Using the ITS Architecture during Project Development

INTRODUCTION

The NOVA ITS Architecture Version 2.0 describes subsystems, interconnects, and information flows necessary to deploy an integrated transportation system in NOVA. The architecture is used by VDOT project managers to define ITS projects that implement portions of the architecture in a phased manner. Based on priorities established by VDOT concerning the immediate goals for ITS in the NOVA District, projects are defined that incrementally deploy the required elements over time. Prior to using the architecture, it is recommended that the project manager reviews the planning process memorandum[1] which describes in detail the necessary steps for project definition, review, prioritization, approval, funding allocation, and incorporation of VDOT projects into the transportation plan. The planning process documentation describes several paths a project follows dependent on the funding source being sought for the project. The planning process document also highlights where the NOVA ITS Architecture, ITS Strategic Plan, Concept of Operations, and the Regional ITS Architecture will be beneficial during the planning process based on three stages of a life cycle of a project. This document follows the same three stages and elaborates the specific components of the architecture process that comprise of a project architecture to comply with the Federal Rule on ITS Architecture and Standards.

The NOVA ITS Architecture can be used for many purposes from gathering information about a particular subsystem to planning and generating requirements for a project. The NOVA ITS architecture is available through the web page (www.vdot-itsarch.com) and also through the Turbo Database. In the overall life cycle of a project, the NOVA project manager can benefit from using the NOVA Architecture during three phases as follows:

Stage 1 – Before Funding

The architecture is useful when a project's scope has not been defined and funding has not been estimated. To define the scope, the lead agency that would like to implement the project can use the VDOT NOVA web site to identify a high-level project architecture that will include subsystems or stakeholders that best match their organization. Figure 1 illustrates the process in using the website to generate a high-level project architecture. Using the subsystems or the system inventory, the project manager can select the appropriate subsystems and view their relationship or interfaces to other subsystems. This will provide a better understanding of the proposed project's scope and interface requirements. This will also allow the project manager to develop a high-level concept of the overall system that can be used initially to gain consensus from stakeholders on the project scope, interfaces, and integration opportunities prior to implementation.

[1] Task C.1.2.2 Report- Planning Process Memorandum

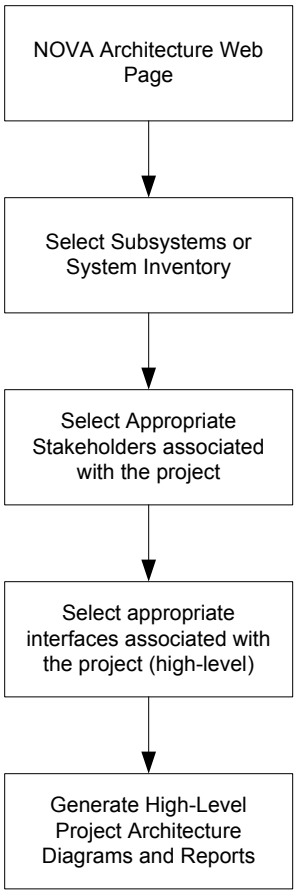

Figure 1: Process to develop High-level Project Architecture (Before Funding)

Stage 2 - Development of a Detailed Project Architecture - Project Implementation with Secured Funds

The ideal use of the NOVA ITS Architecture is to define Project Architectures when funding for a project has been identified. Based on the stakeholders that are involved in the project, the project manager can use the NOVA Architecture and/or the Metropolitan Washington Regional ITS Architecture as a starting point. For developing the detailed project architecture, it is recommended that the project managers use the NOVA Architecture Turbo Database and follow a systems engineering process as required by FHWA Rule 940.

The systems engineering (SE) process is an inter-disciplinary approach to procurement and implementation of a successful project. The process enables the implementer to identify and document all of the project requirements, to effectively manage the results of steps during implementation of the project and to verify that the requirements are thoroughly and correctly implemented. The use of this process assures that all phases of a system's lifecycle are addressed, from conception through design, installation and testing, and operations and maintenance. Figure 2, more commonly termed as the "V" diagram illustrates the various steps of a generic systems engineering process. This process is well-established and will allow NOVA project implementers a consistent approach to facilitate integration and ensure that they adhere to the

federal rule and requirements on ITS architecture. Defining a project using the SE process and the NOVA ITS Architecture maximizes the integration opportunities available by examining the interfaces that the project should accommodate.

