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Metropolitan Transportation Planning Organization

JOHNSON CITY

Regional Intelligent Transportation System Architecture and Deployment Plan Update

MARCH 2015

Johnson City

Regional Intelligent Transportation System Architecture and Deployment Plan

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TABLE OF CONTENTS

1. INTRODUCTION 1
   1.1 Project Overview 1
   1.2 The Johnson City Region 2
      1.2.1 Geographic Boundaries 2
      1.2.2 Transportation Infrastructure 4
      1.2.3 Project Participation 5
   1.3 Document Overview 7
2. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS 9
3. REGIONAL ITS NEED 12
4. REGIONAL ITS INVENTORY 13
   4.1 Stakeholders 13
   4.2 ITS Elements 15
5. REGIONAL ITS ARCHITECTURE 26
   5.1 ITS Service Packages 26
      5.1.1 Overview of ITS Service Package Structure 27
      5.1.2 Selection and Prioritization of Regional ITS Service Packages 28
      5.1.3 Customization of Regional ITS Service Packages 30
      5.1.4 Regional Needs and Corresponding ITS Service Packages 31
   5.2 Architecture Interfaces 34
      5.2.1 Top Level Regional System Interconnect Diagram 34
      5.2.2 Element Connections 36
      5.2.3 Data Flows Between Elements 36
   5.3 Functional Requirements 37
   5.4 Standards 38
   5.5 Operational Concepts 41
   5.6 Potential Agreements 49
   5.7 Phases of Implementation 53
6. REGIONAL ITS DEPLOYMENT PLAN 54
   6.1 Project Development and Selection 54
   6.2 ITS Project Recommendations 55
7. USE AND MAINTENANCE PLAN 62
   7.1 Incorporation into the Regional Planning Process 62
   7.2 Systems Engineering Analysis 63
   7.3 Process for Determining Architecture Conformity 64
   7.4 Regional ITS Architecture Maintenance Process 66
   7.5 Procedure for Submitting ITS Architecture Changes between Major Updates 67

TABLE OF CONTENTS

APPENDIX A – SERVICE PACKAGE DEFINITIONS

APPENDIX B – CUSTOMIZED ITS SERVICE PACKAGES

APPENDIX C – ELEMENT FUNCTIONS

APPENDIX D – STAKEHOLDER DATABASE

APPENDIX E – AGREEMENTS

APPENDIX F – ARCHITECTURE MAINTENANCE DOCUMENTATION FORM

TABLE OF CONTENTS

LIST OF FIGURES

Figure 1 – Johnson City Regional Boundaries 3
Figure 2 – Johnson City Regional ITS Architecture and Deployment Plan Development Process 9
Figure 3 – Overview of ITS Service Package Structure 27
Figure 4 – Example ITS Service Package Diagram: ATMS06 – Traffic Information Dissemination (TDOT Region 1 TMC) 30
Figure 5 – Johnson City Regional System Interconnect Diagram 35
Figure 6 – Example Interconnect Diagram: City of Elizabethton Traffic Signals 36
Figure 7 – Example Flow Diagram: Network Surveillance 37
Figure 8 – Project Development and Selection Process 54

LIST OF TABLES

Table 1 – Johnson City Region Stakeholder Agencies and Contacts 6
Table 2 – Turbo Architecture Report and Diagrams 11
Table 3 – Johnson City Regional Stakeholder Descriptions 14
Table 4 – Johnson City Region Inventory of ITS Elements 16
Table 5 – Johnson City Regional ITS Service Package Prioritization by Functional Area 29
Table 6 – Johnson City Regional ITS Needs and Corresponding ITS Service Packages 32
Table 7 – Johnson City Regional ITS Standards 39
Table 8 – Johnson City Region Stakeholder Roles and Responsibilities 42
Table 9 – Johnson City Region Potential Agreements 51
Table 10 – State ITS Deployment Plan Projects 57
Table 11 – Local ITS Deployment Plan Projects 58
Table 12 – Transit ITS Deployment Plan Projects 60
Table 13 – Other ITS Deployment Plan Projects 61
Table 14 – Johnson City Regional ITS Architecture Maintenance Summary 66

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 Systems
ASTM	American Society for Testing and Materials
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
C2C	Center-to-Center
CCTV	Closed-Circuit television
CPT	Common Public Transportation
CVISN	Commercial Vehicle Information Systems and Networks
DMS	Dynamic Message Sign
DSRC	Dedicated Short Range Communication
EM	Emergency Management
EMA	Emergency Management Agency
EMC	Emergency Management Center
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTHRA	First Tennessee Human Resource Agency
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
IEEE	Institute of Electrical and Electronics Engineers
ISP	Internet Service Provider
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System

LIST OF ACRONYMS

IVR	Interactive Voice Response
LRTP	Long Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century
MC	Maintenance and Construction
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MTPO	Metropolitan Transportation Planning Organization
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
RPO	Rural Planning Organization
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
SWIFT	Statewide Information for Travelers
TDOT	Tennessee Department of Transportation
TEA-21	Transportation Equity Act for the 21st Century
TEMA	Tennessee Management Emergency Agency
TIP	Transportation Improvement Plan
THP	Tennessee Highway Patrol
TITAN	Tennessee Integrated Traffic Analysis Network
TMC	Transportation Management Center (or Traffic Management Center)
TOC	Traffic Operations Center
TraCS	Traffic and Criminal Software
TSS	Transportation Sensor Systems
USDOT	United States Department of Transportation

LIST OF ACRONYMS

VIVDS	Video Image Vehicle Detection Systems
WAVE	Wireless Access in Vehicular Environments

1. INTRODUCTION

1.1 Project Overview

The Regional Intelligent Transportation System (ITS) Architecture provides a long-range plan for the deployment, integration, and operation of ITS in the Johnson City Region. The Regional ITS Architecture allows stakeholders to plan how they would like their system to operate in the future and then break the system into smaller projects that can be implemented over time as funding permits. Development of a Regional ITS Architecture encourages interoperability and resource sharing among agencies and allows for cohesive long-range planning among regional stakeholders. Completion and update of the plan is also required by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) in order to use federal transportation funds for ITS projects in the Region.

Regional ITS Architectures are living documents and should be updated as necessary to reflect a region's needs and current guidelines. The Johnson City Regional ITS Architecture was first developed in 2006. Since that time, a number of ITS programs and projects have been implemented in the Johnson City Region including the City of Johnson City's traffic operations center (TOC), advanced traffic signal system (ATMS), closed-circuit television (CCTV) cameras, and the Johnson City Transit System's automated vehicle location (AVL) system which allows the agency to display real-time bus location information on their website. Additionally, the National ITS Architecture, which served as the basis for the Johnson City Regional ITS Architecture, was updated several times, with the most recent update occurring in 2012. In order to incorporate these changes, the Tennessee Department of Transportation, in close coordination with the Johnson City Metropolitan Transportation Planning Organization (MTPO), completed an update of the Regional ITS Architecture in 2015.

The Regional ITS Architecture consists of several key components:

- ITS Needs – The needs describe the transportation related needs in the Region that could possibly be addressed by ITS.
- ITS Inventory – The inventory describes all of the ITS related elements that either exist or are planned for the Region.
- ITS Service Packages – The ITS service packages describe the services that stakeholders in the region want ITS to provide. ITS service package diagrams have been developed to illustrate how each service will be deployed and operated by each agency in the Region that expressed interest in a particular service. In the previous version of the Johnson City Regional ITS Architecture, ITS service packages were referred to as ITS market packages. The name change has been made to be consistent with the terminology that is now used in Version 7.0 of the National ITS Architecture.
- Use and Maintenance Plan – The use and maintenance plan describes how to use the Regional ITS Architecture for ITS planning and design efforts, such as the development of a Systems Engineering Analysis. It also describes how the Regional ITS Architecture should be maintained in the future.

A regional ITS architecture is 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 and the Moving Ahead for Progress in the 21st Century (MAP-21) bill passed in 2012. 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 or statewide 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 Johnson City Regional ITS architecture update includes the same geographic boundaries as the Johnson City MTPO. The stakeholders developed the Regional ITS Architecture based on a vision of how they wanted to implement and operate ITS through the year 2040 in the Johnson City Region. Additionally, the Regional ITS Architecture includes an ITS Deployment Plan. The ITS Deployment Plan identifies projects that have been recommended by the stakeholders as priority projects for their agency that will help achieve the vision of the Regional ITS Architecture.

The Johnson City ITS Architecture was developed with significant input from local, state, and federal officials. Two stakeholder workshops were held and individual interviews were conducted with many of the stakeholders outside of the workshops to gather input 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 Deployment Plan developed reflects an accurate snapshot of existing ITS deployment 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 The Johnson City Region

1.2.1 Geographic Boundaries

The Johnson City Region is comprised of the majority of Washington County, the northern and western portions of Carter County, a northern portion of Unicoi County, and a southern portion of Sullivan County. Other municipalities within the region include the Town of Jonesborough, City of Watauga, City of Elizabethton, City of Bluff City, and Town of Unicoi. These boundaries correspond with the boundaries of the Johnson City Metropolitan Transportation Planning Organization, which are shown in **Figure 1**. Johnson City is also a principal city in a larger region known as the Tri-Cities. The other principal cities include Kingsport, TN and Bristol, TN (in addition to Bristol, VA which shares a central business district across the State border from Bristol, TN). Although the Tri-Cities are often referred to collectively, each city lies within a separate metropolitan planning organization.

When developing the stakeholder group, the project team coordinated with the Johnson City MTPO to include the appropriate city, county, regional, state and federal agencies. Stakeholders included both local representatives as well as representatives from TDOT headquarters and Region 1 in Knoxville and FHWA from the Tennessee Division Office in Nashville.

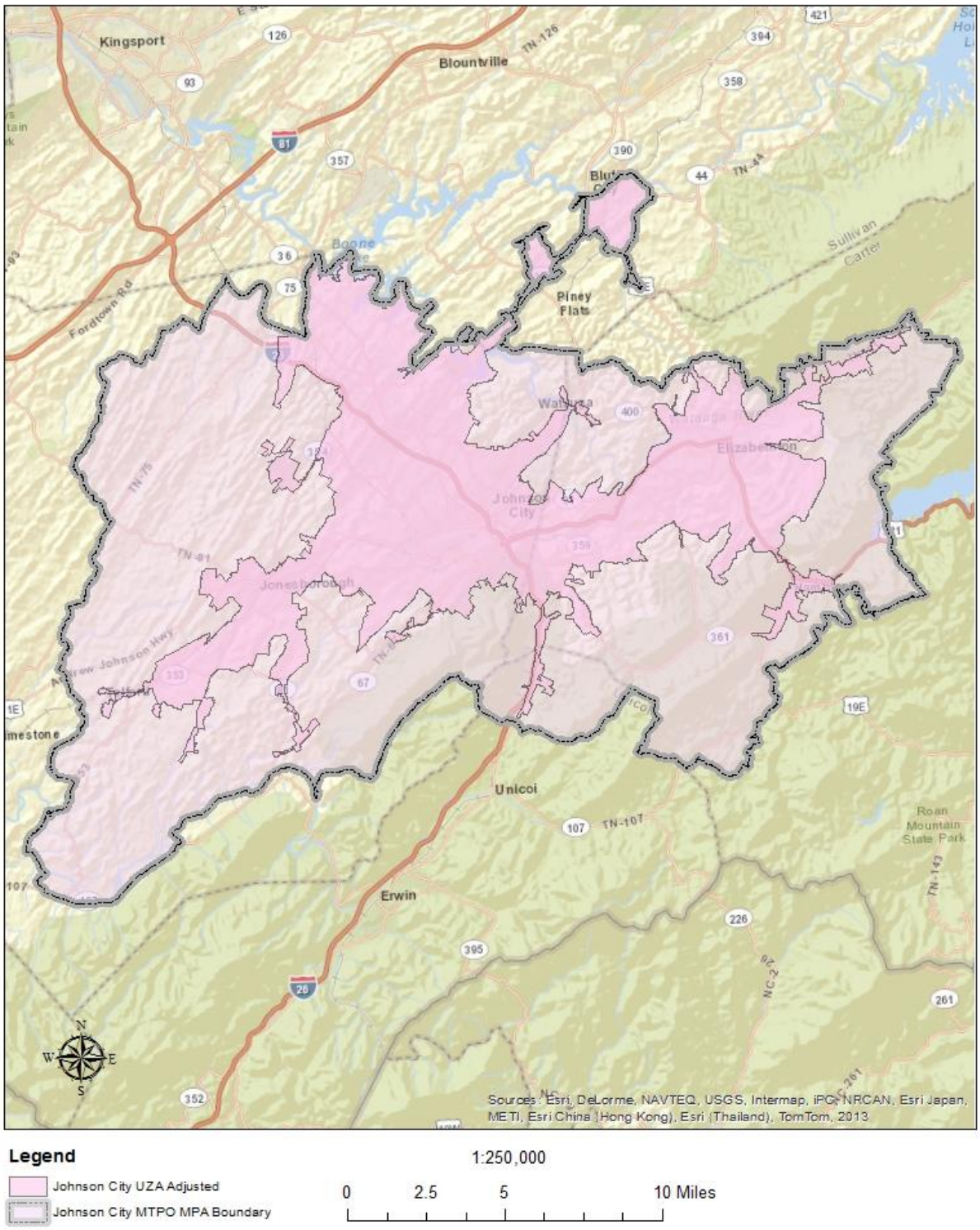


Figure 1 – Johnson City Regional Boundaries

1.2.2 Transportation Infrastructure

The Johnson City Region is served by a number of significant State and Federal Highways. The primary access controlled facilities are I-26 and I-81. I-26 is designated as an east-west route; however, within the Johnson City Region, the interstate runs more north-south connecting the Region with the City of Kingsport to the north and western North Carolina and the City of Asheville to the south. I-81, which is runs just north of the Johnson City Regional Boundaries, is also an east-west route that connects to I-40 and the City of Knoxville to the west and the Bristol, TN and VA Region to the northeast. The I-24/I-81 interchange provides a connection between the principal cities of the Tri-Cities Region.

Major arterials in the Region include SR 34/US 11E/US 321 which connects the City of Johnson City with the Town of Jonesborough and the City of Greeneville to the west, SR 67/US 321 which connects the City of Johnson City to the City of Elizabethton in the east, and SR 34/US 11E/ US 19W which connects the City of Johnson City to the City of Bristol to the northeast. SR 381 (State of Franklin Road) is a semi-circumferential route that serves as a major commercial corridor, links to other major routes including I-26, and serves the campus of East Tennessee State University. Other federal highways that traverse the Johnson City Region include US 23 and US 19E.

Fixed-Route and paratransit services are provided in the City of Johnson City by the Johnson City Transit (JCT) System. Northeast Tennessee Transit (NET Trans) operates a demand response service in the Johnson City Region that is operated by the First Tennessee Human Resource Agency (FTHRA). NET Trans also operates two fixed-route lines, one of which connects Greeneville with the Johnson City Transit Transit Center.

The Johnson City Region is also served by two Class I railroads operated by Norfolk Southern and CSX. Norfolk Southern's rail line connects to Greeneville and Knoxville to the west and the Bristol Region to the northeast, and the CSX rail line connects to the City of Kingsport in the north and western North Carolina to the south. The development of a bicycle and pedestrian rails-to-trails project is underway along an abandoned rail line that connects Johnson City and Elizabethton. Additionally, the Johnson City Region is served by the Tri-Cities Regional Airport, which is located along I-81.

The Johnson City Region has undertaken several deployments of ITS programs throughout the Region. These programs are 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 Johnson City Region:

- **TDOT SmartWay Program** – TDOT's SmartWay platform is predominately a freeway traffic management platform comprised of closed-circuit television (CCTV) cameras, dynamic message signs (DMS), radar detection systems (RDS), and highway advisory radio (HAR). CCTV cameras, DMS, and HAR are currently located along I-81 near the interchange of I-26. Although these elements are not within the Region's boundaries, their close proximity allows the Johnson City Region to benefit significantly from their presence. TDOT's SmartWay website provides congestion, incident, and construction information, in addition to live video from CCTV cameras in the Johnson City Region. TDOT has also created the SmartView software program that allows municipalities to view live video feeds with expanded capabilities compared to the SmartWay website. In the future, SmartView may allow municipalities to share their CCTV camera feeds with TDOT and other municipalities.
- **City of Johnson City Traffic Management –** The City of Johnson City has installed 41 CCTV cameras supporting real-time monitoring of the roadway network including

along I-26. There are plans to install additional cameras in the future especially along Boones Creek Road and the Gray area. The expansion of CCTV coverage would coincide with the extension of the City's fiber optic cable network. Additionally, agreements with local media will be necessary to share live video feeds.

- **Johnson City Transit ITS** – Johnson City Transit has implemented or plans to implement a number of programs. All Johnson City Transit fixed-route and demand response vehicles include automated vehicle location (AVL) systems. Additionally, riders can view real-time bus locations on the Johnson City Transit website or text a specific code located at each bus stop to receive next bus departure times. A dynamic message sign at the Johnson City Transit Transit Center also displays bus arrival and departure information. Future initiatives include a mobile phone application and an electronic fare payment card.
- **City of Elizabethton Traffic Signal Coordination –** All traffic signals along the City's main corridor, SR 67/SR 9/US 321 (W. Elk St/Broad Street), are interconnected and various intersections now have video or microwave sensors for vehicle detection. The City would like to establish a central location for traffic signal control.

1.2.3 Project Participation

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.

Table 1 contains a listing of stakeholders in the Johnson City Region who have participated in the project workshops or provided input through in-person or telephone interviews to the study team as to the needs and issues to be considered as part of the Regional ITS Architecture. Other stakeholders that were invited to participate but were not able to attend were provided the minutes from the workshops and notified when copies of the 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 database in **Appendix D**.

Table 1 – Johnson City Region Stakeholder Agencies and Contacts

Stakeholder Agency	Address	Contact
City of Elizabethton	136 South Sycamore Street Elizabethton, TN 37643	Jerome Kitchens City Manager
City of Johnson City Public Works Department – Traffic Division	209 Water Street Johnson City, Tennessee 37601	Mark Stidham Traffic System Specialist
City of Johnson City Public Works Department – Traffic Division	209 Water Street Johnson City, Tennessee 37601	Anthony Todd Traffic Engineer
FHWA – Tennessee Division	404 BNA Drive - Building 200, Suite 508 Nashville, TN 37217	Pamela Heimsness Safety & Traffic Operations Team Leader
FHWA – Tennessee Division	404 BNA Drive - Building 200, Suite 508 Nashville, TN 37217	Nick Renna Operations Program Manager
First Tennessee Development District	3211 North Roan Street Johnson City, TN 37601	Chris Craig Assistant Executive Director
Johnson City Metropolitan Transportation Planning Organization	137 West Market Street Johnson City, Tennessee 37604	Glenn Berry Transportation Coordinator
Johnson City Metropolitan Transportation Planning Organization	137 West Market Street Johnson City, Tennessee 37604	Mary Butler Transportation Planner
Johnson City Transit System	137 West Market Street Johnson City, Tennessee 37604	Wendi Davis Planner
Johnson City Transit System	137 West Market Street Johnson City, Tennessee 37604	Jane Fillers
Johnson City Transit System	137 West Market Street Johnson City, Tennessee 37604	Jeff Rawles Assistant Transit Director
Johnson City Transit System	137 West Market Street Johnson City, Tennessee 37604	Emily Wood Transit Planner
Tennessee Department of Transportation – Long Range Planning Division	505 Deaderick Street Suite 900, James K Polk Building Nashville, Tennessee 37243	Lia Prince Transportation Project Specialist
Tennessee Department of Transportation – Long Range Planning Division	7345 Region Lane Knoxville, Tennessee 37914	Nick Weander Community Transportation Planner
Tennessee Department of Transportation – Region 1 Traffic	7345 Region Lane Knoxville, TN 37901	Mark Best ITS/ Traffic Manager
Tennessee Department of Transportation – Region 1 Traffic	7345 Region Lane Knoxville, TN 37901	Nathan Vatter Region 1 Traffic Engineer
Tennessee Department of Transportation – Traffic Operations Division	505 Deaderick Street Suite 300, James K Polk Building Nashville, TN 37243	Robert Benshoof ITS Deployments Manager
Tennessee Department of Transportation – Traffic Operations Division	505 Deaderick Street Suite 300, James K Polk Building Nashville, TN 37243	Andrew Christie Transportation Project Specialist
Tennessee Department of Transportation – Traffic Operations Division	505 Deaderick Street Suite 300, James K Polk Building Nashville, TN 37243	Said El Said ITS Program Manager

1.3 Document Overview

The Johnson City Regional ITS Architecture report is organized into seven key sections:

Section 1 – Introduction

This section provides an overview of the Johnson City Regional ITS Architecture, including a description of the Region and list of participating stakeholders.

Section 2 – Regional ITS Architecture Development Process

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

Section 3 – Regional ITS Needs

This section contains a summary of regional needs for the Johnson City Region that are related to ITS.

Section 4 – Regional ITS Inventory

This section provides a description of the stakeholders and ITS elements in the Region. Elements are grouped based on the stakeholder, such as the City of Johnson City or Johnson City Transit, and their current status is listed as either existing or planned.

Section 5 – Regional ITS Architecture

This section describes how the National ITS Architecture was customized to meet the ITS needs, plans, and visions for the Johnson City 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 also 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 6 – Regional ITS Deployment Plan

This section describes the ITS projects that regional stakeholders expressed a need to deploy in order to deliver the ITS services identified in the regional ITS architecture. Project descriptions include a target deployment timeframe, responsible agency, an opinion of probable cost, funding status, and applicable ITS service packages.

Section 7 – 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 Johnson City Regional ITS Architecture also contains six appendices:

- Appendix A – Service Package Definitions
- Appendix B – Customized Service Packages
- Appendix C – Element Functions
- Appendix D – Stakeholder Database

- Appendix E – Agreements
- Appendix F – Architecture Maintenance Documentation Form.

A corresponding website was also developed for the Johnson City Regional ITS Architecture which contains electronic versions of all documents and an interactive version of the Turbo Architecture database. The website is located at the following address:

http://www.kimley-horn.com/projects/tennesseeITSarchitecture/johnsoncity.html

2. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

The update of the Regional ITS Architecture and Deployment Plan for the Johnson City Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. Two workshops were held along with a series of stakeholder interviews to gather input, and draft documents were made available to stakeholders for review and comment.

The process followed for the Johnson City 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.

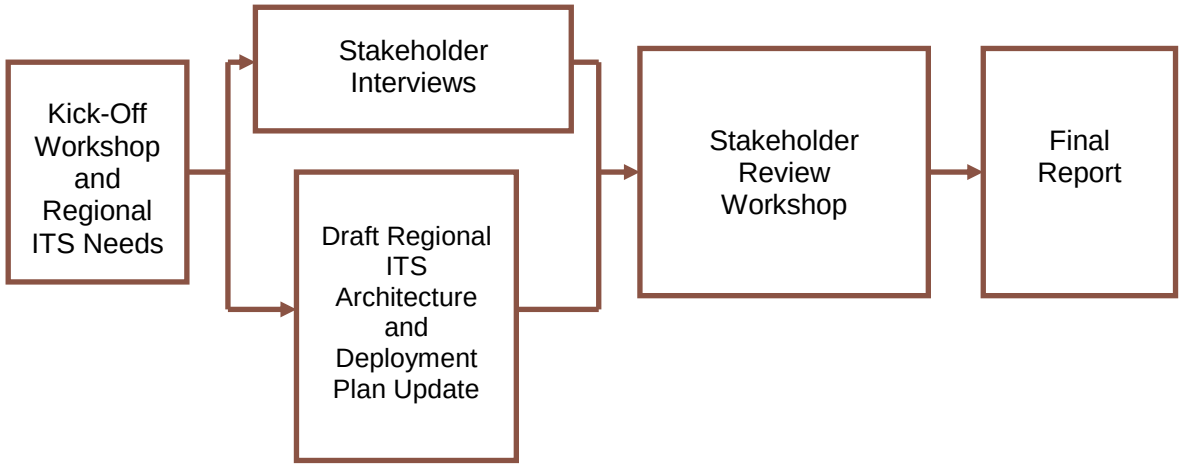


Figure 2 – Johnson City Regional ITS Architecture and Deployment Plan Development Process

Two workshops with stakeholders were held to update the Johnson City Regional ITS Architecture and Deployment Plan. These workshops included:

- Kick-Off Workshop
- Stakeholder Workshop

In addition, interviews were conducted with many of the key stakeholder agencies outside of the workshops to gather additional information for developing the Regional ITS Architecture. Key components of the process are described below:

Kick-Off Workshop: 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 an overview of the project was provided, the regional boundaries were defined, existing and planned ITS deployments in the Region were discussed, and ITS needs for the Region were identified.

Stakeholder Interviews: Stakeholder input was gathered through the two stakeholder workshops as well as a series of interviews that were conducted with stakeholder agencies. The interviews were used to complete the system inventory for the region, define how ITS services are currently being operated, define how ITS services could be operated in the future, and identify potential ITS projects for the region.

Develop Draft Regional ITS Architecture and Deployment Plan Update: Following the stakeholder input, a draft report was developed which identifies the roles and responsibilities of

participating agencies and stakeholders in the operation and implementation of the ITS system, identifies projects for deployment, and establishes a maintenance plan. Additionally, a website was created to allow stakeholders access to an interactive version of the ITS architecture and documents such as reports, meeting minutes, presentations, and the Turbo Architecture database.

Stakeholder Review Workshop: A second stakeholder workshop was conducted to review the Draft Regional ITS Architecture document as well as identify priorities for ITS service packages and confirm the list of potential ITS projects for the Johnson City Region. Use and maintenance of the Regional ITS Architecture was also discussed.

Final Report: The final Regional ITS Architecture and Deployment Plan was developed, which included an executive summary, project report, Turbo Architecture database, and project website with an interactive version of the Regional ITS Architecture.

Turbo Architecture

Turbo Architecture Version 7.0 was used to develop the Johnson City 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 released in February 2012 and 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 FTA.

In the Johnson City 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**.

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. With the release of Version 4.1 of Turbo Architecture, the USDOT began offering the Turbo Architecture software free of charge and provides 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/ and Version 7.0 was the most recent version available.

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.

3. REGIONAL ITS NEED

Regional needs that could be addressed by ITS were identified by stakeholders in the Johnson City Regional ITS Architecture Kick-off Workshop and interviews held in October 2014. In addition, the Johnson City MTPO's 2040 Long Range Transportation Plan (LRTP) was reviewed to determine other regional needs that could possibly be addressed in some way through ITS.

Within the 2040 LRTP, there are four regional goals that were identified to help direct future decisions regarding transportation for the Johnson City Region. Of the four regional goals, ITS can directly support two as described below:

Reduce Traffic Congestion along Major Routes of the MTPO: ITS can be used to real-time network conditions information to travelers that allow them to make informed decisions regarding route or mode choice. Additionally, measures such as variable speed limits, ramp metering, and adaptive traffic signal control systems, which can respond to changing traffic patterns, are strategies that can help reduce congestion. ITS is also a critical part of incident management, such as the use of the TDOT HELP trucks to manage traffic during an incident. Incidents make up a large part of the congestion experienced in most urban areas, and improved incident management can reduce non-recurring congestion.

Improve Safety and Security throughout the Transportation System of the MTPO Area: ITS can be used to monitor infrastructure, improve incident detection time, and provide advanced warning of incidents or other potential safety issues that might impact travelers. Additionally, ITS can be used to track and manage commercial vehicles, provide HAZMAT management, and support highway-rail intersection coordination. Emergency management agencies can benefit from ITS through emergency vehicle traffic signal preemption and emergency vehicle routing.

The investment needs identified through the Regional ITS Architecture development process as well as the 2040 LRTP regional goals provided guidance for determining which service packages should be included in the architecture. Stakeholders identified ITS needs for the Johnson City Region in the following areas:

- Traffic management;
- Traveler information;
- Emergency management;
- Maintenance and construction management;
- Public transportation management; and
- Archived data management.

In Section 5.1.4 a complete 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) in order to address the needs.

4. REGIONAL ITS INVENTORY

The inventory and needs documented during the individual interviews were the starting point for updating the Regional ITS Architecture. These ITS systems and components are used to customize the National ITS Architecture and create the updated Regional ITS Architecture for the Johnson City Region.

The Johnson City stakeholder group agreed to create individual traffic, maintenance, and emergency management elements for the City of Johnson City and individual traffic and emergency management elements for the City of Elizabethton. The other smaller cities and towns in the Region were documented as part of the municipal elements. This documentation allows the smaller cities and towns to be included in the Regional ITS Architecture, and therefore eligible to use federal funds for future ITS deployments, even if there are no specific plans for ITS implementation at this time.

4.1 Stakeholders

Each element included in the Johnson City Regional ITS Architecture is associated with a stakeholder agency. A listing of stakeholders agencies identified in the Johnson City Regional ITS Architecture can be found in **Table 3** along with a description of each stakeholder. Most stakeholder agencies are called out by name with exception of smaller municipalities. In the Regional ITS Architecture, the City of Johnson City and the City of Elizabethton are called out by name, but all other municipalities are covered under the general stakeholder name municipal government.

Table 3 – Johnson City Regional Stakeholder Descriptions

Stakeholder	Stakeholder Description
Carter County/City of Elizabethton Emergency Management	Emergency management agencies for the City of Elizabethton and Carter County. Includes the Carter County Sheriff's Department, City of Elizabethton Police and Fire Departments as well as emergency medical services.
City of Elizabethton	Municipal government for the City of Elizabethton, Tennessee. Covers all city departments including those that deal with traffic and public safety.
City of Johnson City	Municipal government for the City of Johnson City, Tennessee. Covers all city departments including those that deal with traffic and public safety.
Financial Institution	Handles exchange of money for transit electronic fare collection.
First Tennessee Human Resource Agency	Among other Regional social services, the human resource agency operates NET Trans. NET Trans provides demand response transit in the Region outside the Johnson City Transit service area.
Johnson City Transit System	Transit provider that operates both fixed-route and paratransit service within the City of Johnson City. Johnson City Transit also operates buses on the East Tennessee State University campus.
Media	Local media outlets. This can include television stations, newspapers, radio stations and their associated websites.
Mountain States Health Alliance	Health care system serving the Johnson City Region. Mountain States Health Alliance operates several hospitals within the Region.
Municipal Government	Municipal government for the City of Jonesborough and other municipalities within the Region that are not identified individually. Covers all city departments including those that deal with traffic and public safety.
NOAA	National Oceanic and Atmospheric Administration, agency that gathers weather information and issues severe weather warnings.
Other Agencies	This stakeholder represents a wide variety of agencies. The associated elements are groups of agencies or providers that do not have a primary stakeholder agency.
Other States	Emergency or traffic management agencies in other states adjacent to Tennessee. In the Johnson City Region this includes North Carolina.
Private Information Provider	Private sector business responsible for the gathering and distribution of traveler information. This service is typically provided on a subscription basis.
Rail Operators	Companies that operate trains and/or are responsible for the maintenance and operations of railroad tracks.
System Users	All of the users of the transportation system.
TDOT	The Tennessee Department of Transportation is responsible for the construction, maintenance, and operation of roadways in the State of Tennessee.
TEMA	Tennessee Emergency Management Agency. The agency is 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.

Table 3 – Johnson City Region Stakeholder Descriptions (continued)

Stakeholder	Stakeholder Description
Tennessee Department of Health and Human Services	State department that manages funding for medical transportation services.
THP	Tennessee Highway Patrol. State law enforcement agency that enforces traffic safety laws as well as commercial vehicle regulations.
Washington County/City of Johnson City Emergency Management	Emergency management agencies for the City of Johnson City and Washington County. Includes the Washington County Sheriff's Department, City of Johnson City Police and Fire Departments as well as emergency medical services

4.2 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 Johnson City 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 – Johnson City Region Inventory of ITS Elements

Stakeholder	Element Name	Element Description	Status
Carter County/City of Elizabethton Emergency Management	Carter County 911 Communications District	The City of Elizabethton operates the Carter County 911 Communications District. The 911 PSAP answers and dispatches all 911 calls within the County.	Existing
	Elizabethton/Carter County EMA	Emergency management agency for all of Carter County, including the City Elizabethton. Responsible for communications with TEMA and coordination of local resources during a disaster or large scale incident.	Existing
	Carter County/Elizabethton Public Safety Vehicles	Carter County Sheriff vehicles, City of Elizabethton Police and Fire Vehicles and EMS vehicles operating within the County and the City.	Existing
City of Elizabethton	City of Elizabethton - City Engineers Office	Responsible for administration of maintenance and construction projects within the City.	Existing
	City of Elizabethton CCTV Cameras	Closed-circuit television cameras operated by the City of Elizabethton TOC for traffic condition monitoring and management of incidents.	Planned
	City of Elizabethton DMS	Dynamic message signs for traffic information dissemination operated by the City of Elizabethton TOC.	Planned
	City of Elizabethton Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. This information is used in the operation of the traffic signal system.	Existing
	City of Elizabethton Government Information Channel	A government cable television channel operated by the City of Elizabethton that provides residents with important information.	Existing
	City of Elizabethton Mayor's Office	The office of the Mayor of the City of Elizabethton is responsible for communicating with the media regarding incidents or construction affecting the roadway network. They are also responsible for placing these same types of information on the City of Elizabethton Website.	Existing
	City of Elizabethton Public Works Department	The public works department is responsible for the maintenance of roadways in the City of Elizabethton.	Existing
	City of Elizabethton Public Works Department Vehicles	Vehicles used in maintenance operations including snow removal.	Existing
	City of Elizabethton Rectangular Rapid Flash Beacons	High intensity rapid flashing beacons used to alert motorists of pedestrian crossings.	Planned
	City of Elizabethton Speed Monitoring Equipment	Field equipment used for monitoring roadway speeds in the City of Elizabethton.	Planned

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
City of Elizabethton (continued)	City of Elizabethton TOC	Traffic operations center for the City of Johnson City. Responsible for operating the traffic signal system, CCTV cameras and dynamic message signs.	Planned
	City of Elizabethton Traffic Signals	Traffic signal system operated by the City of Elizabethton TOC.	Existing
	City of Elizabethton Website	Website for the City of Elizabethton. Includes information on various departments and in the future it is envisioned that the website will have real-time information about roadway conditions.	Existing
City of Johnson City	City of Johnson City - City Engineers Office	Responsible for administration of maintenance and construction projects within the City.	Existing
	City of Johnson City CCTV Cameras	Closed-circuit television cameras operated by the City of Johnson City TOC for traffic condition monitoring and management of incidents.	Existing
	City of Johnson City Community Relations	The office of community relations for the City of Johnson City. The office is responsible for communicating with the media regarding incidents or construction affecting the roadway network. They are also responsible for placing these same types of information on the City of Johnson City Website.	Existing
	City of Johnson City DMS	Dynamic message signs for traffic information dissemination operated by the City of Johnson City TOC.	Planned
	City of Johnson City Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. The data collected from these devices is used to evaluate the performance of the roadway network and for the operation of the traffic signal system.	Existing
	City of Johnson City Flood Detectors	Flood warning systems for the City of Johnson City that detect flood events at low water crossings throughout the city.	Planned
	City of Johnson City Flood Warning Beacons	Flashing beacons that are activated to warn motorists that water may be on a section of the roadway.	Planned
	City of Johnson City Police Department	Police department for the City of Johnson City. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles.	Existing
	City of Johnson City Portable DMS	Portable dynamic message signs used for traffic information dissemination during maintenance and construction activities, special events, or incidents.	Existing
	City of Johnson City Rail Notification System	Roadway equipment used to alert motorists that a crossing is currently blocked by a train.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
City of Johnson City (continued)	City of Johnson City Rectangular Rapid Flash Beacons	High intensity rapid flashing beacons used to alert motorists of pedestrian crossings.	Planned
	City of Johnson City RWIS Sensors	Road weather information systems installed in the field to gather information about the roadways such as temperature and moisture levels.	Planned
	City of Johnson City Speed Monitoring Equipment	Field equipment used for monitoring Johnson City roadway speeds. Speed monitoring equipment is owned by the City of Johnson City Police Department.	Existing
	City of Johnson City Stormwater Management Division	The Stormwater Management Division is responsible for managing stormwater runoff.	Existing
	City of Johnson City Stream Gauges	Field sensors used to measure water levels.	Existing
	City of Johnson City Street Division	The Street Division is responsible for the maintenance of roadways in the City of Johnson City.	Existing
	City of Johnson City Street Division Vehicles	Vehicles used in maintenance operations including snow removal.	Existing
	City of Johnson City TOC	Traffic operations center for the City of Johnson City. Responsible for operating the traffic signal system, CCTV cameras and dynamic message signs. Traffic signal system operations are an existing function.	Existing
	City of Johnson City Traffic Signals	Traffic signal system operated by the City of Johnson City TOC.	Existing
	City of Johnson City Website	Website for the City of Johnson City. This website is existing in a static format. The City envisions that at some point the site will provide real-time information.	Existing
	JCTV Government Information Channel	A government cable television channel operated by the City of Johnson City Community Relations Department that provides residents in the region with important information.	Existing
	Johnson City MTPO Data Archive	Metropolitan Transportation Planning Organization for Johnson City, Tennessee. The agency is responsible for transportation planning in the Region including development of the Long Range Transportation Plan (LRTP) and Transportation Improvement Plan (TIP) for the Region.	Planned
Financial Institution	Financial Service Provider	Handles exchange of money for transit electronic fare collection.	Planned

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
First Tennessee Human Resources Agency	FTHRA Data Archive	First Tennessee Human Resource Agency data archive for transit data.	Planned
	NET Trans Demand Response Vehicles	Transit vehicles for demand response transit operations.	Existing
	NET Trans Dispatch Center	Responsible for the dispatch and scheduling of demand response transit trips in the Region outside of the Johnson City Transit service area.	Existing
	NET Trans Fixed-Route Vehicles	Transit vehicles that operate on fixed routes in the Region.	Existing
	NET Trans Website	Website with information on fares and schedules.	Existing
Johnson City Transit	Electronic Fare Payment Card	Medium for collection of transit fares electronically.	Planned
	Johnson City Transit Bus Stop DMS	Johnson City Transit real-time next bus arrival information boards.	Existing
	Johnson City Transit Center CCTV Surveillance	Closed-circuit television cameras for surveillance at the Johnson City Transit Center.	Existing
	Johnson City Transit Data Archive	Transit data archive for Johnson City Transit. The archive will be used by FTA, NTD and the TDOT Office of Public Transportation.	Planned
	Johnson City Transit Demand Response Vehicles	Transit vehicles for demand response transit operations.	Existing
	Johnson City Transit Dispatch Center	Transit dispatch center responsible for the tracking, scheduling and dispatching of fixed route and paratransit vehicles operated by Johnson City Transit.	Existing
	Johnson City Transit Fixed-Route Vehicles	Transit vehicles that operate on fixed routes within Johnson City.	Existing
	Johnson City Transit Kiosks		
	Johnson City Transit Mobile Phone App	Johnson City Transit mobile phone application that allows users to view transit service information, real-time bus location, and create a transit trip plan.	Planned
	Johnson City Transit Trip Planner	Johnson City Transit online routing application that assists travelers in developing a customized transit plan for an upcoming trip.	Existing
	Johnson City Transit Website	Website with information about fares and schedules.	Existing
	Transit Operations Personnel	Transit personnel responsible for fleet management, maintenance, and operations of the transit system.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
Media	Local Print and Broadcast Media	Local media that provide traffic or incident information to the public.	Existing
Mountain States Health Alliance	Mountain States Health Alliance - Johnson City Medical Center	Trauma center located in Johnson City.	Existing
	Mountain States Health Alliance - Sycamore Shoals Hospital	Hospital located in the City of Elizabethton. The hospital has a 24 hour emergency department.	Existing
	Wings Air Rescue Flight Operations	Regional medical communications center that dispatches EMS as well as air rescue services.	Existing
Municipal Government	Municipal CCTV Cameras	Municipal closed circuit television cameras for traffic surveillance and incident management.	Planned
	Municipal Field Sensors	Municipal 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 Police Department	Police department for the municipalities. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles.	Existing
	Municipal Public Safety Dispatch	Responsible for the dispatch of municipal public safety vehicles.	Planned
	Municipal Rail Notification System	Roadway equipment used to alert motorists that a crossing is currently blocked by a train.	Planned
	Municipal Speed Monitoring Equipment	Field equipment used for monitoring roadway speeds.	Planned
	Municipal TOC	Municipal Traffic Operations Center responsible for municipal signal system operations.	Planned
	Municipal Traffic Signals	Municipal traffic signal systems.	Planned
	Municipal Website	Municipal website that includes information on agency departments. In the future it is envisioned that the website would have real-time information about roadway conditions.	Existing
	Municipal/County Maintenance	Department responsible for maintenance of municipal or county roadway facilities.	Existing
	Municipal/County Public Safety Vehicles	Municipal or County law enforcement, fire, and EMS vehicles.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
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	Other Maintenance and Construction Management Agencies	Additional maintenance and construction operations with which information is shared for coordination in an emergency situation.	Planned
	Other Traffic Management Agencies	Additional traffic management agencies with which information is shared for coordination in an emergency situation.	Planned
	Private Transportation Providers	Transportation providers such as taxi companies that pick up at the transit center and long distance bus companies like Greyhound.	Planned
Other States	NCDOT Division 13 Maintenance and Construction	NCDOT entity responsible for the oversight of construction and maintenance in Division 13.	Existing
	North Carolina 511 System	North Carolina 511 traveler information system central server.	Existing
	North Carolina DOT	North Carolina Department of Transportation, responsible for the maintenance and operation of roadways in the State of North Carolina. Included for coordination purposes.	Existing
Private Information Provider	Private Sector Traveler Information Services	Subscription based traveler information service.	Existing
	Social Networking Services	Subscription based services operated by private providers that provide an option for real-time traveler information dissemination. Examples of such services include Facebook or Twitter.	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
System Users	Archived Data User	Those who request information from the data archive systems.	Planned
	Pedestrians	Individuals afoot or using a motorized or non-motorized wheelchair.	Existing
	Public/Private Vehicles	Public or private vehicles that traverse the region.	Existing
	Private Traveler Personal Computing Devices	Computing devices that travelers use to access public information.	Existing
	Traveler	Users of the transportation system.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
TDOT	Other TDOT Region District Operations	Other Tennessee Department of Transportation's regional district operations offices.	Existing
	TDOT CCTV Cameras	Closed-circuit television cameras for traffic surveillance and incident management.	Planned
	TDOT Changeable Speed Limit Signs	TDOT roadway equipment that can change the speed limit depending on roadway and traffic conditions.	Planned
	TDOT Community Relations Division	Tennessee Department of Transportation department responsible for the dissemination of traffic information to the media and the public.	Existing
	TDOT DMS	Dynamic message signs for traffic information dissemination.	Existing
	TDOT Emergency Services Coordinator	Emergency service coordinator from TDOT who serves in the TEMA emergency operations group. During a disaster this coordinator acts as a liaison between TEMA and the various TDOT TMCs and maintenance groups.	Existing
	TDOT Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as VIVDS, RTMS or traditional loops.	Planned
	TDOT HAR	Highway Advisory Radio for traffic information dissemination.	Existing
	TDOT HELP Vehicles	Roadway service patrol vehicles. Currently operate in Knoxville and are dispatched to the Johnson City Region for special events or large incidents.	Existing
	TDOT Long Range Planning Division Archive	Data archive for the Long Range Division. The Division is responsible for traffic data collection and analysis.	Existing
	TDOT Maintenance Headquarters	TDOT statewide maintenance headquarters in Nashville.	Existing
	TDOT Maintenance Vehicles	Tennessee Department of Transportation vehicles used in maintenance operations including snow removal.	Existing
	TDOT Ramp Metering Equipment	TDOT roadway equipment used in the operation of a ramp metering system. Includes the signals and any other ITS equipment.	Planned
	TDOT Region 1 District Operations	Each TDOT Region contains several TDOT district maintenance offices. These district offices handle most of the routine roadway maintenance and respond to incidents when their services are requested by local emergency management.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
TDOT (continued)	TDOT Region 1 Engineer's 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 PIO.	Planned
	TDOT Region 1 HELP Dispatch	Roadway service patrol dispatch center located in Knoxville. Currently service is limited to the Knoxville area except in the case of a large scale incident of special event.	Existing
	TDOT Region 1 TMC - Knoxville	Traffic 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 Johnson City Region is located within TDOT Region 1.	Existing
	TDOT Region 2 TMC - Chattanooga	Traffic 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
	TDOT Region 3 TMC - Nashville	Traffic 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	Traffic 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 RWIS Sensors	Road weather information system sensors to monitor road conditions.	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 CCTV, vehicle detection and/or DMS.	Existing
	TDOT SmartWay Mobile App	Mobile phone application that allows users to view traffic images, receive incident information, and monitor traffic speeds.	Existing
	TDOT SmartWay Website	TDOT SmartWay website providing road network conditions including incident and construction information and camera views. Much of the data for the website comes from SWIFT.	Existing

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
TDOT (continued)	TDOT Statewide Information for Travelers (SWIFT)	SWIFT 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). SWIFT feeds the Statewide 511 system and SmartWay website.	Existing
	TDOT Wrong-Way Detection and Warning Equipment	Electronic warning signs, field sensors, or other devices used in the operation of wrong-way vehicle detection and warning.	Planned
	Tennessee 511 IVR	Tennessee 511 Interactive Voice Response. TDOT contracts the IVR operation to a vendor. The IVR accepts 511 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
TEMA	TEMA	The Tennessee Emergency Management Agency manages emergency operations during a disaster or large scale incident.	Existing
Tennessee Bureau of Investigation	Tennessee Bureau of Investigation	Responsible for issuing statewide Amber Alerts in Tennessee.	Existing
THP	THP Dispatch	Tennessee Highway Patrol dispatch center. There are several THP dispatch centers around the State.	Existing
	THP Vehicles	Tennessee Highway Patrol vehicles.	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
Tennessee Department of Health and Human Services	Service Agency	Agency responsible for payment of transit fares for medical transportation as part of government subsidized medical care. This includes TennCare, Medicare and VA programs.	Planned

Table 4 – Johnson City Region Inventory of ITS Elements (continued)

Stakeholder	Element Name	Element Description	Status
Washington County/City of Johnson City Emergency Management	Washington County Emergency Communications District	The 911 PSAP answers and dispatches all 911 calls within the County including the City of Johnson City and Town of Jonesborough.	Existing
	Washington County Sheriff's Office	Law enforcement agency for Washington County. The emergency dispatch functions for the Sheriff's Office are included in the Washington County Emergency Communications District. Non-emergency functions include the collection of crash data.	Existing
	Washington County/Johnson City EMA	Emergency management agency for all of Washington County, including Johnson City. Responsible for communications with TEMA and coordination of local resources during a disaster or large scale incident.	Existing
	Washington County/Johnson City Public Safety Vehicles	Washington County Sheriff vehicles, City of Johnson City Police and fire Vehicles and EMS vehicles operating within the County and the City.	Existing

5. 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 Johnson City Region. The National ITS Architecture has the following eight groups of ITS service areas:

- ***Traffic Management*** – includes the TDOT SmartWay Transportation Management Center (TMC) in Knoxville as well as other existing and future TMCs and traffic operations centers (TOCs), detection systems, CCTV cameras, fixed and portable dynamic message signs (DMS), and other related technologies.
- ***Emergency Management*** – includes emergency operations/management centers, improved information sharing among traffic and emergency services, automated vehicle location (AVL) on emergency vehicles, traffic signal preemption for emergency vehicles, and wide-area alerts.
- ***Maintenance and Construction Management*** – includes work zone management, roadway maintenance and construction information, and road weather detection systems.
- ***Public Transportation Management*** – includes transit and paratransit AVL, transit travel information systems, electronic fare collection, and transit security.
- ***Commercial Vehicle Operations*** – includes coordination with the Commercial Vehicle Information Systems and Networks (CVISN) effort.
- ***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 Johnson City Regional ITS Architecture because implementation of those service packages would primarily be by private sector automobile manufacturers and information service providers. Additionally, Commercial Vehicle Operations was not included as it is viewed as more of a statewide effort and there was no expressed need by stakeholders to include this service on a regional level at this time.

5.1 ITS Service Packages

In the National ITS Architecture, services that are provided by ITS are referred to as ITS service packages. ITS service packages can include several stakeholders and elements that work together to provide a service in the Region. Examples of ITS service packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently a total of 97 ITS service packages identified in the National ITS Architecture Version 7.0, which was the most recent version available of the National ITS Architecture at the time of the 2015 Johnson City Regional ITS Architecture update. As noted in Section 1.1, in the previous version of the Johnson City Regional ITS Architecture, ITS service packages were referred to as ITS market packages. The name change has been made to be consistent with the terminology that is now used in Version 7.0 of the National ITS Architecture.

5.1.1 Overview of ITS Service Package Structure

An ITS service package is made up of elements and data flows. Each identified system or component in the Johnson City regional ITS 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.

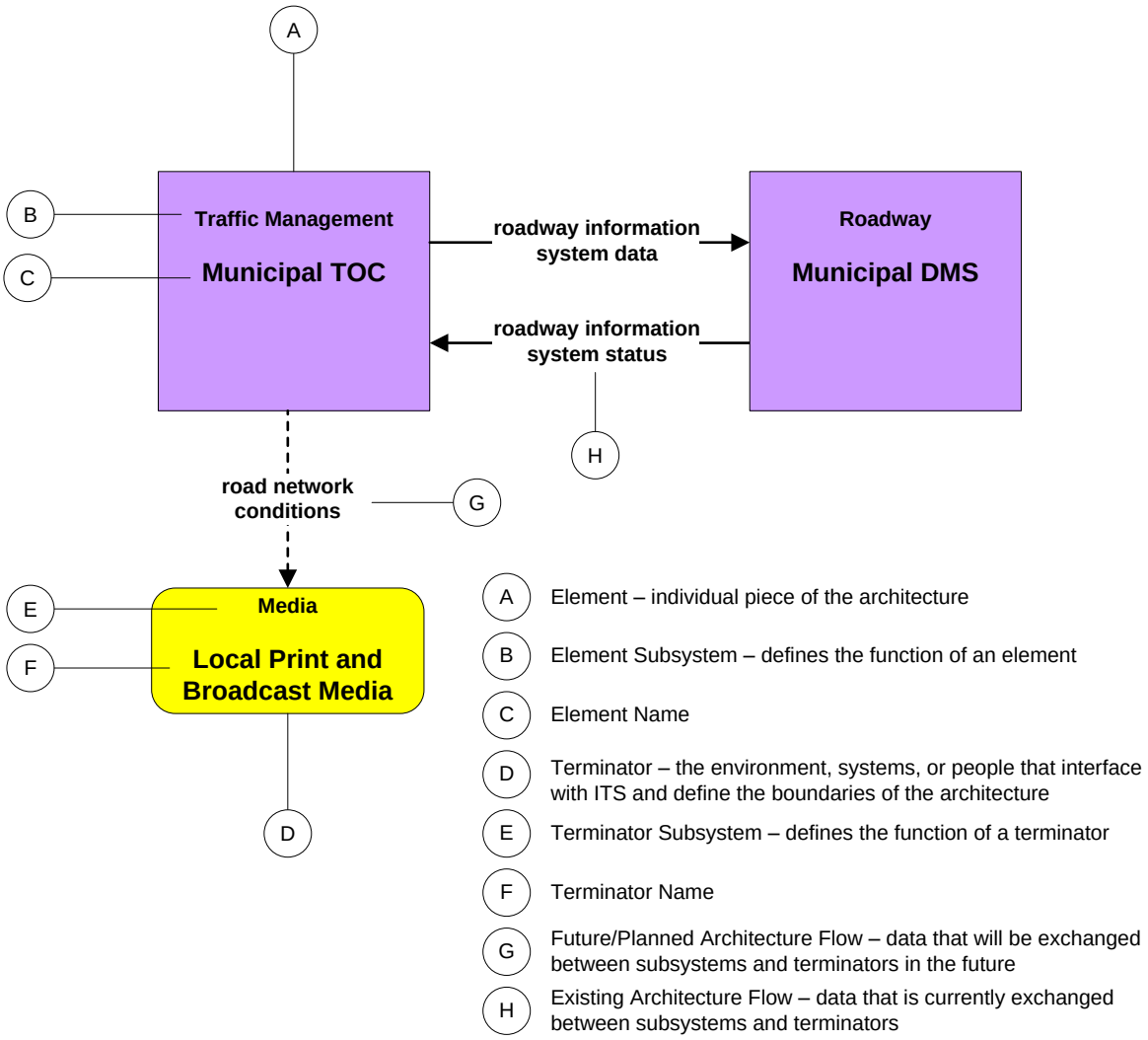


Figure 3 – Overview of ITS Service Package Structure

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 transfer 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 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.

5.1.2 Selection and Prioritization of Regional ITS Service Packages

In the Johnson City Region, the National ITS Architecture service packages were reviewed by the stakeholders and selected based on the relevance of the functionality that the ITS service package could provide to the Region. Stakeholders selected 40 ITS service packages for implementation in the Region, and 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 Johnson City 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 ITS service packages that were applicable for the Region, stakeholders reviewed each ITS service package and the elements that could be included to customize it for the Region. This customization is discussed further in the next section (Section 5.1.3).

Table 5 – Johnson City Regional ITS Service Package Prioritization by Functional Area

High Priority Service Packages	Medium Priority Service Packages	Low Priority Service Packages
Travel and Traffic Management		
ATMS01 Network Surveillance ATMS03 Traffic Signal Control ATMS06 Traffic Information Dissemination ATMS07 Regional Traffic Management ATMS08 Traffic Incident Management System	ATMS02 Traffic Probe Surveillance ATMS13 Standard Railroad Grade Crossing ATMS19 Speed Warning and Enforcement ATMS24 Dynamic Roadway Warning ATMS26 Mixed Use Warning System	ATMS04 Traffic Metering ATMS22 Variable Speed Limits
Emergency Management		
EM01 Emergency Call-Taking and Dispatch EM02 Emergency Routing EM04 Roadway Service Patrols EM06 Wide-Area Alert EM10 Disaster Traveler Information	EM08 Disaster Response and Recovery EM09 Evacuation and Reentry Management	EM07 Early Warning System
Maintenance and Construction Management		
MC03 Road Weather Data Collection MC04 Weather Information Processing and Distribution MC08 Work Zone Management MC10 Maintenance and Construction Activity Coordination	MC01 Maintenance and Construction Vehicle and Equipment Tracking MC06 Winter Maintenance	
Public Transportation Management		
APTS01 Transit Vehicle Tracking APTS02 Transit Fixed-Route Operations APTS03 Demand Response Transit Operations APTS05 Transit Security APTS08 Transit Traveler Information APTS11 Multimodal Connection Protection	APTS04 Transit Passenger and Fare Management APTS07 Multi-modal Coordination APTS10 Transit Passenger Counting	APTS06 Transit Fleet Management
Traveler Information		
ATIS01 Broadcast Traveler Information ATIS02 Interactive Traveler Information		
Archived Data Management		
	AD1 ITS Data Mart	AD3 ITS Virtual Data Warehouse

5.1.3 Customization of Regional ITS Service Packages

The ITS service packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Johnson City Region. ITS 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 ITS service package shows the distribution of traffic information from the TDOT Region 1 TMC to THP dispatch and the media as well as in the future to local emergency dispatch and transit management agencies. Messages are also placed on DMS and HAR and entered into SWIFT for inclusion on the SmartWay website and mobile phone app as well as 511. Data flows between the subsystems indicate what information is being shared. The remainder of the ITS service packages that were customized for the Johnson City Region are shown in **Appendix B**.

