VIRGINIA STATEWIDE ITS ARCHITECTURE MAINTENANCE PLAN

Version 2.0

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1 Introduction

An ITS Architecture is a blueprint for the deployment of ITS. Just as blueprints are critical for constructing a building, an ITS architecture, if kept up-to-date, is valuable for ITS deployment. The Virginia Statewide ITS Architecture is a living document and must change as ITS projects are implemented, plans and priorities change, and the transportation needs and services of the region evolve. The goal of maintaining the architecture is to keep an up-to-date ITS architecture that is accessible and easily used for planning and deploying ITS.

This Maintenance Plan documents who will maintain the architecture and what the timetable for maintenance is in the next section. The Plan, in the final section, also defines the configuration management process that will be used to maintain the Virginia Statewide ITS Architecture.

2 Architecture Maintenance Decisions

To properly maintain an ITS Architecture there must be a responsible individual, the Architecture Maintainer and a set timetable for maintenance. These are defined for the Virginia Statewide ITS Architecture in this section.

2.1 Architecture Maintainer

Just as a group of stakeholders were key to the development of the Virginia Statewide ITS Architecture, it is imperative that stakeholders stay involved in its on-going maintenance. While a variety of stakeholders must be involved in maintenance, it is important to have a single maintainer to oversee maintenance of the architecture.

The Virginia Department of Transportation deploys and operates numerous ITS systems and has relationships with most of the stakeholders in Virginia, so it makes sense for VDOT to maintain the Virginia Statewide ITS Architecture. The VDOT Central Office will serve as the Virginia Statewide ITS Architecture Maintainer. Since multiple stakeholders must be involved in architecture maintenance, VDOT Operations and Location Design Division have published an Instructional and Informational Memorandum (IIM) titled as IIM OD-21-02 & LD-261 (ITS Roadway Operations and Technology Architecture Requirements). Link to IIM. The IIM will guide users on steps to capture updates and changes to the ITS Architecture and the process for communicating the changes to the Maintainer. Completing the Architecture Compliance Rule 940 Checklist Link to Rule 940 Form will enable the Architecture Maintainer to capture the changes to the ITS Architecture and to track the changes using the Change Control Log. When a Rule 940 Checklist form is received by the Architecture Maintainer, they will ensure that the changes to the architecture are made and that the architecture configuration management process is followed.

2.2 Architecture Maintenance Timetable

It is critical that the Virginia Statewide ITS Architecture is revised as projects are deployed to ensure that it continues to accurately represent ITS of the region. Additionally, the architecture will need a more thorough update less frequently to ensure that it reflects the future plans of the region.

a. Periodic Project-Related Revisions

When an ITS project is deployed, the architecture may need to be revised to reflect the current deployment of the project. At a minimum, the status of architecture components will need to be changed from planned to existing. Elements, interfaces, and/or other components of the ITS architecture may need to be added, deleted or modified. 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 deployed ITS projects.

These project-related changes will not be incorporated on a set schedule rather when warranted by the proposed changes either in number or in impact to the architecture. The process for reviewing and incorporating project-related revisions is presented in Section 3.2.1.

b. Updates

In addition to project-related changes, other items may impact the Virginia Statewide ITS Architecture such as:

- *Changes in needs of the Commonwealth* - Statewide ITS architectures are created to support transportation planning in addressing statewide needs. Over time these needs can change and the corresponding aspects of the statewide ITS architecture that addresses these needs may need to be updated. These changes in needs should be expressed in updates to planning documents such as the Statewide Multimodal Transportation Plan (VTrans2035) and the Surface Transportation Plan.
- *New stakeholders* - New stakeholders become active in ITS and the statewide ITS architecture should be updated to reflect their place in the regional view of ITS elements, interfaces, and information flows. New stakeholders might represent new organizations that were not in place during the original development of the statewide ITS architecture.
- *Changes in stakeholder or element names* - An agency's name or the name used to describe their element(s) undergoes change. Transportation agencies occasionally merge, split, or just rename themselves. In addition, element names may evolve as projects are defined. The statewide ITS architecture should be updated to use the currently correct names for both stakeholders and elements.
- *Changes in architectures of adjacent regions* - A statewide ITS architecture covers not only elements and interfaces within a state, but also interfaces to elements in adjoining states. Changes in the statewide ITS architecture in one state may necessitate changes

in the architecture in adjoining states to maintain consistency between the two. Architectures may also overlap (e.g. a statewide ITS architecture and a regional ITS architecture for a region within the state) and a change in one might necessitate a change in the other.

