MARC

MID-AMERICA REGIONAL COUNCIL

2018 Kansas City Regional ITS Architecture

USE AND MAINTENANCE MANUAL

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2018 Kansas City Regional ITS Architecture Use and Maintenance Manual

Contents

1. Kansas City Regional ITS Architecture Use

The Kansas City Regional Intelligent Transportation System (ITS) Architecture is a valuable tool for stakeholders to use in developing consistent, interoperable and effective ITS. The success of the Kansas City Regional ITS Architecture is dependent upon its proper use. This Plan provides a plan for the use and maintenance of the ITS Architecture.

There are three key use cases for the ITS Architecture:

1. **Planning** – The Architecture should be used to assist in the traditional transportation planning process for all Kansas City region stakeholders. The planning process defines projects that include ITS elements. The Architecture can be used to determine the sequence of ITS deployment based on project dependencies, and provide high-level descriptions that complement the region's other transportation planning efforts, such as updates to the Transportation Outlook 2040 Metropolitan Transportation Plan (MTP) which will become the Regional Transportation Plan 2050, local agency ITS deployment plans and the Congestion Management Plan.
2. **Design** – The Architecture should be followed during the design of ITS projects in order to implement interoperable ITS elements that are able to communicate with other systems in the region. In addition, the Architecture can be applied in design, using the architecture tool set, to contribute to the systems engineering process with inputs to the concept of operations and high-level requirements. This approach provides a basis for the vision of the project anchored in the Regional ITS Architecture framework developed by the regional stakeholders and to verify that the desired functions will be provided by the project's ITS elements.
3. **Implementation** – During implementation, the Architecture can provide information to support the procurement and testing of ITS. These include the functional requirements that define what the ITS should do, and the information exchange standards which define open, non-proprietary protocols and formats for data exchange with other systems.

To help maximize the Architecture's value for the region, this document provides a guide for how the Kansas City Regional ITS Architecture will be maintained to support those processes in the future.

1.1 Architecture Use in Planning

The goal of the regional transportation planning process is to make informed decisions on the investment of public funds for regional transportation systems and services. The Regional ITS Architecture should be an evolving reference that serves as the authoritative resource for the region's ITS. The Architecture provides a high-level summary of existing, planned and future ITS in the region. It should be maintained and updated in conjunction with the MTP and CMP in order to stay consistent with them.

The ITS Architecture should also be readily available to all agencies participating in regional planning so they may reference it while considering how to address regional transportation needs, and how to incorporate ITS into transportation projects. If all regional partners use the same resource, deployments can occur in an economical and efficient manner according to funding, regional capabilities, technology, and other regional priorities.

Use of the Architecture in planning requires that stakeholders are aware of its use and consult the resource during planning. To that extent, the Kansas City Region should incorporate a review of the Architecture into the project funding process.

Section 3 of this Plan provides step-by-step instructions on how the region's stakeholders should use the Architecture to verify their project planning and design is consistent with its elements.

1.2 Architecture Use in Design

The Kansas City Regional ITS Architecture contributes information to the systems engineering process[1] that is required for ITS project development using federal funds. The Architecture is an initial reference for the Systems Engineering "Vee" diagram, as shown in Figure 1. The Architecture provides a high-level project idea and system functionality that leads into more detailed project-specific processes, such as a project's Concept of Operation and detailed system requirements.

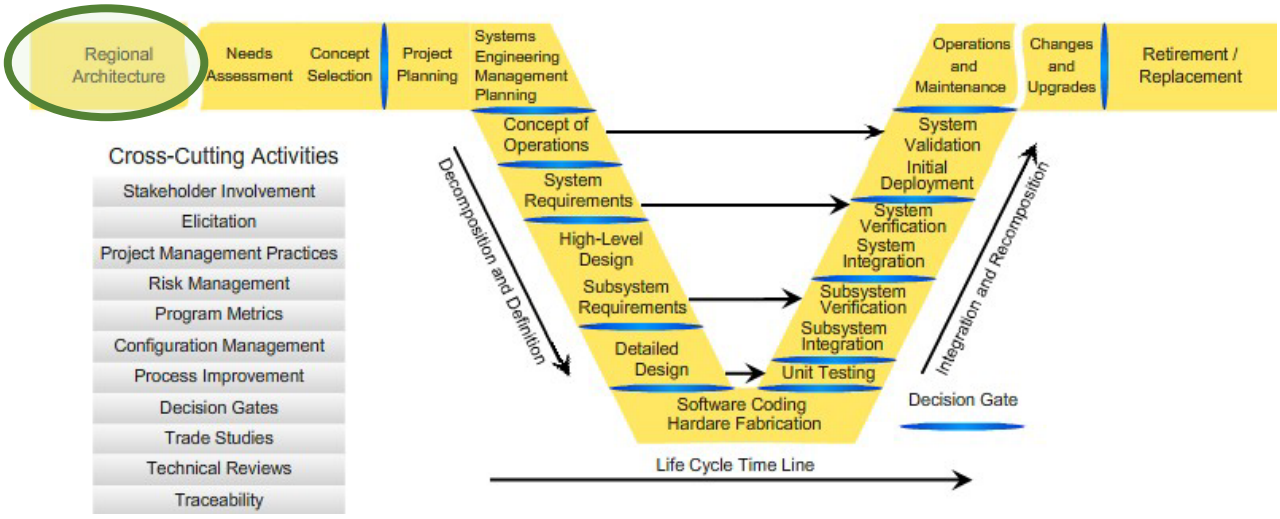


Figure 1 Systems Engineering Vee Diagram

The Kansas City Regional ITS Architecture provides a framework for multiple ITS deployments to be developed, deployed and operated in a consistent manner. It also defines high-level functionality for each specific project. Because stakeholder consensus is a critical part of Regional ITS Architecture development, the Architecture serves as a source for defining the region's projects at a high level that has been agreed upon by the stakeholders.

In the concept development and design phase of project development (the left-hand side of the Systems Engineering Vee diagram), the Regional ITS Architecture serves as a valuable resource to provide various inputs including:

- **Project Stakeholders** - Each project in the Architecture identifies the stakeholders who will participate. There are many distinct transportation agencies in the Kansas City region with different institutional interactions based on services provided and geographic separation. The selection of stakeholders involved in a project will reflect the relationships required for the project's success.

[1] http://ops.fhwa.dot.gov/int_its_deployment/sys_eng.htm

- **Operational Concept** - The Architecture defines the ITS operational concept, or stakeholder roles and responsibilities. These roles and responsibilities can serve as the basis for agreements to ensure that each stakeholder understands their role and what is expected from their involvement. The roles and responsibilities can also be used by the stakeholders during the development of a project's Concept of Operations to identify the needed technical and staffing resources to successfully deploy, operate and maintain ITS.
- **ITS Services and Functions** - The ITS services and functional requirements for each project in the Regional ITS Architecture can be used as the basis for developing detailed project system requirements. This process builds detail specific to the stakeholders based upon the Architecture. By using the Architecture as the basis for requirements, the project will be consistent with both the Regional and National ITS Architectures.

It is recommended that stakeholders are aware of, and require their project consultants and contractors to design projects consistent with the Kansas City Regional ITS Architecture. Where project design deviates from the Architecture, the stakeholder should identify the changes through the process defined in this Plan.