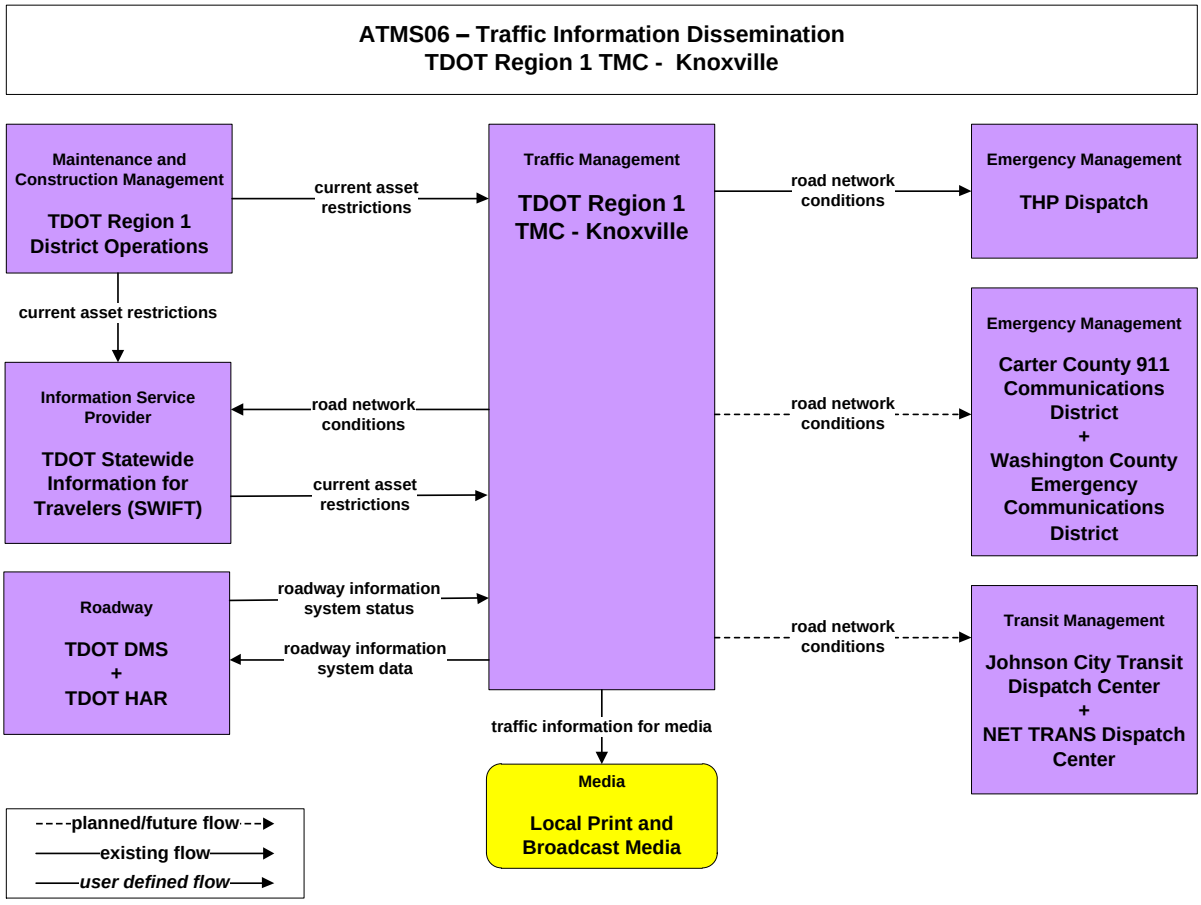


Figure 4 – Example ITS Service Package Diagram: ATMS06 – Traffic Information Dissemination (TDOT Region 1 TMC)

5.1.4 Regional Needs and Corresponding ITS Service Packages

Input received from stakeholders at the Johnson City Region ITS Architecture workshops provided valuable input for the ITS service package customization process. The needs identified in the ITS Architecture workshops, as well as needs from Johnson City MTPO's 2040 Long Range Transportation Plan (LRTP) are identified in **Table 6**. The table also identifies which ITS service packages could be implemented to address the particular need.

Table 6 – Johnson City Regional ITS Needs and Corresponding ITS Service Packages

ITS Need	Corresponding ITS Service Packages
Traffic Management and Traveler Information	
Need to reduce traffic congestion along major routes within the MTPO area	ATMS01 – Network Surveillance ATMS02 – Traffic Probe Surveillance ATMS03 – Traffic Signal Control ATMS04 – Traffic Metering ATMS06 – Traffic Information Dissemination ATMS07 – Regional Traffic Management ATMS08 – Traffic Incident Management System ATMS22 – Variable Speed Limits ATMS24 – Dynamic Roadway Warning EM04 – Roadway Service Patrols MC08 – Work Zone Management MC10 – Maintenance and Construction Coordination
Need to improve coordination and the sharing of information between TDOT and Johnson City	ATMS07 – Regional Traffic Management
Need for Johnson City traffic to provide Johnson City emergency management agencies with roadway network conditions	ATMS06 – Traffic Information Dissemination
Need to implement adaptive traffic signal control along congested corridors	ATMS01 – Network Surveillance ATMS02 – Traffic Probe Surveillance ATMS03 – Traffic Signal Control
Need to expand the interconnected traffic signal system network	ATMS03 – Traffic Signal Control
Need to expand CCTV camera coverage areas throughout the Region	ATMS01 – Network Surveillance
Need for better coordination among various agencies during large-scale events	ATMS06 – Traffic Information Dissemination ATMS07 – Regional Traffic Management ATMS08 – Traffic Incident Management System EM01 – Emergency Call Taking and Dispatch EM02 – Emergency Routing EM08 – Disaster Response and Recovery EM09 – Evacuation and Reentry Management EM10 – Disaster Traveler Information MC10 – Maintenance and Construction Activity Coordination APTS07 – Multi-modal Coordination
Need to convey information to drivers through dynamic message signs, highway advisory radio, social media, television, or other methods	ATMS06 – Traffic Information Dissemination ATMS24 – Dynamic Roadway Warning ATIS01 – Broadcast Traveler Information ATIS02 – Interactive Traveler Information
Need to monitor rail crossing and convey blockages to drivers	ATMS13 – Standard Railroad Grade Crossing
Need to provide a transportation system that supports vulnerable road users	ATMS03 – Traffic Signal Control ATMS26 – Mixed Use Warning Systems

Table 6 – Johnson City Regional ITS Needs and Corresponding ITS Service Packages (continued)

ITS Need	Corresponding ITS Service Packages
Emergency Management	
Need to assist emergency vehicle movement with traffic signal preemption and monitoring	ATMS03 – Traffic Signal Control EM01 – Emergency Call-Taking and Dispatch EM02 – Emergency Routing
Need to implement a reverse 911 system that allows emergency management officials to reach a large group of people	EM01 – Emergency Call-Taking and Dispatch
Need to expand roadway service patrols for motorist assistance and incident management	ATMS08 – Traffic Incident Management System EM04 – Roadway Service Patrols
Maintenance and Construction Management	
Need to monitor roadway weather conditions and provide accurate dissemination to agencies and travelers	ATMS06 – Traffic Information Dissemination ATMS24 – Dynamic Roadway Warning EM07 – Early Warning System MC03 – Road Weather Data Collection MC04 – Weather Information Processing and Distribution MC06 – Winter Maintenance
Need for better coordination between TDOT and local agencies during maintenance and construction.	MC08 – Work Zone Management MC10 – Maintenance and Construction Coordination
Public Transportation Management	
Need to improve coordination among transit agencies	APTS02 – Transit Fixed-Route Operations APTS03 – Demand Response Transit Operations APTS07 – Multi-modal Coordination APTS11 – Multimodal Connection Protection
Need for Johnson City Transit to implement scheduling software for paratransit vehicle	APTS01 – Transit Vehicle Tracking APTS03 – Demand Response Transit Operations
Need to monitor bus passenger boarding and alighting	APTS10 – Transit Passenger Counting
Need to implement smart card system for both fixed-route and demand response vehicles that is compatible with other transit agencies	APTS04 – Transit Fare Collection Management APTS07 – Multi-modal Coordination
Need to continue to improve the dissemination of real-time transit information for riders through mobile phone application, bus stop DMS, and website	APTS08 – Transit Traveler Information ATIS02 – Interactive Traveler Information
Archived Data Management	
Need to archive data gathered through ITS to make it more accessible to regional stakeholders	AD1 – ITS Data Warehouse AD2 – ITS Virtual Data Warehouse

5.2 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 Johnson City Region. The system interconnect diagram shows the high-level relationships of the subsystems and terminators in the Johnson City 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.

5.2.1 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 Johnson City Region based on the system inventory and information gathered from the stakeholders. **Figure 5** summarizes the existing and planned ITS elements for the Johnson City 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.

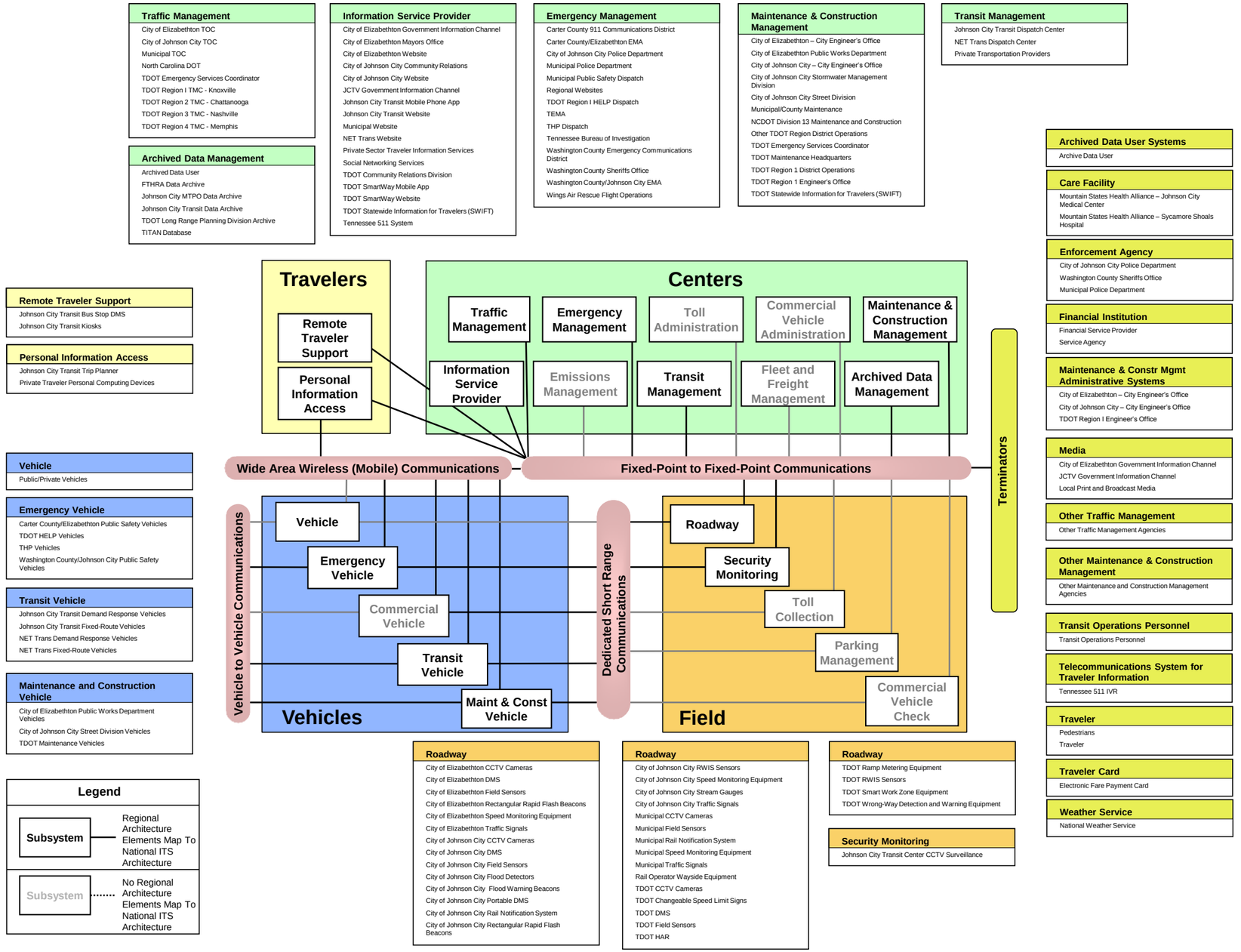


Figure 5 – Johnson City Regional System Interconnect Diagram

5.2.2 Element Connections

A number of different elements are identified as part of the Johnson City 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 Johnson City 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 Elizabethton Traffic Signals, which shows existing connections in additions to connections that could be made in the future.

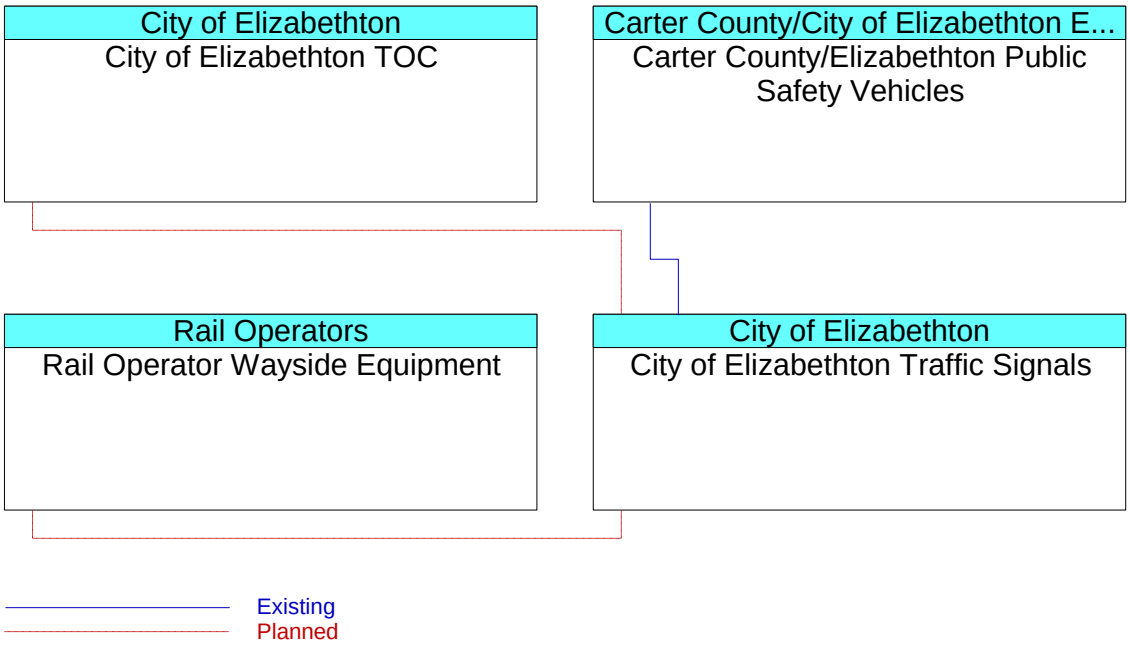


Figure 6 – Example Interconnect Diagram: City of Elizabethton Traffic Signals

5.2.3 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 is shown in **Figure 7**. The diagram shows existing and planned data flows between elements that support network surveillance.

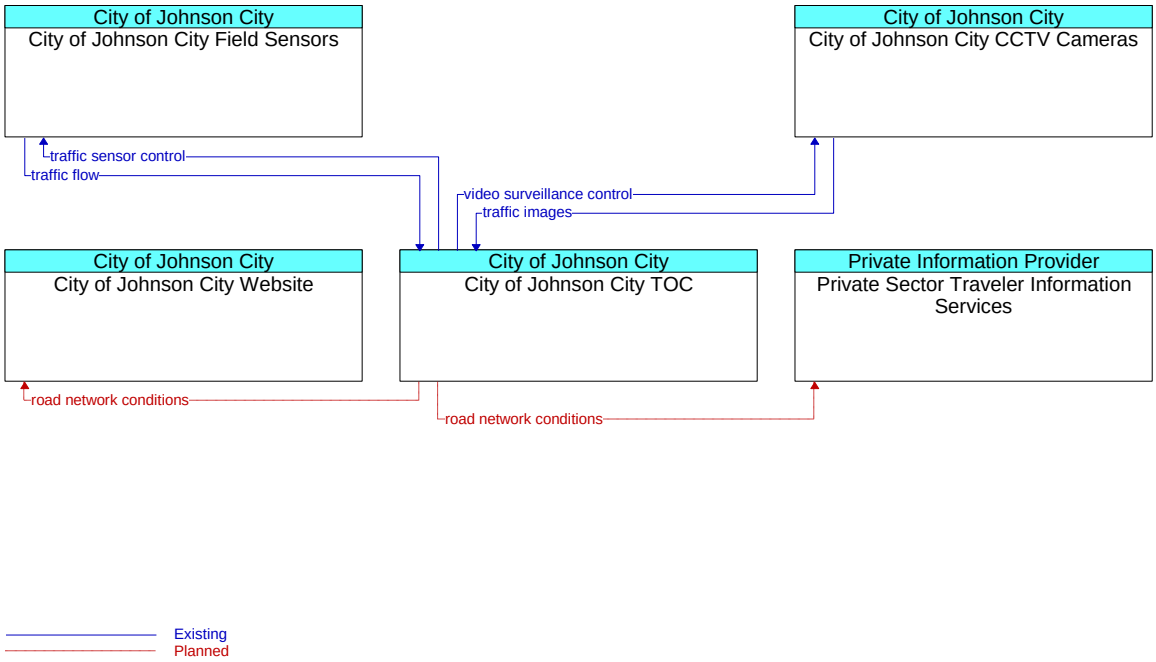


Figure 7 – Example Flow Diagram: Network Surveillance

5.3 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 Johnson City 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 Johnson City Regional ITS Architecture, functional requirements have been identified at two levels. The customized service packages, discussed previously in Section 5.1.3, 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 Johnson City Region has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the Johnson City 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 excluding terminators. In addition to Appendix C, the requirements tab within the Turbo Architecture database also includes the functional requirements that have been identified for each of the elements in the Johnson City Region. These functional requirements include the "shall" statements that describe what the system does. The "shall" statements should be reviewed during future project level planning and design phases, and stakeholders should determine which of the "shall" statements are existing, which need to be implemented, and which are not needed based on their specific

project needs. Section 7.2 contains additional information on the use of functional requirements when performing a systems engineering analysis on a project.

5.4 Standards

Standards are an important tool that will allow efficient implementation of the elements in the Johnson City 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 Johnson City Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 5.2.3 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 left hand side 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 – Johnson City Regional ITS Standards

SDO	Document ID	Title
AASHTO/ITE	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)
AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units
	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)
	NTCIP 1204	Object Definitions for Environmental Sensor Stations (ESS)
	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control
	NTCIP 1206	Object Definitions for Data Collection and Monitoring (DCM) Devices
	NTCIP 1207	Object Definitions for Ramp Meter Control (RMC) Units
	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching
	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)
	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters
	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)
	NTCIP 1214	Object Definitions for Conflict Monitor Units (CMU)
		NTCIP Center-to-Center Standards Group
	NTCIP 1102	Octet Encoding Rules (OER) Base Protocol
	NTCIP 1104	Center-to-Center Naming Convention Specification
	NTCIP 2104	Ethernet Subnetwork Profile
	NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile
	NTCIP 2303	File Transfer Protocol (FTP) Application Profile
	NTCIP 2304	Application Profile for DATEX-ASN (AP-DATEX)
	NTCIP 2306	Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML)
		NTCIP Center-to-Field Standards Group
	NTCIP 1102	Octet Encoding Rules (OER) Base Protocol
	NTCIP 1103	Transportation Management Protocols (TMP)
	NTCIP 2101	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile
	NTCIP 2102	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile
	NTCIP 2103	Point-to-Point Protocol Over RS-232 Subnetwork Profile
	NTCIP 2104	Ethernet Subnetwork Profile
	NTCIP 2201	Transportation Transport Profile
	NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile
	NTCIP 2301	Simple Transportation Management Framework (STMF) Application Profile
	NTCIP 2302	Trivial File Transfer Protocol (TFTP) Application Profile
	NTCIP 2303	File Transfer Protocol (FTP) Application Profile

Table 7 – Johnson City Regional ITS Standards (continued)

SDO	Document ID	Title
APTA	APTA TCIP-S-001 3.0.4	Standard for Transit Communications Interface Profiles
ASTM	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
	Dedicated Short Range Communication at 915 MHz Standards Group	
	ASTM E2158-01	Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band
ASTM/IEEE/SAE	Dedicated Short Range Communication at 5.9 GHz Standards Group	
	ASTM E2213-03	Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications
	IEEE 1609.1-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager
	IEEE 1609.2-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages
	IEEE 1609.3	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services
	IEEE 1609.4-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation
	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 (MAC) and Physical Layer (PHY) Specification
	IEEE P1609.0	Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture
IEEE	IEEE 1455-1999	Standard Message Sets for Vehicle/Roadside Communications
	IEEE 1570-2002	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection
	Incident Management Standards Group	
	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 Incident Management Message Sets for Use by Emergency Management Centers
	IEEE 1512.3-2006	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers
	IEEE P1512.4	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers

Table 7 – Johnson City Regional ITS Standards (continued)

SDO	Document ID	Title
SAE	SAE J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary
	Advanced Traveler Information Systems (ATIS) General Use Standards Group	
	SAE J2266	Location Referencing Message Specification (LRMS)
	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	RDS (Radio Data System) Phrase Lists
	SAE J2540/2	ITIS (International Traveler Information Systems) Phrase Lists
	SAE J2540/3	National Names Phrase List

5.5 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 Architecture. The services covered are:

- **Traffic Signal Control** – 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 Traffic Metering 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.
- **Archived Data Management** – The development of systems to collect transportation data for use in non-operational purposes (e.g., planning and research).

Table 8 identifies the roles and responsibilities of key stakeholders for a range of transportation services.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Traffic Signal Control	City of Elizabethton	Operate and maintain traffic signal systems within the City.
		Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
		Provide traffic signal preemption for emergency vehicles.
		Remotely control traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions.
	City of Johnson City	Operate and maintain traffic signal systems within the City.
		Operate DMS for the distribution of traffic information and roadway conditions to travelers on the roadway.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
		Provide traffic signal preemption for emergency vehicles.
		Remotely control traffic signal controllers to implement traffic management strategies at signalized intersection based on traffic conditions, incidents, and emergency vehicle preemptions.
	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 control traffic signal controllers to implement traffic management strategies at signalized intersection based on traffic conditions, incidents, and emergency vehicle preemptions.
Freeway Traffic Metering Management	TDOT	Operate dynamic message signs (DMS) and highway advisory radio (HAR) for the distribution of traffic information and roadway conditions to travelers on the roadway.
		Operate dynamic roadway warning equipment for wrong-way driver detection and warning.
		Operate motorist assistance patrol (HELP) to facilitate special event traffic control and incident management.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on state roadways.
		Operate ramp metering equipment to manage vehicles entering a controlled access facility
		Operate variable speed limit signs based on weather and traffic conditions.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Incident Management (Traffic)	City of Elizabethton	Coordinate maintenance resources for incident response with the City of Elizabethton Public Works Department.
		Operate dynamic message signs for the distribution of incident information to travelers on the roadway.
		Remotely control traffic and video sensors to support incident detection and verification.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Responsible for the dissemination of traffic related data to other centers and the media.
	City of Johnson City	Coordinate maintenance resources for incident response with the City of Johnson City Streets Division.
		Operate dynamic message signs for the distribution of incident information to travelers on the roadway.
		Remotely control traffic and video sensors to support incident detection and verification.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Responsible for the dissemination of traffic related data to other centers and the media.
	Municipal Government	Coordinate maintenance resources for incident response.
		Remotely control traffic and video sensors to support incident detection and verification.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Responsible for the dissemination of traffic related data to other centers and the media.
	TDOT	Remotely control traffic and video sensors to support incident detection and verification.
		Remotely control traffic and video sensors to support incident detection and verification.
		Responsible for coordination with other traffic operations centers and emergency management agencies for coordinated incident management.
		Responsible for the development, coordination and execution of special traffic management strategies during evacuation.
		Responsible for the dissemination of traffic related data to other centers and the media.
Incident Management (Emergency)	Carter County/City of Elizabethton Emergency Management	Dispatch public safety vehicles for incidents.
		Coordinate incident response with other public safety agencies, the City of Elizabethton TOC, and the TDOT TMC in Knoxville for incidents on state facilities.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Incident Management (Emergency) (continued)	Mountain States Health Alliance	Coordinate incident response with other public safety agencies and the City of Johnson City TOC.
		Dispatch public safety vehicles for incidents.
	Municipal Government	Coordinate incident response with other public safety agencies as well as the TDOT TMC in Knoxville for incidents on state facilities.
		Dispatch public safety vehicles for incidents.
	THP	Coordinate incident response with other public safety and traffic management agencies as well as the TDOT TMC in Knoxville for incidents on state facilities.
		Dispatch public safety vehicles for incidents.
	Washington County/Johnson City 911 Dispatch	Coordinate incident response with other public safety agencies, the City of Johnson City TOC and the TDOT TMC in Knoxville for incidents on state facilities.
		Dispatch public safety vehicles for incidents.
Emergency Management	Carter County/City of Elizabethton Emergency Management	911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for emergency call-taking for Carter County, including the City of Elizabethton, as the 911 Public Safety Answering Point (PSAP).
		911 Dispatch - Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
		911 Dispatch - Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
		EMA - Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		EMA - Lead regional efforts for emergency planning to support large-scale incidents and disasters.
		EMA - Operates the Emergency Operations Center (EOC) for the County and City of Elizabethton in the event of a disaster or other large-scale emergency situation.
		EMA - Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		EMA - Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	Mountain States Health Alliance	911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
		911 Dispatch - Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Emergency Management (continued)	Municipal Government	911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
		911 Dispatch - Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
		EMA - Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
	TEMA	Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		Lead statewide efforts for emergency planning to support large-scale incidents and disasters.
		Operates the Emergency Operations Center (EOC) for the State of Tennessee in the event of a disaster or other large-scale emergency situation.
		Responsible for coordination with adjacent states, including the State of North Carolina, as needed to support emergency management.
		Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the State.
	Tennessee Bureau of Investigation	Responsible for the initiation of AMBER alerts.
	THP	Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		Participate in regional emergency planning to support large-scale incidents and disasters.
		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.
	Washington County/City of Johnson City Emergency Management	911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for emergency call-taking for Washington County and the City of Johnson City as the 911 Public Safety Answering Point (PSAP).
		911 Dispatch - Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
		911 Dispatch - Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Emergency Management (continued)	Washington County/City of Johnson City Emergency Management (continued)	EMA - Lead evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		EMA - Lead regional efforts for emergency planning to support large-scale incidents and disasters.
		EMA - Operates the Emergency Operations Center (EOC) for the County and City of Johnson City in the event of a disaster or other large-scale emergency situation.
		EMA - Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		EMA - Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
Maintenance and Construction Management	City of Elizabethton	Disseminates work zone activity schedules and current asset restrictions to other agencies.
		Monitors environmental sensors and distributes information about road weather conditions.
		Responsible for the tracking and dispatch of maintenance vehicles for snow removal during a winter weather event.
		Supports coordinated response to incidents.
		Supports work zone activities including the dissemination of work zone information through portable DMS, highway advisory radio, and sharing of information with other groups.
	City of Johnson City	Disseminates work zone activity schedules and current asset restrictions to other agencies.
		Monitors environmental sensors and distributes information about road weather conditions.
		Responsible for the tracking and dispatch of maintenance vehicles for snow removal during a winter weather event.
		Supports coordinated response to incidents.
		Supports work zone activities including the dissemination of work zone information through portable DMS, highway advisory radio, and sharing of information with other groups.
	Municipal Government	Disseminates work zone activity schedules and current asset restrictions to other agencies.
		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, highway advisory radio, and sharing of information with other groups.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Maintenance and Construction Management	TDOT	Disseminates work activity schedules and current asset restrictions to other agencies.
		Monitors environmental sensors and distributes information about road weather conditions.
		Operates work zone traffic control equipment including portable surveillance equipment, dynamic message signs, and highway advisory radio transmitters.
		Responsible for the tracking and dispatch of maintenance vehicles for snow removal during a winter weather event.
		Supports coordinated response to incidents.
		Supports work zone activities including the dissemination of work zone information through portable DMS, highway advisory radio, and sharing of information with other groups.
Transit Management	First Tennessee Human Resource Agency	Coordinate transit service with other regional transit providers.
		Operates fixed-route and demand response transit services from central dispatch facilities responsible for tracking their location and status.
		Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		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.
	Johnson City Transit System	Coordinate transit service with other regional transit providers.
		Operate on-board systems to provide next stop annunciation.
		Operates demand response and fixed-route transit services from a central dispatch facility responsible for tracking their location and status.
		Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		Provide real-time transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 system.
		Provide schedule and fare information on transit kiosks.
		Provide transit passenger electronic fare payment on fixed-route and demand response transit vehicles.
		Provide transit security on transit vehicles and at transit terminals through silent alarms and surveillance systems.

Table 8 – Johnson City Region Stakeholder Roles and Responsibilities (continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Traveler Information	City of Elizabethton	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
		Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	City of Johnson City	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
		Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	Johnson City Transit System	Provide real-time transit traveler information to the agency website, local private sector traveler information services, and the Tennessee 511 system.
	Municipal Government	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.
		Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	TDOT	Collection, processing, storage, and broadcast dissemination of traffic, transit, maintenance and construction, event and weather information to travelers via the SmartWay Website and Mobile Phone App and the Tennessee 511 system.
		Operate DMS and HAR to distribute traffic information and roadway conditions to travelers on the roadway.
		Provide transportation network condition data to private sector information service providers.
Archived Data Systems	City of Johnson City	Collect and maintain data from regional traffic, transit, and emergency management agencies.
	First Tennessee Human Resource Agency	Collect and maintain transit archive data.
	Johnson City Transit System	Collect and format transit operations and ridership data to satisfy local, state, and federal government data reporting requirements.
	TDOT	Collect and maintain traffic archive data.
	THP	Collect and maintain crash record information from regional emergency management agencies.

5.6 Potential Agreements

The Regional ITS Architecture for the Johnson City Region has identified many agency interfaces, information exchanges, and integration strategies 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 regards 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. The focus of the agreement should be on the responsibilities of the agencies and the high level information that needs to be exchanged. Depending on the type of agreement being used, agencies need to be prepared for the process to complete an agreement to take several months to years. Agencies must first reach consensus on the content of an agreement and then proceed through the approval process. The approval process for formal agreements varies by agency. The process often is lengthy; agencies should 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 to determine if amendments or modifications to the existing agreement can include the additional requirements of deploying a system. If there are no existing agreements to modify or use 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 is not communicated to 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 each 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 that 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 9 provides a list of existing and potential agreements for the Johnson City 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.

In **Appendix E**, copies of the existing agreements that were available have been included. These agreements include:

- Agreement between the Johnson City Transit System and Johnson City MTPO defining mutual responsibilities and roles;
- Memorandum of Understanding among TDOT, TDOSHS, and local governments for the quick clearance of incidents along the State Highway System;
- Agreement developed by TDOT for live CCTV video access and information sharing for governmental agency users; and
- Agreement developed by TDOT for live CCTV video access for private entity users.

Table 9 – Johnson City Region Potential Agreements

Status	Agreement and Agencies	Agreement Description
Existing	**Data Sharing and Usage (Public-Private)** –TDOT and Media	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 is also part of the agreement.
Existing	**Data Sharing and Usage (Public-Public)** –TDOT and Local Responder Entity Users	Agreement to define the parameters, guidelines, and policies for inter-agency ITS data sharing between public sector agencies including CCTV camera feeds. Allows local governmental agencies the ability to view live TDOT SmartWay cameras through TDOT's new SmartView Program. Local governments are required to share traffic related information with TDOT that may negatively impact interstates or state routes in addition to attending incident management training.
Existing	**Open Roads Policy (Public-Public)** – TDOT, THP (TDOSHS), and Municipalities/Counties	Memorandum of Understanding among TDOT, THP (TDOSHS), and local governments that establishes guidelines to accelerate the removal of vehicles or debris on the State Highway System to restore the flow of traffic following an incident.
Future	**Data Sharing and Usage (Public-Public)** – City of Johnson City, City of Elizabethton, TDOT	Agreement would define the parameters, guidelines, and policies for inter-agency ITS data sharing between the public sector agencies. 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.
Future	**Data Sharing and Usage (Public-Private)** – City of Johnson City and Media	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.
Future	**ITS and Traffic Signal Timing Data Sharing and Usage (Public-Public)** – City of Johnson City, City of Elizabethton	Agreement would define the parameters, guidelines, and policies for inter-agency ITS and traffic signal timing sharing between cities, counties, and any other agencies that might maintain their traffic signal system.
Future	**Incident Data Sharing and Usage (Public-Public)** – TDOT, City of Johnson City, City of Elizabethton, THP, Carter County, Washington County	Agreement would 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 (CAD) systems and include information on lane closures, travel delays, and weather.

Table 9 – Johnson City Region Potential Agreements (continued)

Status	Agreement and Agencies	Agreement Description
Future	**Joint Operations Agreements (Public-Public) –** TDOT and City of Johnson City	Agreement to operate the ITS system from a shared control facility that could include traffic, transit, and emergency management. Examples could include a regional TMC or a combined TMC and EOC. Agreement will need to identify such issues as sharing of data and control of devices, cost sharing of the facilities, and standard operating procedure. Shared field equipment, such as a CCTV camera that can be accessed by multiple agencies could also be covered under this type of agreement.
Future	**Maintenance Agreements (Public-Public)** – City of Johnson City, City of Elizabethton, Municipalities, TDOT	Agreement that would allow multiple public agencies to pull their funding together to hire a single maintenance contractor to maintain ITS devices throughout the Region.
Existing	**Operations and Maintenance (Public-Public)** – City of Jonesborough, City of Johnson City	Interlocal agreement for the City of Johnson City to operate and maintain the traffic signals within the City of Jonesborough.

5.7 Phases of Implementation

The Johnson City Regional ITS Architecture will be implemented over time through a series of projects. Key foundation systems will need to be implemented in order to support other systems 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 timeframes were identified in the Johnson City Regional ITS Deployment Plan presented in Section 6. These projects were sequenced over a time period that coincides with the 2040 Long Range Transportation Plan, with projects identified for deployment in the short-term (0 to 5 years), mid-term (5 to 10 years), and long-term (beyond 10 years.)

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

- ATMS01 – Network Surveillance;
- ATMS02 – Traffic Probe Surveillance;
- ATMS03 – Traffic Signal Control;
- ATMS06 – Traffic Information Dissemination;
- ATMS07 – Regional Traffic Management;
- ATMS08 – Traffic Incident Management System;
- EM07 – Early Warning System;
- MC01 – Maintenance and Construction Vehicle Equipment Tacking;
- MC03 – Road Weather Data Collection;
- MC04 – Weather Information Processing and Distribution;
- MC09 – Winter Maintenance;
- APTS02 – Transit Fixed-Route Operations;
- APTS03 – Demand Response Transit Operations;
- APTS04 – Transit Fare Collection Management;
- APTS07 – Multi-modal Coordination;
- APTS08 – Transit Traveler Information;
- APTS11 – Multimodal Connection Protection;
- ATIS02 – Interactive Traveler Information; and
- AD1 – ITS Data Mart.

6. REGIONAL ITS DEPLOYMENT PLAN

The Regional ITS Deployment Plan serves as a tool for the Johnson City Region to identify specific projects that should be deployed in order to achieve the desired functionality identified in the Regional ITS Architecture. The Regional ITS Deployment Plan builds on the Regional ITS Architecture by outlining specific ITS project recommendations and strategies for the Region and identifying deployment timeframes so that the recommended projects and strategies can be implemented over time.

The Regional ITS Deployment Plan also shows the correlation between each project and the Regional ITS Architecture by identifying the ITS service packages that correspond to each project. If projects were identified that did not correspond to an ITS service package, the ITS service packages in the Regional ITS Architecture were revised while the Regional ITS Architecture was still in draft format; therefore, the resulting ITS deployment projects are supported by the Regional ITS Architecture.

The Johnson City Regional ITS Deployment Plan provides stakeholders with a list of regionally significant ITS projects that are consistent with the Regional ITS Architecture and assists with addressing transportation needs in the Region. It is important to note that the Regional ITS Deployment Plan is not fiscally constrained. The projects in the plan represent those projects that stakeholders would like to implement; however, funding will still be needed in order for these projects to actually be implemented.

6.1 Project Development and Selection

An overview of the process used to develop the Regional ITS Deployment Plan is provided in **Figure 8**. This figure demonstrates that a variety of inputs were used to gather information and develop a set of ITS projects for selection by stakeholders, including a review of the regional needs, ITS service package priorities, and regional and local plans.

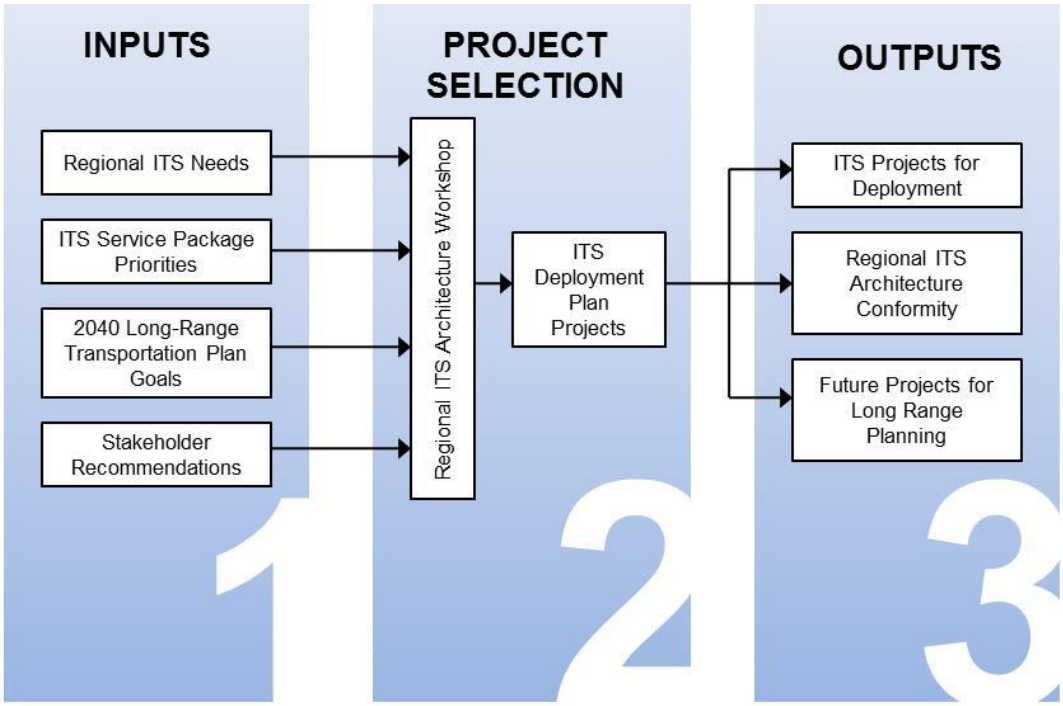


Figure 8 – Project Development and Selection Process

Stakeholder input in Step 1 was gathered through a stakeholder workshop where the regional ITS needs, ITS service package priorities, and planned ITS projects were discussed. A series of interviews were also conducted to discuss this same information in more detail with key agencies in the Region. A review of regional and local plans was conducted as well to identify potential project ideas.

The inputs in Step 1 led to the project selection in Step 2. Project selection was completed through a combination of a stakeholder workshop held in October 2014 as well as stakeholder review of the Regional ITS Architecture Report.

The outputs of the plan, shown in Step 3, will provide stakeholders and the Johnson City MTPO with a list of priority ITS projects for the Johnson City Region. Each of the projects recommended in the plan has been checked against the Johnson City Regional ITS Architecture to ensure they are in conformance. This should assist agencies deploying these projects in the future with meeting FHWA and FTA requirements for ITS architecture conformity. The projects in the plan could also feed into the long-range planning process and provide agencies with a list of priority ITS projects for consideration during future calls for projects from the MTPO.

6.2 ITS Project Recommendations

In order to achieve the ITS deployment levels outlined in their Regional ITS Architecture, a region must deploy carefully developed projects that provide the functionality and interoperability identified in their Regional ITS Architecture. A key step toward achieving the Johnson City Region's ITS vision, as established in the Regional ITS Architecture, is the development of an ITS Deployment Plan that identifies specific projects, timeframes, and responsible agencies.

Input from all stakeholders is required for stakeholders to have ownership of the ITS Deployment Plan and to ensure that the plan has realistically identified projects and timeframes for deployment. Cost is another important factor—cost can vary a great deal for many ITS elements, depending on the level of deployment, maturity of the technology, type of communications, etc. For example, freeway network surveillance could be adequately achieved for one region by the deployment of still frame CCTV cameras only at freeway interchanges. In another region, full motion cameras may be deployed at one-mile intervals to provide complete coverage of the freeway. The infrastructure and telecommunications costs for these two projects would vary a great deal, yet either one could be suitable for a particular region.

Regional projects are identified in **Table 10** through **Table 13**. The tables are divided by the primary responsible agency as follows:

- **Table 10** – State ITS Deployment Plan Projects
- **Table 11** – Local ITS Deployment Plan Projects
- **Table 12** – Transit ITS Deployment Plan Projects
- **Table 13** – Other ITS Deployment Plan Projects

The projects identified in the tables represent priority projects for each agency that are needed in order to implement the ITS services that were identified as part of the Regional ITS Architecture development. Projects that have been funded using federal transportation funds will be included in the Regional Transportation Improvement Plan (TIP). Projects that are funded with non-federal funding may also be included in the TIP, but are not required to be included. Many of the projects identified in the plan do not yet have funding. Identification of a funding source will likely be the most significant challenge in getting the projects implemented.

For each project, the following categories are discussed:

- **Project** – Identifies the project name including the agency responsible for implementation where applicable.
- **Description** – Provides a description of the project including notes on time-frames for deployment and costs if applicable. The level of detail in the project descriptions varies depending on the implementing agency and how much detail they wanted to include regarding a project. In some cases, projects had not been discussed beyond a very high conceptual level and there was limited or no information available on cost and scale of the potential project.
- **Deployment Timeframe and Responsible Agency** – Provides a recommended timeframe for deployment for each project. Timeframes have been identified as short-term (deployment recommended in 0-5 years), mid-term (deployment recommended in 5-10 years), and long-term (deployment recommended beyond 10 years). Recommendations for deployment timeframes were based on input from each agency and considered the project priority, possibility of funding, and dependency on other project deployments.
- **Funding Status** – Indicates whether funding has been identified or is still needed for the project.
- **Applicable ITS Service Packages** – Identifies the ITS service packages from the Regional ITS Architecture that each project will assist in implementing. Knowing which ITS service packages each project identifies is an important part of an ITS architecture conformance review.

Table 10 – State ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
TDOT/Johnson City Coordination	Improve coordination between TDOT and the City of Johnson City, including the exchange of future CCTV camera feeds and improved coordination during incidents.	Short-Term: TDOT & City of Johnson City	Funding Identified: No	ATMS01 – Network Surveillance ATMS07 – Regional Traffic Management ATMS08 – Traffic Incident Management System
TDOT SmartWay Installation	Install CCTV camera, DMS, and HAR equipment along I-26 and expand the existing infrastructure along I-81.	Mid to Long -Term: TDOT	Funding Identified: No	ATMS01 – Network Surveillance ATMS07 – Regional Traffic ATMS06 – Traffic Information Dissemination
TDOT SmartView Access for Local Governments	SmartView is a software program that is currently used internally by TDOT to view real-time CCTV camera video in addition to other functions. In the future, this program will allow local government agencies the ability to view TDOT CCTV cameras feeds and offer additional viewing capabilities that are not available to the general public on the SmartWay website. TDOT is currently working with local agencies to obtain signed MOUs regarding access to SmartView and data sharing. Estimated project cost for the SmartView video distribution software and a five year support contract is $3,300,000. The project is funded through State funds.	Short-Term: TDOT and Counties/ Municipalities	Funding Identified: Yes	ATMS01 – Network Surveillance ATMS07 – Regional Traffic Management

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

Table 11 – Local ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
City of Johnson City Adaptive Traffic Signals	Install an adaptive traffic signal system to reduce congestion. This is a system wide improvement. The City currently has a $670,000 in Federal STP funds for this project.	Mid to Long-Term: City of Johnson City	Funding Identified: Yes	ATMS01 – Network Surveillance ATMS02 – Traffic Probe Surveillance ATMS03 – Traffic Signal Control
City of Johnson City CCTV Camera Expansion	Install additional CCTV cameras along major arterials including along Boones Creek Road and in the Gray area in north Washington County. The City currently has $2,330,000 in Federal STP funds for traffic signal improvements, which can include CCTV camera implementation.	Short to Mid-Term: City of Johnson City	Funding Identified: Yes	ATMS01 – Network Surveillance
City of Johnson City CCTV Camera Video Dissemination	Allow the City of Johnson City Police Department, City of Johnson City Fire Department, TDOT, and other agencies the ability to view CCTV camera feeds.	Short to Mid-Term: City of Johnson City	Funding Identified: No	ATMS01 – Network Surveillance ATMS06 – Traffic Information Dissemination
City of Johnson City Fiber Optic Expansion	Install additional fiber optic cable for traffic signal communications and CCTV camera installation. The City currently has $2,330,000 in Federal STP funds for traffic signal improvements, which can include fiber optic expansion to the signals.	Short to Mid-Term: City of Johnson City	Funding Identified: Yes	ATMS01 – Network Surveillance ATMS03 – Traffic Signal Control
City of Johnson City Speed Monitoring System	Collect and disseminate travel time information along major corridors using Bluetooth technology.	Mid to Long-Term: City of Johnson City	Funding Identified: No	ATMS02 – Traffic Probe Surveillance ATMS06 – Traffic Information Dissemination

Table 11 – Local ITS Deployment Plan Projects (continued)

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
City of Johnson City Flood Detection and Warning System	Implement a system to provide automated flood detection, road closure, and advanced warning on roads with low water crossings that frequently flood.	Mid to Long-Term: City of Johnson City	Funding Identified: No	ATMS06 – Traffic Information Dissemination EM07 – Early Warning System MC03 – Road Weather Data Collection MC04 – Weather Information Processing and Distribution
City of Johnson City Automatic Vehicle Location (AVL)	Install AVL technology on snowplows to track them during winter weather events.	Short-term: City of Johnson City	Funding Identified: No	MC01 – Maintenance and Construction Vehicle and Equipment Tracking MC09 – Winter Maintenance
City of Johnson City DMS	Install permanent dynamic message signs along key corridors to provide motorists with roadway network conditions.	Mid to Long-Term: City of Johnson City	Funding Identified: No	ATMS06 – Traffic Information Dissemination
City of Johnson City RWIS	Install road weather information systems that include field sensors to monitor road weather conditions including ice, snow, and rain.	Long-Term: City of Johnson City	Funding Identified: No	MC03 – Road Weather Data Collection MC04 – Weather Information Processing and Distribution
City of Elizabethton TOC	Connect all traffic signals within the City of Elizabethton to a centralized TOC for operations.	Short to Mid-Term: City of Johnson City	Funding Identified: No	ATMS03 – Traffic Signal Control ATMS07 – Regional Traffic Management

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

Table 12 – Transit ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
Johnson City Paratransit Scheduling	Implement scheduling software for the Johnson City Transit paratransit vehicles. The estimated costs of the project is between $85,000 and $100,000. Approximately $1,900,000 in FTA, state and local funds have been identified for the purchase of paratransit vehicles and technology systems.	Short-Term: Johnson City Transit	Funding Identified: Yes	APTS01 – Transit Vehicle Tracking APTS03 – Demand Response Transit Operations
Johnson City Transit Mobile Phone Application	Develop a mobile phone application that allows users to view transit service information, real-time bus location, and create a transit trip plan.	Short to Mid-Term: Johnson City Transit	Funding Identified: No	APTS08 – Transit Traveler Information ATIS02 – Interactive Traveler Information
Johnson City Transit Smart Card Implementation	Implement a Smart Card system to pay for Johnson City Transit and NET Trans fares. Card could be expanded to coordinate with other City services.	Short to Mid-Term: Johnson City Transit and NET Trans	Funding Identified: No	APTS04 – Transit Fare Collection Management APTS07 – Multimodal Coordination
Regional Transit Coordination	Improve coordination within and among transit agencies to optimize transit travel times.	Short to Mid-Term: Johnson City Transit and NET Trans	Funding Identified: No	APTS07 – Multimodal Coordination APTS11 – Multimodal Connection Protection
Johnson City Transit Northern Transfer Center	Construct a transfer center in Johnson City Transit's northern service area to serve an expanding population. Transit center could include additional ITS elements such as transit security cameras and bus stop DMS.	Mid-Term Johnson City Transit	Funding Identified: No	APTS02 – Transit Fixed-Route Operations APTS05 – Transit Security APTS08 – Transit Traveler Information APTS11 – Multimodal Connection Protection

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

Table 13 – Other ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Opinion of Probable Cost and Funding Status	Applicable ITS Service Packages
Johnson City Metropolitan Transportation Planning Organization Data Warehouse Implementation	Develop a transportation data warehouse that includes region-wide transportation data gathered from the ITS network and various agencies.	Long-Term: Johnson City MTPO	Funding Identified: No	AD1 – ITS Data Mart AD3 – ITS Virtual Data Warehouse

[1]Deployment timeframes include short-term (0-5 years), mid-term (5-10 years), and long-term (10+ years).

7. USE AND MAINTENANCE PLAN

The Regional ITS Architecture developed for the Johnson City Region addresses the Region's vision for ITS implementation at the time the plan was developed. As the Region grows, needs will change and as technology progresses, new ITS opportunities will arise. Shifts in regional needs and focus as well as changes in the National ITS Architecture will necessitate that the Johnson City 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 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.

In 2001 the FHWA issued Final Rule 23 CFR 940, which required that ITS projects using federal funds (or ITS projects that integrate with systems that were deployed with federal funds) conform to a regional ITS architecture and also be developed using a systems engineering process. The purpose of Section 7 of this report is to discuss how the Johnson City Regional ITS Architecture can be used to support meeting the ITS architecture conformity and systems engineering requirements. A process for maintaining the Regional ITS Architecture, including the Regional ITS Deployment Plan, which has been incorporated as Section 6 of the Regional ITS Architecture, is also presented. In Section 7.2 the systems engineering analysis requirements and the guidance provided by TDOT and the FHWA Tennessee Division are discussed. In Section 7.3, the process for determining ITS architecture conformity of an ITS project is presented.

The Regional ITS Architecture is considered a living document. Shifts in regional focus and priorities, changes and new developments in technology, and changes to the National ITS Architecture will necessitate that the Johnson City Regional ITS Architecture be updated to remain a useful resource for the Region. In the Regional ITS Architecture, a process for maintaining the plan was developed in coordination with stakeholders. The process covers both major updates to the Regional ITS Architecture as well as minor changes that may be needed between major updates of the documents. These processes have been included in this document in Sections 7.3 and 7.4.

7.1 Incorporation into the Regional Planning Process

Stakeholders invested a considerable amount of effort in the development of the Regional ITS Architecture for the Johnson City Region. The plan needs 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 Johnson City 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 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 7.3, and the Johnson City MTPO will review each project to confirm it does conform to the Regional ITS Architecture.

7.2 Systems Engineering Analysis

In order to assist agencies with meeting the requirements of the TDOT Traffic Design Manual Chapter 8 – Intelligent Transportation Systems, TDOT and the FHWA Tennessee Division Office developed a guidance document entitled "Standardized Procedures for Implementing ITS Regulations." The guidance document indicates that unless projects are categorically excluded, a systems engineering analysis must be performed. Projects may be categorically excluded because they do not use federal funding or they are an ITS system expansion that do not add new functionality. For example, installation of an isolated traffic signal or expansion of a freeway management system through the deployment of additional CCTV cameras would be categorically excluded and not require a systems engineering analysis. It should be noted that Chapter 8 of the TDOT Traffic Design Manual is currently being updated, and should be complete by the end of 2015. Additionally, the TDOT Local Programs Development Office has developed similar guidance associated with performing a systems engineering analysis, which is available in the TDOT Local Government Guidelines for the Management of Federal and State Funded Transportation Projects. The Local Government Guidelines reference the Chapter 8 of the TDOT Traffic Design Manual for additional guidance.

The goal of performing a systems engineering analysis is to systematically think through the project deployment process. Thorough upfront planning has been shown to help control costs and ensure schedule adherence. The Tennessee procedures indicate that the following should be included in a systems engineering analysis:

- Identification of portions of the Regional ITS Architecture being implemented;
- Identification of participating agencies roles and responsibilities;
- Definition of system requirements;
- Analysis of alternative system configurations and technology options that meet the system requirements;
- Identification of various procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Documentation of the procedures and resources necessary for operations and management of the system.

The Johnson City Regional ITS Architecture and associated Turbo Architecture database can supply information for many of the required components for a systems engineering analysis. These include:

- Portions of the Regional ITS Architecture being implemented (discussed in Section 7.3);
- Participating agencies roles and responsibilities;
- Definition of system requirements (identified in the Johnson City Regional ITS Architecture Turbo Architecture database equipment packages); and
- Applicable ITS standards (identified using the ITS service package data flows from the Johnson City Regional ITS Architecture document and the National standards associated with the ITS service package data flows).

The Vee Diagram, shown as **Figure 9**, is frequently used in systems engineering discussions to demonstrate where the Regional ITS Architecture and systems engineering process fits into the life cycle of an ITS project. The Regional ITS Architecture is shown unattached from the rest of the diagram because it is not specifically project related, and an undetermined amount of time can pass between the architecture development and the beginning of project implementation. Traveling along the diagram, the systems engineering process addresses concept exploration, the

systems engineering management plan framework, concept of operations, and systems requirements.

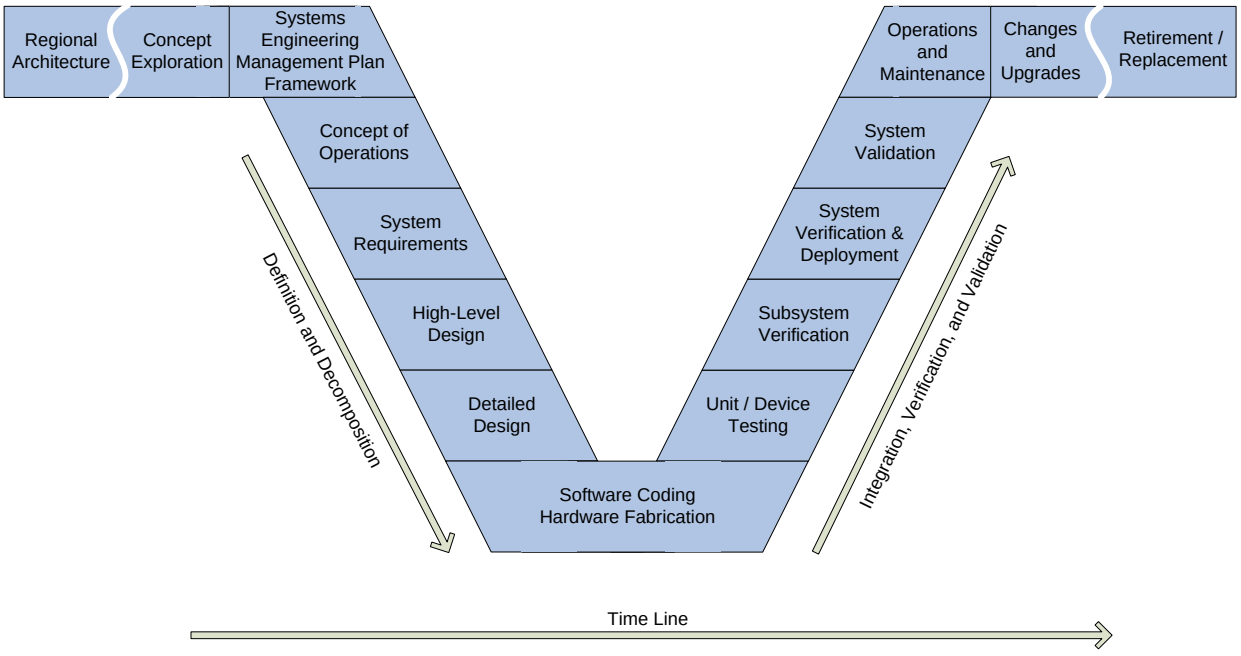


Figure 9 – Systems Engineering Vee Diagram

The Tennessee guidance document contains an example worksheet to aid in the preparation of a systems engineering analysis. During the process, if it is determined that a project is not adequately addressed in the Regional ITS Architecture, the Regional ITS Architecture maintenance process should be used to document the necessary changes.

7.3 Process for Determining Architecture Conformity

The Johnson City Regional ITS Architecture documents the customized service packages that were developed as part of the ITS architecture process. To satisfy federal 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 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 list of projects identified in the Johnson City Regional ITS Deployment Plan, then the applicable service package(s) for that project were also identified. 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 Johnson City Region should be reviewed to determine if they adequately cover the project. Service packages selected for the Johnson City 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 Johnson City 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 future element called the City of Elizabethton TOC was included in the Johnson City Regional ITS Architecture. Detailed planning for this center has not begun and it would not be unusual for the City to select a different name for the TOC once planning and implementation is underway. Such a name change should be documented using the process outlined in Section 7.5.

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 7.5.

Step 5 – Document Required Changes

If any changes are needed to accommodate the project under review, Section 7.5 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.

7.4 Regional ITS Architecture Maintenance Process

The Johnson City MTPO will be responsible for leading the process to update the Johnson City Regional ITS Architecture and Deployment Plan in coordination with the TDOT Traffic Operations Division. **Table 14** summarizes the maintenance process agreed upon by stakeholders in the Region.