- *Changes of project status* - During the planning process, projects may be delayed, accelerated, added, deleted or modified due to funding constraints, technological changes or other considerations. Since such changes may impact other projects, they will need to be reflected in the Virginia Statewide ITS Architecture.
- *Change to the National ITS Architecture* - Just as any ITS architecture, the National ITS Architecture is a living resource; it is expanded and updated from time to time. The current version of the Virginia Statewide ITS Architecture was based on Version 6.1 of the National ITS Architecture that was released in 2009. When a new version of the National ITS Architecture is released, during the subsequent update of the Virginia Statewide ITS Architecture the new services, interfaces, and other components of the National ITS Architecture should be considered to see if they are applicable.

Since the Virginia Statewide ITS Architecture supports long range transportation planning including the Multimodal Transportation Plan and Surface Transportation Plan, the architecture should undergo a formal review to see if it needs to be updated prior to an update to the Transportation Plans. The Architecture Maintainer will review the architecture to see if it needs to be updated for any of the reasons listed two years prior to the Surface Transportation Plan update to allow adequate time for an architecture update if necessary. This will ensure that an up-to-date architecture can be used in development of the Surface Transportation Plan.

3 Architecture Maintenance Process

To maintain an architecture that is spread across a website, documents and a database, a configuration management process must be applied. The architecture configuration management activities defined in this plan are:

- Architecture Configuration Identification
- Architecture Configuration Control
- Architecture Configuration Status Accounting
- Architecture Configuration Auditing

3.1 Architecture Configuration Identification

The Virginia Statewide ITS Architecture is defined to include:

A. Virginia Statewide ITS Architecture Website files (currently local.iteris.com/virginiaitsarchitecture)
B. Virginia Statewide ITS Architecture Implementation Plan,
C. Virginia Statewide ITS Architecture Maintenance Plan, and
D. Virginia Statewide ITS Architecture Database (a Turbo Architecture™ and Microsoft Access database).

US DOT's Final Rule/ Final Policy requires that, at a minimum, an ITS architecture includes nine components:

A. Description of the region,
B. Identification of the participating agencies and stakeholders,
C. An operational concept that identifies roles and responsibilities of stakeholders,
D. Any agreements required for operations,
E. System functional requirements (high level),
F. Interface requirements and information exchanges with planned and existing systems and subsystems,
G. Identification of ITS standards supporting regional and national interoperability, H. Sequence of projects required for implementation, and
I. Procedures and responsibilities for maintaining the architecture.

The components of the Virginia Statewide ITS Architecture are available on the website, in documents and/or in an associated database. Some components of the architecture may require more frequent updates than others, but the entire architecture will need a periodic review for consistency with the vision and goals of the stakeholders.

The key components of the architecture are stored in a Microsoft Access database that was created and can be modified with Turbo Architecture™. It contains the following components of the architecture:

- Description of the region,
- List of ITS stakeholders,
- Inventory of ITS elements,
- List of ITS services and the elements involved in them,
- Functional requirements of the key elements,
- Interfaces between elements (interconnects and architecture flows),
- Applicable ITS standards, and
- Agreements required for deployment.

The architecture diagrams and lists can be produced directly from RAD-IT™ so they can be generated when needed.

Since the database contains the majority of architecture components, it will be updated during the periodic project-related revisions and major updates. For a major update of the architecture, all documents will be updated. It is not critical to revise the documents every time the architecture database is modified. They can be updated as necessary for meetings or outreach activities.

The current version of Turbo Architecture™ RAD-IT v8.2.75.8 is the current version which is based on Version 6.1 of the National ITS Architecture. The Virginia Statewide ITS Architecture is based on Version 6.1 of the National ITS Architecture.

