DuPage County
Transportation Coordination Initiative (TCI)

FINAL
SUBREGIONAL INTELLIGENT TRANSPORTATION SYSTEMS (ITS) ARCHITECTURE

February 2007

Edwards and Kelcey

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DOCUMENT REVISION HISTORY

ITS Architecture Issue No.	*ITS Architecture Issue Date*	*Comment*
1.0	February, 2007	Initial release, National Architecture v5.1

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TABLE OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AVL	Automatic Vehicle Location
CAD	Computer-Aided Dispatch
CATS	Chicago Area Transportation Study
CCTV	Closed-Circuit Television
CMAQ	Congestion Mitigation and Air Quality (Improvement Program)
CVO	Commercial Vehicle Operations
DMMC	DuPage Mayors and Managers Conference
DMS	Dynamic Message Signs
DOT	Division of Transportation
Du-COMM	DuPage Public Safety Communications
ESDA	Emergency Services and Disaster Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GCM Corridor	Gary-Chicago-Milwaukee ITS Priority Corridor
GPS	Global Positioning System
HAR	Highway Advisory Radio
HOV	High Occupancy Vehicle (lane)
HRI	Highway Railroad Intersection
IDOT	Illinois Department of Transportation
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IFERN	Interagency Fire Emergency Radio Network
IREACH	Illinois Radio Emergency Assistance Channel
IRP	International Registration Plan
ISP	Illinois State Police
ISPERN	Illinois State Police Emergency Radio Network
ISTHA	Illinois State Toll Highway Authority
ITS	Intelligent Transportation Systems
ITSPO	Intelligent Transportation System Program Office
ITTF	Illinois Terrorism Task Force
IWIN	Illinois Wireless Information Network
LRTP	Long Range Transportation Plan
MABAS	Mutual Aid Box Alarm System
MDT	Mobile Data Terminal
MOE	Measures of Effectiveness
MPO	Metropolitan Planning Organization
NIMS	National Incident Management System
NTCIP	National Transportation Communications for ITS Protocol
PSAP	Public Safety Answering Point
RTA	Regional Transportation Authority
RTIP	Regional Transit ITS Plan

TABLE OF ACRONYMS

SAFETEA-LU	"Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" – authorizing legislation for federal transportation programs (2005 – 2009)
SEDP	Strategic Early Deployment Plan
SEOC	State Emergency Operations Center
STIP	Statewide Transportation Improvement Plan
TEA-21	"Transportation Equity Act for the 21st Century" – authorizing legislation for federal transportation programs (1998 – 2004)
TCI	Transportation Coordination Initiative
TIMS	Traffic and Incident Management System (Illinois Tollway), Train Information Management System (Metra)
TIP	Transportation Improvement Plan
TMC	Traffic Management Center
TSC	Traffic Systems Center
USDOT	United States Department of Transportation

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Foreword

Intelligent transportation systems (ITS) are the integrated application of various technologies and management strategies to provide traveler information to increase the safety and efficiency of the surface transportation system. This ITS architecture document represents the next in a series of steps intended to chart a course for ITS in DuPage County.

A regional ITS architecture is a framework for describing, planning, and implementing intelligent transportation systems. It is intended to promote integration between stakeholders by providing a common framework under which stakeholders in a region can build intelligent transportation systems. Once implemented, these systems can combine to increase the safety and efficiency of the surface transportation system. This DuPage County Subregional ITS Architecture builds upon elements of the Northeastern Illinois Regional ITS Architecture.

As a further incentive for the development of regional ITS architectures, the Federal Highway Administration (FHWA) developed a Rule and the Federal Transit Authority (FTA) developed a parallel Policy to enact Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) in April of 2001. This Rule/Policy states that, in order to receive funding for ITS through the Highway Trust Fund, any region in the United States that has deployed or will soon deploy ITS projects must develop a regional ITS architecture. As ITS projects are deployed in the region, DuPage will certainly fall within this category. Table 1 provides a reference for each of the FHWA/FTA Rule/Policy requirements, and the manner in which they are addressed in this Architecture Document.

The FHWA has provided a number of resources to assist architecture developers around the country with their task. First, the FHWA created the National ITS Architecture as a guide for the development of regional ITS architectures (www.iteris.com/itsarch/). Now in its fifth version, the National ITS Architecture provides architecture developers with a common vocabulary, promoting the integration and interoperability of ITS systems. The FHWA's "Regional ITS Architecture Guidance Document" (Oct. 12, 2001) elaborates on the Rule/Policy, providing recommendations for each stage of architecture development (see Figure 1). In addition, the FHWA developed Turbo Architecture® software as a tool for assembling, organizing, and displaying the information necessary to create and use an ITS architecture.

As the architecture "champion," the DuPage County Department of Economic Development and Planning and the Division of Transportation have led the effort to bring stakeholders together to create this DuPage County Subregional ITS Architecture, and will be responsible for the ongoing use and maintenance of this architecture. This Subregional Architecture has been developed to be consistent with the Chicago Metropolitan Agency for Planning (CMAP) Northeastern Illinois Regional ITS Architecture and the Illinois Department of Transportation (IDOT) Illinois Statewide ITS Architecture, thus providing a link between the various regional ITS architectures across Illinois.

Overall, this DuPage County Subregional ITS Architecture is intended to promote continued improvements in the movement of goods and people throughout the region through the implementation of ITS strategies, technologies, and projects. Most importantly, the deployment

of these ITS strategies, technologies, and infrastructure will help to make the DuPage transportation system safer, better coordinated, and more efficient. In addition, by taking a cooperative multi-agency approach, DuPage County and partner agencies will be able to better integrate ITS related efforts beyond their boundaries, pool funds, and deploy ITS technologies and projects that benefit not only the DuPage County, but the entire region.

Table 1 – Architecture Requirements Reference

ITS Architecture Requirement	Report Section Addressing Requirement
Architecture Scope and Region Description	The geographic area, timeframe, and service scope of the DuPage County Subregional ITS Architecture are provided in Sections 2.1-2.3 of this document.
Stakeholder Identification	A listing of stakeholders can be found in Section 2.4 and Appendix B of this document.
System Inventory	Section 3.1 contains a complete systems inventory (subsystems and terminators).
Needs and Services	Section 3.2 documents those needs identified by the stakeholders, as well as a listing of existing and planned services (market packages).
Operational Concept	The operational concept for DuPage County is defined in Section 4 of this document.
Functional Requirements	The functional requirements of the DuPage County Architecture are listed in Section 5 of this document.
Interfaces/Information Flows	Interfaces and information flows are described in Section 6 of this document. Individual interconnect diagrams are contained in Appendix C.
Project Sequencing	A listing of ITS projects and their anticipated sequence are addressed in Section 7 of this document.
Agreements	A listing of existing and planned agreements is included in Section 8 of this document.
Standards Identification	Applicable ITS Standards are included in Section 9 of this document.
Using the Regional ITS Architecture	Section 10 describes the manner in which the DuPage County Subregional ITS Architecture can be used to plan, design, and deploy ITS projects in the region.
Maintenance Plan	Section 11 outlines the tasks associated with maintaining the architecture.

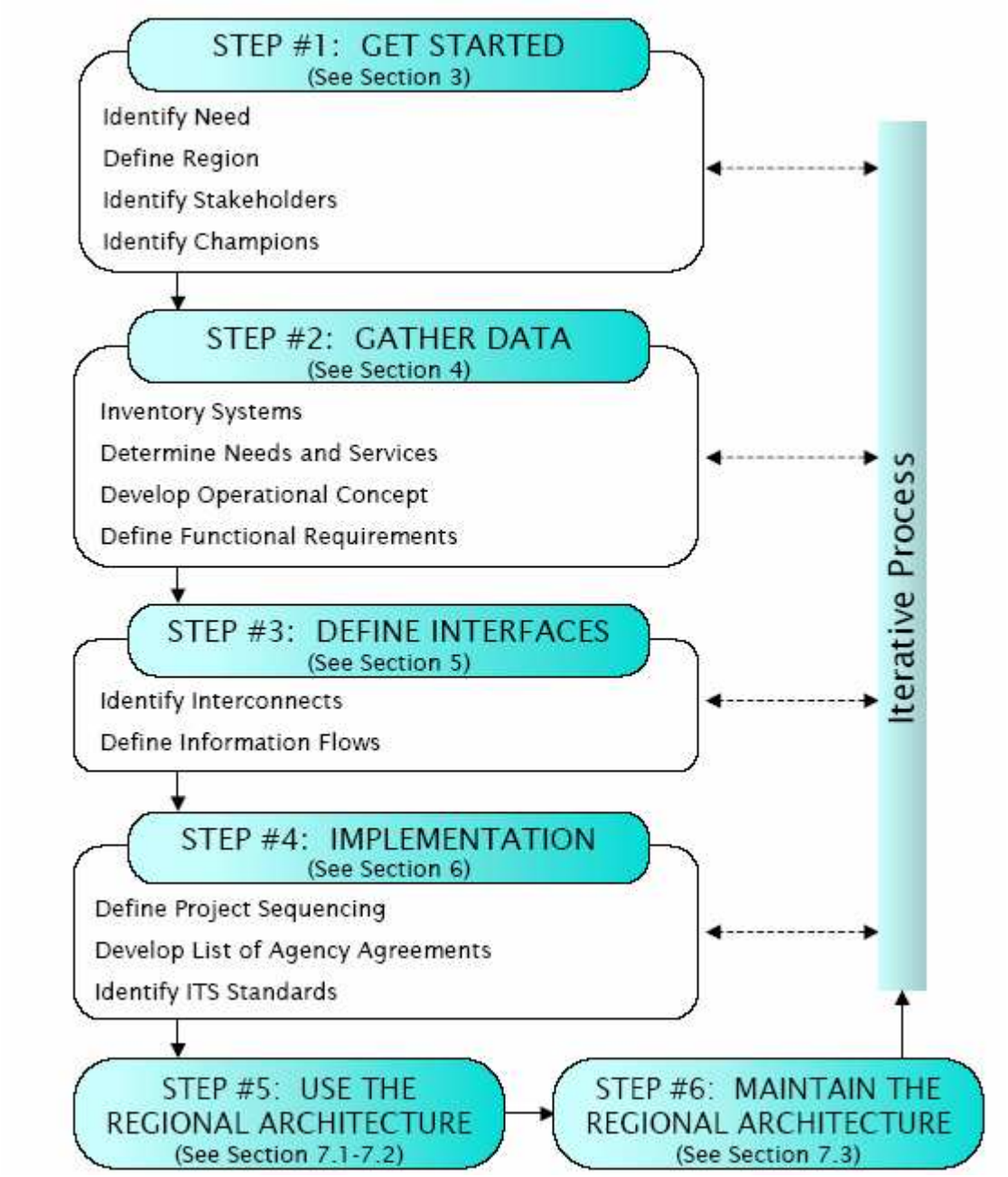

Figure 1 – Architecture Development Process Diagram

1. INTRODUCTION

The DuPage County Transportation Coordination Initiative (TCI) Strategic Plan consists of the following documentation:

- Concept of Operations technical memorandum (which includes the stakeholder Needs Assessment technical memorandum)
- ***DuPage County Subregional ITS Architecture document***
- Integration Strategies and Technologies technical memorandum
- Implementation Plan

This Architecture document describes the functions (existing, planned, and potential) associated with the transportation system in DuPage County. It identifies the resources (systems) that local agencies use to provide transportation services to the public. The architecture also describes the flow of information between these agencies that are necessary to provide coordinated services.

Building upon the Concept of Operations, this document represents the next step in the systems engineering process, depicted below in Figure 2.

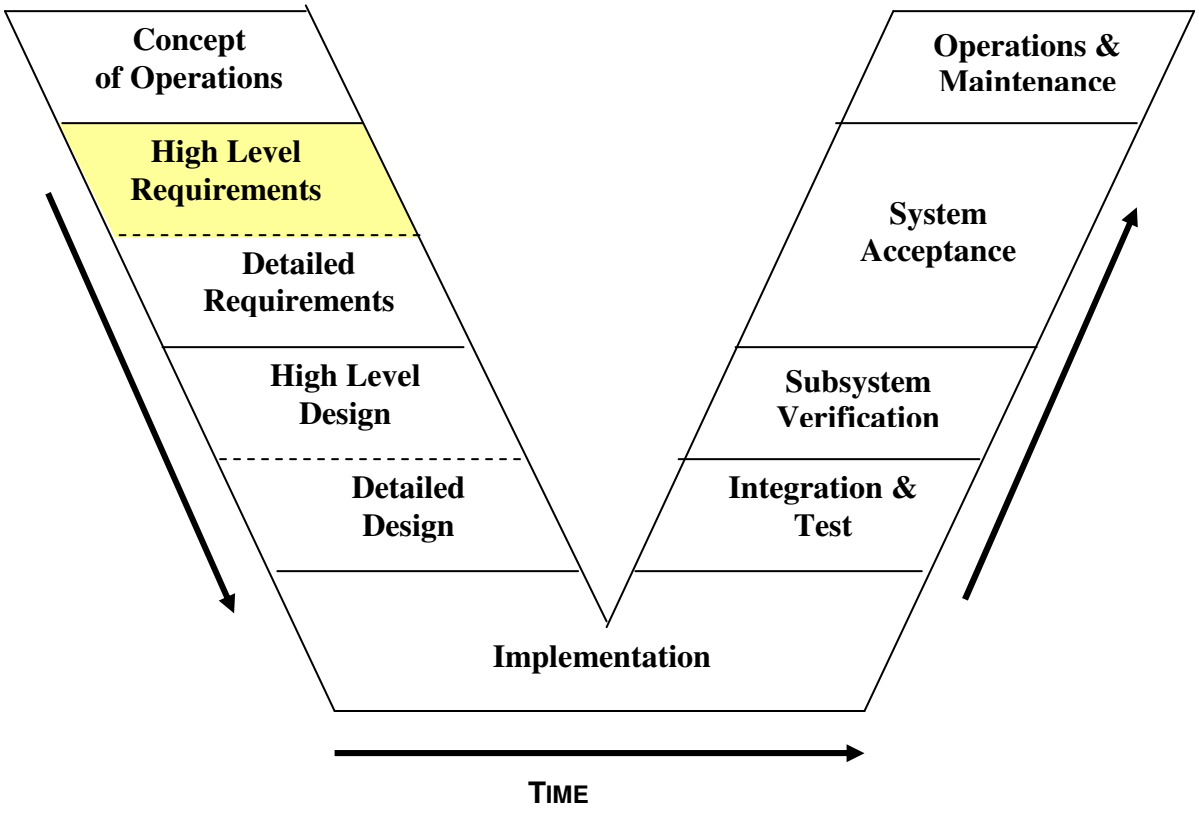

Figure 2 – "V" Diagram of Systems Engineering[1]

[1] Building Quality Intelligent Transportation Systems Through Systems Engineering, Mitretek, April, 2002.

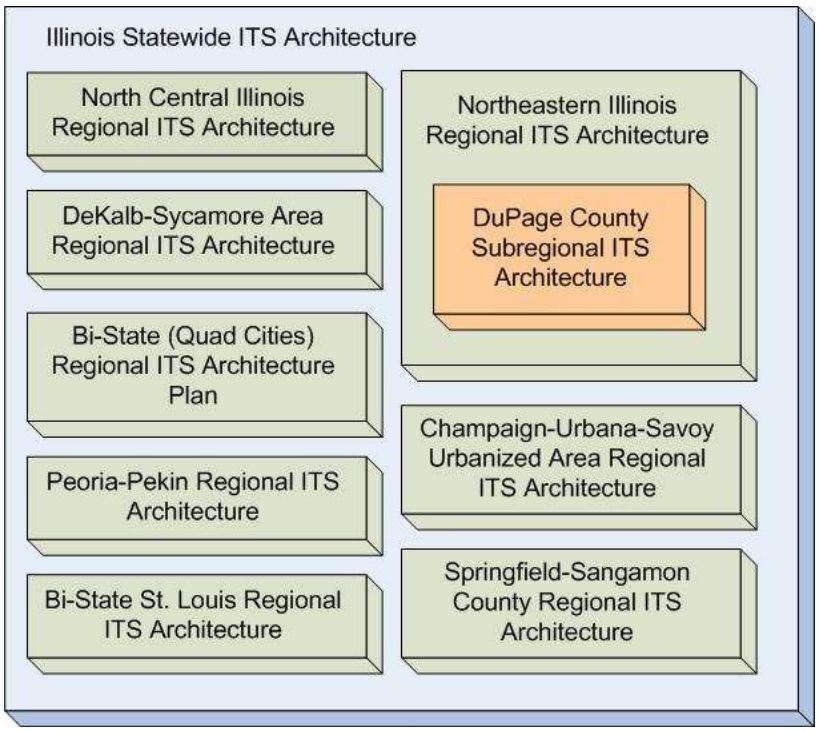

Figure 3 – Hierarchy of ITS Architectures in Illinois

In much the same way that the National ITS Architecture serves as a "template" for development of regional ITS architectures, the Northeastern Illinois Regional ITS Architecture, or 'Regional Architecture' (http://www.catsmpo.com/itsarc/illinois-final-arch/neil/neilintro.htm), serves as the platform for development of DuPage County Subregional ITS Architecture, or 'Subregional Architecture' (see Figure 3). Since DuPage County, surrounding counties, and many regional transportation agencies were involved in the development of the Regional Architecture, many of the stakeholders, systems, services, etc. contained in the Regional Architecture are critical to transportation operations in DuPage County, and are thus included in this Subregional Architecture (likewise, Regional Architecture elements that do not apply to DuPage County have not been included in the Subregional Architecture). However, the sheer size of the Regional Architecture limits the amount of detail that it can contain. This means that many ITS initiatives at the local and even county level are not explicitly included in the Regional Architecture. To remedy this situation, this Subregional Architecture has been developed to include a next level of detail specifically tailored to DuPage County.

