CLARKSVILLE URBANIZED AREA

Regional Intelligent Transportation System Architecture and Deployment Plan

CLARKSVILLE URBANIZED AREA
Metropolitan Planning Organization

Prepared by

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Clarksville Urbanized Area

Regional ITS Architecture and Deployment Plan

Final Report

A Clarksville Urbanized Area Metropolitan Planning Organization Project

Prepared by:

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TABLE OF CONTENTS

Executive Summary ..... **vii**

1.0 Introduction **1**

1.1 Project Overview *1*

1.2 Clarksville Regional Area *3*

2.0 Regional ITS Architecture Update Process **11**

2.1 Stakeholder Input *11*

2.2 Regional ITS Architecture Software *12*

3.0 Regional ITS Needs **15**

4.0 Regional ITS Inventory **19**

4.1 Stakeholders *19*

4.2 ITS Elements *21*

5.0 Regional ITS Architecture **36**

5.1 ITS Service Packages *38*

5.2 Architecture Interfaces *56*

5.3 Functional Requirements *59*

5.4 Standards *60*

5.5 Cyber Security *64*

5.6 Operational Concepts *66*

5.7 Existing and Planned Agreements *75*

5.8 Phases of Implementation *78*

6.0 Regional ITS Deployment Plan **79**

6.1 Deployment Plan Project Development Process *79*

6.2 Existing ITS Deployments *81*

6.3 ITS Project Recommendations *83*

7.0 Use and Maintenance Plan **90**

7.1 Incorporation into the Regional Planning Process *91*

7.2 Systems Engineering Analysis *91*

7.3 Process for Determining ITS Architecture Conformity *92*

7.4 Regional ITS Architecture Maintenance Process *94*

7.5 Procedure for Submitting ITS Architecture Changes Between Major Updates *95*

TABLE OF CONTENTS

Appendix A – Service Package Definitions

Appendix B – Element Functions

Appendix C – Agreements

Appendix D – Architecture Maintenance Documentation Form

TABLE OF CONTENTS

List of Figures

Figure 1 – CUAMPO Boundaries 4
Figure 2 – Regional ITS Architecture and Deployment Plan Development Process 11
Figure 3 – Example ITS Service Package Diagram: TM06 Traffic Information Dissemination (City of Clarksville) 43
Figure 4 – Clarksville ITS Regional System Interconnect Diagram 57
Figure 5 – Example Context Diagram: City of Clarksville Traffic Signals 58
Figure 6 – Project Development and Selection Process 80

TABLE OF CONTENTS

List of Tables

Table 1 – Clarksville Regional Stakeholder Agencies and Contacts.....7
Table 2 – RAD-IT and SET-IT Report and Diagrams 14
Table 3 – Summary of Clarksville Regional ITS Needs.....17
Table 4 – Clarksville Urbanized Area Stakeholder Descriptions.....20
Table 5 – Clarksville Regional Inventory of ITS Elements 22
Table 6 – Clarksville Regional ITS Architecture Service Areas 37
Table 7 – Clarksville Urbanized Area ITS Service Package Prioritization by Service Area.....40
Table 8 – Regional Service Packages with Corresponding Agency 44
Table 9 – Clarksville Regional ITS Needs and Corresponding Service Packages.....53
Table 10 – Clarksville Regional ITS Standards 61
Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities 67
Table 12 – Clarksville Regional Area Existing and Potential ITS Agreements.....77
Table 13 – Clarksville Regional Existing ITS Deployments 82
Table 14 – State ITS Deployment Plan Projects 84
Table 15 – Local ITS Deployment Plan Projects 86
Table 16 – Transit ITS Deployment Plan Projects.....88
Table 17 – Other ITS Deployment Plan Projects.....89
Table 18 – Regional ITS Architecture and Deployment Plan Maintenance Summary 94

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AD	Archived Data
AMBER	America's Missing: Broadcast Emergency Response
APTA	American Public Transportation Association
APTS	Advanced Public Transportation System
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
ASTM	American Society for Testing and Materials
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
C2C	Center-to-Center
CCTV	Closed Circuit Television
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CUAMPO	Clarksville Urbanized Area Metropolitan Planning Organization
CTS	Clarksville Transit System
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
DSRC	Dedicated Short Range Communication
EM	Emergency Management
EMA	Emergency Management Agency
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Materials
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
IVR	Interactive Voice Response
KYTC	Kentucky Transportation Cabinet
MAP-21	Moving Ahead for Progress in the 21st Century
MC	Maintenance and Construction
MOA	Memorandum of Agreement

LIST OF ACRONYMS

MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MCHRA	Mid-Cumberland Human Resource Agency
MTP	Metropolitan Transportation Plan
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NOCoE	National Operations Center for Excellence
NTCIP	National Transportation Communications for ITS Protocol
PSAP	Public Safety Answering Point
RAD-IT	Regional Architecture Development for Intelligent Transportation
RDS	Radar Detection System
RTA	Regional Transportation Authority of Middle Tennessee
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
SET-IT	Systems Engineering Tool for Intelligent Transportation
SDO	Standards Development Organization
SWIFT	Statewide Information for Travelers
TDOSHS	Tennessee Department of Safety and Homeland Security
TDOT	Tennessee Department of Transportation
TEA-21	Transportation Equity Act for the 21st Century
TEMA	Tennessee Emergency Management Agency
TIP	Transportation Improvement Program
THP	Tennessee Highway Patrol
TITAN	Tennessee Integrated Traffic Analysis Network
TMC	Transportation Management Center (or Traffic Management Center)
TOC	Traffic Operations Center
TraCS	Traffic and Criminal Software
USDOT	United States Department of Transportation
VIVDS	Video Image Vehicle Detection Systems
WAVE	Wireless Access in Vehicular Environments

Executive Summary

Originally developed in 2006, the Clarksville Urbanized Area Regional Intelligent Transportation System (ITS) Architecture provides a framework for implementing ITS projects within the Clarksville Urbanized Area Metropolitan Planning Organization (CUAMPO) Region. Simply defined, ITS is the application of electronic technologies and communications to improve the operation of a transportation network. ITS can improve safety, support transit and ridesharing, improve reliability, and support environmental sustainability by reducing delay and emissions resulting from delay A regional ITS architecture encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to ITS projects, and allows for cohesive long-range planning among regional stakeholders.

This 2020 update to the Clarksville Urbanized Area Regional (ITS) Architecture allows the region's transportation stakeholders to plan for what they want their transportation network to look like in the long-term with respect to the incorporation of ITS technology. The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) require that ITS projects show conformance with the regional ITS architecture to be eligible for federal funding from either agency. In order to show this conformance, it is important that any region deploying ITS have an updated regional ITS architecture in place.

The CUAMPO Region is comprised of Montgomery County in Tennessee and the southeast portion of Christian County in Kentucky, which includes the City of Oak Grove and a small portion of the City of Hopkinsville. When developing the stakeholder group to guide this regional ITS architecture update, the project team coordinated with CUAMPO to invite the appropriate city, county, regional, state and federal agencies from throughout the Region. Stakeholders included both local city and county representatives as well as representatives from Tennessee Department of Transportation (TDOT) Traffic Operations Division in Nashville, Kentucky Transportation Cabinet District 2 (KYTC) in Madisonville, and FHWA from the Tennessee Division Office in Nashville and Kentucky Division Office in Frankfort.

Input was first gathered through a series of interviews that were conducted with stakeholder agencies in July and August 2020. The stakeholder group was then invited to a regional ITS architecture workshop held in September 2020 where ITS needs for the Region were identified, existing and planned ITS technologies in the Region were reviewed, and regional ITS deployments recommended by stakeholders in interviews were discussed with the group as a whole.

Stakeholders developed the Regional ITS Architecture based on a vision of how they wanted to implement and operate ITS through the next approximately 20 years, with the primary focus on the next five to ten years. The deployment of ITS will also support the 2045 Clarksville Metropolitan Transportation Plan vision and three of the five goals identified in the plan, including goals related to safety, reliability, and multimodal system implementation.

The Clarksville Regional ITS Architecture will support the vision and three of the five goals established in the MTP.

2045 Clarksville MTP Vision

In 2045, the residents and workers of the Clarksville Urbanized Area will be able to travel within a **safe**, well-maintained, and **multimodal** transportation system. This **sustainable** system will provide **reliable** transportation, with multiple travel options, that support a higher quality of life.

2045 Clarksville MTP Goals Supported by the Regional ITS Architecture

- Provide a safe transportation system.
- Provide a multimodal transportation system.
- Provide a reliable transportation system by reducing travel delay times and improving mobility.

The Clarksville Urbanized Area Regional ITS Architecture summarizes regional transportation needs that could be addressed in some way through ITS and an inventory of existing and planned ITS elements that would be necessary to implement desired ITS technologies. The Regional ITS Architecture also identifies the ITS services that were important to stakeholders in the CUAMPO Region. Stakeholders selected from the National ITS Architecture a total of 65 ITS service packages for implementation in the Region. The service packages in the National ITS Architecture were customized to reflect regional transportation needs and desired project deployments in the CUAMPO Region.

The 2020 update to the Clarksville Urbanized Area Regional ITS Architecture includes a Regional ITS Deployment plan. The Deployment Plan builds on the architecture by outlining specific ITS project recommendations and strategies for the Region. The Deployment Plan includes discussion of local agency, TDOT and KYTC ITS projects and programs, as well as projects of a regional nature that would require interagency coordination for successful implementation. Stakeholders identified specific projects that include a recommended timeframe for deployment, funding status, Fort Campbell Entrance Gate Traveler Information System and the corresponding ITS service packages that support the deployment.

The Clarksville Urbanized Area Regional ITS Architecture must 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 2045 Clarksville MTP vision and goals, and the national standards described in the regional ITS architecture. Therefore, prior to a project deployment, it is the responsibility of that project's lead stakeholder agency to evaluate the Regional ITS Architecture to confirm that the project conforms or else to request the necessary changes to the architecture. It is then CUAMPO's responsibility to accept or reject the requested changes to the architecture. Finally, if the changes are accepted, it is the responsibility of TDOT to certify the project for which the architecture was updated.

Stakeholders agreed that a full update of the Clarksville Urbanized Area Regional ITS Architecture and Deployment Plan should occur approximately every five years in the year preceding the MTP update. CUAMPO, in coordination with the TDOT Traffic Operations Division, will be responsible for completing the full updates. Minor changes should occur as needed between full updates of the plan. For situations where a change is required, an

Architecture Maintenance Documentation Form has been developed. 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.

A corresponding website was also developed for the Clarksville Urbanized Area Regional ITS Architecture which contains electronic versions of all documents, meeting minutes, and an interactive version of the architecture database known as RAD-IT (Regional Architecture Development for Intelligent Transportation). The website is located at the following address:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

1.0 Introduction

1.1 Project Overview

The Clarksville Urbanized Area Regional Intelligent Transportation System (ITS) Architecture was first developed in 2006. The Regional ITS Architecture provides a framework for implementing ITS projects, encourages interoperability and resource sharing among agencies, identifies applicable standards to apply to projects, and allows for cohesive long-range planning among regional stakeholders. ITS architectures allow stakeholders to plan for what they want their system to look like in the long-term and then break out the system into smaller pieces that can be implemented as funding permits.

The Regional ITS Architecture is a living document that should be periodically updated in order to accurately reflect the ITS needs, plans, and visions within a region as ITS infrastructure and processes are implemented and improved. In 2015, CUAMPO, in coordination with the Tennessee Department of Transportation (TDOT), updated the Clarksville Urbanized Area Regional ITS Architecture and Deployment Plan. The maintenance plan that was developed in the 2015 Clarksville Urbanized Area Regional ITS Architecture and Deployment Plan set a goal to update the plan every five years. In order to meet that goal, CUAMPO completed an update in 2020 in coordination with the 2045 Clarksville MTP, which updated and replaced the existing 2040 Clarksville MTP. The 2020 update is based on the US Department of Transportation (USDOT) National ITS Reference Architecture. Terminology and elements in the 2020 CUAMPO Regional ITS Architecture and Deployment plan align with the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) Version 8.3. The USDOT Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) Version 8.3 software was also used in developing the CUAMPO software and is referenced throughout this document.

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. Previous versions of the Clarksville Urbanized Area Regional ITS Architecture refer to 97 service packages that were available in the National ITS Architecture. The 2020 Clarksville Regional ITS Architecture uses Version 8.3 of the National ITS Architecture RAD-IT, which now includes 141 service packages.
- ITS Deployment Plan – The Deployment Plan documents planned and potential ITS projects that could be implemented in the region to provide the ITS services that stakeholders identified as important to the Region. The primary focus of the ITS Deployment Plan is a set of regional projects that could include multiple stakeholders and address regional transportation needs.

- 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 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.

In December 2015 the federal government implemented the Fixing America's Surface Transportation (FAST) Act, to provide long-term funding for surface transportation investments. With an emphasis on safety, the FAST Act authorizes $305 billion from 2016 to 2020, helping to streamline the project process and apply federal dollars to transportation projects, including highway, public transportation, rail, and freight initiatives. Current programs supported by the FAST Act include the Congestion Mitigation and Air Quality (CMAQ) Improvement Program, the Highway Safety Improvement Program, and the Surface Transportation Block Grant Program.

The Clarksville Urbanized Area Regional ITS Architecture update includes the same geographic area and agencies that are included as part of CUAMPO which include the Fort Campbell Military Installation. Stakeholders developed the Regional ITS Architecture based on a vision of how they wanted to implement and operate ITS through the next approximately 20 years, with the primary focus on the next five to ten years. The deployment of ITS will also support the 2045 Clarksville Metropolitan Transportation Plan vision and the goals identified in the plan. The 2045 MTP is centered around five planning goals, three of which are supported by the Regional ITS Architecture:

- Provide a safe transportation system;
- Provide a multimodal transportation system; and
- Provide a reliable transportation system by reducing travel delay times and improving mobility.

The 2045 MTP and this Regional ITS Architecture both help to identify projects for the Transportation Improvement Program (TIP), a four-year, fiscally constrained program that prioritizes short-range transportation spending for the CUAMPO Region.

The Clarksville Urbanized Area Regional ITS Architecture was developed with significant input from local, state, and federal officials. A stakeholder workshop was held with all stakeholders, and individual interviews were conducted with many of the stakeholders outside the workshop to solicit 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 deployments and future ITS plans in the Region. Needs and priorities of the Region will change over time, and in order to remain effective, this plan should be periodically reviewed and updated.

1.2 Clarksville Regional Area

1.2.1 Geographic Boundaries

The Clarksville Urban Area Regional ITS Architecture geographic boundaries encompass Montgomery County in Tennessee and the southeast portion of Christian County in Kentucky, which includes the City of Oak Grove and a small portion of the City of Hopkinsville. These boundaries correspond with the boundaries of CUAMPO, which are shown in **Figure 1**. Also considered within the CUAMPO Region are the sections of the Fort Campbell Military Installation that are located in Montgomery and Christian Counties. The portions of the CUAMPO Region within Tennessee are also within the geographic boundaries of the Tennessee Statewide ITS Architecture, which documents the state's ITS implementation framework.

When developing the stakeholder group, the project team coordinated with CUAMPO to invite the appropriate city, county, regional, state and federal agencies. Stakeholders included both local representatives as well as representatives from TDOT headquarters and Region 3 in Nashville, the Kentucky Transportation Cabinet in Madisonville, and FHWA from the Tennessee Division Office in Nashville and the Kentucky Division Office in Frankfort.

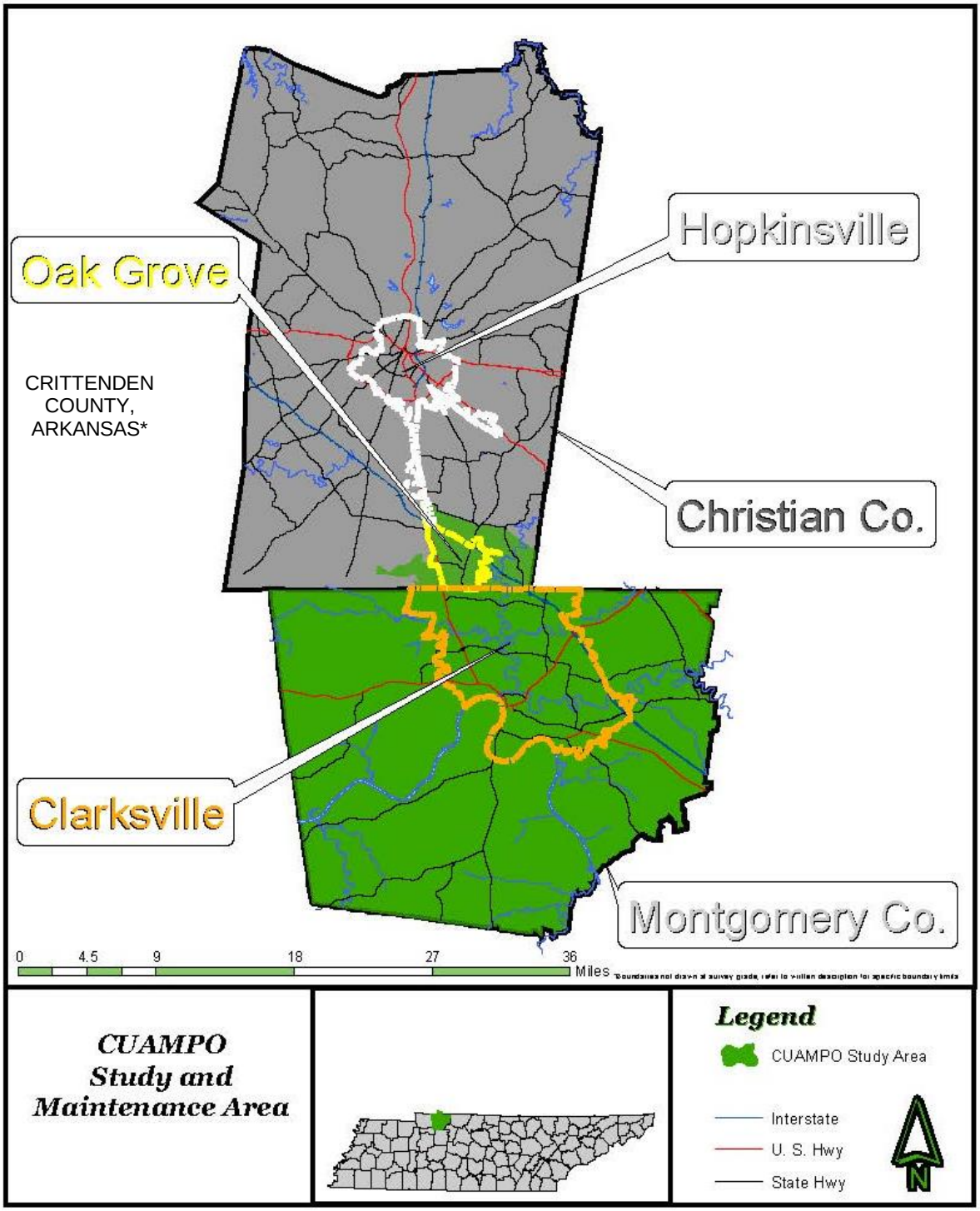

Figure 1 – CUAMPO Boundaries

1.2.2 Transportation Infrastructure

The primary access-controlled facility in the CUAMPO Region is I-24, which is the principal east-west corridor linking the Clarksville Region to Central Tennessee and Western Kentucky. Additionally, the Edward T. Breathitt Pennyrile Parkway is an access-controlled facility located in Christian County just outside the MPO boundaries that serves as a connection to Southern Indiana.

US 41A is the primary north-south route through the Region that facilitates Clarksville commuter traffic. It links the Clarksville urban area to communities to the north including the cities of Hopkinsville, Oak Grove, and the Fort Campbell Military Installation. US 41A parallels I-24 as they both extend southward to Nashville. Other major arterial routes include US 79/SR 13 (Wilma Rudolph Boulevard), SR 236 (Tiny Town Road) and US 79/SR 76 (Dover Road). SR 374 is a semi circumferential route that serves as a link for many of these principal corridors.

Fixed-route and paratransit services are provided in the City of Clarksville and portions of Fort Campbell by the Clarksville Transit System (CTS). Demand response service in the Clarksville Region is provided by several different agencies depending on the County. Within Tennessee, the Mid-Cumberland Human Resource Agency (MCHRA) provides demand response in Montgomery County. In Kentucky, demand response service is provided by Pennyrile Allied Community Services (PACS) in Christian County. Commuter rail and light rail service does not exist within the Region; however, a Regional Express Bus service to Nashville is operated by the Regional Transportation Authority of Middle Tennessee (RTA).

Within the Clarksville Regio there have been several ITS initiatives and deployments throughout the Region. These programs have come from multiple agencies and cover multiple transportation modes as well. Some of the larger ITS initiatives and deployments that are existing or underway in the Clarksville Region are listed below.

- **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). Although those elements are not currently within the Clarksville Region, TDOT's SmartWay website provides congestion, incident, and construction information in the Clarksville Region. TDOT has also updated their SmartWay system to allow municipalities to view live video feeds. Municipalities can access live video feeds through an MOU. Further potential updates could allow municipalities to share their CCTV camera feeds with TDOT and other municipalities statewide.
- **Kentucky SAFE Patrol** – KYTC's Kentucky Safety Assistance for Freeway Emergencies (SAFE) Patrol was put into operation in 2004 on a limited number of interstates. In 2006, the program expanded to cover all interstates and parkways statewide in addition to US 23 and SR 80 in eastern Kentucky. SAFE Patrol operators assist motorists with minor vehicle repairs, change flat tires, and provide gas or oil and they also assist with traffic control and detours during major incidents. Due to funding cuts, SAFE Patrol services were suspended in 2020 and the trucks were repurposed for other programs in the state.
- **City of Clarksville Traffic Management –** The City of Clarksville has installed CCTV cameras supporting real time monitoring of the roadway network with plans to install additional cameras in the future. Live video feeds of the CCTV cameras are available to the general public on the City's website. A majority of the traffic signals are

connected through fiber optic cables and run on a software program that allows for remote changes to timing plans. The City also operates approximately half a mile of a reversible lane along US 41A/SR 76 (Madison Street).

- **CTS ITS** – CTS continues to expand their ITS program that includes a number of different programs that are either fully implemented or in the process of being implemented. All CTS fixed-route and demand response vehicles include automated vehicle location (AVL) systems and on-board security cameras. Fixed-route vehicles also include electronic fare payment. Transit trip planning services are currently being developed for Google Maps.
- **Fort Campbell** –The Fort Campbell Military Installation is a main traffic generator for the Clarksville Region. Due to the high traffic entering and exiting the fort daily, the main gates for ingress and egress frequently experience queuing. Commuters to the fort are not aware of which gates are closed or are experiencing high delays until they are reached. Fort Campbell seeks to implement traffic balancing measures at entry points through gate traffic information dissemination and traffic monitoring. Possible improvements could include the installation of CCTV cameras and DMS.

1.2.3 Project Participants

Due to the fact that ITS often transcends traditional transportation infrastructure, it is important to involve a wide range of local, state, and federal stakeholders in the ITS architecture development and visioning process. Input from these stakeholders is a critical part of defining the interfaces, integration needs, and overall vision for ITS in a region.

Table 1 contains a listing of stakeholders in the Clarksville Region who participated in the project workshop or provided input to the study team as to the needs and issues that should be considered as part of the Regional ITS Architecture.

