

ITS Project Planning: *It's Easier Than It Looks*

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Session #7

Applying the System Engineering Process in ITS
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OUTLINE

- What Tools Are Available?
- It's Easy with the User Guide!
- Planning and Program Process
- Integrating Rule 940, Regional Architecture, and System Engineering (SE) into the Checklist
- Why Is It Easy?



User Guide for Planning ITS Project

- Guide the development of ITS Projects

NOVA ITS Architecture

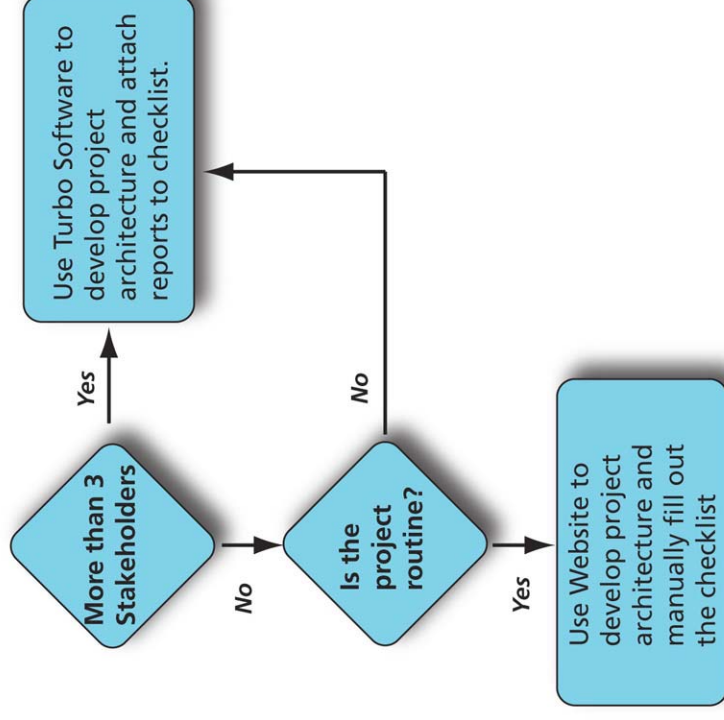
- Turbo Database
- Architecture Website
www.vdot-itsarch.com