Table 14 – Johnson City Regional ITS Architecture Maintenance Summary

Maintenance Details	Regional ITS Architecture and Deployment Plan	
	Minor Update	**Full Update**
Timeframe for Updates	As needed	Review every 4 years in the year preceding the Metropolitan Transportation Plan update to determine if a full update is required
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 and Deployment Plan
Lead Agency	Johnson City MTPO in Coordination with TDOT	
Participants	Stakeholders impacted by service package modifications	Entire stakeholder group
Results	ITS service package or other change(s) documented for next complete update	Updated Regional ITS Architecture and Deployment Plan document, Appendices, and Turbo Architecture database

It was agreed that a review of the Regional ITS Architecture should occur approximately every four years in the year preceding the Long Range Transportation Plan (LRTP) update to determine if a full update of the Regional ITS Architecture is necessary. The need for an update will depend on the level of ITS implemented in the region since the previous update as well as changes that may have occurred in the National ITS Architecture. The Johnson City MTPO will coordinate with TDOT to determine if an update is required.

By completing a full update of the Regional ITS Architecture in the year prior to the LRTP update (if an update is needed), 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 Jonson City MTPO, in coordination with the TDOT Traffic Operations Division, will be responsible for completing the full update. 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 and Deployment Plan should occur as needed between full updates of the plan. In Section 7.5 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.

7.5 Procedure for Submitting ITS Architecture Changes between Major Updates

Updates to the Johnson City Regional ITS Architecture will occur on a regular basis as described in Section 7.4 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 7.3 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 Section of the Regional ITS Architecture.

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 Johnson City MTPO will review and accept the proposed changes and forward the form to the TDOT Traffic Operations 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 – SERVICE PACKAGE DEFINITIONS

Service Package	Service 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	Traffic Signal Control	Provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. This service package is consistent with typical traffic signal control systems.
ATMS04	Traffic Metering	Includes 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 service 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	Traffic Decision Support and Demand Management	Recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. All recommendations are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. This service package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support TDM, where applicable.
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 service 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.

Service Package	Service Package Name	Description
Traffic Management Service Area (continued)		
ATMS16	Parking Facility Management	Provides enhanced monitoring and management of parking facilities. Service package assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees.
ATMS17	Regional Parking Management	Supports communication and coordination between parking facilities as well as coordination between parking facilities and traffic and transit management systems.
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. Service package covers general road closures applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other service 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. Also known as speed harmonization, this service monitors traffic and environmental conditions along the roadway.
ATMS23	Dynamic Lane Management and Shoulder Use	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 along a roadway. This equipment can be used to change the lane configuration on the roadway according to traffic demand and lane destination along a typical roadway section or on approach to or access from a border crossing, multimodal crossing or intermodal freight depot. This package can be used to allow temporary or interim use of shoulders as travel lanes.
ATMS24	Dynamic Roadway Warning	Includes systems that dynamically warn drivers approaching hazards on a roadway. These dynamic roadway warning systems can alert approaching drivers via warning signs, flashing lights, in-vehicle messages, etc. Such systems can increase the safety of a roadway by reducing the occurrence of incidents.
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 (a local policy decision by each roadway owner).
ATMS26	Mixed Use Warning Systems	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. These systems could allow automated warning or active protection for this class of users.
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.

Service Package	Service Package Name	Description
Emergency Management Service Area (continued)		
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 service package monitors service patrol vehicle locations and supports vehicle dispatch.
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 service 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 service package. This service 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.

Service Package	Service Package Name	Description
Maintenance and Construction Management Service Area (continued)		
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.
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 on 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 service package.
APTS09	Transit Signal Priority	Determines the need for transit priority on routes 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	Multi-modal 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).

Service Package	Service Package Name	Description
Commercial Vehicle Operations Service Area		
CVO01	Carrier Operations and Fleet Management	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 service package.
CVO02	Freight Administration	Tracks the movement of cargo and monitors the cargo condition.
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, and includes support for collecting on-board safety data via transceivers or other means. The on-board safety data are assessed by an off-board system. In some cases the monitoring and safety assessment may occur remotely (i.e., not at a roadside site).
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 service 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.

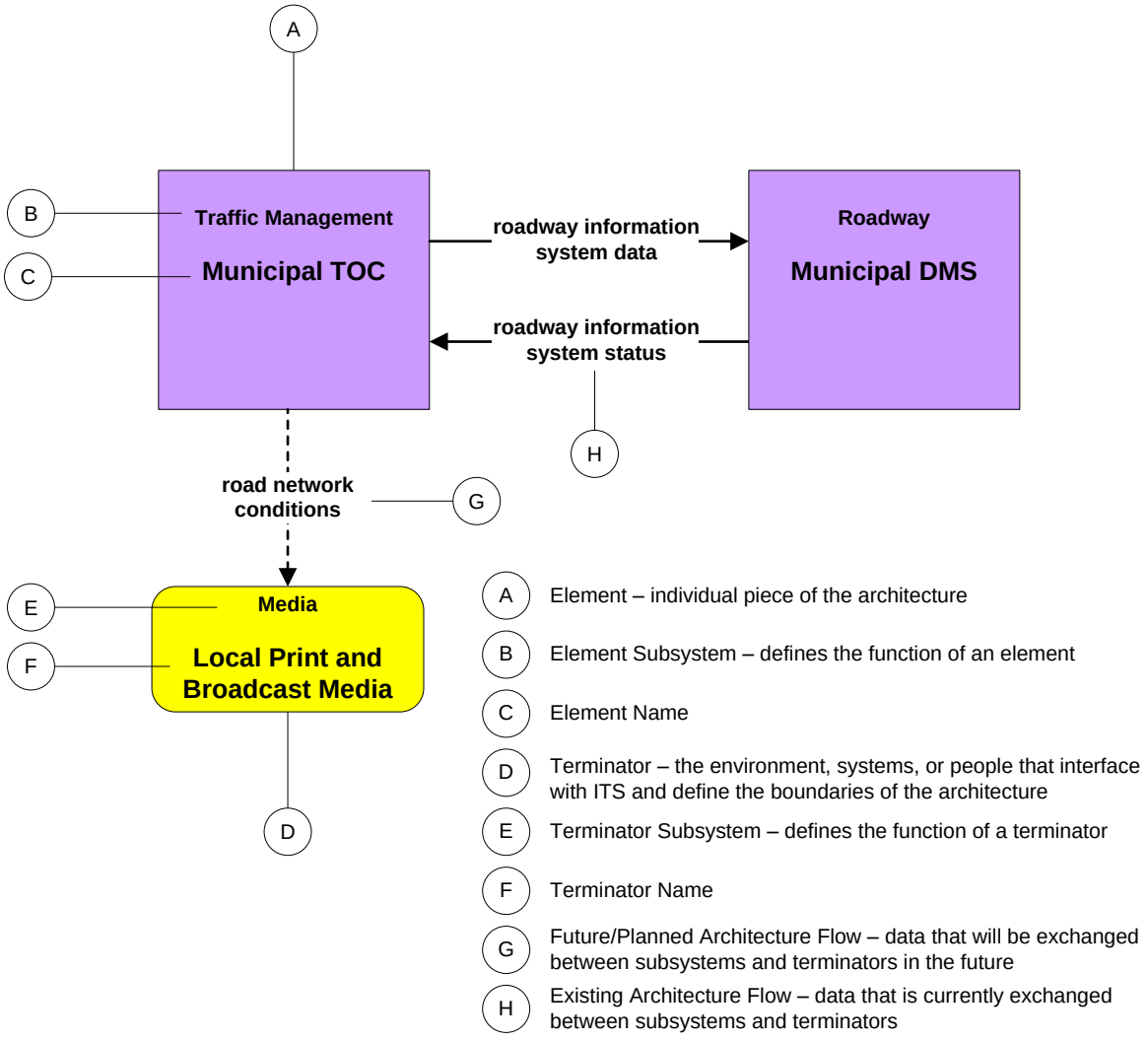
Service Package	Service Package Name	Description
Traveler Information Service Area		
ATIS06	Transportation Operations Data Sharing	Collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes the information available to transportation system operators.
ATIS07	Travel Service Information and Reservation	Provides travel information and reservation services to the user. This service package provides multiple ways for accessing information either while en route in a vehicle using wide-area wireless communications or pre-trip via fixed-point to fixed-point connections.
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 (DSRC) infrastructure supporting mobility applications for connected vehicles. Delivers real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass DSRC roadside equipment along their route.
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 Service 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 service 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.

Service Package	Service Package Name	Description
Vehicle Safety Service Area (continued)		
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.
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 service 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 ITS SERVICE PACKAGES

APPENDIX B

ITS SERVICE PACKAGE DIAGRAM COMPONENT AND TERMINOLOGY KEY



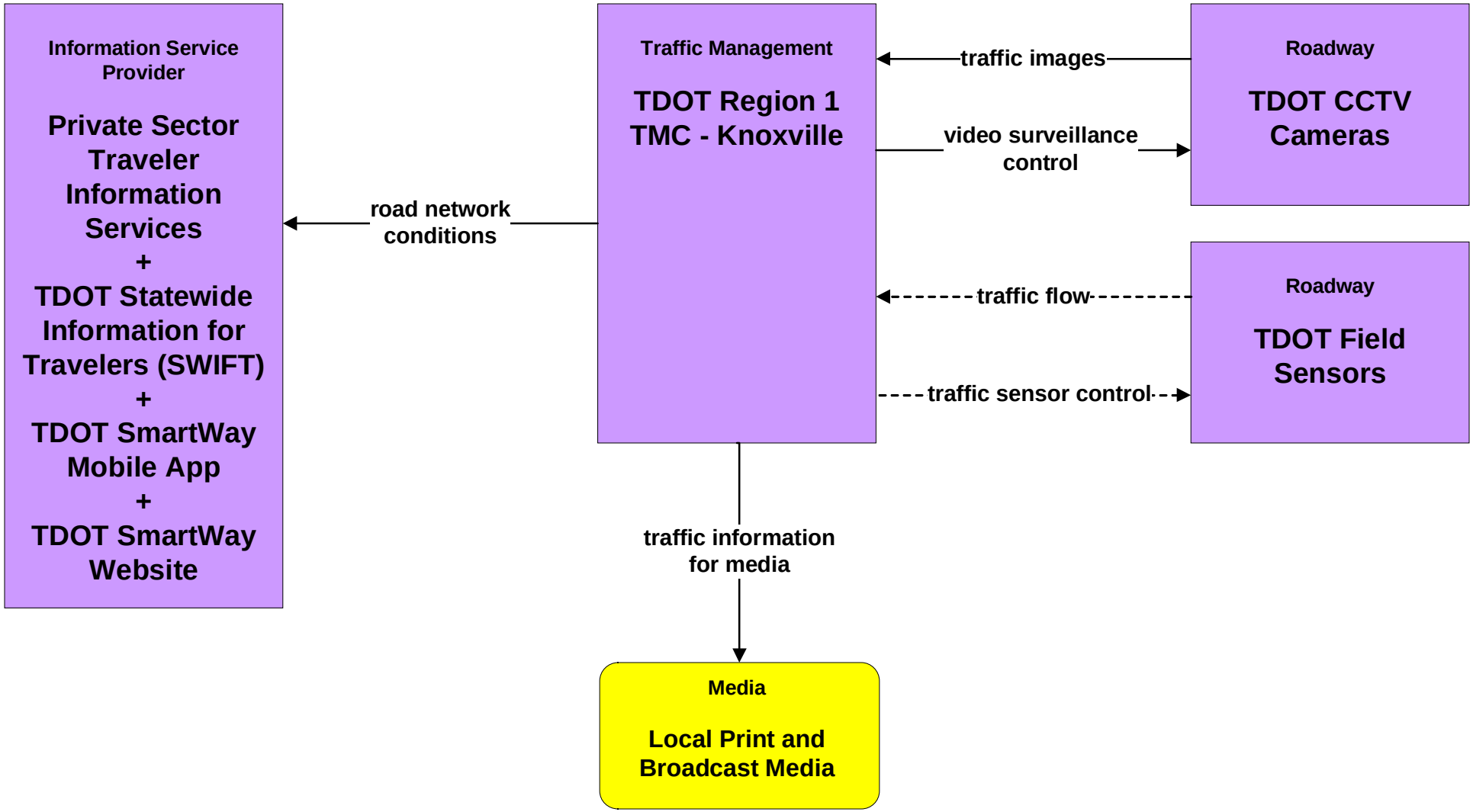
Johnson City Regional ITS Architecture Service Packages

March 2015

Advanced Traffic Management System (ATMS)……..……..……..2
Emergency Management (EM)……...19
Maintenance and Construction Management (MC)……..……..27
Advanced Public Transportation System (APTS)……36
Advanced Traveler Information System (ATIS)……44
Archived Data Management (AD)……..……..47

Advanced Traffic Management System

ATMS01 – Network Surveillance
TDOT Region 1 TMC - Knoxville



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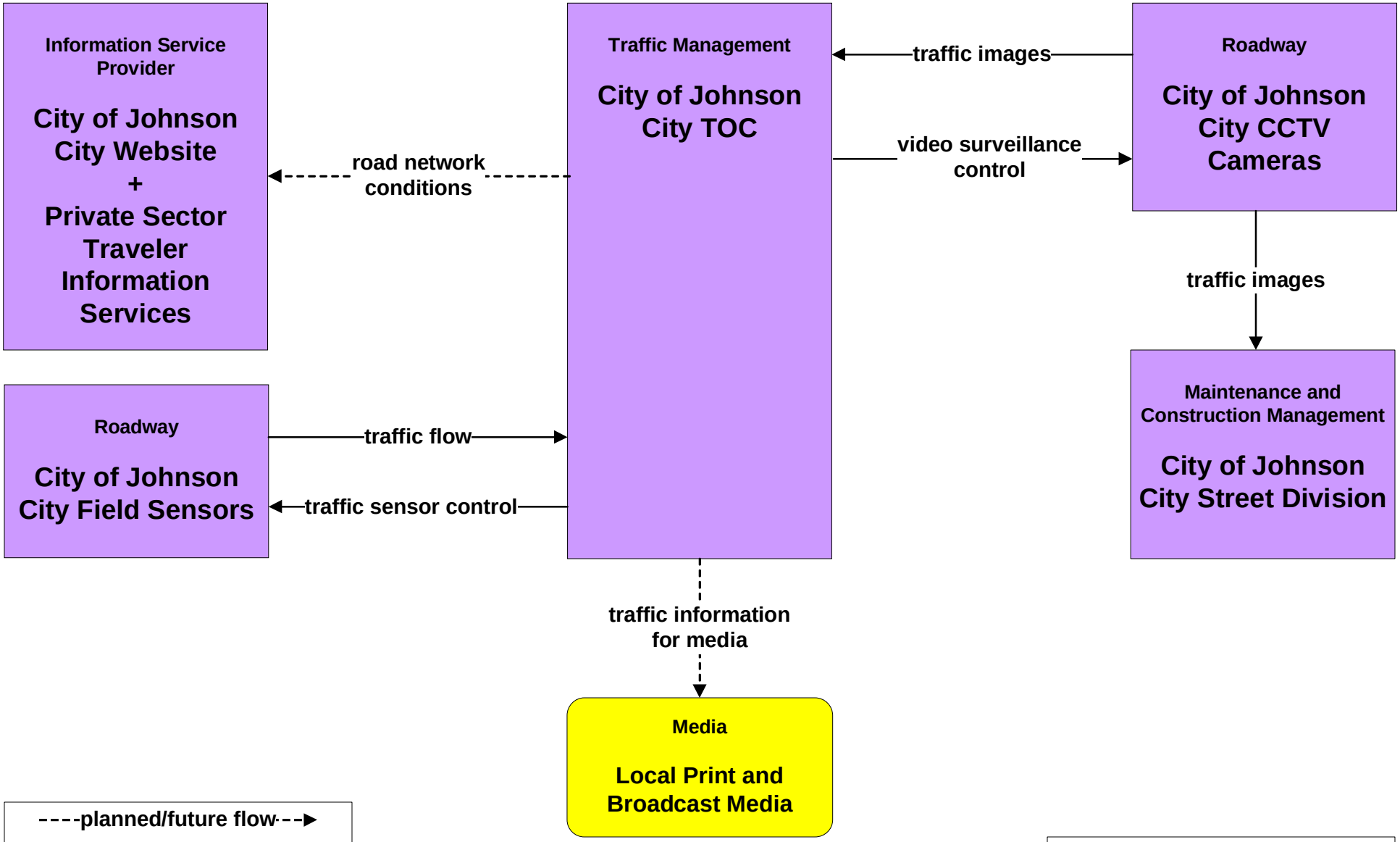
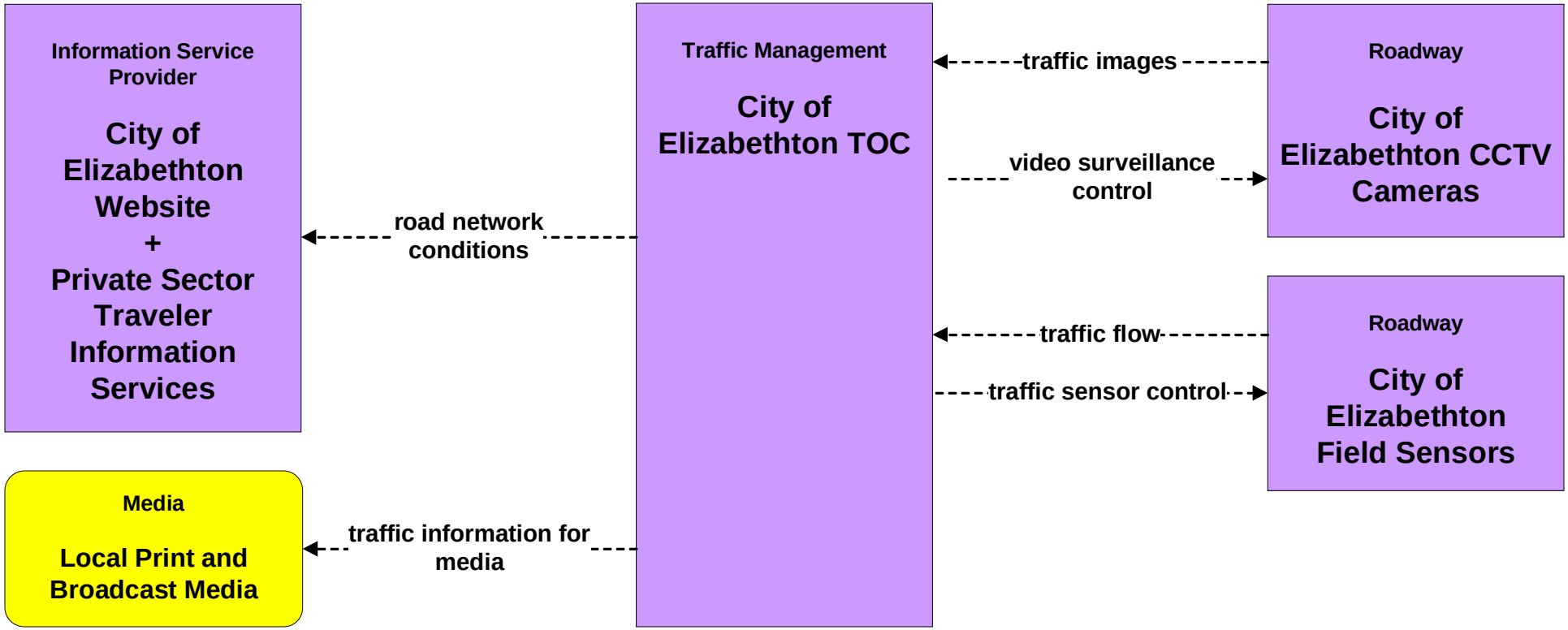
Note:
TDOT Field Sensors include VIVDS, RTMS, and any other type of vehicle detection.

ATMS01 – Network Surveillance
City of Johnson City



Note:
Johnson City Field Sensors include VIVDS and any other type of vehicle detection.

ATMS01 – Network Surveillance
City of Elizabethton



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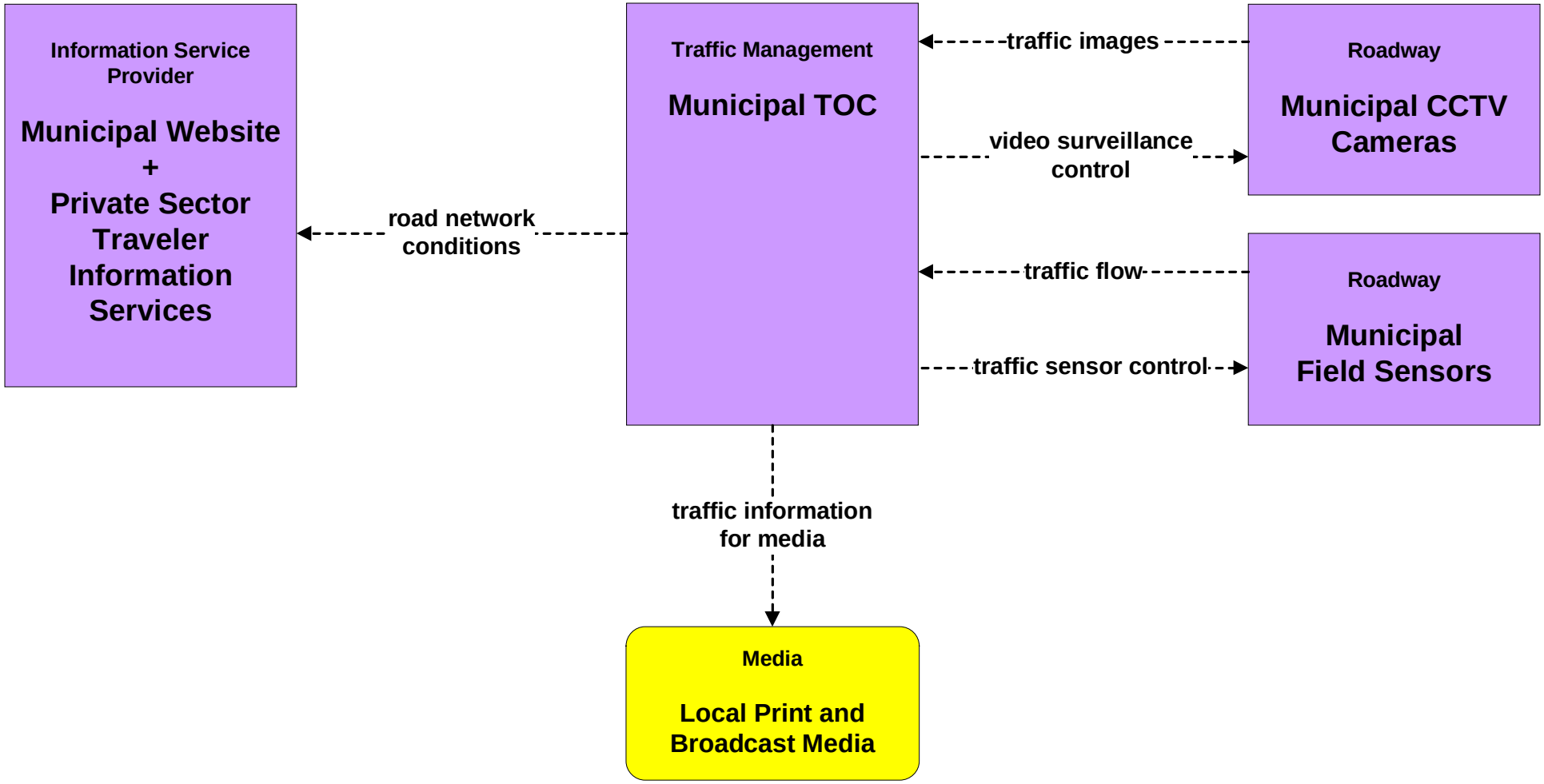
Note:
Elizabethton Field Sensors include VIVDS and any other type of vehicle detection.

ATMS01 – Network Surveillance
Municipal



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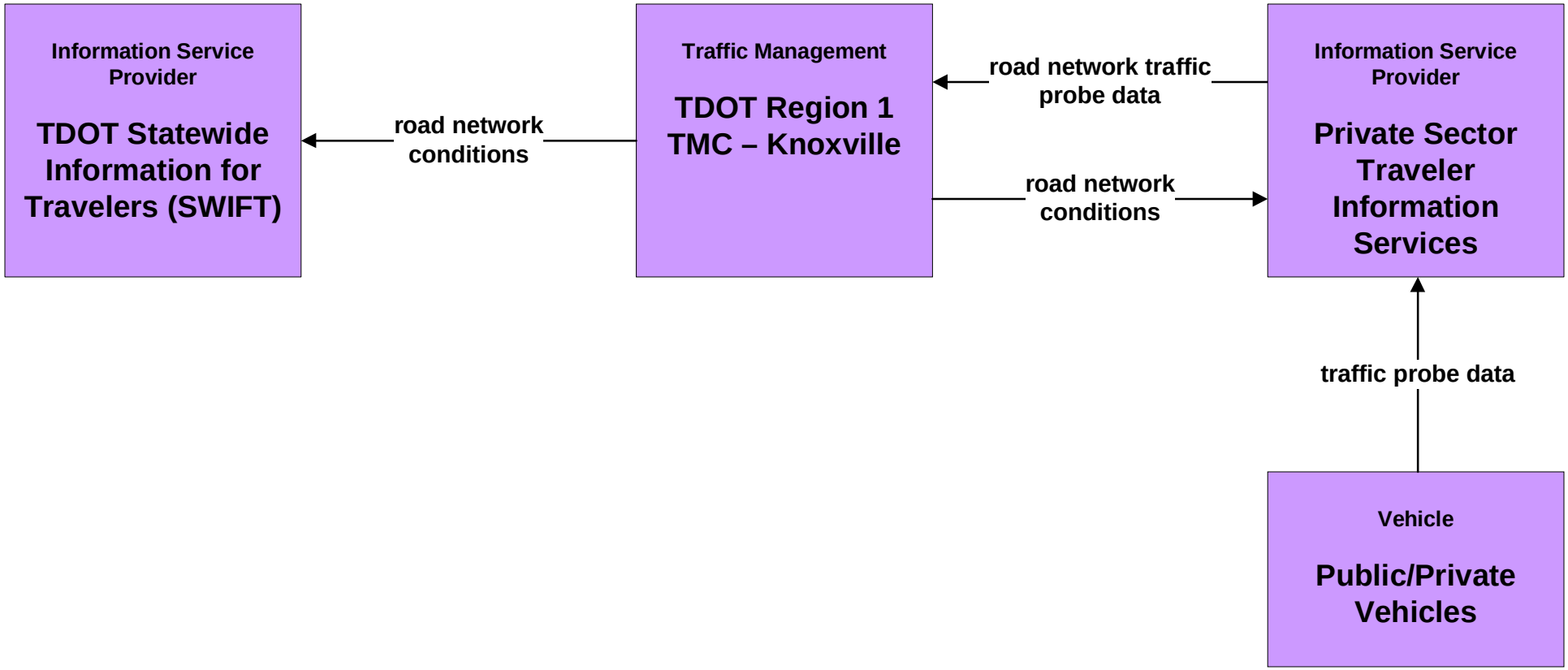
Note:
Municipal Field Sensors include VIVDS and any other type of vehicle detection.

ATMS02 – Traffic Probe Surveillance
TDOT



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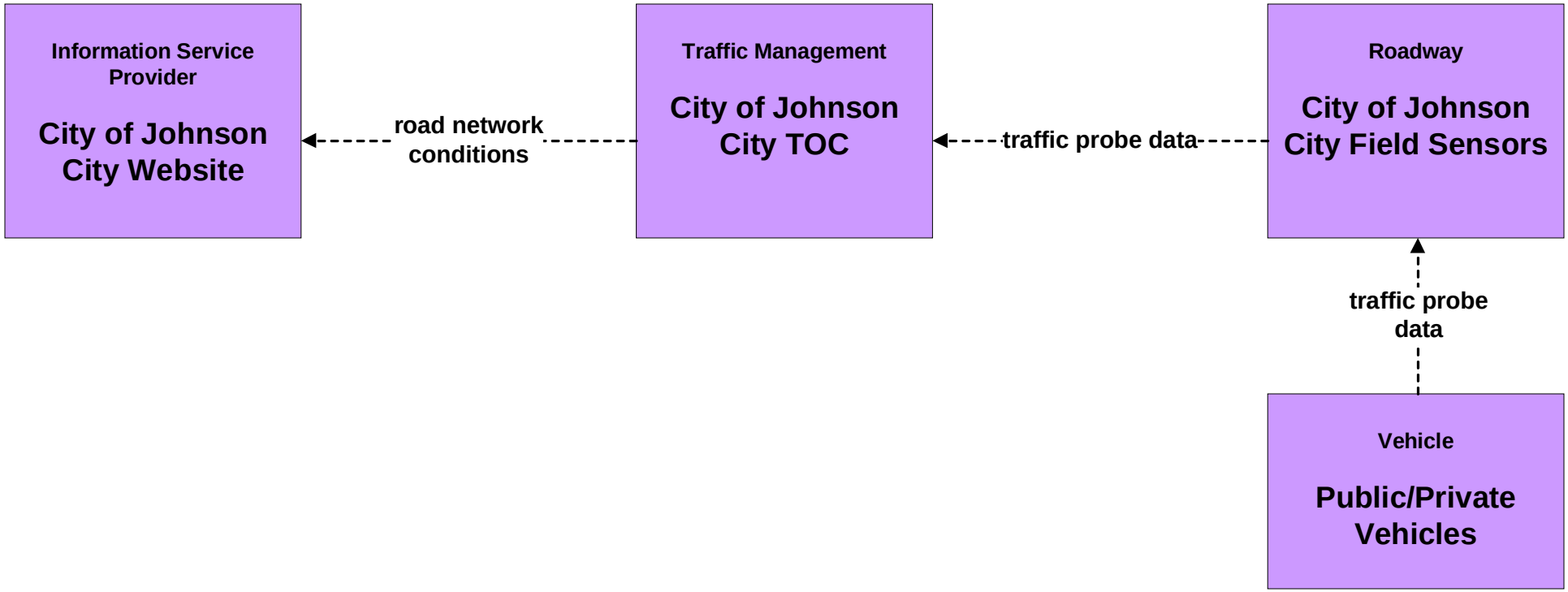
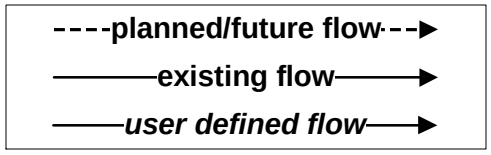
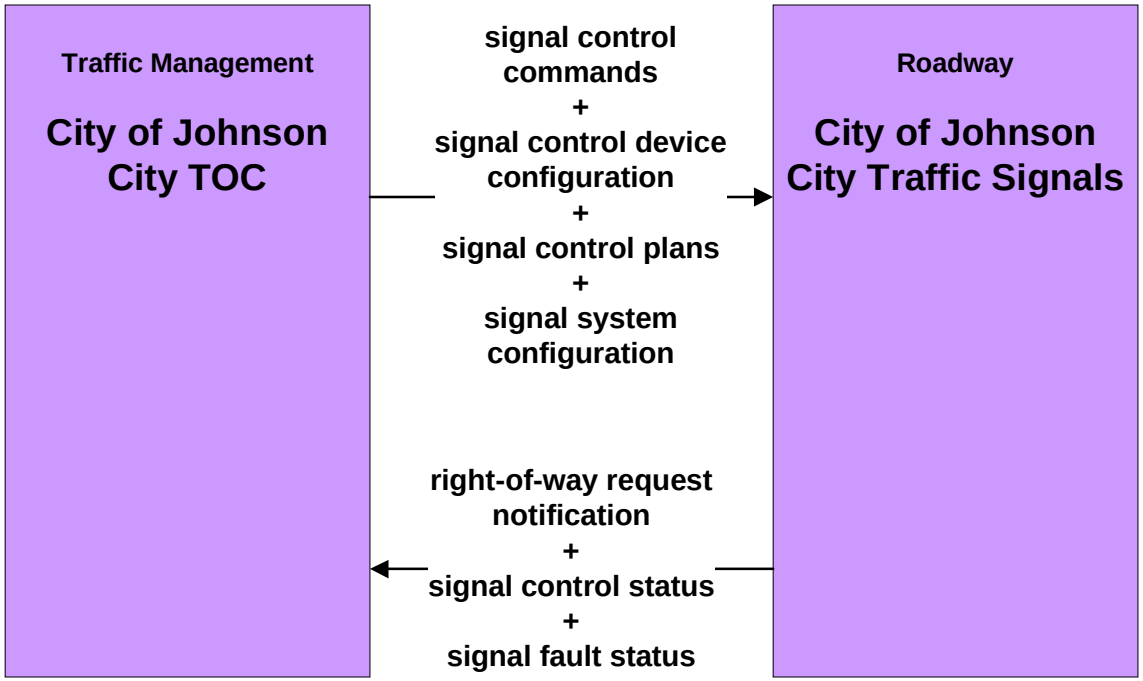
Note:
Private Sector Traveler Information Services includes traffic data from INRIX and Google Traffic

ATMS02 – Traffic Probe Surveillance
City of Johnson City





ATMS03 – Traffic Signal Control
City of Johnson City Signal System



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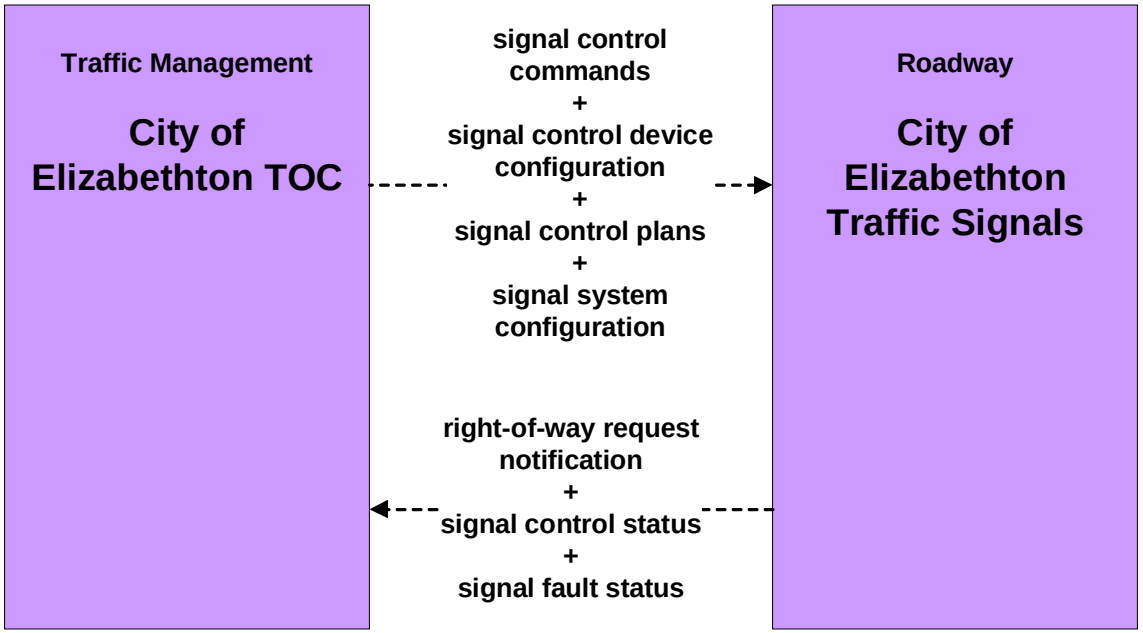
ATMS03 – Traffic Signal Control
City of Elizabethton Signal System



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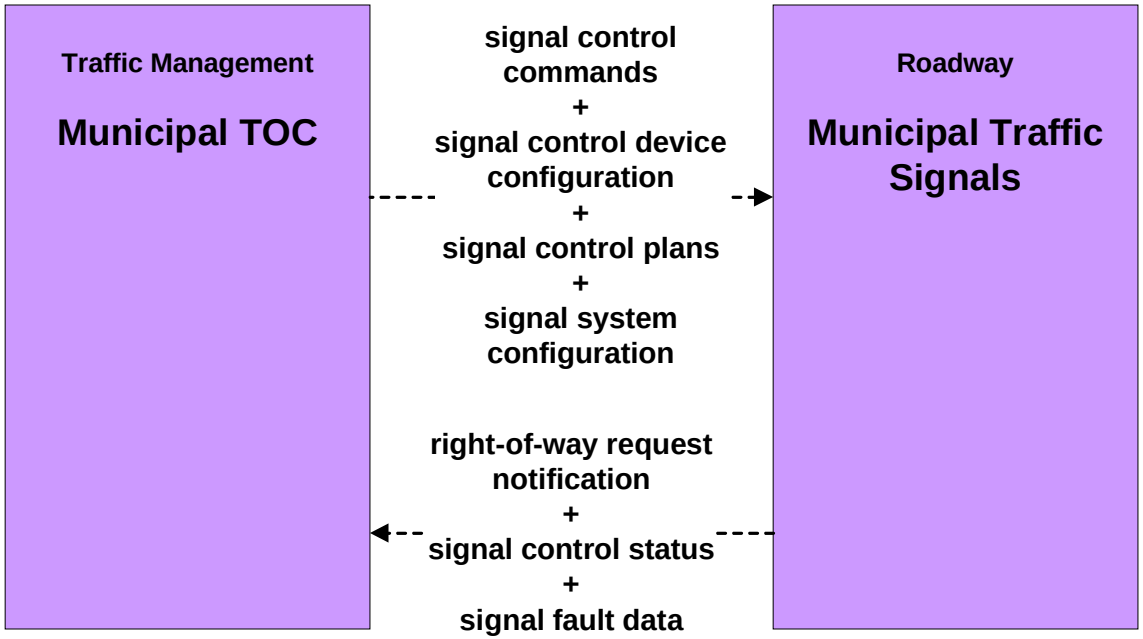
ATMS03 – Traffic Signal Control
Municipal Signal System



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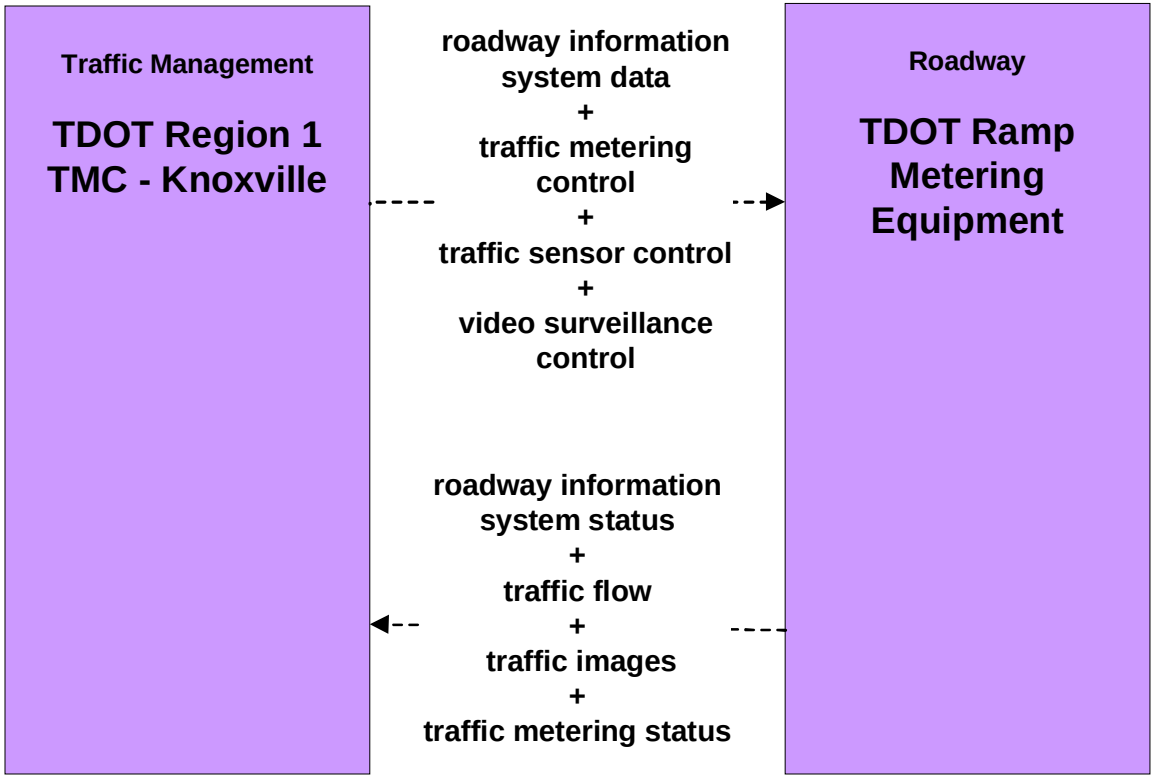
Note:
Jonesborough traffic signals currently controlled by Johnson City. Carter County traffic signals are privately maintained. Washington County traffic signals are maintained by Johnson City.

ATMS04 – Traffic Metering
TDOT

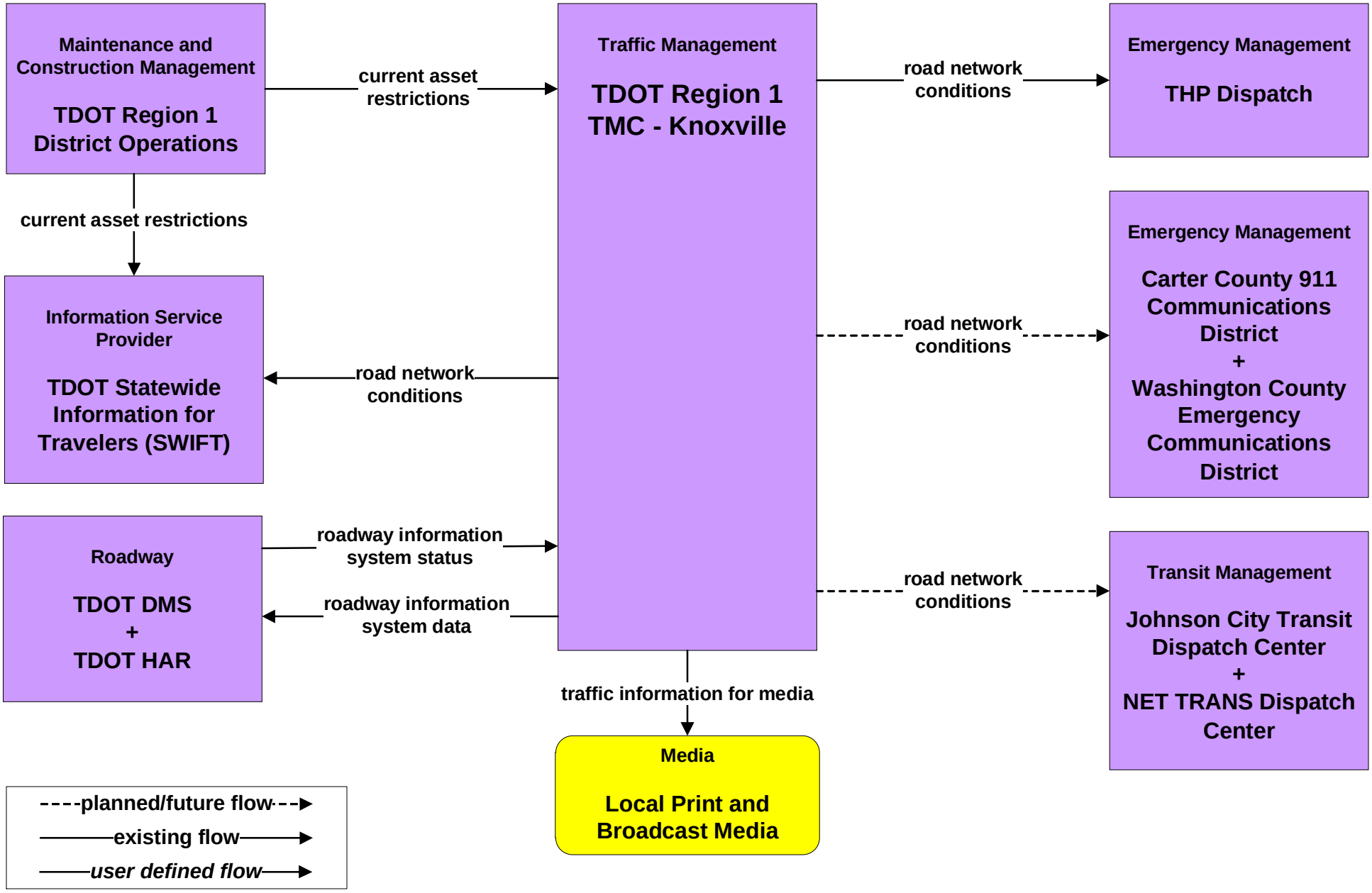


----planned/future flow--->

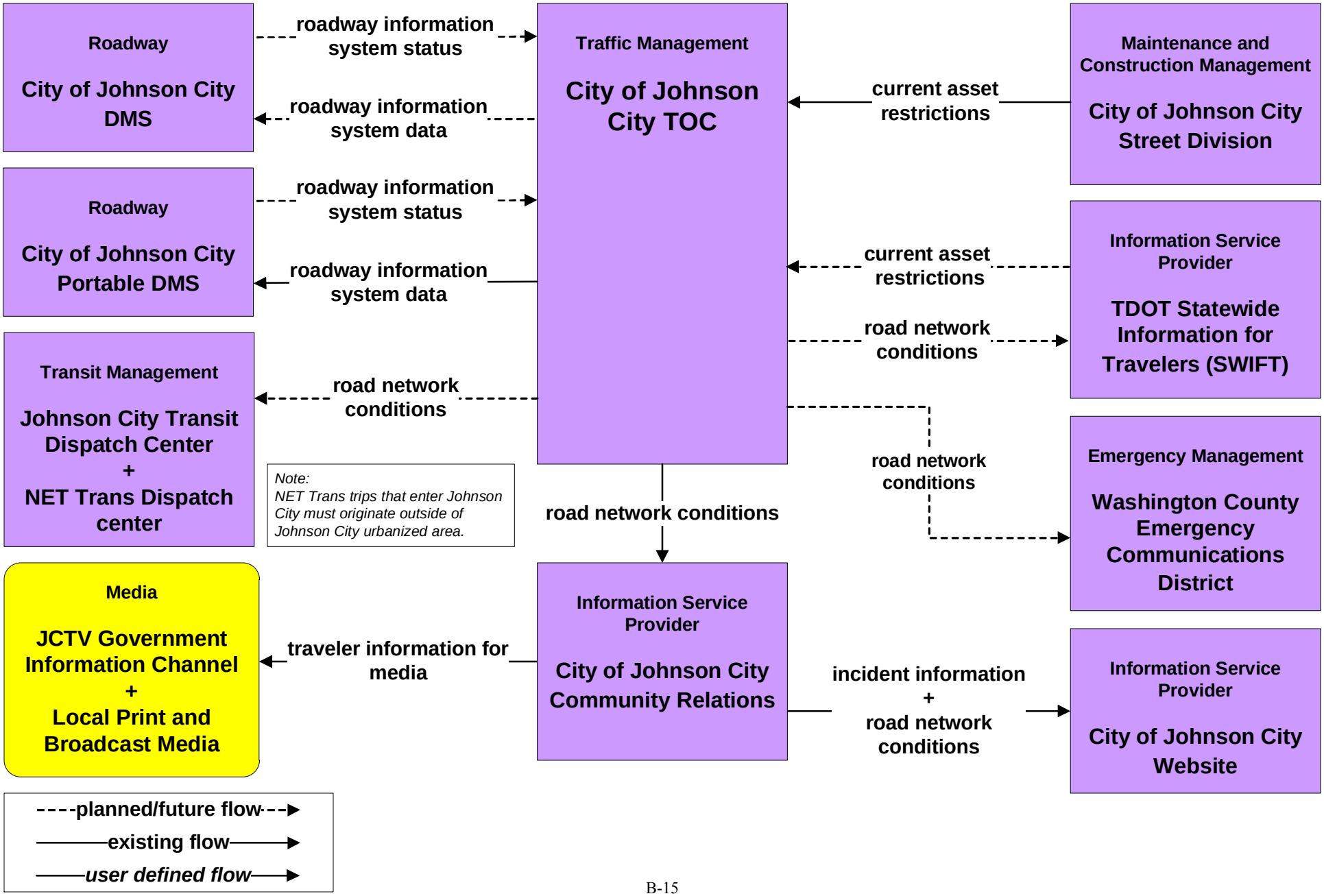
————existing flow————>

———*user defined flow*———>

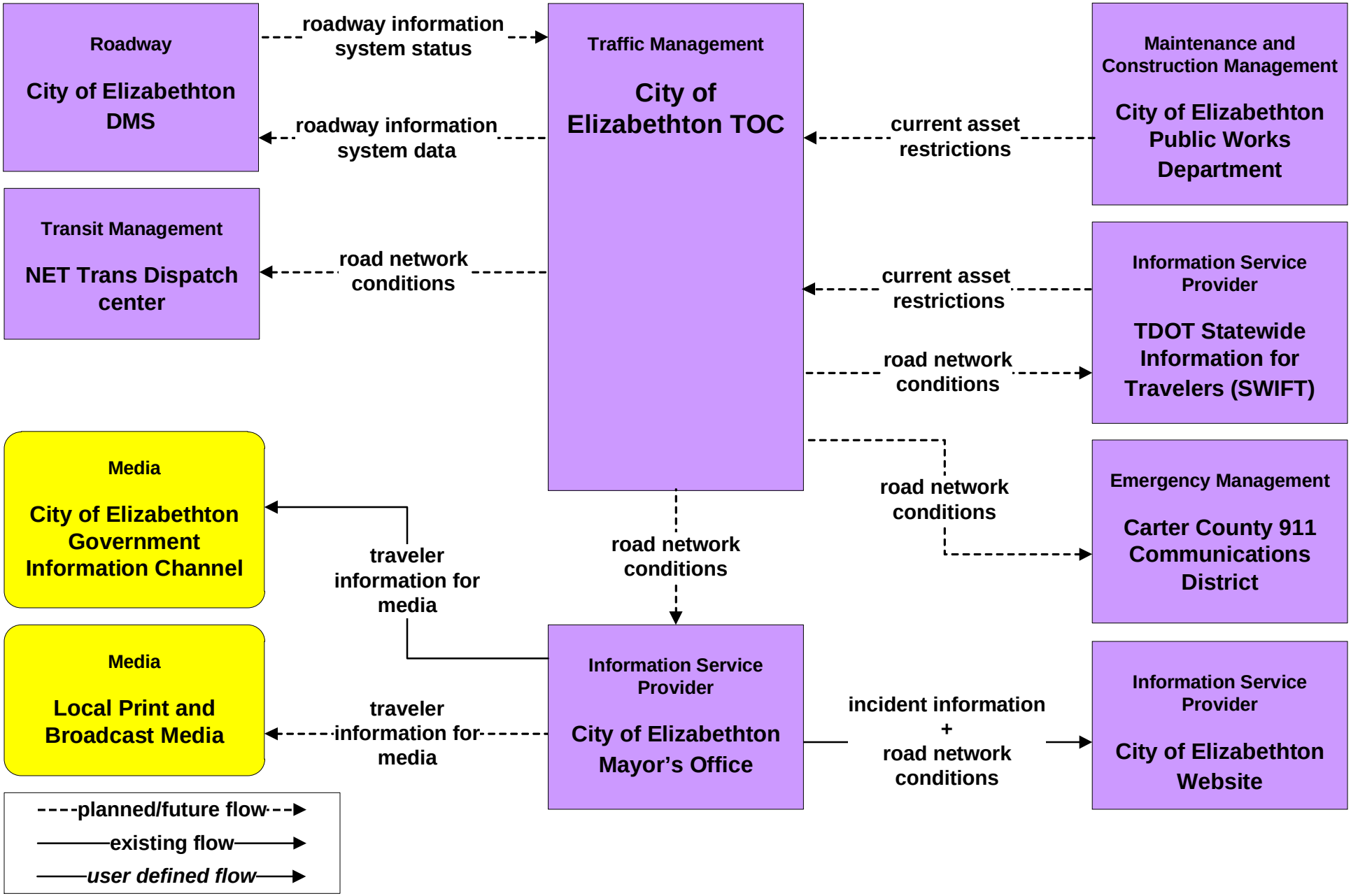
ATMS06 – Traffic Information Dissemination
TDOT Region 1 TMC - Knoxville



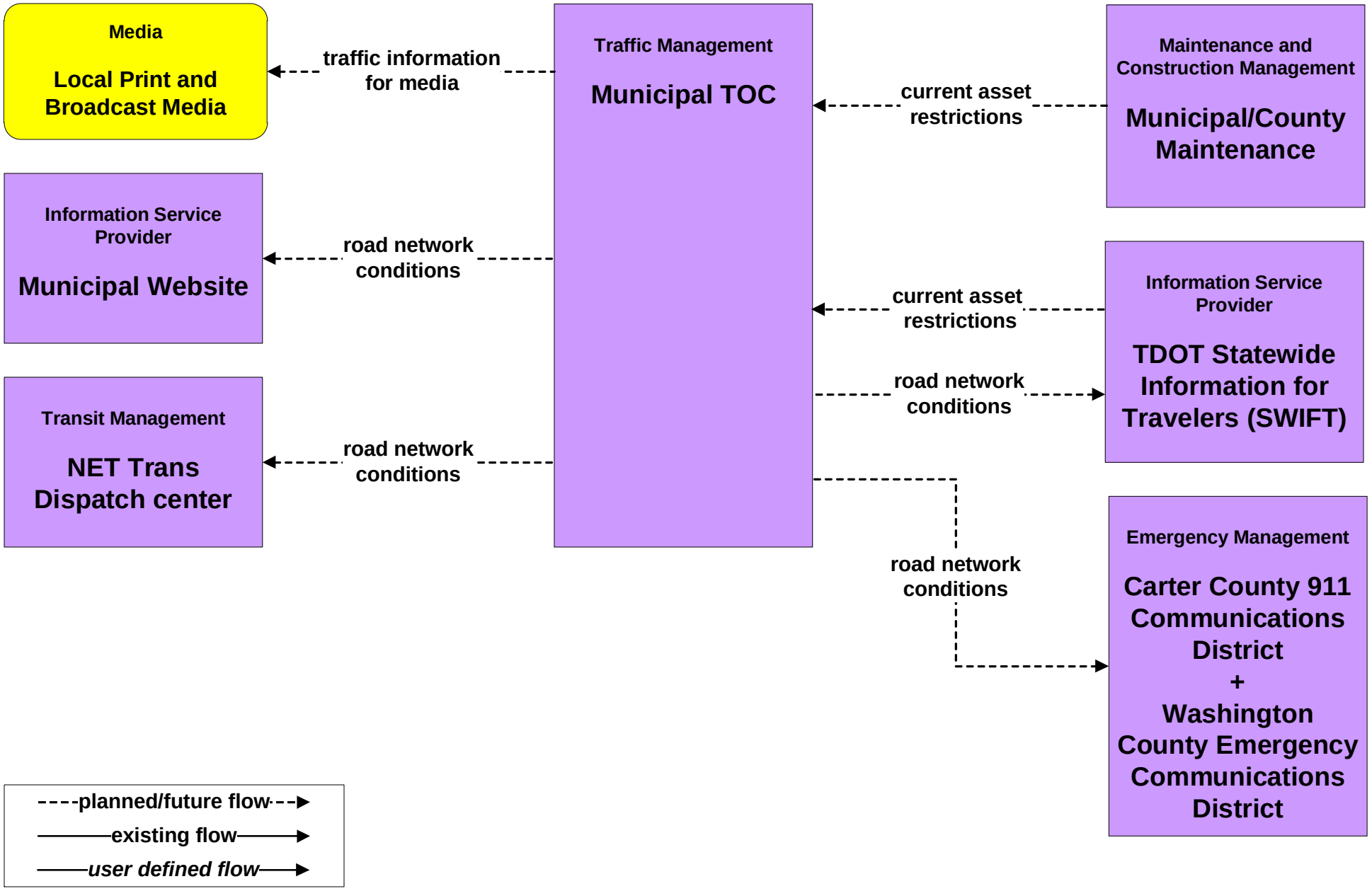
ATMS06 – Traffic Information Dissemination
City of Johnson City