Throughout the Subregional Architecture development process, an effort was made to maintain the attributes and conventions of the elements imported from the Regional Architecture while adding new elements for DuPage County. Where applicable, systems which are outside of DuPage County, but interact with systems inside the county, are grouped together into generic entities while preserving their common functionalities. For instance, the Lake County TMC (Lake County "PASSAGE"), the planned Will County TMC, and the future Kane County TMC were grouped together as "Other County TMC." These generic systems maintain the same interactions with DuPage systems as their individual predecessors. A similar approach was taken for market packages, functional requirements, interconnects, and the other overlapping

components of the Regional Architecture. This approach to Subregional Architecture development is intended to retain the integrity of the Regional Architecture elements while still keeping the Subregional Architecture to a manageable size.

To highlight the links between Regional and Subregional Architectures, common elements between the two are highlighted throughout this architecture document and any suggested modifications to the Regional Architecture element attributes are shown in italics. These suggested changes have also been collected in Appendix A.

1.1 The Transportation Coordination Initiative (TCI)

The DuPage County Transportation Coordination Initiative represents the efforts of numerous transportation stakeholders over a number of years to improve the operation and management of the transportation system in the County. The TCI builds upon work that began in the late 1990s with the development of the "Multi-Jurisdictional Signal Coordination and Monitoring Demonstration Project" and corresponding "Guidelines for the Implementation of Multi-Jurisdictional Signal Coordination and Monitoring."[2]

The TCI is led by a Steering Committee that consists of the following organizations/agencies:

- DuPage County Division of Transportation (DCDOT)
- DuPage Mayors and Managers Conference (DMMC)
- DuPage County Office of Homeland Security and Emergency Management (OHSEM)
- Illinois Department of Transportation (IDOT)
- Illinois State Toll Highway Authority (ISTHA)
- Regional Transportation Authority (RTA)
- Chicago Metropolitan Agency for Planning (CMAP)
- City of Naperville
- Village of Lombard
- Village of Oak Brook
- Village of Downers Grove

These agencies and many others have key roles in the development of the TCI Strategic Plan, including meeting participation, document review, and funding support.

The TCI is directed at four focus areas:

- **Arterial Operations** – improvements to local and regional traffic signal control and coordination, highway-rail intersection operations, and arterial-freeway link coordination
- **Transit Management** – improvements to transit efficiency and coordination with other transportation modes
- **Traffic Incident Management** – improvements to the detection, response, and resolution of planned and unplanned incidents on the transportation system

[2] Parsons Transportation Group, 2001.

- **Traveler Information** – improvements to the collection, processing, and dissemination of timely, useful, and accurate traveler information

It is these four focus areas that serve as the basis for operational improvements as part of this document. Each focus area is discussed in greater detail in subsequent sections.

1.2 Definition of Intelligent Transportation Systems (ITS)

Intelligent transportation systems can be defined as "the integrated application of sensor, computer, electronics, and communications **technologies and management strategies** to provide traveler information to increase the **safety and efficiency** of the surface transportation system." Or, simply put,

People using technology in transportation to save time, lives, and money

The most visible ITS components are the physical infrastructure that interface with the traveling public. This "intelligent infrastructure" includes the following components[3]:

- Arterial Management Systems
- Freeway Management Systems
- Transit Management Systems
- Incident Management Systems
- Emergency Management Systems
- Electronic Payment Systems
- Traveler Information
- Information Management
- Crash Prevention and Safety
- Roadway Operations and Maintenance
- Road Weather Management
- Commercial Vehicle Operations
- Intermodal Freight

In addition, emerging in-vehicle technologies are creating an "intelligent vehicle" initiative that includes the following components[4]:

- Collision Avoidance Systems
- Collision Notification Systems
- Driver Assistance Systems

In order for these intelligent transportation systems to be most effective, they must work together in an integrated manner. This less visible integration component requires various wireline and wireless communications systems to support the exchange of data between management centers, personnel, vehicles, field devices, and the traveling public.

[3,4] USDOT ITS Joint Program Office website – Technology Overview

Before this level of integration can be realized and ITS can be deployed, transportation managers must identify a framework upon which ITS should be built. This framework should:

- Identify ITS goals and objectives – a concept of how ITS will be operated;
- The various stakeholders and systems that are involved;
- The transportation services that partner agencies perform or plan to perform;
- Individual functional requirements for deployment of ITS;
- Functional links between partner agencies and the data exchanged over those links;
- Applicable standards that apply to the exchange of information; and
- Any applicable or necessary agreements between partner agencies.

Acknowledging the need for this framework before deploying ITS, in 2001 the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) developed a rule/policy that requires regions that plan to deploy ITS to develop a regional ITS architecture in order to receive Federal funding for such projects. As a result, various ITS architectures have been developed across the state and the region to provide a framework for the planning, deployment, and operation of ITS in Illinois.

There are several proven benefits to the implementation of ITS systems. These benefits are typically measured by an increase in system capacity/throughput, cost savings, increased customer satisfaction, reductions in delay/travel time, reduced energy usage/environmental impacts, and improved safety. ITS projects often provide a high return on investment, some with cost-to-benefit ratios of 20:1 or more, partly because they leverage existing infrastructure, instead of creating more infrastructure that must then be maintained.

1.3 TCI Vision

Before intelligent transportation systems can be effectively deployed, ITS stakeholders should come together to develop a common vision for ITS. This vision statement is a key component of the TCI Strategic Plan because it provides overall direction for the identification of stakeholder needs, operational concepts, potential ITS strategies and technologies, and ultimately the final recommendations.

During the project kickoff meeting held on March 23, 2006, key transportation and public safety representatives worked together to develop a vision for ITS in DuPage County. During the visioning exercise, a number of key words and phrases were considered for inclusion in the vision statement. These are:

- Coordination
- Communication
- Cooperation
- Promote true intermodal choices
- Resilient systems
- Efficient
- Safety
- Integrated
- Maintain a broader perspective
- Reliable
- Secured system
- Multi-jurisdictional integration
- Effective
- Dynamic

- Responsive
- Maintainable/sustainable
- User friendly
- Include public awareness
- NIMS-compliant
- Simple/affordable in structure
- State of the art
- Keep it simple
- Building institutional and technological bridges

The resulting vision statement is:

> *"Build a resilient, sustainable, technologically advanced, multi-modal transportation system that provides practical, safe, accessible and coordinated movement of people and goods throughout DuPage County and the region"*

The vision statement is intended to serve as guidance for the planning and deployment of ITS in DuPage County for the next 10 years, and should be continually reevaluated to ensure that it accurately captures the needs and goals of travelers and transportation stakeholders in the region.

1.4 TCI Goals and Objectives

As traffic volumes and congestion grow, it has become evident that the physical infrastructure of the roadway system in DuPage County has a practical limit. As such, the Transportation Coordination Initiative is intended to provide recommendations for the deployment of ITS technologies and operational strategies in DuPage County that can maximize the capacity of the network. These deployments should:

- Improve traffic system performance and transit services – past studies in DuPage County have demonstrated that signal timing optimization and signal coordination can improve travel speeds and reduce delays.
- Reduce travel times – improvements to signal control systems in the last decade have kept average arterial travel times in DuPage County in check; these improvements will need to continue to keep pace with ever increasing traffic volumes.
- Enhance incident management and coordination – incidents account for at least half of non-recurring travel delay in urban areas[5]; improvements in traffic incident management (TIM) coordination between transportation agencies and emergency responders can result in reduced response times and thus reduced driver delay.
- Improve traveler information services throughout the County – through improved data collection, storage, processing, sharing, and dissemination, travelers in DuPage County can make better, more informed decisions.

Above all, recommendations resulting from the TCI should provide discrete objectives and actionable projects that will support these goals.

[5] Traffic Incident Management on Highways, Rutgers University

2. ARCHITECTURE SCOPE

Before creating an ITS architecture, it is necessary to define the general parameters of the architecture. These parameters include the geographic area, timeframe, service scope, and involved stakeholders of the architecture. Setting these architecture boundaries leads to the tasks in subsequent steps.

2.1 Geographic Area

DuPage County serves as the geographic area for the DuPage Subregional ITS Architecture (Figure 4). The transportation network in DuPage County consists of the roadway system (expressways/Tollways, arterials, collectors) and transit services such as Pace, paratransit, and Metra commuter rail.

2.2 Timeframe

For the purposes of this architecture, the timeframe has been set at ten (10) years from the date of this document, or 2017. As such, this Subregional Architecture defines the ITS functionality that 1) currently exists (defined with an "existing" status); 2) is expected for deployment in the next five years ("planned" status), and 3) functionality that may develop within the ten-year horizon, based on current findings ("proposed" status). Defining an architecture timeframe provides a basis for determining the status of ITS systems, services, and interconnections, as identified in later steps.

2.3 Service Scope

Before delving into the particular ITS services that are found in DuPage County (described in detail in Section 3.2), it should be noted that several statewide ITS services have been excluded from this Subregional Architecture and are instead contained within the Regional or Statewide ITS Architectures. These include commercial vehicle services, and other ITS services that are administered from a single statewide agency, such as the Department of Motor Vehicles, the Environmental Protection Agency, and the Department of Revenue.

2.4 Stakeholders

From the onset of architecture development, every effort was made to include as many ITS stakeholders as possible. This outreach process resulted in a stakeholder group comprised of a comprehensive list of surface transportation agencies and organizations. Below in Table 2 is a listing of these stakeholders with descriptions as designated in the Turbo Architecture® database. Appendix B includes a listing of stakeholders that participated in the architecture workshops.

As shown in Table 2, some stakeholders are explicitly identified in the architecture (e.g., 'City of Naperville Public Works Department), while others are combined within a general stakeholder designation (e.g., 'Municipalities'). This was done to include as many ITS stakeholders as possible while keeping the architecture to a manageable size.

Figure 3 – DuPage County Map

Table 2 – Architecture Stakeholder List

Stakeholder Name	Stakeholder Description
Amtrak	Nationwide Passenger Rail Organization with regional hub in Naperville.
Area Media Outlets	Television, Radio, and Print Media. Includes TV network affiliates, WGN, radio stations, Chicago Tribune, Chicago Sun-Times and others.
Argonne National Laboratory	This is an academic organization involved in research in the transportation industry.
City of Chicago Department of Aviation	City agency that manages the Chicago Airport System, which is comprised of two major airports - Chicago O'Hare International Airport and Midway Airport.
Chicago Metropolitan Agency for Planning (CMAP)	The Metropolitan Planning Organization (MPO) of the Chicago metropolitan area.
Chicago Bureau of Convention and Tourism	The sales and marketing organization charged with bringing both business and leisure visitors to Chicago, actively booking group meetings at McCormick Place and Navy Pier, and promoting Chicago as a destination to the visitor industry.
DuPage County Department of Economic Development and Planning	Agency responsible for planning, feasibility studies, and/or financing of all transportation related programs in the county.
DuPage County Division of Human Services	Department of DuPage County responsible for enabling and equipping people with needs in DuPage County to become self-sufficient and lead enriched productive lives.
DuPage County Division of Transportation	*The Division of Transportation is responsible for the construction and maintenance of the County Highway system which serves the over 900,000 residents of DuPage County. The Division of Transportation maintains approximately 220 miles of arterial highway and 50 miles of recreational trails in DuPage County.*
DuPage County G.I.S.Department	Responsible for meeting all mapping and G.I.S. data needs in the county.
DuPage County Highway Maintenance Department	The Maintenance Department operations include road and path reconstruction and maintenance, bridge repair, right-of-way maintenance, and snow plowing.
DuPage County Hospitals/ Medical Centers	*Represents DuPage County hospitals/medical centers.*
DuPage County Office of Homeland Security and Emergency Management	*The Office of Homeland Security and Emergency Management coordinates the operations of all governmental and non-governmental agencies in time of emergency and provides the unique skills and capabilities related to disaster preparedness.*
DuPage County Sheriff	*The Sheriff is the chief law enforcement officer in DuPage County. The Office directly services the unincorporated areas of the county providing public safety dispatch and emergency call taking.*
DuPage Mayors and Managers Conference	The DuPage Mayors and Managers Conference is a council of 36 municipal governments in DuPage County. The Conference is a not-for-profit organization dedicated to addressing municipal public policy issues.
Emergency Traffic Management Group*	For a large-scale traffic event, the Emergency Traffic Management Group (County Division of Transportation, OHSEM, GIS Department, Sheriff, and Public Information) would convene at the CMC, consider the scenario, develop a plan, and contact the other affected agencies (via EMnet) to enact the plan.
Illinois County Emergency Services	*Represents the agencies that own and operate EOCs in adjacent counties (Will, Kane and Cook). Responsible for providing comprehensive emergency management system that integrates all departments, levels of government, and the private sector during disasters.*
Illinois County Highway Departments	Represents the Highway Departments in adjacent counties (Will, Kane and Cook). Responsible for developing, operating, and maintaining County highways, including pavement patching, mowing, tree branch trimming and snow and ice control.

Stakeholder Name	Stakeholder Description
Illinois County Sheriff Departments	Represents the Sheriff Departments in adjacent counties (Will, Kane and Cook). Provides public safety dispatch and emergency call taking services for these counties.
Illinois Dept of Transportation Bureau of Information Processing	The IDOT Central Bureau of Information Processing (BIP) is responsible for information technology (IT) applications throughout IDOT, including hardware and software procurement and integration.
Illinois Dept of Transportation District 1 Bureau of Construction	Bureau under IDOT District 1 - Project Implementation responsible for the construction of the state highway system and the state's local roads and streets.
Illinois Dept of Transportation District 1 Bureau of Electrical Operations	Bureau under IDOT District 1 - Operations responsible for the operations of electrical equipment along the state highway system and the state's local roads and streets.
Illinois Dept of Transportation District 1 Bureau of Local Roads	Division of IDOT that is responsible for coordination and administration of highway improvement projects on the state's local roads and streets.
Illinois Dept of Transportation District 1 Bureau of Maintenance	Bureau under IDOT District 1 - Operations responsible for the maintenance of the state highway system and the state's local roads and streets.
Illinois Dept of Transportation District 1 Bureau of Traffic	Bureau under IDOT District 1 - Operations responsible for the design of traffic control equipment along the state highway system and the state's local roads and streets.
Illinois Dept of Transportation Division of Traffic Safety	Division of IDOT that is responsible for highway safety activities, inspection of school buses, trucks and ambulances; and overseeing the transportation of hazardous materials.
Illinois Dept of Transportation ITS Program Office	Illinois Dept of Transportation ITS Program Office is a part of the IDOT Office of Programming and Planning. It houses the Gateway Traveler Information System.
Illinois Dept of Transportation Operations	Group in IDOT that includes Bureau of Highway Administration and Bureau of Operations.
Illinois Emergency Management Agency	State agency responsible for coordinating voluntary relief organizations and local, state, and federal EM agencies during emergencies
Illinois State Police District 15	State police district dedicated to serving the Illinois Tollways.
Illinois State Police Districts 2	*State police district that covers the DuPage County.*
Illinois State Police Group*	A general stakeholder entry for the Illinois State Police used when reference is to the agency in general vs to a specific district.
Illinois State Toll Highway Authority	The authority responsible for providing and promoting a safe and efficient system of toll supported highways while ensuring the highest possible level of service its motorists.
Independent School Districts	*Represents the many school districts within the county.*
Metra	Regional commuter rail agency that provides service from downtown Chicago to the outlying suburbs.
Municipalities	Represents over 40 municipalities located in DuPage County, including Downers Grove, Addison, Wheaton, Elmhurst, Aurora, Wood Dale, West Chicago, Bartlett, Bensenville, Bloomingdale, Bolingbrook, Burr Ridge, Carol Stream, Glen Ellyn, Hanover Park, Hinsdale, Itasca, Lisle, Lombard, Oak Brook, Roselle, Villa Park, Westmont Willowbrook, and Woodridge.
Pace	A public transportation provider for the Chicagoland area with a focus on travel between the suburbs and the City.
Private Bus Agencies	Represents private bus companies such as Greyhound.
Private Hazmat Agencies	Private companies with hazardous materials response teams.

