OKI ITS ARCHITECTURE UPDATE AND STRATEGIC PLAN: USING AND MAINTAINING THE REGIONAL ITS ARCHITECTURE

January 31, 2008 Project Review Stakeholder Meeting

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1.0 Using the Regional ITS Architecture

As our nation's freeways became more congested, transportation officials looked at new technologies to help ease the burden on highways and lessen the frustrations of motorists. Emerging from this search are new methods of traffic technology, collectively known as Intelligent Transportation Systems (ITS). During the early 1990's, the Ohio Kentucky Indiana Regional

Council of Governments became a leader in ITS by establishing a framework for coordinated regional traffic management. This ITS Architecture is a key reference in the transportation planning process for the OKI region and serves as the foundation for the Advanced Regional Traffic Interactive Management and Information System (ARTIMIS). ARTIMIS which provides incident, congestion, and freeway management for over 88 miles of Cincinnati-Northern Kentucky regional highways, is the first major ITS effort in Ohio and the second in Kentucky.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) formalized a Federal program to research, develop, and operationally test ITS and to promote their implementation. As a result, a National ITS Architecture was established to guide the deployment of intelligent transportation systems in the U.S.

In 2007, as part of the technology upgrade cycle, OKI has undertaken an effort to advance its regional architecture and align with the now established statewide ITS architecture and to consider additional integration opportunities leading to more efficient implementations. The overarching goals of the regional, statewide, and national program is designed to facilitate deployment of technology to enhance the efficiency, safety, and convenience of surface transportation, resulting in improved access, saved lives and time, and increased productivity.

OKI's primary planning document is the OKI 2030 Regional Transportation Plan. Last updated in 2004, the Plan is the long-range, comprehensive multimodal transportation-planning document for the three-state, eight-county Greater Cincinnati region. It defines the overarching goals for transportation in our region, establishes existing and future transportation needs of the region and allocates projected revenue to transportation programs and projects that address those needs. An update for this plan is ongoing and is scheduled to be completed in June 2008. The updated ITS architecture is to be included in this plan update.

The Plan functions long-range in that it recommends major projects, systems, policies, and strategies designed to maintain the existing transportation system and serve the region's future travel needs.

Upon completion of the OKI Regional ITS Architecture, the Transportation Improvement Program (TIP) should be updated to reflect the information gathered and the regional ITS needs.
The OKI Regional ITS Architecture defines and supports the ITS project development cycle. This cycle begins with project definition, followed by procurement, leading to implementation. Properly maintained, the information in the Regional ITS Architecture can assist in all three of these cycles of the project development process.

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. Prior to the beginning of implementation, the details of the project must be developed. The detail system definition will also include the interface with the systems or parts of systems which will make up the project, establish the interconnections the project entails, and define the information needs to flow across the system interconnections. The definition may go through multiple 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 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 cab extract the applicable ITS standards for the project.

Once a project is defined and funding for it is committed, the implementation process can commence with the generation of a Request for Proposal (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. Because ITS projects involve systems and their interconnections, it is very important to follow a system engineering approach to designing and implementing the project. While the exact process followed is at the discretion of the local agency, the ITS projects funded through the highway trust fund must follow their specific procedures.

The required system engineering analysis steps are:

- Identifications of portions of the Regional ITS Architecture being implemented (or if a Regional ITS Architecture does not exist, the applicable portions of the *National ITS Architecture*)

- Identification of participating agencies roles and responsibilities

- Requirements of definitions

- Analysis of alternative system configurations and technology options to meet requirements

- Procurement options

- Identification of applicable ITS standards and testing procedures

- Procedures and resources necessary for operations and management of the system

The Regional ITS Architecture can provide inputs to a number of these steps as shown in **Exhibit 1**.

Exhibit 1. System Engineering Requirements Supported by Regional ITS Architecture

System Engineering Requirements	Regional ITS Architecture Output
Identification of portions of the Regional ITS Architecture being implemented	Mapping project to the elements and interfaces of the Regional ITS Architecture
Identification of participating agencies' roles and responsibilities	Use Operational Concept as a starting point