Table 1 – Clarksville Regional Stakeholder Agencies and Contacts

Stakeholder Agency	Address	Contact
City of Clarksville Street Department	199 10th Street Clarksville, TN 37040	Chris Cowan Traffic Engineer
City of Hopkinsville (Hopkinsville/Christian County Community Development Services)	710 South Main Street Hopkinsville, KY 42241	Steve Bourne Director
Clarksville Transit System	430 Boillin Lane Clarksville, TN 37040	Paul Nelson Director
Barge Design (Consultant to the City of Clarksville)	615 3rd Avenue South Nashville, TN 37210	Mark Washing ITS/Signal Practice Lead
Clarksville Urbanized Area MPO	329 Main Street Clarksville, TN 37040	Stan Williams Director
FHWA – Kentucky Division	300 Fair Oaks Lane Frankfort, KY 40601	Bernadette Dupont Transportation Specialist
FHWA – Tennessee Division	404 BNA Drive - Building 200, Suite 508 Nashville, TN 37217	Melissa Furlong Operations Program Specialist
		Sean Santalla Transportation Planning Specialist
Fort Campbell Directorate of Public Works	Building 865 Bastogne Avenue Fort Campbell, KY 42223	Christopher Brown Community Planner
Fort Campbell Directorate of Public Works	Building 865 Bastogne Avenue Fort Campbell, KY 42223	Sally Castleman Chief Master Plans
Fort Campbell Directorate of Plans, Training, Mobilization & Security (DPTMS) – G3 Aviation Special Projects	6087 Screaming Eagle Blvd, Fort Campbell, KY 42223	David Draper Supervisor of Airfield Operations
Fort Campbell Directorate of Plans, Training, Mobilization & Security (DPTMS) - Range Branch	6087 Screaming Eagle Blvd, Fort Campbell, KY 42223	Paul Shannon Range Officer
Fort Campbell Installation Transportation Division	7162 Hedge Row Road Fort Campbell, KY 42223	Russell Baggerly Installation Transportation Officer
Kentucky Transportation Cabinet	200 Mero Street Frankfort, KY 40622	Jason Siwula Assistant State Highway Engineer
Kentucky Transportation Cabinet District 2 Traffic	1840 North Main Street Madisonville, KY 42431	Tate Byrum Transportation Engineering Branch Manager
Mid-Cumberland HRA	1101 Kermit Drive, Suite 300 Nashville, TN 37217	Jeff Simpson Transportation Director
Prometheus Transportation	1175 Pineville Rd, #42 Chattanooga, TN 37405	Kevin Comstock CEO of Prometheus Transportation
TDOT Region 3 Traffic Operations	6601 Centennial Boulevard Nashville, TN 37243	Adam Perez TMC Supervisor
	6603 Centennial Boulevard Nashville, TN 37243	Zane Pannell Region 3 Traffic Engineer

Table 1 – Clarksville Regional Stakeholder Agencies and Contacts (Continued)

Stakeholder Agency	Address	Contact
TDOT Traffic Operations Division	505 Deaderick Street Suite 1800, James K Polk Building Nashville, TN 37243	Greg Dyers Civil Engineer Manager I
		Eric Flora Transportation Project Specialist
		Brad Freeze, Dir. Traffic Operations Division Director
		Eric Houck Project Manager
		Khuzaima Mahdi Senior Transportation Project Specialist
		Said El Said ITS Manager
		Lee Smith Assistant Director of Traffic Operations

1.3 Document Overview

The Clarksville Urbanized Area Regional ITS Architecture report is organized into seven key sections:

Section 1 – Introduction

This section provides an overview of the Clarksville Urbanized Area 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 CUAMPO Region as well as an overview of the RAD-IT Architecture database and reports.

Section 3 – Regional Needs

This section contains a summary of regional needs for the CUAMPO 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 owner, such as the City of Clarksville or CTS, 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 CUAMPO Region. The ITS service packages that 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. A section discussing cyber security has been included to highlight its importance in an ITS architecture.

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. Focus is primarily on regional projects that involve multiple stakeholders.

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 Clarksville Urbanized Area Regional ITS Architecture also contains four appendices:

- Appendix A – Service Package Definitions
- Appendix B – Element Functions
- Appendix C – Agreements
- Appendix D – Architecture Maintenance Documentation Form

A corresponding website was also developed for the Clarksville Urbanized Area Regional ITS Architecture which contains electronic versions of all documents, meeting minutes, and an interactive version of the architecture database known as RAD-IT (Regional Architecture Development for Intelligent Transportation). The website is located at the following address:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

2.0 Regional ITS Architecture Update Process

The update of the Regional ITS Architecture and Deployment Plan for the CUAMPO Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A workshop was 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 CUAMPO Region was designed to ensure that stakeholders could provide input and review for the development of the Regional ITS Architecture and Deployment Plan. **Figure 2** illustrates the process followed.

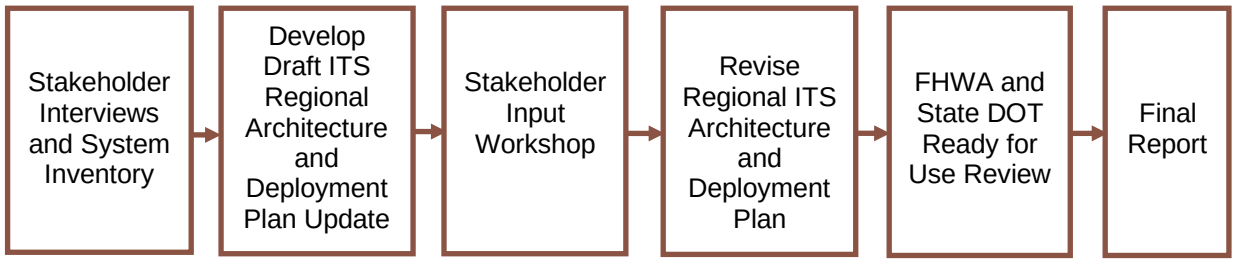

Figure 2 – Regional ITS Architecture and Deployment Plan Development Process

2.1 Stakeholder Input

A workshop with stakeholders was held on October 6, 2020, to update the Clarksville Urbanized Area Regional ITS Architecture and Deployment Plan.

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:

Stakeholder Interviews and System Inventory: Stakeholder input was first gathered through a series of interviews that were conducted with stakeholder agencies. The interviews were used to develop 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 through interviews, 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 for the Clarksville Urbanized Area Regional ITS Architecture. Additionally, a website was created to allow stakeholders access to an interactive version of the Regional ITS Architecture and documents such as reports, meeting minutes, presentations, and the RAD-IT architecture database.

Stakeholder Input Workshop: The stakeholder group was invited to a stakeholder input workshop, where an overview of the project was provided, existing and planned ITS deployments in the Region were reviewed, ITS needs for the Region were identified, selected ITS service packages were discussed, and regional ITS deployments recommended by stakeholders in interviews were reviewed and confirmed.

Revise Regional ITS Architecture and Deployment Plan: Following the stakeholder input workshop, revisions were made to the draft report based on stakeholder feedback. .

FHWA and State DOT Ready for Use Review: The Draft Regional ITS Architecture document was distributed to the FHWA, TDOT and KYTC for the Ready for Use review. The agencies provided comments via email, and the project team revised the document accordingly, in coordination with CUAMPO.

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

2.2 Regional ITS Architecture Software

The Regional Architecture Development for Intelligent Transportation (RAD-IT) Version 8.3 was used to develop the Clarksville Urbanized Area Regional ITS Architecture. RAD-IT, which had formerly been referred to as 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 8.3 of RAD-IT was released in July 2019 and was developed to support Version 8.3 of the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT), the National ITS Architecture framework. RAD-IT can be used to develop service package diagrams for the Regional ITS Architecture. Use of RAD-IT software in development of the regional ITS architectures is recommended by both FHWA and FTA. The related Systems Engineering Tool for Intelligent Transportation (SET-IT) Version 8.3 is recommended by FHWA for systems engineering analysis at the project level.

In the CUAMPO Region, the RAD-IT architecture database for the Regional ITS Architecture was based on the ITS service packages, which are provided in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

The ITS service packages provide a graphical representation of the services that 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. RAD-IT allows the Region to document all of the elements and data flows that exist or are planned in the Region. SET-IT 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 RAD-IT and SET-IT software are included in **Table 2**.

RAD-IT saves data in Microsoft Access compatible data files. RAD-IT 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 RAD-IT software. With the release of Version 4.1 of Turbo Architecture (the software package that preceded RAD-IT and SET-IT), the USDOT began offering the Turbo Architecture software free of charge and provided a link for downloading the software on the National ITS Architecture website. RAD-IT and SET-IT were also offered free of charge and were available for download from the ARC-IT website. At the time this report was written, that site was located at www.arc-it.net. Version 8.3 was the most recent version available.

Table 2 – RAD-IT and SET-IT Report and Diagrams

Report or Diagram Name	Functions
RAD-IT Software	
Stakeholder Summary	Provides a description of the stakeholder and the associated elements for each stakeholder in the Regional ITS Architecture.
Inventory Summary	Provides a description and status for each element in the Regional ITS Architecture.
Service Packages Summary	Identifies each of the service packages selected for the Region and the elements associated with each service package.
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.
Context Diagrams	Context Diagrams show all of the data flows coming to and from a center (such as a Traffic Management Center), physical object, functional object, or a terminator (such as a vehicle). (Context diagrams can also be exported from SET-IT.)
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.
Service Package Diagrams	Service Package Diagrams show the elements and flows associated with a service package that has been developed for a selected stakeholder.
Website	RAD-IT generates a customized regional architecture website with a hyperlinked database of stakeholders, ITS elements, data standards, and other elements of the architecture for reference.
SET-IT Software	
Enterprise Diagrams	Enterprise Diagrams show functional relationships between users of the transportation system.
Summary Physical Diagrams	Summary Physical Diagrams show data connections between centers (such as a Traffic Management Center), terminators (such as a TMC operator), and physical objects (such as a vehicle).
Context Diagrams	Context Diagrams show all of the data flows coming to and from a center (such as a Traffic Management Center), physical object, functional object, or a terminator (such as a vehicle). (Context diagrams can also be exported from RAD-IT.)
Communications Diagrams	Communications Diagrams are a graphical representation of data standards that apply to a given data flow.
Concept of Operations	SET-IT creates a Concept of Operations document by populating a standardized outline with SET-IT data. The document template is customizable.

3.0 Regional ITS Needs

Regional needs that could be addressed by ITS were identified by stakeholders in interviews conducted in July and August 2020 and the Clarksville Urbanized Area Regional ITS Architecture workshop held in October 2020. In addition, the Clarksville Urbanized Area MPO's 2045 Metropolitan Transportation Plan (MTP) updated in January 2019 was reviewed to determine other regional needs that could possibly be addressed in some way through ITS.

Within the 2045 MTP. there are five goals that were defined for the plan, each with a corresponding set of objectives. Three of the goals had objectives that could be met in part through the use of ITS. These goals and their objectives are summarized below.

2045 MTP Goal – Provide a Safe Transportation System.

Goal objectives include:

- Pursue state and federal funding for transportation improvements that can reduce the number of vehicle crashes resulting in fatalities or serious injuries for roadway users (including cyclists, pedestrians, and transit riders) and the respective rates per 100 million vehicle miles traveled.
- Cooperate with local and state police agencies to continue, and improve, the management and analysis of crash records to identify focus areas for engineering, education, enforcement, and emergency response efforts.
- Improve the ability to provide timely traveler information and emergency response support concerning incidents within the transportation system by increasing the number of intersections and corridors managed by Intelligent Transportation Systems.

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 archive crash records and use this data to measure performance.

2045 MTP Goal –Provide a Multimodal Transportation System

Goal objectives include:

- Increase amenities at major transit stops and improve on-time performance to increase transit service convenience, safety, and security for all transit users.

ITS can be used to optimize the travel times of transit users through vehicle tracking and improve multimodal coordination as transit users transfer between modes. ITS in transit operations can assist riders by providing accurate information for trip planning, real-time transit vehicle location information, and transit signal priority to help keep transit vehicles on schedule.

2045 MTP Goal – Provide a Reliable Transportation System by Reducing Travel Delay Times and Improving Mobility

Goal objectives include:

- Emphasize transportation improvements that can increase the percentage of the population with an average in-vehicle travel time of 20 minutes or less for all trips during peak hours.
- Emphasize transportation improvements which can reduce annual vehicle miles traveled per capita and vehicle hours traveled per capita, including Transportation Demand Management strategies and Intelligent Transportation Systems.
- Minimize railroad freight delay by improving operations and infrastructure that reduce railroad/roadway and land use conflicts.
- Emphasize roadway improvements that increase travel time reliability on major freight corridors, including accommodations for anticipated truck volumes, weights, and connectivity to other freight modes.

ITS can be used to provide real-time information about current conditions allowing travelers to make more informed decisions, and adaptive traffic signal systems can respond to changing traffic patterns in real-time. 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. Additionally, for the movement of freight, ITS can be used to track commercial vehicles, provide HAZMAT management, manage the administration of commercial vehicles, and support the highway-rail intersection coordination.

The needs identified through the Regional ITS Architecture development process as well as the 2045 MTP provided guidance for determining which ITS service packages should be included in the Regional ITS Architecture. Stakeholders identified a number of ITS needs for the Clarksville Regional Area, with the majority of the needs focused on the following four areas:

- Traffic Management;
- Traveler Information;
- Data Management; and
- Public Safety.

In Section 5.1.4 a list of regional needs is presented along with the ITS service packages that have been recommended for the Region to consider implementing or expanding (if the service package currently exists.) A summary of these needs is presented in **Table 3**.

Table 3 – Summary of Clarksville Regional ITS Needs

Traffic Management Needs
Need to expand TDOT's SmartWay system, including closed-circuit television (CCTV) cameras, dynamic message signs (DMS), and radar detection systems (RDS), onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events.
Need to expand TDOT's HERO Freeway Safety Service Patrol onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events.
Need to deploy KYTC's SAFE Patrol in Christian County to manage traffic incidents and other events.
Need to improve Fort Campbell entrance traffic flow and barrier gates.
Need to improve coordination between TDOT and KYTC's TMCs for traffic incident management and other events that impact traffic.
Need to expand CCTV camera coverage areas throughout the Region.
Need to utilize various strategies to improve travel within a safe, well-maintained and reliable transportation system.
Need to implement and expand the Adaptive Signal Control Technology (ASCT) along major corridors to address the variable and unpredictable traffic patterns, such as traffic on arterials due to traffic incidents on I-24.
Need to remotely control warning beacons for school zones.
Need to monitor rail crossing and convey blockages to drivers.
Need to create and expand fiber optic connections between traffic management agencies for better coordination.
Need to utilize various ITS and technology to support environmental sustainability.
Need to consider implementation of connected and automated vehicle technology to improve safety.
Need to develop an ITS master plan for the deployment of ITS projects.
Commercial Vehicle Operations Needs
Need to provide truck parking facilities for I-24 and information on the availability.
Maintenance and Construction Needs
Need to monitor roadway weather conditions through the installation of additional road weather data collection stations and warn drivers of hazardous conditions.
Need to continue to provide real-time construction and maintenance information to the motoring public.
Traveler Information Needs
Need to convey information to drivers through DMS or other devices.
Need to provide alternate route information when incidents occur on the interstate.
Need to monitor rail crossing and convey blockages to drivers. *(Also noted in Traffic Management Needs)*
Parking Management Needs
Need to expand parking facility management and provide information on parking availability.
Data Management Needs
Need to archive data gathered through ITS to make it more accessible to regional stakeholders.

Public Safety Needs
Need to assist emergency vehicle movement with traffic signal preemption and monitoring.
Need to expand TDOT's HERO Freeway Safety Service Patrol onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events. *(Also noted in Traffic Management Needs)*
Need to deploy KYTC's SAFE Patrol in Christian County to manage traffic incidents and other events. *(Also noted in Traffic Management Needs)*
Public Transportation Needs
Need to provide real-time information to transit riders through DMS, a smartphone application, and QR codes.
Need to implement a transit trip planning system that is accessed by transit users through the web.
Need to improve transit vehicle and transit center safety and security through CCTV camera monitoring.
Need to improve coordination among transit agencies.
Need to implement bus priority along specific corridors.
Need to monitor bus passenger boarding and alighting.

4.0 Regional ITS Inventory

The inventory and needs were documented through an initial meeting with CUAMPO and individual interviews with stakeholder. This information was used to customize the National ITS Architecture and create the Regional ITS Architecture for the CUAMPO Region.

When developing customized elements for the 2015 update, the Clarksville stakeholder group agreed to create individual traffic, maintenance, and emergency management elements for the City of Clarksville and individual traffic and emergency management elements for Fort Campbell. New elements such as Connected Vehicle Roadside Equipment have been added to existing stakeholders. The other smaller communities in the Region were documented as part of the municipal elements. This documentation allows the communities to be included in the Regional ITS Architecture, and therefore eligible to use federal 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 Clarksville Urbanized Area Regional ITS Architecture is associated with a stakeholder agency. A listing of stakeholders as identified in the Clarksville Urbanized Area Regional ITS Architecture can be found in **Table 4** along with a description of the stakeholder. Rather than individually documenting each of the smaller municipalities in the Region, a single stakeholder, which represents the cities and towns not specifically called out in the architecture, was created for municipal agencies.

Table 4 – Clarksville Urbanized Area Stakeholder Descriptions

Stakeholder	Stakeholder Description
Christian County	County government for Christian County. Includes all county departments such as the Sheriff's Office, Road Department and Christian County Emergency Management.
City of Clarksville	Municipal government for the City of Clarksville. Covers all city departments including those that deal with traffic and public safety.
CTS	Clarksville Transit System. Responsible for fixed route transit and paratransit service in the City of Clarksville.
CUAMPO	Clarksville Urbanized Area Metropolitan Planning Organization
Financial Institution	Institution that handles exchange of money for transit electronic fare collection.
Fort Campbell	US Army Garrison Fort Campbell responsible for all (garrison) departments including those related to traffic and public safety within the boundaries of the military base.
KYDMA	Kentucky Department of Military Affairs. Responsible for emergency operations during a disaster or large-scale incident.
KYEEC	Kentucky Energy and Environment Cabinet. State agency that operates air quality monitors.
KYJPSC	Justice and Public Safety Cabinet. Responsible for statewide enforcement of traffic safety laws.
KYTC	Kentucky Transportation Cabinet. Responsible for the construction, maintenance, and operation of state roadways in Kentucky as well as commercial vehicle regulations.
MCHRA	Mid-Cumberland Human Resource Agency. Responsible for demand response transportation services in Montgomery County and other counties in Tennessee.
Media	Local media outlets including television stations, newspapers, radio stations and their associated websites.
Montgomery County	County government for Montgomery County. Includes all county departments such as the Sheriff's Office, Highway Department, Emergency Management Agency, and Emergency Medical Services.
Municipal Government	Municipalities within the Region that are not specifically called out. Covers all departments including those that manage traffic, public safety, maintenance, and construction.
NOAA	The National Oceanic and Atmospheric Administration 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.
PACS	Pennyrile Allied Community Services. Responsible for demand response transportation services in Christian County and other counties in Kentucky.
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 rail systems including the dispatch and control of trains and the maintenance and operations of railroad tracks.
System Users	All of the users of the transportation system.
TDEC	Tennessee Department of Environment and Conservation. State agency that monitors air quality stations in Montgomery County.
TDOT	Tennessee Department of Transportation. Responsible for the construction, maintenance, and operation of state roadways in Tennessee.
TEMA	Tennessee Emergency Management Agency. Responsible for emergency operations during a disaster or large-scale incident.
Tennessee Bureau of Investigation	Statewide law enforcement agency responsible for issuing statewide AMBER Alerts in Tennessee.
THP	Tennessee Highway Patrol. Responsible for statewide enforcement of traffic safety laws as well as commercial vehicle regulations.
Transit Operations Personnel	Transit personnel responsible for fleet management, maintenance, and operations of the transit system.

4.2 ITS Elements

The ITS inventory is documented in the Regional ITS Architecture as elements. **Table 5** sorts the inventory by stakeholder so that each stakeholder can easily identify and review all of the architecture elements associated with their agency. The table includes the status of each 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 Clarksville Urbanized Area Regional ITS Architecture is consistent with the naming convention used in the Tennessee Statewide ITS Architecture. This consistency provides seamless connections between the Regional and Statewide ITS Architectures within Tennessee.

The status listed in **Table 5** for each element reflects that element's status within the CUAMPO Region. Elements listed as Planned were identified by stakeholders as ones desired for the Region and do not necessarily have dedicated funding for deployment. Furthermore, elements listed as planned in the Clarksville Region may already exist elsewhere in the state.

Table 5 – Clarksville Regional Inventory of ITS Elements

Stakeholder	Element Name	Element Description	Status
Christian County	Christian County Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	Planned
	Christian County Emergency Management	Agency responsible for disaster planning for Christian County and managing the emergency operations center (EOC).	Existing
	Christian County TOC	Traffic operations center for Christian County. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by Christian County.	Planned
	Christian County Traffic Signals	Traffic signal system operated by Christian County.	Planned
City of Clarksville	Hopkinsville-Christian County Emergency Communications Center	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within Christian County and dispatching emergency responders.	Existing
	City of Clarksville CCTV Cameras	Closed circuit television cameras for traffic surveillance and incident management.	Existing
	City of Clarksville Changeable Speed Limit Signs	City of Clarksville roadway equipment that can change the speed limit depending on roadway and traffic conditions.	Planned
	City of Clarksville City Engineers Office	City Engineer's Office responsible for the administration of maintenance and construction projects within the City.	Existing
	City of Clarksville Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	Planned
	City of Clarksville DMS	Dynamic message signs for traffic information dissemination.	Planned
	City of Clarksville Electric Vehicle Charging Station	Provides access to electric vehicle supply equipment that is used to charge hybrid and all-electric vehicles. This includes public charging stations that support consumers, workplace charging stations, and fleet charging stations.	Existing
	City of Clarksville Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), Bluetooth devices, or traditional loops.	Existing
	City of Clarksville Fire Dispatch	Emergency dispatch functions for the Fire Department.	Existing
	City of Clarksville Fire Vehicles	City of Clarksville Fire Department vehicles.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
City of Clarksville (Continued)	City of Clarksville Flood Detectors	Flood warning systems for the City of Clarksville that detect flood events at low water crossings throughout the city.	Planned
	City of Clarksville Flood Warning Beacons	Flashing beacons that are activated to warn motorists that water may be on a section of the roadway.	Planned
	City of Clarksville Gas and Water	Department that provides utility services including gas, water, and sewer for Clarksville, Montgomery County, and several counties in Tennessee and Kentucky.	Existing
	City of Clarksville On-Street Parking Meters	On-street parking meters that allow for electronic payment and use sensors in the pavement to detect the presence of vehicles.	Existing
	City of Clarksville Parking Authority	Parking Authority for the City of Clarksville that maintains and operates on-street and surface parking facilities and parking structures.	Existing
	City of Clarksville Pedestrian Hybrid Beacon	Pedestrian Hybrid Beacons operated by the City of Clarksville.	Planned
	City of Clarksville Police Department	Police department for the City of Clarksville. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles.	Existing
	City of Clarksville Police Department	Police department for the City of Clarksville. Non-emergency functions include the collection of crash data and enforcement of speed limits and commercial vehicles.	Existing
	City of Clarksville Police Vehicles	City of Clarksville Police Department vehicles.	Existing
	City of Clarksville Portable DMS	Portable dynamic message signs used for traffic information dissemination during maintenance and construction activities, special events, or incidents.	Existing
	City of Clarksville Programmable School Flashing Beacons	School zone warning system that would be installed in the City of Clarksville school zones to warn drivers and allow for remote activation or deactivation the flashers.	Planned
	City of Clarksville Rail Notification System	Roadway equipment used to alert motorists that a crossing is currently blocked by a train.	Planned
	City of Clarksville Reversible Lane Equipment	Lane control signals, dynamic lane control signs, or other devices used in the operation of reversible lanes.	Existing
	City of Clarksville RWIS	Road weather information system sensors to monitor weather conditions at the roadway.	Planned
	City of Clarksville Speed Monitoring Equipment	Equipment used to monitor vehicle speeds for use in targeting locations for police enforcement.	Planned

