Wichita Area Regional Intelligent Transportation System (ITS) Architecture
Version 1.2

EXECUTIVE SUMMARY

Submitted by

ITERIS™

In association with

RCC

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1.0   Introduction

The purpose of this project is to develop and maintain a Regional Intelligent Transportation System (ITS) Architecture for the Wichita region that is consistent with the National ITS Architecture and compliant with FHWA Rule 940. The project has resulted in an integrated ITS and Strategic Deployment Plan for the Wichita region and provides a framework for current ITS elements in the region and a strategic approach for future ITS investments. The Iteris project team has conducted this work under contract to the Wichita Area Metropolitan Area Planning Department (MAPD) under the approval of the Wichita Area Metropolitan Planning Organization (WAMPO) in close consultation with the Federal Highway Administration (FHWA), the Kansas Department of Transportation (KDOT), the City of Wichita, Sedgwick County and other regional agencies.

An ITS Architecture provides a blueprint of how transportation systems within the region will be identified and interconnected. The Architecture development and resulting architecture documents are a direct result of stakeholder meetings held in Wichita where participants discussed in detail the existing and future information exchanges between surface transportation systems. The purpose of developing a regional ITS architecture is to illustrate and document regional integration so that planning and deployment of ITS can take place in an organized, efficient and coordinated fashion.

The project was conducted through a number of key tasks as outlined below with multiple milestones and project deliverables:

- Project Management
- Architecture Technical Development
- Stakeholder Outreach
- Implementation Plan Development
- Communications Plan Development
- Final Architecture Development

The Regional Architecture includes the development of three primary documents: the Architecture Document (Volume 1), an Implementation Plan (Volume 2), and a Communications Plan (Volume 3). Appropriate supporting technical documentation including both hardcopy and electronic copies has been provided. This document provides an Executive Summary of these three volumes of the Wichita Area Regional ITS Architecture.

2.0   Background and Architecture Documents Organization

In 1998, the Wichita-Sedgwick County region published the Strategic Deployment Plan for Intelligent Transportation Systems (ITS). The purpose of the study was to identify the ITS user services appropriate for the Wichita region and to develop a strategic deployment plan to provide these user services. In 2001, the Wichita-Sedgwick County region participated in the creation of an initial Wichita-Sedgwick County Regional ITS

Architecture based on the National ITS Architecture and the 1998 Strategic Deployment Plan. The currently named Wichita Area Regional ITS Architecture project is comprised of three volumes. Volume 1, the Architecture Document, contains the core ITS architecture stakeholders, inventory elements and transportation services. There is a companion web site with much of the same information in a hyperlinked format at www.iteris.com/wichitaarchitecture.

Version 1.2 of the Wichita Area Regional ITS Architecture includes 2 significant ITS projects namely, the Wichita Traffic Operations Center Signal System Upgrade and the Wichita Area Public Safety AVL/MDC projects. This version of the Wichita Area Regional ITS Architecture is based on version 5.1 of the National ITS Architecture.

Section 1 of the Architecture Document provides an introduction to the Wichita Area Regional ITS Architecture including the background, geographic scope of the architecture and timeframes for ITS project planning. Section 2 describes each of the stakeholders represented in the architecture. Section 3 contains all of the surface transportation inventory elements identified by the region's stakeholders as important to include in the architecture as existing and future elements. Section 4 describes all of the existing and future transportation services envisioned for the region. Appendix A to the Architecture Document details the participants of these meetings and their affiliations.

The Implementation Plan document (Volume 2) describes projects within the overall regional ITS architecture and their phasing or sequencing over the next 20 years. Volume 2 also contains a list of necessary agency agreements for interconnecting diverse stakeholder's systems, ITS standards information and recommendations to help with standardizing electronic communication between stakeholders and an architecture maintenance plan which will detail the process for keeping the Wichita Area Regional ITS Architecture up-to-date.

The Communications Plan document (Volume 3) is based on Volumes 1 and 2 and contains the communications system requirements and framework based on the interfaces described in the regional ITS architecture. In addition, a high-level survey of current communication capabilities as well as discussion of potential future methods of communication is included along with possible communications network options. The Communications Plan will help guide the Wichita region in their planning needs for their envisioned surface transportation services.

