

Appendix D

The Need for a Systems Engineering Process – Federal *Rule 940*

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1. Introduction

On April 8, 2001, the FHWA issued federal *Rule 940* entitled *Intelligent Transportation System (ITS) Architecture and Standards* and, concurrently, the Federal Transit Administration (FTA) issued a policy entitled *National ITS Architecture Policy on Transit Projects*. The intent of the *Rule* and *Policy* is to require procedures for implementing *Section 5206(e)* of *TEA-21* requiring ITS projects to conform to the *NITSA*, as well as USDOT-adopted ITS standards. Federal *Rule 940* addresses both regional requirements and project requirements of ITS deployments. The *FDOT Draft Rule 940 Procedures*, prepared for the FDOT ITS Section in June 2002, focuses on the regional architecture requirements. The SEMP project deals with the project requirements.

For ITS projects, federal *Rule 940* specifies that any project moving into design is required to follow a systems engineering approach that is commensurate with the project scope. A project is defined as an ITS project or program that receives federal-aid. If the project moves into design prior to the completion of a regional architecture, then a project architecture is required to support the systems engineering approach. According to federal *Rule 940*, project development requirements took effect April 8, 2001. Federal *Rule 940* states that the systems engineering approach shall include at a minimum:

- Identification of portions of the regional architecture being implemented
- Identification of participating agencies' roles and responsibilities
- Requirements definition
- Analysis of alternate system configurations and technology options to meet requirements
- Procurement options
- Identification of applicable standards and testing procedures
- Procedures and resources necessary for operations and management of the system

1.1 Florida Statewide and Regional ITS Architectures

The FDOT has developed a *SITSA* based on the *NITSA*. (*Appendix B* presents definitions of the terms used in the *SITSA* and *NITSA* documentation.) In developing the *SITSA*, the *NITSA* was used as a starting framework, but was augmented as needed to develop solutions to physical and high-level functional requirements unique to Florida and Florida's Districts.

1.2 How the SITSA was Developed

The *SITSA* was completed in February 2001 through a process that included various transportation system stakeholders. A total of eight RITSA workshops were conducted. For each FDOT District, a three-day workshop over a period of one week was conducted with regional stakeholders representing all aspects of ITS in the District. At the end of the regional workshops, the District RITSA's were completed, reviewed, and agreed to by the stakeholders. In the workshops, the stakeholders validated and added to the inventory of existing/legacy systems developed by the *SITSA* project development team based on prior documentation. Next, market packages from the *NITSA* were used as an easy way to describe user services, and were customized to Florida inventory elements and user inputs.

The *NITSA* market packages were extended with new market packages to represent requirements and concepts of operations that are unique to Florida or that were not anticipated by the *NITSA*. Finally, the stakeholders reviewed and recommended modifications to the external interfaces for each stakeholder element of the inventory. These external interfaces were derived from the earlier market package analysis.

Criteria were developed to identify architectural elements and interfaces that should be included in the *SITSA*. After completing stakeholder workshops for each of the seven FDOT Districts, the results were analyzed according to the developed criteria and then "rolled up" to define the *SITSA*. Requirements that were common across FDOT Districts were allowed to "percolate" to the statewide level. Other requirements remained local to the FDOT District where they were identified.

1.3 Regional and Local ITS Architectures

FDOT Districts 3 and 7, and Florida's Turnpike Enterprise have developed their own regional and corridor architectures to address the unique aspects of the ITS needs within their local areas. Harmonization procedures were performed to integrate these architectures with the *SITSA*. This has provided the necessary assurance that these independently developed architectures are consistent with the *SITSA* and *NITSA*, and that updates to the *SITSA* and *NITSA* consider the harmonization recommendations from these architectures.

As described above, the approach taken in the *SITSA* development is oriented to using market packages and stakeholder-driven customization of these market packages as entry points to the architecture development. These market packages present an explicit selection of subsystems and their component equipment packages with the architecture flows representing information transmission between them.

1.4 Market Packages Instead of User Service Requirements

The *SITSA* development team decided on the use of market packages from the *NITSA* as a starting point for the architecture analysis rather than starting from the user service requirements, which are actual statements of user needs that do not specify a particular architectural implementation. This is because the team concluded that the abstract concepts of user services, while invaluable for the system engineers that developed the *NITSA*, are generally too abstract for the majority of stakeholders in a limited time setting.

The *SITSA Final Report* mentioned that the above approach should not be taken to understate the importance of the logical architecture because it is crucial to understanding the physical architecture in sufficient detail to develop interface standards and to understanding the underlying processes that explain what a physical subsystem does. The report said that these details are important to standards developers and project designers at the PS&E stage, but are less important to regional stakeholders and large investment decision-makers who are responsible for the RITSA requirements and decisions.

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