Agenda No. 5.02

Regional Intelligent Transportation System (ITS) Architecture

Prepared by
Chicago Metropolitan Agency for Planning

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Introduction

The Northeastern Illinois Regional Intelligent Transportation Systems (ITS) Architecture is a roadmap for transportation systems integration for the northeastern Illinois counties of Cook, DuPage, Kane, Kendall, Lake, McHenry, Will and a portion of Grundy County over the next 15 years. The Architecture has been developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. The Architecture represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

The Architecture is an important tool that will be used by:

- Operating agencies to recognize and plan for transportation integration opportunities in the region;
- Planning agencies to better reflect integration opportunities and operational needs into the transportation planning process; and
- Other organizations and individuals that use the transportation system in the Northeastern Illinois region.

The Architecture provides an overarching framework that spans all of these organizations and individual transportation projects. Using the Architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated intelligent transportation system over time.

Relationship to Other Architectures

The Architecture was developed in cooperation with the Illinois Department of Transportation (IDOT) and recognizes linkages to the Illinois Statewide ITS Architecture. The Architecture also supports information flows from the states of Wisconsin, Indiana, and Michigan who maintain their own Statewide ITS Architectures. Within the region, DuPage County has adopted the DuPage County Transportation Coordination Initiative, and the Regional Transportation Authority has adopted the Regional Transit Intelligent Transportation Systems Plan - both subregional ITS architectures whose activities are also supported and included within the Regional ITS Architecture.

Background

In 2001, the U.S. Department of Transportation (U.S. DOT) published the Federal Highway Administration (FHWA) Final Rule and Federal Transit Administration (FTA) Policy which implement section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21). The rule set out the requirement that regions who were implementing ITS projects must develop an ITS Architecture by April 2005.

Fortunately, the Chicago metropolitan area understood early on the value of a plan to guide the

development of the region's intelligent transportation systems. In 1999, the Strategic Early Deployment Plan (SEDP) identified the need for a Regional ITS Architecture. A preliminary, high level Architecture of key regional systems was prepared through the Gary-Chicago-Milwaukee Corridor Multi-Modal Traveler Information System (GCM/MMTIS) and is described in the SEDP and in GCM documentation.

In July of 2000, IDOT and Chicago Area Transportation Study (CATS), a predecessor of the Chicago Metropolitan Agency for Planning (CMAP), sponsored a regional Tier 1 Architecture workshop to continue the development of the preliminary regional architecture. This one-day workshop gathered local transportation stakeholders and introduced the basic steps and concepts necessary to continue the development of a Regional ITS Architecture. In March of 2001, the Tier II Architecture workshop was held which incorporated the information from GCM and SEDP documentation, and stakeholder input into the first Regional ITS Architecture for northeastern Illinois – well in advance of the deadline set out by U.S. DOT for this task. This Regional ITS Architecture was built using the Turbo Architecture© tool. The resulting 2002 Regional ITS Architecture v1.0 was found to be consistent with the National ITS Architecture by the FHWA and FTA in June of 2003.

In 2007, another major update to the base Regional ITS Architecture was undertaken. Over a period of two days, half-day stakeholder meetings were held with groups of stakeholders from the region's agencies representing:

- Emergency Management and Security Functions
- Arterial Management Functions
- Expressway Management Functions
- Transit Management Functions

The stakeholders had a chance to review information included in the northeastern Illinois Regional ITS Architecture v1.0 and participate in discussions guided by consultants regarding ITS activities. In addition to stakeholder input, ITS documents from a variety of agencies were reviewed with information incorporated into the revised Regional ITS Architecture. The results of the document review and outreach produced the northeastern Illinois Regional ITS Architecture v2.0, adopted in early 2008.

After an information gathering process which extended from spring of 2013 until the middle of 2014, an updated Regional ITS Architecture v.3.0 was developed. The CMAP Board and MPO Policy Committees approved the updated architecture at their respective January 2015 meetings.

On December 4, 2015, President Obama signed into law H.R. 22, the Fixing America's Surface Transportation (FAST) Act. The bill retained funding for research in Intelligent Transportation systems, and also reiterated the requirement that ITS projects carried out with funding from the Highway Trust Fund must conform to the appropriate regional ITS Architecture.