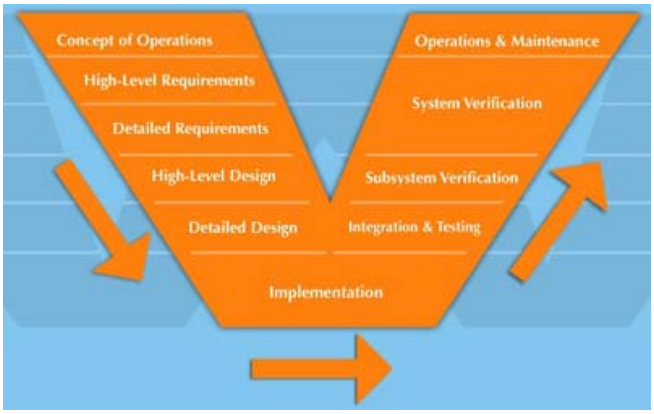

Figure 2: Typical Systems Engineering Process "V" Diagram

Figure 3 illustrates the process to develop the detailed project architecture using the NOVA Turbo Database and the systems engineering process. To start the process, the project manager should download the NOVA Turbo Architecture database from the website. This database allows the project manager to enter details of the project architecture. Using the project scope (previously defined in a high-level project architecture prior to funding), the project manager can initiate the project architecture by entering appropriate information into the Turbo database. Each of the Turbo Architecture steps illustrated in the figure can be entered directly into the database to generate a project architecture. The steps illustrated in the process combine the Turbo Architecture products and the seven steps of the systems engineering process to implement a project. The steps that requires the use of both the architecture and the systems engineering process is highlighted in the figure. This combined process allows the project manager to efficiently track and use a systematic approach to fulfill the Rule requirements and implement a successful project.

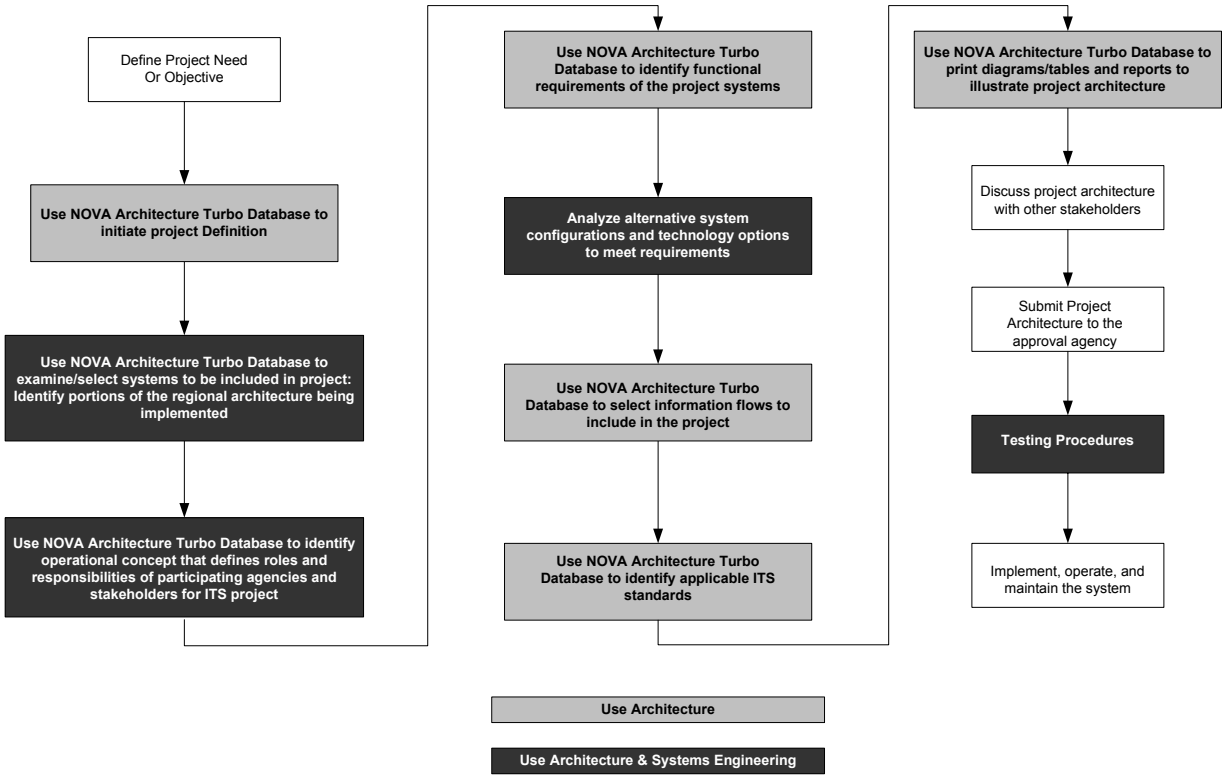

Figure 3: Process to develop Detailed Project Architecture (After Funding Approval)

Once the project definition has been initiated in the Turbo Database, the project manager must select the appropriate systems and subsystems that need to be included in the project. It is also at this stage that the project manager will identify the portions of the regional architecture that is being implemented. After selecting appropriate systems and subsystems, the project manager needs to identify an operational concept that would define the roles and responsibilities of the stakeholders included in the project. It is recommended that the project manager also review the NOVA Concept of Operations document for additional reference. The next step in the process is the identification of functional requirements for selected project elements from the system inventory. Following this step, an analysis of alternative system configurations and technology options should be considered for identified requirements.