3.1.1 Architecture Specification Identification

To aid in architecture version control, the filename of the documents and database should contain the version and/or date on which it was updated. This will allow the current version to be easily identified and for all items of the same version to be identified. The Virginia Statewide ITS Architecture developed in June 2009 was version 1.0. As minor revisions are made, the release number is incremented (i.e. 3.1, 3.2, 3.3, …) The version number is incremented when the architecture undergoes an update (i.e. 3.0, 4.0, 5.0, …)

3.1.2 Architecture Baselines

The current version of the Virginia Statewide ITS Architecture completed in June 2009 is established as the baseline architecture. It is numbered version 1.0. The baseline contains:

A. Virginia Statewide ITS Architecture Website,
B. Virginia Statewide ITS Architecture Implementation Plan, C.
Virginia Statewide ITS Architecture Maintenance Plan, and
D. Virginia Statewide ITS Architecture Database (a Turbo and Microsoft Access database).

The maintenance time frames identified in this Maintenance Plan began upon completion of this version of the architecture.

Only the Architecture Maintainer can set a baseline. A new baseline must be documented in the architecture database and all documents.

3.2 Architecture Configuration Control

The architecture maintenance processes are the procedures that will be used for modifying the architecture for periodic project-related revisions and more substantial updates. For each, the processes include how changes are identified, how they are requested, how they are reviewed and implemented and how the changes will be released. The architecture maintenance processes for the Virginia Statewide ITS Architecture are specified in the following sections. This section concludes by defining the processes of the Architecture Maintenance Committee and the responsibilities of the parties involved in architecture maintenance.

3.2.1 Architecture Maintenance Processes

As discussed in Section 2.2, the Virginia Statewide ITS Architecture will need to be revised periodically for project-related impacts and less frequently for updates. The processes for both are described below.

a. Process for Periodic Project-Related Revisions

Any ITS stakeholder in Virginia can propose a change to the Virginia Statewide ITS Architecture. Using the Rule 940 Form located here. Stakeholders should inform the Architecture Maintainer of a change in the status of any ITS-related project. To properly maintain the architecture, the Architecture Maintainer must be informed not only when projects are planned; but also when projects are completed or when changes are made during design or construction that impact the architecture.

The process for reviewing requested changes and implementing them is shown in Figure 1. The Project Architecture Information Form is received by the Architecture Maintainer at VDOT. The Architecture Maintainer reviews the impact of the project on the architecture and enters the project on the Architecture Change Log. The Rule 940 Form includes contact information so the Architecture Maintainer can contact the submitter if questions arise. The Architecture Maintainer compiles changes and when warranted arranges a meeting with applicable stakeholders.

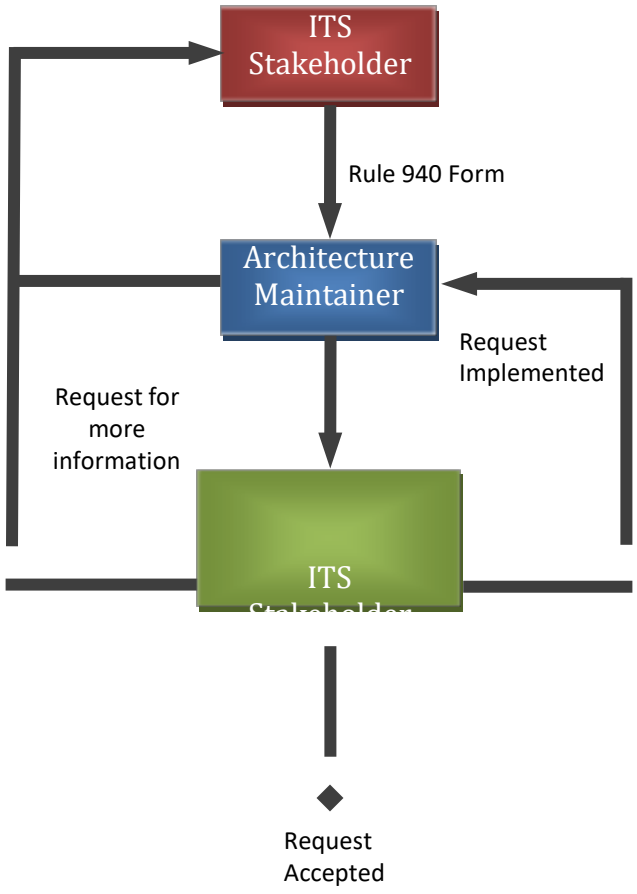


Figure 1. Periodic Project-Related Revision Process

If a proposal for an architecture revision impacts other stakeholders, the Architecture Maintainer will ensure that the impacted stakeholders have been contacted and their agreement with the modification is confirmed. If any issue involves several stakeholders or requires extensive discussion and agreement, a stakeholder meeting may be needed to discuss the modification.