Project Work Plan Template

- Develop a project proposal for requesting funds

Rule 940 Checklist

- For project planning purposes after funding is available

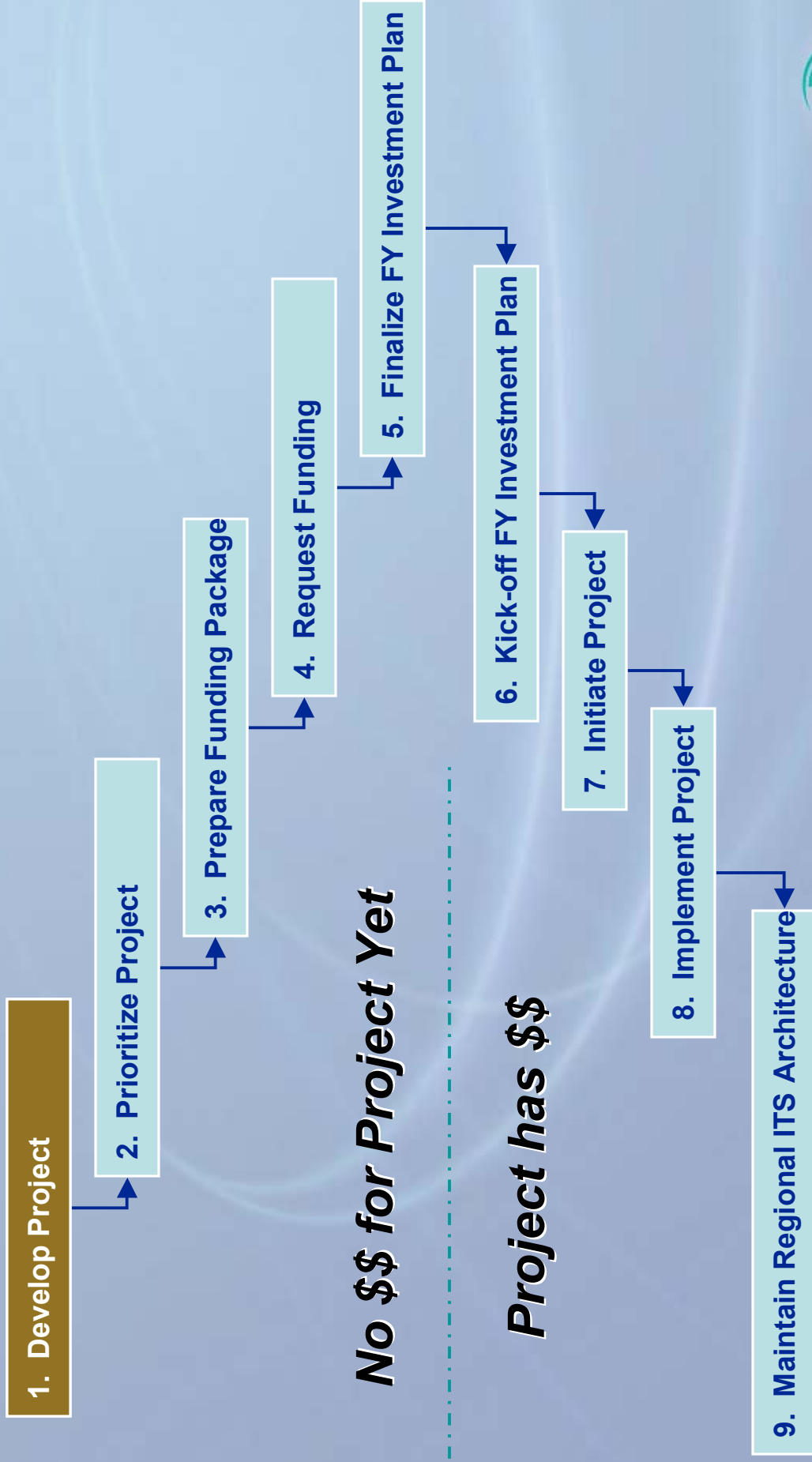


To help project managers conform to the regional architecture, using system engineering, and conforming to FHWA Rule 940 requirements.

The User Guide

- Define when project managers need to conform to Rule 940.
- Show project managers when to use what tools for project development.
- Answer the following questions:
 - What is an ITS project?
 - What are the FHWA Rule/FTA Policy requirements?
 - What is the NOVA Rule Conformity Process?
 - How does one use the architecture to develop projects?
 - How do they provide input to maintain the architecture?





Planning & Programming Process

1. Develop Project

New project:
Develop
Work Plans

Existing
Unfinished
Projects

Existing
Contracts

Previously
Unfunded
Project Pool

Tools:

Work Plan Template
Architecture Website

Consolidate
& Modify
Work Plans into
Projects

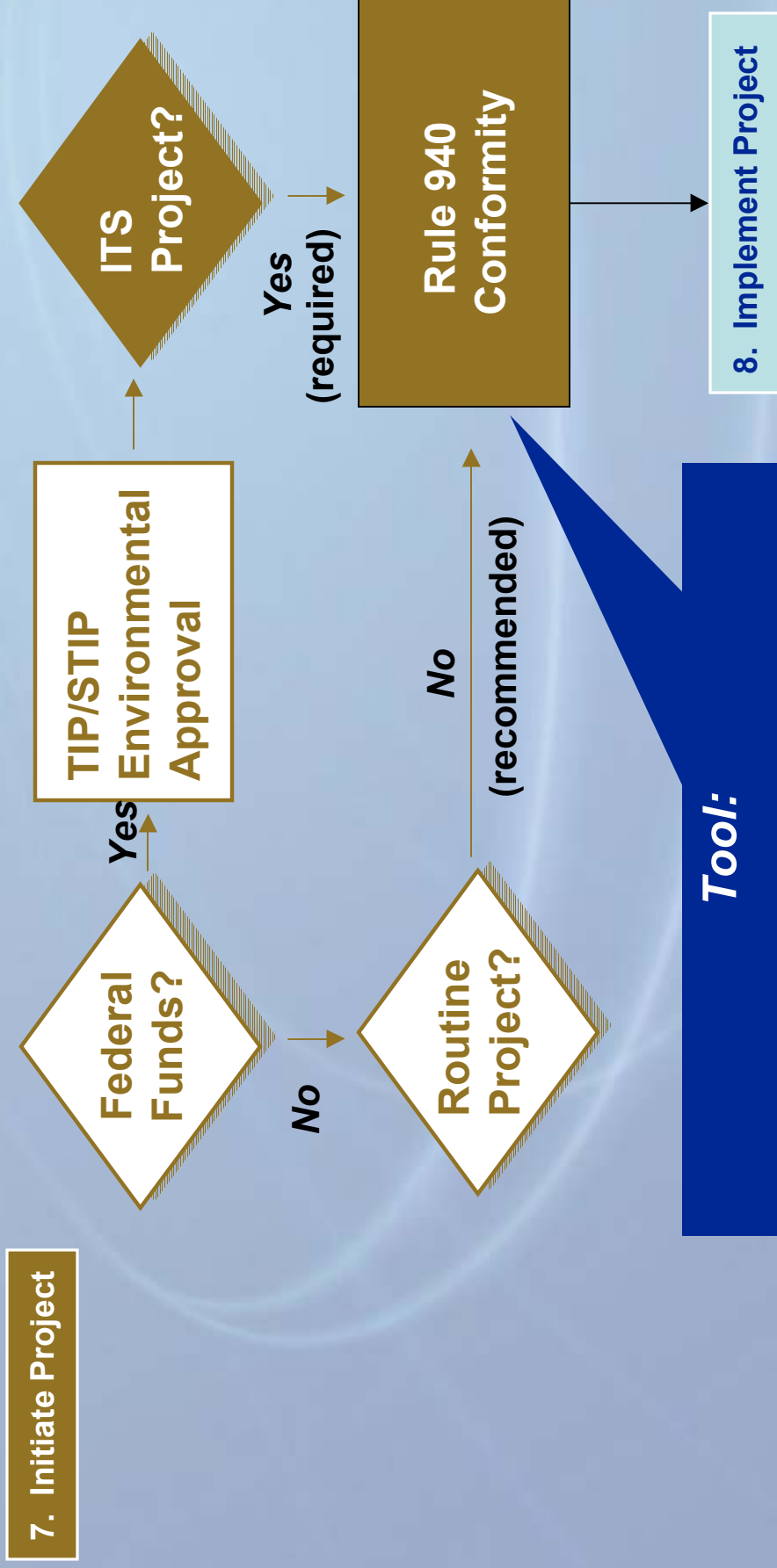
List of Projects
For
Prioritization

2. Prioritize Project





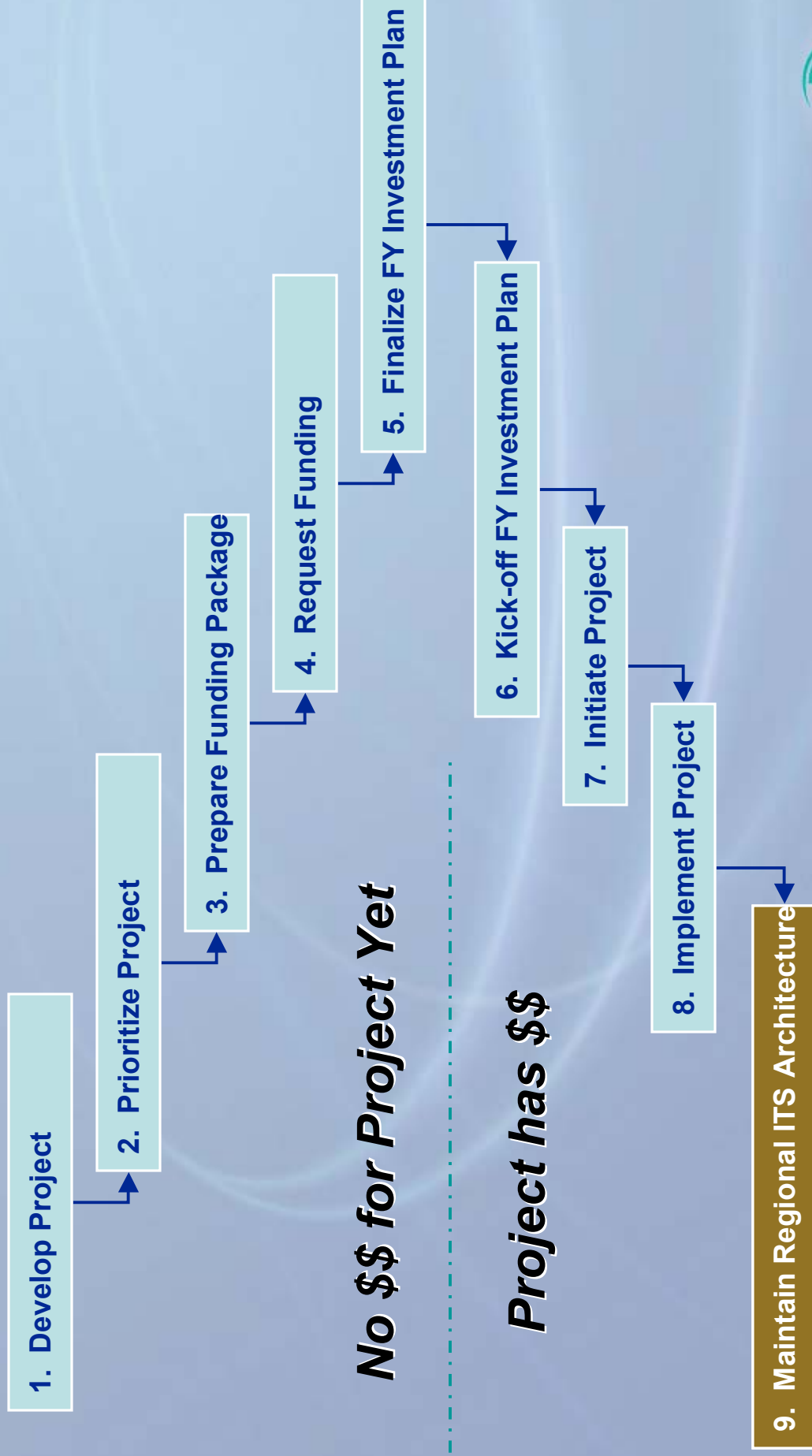
Planning & Programming Process



Tool:

**Rule 940 Checklist
Turbo Architecture & Website**





Planning & Programming Process

9. Maintain Regional ITS Architecture

Update checklist,
Submit project
architectures

Compile all changes to
regional architecture
(various projects)