1.3 Architecture Use in Implementation

The Kansas City Regional ITS Architecture defines subsystems and functionality that comprise the region's existing and planned ITS. The Architecture also defines the information flows that connect subsystems into integrated systems. Functional objects are defined functionality within a subsystem that it with capabilities needed to carry out the subsystem's mission. The functional objects provide distinct functional components that can be procured either independently or in groups as part of a project implementation.

Functional objects are the most detailed elements of the physical viewpoint of the Architecture and are tied to specific service packages. They provide a common means to understand ITS and are used to derive the functional requirements.

The functional requirements are valuable for helping regional agencies define the functionality they desire from ITS. As previously discussed, functional requirements also provide a basis for developing more detailed project system requirements. These may be used in the procurement process to describe to vendors what capabilities are expected of new ITS.

By definition, the functional requirements, and the system requirements derived from them, are testable, and can be used as the basis for ITS acceptance testing. The requirements can be used to develop testing strategies to verify that implemented systems deliver the functionality desired by the stakeholders.

Once a project is included in the Kansas City Regional ITS Architecture, there are many reports and diagrams that can be generated from the Regional Architecture Development for Intelligent Transportation (RAD-IT) software tool that are helpful in the procurement process. They include:

- Interconnect and information flow diagrams that describe the expected communications for new ITS.

- Standards reports that identify the availability of national standards for the information flows included in the Kansas City Regional ITS Architecture, allowing stakeholders to procure devices and systems that will be interoperable.
- Inventory reports that define the status and ownership of each subsystem in a project.

2 Kansas City Regional ITS Architecture Maintenance

The Kansas City Regional ITS Architecture is a living reference and will be modified as the region's plans and priorities change, ITS projects are implemented, and the region's ITS needs and services evolve. The Architecture was developed with a ten-year time horizon, as reflected by the project time frames:

- Near-Term: zero to three years.
- Mid-Term: three to five years.
- Long-Term: five to ten years.

The goal of maintaining the Architecture is to keep the Kansas City Regional ITS Architecture accurate, accessible and easy to use for ITS planning, design and implementation. If the Architecture's information is not consistent with the MTP, CMP and other regional transportation plans, it is less likely to be used by the region's stakeholders.

The key aspects of the Architecture maintenance process are:

- Architecture ownership
- Maintenance responsibility and staffing
- Maintenance skills and training
- Maintenance elements
- Maintenance schedule
- Identifying needed Architecture changes
- Change Management Process

2.1 Ownership of the Architecture

The Architecture should be accessible to all stakeholders in the region. All stakeholders should also be able to suggest potential changes to the Architecture. However, it is critical for the sake of consistency that the Architecture has only one entity responsible for ownership and for physically maintaining it.

The Mid-America Regional Council (MARC) owns the 2012 Kansas City Regional ITS Architecture. MARC has also led this update of the Architecture. In addition, MARC has an existing relationship with virtually all of the region's transportation stakeholders in both Kansas and Missouri. It is recommended that MARC continue to own the Regional ITS Architecture and be responsible for its maintenance.

As owner, MARC's responsibility will be to follow this Maintenance Plan to ensure the Architecture remains current and accurately reflects the ITS activities of the region's stakeholders. Ownership will require a commitment by MARC to develop Architecture maintenance skills through training, and to work with the region's stakeholders to identify and incorporate updates to the Architecture.

2.2 Responsibility for Maintaining the Regional ITS Architecture

As the owner of the Kansas City Regional ITS Architecture, MARC shall be responsible for its maintenance. This section discusses MARC's role in leading the maintenance activities, and the level of effort required for MARC and the stakeholders.

2.2.1 Leadership

MARC will be responsible for leading the Architecture maintenance process in the region. The leadership responsibilities will be:

- To have an appropriate understanding of the use and maintenance of ITS Architecture.
- To have practical skills using the RAD-IT software application.
- To provide local ITS Architecture expertise.
- To facilitate and lead Maintenance Team meetings.
- To document all change requests and the results.
- To make physical changes to the Kansas City Regional ITS Architecture using RAD-IT.
- To post updated Kansas City Regional ITS Architecture content to the Architecture website.

The leadership role does not require a full-time position. For the Kansas City Region, approximately 60 to 80 hours per year are estimated for meetings and to address potential Architecture changes. It should be noted, however, that the required effort may be higher in the first year as staff develops expertise to maintain the Architecture.

MARC will identify and train at least one, but preferably two, qualified individuals from its staff to gain the knowledge and technical skills to maintain the Regional ITS Architecture. Training two staff members is preferable to help prevent the region from losing Architecture expertise if one employee leaves the agency.

An alternative approach to using MARC staff is to hire a consultant that already possesses ITS Architecture expertise to maintain the Kansas City Regional ITS Architecture. The consultant should have an appropriate knowledge of the region and its stakeholders, and proven expertise with Architecture development and maintenance. It is generally preferable for the Architecture owner to perform the maintenance. However, this option may be considered in the future if maintaining the Architecture in-house is not a viable option for MARC.

2.2.2 Maintenance Team

MARC will assemble and work with a group of regional stakeholders for the ongoing maintenance. Changes can arise from many sources in the region, and it is possible that some may come from sources outside the technical expertise of the region's stakeholders. For that reason, a group of the region's transportation professionals who represent a range of areas and technological expertise will be involved in the Architecture maintenance. The Kansas City Regional ITS Architecture Maintenance Team should have members who represent, at a minimum:

- Mid-America Regional Council
- Kansas Department of Transportation
- Missouri Department of Transportation
- Kansas City Area Transportation Authority
- City of Kansas City, MO
- Unified Government of Wyandotte County and Kansas City, KS
- City of Olathe
- City of Overland Park

The Maintenance Team members do not need to be able to physically maintain the Architecture, but they should be knowledgeable about the Architecture and its importance.

The responsibility of the Maintenance Team will be to identify changes in the region in their areas of expertise, and to make decisions by consensus with input from other regional stakeholders on how those changes should be reflected in the Architecture.

The Maintenance Team may only need to meet once a year while exchanging e-mails or holding conference calls more frequently. At the discretion of MARC, meetings may occur more often during periods of higher ITS activity, such as during major ITS project activities.

2.3 Maintenance Skills and Training

As owner and maintainer of the Kansas City Regional ITS Architecture, MARC staff will complete basic architecture training. The training will provide the skills to understand how to use the Architecture and how to maintain it within the RAD-IT software tool.

This training can be done in person or via the web through the United States Department of Transportation (USDOT). More information about training is available at the National ITS Architecture web site www.arc-it.net under the Architecture Resources menu. Specifically, the following web-based courses are available at any time:

- **ARC-IT Web Training** – provides an introduction to the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) and acquaints students with the background, structure, and use of the architecture. Students will be able to effectively navigate the website to find the ARC-IT content they need for their ITS architecture and project definition. The course covers website features, service packages, physical diagrams, communications diagrams, and other architecture resources and tools. It presents how regional architectures support planning and project implementation as well as how the architecture tool set of RAD-IT and SET-IT support development.
- **RAD-IT Web Training** – provides training on the RAD-IT software tool which is a high-level, interactive software program to assist transportation planners and system integrators in the development of regional and project architectures using ARC-IT as a reference. The course covers entering stakeholders, entering inventory data, selecting service packages, entering operational concepts, building and customizing interconnects and information flows, generating standards outputs, entering agreements and creating reports and diagrams.
- **Use and Maintenance Web Training** – provides training to effectively use and maintain a regional ITS architecture. The course covers architecture components, use of the architecture in long range planning, use of the architecture in project implementation and efficient maintenance of a regional ITS architecture.