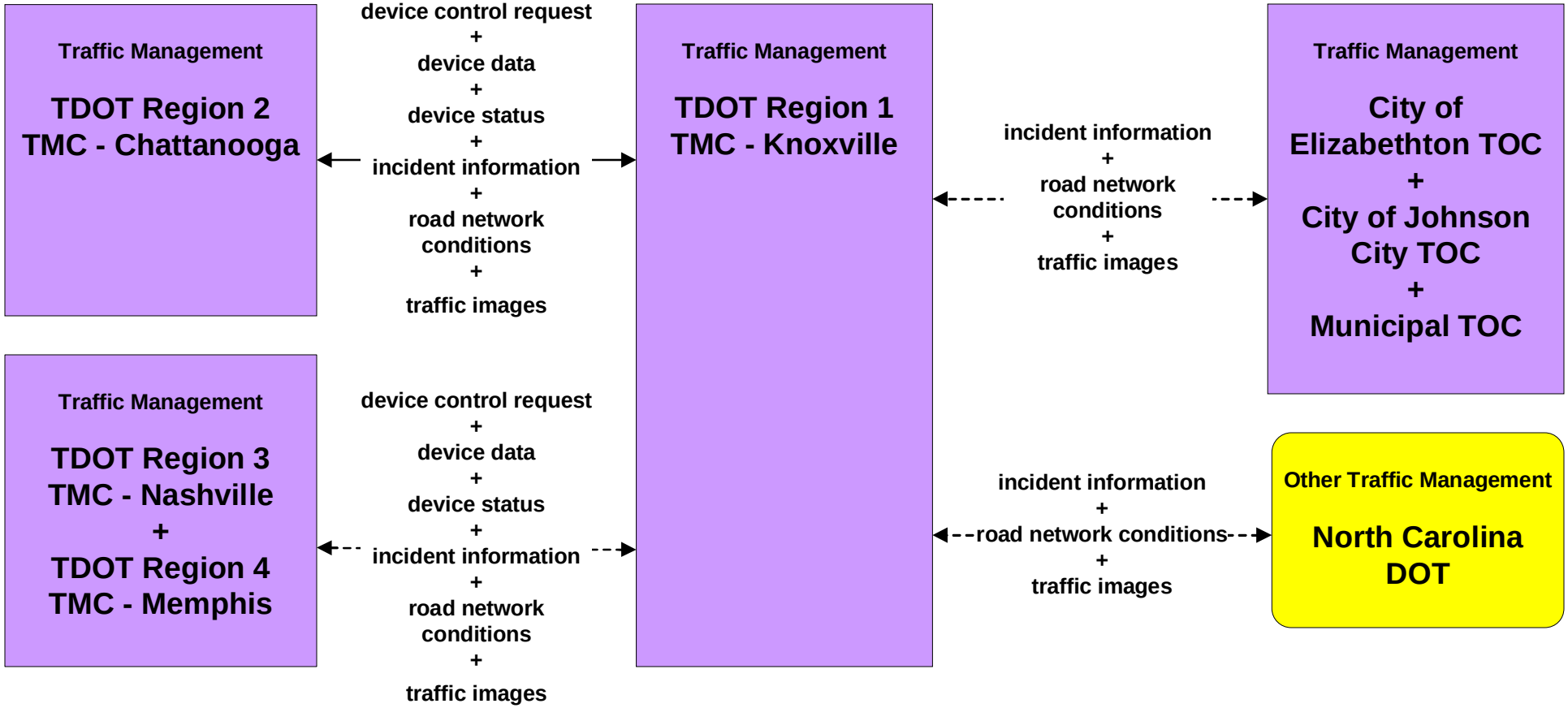
ATMS06 – Traffic Information Dissemination
City of Elizabethton



ATMS06 – Traffic Information Dissemination
Municipal



ATMS07 - Regional Traffic Management
TDOT Region 1 TMC - Knoxville

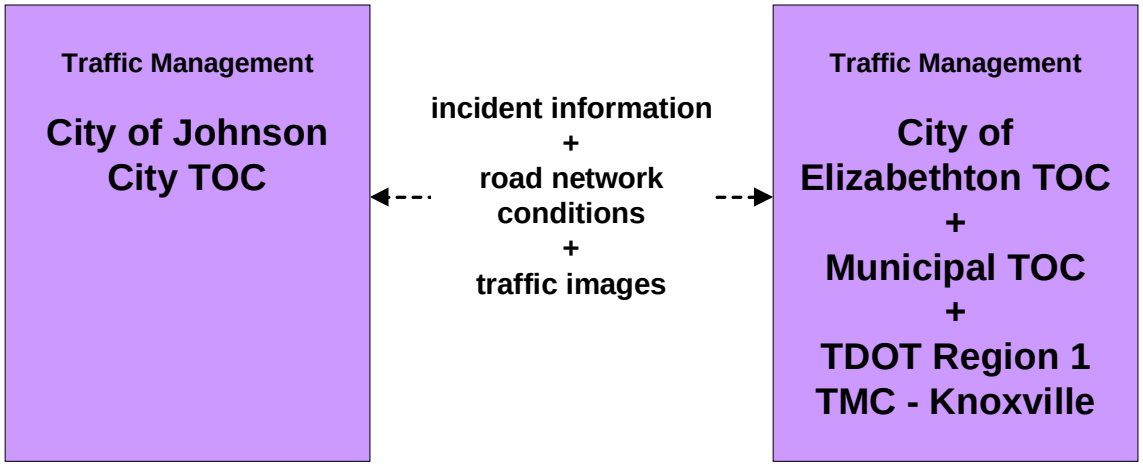


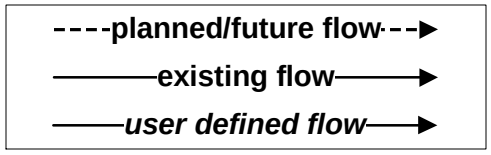
----planned/future flow--->

————existing flow————>

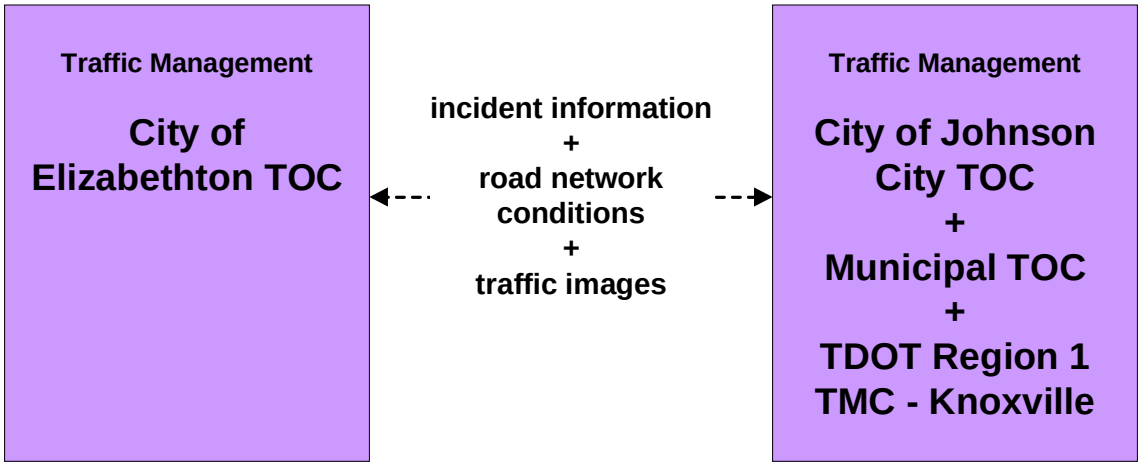
———*user defined flow*———>

ATMS07 – Regional Traffic Management
City of Johnson City





ATMS07 – Regional Traffic Management
City of Elizabethton

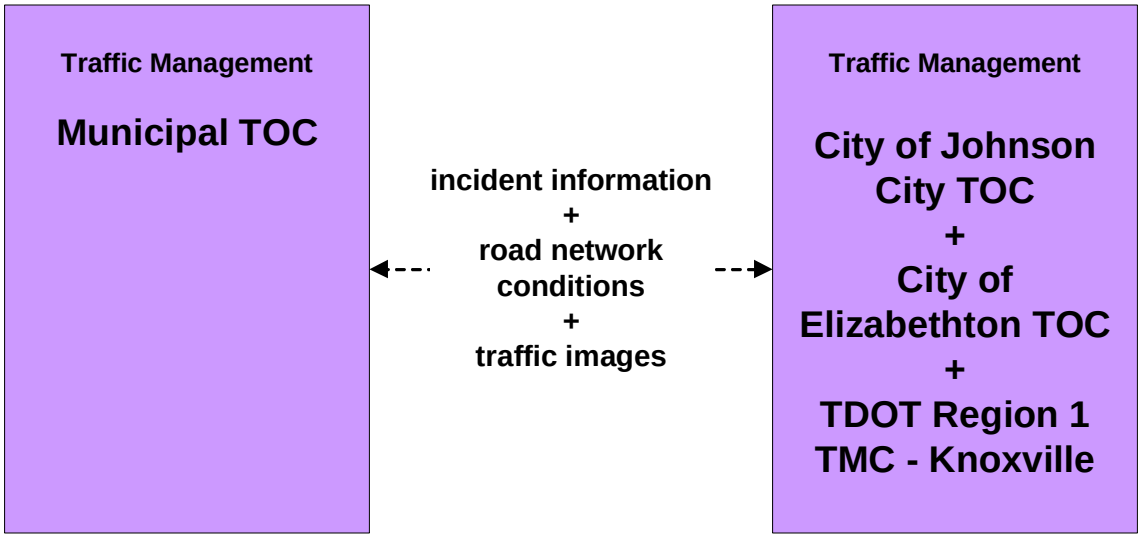


----planned/future flow--->

————existing flow———>

———*user defined flow*———>

ATMS07 – Regional Traffic Management
Municipal

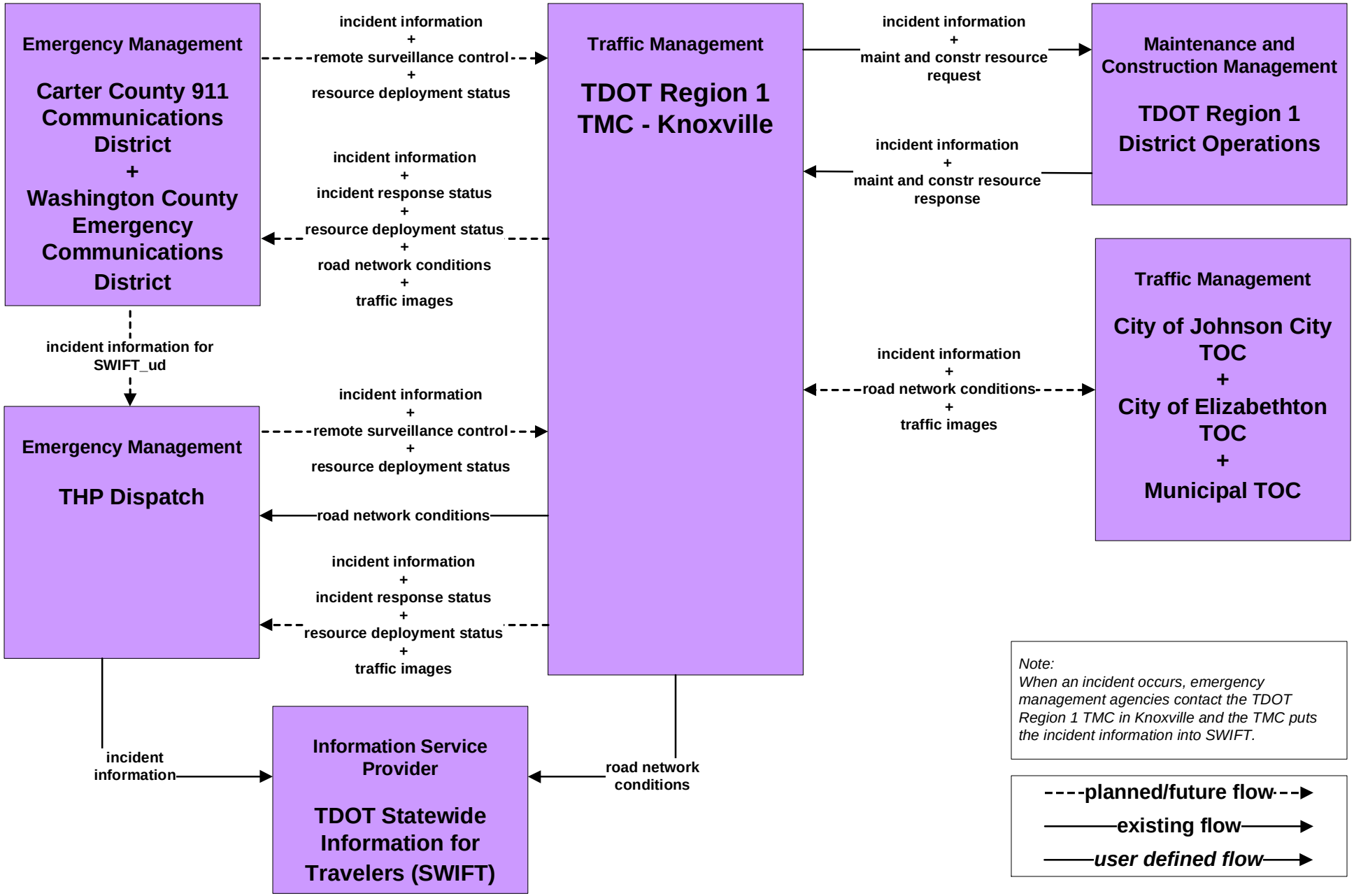


----planned/future flow--->

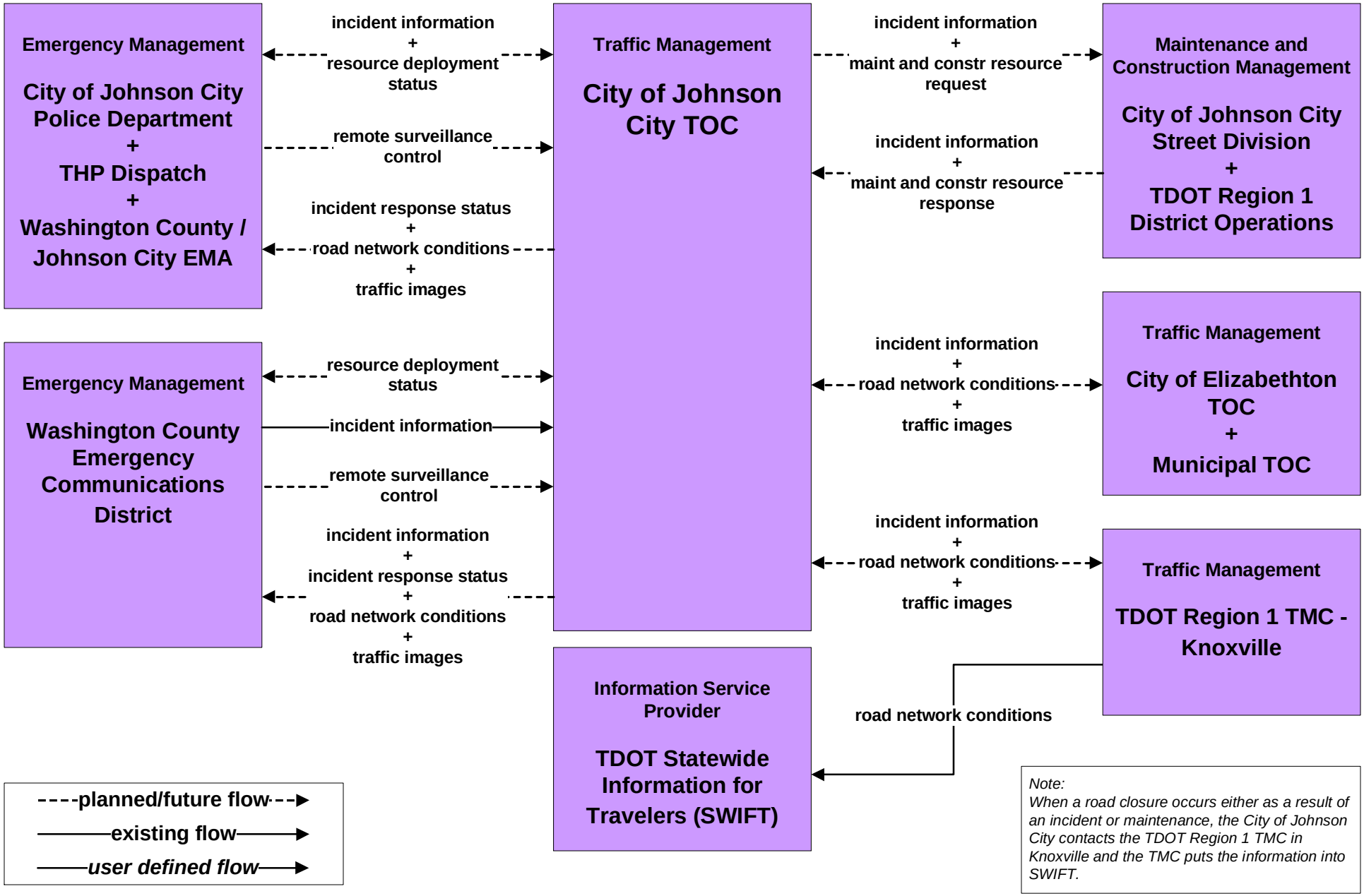
————existing flow————>

———*user defined flow*———>

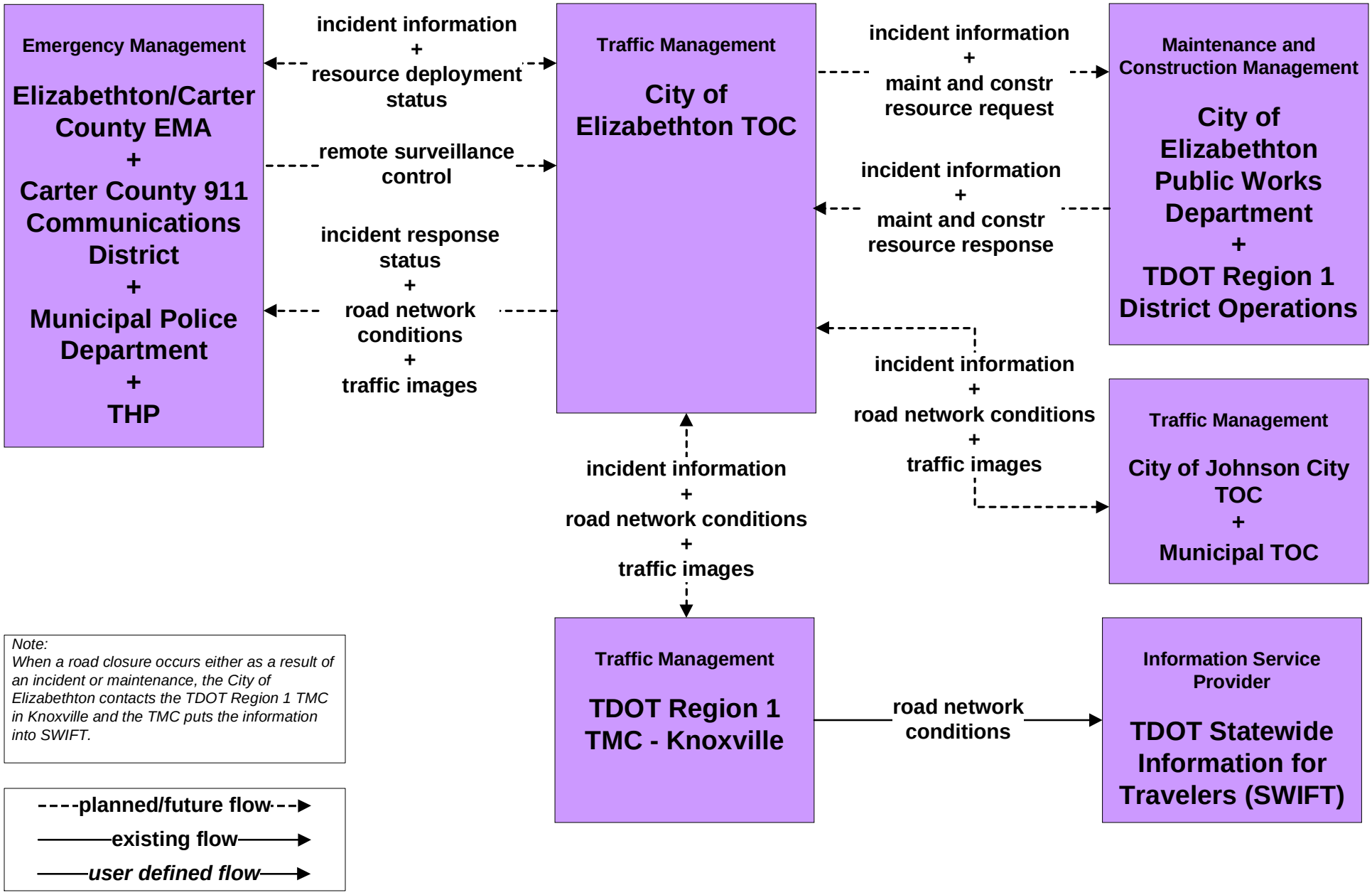
ATMS08 - Traffic Incident Management System
TDOT Region 1 TMC - Knoxville



ATMS08 - Traffic Incident Management System
City of Johnson City TOC



ATMS08 - Traffic Incident Management System
City of Elizabethton TOC



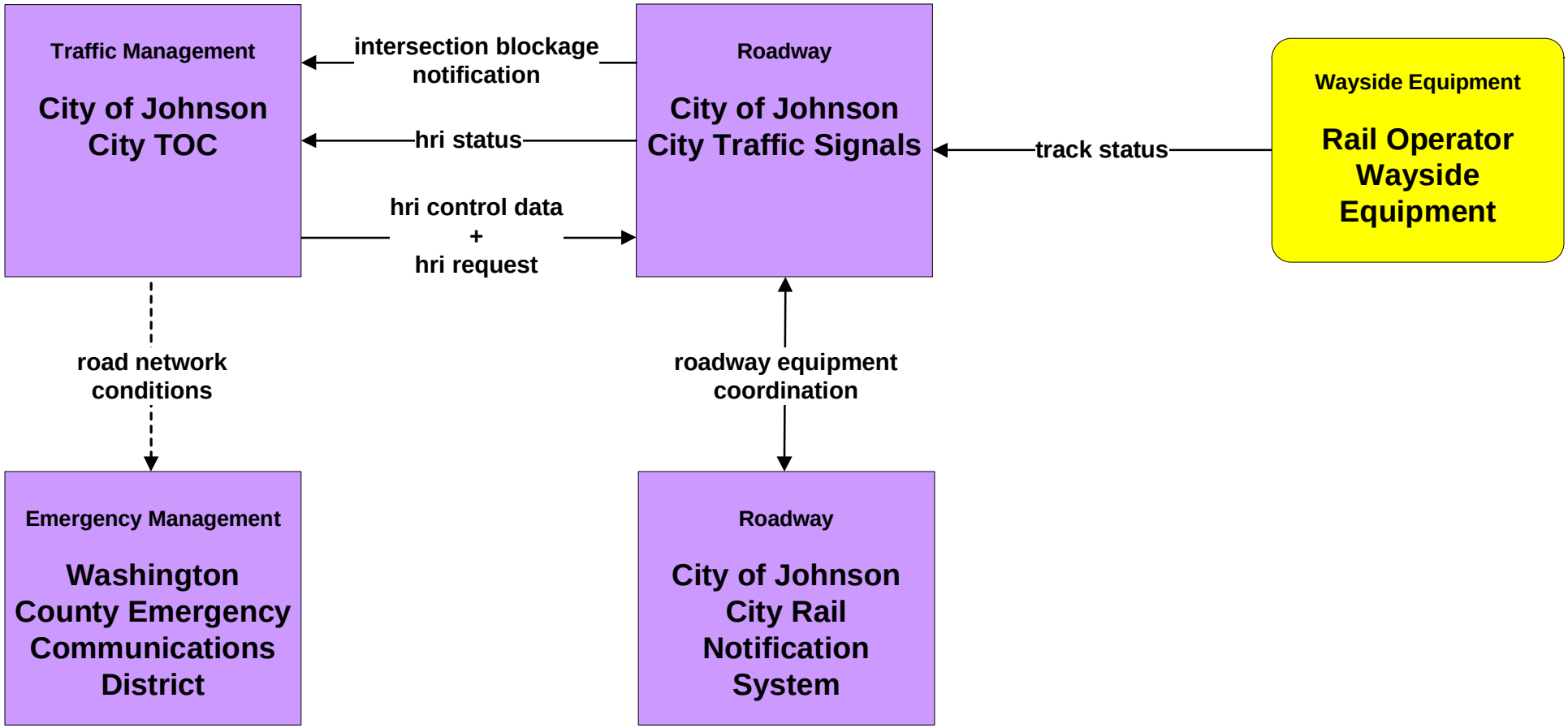
Note:
When a road closure occurs either as a result of an incident or maintenance, the City of Elizabethton contacts the TDOT Region 1 TMC in Knoxville and the TMC puts the information into SWIFT.

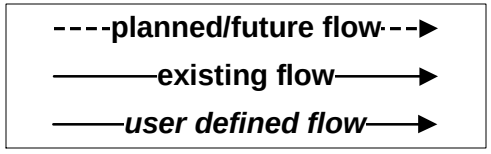
----planned/future flow--->

————existing flow————>

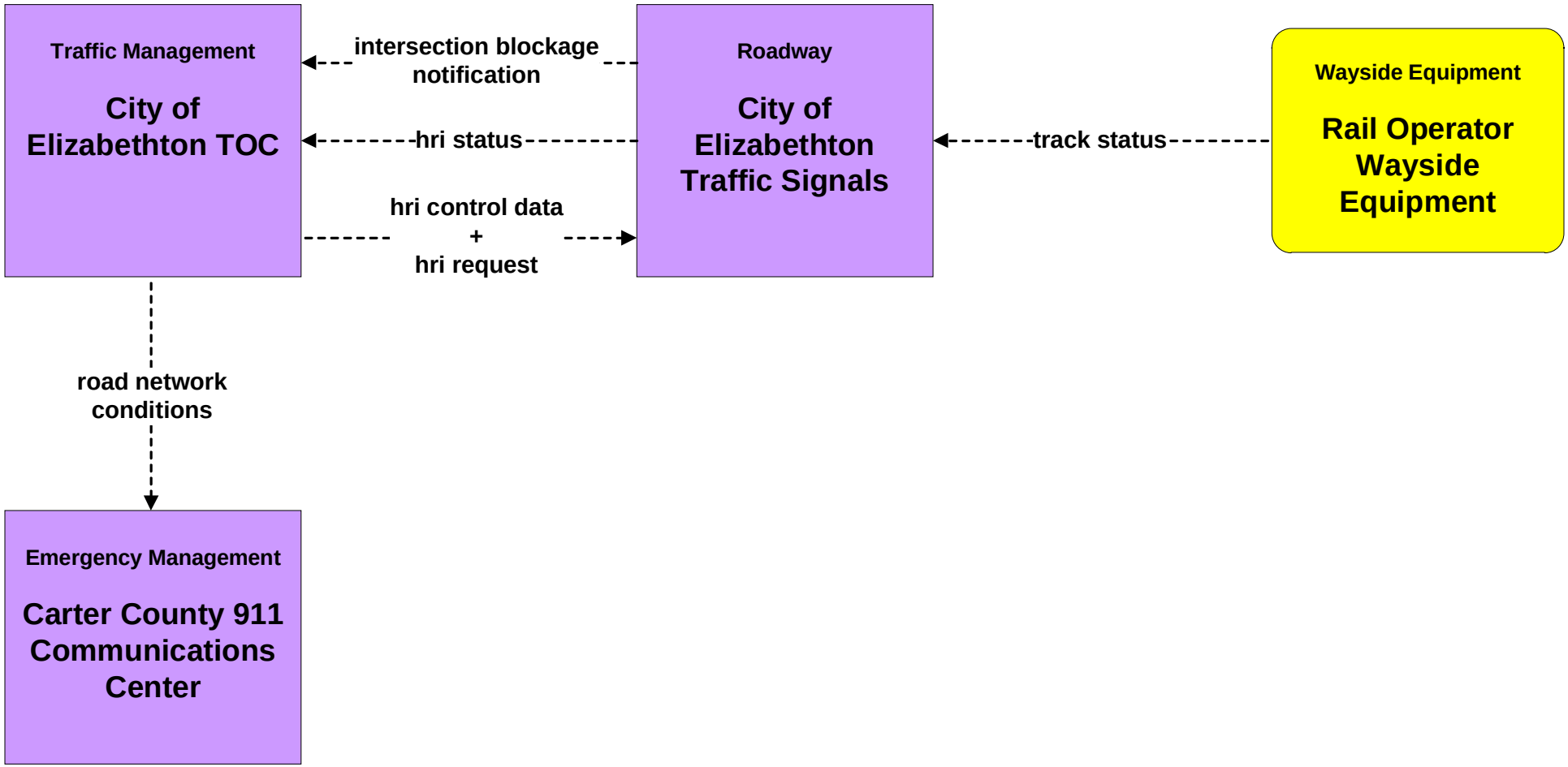
———*user defined flow*———>

ATMS13 – Standard Railroad Grade Crossing
City of Johnson City





ATMS13 – Standard Railroad Grade Crossing
City of Elizabethton



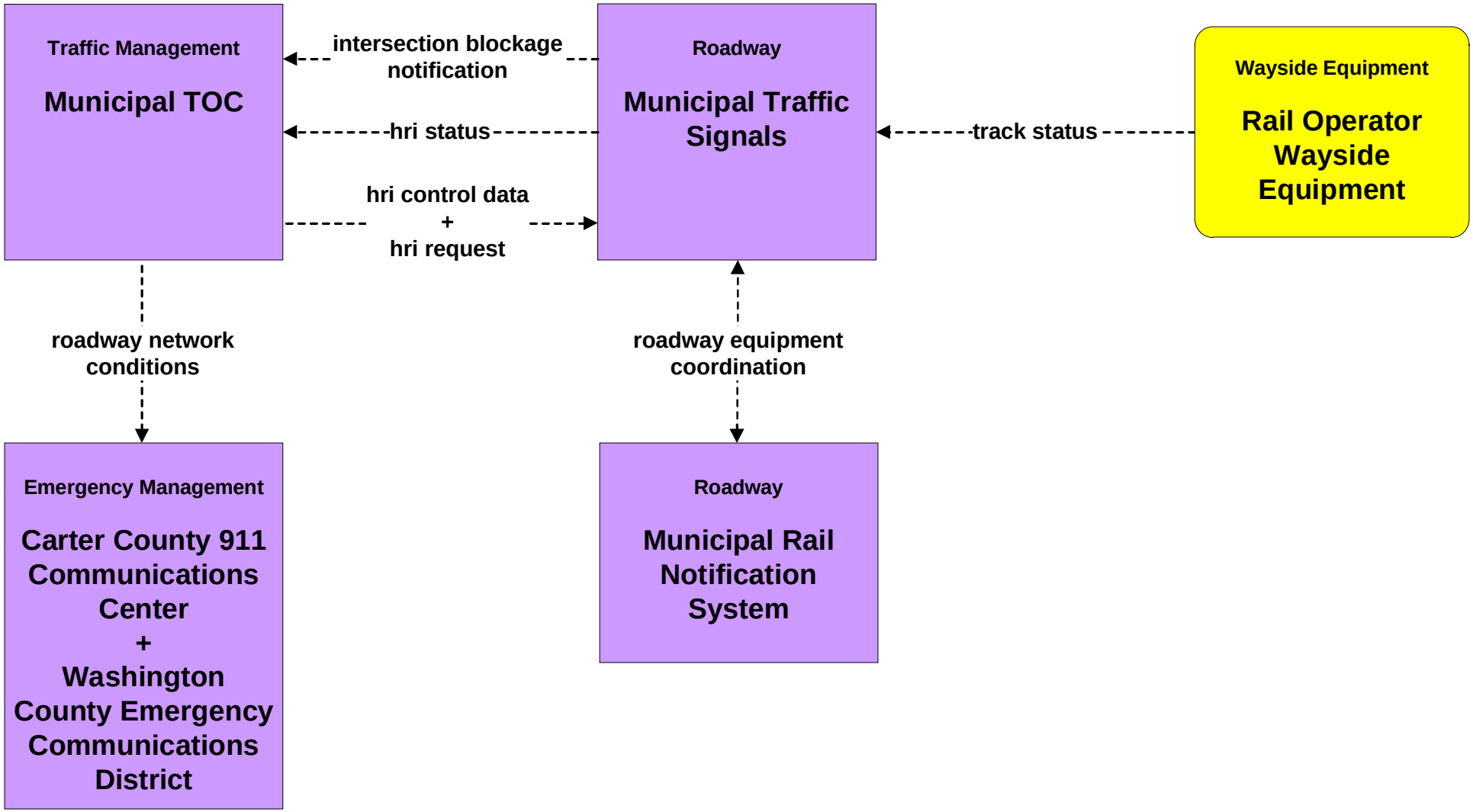
----planned/future flow--->

————existing flow————>

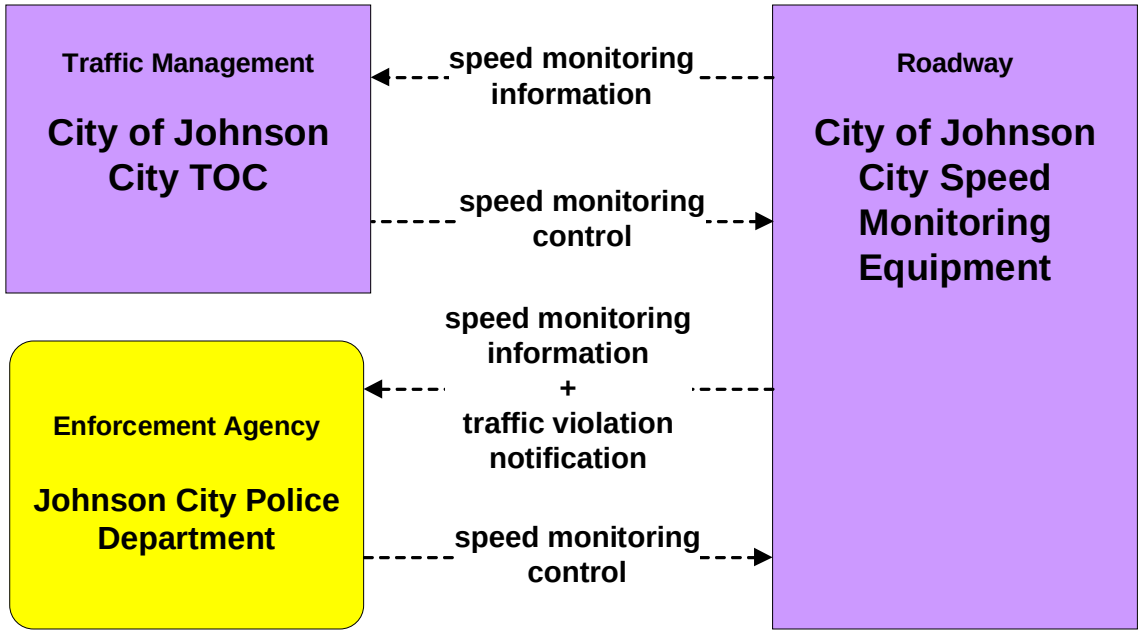
———*user defined flow*———>

Note:
Rail line is currently inactive, may be used again in the future.

ATMS13 – Standard Railroad Grade Crossing
Municipal



ATMS19 – Speed Warning and Enforcement
City of Johnson City

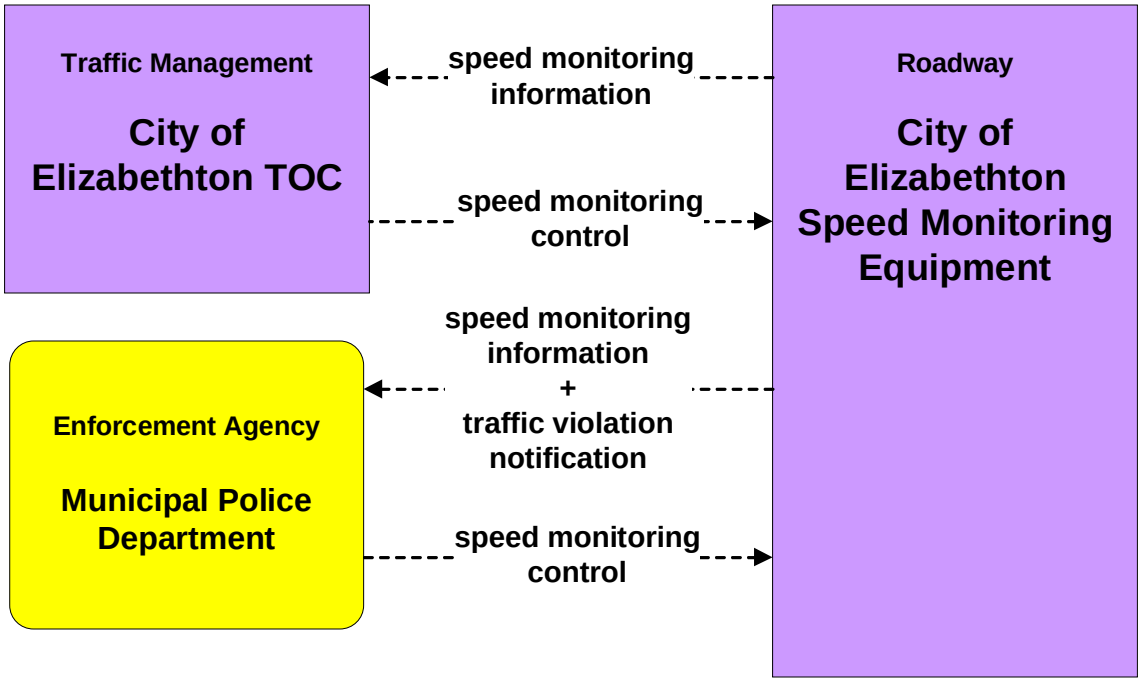


----planned/future flow---►

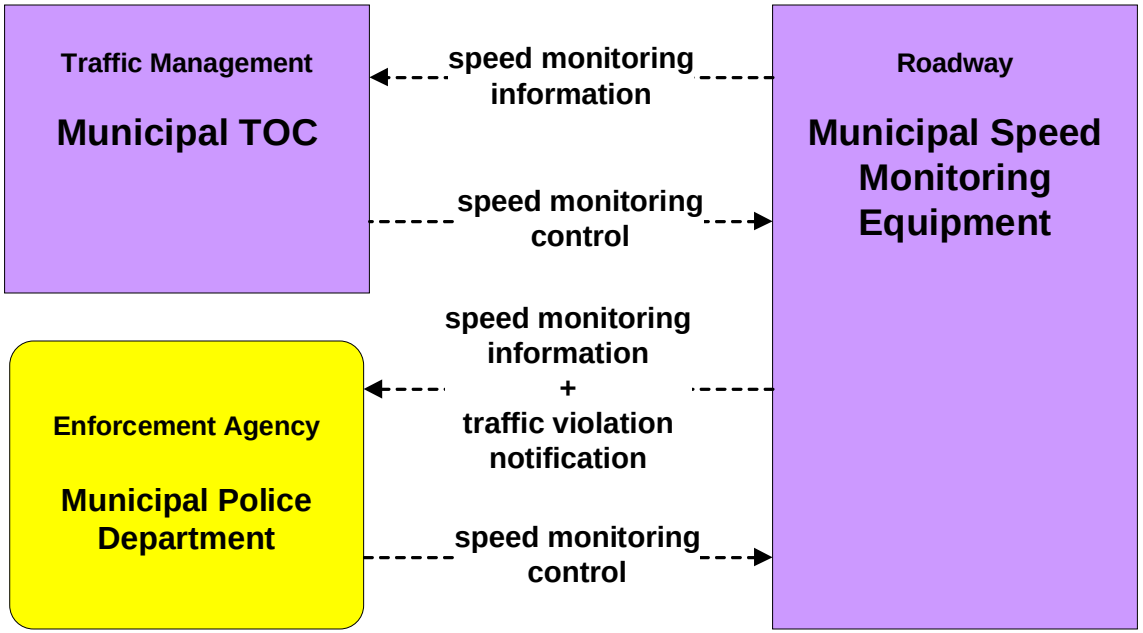
————existing flow————►

———*user defined flow*———►

ATMS19 – Speed Warning and Enforcement
City of Elizabethton



ATMS19 – Speed Warning and Enforcement
Municipal



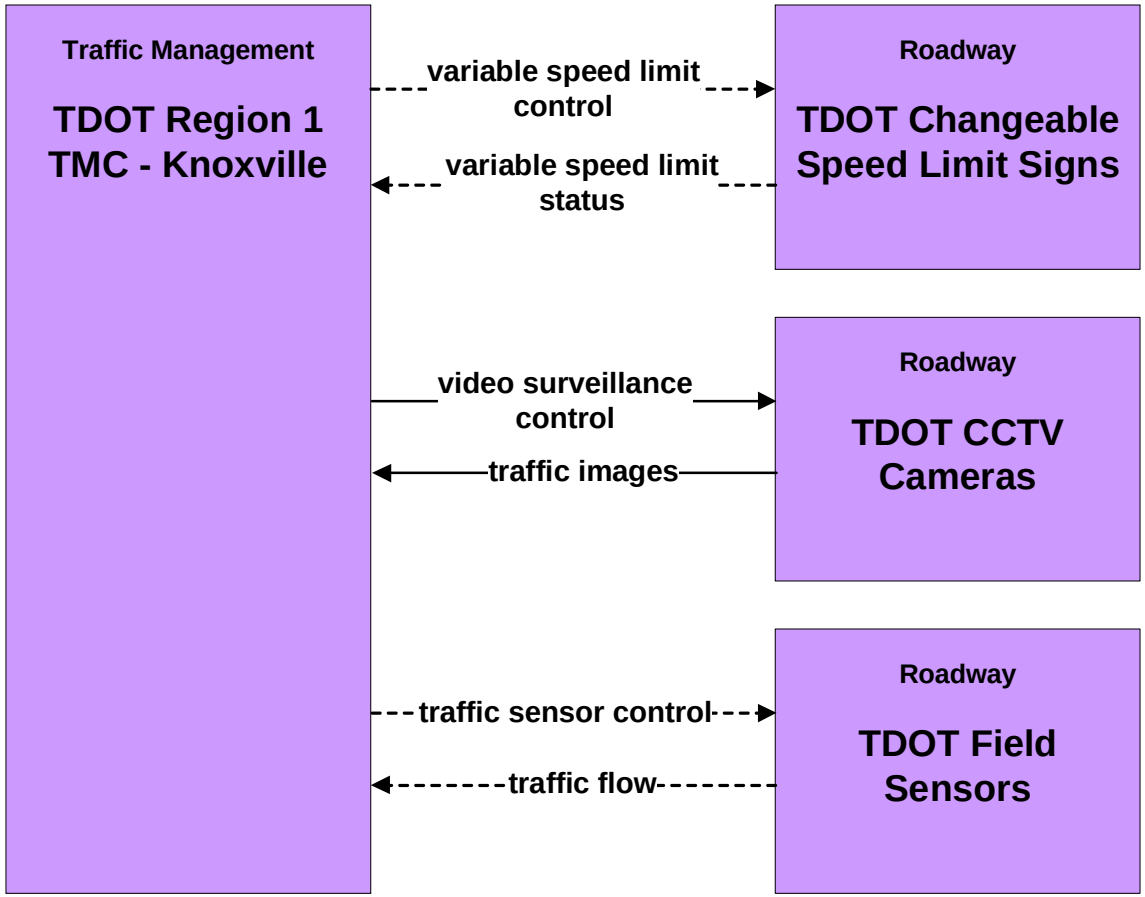
----planned/future flow--->

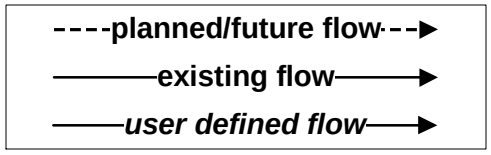
————existing flow————>

———*user defined flow*———>

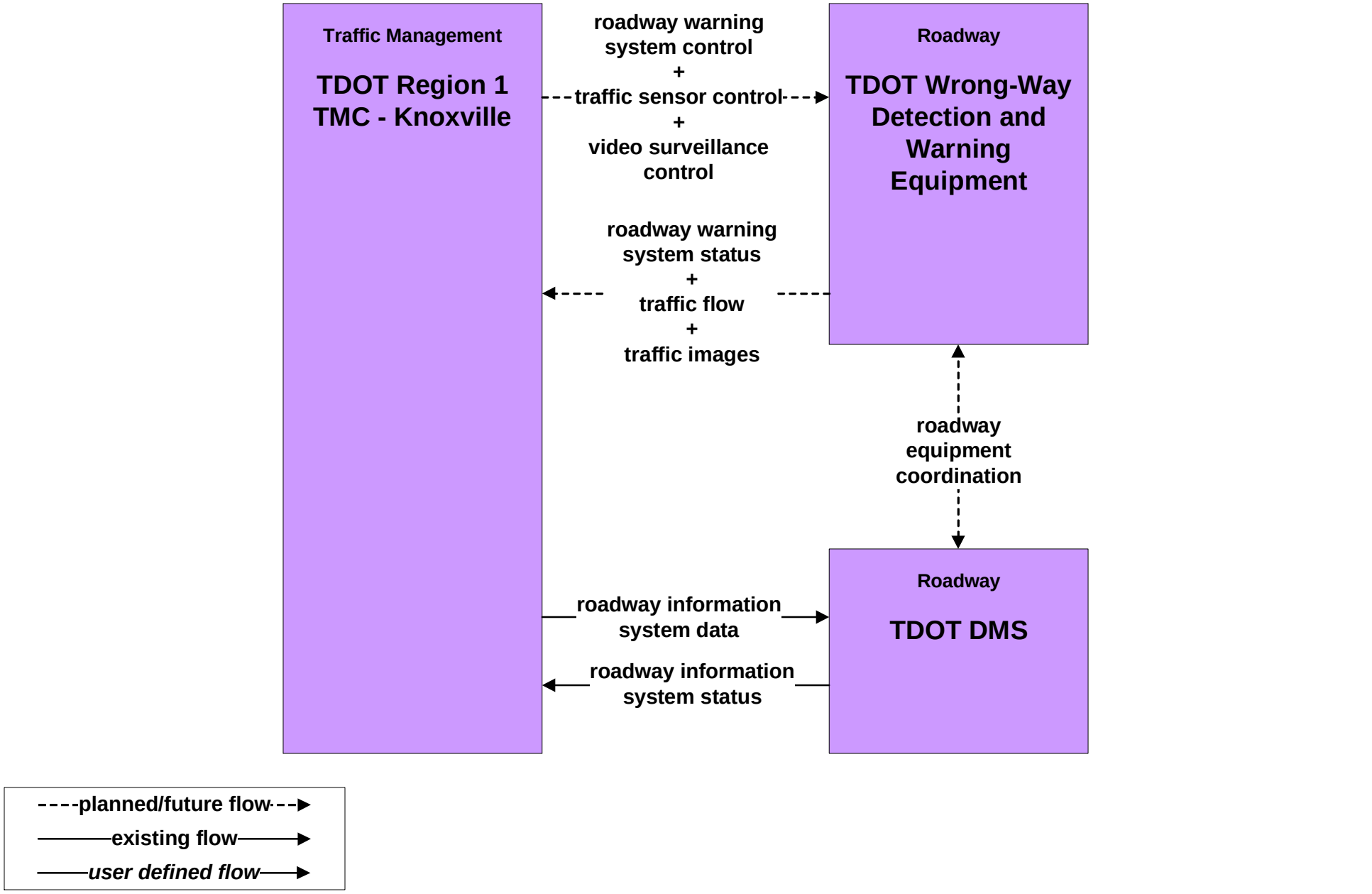
Note:
Speed enforcement cameras currently operate in the Town of Jonesborough.

ATMS22 – Variable Speed Limits
TDOT Region 1 TMC - Knoxville

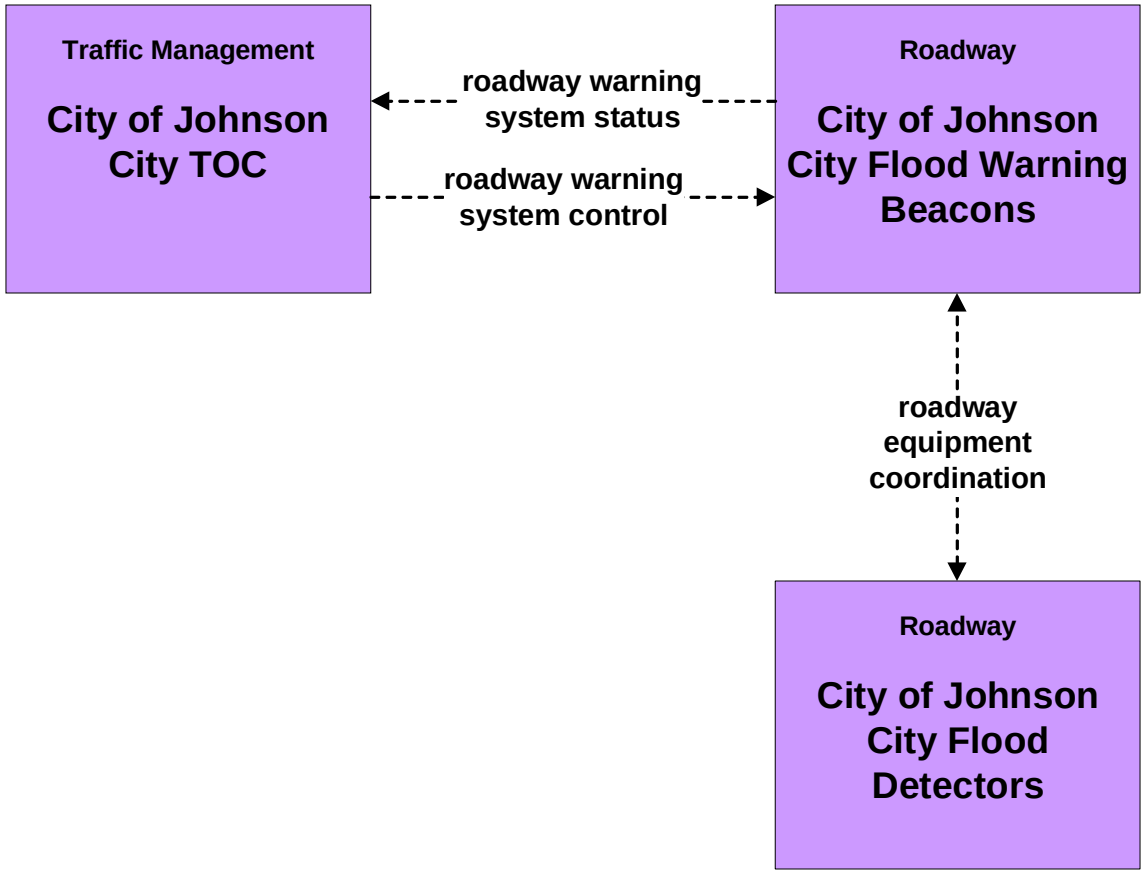


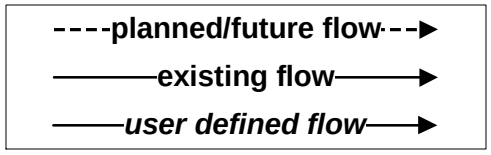


ATMS24 – Dynamic Roadway Warning
TDOT Region 1 TMC - Knoxville

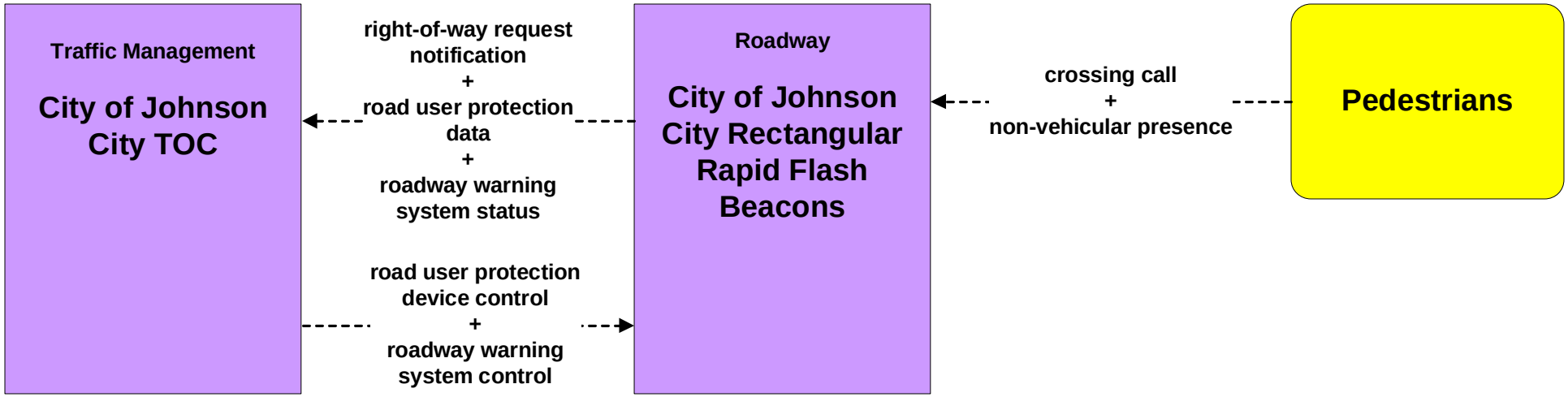


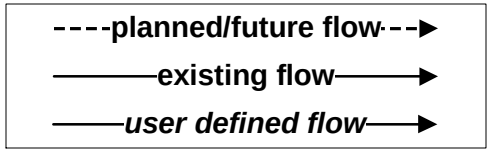
ATMS24 – Dynamic Roadway Warning
City of Johnson City



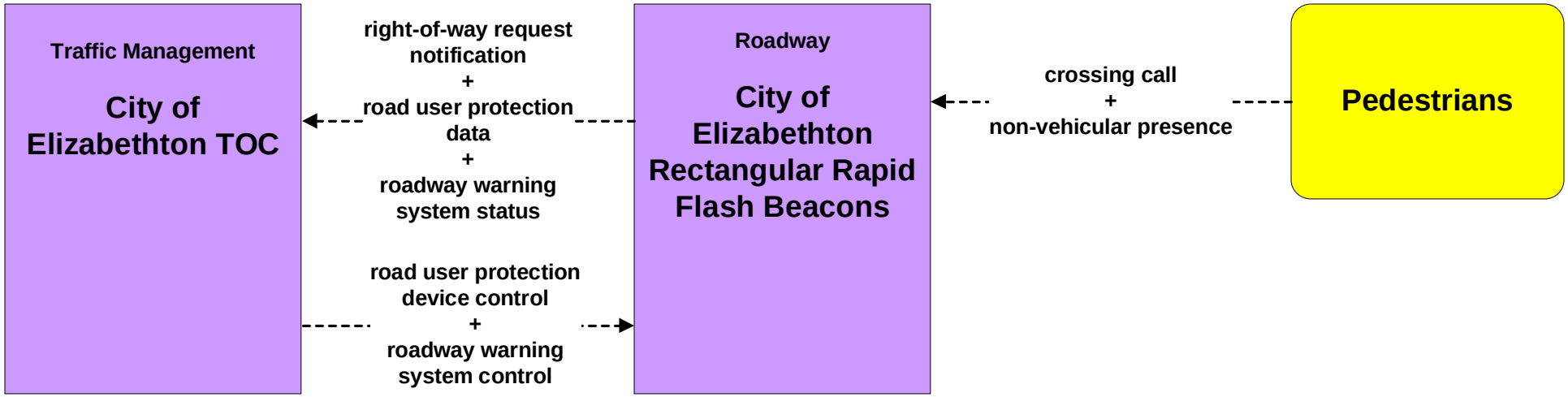


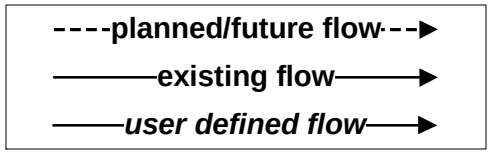
ATMS26 – Mixed Use Warning System
City of Johnson City





