TOPEKA/SHAWNEE COUNTY REGIONAL ITS ARCHITECTURE

STRATEGIC DEPLOYMENT PLAN

Submitted to

Metropolitan Topeka Planning Organization

Submitted by

In association with

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Contents

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GLOSSARY

Acronym	Description
ADA	Americans with Disabilities Act
ADMS	Archival Data Management System – refers to technologies designed to collect and store roadway related data for planning and/or sharing with other agencies.
AMR	American Medical Response – private paramedic service provider.
ATIS	Advanced Traveler Information Systems – provides travelers with information from various sources through one user interface, such as the phone (511) or the Internet.
ATMS	Advanced Traffic Management Systems - enhances mobility on roadways by incorporating the latest technological advancements, such as Variable Message Signs (VMS)
AVL	Automatic Vehicle Location – used for real time tracking of emergency vehicles, transit vehicles and school buses.
BNSF	Burlington Northern Santa Fe Railroad
CAD	Computer Aided Dispatching – used for emergency and fleet dispatching.
CCTV	Closed Circuit Television - cameras placed to observe traffic conditions. These are only used for observation and have no automatic speed enforcement capabilities, for example.
CVAS	Commercial Vehicle Administrative Systems – a subpart of the Commercial Vehicle Information System, see CVISN.
CVISN	Commercial Vehicle Information System Network – a program to improve commercial trucking and public agency efficiency to improve safety and cost effective administration of permitting and taxation.
DMS	Dynamic Message Signs – electronic message signs used to provide real-time traffic warnings and Amber Alert messages. Other names are Variable Message Signs (VMS) and Changeable Message Signs (CMS).
DOT	Department of Transportation
EM	Emergency Management, or Emergency Managers – each county has an emergency management agency.
ECC	Emergency Communications Center – the Shawnee County Emergency Communications Center
FD	Fire department
FHWA	Federal Highway Administration
FTA	Federal Transit Administration

Acronym	Description
GIS	Geographic Information System – used to provide information tied to specific physical locations, such as road segments.
HF/VHF/UHF	High frequency, very high frequency and ultra high frequency - radio frequency groupings. VHF and UHF are also used for public broadcast radio systems.
HOV	High Occupancy Vehicle – refers to car pool vehicles or buses with more than the driver. Can also refer to highway lanes restricted for HOV use during peak travel periods.
HRI	Highway-Rail Intersection – refers to technologies designed to make at-grade highway/rail crossing safer.
IRD	International Road Dynamics – manufacturer of commercial fixed and portable truck scales used for overweight vehicle enforcement.
ISP	Information Service Provider – usually the radio or television or other private organization that provide road conditions or other information for travelers.
ITS	Intelligent Transportation Systems
KANROAD	Kansas GIS-based traveler information system.
KDOT	Kansas Department of Transportation
KHP	Kansas Highway Patrol
KTA	Kansas Turnpike Authority
LRTP	Long Range Transportation Plan – a regional transportation plan that typically has a 30 year horizon.
MCO	Maintenance and Construction Operations – refers to ITS designed to make highway maintenance and construction safer for travelers and more efficient for highway agencies.
MCOC	Maintenance and Construction Operations Center – usually located at a Kansas Department of Transportation District Office, it monitors maintenance and construction activities and provides dispatching of state maintenance vehicles.
MDMS	Maintenance Decision Management System
MDT	Mobile Data Terminal, Also, Mobile Data Computers – provides mobile access to information services, such as vehicle registration records for police or passenger records for transit drivers.
MTPO	Metropolitan Topeka Planning Organization – the lead planning agency responsible for regional transportation planning in the Topeka metropolitan areas.
NOAA	National Oceanographic and Atmospheric Administration – parent Federal agency for the National Weather Service.
NTCIP	National Transportation Communications for ITS Protocol

Acronym	Description
NWS	National Weather Service
OS/OW	Oversize, overweight pertaining to commercial vehicles using public highways.
PD	Police Department
PIO	Public Information Officer – usually a public official who is responsible for keeping the public informed about what is happening within his/her agency.
PWD	Public Works & Utilities department of the City of Topeka
RWIS	Road-weather information systems, also called environmental sensors. Used to measure pavement temperature (potential for icing), wind, and other weather-related conditions. RWIS is also used to support highly accurate weather forecasting systems.
SDO	Standards Development Organization
SDP	Strategic Deployment Plan
TMC	Traffic Management Center
TMTA	Topeka Metropolitan Transit Authority
TOC	Traffic Operations Center
UPRR	Union Pacific Railroad
WebEOC	Web-based notification system used by the Shawnee County Emergency Communications Center.
XML	eXtensible Markup Language – structures format for exchanging data over the Internet.

1. Project Overview

The Metropolitan Topeka Planning Organization (MTPO) has updated the Intelligent Transportation System (ITS) Architecture for the Topeka/Shawnee County Metropolitan region. The Architecture describes the region's ITS plans and how future projects will integrate and interoperate with existing systems.

The goal of the architecture update project is ***to develop a framework for the planning and development of Intelligent Transportation Systems that improve the safety and efficiency of travel in the region***. The goal is being achieved through:

- Working with stakeholders to understand and prioritize the region's needs.
- Maximizing the value of existing and future ITS.
- Integrating and coordinating the development, operation and maintenance of ITS among the region's stakeholders.
- Developing a regional architecture and Strategic Deployment Plan (SDP) that has the support of the region's stakeholders.

The Topeka/Shawnee County Regional ITS Architecture update began in November 2013 and will be completed by the end of April 2014.

1.1 Description of Project Process and this Document

The Topeka/Shawnee County Regional ITS Architecture Update was completed through twelve tasks. The tasks are:

1. **Project Management** including management of communications, progress reporting, quality control and assurance, and the development of a Project Management Plan that describes key concepts of how the project will be completed.
2. **ITS Inventory Review** including a review of the existing architecture, as well as other regional transportation planning documents that identify the region's goals, objectives and plans for transportation improvements.
3. **Assemble Regional Data** that compiles the data about ITS in the region from the review of existing plans and the results of interviews, discussions and surveys with key stakeholders.
4. **Stakeholder Engagement** that identifies the region's transportation stakeholders and encourages their participation in identifying transportation needs through a workshop, surveys and interviews.
5. **Regional ITS Strategies** that determine the priority of stakeholder needs and define how ITS can address the region's needs in a manner consistent with the region's long-range transportation plan.
6. **Determine Specific Needs and ITS** to address the needs.
7. **Operational Roles and Responsibilities** describe what will be expected of the regional stakeholders regarding who will own, operate and maintain ITS in the region, as well as how information will be shared.
8. **Regional ITS Architecture Plan** includes a physical representation of the architecture in the software tool Turbo Architecture.

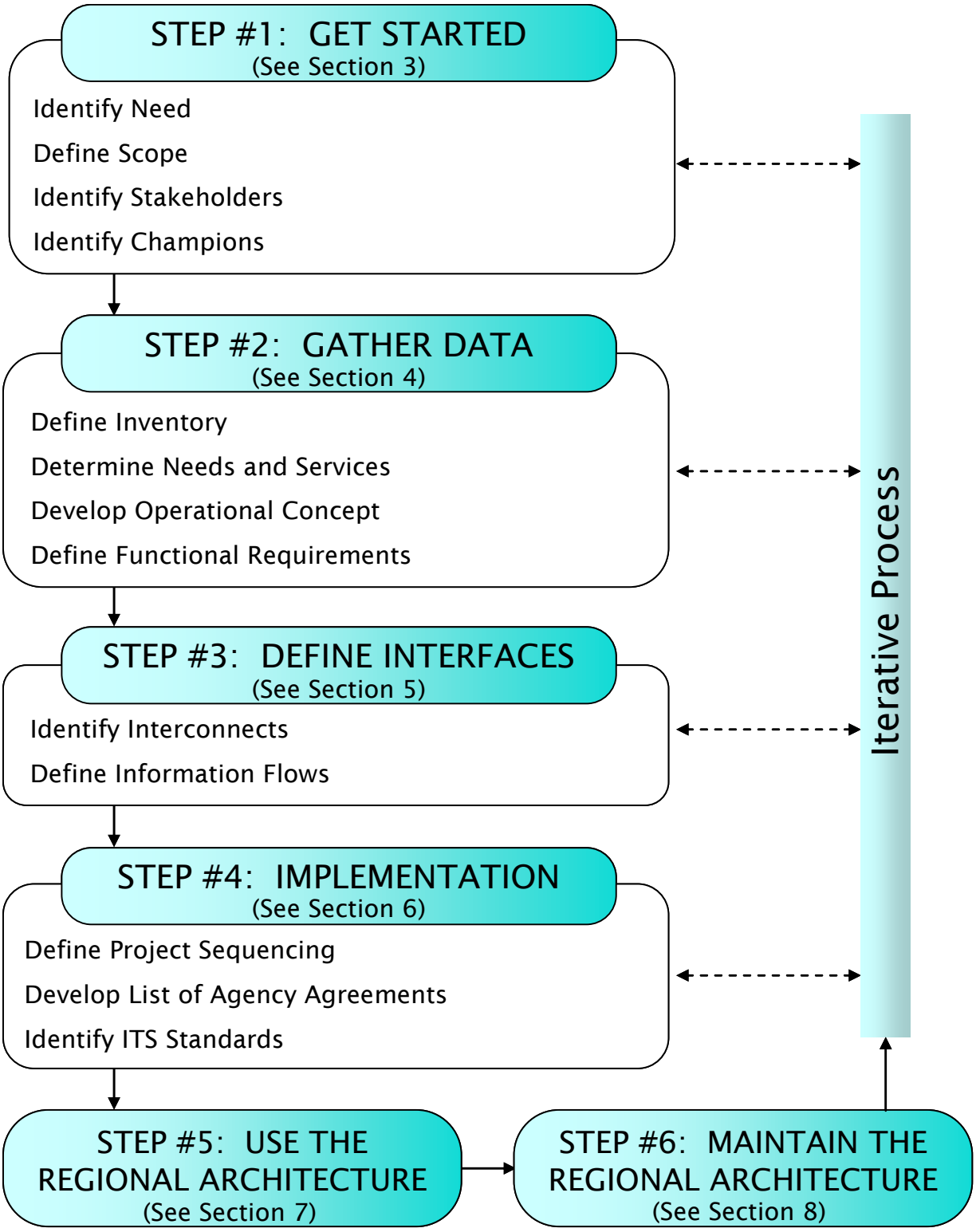
9. **Maintenance Strategy** describes how the architecture will be maintained to stay current with the region's other planning and the current status of ITS projects.
10. **Strategic Deployment Plan** describes how the region's ITS projects can be planned, procured and deployed in a manner consistent with the region's objectives.
11. **ITS Web Site** has an interactive version of the ITS architecture that allows users to see all its components from multiple perspectives.
12. **Presentations** provide executive and detailed PowerPoint slide presentations of the architecture process, the resulting projects and how they will benefit the region.

This document, the Strategic Deployment Plan, is the result of Tasks 1 through 10. It incorporates content from both of the project's Technical Memorandums and output from Turbo Architecture.

Figure 1 shows the process for developing, using and maintaining a Regional ITS Architecture per Federal Highway Administration (FHWA) guidance[1]. This document describes the process and summarizes the findings for all six steps for the Topeka/Shawnee County region.

[1] Regional ITS Architecture Guidance, http://ops.fhwa.dot.gov/publications/regitsarchguide/

Figure 1: Regional ITS Architecture Development, Use and Maintenance



1.2 Project Boundaries

The Topeka/Shawnee County Regional ITS Architecture has established boundaries for transportation services, geographic region and timeframe. This section describes each of the boundaries.

1.2.1 Transportation Services Boundaries

The Topeka/Shawnee County Regional ITS Architecture examines transportation services in the following categories:

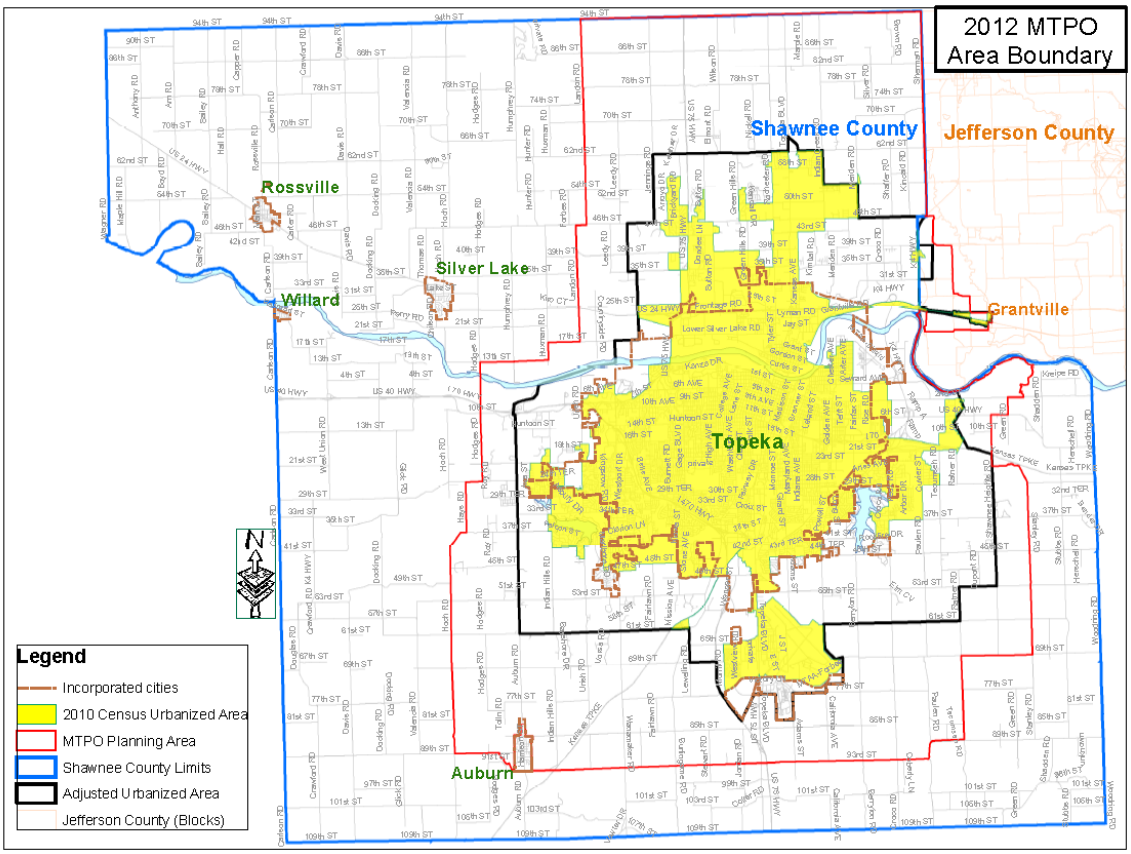
1. Arterial Traffic Management
2. Freeway Traffic Management
3. Traveler Information
4. Transit Management and Information
5. Emergency Management
6. Maintenance and Construction
7. Electronic Fare Management

ITS Projects and existing conditions in the region will fall into these categories.

1.2.2 Geographic Boundaries

The Topeka/Shawnee County ITS Architecture covers the MTPO planning boundaries, as shown in **Figure 2**. The boundary encompasses all of the City of Topeka and a surrounding area within Shawnee County. The region encompasses city and county roads, state highways, regional transit and two railroads that operate out of Topeka.

Figure 2: Region for the Topeka/Shawnee County Regional ITS Architecture



1.2.3 Timeframe

The Topeka/Shawnee County Regional ITS Architecture complements the region's Long-Range Transportation Plan (LRTP), which provides a vision of the region's transportation services through the year 2040. The LRTP identifies many major transportation improvements that are fiscally constrained and unconstrained that will be needed before 2025, particularly on the region's state highways. For that reason, and to constrain the architecture to allow it to be updated with future LRTP updates, 2025 is the horizon of the architecture. However, like the LRTP, the architecture should be revisited and updated to align with changes in the LRTP and the region's transportation needs.

Projects in the Topeka/Shawnee County ITS Architecture are placed into three timeframes. They are:

1. ***Near-term*** – Near-term projects are needed in the next three years (through 2016), and align with fiscally-constrained projects in the LRTP. These projects address the region's highest-priority needs using realistic and mature technologies.
2. ***Medium-term*** – Medium-term projects should be deployed within the next seven years (through 2020). Medium-term projects address needs in the region that may not be as high a priority as those in the near-term. A project may also be programmed for the medium-term if its

success is dependent upon other projects not yet deployed, or if funding opportunities for the project are not known.

3. ***Long-term*** – Long-term projects should be deployed in the next twelve years (through 2025). These projects address regional needs that are not high priorities. They may also be considered long-term because their success depends on other projects not yet deployed, are unfunded or are dependent upon technologies that are still evolving.

2. Topeka/Shawnee County Regional ITS Vision and Goals

The ITS vision and goals describe the guiding principles for the region in how ITS should be planned, developed and implemented. They have been established to be consistent with, and complement, the goals of the MTPO LRTP[2].

2.1 MTPO Long-Range Transportation Plan Goals

The LRTP for the Metropolitan Topeka/Shawnee County Region identifies seven goals that are consistent with federal planning guidelines. They are:

1. Cultivate, Maintain, and Enhance the Region's Economic Vitality.
2. Increase the Safety and Security of the Region's Transportation System.
3. Increase Accessibility and Mobility Choices in the Region.
4. Protect, Preserve, and Enhance the Social, Historical, and Natural Environments of the Region.
5. Promote Efficient System Management and Operation.
6. Enhance Integration and Connectivity of the Transportation System Across and Between Modes.
7. Emphasize Maintenance and Preservation of the Existing Transportation System.

2.2 Topeka/Shawnee County Regional ITS Vision

The ITS Vision is the guiding principle for the development of the ITS Architecture and Strategic Deployment Plan and ITS investment in the region. The Vision has been developed based on input from the Project Team.

Topeka/Shawnee Regional ITS Vision

The Topeka/Shawnee County Region will use Intelligent Transportation Systems to provide cost-effective and practical technologies that improve the safety, capacity, and efficiency of moving people and goods on the area's roadways.

2.3 Topeka/Shawnee County Regional ITS Goals

The ITS Goals describe how the region will achieve its vision of improved transportation through ITS. Table 1 lists the ITS goals as developed by the Project Team. Each ITS goal is mapped to the region's LRTP goals.

[2] MTPO 2040 Long Range Transportation Plan Update, http://www.topekampo.org/lrtp_documents.html

Table 1: Topeka/Shawnee County ITS Goals

ITS Goal	Related LRTP Goals
1. Integrate efficient and effective ITS into regional transportation planning and project development.	1, 2, 3, 4, 5, 7
2. Improve information sharing among the region's transportation agencies and with the public.	1, 2, 3, 5, 6, 7
3. Increase the safety and security of transportation through improved infrastructure monitoring and emergency management.	2, 4, 7
4. Improve the utilization of existing facilities and infrastructure.	3, 5, 7
5. Encourage efficient modal choices through improved information sharing.	1, 3, 6

3. Regional ITS Stakeholders

The success and accuracy of the Topeka/Shawnee County Regional ITS Architecture is dependent upon the input and support of the region's stakeholders. The stakeholders represent a range of agencies and organizations that not only fund, plan, build and operate transportation systems, but also those that have an interest in their operations and the need for improved safety and efficiency. **Table 2** provides a summary of the types of groups that were candidates to participate as stakeholders.

Table 2: Stakeholder Candidate Types

Federal transportation agencies	State, County, and City street, highway and traffic agencies	Public and private transportation providers	State, County, and City public safety agencies
State, County, City, and private emergency service agencies and providers	Universities, colleges, schools, and pupil transportation providers	Agencies and organizations representing major traffic generators	Private organizations representing transportation users and the media

3.1 Stakeholder Involvement

The consultant contacted the candidate organizations and invited them to participate in the project through the following means:

1. Project web site that contains project information, deliverables and announcements.
2. Online community forum that allows stakeholders to discuss topics and issues related to ITS. The forum is accessible through the project web site.
3. Stakeholder workshop where stakeholders interacted and defined regional needs and potential project ideas.

3.2 Topeka/Shawnee County Stakeholders

Because this Topeka/Shawnee County Regional ITS Architecture is an update, the project manager and consultant reviewed the stakeholder list from the 2007 architecture to identify a set of potential stakeholders representing the region's transportation systems. The list of candidates was presented to the Project Team for review. The Project Team identified key individuals and additional organizations to involve in the project.

Table 3 lists the project stakeholders and indicates the categories in which they may materially participate in the region's ITS. Note that some agencies, such as the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), do not materially participate in Topeka transportation systems. However, they provide guidance, funding, and represent the needs of the region. Also note that as ITS in the region matures, additional stakeholders may be identified, and the categories in which the stakeholders participate may change.

Table 3: Topeka/Shawnee County Region ITS Stakeholders

Stakeholder	Transportation Services Category(ies)	Stakeholder Description
City of Topeka Public Works	• Traffic Management • Maintenance and Construction	The City of Topeka Public Works build, operate and maintain the transportation network owned by the City.
City of Topeka Emergency Services	• Emergency Management	The City of Topeka Emergency Services Fire and Police Departments provide emergency and law enforcement services within the city.
AMR Emergency Response	• Emergency Management	AMR (American Medical Response) provides emergency and non-emergency medical transportation services for the Topeka, Kansas and Shawnee County area.
Federal Highway Administration (FHWA)		The FHWA assists states, local governments, and tribal/federally owned lands in the design, construction, and maintenance of the Nation's highway system. The Kansas division of the FHWA currently operates out of Topeka, Kansas and provides leadership, guidance, and direction in the planning, construction, and maintenance of the state's transportation projects.
Federal Transit Administration (FTA)		The FTA provides financial and technical assistance to local public transit systems. Currently the State of Kansas (along with Topeka, Kansas and Shawnee County) falls under Region 7 of the FTA.
Google	• Traveler Information	Google operates a public transit route planner called Google Transit (website is transit.google.com). The TMTA currently provides Google Transit their route, fare and schedule information, which Google displays to the public on the Google Transit website.

Stakeholder	Transportation Services Category(ies)	Stakeholder Description
Kansas Department of Emergency Management	• Emergency Management	The Kansas Department of Emergency Management is a subgroup of the Kansas Adjutant General's Department. The main goal of the Kansas Department of Emergency Management is to create sustainable capabilities across all phases of Emergency Management in Kansas. The Kansas Department of Emergency Management works with local Kansas communities to assist one another in times of disaster and to ensure proper disaster agencies and proper Emergency Operation Plans are in effect for all Kansas counties.
Kansas Highway Patrol	• Emergency Management	The Kansas Highway Patrol has the primary responsibility of maintaining the safety of the State, Federal, and Interstate highways within the state of Kansas. State patrolmen aim to reduce the number and severity of accidents on state highways and mitigate the use of Kansas highways for criminal activities.
Kansas Motor Carrier Association		The Kansas Motor Carriers Association is a non-profit corporation that provides lobbying and helps the commercial vehicle industry improve its services to the public.
Kansas Turnpike Authority (KTA)	• Electronic Toll Collection • Freeway Management • Maintenance and Construction • Traveler Information	The Kansas Turnpike Authority (KTA) aims to provide safe, high-quality highway transportation services for all turnpike users. The Kansas Turnpike Authority is responsible for all repairs and upgrades for the roadway, and for toll collection on the Turnpike. Recently, the Kansas Turnpike Authority was brought under KDOT.
KTA Highway Patrol	• Emergency Management	The KTA Highway Patrol (Troop G) is responsible for the patrolling of the Kansas Turnpike. The Kansas Turnpike Highway Patrol is headquartered in Wichita, Kansas and operates 24/7. Other responsibilities of the Kansas Turnpike Highway Patrol include providing security at interchange and service areas, managing unpaid tolls, and performing special projects for the Kansas Turnpike Authority (KTA).