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
City of Clarksville (Continued)	City of Clarksville Street Department	Responsible for providing roadway construction and maintenance, drainage maintenance, and traffic control and engineering.	Existing
	City of Clarksville Street Department Vehicles	Vehicles used for street construction, street maintenance, and emergency maintenance response.	Existing
	City of Clarksville TOC	Traffic operations center for the City of Clarksville. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by the City of Clarksville.	Existing
	City of Clarksville Traffic Signals	Traffic signal system operated by the City of Clarksville and includes Adaptive Signal Control Technology (ASCT).	Existing
	City of Clarksville Variable LED Streetlights	Energy efficient streetlights in the City of Clarksville that allow for variable lighting based on traffic, weather, and roadway conditions.	Existing
	City of Clarksville Website	Website for the City of Clarksville. Includes information on City departments including traffic images.	Existing
CTS	CTS Bus Stop DMS	Clarksville Transit System real-time next bus arrival information boards at select bus stops.	Planned
	CTS Data Archive	Clarksville Transit System data archive for transit data.	Existing
	CTS Demand Response Dispatch Center	Clarksville Transit System paratransit dispatch center.	Existing
	CTS Demand Response Vehicles	Clarksville Transit System paratransit vehicles.	Existing
	CTS Fixed-Route Dispatch Center	Clarksville Transit System fixed-route dispatch center.	Existing
	CTS Fixed-Route Vehicles	Clarksville Transit System fixed-route vehicles. Includes neighborhood and downtown routes, express buses and any other fixed-route service.	Existing
	CTS Mobile Phone App	Clarksville Transit System mobile phone application that allows users to view transit service information, real-time bus location, and create a transit trip plan.	Planned
	CTS Routing Application	Clarksville Transit System online routing application to assist travelers in developing a customized transit plan for an upcoming trip.	Planned
	CTS Transit Center CCTV Camera Surveillance	Clarksville Transit System closed circuit television camera surveillance at the transit transfer center, on transit vehicles, or at other transit facilities.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
CTS (Continued)	CTS Website	Clarksville Transit System website. Provides route and fare information.	Existing
	Electronic Fare Payment Card	Medium for collection of transit fares electronically obtained on all fixed-route buses.	Existing
CUAMPO	CUAMPO Data Archive	Data archive for the transportation related data in Clarksville Urbanized Area Metropolitan Planning Organization.	Planned
	CUAMPO Website	Clarksville Urbanized Area MPO website that displays daily air quality measurements and forecasts and other Regional information.	Existing
	Electronic Fare Payment Card	Medium for collection of transit fares electronically obtained on all fixed-route buses.	Existing
Financial Institution	Financial Service Provider	Handles exchange of money for transit electronic payment collection.	Existing
Fort Campbell	Blanchfield Army Community Hospital EMS Vehicles	Emergency Medical Services vehicles that serve Fort Campbell.	Existing
	Fort Campbell CCTV Cameras	Closed circuit television cameras for traffic surveillance, incident management and security.	Planned
	Fort Campbell Directorate of Emergency Services	Provide emergency and non-emergency services for Fort Campbell including fire, police, 911 dispatch, and gate security.	Existing
	Fort Campbell Entry Gate Closure Barriers	Equipment that is used to secure the gates on Fort Campbell and control ingress and egress of vehicles.	Existing
	Fort Campbell Field Sensors	Roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as video image vehicle detection systems (VIVDS), remote traffic microwave sensors (RTMS), or traditional loops.	Existing
	Fort Campbell Public Affairs Office	Fort Campbell office responsible for the dissemination of traffic information to the media and the public.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
Fort Campbell (Continued)	Fort Campbell Public Safety Vehicles	Fire and Military Police vehicles on Fort Campbell.	Existing
	Fort Campbell Rail Notification System	Roadway equipment used to alert motorists that a crossing is currently blocked by a train.	Planned
	Fort Campbell TOC	Traffic operations center Fort Campbell. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, and any other ITS infrastructure deployed within Fort Campbell.	Existing
	Fort Campbell Traffic Signals	Traffic signal system operated by Fort Campbell.	Existing
	Fort Campbell Website	Website for Fort Campbell. Includes information on various departments and in the future, it is envisioned that the website will have real-time information about roadway conditions.	Existing
KYDMA	KYEM	Kentucky Emergency Management. Responsible for managing emergency operations during a disaster or large-scale incident.	Existing
KYEEC	KYEEC Air Quality Sensors	Kentucky Energy and Environment Cabinet air quality sensors that monitor ozone and particulate matter levels.	Existing
	KYEEC Division for Air Quality	Kentucky Energy and Environment Cabinet responsible for maintaining air quality monitoring stations.	Existing
KYJPSC	KSP Commercial Vehicle Enforcement	Kentucky State Police Commercial Vehicle Enforcement.	Existing
	KSP Commercial Vehicle Enforcement Truck Weigh and Inspection Stations	Kentucky State Police Commercial Vehicle Enforcement Truck Weigh and Inspection Stations.	Existing
	KSP Post 2 Dispatch	Kentucky State Police Post 2 dispatch that includes Christian County.	Existing
	KSP Vehicles	Kentucky State Police vehicles.	Existing
	KSP Weigh-In-Motion	Kentucky State Police Weigh-in-Motion.	Existing
KYTC	Cincinnati Area / Northern Kentucky ITS Region	Kentucky assets are now managed by KYTC / TRIMARC, while ODOT manages assets north of the Ohio River.	Existing
	GoKY.ky.gov	GoKY.ky.gov is a statewide traffic, construction and weather condition information system.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
KYTC (Continued)	Kentucky SAFE Patrol Dispatch	Kentucky Safety Assistance for Freeway Emergencies (SAFE) dispatch for roadway service patrols.	Existing
	Kentucky SAFE Patrol Vehicles	KYTC roadway service patrol vehicles that serve all interstates and parkways in the state in addition to US 23 and KY 80.	Suspended
	KYTC CCTV Cameras	KYTC closed circuit television cameras for traffic surveillance and incident management.	Suspended
	KYTC Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	Planned
	KYTC DataMart	KYTC data archive for the Kentucky Transportation Cabinet.	Existing
	KYTC District 2 Engineers Office	KYTC Office responsible for administration of maintenance and construction projects within the District as well as communicating work zone information to the public through the Public Information Office.	Existing
	KYTC District 2 Maintenance and Construction	KYTC entity responsible for the oversight of construction and maintenance in District 2.	Existing
	KYTC District 2 TMC	KYTC District 2 Transportation Management Center (TMC) located in Madisonville. Operate and maintain traffic signals on state routes and CCTV cameras.	Existing
	KYTC DMS	KYTC dynamic message signs used for traffic information dissemination.	Existing
	KYTC Emergency Services Coordinator	KYTC coordinator responsible for managing the KYTC response in a large-scale incident or disaster in which the Kentucky Emergency Management (KYEM) division activates the state emergency operations center (EOC).	Existing
	KYTC Field Sensors	KYTC roadway equipment used to detect vehicle volumes and/or speeds. Includes equipment such as VIVDS, RTMS, or traditional loops.	Existing
	KYTC Lane Control DMS	Dynamic message sign with the ability to display full-color traffic information messages and dynamic lane management.	Planned
	KYTC Maintenance Vehicles	KYTC vehicles used in maintenance operations.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
KYTC (Continued)	KYTC Public Affairs Office	KYTC Office responsible for the dissemination of traffic information to the media and the public.	Existing
	KYTC Ramp Queue Detection System	Vehicle detection system that monitors queues at exit ramps and can either warn drivers approaching the queue through DMS or warning beacons or the system can interact with the traffic signal system to clear the queue.	Planned
	KYTC RWIS Sensors	KYTC road weather information system sensors to monitor weather conditions at the roadway.	Existing
	KYTC Smart Work Zone Equipment	KYTC portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes portable closed-circuit television (CCTV) cameras, vehicle detection, and dynamic message signs (DMS).	Existing
	KYTC Speed Monitoring Equipment	Equipment used to monitor vehicle speeds for use in targeting locations for police enforcement.	Planned
	KYTC Statewide IMOC	KYTC Incident Management Operations Center (IMOC) in Frankfort that serves as the statewide traffic management center. The IMOC has operates all DMS in the region.	Existing
	KYTC Traffic Signals	KYTC traffic signal system operated on state highways.	Existing
	Louisville (TRIMARC) TMC	Traffic management center operated by KYTC that covers the Louisville metro area and Northern KY regional ITS assets in District 6.	Existing
MCHRA	MCHRA Data Archive	Mid-Cumberland Human Resource Agency data archive for transit data.	Planned
	MCHRA Public Transit Demand Response Vehicles	Mid-Cumberland Human Resource Agency demand response vehicle fleet.	Existing
	MCHRA Public Transit Dispatch Center	Mid-Cumberland Human Resource Agency dispatch center responsible for the tracking, scheduling and dispatching of MCHRA demand response services. MCHRA operates in Cheatham, Davidson, Dickson, Houston, Humphreys, Montgomery, Robertson, Rutherford, Stewart, Sumner, Trousdale, Williamson, and Wilson Counties.	Existing
	MCHRA Public Transit IVR System	Mid-Cumberland Human Resource Agency Interactive Voice Response. This is a customer interface component that calls transit riders and reminds them of thei r transit trip and provides approximate next-stop arrival times of the transit vehicle.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
MCHRA (Continued)	MCHRA Public Transit Passes	Mid-Cumberland Human Resource Agency passes for MCHRA Public Transit that can be purchased on the MCHRA Public Transit website.	Existing
	MCHRA Public Transit Website	Mid-Cumberland Human Resource Agency website with information about fares and schedules.	Existing
Media	Local Print and Broadcast Media	Local media that provide traffic or incident information to the public.	Existing
Montgomery County	Montgomery County E-911 Center Dispatch	911 Public Safety Answering Point (PSAP) responsible for answering all 911 calls made within the county and dispatching emergency responders.	Existing
	Montgomery County EMA	Montgomery County Emergency Management Agency. Responsible for disaster planning for the County and operating the emergency operations center (EOC).	Existing
	Montgomery County EMS Vehicles	Montgomery County Emergency Medical Services.	Existing
	Montgomery County Sheriff Vehicles	Montgomery County Sheriff's Office vehicles.	Existing
	Montgomery County Sheriff's Office	Law enforcement agency for Montgomery County. The emergency dispatch functions for the Sheriff's Office are included in the Montgomery County E-911 Center. Non-emergency functions include the collection of crash data.	Existing
	Montgomery County TOC	Traffic operations center for Montgomery County. Responsible for the operation of the traffic signal system, closed circuit television (CCTV) cameras, dynamic message signs (DMS), and any other ITS infrastructure deployed by Montgomery County.	Planned
	Montgomery County Traffic Signals	Traffic signal system operated by Montgomery County.	Existing
Municipal Government	Municipal CCTV Cameras	Municipal closed-circuit television cameras for traffic surveillance and incident management.	Planned
	Municipal Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	Planned

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
Municipal Government (Continued)	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	Municipal police departments within the Region responsible for law enforcement. The emergency dispatch functions for the police departments are included in the Montgomery County E-911 Center or the Hopkinsville-Christian County Emergency Communications Center. Non-emergency functions include the collection of crash data.	Existing
	Municipal Rail Notification System	Municipal roadway equipment used to alert motorists that a crossing is currently blocked by a train.	Planned
	Municipal Speed Monitoring Equipment	Equipment used to monitor vehicle speeds for use in targeting locations for police enforcement.	Planned
	Municipal TOC	Municipal traffic operations centers responsible for the operation of municipal signal systems and any other municipal ITS infrastructure.	Planned
	Municipal Traffic Signals	Municipal traffic signal systems within the Clarksville Region.	Existing
	Municipal/County Engineers Office	Municipal or County Offices responsible for the administration of maintenance and construction projects within the municipality or county.	Existing
	Municipal/County Maintenance	Municipal or County Department that oversees the maintenance of streets, sidewalks, and roadway right-of-way.	Existing
	Municipal/County Maintenance Vehicles	Municipal or County vehicles used by Municipal/County maintenance departments in maintenance and construction activities.	Existing
	Municipal/County Portable DMS	Municipal or County portable dynamic message signs used for traffic information dissemination during maintenance and construction activities, special events, or incidents.	Planned
	Municipal/County Public Safety Vehicles	Municipal or County law enforcement, fire, and EMS vehicles.	Existing
	Municipal/County RWIS	Municipal or County road weather information system sensors to monitor weather conditions at the roadway.	Planned
	Municipal/County Website	Municipal or county 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

Table 5 – Clarksville Regional 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 KYTC District Maintenance and Construction	Other KYTC District Maintenance and Construction Offices.	Existing
	Other KYTC District TMCs	KYTC traffic management centers in adjacent districts with which information is shared for coordination in an emergency situation or for regional traffic management.	Existing
	Other Maintenance and Construction Management Agencies	Additional maintenance and construction operations agencies with which information is shared for coordination in an emergency situation.	Existing
	Other TDOT Region District Operations	Other TDOT regional district operations offices.	Existing
	Other Traffic Management Agencies	Additional traffic management agencies with which information is shared for coordination in an emergency situation.	Existing
PACS	PACS Data Archive	Data archive for Pennyrile Allied Community Services data.	Planned
	PACS Transportation Demand Response Vehicles	Vehicles used by Pennyrile Allied Community Services to provide demand response transit service in Christian County. The fleet includes vehicles equipped with wheelchair lifts and lowered floor wheelchair vans.	Existing
	PACS Transportation Dispatch Center	Dispatch center for Pennyrile Allied Community Services vehicles.	Existing
	PACS Transportation Website	Pennyrile Allied Community Services website that contains information about fares and schedules.	Existing
Private Fleet Management Systems	Private Fleet Management Systems	Fleet and freight management for private carriers.	Existing
Private Information Provider	Private Sector Traveler Information Services	Traveler information service operated by a private entity.	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

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
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	Archive Data User	Users that request information from the data archive systems.	Existing
	Commercial Vehicles	Privately owned commercial vehicles traveling within the Region.	Existing
	Emergency Vehicle OBE	The Emergency Vehicle On-Board Equipment (OBE) resides in an emergency vehicle and provides the processing, storage, and communications functions that support public safety-related connected vehicle applications.	Existing
	Maint and Constr Vehicle OBE	The 'Maint and Constr Vehicle OBE' resides in a maintenance, construction, or other specialized service vehicle or equipment and provides the processing, storage, and communications functions necessary to support highway maintenance and construction.	Existing
	Personal Computing Devices	Computing devices that travelers use to access public information.	Existing
	Public/Private Vehicles	Public or private vehicles that traverse the region.	Existing
	Rail Freight	Railcars traveling within the region.	Existing
	Transit Vehicle OBE	The Transit Vehicle On-Board Equipment (OBE) resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers.	Existing
	Traveler	Users of the transportation system.	Existing
TDEC	TDEC Air Quality Sensors	Air quality sensors that monitor ozone and particulate matter levels.	Existing
	TDEC Division of Air Pollution Control	Tennessee Department of Environment and Conservation division responsible for establishing emission standards and procedures for industries and maintaining air quality monitoring stations.	Existing
TDOT	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	TDOT Division responsible for the dissemination of traffic information to the media and the public.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
TDOT (Continued)	TDOT Connected Vehicle Roadside Equipment	Field devices that are able to send information to and receive information from adjacent vehicles that are equipped with digital short-range communications (DSRC) or other wireless communications technology.	Planned
	TDOT DMS	TDOT dynamic message signs for traffic information dissemination.	Planned
	TDOT Emergency Services Coordinator	TDOT coordinator responsible for managing the TDOT response in a large-scale incident or disaster in which the Tennessee Emergency Management Agency (TEMA) activates the state emergency operations center (EOC).	Existing
	TDOT Field Sensors	TDOT 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), roadway detection system (RDS), or traditional loops.	Planned
	TDOT HELP Vehicles	TDOT roadway service patrol vehicles. Currently operate in and are dispatched elsewhere in the Region for large incidents.	Planned
	TDOT Lane Control DMS	Dynamic message sign with the ability to display full-color traffic information messages and dynamic lane management.	Planned
	TDOT Long Range Planning Division Archive	Data archive for the Long-Range Planning Division. The Division is responsible for traffic data collection and analysis.	Existing
	TDOT Maintenance Headquarters	TDOT maintenance headquarters.	Existing
	TDOT Maintenance Vehicles	TDOT vehicles used in maintenance operations.	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 Ramp Queue Detection System	Vehicle detection system that monitors queues at exit ramps and can either warn drivers approaching the queue through DMS or warning beacons or the system can interact with the traffic signal system to clear the queue.	Planned
	TDOT Region 1 TMC - Knoxville	TDOT Transportation management center for Region 1, located in Knoxville. Responsible for the operation of the ITS equipment located in Region 1. This includes the freeway management system in Knoxville as well as rural ITS deployments.	Existing

Table 5 – Clarksville Regional Inventory of ITS Elements (Continued)

Stakeholder	Element Name	Element Description	Status
TDOT (Continued)	TDOT Region 2 TMC - Chattanooga	TDOT transportation management center for Region 2, located in Chattanooga. Responsible for the operation of the ITS equipment located in Region 2. This includes the freeway management system in Chattanooga as well as rural ITS deployments.	Existing
	TDOT Region 3 Engineers Office	TDOT Office is responsible for administration of maintenance and construction projects within the Region as well as communicating work zone information to the public through the Public Information Office.	Existing
	TDOT Region 3 HELP Dispatch	TDOT roadway service patrol dispatch. Currently service is limited to the Nashville area except in the case of a large-scale incident.	Existing
	TDOT Region 3 District Operations	TDOT office that manages roadway maintenance and construction projects and responds to incidents when services are requested by local emergency management in Region 3.	Existing
	TDOT Region 3 TMC - Nashville	TDOT transportation management center for Region 3, located in Nashville. Responsible for the operation of the ITS equipment located in Region 3. This includes the freeway management system in Nashville as well as rural ITS deployments.	Existing
	TDOT Region 4 TMC - Memphis	TDOT transportation management center for Region 4, located in Memphis. Responsible for the operation of the ITS equipment located in Region 4. This includes the freeway management system in Memphis as well as rural ITS deployments.	Existing
	TDOT RWIS Sensors	TDOT road weather information system sensors to monitor weather conditions at the roadway.	Existing
	TDOT Smart Work Zone Equipment	TDOT portable ITS equipment that can be used in work zones to more efficiently manage traffic and provide traveler information. Includes portable closed-circuit television (CCTV) cameras, vehicle detection, and dynamic message signs (DMS).	Planned
	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
	TDOT Speed Monitoring Equipment	Equipment used to monitor vehicle speeds for use in targeting locations for police enforcement.	Planned

Table 5 – Clarksville Regional 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 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	Tennessee 511 traveler information system central server.	Existing
	TN Trips	TN Trips is a software that allows TDOT to give permission for trailers that are oversized and overweight to enter Tennessee and to give a route for safe passage.	Existing
TEMA	TEMA	Tennessee Emergency Management Agency responsible for managing emergency operations during a disaster or large-scale incident.	Existing
Tennessee Bureau of Investigation	Tennessee Bureau of Investigation	Agency responsible for issuing statewide America's Missing: Broadcast Emergency Response (AMBER) Alerts in Tennessee.	Existing
THP	THP Commercial Vehicle Enforcement	THP division responsible for commercial vehicle operations inspection and enforcement.	Existing
	THP Dispatch	Tennessee Highway Patrol dispatch center. There are several THP dispatch centers around the state of Tennessee.	Existing
	THP Vehicles	Tennessee Highway Patrol vehicles.	Existing
	THP Weigh-in-Motion	THP facilities with the capability to weigh commercial vehicles while they are traveling at highway speeds.	Planned
	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
Transit Operations Personnel	Transit Operations Personnel	Transit personnel responsible for fleet management, maintenance, and operations of the transit system.	Existing

5.0 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 CUAMPO Region. The National ITS Architecture has the twelve groups of ITS service areas shown in **Table 6**. Each service area is shown in the table with the current level of deployment in the Region and the level of regional interest based on stakeholder feedback aggregated from the interviews and workshop.

Existing, planned, and future systems in the Region were considered in each of the service areas. It is worth noting that while Vehicle Safety service packages are included in the Clarksville Urbanized Area Regional ITS Architecture and assigned to TDOT and KYTC as primary stakeholders, implementation of those service packages will be heavily supported by private sector automobile manufacturers and information service providers.

Table 6 – Clarksville Regional ITS Architecture Service Areas

Service Area	Description	Level of Deployment	Level of Interest
Traffic Management	Example service packages include Traffic Signal Control, Regional Traffic Management, Connected Vehicle Traffic Signal System, and Traffic Incident Management System.	Medium	High
Public Transportation	Example service packages include Transit Vehicle Tracking, Transit Traveler Information, and Transit Signal Priority.	Medium	High
Traveler Information	Example service packages include Broadcast Traveler Information, Dynamic Route Guidance, and In-Vehicle Signage.	Low	High
Public Safety	Example service packages include Emergency Vehicle Preemption, Roadway Service Patrols, and Disaster Response and Recovery.	Medium	High
Commercial Vehicle Operations	Example service packages include Electronic Clearance, HAZMAT Management, and Roadside and Virtual Weigh-in-Motion.	Low	Medium
Maintenance and Construction	Example service packages include Maintenance Vehicle and Equipment Tracking, Infrastructure Monitoring, and Roadway Automated Treatment.	Low	High
Weather	Example service packages include Weather Data Collection, Weather Information Processing and Distribution, and Spot Weather Impact Warning.	Low	Medium
Support	Catch-all category for systems supporting transportation operations. Example service packages include Map Management, Data Distribution, and Security and Credentials Management.	Low	Low
Vehicle Safety	Example service packages include Queue Warning, Curve Speed Warning, and Automated Vehicle Operations.	Low	High
Data Management	Example service packages include ITS Data Warehouse and Performance Monitoring.	Low	Medium
Parking Management	Example service packages include Parking Space Management, Parking Electronic Payment, and Regional Parking Management.	Low	Medium
Sustainable Travel	Example service packages include Emissions Monitoring, High Occupancy Vehicle/High Occupancy Toll Lane Management, and Electric Charging Stations Management.	Low	Low

5.1 ITS Service Packages

In the National ITS Architecture, services that are provided by ITS are referred to as service packages. ITS service packages provide a visual representation of how ITS services are deployed and how information is shared. ITS service packages can include several stakeholders and elements that work together to provide a service in the Region. Examples of service packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently 141 ITS service packages identified in the National ITS Architecture Version 8.3, which was the most recent version available of the National ITS Architecture at the time of the Clarksville Urbanized Area Regional ITS Architecture update. Previous versions of the Clarksville Urbanized Area Regional ITS Architecture refer to the 97 total service packages previously provided, as opposed to the set of 141 total service packages now available.

5.1.1 Overview of ITS Service Package Structure

A service package is made up of elements and data flows. Each identified system or component in the Clarksville Urbanized Area 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.

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, Fields, 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 corresponds to physical elements such as: traffic operations centers, traffic signals, or vehicles. Each element is assigned to one or more subsystems.

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

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

5.1.2 Selection and Prioritization of Regional Service Packages

In the CUAMPO 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 65 ITS service packages for implementation in the Region. The selected service packages are identified in **Table 7**. Stakeholders prioritized the selected service packages during the workshops, and the table organizes the service packages into service areas and priority groupings. Support service packages were not included due to primary services, such as mapping and location information, being provided by the private sector and not at the state or local level.

TDOT is leading a separate effort to maintain 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 CUAMPO Region that could be addressed locally, the commercial vehicle operations service packages were not selected and instead will be covered in the CVISN effort to ensure consistency.

After selecting the service packages that were applicable for the Region, stakeholders reviewed each service package and the elements that could be included to customize it for the Region. This customization is discussed further in the next section (Section 5.1.3.).