Architecture update
Validation Workshop

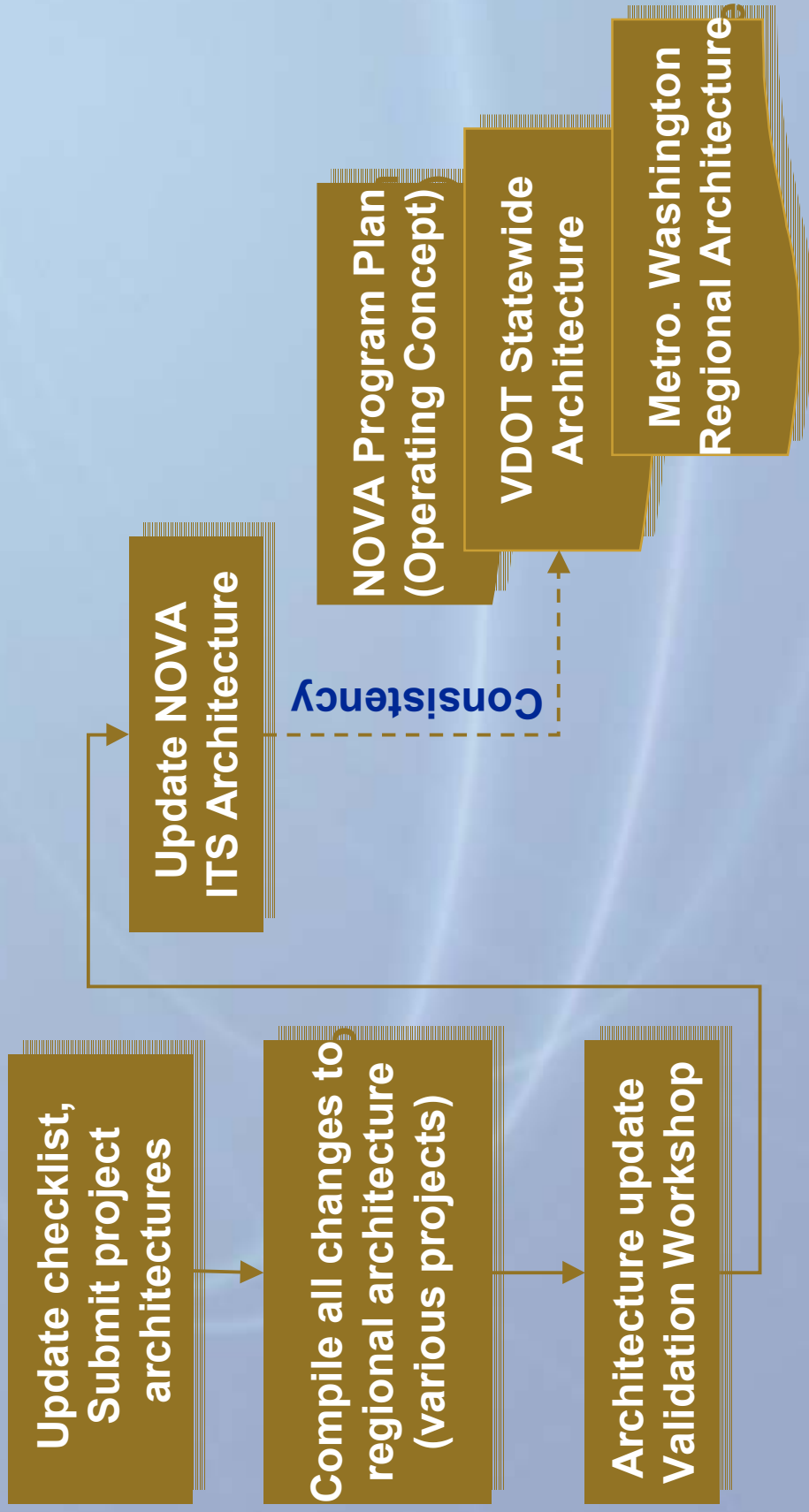
Update NOVA
ITS Architecture

NOVA Program Plan
(Operating Concept)

VDOT Statewide
Architecture

Metro. Washington
Regional Architecture

Consistency



The Rule 940 Checklist



Northern Virginia

ITS Projects – Systems Engineering and Architecture Compliance (Rule 940) Checklist

The Checklist needs to be filled out by the NOVA ITS Planning staff and Project Manager.

HOV Condition Monitoring and Improvement		
Date	Name of Person Filling/Modifying the Form	Notes
1/18/06	Amy Tang McElwain	Documents still to be developed - Detailed Work Plan - Requirements - Detailed Design - Integration Plan - Test Plan and System Verification Plan - RFP for contract with Private ISP - Evaluation Plan

Version Control



ITS Projects – Systems Engineering and Architecture Compliance (Rule 940) Checklist			
SECTION 1 – Project Information			
1.1 PROJECT TITLE		1.2 PROJECT NUMBER ☒ New Project ☐ Modification to existing Project	
1.3 BRIEF DESCRIPTION/PURPOSE			
1.4 CONTACT PERSON/GROUP	1.5 PROJECT LOCATION	1.6 PERIOD OF PERFORMANCE	1.7 BUDGET & FUNDING SOURCE
1.8 NATURE OF WORK (Double Click appropriate box and Change Default Value to Checked) ☒ Scoping ☒ Design ☒ Software/Integration ☒ Implementation ☒ Operations ☒ Evaluations ☐ Others (Please Specify) If Other, Please Specify			
1.9 RELATIONSHIP TO OTHER PROJECTS AND PHASES			
1.10 EQUIPMENT TO BE PURCHASED WITH PROJECT FUNDING			
1.11 STATUS ☒ STOB Approval ☒ Environmental Clearance, If applicable ☐ TIP/STIP Amendment ☐ FHWA Authorization		1.12 IS THERE A WORK PLAN FOR THIS PROJECT WITH TASK BREAKDOWN? ☐ No ☐ Yes, Provide Document Reference ☒ To Be Developed	
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? (Double Click appropriate box and Change Default Value to Checked) ☒ Internal VDOT Assessment ☐ Stakeholder Involvement ☐ From Technical Reviews or other studies ☐ Other Please provide details on how needs were identified – If other documentation was used as reference, please identify it here.			

