



U.S. Department of  
Transportation



## Intelligent Transportation Systems Standards Fact Sheet

### AASHTO/ITE/NEMA TS 3.1

October 1999

## National Transportation Communications for ITS Protocol (NTCIP) Overview

Note: The NTCIP Guide (NTCIP 9001) has superseded TS 3.1-NTCIP Overview

### Overview

NTCIP is a family of standards that provides both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. The NTCIP is the first set of standards for the transportation industry that allows traffic control systems to be built using a “mix and match” approach with equipment from different manufacturers. Therefore, NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software. To assure both manufacturer and user community support, NTCIP is a joint product of the National Electronics Manufacturers Association (NEMA), the American Association of State Highway and Transportation Officials (AASHTO) and the Institute of Transportation Engineers (ITE).

To obtain a copy of this standard,  
please contact:

**National Electrical Manufacturers  
Association (NEMA)**

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Human communications—the exchange of ideas and information—relies on rules of etiquette to enable the members of a conversation group to communicate in an orderly manner. Computer communication—the exchange of data and information—relies on a similar set of rules called “protocols” that allow computers to exchange information. Just as different rules of etiquette apply to small and large groups and differing communications media, the NTCIP establishes sets of differing protocols suited to specific network communications needs.

Human communication also relies on a vocabulary of words, each defined with a fixed meaning and spelling and each understood by the members of the conversation group. Computers have a similar vocabulary, called “objects” in the NTCIP standards. These objects define all possible commands, responses and information that may be exchanged among microprocessor-controlled electronic equipment, a central computer, and, by extension, their human operators. The NTCIP groups these objects by subject material (e.g., traffic signal controller) and calls these groupings “object definitions.”

### What is this standard for?

This standard, **NEMA/AASHTO/ITE TS 3.1, NTCIP Overview**, provides an introduction to the NTCIP family of standards and an overview as to how the various protocols and object definitions are used. Using this standard, one may select the communications protocol best suited to meet the needs of either an existing traffic control network or a network developed to handle the specific traffic control needs for a municipality or region.

Historically, there have been no information transfer standards used by the various manufacturers of traffic control and signaling equipment. When equipment, especially microprocessor-controlled equipment, and systems from different manufacturers are integrated into a centrally controlled system, the communications protocol, commands and responses, and sensor data may be different for each item and may be manufacturer-specific. The lack of standardization made it difficult for users to combine equipment from different manufacturers into a system, resulting in higher costs. However, because NTCIP establishes national standards for communications protocols and information objects, it allows traffic control equipment from multiple vendors to interoperate. It meets existing traffic control functional requirements, supports traffic management communications, and lends itself to future, not-yet-defined traffic applications for ITS. NTCIP embraces features of existing worldwide and U.S. national interconnectivity standards on how information is passed in open systems. The NTCIP standards provide the mechanisms to exchange information between traffic control and other ITS devices.

In October of 1999, the NTCIP Guide (NTCIP 9001) was issued in draft form. The guide is a newer and more complete document than the Overview and contains additional information about the NTCIP family of standards.

For more information on ITS standards, contact the Federal Highway Administration, ITS Joint Program Office, Room 3401, HOIT, 400 7<sup>th</sup> Street, SW, Washington, DC 20590, phone: 202-366-2180, fax: 202-366-3302, Web site: [www.its.dot.gov/standard/standard.htm](http://www.its.dot.gov/standard/standard.htm)

Produced by the Jet Propulsion Laboratory for the U.S. Department of Transportation.

## Who uses it?

This standard is intended for traffic managers, traffic engineers and communications engineers involved in the specification, selection, procurement, installation, operation or maintenance of electronic traffic control equipment including sensors, signals, dynamic message signs, etc.

## How is it used?

This standard is used as an overview to the NTCIP family of standards. It serves as a foundation to understand and use related, more detailed standards in the NTCIP family. It describes “communications profiles” for standardized conceptual modeling of communications interfaces based on international communications standards. It describes “object definitions” for particular roadside devices, traffic signal controllers and dynamic message signs. It is also used to select additional standards from the NTCIP family that will be needed to address specific functional needs of a particular traffic management system.

