A307a: Understanding User Needs for Advanced Transportation Controllers Based on ATC 5201 Standard v06

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1. Introduction/Purpose

The advanced transportation controller (ATC) family of standards provides an open architecture hardware and software platform that can support a wide variety of Intelligent Transportation Systems (ITS) field applications including traffic management, safety, security, and other applications. These standards are characterized by their modularity, support of multiple and current application programs, and design to facilitate the adoption of new technologies. ATC 5201 Advanced Transportation Controller Standard v06 defines transportation controller units that can grow with technology, are multipurpose, and can be specified to operate in any of the major transportation field cabinet systems (TFCSs) in use today.

Modules A207b and A208 provided details of ATC 5201 Standard v06 and suggested a procurement specification outline. This module focuses on how such a procurement specification may be developed, emphasizing the identification and formalization of user needs. This module reviews features of ATC controller units, offers new ways to think in developing procurements, discusses the components of an ATC procurement specification, and helps users identify user needs.

2. Samples/Examples

Figure 1 illustrates the processes (stages) of the systems life cycle. Figure 1 highlights the concept of operations (ConOps) development and systems requirements development stages that lead to a software or hardware implementation.

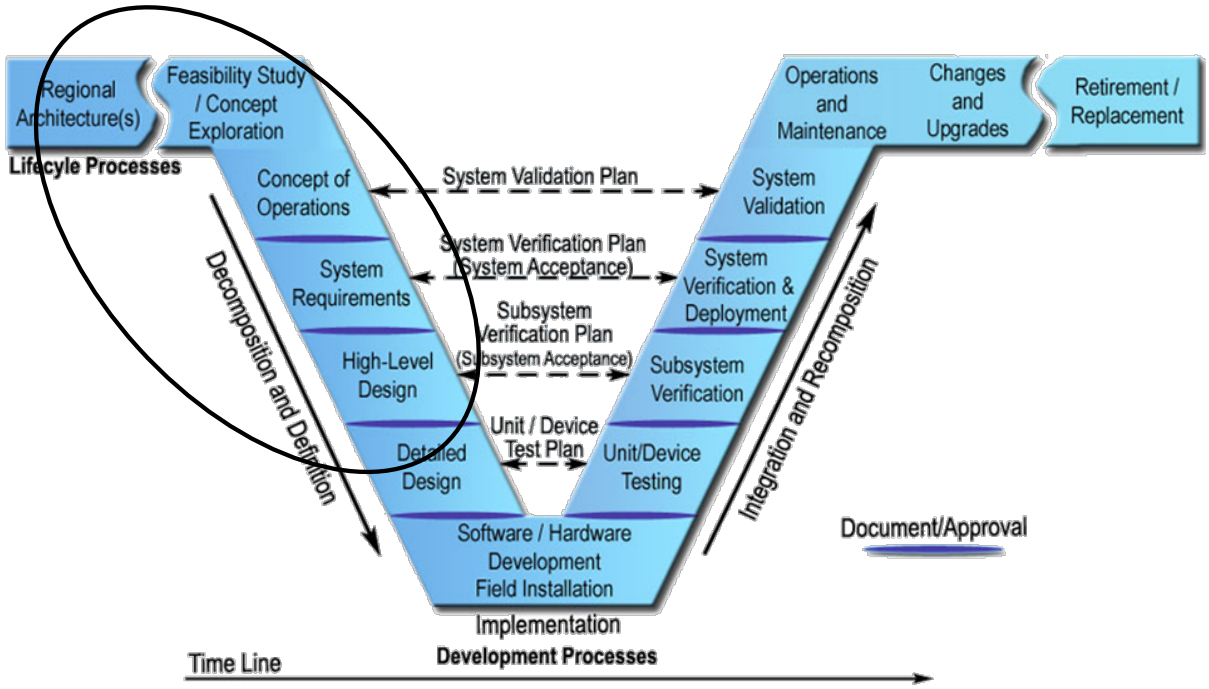

Figure 1. Stages of the Systems Life Cycle

In Figure 2, the systems engineering life cycle stages are modified to show them using process notation. User needs are developed with existing strategic or regional plans as an important input into this process. The output of the user needs development are user needs captured (written) in a ConOps. The user needs are inputs to the requirements development process. Requirements are developed based on the user needs. We have removed the design process typically in a general

systems engineering process. Instead, the result of the requirements process is the agency specification. A critical part of this development process is the tracing of user needs to requirements.