Table 7 – Clarksville Urbanized Area ITS Service Package Prioritization by Service Area

High Priority ITS Service Packages	Medium Priority ITS Service Packages	Low Priority ITS Service Packages
Traffic Management		
TM01 Infrastructure-Based Traffic Surveillance TM03 Traffic Signal Control TM04 Connected Vehicle Traffic Signal Systems TM06 Traffic Information Dissemination TM07 Regional Traffic Management TM08 Traffic Incident Management System TM19 Roadway Closure Management TM20 Variable Speed Limits	TM02 Vehicle-Based Traffic Surveillance TM05 Traffic Metering TM12 Dynamic Roadway Warning TM13 Standard Railroad Grade Crossing TM16 Reversible Lane Management TM17 Speed Warning and Enforcement	
Public Safety		
PS01 Emergency Call-Taking and Dispatch PS03 Emergency Vehicle Preemption PS07 Incident Scene Safety Monitoring PS08 Roadway Service Patrols	PS02 Emergency Response PS10 Wide-Area Alert PS12 Disaster Response and Recovery PS13 Evacuation and Reentry Management PS14 Disaster Traveler Information	PS11 Early Warning System
Maintenance and Construction		
MC06 Work Zone Management MC08 Maintenance and Construction Activity Coordination	MC01 Maintenance and Construction Vehicle and Equipment Tracking	
Public Transportation		
PT01 Transit Vehicle Tracking PT02 Transit Fixed Route Operations PT03 Dynamic Transit Operations PT04 Transit Fare Collection Management PT05 Transit Security PT06 Transit Fleet Management PT07 Transit Passenger Counting PT08 Transit Traveler Information	PT09 Transit Signal Priority PT14 Multi-modal Coordination PT17 Transit Connection Protection	

Table 7 – Clarksville Urbanized Area ITS Service Package Prioritization by Service Area (Continued)

High Priority ITS Service Packages	Medium Priority ITS Service Packages	Low Priority ITS Service Packages
Traveler Information		
TI01 Broadcast Traveler Information TI02 Personalized Traveler Information	TI07 In-Vehicle Signage	
Commercial Vehicle Operations		
CVO09 Freight Specific Dynamic Travel Planning	CVO08 Smart Roadside and Virtual WIM CVO12 HAZMAT Management	CVO03 Electronic Clearance
Data Management		
	DM01 ITS Data Warehouse DM02 Performance Monitoring	
Parking Management		
	PM01 - Parking Space Management PM03 – Parking Electronic Payment	
Vehicle Safety		
VS01 Autonomous Vehicle Safety Systems VS02 V2V Basic Safety VS04 V2V Special Vehicle Alert VS08 Queue Warning VS09 Reduced Speed Zone Warning / Lane Closure VS10 Restricted Lane Warnings VS 13 Intersection Safety Warning and Collision Avoidance	VS07 Road Weather Motorist Alert and Warning VS12 Pedestrian and Cyclist Safety VS15 Infrastructure Enhanced Cooperative Adaptive Cruise Control VS16 Automated Vehicle Operations	
Sustainable Travel		
ST05 Electric Charging Stations Management	ST01 Emissions Monitoring ST02 Eco-Traffic Signal Timing	ST04 Roadside Lighting
Weather		
	WX01 Weather Data Collection WX02 Weather Information Processing and Distribution	

5.1.3 Customization of Regional Service Packages

The service packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the CUAMPO 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 the connection exists in at least one location within the jurisdiction. 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 3 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 Clarksville Traffic Operations Center (TOC). The ITS service package shows the distribution of traffic information and other connections from the TOC to existing elements such as the City of Clarksville CCTV cameras and traffic signals, as well as connections to elements that could be deployed in the future such as the City of Clarksville DMS. Connections to elements that could be deployed in the future are shown as planned.

The remainder of the service packages that were customized for the Clarksville MPO Region are provided in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access these diagrams, from the website select the “Draft Clarksville Interactive ITS Architecture”, then select the “Services” page from the left sidebar, then click the desired Service Package Name. The link below the “Diagram” heading will lead to the service package diagram.

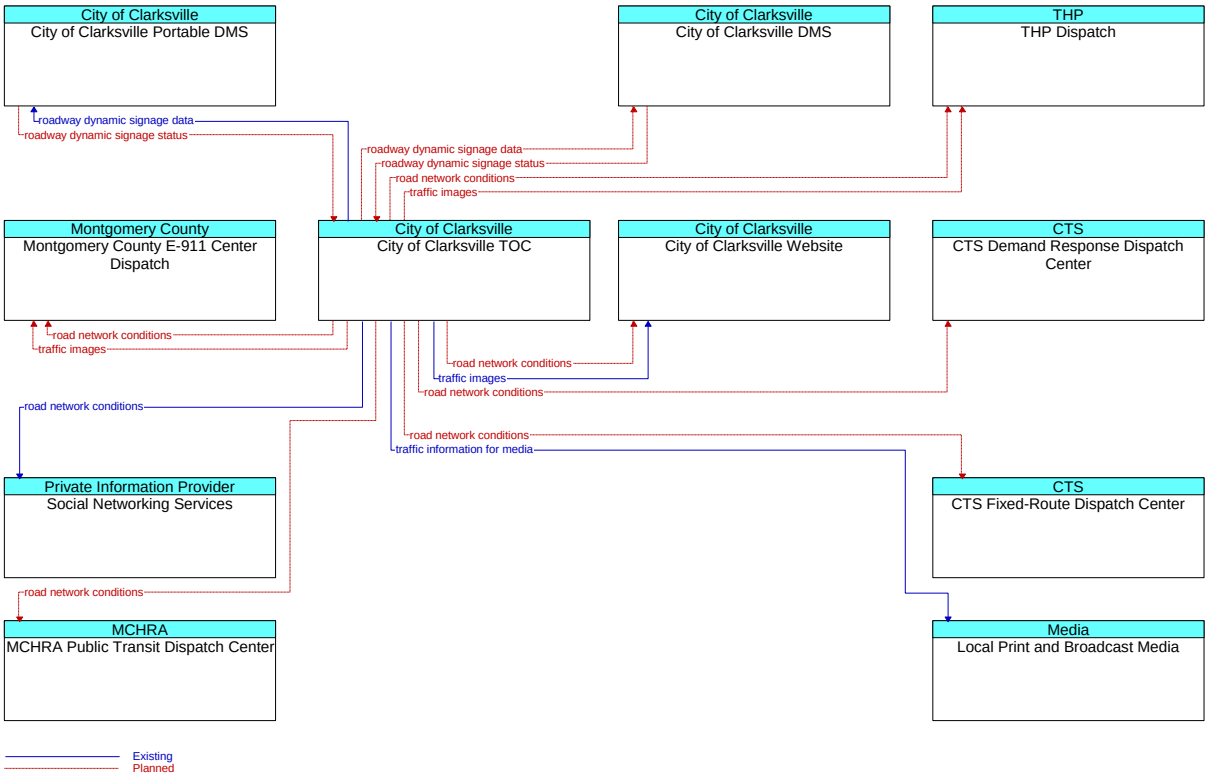

Figure 3 – Example ITS Service Package Diagram:
TM06 Traffic Information Dissemination (City of Clarksville)

Some service packages are created for a specific agency, while others are more general and apply to all municipalities in the Region, for example. **Table 8** lists all service packages and includes whether they apply to a specific agency or a more general category. The service package diagrams for each of the service packages listed in **Table 8** contain ITS elements that are described and organized by each one's owner stakeholder agency in **Table 5**.

Table 8 – Regional Service Packages with Corresponding Agency

Service Package	Service Package Name	Agency / Agencies
Commercial Vehicle Operations Service Area		
CVO03	Electronic Clearance	• TDOT Office of Commercial Vehicle Enforcement
CVO08	Smart Roadside and Virtual WIM	• TDOT Region 3 • TDOT
CVO09	Freight Specific Dynamic Travel Planning	• TDOT Office of Commercial Vehicle Enforcement
CVO12	HAZMAT Management	• TEMA
Data Management Service Area		
DM01	ITS Data Warehouse	• CTS • CUAMPO • KYTC District 2 • MCHRA • PACS • TDOT Region 3 • THP
DM02	Performance Monitoring	• City of Clarksville • TDOT Region 3 • KYTC District 2
Maintenance and Construction Service Area		
MC01	Maintenance and Construction Vehicle and Equipment Tracking	• City of Clarksville • KYTC District 2 Maintenance • Municipal/County • TDOT Region 3 Maintenance
MC06	Work Zone Management	• City of Clarksville • KYTC District 2 Maintenance • Municipal/County • TDOT Region 3 Maintenance
MC08	Maintenance and Construction Activity Coordination	• City of Clarksville • KYTC District 2 • Municipal/County • TDOT Region 3

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Parking Management Service Area		
PM01	Parking Space Management	• City of Clarksville
PM03	Parking Electronic Payment	• City of Clarksville
Public Safety Service Area		
PS01	Emergency Call-Taking and Dispatch	• Christian County • Fort Campbell • KYJPSC • Montgomery County • THP
PS02	Emergency Response	• City of Clarksville • Christian County • Fort Campbell • KYTC District 2 • Montgomery County • TDOT Region 3
PS03	Emergency Vehicle Preemption	• Christian County • Fort Campbell • KYJPSC • Montgomery County • THP
PS07	Incident Scene Safety Monitoring	• City of Clarksville • TDOT Region 3 • KYTC District 2
PS08	Roadway Service Patrols	• TDOT • KYTC
PS10	Wide-Area Alert	• Kentucky AMBER Alert • Tennessee AMBER Alert
PS11	Early Warning System	• Christian County • KYDMA • Fort Campbell • TEMA

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Public Safety Service Area (Continued)		
PS12	Disaster Response and Recovery	• Christian County EMA • Fort Campbell EMA • KYDMA • KYJPSC • Montgomery County EMA • Tennessee EMA • THP
PS13	Evacuation and Reentry Management	• Christian County EMA • Fort Campbell EMA • KYDMA • KYJPSC • Montgomery County EMA • Tennessee EMA • THP
PS14	Disaster Traveler Information	• KYJPSC, Tennessee 511 and SWIFT
Public Transportation Service Area		
PT01	Transit Vehicle Tracking	• CTS • MCHRA • PACS
PT02	Transit Fixed-Route Operations	• CTS
PT03	Dynamic Transit Operations	• CTS • MCHRA • PACS
PT04	Transit Fare Collection Management	• CTS
PT05	Transit Security	• CTS • MCHRA • PACS
PT06	Transit Fleet Management	• CTS • MCHRA • PACS
PT07	Transit Passenger Counting	• CTS
PT08	Transit Traveler Information	• CTS
PT09	Transit Signal Priority	• CTS

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Public Transportation Service Area (Continued)		
PT14	Multi-modal Coordination	• CTS • MCHRA • PACS
PT17	Transit Connection Protection	• CTS
Sustainable Travel Service Area		
ST01	Emissions Monitoring	• Christian and Montgomery County Health Departments
ST02	Eco-Traffic Signal Timing	• City of Clarksville
ST03	Eco-Traffic Metering	• TDOT
ST04	Roadside Lighting	• City of Clarksville
ST05	Electric Charging Stations Management	• City of Clarksville
Traveler Information Service Area		
TI01	Broadcast Traveler Information	• City of Clarksville • Fort Campbell • KYTC • Municipal Government • TDOT • SWIFT
TI02	Personalized Traveler Information	• City of Clarksville • Fort Campbell • KYTC • Municipal Government • TDOT • Tennessee 511
TI07	In-Vehicle Signage	• City of Clarksville • TDOT Region 3 • KYTC District 2
Traffic Management Service Area		
TM01	Infrastructure-Based Traffic Surveillance	• City of Clarksville • Fort Campbell • KYTC District 2 • Municipal Government • TDOT Region 3

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Traffic Management Service Area (Continued)		
TM02	Vehicle-Based Traffic Surveillance	• Christian County • City of Clarksville • Fort Campbell TOC • KYTC District 2 • Municipal • Montgomery County • TDOT • TDOT Region 3 TMC – Clarksville •
TM03	Traffic Signal Control	• Christian County • City of Clarksville • Fort Campbell • KYTC District 2 • Montgomery County • Municipal Government • TDOT Region 3
TM04	Connected Vehicle Traffic Signal System	• Christian County • City of Clarksville • Fort Campbell TOC • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3 TMC – Clarksville
TM05	Traffic Metering	• TDOT Region 3 TMC - Clarksville
TM06	Traffic Information Dissemination	• Christian County • City of Clarksville • Fort Campbell TOC • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3 TMC – Clarksville

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Traffic Management Service Area (Continued)		
TM07	Regional Traffic Management	• Christian County • City of Clarksville • Fort Campbell TOC • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3 TMC – Clarksville
TM08	Traffic Incident Management System	• Christian County • City of Clarksville • Fort Campbell TOC • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3 TMC – Clarksville
TM12	Dynamic Roadway Warning	• Christian County • City of Clarksville • Fort Campbell • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3
TM13	Standard Railroad Grade Crossing	• Christian County • City of Clarksville • Fort Campbell • KYTC District 2 • Municipal • Montgomery County • TDOT Region 3
TM16	Reversible Lane Management	• City of Clarksville
TM17	Speed Warning and Enforcement	• City of Clarksville

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Traffic Management Service Area (Continued)		
TM19	Roadway Closure Management	• City of Clarksville • KYTC District 2 • TDOT Region 3
TM20	Variable Speed Limits	• City of Clarksville • KYTC District 2 • TDOT Region 3
Vehicle Safety Service Area		
VS01	Autonomous Vehicle Safety Systems	• Automobile Manufacturers
VS02	V2V Basic Safety	• Automobile Manufacturers
VS04	V2V Special Vehicle Alert	• Christian County • Fort Campbell • KYJPSC • Montgomery County • THP
VS07	Road Weather Motorist Alert and Warning	• City of Clarksville • TDOT Region 3 • KYTC District 2
VS08	Queue Warning	• TDOT Region 3 • KYTC District 2
VS09	Reduced Speed Zone Warning / Lane Closure	• City of Clarksville • TDOT Region 3
VS10	Restricted Lane Warnings	• City of Clarksville • TDOT Region 3 • KYTC District 2
VS12	Pedestrian and Cyclist Safety	• City of Clarksville • TDOT Region 3 • KYTC District 2
VS13	Intersection Safety Warning and Collision Avoidance	• City of Clarksville • TDOT Region 3 • KYTC District 2
VS15	Infrastructure Enhanced Cooperative Adaptive Cruise Control	• TDOT Region 3 • KYTC District 2
VS16	Automated Vehicle Operations	• TDOT Region 3 • KYTC District 2

Table 8 – Regional Service Packages with Corresponding Agency (Continued)

Service Package	Service Package Name	Agency / Agencies
Weather Service Area		
WX01	Weather Data Collection	• Christian County • City of Clarksville • KYTC • Montgomery County • Municipal/County • TDOT
WX02	Weather Information Processing and Distribution	• City of Clarksville • KYTC • TDOT

5.1.4 Regional Needs and Corresponding Service Packages

Input received from stakeholders at the Clarksville Urbanized Area Regional ITS Architecture workshops provided valuable input for the service package customization process. The needs identified in the ITS Architecture workshops, as well as needs from the Clarksville Urbanized Area Livability 2040 Regional Transportation Plan are identified in **Table 9**. The table also identifies which service packages address each ITS need.

One fifth of the United States population consists of people with disabilities of various kinds, necessitating innovation travel options and ITS solutions. It is worth noting that several of the service packages in this Regional ITS Architecture are equipped to meet the accessibility needs of people with disabilities. For example, Service Package VS 12 Pedestrian and Cyclist Safety addresses the sensing and warning systems to give ample crossing time to non-motorized travelers with disabilities or inform them when to cross and how to stay aligned with crosswalks or pathways.

A complete list of stakeholder needs along with their corresponding service packages is provided in the online RAD-IT database located at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access the Stakeholder Needs table, from the website select the “Draft Clarksville Interactive ITS Architecture”, then select the “Needs” page from the left sidebar, then click the desired Service Package Name.

Table 9 – Clarksville Regional ITS Needs and Corresponding Service Packages

ITS Need	Corresponding ITS Service Packages
Traffic Management and Traveler Information	
Need to expand TDOT's SmartWay system, including closed-circuit television (CCTV) cameras, dynamic message signs (DMS), and radar detection systems (RDS), onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events.	TM01 – Infrastructure-Based Traffic Surveillance TM06 – Traffic Information Dissemination TM07 – Regional Traffic Management TM08 – Traffic Incident Management System
Need to expand TDOT's HERO Freeway Safety Service Patrol onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events.	TM08 – Traffic Incident Management System PS07 – Incident Scene Safety Monitoring PS08 – Roadway Service Patrols VS08 – Queue Warning
Need to expand KYTC's SAFE Patrol into Christian County on I-24 to convey information to manage traffic incidents and other events.	TM08 – Traffic Incident Management System PS07 – Incident Scene Safety Monitoring PS08 – Roadway Service Patrols VS08 – Queue Warning
Need to improve Fort Campbell entrance traffic flow and barrier gates.	TM01 – Infrastructure-Based Traffic Surveillance TM03 – Traffic Signal Control TM06 – Traffic Information Dissemination TM19 – Roadway Closure Management
Need to improve coordination between TDOT and KYTC's TMCs for traffic incident management and other events that impact traffic.	TM07 – Regional Traffic Management TM08 – Traffic Incident Management System
Need to expand CCTV camera coverage areas throughout the Region.	TM01 – Infrastructure-Based Traffic Surveillance
Need to utilize various strategies along major corridors to maintain design capacity and overall level of service	TM03 – Traffic Signal Control TM05 – Traffic Metering TM06 – Traffic Information Dissemination TM16 – Reversible Lane Management TM20 – Variable Speed Limits
Need to implement and expand the Adaptive Signal Control Technology (ASCT) along major corridors to address the variable and unpredictable traffic patterns, such as traffic on arterials due to traffic incidents on I-24.	TM01 – Infrastructure-Based Traffic Surveillance TM03 – Traffic Signal Control
Need to remotely control warning beacons for school zones.	TM03 – Traffic Signal Control
Need to monitor rail crossing and convey blockages to drivers.	TM13 Standard Railroad Grade Crossing TM06 Traffic Information Dissemination
Need to create and expand fiber optic connections between traffic management agencies for better coordination.	TM07 – Regional Traffic Management
Need to utilize various ITS and technology to support environmental sustainability.	ST01 – Emissions Monitoring ST02 – Eco-Traffic Signal Timing ST05 – Electric Charging Stations Management

Table 9 – Clarksville Regional ITS Needs and Corresponding Service Packages (Continued)

ITS Need	Corresponding ITS Service Packages
Need to consider implementation of connected and automated vehicle technology to improve safety.	VS01 – Autonomous Vehicle Safety Systems VS02 – V2V Basic Safety VS12 – Pedestrian and Cyclist Safety – City of Clarksville, TDOT, KYTC VS13 – Intersection Safety Warning and Collision Avoidance VS15 – Infrastructure Enhanced Cooperative Adaptive Cruise Control VS16 – Automated Vehicle Operations
Need to develop an ITS master plan for the deployment of ITS projects	TM07 – Regional Traffic Management
Commercial Vehicle Operations Needs	
Need to provide truck parking facilities for I-24 and information on the availability.	PM01 – Parking Space Management TM06 – Traffic Information Dissemination
Maintenance and Construction	
Need to monitor roadway weather conditions through the installation of additional road weather data collection stations and warn drivers of hazardous conditions.	TM06 – Traffic Information Dissemination TM12 – Dynamic Roadway Warning PS11 – Early Warning System VS07 – Road Weather Motorist Alert and Warning WX01 – Weather Data Collection WX02 – Weather Information Processing and Distribution
Need to provide real-time construction and maintenance information for traffic, transit and emergency operations.	MC06 – Work Zone Management MC08 – Maintenance and Construction Coordination VS09 – Reduced Speed Zone Warning/Lane Closure VS10 – Restricted Lane Warning
Traveler Information	
Need to convey information to drivers through DMS or other devices.	TM06 – Traffic Information Dissemination TM12 – Dynamic Roadway Warning TI07 – In-Vehicle Signage
Need to provide alternate route information when incidents occur on the interstate.	TM01 – Infrastructure-Based Traffic Surveillance TM02 – Vehicle-Based Probe Surveillance TM06 – Traffic Information Dissemination TI01 – Broadcast Traveler Information TI02 – Personalized Traveler Information
Need to monitor rail crossing and convey blockages to drivers. *(Also noted in Traffic Management Needs)*	TM13 – Standard Railroad Grade Crossing
Parking Management	
Need to expand parking facility management and provide information on parking availability.	TI02 – Personalized Traveler Information TM06 – Traffic Information Dissemination PM01 – Parking Space Management PM04 – Regional Parking Management

Table 9 – Clarksville Regional ITS Needs and Corresponding Service Packages (Continued)

ITS Need	Corresponding ITS Service Packages
Data Management	
Need to archive data gathered through ITS to make it more accessible to regional stakeholders.	DM01 – ITS Data Warehouse DM02 – Performance Monitoring
Public Safety	
Need to assist emergency vehicle movement with traffic signal preemption and monitoring.	TM03 – Traffic Signal Control PS01 – Emergency Call-Taking and Dispatch PS02 – Emergency Response PS03 – Emergency Vehicle Preemption
Need to expand TDOT's HERO Freeway Safety Service Patrol onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events. *(Also noted in Traffic Management Needs)*	TM08 – Traffic Incident Management System PS07 – Incident Scene Safety Monitoring PS08 – Roadway Service Patrols VS08 – Queue Warning
Need to expand TDOT's HERO Freeway Safety Service Patrol onto I-24 in Montgomery and Robertson Counties to manage traffic incidents and other events. *(Also noted in Traffic Management Needs)*	TM08 – Traffic Incident Management System PS07 – Incident Scene Safety Monitoring PS08 – Roadway Service Patrols VS08 – Queue Warning
Public Transportation	
Need to provide real-time information to transit riders through DMS, a smartphone application, or QR codes.	PT01 – Transit Vehicle Tracking PT08 – Transit Traveler Information
Need to implement a transit trip planning system that is accessed by transit users through the web.	PT08 – Transit Traveler Information TI02 – Personalized Traveler Information
Need to improve transit vehicle and transit center safety and security through CCTV camera monitoring.	PT02 – Transit Fixed Route Operations PT03 – Dynamic Transit Operations PT05 – Transit Security PT06 – Transit Fleet Management
Need to improve coordination among transit agencies.	PT02 – Transit Fixed-Route Operations PT03 – Dynamic Transit Operations PT07 – Multi-modal Coordination PT17 – Transit Connection Protection
Need to implement bus priority along specific corridors.	PT09 – Transit Signal Priority TM03 – Traffic Signal Control
Need to monitor bus passenger boarding and alighting.	PT07 – Transit Passenger Counting

5.2 Architecture Interfaces

While it is important to identify the various systems and stakeholders that are part of a Regional ITS Architecture, a primary purpose of the ITS architecture is to identify the connectivity between transportation systems in the CUAMPO Region. The system interconnect diagram shows the high-level relationships of the subsystems and terminators in the CUAMPO 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 CUAMPO Region based on the system inventory and information gathered from the stakeholders. **Figure 4** summarizes the existing and planned ITS elements for the CUAMPO Region in the context of a physical interconnect. Subsystems and elements specific to the Region are called out in the boxes surrounding the main interconnect diagram, and these are color-coded to the subsystem with which they are associated.