Stakeholder	Transportation Services Category(ies)	Stakeholder Description
Kansas Department of Transportation (KDOT)	• Archived Data Systems • Emergency Management • Freeway Management • Maintenance and Construction • Traveler Information	KDOT is a state government organization responsible for the maintenance of Kansas public roadways. Currently KDOT District 1 is the district that is responsible for road maintenance in the Topeka, Kansas and Shawnee County area.
Local Towns Emergency Response	• Emergency Management	Local city and town emergency response agencies provide emergency response to their respective regions within Shawnee County
National Weather Service (NWS)	• Maintenance and Construction • Traveler Information	The National Weather Service is a component of the National Oceanic and Atmospheric Administration (NOAA). The National Weather Service provides weather, water, climate data, and weather forecasts for regions across the US. It also provides weather warnings in the case of hazardous or dangerous weather.
Railroads	• Surface Street Management	UPRR and BNSF rail companies with grade crossings within the Topeka/Shawnee County region.
Shawnee County	• Emergency Management • Maintenance and Construction • Surface Street Management	Shawnee County maintains county roads and bridges; installs/maintains county traffic safety signals, signs, and lights; and is responsible for county emergency response through the Shawnee County Public Works. The county is also responsible for the operation of the county sheriff's department.
Shawnee County Emergency Management	• Emergency Management	Shawnee County Emergency Management provides 24 hour service to the Shawnee County area. It protects citizens from various hazards by providing and coordinating resources, expertise, leadership, and advocacy through risk-based emergency preparedness programs involving mitigation, management, response, and recovery.

Stakeholder	Transportation Services Category(ies)	Stakeholder Description
State Capitol Police	• Emergency Management	The State Capitol Police (Troop K) is headquartered in Topeka, Kansas. The State Capitol Police are responsible for the safety and security of employees and visitors on state property and the Capitol grounds. The State Capitol Police have complete statewide policing powers allowing them to investigate crimes, enforce traffic laws, patrol state parking lots, and regulate the flow of traffic around the state capitol and other state buildings.
Topeka Chamber of Commerce		The Topeka Chamber of Commerce advances the general welfare, quality of life, and prosperity of the Greater Topeka Area. It places emphasis on the Greater Topeka Area's economic, civil, commercial, cultural, industrial, and educational interests. The membership of the Greater Topeka Chamber of Commerce includes business and industry, private associations, civic organizations, home-based businesses, social service agencies, education, government, and individuals.
Topeka Mass Transit Authority	• Transit Services	The Topeka Mass Transit Authority (Topeka Metro) operates fixed-route and paratransit bus services within Topeka.
Traveling Public	• Electronic Toll Collection • Traveler Information	The traveling public in the Topeka/Shawnee County region
Washburn University	• Emergency Management	Washburn University is a coed public university in Topeka, Kansas. It has a police force that enforces traffic laws and traffic flow and coordinates with other regional agencies for event management.

4. Existing Topeka/Shawnee County ITS Inventory

As defined in the FHWA Regional ITS Architecture Rule[3], and for purposes of this report, an ITS inventory is a list of systems/elements and the elements that interface with them. An element is defined as the name used by the region's stakeholders to describe a system or piece of a system. The inventory is an accounting of software, hardware, and functions that take place in the region to accomplish electronic data exchange in support of ITS services.

In ITS terms, systems are not just "brick and mortar" or "facility oriented", but are a collection of functions. They may be used throughout a region and interconnected to many stakeholders, or it may be a tool used for communication of information between specific and limited agencies. The scope of a system can also depend on an individual stakeholder's point of view. The inventory only includes systems that exchange information beyond the stakeholder who owns or operates it. Systems internal to a stakeholder are not included unless there is a future plan to expand their information sharing capabilities.

The inventory is the basis for entering data into the Turbo Architecture software tool. Turbo Architecture v7.0, the most recent version of the software tool, is used to facilitate the development and maintenance of a regional architecture by supporting the definition of inventory, ITS services and system interconnects and data flows. The Topeka/Shawnee County Regional ITS Architecture has been built and will be maintained within Turbo Architecture.

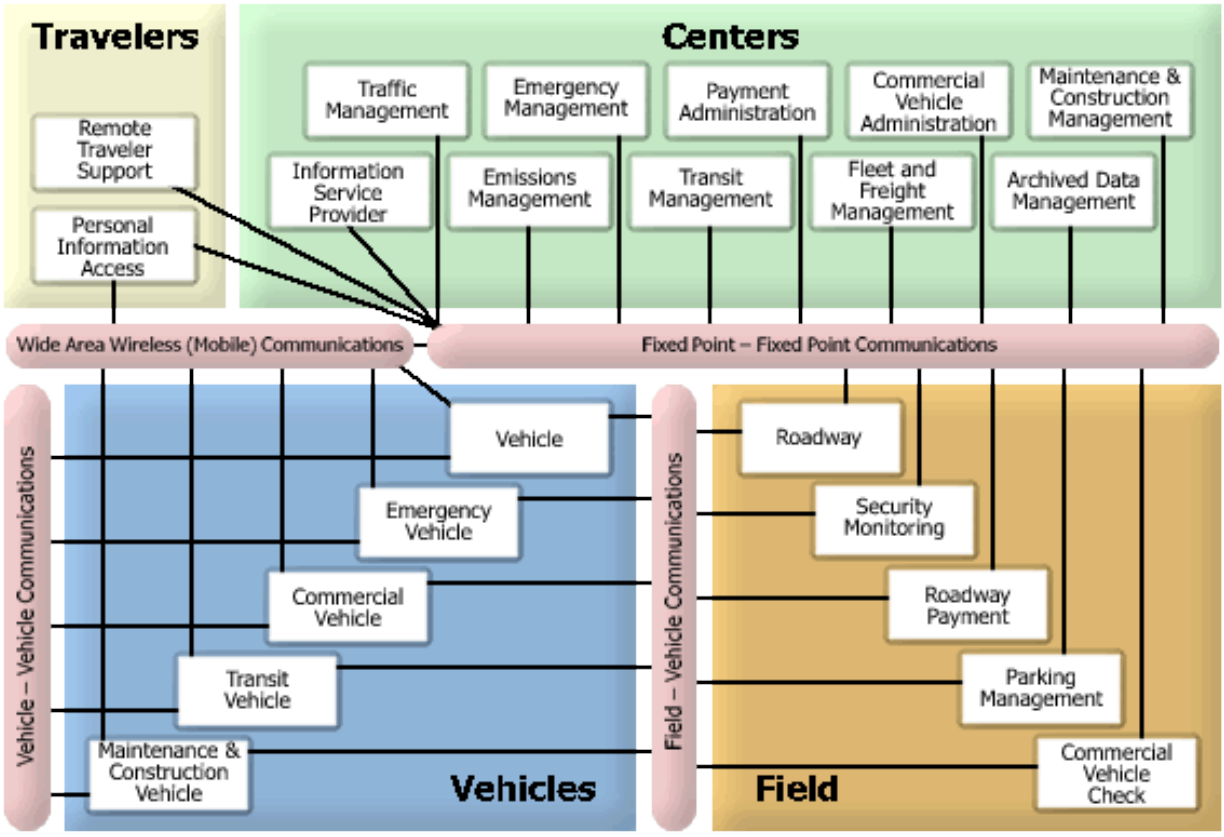
4.1 ITS Architecture Physical Entities

ITS Architecture inventory defines the physical entities of the region's ITS. **Figure 3** provides a high-level view of the physical architecture. The region's existing elements do not encompass all entities shown in the diagram; however, all of the region's elements are contained within this general view. For example, the region does not include or interact with any emissions management systems or fleet and freight management systems, but it does include transit management and interacts with information service providers.

The physical architecture is comprised of "subsystems" and "terminators." They are described in more detail in **Section 6.1**.

[3] FHWA Rule / FTA Policy on Regional ITS Architecture, http://ops.fhwa.dot.gov/its_arch_imp/policy.htm

Figure 3: ITS Architecture Physical Entities



As **Figure 3** shows, there are four types of entities: Centers, Field, Travelers and Vehicles. Following are definitions of each type.

Centers provide management, administrative, and support functions for the transportation system. A center represents a collection of functionality and not necessarily a physical facility. Examples of centers in the Topeka/Shawnee County region are the KDOT Traffic Operations Management Center and the TMTA Transit Management Center.

Field entities are connected infrastructure along the transportation network that perform surveillance, information provision, and plan execution control functions. A field entity's operation is governed by a center subsystem. They may also directly interface to vehicles.

Travelers refer to the equipment used by travelers to access ITS services pre-trip and en-route. This includes equipment that is owned and operated by the traveler, as well as equipment that is owned by transportation and information providers, such as information kiosks.

Vehicles refer to ITS related elements on vehicle platforms and include general driver information and safety systems applicable to all vehicle types. Four fleet vehicle subsystems (Transit, Emergency,

Commercial and Maintenance and Construction Vehicles) add ITS capabilities unique to these special vehicle types.

The entities are not defined by their size or physical presence, but by their functionality. For example, a traffic management center may be a large facility with a video wall, multiple workstations and other amenities where an agency controls its devices and monitors traffic conditions. A traffic management center may also be a single laptop that remotely exchanges information with field devices, disseminates traffic information and controls signs and signals. In addition, a single ITS element may serve as multiple types of centers. For example, a city may have a single system to manage both traffic and emergency response, making it both a traffic management center and emergency management center.

4.2 Collection Methodology

The methodology used to compile an ITS inventory for the Topeka/Shawnee County Region consisted of multiple efforts including document review, meetings, telephone interviews and e-mail exchanges. The Project Team identified stakeholders in the region and the consultant team used various methods to engage them and document their existing and already-planned ITS inventory.

Previous Studies, Reports, and Architecture Databases

The process of creating an inventory of ITS systems in the Topeka/Shawnee County Region started with a review of the previous (2007) ITS Architecture, the region's LRTP and the stakeholders' plans for traffic, emergencies, public transportation and other activities. In addition, other architectures in the state of Kansas were reviewed for overlap. However, it should be noted that the overlapping ITS architectures, including the Kansas Statewide Architecture, are more than five years old and do not accurately reflect all of the regional ITS inventory.

The LRTP was reviewed to identify projects that are planned and funded for the region and contain ITS elements. An example of a project identified in the LRTP is the deployment of electronic fareboxes in transit vehicles by TMTA. This project will be complete and existing by the conclusion of the region's architecture update effort.

Other plans from the region's agencies were also reviewed to identify existing and planned ITS. These include plans such as the region's emergency response plan and the specific plans of agencies, such as the Topeka Fire Department's desire to equip signals and vehicles to allow signal preemption for emergency vehicles. Many of the ITS elements found in these plans are not identified as existing, but will be incorporated into the architecture as planned.

Survey Instruments

The Project Team identified key stakeholders who are known to operate and maintain ITS devices in the region. The stakeholders were contacted by the consultant and provided with a survey of questions specific to their operations. For example, KDOT's maintenance group was asked specific questions about maintenance vehicles, maintenance yards, work zone strategies and interaction with other agencies for traffic management. The key stakeholders provided summaries of their ITS devices, including locations

and quantities, when applicable. The stakeholders also identified any upcoming, funded plans that would add or change their ITS inventory.

Turbo Architecture

Turbo Architecture [4](Turbo) is an interactive software application that assists ITS planners and system integrators, both in the public and private sectors, in the development of regional and project architectures using the National ITS Architecture as a starting point.

Turbo Architecture supports development of regional and system architectures that take advantage of features in the National ITS Architecture. Turbo contains a feature known as "Turbo Conversion". Turbo Conversion automatically converts existing regional and system architectures so they are consistent with the related version of the National ITS Architecture. Specialized conversion reports document all architecture changes made during the conversion. This tool provides a convenient way to migrate the Topeka/Shawnee County Regional ITS Architecture to newer versions of the National ITS Architecture in the future.

Turbo was specifically designed to support development of ITS inventories. Turbo was functionally designed to identify connections between ITS systems or elements in the inventory that support selected services. Although the software tool identifies all potential connections between ITS systems based on the National ITS Architecture, it will pre-select those connections required to support the desired services. The inputs to Turbo are based on the systems inventory. The existing inventory and services were entered into Turbo based on the responses to the document review and surveys. The outputs of Turbo are saved in Microsoft Access-compatible data files. The Turbo data matches the inventory described in **Section 4.3**.

4.3 Topeka/Shawnee County Existing ITS Inventory

The Topeka/Shawnee County ITS Inventory is a summary of known existing ITS in the region that currently, or has the capability to, exchange information outside of their operating agency. The inventory is intentionally broad and includes devices that may not physically exist in the region, but with which regional ITS may interact. The inclusion of many devices is to ensure that the architecture can accurately identify all opportunities to use ITS to improve the region's transportation system.

Although every regional inventory varies based on the unique needs of specific regions, there are several general "best practices" guidelines that have been applied during the development of the Topeka/Shawnee County region inventory. They are:

Appropriate Level of Detail

The inventory is managed to provide the appropriate level of detail while identifying key integration opportunities in the region. Grouping was used to simplify the inventory. For example, instead of listing each individual signal owned and operated by the City of Topeka, the Topeka/Shawnee County Regional

[4] Turbo Architecture Software Tool, http://www.iteris.com/itsarch/html/turbo/turbomain.htm

ITS Architecture inventory reflects one regional ITS element identified as "City of Topeka Field Equipment."

Terminators

In an effort to manage the regional inventory, humans are not included in the inventory. There are, however, other terminators included such as "Local Rail", because information is gathered from these resources in order to operate highway rail interfaces.

Elements Outside the Region

The Topeka/Shawnee County Regional ITS Architecture inventory includes element(s) representing operations centers in adjacent cities, counties and states, where important interfaces are present within these operations centers. These inter-regional interfaces should be coordinated across Regional ITS Architectures to avoid duplicate and/or conflicting definitions of the same interface. An example of this is Google, which does not reside in Topeka, but which the TMTA interfaces with to provide transit traveler information.

Table 4 lists the existing Topeka/Shawnee County regional ITS inventory. It is listed by the stakeholder who owns it. Note that while the elements are grouped, the description of each includes the specific devices that are included in each grouping. For example, the City of Topeka Roadside Devices includes traffic cameras, traffic signals and traffic detectors.

Table 4: Topeka/Shawnee County Existing ITS Inventory

Stakeholder	Element	Description
Travel And Traffic Management		
City of Topeka Public Works	Topeka Roadside Devices	City of Topeka roadside devices include: - Five operating and seven non-operating traffic monitoring cameras. - Signal controllers with coordination on five corridors and adaptive controllers on six corridors, four of which are active. - Signal pre-emption at three intersections (currently not operational) - Railroad crossing monitors. - Loop detectors
	Topeka Traffic Management Center	Traffic control operations center for the City of Topeka using the OASIS traffic signal control software from Econolite. The TMC allows for remote login by traffic signal operators.
	Topeka Web Site	City web site containing information on a variety of issues and topics, including transportation. In particular, it may be used to disseminate traveler and traffic information.
Kansas Department of Transportation	KDOT Roadside Devices	KDOT roadside devices include: - Dynamic Message Signs - Traffic cameras - Speed sensors
	KDOT 511	KDOT system via telephone and Internet for travelers, that provide US Interstate and State highway road and weather information.
	KANROAD	KDOT statewide transportation data collection and dissemination system.
	KDOT Traffic Operations Management Center	Virtual traffic operations and maintenance center for monitoring, controlling and coordinating traffic statewide.
	KDOT RWIS	Road Weather Information
Kansas Turnpike Authority	KTA Roadside Devices	KDOT roadside devices include: - Traffic detection cameras - Dynamic Message Signs - Loop detection - Highway Advisory Radio
	KTA Traffic Management Center	Traffic operations and maintenance center for monitoring, controlling and coordinating traffic on the Kansas Turnpike.

Stakeholder	Element	Description
	KTA Web Site	KSturnpike.com web site provides traveler information for the Turnpike, including road advisories and weather related information.
Railroads	Rail Wayside Equipment	Rail equipment that detects the presence or approach of trains and closes gates at grade crossings.
Shawnee County	Shawnee County Roadside Devices	Shawnee County Roadside Devices include: - Traffic signal controllers - Highway Advisory Radio - Railroad crossing monitors - Railroad crossing preemption
Traveling Public	Travelers	The traveling public using devices such as telephone, mobile devices and personal computers to access traveler and traffic information.
Electronic Payment		
Kansas Turnpike Authority	KTA Electronic Toll Collection	KTAG electronic toll system uses antennas at toll plazas to read vehicle-mounted transponders, identify vehicles and account owners, and manage payment for turnpike travel.
Public Transportation Management		
Topeka Metropolitan Transit Authority	TMTA Transit Management Center	The transit management center manages fixed-route and paratransit operations, including communications with fixed-route and paratransit vehicle operators. The center also manages paratransit scheduling using demand-response management software.
	TMTA Transit Vehicles	TMTA transit vehicles include the following - On-board transit security cameras - Smart electronic fareboxes
Google	Google Transit	Information Service Provider for TMTA transit schedules, routes, fares and other transit information.
Emergency Management		
American Medical Response	AMR Emergency Vehicles	AMR paramedic vehicles.
City of Topeka Emergency Services	Topeka Emergency Vehicles	City fire and police vehicles providing fire, police and rescue response to the City of Topeka

Stakeholder	Element	Description
Kansas Department of Emergency Management	KDEM Emergency Management Center	Statewide center for management of emergencies and catastrophic events. Coordinates to the federal level as well as with local regions, such as Topeka and Shawnee County.
Kansas Highway Patrol	KHP Dispatch	Dispatch of and communications with highway patrol vehicles.
	KHP Emergency Vehicles	Highway Patrol vehicles, including troopers and courtesy service vehicles.
	KHP Courtesy Patrol Vehicles	KHP vehicles providing courtesy car services with the intention of improving traffic flow on state-maintained highways.
KTA	KTA Flood Monitors	Sensors that detect the potential for flooding on the turnpike.
	KTA Courtesy Patrol Vehicles	KTA vehicles providing courtesy car services with the intention of improving traffic flow on the turnpike.
KTA Highway Patrol	KTA HP Dispatch	Dispatch of and communications with highway patrol vehicles on the Turnpike
	KTA HP Emergency Vehicles	Highway Patrol vehicles specifically assigned to service the Turnpike.
Local Towns Emergency Response	Local Towns Emergency Vehicles	Vehicles providing fire, police and rescue response to the local cities and townships.
	Local Towns Emergency Management	These are the vehicles that are operated by the public safety centers (e.g., police cruisers, fire trucks, ambulance, tow truck, etc.) that provide fire, police and rescue response to the local cities and townships.
Shawnee County	Shawnee County 911 Dispatch Center	Emergency dispatching for all emergency responders in Topeka and Shawnee County. The 911 dispatch center coordinates response and communicates via voice to emergency responders.
	Shawnee County Emergency Communications Center (ECC)	County emergency center for emergency planning, coordination and response.
	Shawnee County Emergency Vehicles	County fire, sheriff and rescue response vehicles providing fire, law enforcement and rescue response to Shawnee County. Sheriff vehicles have Automatic Vehicle Location (AVL) technology.
	Shawnee County WebEOC	Software that allows the Shawnee County EOC to communicate and coordinate with agencies outside Shawnee County. It also provides satellite images, weather related information and other information.

Stakeholder	Element	Description
State Capitol Police	State Capitol Police Emergency Vehicles	Vehicles used by State Capitol Police in the State Capitol area of Topeka.
	State Capitol Police Dispatch	Dispatching for State Capitol Police.
Washburn University Police	Washburn University Emergency Vehicles	Police vehicles providing police response in the Washburn University area of Topeka.
	Washburn University Dispatch Center	Dispatches Washburn emergency vehicles.
Maintenance and Construction		
City of Topeka Public Works	City of Topeka Maintenance Vehicles	Topeka vehicles used in the maintenance of the city's roadways. Vehicles are equipped with Automated Vehicle Location (AVL) technology.
	Topeka Maintenance Center	Topeka Maintenance center that monitors road and weather conditions in the region and tracks maintenance vehicles.
Kansas Department of Transportation	KDOT Roadside Devices	Road Weather Information System station for measuring weather conditions.
	KDOT Maintenance Vehicles	KDOT vehicles used in the maintenance of the state highways.
	KDOT Traffic Operations Maintenance Center	KDOT Virtual traffic operations and maintenance center for monitoring, controlling and coordinating traffic statewide.
	KDOT Maintenance Center	Center that manages and controls maintenance of state-maintained roadways
Kansas Turnpike Authority	KTA Roadside Devices	KTA Devices for measuring environmental conditions such as precipitation, wind speed and road temperature.
	KTA Maintenance Center	KTA Maintenance center that monitors road and weather conditions on the turnpike.
Shawnee County	Shawnee County Maintenance Vehicles	Shawnee County vehicles used in the maintenance of the county's roadways. Vehicles are equipped with AVL technology.
	Shawnee County Maintenance Center	Shawnee County Maintenance center that monitors road and weather conditions in the region and tracks maintenance vehicles.
Weather Service	Weather Service	Third-party weather information providers for the City of Topeka, KDOT, KTA and Shawnee County.

5. Topeka/Shawnee County Regional ITS Needs

The existing ITS inventory provides an overview of the current conditions and functionality in the region. The project's next step was to determine the needs that can be addressed by ITS, but are not currently addressed, either in part or in whole.

5.1 Needs Gathering Process

The Project Team interacted with stakeholders through multiple strategies to identify, prioritize and understand their needs. The strategies included:

Needs Survey

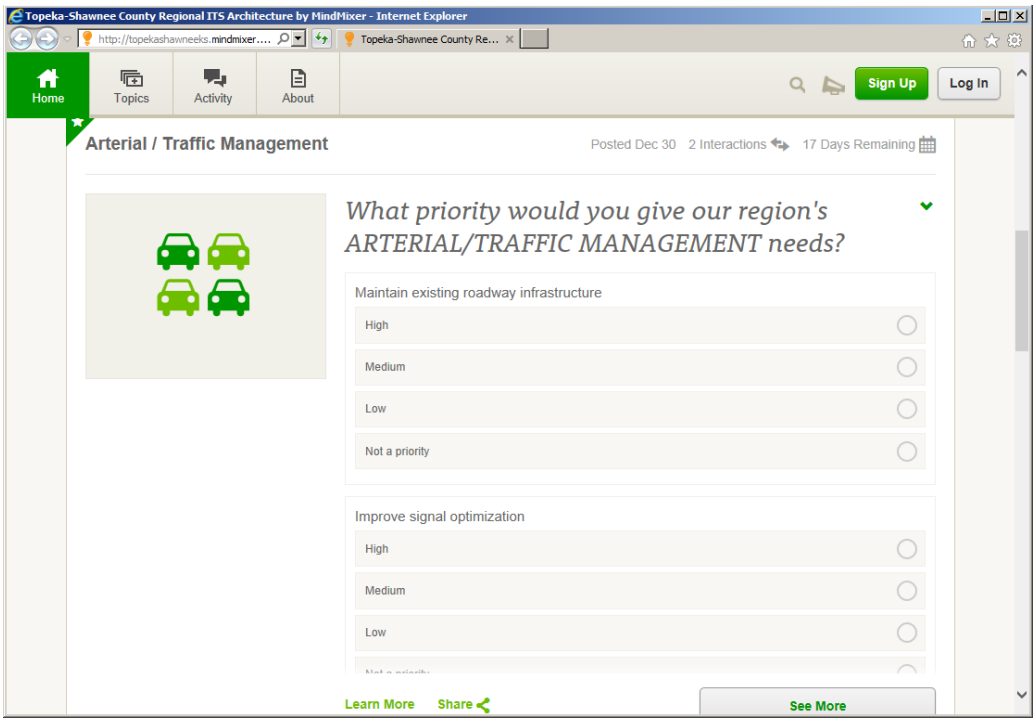
Stakeholders were provided with a survey of "strawman" needs that were developed by the consultant based on the following:

- The needs identified during the 2007 regional ITS architecture development.
- Preliminary contacts with stakeholders throughout the Topeka/Shawnee County Region.
- Study team knowledge of the Topeka/Shawnee County Region.
- Needs identified in the LRTP.
- Experience in developing Regional ITS Architectures in other regions.
- The National ITS Architecture, Version 7.0.