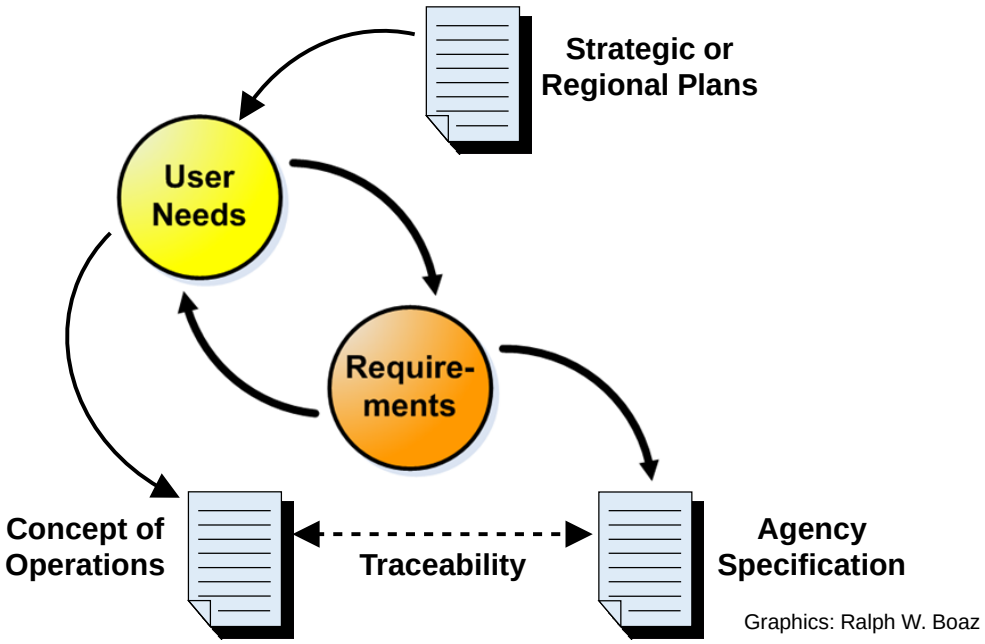

Figure 2. The Systems Engineering Specification Development Process

3. Reference to Other Standards

- Institute of Transportation Engineers, *Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) v02.17*. ATC Joint Committee, 1 September 2011. http://www.ite.org/standards/index.asp

- Institute of Transportation Engineers, ATC 5201 *Advanced Transportation Controller (ATC) Standard Version 06.10*. ATC Joint Committee, 30 July 2012. http://www.ite.org/standards/index.asp

- Institute of Transportation Engineers, *ATC 5202 Model 2070 Controller Standard Version 03.* ATC Joint Committee, 28 December 2012. http://www.ite.org/standards/index.asp

- Institute of Transportation Engineers, *ATC 5401 Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) v02*. ATC Joint Committee, 15 September 2013. http://www.ite.org/standards/index.asp

- Institute of Transportation Engineers, *Intelligent Transportation System (ITS) Standard Specification for Roadside Cabinets v01.02.17b.* ATC Joint Committee, 16 November 2006. http://www.ite.org/standards/index.asp

- National Electrical Manufacturers Association, *NEMA Standards Publication TS 2-2003 v02.06 Traffic Controller Assemblies with NTCIP Requirements*. NEMA, 2003.

- National Electrical Manufacturers Association, *NEMA Standards Publication TS 1-1989 Traffic Control Systems*. NEMA, 1989.

4. Case Studies

This module uses examples from the "Orange County Intelligent Transportation Systems (ITS) Strategic Deployment Plan (SDP) – Update 2013." This SDP was developed by the Orange County Transportation Authority (OCTA) a Metropolitan Planning Organization (MPO) for Orange County, CA.