Section 1 - Project Information:

- Brief project description
- Funding source
- Nature of work

Section 2 - Needs Assessment:

- To ensure that the project will meet the needs of all the stakeholders



ITS Projects - Systems Engineering and Architecture Compliance (Rule 940) Checklist	
SECTION 3 - Regional Architecture Assessment and Concept Exploration	
3.1 STAKEHOLDERS IN VDOT REGIONAL ARCHITECTURE INCLUDED BY PROJECT	
3.2 INVENTORY ELEMENTS IN VDOT REGIONAL ARCHITECTURE INCLUDED BY PROJECT	
3.3 INTERFACE IMPACTS (I.E DATA EXCHANGES) DUE TO PROJECT. PORTIONS OF ARCHITECTURE BEING IMPLEMENTED	
3.4 OTHER REGIONAL ARCHITECTURES IMPACTED BY PROJECT ☐ DC Region (M/MCOG) ☐ Maryland ☐ Other VDOT Districts ☐ VDOT Statewide ☐ Other Changes communicated to appropriate architecture maintenance agencies ☐ No ☐ Yes	
3.5 CHANGES RECOMMENDED TO VDOT NOVA and/or REGIONAL ARCHITECTURES ☒ No ☐ Yes If "Yes", Please Specify and provide detail	

Section 3 - Regional Architecture Assessment and Concept Exploration:

- A new step to traditional project development process.
- Assess architecture using the website or the Turbo Database.

Use Turbo Architecture:

Stakeholder Report

Inventory Report

Project architecture report and interconnect/flow diagram

Regional to project comparison

Rule 940 Requirement vs. Section 3 of Checklist

Identification of portions of the regional ITS architecture being implemented



SECTION 4 - Alternative Analysis	
4.1 WERE ANY ALTERNATE CONCEPTS/IDEAS CONSIDERED? ANY OTHER SOLUTIONS TO THE PROBLEM?	
☒ No	☐ Yes
Please Specify how the best concept was selected	
4.2 REFERENCE DOCUMENTS (IF ANY)	

Section 4 - Alternative Analysis:

- High-level:
 - types of technologies
 - business models
 - technological feasibility
 - cost feasibility
 - schedule feasibility
 - risk, etc
- To ensure that various options were considered to solve the project needs and objectives.

Rule 940 Requirement vs. Section 4 of Checklist

Analysis of alternative system configurations and technology options to meet requirements



SECTION 5 - Concept of Operations

5.1 IS THERE A CONCEPT OF OPERATIONS (COO) FOR THIS PROJECT?

☐ No ☒ Yes ☐ To Be Developed

If "No" was selected, please specify reason

5.2 IF "Yes" WAS SELECTED, PLEASE FILL OUT THE FOLLOWING

COO Contains:

- Scope (Geographic, Timeframe, Region etc) ☐ Yes ☐ No
- Description of what the project/system is expected to do ☐ Yes ☐ No
- Roles and Responsibilities for all stakeholders ☐ Yes ☐ No
- Operational Scenarios ☐ Yes ☐ No
- Project/System Impacts ☐ Yes ☐ No

If "No" was checked in any of the boxes, please specify reason

5.3 PLEASE PROVIDE COO DOCUMENT REFERENCE IF AVAILABLE

Section 5 - Concept of Operations (COO):

- Describe the total environment and the use of the system
- Non-technical and easy-to-understand
- Represents information from the stakeholder(s) viewpoints.
- Typically for bigger projects
- Often a separate document.

Rule 940 Requirement vs. Section 5 of Checklist

Identification of participating agencies roles and responsibilities.

Use Turbo Architecture:

Market packages report

Roles and responsibilities report



SECTION 6 - Requirement Definitions (High-Level and Detailed)

6.1 ARE HIGH-LEVEL FUNCTIONAL REQUIREMENTS WRITTEN AND DOCUMENTED

☐ No ☒ Yes ☐ To Be Developed

6.2 IF "Yes" WAS SELECTED, PROVIDE REQUIREMENTS DOCUMENT REFERENCE IF AVAILABLE

Section 6 - Requirements Definitions:

- Foundation
- Determine WHAT the system must do.
- Drive the system development.
- Need to produce a set of COMPLETE and VERIFIABLE requirements.
- Small projects – might be simple statements.
- Large projects – separate documents with configuration control.