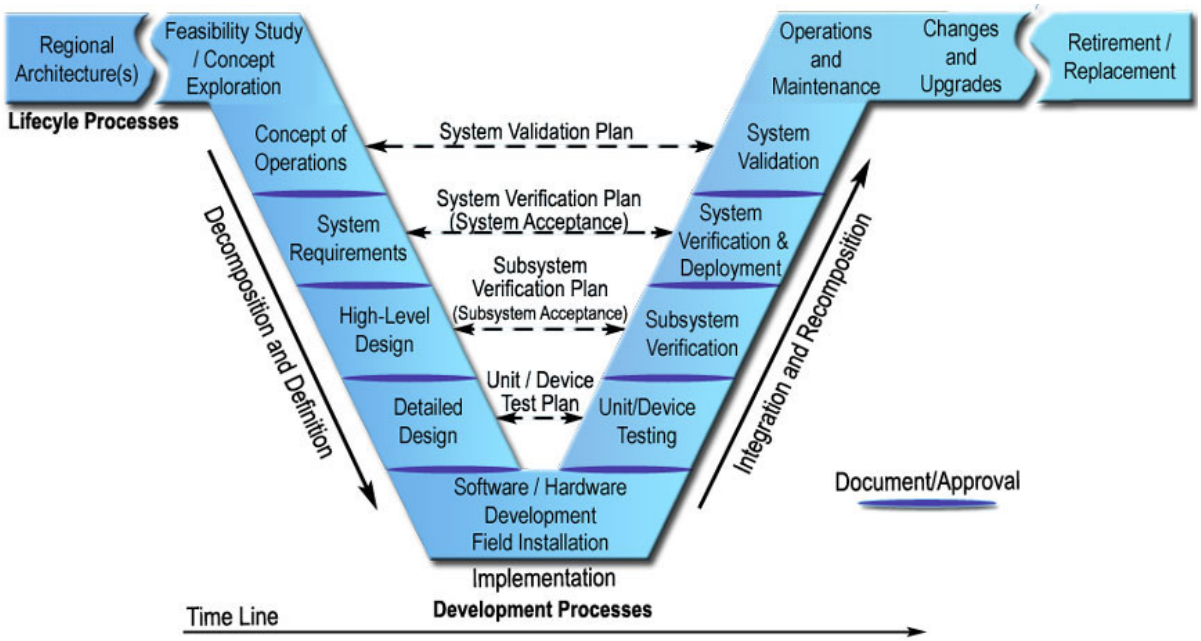
Requirements definitions	Use Functional Requirements as a starting point
Identification of applicable ITS standards and testing procedures	Use Regional Architecture standards outputs as a starting point for the standards definition

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

2.0 Using ITS Architecture in Project Definition

Projects that emerge from the planning process can benefit from the use of the regional ITS architecture in their definition and development. Project implementation should follow a systems engineering process. Exhibit 2 shows a typical project implementation process for deploying ITS projects.

Exhibit 2. Project Implementation Process



The project implementation process shown in **Exhibit 2** is a systems engineering process. It is a process that can be used to systematically deploy ITS while reducing the risks associated with deployments. The systems engineering process is more than just steps in systems design and implementation; it is a life-cycle process. The process recognizes that many projects are deployed incrementally and expand over time. US DOT Rule 940 requires that the systems engineering process be used for ITS projects that are funded with federal funds.

Applying the systems engineering process to ITS project development is a key new requirement that must be addressed by stakeholders using federal funds. Some key references that stakeholders can access to assist in using this process that can be found in **Appendix A**.

There are similarities between the systems engineering process defined in **Exhibit 2** and the project development process generally used by transportation agencies. The project development process is probably similar to as follows:

- Project Selection
- Authorization to Proceed
- Project Definition
    - Purpose and Need
    - Project Scoping
    - Conceptual Design

- Project Design
    - Preliminary Plan Development
    - Semi-Final Plan Development
    - Final Plan Development
- Construction
    - Testing
- Operation and Maintenance

Exhibit 3 shows the relationship between the project development process above to the FHWA system engineering process.

Exhibit 3. Project Development Process Relation to FHWA System Engineering Process

Project Development Process	Relation	System Engineering Process
Project Definition Purpose and Need Project Scoping Conceptual Design	→	Concept of Operations High Level Requirements Detailed Requirements
Project Design Preliminary Plan Development Semi-Final Plan Development Final Plan Development	→	High Level Design Detailed Design
Construction Testing	→	Implementation Integration & Test Subsystem Verification System Verification
Operation and Maintenance	→	Operations & Maintenance

The ITS architecture can be used to support development of the concept of operations, requirements, and high level design in the systems engineering process. In deploying an ITS related project, the ITS architecture should be used as the starting point for developing a project concept of operations (not to be confused with an operational concepts, which defines the roles and responsibilities of the stakeholders). The concept of operations shows at a high level how the systems involved in a project operate in conjunction with the other systems of the region. According to the NHI course "Introduction to Systems Engineering for Advanced Transportation", a concept of operations includes the following information:

- Identification of stakeholders,
- Development of a vision for the project,
- Description of where the system(s) will be used,
- Description of organizational procedures or practices appropriate to the system(s), definition of critical performance parameters associated with the systems(s),
- Description of the utilization environment (conditions under which various parts of the system(s) will be used),
- Definition of performance measures used to evaluate the effectiveness of the system(s),

- Considerations of life cycle expectations, and
- Conditions under which the system(s) must operate (e.g. environmental conditions).