The SDP uses ITS "strategies" to provide context for the agencies and the private sector who are deploying technology today and for the following 10 years. Strategies are organized as follows: Transit management and multi-modal (MM), traffic management (TM), incident management and emergency response (IM), traveler information (TI), performance monitoring (PM), communications and connectivity (CC), safety (SF), and institutional (IN).

Other strategic or regional plans may have different names and different methods of expressing desired capabilities.

5. Glossary

Term	Definition
AASHTO	American Association of State Highway and Transportation Officials
API	Application Programming Interface
APIRI	API Reference Implementation (software)
APIRI Project	Entire project managed by this PMP including software, hardware and documentation.
Application Program	Any program designed to perform a specific function directly for the user or, in some cases, for another application program. Examples of application programs include word processors, database programs, Web browsers and traffic control programs. Application programs use the services of a computer's O/S and other supporting programs such as an application programming interface.
ATC	Advanced Transportation Controller
ATP	Authorization to Proceed
CO	Contracting Officer
COR	Contract Officer's Representative
COTM	Contract Officer's Task Manager
FHWA	Federal Highway Administration
H/W	Hardware
I/O	Input/Output
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
JC	Joint Committee
JPO	Joint Program Office
Linux	Low-level software that is freely available in the Linux community for use with common hardware components operating in a standard fashion.

Term	Definition
Linux Kernel	The Unix-like operating system kernel that was begun by Linus Torvalds in 1991. The Linux Kernel provides general O/S functionality. This includes functions for things typical in any computer system such as file I/O, serial I/O, interprocess communication and process scheduling. It also includes Linux utility functions necessary to run programs such as shell scripts and console commands. It is generally available as open source (free to the public). The Linux Kernel referenced in this document is defined in ATC 5201 Standard v06, Appendix A and Appendix B.
N/A	Not Applicable
Operational User	A technician or transportation engineer who uses the controller to perform its operational tasks.
O/S	Operating System
PCB	Printed Circuit Board
PMP	Project Management Plan
POP	Period of Performance
RI	Reference Implementation
RITA	Research and Innovative Technology Administration
RTC	Real-Time Clock
SDO	Standards Development Organization
SOW	Statement of Work
SRS	Software Requirements Specification
S/W	Software
TBD	To Be Determined
TFCS	Transportation Field Cabinet System
TOD	Time of Day
US	United States
USDOT	United States Department of Transportation
WBS	Work Breakdown Structure
WG	Working Group

6. References

- California Department of Transportation, *Caltrans Transportation Electrical Equipment Specifications (TEES).* California Department of Transportation, 12 March 2009.

- Institute of Transportation Engineers
  http://www.ite.org/standards/

- ITS PCB Training
  http://www.pcb.its.dot.gov/

- NEMA Standards Publication TS 2-2003 v02.06 Traffic Controller Assemblies with NTCIP Requirements

- Orange County Strategic Deployment Plan 2013 Update
  http://www.scag.ca.gov/Documents/OrangeCounty_Aug2013Update_Final.pdf

- United States Department of Transportation Federal Highway Administration. *Systems Engineering for Intelligent Transportation Systems*. January 2007.
  http://www.fhwa.dot.gov/cadiv/segb/

- United States Department of Transportation Federal Highway Administration. *Systems Engineering Guidebook for Intelligent Transportation Systems Version 3.0*. November 2009.
  http://www.fhwa.dot.gov/cadiv/segb/

7. Study Questions

1) **Which of the following features of ATC units allows them to run concurrent application programs?**
   a) Has a computational capability that can grow with technology
   b) Works with all major transportation field cabinet systems
   c) Works with NTCIP standards
   d) Runs API Software

2) Which of the following is NOT a good source for discovering user needs?
   a) Regional Plans
   b) Integration testing
   c) Stakeholders
   d) Strategic plans

3) Which of the following is NOT a source of user needs for the specification development process?
   a) Brand of controller equipment currently used by the agency
   b) Existing type of transportation field cabinet systems
   c) Existing strategic or regional plans
   d) Stakeholders

4) Which of the following is a TRUE statement?
   a) There is only one way to organize user needs in a ConOps
   b) A ConOps for an ATC is written from a vendor's point of view

c) Consider your specification when organizing your user needs
d) A ConOps is just “busy work”