Interactive Web Site

The project established an interactive web site where stakeholders could exchange ideas, prioritize needs and identify new needs. **Figure 4** provides a typical screenshot from the interactive web site.

Figure 4: Interactive Project Web Site



Stakeholder Workshop

During the workshop held on January 9, 2014, the stakeholders took part in two exercises to identify their needs. In the first, the stakeholders broke into small groups around maps of the region. They marked the maps to identify areas where there were needs for improved transportation and then presented their findings to everyone present. In the second exercise, each stakeholder was given a "budget" and asked to assign it to the needs they considered most important. The stakeholders were allowed to assign their budget to their perceived need(s), including assigning their entire budget to a single need or spreading it across multiple needs. The "budget" assigned to each need by the stakeholders was summed to identify what the stakeholders believed were most needed.

5.2 Topeka/Shawnee County Regional ITS Needs

Based on the input of the stakeholders, the highest priority needs for the region are:

1. ***Improved information sharing among agencies***. The stakeholders overwhelmingly indicated that better information sharing was the highest priority need in the region. They stated that better sharing of existing information, including traffic and maintenance data and video images, can help resolve the region's issues.
2. ***Improve incident detection***. This need includes the increase in technologies to detect incidents as well as ensuring that all relevant stakeholders have access to existing tools for incident detection, primarily video images.

3. ***Reduce response delays at signals***. This need was indicated as a high priority in both traffic and emergency management. The City of Topeka Fire Department provided information regarding the specific intersections where reduced delay is most important for their response.
4. ***Improve inter-agency coordination***. Specifically for transit, improved coordination would result in TMTA receiving better and more complete information about road closures, restrictions and maintenance that impact their fixed-route and paratransit routing and schedules. The interagency coordination could also help emergency responders be aware of closures and restrictions that could delay their responses.
5. ***Provide more timely dissemination of traveler information***. Information sought by travelers and the region's transportation agencies include more complete video views of traffic conditions, as well as increased information about regional roadway closures and restrictions. This specific need is related to other high-priority needs such as improved information sharing and improved incident detection.
6. ***Improve incident response times***. This need is also closely related to the other high priority needs. In order to improve incident response times, the region's first responders will need to be aware of incidents and be able to navigate to their sites more quickly. This can be achieved through improved signal response, routing and improved information sharing.
7. ***Improve incident response coordination among agencies***. This need is closely related to the need for improved inter-agency coordination and improved information sharing. Improved response coordination will require better information sharing and the ability for the agencies to be able to communicate their plans and activities.
8. ***Improve signal timing and control***. The City of Topeka has adaptive control and signal coordination in certain places within the City. This need is for more coordination and more responsive signals through increased traffic detection, coordination and adaptive control.
9. ***Improve traffic flow at intersections***. This need is directly related to improved signal timing control and represents a need for more efficient traffic flow with higher average traffic speeds.
10. ***Enable transit agency to locate bus fleet***. This need is for the transit agency to be better able to monitor the location of its vehicles, and thereby monitor the vehicle performance and provide better information to transit riders about vehicle schedules.

As previously stated, the above list only highlights the highest priority needs for the Topeka/Shawnee County Region. The remainder of this section discusses all needs in the region that have been identified and determined to be high, medium or low priority by the stakeholders. The needs have been divided into categories reflective of the main National ITS Architecture service areas of:

- Arterial Traffic Management
- Freeway Traffic Management
- Public Transportation
- Emergency Management

- Maintenance and Construction Operations
- Traveler Information
- Commercial Vehicle Operations
- Archived Data Management or Integration

5.2.1 Arterial / Traffic Management Needs

Examples of arterial/traffic management include: Signal Coordination; Centralized Control; Vehicle Detection Systems; Video Systems; Adaptive Signal Control; Traffic Management Systems/Centers; and Highway Rail Intersection Technologies.

Table 5: Topeka/Shawnee County Arterial/Traffic Management Needs

Arterial / Traffic Management Need	Relative Priority (High, Medium, Low)
Reduce emergency vehicle delays at signals.	High
Improve signal control and timing.	High
Implement or improve signal coordination.	Medium
Improve system operation monitoring.	Medium
Maintain existing roadway infrastructure.	Medium
Improve arterial roadway traffic surveillance.	Low
Remote monitoring of signal system status/operations by public safety agencies.	Low
Upgrade signal hardware.	Low
Deploy network vs. corridor based signal coordination.	Low
Better manage rail-traffic intersections.	Low
Provide quality real time congestion information.	Low
Reduce transit vehicle delays at signals.	Low
Better manage congestion at signals.	Low

5.2.2 Freeway Management Needs

Examples of freeway management systems include: Vehicle Speed Detection Systems; Video Systems; Ramp Metering; Variable Message Signs; Highway Advisory Radio; and Traffic Management Systems/Centers.

Table 6: Topeka/Shawnee County Freeway Management Needs

Freeway Management Need	Relative Priority (High, Medium, Low)
Improve incident detection.	High
Improve inter-agency coordination (e.g. KTA and KDOT).	High
Improve traffic flow at interchanges.	High
Provide quality real time congestion related information.	Low
More timely incident information dissemination (traveler information).	Low
Improve information exchange between state and local agencies.	Low
Improve traveler information/directions (suggested routing for travelers not familiar with the region).	Low
Improve freeway traffic surveillance.	Low
Improve information exchange between Topeka and neighboring regions (e.g. Lawrence, KDOT).	Low
Improve incident response, especially in rural areas.	Low
Improve incident management in urban areas.	Low

5.2.3 Public Transportation Needs

Examples of public transportation systems include: Public Transportation Management; En-route Transit Information; Personalized Public Transit; Public Traveler Safety; Traveler Service Information; Ride Matching and Reservations; and Smart Card Payment/Transaction Systems.

Table 7: Topeka/Shawnee County Public Transportation Needs

Public Transportation Need	Relative Priority (High, Medium, Low)
Improve interagency coordination.	High
Enable transit agencies to locate bus fleet.	High
Enable dissemination/display of real-time bus arrival times.	Medium
Improved service planning (scheduling and run-cutting).	Low
Improved information exchange between/among transit agencies.	Low
Provide transit priority at signals.	Low
Improve regional and interregional trip planning.	Low
Enable emergency information dissemination to transit operators.	Low
Improve Americans with Disabilities Act (ADA) compliance for transit information.	Low
Improve efficiency of social service transportation providers.	Low
Improved information exchange between transit agencies and freeway/arterial management centers.	Low

5.2.4 Emergency Management Needs

Examples of emergency management systems include: Incident Detection; Incident Management; Hazardous Materials Response and Handling; Emergency Notification and Personal Security; Emergency Vehicle Management; and Advanced Dispatching and Response Systems.

Table 8: Topeka/Shawnee County Emergency Management Needs

Emergency Management Need	Relative Priority (High, Medium, Low)
Reduce response delays at signals.	High
Improve incident response times.	High
Improve incident response coordination between agencies.	High
Provide alternate route plans.	Medium
Improve incident detection.	Medium
Provide quality real time congestion related information.	Medium
Improve traffic management during incidents such as wildfires/floods (evacuation, response, suppression, etc.).	Medium

Emergency Management Need	Relative Priority (High, Medium, Low)
Increase use of portable traffic control equipment (Message Signs, Highway Advisory Radio, etc.).	Medium
Improve traveler information/directions (suggested routing for travelers not familiar with the region).	Low
Improve response to adverse weather events.	Low
Improve response to hazardous materials spills/incidents (better manage resulting traffic congestion, improve clean-up time).	Low

5.2.5 Maintenance and Construction Operations Needs

Examples of maintenance and construction operation systems include: Advanced Work Zone Management and Traffic Control; Vehicle Detection Systems; Video Systems; Vehicle Speed Detection Systems; Variable Message Signs; Highway Advisory Radio; Integration with Traffic Management Systems/Centers; Advanced Dispatching and Routing Systems; Advanced Vehicle Tracking Systems; and Fleet Maintenance and Management Systems.

Table 9: Topeka/Shawnee County Maintenance and Construction Operations Needs

Maintenance and Construction Operations Need	Relative Priority (High, Medium, Low)
Increase use of portable traffic control equipment (Dynamic Message Signs, Highway Advisory Radio, etc.).	Medium
Improve coordination on construction notification and information distribution.	Medium
Provide quality real time congestion related information.	Medium
Coordinate traffic control plans between jurisdictions.	Medium
Improve/enhance work zone traffic handling plans.	Low
Deploy mobile/portable traffic management field equipment (mobile surveillance equipment, mobile ramp metering, mobile Highway Advisory Radio).	Low
Provide signal preemption for some maintenance fleet vehicles.	Low
Improve fleet information/management (maintenance schedules, mileage accumulations, tracking snow removal vehicles w/AVL).	Low
Interagency coordination on most advantageous placement of maintenance vehicles (prior to anticipated need).	Low

Maintenance and Construction Operations Need	Relative Priority (High, Medium, Low)
Improved traveler information/directions (suggested routing for travelers not familiar with the region).	Low

5.2.6 Regional Traveler Information Needs

Examples of regional traveler information systems include: En-route Traveler Information; Pre-trip Traveler Information; Portable Event Management Systems; In-vehicle Route Guidance; Traffic Information; Variable Message Signs; Highway Advisory Radio; Internet, Media; and Tourist Information Systems.

Table 10: Topeka/Shawnee County Regional Traveler Information Needs

Regional Traveler Information Need	Relative Priority (High, Medium, Low)
Provide more timely dissemination of traveler information.	High
Improve method of disseminating congestion and incident data from KDOT.	Medium
Improve procedures to get accurate information disseminated in a timely manner.	Medium
Provide quality real time congestion related information.	Medium
Expand traveler information delivery methods.	Low
Provide better road construction information and notification.	Low
Provide weather and road info access at rest stops/visitor centers (could be radar screen video/monitor).	Low

5.2.7 Commercial Vehicle Operations Needs

Examples of commercial vehicle operations systems include: Commercial Vehicle Electronic Clearance; Automated Roadside Safety Inspection; On-board Safety Monitoring; Commercial Vehicle Administration Processes; Hazardous Material Incident Response; Commercial Vehicle Fleet Management; and Services to Assist Agricultural Harvesting and Migration.

Table 11: Topeka/Shawnee County Commercial Vehicle Operations Needs

Commercial Vehicle Operations Need	Relative Priority (High, Medium, Low)
Disseminate better information regarding limited alternative routes.	Medium
Provide interstate/inter-region traveler information covering a wide area (targeted to commercial vehicle operators).	Medium
Improve congestion management during seasonal/local events.	Medium
Provide quality real time congestion related information.	Low
Improve truck storage/parking information (during major road closures).	Low
Expand weigh-in-motion technologies.	Low

5.2.8 Integration Needs

Examples of Integration include: Integration of Systems; Integration with Traffic Management Centers; Determining Central vs. Distributed Control; Communications Infrastructure; Integration of Agencies; and Resolution of Institutional Issues.

Table 12: Topeka/Shawnee County Integration Needs

Integration Need	Relative Priority (High, Medium, Low)
Improve information sharing among agencies.	High
Improve communication limitations.	Medium
Develop interagency governmental agreements that would allow sharing of information, etc.	Medium
Improve coordination with schools and Division of Emergency Management.	Medium
Improve system compatibility.	Medium
Provide central information clearinghouse.	Low

6. Topeka/Shawnee County ITS Services

Once the needs of the region have been defined, ITS Services that can address them are mapped to each. This section describes ITS services and maps the Topeka/Shawnee County region's needs to them.

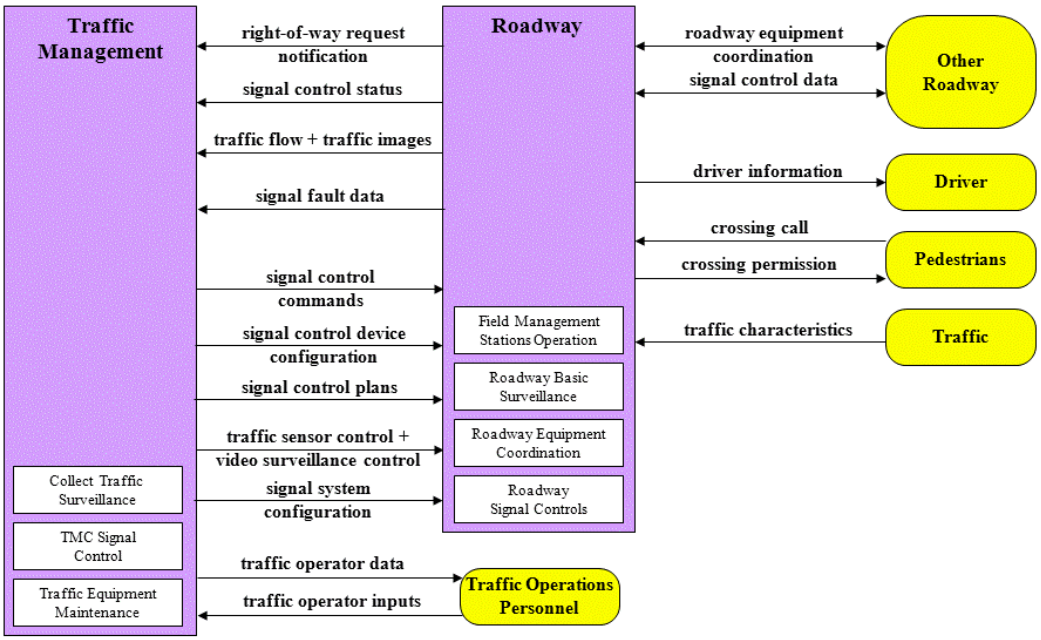
6.1 ITS Service Packages

ITS user services describe what ITS should do from the user's perspective. Users are the individuals and organizations that will use, operate and maintain the transportation network. It includes the traveling public and local and statewide system operators and maintainers representing multiple modes.

Typically, people view ITS architecture in terms of "packages" that define specific functionality. The National ITS Architecture defines several service packages that "bundle" ITS elements to address specific services, such as surface street control. ITS service packages are not necessarily the same as ITS projects. They are, instead, the "building blocks" of ITS. Specific ITS projects for the Topeka/Shawnee County Region, such as a regional traffic management center, may include several service packages to provide multiple functions like traffic control, data gathering and information sharing.

Figure 5 is an example of a service package. Following the diagram is a description of each element in the package.

Figure 5: Service Package ATMS03: Traffic Signal Control



Subsystem

Subsystems are defined functionally, not physically. They are grouped into four classes: Centers, Field, Vehicles, and Travelers. Example subsystems are the Traffic Management Subsystem, the Vehicle Subsystem, and the Roadway Subsystem. These correspond to the physical world: respectively traffic operations centers and roadside signal controllers.

Subsystems, as defined by the National ITS Architecture, are typically related to transportation management or information processing. Examples of Subsystems could include the following:

- **Traffic Management Center** manages traffic, but may include a single physical center that co-locates the capabilities of several Subsystems. In the future, the Traffic Management Center's functions may include traffic management, functioning as a data warehouse, and being an information service provider.
- **Roadways** represent the devices that are located on the roadways, such as video cameras, traffic signal controllers and Dynamic Message Signs.

Terminator

Terminators define the boundaries of an architecture. They represent the people, systems, and general environment that interface to ITS, and often perform a function. The interfaces between terminators and subsystems are defined, but the region's ITS architecture generally does not define the functionality of the terminators. Examples of terminators could include the following:

- "Drivers," or more specifically, the means with which the drivers exchange information. This may include through a handheld device, a computer, or through a device such as a kiosk.
- "Other Roadway" may be devices on the roadway that exchange information but whose functionality is not defined by the architecture. These may include devices such as signals for school crossings that provide information to a traffic management center, but are not controlled by or coordinated with the center.

Information Flows are the information and data exchange between and among various subsystems and terminators in the physical architecture. Information Flows allow for coordinated system operation by using predefined interfaces between Subsystems, which may be owned and operated by different stakeholders. A key component of ITS Architecture development is identifying existing open, non-proprietary standards for these information flows wherever possible to maximize interoperability. Examples of information flows are:

- "Signal control data" information flow starts at the Traffic Management Subsystem (the City of Topeka's Pyramids traffic signal control system) and flows to the Roadway Subsystem (the traffic signal controller in the field). "Signal control data" is information used to configure and control traffic signal systems, such as phases and timing.
- "Signal control status" is in response when the Roadway Subsystem returns the "signal control status" information flow to the Traffic Management Subsystem. "Signal control

status" is the status of surface street signal controllers, such as their phase and whether or not they are operating correctly.

6.2 National ITS Service Packages

The National ITS Architecture Version 7.0 contains 97 service packages that represent the entire spectrum of ITS services that are defined by the architecture. Only a small portion of these Service Packages are deployed, or will be deployed, in the Topeka/Shawnee County Region. The complete list of National ITS service packages are provided in Appendix A. Each is hyperlinked to detailed descriptions and diagrams. They may also be accessed at the National ITS Architecture web site[5].

6.3 Topeka/Shawnee County Existing and Needed ITS Services

The Topeka/Shawnee County Region will not deploy all of the National ITS Services Packages. This section contains the subset of Service Packages that currently exist in the region, and the candidate Service Packages that address the region's transportation needs as identified by the stakeholders.

6.3.1 Topeka/Shawnee County Existing ITS Service Packages

Table 13 identifies the 19 existing ITS service packages in the Topeka/Shawnee County region. The existing service packages have been derived from the current services provided by the region's stakeholders, and from the inventory listed in **Section 4.3**.

Table 13: Topeka/Shawnee County Existing ITS Service Packages

Existing Service Package	Stakeholders
APTS02: Transit Fixed-Route Operations	▪ Topeka Mass Transit Authority
APTS03: Demand Response Transit Operations	▪ Topeka Mass Transit Authority
APTS04: Transit Fare Collection Management	▪ Topeka Mass Transit Authority
ATIS01: Broadcast Traveler Information	▪ KDOT ▪ KTA
ATMS01: Network Surveillance	▪ City of Topeka Public Works ▪ KDOT
ATMS03: Traffic Signal Control	▪ City of Topeka Public Works
ATMS06: Traffic Information Dissemination	▪ KDOT ▪ KTA
ATMS10: Electronic Toll Collection	▪ Kansas Turnpike Authority

[5] http://www.iteris.com/itsarch/html/mp/mpindex.htm

Existing Service Package	Stakeholders
ATMS13: Standard Railroad Grade Crossing	▪ Railroads ▪ Shawnee County
EM01: Emergency Call-Taking and Dispatch	▪ AMR Emergency Response ▪ Kansas Highway Patrol ▪ KTA Highway Patrol ▪ Shawnee County ▪ State Capitol Police ▪ Washburn University Police
EM02: Emergency Routing	▪ City of Topeka Fire and Police ▪ Shawnee County
EM04: Roadway Service Patrols	▪ KHP ▪ KTA
EM08: Disaster Response and Recovery	▪ Shawnee County ▪ City of Topeka Public Works
EM09: Evacuation and Reentry Management	▪ Kansas Department of Emergency Management ▪ KDOT ▪ Kansas Highway Patrol ▪ KTA Highway Patrol ▪ Shawnee County ▪ City of Topeka Public Works
EM10: Disaster Traveler Information	▪ KDOT ▪ KTA
MC01: Maintenance and Construction Vehicle and Equipment Tracking	▪ City of Topeka Public Works
MC03: Road Weather Data Collection	▪ KDOT ▪ KTA
MC04: Weather Information Processing and Distribution	▪ KDOT ▪ KTA
MC06: Winter Maintenance	▪ City of Topeka Public Works ▪ KDOT ▪ Shawnee County

6.3.2 Topeka/Shawnee County Candidate ITS Service Packages

Based on the region's needs, 14 ITS Service Packages have been identified as candidates to be deployed or expanded in the region. **Table 14** provides a list of those ITS Service Packages. The table maps the ITS Service Packages to the specific needs each can address. In some cases, it may take multiple packages to address a single need. In others, a single package may address multiple needs. Some of the needed ITS Service Packages already exist in the region, as summarized in **Table 14**. However, they are included here because they are candidates to be expanded to include additional capabilities or stakeholders.

Note that for the Topeka/Shawnee County Region, each ITS Service Package will be tailored to perform only the functionality needed in the region. For example, **Figure 5** shows many functions available within Traffic Signal Control. However, the Topeka/Shawnee County Region may not implement functionality such as advanced pedestrian solutions.

Table 14: Topeka/Shawnee County Region Candidate ITS Service Packages

ITS Service Package	Need(s) Addressed	Need Priority
AD2: ITS Data Warehouse	Improve information sharing among agencies.	High
	Improve interagency coordination.	High
	Coordinate traffic control plans between jurisdictions.	Medium
	Provide central information clearinghouse.	Low
AITS01: Broadcast Traveler Information	Provide more timely dissemination of traveler information.	High
	Provide quality real time congestion related information.	Medium
	Disseminate better information regarding limited alternative routes.	Medium
	Provide interstate/inter-region traveler information covering a wide area (targeted to commercial vehicle operators).	Medium
	Provide better road construction information and notification.	Low
	Expand traveler information delivery methods.	Low
	Provide weather and road info access at rest stops/visitor centers (could be radar screen video/monitor).	Low
	Improve truck storage/parking information (during major road closures).	Low
ATIS06: Transportation Operations Information Sharing	Improve interagency coordination.	High
	Coordinate traffic control plans between jurisdictions.	Medium
APTS01: Transit Vehicle Tracking	Enable transit agency to locate bus fleet.	High
APTS07: Multi-modal Coordination	Improve interagency coordination.	High

ITS Service Package	Need(s) Addressed	Need Priority
	Improved information exchange between transit agencies and freeway/arterial management centers.	Low
APTS08: Transit Traveler Information	Enable dissemination/display of real-time bus arrival times.	Medium
	Improve Americans with Disabilities Act (ADA) compliance for transit information.	Low
APTS09: Transit Signal Priority	Improved Service Planning.	Low
	Provide transit priority at signals.	Low
ATMS01: Traffic Surveillance	Improve incident detection.	High
	Improve system operation monitoring.	Medium
	Improve freeway traffic surveillance.	Low
	Improve arterial roadway traffic surveillance.	Low
ATMS03: Traffic Signal Control	Reduce response delays at signals.	High
	Improve incident response times.	High
	Improve signal timing and control.	High
	Improve traffic flow at intersections.	High
	Implement or improve signal coordination.	Medium
	Improve system operation monitoring.	Medium
	Deploy network vs. corridor based signal coordination.	Low

ITS Service Package	Need(s) Addressed	Need Priority
	Remote monitoring of signal system status/operations by public safety agencies.	Low
	Reduce transit vehicle delays at signals.	Low
	Upgrade signal hardware.	Low
	Provide signal preemption for some maintenance fleet vehicles.	Low
ATMS06: Traffic Information Dissemination	Provide more timely dissemination of traveler information.	High
	Provide alternate route plans.	Medium
	Provide quality real time congestion related information.	Medium
	Increase use of portable traffic control equipment (Message Signs, Highway Advisory Radio, etc.).	Medium
	Improve method of disseminating congestion and incident data from KDOT.	Medium
	Improve procedures to get accurate information disseminated in a timely manner.	Medium
	Disseminate better information regarding limited alternative routes.	Medium
	Improve traveler information/directions (suggested routing for travelers not familiar with the region).	Low
	Improved information exchange between transit agencies and freeway/arterial management centers.	Low
ATMS07: Regional Traffic Coordination	Improve interagency coordination.	High
	Coordinate traffic control plans between jurisdictions.	Medium

ITS Service Package	Need(s) Addressed	Need Priority
	Improve congestion management during seasonal/local events.	Medium
	Improve coordination with schools and Division of Emergency Management.	Medium
ATMS08: Traffic Incident Management System	Improve incident response coordination among agencies.	High
	Improve coordination with schools and Division of Emergency Management.	Medium
	Improve response to hazardous materials spills/incidents (better manage resulting traffic congestion, improve clean-up time).	Low
MC10: Maintenance and Construction Activity Coordination	Improve coordination on construction notification and information distribution.	Medium
	Interagency coordination on most advantageous placement of maintenance vehicles (prior to anticipated need).	Low
EM02: Emergency Routing	Reduce response delays at signals.	High
	Improve incident response times.	High
	Enable emergency information dissemination to transit operators.	Low

7. Topeka/Shawnee County Regional ITS Operational Concept

The Operational Concept of ITS is a stakeholder–oriented view of operational characteristics. While the Service Packages show the information flowing between ITS elements to perform functions, the operational concept describes the roles and responsibilities of the stakeholders in developing, operating and maintaining the region's ITS.