The customized market package diagrams tailored by OKI's stakeholders can also assist in definition of requirements for ITS systems involved in a specific project. The ITS architecture contains high level functional requirements for all ITS elements in the OKI region. These high level requirements can be the starting point for developing more detailed requirements.

The ITS architecture also can support high level system design. The ITS architecture can be used by system designers to identify the ITS standards that are applicable for the interfaces included in the architecture.

While the above discussion relates the architecture to the general system engineering process, Rule 940 does have a specific set of system engineering analysis requirements that apply to all ITS projects that use funds from the Highway Trust Fund. The required system engineering analysis steps are:

- Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture) – in this case the statewide ITS architecture;
- Identification of participating agencies' roles and responsibilities;
- Requirements definitions;
- Analysis of alternative system configurations and technology options to meet requirements;
- Procurement options;
- Identification of applicable ITS standards and testing procedures; and
- Procedures and resources necessary for operations and management of the system.

The OKI Regional ITS Architecture provides inputs to a number of these steps as shown in **Exhibit 4.**

Exhibit 4. System Engineering Requirements supported by ITS Architecture

System Engineering Requirements	ITS Architecture Output
Identification of portions of the regional ITS architecture being implemented	Mapping project to the elements and interfaces of the regional ITS architecture
Identification of participating agencies' roles and responsibilities (this relates to the Concept of Operations described earlier.	Use operational concepts as a starting point
Requirements definitions	Use functional requirements as a starting point.
Identification of applicable ITS standards and testing procedures	Use regional architecture standards outputs as a starting point for the standards definition.

2.1 Issues/Challenges

One of the challenges of using the ITS architecture to facilitate the system engineering process in the implementation of a project is educating stakeholders about the benefits of the process and the process itself. The systems engineering process is not a new process to many organizations. It may not be called the systems engineering process, but various stakeholders' processes may map to the systems engineering process very well (as shown in **Exhibit 3**). Making these types of linkages between processes makes it easier to incorporate the ITS architecture as a tool in the process.

Another challenge is engaging a broader stakeholder base on a project when the ITS architecture indicates that possibility. For example a project might map to a specific customized market

package that contains 10 elements owned by 8 stakeholders. Yet the initial project definition is for 3 elements owned by 2 stakeholders. Might the project, to provide the service shown in the architecture, include more elements owned by additional stakeholders? The entire activity of seeking integration opportunities is more institutional than technical. There will be instances where getting more stakeholders involved in a project will increase its complexity or cross jurisdictional boundaries that may not have been considered in the initial scope. It is important to explore these integration opportunities so that, at the very least, they are accounted for and supported in the project design even though they may not be implemented with that specific project. The ultimate goal is to make ITS deployment as economical as possible. One way this can be accomplished is by deploying projects across institutional boundaries where different stakeholders get benefit from the ITS deployment.

3.0 Maintaining the Architecture

The OKI Regional ITS Architecture is not a static set of outputs; it must change as plans change, ITS projects are implemented, and the ITS needs and services evolve in the region. This section describes the maintenance plan for maintaining the OKI Regional ITS Architecture. The plan covers the following four key areas:

- Who will be involved in the maintenance of the architecture
- When will the architecture be updated
- What will be maintained
- How it will be maintained (i.e. what configuration control process will be used)

The Regional ITS Architecture is created as a consensus view of what ITS systems the stakeholders in the state have currently implemented and what systems they plan to implement in the future. The Regional ITS Architecture will need to be updated to reflect changes resulting from project implementation or resulting from the planning process itself. Types of changes may include:

- **Changes for Project Definition.** When actually defined, a project may add, subtract, or modify elements, interfaces, or information flows from the Regional ITS Architecture. Because the Regional ITS Architecture is meant to describe the current (as well as future) statewide implementation of ITS, it must be updated to correctly reflect how the developed projects integrate into the state or specific regions.
- **Changes for Project Addition/Deletion.** Occasionally a project will be added or deleted through the planning process and some aspects of the Regional ITS Architecture that are associated with the project may be expanded, changed, or removed.
- **Changes in Project Priority.** Due to funding constraints, or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it. Raising the priority for a project's implementation may also impact the priority of other projects that are dependent upon it.
- **Changes in Regional Needs.** Transportation planning is done to address regional needs. Over time these needs can change and the corresponding aspects of the Regional ITS Architecture that addresses these needs may need to be updated.

