
Black Hawk Metropolitan Area ITS Architecture

Executive Summary

Use Plan

Maintenance Plan

Prepared by the
Iowa Northland Regional Council of Governments

Adopted by the
Black Hawk Metropolitan Area Transportation Policy Board
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Black Hawk Metropolitan Area ITS Architecture

Executive Summary

Defining a Regional ITS Architecture

Intelligent Transportation Systems (ITS) involve the use of technology to promote the movement of traffic in an increasingly safe and efficient manner. The Black Hawk Metropolitan Area ITS Architecture is a framework for developing and integrating ITS technologies within the region. This framework, which is currently maintained electronically using Turbo software, defines the ITS services that must be provided. The regional architecture is responsive to the unique characteristics of the defined area. It not only defines the services that must be provided, but also defines stakeholders and their roles and responsibilities in providing these services within the region. These defined roles and responsibilities guide stakeholders as ITS technologies are implemented. As the role of ITS evolves within the region, so must the ITS Architecture.

Creating a Regional ITS Architecture

The Black Hawk Metropolitan Area ITS Architecture framework was developed with the assistance of URS over a period of six (6) months. It involved researching ITS and attending training classes and seminars on developing a Regional ITS Architecture. An Architecture Steering Committee was developed which met at least once a month. Initially the committee identified stakeholders, which were then surveyed in order to collect the information necessary to develop the Regional ITS Architecture. On several occasions, presentations were made to the MPO Policy Board and Technical Committee to explain the process and garner necessary input.

Defining the Region

The Black Hawk Metropolitan Area ITS Architecture outlines a framework that is contained regionally by the existing MPO planning boundary. As the MPO planning boundary evolves, so will the region that defines the ITS architecture.

Defining the Time Horizon

Due to rapid improvements in ITS-related technologies, and ITS architecture usually outlines a framework that is bound by a specific time frame. Typically this time frame is shorter than the 20 years associated with the long-range transportation plan. The Black Hawk Metropolitan Area ITS Architecture will use a ten (10) year time horizon.

Defining the Stakeholders

The purpose of the Black Hawk Metropolitan Area ITS Architecture is to promote integration of ITS technologies among entities and institutions in the region. Deploying these technologies in the region will require substantial cooperation between these groups. Stakeholders include those entities and institutions that will be actively involved or have an interest in the development of ITS technologies. The region's stakeholders, who were initially defined by the Architecture Steering Committee, include a wide variety of these groups at the local, regional, and state level. As previously stated, as the role of ITS evolves within the region, so must the ITS Architecture. This is especially true for the list of stakeholders, which may increase or decrease based on specific ITS needs.

Available Database Outputs

As previously stated, the Black Hawk Metropolitan Area ITS Architecture is currently maintained electronically using Turbo software. This software offers a variety of outputs, the majority of which are in report form. These reports include the following:

- *Architecture Summary*: Presents summary information for all regional and project architectures that have been defined.
- *Stakeholders*: Presents a list of all regional stakeholders that have been identified in the current architecture.
- *Inventory*: Presents all identified inventory elements with the associated entities, stakeholders, and projects.
- *Market Packages*: Presents market package selections, which represent the transportation services provided for in the current architecture.
- *Operational Concept*: Presents the Roles and Responsibilities for each stakeholder, which supports development of an operational concept.
- *Functional Requirements*: Presents the specific functions for each element defined in the current architecture.
- *Interconnects*: Presents the interconnected elements and interconnected status for each of the interconnects in the current architecture.
- *Regional Architecture*: A detailed report of all elements and architecture flows that are included in the regional architecture.
- *Project Architecture*: A detailed report of all elements and architecture flows that are included in the project architecture.
- *Region to Project Comparison*: Identifies any differences between the regional and project architectures.
- *Additional Regional Integration Options*: A summary of the integration options identified in the National ITS Architecture that have not been identified in the Regional Architecture.
- *Additional Project Integration Options*: A summary of the integration options identified in the National ITS Architecture that have not been identified in the Project Architecture.

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- *Standards Activities*: Presents relevant standards activities (developed by Standards Development Organizations) and their relationship to the current architecture.
 - *List of Agreements*: Presents the list of agreements necessary to implement projects in the current architecture.
 - *Project Sequencing*: Presents the information about projects in a user selectable sequence order.