MARC staff should also be knowledgeable in Systems Engineering for ITS and should keep current with the status and changes that occur to the National ITS Architecture in order to ensure the Regional ITS Architecture remains consistent with national changes, such as the evolution of connected and automated vehicles.

2.4 Elements of the Architecture to Maintain

The elements of the Regional ITS Architecture to be maintained are referred to as the “baseline” Architecture. This section describes the baseline.

Description of Region – This description includes the geographic scope, functional scope and timeframe. Geographic scope defines the physical demarcation of the region or the Regional ITS Architecture environment. Service scope defines the services that are included in the Regional ITS Architecture. Architecture timeframe is the temporal horizon (in years) for which the Regional ITS Architecture content has been envisioned. In RAD-IT, the description of the region is on the Start tab.

Stakeholders – Stakeholders are critical to the definition of the Architecture. Within a region, the stakeholders may consolidate or separate into multiple distinct stakeholders. Such changes should be reflected in the Architecture. In addition, stakeholders that have not been engaged in previous Architecture efforts might be approached through outreach to ensure that the Regional ITS Architecture represents their ITS needs. In RAD-IT, the stakeholders are found under the Stakeholders tab.

Operational Concept – It is crucial that the operational concept (which is represented as roles and responsibilities) in the Regional ITS Architecture accurately represent the consensus vision of how the stakeholders will operate ITS for the benefit of surface transportation users. The Operational Concept should be reviewed and, if necessary, changed to represent the deployed ITS and its impact on stakeholders' operations. In RAD-IT, the roles and responsibilities are found under the R&R tab.

ITS Inventory – Changes in stakeholders as well as the operational concept may impact the inventory. Specifically, ownership of inventory may change, and as a stakeholder's role changes, so may the specific functions of an ITS device or system. Furthermore, recent implementation of ITS elements may change their individual status (e.g. from planned to existing). In RAD-IT, ITS inventory is found under the Inventory tab.

Services – Service packages in the Architecture are collections of physical subsystems and information flows that work together to provide a transportation service. Services are the primary step toward building regional architectures. Services address needs within the region. The services are tailored to meet the region's needs and they include specific regional subsystems to operate. The services are found in RAD-IT under the Services tab.

List of Agreements – One of the most valuable benefits of a Regional ITS Architecture is identifying where information crosses agency boundaries. Information sharing may indicate a need for interagency agreements. An update to the list of agreements can follow an update to the Operational Concepts and/or interfaces between elements. The list of agreements is found under the Agreements tab in the RAD-IT software tool.

Interfaces between Elements (interconnects and information flows) – Interfaces between physical subsystems describe how various ITS elements are or will be integrated over the timeframe of the Architecture. These details are contained in the RAD-IT database. They are a fundamental part of the Architecture baseline, and one that will likely see the greatest amount of change during the maintenance process. Interconnects indicate a relationship or information sharing opportunity between two subsystems in the Architecture but they do not convey what information is exchanged. Information flows define what information is exchanged between two subsystems and link to ITS standards that further define the exchange. In RAD-IT, the interconnects and information flows are found under the Interfaces tab.

Functionality – High-level functions are allocated to ITS elements as part of the Regional ITS Architecture. These can serve as a starting point for the functional definition of projects that map to portions of the Regional ITS Architecture. Functionality may need to be updated when projects change status, scope, or when existing systems are interfaced with new systems. Functional requirements are associated with the element functionality when a project is moved from RAD-IT and the Regional ITS Architecture to the Systems Engineering Tool for Intelligent Transportation (SET-IT) software tool for project development and design. The functionality defined for each element in the Regional ITS Architecture is driven by service selections. In RAD-IT, functionality is found under the Functions tab.

Applicable ITS Standards – The selection of standards depends on the information flows selected in the Architecture. The maintenance process should consider how ITS standards may have evolved and matured since the last update, and consider how any change in the national standards development process may impact previous regional standards choices (especially where competing standards exist). For example, if eXtensible Markup Language (XML) based Center-to-Center standards reach a high level of maturity, reliability and cost-effectiveness, then a regional standards technology decision may be made to transition away from another standard to an XML-based one. In RAD-IT, the list of standards is found under the Standards tab.

Project Sequencing – While project sequencing is reflected in the Architecture by the time frame that each project is defined to take place. The sequencing may be determined by functional dependencies (e.g. “surveillance” is a precursor to “traffic management”), but the reality is that project sequences are often the result of local policy decisions. Project time frames/sequences should be reviewed to make sure that they are in line with current policy decisions. Furthermore, policy makers should be informed of the sequences, and their input should be sought to ensure the project sequencing is in line with their expectations.

2.5 Changing Architecture Content

It is strongly encouraged that any one responsible for directly changing the Architecture content using RAD-IT engage in training regarding ARC-IT, RAD-IT and Architecture Use and Maintenance. Section 2.3 provides training information. Some basic instructions regarding the update of Architecture content are provided in Appendix C – Architecture Change Instructions.

2.6 Maintenance Schedule

MARC will accept and document proposed Architecture changes submitted through discussion and review of other regional plans. Changes may be proposed by any stakeholder at any time during the year. MARC will document each change proposal it receives as described later in this Maintenance Plan.

At the discretion of MARC, minor changes, such as revisions to stakeholder descriptions or names, or those that impact only a single project may be made at the time they are identified. However, changes that impact more than one stakeholder, multiple projects or introduce new elements and services, should be reviewed by the Maintenance Team.

As previously discussed, suggested Architecture changes may only need to be reviewed once a year by the Maintenance Team to determine whether to incorporate them into the Architecture. Depending upon ITS activity in the region, the Architecture can be modified more frequently than once a year at the discretion of MARC.

The Regional ITS Architecture will be referenced in the MTP and CMP. MARC will provide further integration of the Architecture into the MTP as part of future updates. As the MTP and CMP undergo formal updates on regular cycles, the Architecture should undergo simultaneous review and major modifications. This effort should include reviewing every aspect of the Architecture and working with the stakeholders to reprioritize the region's needs. This should be a natural result of the Architecture being mainstreamed into the regional planning process and ensures that the Architecture continues to accurately represent the region.

2.7 Identifying Needed Architecture Changes

The Kansas City Regional ITS Architecture has been created as a consensus view of the ITS elements currently implemented and the systems planned for the future. The Architecture should be revised to reflect changes resulting from project implementation or resulting from the planning process itself. There are many actions that may cause an Architecture update. They include:

Changes in Project Definition – When formally defined during procurement and deployment, a project may add, subtract or modify elements, interfaces, or information flows from the Architecture. Because the Architecture is meant to describe not only ITS planned for the region, but also the current ITS implementations, it should be updated to correctly reflect projects as they are deployed.

Changes Resulting from Project Addition/Deletion – Occasionally a project will be added or deleted during the planning process. When this occurs, the aspects of the Architecture associated with the project must correspond. Because the Regional ITS Architecture is technology neutral, the changes will refer to changes in information flows, subsystems, services, and interoperability. Architecture changes will not be required if the technology to achieve a service or functionality is changed. For instance, vehicle detection is included in the Architecture to gather traffic data for operations and management services as well as traveler information inputs. Vehicle detection can be accomplished with different technologies such as in-pavement electromagnetic loops, radar, video, or acoustic sensors. If an agency changes their technology for vehicle detection, the architecture does not change since it is the vehicle detection functionality that is included in the Architecture, not the technology used to accomplish it.