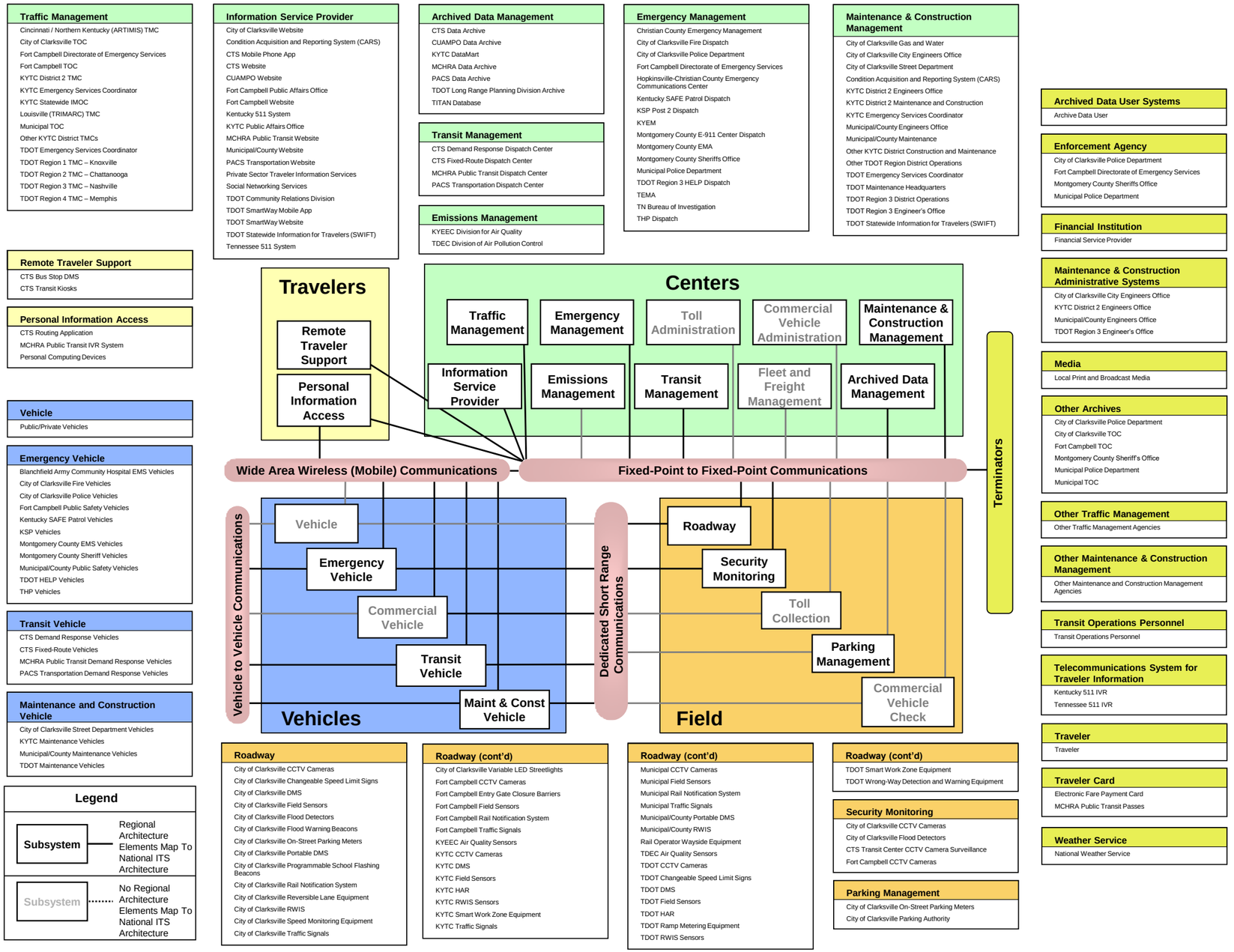

Figure 4 – Clarksville ITS Regional System Interconnect Diagram

While no system interconnect diagram is available online, a complete list of the elements shown above in Figure 4 and in Table 5, along with element definitions and other information, can be found in the RAD-IT database available online at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access this information, from the website select the "Draft Clarksville Interactive ITS Architecture", then select the "Inventory" page from the left sidebar. Select an Element from the table to learn more about it. Users can also sort elements by physical object or by stakeholder using the corresponding sidebar options.

5.2.2 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.

An example of a context diagram that has been filtered for City of Clarksville Traffic Signals is shown in **Figure 5**.

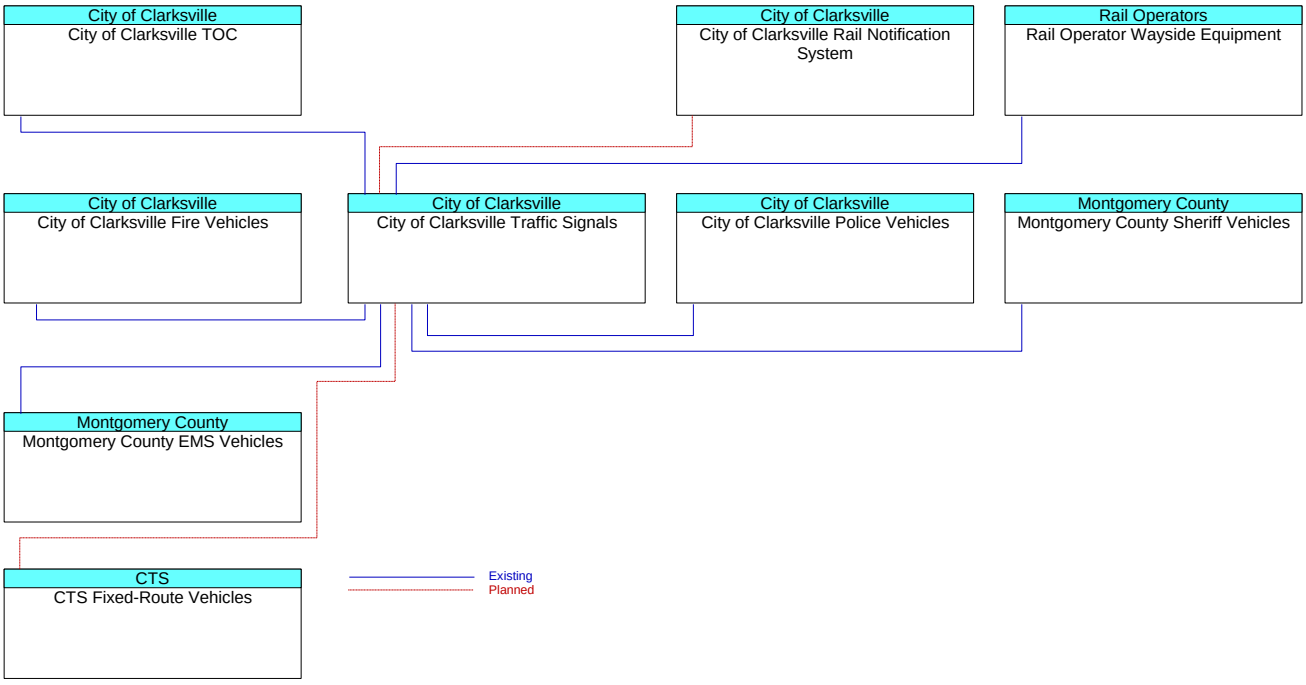

Figure 5 – Example Context Diagram: City of Clarksville Traffic Signals

Context diagrams show the data flows between elements of the architecture. For example, **Figure 5** shows existing connections between the City of Clarksville Traffic Signals and the

City of Clarksville TOC, City of Clarksville Fire Vehicles, and Rail Operator Wayside Equipment. Other connections, such as between the City of Clarksville Traffic Signals and the Montgomery County EMS Vehicles as shown as a planned connection (planned means this connection could exist in the future, but not that it is planned or funded project.)

While service package diagrams contain data flow information, this information can also be filtered by element in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access these element-specific context diagrams, from the website select the "Draft Clarksville Interactive ITS Architecture", then select the "Interfaces" page from the left sidebar, then click the desired element on the left side of the column to see the context diagram showing all of the other elements that are connected.

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 CUAMPO 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 Clarksville 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 CUAMPO Region has to do and the data that needs to be shared among elements.

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

5.4 Standards

Standards are an important tool that will allow efficient implementation of the elements in the Clarksville Urbanized Area 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 10** identifies each of the ITS standards that could apply to the Clarksville Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 5.2.2.

While **Table 10** does not match the standards to specific architecture flows, that information is available through the National ITS Reference Architecture website. 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.arc-it.net/;
- Select the information flows link embedded in the second sub-bullet about Views beneath the first bulleted item, which describes the Architecture menu bar drop-down;
- 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 information flow name is a link that when selected leads to a more detailed description of the standards. The Communication Diagrams tab contains a graphic with applicable standards for the communication solution that satisfies the information flow.

Relevant standards are also provided in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access these standards, from the website select the "Draft Clarksville Interactive ITS Architecture", then select the "Standards" page from the left sidebar, then click the desired Standard title.

Table 10 – Clarksville Regional ITS Standards

SDO	Document ID	Title
APTA	APTA TCIP	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
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 1609.2	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	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 1570	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection
	IEEE 1609.11	Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS)
	Incident Management Standards Group	
	IEEE 1512	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 1512.3	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers

Table 10 – Clarksville Urbanized Area Applicable ITS Standards (Continued)

SDO	Document ID	Title
SAE	SAE J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary
	SAE J2945/9	Vulnerable Road User Safety Message Minimum Performance Requirements
	SAE J3067	Candidate Improvements to Dedicated Short Range Communications (DSRC) Message Set Dictionary [SAE J2735] Using Systems Engineering Methods
	Advanced Traveler Information Systems (ATIS) General Use Standards Group	
	SAE J2266-LRMS	Location Referencing Message Specification (LRMS)
	SAE J2354-ATIS	Message Set for Advanced Traveler Information System (ATIS)
	SAE J2540-Handling Strings	Messages for Handling Strings and Look-Up Tables in ATIS Standards
	SAE J2540/1-RDS	RDS (Radio Data System) Phrase Lists
	SAE J2540/2-IT IS	ITIS (International Traveler Information Systems) Phrase Lists
	SAE J2540/3-Phrase List	National Names Phrase List
	SAE J2945/1	On-Board System Requirements for V2V Safety Communications
	SAE J2945/2	Dedicated Short Range Communications Performance Requirements for V2V Safety Awareness
ECS	CEN – EN 15531-1	Service Interface for Real-Time Information (SIRI)
Profile	Contact-Proximity-Interface	Proximity Communication Interface
Profile	DSRC-UDP	Vehicle-to-Vehicle/Infrastructure using UDP
Profile	DSRC-WSMP	Vehicle-to-Vehicle/Infrastructure using WSMP
GTFS	GTFS	General Transit Feed Specification (GTFS) Static
	GTFS-Realtime	General Transit Feed Specification (GTFS) Realtime
ISO	ISO 19091	Intelligent transport systems – Cooperative ITS – Using V2I and I2V communications for applications related to signalized intersectoins
	ISO 21217	Intelligent transport systems – Communications access for landmobiles (CALM) – Architecture
ITE	ITE ATC 5201	Advanced Transportation Controller (ATC)
	ITE ATC 5202	Model 2070 Controller Standard
	ITE ATC API	Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC)
	ITE ITS Cabinet	ITS Standard Specification for Roadside Cabinets
	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)
NEMA	NEMA TS 2	Traffic Controller Assemblies with NTCIP Requirements
	NEMA TS 4	Hardware Standards for Dynamic Message Signs (DMS) with NTCIP Requirements
	NEMA TS 5	Portable Traffic Signal Systems (PTSS) Standard Control Circuit and Pilot Devices

	NEMA TS 8	Cyber and Physical Security for Intelligent Transportation Systems (ITS)
NIST	NIST FIPS PUB 140-2	Security Requirements for Cryptographic Modules
NTCIP	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 1207	Object Definitions for Ramp Meter Control (RMC) Units
	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 1213	Object Definitions for Electrical and Lighting Management Systems (ELMS)
	NTCIP-DATEX	NTCIP using DATEX
	NTCIP-SNMPv1	NTCIP using SNMPv1
	NTCIP-SNMPv1 Secure	NTCIP-SNMPv1 Secure
	NTCIP-SNMPv3	NTCIP-SNMPv3
	NTCIP-STMP	NTCIP using STMP
Profile	ProtoBuf	ProtoBuf
Profile	RSE-C2F	RSE - Center to Field Communications
	RSE-C2F-SNMP	RSE - Center to Field Communications - SNMP
	RSE-F2F	Roadside Equipment to ITS Roadway Equipment
	RSEGateway-Vehicle Destination	Vehicle Communications via RSEs, Vehicle Destination
	RSEGateway-VehicleSource	Vehicle Communications via RSEs, Vehicle Source
SRC	SRC-Legacy	Legacy Short Range Comm Using IEEE 1455
USDOT	RSU V4	USDOT Roadside Unit (RSU) Specification Document - Version 4
Profile	VehicleGateway-CenterSource	Vehicle Cluster from Center
Profile	Vehicle-On-Board	Vehicle-On-Board
Profile	WAW-ASN1	Wide Area Wireless using ASN.1 as encoding method
Profile	WAW-WWWBrowser-JSON	Wide Area Wireless using JSON as encoding method
Profile	WAW-XML	Wide Area Wireless using XML as encoding method
XML	XML	eXtensible Markup Language

5.5 Cyber Security

Cyber security is a key component to the resiliency of the regional ITS architecture and networks that support ITS. In particular it is important for traffic signal system to have strong cyber security in order to prevent cyber events as technology integration and connectivity increases. The USDOT National ITS Reference Architecture clarifies this further: “surface transportation is now, more than ever relying on information technologies to sense, collect, process and disseminate information to improve the efficiency of moving goods and people, improve the safety of our transportation system and provide travel alternatives.” (https://local.iteris.com/arc-it/html/security/security.html) As stated by the National Operations Center for Excellence (NOCoE), a cyber transportation systems framework should be flexible and sensitive to changing technology and means of communication in order to maintain system resilience against cyber threats (https://transportationops.org/cyberfmwk).

The NOCoE lists several objectives when formulating a cyber security framework. These should include “a means of rapid, secure communication of relevant cybersecurity challenges among stakeholders;” a communications platform for all stakeholders to formulate cybersecurity guidance; and these should be used to create guidance on how to respond to cybersecurity threats. NOCoE objectives are expanded upon by the National ITS Reference Architecture where cyber security threats can be addressed by securing ITS via securing physical objects, methods of information transfer, enterprise objects such as key people and organizations, and communication profiles. This is further enhanced by ITS Security Areas that determine how to recognize, address and rebound from cyber security threats using ITS technology. The ITS Security Areas listed in the National ITS Reference Architecture are listed below:

- Disaster Response and Evacuation
- Freight and Commercial Vehicle Security
- HAZMAT Security
- ITS Wide Area Alert
- Rail Security
- Transit Security
- Transportation Infrastructure Security
- Traveler Security

All security areas listed are relevant to the Clarksville Regional ITS Architecture. Examples of ITS technology to enhance cyber security as stated by the National ITS Reference Architecture include a transit surveillance system which deters cyber security threats and acts as a system for response when cyber events occur. These should be taken into account when creating a cyber security framework to customize to the existing and planned regional technology and ITS architecture.

It is recommended that the Clarksville Region create a cyber resiliency plan if one is not existing. NOCoE states the following on their website regarding creating or reviewing a cyber resiliency plan: website:

Creating or Reviewing Your Cyber Resiliency Plan: Based on recent cyber activity in public agencies that has been reported in the news, it is recommended that State and local agencies

who own and operate their transportation system to review their cyber resiliency plan at the earliest possible opportunity. This includes reviewing the following steps:

1. *Identify where and/or who has your IT and control system plan in response to a cyber event.*
2. *If necessary, familiarize yourself with the response plan procedures.*
3. *Review contact information with internal and external partners to make sure it is current and all partners understand their role and responsibility during a response.*
4. *Verify the location and condition of any backup software, database, and necessary supporting applications and files.*
5. *Confirm the response plan has current procedures for restoring software and systems to operating conditions.*"

In addition, the following standards are listed as from the National ITS Reference Architecture and be relevant to a cyber security framework and resiliency plan:

- FIPS 140-2 Security Requirements for Cryptographic Modules
- IEEE 1609.2 Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages
- IEEE 1609.2a Standard for Wireless Access in Vehicular Environments--Security Services for Applications and Management Messages - Amendment 1
- IETF DTLS The Datagram Transport Layer Security (DTLS) Protocol Version 1.2
- IETF FTP File Transfer Protocol (FTP)
- ETF FTP Auth FTP Security Extensions
- IETF SNMPv3 Simple Network Management Protocol (SNMP) Overview, Management Framework, Protocols, Applications, Security Models and Transport
- NEMA TS 8 Cyber and Physical Security for Intelligent Transportation Systems (ITS)

5.6 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 RAD-IT, in the operation of the Regional ITS Architecture. The services covered are:

- ***Traffic Signal Management*** – The development of signal systems that react to changing traffic conditions and provide coordinated intersection timing over a corridor, an area, or multiple jurisdictions.
- ***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. Also includes the management of construction operations and coordination of construction activities.
- ***Transit Management*** – The development of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both pre-trip and during the trip.
- ***Traveler Information*** – The development of systems to provide static and real-time transportation information to travelers.
- ***Commercial Vehicle Operations*** – The development of systems to facilitate the management of commercial vehicles (e.g., electronic clearance).
- ***Archived Data Management*** – The development of systems to collect transportation data for use in non-operational purposes (e.g., planning and research).

Table 11 identifies the roles and responsibilities of key stakeholders for a range of transportation services.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities

Transportation Service	Stakeholder	Roles/Responsibilities
Traffic Signal Control	City of Clarksville	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.
		Provide traffic signal priority for transit vehicles.
		Operate connected vehicle roadside equipment within the City.
		Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions.
	Fort Campbell	Operate and maintain traffic signal systems within the City.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on roadways within the City to facilitate traffic signal operations.
		Provide traffic signal preemption for emergency vehicles.
		Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemptions.
	KYTC	Operate and maintain traffic signal systems on State Routes.
		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 operate traffic signal controllers to implement traffic management strategies at signalized intersections 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 City to facilitate traffic signal operations.
		Provide traffic signal preemption for emergency vehicles.
		Remotely operate traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, and emergency vehicle preemption requests.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Freeway Traffic Metering Management	KYTC	Operate DMS and HAR to distribute traffic information and roadway conditions to travelers on the roadway.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on state roadways.
	TDOT	Operate DMS and HAR to distribute traffic information and roadway conditions to travelers on the roadway.
		Operate network surveillance equipment including CCTV cameras and vehicle detection on state roadways.
Incident Management (Traffic)	City of Clarksville	Coordinate maintenance resources for incident response.
		Operate DMS to distribute 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.
	Fort Campbell	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.
	KYTC	Operate DMS and HAR to distribute incident information to travelers on the roadway.
		Remotely control traffic and video sensors from KYTC District 2 TMC in Madisonville or KYTC Statewide IMOC in Frankfurt to support incident detection and verification.
		Responsible for coordination with other TOCs and emergency management agencies for coordinated incident management.
		Responsible for the development, coordination, and execution of special traffic management strategies during an evacuation.
		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.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Incident Management (Traffic) (continued)	TDOT	Operate DMS and HAR to distribute incident information to travelers on the roadway.
		Remotely control traffic and video sensors from the SmartWay TMC, CCTV cameras and roadway detection system to support incident detection and verification.
		Responsible for coordination with other TOCs and emergency management agencies for coordinated incident management.
		Responsible for the development, coordination, and execution of special traffic management strategies during an evacuation.
		Responsible for the dissemination of traffic related data to other centers and the media.
Incident Management (Emergency)	Christian County	Coordinate incident response with emergency dispatch agencies, any municipal TOCs, and the KYTC District 2 TMC in Madisonville for incidents on state facilities.
		Dispatch public safety vehicles to incidents.
	KYJPSC (KSP)	Coordinate incident response with other public safety and traffic management agencies as well as the KYTC District 2 TMC in Madisonville for incidents on state facilities.
		Dispatch public safety vehicles to incidents.
	Montgomery County	Coordinate incident response with emergency dispatch agencies, the City of Clarksville TOC, as well as the TDOT Region 3 TMC - Nashville for incidents on state facilities.
		Dispatch public safety vehicles to incidents.
	THP	Coordinate incident response with other public safety and traffic management agencies as well as the TDOT Region 3 TMC - Nashville for incidents on state facilities.
		Dispatch public safety vehicles to incidents.
Emergency Management	Christian County	911 Dispatch - Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for emergency call-taking for Christian County as the 911 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 EOC for Christian County in the event of a disaster or other large-scale emergency situation.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Emergency Management (continued)	Christian County (continued)	EMA - Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	Fort Campbell	911 Dispatch - Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		911 Dispatch - Participate in regional emergency planning to support large-scale incidents and disasters.
		911 Dispatch - Responsible for emergency call-taking for Fort Campbell as the 911 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 EOC for Fort Campbell in the event of a disaster or other large-scale emergency situation.
		EMA - Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in Fort Campbell.
	KYDMA (KYEM)	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 EOC for the State of Kentucky in the event of a disaster or other large-scale emergency situation.
		Responsible for coordination with adjacent states, including the State of Tennessee, as needed to support emergency management.
		Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the State.
	KYJPSC (KSP)	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 initiation of AMBER Alerts.
		Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Emergency Management (continued)	Montgomery County	E911 - Participate in regional emergency planning to support large-scale incidents and disasters.
		E911 - Responsible for emergency call-taking for all of Montgomery County.
		E911 - Responsible for the dispatch of emergency vehicles to incidents and tracking of their location and status.
		E911 - Responsible for the routing of emergency vehicles to facilitate the safest/quickest arrival at an incident.
		E911- Participate in evacuation planning and coordination to manage evacuation and reentry in the vicinity of a disaster or other emergency situation.
		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 EOC for Montgomery County in the event of a disaster or other large-scale emergency situation.
		EMA - Responsible for tactical decision support, resource coordination, and communications integration among emergency management agencies in the County.
	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 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 Kentucky, 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.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Maintenance and Construction Management	City of Clarksville	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 and sharing of information with other groups.
	KYTC	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, DMS, and HAR transmitters.
		Responsible for entering and updating work zone information in GoKY.ky.gov.
		Responsible for the tracking and dispatch of maintenance vehicles.
		Supports coordinated response to incidents.
		Supports work zone activities including the dissemination of work zone information through portable DMS, HAR, and sharing of information with other groups.
	Municipal/County Maintenance	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 and sharing of information with other groups.
	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, DMS, and HAR transmitters.
		Responsible for entering and updating work zone information in SWIFT.
		Responsible for the tracking and dispatch of maintenance vehicles.
		Supports coordinated response to incidents.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Maintenance and Construction Management (continued)	TDOT (Continued)	Supports work zone activities including the dissemination of work zone information through portable DMS, HAR, and sharing of information with other groups.
Transit Management	CTS	Coordinate with the Streets Department on transit signal priority.
		Operate on-board systems to provide next stop annunciation.
		Operate real-time arrival information boards at transit stops and at transfer stations.
		Operates fixed route and paratransit 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 passenger electronic fare payment on fixed route transit vehicles.
		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 system.
	MCHRA	Operates demand response transit services from a central dispatch facility responsible for tracking vehicle 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.
	PACS	Operates demand response transit services from a central dispatch facility responsible for tracking vehicle 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 Kentucky 511 Traveler Information System.
Traveler Information	City of Clarksville	Responsible for the collection and distribution of emergency information to the traveling public, including evacuation information and wide-area alerts.

Table 11 – Clarksville Regional Stakeholder Roles and Responsibilities (Continued)

Transportation Service	Stakeholder	Roles/Responsibilities
Traveler Information	City of Clarksville (continued)	Responsible for the collection and distribution of traveler information including incident information and maintenance and construction closure information.
	Fort Campbell	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.
	KYTC	Collection, processing, storage, and broadcast dissemination of traffic, transit, maintenance and construction, event and weather information to travelers via the GoKY.ky.gov.
		Operate DMS and HAR to distribute incident information to travelers on the roadway.
		Provide transportation network condition data to private sector information service providers.
	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.
Parking Management	City of Clarksville	Monitor parking lots and on-street spaces to determine the availability of parking spaces.
		Provide electronic parking payment through field parking meters.
		Provide parking lot information through website and DMS to motorist.
Archived Data Management	CTS	Collect and maintain transit archive data.
	CUAMPO	Collect and maintain data from regional traffic, transit, and emergency management agencies.
	KYTC	Collect and maintain traffic archive data.
	MCHRA	Collect and maintain transit archive data.
	PACS	Collect and maintain transit archive data.
	TDOT	Collect and maintain traffic archive data.
	THP	Collect and maintain crash record information from regional emergency management agencies.

5.7 Existing and Planned Agreements

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

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

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

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

Common agreement types and potential applications include:

- *Handshake Agreement:* Handshake agreements are often used in the early stage of a project. This type of informal agreement depends very much on relationships between agencies and may not be appropriate for long-term operations where staff is likely to change.
- *Memorandum of Understanding (MOU):* A MOU demonstrates general consensus but is not typically very detailed. MOUs often identify high-level goals and partnerships.
- *Interagency and Intergovernmental Agreements:* These agreements between public agencies can be used for operation, maintenance, or funding projects and systems.

They can include documentation on the responsibility of each agency, functions they will provide, and liability.