INRCOG plans to maintain a link to an updated ITS architecture on the organizational website: www.inrcog.org. Other documents associated with the Black Hawk Metropolitan Area ITS Architecture include the following:

- Black Hawk Metropolitan Area ITS Architecture Use Plan
- Black Hawk Metropolitan Area ITS Architecture Maintenance Plan

Black Hawk Metropolitan Area ITS Architecture

Use Plan

Support Transportation Planning Process

The Black Hawk Metropolitan Area 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 ITS project development efforts. Once the regional ITS architecture has been created, it's important that it be used as a key reference in the transportation planning process. This will ensure all proposed ITS projects are consistent with the regional ITS architecture and additional integration opportunities are considered, leading to more efficient implementations.

Long Range Transportation Plan

One of the principal planning documents is the Long Range Transportation Plan (LRTP). The LRTP is a long-range guide for major projects, systems, policies and strategies designed to maintain the existing regional multi-modal surface transportation system and serve the region's future travel needs. The LRTP must be updated periodically. Serving as the MPO for the Black Hawk metropolitan area, INRCOG is responsible for developing and maintaining the LRTP.

The Black Hawk Metropolitan Area ITS Architecture can serve as a key input to the LRTP. The ITS services and projects identified in the regional ITS architecture can support the development of long-range and short-range strategies/actions during the LRTP planning that lead to an integrated, efficient inter-modal transportation system. The descriptions of the key goals and attributes of the systems and services included in the regional ITS architecture can support measurement assessment during the LRTP planning. The Project Sequencing from the regional ITS architecture can assist the development of prioritized projects and address the consistency of proposed transportation investments in the financial plan, which is typically a part of the LRTP. In addition, the regional ITS architecture provides a framework for analyzing how ITS elements are related and thereby to identify the areas for potential coordination and cooperation among agencies. This can promote both systems and inter-jurisdictional integration during the LRTP planning.

Transportation Improvement Program

The Transportation Improvement Program (TIP) is another primary transportation planning output that can be supported by the regional ITS architecture. The Black Hawk Metropolitan Area TIP describes prioritized transportation projects funded with federal, state, and local funds that will be deployed and/or operated over a three-year period. A TIP is prepared every year and the projects in the TIP should be consistent with the LRTP.

As part of the TIP preparation, a project selection process is conducted, where the regional ITS architecture can play a key role. The Project Sequencing output from the regional ITS architecture can be a major input to prioritization. Integration opportunities identified in the regional ITS can be used to better define the full benefits of ITS projects. In addition, some of the project description information might be available from the outputs of the regional ITS architecture, specially the Project Sequencing output.

In addition to the LRTP and TIP planning, the regional ITS architecture can be considered to support other transportation planning activities or services associated with ITS projects or projects with ITS elements in the region.

Support ITS Project Development

The regional ITS architecture should be considered for support in ITS project development cycle. A typical ITS project development cycle begins with project definition, followed by Request For Proposal (RFP) generation, leading to project implementation. Information in the regional ITS architecture can assist in all three of these areas of project development.

Project Definition

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. Requirement definition may go through similar levels of detail, starting with 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 inter-agency cooperation) 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.

RFP Generation

Once a project is defined, and funding for it is committed, the implementation process can commence with the generation of a RFP, which is the common governmental practice for initiating a contract with the private sector to implement the project. Once a contract is in place, project implementation begins and moves through design, development, integration, and testing.

The regional ITS architecture, and the products produced during its development, can support this RFP generation. 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

Because ITS projects involve systems and their interconnections, it is very important to follow a systems engineering approach to designing and implementing the project. While the exact process followed is at the discretion of the local agency, the FHWA/FTA ITS Architecture and Standards Final Rule/Policy lay out a set of required systems 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;
- Identification of participating agencies' roles and responsibilities;
- Requirements definitions;
- Analysis of alternative system configurations/technology options to meet requirements;
- Procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Procedures and resources necessary for operations and management of the system.

The regional ITS architecture supports many systems engineering requirements as shown below:

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

Black Hawk Metropolitan Area ITS Architecture

Maintenance Plan

Introduction

The Black Hawk Metropolitan Area ITS Architecture was created as a consensus view of what ITS projects have been implemented and what projects will be implemented in the future. The ITS architecture was developed with a 10-year time horizon. By its nature, the architecture is not a static set of outputs and will require modification as plans and priorities change, ITS projects are implemented, and the ITS needs and services evolve in the metropolitan area. The architecture will need to be updated to reflect various changes, including the following:

- *Changes in Project Definition:* When actually defined, a project may add, subtract, or modify elements, interfaces, or information flows of the regional ITS architecture. Because the architecture is meant to describe not only ITS projects planned for the region, but also the current ITS implementations, it should be updated to correctly reflect the deployed projects.
- *Changes for Project Addition/Deletion:* Occasionally a project will be added, deleted, or modified during the planning process. When this occurs, the aspects of the regional ITS architecture associated with the project have to be added, deleted, or modified.
- *Changes in Project Status:* As projects are deployed, the status of the architectural elements, services, and flows that are part of the project will have to be changed from planned to existing. Elements, services, and flows will be considered existing when they are substantially complete and operational.
- *Changes in Project Priority:* Due to funding constraints, technological changes, or other considerations, the sequencing of a project may be delayed or accelerated. Such changes may have a ripple effect on other dependent projects. Therefore priority changes will need to be reflected in the regional ITS architecture.
- *Changes in Regional Needs:* Transportation planning is done to address regional transportation needs. Over time these needs change, and the corresponding aspects of the regional ITS architecture that address these needs may need to be updated.
- *Changes in Participating Stakeholders:* Stakeholder involvement can also change over time. The regional ITS architecture should be updated to reflect the stakeholder roles in the regional view of ITS elements, interfaces, and information flows.
- *Changes in National ITS Architecture:* The National ITS Architecture may be expanded and updated from time to time to include new user services or better define how existing elements satisfy user services. These changes should be considered as the regional ITS architecture is updated.

The Architecture Maintenance Plan for the Black Hawk Metropolitan Area supplements the ITS architecture. The maintenance plan defines the following:

- Who is responsible for architecture maintenance?
- What will be maintained?
- When will the architecture be updated?
- How will the architecture be maintained?

Who is responsible for architecture maintenance?

Responsibility for maintenance of the Black Hawk Metropolitan Area ITS Architecture will lie with the Iowa Northland Regional Council of Governments (INRCOG), which also provides staff support for the Metropolitan Planning Organization (MPO). The MPO's Transportation Policy Board and Technical Committee provides a forum for regional stakeholders to develop and maintain the ITS architecture. In addition, INRCOG has the capacity to organize committees and task forces to address ITS issues that may arise.

What will be maintained?

There are several different components that make up the Black Hawk Metropolitan Area ITS Architecture. Some will require more frequent updates than other, but the entire architecture will need periodic review to ensure that it is consistent with regional goals. The initial version of the Black Hawk Metropolitan Area ITS Architecture will be established as the baseline architecture, and the maintenance timeframe identified in this document will become effective upon completion of the architecture.

The Black Hawk Metropolitan Area ITS Architecture is maintained electronically using Turbo Architecture software. The architecture that was developed using this software is represented through a set of outputs including various reports and diagrams. Collectively these outputs can be used to develop a general ITS architecture document. The following will be reviewed and updated at regular intervals:

- Description of the region
- Participating agencies and other stakeholders
- Operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems
- Agreements required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the systems
- System functional requirements
- Interface requirements and information exchanges with planned and existing systems and subsystems
- Identification of ITS standards supporting regional and national interoperability
- Sequence of projects required for implementation

When will the architecture be updated?

It is recommended that formal updates to the Black Hawk Metropolitan Area ITS Architecture be made at least every five years to correspond with the Long Range Transportation Plan (LRTP) update. The natural result will be a streamlining of the architecture into the transportation planning process. This maintenance schedule will also ensure that the architecture continues to accurately represent regional goals.

Intermediate, informal updates may be made at the discretion of INRCOG staff, assuming the updates are approved by the Change Control Group. The MPO Transportation Policy Board and Technical Committee will serve as the regional Change Control Group. The change management process is described in further detail in the following section.

How will the architecture be maintained?

The general steps in the change management process include the following:

1. *Define changes according to the recommendation(s).* Changes can be suggested by any existing or potential future stakeholder. In order to track change requests, a written request must be submitted to INRCOG staff.
2. *Assess the impact of the requested change.* As the group responsible for maintaining the architecture, INRCOG staff will also be responsible for assessing the impact of change requests.
3. *Provide a recommendation to the Change Control Group.* After assessing the impact of the requested change, INRCOG staff will make a recommendation to the MPO Transportation Policy Board and Technical Committee. Upon deliberation, the Group will decide what changes should go into the architecture baseline.
4. *The Change Control Group makes a decision.* Either the MPO Transportation Policy Board and Technical Committee accepts the change, rejects it, or asks for additional evaluation.
5. *The decision is implemented.* If the decision is to accept the change, then the appropriate portions of the architecture baseline are updated and an updated architecture baseline is defined.

Once the change management process is complete, and a decision has been implemented, stakeholders will be notified of the resulting updates to the architecture. The method of notification will depend on the complexity of the changes. The time to perform this process will also be a direct function of the complexity of the changes to the architecture.

In lieu of hardcopy updates, a link to the updated ITS architecture will be maintained on INRCOG's website: www.inrcog.org.