Changes in Project Status – As projects are deployed, the status of the Architecture elements, services, roles and responsibilities and information flows that are part of the project must be changed from planned to existing. Elements, services, and flows are considered to change to "existing" status when they are substantially complete in that they have been installed, tested and are being used.

Changes in Project Sequencing – Due to funding constraints, technology changes and other considerations, a project planned in the region may be delayed or accelerated. Such changes need to be reflected in the Architecture as changes in their planned time frame.

Stakeholder Changes – Stakeholder additions, deletions and revisions will need to be documented in the Architecture, along with any ITS inventory associated with the revised stakeholder name. A change may be as minor as a stakeholder changing its organization name.

Additionally, ARC-IT itself is a living resource of information or reference. In order to keep a 20-year horizon for ARC-IT, FHWA updates it to refine existing services or add new services as the transportation environment evolves. The Kansas City Regional ITS Architecture has been developed using ARC-IT Version 8.1, however, there will be new versions within the Kansas City Regional ITS Architecture's

lifespan that include significant new functionality. Each revision may add new ITS services that may be applicable to the region and should be considered with major updates of the Architecture.

With any new service there is the potential for new subsystems, terminators, interconnects, flows, and equipment packages. It is recommended that the Maintenance Team reviews changes in ARC-IT during major updates, and determines how national changes may affect the Kansas City Regional ITS Architecture.

2.8 Change Management Process

This section recommends a process for maintaining the Kansas City Regional ITS Architecture. The process described below and illustrated graphically in Figure 2 is based upon the more general discipline of Configuration Management. The figure illustrates a step-by-step description of how Architecture changes are identified, reviewed and implemented.

Figure 2 Architecture Maintenance Process

MARC will maintain the Regional ITS Architecture with the support of a Maintenance Team. Once the Maintenance Team has been established, the maintenance process can be used to update the Architecture.

Identify – Any of the region's stakeholders can identify a change in the Architecture and submit a request to MARC. In turn, MARC can share the information with the Maintenance Team for review and evaluation. A change request form similar to the one in Appendix A – Change Request Form will be available to stakeholders through the Kansas City Architecture web site.

In addition, an Architecture Consistency Statement should be required from stakeholders planning and deploying ITS in the region. MARC will review these Statements to identify any deviations and report them to the Maintenance Team via a change request form.

Once received, the change request or Consistency Statement should be maintained in a change log, such as the one in Appendix B – Architecture Change Log, that tracks each potential change with the following additional fields of information:

- Change number (a unique identifier)

- Change impact (minor or significant)
- Part of baseline affected (may be check boxes for document, database, web site, and not known)
- Disposition comment
- Disposition date
- Change disposition (accepted, rejected, deferred)

Evaluate – Each significant change request needs to be evaluated to determine what impact it has upon the Architecture baseline. If the request has an impact on other stakeholders, MARC will contact the affected entities to confirm their agreement with the modification. If the issue warrants, a stakeholder meeting or teleconference to discuss the modification may be held. In the case of a full baseline update, the change evaluation happens through stakeholder consensus as part of the overall Architecture update.

Approval – The next step is for MARC or the Maintenance Team to approve, defer, or reject the change request. This can be handled through email, conference call and/or through periodic face-to-face meetings. The method of approval may be dependent upon the complexity of the proposed change(s). If a change request is rejected or deferred, the requester will be notified with an explanation. In all cases, the result of the approval step will be communicated back to the requester.

Update Baseline – The baseline update involves updating the Kansas City Regional ITS Architecture RAD-IT database and documentation by MARC staff. This requires the skill and expertise described in the Maintenance Skills and Training section.

Notify Stakeholders – The final part of the maintenance process is to notify stakeholders of the changes or updates to the Architecture. This can be accomplished by sending an email notification to the stakeholder list that a change has occurred and how to access the information on the website.

If there are no change requests between Maintenance Team meetings, and no other issues to discuss, the Team may decide to postpone the meeting.

3 ITS Project Consistency Statement

This section describes a strategy to ensure that the region's ITS projects are consistent with the Kansas City Regional ITS Architecture. Project consistency is required by the Federal Highway Administration (FHWA) Rule 940 and Federal Transit Administration (FTA) Policy for any ITS project using federal funding.

The Project Consistency strategy requires project stakeholders to verify that the projects planned in the region are accurately represented by the Regional ITS Architecture. The strategy also requires MARC to take an active role in verifying project consistency. The strategy also incorporates consistency into the funding process.

The strategy requires the lead stakeholder for each ITS project to complete an ITS Architecture Consistency Statement as part of the region's funding process. MARC reviews each Consistency Statement to verify that the proposed ITS project is consistent with the Regional ITS Architecture.

3.1 Project Consistency Statement

Appendix D – Consistency Statement contains an example Project Consistency Statement. The Consistency Statement is a series of questions that project Stakeholders complete to verify that they have:

1. Reviewed the Regional ITS Architecture as part of their project planning process.
2. Confirmed that their planned ITS project is identified in the Regional ITS Architecture.
3. Confirmed that the Regional ITS Architecture correctly identifies the project as planned.
4. Identified any differences between the project and the Regional ITS Architecture that will require an Architecture update.

MARC uses each Consistency Statement to verify each project's conformance with the Regional ITS Architecture, and to identify Architecture changes that may be required in order to accurately reflect the region's ITS.

The Project Consistency Statement documents:

1. The project's lead and participating Stakeholders.
2. The project's planned ITS systems and the existing systems with which the project will interact.
3. The project's planned information exchanges.
4. Opportunities for integration with other existing and planned ITS that are not part of the project.
5. The interagency agreements necessary for the project to succeed.
6. The project's planned use of ITS communications standards.
7. The project's plans for measuring its performance.
8. The project's plans for continuing operations and maintenance.

3.2 Stakeholder Role in the Consistency Statement

A lead Stakeholder should be identified for each ITS project that requests funding. The lead stakeholder will be responsible for completing the project's Consistency Statement. Through the stakeholder process, the lead stakeholder is encouraged to work with MARC and other stakeholders to clarify information.

The first step for the lead stakeholder will be to review the Kansas City Regional ITS Architecture and find their planned project in it. Note that the current project may have a different name in the Architecture. Similarly, the current project may be represented in the Architecture by only part of a project, or multiple projects. This is because the Architecture is often developed in advance of detailed project planning and is intended to be inclusive of the region's possible services, functions and information flows. If no Architecture project or projects align with the stakeholder's planned project, the stakeholders should make a request using the Change Request Form (Appendix A – Change Request Form).

The next step for the lead stakeholder will be to complete a Consistency Statement. Stakeholders are not required to have detailed knowledge of the Architecture. They are encouraged to work with MARC and other stakeholders in the Consistency Statement process.

Once the lead stakeholder has completed the Consistency Statement, they will submit it to MARC for review.

3.3 MARC Role in the Consistency Statement

MARC's role is to verify that ITS projects planned in the region are consistent with the Regional ITS Architecture. This role will require review, working with stakeholders, and identifying potential Architecture updates based on planned project information.

MARC's first step in the Consistency Statement process will be working with stakeholders on an as-needed basis while the stakeholders complete each planned ITS project's Consistency Statement. This step requires MARC to have a strong understanding of the region, the stakeholders and the Architecture. Stakeholders may need help navigating the Architecture and identifying their planned activities within it.

