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Introduction

According to the Federal Highway Administration (FHWA) Final Rule on Intelligent Transportation Systems' (ITS) Architecture and Standards, "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." The Northeastern Illinois ITS Architecture Maintenance Plan was last revised in 2014 and, while the plan has not changed significantly, it has been updated to reflect current practices. The goal of this process is to provide a straightforward, better understood process for architecture use and maintenance, one that regional ITS stakeholders can follow to improve their ITS projects and to encourage regional integration and cooperation in project deployment and operations.

Maintenance Responsibility

The Chicago Metropolitan Agency for Planning (CMAP), as staff to the MPO of northeastern Illinois, has primary responsibility for maintaining the ITS Architecture. This task cannot be accomplished without the input of the region's ITS implementers.

To accomplish this, CMAP also hosts and staffs the region's Advanced Technology Task Force (ATTF), whose members provide input and review of changes to the region's ITS Architecture. The Task Force is co-chaired by the Chicago Department of Transportation and the Regional Transportation Authority. Members include IDOT, Illinois Tollway, CTA, Metra, Pace, the counties and UIC. The group is also open to the participation of other interested attendees and audience members participate freely to share information.

Maintenance Frequency

CMAP intends to maintain the Regional ITS Architecture continuously, with updates and revisions being made as they are identified. Quarterly meetings with ATTF will provide input from the group on current and future ITS projects.

Maintenance Items

The region's ITS Architecture is maintained in a Regional Architecture Development for Intelligent Transportation (RAD-IT) database (previously known as Turbo Architecture©), with an associated user-friendly web-based presentation of the information. These items will be maintained as part of the maintenance plan:

- Description of the Region – The Architecture focuses on the CMAP area. It does not change frequently.
- List of Stakeholders – Most often, stakeholders have changed to reflect name changes, for example from Highway Department to Division of Transportation.

- List of ITS Elements (inventory) – The list of elements is comprehensive, but implementation of some projects may result in a revised element description or a new element. In CMAP's architecture development, we add a project to reflect the element being developed, and an element to describe the finished product of the project. For example, a project may describe equipping vehicles with AVL technology and purchasing a fleet management system for the operations center. Consequently, the description of vehicles will be changed to reflect that they are AVL equipped, and a new element called Agency X Fleet Management System will also be added.
- Interfaces between Elements (interconnects and information flows) – This is the most difficult item to establish and maintain. Interfaces are included in the architecture, and many times they have been included based on likely interfaces presented by the RAD-IT software application. These will be refined as needed when a project or element is subject to the scrutiny arising from project development.
- Project Descriptions – In the past, projects were described in a separate document. Project information is now being housed in the architecture database. Often, a project may be entered to reflect an agency expanding a capability it already has. For example, an agency may operate a type of field equipment at one location. If a project to expand that type of equipment at another location is being planned, a project will be added to reflect that in the Architecture. This will not result in new ITS elements, because the field and center information already existed in the inventory.
- Project Sequencing – Project sequencing is addressed in a general way, with each project classified as a short-term (1-5 years), mid-term (5-10 years) or long-term (10-15 years) project.
- System Functional Requirements – The National Architecture, as reflected in the RAD-IT software application, provides guidance and the ability to select functional requirements.
- Operational Concept - The concept of operations is included in the RAD-IT database.
- List of Agreements – Identifying existing agreements and potential future agreements continues.
- Applicable ITS Standards – The RAD-IT database associates applicable ITS standards with projects based on how the projects are defined.
- Web-based ITS Architecture Presentation – The new RAD-IT application makes keeping up the web based presentation simple through its ability to export the desired information in a format that can be directly added to the agency website.
- The required Maintenance Plan will also be updated to reflect maintenance procedures as they evolve.

Summary of Change Procedure / Maintenance Steps

The maintenance plan is based on the five ITS architecture maintenance steps identified in the FHWA's Regional ITS Architecture Guidance Document (Figure 1).

Figure 1: Process for Change Identification[1]
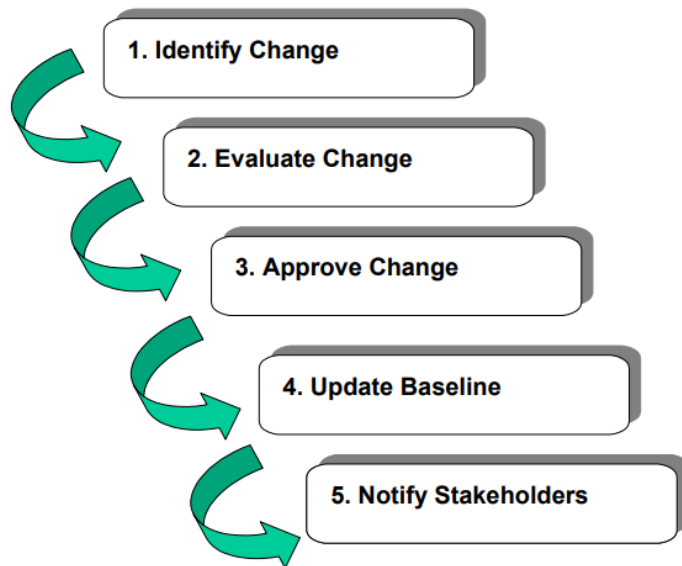
Step 1: Identify Change

ITS Architecture changes occur primarily as a result of stakeholder changes or ITS projects being added, deleted, modified, or reprioritized. Other changes result from adjustments in regional needs or change in the National Reference ITS Architecture, referred to as the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)[2]. It has been most productive to focus on changes needed in response to ITS project changes. Discussion of the project changes lead to identification of new projects, items needed for the project which must be added to the stakeholder inventory, and new agreements that may be needed to support the project.