ARC-IT and RAD-IT Versions

In July 2017, the USDOT released the Architecture Reference for Cooperative and Intelligent

Transportation (ARC-IT), since updated to version 8.3, to replace the National ITS Architecture. The Turbo Architecture© database software has been replaced with Regional Architecture Development for Intelligent Transportation (RAD-IT) software, which has also been updated to maintain consistency with the ARC-IT Version 8.3.

Before updating the information contained within the existing Architecture database, the 2013/2014 Northeastern Illinois ITS Architecture was updated from Turbo Architecture© 7.0 to RAD-IT Architecture version 8.3. This update resulted in a Regional ITS Architecture that is consistent with the current ARC-IT v8.3, which defines the functions that are required for ITS, the physical systems which supply them, and the information exchanges that connect the physical subsystems together into an integrated system.

Regional ITS Architecture Information Update

At the conclusion of the 2013/2014 update, CMAP updated the Architecture maintenance plan to call for a more continuous rather than periodic maintenance process based on information collected at regular meetings of the Transportation Technology and Operations Coalition, formerly the Advanced Technology Taskforce (ATTF) and Regional Transportation Operations Coalition (RTOC), collectively. The maintenance tasks could be either supported by consultants or CMAP staff could take advantage of training provided by FHWA and develop the skills to maintain the ITS Architecture in-house. In the years that followed, CMAP staff availed themselves of this training. Time passed, however, and the continuous update model was not followed. In addition to the passing of time triggering the need for an update, the region updated its regional comprehensive plan in October 2018, ON TO 2050, which included a number of projects, action areas, and policies which are highly dependent on the region's ITS infrastructure and which were not reflected in the Regional ITS Architecture. Therefore, in 2019, CMAP began an outreach process with the TTOC members to collect information on desired revisions to project architectures.

Information collection took place during interviews with regional stakeholder agencies as noted in Table 1 below. The meetings were scheduled with individual TTOC members, who were free to invite additional participants who could add information to the conversation. The Architecture update team traveled to the agency location, and in most cases the meetings were attended by multiple agency representatives. The meetings focused on a review of each agency's project ITS architectures developed as part of the Regional ITS Architecture. Meeting notes were taken during the wide-ranging conversations, focusing on project architecture items that should be changed or added.

Table 1 – Summary of Regional Stakeholder Agency Meeting on Project Architectures

Regional Agency	Meeting Date	Agency Contacts	
IDOT	Sept. 11th, 2019	Lisa Heaven-Baum	Jeff Galas
CMAP	June 18th, 2019	Claire Bozic	Tom Murtha
CDOT	June 27th, 2019	Abraham Emmanuel	John O'Neal
Illinois Tollway	Multiple	Steve Mednis	Elyse Morgan

Table 1 – Summary of Regional Stakeholder Agency Meeting on Project Architectures			
Regional Agency	**Meeting Date**	**Agency Contacts**	
Cook County	June 4th, 2019	Brian Roberts	
DuPage County	May 23rd, 2019	Bill Eidson	
Lake County	May 22nd, 2019	Jon Nelson	
Kane County	May 15th, 2019	Stephen Zulkowski	
City of Naperville	August 15th, 2019	Andy Hynes	
CTA	August 20th, 2019	Herb Nitz	
Pace	June 26th, 2019	Taqhi Mohammed	David Tomzik
Metra	July 11th, 2019	David Kralik	
ILAVA	Sept. 11th, 2019	Jerry Quandt	
UIC	Sept. 11th, 2019	John Dillenburg	
FHWA	Sept. 9th, 2019	Dean Mentjes	

Once the initial interviews were completed, draft changes were added to the Architecture. This included changes indicated by the ON TO 2050 projects, action areas, and policies. Meetings with police and emergency responders were not undertaken. Each of the TTOC agencies maintains a cooperative relationship with appropriate law enforcement and emergency response agencies. The team relied on the TTOC members to comment on coordination activities underway with police and emergency response staff. At the conclusion of the meetings and calls with the key stakeholders, all information was added to the revised RAD-IT Architecture Database and exported to a revised web-based presentation, with the process being documented in this Regional ITS Architecture v.4.