In addition, when new stakeholders come to the table, the Regional ITS Architecture will need be updated to reflect their place in the statewide view of ITS elements, interfaces, and information flows.

Finally, 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 the user services. These changes should also be considered as the Regional ITS Architecture is updated. The National ITS Architecture may have expanded to include a user service that has been discussed in a

region, but not been included in the Regional ITS Architecture, or been included in only a very cursory manner.

3.1 Roles and Responsibilities for Maintenance

Responsibility for maintenance of the OKI ITS Architecture lies with the OKI Regional Council of Governments, since they are the primary planning organization for the region, and are one of the primary users of the architecture. A group of core stakeholders shall act as an "institutional framework" to review proposed changes to the architecture, and may also oversee the update of the OKI ITS Strategic Plan. This group of core stakeholders is important because the Regional ITS Architecture is a consensus framework for integrating ITS systems. As it was a consensus driven product in its initial creation, so it should remain a consensus driven product as it is maintained. This section defines the stakeholders and their roles and responsibilities for the maintenance of the OKI Regional ITS Architecture.

3.1.1 Definitions

The following groups or persons have a role in the maintenance of the architecture:

- **Stakeholders –** Any government agency or private organization that has a role in providing transportation services in the region.
- **Maintenance Working Group –** A group of stakeholder representatives who are responsible for the technical review of updates/changes to the OKI Regional ITS Architecture and for approving changes to go into the architecture.
- **Responsible Agency –** The stakeholder agency with primary responsibility for maintenance of the architecture.
- **Maintenance Manager –** The person responsible for overseeing and guiding the maintenance efforts.

3.1.2 Stakeholders

Stakeholders are any government agency or private organization that is involved with or has an interest in providing transportation services in the state. Each stakeholder owns, operates, and/or maintains one or more ITS element in the state and therefore the architecture.

The success of the change management process outlined in this Maintenance Plan is highly dependent on the participation of the stakeholders identified in the architecture. Without stakeholders participation in tracking the development of their ITS systems and properly updating the architecture, the change management process will not succeed and the usefulness of the architecture will diminish over time.

The primary responsibility of the stakeholder agencies is to submit changes to the OKI Regional ITS Architecture that are brought on by new plans or projects that are being planned or deployed for the stakeholder agency. The stakeholder agency must submit the changes in the Regional ITS Architecture to the Maintenance Working Group.

If stakeholders desire more involvement in the architecture review process, they can get involved through voluntary representation on the Maintenance Working Group.

3.1.3 Maintenance Working Group

The OKI Regional ITS Architecture Maintenance Working Group, or the Maintenance Working Group for short, has the following responsibilities:

- Collecting and compiling proposed changes and updates to the architecture from stakeholder agencies.

- Evaluating each proposed change from a technical standpoint, and reaching a consensus on the proposed change (this may require contacting additional stakeholders if one or more of their systems are affected).

- Approving changes to the architecture.

- Making any institutional or policy related decisions that arise in the maintenance of the architecture.

The maintenance working group for OKI is a subset of the stakeholders dealing with ITS throughout Ohio, Kentucky, and Indiana. In other words, representatives of stakeholder agencies who are represented in the Regional ITS Architecture are candidates for a voluntary maintenance working group.

The maintenance working group will have as its core member's key staff from OKI who represent the different areas of transportation within OKI (e.g. operations, maintenance, and planning). Additionally, "major" stakeholders within the region will be encouraged to participate. A major stakeholder is considered to be any stakeholder that has multiple ITS elements or systems represented throughout the Regional ITS Architecture (e.g. SORTA, TANK, etc.).

The Maintenance Working Group will elect a Chairperson (and Vice-Chairperson in their absence) to conduct the meetings. The Chairperson is responsible for calling meetings, developing an agenda for meetings, and leading the meetings. The Chairperson will be elected for a two-year term by a simple majority vote of a Working Group meeting where there is a quorum (2/3 of the member representatives present).