Stakeholder Name	Stakeholder Description
Private ISPs	Private Information Service Providers, such as Westwood One (which includes Shadow Traffic and Metro Networks) and Mobility Technologies.
Private Parking Operators	*Operators at private parking facilities operating in the county.*
Private Sector Maintenance Contractor	Private maintenance contractors who perform maintenance on regional signal systems, HAR, DMS, lighting systems, and pumping stations.
Private Taxi Companies	*Represents private taxi companies operating in the county.*
Private Towing Companies	*Represents private towing companies operating in the county.*
Private Trucking Companies	*Includes private commercial fleet management operations in the county*
Private Weather Information Providers	Private Companies who provide customized transportation weather information.
Rail Freight Operators	*Rail operators at the operations centers of private rail firms operating in the county.*
Regional Event Organizations	Represents the many organizations whose facilities hold events that have significant impact on traffic or transit.
Regional Transportation Authority	The financial oversight, regional planning, and funding body for the three public transit operators in Northeastern Illinois: the Chicago Transit Authority (CTA), Metra commuter rail and Pace suburban bus.
Travelers	*Users of DuPage County transportation systems.*
Utility Companies	Represents utility companies including electric power, gas, communication, and water.

Elements common to both the Regional (Northeastern Illinois) and DuPage Subregional ITS Architectures (text in *italics* represents modifications to the Regional Architecture names/descriptions)

* Turbo Architecture "stakeholder group"

Appendix B provides a comprehensive listing of all of the project stakeholders and primary contacts for each agency/organization.

3. INVENTORY

To build a foundation for the DuPage Subregional ITS Architecture, a research effort was undertaken to collect and analyze the numerous ITS-related documents that have been created to-date. These documents record the progress of ITS planning and deployment in the region.

The documents include the following:

- 2005 DuPage County Preliminary Comprehensive Road Improvement Plan
- Naperville Intelligent Transportation Systems Plan
- Northeastern Illinois ITS Deployment Plan Update – Final Report
- DuPage County Economic Development and Planning Department Phase II Staff Report "Highway-Rail Crossings in DuPage County"
- Regional Transit Signal Priority Location Study – Phase II, Model Simulation April 18, 2003.

These documents, along with the results of the stakeholder outreach process, provide the ITS inventory that serves as the starting point for this ITS architecture.

3.1 Systems

A 'system' can be defined as:

A collection of hardware, software, data, processes, and people that work together to achieve a common goal.

In the realm of ITS, a system corresponds to the resources of a surface transportation agency. In general, these resources can be categorized as centers (e.g., Traffic Management Center), field elements (e.g., freeway surveillance devices), vehicles (e.g., transit vehicles), or devices that interact with travelers (e.g., traveler information website). The National ITS Architecture includes entities ('subsystems' and 'terminators') that correspond to the real-world examples previously given. Figure 4 displays the National ITS Architecture Subsystem Interconnect Diagram, which shows these subsystems and the potential links between them, including the type of communications media that each link would use.

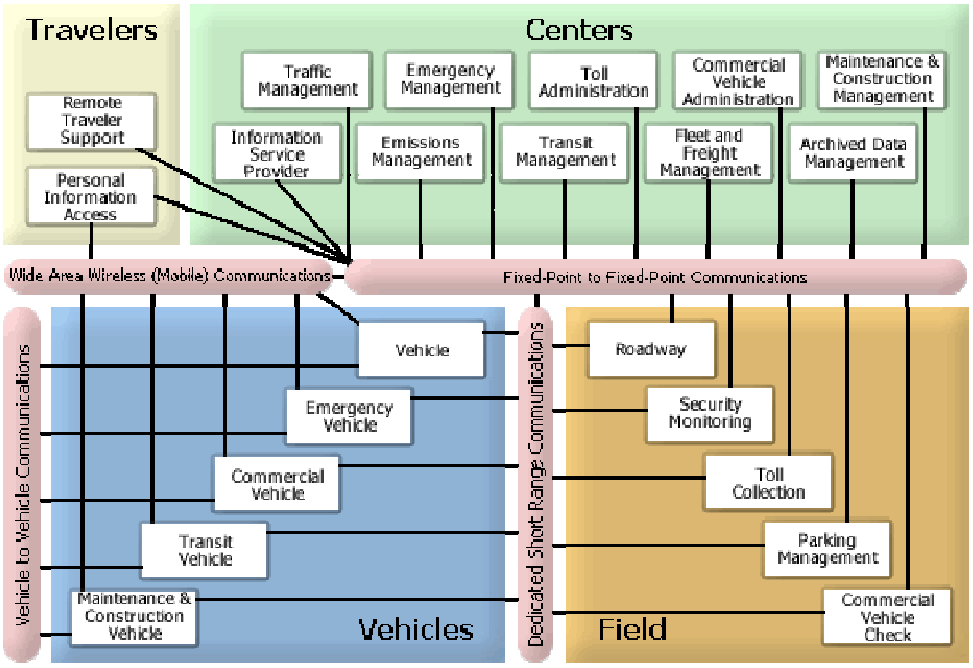

Figure 4 – National ITS Architecture Subsystem Interconnect Diagram

Table 3 provides a listing of the systems identified in the DuPage region, along with the associated stakeholder, National ITS Architecture entity, status, and a brief description.

Table 3 – DuPage ITS Systems Inventory

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Academic/Research Organizations Data Warehouse	*Argonne National Laboratory*	Archived Data Management / Archived Data User Systems	Planned	A data warehouse of traveler information data jointly developed by Argonne National Labs and University of Illinois at Chicago.
AMTRAK Rail	Amtrak	Multimodal Transportation Service Provider / Rail Operations	Planned	Local passenger train terminals that provide access to Amtrak service.
Automated Railroad Crossing Enforcement System	Municipalities	Roadway	Existing	Cameras installed at highway-rail intersections in Naperville and Wood Dale to record vehicles who are in violation of the warning signals of an approaching train
Computer-Aided Management of Emergency Operations (CAMEO)	DuPage County Office of Homeland Security and Emergency Management	Archived Data Management Subsystem/Emergency Management	Existing	CAMEO is a HAZMAT tracking system used to plan for and respond to chemical emergencies.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Construction Information Database System	DuPage County Division of Transportation	Archived Data Management / Maintenance and Construction Management	Potential	Central repository for information regarding the various construction projects being undertaken to the various agencies in DuPage County (would replace current OHSEM paper database).
Crisis Management Center (CMC)	Emergency Traffic Management Group	Emergency Management	Existing	Provides a control point for critical agencies in the County to coordinate their actions during a major incident
Critical Analysis Module (CAM)	DuPage County Office of Homeland Security and Emergency Management	Archived Data Management	Existing	CAM is and GIS-based, Internet-based tool that uses the CILM database to model areas affected by an incident; used to identify affected population, necessary roadway closures, etc. for on-site incident management using tablet computers
Critical Infrastructure Location Manager (CILM)	DuPage County Office of Homeland Security and Emergency Management	Archived Data Management/Emergency Management	Existing	GIS database of critical infrastructure in DuPage County (as specified by the FBI and participating agencies within DuPage County), including schools, elderly care centers, etc.
Disaster Management Information System (DMIS)	DuPage County Office of Homeland Security and Emergency Management	Emergency Management	Planned	Provides automated support for management of disaster situations, including event logging, road closures, shelter and hospital loading, damage assessment.
DuPage County Arterial Travel Time Probe Information Database	DuPage County Division of Transportation	Archived Data User System	Existing	Periodic detailed travel time probes that are available online.
DuPage County EOC	DuPage County Office of Homeland Security and Emergency Management	Emergency Management / Archived Data User System	Existing	DuPage County Emergency Operations Center. This EOC is staffed 24/7. It has a larger role in the region than other county EOCs, acting as a regional EOC (actually for a larger 15 county area of the state). Also maintains countywide road closure information.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
DuPage County Field Equipment	DuPage County Division of Transportation	Roadway Subsystem	Existing	Traffic signals, pedestrian signals, traffic sensors, environmental sensors, CCTV, and dynamic message signs owned and operated by DuPage County Division of Transportation. Currently the Division has video image detection for roadway system monitoring and traffic signal preemption for emergency vehicles. The remainder of the types of elements in the description are planned for the future. The transit signal priority capabilities are also being planned. Will also be able to provide video to its maintenance department in future.
DuPage County Highway Maintenance Dispatch	DuPage County Highway Maintenance Department	Maintenance and Construction Management	Existing	Operations and dispatch of DuPage County Highway Maintenance vehicles and equipment.
DuPage County Highway Maintenance Vehicle	DuPage County Division of Transportation	Maintenance and Construction Vehicle	Existing	Maintenance vehicles used to perform snow removal, roadway treatment and roadway maintenance.
DuPage County Hub	DuPage County Division of Transportation	Archived Data User System	Potential	Collection point for countywide traffic, incident, construction, weather, etc. data.
DuPage County Pavement Maintenance Database	DuPage County Division of Transportation	Archived Data User System	Existing	An existing database that identifies pavement type, class, features, rating and historical repair elements
DuPage County Sheriff Communications Center	DuPage County Sheriff	Emergency Management	Existing	*Public Safety Answering Point (PSAP) operated by the DuPage County Sheriff. Provides 911 call-taking and public safety dispatch for unincorporated areas of the county and cell phone calls throughout the county. Oversees the DuPage Interoperable Radio System (DIRS), a common emergency frequency during incidents.*

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
DuPage County Sheriff Emergency Vehicles	DuPage County Sheriff	Emergency Vehicle	Existing	Sheriff vehicles with mobile data terminals that can be used to access information from dispatch. All vehicles are equipped with EVP transmitters and are will soon have automatic vehicle location (AVL) capabilities.
DuPage County TMC	DuPage County Division of Transportation	Traffic Management/ Archived Data User System	*Existing*	Traffic Management Center for DuPage County operated roadways. Currently, DuPage County manages surface street signal control. In the future, functions may include system monitoring, data storage, and operational coordination.
DuPage County Traffic Signal Inventory	DuPage County Division of Transportation	Archived Data Management	Existing	Signal database that includes 50 fields of information per intersection. It also maintains an inventory of its sign posts in GIS format.
DuPage County Web-based Traffic Accident Record System	Municipalities	Archived Data Management	Existing	An initiative to bring traffic accident data from constituent municipalities, the DuPage Sheriff's Office and the County Division of Transportation into one central traffic accident database.
Hazmat Management and Cleanup	Private HAZMAT Agencies	Fleet and Freight Management	Planned	Private agencies that specialize in Hazmat cleanup.
Highway Emergency Lane Patrol Vehicles	Illinois State Toll Highway Authority	Emergency Vehicle Subsystem	Existing	Highway Emergency Lane Patrol (HELP) Vehicles to provide service patrol on Thruways.
Highway Rail Crossing Notification System	DuPage County Division of Transportation	Roadway Subsystem	Potential	Advanced highway rail information system for notification of highway rail crossing blockages
IDOT District 1 Bureau of Construction	Illinois Department of Transportation District 1 Bureau of Construction	Maintenance and Construction Management	Existing	Operations and dispatch for IDOT construction vehicles and equipment.
IDOT District 1 Bureau of Traffic-Expressway Operations Unit	Illinois Department of Transportation District 1 Bureau of Traffic	Maintenance and Construction Management	Existing	This unit handles approval of lane closures and distributes information regarding closures on the expressway system. Provides info to Illinois Gateway.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
IDOT District 1 Bureau of Traffic Signal Unit	Illinois Department of Transportation District 1 Bureau of Traffic	Traffic Management	Existing	IDOT District 1 Arterial Signal Systems. IDOT Traffic Signal Systems include over 250 coordinated signal systems, operating over 4000 intersections.
IDOT District 1 Bureau of Traffic Signal Unit Field Equipment	Illinois Department of Transportation District 1 Bureau of Traffic	Roadway Subsystem	Existing	*Roadside equipment for IDOT District 1 Bureau of Traffic Signal Unit. Includes traffic signals (including detection), EVP, CCTV cameras, and arterial DMS.*
IDOT District 1 ComCenter	Illinois Department of Transportation District 1 Bureau of Electrical Operations	Archived Data Management / Emergency management / Information Service Provider / Maintenance and Construction Management / Traffic Management	Existing	The Communications Center acts as the 24-hour incident management and operations center for IDOT District 1 and has control over the HAR system and the Kennedy Expressway reversible lane control (RevLac) system. During the TSC off hours, the ComCenter may operate the TSC's DMS. Provides info to Illinois Gateway.
IDOT District 1 ComCenter Field Equipment	Illinois Department of Transportation District 1 Bureau of Electrical Operations	Roadway Subsystem	Existing	RevLac system on the Kennedy Expressway, including CCTV, DMS, HAR, and advance signing.
IDOT District 1 Maintenance Management	Illinois Department of Transportation District 1 Bureau of Maintenance	Maintenance and Construction Management	Existing	Represents Duty Engineer and Operations Area Engineer.
IDOT District 1 Maintenance Yards	Illinois Department of Transportation District 1 Bureau of Maintenance	Equipment Repair Facility / Storage Facility	Existing	This element represents the IDOT District 1 maintenance yards that provide materials storage and equipment repair.
IDOT District 1 Traffic Systems Center (TSC)	Illinois Department of Transportation District 1 Bureau of Traffic	Information Service Provider / Traffic Management	Existing	The TSC is responsible for managing congestion on IDOT's District 1 expressway system. The TSC is also responsible for distributing congestion information to the public and to independent service providers and to the Illinois Gateway. In future it will be the host of the Illinois Gateway.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
IDOT District 1 Traffic Systems Center (TSC) Field Equipment	Illinois Department of Transportation District 1 Bureau of Traffic	Roadway Subsystem	Existing	Equipment includes vehicle detectors, ramp metering, CCTV and DMS. Also includes signals leading to ISTHA ramps. The TSC operates between 5 AM and 7 PM on weekdays. During off hours, some of the TSC operations are performed by the IDOT Comm Center.
IDOT Emergency Traffic Patrol (ETP)	Illinois Department of Transportation District 1 Bureau of Traffic	Emergency Management	Existing	Emergency traffic patrol for interstates
IDOT Emergency Traffic Patrol Vehicles	Illinois Department of Transportation District 1 Bureau of Traffic	Emergency Vehicle Subsystem	Existing	Emergency Traffic Patrol Vehicles that provide motorist assistance on the expressways.
IDOT Maintenance Vehicles	Illinois Department of Transportation District 1 Bureau of Maintenance	Maintenance and Construction Vehicle	Existing	Maintenance vehicles used to perform snow removal, roadway treatment and roadway maintenance.
Illinois Gateway	Illinois Department of Transportation District 1 Bureau of Traffic	Information Service Provider / Traffic Management	Planned	Traveler information collection and distribution hub for NE Illinois. It collects traveler and transportation related information (congestion, travel times, incidents, construction, maintenance, transit schedules, weather, etc.) from systems within NE Illinois.
Illinois GIS Transportation Coalition	Illinois Dept of Transportation Bureau of Information Processing	Archived Data Management	Existing	Focal point for all GIS users as well as other GIS Data Providers in Illinois. Collaboration environment developed by IDOT explicitly focused on GIS for data sharing and knowledge transfer to cultivate creativity among the state and local government GIS Community.
Illinois State Police Dispatch (Districts 2)	Illinois State Police District 2	Emergency Management	Existing	*Operations and dispatch for State Police District 2*
Illinois State Police District 15 Operations Desk	Illinois State Police District 15	Emergency Management	Existing	Operations and Dispatch for State Police District 15, which covers the Tollways.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Illinois State Police Vehicles	Illinois State Police Group	Emergency Vehicle Subsystem	Existing	Police Vehicles with mobile data terminals that can be used to access information from Dispatch as well as information from the Single State Registration System
Illinois Transit Hub	Regional Transportation Authority	Archived Data Management / Information Service Provider / Transit Management	*Existing*	The Illinois Transit Hub will be the Transit Information Service Provider for the RTA region. This includes a messaging subsystem that can provide multimodal information to BusInfo, ATSS, and InfoTrans signs. Serves as information exchange conduit with Illinois Gateway
Independent School District Dispatch	Independent School Districts	Transit Management	Planned	Represents the dispatch function of each of the many independent school districts within the region.
Independent School District Vehicles	Independent School Districts	Transit Vehicle Subsystem	Existing	Vehicles of each of the many independent school districts within the region.
ISTHA Dispatch Center	Illinois State Toll Highway Authority	Emergency Management	Existing	Dispatch of Highway Emergency Lane Patrol (HELP)
ISTHA I-Pass Toll Plazas	Illinois State Toll Highway Authority	Roadway Subsystem / Toll Collection	Existing	Toll Plazas providing electronic Toll Collection using the I-Pass system.
ISTHA Maintenance and Construction	Illinois State Toll Highway Authority	Maintenance and Construction Management	Existing	Operations and dispatch of maintenance vehicles and equipment for the Tollway.
ISTHA TIMS Kiosks	Illinois State Toll Highway Authority	Remote Traveler Support	Planned	Kiosks owned and operated by ISTHA and located at Tollway rest stops.
ISTHA TMC (TIMS)	Illinois State Toll Highway Authority	Information Service Provider /Traffic Management	*Existing*	Planned Tollway Traffic Incident and Management System (TIMS) to provide control and monitoring of roadway devices such as dynamic message signs and CCTV. Reports travel times, incidents, and construction and maintenance information to the Illinois Gateway.
ISTHA TMC Field Equipment	Illinois State Toll Highway Authority	Roadway Subsystem	Existing	Roadway devices such as traffic sensors, dynamic message signs and CCTV used to monitor the roadway for traffic flow and incidents and to provide information to Tollway drivers.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
ISTHA Toll Administration Center	Illinois State Toll Highway Authority	Toll Administration	Existing	Administrative center that manages I-Pass electronic toll system.
MCR System	Illinois Dept of Transportation Division of Traffic Safety	Archived Data Management	Existing	Mobile Capture & Reporting (MCR) System provides crash data from law enforcement agencies via the Illinois Wireless Network (IWIN) to an MCR crash database overseen by IDOT Division of Traffic Safety.
Media	Area Media Outlets	Media	Existing	Television, radio, and print media.
Metra Consolidated Control Facility	Metra	Transit Management / Rail Operations	Existing	The Consolidated Control Facility, located in Chicago at 15th and Canal, is the focal point for management of Metra operated trains. It includes the computer aided dispatch system for train operations, as well as facilities for contract provider representatives who coordinate with Metra dispatchers.
Metra Parking Management Guidance System	Metra	Parking Management	*Existing*	Parking Management Guidance System installations at Metra facilities will monitor parking lot occupancy and pass the information to roadside display signs as well as to the Illinois Transit Hub.
Metra PMGS Signs	Metra	Roadway Subsystem	*Existing*	DMS signs to display information for the Metra Parking Management Guidance System.
Metra Train Information Management System	Metra	Transit Management	Existing	*The Metra TIMS system collects location and schedule adherence information from trains, primarily for passenger information use. This includes the Metra Hub that feeds the Illinois Transit Hub.*
Metra Trains	Metra	Transit Vehicle Subsystem	Existing	Trains will include ITS devices that support the safe and efficient movement of passengers. These systems collect, manage, and disseminate transit-related information to the conductor and travelers. The four train lines are: BNSF, HC, MD-W and UP-W