Within the operational concept are each stakeholder's roles and responsibilities. For ITS, these are related to the implementation and operation of ITS, as well as non-ITS activities based on a common regional architecture. They are what is expected of each stakeholder, at a management and operational level, in order for the ITS to function, provide value and be used for its intended purpose. The process of documenting the operational concept for the region develops existing roles and allows the stakeholders to identify what they are capable of, must prepare for, or will need support in performing. The process also assists in identifying gaps and duplication of efforts. Ultimately, the roles and responsibilities will be the basis for interagency agreements for the development, deployment and operation of ITS.

The entire list of existing and future roles and responsibilities is too long to include in the body of this document, so they are provided in **Appendix B** as it is documented in the Turbo Architecture software tool. They are sorted by stakeholder. However, to provide an understanding of typical roles and responsibilities, **Table 15** lists the current and future roles and responsibilities for surface street management for the City of Topeka. It should be noted **Table 15** represents only a small portion of the City of Topeka's roles and responsibilities.

Table 15: Surface Street Traffic Management Roles and Responsibilities for the City of Topeka Public Works

Role and Responsibility	Status
Collect traffic data, including speed and volumes.	Existing
Maintain and operate centralized traffic signal software.	Existing
Develop and operate coordinated signals within designated corridors.	Existing
Manage traffic control during emergency events, evacuation and reentry.	Existing
Manage traffic on city-owned arterials using traffic signals.	Existing
Monitor traffic via closed circuit television.	Existing
Operate and maintain the closed circuit camera system.	Existing
Operate and maintain traffic signals in the City and Shawnee County.	Existing
Operate and maintain the Traffic Management Center.	Existing

Role and Responsibility	Status
Coordinate traffic control response to incidents with emergency responders and other transportation agencies.	Near-term
Coordinate with other agencies for widespread emergency and incident management.	Near-term
Provide access to traffic camera views for other selected agencies in the region.	Near-term
Redistribute traffic images from local closed circuit television cameras.	Near-term
Archive and maintain data warehouse for use in analysis, planning and operations.	Medium-term
Collect and analyze incident information.	Medium-term
Collect data from own systems and other relevant systems in the Topeka/Shawnee County Region.	Medium-term
Exchange traffic information with emergency responders and other traffic agencies to support coordinated incident response.	Medium-term
Exchange transportation data with the local data warehouse.	Medium-term
Grant transit signal priority requests when appropriate.	Long-term
Provide traffic and incident information to the public, including construction, maintenance, road closures, detours, delays, congestion and incident information.	Long-term

8. Topeka/Shawnee County Regional ITS Functional Requirements

To effectively deliver the ITS services in the Topeka/Shawnee County Region, each system must perform certain functions. While the Operational Concept focused on how people and agencies will interact with ITS, functional requirements focus on what the ITS elements are required to do in order to accomplish the region's ITS objectives.

A functional requirement is a declarative "shall statement" that precisely states a task or activity performed by an ITS element in the region. Each functional requirements is specific and discrete, defining a specific function that an ITS device must perform. For example, the KDOT roadside devices "shall include dynamic messages signs for dissemination of traffic information and other information to drivers, under center control; the DMS may be either those that display variable text messages, or those that have fixed format display(s) (e.g. vehicle restrictions, or lane open/closed)."

The functional requirements for the Topeka/Shawnee County Regional ITS Architecture have been selected based on the ITS services, using the Turbo Architecture software tool. The selection has been tailored based on the particular stakeholders, inventory and the region's objectives. The only ITS elements that do not have functional requirements are "terminators." Terminators are described in **Section 3.1** as the boundaries of the architecture. Their functionality is not defined by the ITS architecture.

Because the functional requirements are very detailed and comprehensive, they are not included in the body of this report. **Table 16** is a small subset of the region's functional requirements meant to serve as an example. It is the functional requirements for the TMTA transit center and vehicles, related to Automated Vehicle Location (AVL). All functional requirements can be viewed within the Turbo Architecture database.

Table 16: Example TMTA Transit Center and Vehicle Functional Requirements

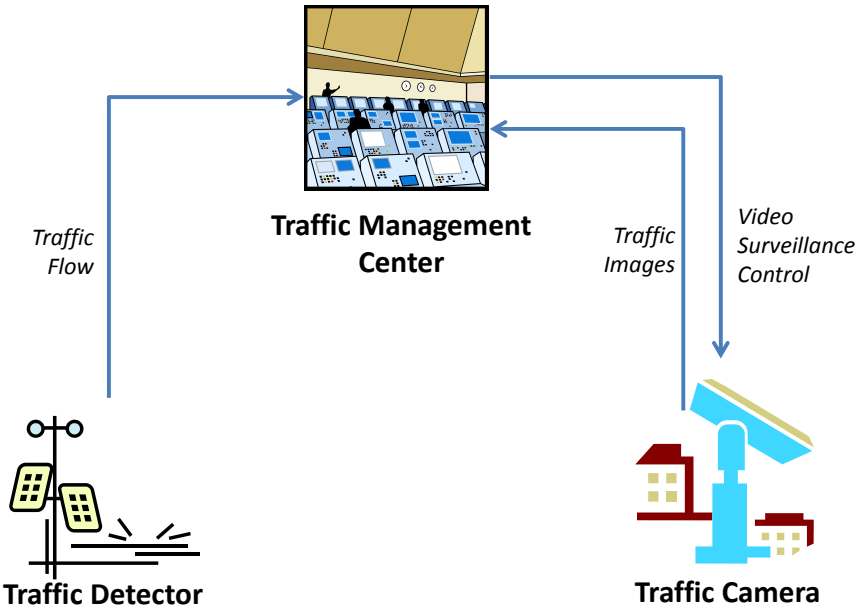
Functional Requirement	Status
The center shall monitor the locations of all transit vehicles within its network.	Near-term
The center shall determine adherence of transit vehicles to their assigned schedule.	Near-term
The transit vehicle shall track the current location of the transit vehicle.	Near-term
The transit vehicle shall support the computation of the location of a transit vehicle using on-board sensors to augment the location determination function. This may include proximity to the transit stops or other known reference points, as well as recording trip length.	Near-term
The transit vehicle shall record transit trip monitoring data including vehicle mileage and fuel usage.	Near-term
The transit vehicle shall send the transit vehicle trip monitoring data to center-based trip monitoring functions.	Near-term

9. Topeka/Shawnee County Interconnects and Information Flows

Interconnects are the data connections between the region's ITS elements. They show the elements that will be exchanging data with other elements. In the case of a transit vehicle, the interconnect will likely only be to the transit center via wireless communication. In the case of a traffic management center, it may be connected to roadside devices, other centers and, potentially, even to vehicles.

Within each interconnect are specific information flows. They define each type of information that will be exchanged between any two ITS elements. **Figure 6** shows two instances of information flow between ITS elements. In the case of the traffic detector, information may flow only one direction with the center receiving the traffic flow information. In the case of a traffic camera, information may flow in both directions. The center may send commands to the camera regarding pan, tilt and zoom. The camera may send back images and operational status.

Figure 6: Examples of Information Flows

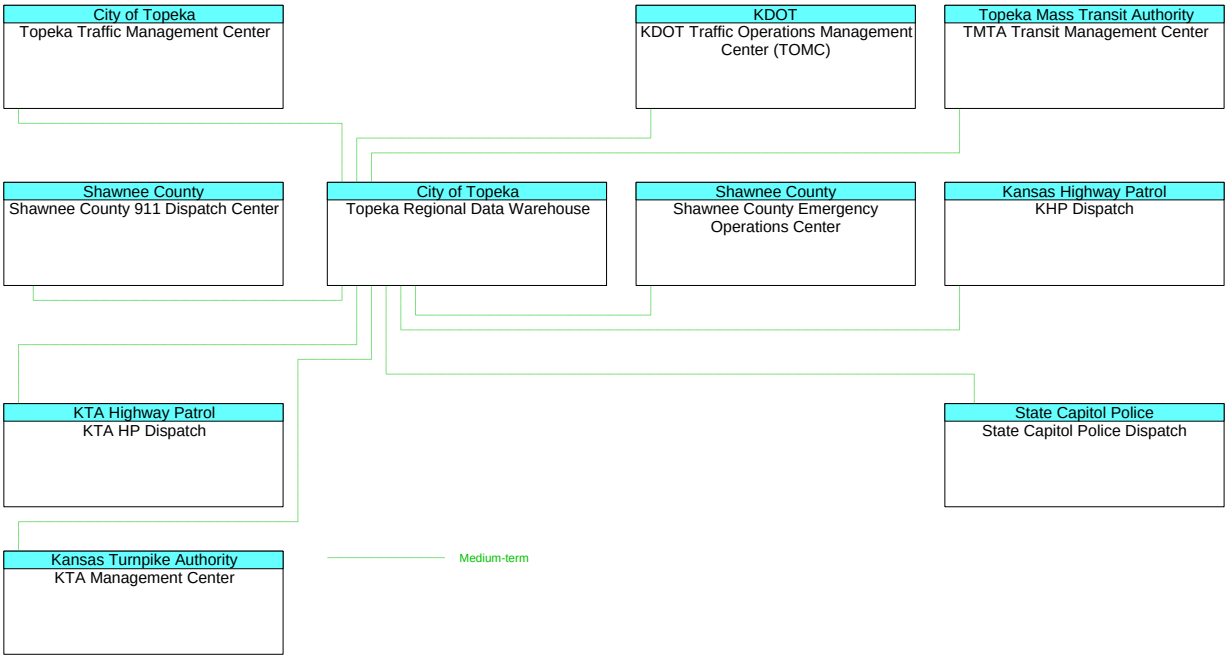


The Topeka/Shawnee County Region ITS Architecture contains all existing and planned information flows among the region's ITS elements. These can be depicted as interconnect and information flow diagrams and provide value in documenting and understanding a regional ITS architecture. Interconnect diagrams graphically depict the connectivity of systems and elements. Information flow diagrams graphically depict the type of information flowing between the connected systems. Both can be generated from the Turbo Architecture software tool, which has been used to document the regional ITS architecture.

9.1 Interconnect Diagrams

Figure 7 shows an Interconnect diagram for the Topeka/Shawnee County region. This interconnect diagram shows which systems will be connected to each other to achieve the region's ITS Data Warehouse functionality in the medium-term.

Figure 7: Interconnect Diagram for Service Package AD2: ITS Data Warehouse

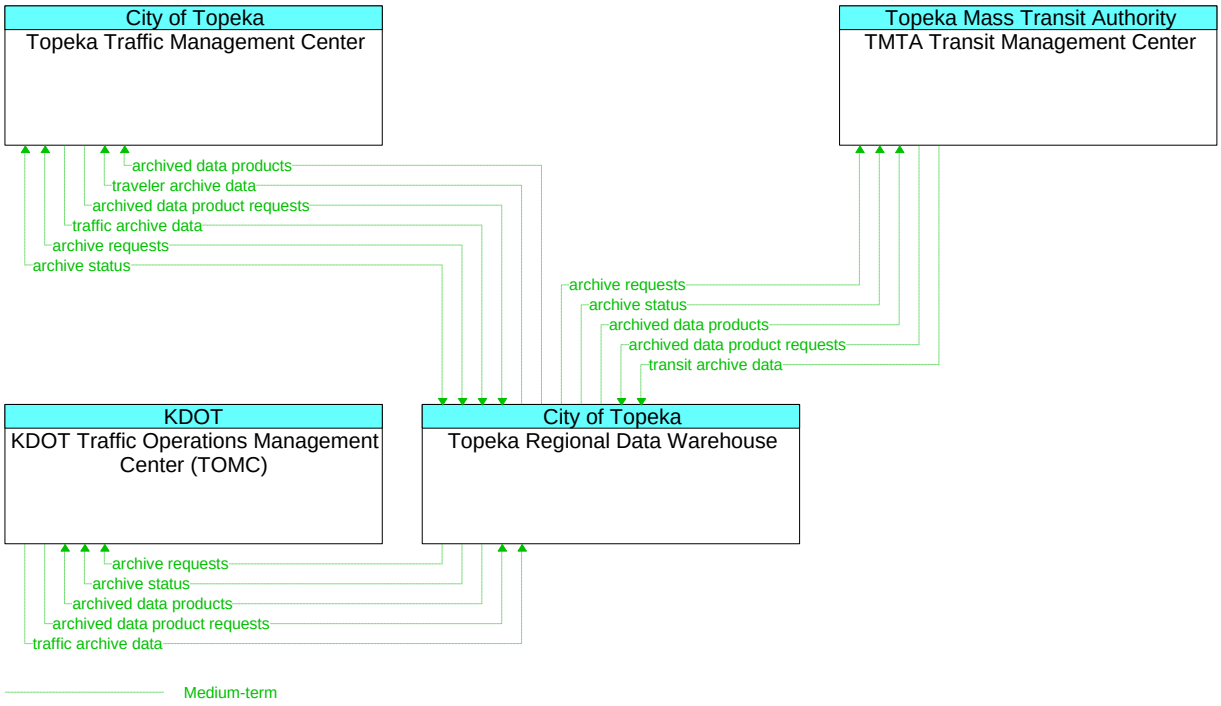


It should be noted that this diagram represents only a very small sample of the region's interconnects. Within Turbo Architecture, a user can tailor the diagrams to display as many or as few of the region's interconnects as desired. It is advisable to view interconnect diagrams at a service or project level in order to keep them clear and understandable.

9.2 Information Flows Diagram

Figure 8 shows some of the information flows that will occur among ITS systems related to Service Package AD2: ITS Data Warehouse. The information flows show the same connectivity as the interconnect diagram in **Figure 7**. However, the information flow diagram shows the specific information to be exchanged and the direction of the exchange.

Figure 8: Information Flows for Service Package AD2: ITS Data Warehouse



It should be noted that this diagram represents only a very small sample of the information flows associated with service package AD2 in the Topeka/Shawnee County region. It has been tailored to only show the management center exchanges in order to keep the diagram legible. **Appendix C** contains all identified information flows among all systems that are part of the planned ITS Data Warehouse functionality.

9.3 Viewing Interconnects and Information Flows

Because of the large quantity of interconnects and information flows in the Topeka/Shawnee County region, they are not included in this document. However, all interconnects and information flows can be viewed within Turbo Architecture. They can be tailored to show the interconnects and flows related to a specific service, a specific project, or going to and from a single system.

10. Topeka/Shawnee County Region Candidate ITS Projects

This section describes the ITS projects recommended for the Topeka/Shawnee County Region, as well as the process used to select them. These projects are in addition to the ITS that has been identified as existing in the region.

The full build-out of the region's ITS Architecture will occur through many individual ITS projects that can occur over the course of at least twelve years. The projects are defined in a logical, or ordered, sequence. The project sequencing contributes to the integrated regional transportation system depicted in the architecture.

10.1 Project Definition Process

The development of the ITS projects for the Topeka/Shawnee County Region was performed in an iterative manner with the stakeholders providing input into the sequencing and project definitions. The first step involved mapping the needs to ITS services that can address them. The next step was to work with the stakeholders to further discuss existing regional plans and programs to ensure ITS projects already planned and/or programmed are included in this plan. Then, the Topeka/Shawnee County Regional ITS Architecture developed as part of this study was reviewed in detail, and projects were created to include the needed ITS Service Packages that worked with the roles and responsibilities of the stakeholders. Where needs were not addressed by existing and planned systems, projects were identified that could meet the regional needs. In some cases, a single need resulted in a project. In others, several defined needs were addressed by a single ITS project. Following the project identification stage was the project sequencing process described in the following section.

10.2 Project Sequencing

To move forward in sequencing projects, each project has been designated as Near-Term, Medium-Term and Long-Term as defined in **Section 1.2.3**. This created groups of near-, medium- and long-term projects instead of attempting to establish specific decreasing priority ranking for all identified projects. This approach is preferable because it does not discretely identify near-term "Project A" as being a higher priority than near-term "Project B," which would potentially pit one project or agency against another when competing for funding. This method of sequencing projects also brings structure to the planning process and gives focus to eventual project selection and deployment without establishing a "pre-defined" funding priority for specific projects.

The project sequencing designations have been assigned to the respective projects based on several factors. These factors are:

1. **Need** – The need for a particular ITS function for the region is critical to the timing of a project. Information on High, Medium and Low priority needs identified in this study has been carried forward in the project sequencing process. The second factor is a logical

ordering of projects based on dependencies. For example, in order for emergency responders to be able to improve their incident response, they will need better monitoring devices in place. So, incident management projects benefit more from being planned after incident detection systems such as traffic cameras.

2. **Funding** – Projects with identified funding are given the highest priority because they can and should be implemented when that funding is available. The projects listed as near-term in the Topeka/Shawnee County region have all had funding sources identified and the lead agencies have agreed that they may take place in the next three years.
3. **Dependencies** – The success of some projects is dependent upon the technologies in other projects. For example, deploying a traveler information system in the region would have limited success if it happened before there was a regional data warehouse from which the information can be disseminated.

It is important to understand that the prioritization of projects is intended as a guide and not an inflexible prescription. Some projects should be considered longer-term efforts because near-term deployment may represent an unacceptable risk or capital cost, or because there is no near-term funding available. In some cases, major events in a region may shift a region's priorities and a project identified as medium- or long-term can be shifted to the near-term to address the new high-priority needs.

In other cases, an early opportunity to deploy a medium- or long-term project in the region, with relatively low risk, may present itself. Or perhaps, a technology or system advanced more quickly than was originally anticipated by this ITS Plan. Neither of these scenarios should preclude implementation of a medium- or long-term project before a near-term project, if it makes sense in the context of the local setting and changing priorities of local needs. This plan should provide flexibility to the region in project deployment and not necessarily restrictions.

10.3 Candidate Projects

This section contains the sequenced ITS projects for the Topeka/Shawnee County region. **Table 17** provides the list of projects by timeframe and estimated cost. Following the table are one-page summaries of each project that contain:

- A brief description.
- The stakeholders who will participate.
- The need(s) the project addresses.
- The ITS Service Packages the project utilizes.
- The estimated project cost.

Table 17: Topeka/Shawnee County Candidate ITS Projects

Projects		Estimated Cost
Near-term (*planned to be deployed in the next three years*)	City of Topeka Traffic Camera Upgrade	$60,000 to $100,000
	Regional Incident Coordination	$100,000
	KDOT Dynamic Message Signs and Cameras South Expansion	$400,000
	TMTA Automatic Vehicle Location	$344,000 to $645,000
	Total Estimated Near-Term Cost	**$904,000 to $1,245,000**
Medium-term (*planned to be deployed in three to seven years*)	City of Topeka Traffic Control Upgrade	$900,000 to $1,200,000
	KDOT Dynamic Message Signs and Cameras North Expansion	$300,000 to $400,000
	Increased Emergency Signal Preemption – Phase 1	$81,000 to $330,000
	Regional Data Warehouse	$800,000 to $2,000,000
	Real-time Bus Arrival Information	$200,000
	Total Estimated Medium-Term Cost	**$2,281,000 to $4,130,000**
Long-term (*planned to be deployed in more than seven years*)	Transit Signal Priority	$87,000 to $303,000
	Regional Traveler Information	$500,000 to $1,500,000
	Increased Emergency Signal Preemption – Phase 2	$60,000 to $240,000
	Total Estimated Long-Term Cost	**$647,000 to $2,043,000**
	Total Cost of All Projects	**$3,832,000 to $7,418,000**

As previously discussed, the inclusion of a project in this list does not mean that it has been programmed in other regional transportation plans. While near-term projects have funding identified and a commitment from the stakeholders to be deployed, medium-term and long-term projects generally do not. Instead, their inclusion here is intended to be used as input for other regional planning and funding exercises.

It should also be noted that cost estimates for near-term projects are more precise than the estimates for the medium-term and long-term projects. The reasons for this are because the near-term projects assume current technologies and are better defined because they will be implemented soon. Medium-term and long-term projects are not as clearly defined because funding has not been identified, stakeholder participation has not been committed, and technologies may change before they are designed.

Table 18: City of Topeka Traffic Camera Upgrade

<table>
<tr><th colspan="2">Project Name: City of Topeka Traffic Camera Upgrade</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will deploy new camera software to better manage the city's existing traffic cameras. It will increase the number of operable City of Topeka traffic cameras from five to 14 and significantly improve coverage near interchanges with I-70 and I-470. The project will provide access to camera images to other agencies, including KDOT, emergency responders, Shawnee County and others, as well as to the traveling public.
Existing operable cameras are near I-70 on California and Wanamaker, near I-470 at Huntoon and the Turnpike Interchange, and at the intersection of 21st and Wanamaker. Existing cameras that will be made operable will include at least four near I-70 and three near I-470.
  </td></tr>
<tr><td><u>Timeframe</u>:
Near-term (next three years)</td><td><u>Project Area:</u>
Within the Topeka Metro area, primarily at key intersections near highways.</td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works will operate and maintain the cameras, as well as have control over them.</td><td><u>Other Stakeholders:</u>
• City of Topeka Fire and Police
• KDOT
• KHP
• KTA
• KTA HP
• Shawnee County
These stakeholders will have access to camera images.</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Provide more timely dissemination of traveler information.
• Provide quality real time congestion related information.
• Improve incident detection.
• Improve system operation monitoring.
• Improve freeway traffic surveillance.
• Improve arterial roadway traffic surveillance.</td><td><u>ITS Service Packages</u>:
ATIS01: Broadcast Traveler Information
ATMS01: Network Surveillance</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>:
The project cost is related only to new control software for existing cameras. Based on information provided to the City by vendors, it is estimated the software will cost from $60,000 to $100,000, depending upon vendor and options.</td></tr>
</table>

Table 19: Regional Incident Coordination

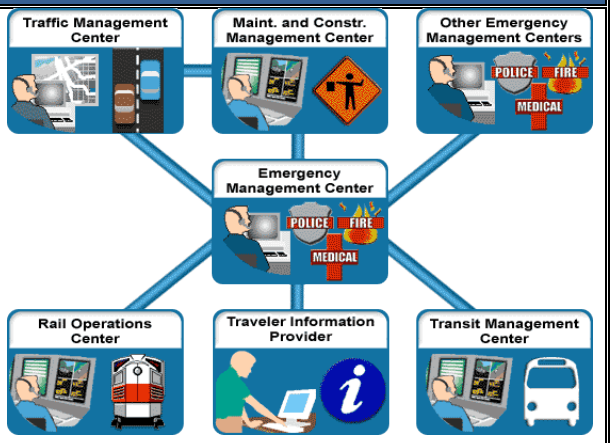
<table>
<tr><th colspan="2">Project Name: Regional Incident Coordination</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will establish a process for the region's transportation and emergency response agencies to share incident and event information. Its product will be a strategy and protocols for information and response strategy coordination to ensure the region improves incident response. The project will bring the stakeholders together to define incident information needs, define what and how information will be shared, and implement a strategy.
 