3.1.4 Responsible Agency

The Responsible Agency is the government agency that formally maintains the architecture. The Responsible Agency assigns resources for making the physical changes to the architecture baseline and for coordinating the maintenance of the architecture. The Responsible Agency for the OKI Regional Statewide ITS Architecture is OKI, since they are the transportation planning organization for the state and will be primary users of the architecture.

3.1.5 Maintenance Manager

The Responsible Agency will appoint a person to the role of Maintenance Manager to coordinate the maintenance activities of the OKI Regional Statewide ITS Architecture. The Maintenance Manager is the coordinator and main point of contact for all maintenance activities, including receiving Change Requests forms, tracking Change Requests, and distributing documentation.

The Maintenance Manager has the following responsibilities:

- Coordinate the activities of the Maintenance Working Group

- Receive Change Request forms and requests for documentation from stakeholders

- Distribute the baseline documents and outputs of the architectures to stakeholders

- Maintain the “official” records of the OKI Regional ITS Architecture, including the baseline documents, meeting minutes, the Change Request Database, and the list of Points of Contacts for the Stakeholder

- Ensures the status of each Change Request are properly updated in the Change Request Database

- Maintains a complete contact list of all stakeholders within the region as well as maintains a list of all stakeholders outside the region along with the maintenance schedule for they’re perspective ITS Architectures

Some of these responsibilities may be delegated to staff or consultants.

3.2 Timetable for Maintenance

How often will the Regional ITS Architecture be modified or updated? What events or timetable will be used for making updates or changes to the architecture? There are two basic approaches that OKI will utilize for maintaining the architecture:

- **Periodic Maintenance –** Update the architecture based upon one of the recurring activities of the transportation planning process. For example, it’s natural that the ITS architecture would be updated at the same frequency as the Transportation Improvement Plan is updated (at least every four years). The update of the architecture will occur several months prior to the transportation planning document update, so that the revised architecture could serve as an input to the planning update. Publication and versioning costs are minimized for the periodic maintenance approach since there is a new version only once in the maintenance cycle.

- **Exception Maintenance –** This approach will be followed if there is an urgent need to make a change or if a minor change is desired to address some stakeholder need. In this case the change can be initiated as needed. Publication and versioning costs are dependent on the frequency of changes made to the Regional ITS Architecture.

3.2.1 Major Updates

A comprehensive architecture update will occur every four years, concurrent with the formal update of the 2030 Transportation Improvement Program. This is a natural result of the OKI Regional ITS Architecture being a component of the regional transportation planning process. The update is necessary to ensure that the architecture continues to accurately represent the regional view of ITS Systems. The comprehensive update may include adding new stakeholders, reviewing transportation needs and services for the region, updating the status of projects, and reflecting new goals and strategies, as appropriate. Operational concepts, system functional requirements, project sequencing, ITS standards, and list of agency agreements may also be updated at this time.

3.2.2 Event-Driven Updates

Between major updates of the architecture, the following interim update actions will be performed:

- On an annual basis, the Maintenance Manager will actively solicit changes from each key stakeholder a set of needed updates. The Maintenance Manager will contact the key stakeholders, via e-mail, written correspondence, or by

telephone, and inquire if the stakeholder has any changes to the Regional ITS Architecture. It is the responsibility of the stakeholders to complete and submit the Change Request Forms to the Maintenance Manager for consideration. Within a defined period, the submitted Change Request Forms will be collected and reviewed by the Maintenance Working Group for consideration in the next minor update of the Regional ITS Architecture.

- Between the annual updates, a stakeholder may submit a Change Request Form to the Maintenance Manager and request that the Maintenance Working Group review and approve the change request prior to the next scheduled update of the Regional ITS Architecture. This may be necessary if a stakeholder suddenly requires federal funding for a previously unplanned ITS project, and needs the ITS project to be included in the Regional ITS Architecture.

The Maintenance Plan will also be reviewed at the annual updates for required changes to the Maintenance Plan. Use of the Regional ITS Architecture and modifications to it may differ from what was anticipated during the initial development of the Maintenance Plan. Revising the Maintenance Plan will ensure that the change management process defined is effective.