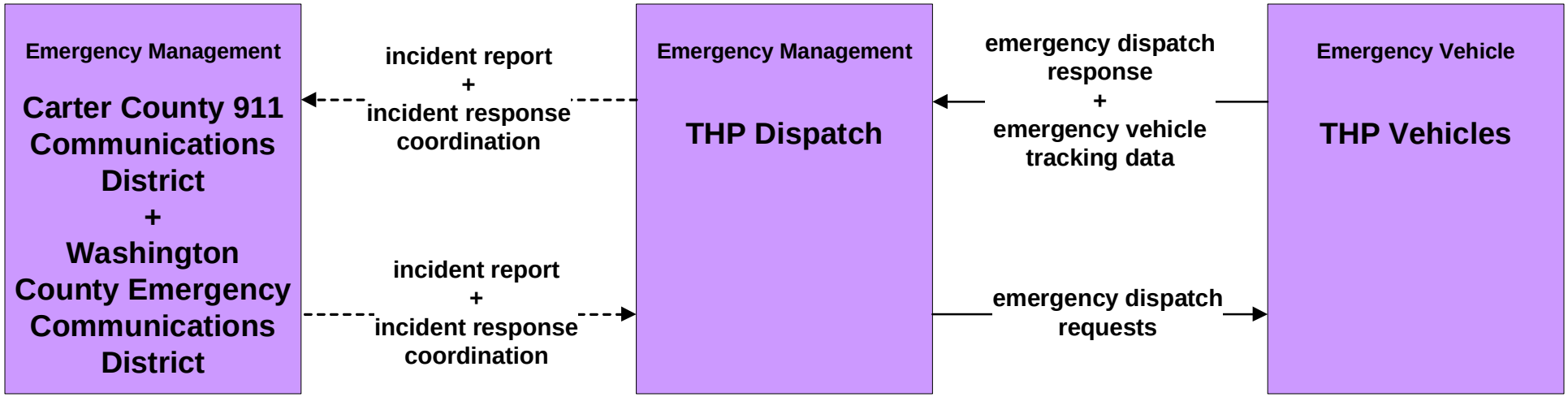
ATMS26 – Mixed Use Warning System
City of Elizabethton





Emergency Management

EM01 - Emergency Call-Taking and Dispatch
Tennessee Highway Patrol

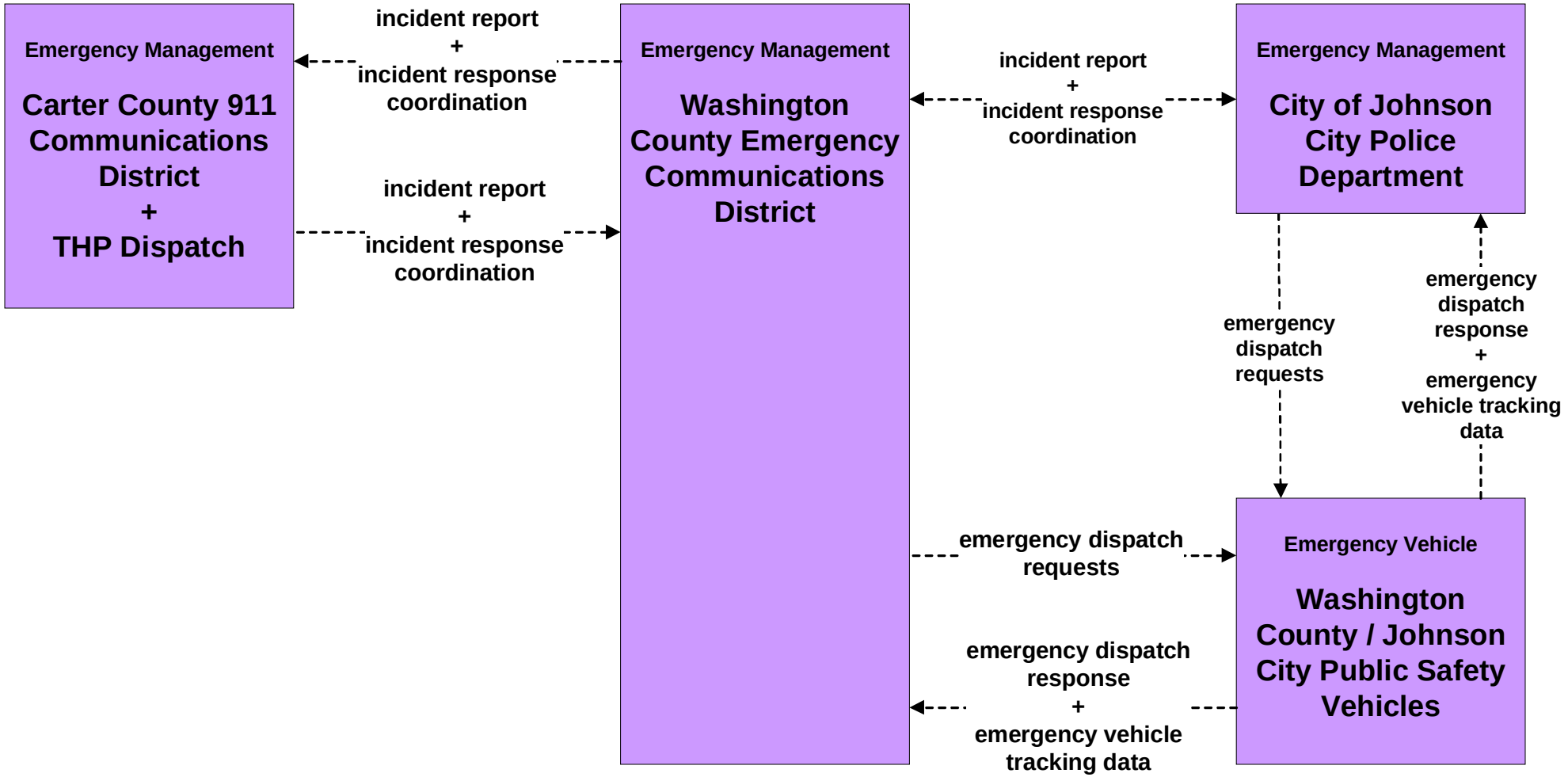


----planned/future flow---►

————existing flow————►

———*user defined flow*———►

EM01 - Emergency Call-Taking and Dispatch
Washington County Emergency Communications District



----planned/future flow--->

————existing flow————▶

———*user defined flow*———▶

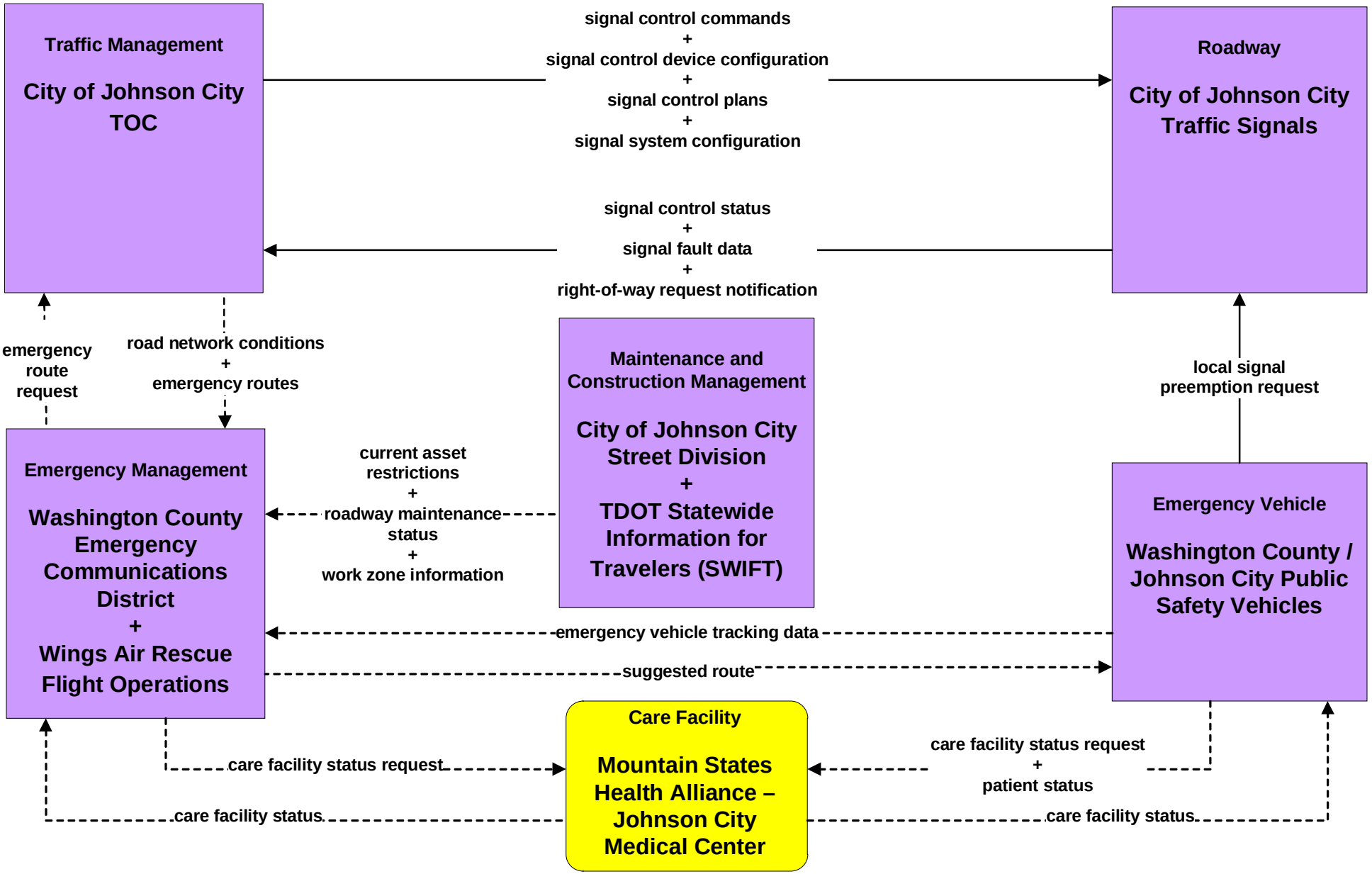
EM01 - Emergency Call-Taking and Dispatch
Carter County 911 Communications District

----planned/future flow---▶

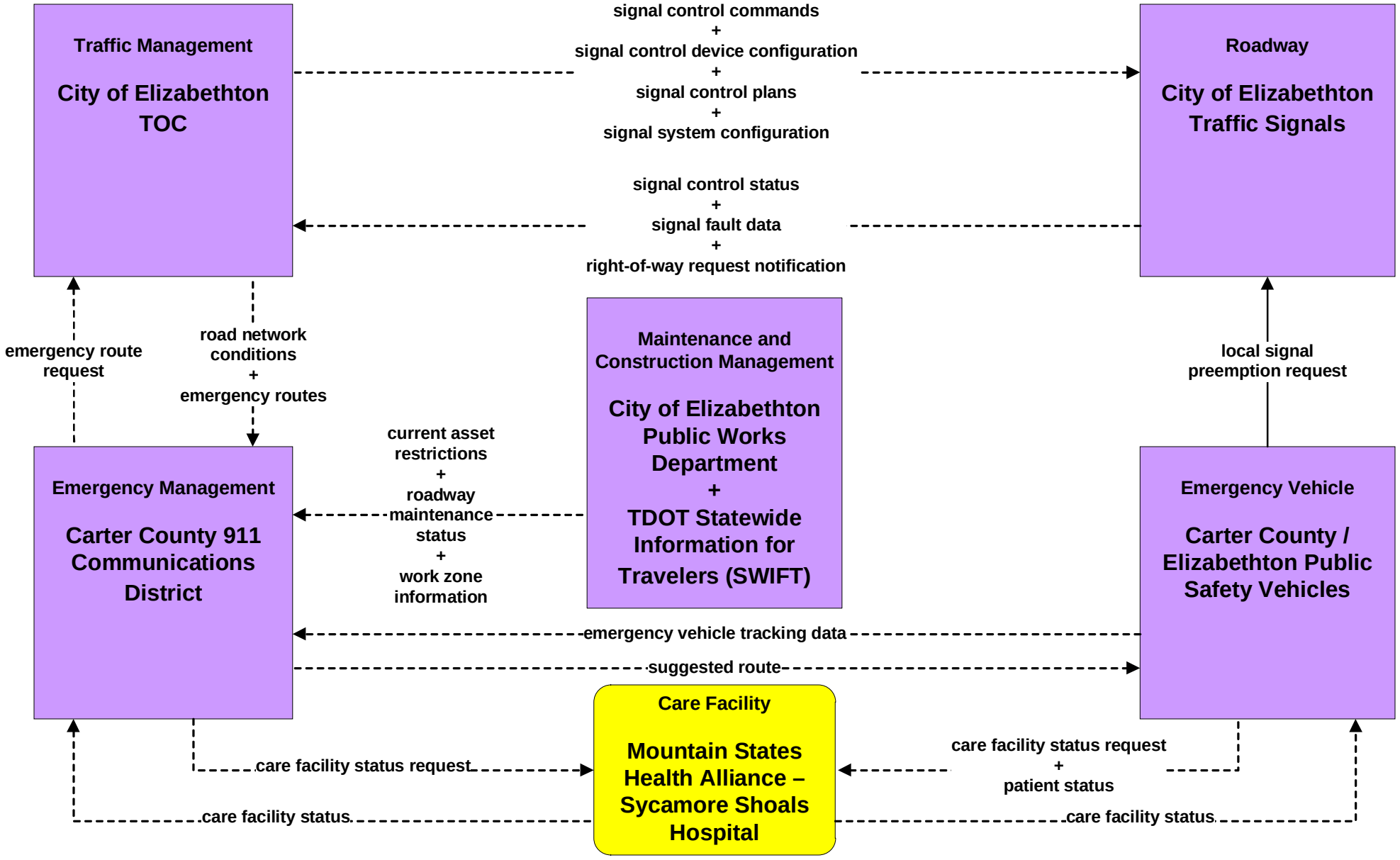
————existing flow————▶

———*user defined flow*———▶

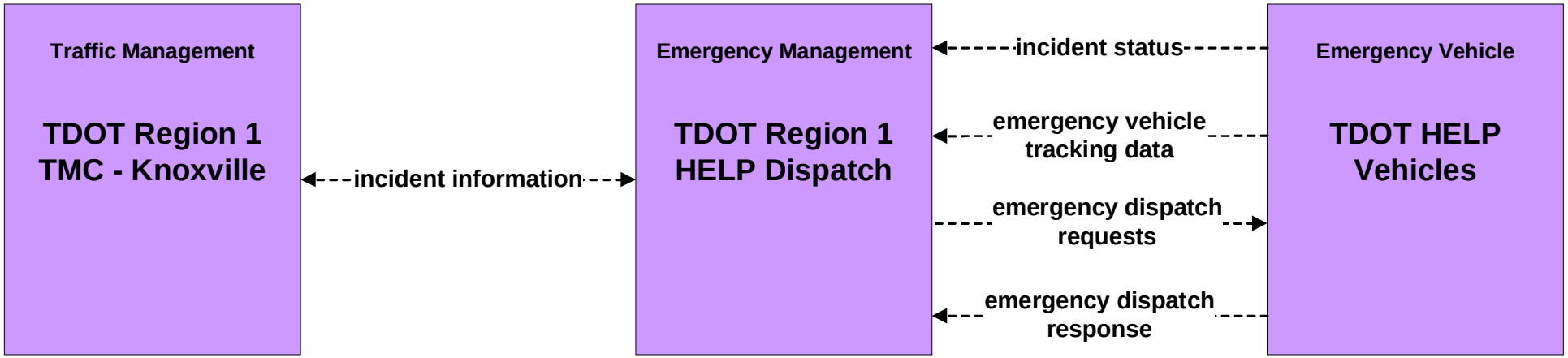
EM02 – Emergency Routing
Washington County Emergency Communications District



EM02 – Emergency Routing
Carter County 911 Communications District



EM04 - Roadway Service Patrols
HELP



planned/future flow

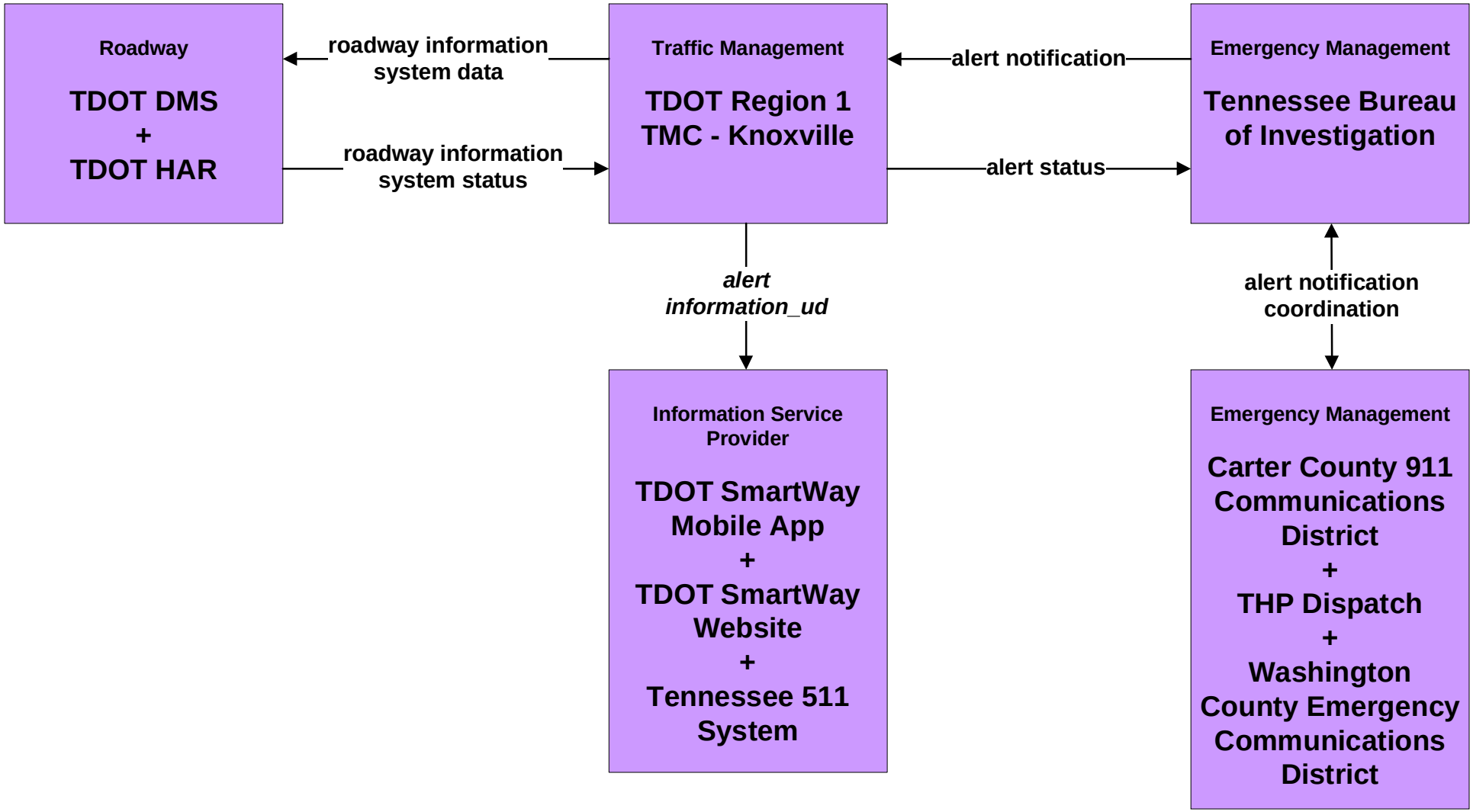
existing flow

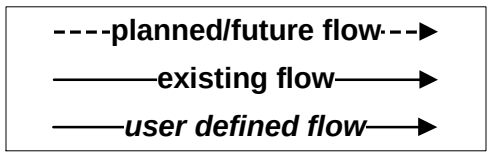
user defined flow

Note:
HELP Dispatch is located in the TDOT Region 1 TMC in Knoxville. HELP trucks are dispatched to Johnson City during special events such as NASCAR or in the event of an extended I-40 closure and detour of traffic on I-26.

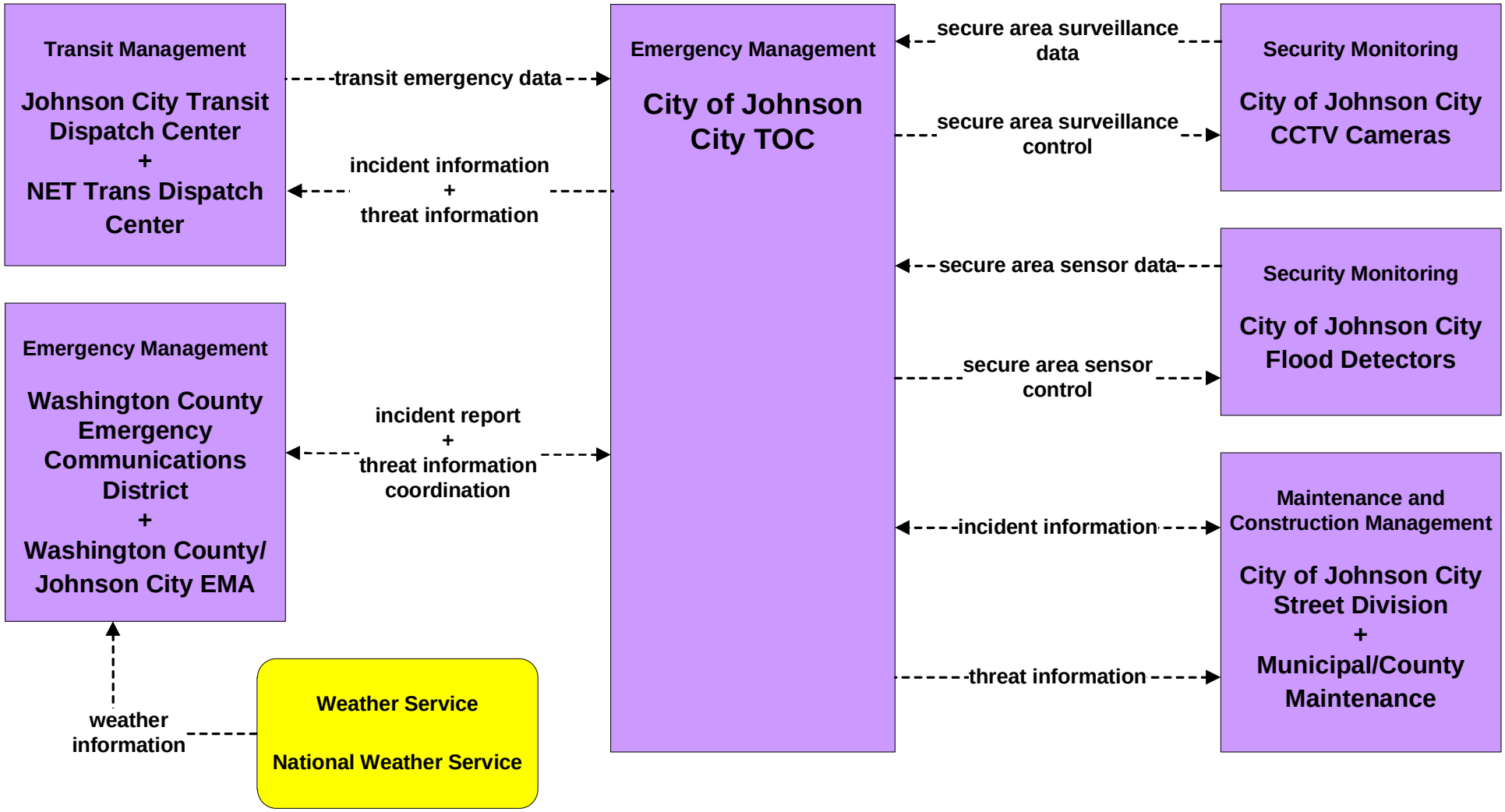
HELP Truck operators have access to radios for local emergency agencies and first responders.

EM06 - Wide-Area Alerts
Tennessee AMBER Alert





EM07 – Early Warning System
City of Johnson City – Flood Monitoring



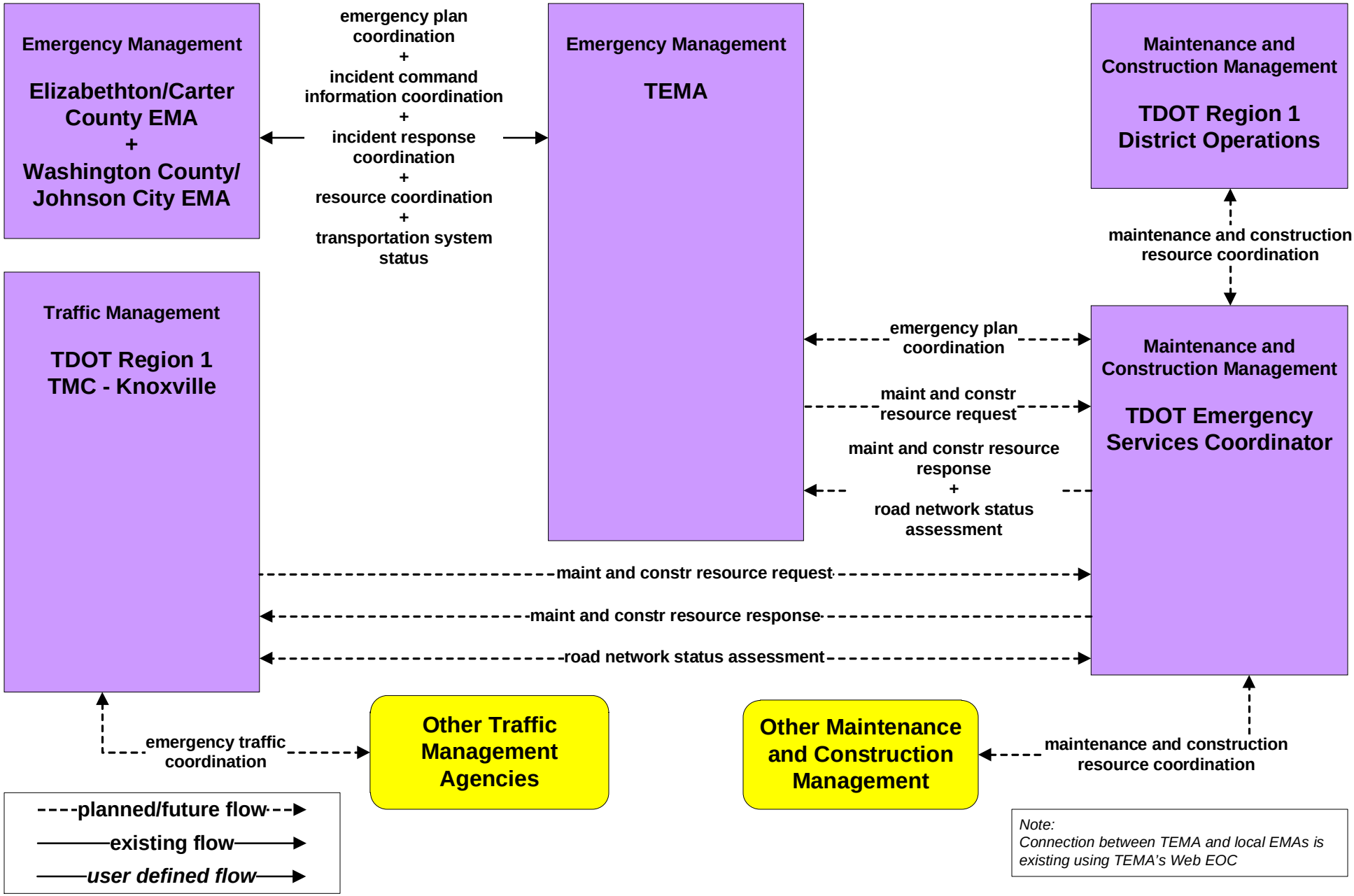
planned/future flow

existing flow

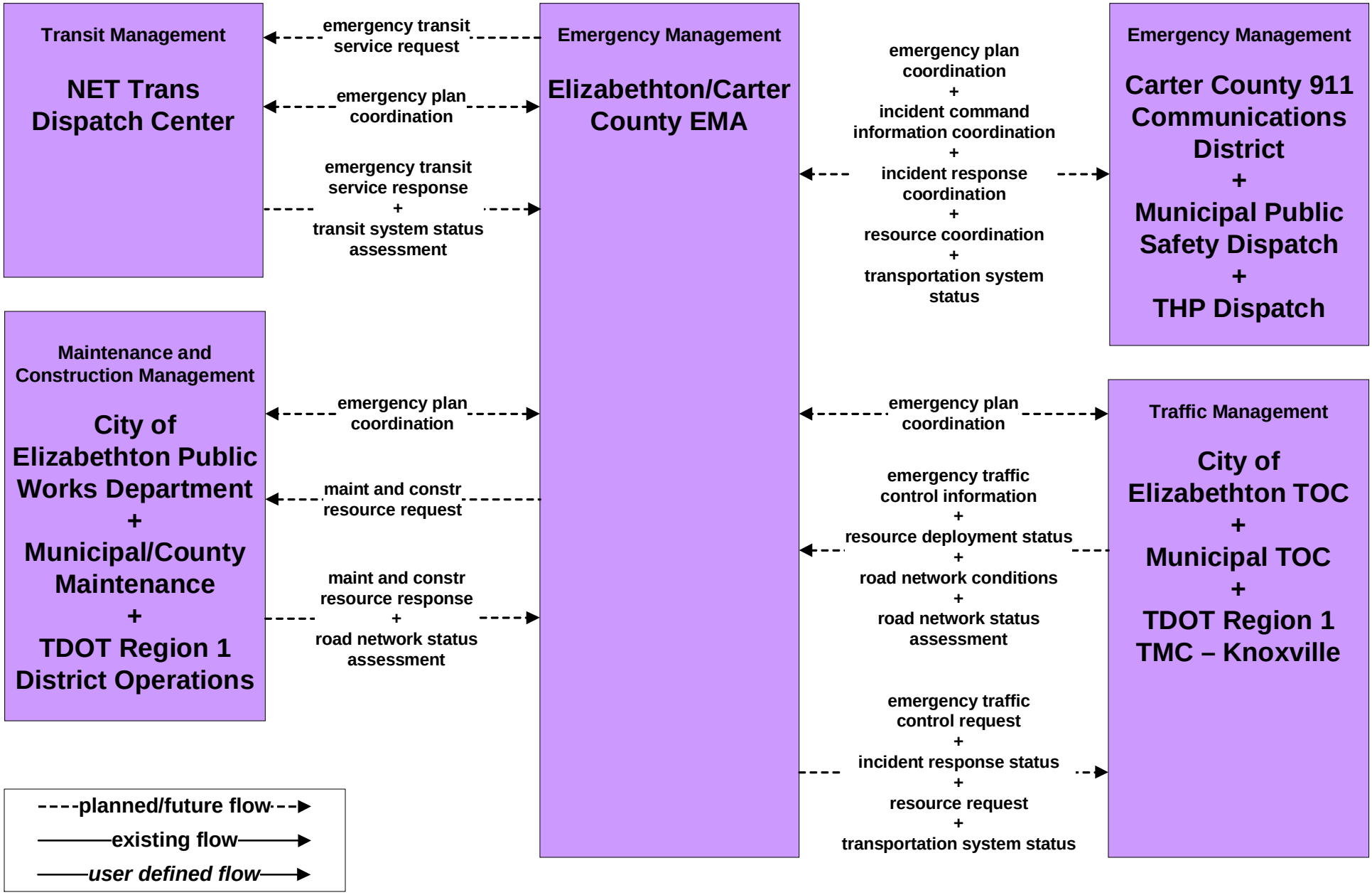
user defined flow

Note:
The City of Johnson City CCTV Cameras for this service package are those located at low-water crossings.

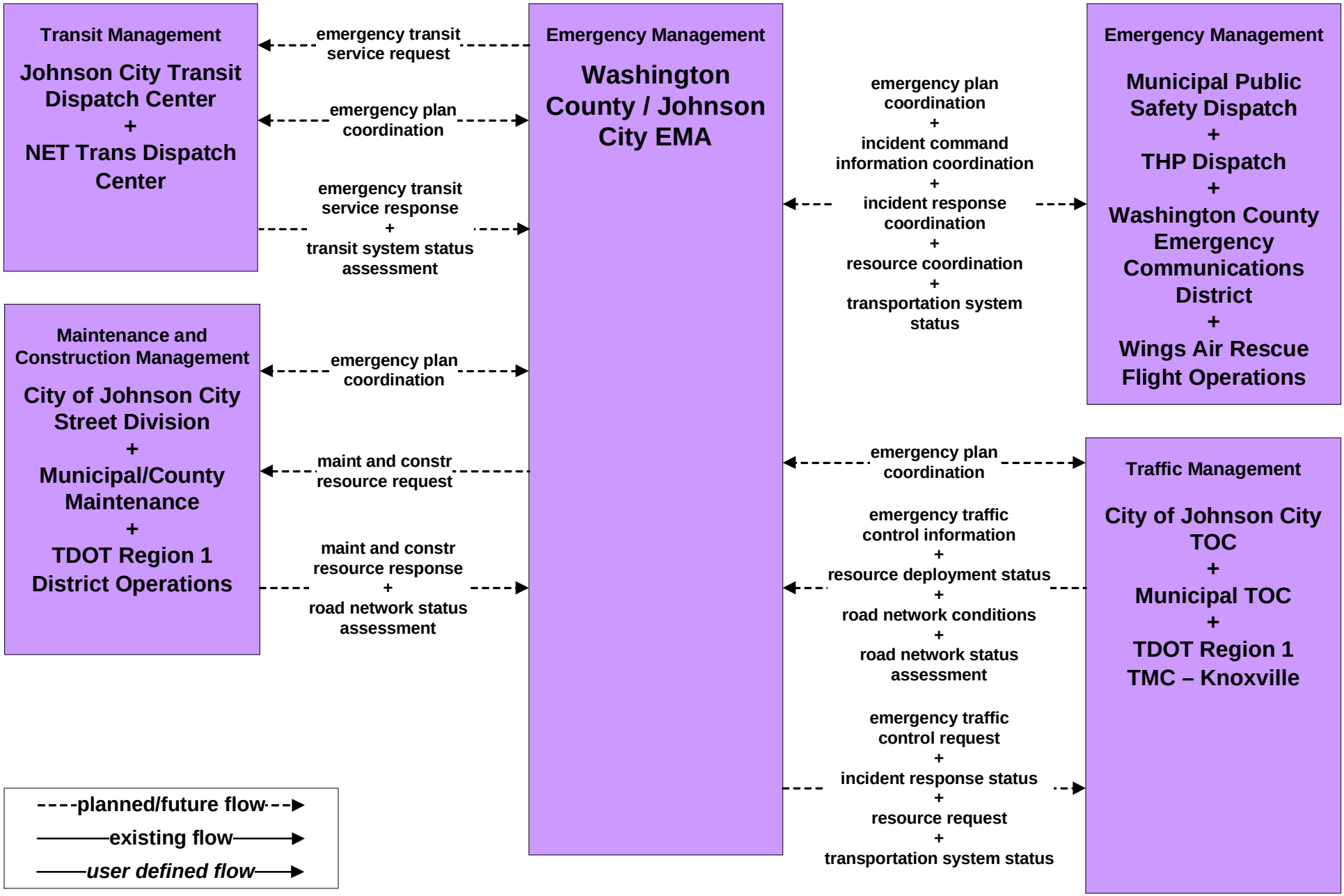
EM08 - Disaster Response and Recovery
TEMA



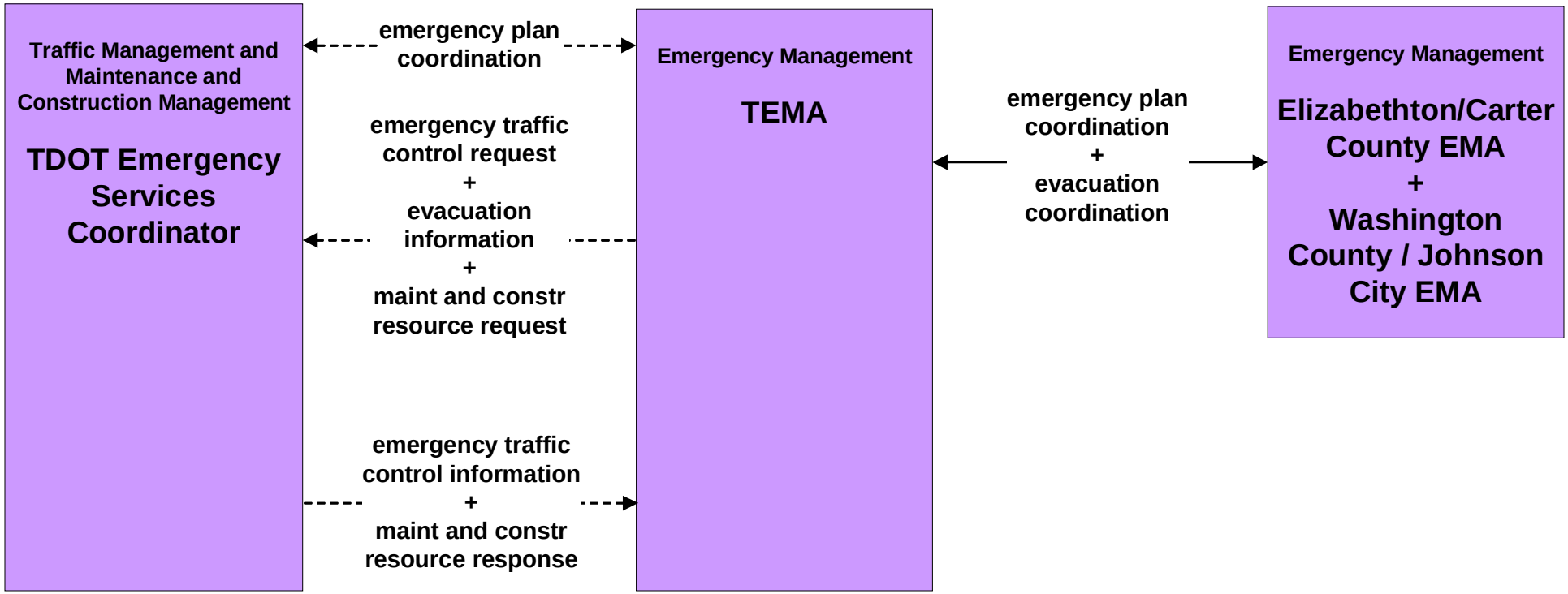
EM08 - Disaster Response and Recovery
Elizabethton/Carter County EMA



EM08 - Disaster Response and Recovery
Washington County / Johnson City EMA



EM09 - Evacuation and Reentry Management
TEMA



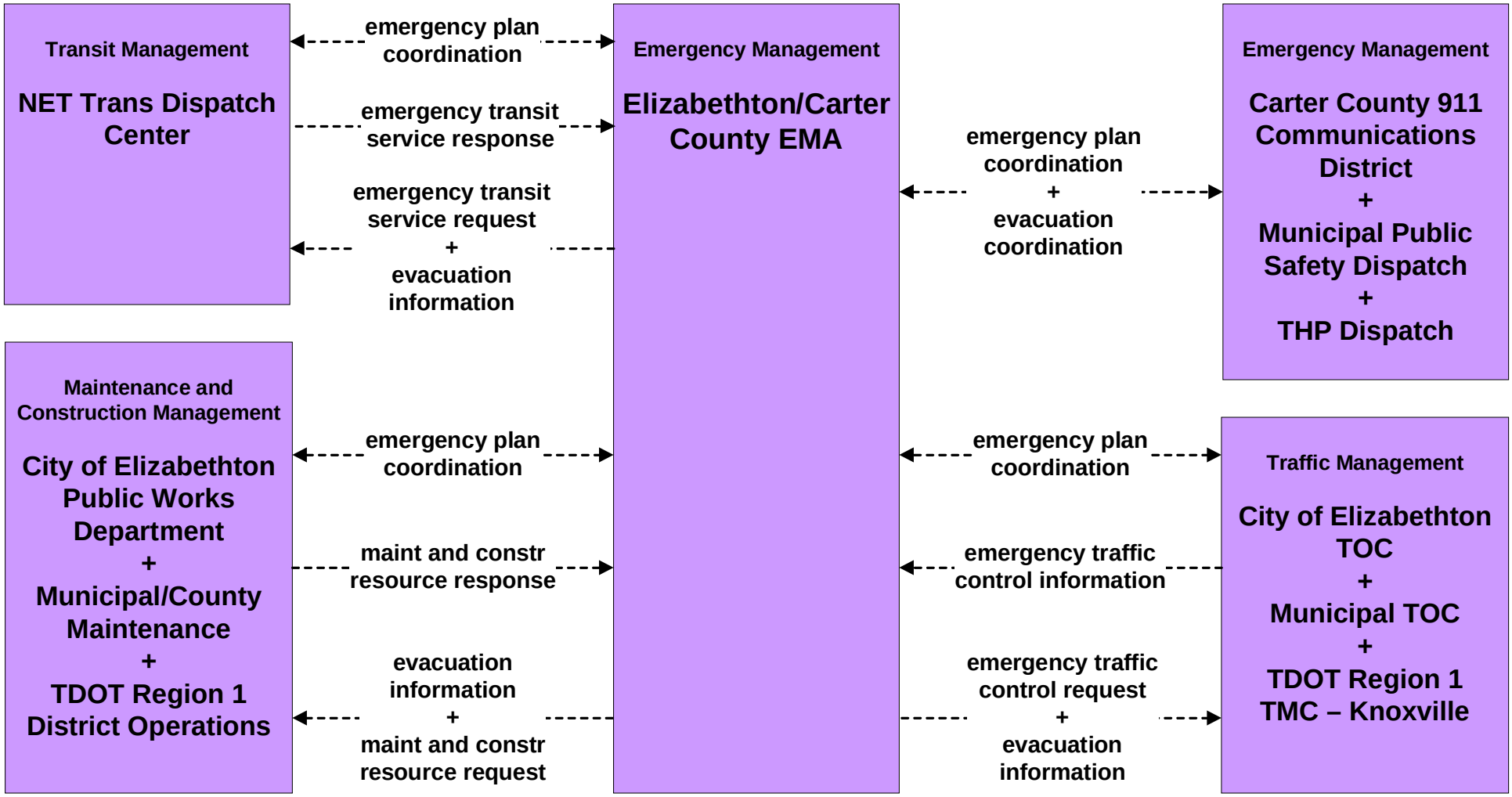
----planned/future flow--->

————existing flow————>

———*user defined flow*———>

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

EM09 - Evacuation and Reentry Management
Elizabethton/Carter County EMA

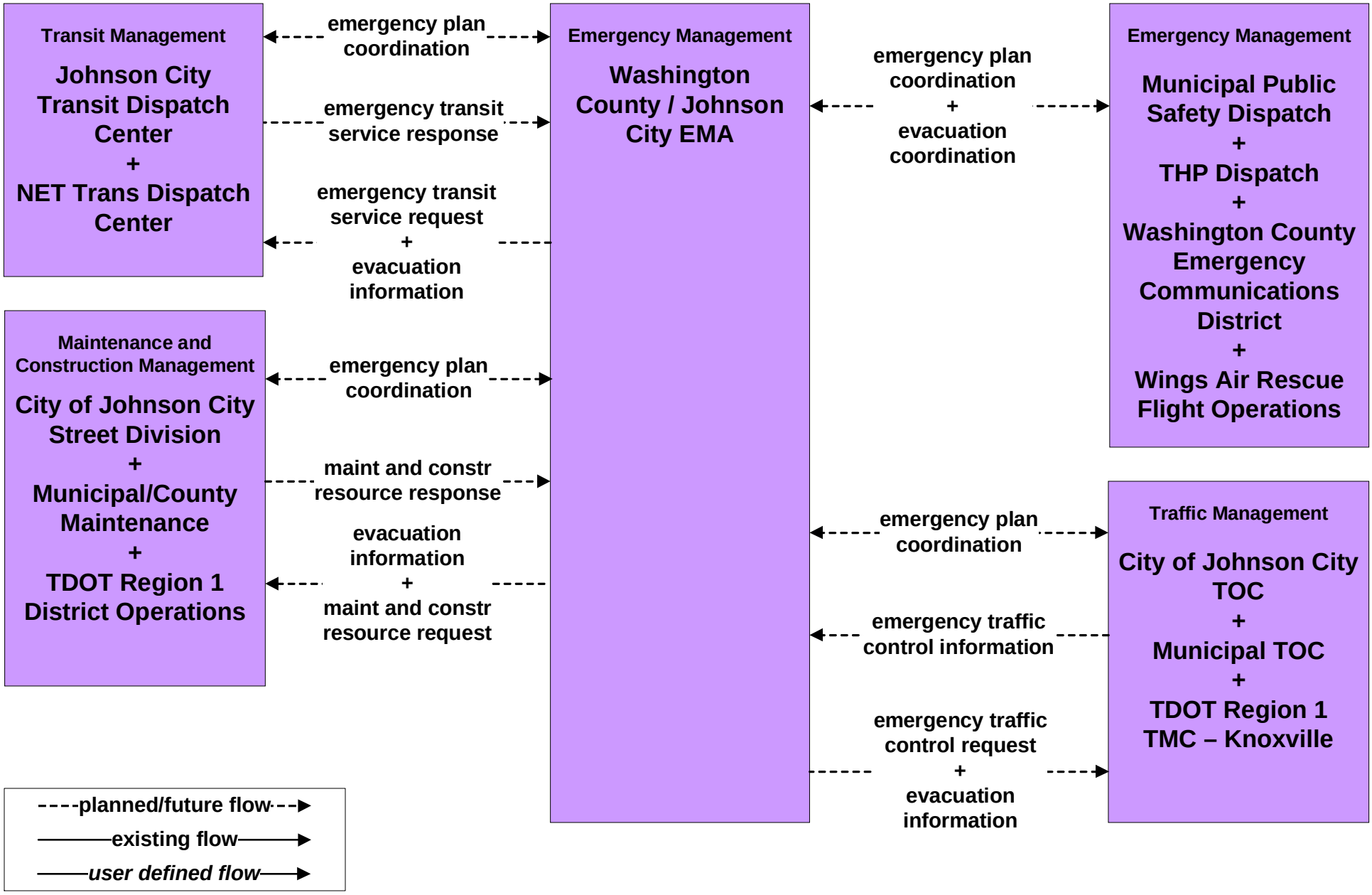


----planned/future flow--->

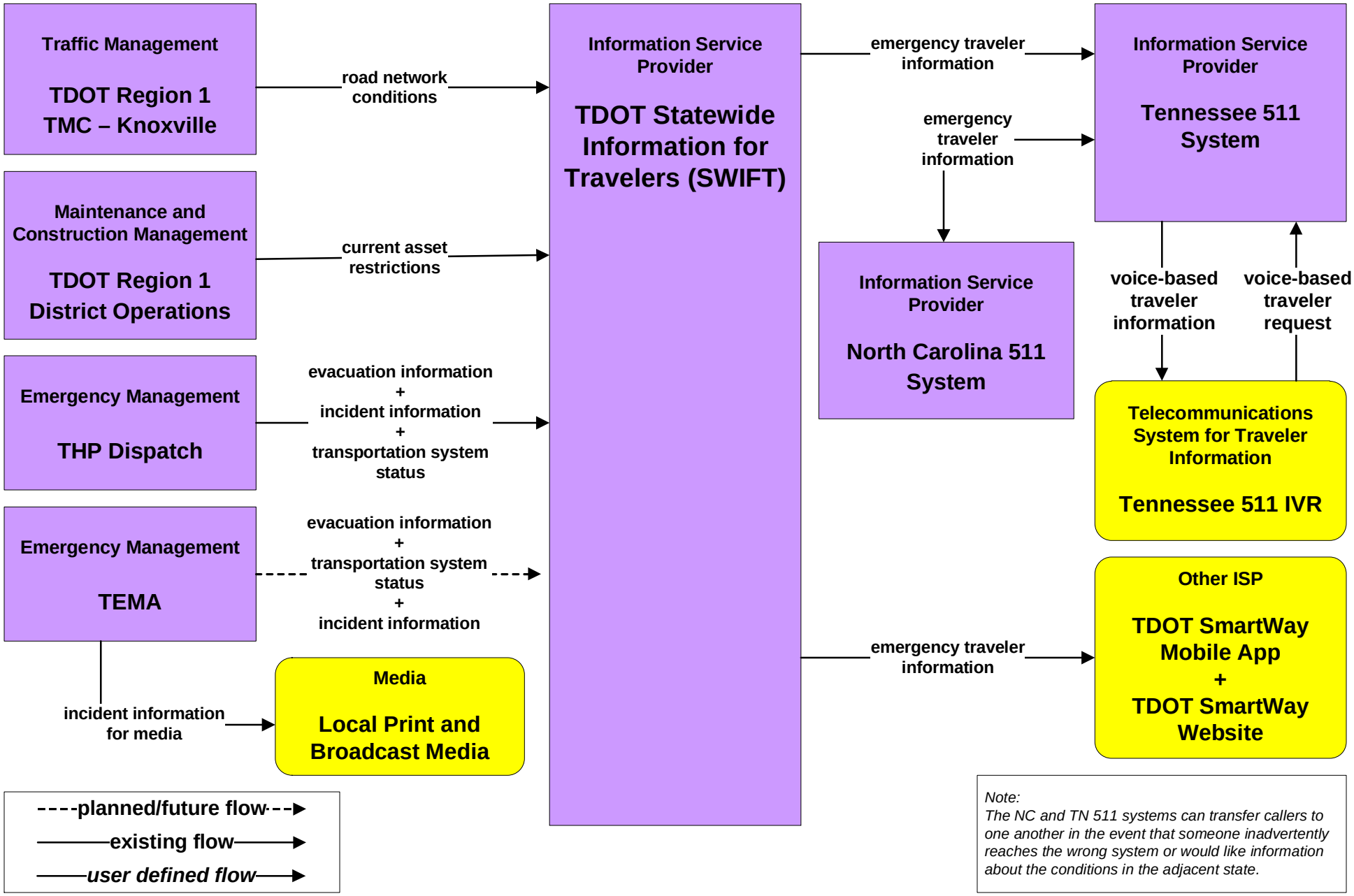
————existing flow———►

———*user defined flow*———►

EM09 - Evacuation and Reentry Management
Washington County / Johnson City EMA



EM10 – Disaster Traveler Information
Tennessee 511 and SWIFT



Note:
The NC and TN 511 systems can transfer callers to one another in the event that someone inadvertently reaches the wrong system or would like information about the conditions in the adjacent state.

Maintenance and Construction Management

MC01 – Maintenance and Construction Vehicle and Equipment Tracking
TDOT Region 1 District Operations

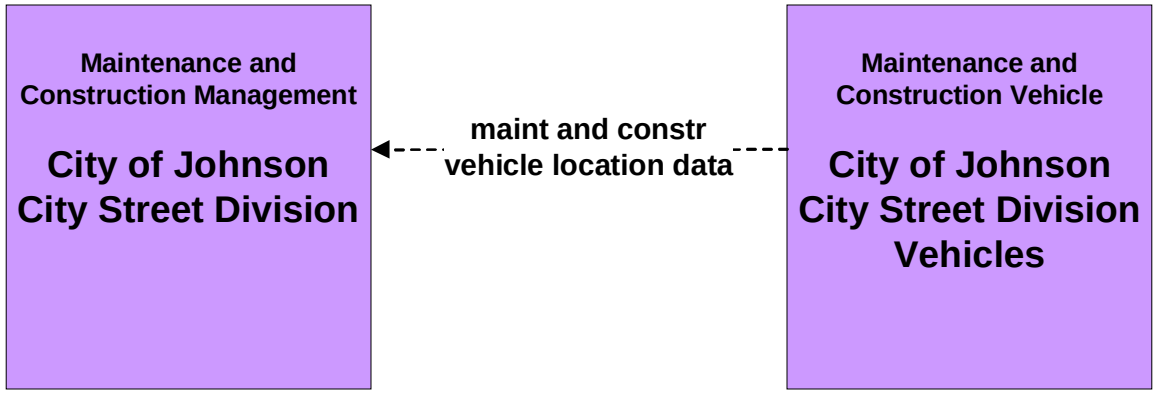
----planned/future flow-->

————existing flow————>

———*user defined flow*———>

Note:
TDOT Maintenance vehicles are fitted with plows for snow removal during a snow event.

MC01 – Maintenance and Construction Vehicle and Equipment Tracking
City of Johnson City



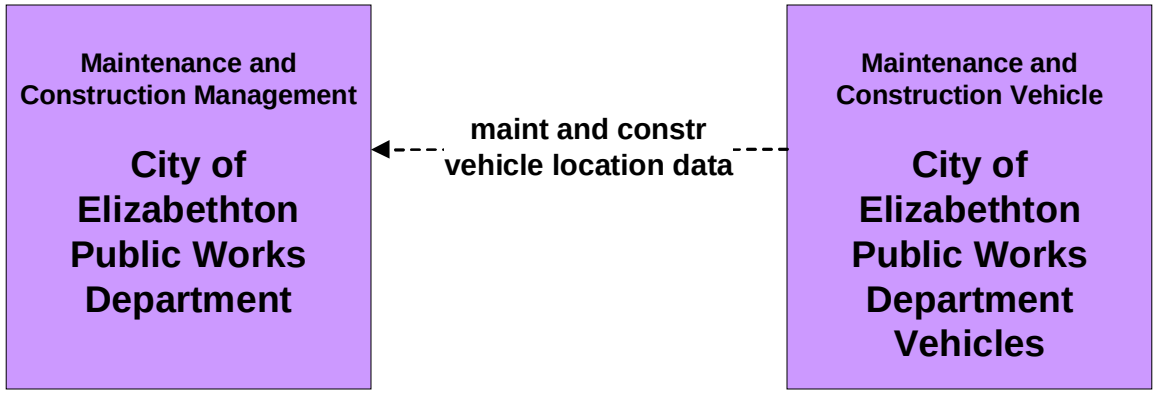
----planned/future flow--->

————existing flow————►

———*user defined flow*———►

Note:
Johnson City Street Division vehicles are fitted with plows for snow removal during a snow event. Sanitation trucks in the City of Johnson City Sold Waste Services Division's vehicle fleet have Automatic Vehicle Location (AVL) systems.

MC01 – Maintenance and Construction Vehicle and Equipment Tracking
City of Elizabethton



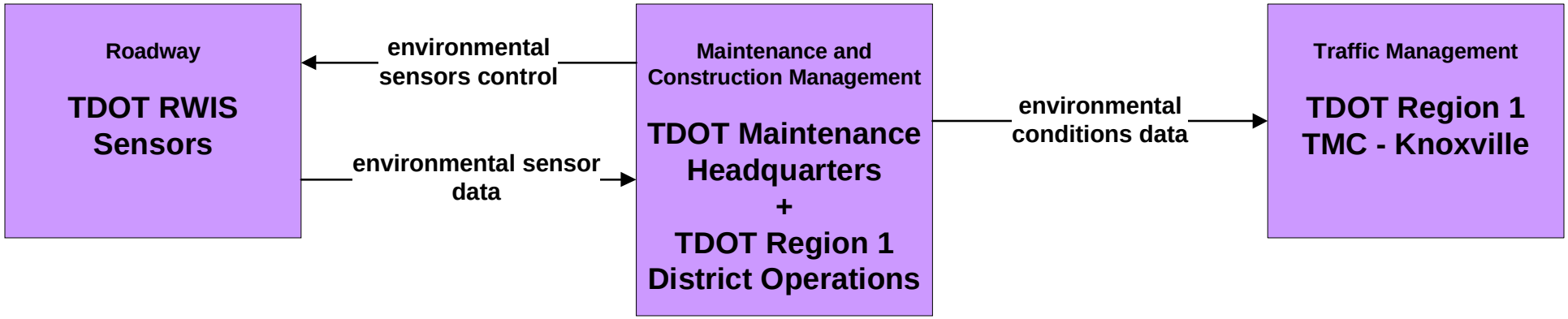
----planned/future flow-->

——————existing flow——————>

——*user defined flow*——>

Note:
Elizabethton Public Works Department vehicles are fitted with plows for snow removal during a snow event.