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Metra Wayside Equipment	Metra	Wayside Equipment	Existing	Track sensors and gate controls at highway rail intersections
Municipal EMCs	Municipalities	Emergency Management	Existing	Emergency Management Centers operated by municipalities in the 6 county region. Also includes EOCs operated by county/ municipal within Northwest Indiana.
Municipal EVAC System	Municipalities	Emergency Vehicle Subsystem	Existing	Village of Oak Brook is deploying a system that will allow police vehicles to receive interior video feeds from participating schools and hotels during emergencies. Eventually this video will be viewed back at the Oak Brook Communications Center.
Municipal Field Equipment	Municipalities	Roadway Subsystem	Existing	Consist of Traffic signal systems, EVP System on municipal roads.
Municipal Fire/EMS Emergency Vehicles	Municipalities	Emergency Vehicle Subsystem	Existing	Fire and EMS vehicles used for incident response and emergency management. These vehicles have onboard EVP transmitters and communications devices.
Municipal GIS Databases	Municipalities	Archived Data Management	Existing	Municipal GIS databases include centerline files with locations of fire hydrants, sanitary lines, jurisdictional boundaries, parcels, street signs, trees, street lights, water lines and traffic signals and other various points of interest
Municipal Maintenance Vehicles	Municipalities	Maintenance and Construction Vehicle	Existing	Maintenance vehicles used to perform snow removal, roadway treatment and roadway maintenance
Municipal Parking Management Guidance System	Municipalities	Parking Management	Planned	Municipal Parking Management Guidance Systems are to be installed at selected transit stops near major tollways, expressways, or strategic regional arterials. The will collect information on parking lot occupancy, and use it (along with transit and highway travel times) to populate DMS designed to give highway travelers the chance to divert to transit.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Municipal Police Emergency Vehicle	Municipalities	Emergency Vehicle Subsystem	Existing	Police Vehicles with mobile data terminals that can be used to access information from dispatch
Municipal Public Safety Dispatch	Municipalities	Emergency Management	Existing	*Call taking and emergency services dispatch (police, fire, and EMS) operated by municipalities in DuPage County. Includes Fire Protection District dispatch. The following municipal public safety dispatch organizations are examples of these types of elements: DuComm (provides emergency dispatch services for 27 police and fire departments in eastern DuPage County) and the City of Naperville Communications Section.*
Municipal TMCs	Municipalities	Traffic Management	*Existing*	*Higher functioning transportation management facilities run by municipalities. Represents a level of TMC below the County TMC. e.g. Naperville, Joliet, Schaumburg, Aurora and Elgin. May include multi-jurisdictional signal coordination within subareas or corridors that may or may not be contiguous. In the future, functions may include system monitoring, data storage, and operational coordination.*
Municipal Transit Operations	Municipalities	Transit Management	Existing	*Transit operations run by municipalities in the county, such as the Downers-Grove Shuttle.*
Municipal/ Township Maintenance	Municipalities	Maintenance and Construction Management	Existing	*Operations and dispatch of maintenance vehicles and equipment operated by municipalities/ townships within the county.*
Northeastern Illinois 511 System	Illinois Department of Transportation Operations	Information Service Provider	Planned	Telephone traveler information system for the Region.
Northeastern Illinois Regional Data Archive	*Chicago Metropolitan Agency for Planning (CMAP)*	Archived Data Management Subsystem	Planned	*Archive of traffic, transit, and traveler information collected by CMAP for use in transportation planning.*

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
OHSEM Emergency Field Devices	DuPage County Office of Homeland Security and Emergency Management	Emergency Management / Roadway Subsystem	Existing	OHSEM has field devices for emergency traffic response, including DMS, arrow boards, and traffic control equipment (e.g., cones, barricades). A proposal has been submitted to obtain more portable DMS that support cellular communications, emergency detour signs, and a "highway alert radio" transmitter. OHSEM also has an Illinois Transportable Emergency Communications Systems (ITECS) unit. ITECS is a portable, low-power, tactical system intended to link disparate radio systems during a disaster.
OHSEM Emergency Vehicles	DuPage County Office of Homeland Security and Emergency Management	Emergency Vehicle Subsystem	Existing	OHSEM emergency vehicles are deployed for emergency coordination activities. They have the following emergency communication systems on-board: STAROM21, EMnet, DIRS.
OHSEM Mobile Operation Center	DuPage County Office of Homeland Security and Emergency Management	Emergency Management		The OHSEM has Mobile Operating Centers (MOC) which are field deployable to an incident site for emergency coordination and as a public information center. The MOC have the following emergency communication systems on-board: STARCOM21, EMnet, DIRS.
Other County 911 Centers	Illinois County Sheriff Departments	Other Emergency Management	Existing	*Represents emergency call taking and public safety dispatch in adjacent counties.*
Other County EOCs	Illinois County Emergency Services	Other Emergency Management	Existing	*Represents Emergency Operations Centers in adjacent counties.*
Other County Field Equipment	Illinois County Highways Departments	Other Roadway	Existing	*Traffic signals, traffic sensors, environmental sensors, CCTV, and dynamic message signs owned and operated by Will, Kane and Cook Counties Highway Departments*
Other County Maintenance Dispatch	Illinois County Highways Departments	Other Maintenance and Construction	Existing	*Operations and dispatch of maintenance vehicles and equipment for Will, Kane and Cook Counties.*

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Other County TMC	Illinois County Highways Departments	Other Traffic Management	Existing	*Traffic Management Center for Will, Kane and Cook Counties operated roadways.*
Pace IBS	Pace	Transit Management	*Existing*	*Pace Intelligent Bus System, a centralized dispatch computer system which supports physically distributed dispatchers. The IBS includes not only the dispatch system, but also AVL, on-board processors, audio and visual information display, passenger counting. Provides bus schedule adherence data for driving BusInfo Signs. This includes the Pace Hub that feeds the Illinois Transit Hub.*
Pace Paratransit Dispatch	Pace	Transit Management	Existing	Pace has a number of public and private contractors who provide paratransit services. Each has their own dispatch center
Pace Paratransit Vehicles	Pace	Transit Vehicle Subsystem	Existing	These are the vans, buses and sedans used for Pace contractor-supplied paratransit services.
Pace Transit Bus Vehicles	Pace	Transit Vehicle Subsystem	Existing	*Fixed route transit vehicles operated by Pace. Contain automated vehicle location, passenger counting and, in the future, transit priority signal transmitters.*
Pace Vanpool Service	Pace	Transit Management	Existing	Transit ride matching program
Private Bus Dispatch	Private Bus Agencies	Transit Management	Existing	Private bus agencies operating in the county region.
Private Bus Vehicles	Private Bus Agencies	Transit Vehicle Subsystem	Existing	Private bus agencies operating in the 6 county region and in neighboring counties of Wisconsin and Indiana.
Private ISPs - Travel Information Services	Private ISP's	Information Service Provider	Planned	Private Information Service Providers (Shadow Traffic, Metro Networks, etc.)
Private Parking Lots	Private Parking Operators	Parking Management	Planned	Private Parking Lots
Private Sector Maintenance Contractor Dispatch	Private Sector Maintenance Contractor	Maintenance and Construction Management	Existing	Operations and Dispatch for private companies with contracts to the county and municipal traffic agencies for maintenance of signals, DMS, HAR, lighting systems, and pumping stations.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Private Sector Maintenance Vehicles	Private Sector Maintenance Contractor	Maintenance and Construction Vehicle	Existing	Operations and Dispatch for private companies with contracts to the county and municipal traffic agencies for maintenance of signals, DMS, HAR, lighting systems, and pumping stations.
Private Taxi Dispatch	Private Taxi Companies	Transit Management	Existing	*Operations and dispatch for private Taxi companies operating within the county.*
Private Taxi Vehicles	Private Taxi Companies	Transit Vehicle Subsystem	Existing	
Private Tow and Recovery Operations	Private Towing Companies	Emergency Management	Existing	Dispatch for private tow and recovery companies.
Private Tow and Recovery Vehicles	Private Towing Companies	Emergency Vehicle Subsystem	Existing	
Rail Freight Operations	Rail Freight Operators	Rail Operations	Existing	Rail operations centers for private rail firms operating in the 6 county region.
Regional Event Facilities	Regional Event Organizations	Event Promoters	Planned	*Represents the various event facilities in the region that are generators of planned events with significant traffic or transit impact. Examples are Universities and Colleges. etc.*
Regional Hospitals	*DuPage County Hospitals / Medical Centers*	Care Facility	Existing	*EMS dispatch from hospitals and medical centers in the county.*
Regional Traffic Signal Inventory	Chicago Metropolitan Agency for Planning (CMAP)	Archived Data Management	Existing	Comprehensive GIS traffic signal database for the six-county region.
Regional Transportation Authority Travel Information Center (TIC)	Regional Transportation Authority	Information Service Provider / Transit Management	Existing	The RTA Travel Information Center (TIC) currently collects static route, schedule and fare information from the three RTA Service Boards, and uses it to provide information over the phone to travelers in the RTA six-county region. The TIC uses its Itinerary Planning System (IPS) to provide information to callers in the form of specific origin to destination trip plans. In the future, this may be enhanced by real time data.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
Ride-DuPage Dispatch	DuPage County Division of Human Services	Transit Management	Existing	DuPage County and Pace are working together with the help of consultants to design a Paratransit Coordinator function. The Coordinator will be equipped with a full paratransit software suite; many participating vehicles will have AVL/MDTs and report back current events and status.
Ride-DuPage Vehicles	DuPage County Division of Human Services	Transit Vehicle Subsystem	Existing	These are the buses, vans and sedans used by participants in the DuPage Coordinator function to provide paratransit service in DuPage County.
RTA Itinerary Planning System	Regional Transportation Authority	Transit Management	Existing	Itinerary Planning System is the web based interface of the TIC, providing an interface to users and the RTA Kiosk.
RTAMS Data Archive	Regional Transportation Authority	Archived Data Management Subsystem	Existing	Regional Transportation Asset Management System (RTAMS) provides planning and financial information on the transportation system in the northeastern Illinois areas surrounding Chicago. RTAMS allows users to access transit and tollway data through an interactive map.
Satellite TMC OHare Airport	Chicago Department of Aviation	Information Service Provider / Parking Management / Traffic Management	Existing	O'Hare Airport is developing a landside transportation communications operation. This operation will coordinate all aspects of land transportation around O'Hare airport.
Statewide Emergency Operations Center	Illinois Emergency Management Agency	Emergency Management	Existing	Illinois Statewide Emergency Operations Center in Springfield.
Transportation Research Analysis and Computing Center	Argonne National Laboratory	Archived Data Management	Planned	Program for simulation of large-scale transportation networks
Trucking Organizations	Private Trucking Companies	Fleet and Freight Management / *Trade Regulatory Agencies*	Existing	Includes private commercial fleet management operations in the region.

System	Associated Stakeholder	Architecture Entity	Element Status	Element Description
User Personal Computing Devices	Travelers	Personal Information Access	Existing	User Personal Computing Devices refers to equipment an individual owns and can personalize with their choices for information about transportation networks. An Internet-connected PC is an example.
Utility Company Dispatch	Utility Companies	Maintenance and Construction Management	Planned	Dispatch function of utility companies in the region. Includes telephone, gas, cable, pipeline.
Vehicles	Travelers	Vehicle / Basic Vehicle	Existing	A general element that represents personal automobiles and fleet vehicles that include ITS safety, navigation and traveler information systems that may be applicable to any highway vehicle.
Weather Services	Private Weather Information Providers	Surface Transportation Weather Service	Existing	Private Companies who provide customized transportation weather information.

Elements common to both the Regional (Northeastern Illinois) and DuPage Subregional ITS Architectures (text in *italics* represents modifications to the Regional Architecture names/descriptions)

3.2 Needs and Services

In order to determine how the systems in Table 3 can best be applied, a stakeholder workshop held on April 27, 2006, included an ITS needs analysis. The attendees considered a number of critical transportation issues. Each transportation issue was defined, discussed, and compared. After discussion, the identified issues were as follows (in no particular order):

- Improve interagency arterial operations coordination
- Better real-time traffic information on arterials
- Reduce congestion
- Improve coordination between emergency services and transportation agencies
- Improve arterial operations support
- Provide interoperability between agencies
- Improve sharing of construction data (locations, durations)
- Design of transit
- Increase public awareness
- Communications infrastructure
- Improve transit access (station lots, park n' ride lots)
- Improved media coordination
- Improve transit performance (on-time arrival, multi-modal transfers)

These issues serve as the basis for the development of ITS goals and objectives for the region, as well as the identification of ITS services.

Each of the systems listed in Table 3 are applied by their associated stakeholder to provide some service to the traveling public. In terms of transportation, a 'service' can be defined as:

Capabilities you put in place to meet transportation needs.

The National ITS Architecture contains 85 "market packages" which correspond to the services provided by various transportation agencies. These market packages demonstrate how the various subsystems and terminators identified in Section 3.1 work together to provide transportation services. As an example, **Error! Reference source not found.** shows the 'Network Surveillance' market package (ATMS01), with its associated subsystems (Information Service Provider, Roadway, and Traffic Management Roadway) and terminators (Map Update Provider, Other Roadway, Traffic, and Traffic Operations Personnel). As defined by the National ITS Architecture, the Network Surveillance market package:

Includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

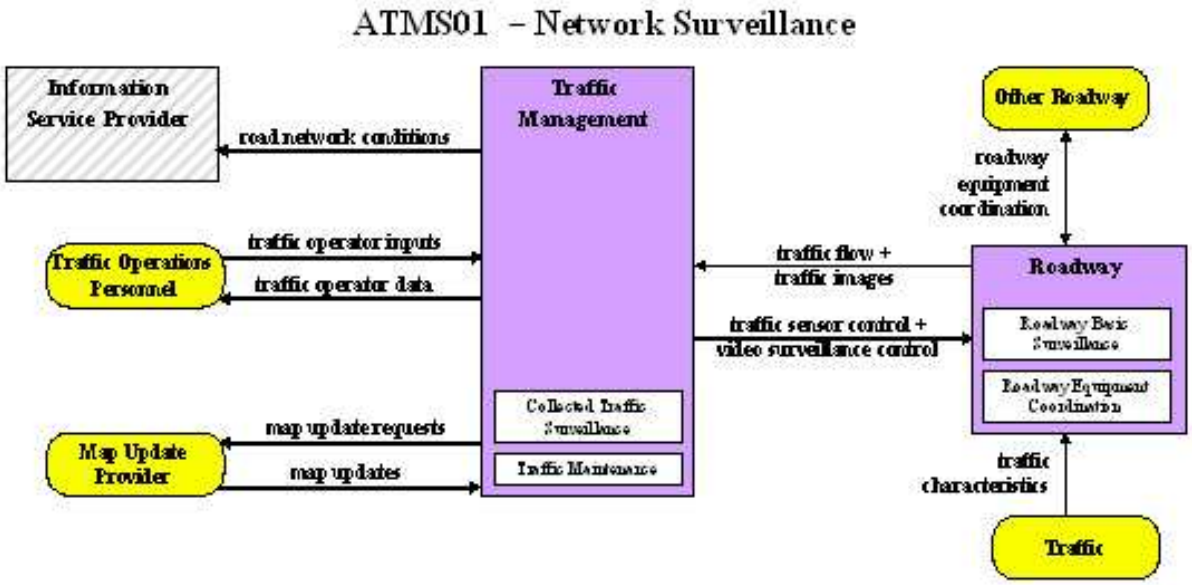

Figure 5 – Network Surveillance Market Package Diagram

During the stakeholder workshop, the attendees were invited to help identify the market packages that are appropriate to their agencies. Table 4 provides a listing of the refined list of market packages for the DuPage County region, along with the associated element(s) and status.