Maintenance Plan Update

CMAP is responsible for maintaining the Northeastern Illinois Regional ITS Architecture. While CMAP assumes responsibility for maintenance, a group of core stakeholders act as an "institutional framework" to provide information and to review proposed changes to the Architecture. The Regional ITS Architecture is a consensus framework for integrating ITS systems in the region. The "institutional framework" is the Transportation Technology and Operations Coalition (now being reconstituted with the Regional Transportation Operations Coalition as the Transportation Technology and Operations Coalition).

The maintenance plan adopted in 2014 made a number of recommended steps:

- Identify Change – focus on ITS projects; take advantage of the TTOC to facilitate the use and maintenance of the Regional Architecture; update the Change Request Form.
- Evaluate/Approve Change – rekindle the TTOC Architecture subgroup to play a more

active role in Architecture maintenance.

- Update Baseline – training or outside support should be provided to facilitate Architecture maintenance.
- Notify Stakeholders – approved Architecture changes should be distributed to regional ITS stakeholders to keep them updated and to encourage use of the Architecture.

CMAP has included these recommended steps in the updated maintenance plan except for the identification of an TTOC ITS Architecture subgroup. There was little appetite for the development of an additional group. As a result, the revised plan reflects that TTOC as a whole serves this purpose.

The updated maintenance plan also goes into more detail about the Architecture approval process and versioning. The main clarification is that minor error corrections or changes are only approved by the TTOC, and will be treated as minor version changes (e.g., 4.0 changes to 4.0.1). A substantial change to a new project or an existing item in the Architecture would initiate a new version number (e.g., 4.0 changes to 4.1) would also require approval by the TTOC. However, multiple substantial changes, including new projects and existing items in the Architecture, would require approval by the MPO Policy Committee and would initiate a major version number revision (e.g., 4.1 changes to 5.0).

The Regional ITS Architecture V4 Maintenance Plan for 2020 maintains these changes from 2014 and has been updated to reference more recent updates to the ARC-IT as version 8.3 and use of RAD-IT database software. The maintenance plan has been updated for approval by the Transportation Technology and Operations Coalition.

Status Categories

Throughout the Regional Architecture, inventory, services, interfaces, agreements, and projects are assigned a status of existing, planned, or potential.

An item is **planned** if the region has invested some efforts or funds on the item and intends to implement it at some point. For example, a traffic management center where a planning study has occurred but which none of the further work to implement it has taken place is defined as planned. An item may still be defined as planned when there is a demonstration project or a small amount of the system in place.

An item is **existing** if the item is in place and operating. The item does not have to be in place systemwide or for all stakeholders. For items which are partially in place, the boundary between whether it is planned or existing is fuzzy. How much should be in place to qualify as existing? The decision to categorize as planned or existing was determined based on the stakeholder conversation.

An item is **potential** if the region believes it is valuable and will likely come into existence one day, but nothing has been invested in developing it yet.

Stakeholder Update

Stakeholder coordination and involvement are key elements for developing a Regional ITS Architecture. The stakeholders have been identified and described with enough detail that a project developer can understand who the stakeholders are and what activities they are responsible for. The web-based presentation conveniently provides a list of elements associated with the stakeholder directly from the stakeholder list. The stakeholders represent a mix of specific agencies or organizations and generic names used to represent groups of stakeholders. Examples of specific agency or organizations are Metra and the Illinois Tollway. An example of a generic stakeholder group name is Municipalities / Townships, which represents any of the municipalities in the region that have ITS elements.

Updates to the stakeholder list for V4 of the Regional ITS Architecture include the following:

- Addition of Cook County Bureau of Technology to reflect their role in planning, developing and maintaining enterprise technology services.
- Addition of Private Transportation Network Providers to represent Uber, Lyft, and other private companies that are providing ride matching or ridesharing services.

Web-Based Presentation Stakeholder List

Inventory

The inventory, viewable either by stakeholder or physical object, provides a list of the ITS systems and equipment in the region along with some statewide elements and even some elements of adjoining states (Indiana and Wisconsin). The majority of elements in the inventory represent a specific existing or planned system. Examples of specific systems are the IDOT District 1 ComCenter and the Chicago Transit Authority Control Center.