MC03 – Road Weather Data Collection
TDOT RWIS



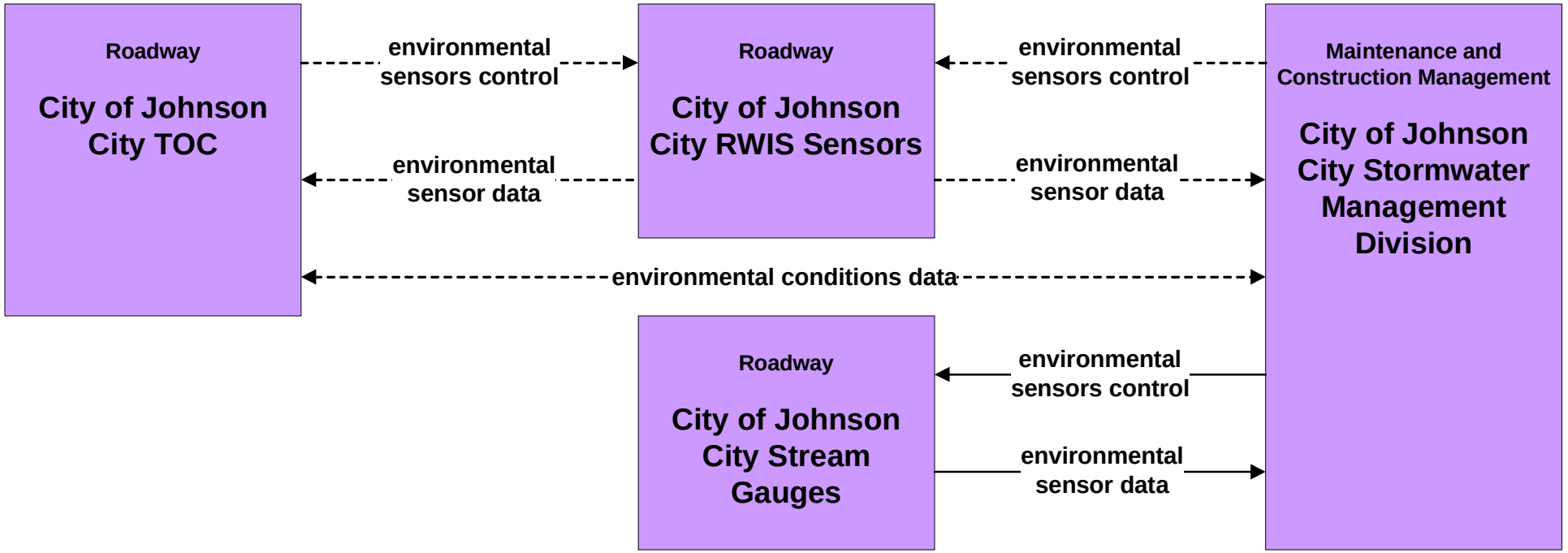
----planned/future flow--->

————existing flow————►

———*user defined flow*———►

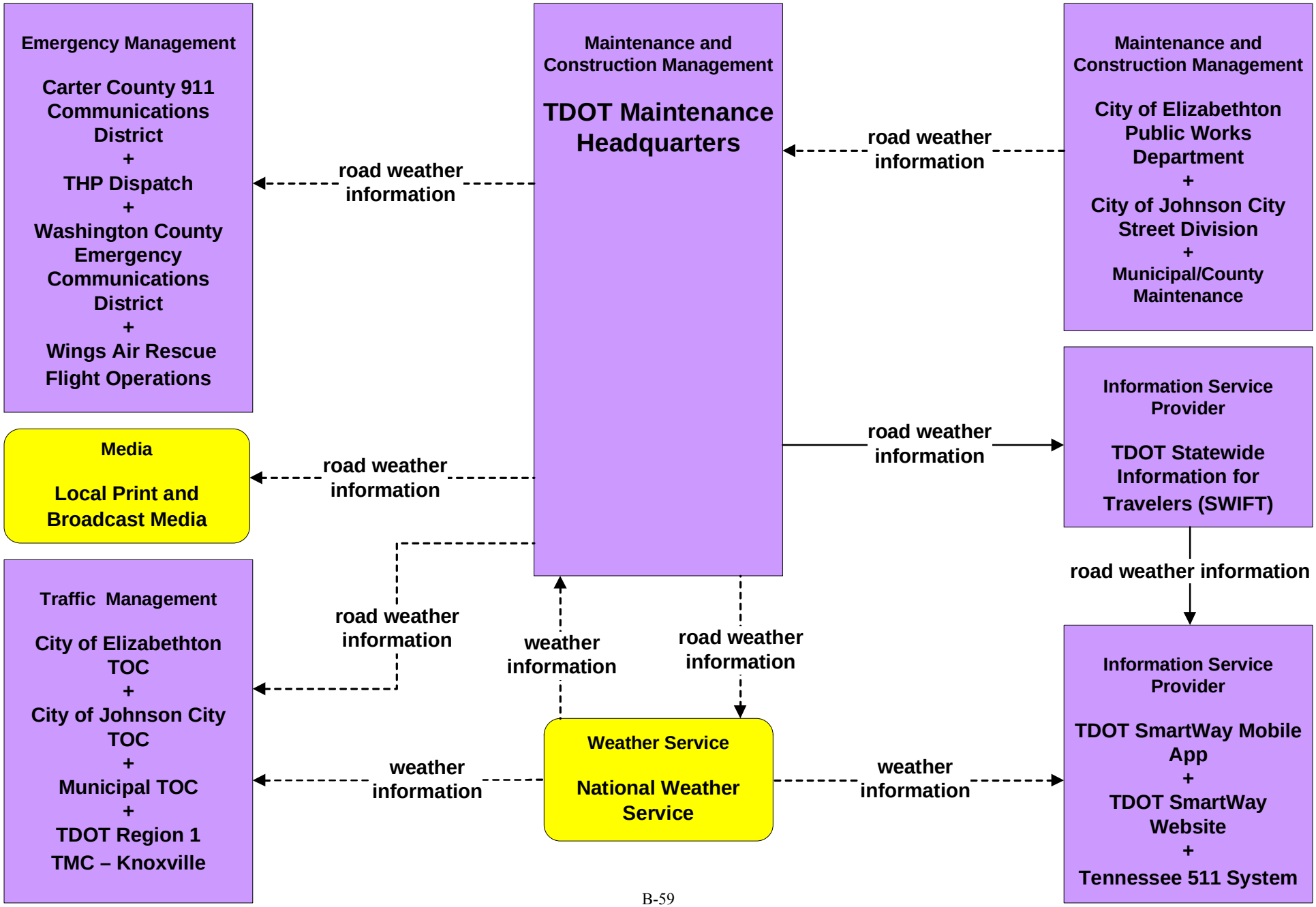
Note:
TDOT RWIS devices currently exist; however, the information received from them may not be accurate as TDOT Region 1 District Operations does not currently maintain them. TDOT will determine if these units should be replaced or fixed in the future.

MC03 – Road Weather Data Collection
City of Johnson City

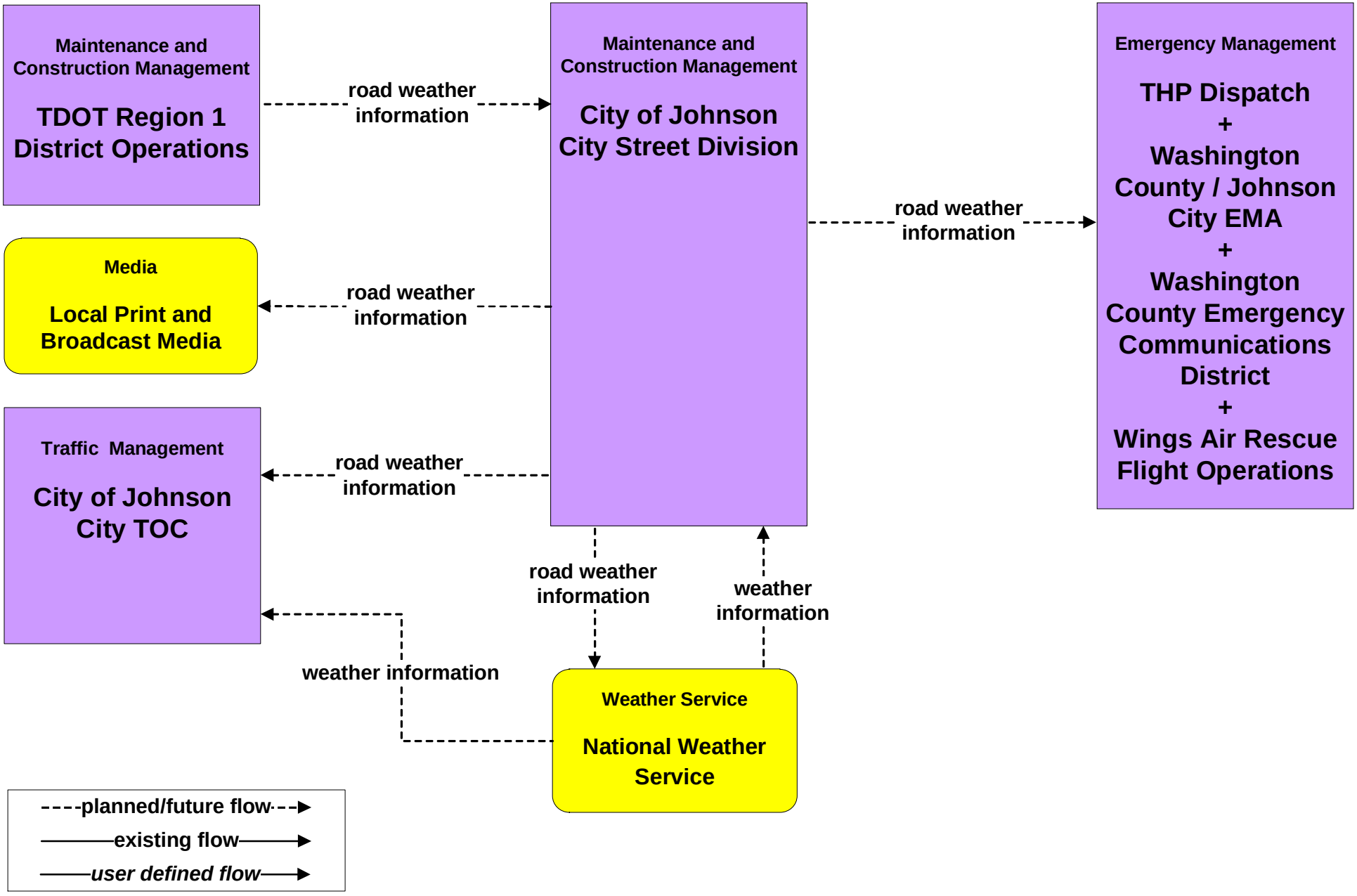


----planned/future flow--->
————existing flow————>
———*user defined flow*———>

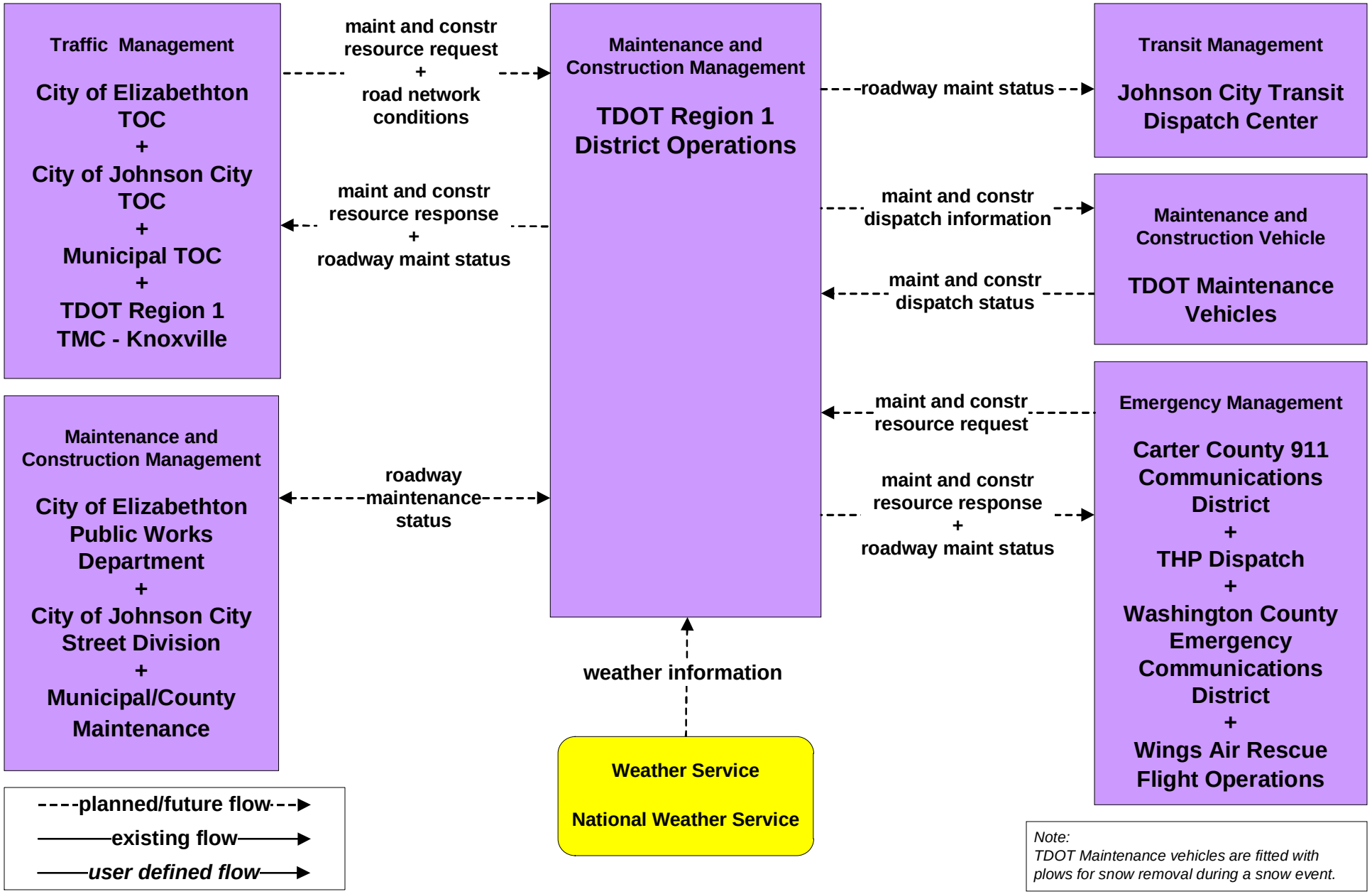
MC04 – Weather Information Processing and Distribution
TDOT Maintenance Headquarters



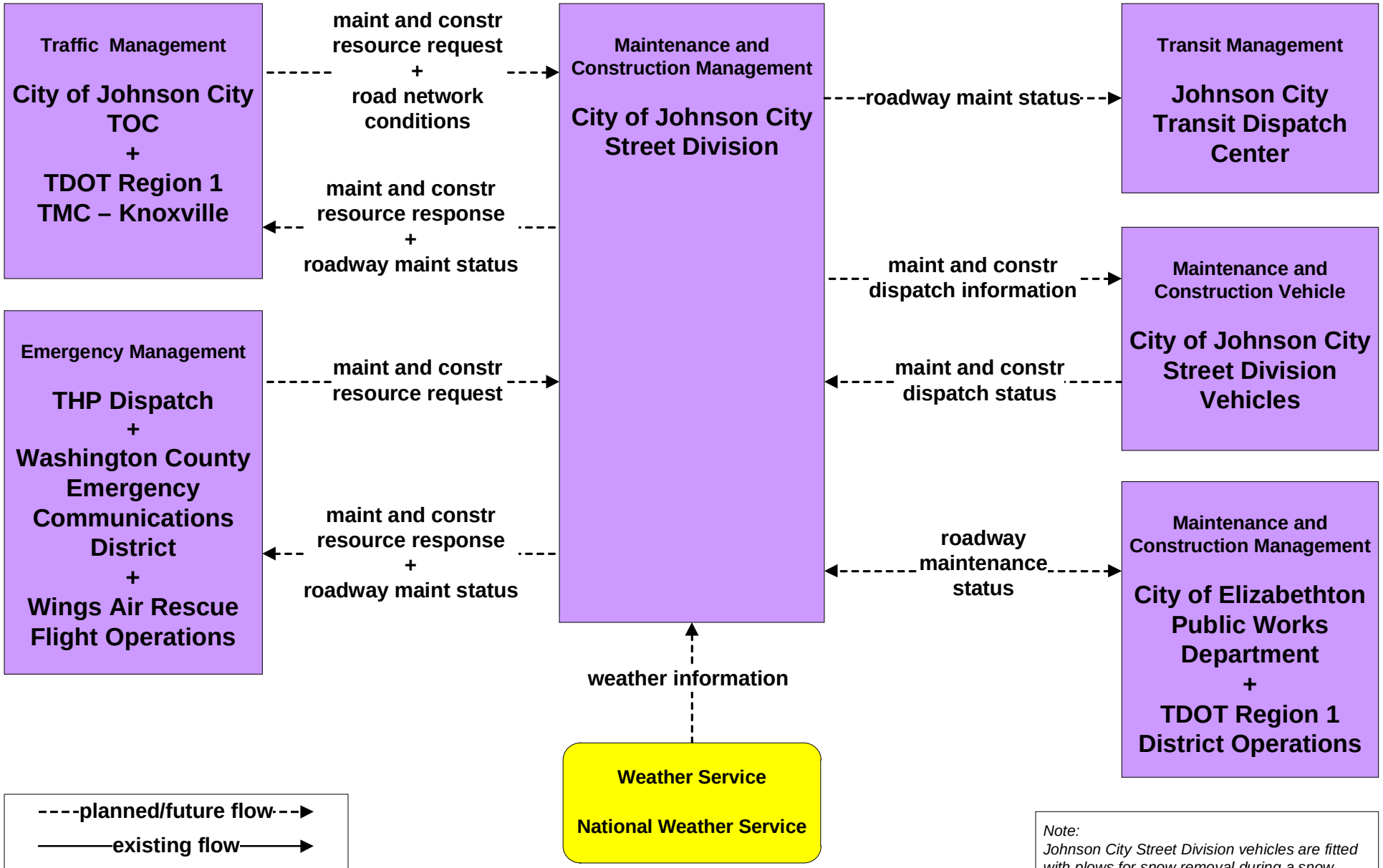
MC04 – Weather Information Processing and Distribution
City of Johnson City



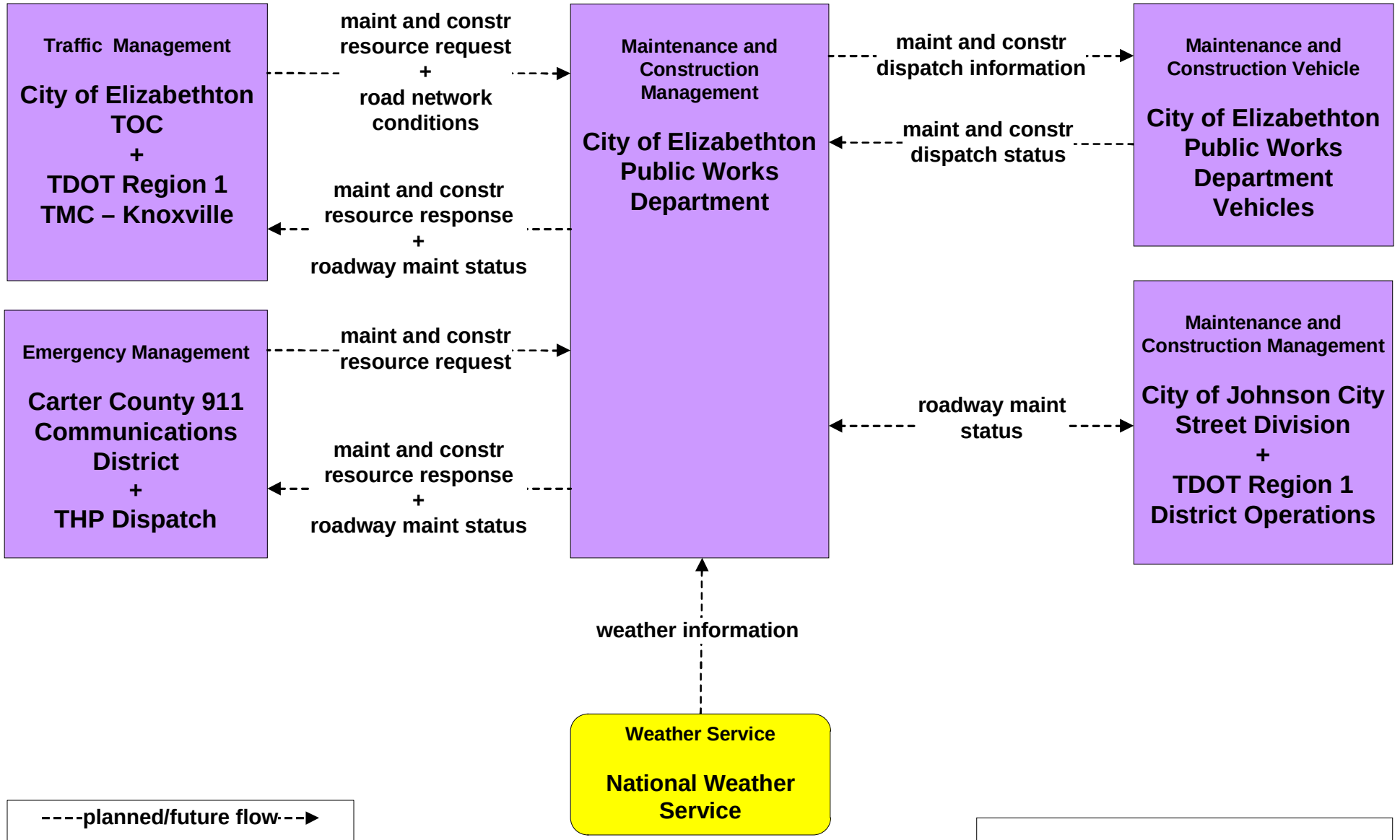
MC06 – Winter Maintenance
TDOT Region 1 District Operations



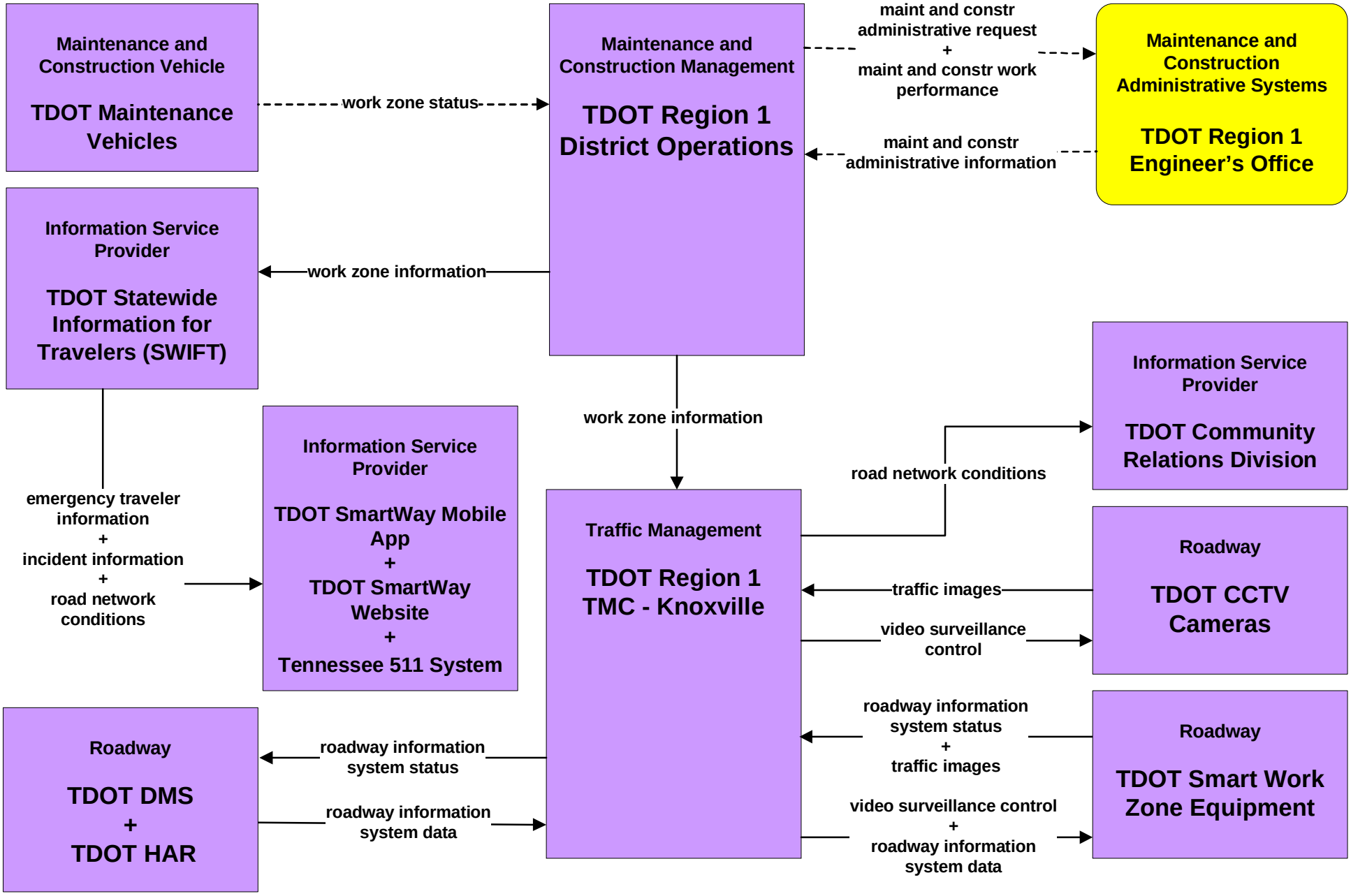
MC06 – Winter Maintenance
City of Johnson City



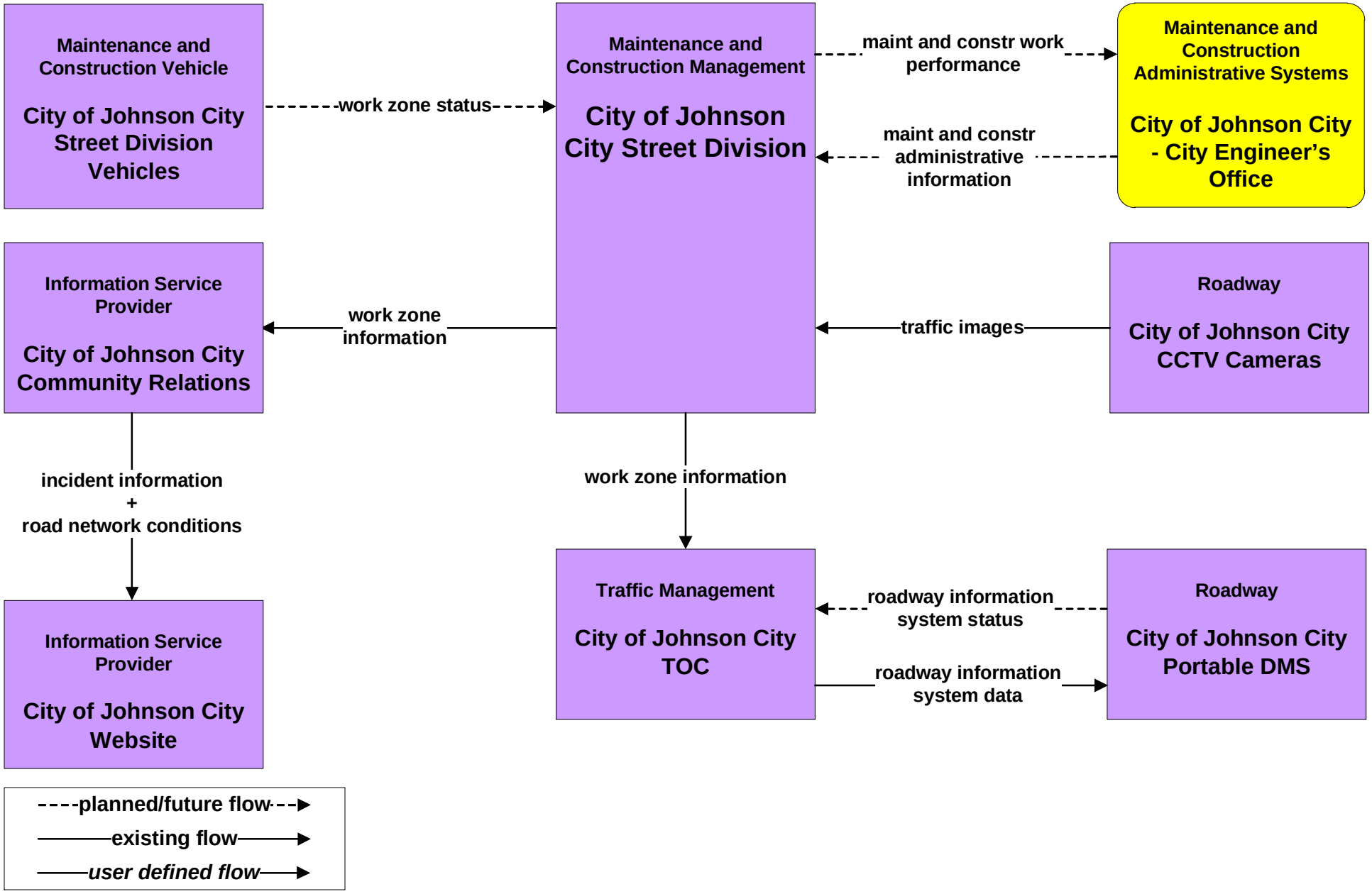
MC06 – Winter Maintenance
City of Elizabethton



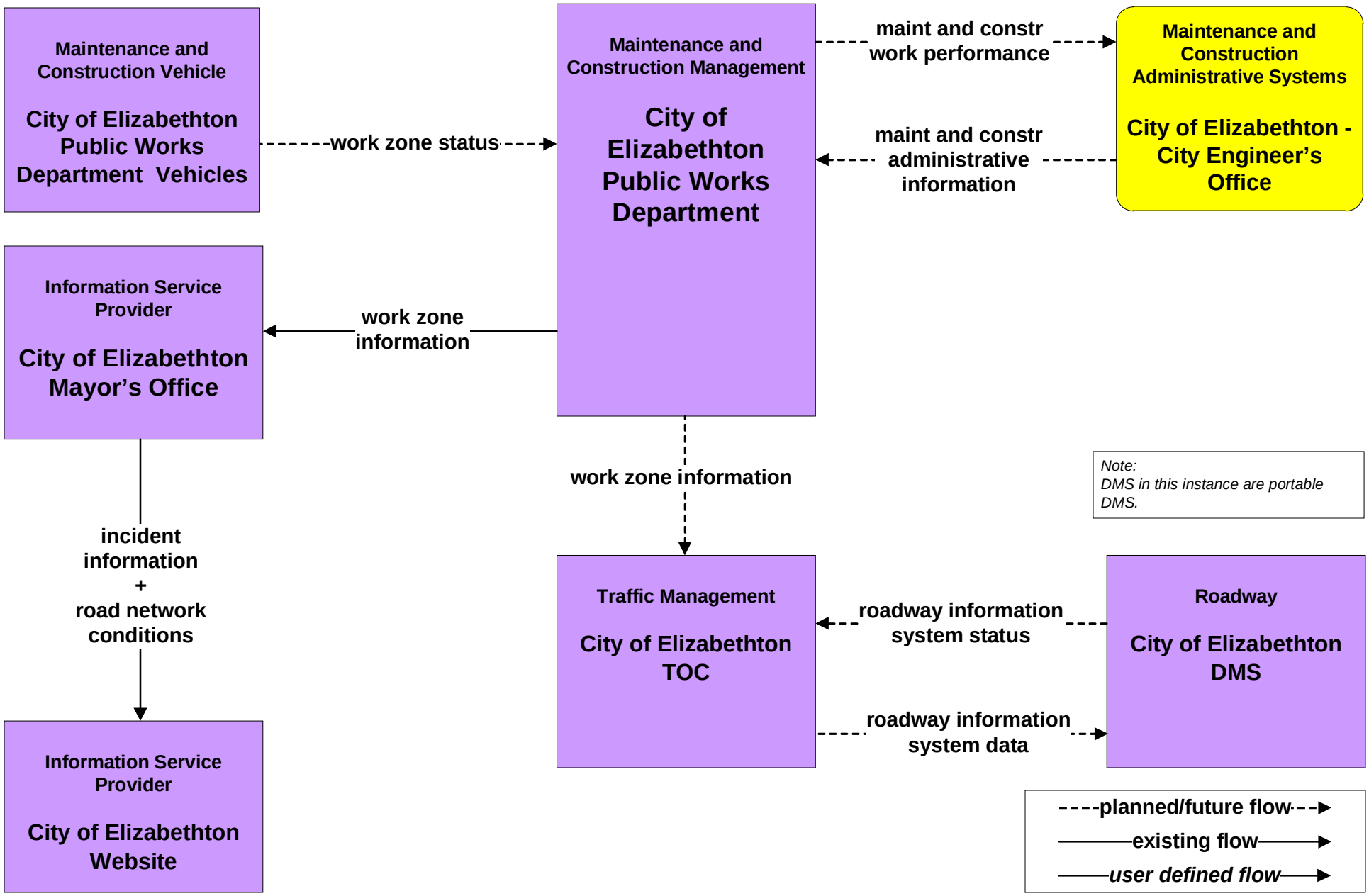
MC08 – Work Zone Management
TDOT Region 1 District Operations



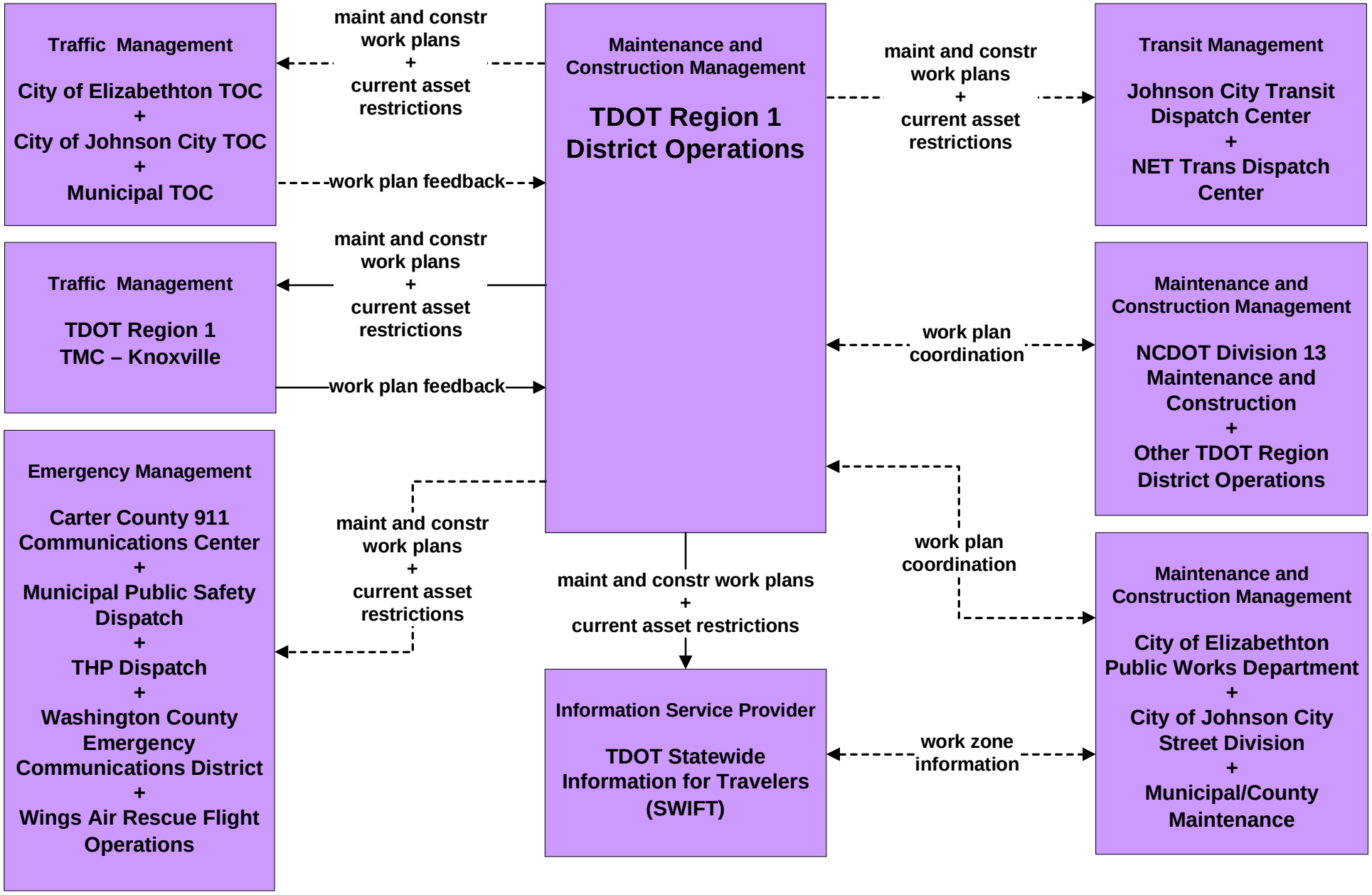
MC08 – Work Zone Management
City of Johnson City



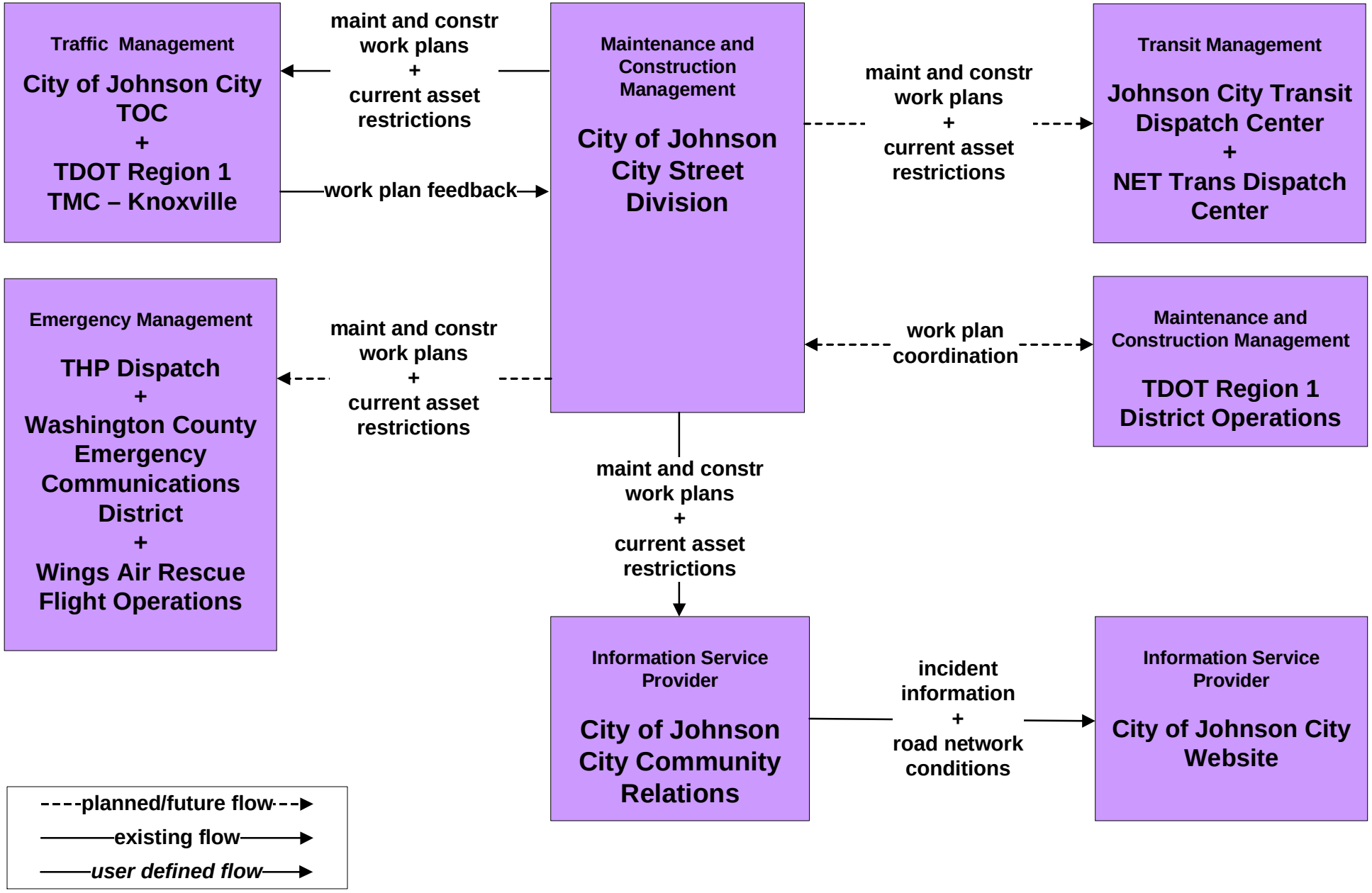
MC08 – Work Zone Management
City of Elizabethton



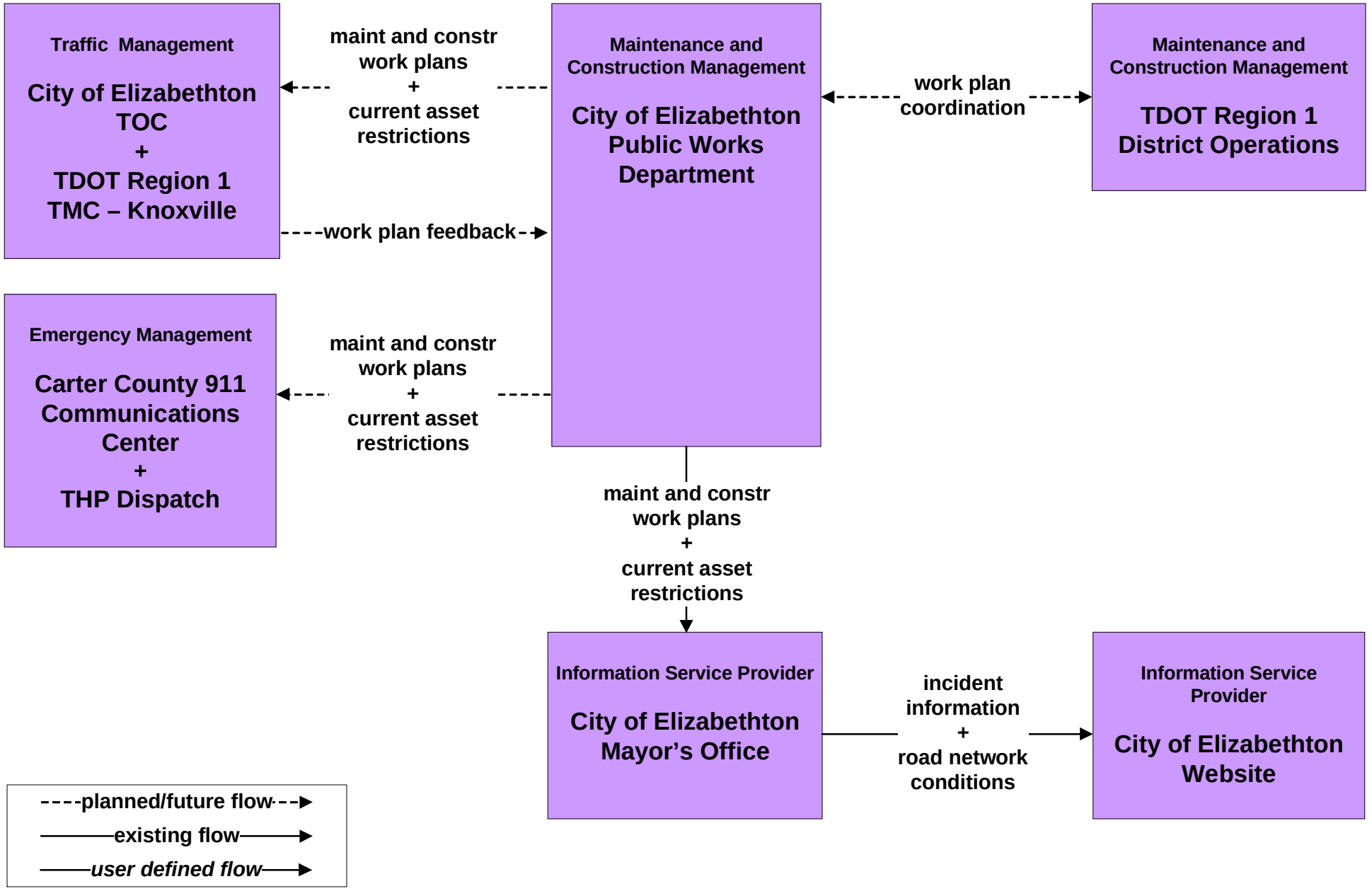
MC10 – Maintenance and Construction Activity Coordination
TDOT



MC10 – Maintenance and Construction Activity Coordination
City of Johnson City

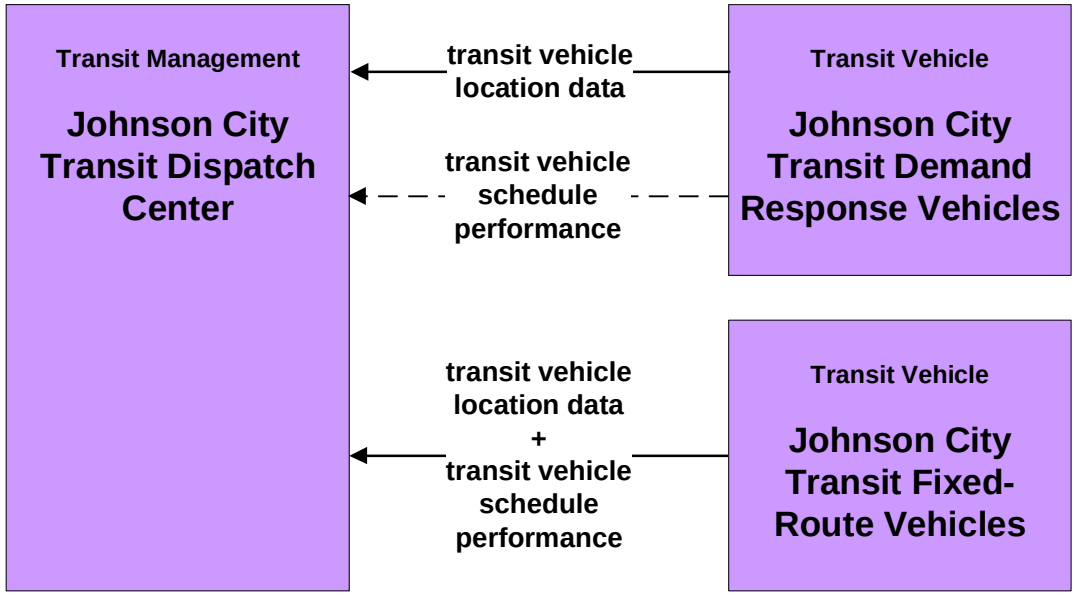


MC10 – Maintenance and Construction Activity Coordination
City of Elizabethton



Advanced Public Transportation Systems

APTS01 – Transit Vehicle Tracking
Johnson City Transit

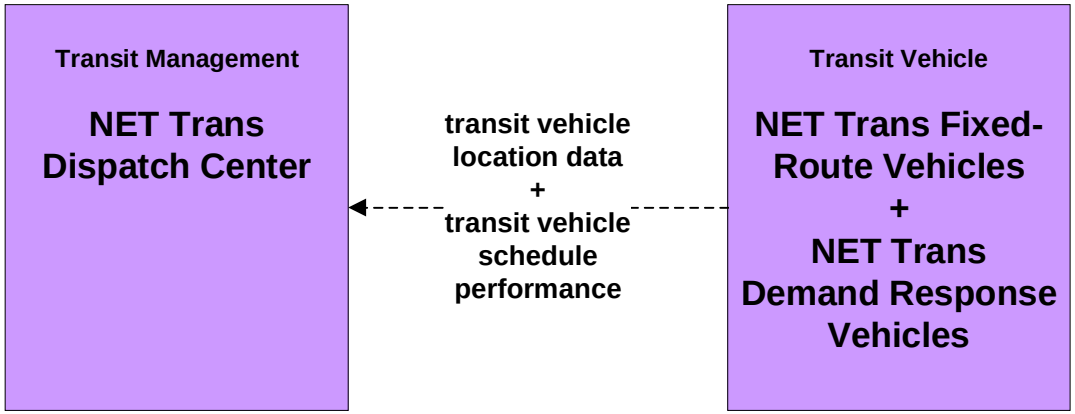


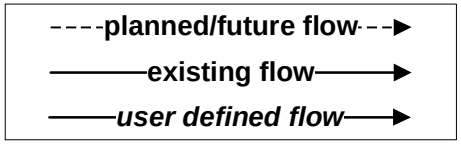
planned/future flow

existing flow

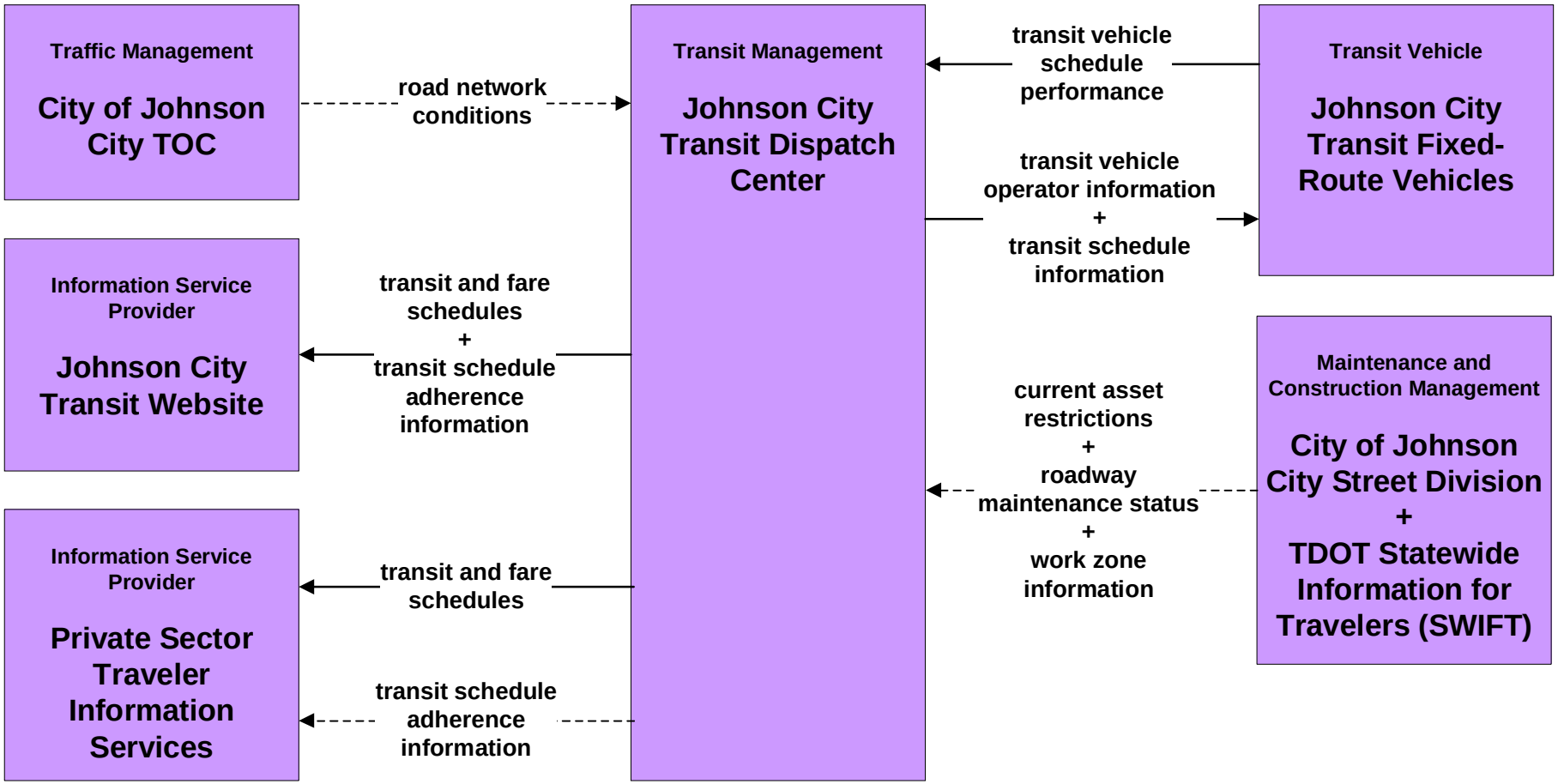
user defined flow

APTS01 – Transit Vehicle Tracking
Johnson City Transit





APTS02 – Transit Fixed-Route Operations
Johnson City Transit



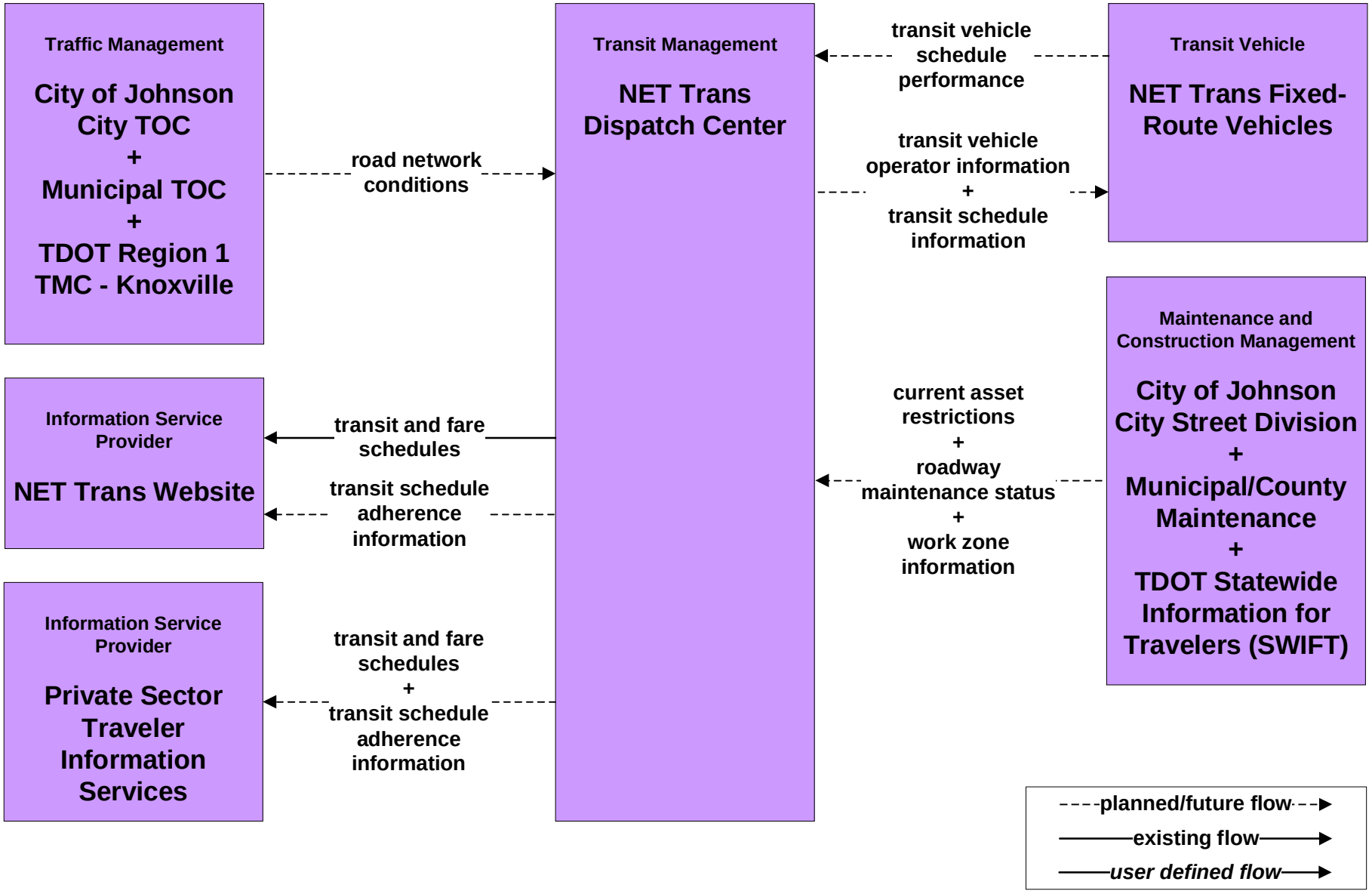
planned/future flow

existing flow

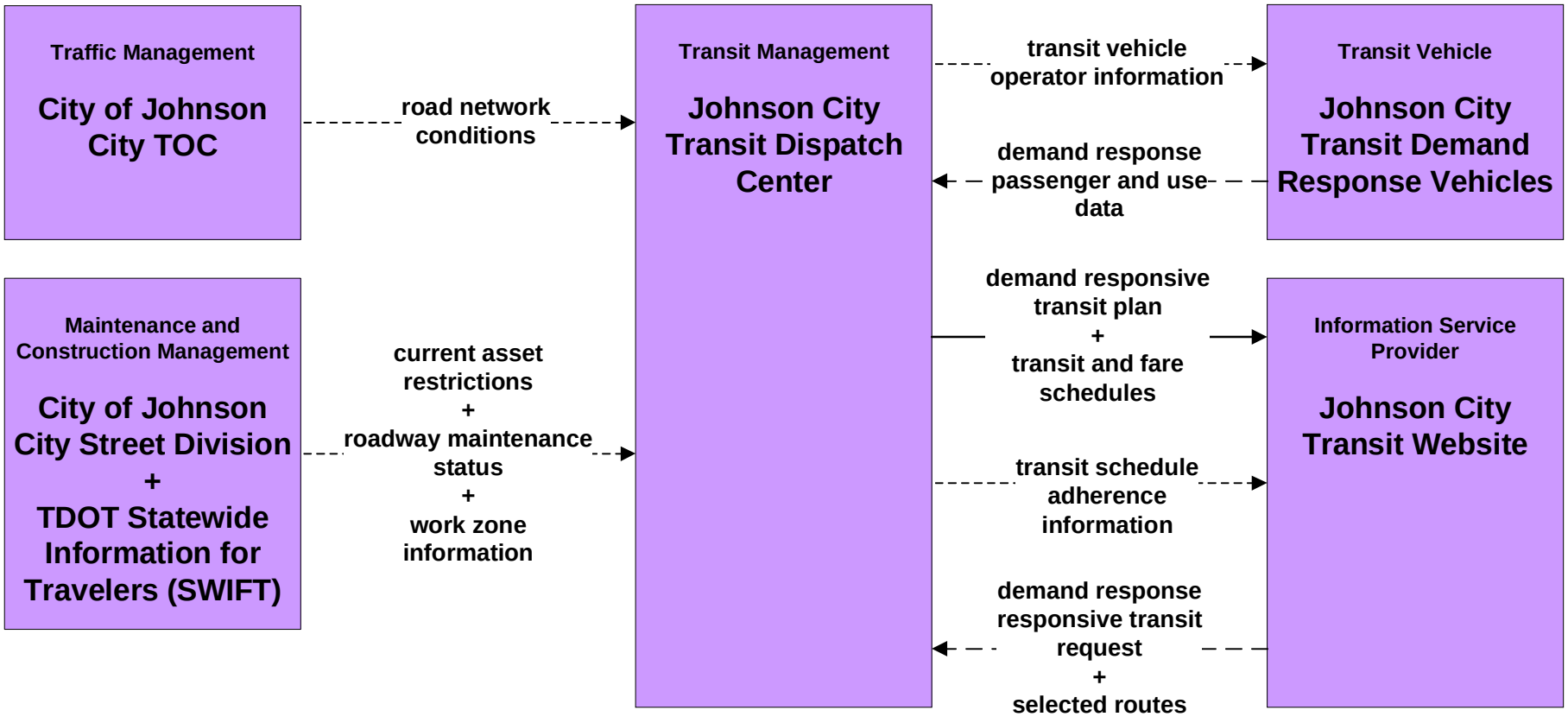
user defined flow

Note:
Johnson City Transit provides fixed-route bus service (BUCSHOT) to the East Tennessee State University Campus.