3.3 Architecture Baseline

Establishing an architecture baseline requires clear identification of the architecture products to be maintained, including specific format and version information. For the OKI Regional ITS Architecture the following are identified as the architecture baseline:

- OKI ITS Architecture Document (this document)
- ITS Strategic Plan for the State of Ohio (document)
- Set of Customized Market Packages (visio file)
- Turbo Architecture Database
- OKI ITS Architecture Web pages
- Change Request Database
- Stakeholder List

Regarding the Architecture, ITS Strategic Plan, and Standards Plan documents, the original source document, in Microsoft Word format, will be held by the maintenance manager, while a PDF version of the documents will be available for general distribution. In addition, a version number and date will be included inside the cover page.

Regarding the set of customized market packages, the visio file will be maintained by the maintenance manager.

Regarding the Turbo Architecture Database, the maintenance manager will maintain a zipped version of the final delivered OKI Regional ITS Architecture database. The name, date, and size of the database file inside the zipped file will be entered into an architecture log as version 1.0 of the architecture.

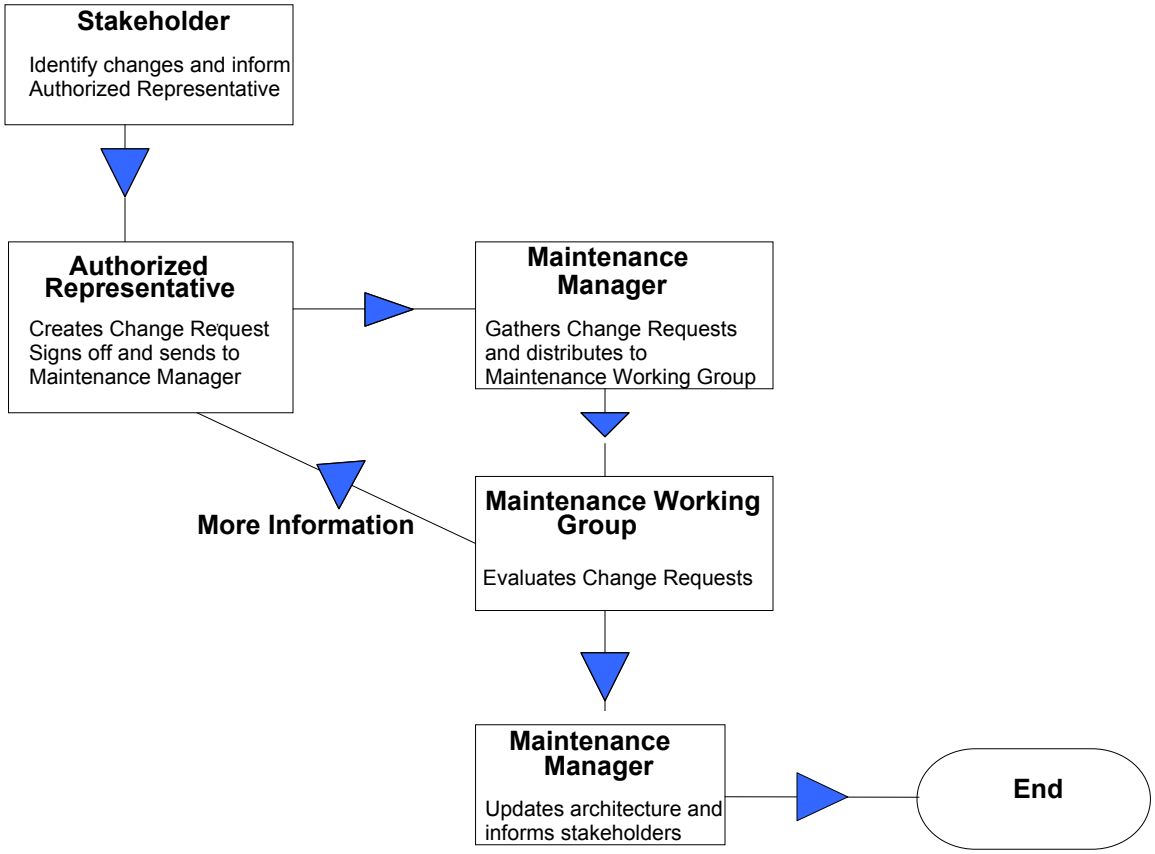
Regarding the web site, a CD-ROM version of the final web site will be maintained by the maintenance manager. The version number of the architecture will be clearly visible somewhere on the home page of the web site so that the version being viewed is immediately identifiable.