Some elements represent sets of devices, rather than a single specific system or device. An example of this type of element is the element "City of Chicago Office of Emergency Management and Communications (OEMC) Field Equipment." This element represents all of the traffic signals, traffic detectors, Closed Circuit Television (CCTV), Dynamic Message Signs (DMS) and Highway Advisory Radio (HAR) that are or will be operated by the City of Chicago OEMC. The element describes the type of devices, not the specific numbers of devices. For example, the element calls out DMS, but does not say how many there are, or their precise location.

A third type of element in the inventory is a "generic" element that represents all of the systems of a certain type in the region. An example of this type of element is the Municipal Public Safety Dispatch, which represents the many municipal public safety answering points (PSAPs) in the region. There are multiple PSAPs in the region. Including these systems using a single element helps keep the Architecture from growing too large.

Each inventory element includes a link to the associated stakeholder, a description of the functionality the item is intended to provide, a context diagram presenting interfaces to all other inventory elements, and individual flow diagrams for interfaces to other elements. The individual flow information defines

the flows and links to the applicable ITS standards.

Some highlights of changes to the inventory include:

- Addition of City of Chicago Open Data Portal as a data source that the CTA, Pace, and DOTs within the region provide data to for review by other agencies in the region.
- Addition of IDOT Data Depository to reflect the http://ritis.org data depository to which IDOT maintains a subscription for traffic data collection and analysis. Data system can be shared with regional agencies upon request.
- Addition of both a planned Kane County Automated Traffic Signal Performance Monitoring System and a Lake County Automated Traffic Signal Performance Monitoring System.
- Addition of private transportation network providers to represent Uber, Lyft, and other private companies that are providing ride matching or ridesharing services.
- Addition of Public Electric Vehicle Charging Stations to represent electric vehicle charging stations installed by municipalities and townships through the NE Illinois region.
- Addition of Regional Transit Ventra card to reflect use of the card on all CTA and Pace transit vehicles.

View the ITS Architecture's inventory here.

Needs and Services

The transportation needs for the region are defined as part of the transportation planning process. ON TO 2050, the region's comprehensive plan, emphasized three principles that relate to improving mobility within the region:

1) Promoting inclusive growth by improving mobility options that spur economic opportunity for low-income communities, people of color, and people with disabilities;
2) Improve resilience by ensuring that infrastructure can adapt to changes in climate and technology; and
3) Prioritize investment of limited resources to efficiently maintain existing infrastructure while securing new revenues for needed enhancements.

Based upon these principles, ON TO 2050 provides a series of recommendations and related strategies / actions to implement the recommendations.

ON TO 2050 Recommendation: Harness technology to improve travel and anticipate future impacts

The related strategies and actions to implement this recommendation include, but are not limited to, coordinating traffic operations region-wide, making a regional priority of data collection, sharing, and analysis of transportation data, and identify public investments that could catalyze emerging technologies.

Example service packages that support these regionally significant projects include:

- Electronic Toll Collection
- Variable Speed Limits
- Dynamic Lane Management and Shoulder Use

ON TO 2050 Recommendation: Make transit more competitive

The related strategies and actions to implement this recommendation include, but are not limited to, investing in and protecting transit's core strengths, encouraging roadway agencies to prioritize improving transit service, and making further progress in fare and service coordination.

Example service packages that support these goals are:

- Transit Vehicle Tracking
- Transit Fixed Route Operations
- Transit Fare Collection Management
- Transit Fleet Management
- Transit Traveler Information
- Transit Signal Priority
- Integrated Multi-Modal Electronic Payment

ON TO 2050 Recommendation: Maintain the region's status as North America's freight hub

The related strategies and actions to implement this recommendation include, but are not limited to, invest strategically in the freight network, improving local and regional truck travel, and mitigating the negative impacts of freight on adjacent areas, particularly Economically Disconnected Areas.

Example service packages that support these goals are:

- Advanced Railroad Grade Crossing
- Freight Electronic Clearance
- Roadside CVO Safety
- Parking Facility Management
- Railroad Operations Coordination

ON TO 2050 Recommendation: Leverage the transportation network to promote inclusive growth

The related strategies and actions to implement this recommendation include, but are not limited to, improving commute options between disinvested areas and employment, education and training, and service opportunities, as well as improving access to public rights of way for pedestrians, cyclists, seniors, and people with disabilities.