If consensus in favor of the modification is reached, the Architecture Maintainer will proceed with the changes to the ITS Architecture database and record changes in the Architecture Change Log.

Revisions to the Virginia Statewide ITS Architecture is to be submitted to the Architecture Maintainer using the Rule 940 form and emailed to itsarchitecture@vdot.virginia.gov. The current SAMPLE version of the form and instruction for using it are provided in Appendix A of this Plan.

Revisions to the Virginia Statewide ITS Architecture will be tracked on the Architecture Change Log by the Architecture Maintainer. The format of the log is given in Appendix B. To allow easy entry, the form will be maintained in Microsoft Excel.

b. Process for Updates

The architecture update process is a natural result of the architecture being streamlined into the transportation planning process to support development of Surface Transportation Plans (as presented in the Architecture Implementation Plan). The Architecture Maintainer determines if the Virginia Statewide ITS Architecture needs to be updated (as described in Section 2.2). The process to update an architecture depends upon the factors driving the update.
At the time of an update, it is important for all components of the architecture to be examined including stakeholders, inventory, services, interfaces, operational concept, functional requirements, project lists and agreements. Also, during an update, the Statewide ITS Architecture should be reviewed for consistency with all adjacent architectures.

Stakeholder involvement is key to an architecture update. Stakeholders must provide input and review revisions to the architecture.

The Virginia Statewide ITS Architecture has a ten-year time horizon. When the architecture is updated, the architecture will be extended further into the future.

3.2.2 Architecture Maintenance Responsibilities

Maintenance of the Virginia Statewide ITS Architecture involves two parties which have distinct responsibilities as listed below.

ITS Stakeholder:

- Propose revisions to the architecture when ITS projects are deployed.
- Participate in Architecture Maintenance Committee meetings when appropriate.

Architecture Maintainer:

- Investigate all requested project-related changes.
- Contact stakeholders impacted by a change request and request their input.
- Track all change requests and changes to the architecture in the Architecture Change Log.
- Ensure that the architecture is modified for all approved changes.

- Update architecture documents when needed.
- Plan and execute configuration audits prior to releasing a baseline.

3.3 Architecture Configuration Status Accounting

Configuration status accounting is the process of ensuring that all of the relevant information about an item – documentation and change history – is up-to-date and as detailed as necessary. This includes the status of requested changes. Configuration status accounting also includes the dissemination of configuration information. Configuration Status Accounting for the Virginia Statewide ITS Architecture is detailed in the following sections.

3.3.1 Architecture Media

To allow stakeholders to use the architecture for their planning and deployment activities, the current Virginia Statewide ITS Architecture must be readily available. The Virginia Statewide ITS Architecture is available to all stakeholders on the VDOT Statewide ITS Architecture website (currently local.iteris.com/virginiaitsarchitecture) or by email request for latest updates to itsarchitecture@vdot.virginia.gov.

The Architecture Maintainer will maintain the list of ITS stakeholders and their contact information.

3.3.2 Document Status Accounting

The Architecture Maintainer will track all proposed and approved changes to the Virginia Statewide ITS Architecture using the Virginia Statewide ITS Architecture Change Log. The format of the log and instructions for using it are given in Appendix B.

3.4 Architecture Configuration Auditing

Configuration auditing is the process of analyzing configuration items and their respective documentation to ensure that the documentation reflects the current situation. A configuration audit should be performed when a baseline is set. The audit does not have to be performed by the Architecture Maintainer but he or she should ensure that one is performed.