Table 4 – DuPage County Market Packages (Transportation Services) Inventory

Market Package	Market Package Name	Status	Element
ATMS01	Network Surveillance	Existing	Automated Rail Crossing Enforcement System
			DuPage County Field Equipment
			DuPage County TMC
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Municipal TMCs
			Municipal Field Equipment
			Satellite TMC OHare
ATMS02	Probe Surveillance	*Existing*	*ISTHA I-Pass Toll Plazas*
			ISTHA Toll Administration Center
			Vehicles
		Potential	DuPage County Field Equipment
			DuPage County TMC
ATMS03	Surface Street	Existing	DuPage County Field Equipment

Market Package	Market Package Name	Status	Element
	Control		DuPage County TMC
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			Municipal Field Equipment
			Municipal TMCs
			Satellite TMC O'Hare Airport
ATMS04	Freeway Control	Existing	IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
ATMS06	Traffic Information Dissemination	Existing	IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			Illinois Transit Hub
			ISTHA TMC(TIMS)
			ISTHA TMC Field Equipment
			Private ISPs – Travel Information Services
			Vehicles
		Planned	DuPage County EOC
			DuPage County Field Equipment
			DuPage County Highway Maintenance Dispatch
			DuPage County TMC
			Highway Rail Crossing Notification System
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			Municipal Field Equipment
			Municipal TMCs
			OHSEM Emergency Field Devices
			OHSEM Mobile Operation Center
ATMS07	Regional Traffic Control	Planned	IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			Illinois Gateway
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Municipal TMCs
			Satellite TMC OHare Airport
		Potential	DuPage County Field Equipment
			DuPage County TMC
			Other County TMCs
ATMS08	Traffic Incident Management System	Existing	Crisis Management Center (CMC)
			Disaster Management Information System (DMIS)
			DuPage County EOC
			DuPage County Highway Maintenance Dispatch
			DuPage County Sheriff Communications Center
			Highway Emergency Lane Patrol Vehicles

Market Package	Market Package Name	Status	Element
			DuPage County TMC
			IDOT District 1 Bureau of Construction
			IDOT District 1 Bureau of Traffic – Expressway Operations Unit
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT Emergency Traffic Patrol (ETP)
			Illinois Gateway
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			ISTHA Dispatch Center
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Media
			Municipal EMCs
			Municipal Public Safety Dispatch
			Municipal TMCs
			Municipal/Township Maintenance
			OHSEM Emergency Field Devices
			OHSEM Emergency Vehicles
			Other County 911 Centers
			Other County Maintenance Dispatch
			Other County TMCs
			Private Tow and Recovery Operations
			Rail Freight Operations
			Regional Event Facilities
			Regional Transportation Authority Travel Information Center (TIC)
			Satellite TMC OHare Airport
ATMS08	Traffic Incident Management System	Planned	DuPage County TMC
			Private Sector Maintenance Contractor Dispatch
			Utility Company Dispatch
ATMS09	Traffic Forecast and Demand Management	Existing	Illinois Gateway
ATMS10	Electronic Toll Collection	*Existing*	ISTHA I-Pass Toll Plazas
			ISTHA Toll Administration Center
			Vehicles
ATMS11	Emissions Monitoring and Management	Existing	Illinois Gateway
ATMS 13	Standard Railroad Grade Crossing	Existing	AMTRAK Rail
			DuPage County Field Equipment
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			Metra Consolidated Control Facility
			Metra Wayside Equipment
			Municipal Field Equipment

Market Package	Market Package Name	Status	Element
			Municipal TMCs
			Rail Freight Operations
ATMS 13	Standard Railroad Grade Crossing	Planned	DuPage County TMC
ATMS 14	Advanced Railroad Grade Crossing	Existing	AMTRAK Rail
			DuPage County Field Equipment
			Metra Consolidated Control Facility
			Metra Wayside Equipment
			Rail Freight Operations Center
		Planned	Automated Railroad Crossing Enforcement System
			Highway Rail Crossing Notification System
ATMS15 ATMS15	Railroad Operations Coordination Railroad Operations Coordination	Planned	AMTRAK Rail
			IDOT District 1 Bureau of Traffic Signal Unit
			Metra Consolidated Control Facility
			Rail Freight Operations
		Potential	DuPage County TMC
			Illinois Gateway
			Municipal TMCs
ATMS 16	Parking Facility Management	Existing	Metra Parking Management Guidance System
			Satellite TMC OHare Airport
			Vehicles
		Planned	Municipal Parking Management Guidance System
			Private Parking Lots
MC01	Maintenance and Construction Vehicle and Equipment Tracking	Planned	DuPage County Highway Maintenance Dispatch
			DuPage County Highway Maintenance Vehicles
			IDOT District 1 Bureau of Construction
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			IDOT Maintenance Vehicles
			ISTHA Maintenance and Construction
			Municipal Maintenance Vehicles
			Municipal/Township Maintenance
			Private Sector Maintenance Contractor Dispatch
			Private Sector Maintenance Vehicles
			Utility Company Dispatch
			Vehicles
MC03	Road Weather Data Collection	Existing	DuPage County Highway Maintenance Dispatch
			DuPage County Sheriff Communication Center
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Traffic Systems Center (TSC)
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Private ISPs – Travel Information Services
			Weather Services
MC04	Weather Information Processing and Distribution	Existing	IDOT District 1 Bureau of Construction
			IDOT District 1 Traffic Signal Unit
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			IDOT District 1 Traffic Systems Center (TSC)
			Illinois Gateway

Market Package	Market Package Name	Status	Element
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			Media
			Ride-DuPage Dispatch
			Weather Services
MC04	Weather Information Processing and Distribution	Planned	DuPage County TMC
			Weather Services
MC06	Winter Maintenance	Existing	Construction Information Database System
			DuPage County Highway Maintenance Dispatch
			DuPage County Highway Maintenance Vehicles
			DuPage County Sheriff Communications Center
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			IDOT District 1 Maintenance Yards
			ISTHA Dispatch Center
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			Municipal Maintenance Vehicles
			Municipal TMCs
			Municipal / Township Maintenance
			Private Sector Maintenance Contractor Dispatch
			Private Sector Maintenance Vehicles
MC06	Winter Maintenance	Planned	DuPage County TMC
MC07	Roadway and Maintenance Construction	Existing	Construction Information Database System
			DuPage County Field Equipment
			DuPage County Highway Maintenance Dispatch
			DuPage County Highway Maintenance Vehicles
			IDOT District 1 Bureau of Construction
			IDOT District 1 Traffic Signal Unit Field Equipment
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Maintenance Management
			IDOT District 1 Maintenance Yards
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			IDOT Maintenance Vehicles
			ISTHA Dispatch Center
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Municipal Maintenance Vehicles
			Municipal TMCs
			Municipal / Township Maintenance
			Private Sector Maintenance Contractor Dispatch
			Private Sector Maintenance Vehicles
			Utility Company Dispatch

Market Package	Market Package Name	Status	Element
MC07	Roadway and Maintenance Construction	Planned	DuPage County TMC
MC08	Work Zone Management	Existing	DuPage County Highway Maintenance Dispatch
			IDOT District 1 Bureau of Construction
			IDOT District 1 Traffic Signal Unit Field Equipment
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			IDOT District 1 Maintenance Management
			IDOT District 1 Traffic Systems Center (TSC)
			IDOT District 1 Traffic Systems Center (TSC) Field Equipment
			ISTHA Dispatch Center
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			ISTHA TMC Field Equipment
			Media
			Municipal TMCs
			Municipal / Township Maintenance
			Private Sector Maintenance Contractor Dispatch
			Utility Company Dispatch
MC08	Work Zone Management	Planned	DuPage County Field Equipment
			DuPage County TMC
MC10	Maintenance and Construction Coordination	Planned	DuPage County Highway Maintenance Dispatch
			IDOT District 1 Bureau of Construction
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			Illinois Gateway
			ISTHA Maintenance and Construction
			Media
			Municipal / Township Maintenance
			Private Sector Maintenance Contractor Dispatch
		Potential	Construction Information Database System
APTS1	Transit Vehicle Tracking	Existing	Metra Consolidated Control Facility
			Metra Train Information Management System
			Metra Trains
			Pace IBS
			Pace Paratransit Dispatch
			Pace Paratransit Vehicles
			Pace Transit Bus Vehicles
			Private Bus Dispatch
			Private Taxi Dispatch
			Ride-DuPage Dispatch
			Ride-DuPage Vehicles
APTS2	Transit Fixed-Route Operations	Existing	Independent School District Dispatch
			Metra Consolidated Control Facility
			Metra Trains
			Municipal transit Operations
			Pace IBS
			Pace Transit Bus Vehicles
			Private Bus Dispatch

Market Package	Market Package Name	Status	Element
			Private Bus Vehicles
			Regional Transportation Authority travel Information Center (TIC)
APTS3	Demand Response Transit Operations	Existing	Pace Paratransit Dispatch
			Pace Paratransit Vehicles
			Private Bus Dispatch
			Private Taxi Dispatch
			Public/Non-Profit Paratransit Services
			Ride-DuPage Dispatch
			Ride-DuPage Vehicles
APTS4	Transit Passenger and Fare Management	Planned	Metra Consolidated Control Facility
			Metra Trains
			Pace IBS
			Pace Paratransit Dispatch
			Pace Paratransit Vehicles
			Pace Transit Bus Vehicles
			Regional Transportation Authority travel Information Center (TIC)
APTS5	Transit Security	Existing	Metra Consolidated Control Facility
			Metra Trains
			Municipal Public Safety Dispatch
			Municipal Transit Operations
			Pace IBS
			Pace Paratransit Dispatch
			Pace Paratransit Vehicles
			Pace Transit Bus Vehicles
			Public/Non-Profit Paratransit Services
			Ride-DuPage Dispatch
			Ride-DuPage Vehicles
APTS6	Transit Maintenance	Planned	Metra Consolidated Control Facility
			Metra Trains
			Pace IBS
			Pace Transit Bus Vehicles
APTS7	Multi-modal Coordination	Planned	AMTRAK Rail
			DuPage County Field Equipment
			DuPage County TMC
			IDOT District 1 Bureau of Traffic Signal Unit
			Illinois Gateway
			Illinois Transit Hub
			Independent School District Dispatch
			Metra Consolidated Control Facility
			Metra Trains
			Municipal Field Equipment
			Municipal TMCS
			Municipal Transit Operations
			Pace IBS
			Pace Paratransit Dispatch
			Private Bus Dispatch
			Private Taxi Dispatch
			Regional Transportation Authority travel Information Center (TIC)
			Ride-DuPage Dispatch

Market Package	Market Package Name	Status	Element
			Satellite TMC OHare Airport
APTS8	Transit Traveler Information	Planned	Illinois Transit Hub
			Metra Consolidated Control Facility
			Metra Train Information Management System
			Metra Trains
			Pace Transit Bus Vehicles
			Private ISPs – Travel Information Services
			Regional Transportation Authority travel Information Center (TIC)
			RTA Itinerary Planning System
			User Personal Computing Devices
		Potential	Ride-DuPage Dispatch
ATIS1	Broadcast Traveler Information	Existing	DuPage County TMC
			IDOT District 1 ComCenter
			IDOT District 1 Traffic Systems Center (TSC)
			Illinois Gateway
			ISTHA TIMS Kiosks
			ISTHA TMC (TIMS)
			Media
			Private ISPs- Travel Information Services
			Regional Transportation Authority Travel Information Center (TIC)
			User Personal Computing Devices
			Vehicles
			Weather Services
		Potential	DuPage County TMC
			IDOT District 1 ComCenter
			Illinois Gateway
			Municipal TMCs
			Municipal Transit Operations
ATIS2	Interactive Traveler Information	Existing	Illinois Gateway
			Media
			Regional Transportation Authority Travel Information Center (TIC)
			RTA Itinerary Planning System
			User Personal Computing Devices
			Vehicles
		Planned	ISTHA TIMS Kiosks
			Northeastern Illinois 511 System
			Private ISPs – Travel Information Services
ATIS5	ISP Based Trip Planning and Route Guidance	Planned	ISTHA TIMS Kiosks
			Private ISPs- Travel Information Services
			User Personal Computing Devices
			Vehicles
CV010	HAZMAT Management	Existing	DuPage County EOC
			Hazmat Management and Cleanup
			IDOT District 1 ComCenter
			IDOT Emergency Traffic Patrol (ETP)
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			ISTHA Dispatch Center

Market Package	Market Package Name	Status	Element
			Municipal EMCs
			Municipal Public Safety Dispatch
EM01	Emergency Call-Taking and Dispatch	Existing	DuPage County EOC
			DuPage County Sheriff Communications Center
			Highway Emergency Lane Patrol Vehicles
			IDOT District 1 ComCenter
			Illinois Emergency Traffic Patrol (ETP)
			IDOT Emergency Traffic Patrol Vehicles
			Illinois Gateway
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			Illinois State Police Vehicles
			Illinois Transit Hub
			ISTHA Dispatch Center
			Municipal EMCs
			Municipal Fire/EMS Emergency Vehicles
			Municipal Police Emergency Vehicles
			Municipal Public Safety Dispatch
			OHSEM Emergency Vehicles
			OHSEM Mobile Operations Center
			Other County 911 Centers
			Other County EOCs
			Private Tow and Recovery Operations
			Statewide Emergency Operations Center
EM02	Emergency Routing	Planned	DuPage County EOC
			DuPage County Sheriff Communications Center
			DuPage County TMC
			Illinois Emergency Traffic Patrol (ETP)
			IDOT Emergency Traffic Patrol Vehicles
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			ISTHA TMC (TIMS)
			OHSEM Emergency Vehicles
			Statewide Emergency Operations Center
		Existing	DuPage County Field Equipment
			IDOT District 1 Bureau of Traffic Signal Unit Field Equipment
			IDOT District 1 ComCenter
			IDOT District 1 ComCenter Field Equipment
			Highway Emergency Lane Patrol Vehicles
			Illinois State Police Vehicles
			Municipal EMCs
			Municipal Public Safety Dispatch
			Regional Hospitals
EM03	Mayday and Alarm Support	Planned	DuPage County EOC
			DuPage County Sheriff Communications Center
			IDOT District 1 ComCenter
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			ISTHA Dispatch Center
			Municipal Public Safety Dispatch
EM04	Roadway Service Patrols	Existing	Highway Emergency Lane Patrol Vehicles
			Illinois Emergency Traffic Patrol (ETP)

Market Package	Market Package Name	Status	Element
			IDOT Emergency Traffic Patrol Vehicles
			ISTHA Dispatch Center
			Private Tow and Recovery Operations
			Private Tow and Recovery Vehicles
EM06	*Wide-Area Alert*	*Existing*	Crisis Management Center (CMC)
			DuPage County EOC
			DuPage County Field Equipment
			DuPage County Sheriff Communications Center
			DuPage County TMC
			Municipal EMCs
			Municipal Public Safety Dispatch
			Municipal TMCs
			Other County 911 Centers
			Private ISPs – Travel Information Services
			Statewide Emergency Operations Center
			User Personal Computing Devices
EM07	*Early Warning System*	*Existing*	OHSEM Emergency Field Devices
			OHSEM Mobile Operation Center
EM08	*Disaster Response and Recovery*	*Existing*	Computer-Aided Management of Emergency Operations (CAMEO)
			Critical Infrastructure Location Manager (CILM)
			Crisis Management Center (CMC)
			Disaster Management Information System (DMIS)
			DuPage County EOC
			DuPage County Highway Maintenance Dispatch
			DuPage County Sheriff Communications Center
			DuPage County TMC
			IDOT District 1 ComCenter
			IDOT District 1 Maintenance Management
			Illinois State Police Dispatch (Districts 2)
			Illinois State Police District 15 Operations Desk
			ISTHA Dispatch Center
			ISTHA Maintenance and Construction
			ISTHA TMC (TIMS)
			Municipal EMC's
			Municipal Public Safety Dispatch
			Municipal TMC
			Municipal Transit Operations
			Municipal/Township Maintenance
			OHSEM Mobile Operations Center
			Other County 911 Centers
			Other County EOCs
			Other County TMCs
			Statewide Emergency Operations Center
EM09	Evacuation and Reentry Management	Potential	AMTRAK Rail
			Computer-Aided Management of Emergency Operations (CAMEO)
			Crisis Management Center (CMC)
			Crisis Infrastructure Location Manager (CILM)
			Disaster Management Information System (DMIS)
			DuPage County EOC
			DuPage County Highway Maintenance Dispatch