MARC's second step will be to review each submitted Consistency Statement. This step requires MARC to review each section of the Statement and verify that the information provided by the ITS project's lead stakeholder is consistent with the Architecture. Note that consistency does not require that the project be exactly as defined in the Architecture, but the Architecture should include all of the stakeholder's currently planned services, subsystems and information flows.

If MARC confirms that the planned ITS project is consistent with the Regional ITS Architecture it should be noted and the project should be confirmed as eligible for the funding process. The Consistency Statement should be archived along with the project plans.

If MARC identifies consistency issues for the planned ITS project, the MPO should work with the project stakeholders to resolve the issues. This may require revising the project to conform to the Architecture. However, consistency issues may also be resolved by changing the Regional ITS Architecture.

Example of issues that may require Architecture changes include a stakeholder adding ITS services that were not identified in the Regional ITS Architecture, and the addition of information flows that were not listed in the Regional ITS Architecture.

If an Architecture change is required, MARC and project stakeholders should complete a Change Request Form (Appendix A). Note that a Change Request should not disqualify a project from the funding process. An Architecture change may be made concurrent with the funding process. What is critical is that the required change is made to ensure the Architecture accurately reflects the region's ITS. However, the project's Consistency Statement should be updated once the Regional ITS Architecture has been updated to reflect the requested change.

The final step for MARC is to archive all Consistency Statements and their status. The Statements can be used to confirm the region's compliance with FHWA rule and FTA policy.

Appendix A – Change Request Form

Date		**Tracking No. (*MARC assigned*)**		
Stakeholder Proposing Change	Name		Title	
	Agency			
	Email		Phone No.	
Description of Change	Title	*Short Description (up to 25 characters)*		
	Detailed Description	*(What is to be added, deleted or modified? Attach additional documentation, including a project architecture, as necessary)*		
	Type of Change	☐ New Project/System ☐ Deleted Project/System ☐ Modified Project/System	☐ New/Changed Stakeholder ☐ Change in Project Status ☐ Change in Project Priority ☐ Other	
	Systems or Projects	*Name of System(s) or Project(s) being implemented or modified (if applicable)*		
Project Status	☐ Proposed (funding not yet secured) ☐ Planned (funding secured) ☐ Under Construction (stakeholder is currently deploying system/project) ☐ Existing			
Maintenance Team Comments				
Maintenance Team Action	☐ Approve ☐ Reject ☐ Deferred Until _____			
Additional Notes (submit additional pages if necessary				

Appendix B – Architecture Change Log

The table below provides a template for the Architecture Change Log. Information provided for a proposed change will be taken from the Change Request Form (Appendix A – Change Request Form). The change log will provide a tracking mechanism to manage change proposals and their disposition.

#	Change Title	Impact	Affected	Disposition	Comment	Date

Legend:

- Change Number: Number assigned by MARC on Change Request Form.
- Change Title: Title from Change Request Form
- Change Impact: minor, significant, major
- Baseline Affected: database, documentation, web site, not known
- Disposition: accepted, rejected, deferred
- Comment: Comments regarding disposition of change
- Date: Date of disposition decision

Appendix C – Architecture Change Instructions

The following Kansas City Regional ITS Architecture-related items will need to be maintained:

- Architecture content in the RAD-IT Database
- Architecture Web Pages
- Architecture Documentation
- Change Request Form
- Consistency Statement
- Use and Maintenance Manual

In addition, a change log (Appendix B – Architecture Change Log will be maintained to track change request dispositions and manage the revision of the architecture content.

The following are basic instructions for maintaining the Architecture. Where available, more detailed resources are provided.

Download/Install RAD-IT

RAD-IT is the primary tool for developing and maintaining the Kansas City Regional ITS Architecture. RAD-IT is a software application that supports development of regional and project ITS architectures using ARC-IT as a starting point. The RAD-IT software is available for free download at www.arc-it.net under the **Architecture Resources** pull-down menu. On the RAD-IT web page, click the **now available for download** link and enter a Name, Organization, and Email address to register your download and select the notification option if update information is desired in the future regarding RAD-IT revisions. Click the **Download** button to start the download process.

A RAD-IT icon will be placed on the computer desktop, but if it is not, RAD-IT should be available under the Programs list on the computer under "ITS Architecture".

Open Kansas City Regional ITS Architecture in RAD-IT

The Kansas City Regional ITS Architecture content is stored in a database which is available for download from the Kansas City Regional ITS Architecture website at http://www.marc2.org/Assets/ITS/index.htm for users to access. A master database file should be stored in a secure location on a MARC server. Copies of the database should be made for use with RAD-IT by the MARC maintainer. Never use the master database for revision purposes. Place a copy of the Kansas City Regional ITS Architecture database in a directory on a local computer of the maintainer.

Open the RAD-IT software and select the **File** tab in the upper left hand corner of the user interface. Under the File tab, select **Open** and navigate the directories to the location of the database copy that was saved for revision. Select the database file.

Before any work begins with the database content, it is recommended that the database be saved with the current date and an increment of the file version number. The **Save As** option is available under the File tab.

RAD-IT Tour with Kansas City Regional ITS Architecture

With the Architecture database open in RAD-IT, the following is a tour of the RAD-IT user interface and how the content changes options are handled in each component of RAD-IT.

- **Menu Bar** – The menu bar provides access to file options, home options which include architecture revision tools, and Output which provides options for diagram generation, table generation, document generation and web page generation.
- **Start** – The Start tab provides the scoping information for the Architecture including Architecture Name, Description, Timeframe, Geographic Scope, Service Scope, and Maintainer information about the developing organization, the maintainer, the version number and the date/time the architecture was edited.

General Note for all RAD-IT operations: When any information is changed in RAD-IT for the Architecture it is being changed in the database underlying the user interface. In order for a change to be saved in the database, the **Apply** button must be selected. If the user attempts to move to another tab or tries to move to another element on the current screen, the operation will not be allowed until the changes made are saved by clicking the **Apply** button or the **Cancel** button. This is a uniform working process in RAD-IT across all tabs.

- **Stakeholders** – The Stakeholders tab contains a list of all Architecture stakeholders. If a stakeholder does not have a checkmark next to the name, it is not included in the architecture content. By selecting a stakeholder on the left, information pertaining to that stakeholder is displayed on the right side of the screen. A stakeholder group can be defined that includes a group stakeholder names by selecting the Stakeholder Group box below the stakeholder description. A new stakeholder is added by selecting the New button on the left bottom portion of the screen. Enter the name and description of the stakeholder on the right side of the screen and click Apply to save the new stakeholder.
- **Inventory** – Inventory includes the subsystems or systems that are related to physical systems in the transportation system or that are planned to be built. The inventory items contain functionality that make them capable of supporting services. To edit an existing inventory element, select it from the left side of the screen. The element's information will be displayed on the right side of the screen. Edit the information as necessary and select Apply to save the changes. Each element is mapped to one or more subsystems or functional objects in ARC-IT. This is how the regional architecture is related to the architecture reference. When adding an inventory element:
    - Select the New button at the bottom of the screen on the left.
    - Enter the name of the new element.
    - Select the Type of element (transportation, communication or human); Transportation (Normal) is the most commonly used.
    - Select the Class from the list of Center, Field, Support, Traveler, or Vehicle. Think of where the system being added will be implemented and select the appropriate option.
    - Select the Stakeholder associated with the inventory element. This will tie the element to a stakeholder entered in the Stakeholders' tab.
    - Select the Status of the inventory element from the list of Existing (it's already deployed and operational), Planned (it's being planned and funding has been identified), Future (it's not been planned but is included for future reference, and Not Planned.
    - Enter a description of the inventory element with information about its purpose, operation and area of influence.