3.4 Change Management Process

This change management process specifies how changes are identified, how often changes will be made, and how the changes will be reviewed, implemented, and released. The basic process for change management is shown in **Figure 2**. The change management process involves five steps:

- **Identify Change.** Review what changes are needed and complete and submit a Change Request Form.
- **Evaluate Change.** Evaluate the change for completeness and consensus.
- **Review Change**.
- **Update Baseline.** Apply the approved changes to the Statewide ITS Architecture documents.
- **Notify Stakeholders.** Inform the stakeholders of the updated changes to the Regional ITS Architecture documents, and distribute the documents as necessary.

Figure 2: Change Management Process



3.4.1 Identify Change

This involves two issues:

- Who can identify a change to the architecture?
- How will the change request be documented?

The question of who can make change requests is an important one. If literally anyone can input requests the region runs the risk of being overrun by requests that will tax scarce resources to review and deliberate the change request. On the other end of the spectrum, if too much formality or paperwork is added to the process then many valid or needed changes may go unexpressed.

Any Stakeholder identified in the Regional ITS Architecture is allowed to submit Change Requests. This effectively indicates that all changes have the approval of an existing, defined Stakeholder in the ITS Architecture. If the Change Request is to add a new Stakeholder and that Stakeholder's ITS Elements and Interfaces, the Responsible Agency for the architecture must submit the Change Request.

A Change Request Form will be used to submit changes for review. The Change Request Form for the OKI Regional ITS Architecture can be found in **Appendix B**. The Change Request Form includes the following information:

- Name of change
- Description of change
- Part of baseline affected (could be check boxes for document, database, web site, and not known)
- Rationale for change
- Originator name or agency
- Date of origination

This information entered on the Change Request Form will be added to a change database, maintained by the Responsible Agency. The change database will include following additional fields of information:

- Change number (some unique identifier)
- Change disposition (accepted, rejected, deferred)
- Change type (minor or significant)
- Disposition comment
- Disposition date

3.4.2 Evaluate Change

Upon receiving a Change Request by the Maintenance Manager, an initial evaluation of the Change Request will be made for the impact to the overall architecture or the affected document. The purpose of the evaluation is two-fold:

- Verify that the Change Request form and supporting materials is complete and correct
- Compare with other Change Request forms and determine if there are any conflicts

If the proposal for architecture modification has an impact on other stakeholders, the evaluator(s) will contact the Stakeholders to confirm their agreement with the modification. All Stakeholders directly affected by the proposed change(s) must approve and sign-off the Change Request before the Maintenance Working Group considers the Change Request.

There are several options as to who performs the initial assessment, including:

- The Maintenance Manager
- Maintenance Working Group
- The person submitting the change
- A consultant, hired to support the maintenance activities of the architecture

Each of the above options has positive and negative implications, but the evaluator must have working knowledge of the architecture to evaluate the proposed changes. The Maintenance Manager or the Maintenance Working Group will assign the evaluation option to use for each change request evaluation received.

3.4.3 Reviewing the Change Request

Upon completing the initial assessment, the Change Request form will be reviewed by the Maintenance Working Group (either at a Maintenance Working Group meeting or via some electronic means). Maintenance Working Group meetings are called by the Maintenance Manager (or their designated representative).

Maintenance Working Group meetings called by the Maintenance Manager will occur at least on an annual basis. When calling the annual meeting, the Maintenance Manager will send a reminder to all Stakeholders to update their ITS Elements and Interfaces in the architecture, if necessary. If sufficient Change Request Forms are submitted, the Maintenance Manager may call a Maintenance Working Group meeting at more frequent intervals to review the Change Request forms. The Maintenance Manager will act as Chairperson for these meetings. The Maintenance Manager will distribute copies of all Change Request Forms submitted and all supporting materials to all Stakeholders prior to the meeting for their review and assemble an agenda. Maintenance Working Group meetings can also be requested by one of the stakeholders if there is an urgent need to update the architecture quickly.

The Maintenance Working Group will be provided sufficient time to review the Change Requests before the meeting. During the meeting, the Maintenance Working Group will review the proposed changes and offer any comments.
After each Change Request is reviewed, if no further comments are offered by the Maintenance Working Group, the Change Request will be considered approved, and the Chairperson will sign off on the Change Request.

If additional comments are made that require action, those comments will be noted on the Change Request form. Where comments (or changes required) are minor in nature they can be made by the submitter of the Change Request form, or by resources designated by the Maintenance Manager and the change considered approved. In the case of major comments or changes to the Change Request, the approval of the change will be deferred until the next meeting of the Maintenance Working Group.

If a Change Request is to be withdrawn from consideration, the Chairperson or the Maintenance Manager will be required to sign-off on the Change Request Form to close out the Change Request.