In the case of the Virginia Statewide ITS Architecture, the architecture database contains most components of the architecture. The Implementation Plan contains the list of projects which reference the services (a.k.a. service packages) of the architecture; therefore, verifying that they are in sync must be done manually. Once the configuration audit is complete, the architecture baseline can be released.

Appendix A: Rule 940 Form

Instructions for Using the Rule 940 Form:

The stakeholder requesting the change will complete the form with the following information (going across).

1. UPC
2. Project Name
3. Project Manager/Coordinator
4. Contact phone number
5. Notes/Comments – Provide details on the project to help maintainer better understand the changes
6. Project Title as entered in Project Pool
7. Project State and Federal numbers
8. Purpose of not completed under #5
9. Contact Person or Group – If different from Project Manager/Coordinator
10. Location
11. Dates
12. Budget/Funding source
13. Nature of Work - i.e.; expansion of existing project, scoping, implementation etc.
14. Interfaces
15. What is being purchased or developed
16. Status
17. What is situation currently exists
18. What will this project address based on the situation described above
19. How were the needs identified
20. Stakeholders
21. Service packages if known
22. What inventory is added to system
23. Interface impacts – example; will a data sharing agreement be implemented
24. Regions impacted – will this be multi-regional
25. Changes to architecture Y/N
26. Alternative considerations
27. Reference documents (Con-Ops, System Engineering Plan etc.)
28. ITS Standards
29. VITA Standards
30. Procurement information
31. Integration Plan
32. Testing
33. Maintenance

Submit Rule 940 form

Systems Engineering and Architecture Compliance Rule 940 Form

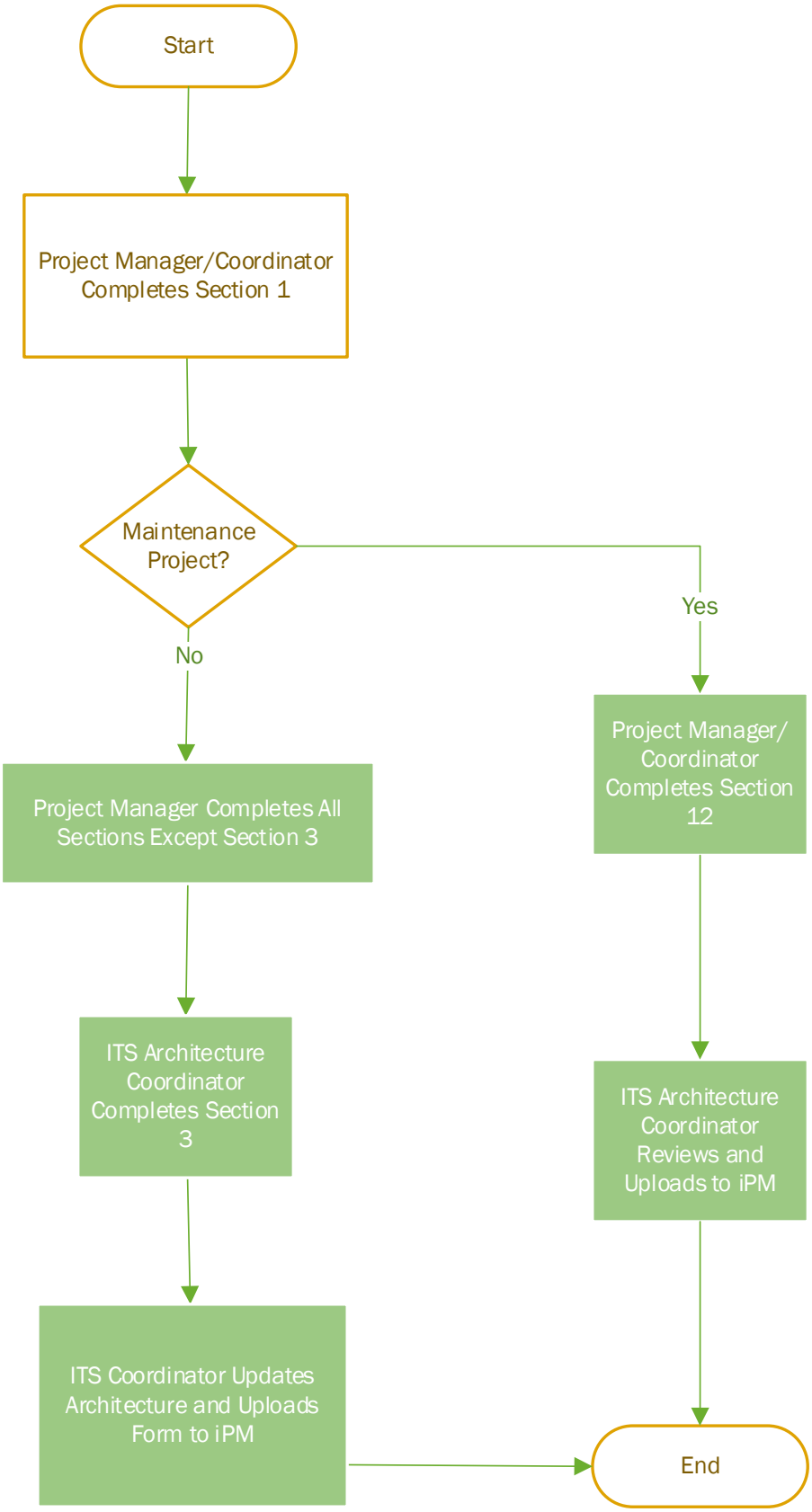
ITS Checklist (Scoping Worksheet - SWITS)