Example service packages that support these goals are:

- Broadcast Traveler Information
- Personalized Traveler Information
- Dynamic Ridesharing and Shared Use Transportation
- Dynamic Roadway Warning

ON TO 2050 Recommendation: Improve travel safety

The related strategies and actions to implement this recommendation include, but are not limited to,

improve incident detection and management and expanding regional data collection and analysis on safety to support programming decisions.

Example service packages that support these goals are:

- Transportation Infrastructure Protection
- Intersection Safety Warning and Collision Avoidance
- Traffic Incident Management System
- ITS Data Warehouse

ON TO 2050 Recommendation: Improve resilience of the transportation network to weather events and climate change

The related strategies and actions to implement this recommendation include, but are not limited to, adapting vulnerable transportation infrastructure to be responsive to weather events and climate change as well as improving the operational response to weather events to ensure mobility.

Example service packages that support these goals are:

- Weather Data Collection
- Weather Information Processing and Distribution
- Winter Maintenance
- Infrastructure Monitoring

ON TO 2050 Recommendation: Fully fund the region's transportation system

The related strategies and actions to implement this recommendation include, but are not limited to, expanding priced parking, implement tolling, and using public-private partnerships strategically.

Example service packages that support these regionally significant projects include:

- Electronic Toll Collection
- Parking Space Management
- Parking Electronic Payment
- Parking Reservations

ON TO 2050 Recommendation: Enhance the region's approach to transportation programming

The related strategies and actions to implement this recommendation include, but are not limited to, implementing performance-based programming region-wide and expand asset management practices to the entire transportation system.

Example service packages that support these regionally significant projects include:

- ITS Data Warehouse

ON TO 2050 Recommendation: Build regionally significant projects

ON TO 2050 recommends building regionally significant projects as major capital projects in the region.

Some of the new major capital projects are recommended to include managed lanes. While not specifically mentioned, all new major capital projects will include significant ITS components.

Example service packages that support these regionally significant projects include:

- Electronic Toll Collection
- Variable Speed Limits
- Dynamic Lane Management and Shoulder Use
- Dynamic Roadway Warning
- VMT Road User Payment
- Transportation Decision Support and Demand Management

Operational Concept

An operational concept documents each stakeholder's current and future roles and responsibilities in the operation of the regional ITS systems. The operational concept documents these roles and responsibilities across a range of transportation services. Agency responsibilities in the following areas have been defined.

- Archived Data Systems
- Commercial Vehicle Operations
- Electronic Toll Collection
- Emergency Management
- Freeway Management
- Incident Management
- Maintenance and Construction
- Parking Management
- Road User Payment
- Surface Street Management
- Transit Services
- Traveler Information

View the ITS Architecture's concept of operations by clicking here.

Interfaces and Information Exchanges

While it is important to identify the various systems and stakeholders as part of a Regional ITS Architecture, a primary purpose of the Architecture is to identify the *connectivity* between transportation systems in the region and where appropriate, outside the region. How these systems interface with each other is an integral part of the overall Architecture. These interactions are referred to as interfaces and are listed in the web-based presentation. The elements are listed alphabetically in the column on the left, and each entry in the Interfacing Element column on the right is a link to more detailed information about the particular interface.

There are 343 different elements identified as part of the Northeastern Illinois Regional ITS Architecture. These elements include city, county and state traffic operations centers, transit centers, transit vehicles,

public safety dispatch centers, media outlets, and others—essentially all of the existing and planned physical components that contribute to the regional intelligent transportation system. Interfaces have been defined for each element in the Architecture. For example, the IDOT District 1 Traffic Systems Center (TSC) has existing or planned interfaces with many other elements in the region ranging from field equipment to transit centers. Some of the interfaces are far less complex. For example, the City of Chicago Skyway Roadside Equipment has interfaces with only two other elements in the Architecture.

Architecture flows between the elements define specific information that is exchanged by the elements. Each Architecture flow has a direction, name and definition. Most of the Architecture flows match ones from the National ITS Architecture (the mapping of elements to National ITS Architecture entities allowed the developers to match the Architecture flows to the appropriate interfaces). In some cases, new user defined flows have been created for interfaces or connections that are not expressed in the National ITS Architecture. These Architecture flows define the interface requirements between the various elements in the Regional Architecture.