Following the requirements phase, detailed information flows and interfaces with other subsystems for inclusion in the project to maximize system integration within the region need to be developed. The project manager needs to also review the list of current ITS standards that are applicable for the systems being deployed and consider any that can be used for project implementation. After completing all the entries and selecting the appropriate systems, the Turbo Architecture database provides the project manager with the capability to generate several reports, produce diagrams and tables to convey the architecture to others for review and approval. The detailed project architecture is then discussed with participating stakeholders and submitted to the approval agency.

Following the approval, the project manager develops testing procedures and other design requirements to implement, operate and maintain the project.

By creating a project Architecture in this manner, the Project Manager is using the NOVA ITS Architecture and the systems engineering process to make informed decisions about the integration boundaries of the project in the initial implementation and what will need to be supported in the future.

Stage 3 -Submit Project Architecture after Project Implementation

It is important that the NOVA ITS Architecture definition remain accurate. As each project is implemented or deployed, the "as deployed" project architecture should be submitted to the NOVA ITS PPA. The NOVA ITS PPA team is responsible for the update and maintenance of this architecture along with ensuring that there is consistency between the NOVA architecture and the Metropolitan Washington Regional ITS Architecture. To assist the NOVA ITS PPA team and to ensure that the architecture reflects the updated and current NOVA projects, the project manager can send architecture details by selecting the Submit Project Architecture in the NOVA architecture website. Figure 4 illustrates the process to enable project managers to send their architectures. This process requires that the project manager fill in specific information on the project including scope, stakeholders, inventory systems, standards, and other federal requirements that are necessary while implementing ITS projects. The submitted project architecture will be incorporated into the NOVA ITS Architecture periodically during the maintenance phase. This process allows for the evolution of the NOVA architecture and maintains its usefulness to other stakeholders.

Once the project architecture has been submitted, the NOVA ITS PPA will share this information with the Council of Governments (COG) staff for inclusion of the project in the Metropolitan Washington Regional ITS Architecture and also the future Statewide Architecture (planned). This will ensure consistency with the NOVA and the regional architectures.

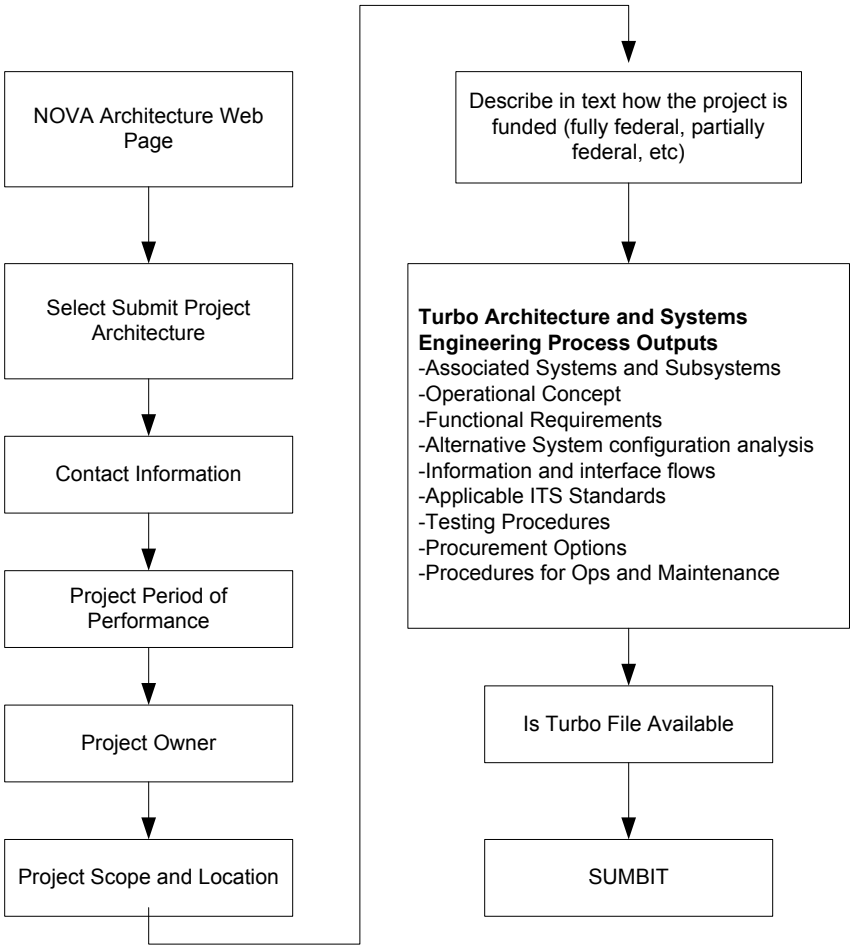

Figure 3: Process for Submission of Project Architecture