SAMPLE ONLY

The Checklist is to be completed by the Project Manager/Coordinator and the Operations Division ITS Architecture Coordinator. Contact the Operations Division ITS Architecture Coordinator Susan Gayton (Email: susan.gayton@vdot.virginia.gov)

Date: Click to enter a date.			
Project Information			
UPC		Project Name	
Project Manager/Coordinator		Operations Division ITS Architecture Coordinator	Susan Gayton susan.gayton@vdot.virginia.gov
Project Manager/ Coordinator Phone number			
Notes/Comments			

Process:


Start
Project Manager/Coordinator Completes Section 1
Maintenance Project?
Yes
No
Project Manager/ Coordinator Completes Section 12
Project Manager Completes All Sections Except Section 3
ITS Architecture Coordinator Completes Section 3
ITS Architecture Coordinator Reviews and Uploads to iPM
ITS Coordinator Updates Architecture and Uploads Form to iPM
End

SECTION 1 – Project Information & Screening			
1.1 Project title: (Use UPC Project Title)			
1.2 Project number	State (ex: 9999-999-999) UPC (ex: 1XXXX) Federal NHPP-		
1.3 Brief description/purpose			
1.4 Contact person/group (name and phone number)			
1.5 Project location (Route, County, MP, and direction)			
1.6 Period of performance (ex: start/end dates)	Start Date: Click or tap to enter a date.	End Date: Click or tap to enter a date.	
1.7 Budget & funding source			
1.8 Nature of work (Ex - Scoping Design Software/Integration Implementation Operations Evacuations, procurement)		☐ Maintenance ☐ Construction ☐ Service Note: If maintenance – go to section 12	
1.9 Relationship to other projects and/or phases Does this project interface or share data with any current systems or ITS assets?	☐ Yes ☐ No	If yes, please list. If no, move to section 12	
1.10 Equipment to be purchased with project funding: Please list service/equipment or applications being procured or installed for the project			
1.11 Status	☐ Planned ☐ Existing		
SECTION 2 – Needs Assessment			
2.1 What is/are the problem(s) with the current situation?			
2.2 What needs does this project address?			
2.3 How were these needs identified? Please provide details on how needs were identified – If other documentation was used as reference, please identify it here and attach documentation.			