APTS02 – Transit Fixed-Route Operations
NET Trans



APTS03 – Demand Response Transit Operations
Johnson City Transit

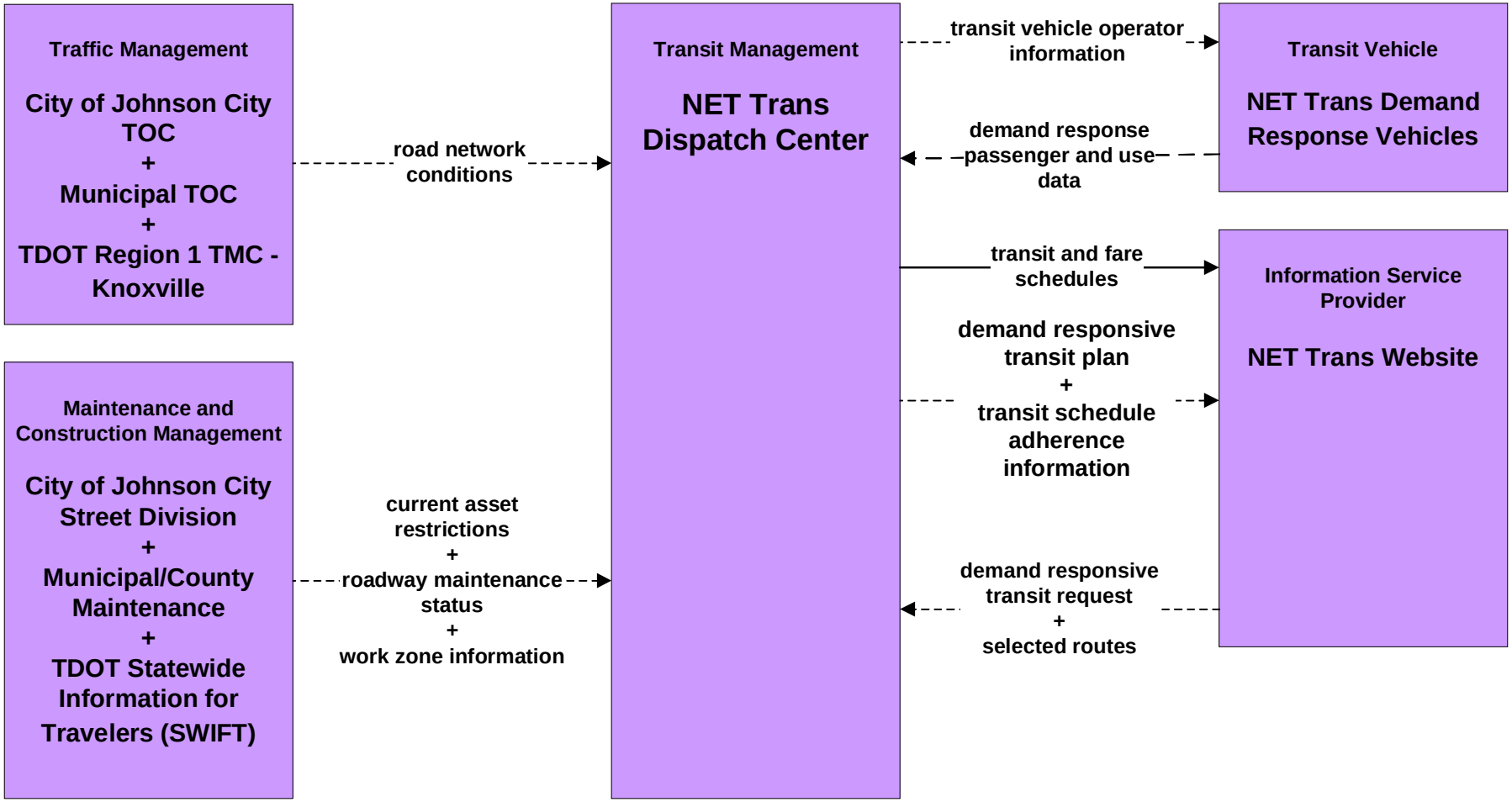


planned/future flow

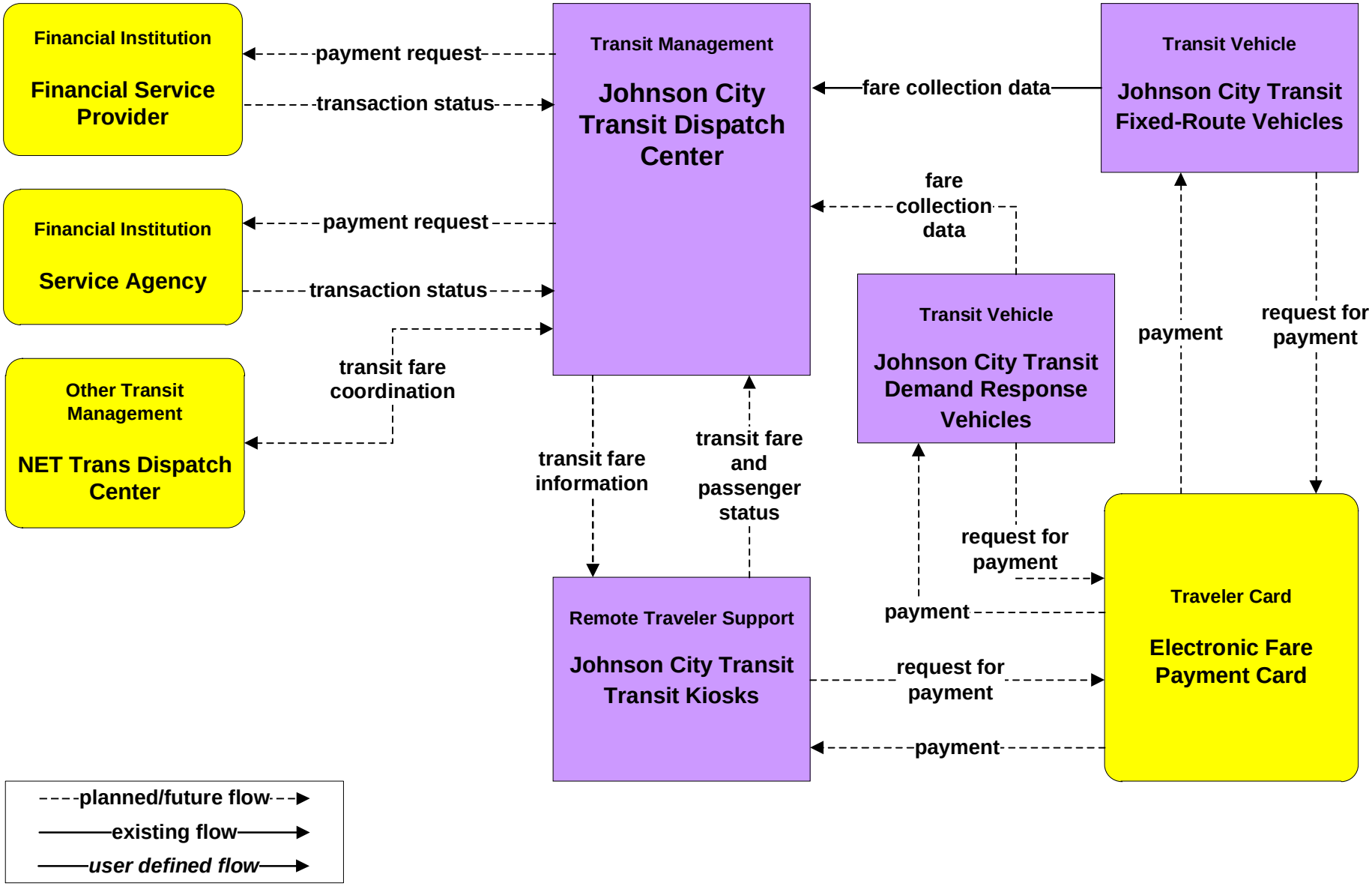
existing flow

user defined flow

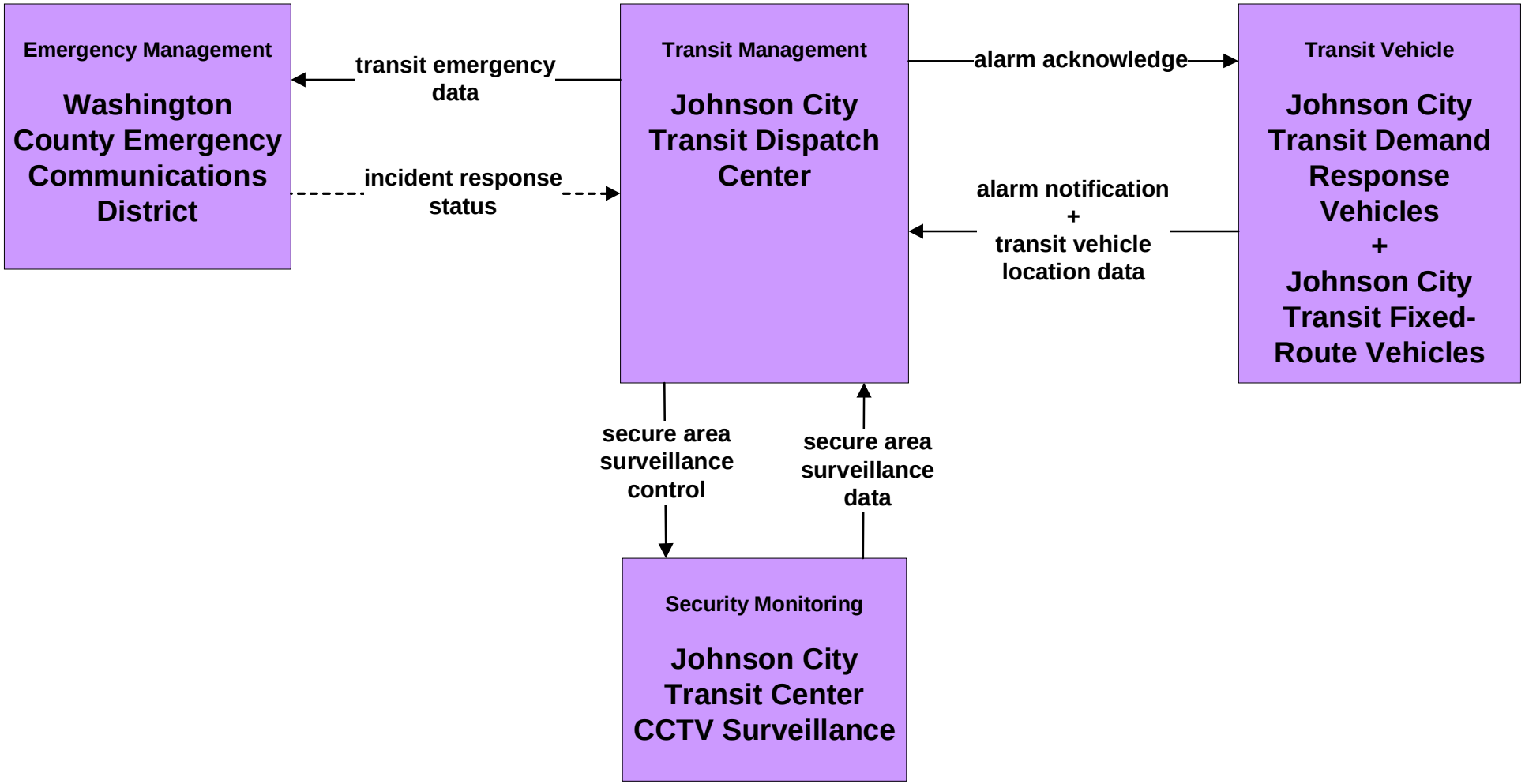
APTS03 – Demand Response Transit Operations
NET Trans



APTS04 – Transit Fare Collection Management
Johnson City Transit



APTS05 – Transit Security
Johnson City Transit Dispatch

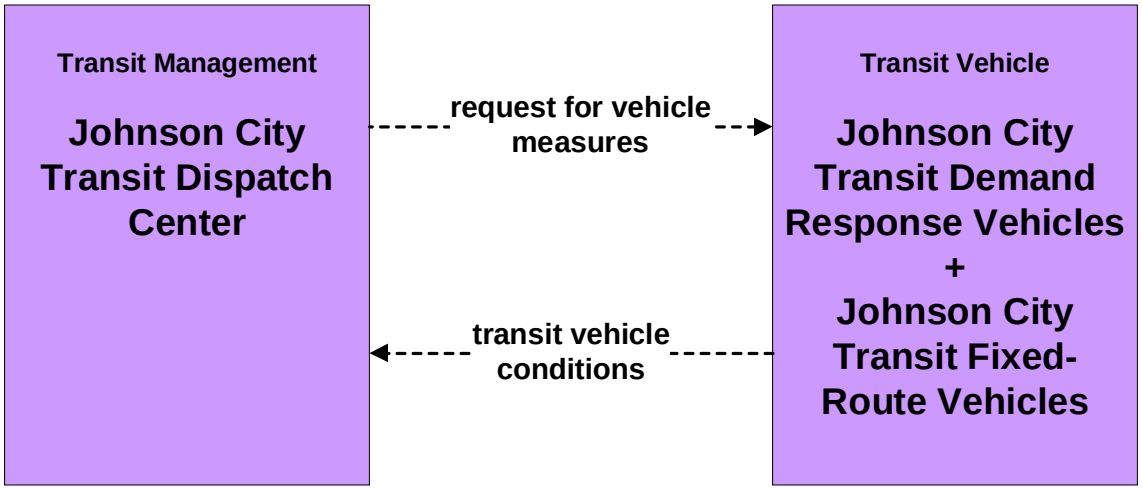


----planned/future flow--->

————existing flow————>

———*user defined flow*———>

APTS06 – Transit Fleet Management
Johnson City Transit



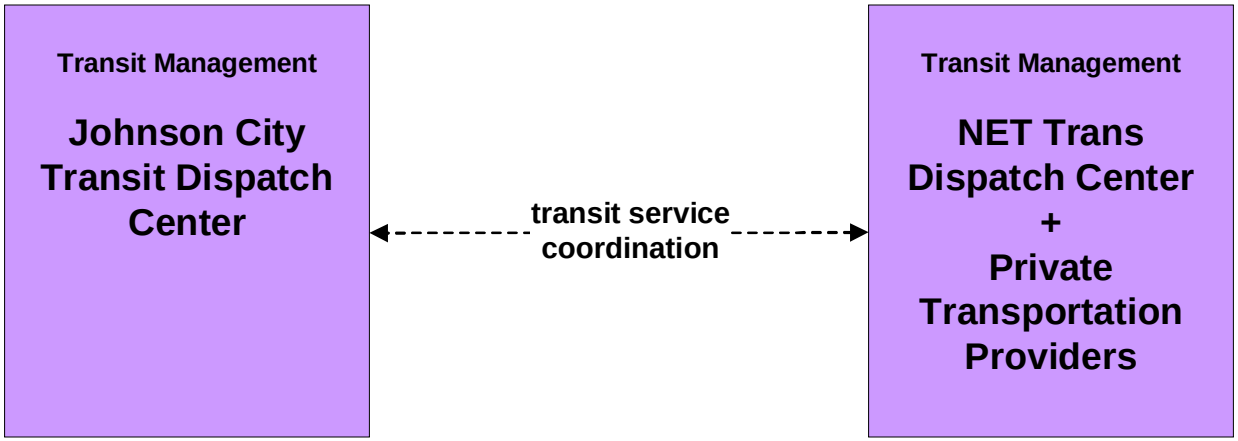
----planned/future flow-->

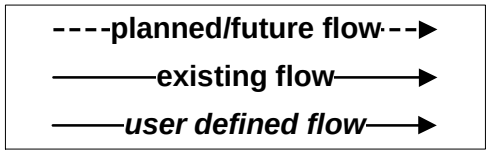
——————existing flow——————>

——*user defined flow*——>

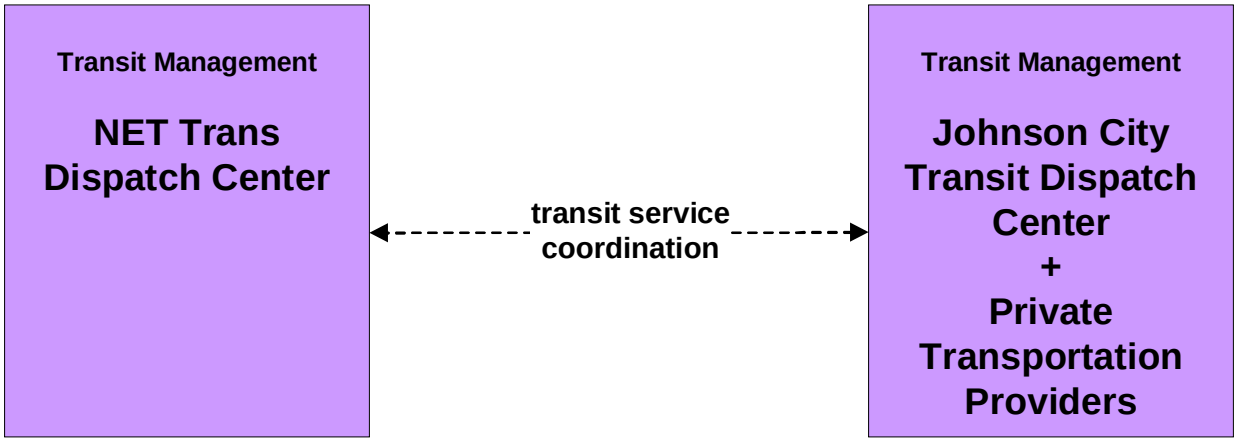
Note:
Transit maintenance data will be collected at the maintenance garage at the end of the day rather than real-time. This service was not included in the AVL system.

APTS07 – Multi-modal Coordination
Johnson City Transit





APTS07 – Multi-modal Coordination
NET Trans

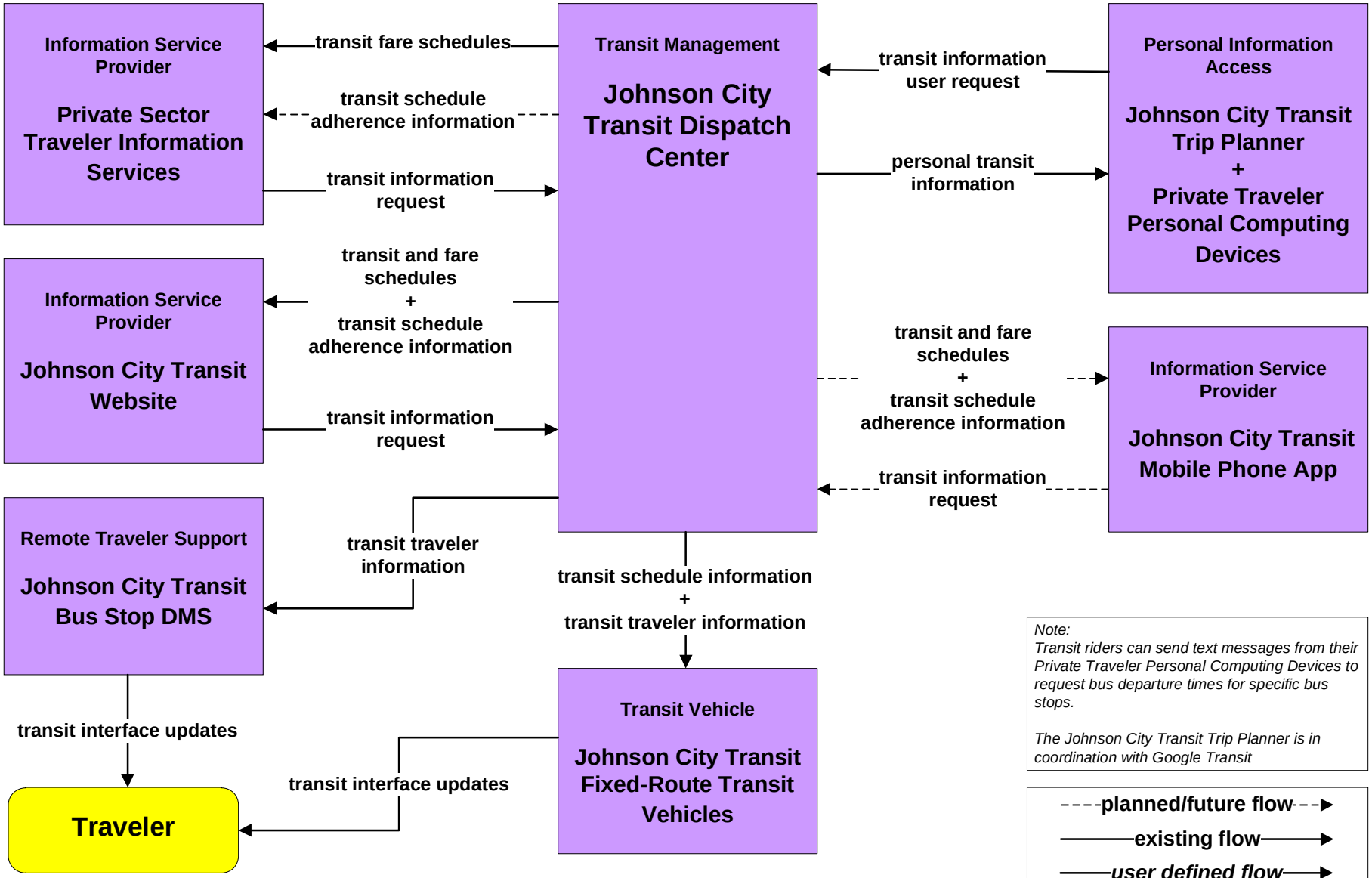


----planned/future flow--->

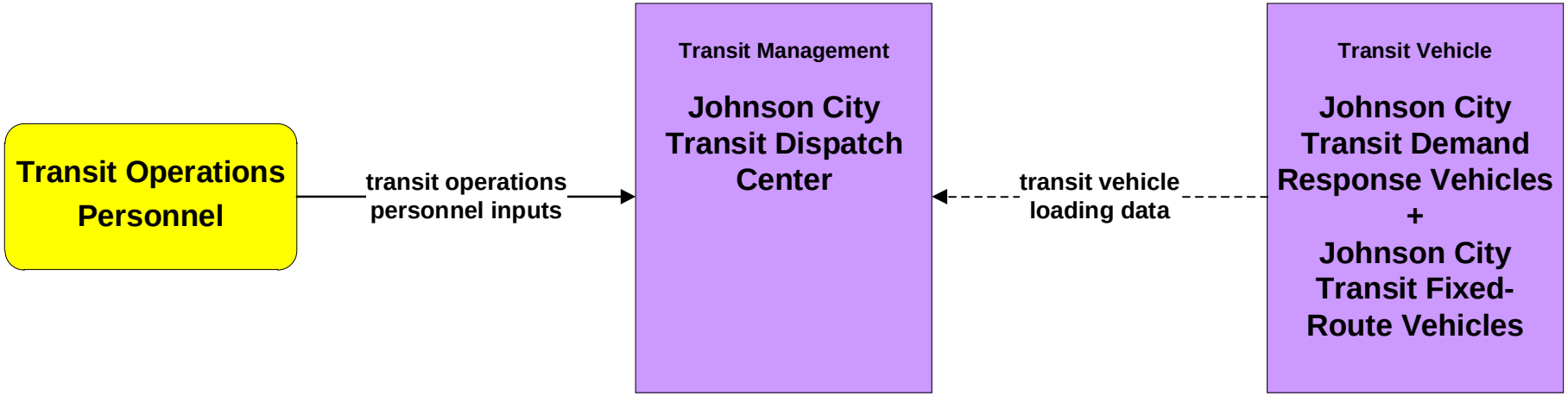
————existing flow————▶

———*user defined flow*———▶

APTS08 – Transit Traveler Information
Johnson City Transit



APTS10 – Transit Passenger Counting
Johnson City Transit



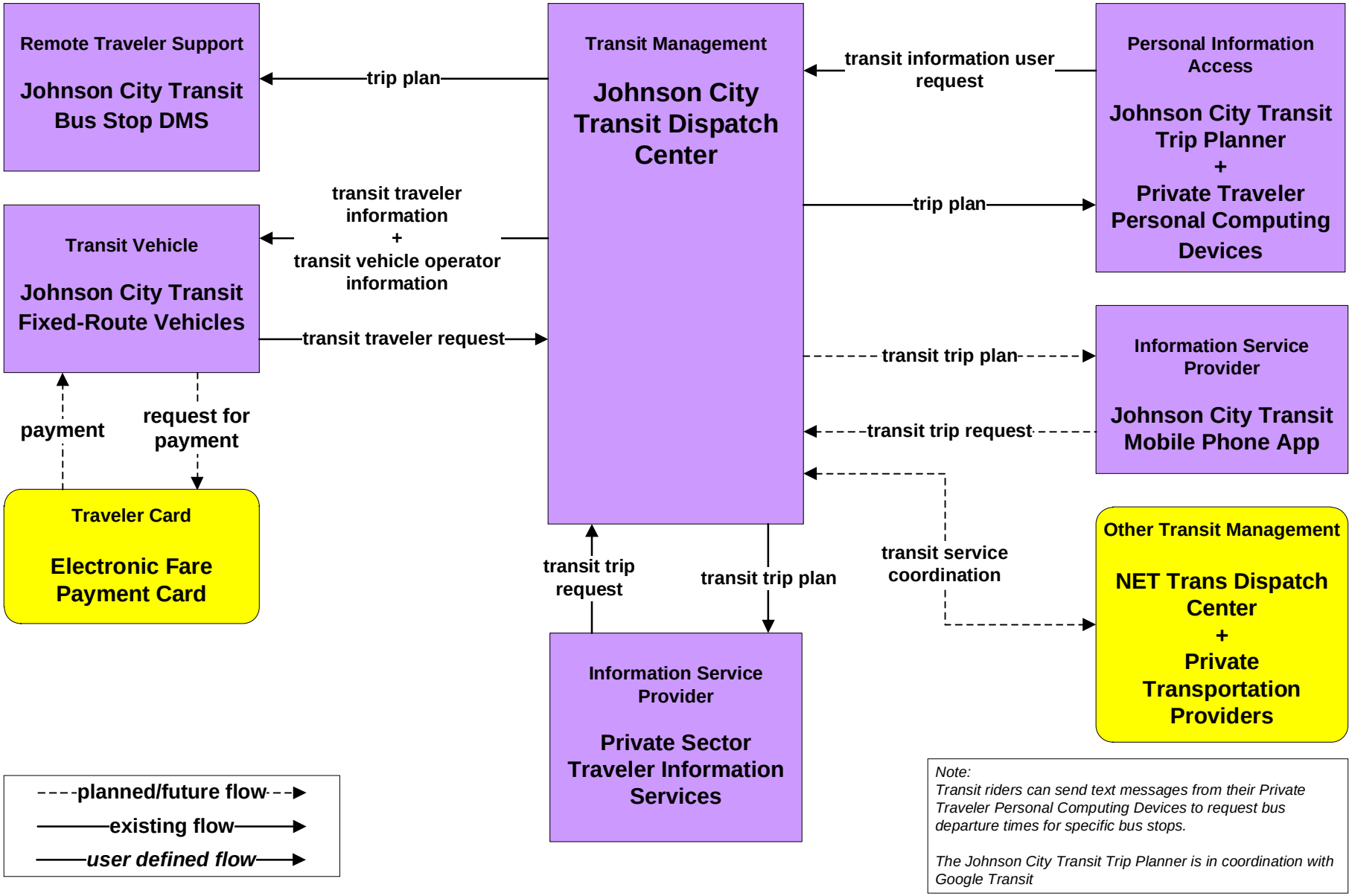
planned/future flow

existing flow

user defined flow

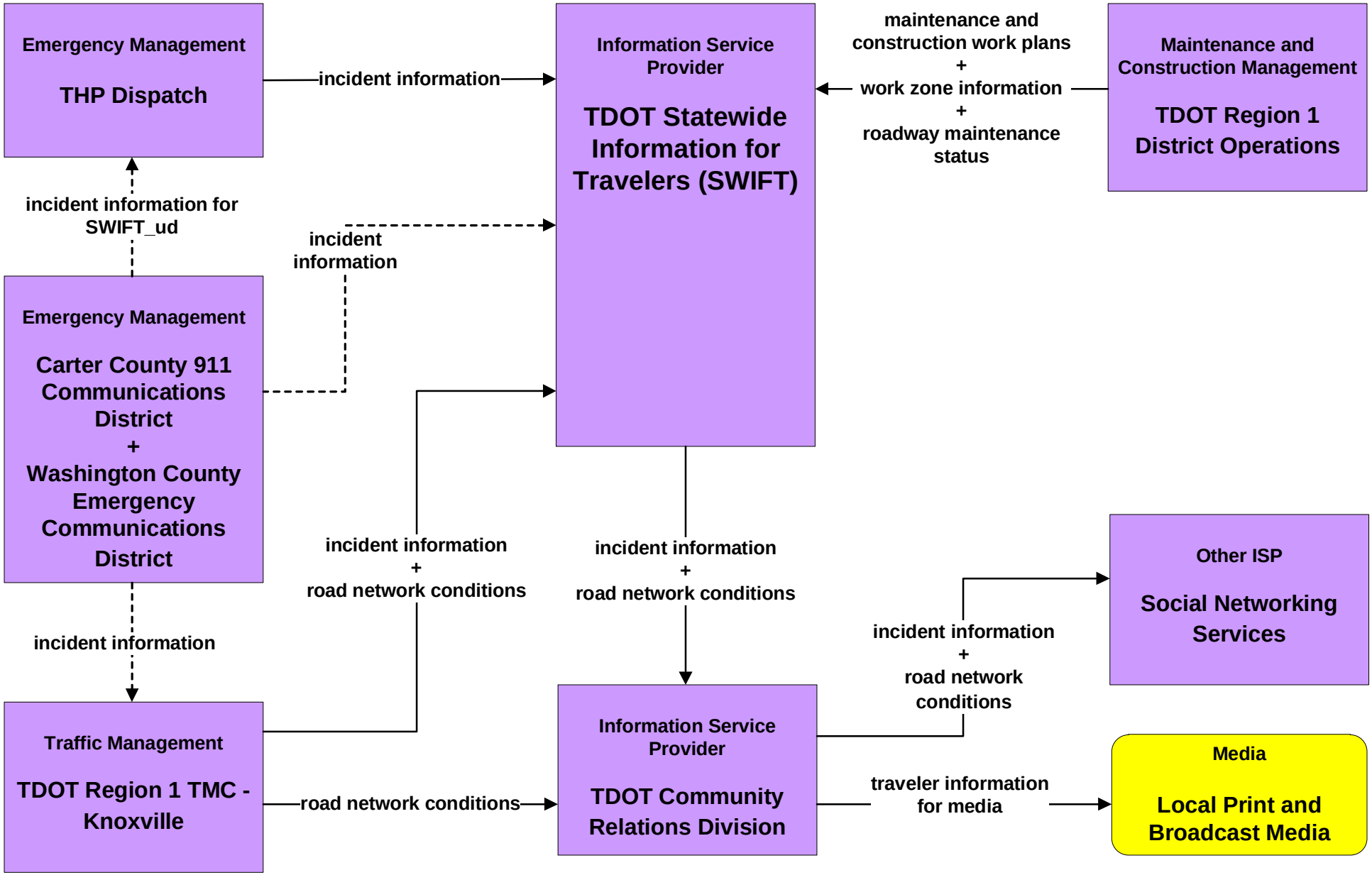
Note:
Transit Operations Personnel (Drivers) manually enter passenger loading data into Johnson City Transit's software system through mobile data terminals on the vehicles. At this time, there are no plans to transition to a fully automated system.

APTS11 – Multimodal Connection Protection
Johnson City Transit

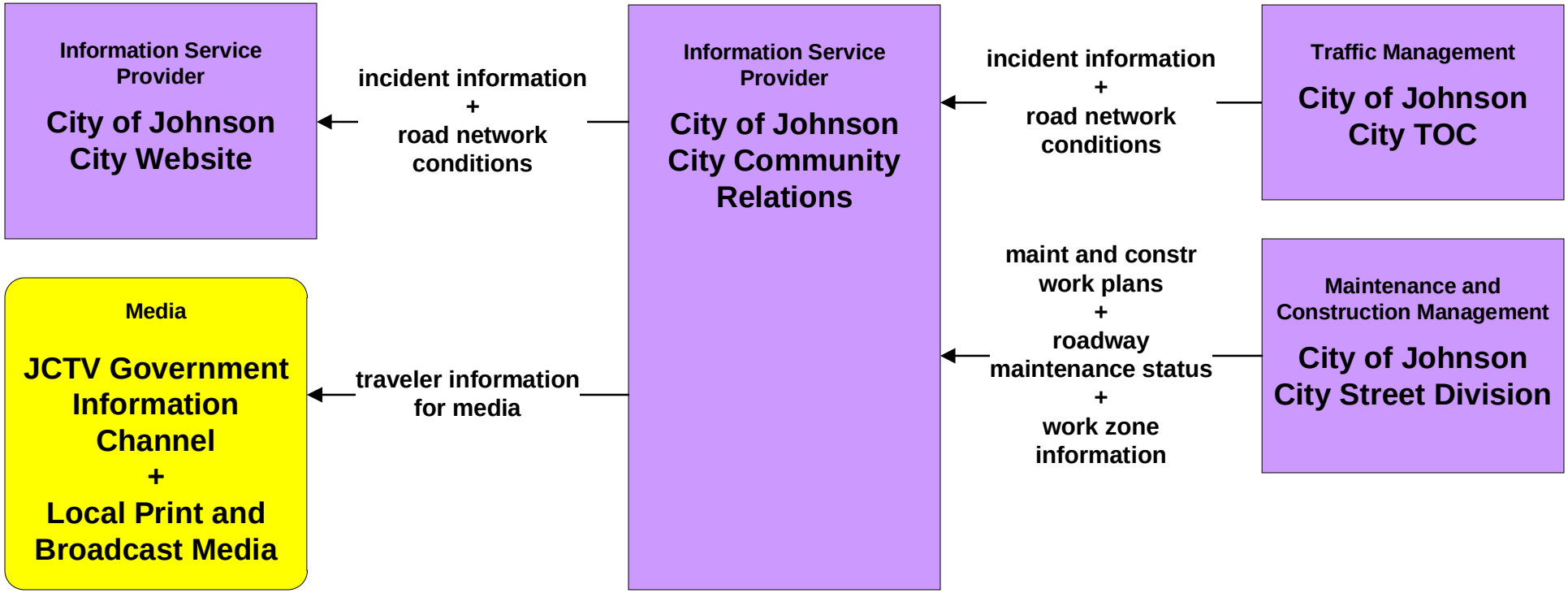


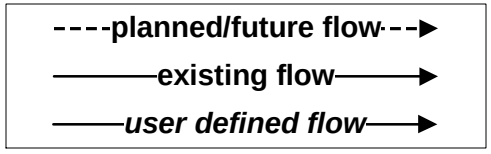
Advanced Traveler Information System

ATIS01 – Broadcast Traveler Information
SWIFT

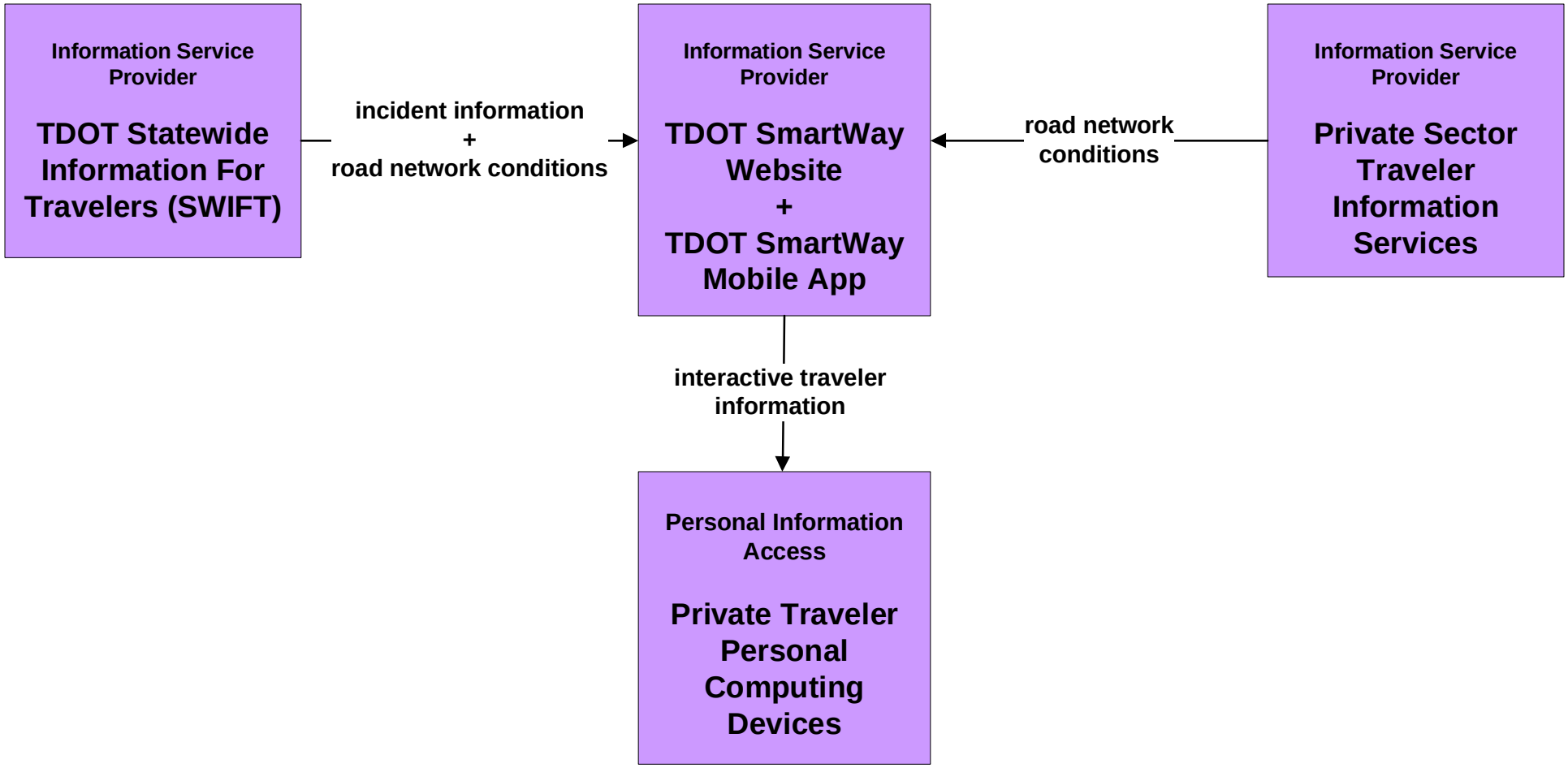


ATIS01 – Broadcast Traveler Information
City of Johnson City





ATIS02 – Interactive Traveler Information
TDOT SmartWay



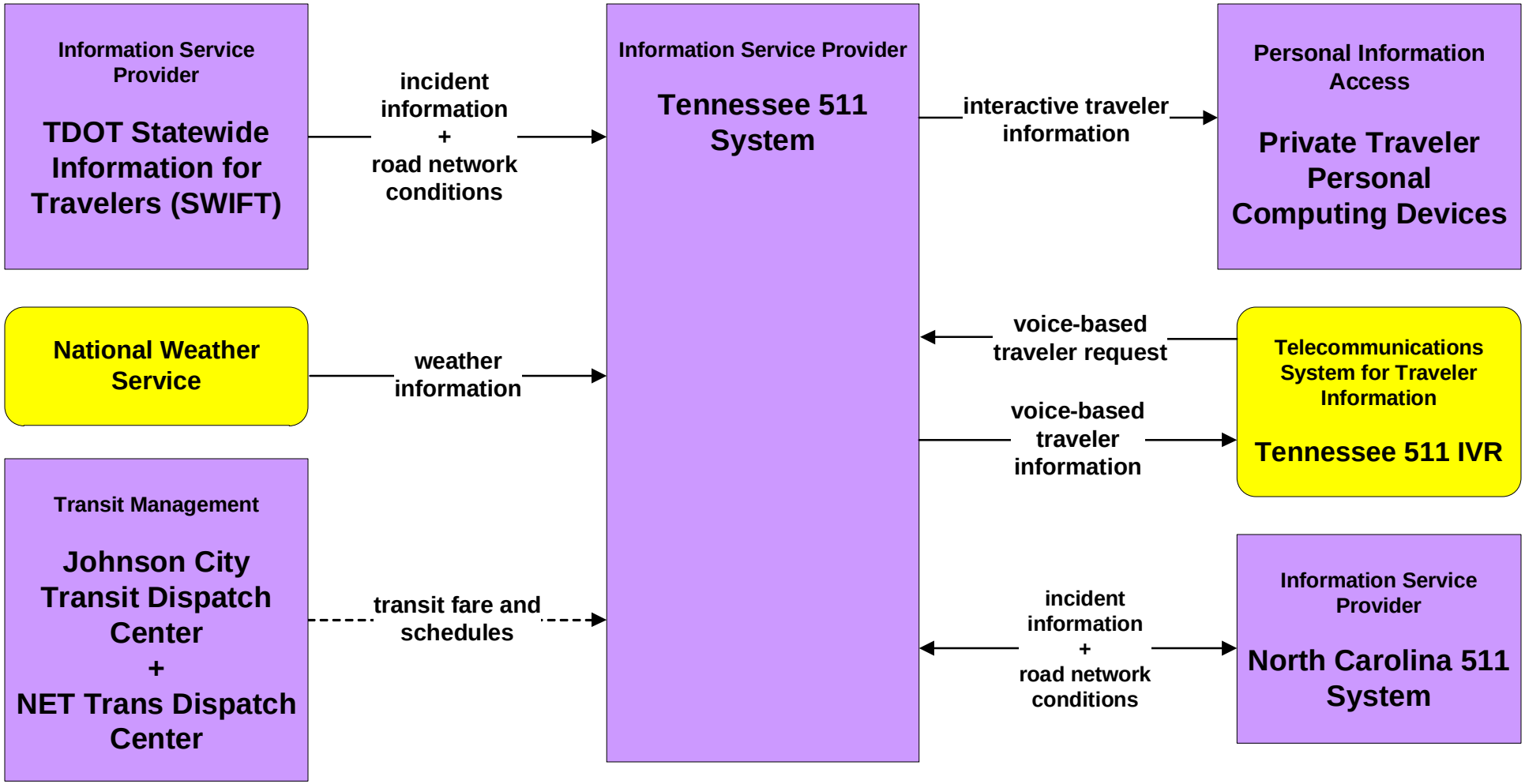
----planned/future flow--->

————existing flow————>

———*user defined flow*———>

Note:
TDOT displays Google Traffic Data on the SmartWay Mobile App and Website.

ATIS02 – Interactive Traveler Information
Tennessee 511



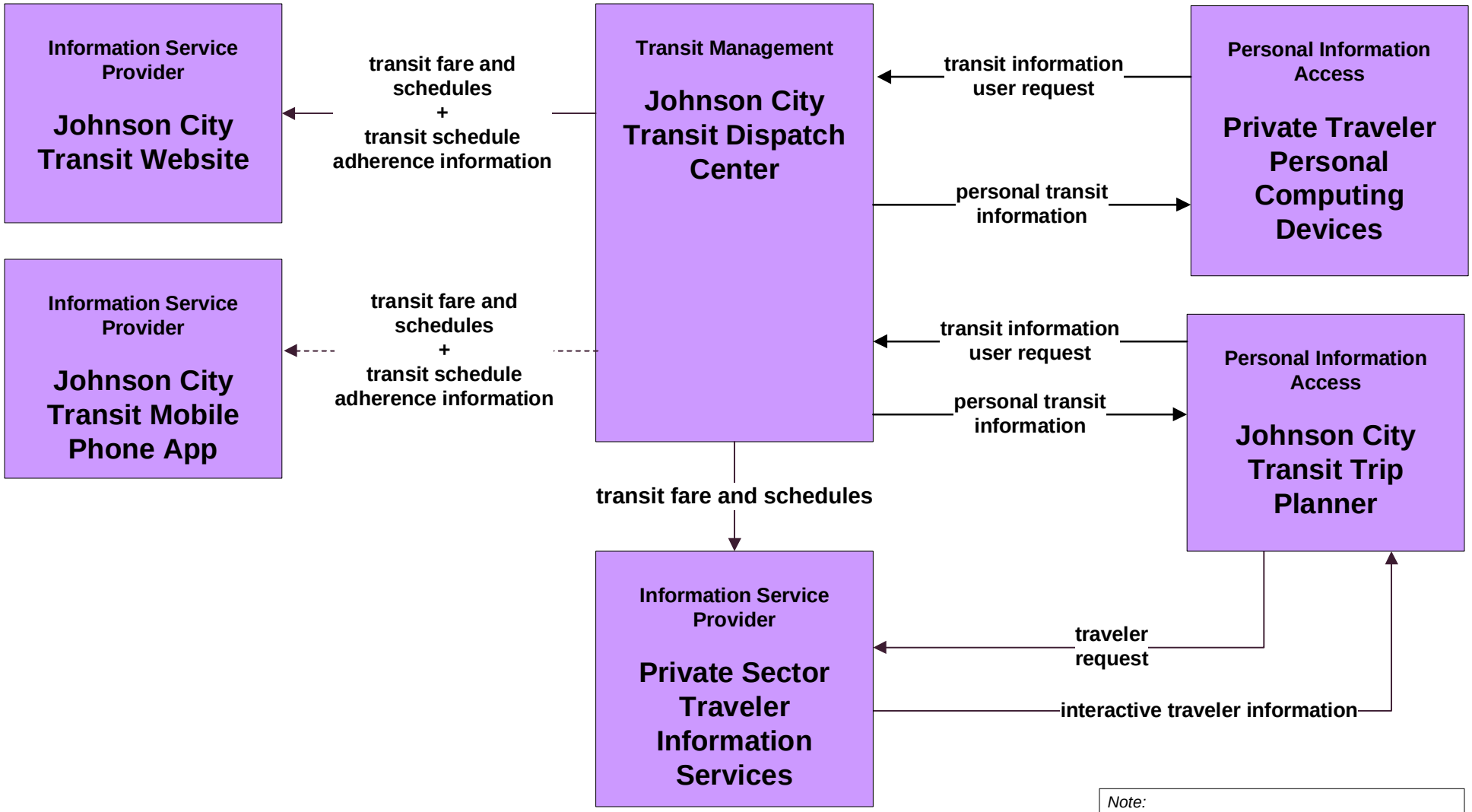
----planned/future flow--->

———existing flow———>

———*user defined flow*———>

Note:
The NC and TN 511 systems can transfer callers to one another in the event that someone inadvertently reaches the wrong system or would like information about the conditions in the adjacent state.

ATIS02 – Interactive Traveler Information
Johnson City Transit



----planned/future flow--->

———existing flow———>

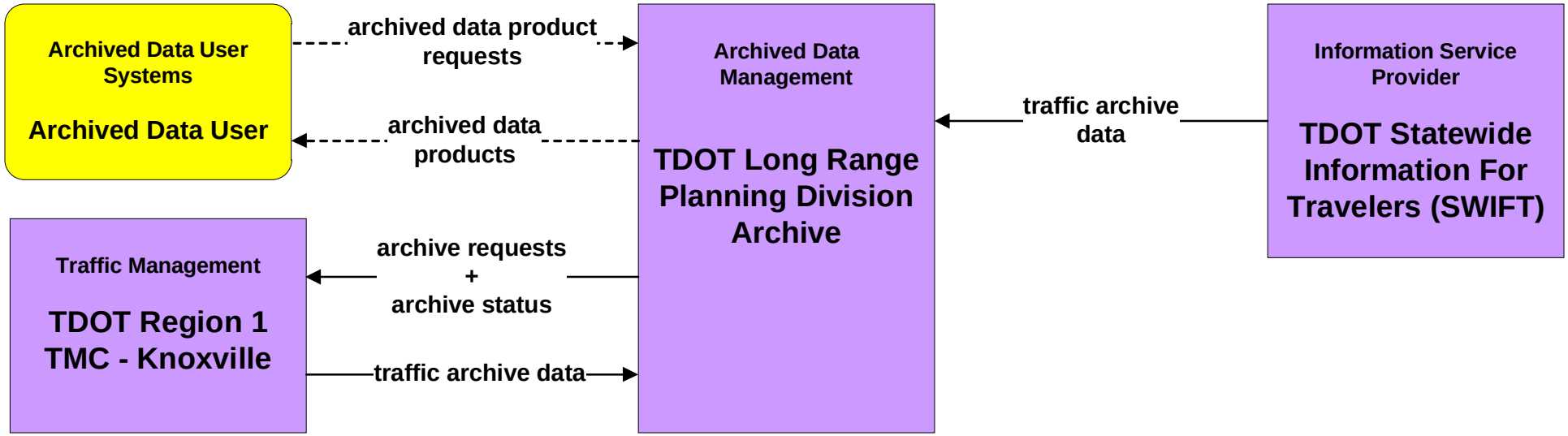
———*user defined flow*———>

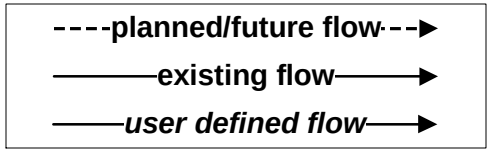
Note:
Transit riders can send text messages from their Private Traveler Personal Computing Devices to request bus departure times for specific bus stops.

The Johnson City Transit Trip Planner is in coordination with Google Transit

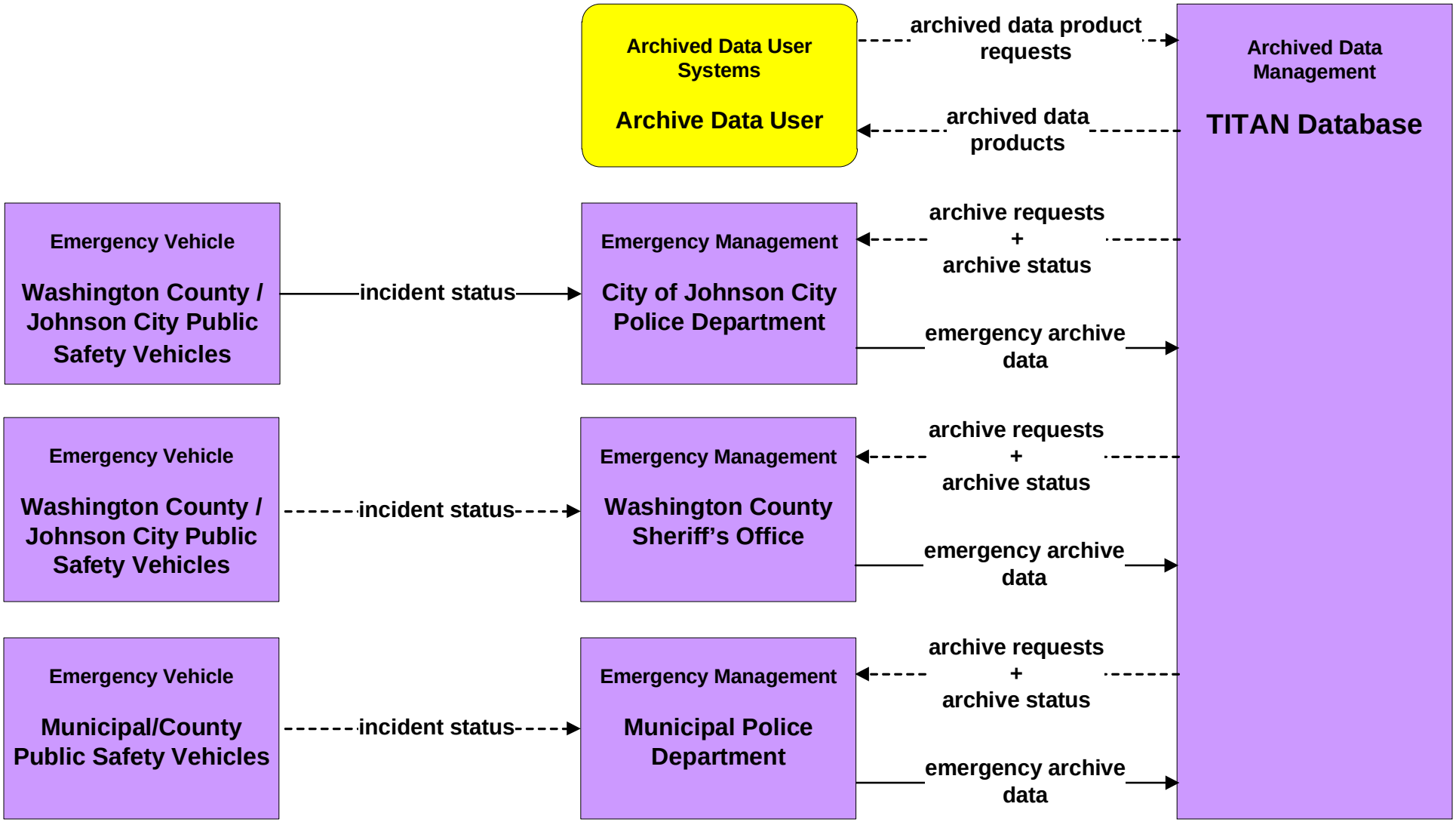
Archived Data Management

AD1 – ITS Data Mart
TDOT





AD1 – ITS Data Mart
TITAN



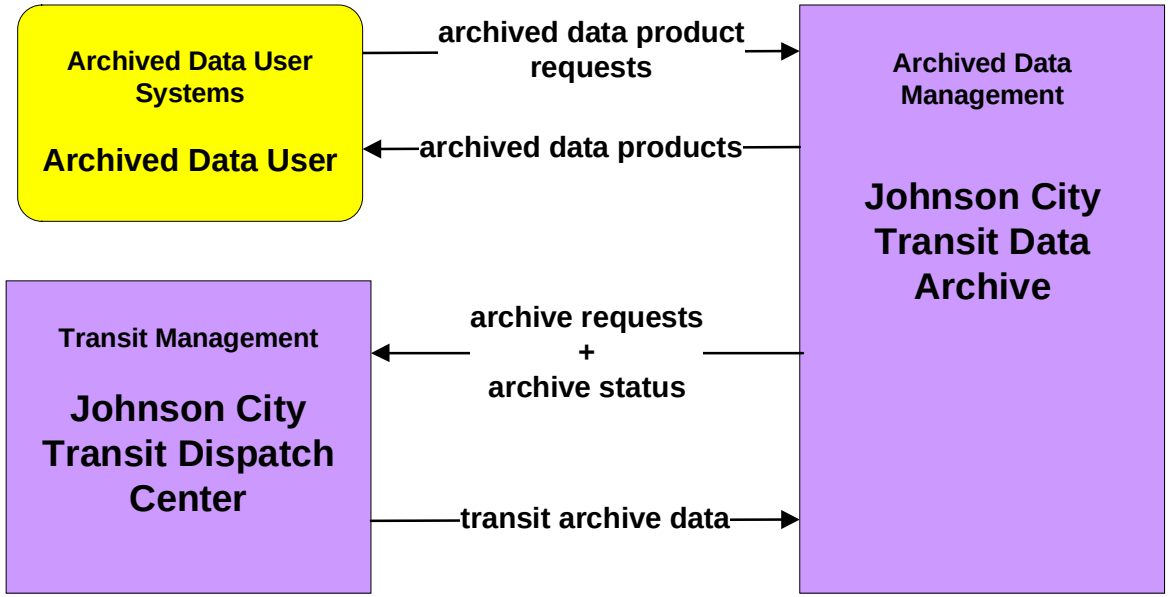
----planned/future flow---->

————existing flow————>

——*user defined flow*——>

Note:
Only reportable crashes are sent to the TITAN database.