- *Funding Agreements:* Funding agreements document the funding arrangements for ITS projects. At a minimum, funding agreements include a detailed scope, services to be performed, and a detailed project budget. Agency funding expectations or funding sources are also typically identified.
- *Master Agreements:* Master agreements include standard contract language for an agency and serve as the main agreement between two entities which guides all business transactions. Use of a master agreement can allow an agency to do business with another agency or private entity without having to go through the often-lengthy development of a formal agreement each time.

Table 12 provides a list of existing and potential agreements for the CUAMPO 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.

Regional Agreements are also provided in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

To access these agreements, from the website select the "Draft Clarksville Interactive ITS Architecture", then select the "Agreements" page from the left sidebar, then click the desired Agreement title.

The following agreements were identified as existing in the CUAMPO Region and have been included in **Appendix C**.

- Agreement developed by TDOT for live CCTV video access for private entity users;
- Agreement developed by TDOT for live CCTV video access for governmental agency users;
- Memorandum of Understanding among TDOT, TDOSHS, and local governments for the quick clearance of incidents along the State Highway System.

Table 12 – Clarksville Regional Area Existing and Potential ITS 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 Municipalities	Agreement to define the parameters, guidelines, and policies for inter-agency ITS data sharing between public sector agencies including CCTV camera feeds. Similar to data sharing and usage agreements for public-private agencies, the agency that owns the equipment should have first priority of the equipment and the ability to discontinue data sharing if a situation warrants such action.
Existing	**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-Private)** – City of Clarksville 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	**Data Sharing and Usage (Public-Public)** – TDOT, KYTC, City of Clarksville, Fort Campbell	Agreement to define the parameters, guidelines, and policies for inter-agency ITS data sharing between public sector agencies including CCTV camera feeds. Similar to data sharing and usage agreements for public-private agencies, the agency that owns the equipment should have first priority of the equipment and the ability to discontinue or limit data sharing if a situation warrants such action.
Future	**Incident Data Sharing and Usage (Public-Public)** – Christian County, TDOT, KYJPSC, KYTC, Montgomery County, THP	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 systems and include information on lane closures, travel delays, and weather.

5.8 Phases of Implementation

The Clarksville Regional Area has been deploying ITS systems for several decades and continues to grow and enhance the system. Much of their focus is currently on expansion of existing systems. Connectivity continues to be a major focus of the Region. As the capability of agencies to monitor and collect information grows, other agencies see the benefit of connecting and sharing information between agencies.

The services identified in the Clarksville Urbanized Area Regional ITS Architecture will be implemented over time through a series of projects. Though TDOT, KYTC, and many of the larger municipalities have already made significant ITS deployments in the Region, for other agencies key foundation systems will need to be implemented in order to support other systems that have been identified in the Regional ITS Architecture. The deployment of all of the systems required to achieve the final Regional ITS Architecture build out will occur over many years.

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

- TM01 – Infrastructure-Based Network Surveillance
- TM02 – Vehicle-Based Traffic Surveillance
- TM03 – Traffic Signal Control
- TM04 – Connected Vehicle Traffic Signal System
- TM06 – Traffic Information Dissemination
- TM07 – Regional Traffic Management
- TM08 – Traffic Incident Management System
- PS08 – Roadway Service Patrols
- PT01 – Transit Vehicle Tracking
- PT02 – Transit Fixed Route Operations
- PT04 – Transit Fare Collection Management
- PT08 – Transit Traveler Information
- TI01 – Broadcast Traveler Information
- DM01 – ITS Data Warehouse
- DM02 – Performance Monitoring

6.0 Regional ITS Deployment Plan

The Regional ITS Deployment Plan serves as a tool for the CUAMPO 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 Clarksville 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 Deployment Plan Project Development Process

An overview of the process used to develop the Regional ITS Deployment Plan is provided in **Figure 6**. 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.

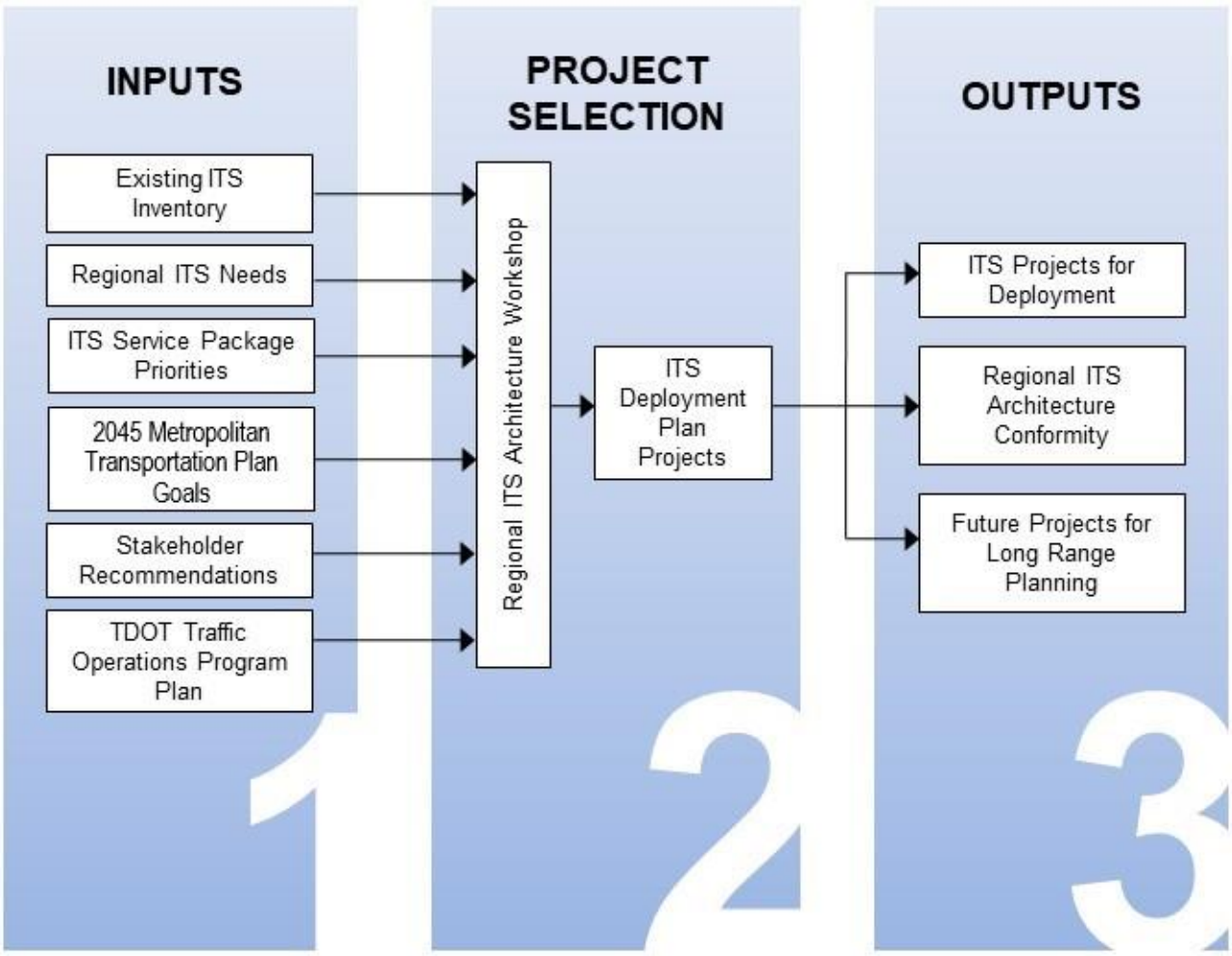

Figure 6 – Project Development and Selection Process

Stakeholder input in Step 1 was gathered through a series of stakeholder interviews where the regional ITS needs, ITS service package priorities, and planned ITS projects were discussed. A stakeholder workshop was also conducted to discuss this same information as a group and gain consensus from the group on regional needs and potential projects. A review of regional and local plans was also conducted to identify potential project ideas.

The inputs in Step 1 led to the project identification and selection in Step 2. Project selection was completed through a combination of a stakeholder workshop held in October 2020 as well as stakeholder review of the Regional ITS Architecture Report.

The outputs of the plan, shown in Step 3, will provide stakeholders and CUAMPO with a list priority regional ITS projects for the CUAMPO Region. Each of the projects recommended in the plan has been checked against the Clarksville Urbanized Area 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 CUAMPO.

6.2 Existing ITS Deployments

The Clarksville Regional Area has investments in the deployment of ITS throughout the Region. In **Table 13**, a summary of ITS deployments by state, regional, municipal, and transit agencies is provided.

The section in the table for state agencies focuses primarily on investments made by state departments of transportation within the Clarksville Urbanized Area MPO Region.

The regional transit agency is CTS. CTS has installed digital route signage at the downtown transit center and additional cameras inside and outside buses as well as in CTS facilities. Inclusion of CTS information in multiple transit applications is in the implementation phase as well as upgrades to GPS on all buses. Further upgrades under implementation include information panels to provide real-time passenger information, notices and updates through the CTS application and website.

Table 13 – Clarksville Regional Existing ITS Deployments

Agency	Freeway and Arterial Applications																							Transit Applications										
	Archived Data	Automated Roadway Treatment Equipment	CCTV Cameras	Center-to-Center Comm. for Traffic Info.	Centralized Traffic Signal Control System	Changeable Speed Limit Signs	Dynamic Message Signs (DMS)	Emergency Vehicle Signal Preemption	Field Sensors - Arterial Intersection	Field Sensors - Freeway	Freeway Service Patrol	Highway Advisory Radio	Lane Control Signals	Parking Management System	Pedestrian Hybrid Beacons	Portable DMS	Rail Notification System	Ramp Metering Equipment	Road Weather Information Systems (RWIS) Sensors	Real-Time Traveler Info. Website/Mobile Data	Smart Work Zones	Speed Monitoring Equipment	Traffic Management/Operations Center	Weigh-in-Motion	Archived Data	Automated Fare Payment	Automated Passenger Counters	Bus Rapid Transit	Center-to-Center Comm. for Traffic Info.	Real-Time Trav. Info. at Transit Centers/Stops	Real-Time Traveler Info. Website/Mobile Data	Transit Operations Center	Transit Facility CCTV Surveillance	Transit Signal Priority	Transit Vehicle Tracking
State																																		
KYTC	●		●	○	●		●			●	○	●				●			●	●	●	●	●	●										
TDOT	●	○	○	○		○	○			○	○					●		○	○	●	○	○	●	○										
Kentucky Counties & Municipalities																																		
City of Hopkinsville																																		
Christian County								●	●																									
Tennessee Counties & Municipalities																																		
City of Clarksville	○		●	●	●	○	○	●	●				●	○		○	○		○	○	○	●	●												
Montgomery County								●	●																									
Transit																																		
Clarksville Transit System																									○	○	○	○	○	●	●	●	●	●	●

Key

Interested ○

Existing ●

6.3 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 ITS Architecture. A key step toward achieving the CUAMPO Region's ITS vision is the development of an ITS Deployment Plan that identifies specific projects, timeframes, and responsible agencies.

Regional projects are identified in Table 14 through Table 17. The tables are divided by the primary responsible agency as follows:

- Table 14 – State ITS Deployment Plan Projects
- Table 15 – Local ITS Deployment Plan Projects
- Table 16 – Transit ITS Deployment Plan Projects
- Table 17 – 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. Many of the projects identified are not funded, and 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 timeframes 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 14 – State ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
TDOT/KYTC Coordination	Improve coordination between TDOT and KYTC, including the exchange of future CCTV camera feeds and improved coordination during incidents.	Short-Term: TDOT & KYTC	Funding Identified: No	TM07 Regional Traffic Management TM08 Traffic Incident Management System MC08 Maintenance and Construction Activity Coordination TI02 Personalized Traveler Information
TDOT SmartWay Region 3 TMC and City of Clarksville Coordination	Implement coordination between the TDOT SmartWay Region 3 TMC and the City of Clarksville to allow for video and data sharing between agencies as needed. TDOT plans to complete and begin distributing software to share CCTV video feeds to municipalities in 2015. 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 to Mid-Term: TDOT and Municipalities	Funding Identified: Yes	TM06 Traffic Information Dissemination TM07 Regional Traffic Management
TDOT SmartWay Installation on I-24	Deploy SmartWay infrastructure on I-24. As part of 2017 TDOT Traffic Operations Program Plan, the Three-Year Strategic Deployment for TDOT Region 3 identified 2 DMS, 4 CCTV cameras, 4 RDS, and 4 temperature sensors. Estimated cost is $1,500,000.	Mid-Term: TDOT	Funding Identified: No	TM01 Infrastructure-Based Traffic Surveillance TM07 Regional Traffic Management TM06 Traffic Information Dissemination
TDOT HERO Service Area Expansion on I-24	Expand the coverage area of the TDOT freeway safety service patrol to include I-24 in Tennessee within the CUAMPO Region.	Mid-Term: TDOT	Funding Identified: No	PS08 Roadway Service Patrols
Tennessee Memphis to Bristol Raceway Fiber	Fiber being built by a private company as part of the Memphis to Bristol Raceway project.	Short-Term: Private Sector in Partnership with TDOT	Funding Identified: Yes	TM03 Traffic Signal Control

Table 14 – State ITS Deployment Plan Projects (Continued)

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
KYTC Traffic Signal System Controller and Communications Upgrades	Complete upgrade of traffic signals to 2070 controllers and communication upgrades on State owned signals.	Short-Term: KYTC	Funding Identified: Yes	TM03 Traffic Signal Control
KYTC SAFE Patrol Deployment	Deploy KYTC SAFE Patrol freeway safety service patrol to include I-24 in Kentucky within the CUAMPO Region. Funding to the SAFE Patrol program was cut in 2020 however the need for this type of service continues to be recognized by stakeholders as a regional need.	Mid-Term: KYTC	Funding Identified: No	PS08 Roadway Service Patrols

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

Table 15 – Local ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
City of Clarksville Adaptive Signal Control System	Install an Adaptive Signal Control System on I-24, US 79, SR 374, and SR 76.	Short-Term: City of Clarksville	Funding Identified: No	TM03 Traffic Signal Control
City of Clarksville CCTV Cameras	Continue to deploy additional pan/tilt/zoom CCTV cameras along major arterials in Clarksville for incident management and traveler information.	Short-Term: City of Clarksville	Funding Identified: No	TM01 Infrastructure-Based Traffic Surveillance TM06 Traffic Information Dissemination
City of Clarksville Fiber Optic Expansion	Install additional fiber optic cable for traffic signal communications. Approximately 1/3 of the City's traffic signals are not currently connected.	Long-Term: City of Clarksville	Funding Identified: No	TM03 Traffic Signal Control
City of Clarksville 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 Clarksville	Funding Identified: No	TM06 Traffic Information Dissemination PS11 Early Warning System WX01 Road Weather Data Collection WX02 Weather Information Processing and Distribution

Table 15 – Local ITS Deployment Plan Projects (Continued)

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
City of Clarksville RWIS	Install road weather information system that includes field sensors to monitor road weather conditions including ice, snow, and rain.	Long-Term: City of Clarksville	Funding Identified: No	WX01 Road Weather Data Collection WX02 Weather Information Processing and Distribution
City of Clarksville Street Lighting Control	Install new streetlights or retrofit existing streetlights to include remote variable lighting control to adjust brightness.	Long-Term: City of Clarksville	Funding Identified: No	ST04 Roadside Lighting
City of Clarksville Remote-Controlled School Flashers	Install school zone flashers by retrofitting existing beacons. Project to be completed by 2021.	Short-Term: City of Clarksville	Funding Identified: Yes	TM03 Traffic Signal Control
Fort Campbell Traffic Signal Communications	Connect all traffic signals within Fort Campbell to a centralized TOC for operations.	Short to Mid-Term: Fort Campbell	Funding Identified: No	TM03 Traffic Signal Control
Fort Campbell Entrance Gate Traveler Information System	Improve operations and reduce congestion at entry points to Fort Campbell including geometric reconfiguration, gate closure information dissemination, traffic signal coordination, CCTV cameras deployment, and other ITS measure to improve monitoring capabilities of traffic and traveler information dissemination.	Short to Mid-Term: Fort Campbell	Funding Identified: No	TM01 Infrastructure-Based Traffic Surveillance TM03 Traffic Signal Control TM06 Traffic Information Dissemination TM19 Road Closure Management

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

Table 16 – Transit ITS Deployment Plan Projects

Project	Project Description	Deployment Timeframe and Responsible Agency[1]	Funding Status	Applicable ITS Service Packages
CTS Trip Route Planner (Google) Implementation	Continue to work with Google to provide information for trip route planning. CTS has awarded a competitive contract for this project.	Short-Term: CTS	Funding Identified: Yes	PT08 Transit Traveler Information TI02 Personalized Traveler Information
CTS 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. CTS has awarded a competitive contract for this project.	Short-Term: CTS	Funding Identified: Yes	PT08 Transit Traveler Information
CTS Real-time Bus Location and Arrival Information	, Provide next-stop announcements on buses, allow transit rides to see bus location on the CTS website or mobile phone app.	Short-Term: CTS	Funding Identified: Yes	PT01 Transit Vehicle Tracking PT08 Transit Traveler Information
CTS Next-Bus Arrival DMS	Install next-bus arrival DMS at CTS bus stops.	Mid to Long-Term: CTS	Funding Identified: No	PT01 Transit Vehicle Tracking PT08 Transit Traveler Information
CTS Transit Signal Priority Deployment	Implement a transit signal priority system on select routes for CTS fixed-vehicle bus routes including Wilma Rudolph Boulevard, Fort Campbell Boulevard Madison Street, and Riverside Drive.	Mid to Long-Term: CTS and City of Clarksville	Funding Identified: No	TM03 Traffic Signal Control PT09 Transit Signal Priority
Regional Transit Coordination	Improve coordination within and among transit agencies to optimize transit travel times.	Short to Mid-Term: CTS, MDHRA, and PACS	Funding Identified: No	PT07 Multimodal Coordination PT11 Transit Connection Protection
MCHRA Transit Fleet Management	Implement an automated process for drivers to perform pre- and post-trip safety inspections of transit vehicles. Estimated project cost is $50,400 with funding available through the FTA's 5309 Grant.	Short-Term: MCHRA	Funding Identified: Yes	PT06 Transit Fleet Management

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

Table 17 – 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
Clarksville Urbanized Are MPO Data Warehouse Implementation	Develop a transportation data warehouse that includes region-wide transportation data gathered from the ITS network.	Long-Term: CUAMPO	Funding Identified: No	DM1 ITS Data Warehouse

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

7.0 Use and Maintenance Plan

With growth and change in the CUAMPO Region, needs will change and as technology progresses new ITS opportunities will arise. Shifts in regional needs and focus as well as changes in the National ITS Architecture will necessitate that the Clarksville Urbanized Area 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 this Section 7 is to discuss how the Clarksville Urbanized Area 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.

Projects and elements contained in this regional ITS architecture may also interface with other ITS projects in nearby regions. This update was completed as TDOT developed its Statewide ITS Architecture, and this statewide architecture should be reviewed once it is completed to determine whether proposed projects or elements may impact the Clarksville Urbanized Area Regional ITS Architecture. Other ITS architectures for areas that either overlap or are geographically adjacent to CUAMPO boundaries should also be reviewed to determine whether other projects and elements should also be considered in the Clarksville Urbanized Area Regional ITS Architecture.

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 Clarksville Urbanized Area 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 that will happen approximately every five years 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.

Many of the ITS projects and strategies identified in the Regional ITS Architecture support goals identify in the 2045 Metropolitan Transportation Plan. Investments in ITS will need to be prioritized through the MPO's planning process to select those that best support regional goals. As a living document the Regional ITS Architecture will be continually updated to

identify new ITS projects and strategies that should be considered, as well as recognize the ITS deployments that have been completed.

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 CUAMPO Region. The architecture 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 for ITS projects. To ease this needed incorporation of separate documents, the regional ITS vision was developed specifically to reflect the transportation planning themes already identified in the greater regional transportation planning process.

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). In Tennessee, the TDOT Local Programs Development Office certifies ITS projects once conformance has been determined.

Stakeholders in the CUAMPO Region agreed that as projects are submitted for inclusion in the TIP, each project should be evaluated by the submitting agency to determine if the project includes any ITS elements. If the project contains any ITS elements, then the project needs to be reviewed to determine if the ITS elements in the project are in conformance with the Regional ITS Architecture. The submitting agency will perform this examination as part of the planning process using the procedure outlined in Section 7.3 and CUAMPO will review each project to confirm it does conform to the Regional ITS Architecture.

Beyond describing this architecture conformity check process, this Regional ITS Architecture focuses on incorporation into the Regional Planning Process in two other ways. First, in Section 3.0, discussion is provided on ways that ITS deployments can assist the Clarksville Region in meeting the goals outlined in the 2045 MTP. This discussion mentions specific ITS technologies, both planned and existing, and how they can help to address these regional transportation goals. In Section 6, the ITS Deployment Plan identifies recommended projects for deployment and includes the relevant ITS service packages from the Regional ITS Architecture that help establish conformance for each project.

7.2 Systems Engineering Analysis

The goal of performing a systems engineering analysis is to systematically think through the project deployment process, and show that thorough, upfront planning has been shown to help control costs and ensure schedule adherence. In order to assist agencies with meeting the requirements of the FHWA's Final Rule 23 CFR 940, TDOT's Traffic Operations Division developed a guidance document entitled "ITS Project Development Guidelines."

Agencies looking to implement an ITS project shall refer to the established TDOT ITS Project Development Guidelines) to determine whether a systems engineering analysis is necessary and, if so, how to properly complete one. These guidelines shall be used for ITS projects that

occur entirely or partly within Tennessee. 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 described in Section 7.4 of this document should be used to document the necessary changes.

The Clarksville Urbanized Area Regional ITS Architecture and associated RAD-IT 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;
- Participating agencies and their roles and responsibilities;
- Definition of system requirements (identified in the Clarksville Urbanized Area Regional ITS Architecture RAD-IT database equipment packages); and
- Applicable ITS standards (identified using ITS service package information flows present in the RAD-IT Database and their associated national standards).

7.3 Process for Determining ITS Architecture Conformity

The Clarksville Urbanized Area Regional ITS Architecture documents the customized service packages that were developed as part of the ITS architecture process. To satisfy FHWA and FTA requirements and remain eligible to use Federal funds, a project must be accurately documented. Therefore, prior to a project deployment, it is the responsibility of that project's lead stakeholder agency to evaluate the Regional ITS Architecture to confirm that the project conforms or else to request the necessary changes to the architecture. It is then the MPO's responsibility to accept or reject the requested changes to the architecture. Finally, if the changes are accepted, it is the responsibility of TDOT to certify the project for which the architecture was updated.

The steps of the process are as follows:

1. Identify the ITS components in the project;
2. Identify the corresponding service packages(s) from the Regional ITS Architecture;
3. Locate the component within the service package;
4. 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
5. Document any changes necessary to the Regional ITS Architecture or the project to ensure there is conformance.

The steps for determining ITS architecture conformity of a project are described in more detail on the following page.

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 Clarksville Urbanized Area 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 Clarksville MPO Area should be reviewed to determine if they adequately cover the project. Service packages selected for the Clarksville Urbanized Area Regional ITS Architecture are identified in **Table 7** 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 CUAMPO Region are provided in the online interactive RAD-IT database at:

https://extsites.kimley-horn.com/projects/TennesseeITSArchitecture/clarksville.html

Once the element is located within the appropriate service package, the project's lead stakeholder should determine whether the element name and description used in the service package is accurate or if a change to the name or description is needed. For example, a future element called the Fort Campbell TOC was included in the Clarksville Urbanized Area Regional ITS Architecture. Detailed planning for this center has not begun and it would not be unusual for the Fort 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.

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 using the Architecture Maintenance Documentation Form included in **Appendix E**. 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

CUAMPO will be responsible for leading the process to update the Clarksville Urbanized Area Regional ITS Architecture in coordination with the TDOT Traffic Operations Division. **Table 18** summarizes the maintenance process agreed upon by stakeholders in the Region.