*Rule 940 Requirement vs.
Section 6 of Checklist*

Requirements definitions

Use Turbo Architecture:

Functional requirements report



SECTION 7 – Detailed Design	
7.1 IS THERE A DESIGN DOCUMENT AVAILABLE ☐ No ☐ Yes ☒ To Be Developed	
Please provide reference to design document.	
7.2 IF "YES" WAS SELECTED, PLEASE FILL OUT THE FOLLOWING Are the design details well documented ☐ Yes ☐ No Do the details of the design trace to requirements definitions ☐ Yes ☐ No Are boundaries and interfaces of the system clearly identified ☐ Yes ☐ No Is there a process for Configuration Control ☐ Yes ☐ No If No was checked in above boxes, please provide an explanation	
7.3 DOES THE DESIGN INCORPORATE NATIONAL ITS STANDARDS ☐ No ☐ Yes IF YES, Please mention what ITS Standards are being used	
7.4 DOES THE DESIGN INCORPORATE ANY VDOT ENTERPRISE STANDARDS ☐ No ☐ Yes, IF YES, Please mention what VDOT Enterprise Standards are being used	

Section 7 - Detailed Design:

- High-level design and component design.
- Use of ITS standards
- Identification of interfaces
- Project boundaries

Rule 940 Requirement vs. Section 7 of Checklist

Identification of applicable
ITS standards
and testing procedures

Use Turbo Architecture:

Standards report



SECTION 8 - Implementation	
8.1 PROCUREMENT DETAILS	
8.2 REFERENCE DOCUMENTS (IF ANY)	

Section 8 - Implementation:

- Procurement
- Contracting

**Rule 940 Requirement vs.
Section 8 of Checklist**

Procurement options

Use Turbo Architecture:
List of Agreements



SECTION 9 – Integration and Test	
9.1 IS THERE AN INTEGRATION PLAN	☐ No ☐ Yes ☒ To Be Developed
If "Yes" Please provide reference	
9.2 IS THERE A TEST PLAN	☐ No ☐ Yes ☒ To Be Developed
If "Yes" Please provide reference	

Section 9 - Integration and Test:

- Large projects usually have a formal integration plan.
- In most implementations, there is a phase allotted for unit testing.

SECTION 10 – System Verification and Acceptance	
10.1 IS THERE A SYSTEM VERIFICATION AND ACCEPTANCE PLAN (verification of the entire system and acceptance criteria)	☐ No ☐ Yes ☒ To Be Developed
If "Yes" Please provide reference	
10.2 IF YES, PLEASE FILL OUT THE FOLLOWING	
– Is there a clear criteria for completion	☐ Yes ☐ No
– Are there clear performance metrics for system acceptance	☐ Yes ☐ No
– Will there be adequate system documentation for all users and maintainers	☐ Yes ☐ No
If No was checked in above boxes , please provide an explanation	

Section 10 - System Verification and Acceptance:

- Section 9 and 10: iterative processes with overlap.
- Trace results of system tests to ensure requirements are met.
- Verification plans need to be developed early so that all users know what constitutes system acceptance.

Rule 940 Requirement vs. Sections 9 & 10 of Checklist

Identification of applicable ITS standards and testing procedures

SECTION 11 – Operations and Maintenance

11.1 WHO WILL MAINTAIN THE SYSTEM

11.2 IS THERE A SCHEDULE FOR UPGRADES/ENHANCEMENTS TO THE SYSTEM

11.3 WILL THERE BE AN EVALUATION OF THE SYSTEM

Section 11 - Operations and Maintenance:

- Identify the primary operators and the maintainers of the system.
- Need to plan ahead for operations and maintenance.
- Plan the budget to allocate the appropriate personnel and equipment to this phase.

Rule 940 Requirement vs. Section 4 of Checklist

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



A Streamlined Process ...

- Integrate regional architecture into planning processes
- Systematically use the architecture before funding – explore integration opportunities.
- Systematically use the Rule 940 Checklist and the architecture after funding – fulfill requirements for federally funded ITS projects
- Allow project managers to follow sound systems engineering principles throughout the project's life cycle
- Provide a means to update and maintain a “living” architecture.



Questions or Comments?

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