3.0   Geographic Scope

The geographic scope for the Wichita Area Regional ITS Architecture is the Wichita Area Metropolitan Planning Area overseen by the MAPD which includes the City of Wichita, Sedgwick County, City of Andover in Butler County, Town of Sedgwick and the City of Mulvane in Sumner County. The WAMPO (Wichita Area Metropolitan Planning Organization) planning area and defined architecture study area is illustrated in Figure 1.
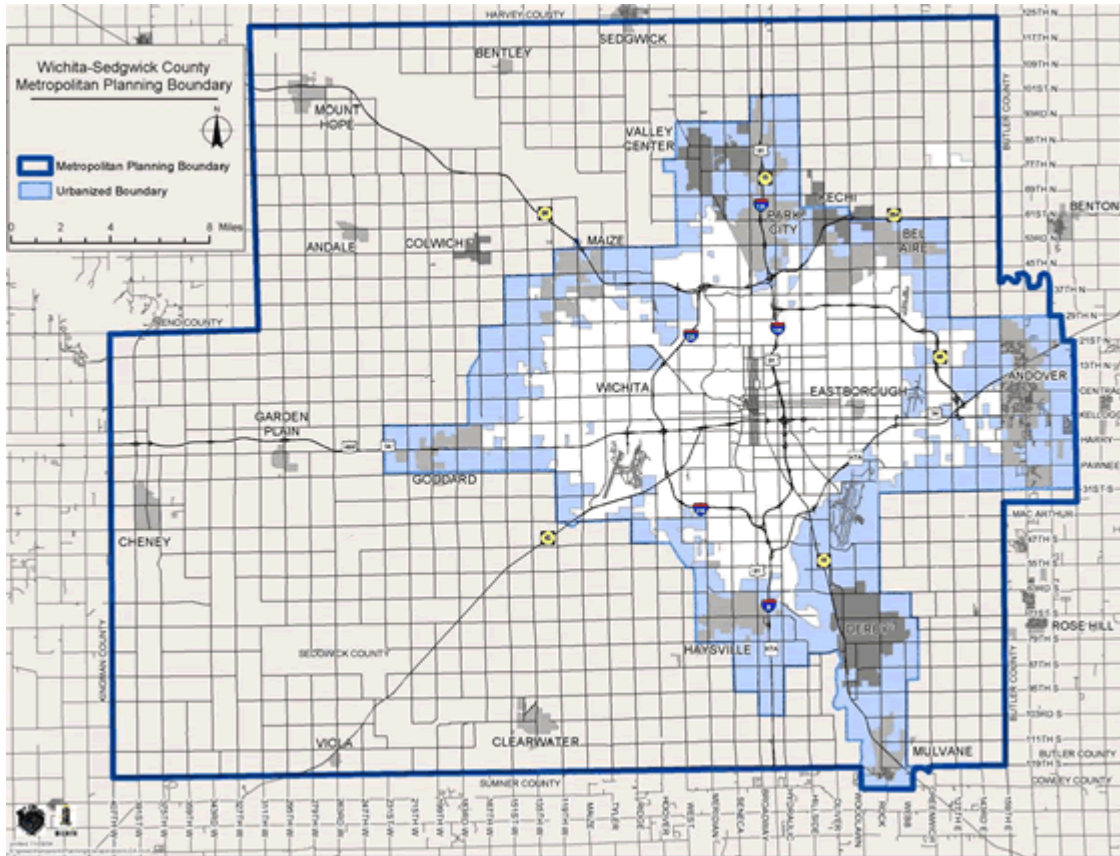
Figure 1. Wichita Area Metropolitan Planning Boundary

4.0   Timeframe

There are five categories of time frames that were decided by the region's stakeholders as outlined below.

- Existing - represents those transportation elements and services that currently exist in the region.
- Near Term - represents those projects and services that should be developed for the region in the next 0-5 years.
- Mid Term - represents those projects and services that should be developed for the region in the next 6-10 year timeframe.
- Long Term - represents projects and services that should be developed for the region beyond a 10-year timeframe to the year 2025.
- Not Planned - represents those projects and services that are not planned at this time.

Some elements may have multiple timeframes (e.g., the Transit Traveler Information project currently is planned near-term but some of its capabilities are medium-term). Typically, the timeframe stated for the element is the closest to the present timeframe. Some projects have letter designations after their number (e.g., 4A, 4B) indicating that

the project is the same but is in multiple phases. As projects are completed, the interfaces between architecture elements will change, for example, from "Near Term" to "Existing".