Market Package	Market Package Name	Status	Element
			DuPage County Sheriff Communications Center
			DuPage County TMC
			IDOT District 1 Bureau of Traffic – Expressway Operations Unit
			IDOT District 1 Bureau of Traffic Signal Unit
			IDOT District 1 ComCenter
			IDOT Emergency Traffic Patrol (ETP)
			Illinois State Police Dispatch (District 2)
			Illinois State Police District 15 Operations Desk
			ISTHA Dispatch Center
			ISTHA TMC(TIMS)
			Metra Consolidated Control Facility
			Municipal EMCs
			Municipal Public Safety Dispatch
			Municipal TMCs
			Municipal Transit Operations
			OHSEM Emergency Field Devices
			OHSEM Mobile Operations Center
			Other County 911 Centers
			Other County TMCs
			Pace Paratransit Dispatch
			Private Bus Dispatch
			Private Taxi Dispatch
			Ride-DuPage Dispatch
			Satellite TMC OHare Airport
			Statewide Emergency Operations Center
AD1	ITS Data Mart	Existing	Critical Analysis Module (CAM)
			DuPage County Traffic Signal Inventory
			IDOT District 1 ComCenter
			IDOT District 1 Traffic Systems Center (TSC)
			Illinois Gateway
			Illinois GIS Transportation Coalition
			MCR System
			Illinois Transit Hub
			Regional Traffic Signal Inventory
		Planned	Academic/Research Organizations Data Warehouse
			DuPage County TMC
			Municipal TMCs
			Northeastern Illinois Regional Data Archive
			Transportation Research and Computing Center
		Potential	Construction Information Database System
			DuPage County Hub
AD2	ITS Data Warehouse	*Existing*	Academic/Research Organizations Data Warehouse
			Illinois Gateway
			Northeastern Illinois Regional Data Archive

Elements common to both the Regional (Northeastern Illinois) and DuPage Subregional ITS Architectures

4. CONCEPT OF OPERATIONS

Before intelligent transportation systems can be effectively deployed, ITS stakeholders should come together to identify goals for ITS deployment. A key component in this process is a Concept of Operations that defines the roles and responsibilities of those agencies that will gather, process, and act upon the information that is collected by the system.

The separate DuPage County TCI Concept of Operations document defines the vision for ITS in DuPage County and what roles and responsibilities each transportation agency must fulfill to effectively deploy ITS in the region.

5. FUNCTIONAL REQUIREMENTS

After identifying the systems and services of an intelligent transportation system, functional requirements are used to define what the systems must do to perform their services. It is important to note that these functional requirements are, like the architecture itself, independent of specific technologies.

To help identify appropriate functional requirements for the systems of an architecture, the National ITS Architecture contains 'equipment packages' that group together similar processes of a subsystem into "implementable" packages. These equipment packages are also tied to the 85 market packages of the National ITS Architecture.

Table 5 provides a listing of the applicable equipment packages for the DuPage County region, along with the associated element and architecture entity (subsystem) for each. In addition, there are a number of individual functional requirement statements under each equipment package. Due to the high level of detail inherent to these functional requirements, they should be viewed using the Turbo Architecture® tool.

Table 5 – DuPage County Equipment Packages (Functional Areas) Inventory

Element	Architecture Entity	Equipment Package
Academic/Research Organizations Data Warehouse	Archived Data Management / Archived Data User Systems	ITS Data Repository
		Government Reporting Systems Support
		On-line Analysis and Mining
Automated Railroad Crossing Enforcement System	Roadway	Roadway Basic Surveillance
		Advanced Rail Crossing
Computer-Aided Management of Emergency Operations (CAMEO)	Emergency Management	Emergency Response Management
Construction Information Database System	Maintenance and Construction Management	MCM Work Activity Coordination
Crisis Management Center (CMC)	Emergency Management	Incident Command
		Emergency Response Management
		Emergency Evacuation Support
Critical Analysis Module (CAM)	Archived Data Management	Emergency Response Management
Critical Infrastructure Location Manager (CILM)	Archived Data Management	ITS Data Repository
Disaster Management Information System (DMIS)	Emergency Management	Emergency Response Management
DuPage County Arterial Travel Time Probe Information Database	Archived Data Management	ITS Data Repository
DuPage County EOC	Emergency Management / Archived Data User System	Incident Command
		Emergency Response Management
		Emergency Evacuation Support
		Emergency Environmental Monitoring
		Emergency Commercial Vehicle Response
		Mayday Support
		TMC Traffic Information Dissemination
DuPage County Field	Roadway Subsystem	Roadway Basic Surveillance

Element	Architecture Entity	Equipment Package
Equipment		Roadway Signal Controls
		Roadway Signal Priority
		Roadway Traffic Information Dissemination
		Roadway Incident Detection
		Standard Rail Crossing
		Roadway Environmental Monitoring
		Roadway Speed Monitoring
		Roadway Work Zone Traffic Control
		Roadway Data Collection
DuPage County Highway Maintenance Dispatch	Maintenance and Construction Management	MCM Vehicle Tracking
		MCM Incident Management
		MCM Maintenance Decision Support
		MCM Winter Maintenance Management
		MCM Roadway Maintenance and Construction
		MCM Work Zone Management
		MCM Work Activity Coordination
DuPage County Highway Maintenance Vehicles	Maintenance and Construction Vehicle	MCV Winter Maintenance
		MCV Roadway Maintenance and Construction
		MCV Work Zone Support
DuPage County Hub	Archived Data Management	ITS Data Repository
DuPage County Pavement Maintenance Database	Archived Data Management	ITS Data Repository
DuPage County Sheriff Communications Center	Emergency Management	Emergency Call-Taking
		Emergency Dispatch
		Emergency Routing
		Emergency Response Management
		Emergency Evacuation Support
		Mayday Support
DuPage County Sheriff Emergency Vehicles	Emergency Vehicle	On-Board EV En Route Support
		On-Board EV Incident Management Communication
DuPage County TMC	Traffic Management/ Archived Data User System	Collect Traffic Surveillance
		TMC Signal Control
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		TMC Evacuation Support
		HRI Traffic Management
		Rail Operations Coordination
		TMC Speed Monitoring
		TMC Work Zone Traffic Management
		TMC Multimodal Coordination
		Traffic Data Collection
DuPage County Traffic Signal Inventory	Archived Data Management	ITS Data Repository
DuPage County Web-based Traffic Accident Record System	Archived Data Management	ITS Data Repository

Element	Architecture Entity	Equipment Package
Hazmat Management and Cleanup	Fleet and Freight Management	Fleet Administration
		Freight Administration and Management
		Fleet HAZMAT Management
Highway Emergency Lane Patrol Vehicles	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
Highway Rail Crossing Notification System	Roadway Subsystem	Advanced Rail Crossing
IDOT District 1 Bureau of Construction	Maintenance and Construction Management	MCM Vehicle Tracking
		MCM Vehicle and Equipment Maintenance Management
		MCM Work Zone Management
		MCM Work Activity Coordination
IDOT District 1 Bureau of Traffic- Expressway Operations Unit	Maintenance and Construction Management	MCM Incident Management
		MCM Roadway Maintenance and Construction
		MCM Work Activity Coordination
IDOT District 1 Bureau of Traffic Signal Unit	Traffic Management	Collect Traffic Surveillance
		TMC Signal Control
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		HRI Traffic Management
		Rail Operations Coordination
		Traffic Maintenance
		TMC Multimodal Coordination
IDOT District 1 Bureau of Traffic Signal Unit Field Equipment	Roadway Subsystem	Roadway Basic Surveillance
		Roadway Signal Controls
		Roadway Signal Priority
		Roadway Traffic Information Dissemination
		Standard Rail Crossing
		Roadway Equipment Coordination
		Roadway Infrastructure Monitoring
		Roadway Work Zone Traffic Control
IDOT District 1 ComCenter	Archived Data Management / Emergency management / Information Service Provider / Maintenance and Construction Management / traffic Management	ITS Data Repository
		Traffic and Roadside Data Archival
		Emergency Response Management
		Emergency Environmental Monitoring
		Mayday Support
		Emergency Data Collection
		Basic Information Broadcast
		Interactive Infrastructure Information
		MCM Environmental Information Collection
		MCM Environmental Information Processing
		MCM Incident Management
		MCM Maintenance Decision Support
		MCM Winter Maintenance Management

Element	Architecture Entity	Equipment Package
		MCM Roadway Maintenance and Construction
		MCM Work Zone Management
		MCM Work Activity Coordination
		Collect Traffic Surveillance
		TMC Freeway Management
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		TMC Reversible Lane Management
		Traffic Maintenance
		TMC Work Zone Traffic Management
IDOT District 1 ComCenter Field Equipment	Roadway Subsystem	Roadway Basic Surveillance
		Roadway Freeway Control
		Roadway Traffic Information Dissemination
		Roadway Incident Detection
		Roadway Equipment Coordination
		Roadway Environmental Monitoring
		Field Barrier System Control
		Roadway Work Zone Traffic Control
IDOT District 1 Maintenance Management	Maintenance and Construction Management	MCM Vehicle Tracking
		MCM Incident Management
		MCM Maintenance Decision Support
		MCM Winter Maintenance Management
		MCM Roadway Maintenance and Construction
		MCM Work Zone Management
		MCM Work Activity Coordination
IDOT District 1 Traffic Systems Center (TSC)	Information Service Provider / traffic Management	ISP Data Collection
		Collect Traffic Surveillance
		TMC Freeway Management
		TMC HOV Lane Management
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		TMC Environmental Monitoring
		Traffic Maintenance
		TMC Work Zone Traffic Management
		Traffic Data Collection
		Roadway Incident Detection
IDOT District 1 Traffic Systems Center (TSC) Field Equipment	Roadway Subsystem	Roadway Basic Surveillance
		Roadway Freeway Control
		Roadway HOV Control
		Roadway Traffic Information Dissemination
		Roadway Incident Detection
		Roadway Equipment Coordination

Element	Architecture Entity	Equipment Package
		Roadway Work Zone Traffic Control
IDOT Emergency Traffic Patrol (ETP)	Emergency Management	Emergency Call-Taking
		Service Patrol Management
		Emergency Response Management
		Mayday Support
IDOT Emergency Traffic Patrol Vehicles	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
IDOT Maintenance Vehicles	Maintenance and Construction Vehicle	MCV Vehicle Location Tracking
		MCV Winter Maintenance
		MCV Roadway Maintenance and Construction
Illinois Gateway	Information Service Provider / Traffic Management	Basic Information Broadcast
		Interactive Infrastructure Information
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		TMC Work Zone Traffic Management
		TMC Multimodal Coordination
Illinois GIS Transportation Coalition	Archived Data Management	ITS Data Repository
		On-line Analysis and Mining
Illinois State Police Dispatch (District 2)	Emergency Management	Emergency Call-Taking
		Emergency Dispatch
		Emergency Response Management
		Center Secure Area Surveillance
		Mayday Support
Illinois State Police District 15 Operations Desk	Emergency Management	Emergency Call-Taking
		Emergency Response Management
		Mayday Support
Illinois State Police Vehicles	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
Illinois Transit Hub	Archived Data Management / Emergency Management / Information Service Provider / Transit Management	Transit Center Information Services
		Transit Center Multi-Modal Coordination
Independent School District Dispatch	Transit Management	Transit Center Vehicle Tracking
		Transit Center Fixed-Route Operations
		Transit Center Security
		Transit Garage Maintenance
		Transit Center Multi-Modal Coordination
Independent School District Vehicles	Transit Vehicle Subsystem	On-board Transit Security
ISTHA Dispatch Center	Emergency Management	Emergency Call-Taking
		Service Patrol Management
		Emergency Response Management
		Emergency Environmental Monitoring
		Center Secure Area Surveillance
		Mayday Support
ISTHA I-Pass Toll Plazas	Toll Collection	Toll Plaza Toll Collection
		Roadway Probe Beacons
ISTHA Maintenance and	Maintenance and Construction	MCM Vehicle Tracking

Element	Architecture Entity	Equipment Package
Construction	Management	MCM Incident Management
		MCM Maintenance Decision Support
		MCM Winter Maintenance Management
		MCM Roadway Maintenance and Construction
		MCM Work Zone Management
		MCM Work Activity Coordination
ISTHA TIMS Kiosks	Remote Traveler Support	Remote Basic Information Reception
		Remote Interactive Information Reception
ISTHA TMC (TIMS)	Information Service Provider /Traffic Management	Collect Traffic Surveillance
		TMC Freeway Management
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		Traffic Maintenance
		TMC Work Zone Traffic Management
ISTHA TMC Field Equipment	Roadway Subsystem	Roadway Basic Surveillance
		Roadway Freeway Control
		Roadway Traffic Information Dissemination
		Roadway Equipment Coordination
		Roadway Work Zone Traffic Control
ISTHA Toll Administration Center	Toll Administration	Toll Administration
MCR System	Archived Data Management	ITS Data Repository
Metra Consolidated Control Facility	Emergency Management /Transit Management / Rail Operations	Transit Center Vehicle Tracking
		Transit Center Fixed-Route Operations
		Transit Center Fare and Load Management
		Transit Center Security
		Transit Garage Maintenance
		Transit Center Information Services
		Transit Center Multi-Modal Coordination
Metra Parking Management Guidance System	Parking Management	Parking Management
		Parking Electronic Payment
		Parking Coordination
		Parking Data Collection
Metra PMGS Signs	Roadway Subsystem	Roadway Traffic Information Dissemination
Metra Train Information Management System	Transit Management	Transit Center Information Services
Metra Trains	Transit Vehicle Subsystem	On-board Transit Trip Monitoring
		On-board Fixed Route Schedule Management
		On-board Transit Fare and Load Management
		On-board Transit Security
		On-board Maintenance
		On-board Transit Signal Priority
		On-board Transit Information Services
Municipal EMCs	Emergency Management	Emergency Response Management

Element	Architecture Entity	Equipment Package
		Emergency Evacuation Support
Municipal EVAC System	Emergency Vehicle Subsystem	On-board EV Incident Management Communication
Municipal Field Equipment	Roadway Subsystem	Roadway Basic Surveillance
		Roadway Signal Controls
		Roadway Signal Priority
		Roadway Traffic Information Dissemination
		Standard Rail Crossing
		Roadway Speed Monitoring
		Roadway Work Zone Traffic Control
Municipal Fire/EMS Emergency Vehicles	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
Municipal Maintenance Vehicles	Maintenance and Construction Vehicle	MCV Winter Maintenance
		MCV Roadway Maintenance and Construction
		MCV Work Zone Support
Municipal Parking Management Guidance System	Parking Management	Parking Management
		Parking Electronic Payment
		Parking Data Collection
Municipal Police Emergency Vehicle	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
Municipal Public Safety Dispatch	Emergency Management	Emergency Call-Taking
		Emergency Dispatch
		Emergency Routing
		Incident Command
		Emergency Response Management
		Center Secure Area Surveillance
Municipal TMC	Traffic Management	Collect Traffic Surveillance
		TMC Signal Control
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		TMC Evacuation Support
		HRI Traffic Management
		Rail Operations Coordination
		TMC Multimodal Coordination
Municipal Transit Operations	Transit Management	Transit Center Fixed-Route Operations
		Transit Garage Maintenance
		Transit Center Multi-Modal Coordination
Municipal/ Township Maintenance	Maintenance and Construction Management	MCM Maintenance Decision Support
		MCM Winter Maintenance Management
		MCM Roadway Maintenance and Construction
		MCM Work Zone Management
		MCM Work Activity Coordination
Northeastern Illinois 511 System	Information Service Provider	Basic Information Broadcast
		Interactive Infrastructure Information

