ITS ATC Controller Standard Development Report

The following Standard Development Report is made in accordance with the Institute of Transportation Engineers (ITE) procedures for the Intelligent Transportation System (ITS) Standard Specification for transportation controllers.

1. Latest Version of the Draft Proposed Standard

Appendix I contains the latest recommended draft standard ITS ATC Controller v.5 Intelligent Transportation (ITS) Standard Specification for transportation controllers.

2. Summary Status Sheet

Appendix II contains a Summary Status Sheet for the ITS ATC Controller v.5 Intelligent Transportation (ITS) Standard Specification for transportation controllers. The controller standard has been reviewed by the User Community and all User Comments have been addressed. The Advance Transportation Controller (ATC) Joint Committee received a Recommended Standard from the contractor tasked with developing the ATC standard and approved that standard for SDO balloting. The standard is now being transmitted to the SDOs for final balloting.

3. History and Background of ATC Standard Development Process

At the present time, ATC controllers predominantly in use are the 2070, 170, and NEMA TS1 & TS2. While each is based on its own standard, there is no unifying standard for all controllers. An ATC controller standard is needed because of increasing efforts to standardize and integrate transportation technologies, and because the technology on which earlier controllers are based have changed while their uses have expanded over time. With the growth in technology, controllers formerly used only for traffic signal control are now being asked to support a variety of other roadway tasks, creating greater demands on the equipment. This is particularly apparent with the communication networks on which these controllers operate and into which the controllers must be integrated. These networks operate at higher speeds than can typically be accommodated with older technology, and require knowledge of more complex communication protocols. Further, the environment in which the controllers must operate has become more complex, requiring consideration of issues that may not have influenced controller design. Ultimately, the new controller standard described here defines a basic hardware platform that encompasses a wide range of CPU designs while providing a basis from which consistent designs for advanced transportation controllers can be achieved. This goal is the result of numerous meetings and discussions with interested parties as documented below.

The effort to develop a family of standards for the ATC began in the mid-1990's when the Federal Highway Administration gathered together a group of users interested in furthering the development of open architecture hardware and software to meet the future needs of Intelligent Transportation Systems. The ATC Users Group gained the support of the Institute of Transportation Engineers to continue their work in developing standards for the ATC family of standards. The American Association of State Highway and Transportation Officials (AASHTO) and the National Electrical Manufacturer's Association (NEMA) joined the ITE to create a joint effort.

At its August 21, 1998 meeting, the Advanced Transportation Controller Joint Committee recognized the specific need for developing an enabling national standard for a general-purpose field computing device platform and established the ATC Controller Unit Working Group to complement its already established Cabinet and API Software working groups. It tasked this new Working Group with (1) converting the Caltrans 2070 specification to an enhanced non-agency specific specification, and (2) developing a next generation ATC standard. The next generation ATC standard would focus on the definition of various interfaces associated with the standard without defining particular hardware specifics except as needed to ensure interchangeability between manufacturers at the device and module levels, interoperability in systems environments, and software portability between manufacturers for enhanced ITS application development support. The goal is a standard that, to the extent possible, embraces the best attributes of all existing national standards while avoiding the vulnerability found in earlier designs to obsolescence of particular specified components.

While the conversion of the Caltrans 2070 specification to an enhanced non-agency specific standard was seen as an excellent first step toward a national ATC standard, most of the public sector participants in the early phases of this process expressed a desire to wait until the completion of the next generation ATC standard before deploying an ATC. The next generation ATC standard aims to break down the barriers between the traditional two camps within the industry, one favoring the NEMA functional specifications and the other favoring the Model 170 specifications. Interoperability issues created, in many cases, a patchwork of equipment by different manufacturers that was difficult to integrate across jurisdictional boundaries. Many agencies deemed this work critical enough to their mission to make significant contributions toward the standard development effort. Among the agencies indicating an early interest in deploying the new ATC standard are:

- Atlanta, GA
- Chicago, IL
- New York, NY
- Ohio State DOT
- Harris County Texas
- Florida DOT
- City of San Francisco
- City of Portland, OR
- New York State DOT
- Texas DOT
- Caltrans (California DOT)
- City of Anaheim, CA
- Oregon DOT

In July 1999, a formal agreement was reached among NEMA, ITE, and AASHTO to jointly develop, approve, and maintain the ATC family of standards. Under the guidance of a Joint AASHTO/ITE/NEMA Committee on the ATC, a Working Group was created to facilitate the development of the ATC standard.

In response to direction given by Federal Highway Administration representatives at the April 19, 2001 Program Review Meeting, an expedited program, aimed at reducing standard development time to approximately 14 (fourteen) months, was instituted. Prior to this request, standards development work for the Advanced Transportation Controller was conducted principally through the efforts of dedicated volunteers constituting the Working Group. Funds expended went largely to pay travel costs for the public sector representatives involved in the programs. The potential benefits of a single unifying standard was readily seen by many agencies who rapidly embraced the novel concept of an expedited standard development effort using a contractor team in place of the more traditional volunteer working group. Following the FHWA directive, a contract was awarded to Siemens Energy & Automation, Gardner Transportation Systems Business Unit (GTS), by ITE, based on a proposal submitted by this group on June 7, 2002. The process by which the contractor would develop the standard, as agreed to in the contract and project management plan, was determined by ITE to be consistent with its Recommended Practice for Standards Development.