Table 18 – Regional ITS Architecture and Deployment Plan Maintenance Summary

Maintenance Details	Regional ITS Architecture and Deployment Plan	
	Minor Update	**Major Update**
Timeframe for Updates	As needed	Approximately every 5 years
Scope of Update	Review and update service packages to satisfy architecture compliance requirements of projects or to document other changes that impact the Regional ITS Architecture	Entire Regional ITS Architecture and Deployment Plan
Lead Agency	CUAMPO	
Participants	Stakeholders impacted by service package modifications	Entire stakeholder group
Results	Service package or other change(s) documented for next complete update	Updated Regional ITS Architecture and Deployment Plan document, Appendices, and RAD-IT Architecture database

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

Minor changes to the Regional ITS Architecture 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.

The Regional ITS Architecture and Deployment Plan is a living document. Beyond making project changes or service packages changes to the architecture, the maintainers of the architecture should also regularly check for new relevant stakeholder agencies to involve in future updates, or whether new funding availability or completion of certain ITS projects might warrant changes to listed project priority levels. Regularly updating these aspects as a part of document maintenance will keep the architecture current, even as local transportation

priorities and technologies may be rapidly changing. The architecture's maintainers also have a responsibility to evaluate and monitor the effectiveness of the ITS architecture. The maintainers must confirm that projects being implemented conform to all relevant aspects of the existing ITS architecture, or else that any changes to the system are identified and are carried throughout all relevant aspects of the existing ITS architecture. The maintainer can verify consistency in the face of project changes by checking the architecture document against the maintained RAD-IT database to ensure that both representations of the architecture match.

7.5 Procedure for Submitting ITS Architecture Changes Between Major Updates

Updates to the Clarksville Urbanized Area Regional ITS Architecture will occur on a regular basis as described in Section 7.4 in order 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 modifications to the Regional ITS Architecture.

Relevant project stakeholders and CUAMPO 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.

For situations where a change is required, an Architecture Maintenance Documentation Form was developed and is included in **Appendix D**. 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 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.

APPENDIX A-SERVICE PACKAGE DEFINITIONS

Service Package	Service Package Name	Service Package Description
Commercial Vehicle Operations Service Area		
CVO03	Electronic Clearance	This service package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration Center to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using vehicle to infrastructure (V2I) Communications. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration Center. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, communications equipment, and computer workstations. Communications may be implemented using a range of technologies from transponder data readers through connected vehicle short range communications.
CVO08	Smart Roadside and Virtual WIM	This service package includes the delivery of capabilities related to wireless roadside inspections and electronic screening/virtual weigh stations. Wireless roadside inspection is defined by a safety screening capability that employs communications technologies to obtain information from a commercial vehicle that will allow safety screening of the vehicle and its driver. This capability provides for the interrogation at mainline speeds of a commercial vehicle when it has entered a control segment or geofenced area. Vehicle identification and driver information are provided to the roadside unit. The information communicated can be used to verify compliance with safety requirements, allowing a decision to be made regarding whether the vehicle should pull in to a roadside check station. A more advanced version of this service package would download safety information measured on the vehicle including driver related information such as the driver log allowing real time evaluation that the vehicle and driver are meeting safety requirements. The electronic screening/virtual weigh stations capability employs communications technologies to obtain information from a commercial vehicle that will allow verification of permits or credentials for the vehicle. The information communicated is used to verify compliance with safety requirements, allowing a decision to be made regarding whether the vehicle should pull in to a roadside check station. This service package can also be used to verify that the commercial vehicle meets vehicle weight (via weigh in motion capability) or dimension requirements.
CVO09	Freight-Specific Dynamic Travel Planning	This service package provides both pre-trip and en route travel planning, routing, and commercial vehicle related traveler information, which includes information such as truck parking locations and current status. The information will be based on data collected from the commercial fleet as well as general traffic data collection capabilities. The information, both real time and static can be provided directly to fleet managers, to mobile devices used by commercial vehicle operators, or directly to in vehicle systems as commercial vehicles approach roadway exits with key facilities such as parking. The service package can also provide oversize/ overweight permit information to commercial managers.
CVO12	HAZMAT Management	This service package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material transport, including response to incidents. HAZMAT tracking is performed by the Fleet and Freight Management Center. The Emergency Management Center is notified by the Commercial Vehicle and the Fleet and Freight Management Center of the HAZMAT vehicle location and information about the HAZMAT load. If an incident occurs, the Emergency Management Center can use the information to coordinate the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Center. The latter information can be provided prior to the beginning of the trip, during the trip, or gathered following the incident depending on the selected policy and implementation.

Service Package	Service Package Name	Service Package Description
Data Management Service Area		
DM01	ITS Data Warehouse	This service package provides access to transportation data to support transportation planning, condition and performance monitoring, safety analysis, and research. Configurations range from focused repositories that house data collected and owned by a single agency, district, private sector provider, or research institution to broad repositories that contain multimodal, multidimensional data from varied data sources covering a broader region. Both central repositories and physical distributed ITS data repositories are supported. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package may be parsed by the local repository and dynamically translated to requests to other repositories that relay the data necessary to satisfy the request. The repositories could include a data registry capability that allows registration of data identifiers or data definitions for interoperable use throughout a region.
DM02	Performance Monitoring	The Performance Monitoring service package uses information collected from detectors and sensors, connected vehicles, and operational data feeds from centers to support performance monitoring and other uses of historical data including transportation planning, condition monitoring, safety analyses, and research. The information may be probe data information obtained from vehicles in the network to determine network performance measures such as speed and travel times, or it may be information collected from the vehicles and processed by the infrastructure, e.g. environmental data and infrastructure conditions monitoring data. Additional data are collected including accident data, road condition data, road closures and other operational decisions to provide context for measured transportation performance and additional safety and mobility-related measures. More complex performance measures may be derived from the collected data.
Maintenance and Construction Service Area		
MC01	Maintenance and Construction Vehicle and Equipment Tracking	This service package tracks the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. Checks can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.
MC06	Work Zone Management	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., TIC, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.
MC06	Work Zone Management: Municipal/County	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.
MC08	Maintenance and Construction Activity Coordination	This service package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to Transportation Information Centers who can provide the information to travelers. Center to center coordination of work plans supports adjustments to reduce disruption to regional transportation operations.

Service Package	Service Package Name	Service Package Description
Parking Management Service Area		
PM01	Parking Space Management	This service package monitors and manages parking spaces in lots, garages, and other parking areas and facilities. It assists in the management of parking operations by monitoring parking lot ingress and egress, parking space occupancy and availability. Infrastructure-based detectors and/or connected vehicles may be used to monitor parking occupancy. The service package shares collected parking information with local drivers and information providers for broader distribution.
PM03	Parking Electronic Payment	This service package supports electronic collection of parking fees. It collects parking fees from in-vehicle equipment, contact or proximity cards, or any smart payment device. User accounts may be established to enhance services offered to frequent customers.
Public Safety Service Area		
PS01	Emergency Call-Taking and Dispatch	This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Centers supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Center and an Emergency Vehicle supports dispatch and provision of information to responding personnel. This service package also provides information to support dynamic routing of emergency vehicles. Traffic information, road conditions, and weather advisories are provided to enhance emergency vehicle routing. The Emergency Management Center provides routing information based on real-time conditions and has the option to request an ingress/egress route from the Traffic Management Center.
PS02	Emergency Response	This service package supports emergency/ incident response by personnel in the field. It includes emergency vehicle equipment used to provide response status as well as video or images from either the vehicle or from emergency personnel in the field. Wide area wireless communications between the Emergency Management Center, Emergency Personnel and Emergency Vehicles supports a sharing of emergency response information. The service package also includes tactical decision support, resource coordination, and communications integration for Incident Commands that are established by first responders at or near the incident scene to support local management of an incident, including the functions and interfaces commonly supported by a mobile command center.
PS03	Emergency Vehicle Preemption	This service package provides signal preemption for public safety first responder vehicles. Both traditional signal preemption systems and new systems based on connected vehicle technology are covered. In more advanced systems, movement of public safety vehicles through the intersection can be facilitated by clearing queues and holding conflicting phases. In addition, this SP also covers the transition back to normal traffic signal operations after providing emergency vehicle preemption.
PS07	Incident Scene Safety Monitoring	This service package employs communications technologies to provide warnings and alerts relating to incident zone operations. One aspect of the service is an in-vehicle messaging system that provides drivers with merging and speed guidance around an incident. Another aspect is providing in-vehicle incident scene alerts to drivers, both for the protection of the drivers as well as incident zone personnel. A third aspect is a warning system for on-scene workers when a vehicle approaching or in the incident zone is being operated outside of safe parameters for the conditions.

Service Package	Service Package Name	Service Package Description
PS08	Roadway Service Patrols	This service package supports roadway service patrol vehicles that monitor roads and aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.
PS10	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information websites.
PS11	Early Warning System	This service package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The service package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.

Service Package	Service Package Name	Service Package Description
PS12	Disaster Response and Recovery	This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).The service package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.The service package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this service package, the Emergency Management Center represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Center and the other centers provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this service package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities. This service package builds on the basic traffic incident response service that is provided by TM08, the Traffic Incident Management service package. This service package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of ARC-IT will want to consider both TM08 and this service package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.Disaster Response and Recovery is also supported by PS14, the "Disaster Traveler Information" service package that keeps the public informed during a disaster response. See that service package for more information.

Service Package	Service Package Name	Service Package Description
PS13	Evacuation and Reentry Management	This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.This service package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.Evacuations are also supported by PS14, the "Disaster Traveler Information" service package, which keeps the public informed during evacuations. See that service package for more information.
PS14	Disaster Traveler Information	This service package uses 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. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.This service package augments the Traveler Information (TI) service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.

Service Package	Service Package Name	Service Package Description
Public Transportation Service Area		
PT01	Transit Vehicle Tracking	This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.
PT02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.
PT03	Dynamic Transit Operations	This service package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this service package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.
PT04	Transit Fare Collection Management	This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other service packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.

Service Package	Service Package Name	Service Package Description
PT05	Transit Security	This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this service package.In addition the service package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.
PT06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Center. The Transit Management Center processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks and the assignment of transit vehicle operators to runs.
PT07	Transit Passenger Counting	This service package 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. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.
PT08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.
PT09	Transit Signal Priority	The Transit Signal Priority service package uses transit vehicle to infrastructure communications to allow a transit vehicle to request priority at one or a series of intersections. The service package provides feedback to the transit driver indicating whether the signal priority has been granted or not. This service package can contribute to improved operating performance of the transit vehicles by reducing the time spent stopped at a red light.
PT14	Multi-modal Coordination	This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency.

Service Package	Service Package Name	Service Package Description
PT17	Transit Connection Protection	This service package allows travelers to initiate a request for connection protection anytime during the trip using a personal device or on-board equipment and receive a confirmation indicating whether the request is accepted. Connection protection uses real time data to examine the arrival status of a transit vehicle and to transmit a hold message to a vehicle or other mode of transportation (e.g. rail) in order for the traveler to make a successful transfer from one vehicle to another. Connection protection can be performed within a single agency, across multiple agencies, and across multiple modes. In an intermodal, multimodal or interagency environment, a transfer request brokerage system, represented by the Transit Management System, can be used to determine the feasibility of a connection protection request and support schedule coordination between agencies.
Sustainable Travel Service Area		
ST01	Emissions Monitoring	This service package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the Emissions Management Center for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this service package. For area wide monitoring, this service package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this service package collects data from on-board diagnostic systems and measures tail pipe emissions to identify vehicles that exceed emissions standards and/or clean vehicles that could be released from standard emissions tests, depending on policy and regulations. Summary emissions information or warnings can also be displayed to drivers. The gathered information can be used to implement environmentally sensitive travel demand management (TDM) programs, policies, and regulations.
ST02	Eco-Traffic Signal Timing	The Eco-Traffic Signal Timing service package is similar to current adaptive traffic signal control systems; however, the service package's objective is explicitly to optimize traffic signals for the environment rather than the current adaptive systems' objective, which is to enhance the intersection level of service or throughput, which might improve the intersection's environmental performance. The Eco-Traffic Signal Timing service package processes real-time and historical connected vehicle data at signalized intersections to reduce fuel consumption and overall emissions at the intersection, along a corridor, or for a region. It evaluates traffic and environmental parameters at each intersection in real time and adapts so that the traffic network is optimized using available green time to serve the actual traffic demands while minimizing the environmental impact.
ST03	Eco-Traffic Metering	The Eco-Traffic Metering service package determines the most environmentally efficient operation of traffic signals at freeway on-ramps to manage the rate of entering automobiles. This service package collects traffic and environmental data from roadside sensors and connected vehicles to allow on-ramp merge operations that minimize overall emissions, including traffic and environmental conditions on the ramp and on the freeway upstream and downstream of the ramp. Using this information, the service package determines a timing plan for the ramp meter based on current and predicted traffic and environmental conditions.
ST04	Roadside Lighting	The Roadside Lighting service package is a connected vehicle version of the automated roadside lighting systems that uses the presence of vehicles based on V2I communications as an input to control of roadside lighting systems. The service package can use the presence of vehicles to alter roadside lighting levels, and can use environmental data obtained from the vehicles as an input to support adjustment of the lighting based on adverse weather conditions such as fog, rain, or snow.
ST05	Electric Charging Stations Management	The Electric Charging Station Management service package provides an exchange of information between the electric vehicle and charging station to manage the charging operation. The agency or company operating the charging station can use vehicle information such as the capability of the vehicle (e.g. operational status of the electrical system, how many amps can the vehicle handle, and % charge complete) to determine that the charge is being properly applied and determine an estimated time to complete charging.

Service Package	Service Package Name	Service Package Description
Traveler Information Service Area		
TI01	Broadcast Traveler Information	This service package provides a digital broadcast service that disseminates traveler information to all equipped travelers within range. It collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet streaming technologies. This service package also provides location-specific or situation-relevant information to travelers in vehicles using Dedicated Short Range Communications (DSRC) infrastructure supporting mobility service packages for connected vehicles. DSRC is used to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass connected vehicle roadside equipment along their route. This service package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.
TI02	Personalized Traveler Information	This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. 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. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications with the traveler. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via smart phone, tablet, personal computer, and a variety of in-vehicle devices.
TI07	In-Vehicle Signage	This service package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). This service package also includes the capability for maintenance and construction, emergency, and transit vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in areas such as work zones, around incidents, and at bus stops.
Traffic Management Service Area		
TM01	Infrastructure-Based Traffic Surveillance	This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and Center to Field communications to transmit the collected data back to the Traffic Management Center. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Center). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Traveler Information Center physical object.

Service Package	Service Package Name	Service Package Description
TM02	Vehicle-Based Traffic Surveillance	This service package uses probe data information obtained from vehicles in the network to support traffic operations, including incident detection and the implementation of localized operational strategies. Since traffic data is collected from vehicles, travel times and other related traffic performance measures are available. This service package includes the capability to collect data from Connected Vehicles so that "probe" data can be collected from all equipped vehicles, providing access to a large vehicle population as penetration increases. Incident detection enables transportation agencies to determine the location of potential incidents so the agencies can respond more quickly to the incident and mitigate any negative impacts to the transportation network. Vehicle data that can be used to detect potential incidents include changes in vehicle speeds indicating the disruption of traffic flow, when a vehicle's safety systems have been activated or deployed, or sudden vehicle turns or deceleration at a specific location (indicating a potential obstacle in the roadway).
TM03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the TM07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.
TM03	Traffic Signal Control: Municipal	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This service package is consistent with typical urban traffic signal control systems.
TM04	Connected Vehicle Traffic Signal System	This service package uses both vehicle location and movement information from connected vehicles as well as infrastructure measurement of non-equipped vehicles to improve the operations of traffic signal control systems. The service package utilizes the vehicle information to adjust signal timing for an intersection or group of intersections in order to improve traffic flow, including allowing platoon flow through the intersection. Other service package provide related mobility services such as Transit Signal Priority, Freight Signal Priority, Emergency Vehicle Preemption, and Pedestrian Mobility to maximize overall arterial network performance.
TM05	Traffic Metering	This service package provides central monitoring and control, communications, and field equipment that support metering of traffic. It supports the complete range of metering strategies including ramp, interchange, and mainline metering. This package incorporates the instrumentation included in the TM01 service package (traffic sensors are used to measure traffic flow and queues) to support traffic monitoring so responsive and adaptive metering strategies can be implemented. Also included is configurable field equipment to provide information to drivers approaching a meter, such as advance warning of the meter, its operational status (whether it is currently on or not, how many cars per green are allowed, etc.), lane usage at the meter (including a bypass lane for HOVs) and existing queue at the meter.

Service Package	Service Package Name	Service Package Description
TM06	Traffic Information Dissemination	This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Transportation Information Centers. A link to the Maintenance and Construction Management Center allows real time information on road/bridge closures and restrictions due to maintenance and construction activities to be disseminated.
TM07	Regional Traffic Management	This service package provides for the sharing of information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the TM03-Traffic Signal Control and TM05-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of device control between traffic management centers.
TM08	Traffic Incident Management System	This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between centers. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel. This service package is closely related with the Public Safety service packages, which focus on services that support first responders. In particular, local management of the incident using an incident command system is covered by PS02.

Service Package	Service Package Name	Service Package Description
TM12	Dynamic Roadway Warning	This service package includes systems that dynamically warn drivers approaching hazards on a roadway. Such hazards include roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway and any other transient event that can be sensed. 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. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous. Speed warnings that consider the limitations of a given vehicle for the geometry of the roadway (e.g., rollover risk for tall vehicles) are not included in this service package but are covered by the TM17 – Speed Warning and Enforcement service package. Roadway warning systems, especially queue warning systems are an Active Traffic Management (ATM) strategy and are typically used in conjunction with other ATM strategies (such as TM20-Variable Speed Limits and TM22-Dynamic Lane Management and Shoulder Use).
TM13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the ITS Roadway Equipment and the Driver in the physical view.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification of an approaching train by interfaced wayside equipment. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the Traffic Management Center.
TM16	Reversible Lane Management	This service package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this service package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This service package also includes the equipment used to electronically reconfigure intersections and manage right-of-way to address dynamic demand changes and special events.
TM17	Speed Warning and Enforcement	This service package 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. Speed monitoring can be made via spot speed or average speed measurements. Roadside equipment can display the speed of passing vehicles and/or suggest a safe driving speed. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to the motorist. For example, warnings can be generated recognizing the limitations of a given vehicle for the geometry of the roadway such as rollover risk for tall vehicles. This service focuses on monitoring of vehicle speeds and enforcement of the speed limit while the variable speed limits service (covered in TM20-Variable Speed Limits service package) focuses on varying the posted speed limits to create more uniform speeds along a roadway, to promote safer driving during adverse conditions (such as fog) and/or to reduce air pollution.

Service Package	Service Package Name	Service Package Description
TM19	Roadway Closure Management	This service package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The service package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this service package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This service package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other Traffic Management service packages.
TM20	Variable Speed Limits	This service package 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. Based on the measured data, the system calculates and sets suitable speed limits, usually by lane. Equipment over and along the roadway displays the speed limits and additional information such as basic safety rules and current traffic information. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous. This service establishes variable speed limits and communicates the speed limits to drivers. Speed warnings and enforcement of speeds limits, including variable speed limits, is covered in the TM17-Speed Warning and Enforcement service package.Variable speed limits are an Active Traffic Management (ATM) strategy and are typically used in conjunction with other ATM strategies (such as TM22-Dynamic Lane Management and Shoulder Use and TM23-Dynamic Roadway Warning).
Vehicle Safety Service Area		
VS01	Autonomous Vehicle Safety Systems	This service package improves vehicle safety using on-board sensors that monitor the driving environment surrounding the vehicle. All levels of driving automation are supported ranging from basic warning systems that warn the driver through full automation where the vehicle controls the steering and acceleration/deceleration in all scenarios and environments, without driver intervention. Unlike other Vehicle Safety service packages, this service package includes autonomous capabilities that rely only on on-board systems without communication with other vehicles or the infrastructure.
VS02	V2V Basic Safety	This service package exchanges basic safety messages with surrounding Connected Vehicles to support and augment the safety warning and control automation features identified in VS01. These exchanges support Connected Vehicle safety applications defined in SAE J2945/1: Emergency Electronic Brake Lights, Forward Crash Warning, Blind Spot Warning/Lane Change Warning, Intersection Movement Assist, Left Turn Assist, and Control Loss Warning. It also supports Do Not Pass Warning, Motorcycle Approaching indication, Tailgating Advisory, Stationary Vehicle, and Pre-Crash Actions applications from CVRIA.
VS04	V2V Special Vehicle Alert	This service package alerts the driver about the location of and the movement of public safety vehicles responding to an incident, slow moving vehicles, oversized vehicles, and other special vehicles that may require special attention from the driver. These public safety, commercial, and maintenance vehicles share their current status and location with surrounding vehicles so that other drivers in the vicinity can avoid interfering with their actions and avoid collisions.

Service Package	Service Package Name	Service Package Description
VS07	Road Weather Motorist Alert and Warning	This service package collects road weather data from connected vehicles and uses that data to develop short term warnings or advisories that can be provided to individual motorists. The information may come from either vehicles operated by the general public and commercial entities (including passenger cars and trucks) or specialty vehicles and public fleet vehicles (such as snowplows, maintenance trucks, and other agency pool vehicles). The raw data will be processed in a controlling center to generate road segment-based data outputs. The processing will also include a road weather motorist alerts algorithm to generate short time horizon alerts that will be pushed to user systems and available to commercial service providers. In addition the information collected can be combined with observations and forecasts from other sources to provide medium (next 2-12 hours) or long term (more than 12 hours) advisories through a variety of interfaces including web based and connected vehicle based interfaces.
VS08	Queue Warning	This service package utilizes connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, to enable vehicles within the queue event to automatically broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to centers (such as the TMC). The infrastructure will broadcast queue warnings to vehicles in order to minimize or prevent rear-end or other secondary collisions. This service package is not intended to operate as a crash avoidance system. In contrast to such systems, this service package will engage well in advance of any potential crash situation, providing messages and information to the driver in order to minimize the likelihood of his needing to take crash avoidance or mitigation actions later. It performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination using vehicle-based, infrastructure-based, or hybrid solutions.
VS09	Reduced Speed Zone Warning / Lane Closure	This service package provides connected vehicles that are approaching a reduced speed zone with information on the zone's posted speed limit and/or if the configuration of the roadway is altered (e.g., lane closures, lane shifts). Reduced speed zones include (but are not be limited to) construction/work zones, school zones, pedestrian crossing areas, and incorporated zones (e.g., rural towns). The connected vehicle uses the revised speed limit along with any applicable changed roadside configuration information to determine whether to provide an alert or warning to the driver. Additionally, to provide warnings to non-equipped vehicles, infrastructure equipment measures the speed of the approaching vehicles and if greater than the reduced speed zone posted speed limit will provide warning signage. It will provide an alert to drivers in advance when aggressive braking is required to reduce to the posted speed limit.
VS10	Restricted Lane Warnings	This service package provides the connected vehicle with restriction information about the travel lanes, such as if the lane is restricted to high occupancy vehicles (HOV), transit, or public safety vehicles only or has defined eco-lane criteria. A connected vehicle can use this information to determine if the vehicle is in a lane that has lane restrictions.
VS12	Pedestrian and Cyclist Safety	This service package supports the sensing and warning systems used to interact with pedestrians, cyclists, and other non-motorized users that operate on the main vehicle roadways, or on pathways that intersect the main vehicle roadways. These systems allow automated warning or active protection for this class of users. It integrates traffic, pedestrian, and cyclist information from roadside or intersection detectors and new forms of data from wirelessly connected, non-motorized traveler-carried mobile devices to request right-of-way or to inform non-motorized travelers when to cross and how to remain aligned with the crosswalk or pathway based on real-time Signal Phase and Timing (SPaT) and MAP information. In some cases, priority will be given to non-motorized travelers, such as persons with disabilities who need additional crossing time, or in special conditions (e.g., weather) where non-motorized travelers may warrant priority or additional crossing time. This service package will enable a service call to be routed to the traffic controller from a mobile device of a registered person with disabilities after confirming the direction and orientation of the roadway that the individual is intending to cross. It also provides warnings to the non-motorized user of possible infringement of the crossing or pathway by approaching vehicles.

