Appendix B

Definitions

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Logical Architecture – The logical architecture consists of processes, data flows, terminators, and data stores. Data flows identify the information that is shared by the processes. The entry and exit points for the logical architecture are the sensors, computers, and human operators of the ITS systems (called terminators). These terminators appear in the physical architecture as well. Data stores are repositories of information maintained by the processes.

The logical architecture view of the *NITSA* defines what has to be done to support the ITS user services. It defines the processes that perform ITS functions and the information or data flows that are shared between these processes. The logical architecture was developed using structured analysis techniques, and consists of data flow diagrams, process specifications, and data dictionary entries. The logical architecture has also been called an "essential model" because it is not technology specific, nor does it dictate a particular implementation. This implementation independence makes the logical architecture accommodating to innovation, scalable from small-scale implementations to large regional systems, and supportive of widely varied system designs.

Function or Activity – A function or activity identified in the logical architecture view of the *NITSA* is required to support the ITS user service requirements. The logical architecture presents processes in a top-down fashion beginning with general processes (e.g., the Manage Traffic process) that are then decomposed into more detailed processes (e.g., the Provide Traffic Surveillance process, Monitor HOV Lane Use process, etc.). General processes are defined in terms of more detailed processes using data flow diagrams. The most detailed processes (sometimes called primitives) are defined in process specifications (PSpecs).

Process Specification – The textual definition of the most detailed processes identified in the logical architecture view of the *NITSA*. The PSpec includes an overview, a set of functional requirements, and a complete set of inputs and outputs.

The diagrams in the logical architecture view of the *NITSA* show the functions that are required for ITS and the information that moves between these functions. Only four different symbols are used on the diagrams. Circles represent the processes or functions that do the work. Arrows represent the data flows that show how data moves through the system. Parallel lines represent data stores that represent "data at rest" in the system. Finally, rectangles represent the terminators that define the architecture boundary. A hierarchy of these diagrams depict the ITS functionality and data flow requirements in successively greater detail until "primitive" processes are defined.

The logical architecture is presented to the reader via data flow diagrams (DFDs) or bubble charts and PSpecs.

Data Flow Diagrams – The DFDs are graphical presentations of the processes, terminators, data flows, and data stores in the architecture. The DFDs are organized hierarchically starting from a high-level activity (e.g., the Manage ITS activity). High-level activities are then decomposed functionally through multiple levels to arrive at the fundamental ITS processes and activities.

The PSpecs are textual descriptions of the most rudimentary processes in the logical architecture. Each PSpec description consists of an overview, a set of functional requirements, and a complete listing of inputs and outputs. A system designer can use these descriptions as a guide to writing the specifications for the systems that will implement the processes described.

The "processes" link presents a list of all of the DFDs and PSpecs defined in this version of the architecture. Also included are the subsystems from the physical architecture that utilize the PSpecs. All of the PSpecs and subsystem entries are hypertexted to detailed descriptions in this document.

Terminators – Terminators define the boundary of an architecture. The *NITSA* terminators represent the people, systems, and general environment that interface to ITS. The interfaces between terminators, and the subsystems and processes within the *NITSA* are defined, but no functional requirements are allocated to terminators. The logical architecture and physical architecture views of the *NITSA* both have exactly the same set of terminators. The only difference is that logical architecture processes communicate with terminators using data flows, while physical architecture subsystems use architecture flows.

Subsystems – The principle structural element of the physical architecture view of the *NITSA*. subsystems are individual pieces of the ITS defined by the *NITSA*. Subsystems are grouped into four classes: 1) centers, 2) roadsides, 3) vehicles, and 4) travelers. Examples of subsystems are the traffic management subsystem, the vehicle subsystem, and the roadway subsystem. These correspond to the physical world, respectively: traffic operations centers, automobiles, and roadside signal controllers. Due to this close correspondence between the physical world and the subsystems, the subsystem interfaces are prime candidates for standardization.

Physical Architecture – The physical architecture is the part of the *NITSA* that provides agencies with a physical representation (though not a detailed design) of the important ITS interfaces and major system components. It provides a high-level structure around the processes and data flows defined in the logical architecture. The principal elements in the physical architecture are the subsystems and architecture flows that connect these subsystems and terminators into an overall structure. The physical architecture takes the processes identified in the logical architecture and assigns them to subsystems. In addition, the data flows (also from the logical architecture) are grouped together into architecture flows. These architecture flows and their communication requirements define the interfaces required between subsystems, which form the basis for much of the ongoing standards work in the ITS program.

Market Packages – The market packages provide an accessible, service-oriented perspective to the *NITSA*. They are tailored to fit, separately or in combination, real-world transportation problems and needs. Market packages combine one or more equipment packages that must work together to deliver a given transportation service, and the architecture flows that connect them and other important external systems. In other words, they identify the pieces of the physical architecture that are required to implement a particular transportation service.

Turbo Architecture – Turbo Architecture is a software application that supports the development of regional and project ITS architectures using the *NITSA* as a starting point. Turbo Architecture Version 2.0 includes a host of new features and fully supports Version 4.0 of the *NITSA*. Version 2.0 also includes a new Turbo Conversion facility that supports quick and easy conversion of existing regional and project ITS architectures, providing a convenient migration path for existing Turbo users.

User Service Requirement – A specific functional requirement statement of what must be done to support the ITS user services. The user service requirements were developed specifically to serve as a requirements baseline to drive *NITSA* development. The user service requirements are not to be construed as mandates to system/architecture implementers, but rather are directions to the National Architecture Team. As a requirements baseline, the user service requirements include little narrative or background material. For a general introduction to the user services, consult the *National ITS Program Plan*.[75]

User Services – The user services document explains what ITS should do from the user's perspective. Broad ranges of users are considered, including the traveling public as well as many different types of system operators. User services, including the corresponding user service requirements, form the basis for the *NITSA* development effort. The initial user services were jointly defined by the USDOT and ITS America™ with significant stakeholder input, and documented in the *National ITS Program Plan*.[76] The concept of user services allows system or project definition to begin by establishing the high-level services that will be provided to address identified problems and needs. New or updated user services have been and will continue to be satisfied by the *NITSA* over time.

[75] Intelligent Transportation Society of America, *National Intelligent Transportation Systems Program Plan: A Ten-Year Vision* (September 2002). Available online at http://www.itsa.org/research.html.

[76] ITS America is a trademark of the Intelligent Transportation Society of America.

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