  - Map the element to ARC-IT subsystems to attach the element to functionality that supports its mission. More than one subsystem mapping can be made but more than two will increase the complexity of the tailoring process.
  - Map the element to projects if the projects have been defined on the Start tab already.
  - Select Apply to save all inputs.

- **Services** – Services are the most important part of building an architecture. Services address particular needs in the transportation system and define what subsystems and information flows are needed for a particular service to be implemented. All of the services defined in ARC-IT are available to be selected in RAD-IT. Highlight a service in the left hand side of the user interface and its description and the relevant inventory elements that are saved in the Architecture database are displayed on the right side of the screen. In addition, if the service is included in a project defined on the Start tab, they may be selected as well to incorporate the subject service into that project. When tailoring a service, select the Status of the service next to the service ID at the top right corner of the screen.
- **Needs** – The Needs tab provides a mapping of each service to a list of needs that the service addresses or satisfies. The Needs are visible by clicking the "+" next to the service name on the left side of the user interface. Checking or Unchecking a Need will change whether it is included in the architecture or not.
- **R&R** – Role and Responsibilities provides a list of regional areas on the left of the screen that can be expanded by clicking on the "+" next to the service name. Highlighting a specific stakeholder in the list under a regional area provides the Roles and Responsibilities assigned to that stakeholder on the right side of the screen. The status of the Roles and Responsibilities can be tailored as well as whether it should be included or not.
- **Functions** – The functionality associated with each inventory element is provided under the Functions tab. Highlighting an inventory element with a script "f" next to it will provide a list of functionality in the right side dialog box on the screen. Functionality can be tailored by selecting/deselecting functionality in the right side of the screen and saving the changes using the Apply button. Functionality is assigned to an inventory element based on the services that include that element.
- **Interfaces** – The Interfaces tab provides the information flows and interconnections between inventory elements. In the options ribbon at the top of the screen in the **Display** category there are two options: Connect and Flows. When **Connect** is selected, the interconnects between elements are displayed in the lower frame of the screen. These are showing connections without showing the information flows. This is useful when tailoring high level interfaces without regard for specific flows between elements. Select the **Flows** option from the Display options and the individual information flows. This is the primary tailoring activity that takes place with the Architecture. The displayed table shows the Source Element (initiates the information), Flow Name (the information flow), Destination Element (receives the information), Status (existing, planned, future, not planned), Communications, and Include (select whether the information flow is included in the architecture or not). The table columns can be sorted by clicking the column title or selecting the **Sort** option from the **Style** category in the options ribbon and choosing the sorting approach desired. When tailoring the architecture content, changes made to the flow list options need to be saved using the Apply button.

Any time an inventory element is changed regarding its functionality or mapping to ARC-IT or a service is changed regarding which inventory elements are added to a service, a **Build** must be executed on the Interface tab to bring the information flows into the architecture from ARC-IT. After inventory mappings and service tailoring has been accomplished and applied, the Interfaces tab should be selected. *Save the Architecture at this point*. Next, select the **Build** button in the options ribbon. The next dialog will be displayed. Select the **Settings…** button. A set of sliders will be presented to select how the user wants the build to operate. The sliders allow for minimal update through all flows being imported. The ideal settings are for both sliders to be in the middle position so that the build brings in flows that are associated with the services selected in the architecture and it will keep the flows deselected in previous tailoring. Close the dialog box and answer the question on the prior dialog box regarding inventory and service comparisons. Unless the report is desired, select the No button and the Build will begin. It may take some time to complete the build and a status bar is presented while it is executing. After the Build is complete, a table of flows that are proposed to be added to the architecture is presented. If the table looks acceptable, select **Yes** and the flows will be added to the architecture. It is highly common for the tool to add flows that may not be related to the specific tailoring being done. This can be from other minor tailoring done. To review the flows added to the architecture, select the **New Flows** option from the options ribbon. This will display only the recently added flows so they can be specifically tailored. Further, there new flows that were added to the Interfaces tab but not selected (not planned) for the architecture. These are flows for consideration in case there are other interfaces the user desires. To limit the list of new flows to only the ones that are included in the architecture, select the **Limit** option from the options ribbon. Only the flows that are checked as **Included** in the rightmost column will be displayed. After all tailoring has been completed, select Apply to save the changes.

- **Standards** – The Standards tab displays the standards associated with flows in the architecture. Selections can be made for inclusion in the architecture by toggling the Include checkbox in the rightmost column.
- **Agreements** – Agreements included in the architecture are listed under the Agreements tab. The agreements are listed on the left and descriptions for each including type, status and the stakeholders involved in each agreement are displayed on the right.

Tailoring Information Flows

When tailoring information flows, it is a good idea to have the ARC-IT website open for reference. It is recommended to work on one service package at a time. Tailor the service package, execute a Build, and finish tailoring the information flows for the service package being worked on. With the ARC-IT website open to the service package being tailored, the information flows will make more sense regarding what should be included. This affords and incremental build of the architecture and minimizes the confusion about what should be included or not.