</td></tr>
<tr><td><u>Timeframe</u>:
Near-term (next three years)</td><td><u>Project Area:</u>
Covering Shawnee County.</td></tr>
<tr><td><u>Lead stakeholder:</u>
• KDOT</td><td><u>Other Stakeholders:</u>
• City of Topeka Public Works
• City of Topeka Fire and Police
• KTA
• Shawnee County
• KDEM
• TMTA</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Improve information sharing among agencies.
• Improve interagency coordination.
• Improve traffic management during incidents.
• Improve incident response coordination among agencies.
• Improve response to hazardous materials spills/incidents.</td><td><u>ITS Service Packages</u>:
ATMS06: Traffic Information Dissemination
ATMS08: Traffic Incident Management System</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>:
The estimated cost for this project according to KDOT is $100,000.</td></tr>
</table>

Table 20: KDOT Dynamic Message Signs and Cameras South Expansion

<table>
<tr><th colspan="2">Project Name: KDOT Dynamic Message Signs and Cameras South Expansion</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will deploy three additional Dynamic Message Signs and cameras on US75 and I470 and a camera on I70. The signs and camera will be under the control of KDOT through its Traffic Management Operation Center. The signs will advise travelers of traffic conditions in the Topeka/Shawnee County region and be located to allow travelers to alter their routes before encountering congestion.
 
</td></tr>
<tr><td><u>Lead stakeholder:</u>
• KDOT</td><td><u>Other Stakeholders:</u>
• N/A</td></tr>
<tr><td><u>Timeframe</u>:
Near-term (next three years)</td><td><u>Project Area:</u>
Three locations on US75 and I470, and a camera on I-70.</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Provide more timely dissemination of traveler information.
• Provide alternate route plans.
• Provide quality real time congestion related information.
• Improve method of disseminating congestion and incident data from KDOT.</td><td><u>ITS Service Packages</u>:
ATMS06: Traffic Information Dissemination</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The estimated cost for the implementation and deployment of three additional Dynamic Message Signs and a camera is estimated to be approximately $400,000.</td></tr>
</table>

Table 21: TMTA Automated Vehicle Location (AVL)

<table>
<tr><th colspan="2">Project Name: TMTA Automated Vehicle Location (AVL)</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will equip transit vehicles with vehicle location technologies, and the dispatch center with the capability to monitor vehicle location and performance in real-time. The project will allow for increased electronic communication between drivers and dispatch, and increased real-time information provided to the public. The project will also allow for increased data collection, such as passenger boarding and exiting by location and schedule performance.
 
</td></tr>
<tr><td><u>Timeframe</u>:
Near-term (next three years)</td><td><u>Project Area:</u>
Within the Topeka Metro Area</td></tr>
<tr><td><u>Lead stakeholder:</u>
• TMTA</td><td><u>Other Stakeholders:</u>
• N/A</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Enable transit agency to locate bus fleet.
• Enable dissemination/display of real-time bus arrival times.</td><td><u>ITS Service Packages</u>:
APTS01: Transit Vehicle Tracking</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The cost to implement vehicle location technologies into each individual transit vehicle is estimated to be in-between $8,000 to $15,000. The total project cost (vehicle location technologies for 30 fixed-route vehicles and 13 paratransit vehicles) is estimated to be from $344,000 to $645,000.</td></tr>
</table>

Table 22: Topeka Traffic Control Upgrade

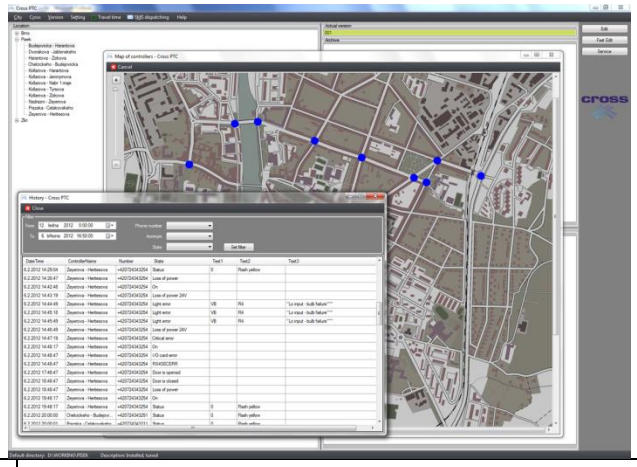
<table>
<tr><th colspan="2">Project Name: City of Topeka Traffic Control Upgrade</th></tr>
<tr><td colspan="2"><u>Description</u>:
In this project, the city's existing Pyramids traffic control system will be upgraded to a newer system that will allow for increased control and information exchange with existing traffic signals. The upgraded system will allow for increased signal coordination, adaptive control and traffic monitoring. Upgraded software may allow for integrated management of signals, cameras and other roadside devices.
  </td></tr>
<tr><td><u>Timeframe</u>:
Medium-term (three to seven years from present time)</td><td><u>Project Area:</u>
Within the Topeka Metro Area</td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works</td><td><u>Other Stakeholders:</u>
• N/A</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Improve signal timing and control.
• Improve traffic flow at intersections.
• Implement or improve signal coordination.
• Improve system operation monitoring.</td><td><u>ITS Service Packages</u>:
ATMS03: Traffic Signal Control</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: This project will require a comprehensive systems engineering approach. The planning and design may cost up to $120,000. Depending on functionality and hardware, the total upgrade may cost from $900,000 to $1,200,000.</td></tr>
</table>

Table 23: KDOT Dynamic Message Signs and Cameras North Expansion

<table>
<tr><th colspan="2">Project Name: KDOT Dynamic Message Signs and Cameras North Expansion</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will deploy two additional Dynamic Message Signs on US24 and K4. The signs and cameras will be under the control of KDOT through its Traffic Management Operation Center. The signs will advise travelers of traffic conditions in the Topeka/Shawnee County region and be located to allow travelers to alter their routes before encountering congestion.
 
</td></tr>
<tr><td><u>Lead stakeholder:</u>
• KDOT</td><td><u>Other Stakeholders:</u>
• N/A</td></tr>
<tr><td><u>Timeframe</u>:
Medium-term (three to seven years from present time)</td><td><u>Project Area:</u>
Two sign locations on US24 and K4.</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Provide more timely dissemination of traveler information.
• Provide alternate route plans.
• Provide quality real time congestion related information.
• Improve method of disseminating congestion and incident data from KDOT.</td><td><u>ITS Service Packages</u>:
ATMS06: Traffic Information Dissemination</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The estimated cost per for the implementation and deployment of two additional Dynamic Message Signs and cameras is estimated to be from $300,000 to $400,000.</td></tr>
</table>

Table 24: Increased Emergency Signal Preemption – Phase 1

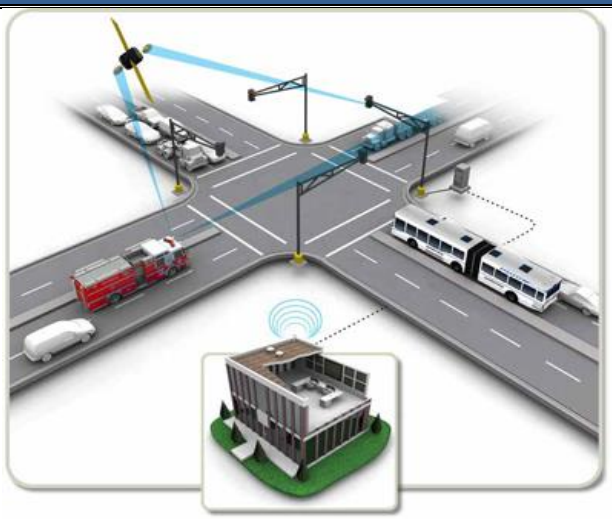
Project Name: Increased Emergency Signal Preemption – Phase 1	
Description: This project will enable signal preemption at key intersections in the City of Topeka. Corridors targeted in this phase are along the streets of Fairlawn and Gage. Fire vehicles will be able to alert signals of their approach and trigger a signal change to give the emergency vehicle a green light. The project entails equipping vehicles with the ability to communicate with traffic signals, and for the signals to be able to receive and respond to communications. The project will improve incident response for emergency vehicles.	
Timeframe: Medium-term (three to seven years from present time)	*Project Area:* Within the Topeka Metro Area, primarily at key intersections within the city
Lead stakeholder: • **City of Topeka Public Works**	*Other Stakeholders:* • City of Topeka Fire
Need(s) Addressed: • Reduce response delays at signals. • Improve incident response times.	*ITS Service Packages:* EM02: Emergency Routing
Estimated Cost: The cost to implement signal preemption technologies is estimated to be in-between $900 to $2,100 per emergency vehicle and $4,000 to $8,000 per intersection (The cost per intersection includes the estimated $2,000 to $5,000 for a Signal Phase Selector). The estimated cost for the total project (For implementation of signal preemption technologies to 15 to 30 signals and 30 to 43 emergency vehicles) then is estimated to be from **$81,000 to $330,000**.	

Table 25: Regional Data Warehouse

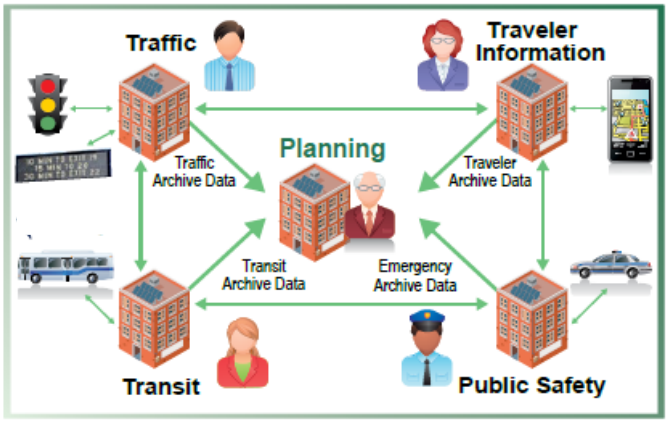
<table>
<tr><th colspan="2">Project Name: Regional Data Warehouse</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will develop a centralized regional data warehouse that collects and centralizes traffic, maintenance, transit, emergency and incident information, including video images from the region's transportation and emergency response stakeholders. Authorized agencies can then use the information and images in real-time for managing traffic and incidents, and for maintenance planning and response. Key functions of the warehouse will be to collect, format and organize information in order to make it usable and to ensure that all regional stakeholders are using the same information for their operations. The centralized data will also have the potential for sharing with the general public.
 
</td></tr>
<tr><td><u>Timeframe</u>:
Medium-term (three to seven years from present time)</td><td><u>Project Area:</u>
Within the boundaries of Shawnee County, with an emphasis on the Topeka Metro Area</td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works</td><td><u>Other Stakeholders:</u>
• Shawnee County
• KDOT
• KTA
• TMTA
• State and Local Emergency Management</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Improve information sharing among agencies.
• Improve interagency coordination.
• Coordinate traffic control plans between jurisdictions.
• Improve incident response coordination among agencies.
• Improve coordination on construction notification and information distribution.</td><td><u>ITS Service Packages</u>:
AD2: ITS Data Warehouse
APTS07: Multi-Modal Coordination
ATIS06: Transportation Operations Data Sharing
ATMS07: Regional Traffic Management
MC10: Maintenance and Construction Activity Coordination</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The regional data warehouse cost will vary based upon the level of participation of the stakeholders and the level of data integration performed at the warehouse. The cost range is from $800,000 to $2,000,000.</td></tr>
</table>

Table 26: Real-time Bus Arrival Information

Project Name: Real-time Bus Arrival Information	
Description: This project will provide real-time bus arrival information to transit riders at bus stops. It will use the vehicle location information collected by an AVL system and calculate the actual time buses will arrive at bus stops. Digital signs at bus stops and smart phone applications may be used to disseminate accurate bus arrival time information for the stop.	
Timeframe: Medium-term (three to seven years from present time)	*Project Area:* Within the Topeka Metro Area, on TMTA Transit Routes at select bus stops
Lead stakeholder: • **TMTA**	*Other Stakeholders:* • N/A
Need(s) Addressed: • Enable dissemination/display of real-time bus arrival times. • Provide more timely dissemination of traveler information. • Expand traveler information delivery methods.	*ITS Service Packages:* APTS08: Transit Traveler Information
Estimated Cost: The cost to implement digital signs with the ability to display bus arrival information is estimated to be approximately $10,000 per bus stop sign. The estimated cost for the total project (Digital Signs to be implemented at 20 bus stops) is estimated to approximately **$200,000**.	

Table 27: Transit Signal Priority

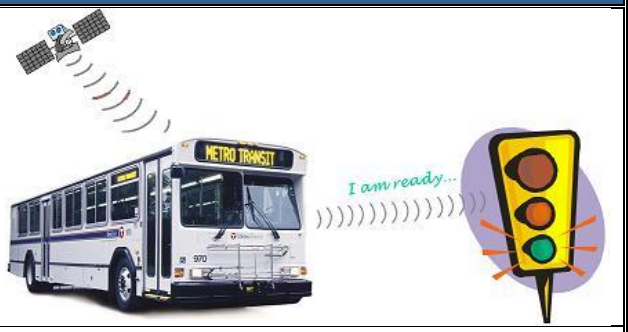
<table>
<tr><th colspan="2">Project Name: Transit Signal Priority</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will equip buses with the ability to request a green light at signals as they approach. The request can be based on such considerations as whether a bus is significantly behind schedule and the passenger load. The traffic control system would determine to grant the green light based on such considerations as corridor coordination, impact on other traffic and impact on signal cycle.
 
</td></tr>
<tr><td><u>Timeframe</u>:
Long-term (Development possible in more than seven years from the present)</td><td><u>Project Area:</u>
Within the Topeka Metro Area</td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works</td><td><u>Other Stakeholders:</u>
• TMTA</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Reduce transit vehicle delays at signals.</td><td><u>ITS Service Packages</u>:
APTS09: Transit Signal Priority</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The cost to equip vehicles with transit signal request technologies is estimated to be in the range of $900 to $2100 per transit vehicle and $4,000 to $8,000 per intersection. The total estimated cost for implementation of transit signal priority request technologies to 15 signals and 30 transit vehicles is from $87,000 to $303,000.</td></tr>
</table>

Table 28: Regional Traveler Information

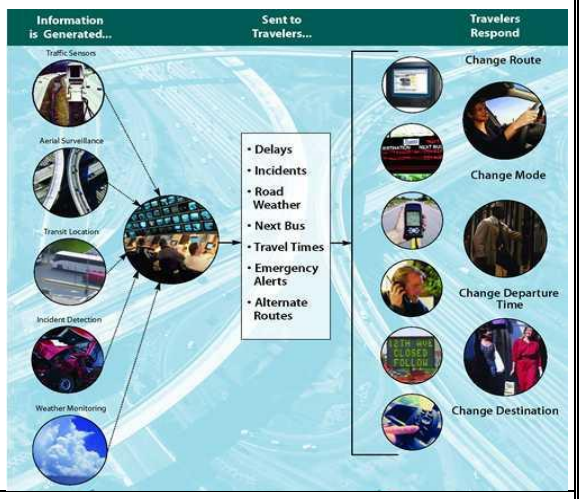
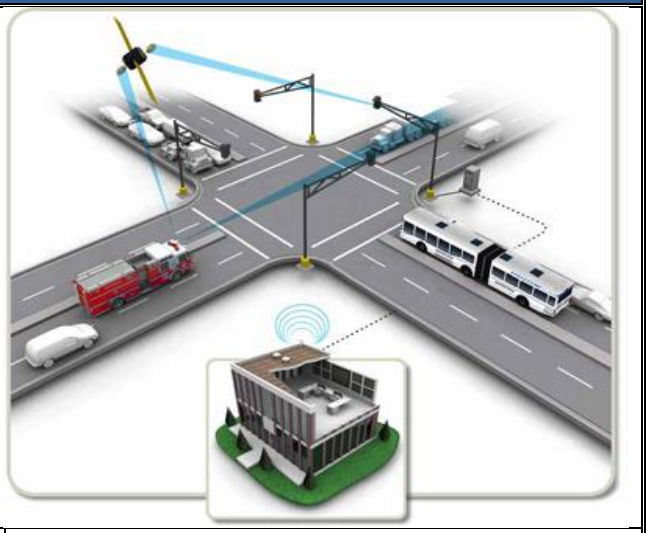
<table>
<tr><th colspan="2">Project Name: Regional Traveler Information</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will build upon the medium-term Regional Data Warehouse project to develop a system for sharing consistent regional traffic and traveler information with the public. The project will pull information from the regional data warehouse and share it with the public in a consistent manner through multiple mediums, potentially including phone, web and DMS. The project may also develop a data feed of regional traveler information that can be shared with third parties for dissemination to the public.
 
</td></tr>
<tr><td><u>Timeframe</u>:
Long-term (Development possible in more than seven years from the present)</td><td><u>Project Area:</u>
Within the boundaries of Shawnee County</td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works</td><td><u>Other Stakeholders:</u>
• Shawnee County
• KDOT
• KTA
• TMTA
• State and Local Emergency Management</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Provide more timely dissemination of traveler information.
• Provide quality real time congestion related information.
• Disseminate better information regarding limited alternative routes.
• Provide better road construction information and notification.
• Expand traveler information delivery methods.</td><td><u>ITS Service Packages</u>:
ATIS01: Broadcast Traveler Information</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The regional traveler information system cost will vary based upon the level of information delivery and the mediums through which it is delivered. The cost estimate is from $500,000 to $1,500,000.</td></tr>
</table>

Table 29: Increased Emergency Signal Preemption – Phase 2

<table>
<tr><th colspan="2">Project Name: Increased Emergency Signal Preemption – Phase 2</th></tr>
<tr><td colspan="2"><u>Description</u>:
This project will expand the deployment of the signal preemption technology described in the medium-term Phase 1 project. This expansion will increase emergency signal preemption to other corridors for fire vehicles. Those corridors may include portions of Topeka Boulevard and 10th Street.
  </td></tr>
<tr><td><u>Lead stakeholder:</u>
• City of Topeka Public Works</td><td><u>Other Stakeholders:</u>
• City of Topeka Fire</td></tr>
<tr><td><u>Timeframe</u>:
Long-term (Development possible in more than seven years from the present)</td><td><u>Project Area:</u>
Within the Topeka Metro Area, primarily at select intersections within the city</td></tr>
<tr><td><u>Need(s) Addressed</u>:
• Reduce response delays at signals.
• Improve incident response times.
• Provide central information clearinghouse.</td><td><u>ITS Service Packages</u>:
EM02: Emergency Routing</td></tr>
<tr><td colspan="2"><u>Estimated Cost</u>: The cost to expand signal preemption technologies is estimated to be from $4,000 to $8,000 per intersection (including the estimated $2,000 to $5,000 for a Signal Phase Selector). There is no additional cost for equipping vehicles because they will be equipped as part of Phase 1. Equipping 15 to 30 signals in this phase is estimated to cost from $60,000 to $240,000.</td></tr>
</table>

10.4 Communications

A robust communications network must exist in order for ITS deployments to succeed. In addition to the twelve projects, the Topeka/Shawnee Region should explore means to improve its ability to exchange information among centers, devices and the public.

The region should explore deploying a wireless network that covers the region and provides flexibility on the placement and movement of ITS devices. The network could serve multiple stakeholders and provide communications to devices such as signals and cameras in locations where wired communications are not feasible. It may also provide the capability for communications to mobile devices, such as on-board transit, maintenance and construction ITS.

10.5 Project Funding

ITS projects may be eligible for funding from a variety of sources, including some specifically for the deployment of advanced technologies. ITS projects should also compete for existing transportation funds with other transportation projects, such as road-widening and expansion. **Table 30** lists the Topeka/Shawnee County region ITS projects and summarizes the funding resources they may qualify for. For each project, a black dot (●) indicates a funding source that the project may qualify for, with the funding covering at least a portion of its cost. This does not mean that each project will be funded by these sources, just that they should be considered.

Table 30: Potential Project Funding Sources

Project Name	Locally Administered			State Administered		Federally Administered		
	Local Transportation Funds	MTPO Funds	Local Emergency Funds	KDOT	ITS Earmark Funds	Homeland Security	Federal Highway Funds	Federal Transit Funds
City of Topeka Traffic Camera Upgrade	●	●	●	●				
Regional Incident Coordination				●			●	
KDOT Dynamic Message Signs and Cameras North Expansion				●			●	
TMTA Automatic Vehicle Location	●	●						●
City of Topeka Traffic Control Upgrade	●	●						
KDOT Dynamic Message Signs and Cameras South Expansion				●			●	
Increased Emergency Signal Preemption – Phase 1	●	●	●					
Regional Data Warehouse	●	●	●	●	●		●	
Real-time Bus Arrival Information	●	●						●
Transit Signal Priority	●	●						●
Regional Traveler Information	●	●		●	●		●	
Increased Emergency Signal Preemption – Phase 2	●	●	●					

Local Transportation Funds – These funds are administered for transportation projects, including maintenance and operations, at the local level. The funds may come from a range of sources, including local tax revenue, but are administered at the discretion of local agencies such as the City of Topeka and Shawnee County.

MTPO Funds – The MTPO conducts and manages long-range plans and TIPs. Federal funds are appropriated annually, by formula, to Urbanized Areas such as the Topeka/Shawnee County region, including Surface Transportation Funds and Public Transit Funds. The MTPO manages an approved project development process for the metropolitan area and calls for the submittal of proposed projects annually. The project concept reports are reviewed and prioritized by the MTPO and incorporated by the State Transportation Commission as part of their STIP.

Local Emergency Funds – These funds are administered at the local level for emergency management projects, including ongoing maintenance and operations. Similar to local transportation funds, they may come from a range of sources, but are administered at the discretion of local agencies.

KDOT Funds – This is a funding plan of highway and transit projects for the state. The plan is published every year and includes transportation projects on the state, city, and county highway systems, as well as projects in the national parks, national forests, and Indian reservations. These projects use various federal and state funding programs.

ITS Earmark Funds – Earmarks are federal funds that are administered by KDOT and applied for by KDOT. Local agencies work with KDOT to apply for earmark funds. Earmark funds may be subject to limitations, such as the purpose and project defined in the federal application, and matching local or state funds. Near-term projects may not be eligible for earmarks because they are planned for deployment sooner than an earmark can be applied for and designated.

Homeland Security – Homeland Security funds are administered by the Federal Department of Homeland Security. To date, they have infrequently been disbursed to regional transportation projects. However, as security and transportation management become more integrated in Traffic Control Centers and Emergency Operations Centers, it is possible that more funds will be used to support coordinated emergency management.