At the end of the meeting, the Maintenance Working Group will agree if all the approved changes to the architecture necessitate an immediate update to the baseline, or whether the update should await either additional changes or the next major revision. The decision should be based on the number of Change Requests approved and the nature of the approved changes.

Minutes will be kept for all Maintenance Working Group meetings. Minutes will include, at a minimum, an attendance list, comments made on each Change Request, and the disposition of each Change Request Form (Approved/Withdrawn/Deferred/Request More Information). Minutes will be distributed to all members of the Maintenance Working Group meeting approximately five (5) working days after the meeting. Comments are due within ten (10) working days to the Maintenance Manager. Approved minutes will be signed by the Chairperson and will be distributed to all Stakeholders and posted on the website. The minutes provide a recording process for the change management process and provide traceability.

The Maintenance Working Group will have the option to handling the review and approval process for minor Change Requests via e-mail exclusively rather than through face to face meetings.

3.4.4 Update Baseline

Upon approvals of the Change Request Forms, the decision agreed upon by the Maintenance Working Group is implemented. If the decision is to accept the change and update the baseline then the appropriate portions of the architecture baseline are updated and an updated architecture baseline is defined. In addition to updating the baseline documents, databases, or other outputs, the configuration status will be updated. In the discipline of Configuration Management this is known as Configuration Status Accounting. This accounting is performed by having a document that defines the following information for each separate output of the architecture baseline:

- Output name
- Output revision number
- Date of latest revision
- File Name
- Location/Point of Contact

Periodically, the information in the various outputs of the architecture baseline will be audited to assure that the different representations of the architecture information (e.g. the database and document) are in sync. This configuration auditing will be performed by someone independent of the staff or resources used to actually enter the changes.

3.4.5 Notify Stakeholders

Point of Contacts for each stakeholder will be notified by e-mail from the Maintenance Manager when baseline documents have been updated. All baseline documents will also be available to stakeholders from a website or other electronic location, such as an ftp site. It is the responsibility of the Maintenance Manager to ensure the most recent document is available from the website. The Configuration Status Document will be one of those outputs that are available.

Request for copies or access to the baseline documents will be made to the Maintenance Manager.

After major revisions to the architecture or the baseline documents, the Maintenance Working Group may elect to also provide all baseline documents to members on CD-ROMs.

Appendix A:

ITS Project Development Resources

General Resources

- FHWA Systems Engineering Website (ops.fhwa.dot.gov/int_its_deployment/sys_eng.htm)
- International Council on Systems Engineering (www.incose.org)

Training

- Introduction to Systems Engineering for Advanced Transportation (NHI Course# 137024)
- Advanced Systems Engineering for Advanced Transportation Projects (CITE - www.citeconsortium.org/courses/syseng.html)

Publications

- Building Quality Intelligent Transportation Systems through Systems Engineering (FHWA-OP-02-046): www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13620.html EDL# 13620
- Systems Engineering Guidebook for ITS (FHWA California Division/Caltrans): www.dot.ca.gov/research/se_guidebook_ver1-12_14_05.pdf
- System Engineering for Intelligent Transportation Systems, An Introduction for Transportation Professionals (Under Development)

Appendix B:

Change Request Form

OKI Regional ITS Architecture

Change Request (CR) Form

To Be Completed By Stakeholder(s) Requesting Changes		
Originator Name:		Date Submitted
Originator Telephone:	Originator Fax:	Originator E-Mail:
Originator Agency:		Functional Area:
Agency Authorized Signature:		Signature Date:
Description of Proposed Change:		
Rationale for Proposed Change:		
Affected Agency:	Authorized Signature:	Signature Date:
Affected Agency:	Authorized Signature:	Signature Date:
List Attachments:		
Baseline Documents Affected: _____ Website _____Turbo Architecture _____Market Package Diagram _____Architecture Document _____Other (describe)		

To Be Completed By Maintenance Manager		
Change Request Number:	Date CR Received:	Date CR Logged:
Date Initially Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date Discussed:	Disposition: ☐ Accepted ☐ Rejected ☐ More Info	Disposition Comments
Date of Maintenance Working Group Approval (If Applicable):		
Baseline Documents Affected/Version implemented ☐ Turbo Architecture Date: _____ Version: _____ ☐ Website Date: _____ Version: ____ ☐ Market Package Date: _____ Version: _____ ☐ _____ Date: _____ Version: ____ ☐ Architecture Doc Date: _____ Version: _____		