View the ITS Architecture's interfaces and information exchange by clicking here

Functional Requirements

Functional requirements are a description of the functions or activities that are currently performed by the ITS elements or that are planned to be performed in the future. The information describes what the systems are supposed to do. The Northeastern Illinois Regional ITS Architecture functions were developed using the functional assignments underlying the National ITS Architecture and the mapping from transportation services to elements. The functions are easily understood and are presented as a list of "shall" statements.

View the ITS Architecture's functional requirements by clicking here.

Regional Projects and Project Sequencing

One focus of this update was to collect more information about ongoing projects. Because of this, the project list changed more than anything else in the Architecture.

The projects listed in the Architecture provide a way to learn about specific ITS development activities. The Northeastern Illinois Regional ITS Architecture views the project entry as reflective of the process which takes place to:

- Expand an existing inventory

  For example, an agency may have traffic surveillance equipment on parts of its system. The inventory items will reflect that the agency owns such equipment. If the equipment is being expanded onto another roadway, a project is included to reflect the expansion on that roadway.

- Develop a new inventory item

An agency may begin the process to develop a truck parking information system. A project will then be added that reflects the activity of building a truck parking system, while the inventory will be updated to reflect the existence of a planned truck parking system belonging to the agency.

- Link the inventory items in a new way to achieve a goal

The work to develop the links between inventory items is reflected as a project. For example, the region has 911 call centers, and the region has traffic management centers. The region has identified the flow of incident information to traffic management centers as an important goal. A project has been added that reflects the activity of establishing communication between those systems.

A number of projects have been added with CMAP as the primary stakeholder in response to the ON TO 2050 plan update. These are: CMAP Congestion Pricing, CMAP Expressway Vision Improvements, CMAP Parking Management, and CMAP VMT Pricing. While it is unlikely that CMAP will ultimately be the primary stakeholder, the ITS projects needed to support the region's long range goals should be included in the ITS Architecture.

Two projects have also been added under the flag of the TTOC. These are the TTOC (formerly RTOC) Integration of Centers and TTOC PSAP Integration projects. In this case, TTOC is not an individual agency but a cooperative group representing the region's transportation system operators. These two activities have risen to the top of the list as this group's regional priorities. A number of agencies are already working on this activity (Kane County, Lake County, Will County, IDOT, Illinois Tollway and CDOT), but as other unlisted agencies begin work on this activity, the Regional ITS Architecture acknowledges that it is a known priority.

Other projects have had major changes to descriptions or names and are included in the table of updated projects below. In other cases, multiple project architectures have been merged into a singular project architecture to reflect a combination of technologies within a specific area. Other project architectures have been merged through a review of the architectures by agency stakeholders.

Project sequencing is addressed in general terms. Projects are defined as short-term (0-5 years), mid-term (5-10 years), and long-term projects (10-15 years).

Table 2 below lists a summary of major updates to project architectures made to the Architecture during this update.

Table 2 – Summary of Major Updates to Project ITS Architectures

Previous Project Architectures	**Updates Made Based on Stakeholder Agency Meeting Notes**
CDOT Transit Signal Priority Project	Merged with **CDOT Bus Rapid Transit System**