## Scope

This standard encompasses device control, data collection, data routing and file transfer services using various communications system topologies. To accomplish this, the NTCIP standards define the following:

- a. The physical interconnection between ITS components;
- b. The protocol and procedures for establishing communications between ITS components;
- c. The procedures to define and register common sets of manageable objects related to controlling and managing ITS components; and
- d. The device control and status variables required by the various transportation-related devices to attain device interoperability.

## Related Documents

To accommodate the broad scope of this standardization effort, the NTCIP family of standards consists of a variety of communications standards and object definitions. At present, the following standards are defined or proposed:

### a. Background

**1. NEMA/AASHTO/ITE TS 3.1-NTCIP Overview now superseded by NTCIP 9001-NTCIP Guide) [this standard]EMA/AASHTO/ITE**

### b. Communications Standards

1. [NTCIP Base Standard for Simple Transportation Management Framework \(STMF\) \(NTCIP 1101, formerly NEMA TS 3.2-1996\)](#)
2. [NTCIP Class B Profile \(NTCIP 2001, formerly NEMA TS 3.3-1996\)](#)
3. [NTCIP Class A and Class C Profiles \(NTCIP 2002\)](#)
4. [NTCIP Framework and Classification of Profiles \(NTCIP 8003\)](#)
5. [NTCIP Application Profile - Common Object Reference Broker Architecture \(CORBA\) \(NTCIP 2305\)](#)
6. [NTCIP Application Profile - Data Exchange-ASN.1 \(DATEX\) \(NTCIP 2304\)](#)
7. [NTCIP Simple Transportation Management Framework - Application Profile \(NTCIP 2301\)](#)
8. [NTCIP File Transport Protocol - Application Profile \(NTCIP 2303\)](#)
9. [NTCIP Trivial File Transfer Protocol - Application Profile \(NTCIP 2302\)](#)
10. [NTCIP Internet \(UDP/IP and TCP/IP\) Protocols - Transport Profile \(NTCIP 2202\)](#)
11. [NTCIP Null Transport - Transport Profile \(NTCIP 2201\)](#)
12. [NTCIP Point-to-Multi-Point Protocol using RS 232 - Subnetwork Profile \(NTCIP 2103\)](#)
13. [NTCIP Point-to-Multi-Point Protocol using FSK Modems - Subnetwork Profile \(NTCIP 2102\)](#)
14. [NTCIP Ethernet - Subnetwork Profile \(NTCIP 2104\)](#)
15. [NTCIP Base Standard for Octet Encoding Rules \(NTCIP 1102\)](#)
16. [NTCIP Technical Report on Assigned Numbers - Part 1 Identifiers \(NTCIP 7001\)](#)
17. [NTCIP Technical Report on Assigned Numbers - Part 2 IP Addresses \(NTCIP 7002\)](#)

### c. Device Object Definitions

1. [NTCIP Global Object \(GO\) Definitions \(NTCIP 1201, formerly NEMA TS 3.4-1996\)](#)
2. [NTCIP Objects for Actuated Signal Controller \(NTCIP 1202, formerly NEMA TS 3.5-1996\)](#)
3. [NTCIP Objects for Dynamic Message Signs \(NTCIP 1203, formerly NEMA TS 3.6-1997\)](#)
4. [NTCIP Objects for Environmental System Sensors \(NTCIP 1204, formerly NEMA TS 3.7-1998\)](#)
5. [NTCIP Objects for Closed Circuit Television Control \(NTCIP 1205\)](#)
6. [NTCIP Objects for Ramp Meter Control \(RMC\) \(NTCIP 1207\)](#)
7. [NTCIP Objects for Data Collection Management \(DCM\) \(NTCIP 1206\)](#)
8. [NTCIP Objects for Transportation System Sensor \(NTCIP 1209\)](#)