5.0   Subsystem Diagram

The overall subsystem diagram for the Wichita region is shown in Figure 2. The white rectangles indicate the subsystems that apply to one or more elements in the Wichita Area Regional ITS Architecture.
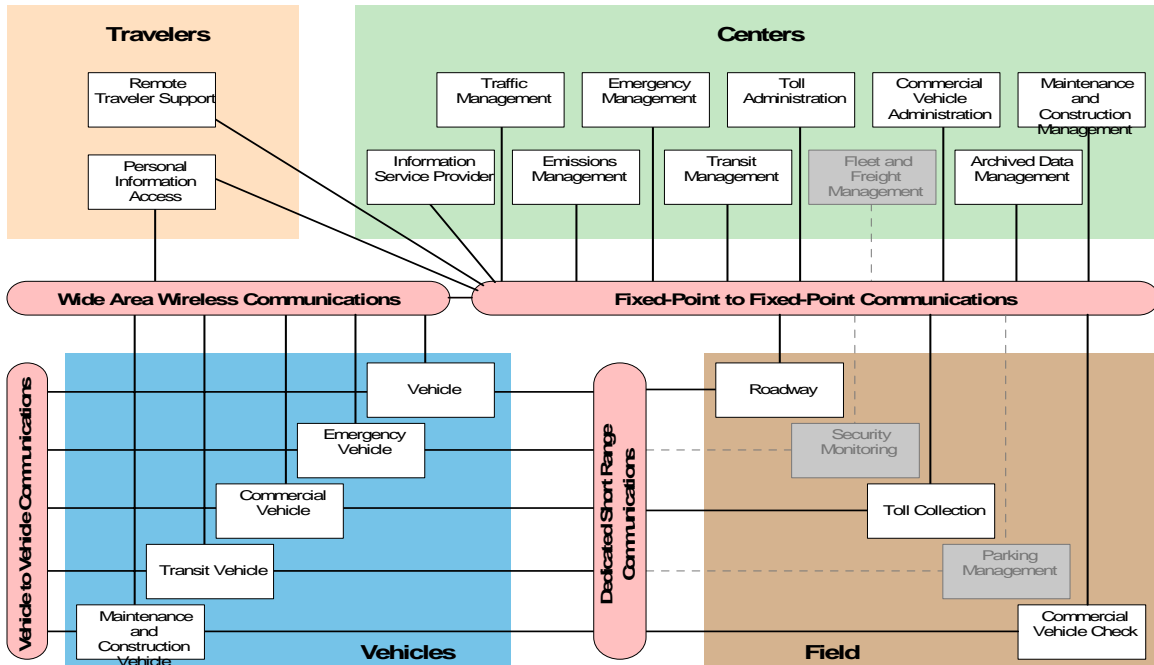

Figure 2. Wichita Area Regional ITS Architecture Subsystem Diagram

This architecture only touches upon the statewide systems like CVISN and 511. It is expected that the Kansas Statewide ITS Architecture will fully define the statewide ITS. The only subsystems not included in the region are:

- The Security Monitoring subsystem for monitoring critical assets as part of Homeland Security, and
- Fleet and Freight Management that defines private-sector fleet and freight operations.
- The Parking Management subsystem which monitors parking areas electronically.

At this time the architecture is focused on transportation services which do not include homeland security unique functions such as cameras used solely for security surveillance. Also at this time, there are no instrumented parking lots indicating available spaces or plans to have them. Since the Fleet and Freight Management subsystem is focused on the private sector it was not a priority to model these types of systems in this regional ITS

architecture. All other National ITS Architecture subsystems are represented by one or more elements in the inventory.

6.0   Stakeholders

The success of the regional ITS architecture depends on participation by a diverse set of stakeholders. In this step, the stakeholders in the regional surface transportation system are identified and the process of encouraging their participation in the regional ITS architecture development process is initiated. All stakeholders who either participated in the creation of the initial Wichita Area Regional ITS Architecture or whom the participating stakeholders felt were needed to be included in the architecture are documented in the three Volumes. Some stakeholders have been grouped in order to better reflect mutual participation or involvement in transportation services and elements. Stakeholder groups are indicated by the 🏿 graphic. Every stakeholder is related to one or more of the transportation inventory elements either as an individual stakeholder or as a member of a stakeholder group. There are currently 68 stakeholders (or stakeholder groups) included in the architecture.