Configuration Control/Incremental File Saving

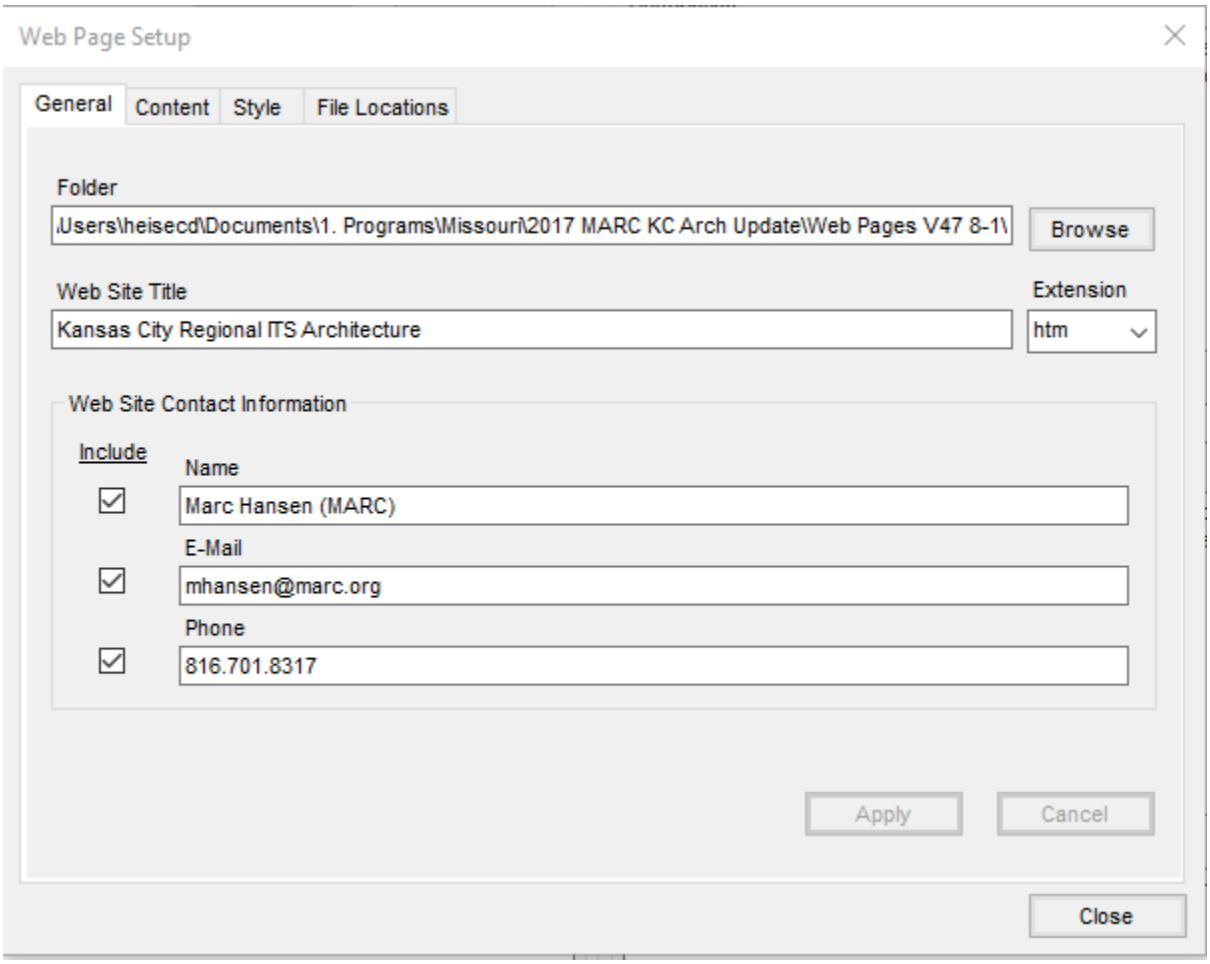
As previously mentioned, it is recommended to conduct incremental saving of the architecture file. While clicking the Apply button on any tab will save the changes made, a Save or Save As of the file under the File tab will maintain an incremental evolution of the file affording the opportunity to roll back to a previously saved version if a mistake is made. It is also recommended that the date and a

version number be include in the database file title. The version number should be incremented with each major save. The date should be incremented for the date the revisions are being made.

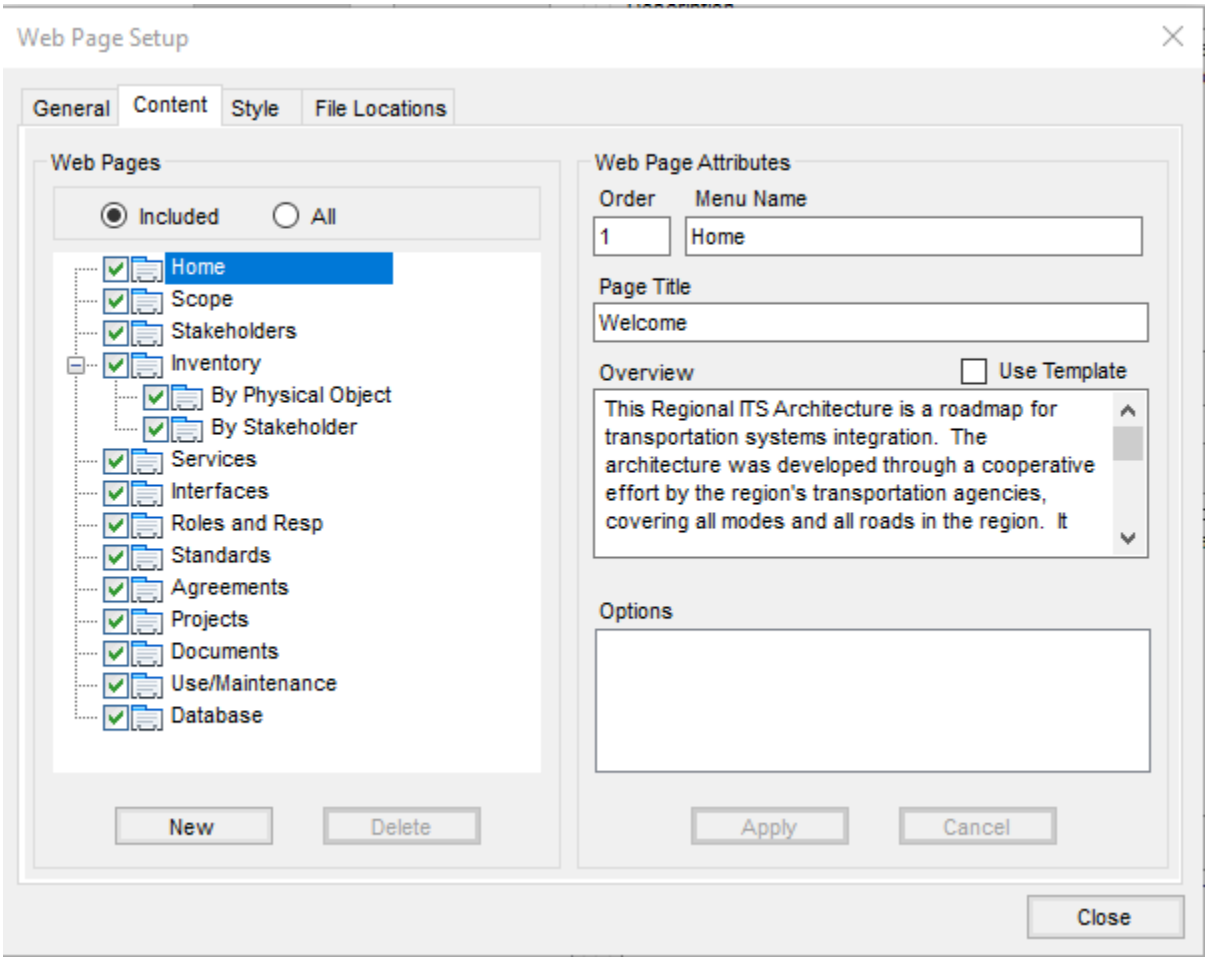
Web Page Generation

When all changes have been made to the architecture and the final version is saved, web pages can be generated to update the website. Under the **Output** tab at the top left corner of the screen, select **Web Pages**. The first dialog box lays out what will be generated. The current web pages contain Top-Level Web Pages, Detailed Web Pages, and Diagrams so select each of these options. Select the **Setup** button to provide more configuration information.

The **General** tab under Setup allows for the target directly for the web pages, the website title and contact information. The following dialog is representative of that dialog box.



Under the **Content** tab, the architecture content can be selected for inclusion in the web page generation. Highlight each selection on the left to display its specific information on the right. The following dialog is representative of that dialog box.



Under the **Style** tab, web page colors can be edited. In the lower left hand corner of the dialog box, there is a selection for the **Page Width** that is desired. To fit most screens, 1024 pixels provides the best option.

Select the **Close** button after all selection are made to return to the Web Pages dialog box. The Create button will execute the Web Page generation. This can take a long time when all of the option are select (2+ hours). Make sure your computer has power if the action is taken on a laptop. When the Web Page generation is complete, the **View** button will launch the website on the computer for review. The Web Pages are stored in the directory the user specified and can be copied or zipped to a file to give to the IT administrator to put on the website for stakeholder access.