Table 2 – Summary of Major Updates to Project ITS Architectures	
Previous Project Architectures	**Updates Made Based on Stakeholder Agency Meeting Notes**
CDOT Chicago Truck Route Advisory System	Renamed to **CDOT Traffic Advisory System**, merged with CDOT Lakeshore Drive Surveillance and CDOT Special Events Advisory System projects
CDOT Cicero Ave Smart Corridor	Renamed to **CDOT Cicero Ave. / Midway Smart Corridor**, also merged with CDOT Railroad Grade Crossing Delay - Traveler Information System project
CDOT Railroad Grade Crossing Delay - Traveler Information System	Merged with **CDOT Cicero Ave. / Midway Smart Corridor** project
CDOT Smart Corridors	Renamed to **CDOT Smart Signal System**, merged with Chicago Wireless Traffic Signal Interconnects project
CDOT US41 Lake Shore Drive Surveillance and Information System	Merged with **CDOT Traffic Advisory System** project
Chicago Special Events Advisory System	Merged with **CDOT Traffic Advisory System** project
CMAP Dedicated and Managed Truckways	Renamed to **CMAP Expressway Vision Improvements**, major updates to reflect existing and future capabilities of project
CTA Bus Rapid Transit	Merged with **CTA Transit Signal Priority Corridors** project
CTA Subway CCTV Station Portal Security	Merged with **CTA Infrastructure Surveillance (Subway Tunnels)** project
CTA Transit Signal Priority Corridors	Merged with **CTA Bus Rapid Transit** project
Kane County Randall Road Adaptive Signal Control	Merged into new project (**Kane County Randall Road ITS Corridor**)
Kane County Randall Road Safety Improvements	Merged into new project (**Kane County Randall Road ITS Corridor**)
Kane County Signal Interconnects / ATMS Integration	Merged into new project (**Kane County Randall Road ITS Corridor**)
Lake County Countywide Bluetooth Traffic Monitoring	Renamed to **Lake County Countywide Traffic Monitoring**, major updates to reflect new project capabilities and goals

Table 2 – Summary of Major Updates to Project ITS Architectures	
Previous Project Architectures	**Updates Made Based on Stakeholder Agency Meeting Notes**
Metra Automatic Passenger Counts	Renamed to **Metra Automated Communications and Onboard Reporting Network (ACORN)**, major updates to reflect new project capabilities and goals
Metra Contactless Electronic Fare Collection	Renamed to **Metra Automated Communications and Onboard Reporting Network (ACORN)**, moderate updates to reflect new project capabilities and goals
Pace TSP and ART Improvements	Project split into two separate projects as **Pace Transit Signal Priority Corridors** and **Pace Pulse BRT**

Reasonable attempts were made to ensure that the project Architecture components (inventory, service packages, and data flows) made sense. However, we acknowledge these items will undergo closer scrutiny and require refinement as projects get underway. We expect that corrections to the project Architectures will be made as they are identified during project development.

View the ITS Architecture project listing by clicking here.

Agreements

There are several types of arrangements associated with the interfaces included with the projects discussed previously. Data exchanges between systems require agreements on the transmission protocol and data formats to ensure compatibility. Coordinating field device operations owned by different agencies requires defined procedures for submitting message requests and rules governing when such requests can be honored. Such coordination can be accomplished either with handshake agreements or formal written instruments. Sharing control of field devices operated by different agencies involves more liability issues, which requires more formal agreements. Coordinated incident response may also require formal agreements, but also requires group training of personnel from various agencies. While all interfaces involve agreements for data compatibility, agreements for procedures and operations as well as training can also be critical elements to optimizing the benefits of the Architecture.

View the ITS Architecture agreements by clicking here.

Standards

ITS standards establish a common way in which devices connect and communicate with one another. This allows transportation agencies to implement systems that cost-effectively exchange data and accommodate equipment replacement, system upgrades, and system expansion. Standards benefit the

traveling public by providing products that will function consistently and reliably throughout the region. ITS standards contribute to a safer and more efficient transportation system, facilitate regional interoperability, and promote an innovative and competitive market for transportation products and services.

Standards are developed by a number of standards development organizations:

- American Association of State Highway and Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Electronic Industries Alliance/Consumer Electronic Association (EIA/CEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Institute of Transportation Engineers (ITE)
- Society of Automotive Engineers (SAE)
- American Public Transportation Association (APTA)
- National Electrical Manufacturers Association (NEMA)

Use of ITS standards is very important to project development in the northeastern Illinois region. These standards apply to many areas including center-to-center, center-to-roadside, center-to-vehicle/traveler, roadside-to-roadside, and roadside-to-vehicle. Based on the interfaces and information flows chosen for the Regional Architecture, a number of ITS standards are applicable to the region. Each information flow is associated with a standard. However, the Regional ITS Architecture does not link directly to details on the applicable standards, but simply lists the relevant standards leaving project developers to find the detailed information on their own. The USDOT Research and Innovative Technology Administration ITS Joint Program Office ITS Standards Program is a good place to start.