SECTION 3 – Regional Architecture Assessment (Completed by ITS Architecture Coordinator)		
3.1 Stakeholders in VDOT regional architecture included by project (list them)		
3.2 Service package		
3.3 Inventory elements In VDOT regional architecture included by project		
3.4 Interface impacts (I.E. Data Exchanges) due to project. Portions of architecture being implemented		
3.5 Are other regions/states impacted? - architectures impacted by project (Please List)		
Changes communicated to appropriate architecture maintenance agencies	☐ Yes	☐ No
3.6 Changes recommended to architectures	☐ Yes	☐ No
3.7 If "Yes", Please specify and provide detail		
SECTION 4 – Alternative Analysis		
4.1 Were any alternate concepts/ideas considered? Any other solutions to the problem? (Please Explain)		
4.2 Reference documents (If Any) (Please List)		
SECTION 5 – Concept of Operations		
5.1 Is there of Concept Of Operations for this project?	☐ Yes	☐ No
5.2 If "Yes" was selected, please fill out the following: Concept of Operations contains: (Please check the applicable box)	☐ Scope (Geographic, Timeframe, Region, etc.) ☐ Description of what the project/system is supposed to do ☐ Roles and responsibilities of all stakeholders ☐ Operational scenarios ☐ Project/System impacts	
5.3 If Concept Of Operations was developed, please provide it to be included in the iPM documents		
SECTION 6 – Requirement Definitions (High-Level and Detailed)		
6.1 Are high-level functional requirements included and documented?	☐ Yes ☐ No	

SECTION 7 – Detailed Design		
7.1 Is there a design document available?	☐ Yes	☐ No

If "Yes" was selected, please check the following that applies	☐ The design details are documented ☐ The details of the design trace to requirements definitions ☐ Boundaries and interfaces of the system clearly defined ☐ Process for configuration control
7.2 If no was checked, please provide update when completed	
ITS Standards – (from ITS Architecture)	
7.3 Does the design incorporate National ITS Standards?	☐ Yes ☐ No
7.4 Does the design incorporate VITA standards?	☐ Yes ☐ No
SECTION 8 – Implementation	
8.1 Procurement Details Example: This project is to be procured using a Full Plan RAAP contract and will be advertised (RAAP process) to award the installation and equipment purchase.	
SECTION 9 – Integration and Test	
9.1 Is there an integration plan?	☐ Yes ☐ No
Please provide details	
9.2 Is there a test plan?	☐ Yes ☐ No
SECTION 10 – System Verification and Acceptance	
10.1 Is there a system verification and acceptance plan? (verification of the entire system and acceptance criteria)	☐ Yes ☐ No
10.2 If yes, please check the following that applies	☐ There is a clear criteria for completion ☐ There are clear performance metrics for system acceptance ☐ There will be adequate system documentation for all users and maintainers

SECTION 11 – Operations and Maintenance	
11.1 Who will maintain the system?	
11.2 What is the life span?	
11.3 Is there a maintenance plan?	☐ Yes ☐ No
SECTION 12 – Certification	
12.1 Certify I certify that the information provided is accurate to the best of my knowledge	

Signed

Print Name and Title

Appendix B: Architecture Change Log

Instructions for Completing the Architecture Change Log:

Enter all change requests on the Architecture Change Log.

Date Received: Date the Project Architecture Information Form was received

Status: Four Options:

- Change is on-hold for the next major update
- Impact of change is under investigation
- Change description has been entered on Rule 940 Form
- Change is being made so it is in-progress
  - Once the change is started, record the target date for completion
  - Once the change is complete, record the completion date

For each approved Change Request, record the details of the change on an Architecture Change Log – Change Description form. On the form include:

Change Request Description: Brief description of the Proposed Change (Either the description from the Project Architecture Information Form or a summary of it)

Impact(s) of Change: For each architecture component impacted by the change, record the impact of the change on the component

If an architecture component is not impacted by the change, enter "n/a".

Resolution(s) of Change: For each architecture component impacted by the change, record how the component will be modified for the change

If an architecture component is not impacted by the change, enter "n/a".

Change Control Log – Change Description

Change Request Number: 1	Change Request Description:	
Architecture Component	**Impact(s) of Change**	**Resolutions**
Description of Region		
Stakeholders		
Elements		
Services		
Operational Concept		
Agreements		
Functional Requirements		
Interfaces		
Standards		
Projects List		
Maintenance Plan		
Implementation Plan		

Change Control Log

Change Request Number	Date Received	Maintenance Committee Action			Status					
		Awaiting Action	Change Approved	Change Rejected	On Hold (for future update)	Under Investigation	Change Description Complete	Change In-Progress	Target Date	Date Complete