Element	Architecture Entity	Equipment Package
Northeastern Illinois Regional Data Archive	Archived Data Management Subsystem	ITS Data Repository
		Traffic and Roadside Data Archival
		On-line Analysis and Mining
OHSEM Emergency Field Devices	Roadway Subsystem	Emergency Response Management
		Roadway Traffic Information Dissemination
OHSEM Emergency Vehicles	Emergency Vehicle Subsystem	On-Board EV En Route Support
		On-Board EV Incident Management Communication
OHSEM Mobile Operation Center	Emergency Management / Emergency Communication System	Incident Command
		Emergency Response Management
		Emergency Evacuation Support
		TMC Traffic Information Dissemination
Pace IBS	Transit Management	Transit Center Vehicle Tracking
		Transit Center Fixed-Route Operations
		Transit Center Fare and Load Management
		Transit Center Multi-Modal Coordination
Pace Paratransit Dispatch	Transit Management	Transit Center Vehicle Tracking
		Transit Center Paratransit Operations
		Transit Center Fare and Load Management
		Transit Center Multi-Modal Coordination
Pace Paratransit Vehicles	Transit Vehicle Subsystem	On-board Transit Trip Monitoring
		On-board Paratransit Operations
		On-board Transit Fare and Load Management
		On-board Transit Security
Pace Transit Bus Vehicles	Transit Vehicle Subsystem	On-board Transit Trip Monitoring
		On-board Fixed Route Schedule Management
		On-board Transit Fare and Load Management
		On-board Transit Security
		On-board Maintenance
		On-board Transit Signal Priority
		On-board Transit Information Services
Pace Vanpool Service	Transit Management	
Private Bus Dispatch	Transit Management	Transit Center Vehicle Tracking
		Transit Center Fixed-Route Operations
		Transit Center Paratransit Operations
		Transit Garage Maintenance
		Transit Center Multi-Modal Coordination
		On-Board Fixed Route Schedule Management
		On-Board Paratransit Operations
Private ISPs – Travel Information Services	Information Service Provider	Basic Information Broadcast
		Interactive Infrastructure Information
		Infrastructure Provided Trip Planning
Private Parking Lots	Parking Management	Parking Management
		Parking Electronic Payment
		Private Data Collection
Private Sector Maintenance Contractor Dispatch	Maintenance and Construction Management	MCM Roadway Maintenance and Construction
		MCM Work Zone Management

Element	Architecture Entity	Equipment Package
Private Sector Maintenance Vehicle	Maintenance and Construction Vehicle	MCV Vehicle Location Tracking
		MCV Roadway Maintenance and Construction
		MCV Work Zone Support
Private Taxi Dispatch	Transit Management	Transit Center Paratransit Operations
		Transit Vehicle Operator Scheduling
		Transit Center Multi-Modal Coordination
		Transit Center Vehicle Tracking
Private Taxi Vehicles	Transit Vehicle	On-board Transit trip Planning
		On-board Paratransit Operations
Private Tow and Recovery Operations	Emergency Management	Emergency Dispatch
		Emergency Response Management
Private Tow and Recovery Vehicles	Emergency Vehicle Subsystem	On-board EV-En Route Support
		On-board EV Incident Management Communication
Regional Transportation Authority Travel Information Center (TIC)	Information Service Provider / Transit Management	Basic Information Broadcast
		Interactive Infrastructure Information
		Infrastructure Provided Yellow Pages and Reservation
		Transit Center Information Services
		Transit Center Multi-Modal Coordination
Ride-DuPage Dispatch	Transit Management	Transit Center Vehicle Tracking
		Transit Center Paratransit Operations
		Transit Center Security
		Transit Garage Maintenance
		Transit Center Multi-Modal Coordination
Ride-DuPage Vehicles	Transit Vehicle Subsystem	On-board Transit Trip Monitoring
		On-board Paratransit Operations
		On-board Transit Security
RTA Itinerary Planning System	Remote Traveler Support	Transit Center Information Services
RTAMS Data Archive (Web-based)	Archived Data Management	ITS Data Repository
		On-line Analysis and Mining
		Virtual Data Warehouse Services
Satellite TMC OHare Airport	Information Service Provider / Parking Management / Traffic Management	Parking Management
		Parking Electronic Payment
		Parking Data Collection
		Collect Traffic Surveillance
		TMC Signal Control
		TMC Traffic Information Dissemination
		TMC Regional Traffic Control
		TMC Incident Detection
		TMC Incident Dispatch Coordination/Communication
		Traffic Maintenance
Statewide Emergency Operations Center	Emergency Management	Emergency Response Management
Transportation Research Analysis and Computing Center	Archived Data Management	ITS Data Repository
		On-line Analysis and Mining
		Virtual Data Warehouse Services
User Personal Computing Devices	Personal Information Access	Personal Basic Information Reception
		Personal Interactive Information Reception
		Personal Location Determination

Element	Architecture Entity	Equipment Package
		Personal Trip Planning and Route Guidance
Utility Company Dispatch	Maintenance and Construction Management	MCM Work Activity Coordination
Vehicles	Vehicle / Basic Vehicle	Basic Vehicle Reception
		Interactive Vehicle Reception
		Vehicle Trip Planning and Route Guidance
		Vehicle Location Determination
		Vehicle Toll/Parking Interface
		Vehicle Probe Support
		In-Vehicle Signing System

Elements common to both the Regional (Northeastern Illinois) and DuPage Subregional ITS Architectures

6. INTERFACES AND INFORMATION FLOWS

Many of the functional requirements listed in Section 5 highlight interactions between the ITS systems of various regional transportation agencies. These interactions emphasize some of the benefits that ITS can provide. While traffic sensors and roadway cameras collect information that is important to a single agency's operations, the sharing of this information often has a greater positive effect on the larger regional transportation system.

As demonstrated in Section 3.1, the National ITS Architecture identifies the interactions that occur between ITS systems to perform services to the traveling public (see Figure 5). The Turbo Architecture® software tool provides the functionality to display these interactions between individual ITS systems in a graphical format. Figure 6, provides an example of these diagrams. This example shows how the different subsystems/terminators (with associated stakeholder) are linked. Note that the status (existing, planned, or future) of those interconnections is also described in the diagram. Appendix C contains the 'interconnect diagrams' for each DuPage County regional ITS system. The architecture also defines the individual bits of information, or 'architecture flows,' that are exchanged between these systems. Due to the high level of detail inherent to the architecture flows, they should be viewed using the Turbo Architecture® tool.

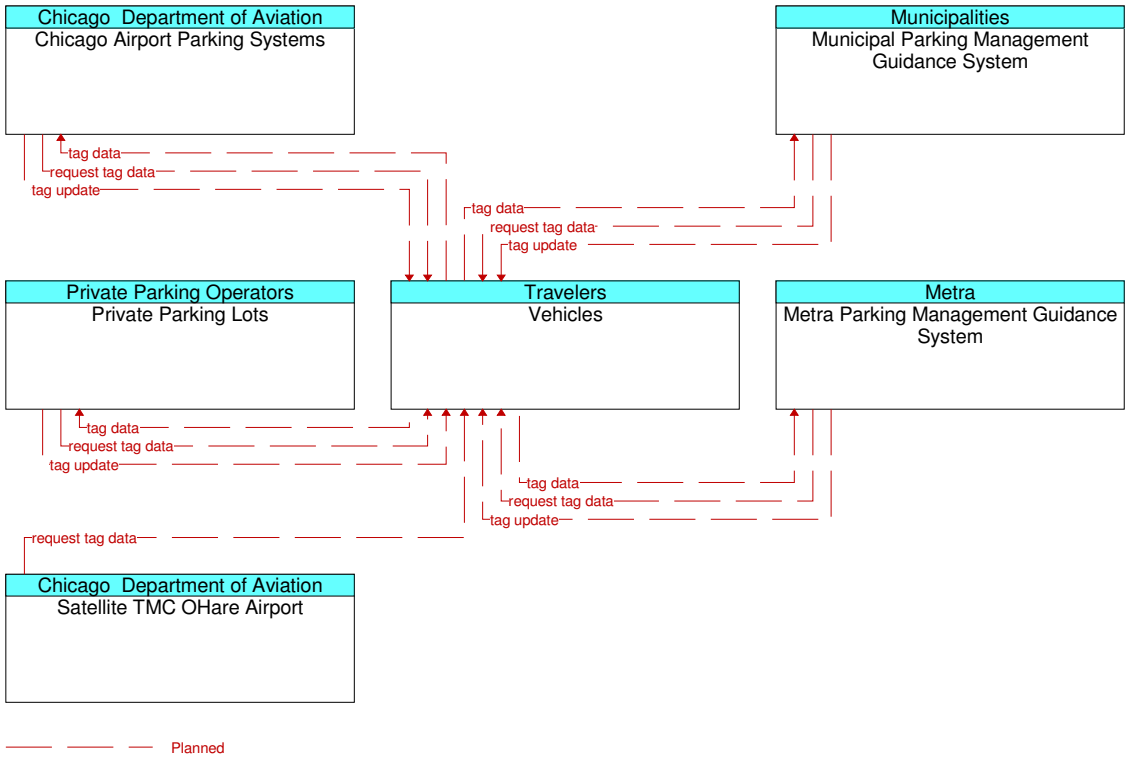

Figure 6 – DuPage County Example Interconnect Diagram

Figure 7 summarizes the various interconnections between the National ITS Architecture subsystems included in the DuPage County TCI Subregional ITS Architecture. As stated in

Section 2.3, commercial vehicle operations are addressed in the Illinois Statewide ITS Architecture.

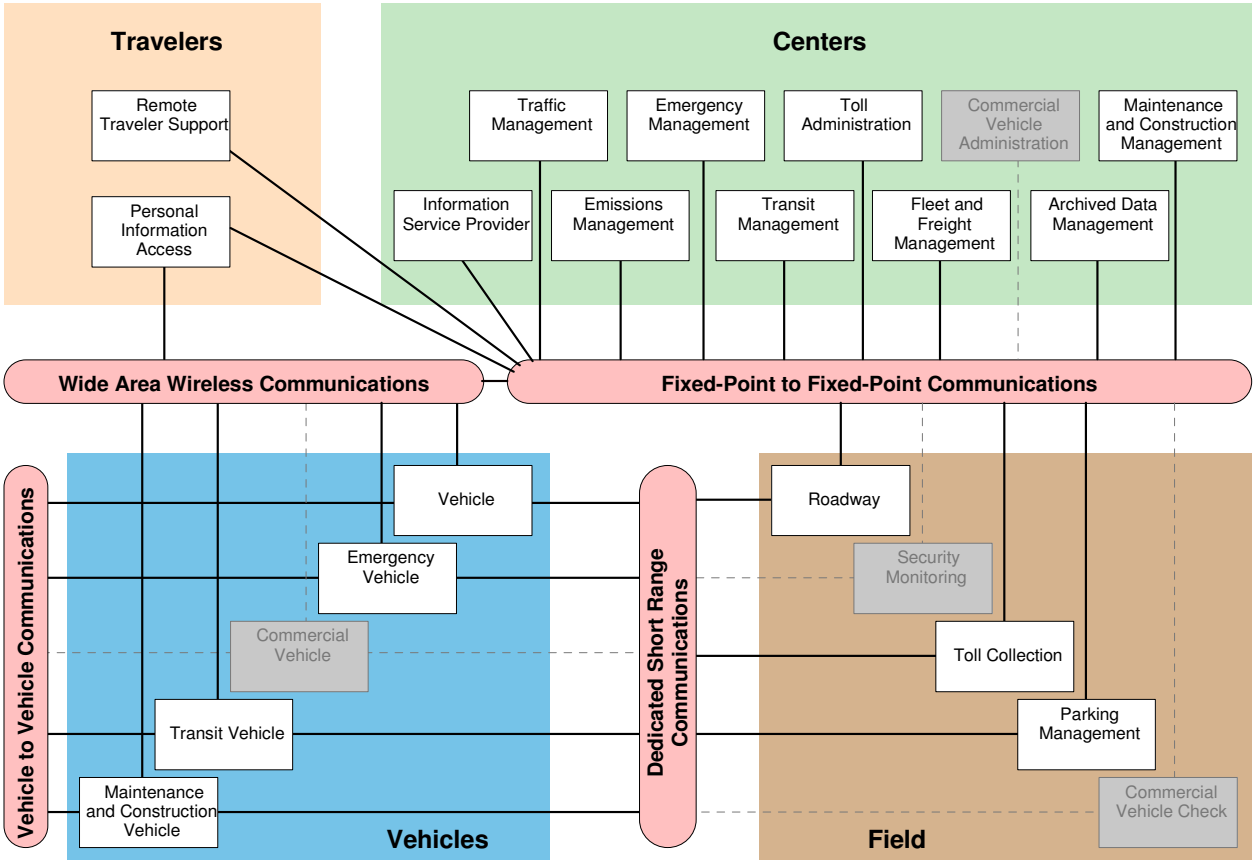

Figure 7 – DuPage County Subsystem Interconnect Diagram

The subsystems that are not a part of the Subregional ITS Architecture are shown in gray, and include the subsystems related to commercial vehicles (not included in the Subregional ITS Architecture as stated above), emissions management, and tolling collection/administration.

7. PROJECT SEQUENCING

Within the timeframe of this report as outlined in Section 2.2, a variety of ITS projects should be considered for deployment and/or implementation in the DuPage County region. These projects involve many agencies and potential funding sources.

As part of the TCI initiative, the separate DuPage County TCI Implementation Plan provides information regarding sequencing and coordination of projects to ensure current/future ITS projects are deployed and implemented in the most effective manner in terms of cost, constructability, and functionality. For most of the projects, details such as in-depth project descriptions and construction cost estimates will need to be developed further in other transportation planning documents.

There are a limited number dollars potentially available for ITS projects over the course of the next several years in DuPage County. It is imperative that implementation of these projects be coordinated as described in order to for the region to achieve optimal operational benefits from any ITS deployments.

8. AGREEMENTS

In DuPage County, a substantial amount of coordination is required between the various ITS stakeholders to ensure that ITS resources are being utilized in the most efficient possible manner. In many cases, the coordination is governed via an agreement between stakeholders. Agreements allow for each party to obtain a clear understanding of what their responsibilities are, and what they can expect from the other party (or parties) involved.

The agreements vary in scope and depth, ranging from informal "handshake" agreements to formal contracts. A wide variety of regional public and private sector ITS stakeholders are participants in the agreements, and a wide variety of ITS activities are addressed.

Table 6 provides a listing of current/planned ITS stakeholder agreements in DuPage County. Included in the table are the agreement title, type, and description, as well as the stakeholders involved and the status of each regional ITS stakeholder agreement. A description of each column heading in the table is as follows:

- **Number:** The agreement's assigned number. The number has no significance other than to provide a "placeholder" in the table.
- **Title:** The agreement's title.
- **Type:** Indicates the type of agreement. Handshake = informal, verbal agreement. MOU = memorandum of understanding (written document providing minimal detail and demonstrating general consensus). Contract = annual written contract stating specific duties and responsibilities of each party. Operational agreement = written document (more specific than an MOU) identifying respective responsibilities for all activities associated with system maintenance and operations. IGA = Intergovernmental Agreement
- **Description:** A brief description of what activities the agreement is intended to govern, and which stakeholders will be involved.
- **Lead Stakeholder:** Stakeholder responsible for initiating the agreement.
- **Associated Stakeholders:** All stakeholders involved in the coordination/execution of the agreement with the lead stakeholder. Stakeholder acronyms are as follows:
    - DCDOT = DuPage County Division of Transportation
    - IDOT = Illinois Department of Transportation
    - ISTHA = Illinois State Toll Highway Authority
    - ISP = Illinois State Police
- **Status:** Existing = agreement is currently in place. Planned = agreement is planned for the near future.

Table 6 – DuPage County ITS Agreements Inventory

No.	Title	Type	Description	Lead Stakeholder	Associated Stakeholders	Status
1	ISTHA - NBC 5 Video Sharing Agreement	Contract	The Toll-way currently shares video with NBC 5 (workstation at NBC 5) through an agreement	ISTHA	NBC 5	Existing
2	ISTHA-IDOT Fiber Optic Sharing Agreement	Contract	The Tollway has a number of agreements in place for sharing fiber optic connectivity with IDOT (I-290, I-355, I-55). There is a potential for Tollway fiber sharing with DuPage County.	ISTHA	IDOT	Existing
3	ISTHA-ISP D15 Construction Data Sharing Agreement	IGA	Construction data sharing between the Tollway and ISP D15 is good, but with other agencies this coordination is minimal.	ISTHA	ISP District 15	Existing
4	Village of Lombard-Elmhurst-Villa Park Signal Coordination Agreement	IGA	The Village of Lombard has an agreement with Elmhurst and Villa Park for coordinated signal timing on St. Charles Road	Village of Lombard	City of Elmhurst, Village of Villa Park	Existing

9. STANDARDS

In order to support regional and national interoperability, a system of nationwide ITS standards has been developed. These standards establish a common protocol for agencies that allows them to cost-effectively design, deploy, and maintain ITS systems in a consistent fashion. With ITS technologies continuing to evolve, many ITS standards are still in their infancy, while others are in various stages of development.

The goal of ITS standards is to ensure that the consistency of ITS system implementation resulting from adherence to ITS standards will allow for more efficient data exchange, and will allow for equipment replacement, system upgrades, and system expansion to be more readily accommodated. Also, ITS standards, as a protocol for consistency and uniformity, should provide a more innovative and competitive regional and nationwide market for transportation products and services.