Federal Highway Funds – Federal Highway Funds are comprised of several potential sources that are administered at the national level. They may include matching funds, grants, and other sources, such as operational tests or model deployments. In order for these funds to be used for ITS, an Architecture must be in place. This project addresses the federal Architecture requirement.

Federal Transit Funds – Transit funds administered by the Federal Transit Administration (FTA) can come in the form of grants, matching funds, disbursement of other transit funds, or special monies for specific projects. In recent history, the FTA has made rural and small urban transit systems a priority, and it has allocated significant funds for transit technologies through grant applications and

model deployments. Similar to FHWA funds, an ITS Architecture must be in place before FTA funds can be spent on transit ITS projects.

11. Agreements

Agreements among the stakeholder agencies and organizations in the Topeka/Shawnee County Region may be required to realize the integration proposed in the ITS Architecture. Each connection between systems owned by different stakeholders represents cooperation between stakeholders and a potential need for an agreement.

Typically, existing stakeholder agreements that support sharing information, funding, or specific ITS projects are reviewed and assessed to determine if they can be extended and used to support the cooperative implementation and operation of ITS in the region. When reviewing the agreements described in this section, stakeholders should consider whether they are already covered by existing agreements.

The list of the required Topeka/Shawnee County Region agreements was developed based on the stakeholder roles and responsibilities, awareness of the types of existing or planned ITS for implementation by the region, and the information that needs to be exchanged in order to operate those systems.

11.1 Agreement Types

There is a wide range of types of agreements that may be necessary to develop and implement an ITS project. Many local agencies have working relationships and existing agreements. The nature of these relationships and existing "local practices" may influence the types of agreements various agencies enter into. For example, two agencies that are co-located or frequently work together may have a working relationship that simplifies the need for detailed agreements. Other stakeholders, brought together for the first time by an ITS project, may need a more clearly defined agreement that helps each understand the responsibilities and capabilities of the other.

Table 31 contains descriptions of common types of agreements relevant to the region's ITS projects as identified in the *FHWA Regional ITS Architecture Guidance Document*.

Table 31: Common Agreement Types

Type of Agreement	Description
Handshake Agreement	• Early agreement between one or more partners • Not recommended for long term operations
Memorandum of Understanding (MOU)	• Initial agreement used to provide minimal detail and usually demonstrates a general consensus • Used to expand a more detailed agreement like an Interagency Agreement, which may be broad in scope but contains all of the standard contract clauses required by a specific agency • May serve as a means to modify a much broader agreement, allowing the master agreement to cover various ITS projects throughout the region and the MOUs to specify the scope and differences between the projects
Interagency Agreement (IA)	• Between local public agencies (e.g. transit authorities, cities, counties, etc.) for operations, services, or funding • Documents responsibility, functions, and liability at a minimum
Operational Agreement (OA)	• Between any agency involved in funding, operating, maintaining or using the right-of-way of another public or private agency • Identifies respective responsibilities for all activities associated with shared systems being operated and/or maintained
Funding Agreement (FA)	• Documents the funding arrangements for ITS projects (and other projects) • Includes at a minimum standard funding clauses, detailed scope, services to be performed, detailed project budgets, etc.
Master Agreements (MA)	• Standard contract and/or legal verbiage for a specific agency and serves as a master agreement by which all business is done. It can be found in the legal department of many public agencies • Allows states, cities, transit agencies, and other public agencies that do business with the same agencies over and over (e.g., cities and counties) to have one Master Agreement that uses smaller agreements (e.g., MOUs, Scope-of-Work and Budget Modifications, Funding Agreements, Project Agreements, etc.) to modify or expand the boundaries of the larger agreement to include more specific language

11.2 Agreement Focus

Rather than focus on specific technologies in an agreement, the focus usually is on the scope-of-service and specific agency responsibilities for various components of the service. The agreement should also describe the high-level information that each agency needs to exchange in order to meet the goals and expectations of the project. The agreement should not focus on how the delivery of that information will occur.

A simple handshake agreement may be enough for some Topeka/Shawnee County region activities. But, once interconnections and integration of systems occur, agencies may want to have a more formal agreement in place to document items such as how operations will occur and who will maintain the system. A documented agreement will aid agencies in planning their operational costs, understanding their respective roles and responsibilities, and in building trust for future projects. Formal agreements are necessary where funding or financial arrangements are defined, or where participation in large regionally-significant projects is required.

11.3 List of Agreements

A few projects planned for the Topeka/Shawnee County region do not require agreements because they involve only one stakeholder. The projects that are not foreseen as requiring agreements among stakeholders are:

- KDOT Dynamic Message Signs and Cameras South and North Expansions
- TMTA Automatic Vehicle Location
- Topeka Traffic Control Upgrade
- TMTA Real-Time Bus Arrival Information

The projects listed in **Table 32** involve two or more stakeholders, where agreements will be needed among them. For these projects, it is recommended that a Memorandum of Understanding (MOU) be the first step in project planning. The purpose of an initial MOU is to confirm that all stakeholders are in support of the project and in agreement on what the objectives are. Stakeholders becoming a party to the MOU will then pursue further agreements, as needed, for development, deployment, operations, and funding.

Table 32: Topeka/Shawnee County Regional ITS Architecture Agreements

Topeka/Shawnee County ITS Project	Stakeholders	Agreement Type(s)	Agreement Status	Agreement Objectives
Regional Incident Coordination	• **KDOT (lead)** • City of Topeka Public Works • City of Topeka Fire and Police • KTA • Shawnee County • KDEM • TMTA	Memorandum of Understanding Operational Agreement	Some inter-local agreements for sharing resources between agencies already exist. Updates or new agreements may be needed.	**MOU**: The MOU should be used in describing how emergency responders and transportation management agencies will coordinate to share resources and information. A key element of this MOU should be defining at a high-level the types of information that will be shared, and how they will be used. In addition, if emergency responders will have some say in how traffic is managed during emergencies, the MOU should describe the level of input and how instructions should be exchanged. **OA:** An incrementally developed OA should address how agencies will actually work together for information sharing, operations, etc. The primary purposes of the agreement are to describe agency expectations and roles for information and resource sharing across jurisdictional boundaries.
Traffic Camera Upgrade	• **City of Topeka Public Works (lead)** • City of Topeka Fire and Police • KDOT • KHP • KTA • KTA HP • Shawnee County	MOU Funding Agreement	Existing	**MOU**: Because the City of Topeka will be solely responsible for the deployment of upgraded software and the operation and maintenance of the cameras, only a simple MOU is needed among agencies to agree upon the sharing of images from the cameras. **FA**: The FA defines the financial terms between the City of Topeka and KDOT for funding to upgrade the camera software.

Topeka/Shawnee County ITS Project	Stakeholders	Agreement Type(s)	Agreement Status	Agreement Objectives
Increased Emergency Signal Preemption – Phase 1 **Increased Emergency Signal Preemption – Phase 2**	• **City of Topeka Public Works (lead)** • City of Topeka Fire	Memorandum of Understanding Operations Agreement Funding Agreement	Needed	**MOU**: The MOU should address expectations and roles regarding how signal preemption will be used by the Fire Department and the Public Works' responsibility in providing preemption. The MOU should define preliminary goals and system functional requirements. This project may need to be coordinated with the City of Topeka Traffic Control Upgrade. **OA**: The OA is needed to formally document how signal preemption will work to improve incident response, to exclude unauthorized users, and to report system usage and impact on timing plans. **FA**: An FA may be needed depending on the source of funds and how costs are distributed between controller hardware/software upgrades, on-vehicle equipment and traffic management center improvements.

Topeka/Shawnee County ITS Project	Stakeholders	Agreement Type(s)	Agreement Status	Agreement Objectives
Regional Data Warehouse	• **City of Topeka Public Works (lead)** • Shawnee County • KDOT • KTA • TMTA • State and Local Emergency Management	Memorandum of Understanding Operations Agreement Funding Agreement	Needed	**MOU:** This MOU will develop high-level expectations for what types of data will be exchanged through the warehouse, how they will be used, and the responsibilities of each agency in providing accurate and usable information. The MOU should also describe at a high-level how data will be archived and who will be granted access to it, and for what purpose. **OA**: The OA is needed to formally document how the data warehouse will operate and the formats and protocols used for data exchange. The OA will define user roles and the level of access by stakeholders, as well as how the system will be maintained. The OA can also define any warehouse functionality for data reporting and display. **FA**: An FA will be needed to define development, deployment and operation funding sources. It will describe the expected funding from each stakeholder for maintaining hardware, software and communications.
Regional Traveler Information	• **City of Topeka Public Works (lead)** • Shawnee County • KDOT • KTA • TMTA • State and Local Emergency Management	Memorandum of Understanding Operations Agreement	Needed	**MOU**: This MOU should develop high-level expectations for disseminating information from the regional stakeholders to the public. It should expand on the understanding that much of the disseminated information will come from the Regional Data Warehouse. **OA**: The OA should formally document the types of information the participating stakeholders agree to share through a regional traveler information system. The OA should also extend any OA from the Regional Data Warehouse to ensure that traveler information, including incident and emergency information, is provided for dissemination.

Topeka/Shawnee County ITS Project	Stakeholders	Agreement Type(s)	Agreement Status	Agreement Objectives
Transit Signal Priority	**TMTA (lead)** City of Topeka Public Works	Memorandum of Understanding Operations Agreement Funding Agreement	Needed	**MOU**: The MOU should address expectations and roles regarding priority signal control for the TMTA. The MOU should define preliminary goals and system functional requirements. This project may need to be coordinated with the City of Topeka Traffic Control Upgrade. **OA**: The OA is needed to formally document how the signal priority system will work to keep buses on schedule, to exclude unauthorized users, and to report system usage and impact on timing plans. **FA**: An FA may be needed depending on the source of funds and how costs are distributed between controller hardware/software upgrades, on-bus equipment, and TMC or transit operation center improvements.

12. ITS Standards

This section provides a summary of ITS standards. It discusses the following topics:

- A discussion of national ITS standards and how they are developed.
- A description of when and how ITS standards may be applied in Topeka/Shawnee County Regional ITS Architecture.
- The benefits of using ITS standards in ITS procurement and deployment.
- A list of all relevant standards applicable to the ITS identified in the Topeka/Shawnee County Region.

12.1 National ITS Standards Development

ITS standards are fundamental to the establishment of an open ITS environment, a goal originally envisioned by the architecture developers. It is an important component of the information flows in a Regional ITS Architecture. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Establishing regional and national standards for exchanging information among ITS deployments is important not only from an interoperability point of view. It also reduces risk and cost since a region can select among multiple vendors for products and applications. Standards help create competition, better products, and lower prices. There are currently eight Standards Development Organizations (SDO) responsible for defining ITS standards. **Table 33** identifies the SDOs and the types of interfaces for which they define standards.

Table 33: ITS Standard Development Organizations

Standard Development Organization	Interfaces Addressed
American Association of State Highway and Transportation Officials	• Traffic Management Center to Other Centers • Traffic Management Center to Field Devices
American National Standards Institute	• Commercial Vehicle Operations related system interfaces
American Public Transportation Association	• Transit Center to Other Centers • Transit Center to Transit Vehicles
American Society for Testing and Materials	• Archived Data Management Center Interfaces • Vehicle to Vehicle • Field to Vehicle
Institute of Electrical and Electronic Engineers	• Vehicle to Vehicle • Field to Vehicle
Institute of Transportation Engineers	• Traffic Management Center to Other Centers • Traffic Management Center to Field Devices
National Electronic Manufacturers Association	• Traffic Management Center to Other Centers • Traffic Management Center to Field Devices

Standard Development Organization	Interfaces Addressed
Society of Automotive Engineers	• Traveler Information Interfaces • Location Referencing

Not all of the standards defined by the SDOs will be used in the Topeka/Shawnee County region. Even within the region, not all agencies will use standards. In order to conform to federal requirements, however, the Regional ITS Architecture is required to reference those standards that are applicable to the region's ITS elements and interconnects.

The standards that are most widely applicable to ITS deployments are the National Transportation Communications for ITS Protocol (NTCIP) family that define interfaces for Traffic Management Centers to Other Centers and to Field Devices. NTCIP is a group of communication protocols and data definition standards that have been designed for use in all types of systems dealing with the transportation environment, including those for freeways, traffic signals, emergency management, traveler information, and data archiving. It has been adopted by the FHWA to meet the needs and requirements for ITS communication and to insure that inter-network connectivity is done through industry standard interfaces.

NTCIP standards provide both the rules for communicating and the vocabulary necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. NTCIP is the first set of standards for the transportation industry that allows traffic control systems to be built using a mix and match approach with equipment from different manufacturers. The proper use of other standards besides those of NTCIP is important for several reasons:

- standards influence design requirements such as interchangeability, interoperability and ease of integration.
- standards offer increased flexibility and eliminates barriers to interagency coordination by reducing the need for reliance on specific equipment vendors and customized one-of-a-kind products.
- standards also allow the future expansion of the system to benefit from true competitive bidding, as well as allow other types of ITS elements to be added.

12.2 ITS Standards in Procurement Specifications

The use of ITS standards in procurement specifications often depends on how much risk can be afforded. Because the ITS standards are always evolving, there is the risk of a standard changing during a regional ITS project's development. Also, early deployers will often identify improvements to the standard that are not addressed by the current version of the standard.

However, many standards are now mature and stable. Also, there is a FHWA Testing Program underway to speed up testing of ITS Standards. The use of standards in procurement should be decided on a project-by-project basis.

Making the best choices for standards depends on multiple factors, including throughput (how much data must be transmitted or received on the interface), network topology (how the ITS systems are connected to each other), and infrastructure (fiber optic lines, leased land lines, etc.), among others. The exact process for making this decision regionally will be a function of the recommended Maintenance Team.

In determining when and how to incorporate ITS standards for a given interface, it's critical to understand the relative maturity of the standards. Currently, many of the exact standards for specific projects have not been formally published, but the process for making those decisions are developing. For each potential standard that may be applicable, the Architecture Maintenance Team should consider:

- Has the ITS standard been approved or published by the SDOs?
- Has the ITS standard been adopted by multiple vendors?
- Has the ITS standard been tested, whether informally by vendors or through the formal ITS Standards Testing Program funded by FHWA?
- Is there an amendment to the ITS standard currently in the works, and if so how much of the standard will change as a result?

Although the Topeka/Shawnee County region should create a plan to migrate toward ITS standards conformance, stakeholders should reach consensus on an interim approach if the ITS standards applicable to the region's interfaces are not yet mature.

12.3 Standards Availability

Standards are available directly from the SDOs, as described earlier in this Report. Standards documentation is available for purchase as individual copies and as sets, where a set is a series of standards. However, the purchase price does not allow copying of the standard, use by more than one entity concurrently, and it does not include updates. Additionally, region-wide licensing is not available.

To ensure that the applicable standards are used in The Topeka/Shawnee County Region, it is recommended the Maintenance Team be tasked with being the point of reference for all questions dealing with standards.

12.4 ITS Standards for Topeka-Shawnee County Region

The ITS standards for the region are based on the information flows, which were developed as described in **Section 9**. **Appendix D** presents the relevant standards for the Topeka/Shawnee County region based on the most currently available definitions.

In reviewing and applying these standards, the user should be aware of the following:

- The standards only need to be applied where there will be an exchange of data or monitoring/control functions between systems.
- The specific standards listed are not static. As the standards are implemented, changes are being made. In addition, the standards are being changed as technology evolves. Typically, these changes result in standards that are backward compatible, although new functionality may not be supported with the older versions of the relevant standard.

The Maintenance Team must be committed to understanding and utilizing standards. This will require that one or more members of the Team be aware of the evolving nature of standards and keep abreast of updates and changes to them. Without a current knowledge of standards and their applicability, the Maintenance Team cannot have a strong commitment to them.

13. Architecture Use

The success of the Topeka/Shawnee County Regional ITS Architecture is dependent upon effective use of the architecture throughout its lifespan. This section discusses how to introduce and use the architecture in the planning and deployment processes of the region's agencies. It should become a tool for stakeholders to use in planning their projects to support regional goals.

There are two key times that a regional ITS architecture can be used. The first is to assist in the traditional transportation planning process that occurs within the City of Topeka/Shawnee County region and any other local and regional agencies to define projects that include ITS elements. The other critical time is in the design and deployment of regional ITS projects. The architecture can be used to determine the sequence of ITS deployment.

In order to maximize the value of the region's architecture, this section expands on specific planning processes that already exist. It also provides a strategy for how the Topeka/Shawnee County Regional ITS Architecture will be maintained to support those processes in the future.

13.1 Architecture Use in Planning

The goal of the regional transportation planning process is to make informed decisions on the investment of public funds for regional transportation systems and services. The regional outputs of the transportation planning process are, basically, two regional plans:

- The Region's Long-Range Transportation Plan has a horizon of 30 years, and was most recently adopted by the MTPO in 2012.
- A Regional Transportation Improvement Program (RTIP) or local Transportation Improvement Program (TIP) is a short-term funding program that gets updated annually. Projects must be included in the LRTP and the TIP in order to receive federal funding.

The Regional ITS Architecture should be a continuously evolving document that serves as the authoritative architecture source that summarizes existing and planned ITS projects in the region. It should be maintained and updated alongside the LRTP and RTIP in order to stay consistent with them. It should also be readily available to all agencies participating in regional planning so they may reference it while considering how to address regional transportation needs, and how to incorporate ITS into other transportation planning projects. If all regional planners use the same document, deployments can occur in an economical and efficient manner according to funding, regional capabilities, technology, and other regional priorities.

13.2 Architecture Use in Design

A regional ITS architecture defines high-level requirements in ITS design for specific project development. Because consensus is a critical part of Regional ITS Architecture development, the regional architecture serves as a source for defining regional projects by simply "pulling projects out" of the regional architecture.

In the design phase of project development, the Regional ITS Architecture can be used as a valuable resource to cut and paste various outputs that contain operational concepts, standards, interconnections and functions. This process builds the architecture that depicts a visual representation of the building block approach to the Regional ITS Architecture implementation process.

This method of defining ITS projects for future deployment is consistent with the National ITS Architecture. It also lends credibility to new projects, it limits duplicate efforts by multiple stakeholders, it identifies an initial set of stakeholders, and it has an agreed upon project description.

The architecture also contains a list of the agreements needed for an ITS project to succeed. Those agreements can formalize the relationship among stakeholders. It can also be used by the stakeholders to agree to the roles and responsibilities of each, as defined in the architecture.

13.3 Architecture Use In Procurement

The Topeka/Shawnee County Regional ITS Architecture defines subsystems and functionality that make up the region's existing and planned intelligent transportation system. It also defines the information flows that connect subsystems into integrated systems. Equipment Packages break the subsystems into components that can be procured either independently or in groups.

Since equipment packages are the most detailed elements of the physical architecture and are tied to specific service packages, they provide a common means to understand ITS. Equipment Package descriptions were used to derive the Topeka/Shawnee County Regional ITS Architecture functional requirements. Each statement was functionally associated and contained information on what certain systems "shall perform" or "shall do." The functional requirements are valuable for helping regional agencies define the functionality they desire. They may be used in the procurement process to explain to vendors what a new system must be capable of.

In addition to the functional requirements, once a project is included in the Regional ITS Architecture, there are many reports and diagrams that can be generated from Turbo Architecture that are helpful in the procurement process. They include:

- Interconnect and information flow diagrams that describe the expected communications for new ITS.

- Standards reports that identify the availability of national standards for the information flows, which allow stakeholders to procure devices and systems that will be interoperable.
- Inventory reports that define the ownership of each subsystem in a project.

13.4 Architecture Use in Deployment

The functional requirements defined by the ITS architecture are valuable in procurement and deployment. In deployment they can be used throughout the deployment process to ensure the system is being built to meet the region's needs. By definition, the functional requirements are testable and can be used as the basis for acceptance testing ITS.

14. Architecture Maintenance

The Topeka/Shawnee County Regional ITS Architecture should be considered a living document and should be modified as the region's plans and priorities change, ITS projects are implemented, and the ITS needs and services evolve. The architecture was developed with a twelve-year-plus time horizon, as reflected by the project time frames of near- (zero to three years), medium- (three to seven years) and long-term (more than seven years). When the architecture is updated, this timeframe will be extended further into the future. The goal of maintaining the architecture is to keep an up-to-date Regional ITS Architecture accessible and easily used for deploying ITS in the Topeka/Shawnee County Region.

The key aspects of the architecture maintenance process that will modify and change the architecture in a consistent manner are defined in this section as follows:

- Architecture ownership
- Maintenance responsibility
- Maintenance skills and training
- Maintenance elements
- Update frequency
- Identifying needed architecture changes
- Change Management Process

14.1 Architecture Ownership

The architecture should be readily available to all stakeholders in the region, and all stakeholders should be able to identify potential changes to the architecture. However, it is critical for consistency that the architecture have only one stakeholder own and physically maintain it.

The MTPO has owned the architecture since it was first developed in 2007. The MTPO led this update of the architecture. It is recommended that the MTPO continue to own the architecture.

As owner, MTPO's key responsibility will be to follow this Maintenance Plan to ensure the architecture remains current and it accurately reflects the activities of the region's stakeholders. This will require training and working with the region's stakeholders to ensure their continued participation in its maintenance and updating.

14.2 Responsibility for Maintaining the Regional ITS Architecture

Just as a project team and a group of stakeholders were needed to develop the ITS Architecture, the MTPO will need stakeholders to stay involved in the ongoing maintenance. Changes can arise from many sources in the Topeka/Shawnee County region, and it is likely that some may come from sources outside the technical expertise of a single agency. For these reasons, it is recommended that a group of stakeholders representing a range of areas and technological expertise be involved in the architecture maintenance.

The MTPO should create a Maintenance Team that represents, at a minimum:

- Freeway management
- Surface street management
- Public Transportation
- Emergency Management
- Maintenance and Construction
- Information Technology

The members do not need to be able to physically maintain an architecture, but they should be aware of the architecture and its importance. The responsibility of the Maintenance Team will be to make decisions together with input from other regional stakeholders, as needed, on changes that should be made to the architecture. Changes to the architecture should be made on a consensus basis. Within the Maintenance Team, it is recommended that the City/MTPO take the lead and share responsibility and accountability for the formal database and architecture maintenance.

It is expected that the Maintenance Team may only need to meet once a year while potentially exchanging e-mails more frequently. Meetings may occur at shorter intervals, at the discretion of the MTPO and depending upon the level of ITS activity in the region.

14.3 Architecture Skills and Training

As owner and maintainer of the regional ITS architecture, the MTPO should have at least one, and ideally two, individuals on staff who have completed basic architecture training. The training should provide the skills to understand how to use the architecture and how to maintain it within the Turbo architecture software tool.

This training can be taken either in person or via the web at no charge through the U.S. DOT. More information about training is available at the National ITS Architecture web site. Specifically, the following two online courses are recommended and are available at any time:

- Turbo Training - provides a hands-on experience using the Turbo software. Participants will work with simulated examples and practice exercises to create, maintain, and use regional and project ITS architectures.
- Use and Maintenance Training - prepares ITS professionals to effectively use and maintain their regional ITS architecture.

14.4 Elements of the Architecture to Maintain

The parts of a Regional ITS Architecture to be maintained are referred to as the “baseline” architecture. This section considers the different parts of the Regional ITS Architecture and whether they should be a part of the maintained baseline.

Description of Region - This description includes the geographic scope, functional scope and architecture timeframe. Geographic scope defines the boundaries that define what ITS elements are

in the region, although additional ITS elements outside the region may be necessary to describe if they communicate ITS information to elements inside the region. Functional scope defines the services that are included in a Regional ITS Architecture. Architecture timeframe is the distance (in years) into the future that the Regional ITS Architecture considers. The description of the region for the Topeka/Shawnee County Regional ITS Architecture is contained in the architecture documentation, and therefore should be updated as needed when maintenance is performed.

