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Caltrans Division of Research, Innovation and System Information

Research Notes

Modernization of Center-to-Center (C2C) Data Communication Standards

Review the current Traffic Management Data Dictionary and National Transportation Communications for ITS Protocol standards and recommend modernization for these standards.

Transportation Safety and Mobility

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Project Title:
Traffic Management Center - Communications

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WHAT IS THE NEED?

The current Center-to-Center (C2C) data communications are based on National Transportation Communications for ITS (Intelligent Transportation Systems) Protocol (NTCIP) (2304 and 2306) and Traffic Management Data Dictionary (TMDD) 3.0x data standards. These standards are based upon Simple Object Access Protocol (SOAP) web services, a method of communication first developed in 1998 and introduced as a World Wide Web Consortium specification in 2003. The latest proposed standard for TMDD, version 3.04 continues to use SOAP-based web services as its sole communication mechanism.

Future uses of C2C communications will demand high speed, high volume communication methods. The California Connected Corridors program's need for real-time intersection signal status and detection information over a relatively small regional area (approximately 15 miles by 2 miles) is testing the limits of the SOAP-based technology.

Larger corridors, and the implementation of multiple corridors within a California Department of Transportation district, will require a more modern set of communication technologies. In addition, as future traffic management center systems' need for new sources of data increases, such as the additional vehicle-to-infrastructure-related data, the ability to manage data at higher throughput and speed will become even more critical. The SOAP-based web services' high verbosity and need for Extensible Markup Language parsing limit both its speed and throughput, and adversely impact today's modern traffic management center capabilities.

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WHAT ARE WE DOING?

The objectives of the project will include a review of the current TMDD standard, the current state-of-the-art software and systems capabilities for high speed and volume communications, and current and future transportation center requirements.

The research team will conduct a gap analysis, and recommend a set of changes to the TMDD specification (and NTCIP specifications, if required). A reference implementation that provides example software using the recommended changes will be provided as well.

WHAT IS OUR GOAL?

The goal of this project is to provide a specification proposal for the modernization of the TMDD and NTCIP specifications, including:

1. Use of more modern data transmission protocols suitable for high speed, high throughput data requirements
2. Alignment of the specification with up-to-date standards of compatibility with existing software development methods, frameworks, and tools.
3. Selection of transmission methods and protocols suitable to projects needs and budget
4. Updates include methods suitable for modern infrastructure environments and cloud-based and hybrid infrastructures.
5. Inclusion of security standards and protocols specific to the communication methods selected.
6. A reference implementation of the communication standard proposal.

WHAT IS THE BENEFIT?

The research results will provide public agencies with useful information to assess the existing TMDD and NTCIP standards, and plan for any upgrades needed to for modernization of C2C data communication.

WHAT IS THE PROGRESS TO DATE?

The project has been kicked off as of 1/27/2020. The kickoff was an in-person meeting with the Principle Investigator and the customers from Traffic Operations.

The first deliverable for this project is expected by 7/31/2020.

Review of the current TMDD standards, communication protocols and other industry standards referenced within TMDD is also in progress.