A specific plan for how the region will consider standards has not been developed, but the Regional Transit Signal Priority Working Group, hosted by the Regional Transportation Authority, provides a good example for how that process might be carried out. This group has developed regional standards for an interoperable system which includes bus equipment from two different transit agencies (Pace and CTA) and roadside equipment owned and operated by city, county and state transportation departments. The group is working cooperatively with all stakeholders involved to implement a regionally interoperable transit signal priority system through use of these standards.

View the ITS Architecture standards by clicking here.

Using the Regional ITS Architecture

Once a Regional ITS Architecture has been created, it is important that it be used as a key reference in the transportation planning process. This will ensure that all proposed ITS projects are consistent with the Regional ITS Architecture and additional integration opportunities are considered, leading to more efficient implementations.

The Regional ITS Architecture should also be considered for support in the ITS project development cycle. This begins with project definition, followed by procurement, leading to implementation. Information in the Regional ITS Architecture can assist in all three of these areas of project development.

Project Definition may occur at several levels of detail. Early in the planning process, a project may be defined only in terms of the transportation services it will provide, or by the major system pieces it contains. At some point prior to the beginning of implementation, the details of the project must be developed. This could include further system definition and interface definition including exactly what systems or parts of systems will make up the project, what interconnections the project entails, and what information needs to flow across the system interconnections. Requirements definition may go through similar levels of detail, starting with a very high level description of project functions and moving toward system specifications. By identifying the portions of the Regional ITS Architecture that define the project, the Regional ITS Architecture outputs can be used to create key aspects of the project definition.

The areas that a Regional ITS Architecture can assist in project definition are:

- The identification of agency roles and responsibilities (including any interagency cooperation) that can come from the operational concept developed as part of the Regional ITS Architecture. This operational concept can either serve as a starting point for a more detailed definition, or possibly provide all the needed information.
- Requirements definition can be completely or partly defined by using the Regional ITS Architecture functional requirements applicable to the project.
- The Regional ITS Architecture includes a map to ITS standards and the project mapping to the Regional ITS Architecture can extract the applicable ITS standards for the project.

Procurement can commence once a project is defined, and funding for it is committed. This generally begins with the development of a Request for Proposal (RFP), which is the common governmental practice for initiating a contract with the private sector to implement the project.

The Regional ITS Architecture can support RFP development. First, the project definition described above forms the basis for what is being procured. Mapping the project to the Regional ITS Architecture allows bidders to have a clear understanding of the scope of the project and of the interfaces that need to be developed. The functional requirements created as part of the Regional ITS Architecture can be used to describe the functional requirements for the project. In addition, a subset of the ITS Standards identified as part of the Regional ITS Architecture development can be specified in the RFP.

Project Implementation begins once a contract is in place. Implementation moves through design, development, integration, and testing.

Because ITS projects involve systems and their interconnections, it is very important to follow a system engineering approach to designing and implementing the project. While the exact process followed is at the discretion of the local agency, the ITS Architecture and Standards Rule/Policy lay out a set of required system engineering analyses for ITS projects funded through the Highway Trust Fund.

The required systems engineering analysis steps are:

- Identification of portions of the Regional ITS Architecture being implemented (or if a Regional ITS Architecture does not exist, the applicable portions of ARC-IT)
- Identification of participating agencies' roles and responsibilities
- Requirements definitions
- Analysis of alternative system configurations and technology options to meet requirements
- Procurement options
- Identification of applicable ITS standards and testing procedures
- Procedures and resources necessary for operations and management of the system

The Regional ITS Architecture can provide inputs to a number of these steps as shown in the Table 3 below.

Table 3 – Summary of Systems Engineering Requirements and ITS Architecture Outputs

System Engineering Requirements	Regional ITS Architecture output
Identification of portions of the regional ITS Architecture being implemented	Mapping project to the elements and interfaces of the regional ITS Architecture.
Identification of participating agencies' roles and responsibilities	Use Operational Concept as a starting point.
Requirements definitions	Use Functional Requirements as a starting point.
Identification of applicable ITS standards and testing procedures	Use Regional Architecture standards outputs as a starting point for the standards definition.

The Regional ITS Architecture represents a detailed plan for the evolution of the ITS systems in the region and can be used to support regional transportation planning efforts and project development efforts.