7.0   Inventory

The process of creating an inventory of ITS systems starts with collecting information on existing and/or planned surface transportation elements. Surface transportation inventory elements for the Wichita Area Regional ITS Architecture are defined in Section 3 of the Volume 1 Architecture Document based on the inventory research task and/or stakeholder input. A transportation element can be a center (i.e., a Traffic Operations Center or Emergency Management Center), a vehicle, a traveler or field equipment (i.e., traffic signals, dynamic message signs, etc.). Each transportation element identified in the architecture has one or more stakeholders associated with it.

In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together. For example, *Suburban Emergency Dispatch Centers* element provides public safety dispatch in the suburban areas that are not covered by the Sedgwick County 911 system or the City of Andover 911 system. The Stakeholders in this group include the City of Derby, City of Hayesville, City of Mulvane and the City of Valley Center. Each transportation inventory element is mapped to at least one National ITS Architecture entity. Using the previous example, *Suburban Emergency Dispatch Centers* is mapped to the Emergency Management subsystem in the National ITS Architecture indicating that these Centers perform the incident management functionality of an Emergency Management Center.

There are currently 70 inventory elements included in the architecture. An example of an inventory element for the *Wichita Traffic Operations Center* is provided below:

   Element: Wichita Traffic Operations Center
   Status: Existing

Description: The Wichita TOC is responsible for managing and controlling traffic conditions on the arterials they operate.

Associated Stakeholder: Wichita Public Works

Mapped to Entity: Traffic Management

Project: Wichita Traffic Operations Center Signal Systems Upgrade

8.0   Services

In the previous task, an inventory of the existing and planned ITS systems in the region was developed. In this task, the ITS services provided by these systems to address regional needs are identified. This is the first step in determining what the system should do tomorrow that it doesn't do today. Through the task, a myriad of surface transportation services for the Wichita region have been identified. Some services (e.g., City of Wichita Network Surveillance) are specific to one primary stakeholder (e.g., the City of Wichita Public Works); while other services require multiple stakeholder participation in order to accomplish the given service.

An example of a region-wide service is the Regional Traffic Control service where KDOT's freeway management is coordinated with the arterial roadway management by the City of Wichita. Each transportation service depicts multiple transportation inventory elements along with information flows representing information content exchanges between the elements that are necessary to accomplish different level of each service. These information flows have directionality as indicated by the arrow pointing to the destination element. Also, each information flow has been given a timeframe status (e.g., Existing, Near Term, Medium Term and Long Term) as defined above.

Currently there are 62 existing and/or planned transportation services included in the architecture. The Regional Traffic Control service description is shown below while the Architecture Flow Diagram (including interconnects and information flows) is illustrated in Figure 3.

> **Service: Regional Traffic Control**
> *The Regional Traffic Control service (Figure 3) provides for the sharing of traffic information and control among the KDOT and Wichita Traffic Operations Centers to support a regional control strategy. This service advances the Surface Street Control and Freeway Control Services by adding the communications links and integrated control strategies that enable integrated inter-jurisdictional traffic control. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This service relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Services and adds hardware, software, and fixed-point to fixed-point*