AD1 – ITS Data Mart
Johnson City Transit



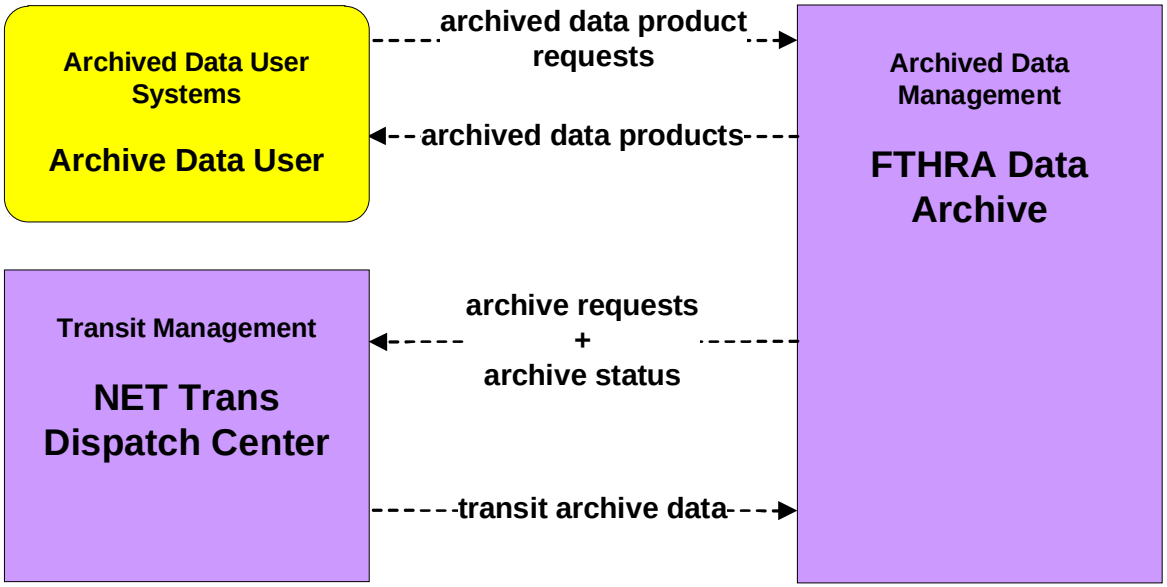
----planned/future flow--->

————existing flow————>

———*user defined flow*———>

Note:
Data archive used by FTA, NTD, and TDOT Division of Multi Modal Transportation Resources, as well as Johnson City Transit staff for planning.

AD1 – ITS Data Mart
First Tennessee Human Resource Agency



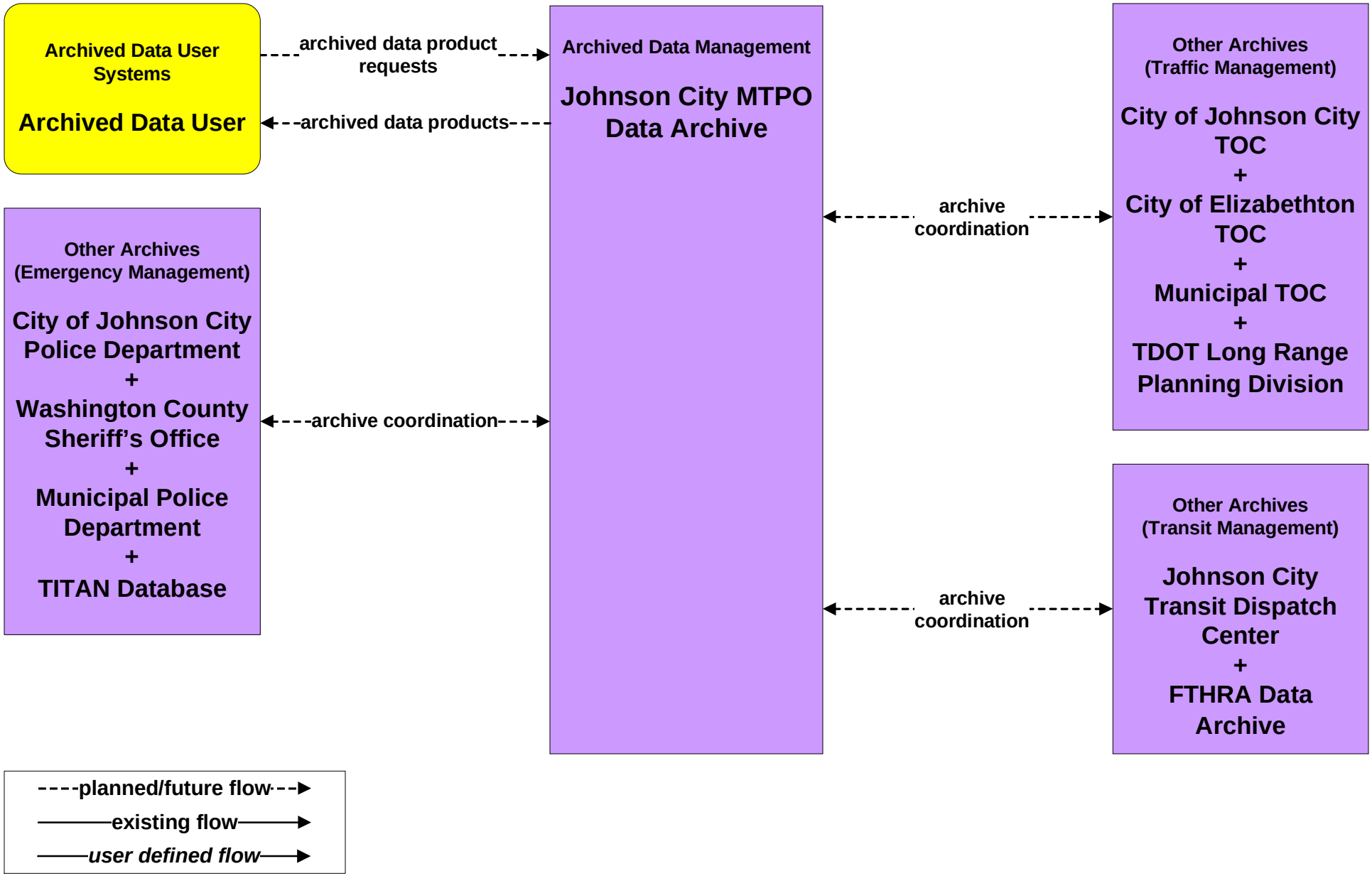
----planned/future flow-->

——————existing flow——————>

———*user defined flow*———>

Note:
Data archive used by FTA, NTD, and TDOT Division of Multi Modal Transportation Resources.

AD3 – ITS Virtual Data Warehouse
Johnson City MTPO



APPENDIX C – ELEMENT FUNCTIONS

Element Name	Equipment Package (Function)
Carter County 911 Communications District	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command
Carter County/Elizabethton Public Safety Vehicles	On-board EV En Route Support
	On-board EV Incident Management Communication
City of Elizabethton CCTV Cameras	Roadway Basic Surveillance
	Roadway Incident Detection
City of Elizabethton DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
City of Elizabethton Field Sensors	Roadway Basic Surveillance
	Roadway Data Collection
	Roadway Incident Detection
City of Elizabethton Mayor's Office	Basic Information Broadcast
	ISP Emergency Traveler Information
City of Elizabethton Public Works Department	MCM Incident Management
	MCM Roadway Maintenance and Construction
	MCM Vehicle and Equipment Maintenance Management
	MCM Vehicle Tracking
	MCM Winter Maintenance Management
	MCM Work Activity Coordination
	MCM Work Zone Management
	MCV Vehicle Location Tracking
City of Elizabethton Public Works Department Vehicles	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Winter Maintenance
	MCV Work Zone Support
City of Elizabethton Speed Monitoring Equipment	Roadway Data Collection
	Roadway Speed Monitoring
City of Elizabethton TOC	Collect Traffic Surveillance
	HRI Traffic Management
	TMC Evacuation Support
	TMC Incident Detection

Element Name	Equipment Package (Function)
City of Elizabethton TOC (continued)	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication
	TMC Regional Traffic Management
	TMC Signal Control
	TMC Speed Monitoring and Warning
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
	Traffic Data Collection
	Traffic Equipment Maintenance
City of Elizabethton Traffic Signals	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Mixed Use Sensing
	Roadway Signal Controls
	Roadway Signal Preemption
	Standard Rail Crossing
City of Elizabethton Website	Basic Information Broadcast
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
City of Johnson City CCTV Cameras	Roadway Basic Surveillance
	Roadway Incident Detection
City of Johnson City Community Relations	Basic Information Broadcast
	ISP Emergency Traveler Information
City of Johnson City DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
City of Johnson City Field Sensors	Roadway Basic Surveillance
	Roadway Data Collection
	Roadway Environmental Monitoring
	Roadway Equipment Coordination
	Roadway Incident Detection
	Roadway Probe Data Communications
Johnson City Flood Detectors	Roadway Basic Surveillance
	Roadway Environmental Monitoring
	Roadway Equipment Coordination

Element Name	Equipment Package (Function)
City of Johnson City Flood Warning Beacons	Roadway Equipment Coordination
	Roadway Warning
City of Johnson City Police Department	Emergency Data Collection
	Emergency Dispatch
	Emergency Routing
City of Johnson City Portable DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
City of Johnson City Rail Notification System	Roadway Equipment Coordination
	Standard Rail Crossing
City of Johnson City Rectangular Rapid Flash Beacons	Roadway Mixed Use Sensing
	Roadway Signal Controls
City of Johnson City RWIS Sensors	Roadway Environmental Monitoring
City of Johnson City Speed Monitoring Equipment	Roadway Data Collection
	Roadway Speed Monitoring and Warning
City of Johnson City Stormwater Management Division	MCM Environmental Information Collection
	MCM Work Activity Coordination
City of Johnson City Stream Gauges	Roadway Environmental Monitoring
City of Johnson City Street Division	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance and Construction
	MCM Vehicle Tracking
	MCM Winter Maintenance Management
	MCM Work Activity Coordination
	MCM Work Zone Management
City of Johnson City Street Division Vehicles	MCV Vehicle Location Tracking
	MCV Work Zone Support
City of Johnson City TOC	Collect Traffic Surveillance
	HRI Traffic Management
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication

Element Name	Equipment Package (Function)
City of Johnson City TOC (continued)	TMC Probe Information Collection
	TMC Regional Traffic Management
	TMC Roadway Warning
	TMC Signal Control
	TMC Speed Monitoring and Warning
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
	Traffic Data Collection
	Traffic Maintenance
City of Johnson City Traffic Signals	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Roadway Mixed Use Sensing
	Roadway Signal Controls
	Roadway Signal Preemption
	Standard Rail Crossing
City of Johnson City Website	Basic Information Broadcast
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
Elizabethton/Carter County EMA	Emergency Evacuation Support
	Emergency Response Management
	Incident Command
FTHRA Data Archive	Government Reporting Systems Support
	ITS Data Repository
Johnson City MTPO Data Archive	Government Reporting Systems Support
	ITS Data Repository
	Virtual Data Warehouse Services
Johnson City Transit Bus Stop DMS	Remote Transit Information Services
Johnson City Transit Center CCTV Surveillance	Field Secure Area Surveillance
Johnson City Transit Data Archive	Government Reporting Systems Support
	ITS Data Repository
Johnson City Transit Demand Response Vehicles	On-board Maintenance
	On-board Paratransit Operations
	On-board Schedule Management

Element Name	Equipment Package (Function)
Johnson City Transit Demand Response Vehicles	On-board Transit Fare Management
	On-board Transit Information Services
	On-board Transit Security
	On-board Transit Trip Monitoring
Johnson City Transit Dispatch Center	Center Secure Area Alarm Support
	Center Secure Area Surveillance
	Transit Center Connection Protection
	Transit Center Fare Management
	Transit Center Fixed-Route Operations
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Passenger Counting
	Transit Center Security
	Transit Center Vehicle Tracking
	Transit Data Collection
	Transit Evacuation Support
	Transit Garage Maintenance
	Transit Vehicle Operator Assignment
Johnson City Transit Fixed Route Vehicles	On-board Connection Protection
	On-board Maintenance
	On-board Passenger Counting
	On-board Schedule Management
	On-board Transit Fare Management
	On-board Transit Information Services
	On-board Transit Security
	On-board Transit Trip Monitoring
Johnson City Transit Kiosks	Remote Basic Information Reception
	Remote Interactive Information Reception
	Remote Transit Fare Management
	Remote Transit Information Services
Johnson City Transit Mobile Phones App	Basic Information Broadcast
	Infrastructure Provided Trip Planning
	Interactive Infrastructure Information

Element Name	Equipment Package (Function)
Johnson City Transit Planner	Personal Autonomous Route Guidance
	Personal Interactive Information Reception
	Personal Trip Planning and Route Guidance
Johnson City Transit Website	Basic Information Broadcast
	Infrastructure Provided Trip Planning
	Interactive Infrastructure Information
Municipal CCTV Cameras	Roadway Basic Surveillance
	Roadway Incident Detection
Municipal Field Sensors	Roadway Basic Surveillance
	Roadway Data Collection
	Roadway Incident Detection
Municipal Police Department	Emergency Data Collection
	Emergency Dispatch
	Emergency Routing
Municipal Public Safety Dispatch	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command
	Mayday Support
Municipal Rail Notification System	Roadway Equipment Coordination
	Standard Rail Crossing
Municipal Speed Monitoring Equipment	Roadway Data Collection
	Roadway Speed Monitoring and Warning
Municipal TOC	Collect Traffic Surveillance
	HRI Traffic Management
	TMC Regional Traffic Management
	TMC Signal Control
	Traffic Information Dissemination
	Traffic Maintenance
Municipal Traffic Signals	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Roadway Signal Controls
	Roadway Signal Preemption

Element Name	Equipment Package (Function)
Municipal Website	Basic Information Broadcast
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
Municipal/County Maintenance	MCM Incident Management
	MCM Roadway Maintenance and Construction
	MCM Work Activity Coordination
	MCM Work Zone Management
Municipal/County Public Safety Vehicles	On-board EV En Route Support
	On-board EV Incident Management Communication
NCDOT Division 13 Maintenance and Construction	MCM Environmental Information Processing
	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Management
NET Trans Demand Response Vehicles	On-board Maintenance
	On-board Paratransit Operations
	On-board Transit Security
	On-board Transit Trip Monitoring
NET Trans Dispatch Center	Transit Center Connection Protection
	Transit Center Fixed-Route Operations
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Vehicle Tracking
	Transit Data Collection
NET Trans Fixed-Route Vehicles	On-board Connection Protection
	On-board Schedule Management
	On-board Transit Security
	On-board Transit Trip Monitoring
NET Trans Website	Basic Information Broadcast
	Infrastructure Provided Trip Planning
	Interactive Infrastructure Information
North Carolina 511 System	Basic Information Broadcast
	Interactive Infrastructure Information
	ISP Traveler Data Collection
	ISP Emergency Traveler Information
	Traveler Telephone Information

Element Name	Equipment Package (Function)
Other TDOT Region District Operations	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Management
Private Sector Traveler Information Services	Infrastructure Provided Trip Planning
	Interactive Infrastructure Information
	ISP Emergency Traveler Information
Private Transportation Providers	Transit Center Multi-Modal Coordination
Private Traveler Personal Computing Devices	Personal Autonomous Route Guidance
	Personal Basic Information Reception
	Personal Interactive Information Reception
	Personal Trip Planning and Route Guidance
Public/Private Vehicles	Vehicle Traffic Probe Support
Rail Operator Wayside Equipment	Roadway Equipment Coordination
	Standard Rail Crossing
Social Networking Services	Basic Information Broadcast
	ISP traveler Information Alerts
TDOT CCTV	Roadway Basic Surveillance
	Roadway Incident Detection
	Roadway Work Zone Traffic Control
TDOT Changeable Speed Limit Signs	Roadway Equipment Coordination
	Roadway Speed Monitoring and Warning
	Roadway Variable Speed Limits
TDOT Community Relations Division	Basic Information Broadcast
	ISP Emergency Traveler Information
	Traveler Telephone Information
TDOT DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
TDOT Emergency Services Coordinator	MCM Incident Management
	MCM Roadway Maintenance and Construction
	TMC Evacuation
	TMC Incident Dispatch Coordination/Communication

Element Name	Equipment Package (Function)
TDOT Field Sensors	Roadway Basic Surveillance
	Roadway Data Collection
	Roadway Equipment Coordination
	Roadway Incident Detection
	Roadway Speed Monitoring and Warning
TDOT HAR	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
TDOT HELP Vehicles	On-board EV En Route Support
	On-board EV Incident Management Communication
TDOT Long Range Planning Division Archive	Government Reporting Systems Support
	ITS Data Repository
	Traffic and Roadside Data Archival
	Traffic Data Collection
TDOT Maintenance Headquarters	MCM Environmental Information Collection
	MCM Environmental Information Processing
TDOT Maintenance Vehicles	MCV Vehicle Location Tracking
	MCV Winter Maintenance
	MCV Work Zone Support
TDOT Ramp Metering Equipment	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Roadway Traffic Metering
TDOT Region 1 District Operations	MCM Data Collection
	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance and Construction
	MCM Vehicle Tracking
	MCM Winter Maintenance Management
	MCM Work Activity Coordination
	MCM Work Zone Management
TDOT Region 1 HELP Dispatch	Emergency Evacuation Support
	Incident Command
	Service Patrol Management

Element Name	Equipment Package (Function)
TDOT Region 1 TMC - Knoxville	Collect Traffic Surveillance
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication
	TMC Regional Traffic Management
	TMC Roadway Warning
	TMC Speed Monitoring and Warning
	TMC Traffic Information Dissemination
	TMC Traffic Metering
	TMC Variable Speed Limits
	TMC Work Zone Traffic Management
	Traffic Data Collection
	Traffic Equipment Maintenance
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
TDOT RWIS Sensors	Roadway Environmental Monitoring
TDOT Smart Work Zone Equipment	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Roadway Incident Detection
	Roadway Safety Warning System
	Roadway Traffic Information Dissemination
	Roadway Variable Speed Limits
	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control
TDOT SmartWay Mobile App	Interactive Infrastructure Information
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
	ISP Traveler Information Alerts
TDOT SmartWay Website	Interactive Infrastructure Information
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
	ISP Traveler Information Alerts

Element Name	Equipment Package (Function)
TDOT Statewide Information for Travelers (SWIFT)	Basic Information Broadcast
	ISP Data Collection
	ISP Emergency Traveler Information
	ISP Operational Data Repository
	ISP Traveler Data Collection
	ISP Traveler Information Alerts
	Traveler Telephone Information
	MCM Data Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Safety Management
TDOT Wrong-Way Detection and Warning Equipment	Roadway Basic Surveillance
	Roadway Equipment Coordination
	Roadway Warning
TEMA	Emergency Evacuation Support
	Emergency Response Management
	Incident Command
Tennessee 511 IVR	Traveler Telephone Information
Tennessee 511 System	Basic Information Broadcast
	Interactive Infrastructure Information
	ISP Emergency Traveler Information
	ISP Traveler Data Collection
	Traveler Telephone Information
Tennessee Bureau of Investigation	Emergency Response Management
	Incident Command
THP Dispatch	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command
THP Vehicles	On-board EV En Route Support
	On-board EV Incident Management Communication

Element Name	Equipment Package (Function)
TITAN Database	Government Reporting Systems Support
	ITS Data Repository
	Virtual Data Warehouse Services
Washington County/Johnson City 911 Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command
Washington County Sheriff's Office	Emergency Data Collection
	Emergency Dispatch
	Emergency Response Management
	Incident Command
Washington County/Johnson City EMA	Emergency Evacuation Support
	Emergency Response Management
	Incident Command
Washington County/Johnson City Public Safety Vehicles	On-board EV En Route Support
	On-board EV Incident Management Communication
Wings Air Rescue Flight Operations	Emergency Dispatch
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command

APPENDIX D – STAKEHOLDER DATABASE

Johnson City Regional ITS Architecture Update
Stakeholder Participation Record

Invitees			Attendance		
Organization	First Name	Last Name	Kick-off Workshop	Interview	Stakeholder Review Workshop
Carter County	Leon	Humphrey			
Carter County Highway Department	Jack	Perkins			
Carter County Sheriff's Department	Dexter	Lunceford			
City of Elizabethton	Johann	Coetzee			
City of Elizabethton	Jerome	Kitchens	X		
City of Elizabethton	Mike	Potter			
City of Elizabethton Fire Department	Barry	Carrier			
City of Elizabethton Police Department	Greg	Workman			
City of Johnson City	Pete	Peterson			
City of Johnson City Police Bureau	Mark	Sirois			
City of Johnson City Fire Department	Mark	Scott			
City of Johnson City IT Department	David	Harrell			
City of Johnson City IT Department	Lisa	Sagona			
City of Johnson City Public Works Department – Traffic Division	Mark	Stidham			X
City of Johnson City Public Works Department – Traffic Division	Anthony	Todd	X	X	X
Elizabeth-Carter County EMA	Gary	Smith			
Federal Highway Administration - TN Division	Pam	Heimsness			
Federal Highway Administration - TN Division	Nick	Renna			
First Tennessee Development District	Chris	Craig	X		X
First Tennessee Development District	Susan	Reid			
Johnson City MTPO	Glenn	Berry	X	X	X
Johnson City MTPO	Mary	Butler			X

Johnson City Regional ITS Architecture Update
Stakeholder Participation Record

Invitees			Attendance		
Organization	First Name	Last Name	Kick-off Workshop	Interview	Stakeholder Review Workshop
Johnson CIty Transit	Wendi	Davis		X	X
Johnson City Transit	Jane	Fillers		X	
Johnson City Transit	Eldonna	Janutolo			
Johnson City Transit	Jeff	Rawles	X	X	X
Johnson City Transit	Emily	Wood		X	
Tennessee Department of Transportation	Rob	Benshoof			
Tennessee Department of Transportation	Mark	Best	X	X	
Tennessee Department of Transportation	Andrew	Christie			
Tennessee Department of Transportation	Mark	Dykes			
Tennessee Department of Transportation	Said	El Said			
Tennessee Department of Transportation	Deborah	Fleming			
Tennessee Department of Transportation	Brad	Freeze			
Tennessee Department of Transportation	Don	Gedge			
Tennessee Department of Transportation	Tanisha	Hall			
Tennessee Department of Transportation	Christy	Haynes			
Tennessee Department of Transportation	Liza	Joffrion			
Tennessee Department of Transportation	Andrew	Padgett			
Tennessee Department of Transportation	Lia	Prince			
Tennessee Department of Transportation	Jack	Qualls			
Tennessee Department of Transportation	Rusty	Staggs			
Tennessee Department of Transportation	Whitney	Sullivan			
Tennessee Department of Transportation	Nathan	Vatter		X	

Johnson City Regional ITS Architecture Update
Stakeholder Participation Record

Invitees			Attendance		
Organization	First Name	Last Name	Kick-off Workshop	Interview	Stakeholder Review Workshop
Tennessee Department of Transportation	Nick	Weander	X		X
Tennessee Department of Transportation	David	Wortham			
Tennessee Emergency Management Agency East Region Office	Judy	Wasik			
Tennessee Highway Patrol	Stephen	Street			
Town of Jonesborough	Bob	Browning			
Town of Jonesborough	Matt	Hawkins			
Town of Jonesborough	Phil	Fritts			
Town of Jonesborough	Matt	Rice			
Town of Jonesborough	Wally	Sparks			
Washington County	Dan	Eldridge			
Washington County – Johnson City Emergency Management Agency	Nester	Levotch			
Washington County – Johnson City Emergency Medical Services	Dan	Wheeley			
Washington County Highway Department	Johnny	Deakins			
Washington County Sheriff's Office	Edwin	Graybeal Jr.			

APPENDIX E – AGREEMENTS

JOHNSON CITY TRANSIT SYSTEM AND JOHNSON CITY MTPO MUTUAL RESPONSIBILITIES AND ROLES AGREEMENT

TDOT, TDOSHS, AND LOCAL GOVERNMENT "OPEN ROADS POLICY" (QUICK CLEARANCE FOR SAFETY AND MOBILITY) MEMORANDUM OF UNDERSTANDING

TDOT LIVE CCTV VIDEO AND INFORMATION SHARING AGREEMENT FOR LOCAL RESPONDER ENTITY USERS

TDOT LIVE CCTV VIDEO ACCESS AGREEMENT FOR PRIVATE ENTITY USERS

AGREEMENT BETWEEN THE

JOHNSON CITY TRANSIT SYSTEM

AND THE

JOHNSON CITY METROPOLITAN PLANNING ORGANIZATION

This Agreement defines mutual responsibilities and roles between the City of Johnson City Transit System (JCT) and the Johnson City Metropolitan Planning Organization (MPO) related to carrying out the Metropolitan Planning process under the urban planning requirements as defined under SAFETEA-LU.

1. The Director of the Johnson City Transit System shall be a permanent member of the Executive Staff of the Johnson City Metropolitan Planning Organization with equivalent status to any other voting member of the Executive Staff.

2. Johnson City Transit relies on the MPO Public Participation Process. The MPO will develop a Long-Range Transportation Plan which will include a section on area public and private transportation providers, including the Johnson City Transit system. The MPO public participation process allows interested parties (including transit employees and representatives of users of public transportation) with a reasonable opportunity to comment on the long-range transportation plan. Copies of the long-range transportation plan will be made available to the public in written (at JCMPO offices, Johnson City Public Library, and area agencies as stipulated in the *Johnson City MPO Public Involvement Policy*) and electronic format (www.jcmpo.org), with Spanish summaries available upon request. Public comments may be submitted to the MPO Coordinator in writing or by e-mail, and will be taken into consideration by MPO staff, with adjustments made as appropriate.

3. The JCT staff and MPO staff shall jointly prepare work tasks and share responsibilities for work performed under the Unified Planning Work Program which includes financial participation from Sections 5503 and 5307 of the Federal Transit Administration's (FTA) assistance for transit planning.

4. The JCT staff and MPO staff shall jointly prepare the annual Transportation Improvement Program (TIP), with the JCT staff providing the list of JCT projects to be included in the TIP. These projects will include capital and operating budgets and grant requests related to public

transportation services. JCT, in cooperation with TDOT and the MPO, will develop estimates of funds reasonably expected to support the proposed projects in the TIP, and these funds will be listed by funding source and project in the TIP. The MPO staff will coordinate submittal of the TIP for inclusion in the State of Tennessee's Transportation Improvement Program (STIP).

5. The MPO staff and JCT staff shall jointly work to implement the Job Access and Intelligent Transportation Systems projects developed under the guidance of SAFETEA-LU. JCT staff shall serve on technical and other relevant project committees established by the MPO Executive Board and Executive Staff.

6. Development of transportation plans and studies related to public transit services will be joint responsibilities of the JCT and MPO staffs with final review authority on staff recommendations vested with the JCT Director, subject to public comment and review provisions applicable for each study or project.

7. All transportation planning and project activities and projects in the UPWP shall be considered in an intermodal framework with respect to the important role public transportation services have for a significant portion of the elderly, handicapped, and disadvantaged population.

Date: March 17, 2008

Eldonna Janutolo

Eldonna Janutolo, Director, Johnson City Transit System

Glenn Berry, Transportation Planning Coordinator
Johnson City Metropolitan Planning Organization

State of Tennessee

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Between the Tennessee Department of Transportation,

Tennessee Department of Safety and Homeland Security, and

Tennessee Counties and Cities

This Memorandum of Understanding (MOU) by and between the Tennessee Department of Transportation (TDOT), the Tennessee Department of Safety and Homeland Security (TDOSHS), County/City Law Enforcement and Fire and Rescue Agencies (City/County Agencies), establishes a policy for the Tennessee Highway Patrol (THP), TDOT, City/County Agencies to expedite the removal of vehicles, cargo, and debris from roadways on the State Highway System (roadways) to restore, in an URGENT MANNER the safe and orderly flow of traffic following a motor vehicle crash or incident on Tennessee's roadways. This MOU is intend to complement the existing Memorandum of Understanding between TDOT and TDOSHS entered into on February 16, 2012, and does not supersede or circumvent any of the components of that document between the two State departments.

Whereas: Public safety is the highest priority and must be maintained especially when injuries or hazardous materials are involved. The quality of life in the State of Tennessee is heavily dependent upon the free movement of people, vehicles, and commerce. THP, TDOT, and City/County Agencies share the responsibility for achieving and maintaining the degree of order necessary to make this free movement possible. THP, TDOT, and City/County Agencies have the responsibility to do whatever is reasonable to reduce the risk to responders, secondary crashes, and delays associated with incidents, crashes, roadway maintenance, construction, and enforcement activities.

The following operating standards are based on the philosophy that the State Highway System will not be closed or restricted any longer than is absolutely necessary.

Be it resolved: Roadways will be cleared of damaged vehicles, spilled cargo, and debris as soon as it is safe to do so. It is understood that damage to vehicles or cargo may occur as a result of clearing the roadway on an urgent basis. While reasonable attempts to avoid such damage shall be taken, the highest priority is restoring traffic to normal conditions. Incident caused congestion has an enormous cost to society. This cost is significantly greater than the salvage value of an already damaged vehicle and its cargo.

Tennessee Highway Patrol Responsibilities

Members of the THP who respond to the scene of traffic incidents will make clearing the travel portion of the roadway a high priority. When an investigation is required, it will be conducted in as expedient a manner as possible considering the severity of the collision. Non-critical portions of the investigation may be delayed until lighter traffic conditions allow completion of those tasks. The THP will only close those lanes absolutely necessary to conduct the investigation safely. THP will coordinate with TDOT representatives to set up appropriate traffic control, establish alternate routes, expedite the safe movement of traffic trapped at the scene, and restore the roadway to normal as soon as possible.

Whenever practical, crashes on access controlled roadways will be removed to off ramps, accident investigation sites or other safe areas for completion of investigations to reduce the delays associated with motorists slowing to "gawk". Tow trucks will be requested a soon as it is evident that they will be needed to clear the roadway. THP will assure that all authorized tow operators have met established competency levels and that the equipment is of appropriate size, capacity and design meeting the standards for the State of Tennessee.

The THP will not unnecessarily cause the delay in reopening all or part of a roadway to allow a company to dispatch their own equipment to off-load cargo or recover a vehicle or load that is impacting traffic during peak traffic hours or creating a hazard to the public. The THP and TDOT will cooperate in planning and implementing clearance operations in the most safe and expeditious manner.

Tennessee Department of Transportation Responsibilities

When requested by the THP or City/County Agencies, TDOT will respond and deploy resources to major traffic incidents 24 hours a day, 7 days per week. Each TDOT District will develop and implement response procedures to meet the goal of providing initial traffic control within **30 minutes** of notification during normal working hours and **60 minutes** after hours and on weekends.

TDOT, in cooperation with the THP, will determine and deploy the necessary heavy equipment and manpower to reopen the roadway if clearance of the travel lanes are being delayed or is determined that the task is beyond the capabilities of the wrecker service on scene. If cargo or non-hazardous spilled loads are involved, TDOT will make every effort to assist in the relocation of the materials in the shortest possible time, using whatever equipment necessary. All such materials or any vehicles relocated by TDOT will be moved as short a distance as possible to eliminate the traffic hazard.

TDOT personnel will document all hours and equipment used for traffic control, roadway clearance, and debris clean up. TDOT will place traffic control devices at the scene should any damaged vehicles or cargo remain adjacent to the travel lanes on the shoulder for removal at a later time.

The THP and TDOT will continually work together to ensure that the needs of motorists on our roadways are being met in the most professional, safe, and efficient manner.

Local Law Enforcement, Fire and Rescue Department Responsibilities

Members of City/County Agencies who respond to the scene of traffic incidents will make clearing the travel portion of the roadway a high priority. When investigating an incident, the investigation will be conducted in as expedient a manner as possible considering the severity of the collision (serious injuries, fatality, or hazardous materials). City/County Agencies will close only those lanes absolutely necessary to safely conduct the fire/rescue operations. City/County Agencies will coordinate with TDOT representatives to set up appropriate traffic control, establish alternate routes, expedite the safe movement of traffic trapped at the scene, and restore the roadway to normal conditions as soon as possible. As soon as TDOT has set up appropriate traffic control for the safety of the responders and travelers, City/County Agencies will move any fire/rescue apparatus or vehicles initially used to shield responders to appropriate areas.

Therefore, it is agreed as follows:

The THP, TDOT, and City/County Agencies, will evaluate and continually update and modify their operating policies, procedures, rules, and standards to assure they are consistent with this **"OPEN ROADS POLICY"** MOU.

The THP, TDOT, and City/County Agencies, will research, evaluate and conduct training in the most advanced technologies, equipment, and approved methods for the documentation and investigation of crash or incident scenes. THP and City/County Agencies will prioritize the investigative tasks and reopen travel lanes upon completion of tasks that must be conducted, without the impediment of traffic flowing.

Roadways will be cleared as soon as possible. It is the goal of THP, TDOT, and City/County Agencies that **all incidents be cleared from the roadway within 90 minutes of the arrival of the first responding officer.** This goal is being made with the understanding that a more complex scenario may require additional time for complete clearance. Incidents that extend beyond the 90 minute goal will be assessed every 30 minutes to determine an expected clearance time and reported to the appropriate communications center.

City/County Agencies will determine the well-being of motorists in the event of a lengthy traffic queue and /or roadway closure and provide assistance to motorists within the stopped traffic queue whenever possible.

City/County Agencies will establish a local Highway Incident Management Committee that will include Local Law Enforcement, Fire and Rescue Departments and all other City/County agencies that respond to roadway incidents for the purpose of optimizing communication, coordination and collaboration at roadway incident scenes. The Committee will meet at least bi-monthly

It is further agreed that:

The THP, TDOT, and City/County Agencies, will actively solicit and enlist other state, county, and local agencies, political subdivisions, industry groups, and professional associations to endorse and become party to this **"OPEN ROADS POLICY"** for the State of Tennessee.

MOU Execution: ***Use of Counterpart Signature Pages***

This MOU, and any amendments hereto may be simultaneously executed in multiple counterparts, each of which so executed shall be deemed to be an original, and such counterparts together shall constitute one and the same instrument. Notwithstanding any other provision herein to the contrary, this MOU shall constitute an agreement amongst the parties that have executed a counterpart and parties listed but not executing shall not be deemed to be parties to the MOU.

In witness whereof, each party hereto has caused this document to be executed in its name and on its behalf by it's duly authorized Chief Executive.

TENNESSEE DEPARTMENT OF TRANSPORTATION

By: _____
Commissioner

Date: 10/12/2012

TENNESSEE DEPARTMENT OF SAFETY AND HOMELAND SECURITY

By: _____
Commissioner

Date: 9/19/12

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Johnson City Police Department

Local Agency

By: _____

Print/Type Name: Mark Sirois

Title: Chief of Police

Date: 4-6-14

ADDITIONAL SIGNATORIES

Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Washington County Sheriffs Office
Local Agency

By: Ed Grayberal Jr

Print/Type Name: ED GRAYBERAL JR

Title: Sheriff

Date: 9-10-13

ADDITIONAL SIGNATORIES

Name	Title	Date
Les Lenton	Director W.C.EMA	9 Sept 2013

Name Title Date

Name Title Date

Name Title Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Johnson City Fire Department

Local Agency

By: Mark A. Scott

Print/Type Name: Mark A. Scott

Title: Chief

Date: 11/07/2013

ADDITIONAL SIGNATORIES

Name	Title	Date
Name	Title	Date
Name	Title	Date
Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

FALL BRANCH VOLUNTEER FIRE DEPARTMENT

Local Agency

By: James M. Dawson, Operations Chief

Print/Type Name: JAMES M. DAWSON

Title: OPERATIONS CHIEF

Date: 10/1/13

ADDITIONAL SIGNATORIES

Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Sulphur Springs Vol. Fire Department
Local Agency

By: [signature]

Print/Type Name: Bruce Brocklebank

Title: Assistant Chief

Date: October 1, 2013

ADDITIONAL SIGNATORIES

Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Em Breeville Volunteer Fire Dept.
Local Agency

By: Earl Greene

Print/Type Name: Earl Greene

Title: Chief

Date: 10-2-2013

ADDITIONAL SIGNATORIES

Name	Title	Date
Peter Jackson	Captain	10-2-2013

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Nolichuckey Valley Volunteer Fire Department
Local Agency

By: Charles A. Baines

Print/Type Name: Charles A. Baines

Title: Chief

Date: Oct. 1, 2013

ADDITIONAL SIGNATORIES

Name	Title	Date
Name	Title	Date
Name	Title	Date
Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

Limestone Vol Fire Dept
Local Agency

By: Stephen Archer

Print/Type Name: Stephen Archer

Title: Chief

Date: 10-01-2013

ADDITIONAL SIGNATORIES

Name	Title	Date
Name	Title	Date
Name	Title	Date
Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

GRAY VOL. FIRE DEPT.

Local Agency

By: Chris Rogers

Print/Type Name: CHRIS ROGERS

Title: CHIEF

Date: 10-01-13

ADDITIONAL SIGNATORIES

Name	Title	Date
Name	Title	Date
Name	Title	Date
Name	Title	Date

Tennessee Department of Transportation

TRAFFIC OPERATIONS PROGRAM POLICY

Effective Date:

Title: Access to Live Video feeds and Information Sharing

POLICY

The Tennessee Department of Transportation (TDOT) will make live video of traffic conditions from Closed Circuit Television (CCTV) available to the public. CCTV feeds from the Regional Transportation Management Centers (RTMC), located in Nashville, Knoxville, Chattanooga, and Memphis, will be supplied through TDOT's SmartView CCTV web site. The video feeds provided are those made available by the RTMC Operators from the images on the traffic surveillance monitors within the RTMC and that are consistent with the objectives of traffic management.

Live video feeds will generally be made available upon request to other government and public agencies to better coordinate traffic management strategies on incidents and crashes, and to private news media and other organizations for their use in providing traffic information to the public or their customers.

A non-exclusive access Agreement is required in order for governmental and private interests to receive access to live video. Costs associated with the access connection, if any, will be determined by TDOT and may become the responsibility of the USER.

BACKGROUND

In order to gather real-time traffic condition information, TDOT has constructed and operates four Regional Traffic Management Centers located in Nashville, Knoxville, Chattanooga, and Memphis. The RTMC is the central collection point for roadway condition information. The RTMC support systems gather and disseminate traffic information using the latest technologies.

CCTV has proven to be a significant management and delay-reduction tool for the identification and verification of incidents and crashes, thereby enabling a proper and timely response. The sharing of video information enhances the communication of current traffic conditions, thereby aiding travelers in planning their trip times, routes, and travel mode using the latest available information. TDOT will operate and maintain the CCTV system for the purpose of enhancing traffic incident response on the Tennessee roadway system. TDOT wishes to share that traffic information with other transportation operating agencies, incident response agencies and the public.

Tennessee Department of Transportation
And
Responder Entity USERs

ACCESS AGREEMENT FOR LIVE VIDEO AND INFORMATION SHARING

This Access Agreement for Live Video and Information Sharing is an Agreement between the Tennessee Department of Transportation (TDOT) and _____hereafter referred to as the "USER."

The effective date of this Agreement is _____.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Tennessee Department of Transportation Regional Transportation Management Centers (RTMC) operated by TDOT. The CCTV feeds will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, maintenance work, and repair work locations.

The purpose of providing the USER with Access to Live Video is to detect and disseminate real-time traffic information to motorists and improve incident response and recovery. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information is used for this purpose and this purpose alone.

Information Sharing, as defined in this agreement, is that information provided or discovered by the USER which has an adverse traffic impact on any Tennessee Interstate, State Route, and that which adversely affects travelers. Any information that falls within this definition will be shared with the TDOT RTMC within 10 minutes of receiving such information. See section 2.I.

The USER hereby acknowledges and agrees that other matters not specifically addressed in this Agreement may arise and that TDOT shall have the right to make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes to this Agreement to the USER at which time the USER may or may not accept the revisions. Not accepting future revisions may result in the USER being denied access to the live video feeds.

USER shall also retain the right to terminate this Agreement as provided herein.

1. **GENERAL INFORMATION:**

A. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video and Information Sharing. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video image or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.

B. TDOT will not record video feeds except for staff training purposes, and no files will be made available to the USER under this Agreement.

C. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.

D. TDOT RTMC personnel will not accept requests that specific CCTV cameras are operated or repositioned.

E. TDOT will provide each USER the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential USER.

F. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the RTMC at any time.

G. TDOT will provide training opportunities to all entities named in this Agreement and encourage participation in said training.

2. **USER'S RESPONSIBILITIES:**

A. USER is exclusively responsible for any costs related to the purchase and installation of the equipment necessary to receive the live video feed. User will be required to remove previously installed equipment from the RTMC (if any). USER is exclusively responsible for any costs related to the removal of this equipment. USER must give RTMC personnel

reasonable advance notice to schedule an appointment to remove equipment and RTMC personnel reserve the right to schedule such at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER staff at the RTMC shall be under the general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

B. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals within their agency, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an incident where individuals or license numbers are recognizable.

C. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feeds, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. The USER agrees to hold TDOT harmless, including TDOT employees and TDOT designated agents, from any damages caused to USER by loss of a video signal due to equipment failure or any act or omission on their part.

D. USER agrees to provide TDOT with a technical contact person and with a list of all USER personnel trained to operate the TDOT SmartView system. USER shall limit technical calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on the SmartView system.

E. USER agrees to acknowledge that the video feeds are provided by the Tennessee Department of Transportation.

F. USER agrees to display the SMARTWAY logo in the upper left hand corner of any view provided outside of the agency.

G. USER agrees to actively participate in the National Traffic Incident Management Responder Training Program. USER agrees that any employee of the agency reporting to the scene of an incident shall attend one 4-hour, in-person, National Traffic Incident Responder Training Program session within one year of the signing of this document. Training sessions will be provided for free and coordinated between the USER and TDOT.

H. USER agrees to support and abide by the concept of a safe and quick clearance approach to traffic incidents and events, as defined by the National Traffic Incident Responder Training Program.

I. USER agrees to provide timely, accurate information and assistance to TDOT or other agencies, responders and roadway users about roadway conditions, major and minor incidents and alternate routes through the use of any USER resources.

i. USER agrees to notify the RTMC of their surrounding TDOT Region of any unexpected incidents that are expected to have an adverse impact on traffic operations of Interstate or State Routes, within 10 minutes of first notification to the USER. This applies to any incident where TDOT or the Tennessee Highway Patrol is not already on-scene. Unexpected incidents may include, but are not limited to: traffic crashes, disabled vehicles, roadway debris, hazardous weather conditions, traffic queues, or traffic signal failures.

ii. USER agrees to collaborate with TDOT with respect to traffic management of planned events that are expected to have an adverse impact on traffic operations of Interstate or State Routes. Planned events include temporary traffic generating events (such as concerts or fairs) and roadway work zone activities (such as construction or maintenance activities). Collaboration and information sharing between USER and TDOT should occur as early as possible.

J. USER agrees to actively participate in quarterly Regional Traffic Incident Management meetings. USER agrees to provide the names of a primary and alternate individual with the authority to speak on behalf of the USER at these quarterly meetings.

3. **LIABILITY AND INDEMNITY PROVISIONS:**

A. USER agrees to defend, indemnify, and hold TDOT harmless from and against any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system to the extent that such expenses or liability may be incurred by TDOT, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.

B. The liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or

privacy occurring as a proximate result of information made available from the CCTV system.

4. **TERMINATION:**

A. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

State of Tennessee
Department of Transportation

Approved as to Form:

By:_____ _____
John Schroer John Reinbold
Commissioner General Counsel

Date:_____

USER AGENCY_____

By_____

(Print Name)_____

(Title)_____

Date:_____

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

Live CCTV Video Access Agreement Between
Tennessee Department of Transportation
And
Private Entity Users

Tennessee Department of Transportation
And
Private Entity Users

ACCESS AGREEMENT FOR LIVE VIDEO

This Access Agreement for Live Video (Agreement), is an agreement between the Tennessee Department of Transportation (TDOT) and InterLink USA, hereinafter referred to as the "USER."

The effective date of this Agreement is Jan. 1, 2013.

The "Access to Live Video" is that video provided by a Closed Circuit Television (CCTV) system developed for traffic management and provided by the Knoxville Transportation Management Center (TMC) which is operated by TDOT. The CCTV images will show live traffic conditions including crashes, stalled vehicles, road hazards, weather conditions, traffic congestion, and maintenance and repair work locations.

The purpose of providing the USER with Access to Live Video is to disseminate real-time traffic information to motorists and public safety agencies. The following provisions of this Agreement are intended to ensure that the CCTV system is accessed and its information used for this purpose, and this purpose alone.

The USER hereby acknowledges that other matters not addressed in this Agreement may arise after the signing of this agreement. Therefore, TDOT reserves the right to amend this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes. TDOT shall provide prior written notice of any such changes in this Agreement. USER shall retain the right to terminate this Agreement as provided hereinbelow.

A. GENERAL INFORMATION:

1. TDOT will operate and maintain the CCTV system as a traffic management tool and, consistent with this purpose, TDOT agrees to provide the USER with Access to Live Video. TDOT does not guarantee the continuity of this access, and TDOT does not warrant the quality of any video image or the accuracy of any image or information provided. Any reliance on such images or information is at the risk of the USER.

2. TDOT will not record video images except for staff training purposes, and no videotapes will be made available to the USER under this Agreement.

3. TDOT will maintain exclusive control of the information and images released from the CCTV system to the USER, including but not limited to determining whether and when to provide a CCTV system feed, from what location, and for what duration. No feed will deploy the cameras' zoom capabilities, and no image will focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident. No image will focus on any property or person outside the TDOT right-of-way. Access via feed will not be provided for events that are not, in the opinion of TDOT personnel, traffic-related. The decision whether to activate, and upon activation to terminate the access, is exclusively at the discretion of TDOT personnel.

4. TMC personnel will not accept requests that specific CCTV cameras be operated or that cameras be repositioned.

5. Each USER will receive the same video feed from the CCTV system as any other USER participating in this Agreement. This Agreement in no way limits or restricts TDOT from providing video information to any other potential USER.

6. TDOT reserves the right to terminate this video access program or to change the areas, times, or levels of access within the TMC at any time.

7. TDOT cannot guarantee camera availability to USER.

8. TDOT will provide approximately 10 units of rack space and up to six 120 volt electrical outlets for USER equipment. The electrical outlets will be on a UPS of sufficient size to handle a total load of fifteen amperes. The space and electrical will be provided at the Knoxville Transportation Management Center.

9. TDOT will provide up to two 10/100 Megabit ports on the main network switch located at Knoxville Transportation Management Center for connection of up to two MPEG video decoder(s) appliances. Any additional ports will have to be approved by TDOT prior to connection.

10. TDOT will allow USER to access the video multicast streams from all TDOT Region 1 cameras unless there is an operational reason not to do so. TDOT expressly prohibits USER from attempting to gain any other type of access to the cameras including, but not limited to, taking operational control of the cameras or any other TDOT owned device.

11. TDOT reserves the right, for operational reasons, to temporarily block camera images/streams from going to the internet. TDOT may use any method it deems necessary to accomplish this, including the removal of USER's network connection(s). TDOT agrees that the preferred method would be a software solution provided by USER at no cost to TDOT.

B. USER'S RESPONSIBILITIES:

1. USER may install necessary equipment at the TMC in order to obtain the video feed; the USER is exclusively responsible for any costs related to the purchase and installation of the equipment. TDOT personnel shall determine at what location within the TMC the equipment is to be placed, and TDOT reserves the right to inspect all installation of equipment. Under no circumstances shall the placement and installation of USER's equipment interfere with TMC equipment or activities of TMC personnel. The responsibility for the service, maintenance, and upkeep of the installed equipment is exclusively that of the USER. USER must give TMC personnel reasonable advance notice of any maintenance/repair visits, and TMC personnel reserves the right to schedule such visits at a time and in such a manner so as to not interrupt or otherwise obstruct TMC operations. USER assumes any and all liability for the cost of any repair and/or other damages to TDOT's CCTV system caused in any manner by the installation, servicing or maintenance of the USER's equipment or by the equipment once installed. USER staff at the TMC shall be under the general direction of the TMC Manager for routine conduct, privileges, and protocols within the TMC.

2. USER shall maintain the security and integrity of the CCTV system by limiting use of the system to trained and authorized individuals, and by insuring the system is used for the specific purpose stated in this Agreement. No feed shall be purposely broadcast live or rebroadcast that is zoomed in on an accident where individuals or license numbers are recognizable.

3. USER agrees to move or alter, at its own expense, any of its equipment, hardware, or software, as TDOT deems necessary to accommodate future alterations, improvements, or other changes to the TMC equipment or facilities.

4. USER accepts all risks inherent with the live video feeds, including, but not limited to, interruptions in the video feed, downtime for maintenance, or unannounced adjustments to the camera displays. TDOT is providing the video feeds as a convenience to the private media company and agrees to provide a good faith effort to maintain the video feed from TDOT equipment. The USER agrees to hold TDOT harmless, including TDOT employees and TDOT-designated agents, from any damages caused by loss of a video signal due to equipment failure or any unintentional act on their part.

5. USER agrees to provide TDOT with a technical contact person and with a list of all USER's owned and supplied equipment connected to the TMC, including the basic operational capabilities of such equipment. USER shall limit calls to the TMC for monitoring, diagnosing problems or otherwise performing any minor service on USER owned and supplied equipment.

6. USER agrees to acknowledge the video images are provided by the Tennessee Department of Transportation both verbally and by including the vertical or horizontal orientation of the TDOT SmartWay logo on the camera image.

7. USER will provide TDOT with an easily accessible mechanism to block one or more camera images/streams from the internet.

8. USER will only have access to the Region 1 TMC equipment room when accompanied by a TDOT employee. USER will schedule access by calling TMC personnel ahead of time.

9. USER will be allowed to place up to two rack mounted video MPEG decoder appliances, each capable of decoding one video stream at a time, into the provided rack space at the Knoxville Transportation Management Center. Any additional decoders will have to be approved by TDOT prior to connection.

10. USER will be allowed to place up to two rack mounted servers into the provided rack space at the Knoxville Transportation Management Center. These servers will not be connected to the TDOT network. They will access video streams only via an analog connection to the decoder(s) placed by USER. Any additional servers will have to be approved by TDOT prior to connection.

C. LIABILITY AND INDEMNITY PROVISIONS:

1. The USER agrees to defend, indemnify, and hold TDOT harmless from and against any and all liability and expense, including defense costs and legal fees, caused by any negligent or wrongful act or omission of the USER, or its agents, officers, and employees, in the use, possession, or dissemination of information made available from the CCTV system to the extent that such expenses or liability may be incurred by TDOT, including but not limited to, personal injury, bodily injury, death, property damage, and/or injury to privacy or reputation.

2. The liability obligations assumed by the USER pursuant to this Agreement shall survive the termination of the Agreement, as to any and all claims including without limitation liability for any damages to TDOT property or for injury, death, property damage, or injury to personal reputation or privacy occurring as a proximate result of information made available from the CCTV system.

D. TERMINATION:

1. TDOT or USER may terminate this Agreement at any time for any reason by providing written notice of termination.

2. Upon termination of this Agreement by either party, the USER shall promptly remove its equipment from the TMC as directed by TDOT.

State of Tennessee
Department of Transportation

By:_____ Date: FEB 2 0 2013
JOHN SCHROER
Commissioner

Approved as to Form:

By:_____ Date: 2/8/13
General Counsel

InterLink USA

By_____

(Print Name) Jeffrey R. Dobson, Ph.D.

(Title) President

Date: Jan. 29, 2013

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

APPENDIX F – REGIONAL ITS ARCHITECTURE MAINTENANCE FORM

Johnson City Region Regional ITS Architecture
Maintenance Form

Please complete the following form to document changes to the 2015 Johnson City Regional ITS Architecture. Forms should be submitted to the Johnson City Metropolitan Transportation Planning Organization (MTPO) for review and acceptance. All accepted changes will be kept on file by the MTPO and shared with the TDOT Traffic Operations Division. Changes will be incorporated into the 2015 Johnson City 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 service 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 service packages that impact only one agency in the Regional ITS Architecture.
  Examples include: Addition of a new ITS service package or changes to data flow connections of an existing ITS service package. The addition or changes 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: 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.
- ☐ Other: _____
  _____

Submittal

Please submit ITS Architecture Maintenance Documentation form to:

Johnson City Metropolitan Transportation Planning Organization
137 West Market Street
Johnson City, TN 37604
Phone: 423-434-6272
E-mail: jcmpo@jcmpo.org

Form Submittal Date: _____

Johnson City Region Regional ITS Architecture
Maintenance Form

Question 1 Describe the requested change to the Regional ITS Architecture or Deployment Plan.	
Question 2 Are any of the Regional ITS Architecture service packages impacted by the proposed change?	☐ Yes: Please complete Questions 2A and 2B ☐ No: Please proceed to Question 3 ☐ Unknown: Please coordinate with the Johnson City MTPO to determine impacts of the change to the Regional ITS Architecture
Question 2A List all of the ITS service packages impacted by the proposed change.	
Question 2B Include a copy of the ITS service packages impacted by the proposed change and mark any proposed modifications to the ITS service packages. Add any additional notes on proposed changes in this section.	
Question 3 Does the proposed change impact any stakeholder agencies other than the agency completing this form?	☐ Yes: Please complete Questions 3A and 3B ☐ No: Form is complete ☐ Unknown: Please coordinate with the Johnson City MTPO to determine impacts of change to other agencies in the Regional ITS Architecture
Question 3A Identify the stakeholder agencies impacted by the change and a contact person for each agency.	
Question 3B Describe the coordination that has occurred with the stakeholder agencies and the results of the coordination?	

Johnson City Region Regional ITS Architecture

Maintenance Form (Example of Completed Form)

Question 1 Describe the requested change to the Regional ITS Architecture or Deployment Plan.	*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.*
Question 2 Are any of the Regional ITS Architecture service packages impacted by the proposed change?	☑ Yes: Please complete Questions 2A and 2B ☐ No: Please proceed to Question 3 ☐ Unknown: Please coordinate with the Johnson City MTPO to determine impacts of the change to the Regional ITS Architecture
Question 2A List all of the ITS service packages impacted by the proposed change.	*Example: ATMS08 – Traffic Incident Management System* *ATMS01 – Network Surveillance*
Question 2B Include a copy of the ITS service packages impacted by the proposed change and mark any proposed modifications to the ITS service packages. Add any additional notes on proposed changes in this section.	*Example: A sketch of the ATMS08 – Traffic Incident Management System service 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 service package diagram. (Note: The ITS service package diagrams can be found in Appendix B of the Regional ITS Architecture.)*
Question 3 Does the proposed change impact any stakeholder agencies other than the agency completing this form?	☑ Yes: Please complete Questions 3A and 3B ☐ No: Form is complete ☐ Unknown: Please coordinate with the Johnson City MTPO to determine impacts of change to other agencies in the Regional ITS Architecture
Question 3A Identify the stakeholder agencies impacted by the change and a contact person for each agency.	*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.)*
Question 3B Describe the coordination that has occurred with the stakeholder agencies and the results of the coordination?	*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.*