Specifically, the contractor was asked to:

- Define a standard for ATC, making maximum use of existing materials developed to date.
- Integrate the effort with ongoing work of standards development efforts in ATC API and ITS Cabinet working groups to ensure compatibility.
- Facilitate review of the draft standard by appropriate review bodies and revised as indicated in a timely manner.
- Complete all work within allotted one-year period.

4. Status of the Standard Development Process

The ITE directive to the contractor team was to develop a consensus based standard for a field-hardened, general purpose computer for embedded applications that can, with the appropriate additional software (API-defined, for the most part; see details of separate standard development effort for details) and hardware modules (including the ATC cabinet, with separate standard in development), support the variety of road tasks identified in the ATC Standards Overview (most recent version is 2.1, 8 Oct 02).

The expedited development process envisioned the use of a team of industry experts experienced and skilled in the establishment of requirements-based, environmentally-hardened, field equipment standard. The project would be broken down into seven task areas, beginning with an architecture overview of the ATC, followed by five detailed task areas, and concluding with a project management plan for the standard development process. The project management plan submitted for this effort (see Appendix II), as approved by ITE, called for a specific number of review cycles involving the ATC Working Group and the ATC Joint Committee.

Appendix II (Summary Status Sheet for the ITS ATC Controller v.5 Intelligent Transportation (ITS) Standard Specification for transportation controllers) shows clear agreement between the content and timing of actual review meetings conducted by the contractor team with those agreed to between the contractor and ITE via the project management plan for this effort.

5. Need for the ATC controller standard

As agencies seek to resolve complex transportation problems through the use of ITS, their strategy often involves the use of multiple management applications that need to be concentrated in a given area. An example of this is the typical freeway to surface street interchange where there is a need for traffic control, motorist information, ramp metering, and dynamic lane assignment applications to all be coordinated and co-located at that location. Traditional solutions have relied on the implementation of individual single-purpose control equipment for each of the management applications within the strategy. This approach has left our street corners littered with control cabinets for each of the management applications and burdened local agencies with increasing costs associated with networking these devices, maintaining each individual component, purchasing sufficient support equipment and right-of-way for said equipment. The ATC controller standard defines a common computing platform that can safely and reliably perform these functions in a coordinated manner, thereby reducing overall agency costs while enhancing overall safety and reliability.

The Advanced Transportation Controller (ATC) standard has been developed to provide an open architecture hardware platform (in conjunction with companion standards for the ATC cabinet and ATC API software interface) for a wide variety of ITS applications. In this context the words "open architecture" mean that the system will include both public and private sector developers and will allow (via the assumed API) modular software cooperatively running on standardized and shared modular hardware platforms. This will provide cost-effective ITS functionality for a wide variety of applications. To accomplish this goal, the proposed design optimizes flexibility for a variety of system configurations and installations. The general concept and model for the ATC is a field hardened, special function computer for embedded applications which, with the appropriate software and hardware modules, could be asked to perform many different duties. Among the applications anticipated for the ATC are traffic signal control, ramp control, traffic surveillance coordination, lane use signal control, field (network) master control, general ITS beacon control, lane control, and other general access control.

6. List of Committee Members

   A. Joint Committee

      ITE Appointees: Gerry DeCamp, Andy Mao, Anson Nordby, Ed Seymour, Bob Rausch, John Thai
      AASHTO Appointees: Al Bonificio, Lap Hoang, Al Kosik, Ken Montgomery, John Renfro, Martha Styer
      NEMA Appointees: Gary Duncan, Craig Gardner, Ron Johnson, Peter Kohl, Dave Miller, Siebe Turksma

   B. Working Group

      Douglas Acker, Ralph Boaz, Al Bonificio, Richard D'Alessandro, Gary Duncan, Craig Gardner, Curtis Herrick, Ron Johnson, Andy Mao, Dave Miller, Bob Rausch, John Renfro, Sean Skehan, Donald Snyder, John Thai, Minh Tran, Siebe Turksman

   C. Rapid Response Subgroup to Advise Contractor Team

      Douglas Acker, Al Bonificio, Gary Duncan, Harasmo Iniguez, Andy Mao, Paul Olsen, Richard Reeves, John Renfro, Sean Skehan, John Thai

7. Other Material of Interest

Appendix IV contains the paper “Advanced Transportation Controller Standards Overview”

8. Declaration confirming that any other known national and international standards have been examined with regard to harmonization and duplication of content, and that no significant conflicts with another known standard have been identified.

Other known national and international standards have been examined with regard to harmonization and duplication of content and there are no significant conflicts with other known standards.

9. Abstract of the Standard

Section 2 of the draft ATC Standard v.5 (see Appendix I) contains an abstract of the proposed standard.

10. Description of Alternate Processes

This standard followed the process as outlined in the contract between ITE and Siemens E&A - Gardner Transportation Systems, consistent with the Memorandum of Understanding between ITE, AASHTO, and NEMA that created the ATC Joint Committee and established procedures for subsequent standards development.

APPENDICES

I -Latest recommended draft standard ITS ATC Controller v.5 Intelligent Transportation (ITS) Standard Specification for transportation controllers

II- Summary Status Sheet for the ITS ATC Controller v.5 Intelligent Transportation (ITS) Standard Specification for transportation controllers

III – User comments

- A – memo of comments from rev. 1.05 to 2
- B – CD of contractor website documenting additional user comments

IV – Advanced Transportation Controller Standards Overview