Service Package	Service Package Name	Service Package Description
VS13	Intersection Safety Warning and Collision Avoidance	This service package enables a connected vehicle approaching an instrumented signalized intersection to receive information from the infrastructure regarding the signal timing and the geometry of the intersection. The vehicle uses its speed and acceleration profile, along with the signal timing and geometry information to determine if it appears likely that the vehicle will be able to pass safely through the intersection without violating the signal or colliding with other vehicles. If the vehicle determines that proceeding through the intersection is unsafe, a warning is provided to the driver and/or collision avoidance actions are taken, depending on the automation level of the vehicle.
VS15	Infrastructure Enhanced Cooperative Adaptive Cruise Control	This service package adds Infrastructure to Vehicle (I2V) communications to Cooperative Adaptive Cruise Control systems so that strings of compatible CACC-equipped vehicles can be more efficiently formed and cooperating vehicles gain access to speed recommendations and traffic control status from the infrastructure, further enhancing traffic flow stability and improving highway capacity and throughput. Speed recommendations provided by the infrastructure can be used to stabilize traffic flow, reducing speed differentials and enhancing throughput along a route that includes a bottleneck. Access to traffic control information such as signal phase and timing enables synchronized starts by adjacent CACC-equipped strings of vehicles, increasing intersection throughput. The infrastructure can also assist with broader coordination between CACC-equipped vehicles, enabling strings of vehicles to be more efficiently formed that share performance parameters and destinations.
VS16	Automated Vehicle Operations	This service package provides full vehicle automation, controlling both the steering and acceleration/deceleration on areas of the highway system that support full automation. Communications between vehicles and between the vehicles and supporting infrastructure equipment supports cooperative check-in to the automated portion of the system and transition to automated mode, coordination of maneuvers between vehicles in automated mode, and checkout from the automated system. This service package is distinguished from the most advanced CACC systems in that full longitudinal and lateral control automation are supported, enabling closely spaced, tightly coupled platoons of vehicles to operate with short fixed gaps, providing greatly enhanced highway capacity and throughput with enhanced efficiency since aerodynamic drag is reduced.
Weather Service Area		
WX01	Weather Data Collection	This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway. It also collects data from vehicles in the road network that can be used to directly measure or infer current environmental conditions. It leverages vehicle on-board systems that measure temperature, sense current weather conditions (rain and sun sensors) and also can monitor aspects of the vehicle operational status (e.g., use of headlights, wipers, and traction control system) to gather information about local environmental conditions. In addition, environmental sensor systems located on Maintenance and Construction Vehicles are also potential data sources. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.
WX02	Weather Information Processing and Distribution	This service package processes and distributes the environmental information collected from the 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 operational centers and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination service package, and aid operators in scheduling work activity.

APPENDIX B-ELEMENT FUNCTIONS

Element Name	Equipment Package (Function)
Archive Data User	Not Applicable
Blanchfield Army Community Hospital EMS Vehicles	EV Barrier System Control
	EV On-Board En Route Support
	EV Service Patrol Vehicle Operations
Christian County Emergency Management	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Cincinnati / Northern Kentucky (ARTIMIS) TMC	TMC Regional Traffic Management
City of Clarksville CCTV Cameras	Roadway Basic Surveillance
City of Clarksville Changeable Speed Limit Signs	Roadway Speed Monitoring and Warning
City of Clarksville Connected Vehicle Roadside Equipment	RSE Commercial Vehicle Services
	RSE Communications Relay
City of Clarksville DMS	Roadway Traffic Information Dissemination
City of Clarksville Field Sensors	Roadway Basic Surveillance
City of Clarksville Fire Dispatch	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
City of Clarksville Fire Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
City of Clarksville Flood Detectors	Roadway Environmental Monitoring
City of Clarksville Flood Warning Beacons	Roadway Equipment Coordination
	Roadway Safety Warning System
City of Clarksville Gas and Water	MCM Roadway Maintenance
	MCM Work Activity Coordination
	MCM Work Zone Management
City of Clarksville On-Street Parking Meters	Parking Coordination
	Parking Data Collection
	Parking Electronic Payment
	Vehicle Emergency Notification
City of Clarksville Parking Authority	Parking Coordination
	Parking Data Collection
	Parking Management
	Vehicle Emergency Notification
City of Clarksville Police Department	Emergency Data Collection
	Emergency Dispatch
	Emergency Routing
City of Clarksville Police Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
City of Clarksville Portable DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control

Element Name	Equipment Package (Function)
City of Clarksville Programmable School Flashing Beacons	Roadway Basic Surveillance
	Roadway Signal Control
City of Clarksville Rail Notification System	Roadway Standard Rail Crossing
City of Clarksville Reversible Lane Equipment	Roadway Reversible Lanes
	Roadway Signal Control
City of Clarksville RWIS	Roadway Environmental Monitoring
City of Clarksville Speed Monitoring Equipment	Roadway Speed Monitoring and Warning
	Roadway Variable Speed Limits
City of Clarksville Street Department	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Infrastructure Monitoring
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
City of Clarksville Street Department Vehicles	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Work Zone Support
City of Clarksville TOC	TMC Advanced Rail Crossing Management
	TMC Basic Surveillance
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Lighting System Control
	TMC Multi-Modal Coordination
	TMC Regional Traffic Management
	TMC Reversible Lane Management
	TMC Roadway Equipment Monitoring
	TMC Roadway Warning
	TMC Signal Control
	TMC Speed Warning
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Variable Speed Limits
	TMC Work Zone Traffic Management
City of Clarksville Traffic Signals	Roadway Basic Surveillance
	Roadway Signal Control
	Roadway Signal Preemption
	Roadway Standard Rail Crossing
	RSE Intersection Management
City of Clarksville Variable LED Streetlights	Roadway Lighting System Control

Element Name	Equipment Package (Function)
City of Clarksville Website	TIC Data Collection
CTS Bus Stop DMS	Transit Stop Information Services
CTS Data Archive	Archive Data Repository
	Archive Government Reporting
CTS Demand Response Dispatch Center	Transit Center Connection Protection
	Transit Center Data Collection
	Transit Center Fare Management
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Passenger Counting
	Transit Center Vehicle Tracking
	Transit Evacuation Support
	Transit Garage Maintenance
CTS Demand Response Vehicles	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Schedule Management
	Transit Vehicle Security
CTS Fixed-Route Dispatch Center	Emergency Secure Area Alarm Support
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	ITS Management Support
	Transit Center Connection Protection
	Transit Center Data Collection
	Transit Center Fare Management
	Transit Center Fixed-Route Operations
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Passenger Counting
	Transit Center Priority Management
	Transit Center Security
	Transit Center Vehicle Assignment
	Transit Center Vehicle Tracking
	Transit Evacuation Support
	Transit Garage Maintenance
CTS Fixed-Route Vehicles	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
	ITS Management Support
	ITS Security Support
	Transit Vehicle On-Board Fare Management
	Transit Vehicle On-Board Information Services

Element Name	Equipment Package (Function)
CTS Fixed-Route Vehicles (Continued)	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Trip Monitoring
	Transit Vehicle Passenger Counting
	Transit Vehicle Schedule Management
	Transit Vehicle Security
	Transit Vehicle Signal Priority
CTS Mobile Phone App	TIC Interactive Traveler Information
	TIC Trip Planning
CTS Routing Application	Personal Interactive Traveler Information
	Personal Local Route Guidance
	Personal Trip Planning and Route Guidance
CTS Transit Center CCTV Camera Surveillance	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
	ITS Management Support
	ITS Security Support
CTS Transit Kiosks	Transit Stop Information Services
	Traveler Fare Management
CTS Website	TIC Data Collection
	TIC Trip Planning
CUAMPO Data Archive	Archive Data Repository
	Archive Government Reporting
	Archive On-Line Analysis and Mining
CUAMPO Website	TIC Data Collection
	TIC Operations Data Collection
Driver	Not Applicable
Emergency Vehicle OBE	Not Applicable
Financial Service Provider	Not Applicable
Fort Campbell CCTV Cameras	Field Secure Area Surveillance
	ITS Management Support
	ITS Security Support
	Roadway Basic Surveillance
Fort Campbell Directorate of Emergency Services	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
	Emergency Secure Area Sensor Management
	Emergency Secure Area Surveillance
	ITS Management Support
	ITS Security Support
	TMC Barrier System Management

Element Name	Equipment Package (Function)
Fort Campbell Entry Gate Closure Barriers	ITS Management Support
	ITS Security Support
	Roadway Barrier System Control
Fort Campbell Field Sensors	Roadway Basic Surveillance
Fort Campbell Public Affairs Office	TIC Emergency Traveler Information
	TIC Traveler Information Broadcast
Fort Campbell Public Safety Vehicles	EV Barrier System Control
	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
Fort Campbell Rail Notification System	Roadway Standard Rail Crossing
	Roadway Traffic Information Dissemination
Fort Campbell TOC	TMC Advanced Rail Crossing Management
	TMC Basic Surveillance
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
Fort Campbell Traffic Signals	Roadway Basic Surveillance
	Roadway Signal Control
	Roadway Signal Preemption
	RSE Intersection Management
Fort Campbell Website	TIC Data Collection
GoKY.ky.gov	DDS Data Access Management
	DDS Data Collection and Aggregation
	MCM Data Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Management
	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Operations Data Collection
	TIC Traveler Information Broadcast
Hopkinsville-Christian County Emergency Communications Center	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support

Element Name	Equipment Package (Function)
Hopkinsville-Christian County Emergency Communications Center (Continued)	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
Kentucky SAFE Patrol Dispatch	Emergency Incident Command
	Emergency Response Management
	TMC Service Patrol Management
Kentucky SAFE Patrol Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
KSP Commercial Vehicle Enforcement	Not Applicable
KSP Commercial Vehicle Enforcement Truck Weigh and Inspection Stations	Not Applicable
KSP Post 2 Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Early Warning System
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
KSP Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
KSP Weigh-in-Motion	Not Applicable
KYEEC Air Quality Sensors	Roadway Emissions Monitoring
	RSE Emissions Monitoring
KYEEC Division for Air Quality	Emissions Data Collection
	Emissions Data Management
KYEM	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
KYTC CCTV Cameras	Roadway Basic Surveillance
KYTC Connected Vehicle Roadside Equipment	Not Applicable
KYTC DataMart	Archive Data Repository
	Archive Government Reporting
	Archive Situation Data Archival
KYTC District 2 Maintenance and Construction	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management

Element Name	Equipment Package (Function)
KYTC District 2 TMC	TMC Advanced Rail Crossing Management
	TMC Basic Surveillance
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
KYTC DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
KYTC Emergency Services Coordinator	MCM Incident Management
	MCM Roadway Maintenance
	TMC Evacuation Support
	TMC Incident Dispatch Coordination
KYTC Field Sensors	Roadway Basic Surveillance
KYTC Lane Control DMS	Not Applicable
KYTC Maintenance Vehicles	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Work Zone Support
KYTC Public Affairs Office	TIC Data Collection
	TIC Traveler Information Broadcast
KYTC Ramp Queue Detection System	Not Applicable
KYTC RWIS Sensors	Roadway Environmental Monitoring
KYTC Smart Work Zone Equipment	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control
KYTC Speed Monitoring Equipment	Not Applicable
KYTC Statewide IMOC	TMC Regional Traffic Management
	TMC Traffic Information Dissemination
KYTC Traffic Signals	Roadway Basic Surveillance
	Roadway Signal Control
	Roadway Signal Preemption
	RSE Intersection Management
Local Print and Broadcast Media	Not Applicable
Louisville (TRIMARC) TMC	TMC Regional Traffic Management
Maint and Constr Vehicle OBE	Not Applicable
MCHRA Data Archive	Archive Data Repository
	Archive Government Reporting

Element Name	Equipment Package (Function)
MCHRA Public Transit Demand Response Vehicles	Transit Vehicle On-Board Maintenance
	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
MCHRA Public Transit Dispatch Center	Transit Center Data Collection
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Vehicle Tracking
	Transit Evacuation Support
MCHRA Public Transit Website	TIC Data Collection
	TIC Travel Services Information and Reservation
Montgomery County E-911 Center Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
	Emergency Secure Area Alarm Support
Montgomery County EMA	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Montgomery County EMS Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
Montgomery County Sheriff Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
Montgomery County Sheriffs Office	Emergency Data Collection
	Emergency Dispatch
	Emergency Incident Command
	Emergency Response Management
Municipal CCTV Cameras	Roadway Basic Surveillance
Municipal Field Sensors	Roadway Basic Surveillance
Municipal Police Department	Emergency Data Collection
	Emergency Dispatch
	Emergency Incident Command
	Emergency Response Management
Municipal Rail Notification System	Roadway Standard Rail Crossing
Municipal TOC	TMC Advanced Rail Crossing Management
	TMC Basic Surveillance
	TMC Environmental Monitoring
	TMC Evacuation Support

Element Name	Equipment Package (Function)
Municipal TOC (Continued)	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Signal Control
	TMC Standard Rail Crossing Management
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
Municipal Traffic Signals	Roadway Basic Surveillance
	Roadway Signal Control
	Roadway Signal Preemption
	Roadway Standard Rail Crossing
	RSE Intersection Management
Municipal/County Maintenance	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
	MCM Work Zone Safety Management
Municipal/County Maintenance Vehicles	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Work Zone Support
Municipal/County Portable DMS	Roadway Traffic Information Dissemination
	Roadway Work Zone Traffic Control
Municipal/County Public Safety Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
Municipal/County RWIS	Roadway Environmental Monitoring
Municipal/County Website	TIC Data Collection
National Weather Service	Not Applicable
Other KYTC District Maintenance and Construction	MCM Work Activity Coordination
	MCM Work Zone Management
Other KYTC District TMCs	TMC Regional Traffic Management
Other Maintenance and Construction Management Agencies	Not Applicable
Other Public/Private Vehicle OBE	Not Applicable
Other TDOT Region District Operations	MCM Work Activity Coordination
	MCM Work Zone Management
Other Traffic Management Agencies	Not Applicable
PACS Data Archive	Archive Data Repository
	Archive Government Reporting

Element Name	Equipment Package (Function)
PACS Transportation Demand Response Vehicles	Transit Vehicle On-Board Paratransit Operations
	Transit Vehicle On-Board Trip Monitoring
PACS Transportation Dispatch Center	Transit Center Data Collection
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Vehicle Tracking
	Transit Evacuation Support
PACS Transportation Website	TIC Operations Data Collection
Pedestrian	Not Applicable
Personal Computing Devices	Personal Interactive Traveler Information
Private Fleet Management Systems	Not Applicable
Private Sector Traveler Information Services	TIC Dynamic Ridesharing
	TIC Interactive Traveler Information
	TIC Operations Data Collection
	TIC Traveler Information Broadcast
	TIC Trip Planning
Public/Private Vehicles	Vehicle Situation Data Monitoring
Rail Freight	Not Applicable
Social Networking Services	TIC Traveler Information Broadcast
TDEC Air Quality Sensors	Roadway Emissions Monitoring
	RSE Emissions Monitoring
TDEC Division of Air Pollution Control	Emissions Data Collection
	Emissions Data Management
TDOT CCTV Cameras	Roadway Basic Surveillance
TDOT Changeable Speed Limit Signs	Roadway Speed Monitoring and Warning
	Roadway Variable Speed Limits
TDOT Community Relations Division	TIC Emergency Traveler Information
	TIC Traveler Information Broadcast
TDOT Connected Vehicle Roadside Equipment	Not Applicable
TDOT DMS	Roadway Traffic Information Dissemination
TDOT Emergency Services Coordinator	MCM Incident Management
	MCM Roadway Maintenance
	TMC Evacuation Support
	TMC Incident Dispatch Coordination
TDOT Field Sensors	Roadway Basic Surveillance
TDOT HELP Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
TDOT Lane Control DMS	Not Applicable
TDOT Long Range Planning Division Archive	Archive Data Repository
	Archive Government Reporting
	TMC Data Collection

Element Name	Equipment Package (Function)
TDOT Maintenance Headquarters	MCM Environmental Information Collection
	MCM Environmental Information Processing
TDOT Maintenance Vehicles	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Work Zone Support
TDOT Ramp Metering Equipment	Roadway Basic Surveillance
	Roadway Traffic Information Dissemination
	Roadway Traffic Metering
TDOT Ramp Queue Detection System	Not Applicable
TDOT Region 1 TMC – Knoxville	TMC Regional Traffic Management
TDOT Region 2 TMC – Chattanooga	TMC Regional Traffic Management
TDOT Region 3 District Operations	MCM Incident Management
	MCM Roadway Maintenance
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
TDOT Region 3 Engineers Office	Not Applicable
TDOT Region 3 HELP Dispatch	Emergency Incident Command
	Emergency Response Management
	TMC Service Patrol Management
TDOT Region 3 TMC – Nashville	Center Data Collection
	Center Data Subscription Management
	TMC Basic Surveillance
	TMC Data Collection
	TMC Evacuation Support
	TMC Incident Detection
	TMC Incident Dispatch Coordination
	TMC Regional Traffic Management
	TMC Roadway Equipment Monitoring
	TMC Speed Warning
	TMC Traffic Information Dissemination
	TMC Traffic Metering
	TMC Variable Speed Limits
	TMC Work Zone 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 Traffic Information Dissemination
	Roadway Variable Speed Limits
	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control

Element Name	Equipment Package (Function)
TDOT SmartWay Mobile App	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
TDOT SmartWay Website	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
TDOT Speed Monitoring Equipment	Not Applicable
TDOT Statewide Information for Travelers (SWIFT)	DDS Data Access Management
	DDS Data Collection and Aggregation
	MCM Data Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Work Activity Coordination
	MCM Work Zone Safety Management
	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Operations Data Collection
	TIC Traveler Information Broadcast
TDOT Wrong-Way Detection and Warning Equipment	Roadway Basic Surveillance
	Roadway Warning
TEMA	Emergency Early Warning System
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
Tennessee 511 System	TIC Data Collection
	TIC Emergency Traveler Information
	TIC Interactive Traveler Information
	TIC Traveler Information Broadcast
	TIC Traveler Telephone Information
Tennessee Bureau of Investigation	Emergency Early Warning System
	Emergency Incident Command
THP Dispatch	Emergency Call-Taking
	Emergency Dispatch
	Emergency Evacuation Support
	Emergency Incident Command
	Emergency Response Management
	Emergency Routing
THP Vehicles	EV On-Board En Route Support
	EV On-Board Incident Management Communication
	EV Service Patrol Vehicle Operations
THP Weigh-in-Motion	Not Applicable
Element Name	**Equipment Package (Function)**

Element Name	Equipment Package (Function)
TITAN Database	Archive Data Repository
	Archive Government Reporting
TN Trips	Not Applicable
Transit Operations Personnel	Not Applicable
Transit Vehicle OBE	Not Applicable
Traveler	Not Applicable

APPENDIX C–AGREEMENTS

TDOT LIVE CCTV VIDEO ACCESS AGREEMENT FOR PRIVATE ENTITY USERS

TDOT LIVE CCTV VIDEO ACCESS AGREEMENT FOR GOVERNMENTAL USERS

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

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.

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

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 pursuant to 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. To the extent permitted by applicable law, 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 right 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. To the extent permitted by applicable law, 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:_____ _____
Clay Bright 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:_____

Technical Contact Person:

(Please Print)

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

Other Contact Person (Optional**):**

Name: _____

Email: _____

Phone: _____

Live CCTV Video Access Agreement Between
Tennessee Department of Transportation
And
Governmental Agency Users

Tennessee Department of Transportation
And
Governmental Agency Users

ACCESS AGREEMENT FOR LIVE VIDEO

This Access Agreement for Live Video (Agreement) 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 Chattanooga Regional Transportation Management Center (RTMC) 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 to help improve incident management response times. The following provisions of this Agreement are provided 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 make changes in this Agreement, by adding provisions, deleting provisions, and/or changing existing provisions when in TDOT's opinion circumstances require such changes.

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. RTMC 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 RTMC at any time.

B. USER'S RESPONSIBILITIES:

1. USER, through this Agreement, may be allowed to control the pan, tilt and zoom capabilities of selected CCTV cameras. TDOT will maintain an override capability of these functions.

2. USER agrees not to focus on vehicle license plates, drivers, or other personal identification of individuals involved in any traffic-related incident, nor focus on any property or person outside the TDOT right-of-way. USER further agrees to access the feed only for traffic-related or emergency response activities.

3. USER may install necessary equipment at the RTMC 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 RTMC 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 RTMC equipment or activities of RTMC personnel. The responsibility for the service, maintenance, and upkeep of the installed equipment is exclusively that of the USER. USER must give RTMC personnel reasonable advance notice of any maintenance/repair visits, and RTMC personnel reserve the right to schedule such visits at a time and in such a manner so as to not interrupt or otherwise obstruct RTMC operations. USER assumes any and all liability for the cost of repair and/or other damages to TDOT's CCTV system caused in any manner by the installation, servicing or maintenance of the USER equipment or by the equipment once installed. USER staff at the RTMC shall be under the general direction of the RTMC Manager for routine conduct, privileges, and protocols within the RTMC.

4. 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 that 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.

5. 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 RTMC equipment or facilities.

6. 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 USER and agrees to provide a good faith effort to maintain the video feed from TDOT equipment.

7. 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 RTMC, including the basic operational capabilities of such equipment. USER shall limit calls to the RTMC for monitoring, diagnosing problems or otherwise performing any minor service on USER owned and supplied equipment.

8. USER agrees that video feed will not be used for automated traffic enforcement purposes unless it is specifically allowed by legislation.

C. LIABILILTY AND INDEMNITY PROVISIONS:

1. The USER agrees to be responsible for any and all liability and expense, including defense costs and legal fees, caused by the 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 provided by law, 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 this Agreement, as to any and all claims, including without limitation liability for any damages to TDOT property or for personal 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 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 RTMC as directed by TDOT.

State of Tennessee
Department of Transportation

By:_____ Date:_____
John Schroer
Commissioner

Approved as to Form:

By:_____ Date: _____
General Counsel

_____

USER AGENCY:_____

By_____

(Print Name)_____

(Title)_____

Date:_____

Approved by Legal Counsel for USER AGENCY

By_____

(Print Name)_____

(Title)_____

Date:_____

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

MONTGOMERY COUNTY EMA
Local Agency

By: Jerry J. Buchanan

Print/Type Name: JERRY J. BUCHANAN

Title: DIRECTOR

Date: 12-3-2013

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

Montgomery County Sheriff's Office
Local Agency

By: _____

Print/Type Name: John R Smith

Title: Chief Deputy

Date: 12/16/13

ADDITIONAL SIGNATORIES

Name	Title	Date

Tennessee's

"OPEN ROADS POLICY"

Quick Clearance for Safety and Mobility

CLARKSVILLE POLICE DEPARTMENT

Local Agency

By: Alonzo R Ansley

Print/Type Name: ALONZO R. ANSLEY

Title: CHIEF OF POLICE

Date: October 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

Montgomery County EMS
Local Agency

By: Jimmie Edwards

Print/Type Name: Jimmie Edwards

Title: EMS Director

Date: 12-3-2013

ADDITIONAL SIGNATORIES

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

APPENDIX D–REGIONAL ITS ARCHITECTURE MAINTENANCE FORM

Clarksville Region
Regional ITS Architecture
Maintenance Form

Please complete the following form to document changes to the 2020 Clarksville Regional ITS Architecture. Forms should be submitted to the Clarksville Urbanized Area Metropolitan Planning Organization (CUAMPO) for review and acceptance. All accepted changes will be kept on file by CUAMPO and shared with the TDOT Traffic Operations Division. Changes will be incorporated into the 2020 Clarksville 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:

Clarksville Urbanized Area Metropolitan Planning Organization
329 Main Street
Clarksville, TN 37040
Phone: 931-645-7448
E-mail: cuampo@cityofclarksville.com

Form Submittal Date: _____

Clarksville 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 Clarksville Urbanize Area MPO 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 Clarksville Urbanized Area MPO 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?	

Clarksville 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 Clarksville Urbanize Area MPO 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 Clarksville Urbanized Area MPO 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.*