ITS standards are mapped to the architecture flows between ITS architecture subsystems. For instance, ITS standards are mapped to the file transfer protocol for the transmission of roadway network conditions between a metropolitan traffic management center and a suburban traffic management center. A variety of ITS standards might apply in DuPage County based upon the architecture flows connecting the various regional architecture elements as identified in the Turbo Architecture® software file. A listing of the ITS standards mapped to the architecture flows within the DuPage County Subregional ITS architecture is provided in Table 7. Included in the table are the Standards Development Organization(s), the standard name, and the document ID for each standard or group of standards. A description of each column heading in the table is as follows:

- **Lead SDO:** The main standards development organization(s) (SDO) responsible for the development of the listed standard. SDO acronyms are as follows:
    - AASHTO = American Association of State Highway and Transportation Officials
    - ITE = Institute of Transportation Engineers
    - NEMA = National Electrical Manufacturer's Association
    - ASTM = American Society for Testing and Materials
    - IEEE = Institute of Electrical and Electronics Engineers
    - SAE = Society of Automotive Engineers
- **Standard:** The name of the standard or group of standards. For each standards group, the individual standards contained within the group are listed directly below the group identifier. Standard name acronyms not identified in the table are as follows:
    - NTCIP = National Transportation Communications for ITS Protocol
    - TCIP = Transit Communications Interface Profile
- **Document ID:** Indicates the identification of each standard's supporting documentation.

Table 7 – DuPage County TCI ITS Standards Inventory

Lead SDO	Standard Name	Document ID
AASHTO/ ITE/ NEMA	NTCIP Center to Center Standards Group	NTCIP 1102, NTCIP 1104, NTCIP 1105, NTCIP 1106, NTCIP 2104, NTCIP 2202, NTCIP 2303, NTCIP 2304, NTCIP 2305, NTCIP 2306, NTCIP 2501, NTCIP 2502
	NTCIP Center to Field Standards Group	NTCIP 1101, NTCIP 1102, NTCIP 1103, NTCIP 2101, NTCIP 2102, NTCIP 2103, NTCIP 2104, NTCIP 2201, NTCIP 2202, NTCIP 2301, NTCIP 2302, NTCIP 2303
	Global Object Definitions	NTCIP 1201
	Object Definitions for Actuated Traffic Signal Controller Units	NTCIP 1202
	Object Definitions for Dynamic Message Signs (DMS)	NTCIP 1203
	Environmental Sensor Station Interface Standard	NTCIP 1204
	Object Definitions for Closed Circuit Television (CCTV) Camera Control	NTCIP 1205
	Object Definitions for Data Collection and Monitoring (DCM) Devices	NTCIP 1206
	Object Definitions for Ramp Meter Control (RMC) Units	NTCIP 1207
	Object Definitions for Closed Circuit Television (CCTC) Switching	NTCIP 1208
	Data Element Definitions for Transportation Sensor Systems (TSS)	NTCIP 1209
	Field Management Stations – Part 1: Object Definitions for Signal System Masters	NTCIP 1210
	Object Definitions for Signal Control and Prioritization	NTCIP 1211
	TCIP Common Public Transportation (CPT) Objects	NTCIP 1401
	TCIP Incident Management (IM) Objects	NTCIP 1402
	TCIP Passenger Information (PI) Objects	NTCIP 1403
	TCIP Scheduling/Runcutting (SCH) Objects	NTCIP 1404
	TCIP Spatial Representation (SP) Objects	NTCIP 1405
	TCIP On-Board (OB) Objects	NTCIP 1406
	TCIP Control Center (CC) Objects	NTCIP 1407
	TCIP Fare Collection (FC) Business Area Objects	NTCIP 1408
ASTM	Dedicated Short Range Communication at 915 MHz Standards Group	ASTM E2158-01, ASTM PS105-99
	Standard Specification for Metadata to Support Archived Data Management Systems	ASTM E2259-xx
	Standard Specification for Archiving ITS Generated Travel Monitoring Data	ASTM E2259- yy
IEEE	Incident Management Standards Group	IEEE 1512.1-2003,IEEE1512.2-2004, IEEE 1512.3-2002, IEEE 1512-2000, IEEE P1512.4
	Standard for Interface between the Rail Subsystem and the Highway at a Highway Rail Intersection	IEEE 1570-2002
	Standard for Message Sets for Vehicle/Roadside Communications	IEEE Std 1455-1999
ITE	Standard for Functional Level Traffic Management Data Dictionary (TMDD)	ITE TM 1.03

Lead SDO	Standard Name	Document ID
	Message Sets for External TMC Communication (MS/ETMCC)	ITE TM 2.01
SAE	Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group	SAE J2266, SAE J2354, SAE J2369, SAE J2540, SAE J2540-1, SAE J2540-2, SAE J2540-3
	Advanced Traveler Information Systems (ATIS) General Use Standards Group	SAE J2266, SAE J2354, SAE J2540, SAE J2540-1, SAE J2540-2, SAE J2540-3
SAE/IEEE	Dedicated Short Range Communication at 5.9 GHz Standards Group	IEEE 1609.1, IEEE 1609.2, IEEE 1609.3, IEEE 1609.4, IEEE 802.11, IEEE 802.2, ISO 21210

As new ITS technologies continue to be implemented within DuPage County, or as obsolete technologies are phased out, ITS standards may need to be added or subtracted from the ITS standards list.

10. USE OF THE ARCHITECTURE

As shown in Figure 1, step five of the architecture process is use of the architecture. A regional ITS architecture is developed so that it can be used as a tool for region-wide transportation planning, ITS project development, and ITS project implementation. It is important that the architecture be used in conjunction with other regional planning documents to ensure that proposed ITS projects are implemented in the most practical, cost-effective, and beneficial manner.

10.1 Planning

From a planning standpoint, the Subregional ITS Architecture should be used as a reference when updating regional transportation plans. ITS projects as listed in the architecture add to the pool of potential regional projects to be programmed. The planning agencies responsible for updating the transportation plans will now be able to make a more informed determination of transportation project priority given the information the Subregional ITS Architecture provides concerning ITS projects and their potential effect on other roadway and transit projects.

Another planning document which will play a significant role in the planning process is the Northeastern Illinois ITS Deployment Plan. This recently updated document provides detailed information on planned ITS projects in the region. The Subregional ITS Architecture and TCI Implementation Plan, in conjunction with the Northeastern Illinois ITS Deployment Plan, will work together to provide comprehensive ITS data to be used in determining transportation project priority in the region.

Since ITS technologies are continually evolving, expanding, and changing, ITS architectures (including the Subregional ITS Architecture) are generally developed to a medium-term timeframe of approximately 5-10 years. Therefore, this Subregional ITS Architecture will be of some benefit in determining medium-term project priority within a long range plan, and will be of substantial benefit in prioritizing projects within the short-term TIP and STIP plans.

10.2 Project Development and Implementation

From a project development and implementation standpoint, an ITS architecture can aid individual stakeholders in defining the scope and details of an ITS project. Generally, the stakeholder has an idea of the general parameters of a project, but the ITS architecture allows the stakeholder to develop a detailed scope via identification of:

- the appropriate systems or parts of systems that will need to be employed,
- the various interconnections with other systems and/or stakeholders that may be required, and
- what information needs to flow across the interconnections.

Determination of systems to be employed begins with identification of stakeholder roles and responsibilities, which are defined in the Concept of Operations. The appropriate interconnections can be partially or completely defined using the ITS architecture functional

requirements applicable to the project. The requirements for the information flows across the interconnections can be identified by mapping to the ITS standards within the ITS architecture.

The development of an ITS project as outlined above follows the left side of the standard systems engineering approach as illustrated in Figure 8 below.

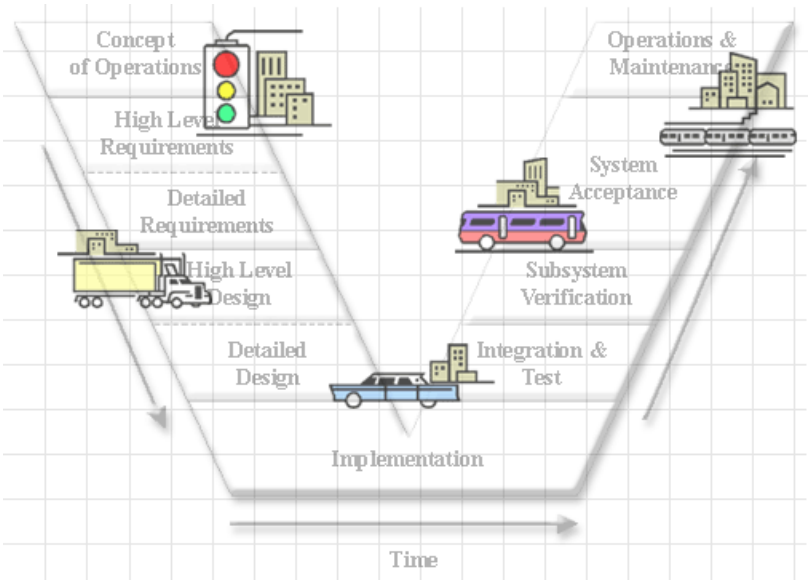

Figure 8 – Standard Systems Engineering Diagram

The concept of operations, functional requirements, and standards as defined in the ITS architecture allow for the stakeholder to develop the project to the detailed design level, then onward into the implementation stage. The systems engineering approach, which includes the identification of roles and responsibilities, functional requirements, and ITS standards, is also important to follow since it is required by the FHWA/FTA Rule/Policy governing ITS projects funded via the Highway Trust Fund.

Once a project has been defined and funding has been committed, the implementation portion can proceed with the generation of a Request for Proposal (RFP), a common governmental practice for initiating a contract with the private sector to implement the project. The ITS architecture can support the RFP generation process by developing the project definition as described above, which forms the basis for the items/equipment to be procured in the contract. Also, mapping the project to the ITS architecture allows potential bidders to have a clear understanding of the project scope and the interfaces that need to be developed. After the project has been awarded, the process moves up the right side of the systems engineering diagram shown above via installation of the appropriate systems and devices, testing and integration, acceptance and verification, and then maintenance.

As detailed above, the Subregional Architecture represents a plan for the implementation of ITS systems throughout DuPage County, and is a valuable tool that should be used to support regional transportation planning and ITS project development/implementation efforts.

11. MAINTAINING THE ARCHITECTURE

The sixth and final step in developing an ITS architecture is the maintenance of the architecture. The DuPage County Subregional ITS Architecture is a dynamic framework for the planning, development, and deployment of ITS in the region. As such, the architecture will need to be periodically updated as ITS projects are implemented and as the ITS needs and services evolve within the region. The FHWA/FTA has emphasized the importance of this step in its Final Rule/Final Policy, stating that "The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region."

In order to define these procedures, the following three questions are addressed in this maintenance plan:

- Who will maintain the architecture?
- What will be maintained?
- How will it be maintained?

The following subsections demonstrate how the three primary questions of architecture maintenance will be addressed in DuPage County.

11.1 Who Will Maintain the Architecture?

The DuPage County Division of Transportation (DCDOT) will maintain the DuPage County Subregional ITS Architecture. As the primary countywide transportation agency within the geographic boundary of the Subregional Architecture, the DCDOT is well suited to serve this role.

In order to facilitate maintenance of the Subregional Architecture, the TCI Steering Committee shall be responsible for ensuring that the DuPage County Subregional ITS Architecture is maintained in accordance with the FHWA/FTA Final Rule and Policy.

11.2 What Will be Maintained?

The DuPage County Subregional ITS Architecture consists of two components: this architecture document and the Turbo Architecture® database. Architecture changes approved by the TCI Steering Committee should be reflected in both components.

11.3 How Will it be Maintained?

Maintenance of the architecture is a multi-step process. First, a potential architecture change must be identified by a regional ITS stakeholder (or stakeholders). Next, the change request form (see below) must be submitted by the stakeholder and reviewed by the TCI Steering Committee to determine if an architecture change is in order. If the change is approved, it is to be documented in the list of changes for the next architecture update and then implemented.

Change Request Identification

Change requests must originate within the TCI Steering Committee membership using the Change Request Form found at the conclusion of this section. Entries on the form include:

- Change identification,
- Request date,
- Change description,
- Rationale for change,
- Request originator contact information, and
- Administrative fields.

All change request forms will be catalogued by the DCDOT in the Change Database (described below).

Change Request Review

Each requested change will be reviewed by the TCI Steering Committee to ensure that the request warrants a change in the architecture. The following are examples of circumstances that could lead to an architecture change request:

1. Changes in regional needs
2. Change in description of the region
3. Stakeholders added, deleted, or revised
4. Change in service scope or change to the National ITS Architecture
5. Changes to adjacent or overlapping regional ITS architectures
6. Changes in status of systems or services
7. Changes in ITS standards
8. Interagency agreements added, deleted, or revised
9. Changes in project priority, including new or deleted ITS-related projects
10. Changes to existing regional transportation plans, including the Northeastern Illinois ITS Deployment Plan or the Illinois Statewide ITS Strategic Plan

For change requests concerning ITS-related projects, the TCI Steering Committee will determine if a proposed project is, in fact, an intelligent transportation systems project. Next, the committee will determine if the Subregional Architecture already includes the requested item. If the project is not yet reflected in the architecture, the TCI Steering Committee will vote to determine if it should be recommended for DuPage County Board Transportation Committee approval.

Change Request Approval

In order for an architecture change to be recommended by the TCI Steering Committee, a majority vote is required. This vote could be made via an TCI Steering Committee meeting, or email/telephone. At a minimum, the committee should convene on an annual basis to review and/or recommend requested architecture changes.

Once the TCI Steering Committee has voted to recommend a change to the architecture, the change request will be carried forward to the DuPage County Board Transportation Committee

for their approval. Approval will be granted by those committees in accordance with current procedures. If the change request is rejected by the TCI Steering Committee, within two weeks the request originator will be informed of the decision (and the reason(s) for the decision) and will be invited to resubmit a change request if deemed appropriate by the maintainer.

Next, the approved change will be documented in the DuPage County Subregional ITS Architecture Change Database. Below is a sample Change Database Entry which highlights the information that would be taken from the Change Request forms and entered into the Change Database.

Change Number	*Change Description*	*Request Originator*	*Change Decision*	*Decision Date*	*Decision Comment*	*Architecture Components Affected*	*Change Type*
XX-YY*	Expanded description of the requested change	Name of request originator	Accept, reject, or defer	Date decision is made	Pertinent details associated with change decision	Listing of affected architecture components	Minor or major

* XX = year and YY = chronological value

Change Implementation

Formal implementation of changes to the DuPage County Subregional ITS Architecture will occur every three years, beginning approximately January of 2010. It should be noted that time-sensitive changes may be incorporated to the architecture as needed. The DCDOT (or its Architecture Maintenance Contractor) will implement the approved changes from the Change Database at that time. The maintainer should ensure that updates are consistent with the most recent version of the National ITS Architecture and Turbo Architecture®. To properly track updates to the DuPage County Subregional ITS Architecture, the maintainer should update the Document Revision History table at the front of this document and the Change Log in Turbo Architecture®.

Once the architecture update process is complete, the maintainer shall submit the updated architecture document and Turbo Architecture® file to the TCI Steering Committee for approval. The updated architecture will then undergo the same review and approval process as described above for individual architecture change requests.

Summary

Below is a bulleted chronological summary of the DuPage County Subregional ITS Architecture maintenance process:

- Subregional ITS Architecture change requested by stakeholder
- Subregional ITS Architecture Change Form submitted to DCDOT by requesting stakeholder
- Change request catalogued in DCDOT Subregional ITS Architecture Change Database
- TCI Steering Committee meets annually (minimum) to review Subregional ITS Architecture change requests
- Changes approved by TCI Steering Committee are forwarded to DuPage County Board Transportation Committee for approval

- Changes approved, denied, or deferred by TCI Steering Committee are indicated as such by DCDOT in Subregional ITS Architecture Change Database
- Subregional ITS Architecture revised by Architecture Maintainer every three years to include all approved Subregional ITS Architecture changes since most recent architecture update
- Subregional ITS Architecture revision documented by Architecture Maintainer in Architecture Revision History table and Turbo Software® change log
- Revised Subregional ITS Architecture Document and Turbo Software® file submitted to TCI Steering Committee and DuPage County Board Transportation Committee for approval

Adherence to the above process will ensure that the DuPage County Subregional ITS Architecture is maintained in accordance with the FHWA/FTA Final Rule and policy

DuPage County Subregional ITS Architecture Change Request Form

Change Identification:			Request Date:	
Change Description (describe affected architecture elements):				
Rationale for Change:				
Request Originator Contact Information:	Name:			
	Agency:			
	Address:			
	Telephone:			
	Fax:			
	Email:			
To be filled out by Architecture Maintainer				
Change Number*:				
Change Decision:	Accept	Reject	Defer	
Decision Comments:				
Decision Date:				
Architecture Components Affected:				
Change Type:	Minor	Major		

* XX-YY, where XX = year and YY = chronological value, e.g., the first change request of 2006 would be '06-01'