List of Stakeholders - Stakeholders are critical to the definition of the architecture. Within a region, they may consolidate or separate, and such changes should be reflected in the architecture. Sometimes projects within a single agency may necessitate that the agency be represented as more than one stakeholder. In addition, stakeholders that have not been engaged in the past might be approached through outreach to ensure that the Regional ITS Architecture represents their ITS requirements as well. The Topeka/Shawnee County Region stakeholders are described in the architecture documentation and also reside in the Turbo database, representing aspects of the Regional ITS Architecture. Their listing and description should be part of the baseline and should be updated in the maintenance process.

Operational Concept - It is crucial that the operational concept (which is represented as roles and responsibilities) in a Regional ITS Architecture accurately represent the consensus vision of how the stakeholders want their ITS to operate for the benefit of surface transportation users. These should be reviewed and, if necessary, changed to represent what has been deployed (which may have been shown as "planned" in the earlier version of the Regional ITS Architecture). Many of the remaining maintenance efforts will depend on the outcome of the changes made here. The operational concepts are in the architecture documentation and should be part of the baseline.

List of ITS Elements - The ITS inventory is an important part of the Regional ITS Architecture. Changes in stakeholders as well as operational concepts may impact the inventory of ITS elements. Furthermore, recent implementation of ITS elements may change their individual status (e.g. from planned to existing). The list of elements is contained in the architecture documentation and is contained in the Turbo database. The list of ITS elements should be part of the architecture baseline.

List of Agreements - One of the greatest values of a Regional ITS Architecture is to identify where information crosses agency boundaries, which may indicate a need for an agency agreement. An update to the list of agreements can follow the update to the operational concepts and/or interfaces between elements. The list of agreements is found in the architecture documentation. The list of agreements is part of the baseline.

Interfaces between Elements (interconnects and information flows) - Interfaces between elements are the details of the architecture. They describe how various ITS elements are or will be integrated throughout the timeframe of the architecture. These details are contained in the Turbo database. They are a fundamental part of the architecture baseline, and one that will likely see the greatest amount of change during the maintenance process.

System Functional Requirements - High-level functions are allocated to ITS elements as part of the Regional ITS Architecture. These can serve as a starting point for the functional definition of projects that map to portions of the Regional ITS Architecture. These details are contained in the Turbo database, included in the architecture documentation, and should be part of the baseline.

Applicable ITS Standards - The selection of standards depends on the information exchange requirements. The maintenance process should consider how ITS standards may have evolved and matured since the last update, and how any change in the national standards development process may impact previous regional standard choices (especially where competing standards exist). For example, if extensible Markup Language (XML) based Center-to-Center standards reach a high level of maturity, reliability and cost-effectiveness, then a regional standards technology decision may be made to transition from other standards to XML. The description of the standards environment for the region, as well as the details of which standards apply to the architecture, are in the architecture documentation as well as the Turbo database and should be part of the baseline.

Project Sequencing - While project sequencing is partly determined by functional dependencies (e.g. "surveillance" must be a precursor to "traffic management"), the reality is that for the most part project sequences are local policy decisions. Project sequences should be reviewed to make sure that they are in line with current policy decisions. Furthermore, policy makers should be informed of the sequences, and their input should be sought to make the project sequences in line with their expectations. This is crucial in avoiding the Regional ITS Architecture from becoming irrelevant. The project sequencing is included in the architecture documentation and is part of the architecture baseline.

14.5 Architecture Update Frequency

As previously discussed, the architecture may only need to be reviewed by the Project Team once a year to determine whether it needs minor updates. Minor updates include small modifications to portions of the architecture that do not reflect changes to the region's priorities and needs. Depending upon project activity in the region, the architecture can be modified more frequently than once a year.

For major updates, such as this effort, it is recommended that the main regional ITS architecture become an appendix to the MTPO's LRTP. As the LRTP undergoes formal updates on regular cycles, the architecture should undergo simultaneous review and major modifications. This is a natural result of the architecture being mainstreamed into the regional planning process and ensures that the architecture continues to accurately represent the region.

The operational concepts, system functional requirements, project sequencing list, and the list of agency agreements represent high-level views of the architecture and do not necessarily need to be modified each time a revision is made. However, these documents will be modified as the architecture broadens to address new needs and services, add new stakeholders to the region, or on an as-needed basis.

In summary, the MTPO and Maintenance Team should determine the exact dates and times that modifications will be submitted for inclusion into the Regional ITS Architecture, but it is anticipated that based on the schedule for updating planning documents, there will be minor updates annually with a major update to occur once every few years.

14.6 Identifying Needed Architecture Changes

The Topeka/Shawnee County Regional ITS Architecture was created as a consensus view of the ITS elements currently implemented in the region and the systems planned for the future. The architecture needs to be updated to reflect changes resulting from project implementation or resulting from the planning process itself. There are many actions that may cause a need to update the architecture, as described here:

Changes in Project Definition - When formally defined during procurement and deployment, a project may add, subtract or modify elements, interfaces, or information flows from the Regional ITS Architecture. Because the architecture is meant to describe not only ITS planned for the region, but also the current ITS implementations, it should be updated to correctly reflect projects as they are deployed.

Multiple Agency Stakeholders - There are grouped stakeholders in the Topeka/Shawnee County Regional ITS Architecture. For example, smaller cities that operate their own emergency response, such as volunteer fire departments, are grouped as “Local Emergency Response”. If any of these stakeholders become more unique, or as these stakeholders deploy ITS elements that are different from the other partners in that grouping, more specific descriptions of these stakeholders should be added to the architecture.

Changes for Project Addition/Deletion - Occasionally a project will be added, deleted or modified during the planning process. When this occurs, the aspects of the architecture associated with the project must be added, deleted or modified.

Changes in Project Status - As projects are deployed, the status of the architecture elements, services, and flows that are part of the project must be changed from planned to existing. Elements, services, and flows are considered to change from "planned" to "existing" when they are substantially complete, in that they have been installed, tested and are being used.

Changes in Project Priority - Due to funding constraints, technological changes or other considerations, a project planned in the region may be delayed or accelerated. Such changes need to be reflected in the Topeka/Shawnee County Regional ITS Architecture.

Changes in Regional Needs - Over time, the needs in the region can change and the corresponding aspects of the Regional ITS Architecture will have to be updated. While the Topeka/Shawnee County Regional ITS Architecture was developed with input from many ITS stakeholders in the region, not all identified stakeholders participated in its development. As ITS deployment increases and benefits of

integration are realized, additional stakeholders may become interested in ITS and the architecture should be updated to reflect their place in the regional view of ITS. The systems they operate and their interfaces will also have to be added or revised based on actual information gained from their participation.

Changes in Stakeholder or Element Names - An agency's name or the name used to describe its element(s) may change. Transportation agencies occasionally merge, split, or just rename themselves. In addition, element names may evolve as projects are defined. The Topeka/Shawnee County Regional ITS Architecture should be updated to use the currently correct names for both stakeholders and elements.

Changes in Other Architectures - The Topeka/Shawnee County Regional ITS Architecture covers not only its region, but it also interfaces to elements in the Kansas Statewide Architecture. Changes in these other architectures may necessitate changes in the Topeka/Shawnee County Regional ITS Architecture to maintain consistency, as the two architectures may overlap.

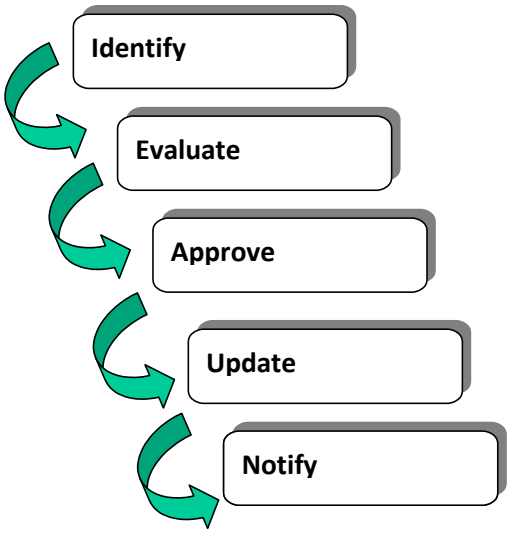
Additionally, the National ITS Architecture itself is a living resource of information. In order to keep a 20-year horizon on the National ITS Architecture, FHWA updates it to refine existing services or add new user services. The Topeka/Shawnee County Regional ITS Architecture has been developed using Version 5.1 of the National ITS Architecture, however, there may be a Version 5.2 in the near-term, and potentially a Version 6.0. Each revision may add new User Services.

With any new user service there is the potential for new subsystems, terminators, interconnects, flows, and equipment packages. It is recommended that during major updates the Maintenance Team review changes in the National ITS Architecture and determine how they may affect the Topeka/Shawnee County Regional ITS Architecture.

14.7 Change Management Process

This section recommends a process for maintaining the Topeka/Shawnee County Regional ITS Architecture. The process described below and illustrated graphically in **Figure 9** is based upon the more general discipline of Configuration Management. It is a step-by-step description on how changes are identified, reviewed and implemented.

Figure 9: Architecture Maintenance Process



As previously discussed, the MTPO should maintain the regional ITS architecture with the support of a Maintenance Team. Once the MTPO individuals and the Team membership have been established, the following process can be used to complete a cycle to update the Topeka/Shawnee County Regional ITS Architecture.

Identify – Any of the region's stakeholders can identify a change in the architecture and submit a request to the MTPO. The MTPO can share the information with the Maintenance Team for review and evaluation. It is recommended that a simple change request form be created that contains at least the following information:

- Name of change
- Description of change
- Rationale for change
- Originator name or agency
- Originator contact information
- Date of origination

Once received, the request should be maintained in a change log (or change database) that would add the following additional fields of information:

- Change number (some unique identifier)
- Change disposition (accepted, rejected, deferred)
- Change type (minor or significant)
- Part of baseline affected (could be check boxes for document, database, web site, and not known)
- Disposition comment
- Disposition date

A sample Change Request Form is provided in **Appendix E**.

There are many ways a change request can be made: via a web site, by submittal of a formal hard copy, or by submittal of an e-mail containing all relevant information. The MTPO and the Maintenance Team should discuss and state a preference, preferably an electronic process with a web-based change form. The web-site approach generates an electronic copy of the request, and therefore an audit trail of all changes considered.

Evaluate - Each change request needs to be evaluated to determine what impact it has upon the architecture baseline. If the request has an impact on other stakeholders, someone from the Maintenance Team will contact the affected stakeholders to confirm their agreement with the modification. If the issue warrants, a stakeholder meeting or teleconference to discuss the modification may be held. In the case of a full baseline update, the change evaluation happens through stakeholder consensus as part of the overall update.

Approval - The next step is to approve, defer, or reject the change request. This will be handled through email, the web site and/or through periodic face-to-face meetings. This is dependent upon the complexity of the proposed change(s). If the change request is rejected or deferred, the requester will be notified with an explanation. Approval of affected stakeholders is a good approach to build consensus and is one that may fit a wide range of conditions. The result of the approval step will be communicated back to the requester.

Update Baseline - This activity involves updating the Topeka/Shawnee County Regional ITS Turbo Architecture and documentation. This requires the same skills and techniques used in developing the initial baseline. The frequency of updating the Turbo Architecture will be established by the Maintenance Team. It is recommended a firm or staff member with Turbo expertise be used to update the Turbo baseline.

Notify Stakeholders - The final part of the maintenance process is to notify stakeholders of the changes or updates to the Topeka/Shawnee County Regional ITS Architecture. This will be accomplished by sending an email notification to the stakeholder list that a change has occurred and to access the information on the website.

If there are no change requests between Maintenance Team meetings and no other issues to discuss, the Team may decide to skip its next meeting.

APPENDIX A – National ITS Architecture ITS Service Packages

Service Package ID	Service Package Name
Service Area: Archived Data Management provides ITS historical data for relevant ITS data and will incorporate the planning, safety, operations, and research communities into ITS. It will provide the data collection, manipulation, and dissemination functions of these groups, as they relate to data generated by ITS.	
AD1	ITS Data Mart
AD2	ITS Data Warehouse
AD3	ITS Virtual Data Warehouse
Service Area: Public Transportation provides services for the management, security, maintenance and operation of public transportation systems, such as bus and rail.	
APTS01	Transit Vehicle Tracking
APTS02	Transit Fixed-Route Operations
APTS03	Demand Response Transit Operations
APTS04	Transit Fare Collection Management
APTS05	Transit Security
APTS06	Transit Fleet Management
APTS07	Multi-modal Coordination
APTS08	Transit Traveler Information
APTS09	Transit Signal Priority
APTS10	Transit Passenger Counting
APTS11	Multimodal Connection Protection
Service Area: Traveler Information provides information to travelers pre-trip and en-route concerning	

Service Package ID	Service Package Name
traffic and weather conditions.	
ATIS01	Broadcast Traveler Information
ATIS02	Interactive Traveler Information
ATIS03	Autonomous Route Guidance
ATIS04	Dynamic Route Guidance
ATIS05	ISP Based Trip Planning and Route Guidance
ATIS06	Transportation Operations Data Sharing
ATIS07	Travel Services Information and Reservation
ATIS08	Dynamic Ridesharing
ATIS09	In Vehicle Signing
ATIS10	Short Range Communications Traveler Information
Service Area: Traffic Management provides for the surveillance and maintenance and operation of traffic control devices in order to improve efficiency and safety of traffic flow.	
ATMS01	Network Surveillance
ATMS02	Traffic Probe Surveillance
ATMS03	Traffic Signal Control
ATMS04	Traffic Metering
ATMS05	HOV Lane Management
ATMS06	Traffic Information Dissemination
ATMS07	Regional Traffic Management

Service Package ID	Service Package Name
ATMS08	Traffic Incident Management System
ATMS09	Transportation Decision Support and Demand Management
ATMS10	Electronic Toll Collection
ATMS11	Emissions Monitoring and Management
ATMS12	Roadside Lighting System Control
ATMS13	Standard Railroad Grade Crossing
ATMS14	Advanced Railroad Grade Crossing
ATMS15	Railroad Operations Coordination
ATMS16	Parking Facility Management
ATMS17	Regional Parking Management
ATMS18	Reversible Lane Management
ATMS19	Speed Warning and Enforcement
ATMS20	Drawbridge Management
ATMS21	Roadway Closure Management
ATMS22	Variable Speed Limits
ATMS23	Dynamic Lane Management and Shoulder Use
ATMS24	Dynamic Roadway Warning
ATMS25	VMT Road User Payment
ATMS26	Mixed Use Warning Systems

Service Package ID	Service Package Name
Service Area: Vehicle Safety provides advanced safety and warning systems for vehicles to alert drivers and reduce the risk of crashes.	
AVSS01	Vehicle Safety Monitoring
AVSS02	Driver Safety Monitoring
AVSS03	Longitudinal Safety Warning
AVSS04	Lateral Safety Warning
AVSS05	Intersection Safety Warning
AVSS06	Pre-Crash Restraint Deployment
AVSS07	Driver Visibility Improvement
AVSS08	Advanced Vehicle Longitudinal Control
AVSS09	Advanced Vehicle Lateral Control
AVSS10	Intersection Collision Avoidance
AVSS11	Automated Vehicle Operations
AVSS12	Cooperative Vehicle Safety Systems
Service Area: Commercial Vehicle Operations provides services for commercial vehicle fleet management, administrative functions, advanced screening and inspection, and goods movement security.	
CVO01	Carrier Operations and Fleet Management
CVO02	Freight Administration
CVO03	Electronic Clearance
CVO04	CV Administrative Processes

Service Package ID	Service Package Name
CVO05	International Border Electronic Clearance
CVO06	Weigh-In-Motion
CVO07	Roadside CVO Safety
CVO08	On-board CVO Safety
CVO09	CVO Fleet Maintenance
CVO10	HAZMAT Management
CVO11	Roadside HAZMAT Security Detection and Mitigation
CVO12	CV Driver Security Authentication
CVO13	Freight Assignment Tracking
Service Area: Emergency Management provides services to manage emergency detection and response and improve coordination among transportation entities and emergency responders.	
EM01	Emergency Call-Taking and Dispatch
EM02	Emergency Routing
EM03	Mayday and Alarms Support
EM04	Roadway Service Patrols
EM05	Transportation Infrastructure Protection
EM06	Wide-Area Alert
EM07	Early Warning System
EM08	Disaster Response and Recovery
EM09	Evacuation and Reentry Management

Service Package ID	Service Package Name
EM10	Disaster Traveler Information
Service Area: Maintenance and Construction Management provides services to manage maintenance and construction, including managing weather, incident response and work zones.	
MC01	Maintenance and Construction Vehicle and Equipment Tracking
MC02	Maintenance and Construction Vehicle Maintenance
MC03	Road Weather Data Collection
MC04	Weather Information Processing and Distribution
MC05	Roadway Automated Treatment
MC06	Winter Maintenance
MC07	Roadway Maintenance and Construction
MC08	Work Zone Management
MC09	Work Zone Safety Monitoring
MC10	Maintenance and Construction Activity Coordination
MC11	Environmental Probe Surveillance
MC12	Infrastructure Monitoring

APPENDIX B – Topeka/Shawnee County Operational Concept

(Stakeholder Roles and Responsibilities)

Operational Concept (Roles & Responsibilities)

Sorted by Stakeholder

Topeka Regional ITS Architecture (Region)

3/6/2014 11:33:30AM

AMR Emergency Response

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing

City of Topeka - Emergency Services

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Emergency vehicles request signal preemption when necessary.	Medium-term

City of Topeka - Public Works

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Archive and maintain data warehouse for use in analysis, planning and operations.	Medium-term
Collect data from own systems and other relevant systems in the Topeka-Shawnee Region	Medium-term
Create data archives of various operational parameters of the local transportation systems for use in regional, state and national planning activities	Medium-term
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Manage traffic control during emergency events, evacuation and reentry	Existing
Exchange incident and threat information with emergency management systems and with maintenance and construction operations for coordination	Near-term
Exchange incident information with emergency management systems	Near-term
Exchange traffic information with emergency responders and other traffic agencies to support coordinated incident response	Medium-term
Provide signal preemption to emergency vehicles at specific locations	Medium-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect and analyze incident information	Existing

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate with emergency responders for the implementation, operation and maintenance of emergency signal preemption at city-maintained signals	Existing
Monitor traffic via closed circuit television	Existing
Provide signal preemption to emergency vehicles at specific locations	Existing
Coordinate with other agencies for widespread emergency and incident management	Near-term
Exchange incident and threat information with emergency management systems and with maintenance and construction operations for coordination	Near-term
Exchange traffic information with emergency responders and other traffic agencies to support coordinated incident response	Near-term
Exchange transportation data with the local data warehouse	Near-term
Share incident information with other agencies for planning, analysis and operational purposes	Near-term
Collect data from own systems and other relevant systems in the Topeka-Shawnee Region	Medium-term
Exchange incident information with emergency management systems	Medium-term
Implement traffic control response to incidents	Medium-term

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch maintenance vehicles	Existing
Monitor weather conditions and use the information for maintenance operations.	Existing
Operate and maintain maintenance vehicles, including on-board ITS equipment	Existing
Track the location of maintenance vehicles.	Existing
Coordinate with traffic and other maintenance agencies for scheduling and performing maintenance and construction activities	Near-term
Exchange construction and maintenance information with other maintenance, safety and traffic agencies	Near-term
Exchange transportation data with the local data warehouse	Near-term

RR Area: **Surface Street Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect traffic data, including speed and volumes	Existing
Coordinate with emergency responders for the implementation, operation and maintenance of emergency signal preemption at city-maintained signals	Existing
Develop and operate coordinated signals within designated corridors	Existing
Maintain and operate centralized traffic signal software	Existing
Manage traffic control during emergency events, evacuation and reentry	Existing
Manage traffic on city-owned arterials using traffic signals	Existing
Monitor traffic on local arterial roads	Existing
Monitor traffic via closed circuit television	Existing
Operate and maintain the Traffic Management Center	Existing
Operate and maintain closed circuit camera system	Existing

RR Area: **Surface Street Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain traffic signals in the City and Shawnee County	Existing
Coordinate traffic control response to incidents with emergency responders and other transportation agencies	Near-term
Coordinate with other agencies for widespread emergency and incident management	Near-term
Implement traffic control response to incidents	Near-term
Provide access to traffic camera views for selected other agencies in the region	Near-term
Redistribute traffic images from local closed circuit television cameras	Near-term
Archive and maintain data warehouse for use in analysis, planning and operations.	Medium-term
Collect and analyze incident information	Medium-term
Collect data from own systems and other relevant systems in the Topeka-Shawnee Region	Medium-term
Exchange traffic information with emergency responders and other traffic agencies to support coordinated incident response	Medium-term
Exchange transportation data with the local data warehouse	Medium-term
Grant transit signal priority requests when appropriate.	Long-term
Provide traffic and incident information to the public, including construction, maintenance, road closures, detours, delays, congestion and incident information	Long-term

RR Area: **Traveler Information for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Redistribute traffic images from local closed circuit television cameras	Near-term
Collect, process and disseminate traffic information	Long-term
Operate and maintain traveler information system	Long-term

Google

RR Area: **Transit Services for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Receive and disseminate fixed-route transit information.	Existing

Kansas Department of Emergency Management

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate emergency evacuation and reentry activities among local and state agencies	Existing
Coordinate large-scale emergency response	Existing

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Share incident and threat information with regional and other emergency management agencies	Near-term

Kansas Highway Patrol

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Dispatch emergency vehicles	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Existing
Monitor freeway conditions via closed circuit television	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Operate and maintain courtesy patrol vehicles	Existing
Operate and maintain courtesy patrol vehicles, including on-board ITS related equipment	Existing
Provide incident status to the KHP Dispatch Center	Existing
Receive public safety calls and provide appropriate response	Existing
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch emergency vehicles	Existing
Monitor freeway conditions via closed circuit television	Existing
Operate and maintain courtesy patrol vehicles	Existing
Provide incident status to the KHP Dispatch Center	Existing
Receive public safety calls and provide appropriate response	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Near-term
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

Kansas Turnpike Authority

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Electronic Toll Collection for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect tolls and manage traveler accounts	Existing
Operate and maintain electronic toll system	Existing

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Disseminate emergency information	Existing
Monitor flood conditions on and near the Turnpike	Existing
Monitor flood conditions on the Turnpike	Existing
Coordinate with other regional agencies to respond and manage emergency and incident response.	Near-term

RR Area: **Freeway Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect traffic data on freeways and highways	Existing
Collect, process and disseminate traffic information	Existing
Maintain and operate dynamic message signs	Existing
Monitor traffic via closed circuit television	Existing
Operate and maintain a Turnpike traffic management center	Existing
Operate and maintain traffic on the Turnpike	Existing
Receive weather data from road weather information systems	Existing

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch maintenance vehicles	Existing
Monitor flood conditions on and near the Turnpike	Existing
Monitor weather conditions and use the information for maintenance operations.	Existing
Operate and maintain maintenance vehicles, including on-board ITS equipment	Existing
Receive weather data from road weather information systems	Existing
Coordinate with traffic and other maintenance agencies for scheduling and performing maintenance and construction activities	Medium-term
Exchange construction and maintenance information with other maintenance, safety and traffic agencies	Medium-term

RR Area: **Traveler Information for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Receive and process weather information from weather service providers and road-weather information systems and disseminate it to the traveling public	Existing
Receive and process weather information from weather service providers and road-weather information systems and disseminate it to the traveling public	Existing

