

Final Report*
EXECUTIVE SUMMARY

Reporting Period: January 2007 – June 2009

Reference: *Executed contract - Research Project Work Order #16 -- Federal Aid Project CFDA-20.205 / Contract No. BD543, "Florida Specific NTCIP MIB Development for Actuated Signal Controller (ASC), Closed-Circuit Television (CCTV), and Center-to-Center (C2C) Communications with SunGuideSM Software and ITS Device Test Procedure Development."*

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* The complete final report is in a CD, which is also submitted.

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1. BACKGROUND

To provide hardware, software, network, systems research, and testing for multi-million dollar traffic operations, Intelligent Transportation Systems (ITS), and statewide communications investments, the Traffic Engineering and Operations Office has expanded the existing Traffic Engineering Research Laboratory (TERL) facility to include additional ITS and Statewide Communications Laboratory.

University-level advanced research support has been required to provide unbiased research and development procedures to maximize the state's return on these investments. These efforts have helped to develop statewide ITS device certification processes that can simplify ITS equipment testing, evaluation, and procurements.

The research team at TERL has provided FDOT with interactive and coordinated problem-solving testing tools that will be used to ensure quick and efficient resolution to today's complex transportation engineering and ITS device evaluation problems. Specific critical and important research issues identified by FDOT engineers and District staff have been addressed by the research team. The coordinated efforts between the TERL staff and the professionals involved in designing, operating, and maintaining ITS systems throughout the state have helped strengthen Florida's position as a leader in transportation engineering systems, and ITS.

The research team has focused on National Transportation Communications for ITS Protocol (NTCIP) research and testing across the entire life cycle of traffic operations, ITS, and statewide communications deployments. This life cycle includes design, development, operations, and maintenance. Specifically, the research efforts have provided the processes needed to allow the FDOT to test ITS software, Closed-Circuit Television (CCTV), Actuated Signal Controllers (ASC), and Center-to-Center (C2C) communications, as well as support the ongoing change management, integration, and acceptance testing of the FDOT SunGuideSM software System.

2. RESEARCH OBJECTIVES AND SUPPORTING TASKS

The principal objective of virtually all projects at TERL is to conduct and support applied research, testing, standards, and specifications development. The main research efforts of this project include the following:

- Research and develop NTCIP management information base (MIB) requirements specific to Florida, for Actuated Signal Controller (ASC), Closed-Circuit Television (CCTV), and Center to Center (C2C) communications.
- Develop a change management process for NTCIP standards, hardware, SunGuideSM Software, and manufacturer's firmware changes. This process will be provided for

FDOT Change Management Board’s consideration and vote. Research needs of Florida-specific MIB for remaining ITS devices.

- Explore the development of ASC and CCTV testing tool kits, derived from the SwRI current XML scripts that could be used to test ITS device NTCIP and SunGuide software compatibility without applying the entire SunGuide software’s network server’s setup.

3. AREAS OF WORK: 2007 - 2009

The work of this project was performed during the two-year period from 2007 to 2009. The key areas of work alongside their objectives are tabulated as follows (**Table 1**):

Table 1: Areas of work and objectives

Area of Work	Objectives
<p><i>Research and develop NTCIP management information base (MIB) requirements specific to Florida, for Actuated Signal Controller (ASC), Closed-Circuit Television (CCTV), and Center to Center (C2C) communications.</i></p>	<ol style="list-style-type: none"> 1. Identify FDOT stakeholders and collect input from stakeholders regarding Florida MIB requirements. 2. Complete the development began in the prior research phase, of the NTCIP requirements and a Florida-specific MIB, along with testing procedures for ASC NTCIP 1202. 3. Provide research necessary to maintain and update the Florida-specific MIB for Dynamic Message Signs (DMS) NTCIP 1203 v1.0 Amendment 1. 4. Provide research and development assistance during the development of the NTCIP requirements and a Florida-specific MIB, along with SunGuideSM testing procedures, for CCTV. 5. Provide research to identify NTCIP Florida Center-to-Center (C2C) XML Standards and MIB requirements.
<p><i>Develop a change management process for NTCIP standards, hardware, SunGuideSM Software, and manufacturer’s firmware changes.</i></p>	<ol style="list-style-type: none"> 1. Review of current FDOT ITS standards and specifications with respect to NTCIP conformance. 2. Test procedure development and standards updates based on the developed test methods. 3. Establishment of Quality Assurance (QA) processes for all activities related to this task.
<p><i>Explore the development of ASC and CCTV testing tool kits, derived from the SwRI current XML scripts.</i></p>	<ol style="list-style-type: none"> 1. Identify tools that could be used to test ITS device NTCIP and SunGuide software compatibility without applying the entire SunGuide software’s network server’s setup.