There are pages such as Documents, Use/Maintenance, and Database that will not have content until files are added to those pages. The Web Page developer will need manually insert page links to the appropriate files in the HTML directory for the website.

- Under Documentation, provide any architecture documentation that should be accessed by the stakeholders such as the comprehensive architecture document which is a paper/electronic

version of the architecture. Add any other documents such as the Architecture Change Form or the Consistency Statement to this page.

- Under Use/Maintenance, provide this Use and Maintenance Manual. If desired, provide the Architecture Change Log.
- Under Database, it is recommended that a zipped copy of the Kansas City Regional ITS Architecture RAD-IT database be added to the page for stakeholder access.

These file additions will likely need to be made by the IT administrator with knowledge of HTML so they can be loaded properly.

Documentation Generation

Documents can be generated that represent Architecture content by selecting the **Document** option under the **Output** tab. Use the document and diagram selections along with the **Setup** button to tailor the configuration and content of the documents desired.

Diagram Generation

Diagrams for services and inventory elements can be generated using the **Diagram** option under the **Output** tab. This is useful for displaying diagrams of services in presentations or reports. Select the **Flow** button and then **Filters** to specify the services or inventory elements desired. Return to the first dialog box and select **Preview** to generate the diagram. From diagram displayed, the file can be saved to a directory of choice for later use. Note that diagram resolution/**Saved Diagram Size** can be selected on the top dialog box which is useful for better clarity in the diagrams.

Appendix D – Consistency Statement

Kansas City Regional ITS Architecture
ITS Project Consistency Statement

Before federal funding agreements with Missouri Department of Transportation (MoDOT), the Kansas Department of Transportation (KDOT) or the Mid-America Regional Council (MARC) are developed, the stakeholders for each project containing ITS elements must have a completed Consistency Statement that identifies how the project will be consistent with the Kansas City Regional Intelligent Transportation System (ITS) Architecture. Each Statement will be reviewed by MARC.

Please complete the following form in its entirety to document your project's consistency with the Regional ITS Architecture. Use the Kansas City Regional ITS Architecture Web Site (http://www.marc2.org/Assets/ITS/index.htm) to view the most current version of the Regional ITS Architecture. If you have questions or need guidance in completing this Statement, please contact MARC staff at (816) 474-4240 or mhansen@marc.org.

Your Name:	**Your Agency:**
Your Phone No.:	**Your Email:**
Your Project Name:	
Related Project Name in the Regional ITS Architecture: *(Note that your project may not have the same name or scope as the projects in the ITS Architecture. Choose the project(s) in the Architecture that most closely resemble the services you plan to deploy.)*	
Brief Project Description:	
Project TIP Code:	
Mark the Current Project Status:	☐ **In Planning** ☐ **In Design** ☐ **In Development or Procurement** ☐ **Deployed**

1. STAKEHOLDERS

Review the Kansas City Regional ITS Architecture and your project documents to identify the stakeholders participating in this project.

a. Who is the lead stakeholder for this project?

b. Are there other project stakeholders? If so, please list them:

c. Are there any differences in the stakeholders listed in the ITS Architecture and in your project plans? If so, please list them. (*Examples may be additional stakeholders, or a stakeholder identified in the Architecture who will not participate in the project.*)

2. SYSTEM ELEMENTS

Review the Kansas City Regional ITS Architecture and project documents to identify the ITS elements to be used in this project.

a. List the types of ITS equipment developed or purchased as part of this project.

b. List the types of existing ITS equipment that will interface and exchange data with new equipment in this project. (*Examples are the Kansas City Scout Traffic Management Center or the RideKC Operations Center.*)

3. SYSTEM DESIGN

Describe your agency's commitment to consider all applicable subsystems and information flows from the regional architecture in the project development process.

a. Submit documentation of all Architecture information flows for this project to this Statement, or provide a web address or addresses below where they can be viewed. (*Note that this may be the page, or pages, on the Kansas City Regional ITS Architecture web site that describes your project*.)

b. If there are information flows listed in the Kansas City Regional ITS Architecture for your project that you do not plan to use, please identify them and explain why. (*Example reasons are that the project will only deploy a part of a project as identified in the Architecture, or that some flows will be deployed in a later project phase.*)

4. FUTURE INTEGRATION

Your responses in this section should address how your project addresses potential future integration and ensures interoperability of the project's equipment with other ITS in the region.

a. List any opportunities for integration with other existing or planned ITS that are not part of this project but may benefit the region in the future. (*Examples are sharing information collected by the current project with a maintenance center or emergency center.*)

5. INTERAGENCY AGREEMENTS

Your responses in this section should express your agency's commitment to developing operating agreements between the stakeholders to ensure the successful ongoing operation and usage of the project.

a. List the stakeholders that will participate in the **operation** phase of this project:

b. Will there be operating agreements among the stakeholders listed in 5a?

☐ Yes

☐ No

c. If you answered **No** to the previous question, explain why there will not be operating agreements. (*Example reasons may be that an existing agreement covers operations or that only one agency is involved in the project, so no agreements are needed.*)

6. STANDARDS

Your responses in this section should provide assurance that the project will use the appropriate standards and protocols for information exchange.

a. List the standards identified in the Kansas City Regional ITS Architecture applicable for this project.

b. Will you incorporate the standards listed in 6a into the project design and procurement documents?

☐ Yes, all of them.

☐ Some of them.

☐ No, none of them.

c. If you answered the previous question "some" or "none," list the standards for this project that will not be incorporated into the design and procurement documents, and briefly explain why each is not being used. (*An example reason is that the Architecture contains multiple standards that apply to an information exchange, and only one of those standards will be used.*)

7. PERFORMANCE MEASUREMENT

In this section you should provide assurance that your project has clearly defined performance measures and a plan for evaluating project progress and success.

a. Submit the Performance Reporting Plan for this project with this Statement, or provide a web address below where it can be viewed:

If you attached a Performance Reporting Plan, please skip forward to Section 8. *If you did not attach a Performance Reporting Plan, complete Section 7.*

b. List the performance measures you will use to evaluate the progress and performance of this project:

c. How will the project report its performance? To whom and how frequently will the performance be reported?

d. Will the data be stored or archived by the collecting agency?

☐ Yes.

☐ No.

☐ Not Applicable.

e. Will the devices and the data generated by the project be validated and periodically evaluated?

☐ Yes.

☐ No.

☐ Not Applicable.

f. Please elaborate on how data will be validated, shared, stored and/or archived. If the project does not plan to validate, share or store data, please explain why.

8. OPERATIONS AND MAINTENANCE

Your responses in this section should provide assurance that the project has a plan for operating and maintaining the systems it deploys.

a. Submit the Operations and Maintenance Plan for this project to this Statement, or provide a web address below where it can be viewed:

***If you attached an Operations and Maintenance Plan, please skip forward to Section 9**. If you did not attach an Operations and Maintenance Plan, complete Section 8.*

b. What is the estimated annual cost, in dollars, for the project's operation and maintenance?

$ _____

c. Briefly describe the staffing and technical resources required for the operation and maintenance of your project.

d. Briefly describe how the project will meet its needs for resources.

9. OTHER INFORMATION

Please use this section to provide additional information and clarification regarding your project's ITS architecture compliance.

a. Submit additional documents for this project, or provide the web addresses where they can be viewed below:

b. Please provide any other comments you would like to share about your ITS project.

MARC thanks you for your time and diligence in completing this ITS Architecture Consistency Statement.