communications capabilities to implement traffic management strategies that are coordinated between the KDOT and Wichita Traffic Operations Centers.
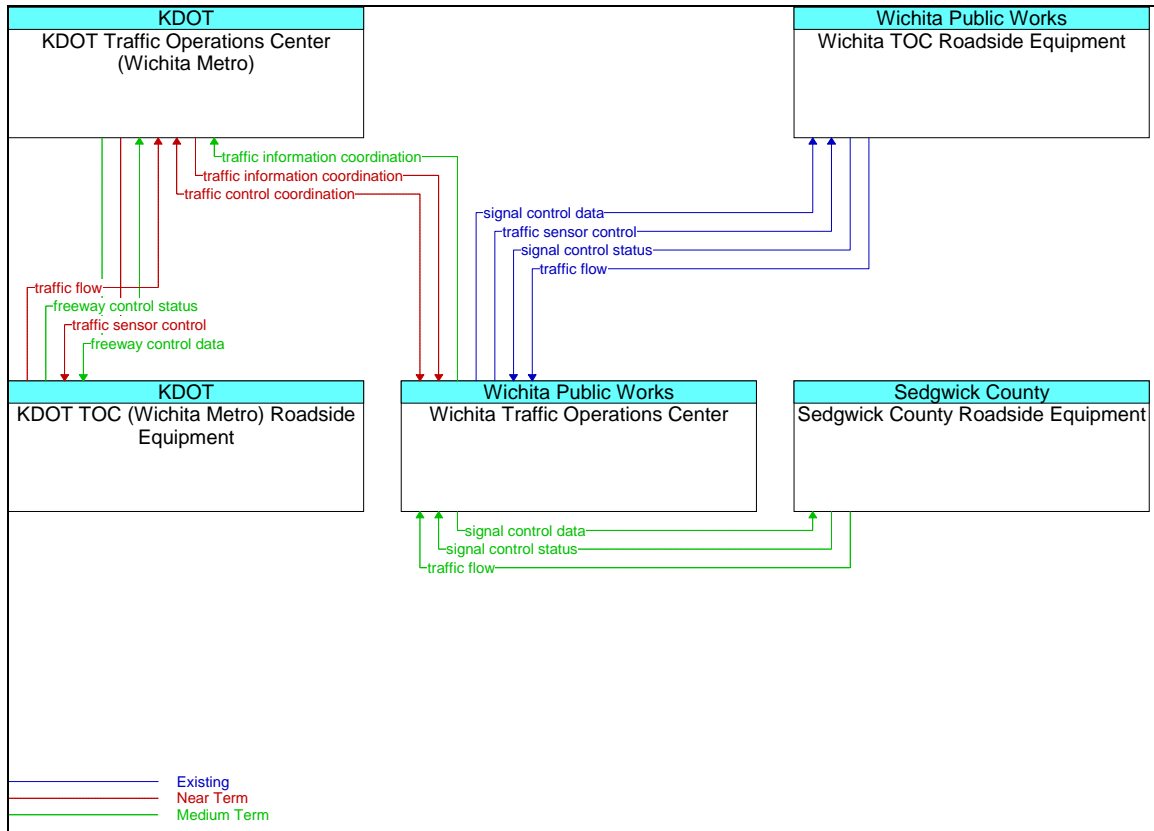

Figure 3. Regional Traffic Control Architecture Flow Diagram

9.0   Implementation Plan

During the development of the regional architecture, a number of projects were identified in the near, medium and long-term. The second section of the Implementation Plan describes how projects were selected and relates the projects to the overall ITS and transportation planning process. Section 3 of the Volume 2 Implementation Plan document describes each proposed project at a high-level. The following information is provided for each project:

- Project Category
- Project Number
- Project Title
- Time Frame
- Duration
- Project Costs
- Stakeholders
- Project Dependencies

- Expected Benefits
- Market Packages to Consider

The project numbers are used for reference purposes only and do not indicate any type of priority. Some project numbers have letters appended to them representing different phases of the same overall project.

Section 4 contains general project sequencing for the region. The deployment plan schedule shows the proposed projects, grouped by area of interest. The schedule follows a Near-Term Plan, a Medium-Term Plan, and a Long-Term Plan showing the project start time and duration followed by a table of capital costs, followed by another table of capital costs and projected operations and maintenance. This schedule is an estimate of when the projects are expected to occur but are heavily dependent on funding constraints, availability of resources and the changing needs of the region. It is more important to note the project dependencies so later projects do not get deployed before the earlier foundational projects. At the time this Version 1.2 of the regional architecture was published, the City of Wichita ITS Signal System Upgrade project and the Public Safety AVL project were in progress and the updated interface information status was added to the regional architecture. Section 5 describes applicable ITS Standards for the Wichita region as well as general information and recommendations. Section 6 contains a list of agency agreements and section 7 describes the Wichita Area Regional ITS Architecture Maintenance Plan.

10.0   Communications Plan

For a given project, each system element (e.g., center, vehicle or field device) included needs to be analyzed with regard to which architecture flows surrounding the element are part of the project. Once the scope of architecture flows interfacing to and from the project (and its elements) are determined, analysis of message realization via ITS standards as well as expected message frequency will all together provide an idea of the bandwidth required for that particular project. Communication services should take into account each individual project as well as other projects that potentially could leverage or share that communication service.

Section 2 of the Volume 3 Communications Plan document provides a comprehensive element needs assessment showing all the interface flows around each element. Section 3 describes currently available communications resources in the Wichita region. Section 4 contains planned communication resources in the Wichita region including WiMax. Section 5 analyzes these communication needs and includes high-level communication requirements for the region. Finally, Section 6 provides further analysis and recommendations for possible communication network architecture alternatives.

During the development of the regional architecture, a number of center-to-center, center-to-vehicle and center-to-field communications needs were identified for project development in the near, medium and long-term. The Communications Plan document

defines the needs for communication systems based on these data flow requirements established for center-to-center, center-to-vehicle and center-to-field applications.