4. RESULTS AND PRODUCTS

All the results and products of this research project conducted during in the two-year period, 2007 – 2009, are compiled and stored in the accompanying compact disc (CD). The summary of result and products is presented in **Table 2**.

Table 2: Results and products

Area of Work	Results and Products
<p><i>Research and develop NTCIP management information base (MIB) requirements specific to Florida, for Actuated Signal Controller (ASC), Closed-Circuit Television (CCTV), and Center to Center (C2C) communications.</i></p>	<ul style="list-style-type: none"> • A draft Florida-Specific NTCIP MIB for CCTV Camera. • A paper and presentation titled “NEWLY DEVELOPED CCTV NTCIP TESTING PROCEDURES AT FDOT” by Leonard Tung at the 15th World Congress on ITS in November, 2008. • An Alternative NTCIP Testing Software (ANTS) using the scripting language Python. • A paper and presentation titled “SOFTWARE DEVELOPMENT FOR TESTING NTCIP DEVICES AT THE FLORIDA DEPARTMENT OF TRANSPORTATION TRAFFIC ENGINEERING RESEARCH LAB” by Leonard Tung at the Transpo 2008. • A draft FDOT ASC MIB and NTCIP Requirements. • A paper and presentation titled “INITIAL NTCIP TESTING FOR THE ASC AT FDOT” by Leonard Tung at the 15th World Congress on ITS in November, 2008. • A thesis titled “Testing of Actuated Signal Controllers for NTCIP Compliance” by Derek Vollmer.
<p><i>Develop a change management process for NTCIP standards, hardware, SunGuideSM Software, and manufacturer’s firmware changes.</i></p>	<ul style="list-style-type: none"> • Exerciser macros for the FDOT NTCIP-compliance testing of CCTV. • The FDOT NTCIP Testing Procedure for CCTV. • The FDOT NTCIP Testing Procedure for ASC with twenty-two test cases based on the functionalities of ASC.
<p><i>Explore the development of ASC and CCTV testing tool kits, derived from the SwRI current XML scripts.</i></p>	<ul style="list-style-type: none"> • Due to the fact that SunGuide software is in the early stage of deployment in the state of Florida and is required to be NTCIP compliant itself, it is recommended not to use the software as a part of testing tool for NTCIP compliance testing.

Notes:

1. The CCTV NTCIP MIB development at TERL is based on two sets of standards:
 - NTCIP 1205 v0108 Amendment A “National Transportation Communications for ITS Protocol Object Definitions for Closed Circuit Television (CCTV) Camera Control”
 - Section 782: Intelligent Transportation Systems Video Requirement of the “Workbook of Implemented Modifications to the Standard Specifications for Road and Bridge Construction” by FDOT Specifications Office.
2. The CCTV NTCIP MIB development at TERL is based on two sets of standards:
 - NTCIP 1202 v0219 – Object Definitions for Actuated Traffic Signal Controller Units.

- FDOT Minimum Specifications for Traffic Control Signal Devices July 2000.
- 3. The FDOT NTCIP Testing Procedure for ASC conforms to the NTCIP 8007 - Testing and CA Documentation within NTCIP Standards.