KDOT

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect and analyze incident information	Existing
Dispatch maintenance vehicles	Existing
Disseminate emergency information	Existing
Exchange construction and maintenance information with other maintenance, safety and traffic agencies	Existing
Implement traffic control response to incidents	Existing
Exchange incident and threat information with emergency management systems and with maintenance and construction operations for coordination	Near-term

RR Area: **Freeway Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect traffic data on freeways and highways	Existing
Collect, process and disseminate traffic information	Existing
Maintain and operate dynamic message signs	Existing
Monitor traffic via closed circuit television	Existing
Monitor vehicle speeds using roadside devices	Existing
Operate and maintain a statewide virtual traffic management center	Existing
Operate and maintain traffic on state-owned freeways and highways	Existing
Receive weather data from road weather information systems	Existing

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect and analyze incident information	Existing
Disseminate traffic and incident information	Existing
Exchange incident and threat information with emergency management systems and with maintenance and construction operations for coordination	Near-term
Share incident information with other agencies for planning, analysis and operational purposes	Near-term
Implement traffic control response to incidents	Long-term

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect and analyze incident information	Existing
Dispatch maintenance vehicles	Existing
Monitor weather conditions and use the information for maintenance operations.	Existing
Operate and maintain maintenance vehicles, including on-board ITS equipment	Existing

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate with traffic and other maintenance agencies for scheduling and performing maintenance and construction activities	Medium-term
Exchange construction and maintenance information with other maintenance, safety and traffic agencies	Medium-term

RR Area: **Traveler Information for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect, process and disseminate traffic information	Existing
Operate and maintain a 511 phone system and related web site	Existing
Receive and process weather information from weather service providers and road-weather information systems and disseminate it to the traveling public	Existing

KTA Highway Patrol

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Existing
Operate and maintain courtesy patrol vehicles, including on-board ITS related equipment	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide courtesy patrol vehicles to assist distressed motorists	Existing
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Provide courtesy patrol vehicles to assist distressed motorists	Existing
Provide incident status to the KHP Dispatch Center	Existing
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

Local Towns Emergency Response

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to the 911 Dispatch Center	Existing

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Provide incident status to Shawnee County 911 Center	Existing

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

National Weather Service

RR Area: **Freeway Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect, analyze and provide accurate weather information	Existing

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect, analyze and provide accurate weather information	Existing

Railroads

RR Area: **Surface Street Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Alert traffic signals of approaching train status and identified grade crossings	Existing
Operate and maintain wayside equipment and communications to roadside equipment	Existing

Shawnee County

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Dispatch emergency vehicles	Existing
Maintain centralized emergency management systems	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Track the locations of emergency vehicles	Existing

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term
Interface with other emergency and transportation services and with maintenance and construction operations	Near-term
Provide construction and maintenance information with other maintenance, safety and traffic agencies	Near-term
Receive routing and traffic information from the City of Topeka Traffic Management Center	Medium-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch emergency vehicles	Existing
Dispatch maintenance vehicles	Existing
Dispatch vehicles to respond to incidents	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to the 911 Dispatch Center	Existing
Receive safety calls and coordinate appropriate response	Existing
Track the locations of emergency vehicles	Existing
Coordinate incident response within the Topeka-Shawnee County Region	Near-term
Exchange incident and threat information with other emergency management systems and with maintenance and construction operations	Near-term

RR Area: **Maintenance and Construction for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch maintenance vehicles	Existing
Monitor weather conditions and use the information for maintenance operations.	Existing
Operate and maintain maintenance vehicles, including on-board ITS equipment	Existing
Coordinate with traffic and other maintenance agencies for scheduling and performing maintenance and construction activities	Medium-term
Exchange construction and maintenance information with other maintenance, safety and traffic agencies	Medium-term

RR Area: **Surface Street Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Manage traffic on county-owned arterials	Existing

Shawnee County Emergency Management

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate emergency evacuation and reentry activities among local and state agencies	Existing
Coordinate large-scale emergency response	Existing
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Share incident and threat information with regional and other emergency management agencies	Near-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate emergency evacuation and reentry activities among local and state agencies	Existing
Coordinate large-scale emergency response	Existing
Create, store and utilize emergency response plans to facilitate coordinated response	Existing
Share incident and threat information with regional and other emergency management agencies	Near-term

State Capitol Police

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Near-term
Interface with other emergency and transportation agencies to support coordinated emergency response	Near-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Near-term
Interface with other emergency and transportation agencies to support coordinated emergency response	Near-term

Topeka Metro Transit Authority

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Coordinate with emergency management agencies to provide transit services during emergencies, evacuation and reentry	Medium-term

RR Area: **Transit Services for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Collect, process and disseminate transit information to the public	Existing
Disseminate transit information.	Existing
Maintain and operate transit vehicles	Existing
Operate and maintain transit vehicles, including on-board ITS.	Existing
Operate and maintain transit management systems	Existing
Schedule and dispatch fixed-route and paratransit vehicles	Existing
Track vehicle locations	Near-term
Collect payments, count passengers and generate reports automatically	Medium-term
Exchange transportation data with the local data warehouse	Medium-term
Provide real-time transit information at the roadside and via personal devices.	Medium-term
Manage transit signal priority in accordance with city traffic plans.	Long-term

Traveling Public

RR Area: **Traveler Information for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Receive, process and use traffic and transit information using personal access devices to make educated travel decisions	Existing
Receive, process and use ten-route traffic and transit information to make educated travel decisions	Existing

Washburn University

RR Area: **Archived Data Systems for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange transportation data with the local data warehouse	Medium-term

RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch Washburn University Emergency Response Vehicles	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing

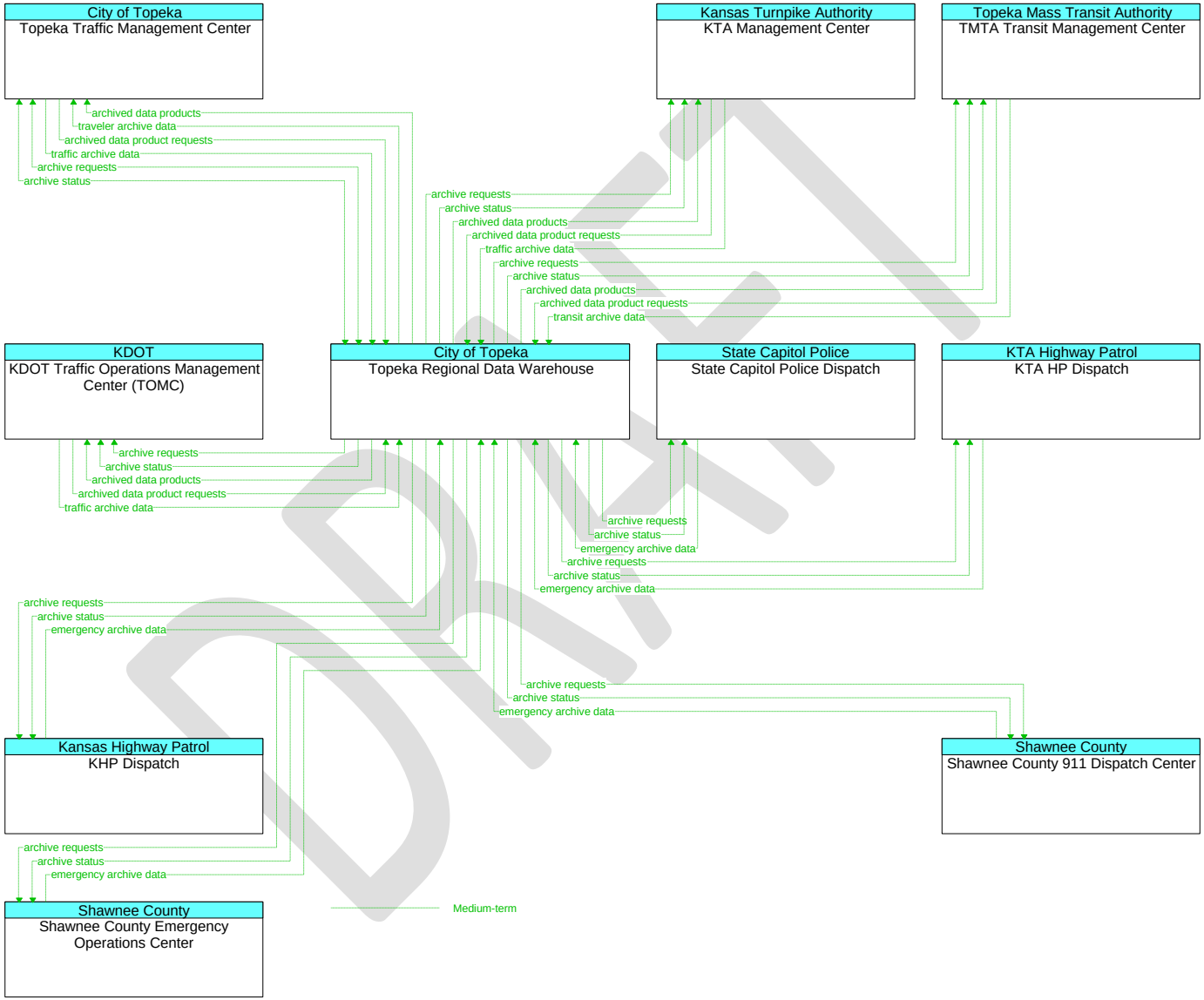
RR Area: **Emergency Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Near-term
Interface with other emergency and transportation agencies to support coordinated emergency response	Near-term

RR Area: **Incident Management for Topeka Regional ITS Architecture**

Roles and Responsibilities	*Status*
Dispatch Washburn University Emergency Response Vehicles	Existing
Operate and maintain emergency vehicles, including on-board ITS related equipment	Existing
Provide incident status to Shawnee County 911 Center	Existing
Exchange incident and threat information with other emergency management services and with maintenance and construction operations	Near-term
Interface with other emergency and transportation agencies to support coordinated emergency response	Near-term

APPENDIX C – Topeka/Shawnee County Information Flows for Service Package AD2: ITS Data Warehouse



APPENDIX D – Topeka/Shawnee County Relevant ITS Standards

Relevant Standards Activities

3/17/2014 2:14:35PM

Standards for Topeka Regional ITS Architecture

NOTE: The ITS standards presented in this report may represent a superset of options, and in some cases, provide redundant capabilities. In addition, these ITS standards are at different maturity levels. Care should be taken to select the standards that best meet the needs of the region or project.

Lead SDO	Standard Name	Document ID
Flow: **bad tag list**		
Source: TMTA Transit Management Center	*Destination:* TMTA Transit Vehicles	
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
Flow: **broadcast traveler information**		
Source: KANROAD	*Destination:* Travelers	
SAE	Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group	(See Footnote)
SAE	Advanced Traveler Information Systems (ATIS) General Use Standards Group	(See Footnote)
Flow: **current asset restrictions**		
Source: KDOT Maintenance Center	*Destination:* KANROAD	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Flow: **emergency plan coordination**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Source: Shawnee County Maintenance Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Flow: **environmental conditions data**		
Source: National Weather Service	*Destination:* KDOT Maintenance Center	
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	ITE TMDD
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Source: National Weather Service	*Destination:* Topeka Maintenance Center	
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	ITE TMDD
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Flow: **environmental sensor data**		
Source: KDOT Roadside Devices	*Destination:* KDOT Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Source: KDOT Roadside Devices	*Destination:* KDOT Maintenance Center	
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Environmental Sensor Stations (ESS)	NTCIP 1204
Source: Topeka Roadside Devices	*Destination:* Topeka Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Environmental Sensor Stations (ESS)	NTCIP 1204
***Flow:* environmental sensors control**		
Source: KDOT Maintenance Center	*Destination:* KDOT Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Environmental Sensor Stations (ESS)	NTCIP 1204
***Flow:* fare collection data**		
Source: TMTA Transit Vehicles	*Destination:* TMTA Transit Management Center	
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
***Flow:* fare management information**		
Source: TMTA Transit Management Center	*Destination:* TMTA Transit Vehicles	
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
***Flow:* hri operational status**		
Source: Shawnee County Roadside Devices	*Destination:* Rail Wayside Equipment	
IEEE	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	IEEE 1570-2002
***Flow:* incident command information coordination**		
Source: KTA HP Dispatch	*Destination:* KHP Dispatch	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* Shawnee County 911 Dispatch Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* incident report**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* KDEM Emergency Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* Shawnee County 911 Dispatch Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Source: Shawnee County Emergency Operations Center	*Destination:* Shawnee County 911 Dispatch Center	
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* incident response coordination**		
Source: KHP Dispatch	*Destination:* KDEM Emergency Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: KTA HP Dispatch	*Destination:* KDEM Emergency Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County 911 Dispatch Center	*Destination:* KDEM Emergency Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* KDEM Emergency Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* Shawnee County 911 Dispatch Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* incident response status**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* local signal preemption request**		
Source: Shawnee County Emergency Vehicles	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
ASTM	Dedicated Short Range Communication at 915 MHz Standards Group	(See Footnote)
ASTM/IEEE/SAE	Dedicated Short Range Communication at 5.9 GHz Standards Group	(See Footnote)
***Flow:* maint and constr resource request**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County 911 Dispatch Center	*Destination:* Topeka Maintenance Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* maint and constr resource response**		
Source: Shawnee County Maintenance Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Source: Shawnee County Maintenance Center	*Destination:* Shawnee County Emergency Operations Center	
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* maint and constr work plans**		
Source: KDOT Maintenance Center	*Destination:* KANROAD	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* request for bad tag list**		
Source: TMTA Transit Vehicles	*Destination:* TMTA Transit Management Center	
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
***Flow:* resource coordination**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
Source: Shawnee County Emergency Operations Center	*Destination:* Shawnee County 911 Dispatch Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
IEEE	Incident Management Standards Group	(See Footnote)
***Flow:* road network conditions**		
Source: KDOT Traffic Operations Management Center (TOMC)	*Destination:* KANROAD	
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	ITE TMDD
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Source: KTA Management Center	*Destination:* KSTurnpike.com	
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	ITE TMDD
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* road weather information**		
Source: KDOT Maintenance Center	*Destination:* KANROAD	
AASHTO/ITE	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	ITE TMDD
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* roadway information system data**		
Source: KTA Management Center	*Destination:* KTA Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Dynamic Message Signs (DMS)	NTCIP 1203
***Flow:* roadway information system status**		
Source: KTA Roadside Devices	*Destination:* KTA Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Dynamic Message Signs (DMS)	NTCIP 1203

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Flow: **roadway maintenance status**		
Source: KDOT Maintenance Center	*Destination:* KANROAD	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
Flow: **signal control commands**		
Source: Topeka Traffic Management Center	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
Flow: **signal control device configuration**		
Source: Topeka Traffic Management Center	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
Flow: **signal control plans**		
Source: Topeka Traffic Management Center	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
Flow: **signal control status**		
Source: Topeka Roadside Devices	*Destination:* Topeka Traffic Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
Flow: **signal fault data**		
Source: Topeka Roadside Devices	*Destination:* Topeka Traffic Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Source: Topeka Roadside Devices	*Destination:* Topeka Traffic Management Center	
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
***Flow:* signal system configuration**		
Source: Topeka Traffic Management Center	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	NTCIP 1202
AASHTO/ITE/NEMA	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization (SCP)	NTCIP 1211
AASHTO/ITE/NEMA	Object Definitions for Conflict Monitor Units (CMU)	NTCIP 1214
***Flow:* toll advisories**		
Source: KTA Management Center	*Destination:* KTA Electronic Toll Collection	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* toll instructions**		
Source: KTA Management Center	*Destination:* KTA Electronic Toll Collection	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* toll transactions**		
Source: KTA Electronic Toll Collection	*Destination:* KTA Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* track status**		
Source: Rail Wayside Equipment	*Destination:* Shawnee County Roadside Devices	
IEEE	Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	IEEE 1570-2002
***Flow:* traffic flow**		
Source: Topeka Roadside Devices	*Destination:* Topeka Traffic Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Data Element Definitions for Transportation Sensor Systems (TSS)	NTCIP 1209
***Flow:* traffic images**		
Source: Topeka Roadside Devices	*Destination:* Topeka Traffic Management Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Camera Control	NTCIP 1205
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Switching	NTCIP 1208
***Flow:* transit and fare schedules**		
Source: TMTA Transit Management Center	*Destination:* TMTA Web Site	

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID
Source: TMTA Transit Management Center	*Destination:* TMTA Web Site	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
***Flow:* transit service information**		
Source: TMTA Transit Management Center	*Destination:* Google Transit	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
SAE	Advanced Traveler Information Systems (ATIS) General Use Standards Group	(See Footnote)
***Flow:* transit vehicle operator information**		
Source: TMTA Transit Management Center	*Destination:* TMTA Transit Vehicles	
APTA	Standard for Transit Communications Interface Profiles	APTA TCIP-S-001 3.0.4
***Flow:* transportation system status**		
Source: Shawnee County 911 Dispatch Center	*Destination:* Shawnee County Emergency Operations Center	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* transportation weather information**		
Source: National Weather Service	*Destination:* KSTurnpike.com	
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group	(See Footnote)
***Flow:* vehicle payment information**		
Source: Vehicles	*Destination:* KTA Electronic Toll Collection	
ASTM	Dedicated Short Range Communication at 915 MHz Standards Group	(See Footnote)
ASTM/IEEE/SAE	Dedicated Short Range Communication at 5.9 GHz Standards Group	(See Footnote)
IEEE	Standard for Message Sets for Vehicle/Roadside Communications	IEEE 1455-1999
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS)	IEEE P1609.11
***Flow:* vehicle payment request**		
Source: KTA Electronic Toll Collection	*Destination:* Vehicles	
ASTM	Dedicated Short Range Communication at 915 MHz Standards Group	(See Footnote)
ASTM/IEEE/SAE	Dedicated Short Range Communication at 5.9 GHz Standards Group	(See Footnote)
IEEE	Standard for Message Sets for Vehicle/Roadside Communications	IEEE 1455-1999
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS)	IEEE P1609.11
***Flow:* vehicle payment update**		
Source: KTA Electronic Toll Collection	*Destination:* Vehicles	
ASTM	Dedicated Short Range Communication at 915 MHz Standards Group	(See Footnote)
ASTM/IEEE/SAE	Dedicated Short Range Communication at 5.9 GHz Standards Group	(See Footnote)
IEEE	Standard for Message Sets for Vehicle/Roadside Communications	IEEE 1455-1999

Lead SDO	Standard Name	Document ID
Source: KTA Electronic Toll Collection	*Destination:* Vehicles	
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Over- the-Air Data Exchange Protocol for Intelligent Transportation Systems (ITS)	IEEE P1609.11

Flow: **video surveillance control**

Source: Topeka Traffic Management Center	*Destination:* Topeka Roadside Devices	
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group	(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions	NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Camera Control	NTCIP 1205
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Switching	NTCIP 1208

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID

Footnotes:

Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group

SDO	Standard Name	Document ID
SAE	Location Referencing Message Specification (LRMS)	SAE J2266
SAE	Message Set for Advanced Traveler Information System (ATIS)	SAE J2354
SAE	Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media	SAE J2369
SAE	Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE J2540
SAE	RDS (Radio Data System) Phrase Lists	SAE J2540/1
SAE	ITIS (International Traveler Information Systems) Phrase Lists	SAE J2540/2
SAE	National Names Phrase List	SAE J2540/3

Advanced Traveler Information Systems (ATIS) General Use Standards Group

SDO	Standard Name	Document ID
SAE	Location Referencing Message Specification (LRMS)	SAE J2266
SAE	Message Set for Advanced Traveler Information System (ATIS)	SAE J2354
SAE	Messages for Handling Strings and Look-Up Tables in ATIS Standards	SAE J2540
SAE	RDS (Radio Data System) Phrase Lists	SAE J2540/1
SAE	ITIS (International Traveler Information Systems) Phrase Lists	SAE J2540/2
SAE	National Names Phrase List	SAE J2540/3

Dedicated Short Range Communication at 5.9 GHz Standards Group

SDO	Standard Name	Document ID
ASTM	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	ASTM E2213-03
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager	IEEE 1609.1-2006
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages	IEEE 1609.2-2006
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services	IEEE 1609.3
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation	IEEE 1609.4-2006
IEEE	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 802.11p
IEEE	Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture	IEEE P1609.0

Standards for Topeka Regional ITS Architecture

Lead SDO	Standard Name	Document ID

Dedicated Short Range Communication at 915 MHz Standards Group

SDO	Standard Name	Document ID
ASTM	Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band	ASTM E2158-01

Incident Management Standards Group

SDO	Standard Name	Document ID
IEEE	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	IEEE 1512 -2006
IEEE	Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.1-2006
IEEE	Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.2-2004
IEEE	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	IEEE 1512.3-2006
IEEE	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers	IEEE P1512.4

NTCIP Center-to-Center Standards Group

SDO	Standard Name	Document ID
AASHTO/ITE/NEMA	Octet Encoding Rules (OER) Base Protocol	NTCIP 1102
AASHTO/ITE/NEMA	Center-to-Center Naming Convention Specification	NTCIP 1104
AASHTO/ITE/NEMA	Ethernet Subnetwork Profile	NTCIP 2104
AASHTO/ITE/NEMA	Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
AASHTO/ITE/NEMA	File Transfer Protocol (FTP) Application Profile	NTCIP 2303
AASHTO/ITE/NEMA	Application Profile for DATEX-ASN (AP-DATEX)	NTCIP 2304
AASHTO/ITE/NEMA	Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML)	NTCIP 2306

NTCIP Center-to-Field Standards Group

SDO	Standard Name	Document ID
AASHTO/ITE/NEMA	Octet Encoding Rules (OER) Base Protocol	NTCIP 1102
AASHTO/ITE/NEMA	Transportation Management Protocols (TMP)	NTCIP 1103
AASHTO/ITE/NEMA	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	NTCIP 2101
AASHTO/ITE/NEMA	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	NTCIP 2102
AASHTO/ITE/NEMA	Point-to-Point Protocol Over RS-232 Subnetwork Profile	NTCIP 2103
AASHTO/ITE/NEMA	Ethernet Subnetwork Profile	NTCIP 2104
AASHTO/ITE/NEMA	Transportation Transport Profile	NTCIP 2201
AASHTO/ITE/NEMA	Internet (TCP/IP and UDP/IP) Transport Profile	NTCIP 2202
AASHTO/ITE/NEMA	Simple Transportation Management Framework (STMF) Application Profile	NTCIP 2301
AASHTO/ITE/NEMA	Trivial File Transfer Protocol (TFTP) Application Profile	NTCIP 2302
AASHTO/ITE/NEMA	File Transfer Protocol (FTP) Application Profile	NTCIP 2303

APPENDIX E – SAMPLE ARCHITECTURE CHANGE REQUEST FORM

Stakeholder Proposing Change	Name		Title
	Agency		
	Email		
	Phone No.		
Date			
Description of Change	Title	*Short Description (up to 25 characters)*	
	Detailed Description	*(What is to be added, deleted or modified? Attach additional documentation, including a project architecture, as necessary)*	
	Type of Change	☐ New Project/System ☐ Deleted Project/System ☐ Modified Project/System	☐ New/Changed Stakeholder ☐ Change in Project Status ☐ Change in Project Priority ☐ Other
	Systems or Projects	*Name of System(s) or Project(s) being implemented or modified (if applicable)*	
Project Status	☐ PROPOSED (funding not yet secured) ☐ PLANNED (funding secured) ☐ UNDER CONSTRUCTION (stakeholder is currently deploying system/project) ☐ EXISTING		
Additional Notes (submit additional pages if necessary)			