: The City A TOC and City A Police Department are the two agencies impacted by this change. (Note: Assuming the City A TOC representative is completing this form, the contact person from the City A Police Department working on this project should be listed.)</i></p> |
| <p>Question 3B Describe the coordination that has occurred with the stakeholder agencies and the results of the coordination?</p> | <p><i>Example: The City A TOC and City A Police Department have had several meetings in the last year to discuss the operations of the arterial CCTV cameras. An operational agreement for the joint operations of the CCTV cameras is currently being developed.</i></p> |