ATTF meetings provide an opportunity to identify ITS projects. Architecture Change Request Forms will be distributed electronically to all ATTF members as an attachment to meeting invitations, which ATTF members can then use to identify new regional ITS projects. At ATTF meetings, regional ITS updates by the Illinois Department of Transportation (IDOT), Illinois State Toll Highway Authority (ISTHA), Regional Transportation Authority (RTA), counties, municipalities, and other ATTF members should reference the architecture (using the Change Request Forms as formal submittals), when applicable. CMAP architecture staff will facilitate this process. Through this approach, the ATTF members can identify appropriate elements, user services, interconnect diagrams, standards, agreements, etc. from the architecture that may be affected – and identify potential integration opportunities.

To improve the flexibility of architecture change identification, the Change Request Form was modified to allow for attachments (e.g., spreadsheet, text document) in instances when the text

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[1] Regional ITS Architecture Guidance – "Developing, Using, and Maintaining an ITS Architecture for Your Region," Version 2.0, U.S. DOT FHWA, July, 2006.
[2] ARC-IT: The National ITS Reference Architecture. Available at: https://local.iteris.com/arc-it/index.html.

areas on the form are too small or when there is a report that can be attached. This will provide a regional ITS stakeholder with more space to clarify a requested change.

Step 2: Evaluate/Approve Change

It is critical that the ATTF actively seek out architecture changes, provide support to regional ITS stakeholders as they incorporate the architecture into their processes, and serve as the decision makers for Regional ITS Architecture changes. This group consists of members that are familiar with ITS architecture and the systems engineering process, and are highly aware of regional ITS activities. This group should meet quarterly to discuss potential changes to the architecture. Potential architecture changes could come from ATTF members or other ITS stakeholders.

The ATTF would evaluate a potential change to determine whether it constituted a minor revision and needed only ATTF approval. Such cases would include error corrections to stakeholders, projects, inventories and flows. These corrections would be approved by the ATTF and a minor version number revision to the Architecture would be made, for example from 4.0 to 4.0.1.

If the change is not an error correction, including new projects, new inventory items, or a significant change to an existing item that would impact its connections to other agency items, the change will be approved by the ATTF. A version number revision to the Architecture would also be made with this approval, for example from 4.0 to 4.1.

If there are a group of changes to multiple items, including multiple new projects, inventory items, and other significant change to existing items that impact their connections to other agency items, these changes can be reviewed by the ATTF but would need approval by the CMAP Policy Committee. A major version revision to the Architecture would also be made with this approval, for example from 4.1 to 5.0.

Step 3: Update Baseline

The baseline Regional ITS Architecture consists of the RAD-IT database and the Regional ITS Architecture website. To implement approved changes, CMAP staff assigned to carry out this work have been trained for RAD-IT using free RAD-IT training workshops. Any approved changes to the baseline architecture should be documented.

When the RAD-IT database is updated, a new web-based presentation will be generated and posted on the CMAP website.

Step 4: Notify Stakeholders

Once an architecture change has been identified, evaluated, and implemented, it is important that both the requesting agency and other regional ITS stakeholders be made aware of the change. Some reasons this is important are:

- The requesting agency may be relying on Highway Trust Fund dollars to support implementation of the project, which requires inclusion in the Regional ITS Architecture.
- The change may affect other related projects or ITS architectures.

- Alerting regional ITS stakeholders about architecture changes will encourage them to use the architecture and participate in its maintenance process.

Changes will be summarized by the ATTF and distributed via email, posted on the architecture website, and/or discussed at quarterly ATTF meetings.

In addition, requested architecture changes that are not approved should also be relayed back to the requesting agency. This notification should provide an explanation (e.g., the ITS project is already included in the Regional ITS Architecture) and the opportunity for the agency to clarify or resubmit its request.

Conclusion

For the Northeastern Illinois Regional ITS Architecture to fulfill its potential as an ITS planning and deployment tool, regional stakeholders must be aware of it, understand its purpose, and know how to use it. The current ITS Architecture Maintenance Plan provides a strong starting point for reaching these goals, and the process outlined in this document should provide CMAP with the steps necessary to maximize the utility of the Northeastern Illinois Regional ITS Architecture. The goal of these steps is to make the architecture a "living" document, one that regional ITS stakeholders can feel comfortable using.