NTCIP 2103 v02

National Transportation Communications for ITS Protocol

Point-to-Point Protocol over RS-232 Subnetwork Profile

A Joint Standard of AASHTO, ITE, and NEMA

version 02.07

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FOREWORD

NTCIP 2103 v02, a standards publication, is also an NTCIP Subnetwork Profile. Subnetwork Profiles provide the rules and procedures for exchanging data over a single physical communications link by referring to one or more base standards. NTCIP 2103 v02 uses only metric units.

NTCIP 2103 v02 defines the rules and procedures for using the point-to-point protocol over RS-232 like circuits. NTCIP 2103 v02 defines requirements that are applicable to all NTCIP devices that exchange data over this type of communications circuit. NTCiP 2103 v02 also contains optional and conditional clauses that are applicable to specific environments for which they are intended.

There are three normative and three informative annexes in this document.

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Approvals

This standards publication was separately balloted and approved by AASHTO, ITE, and NEMA after recommendation by the Joint Committee on the NTCIP. Each organization has approved this standard as the following standard type, as of the date:

AASHTO—Standard Specification; May 2006
ITE—Software Standard; August 2006
NEMA—Standard; April 2006

History

In 1996, an agreement was executed among AASHTO, ITE, and NEMA to jointly develop, approve, and maintain the NTCIP standards. In August 1997, the Joint Committee on the NTCIP formed a new working group to develop communications profiles that were more modular in order to meet the varied needs of different communication environments. The Profiles WG first met in September 1997.

The first task of the NTCIP Profiles Working Group was to develop the overall structure of profiles. After research into how national and international standards organizations combine protocols and standards to address all seven layer of the OSI Basic Reference Model, the committee adopted the approach defined in NTCIP 8003. Following that approach, a protocol stack is specified by Information, Application, Transport, and Subnet profiles. An Information Profile defines the data that an end system is required to support. An Application Profile addresses the Application, Presentation, and Session Layers of the OSI Basic Reference Model. A Transport Profile addresses the Transport and Network Layers. A Subnet Profile addresses the Data Link and Physical Layers.

Once the rules for defining profiles were established, work began on a series of profiles for different environments, in order of their assigned priority by the NTCIP Joint Committee. Work on the *Subnet Profile for the Point-to-Point Protocol over RS-232* (SP-PPP) began in June 1998. NTCIP 2103 v02 was previously referenced as TS 3.SP-PPP. However, in order to provide a more organized numbering scheme, NTCIP 2103 v02 is now the reference.

NTCIP 2103 v01.05. November 1999—Accepted as a User Comment Draft by the Joint Committee on the NTCIP. April 2000—NTCIP Standards Bulletin B0050 sent NTCIP 2103 to AASHTO, ITE, and NEMA for comment.

NTCIP 2103 v01.13. September 2001—Version 01.12 was accepted as a Recommended Standard by the Joint Committee on the NTCIP. February 2002—NTCIP Standards Bulletin B0069 sent version 01.13 to AASHTO, ITE, and NEMA for ballot.

NTCIP 2103 v01 to v02. The BSP2 WG drafted a major version revision, which included:

Subclause 1.3.1 Normative References
ANSI 574, RFC 1317, and the ITU-T standards V.90, V92, and V.250 were added.

Subclause 1.3.2 Other References
Several internet references regarding modems were added.

Clause 2.2 Multilink Operations
A reference to the configuration of type 22 was deleted.

Subclause 2.2.7 Modem Configuration and Control Protocol; subclause was added.

Clause 2.3 Physical Layer Requirements and following subclauses
Significant information related to modems was added.
Miscellaneous tables were reformatted.

Annex A PRL
Significant information related to modems was added.
RS232 Asynchronous and Interfaces Object Group were added.

Annex B PPP MIB; Header was added.

Annex D Modem MIB; MIB was added.

Annex F Typical Modem Dialogs; Dialogs were added.

NTCIP 2103 v02.04. January 2005—Accepted as a User Comment Draft by the Joint Committee on the NTCIP. June 2005—NTCIP Standards Bulletin B0102 sent NTCIP 2103 to AASHTO, ITE, and NEMA for comment.

NTCIP 2103 v02.06. December 2005—Accepted as a Recommended Standard by the Joint Committee on the NTCIP. January 2006—after editing front matter and v01-to-v02 changes, NTCIP Standards Bulletin B0110 referred v02.06b for balloting.

NTCIP 2103 v02.07. December 2008—Prepared standard for publication; edited format, front matter, and style.

Compatibility of Versions

To distinguish NTCIP 2103 v02 (as published) from previous drafts, NTCIP 2103 v02 also includes NTCIP 2103 v02.07 on each page header. All NTCIP Standards Publications have a major and minor version number for configuration management. The version number syntax is "v00.00a," with the major version number before the period, and the minor version number and edition letter (if any) after the period.

NTCIP 2103 v02 is designated, and should be cited as, NTCIP 2103 v02. Anyone using NTCIP 2103 v02 should seek information about the version number that is of interest to them in any given circumstance. The MIB, the PRL, and the PICS should all reference the version number of the standards publication that was the source of the excerpted material.

Compliant systems based on later, or higher, version numbers MAY NOT be compatible with compliant systems based on earlier, or lower, version numbers. Anyone using NTCIP 2103 v02 should also consult NTCIP 8004 v01 for specific guidelines on compatibility.

INTRODUCTION

NTCIP 2103 v02 defines a subnetwork profile that is a combination of standards intended to meet specific requirements for data transfers to and from processors in direct-connect or circuit-switched environments. The purpose of NTCIP 2103 v02 is to provide the information necessary to establish a connection using the Point-to-Point Protocol (PPP) via an RS-232 interface and/or a dial-up modem. This profile is a subnetwork specification and uses protocols and standards to address the Physical and Data Link Layers (i.e., Layers 1 and 2 of the OSI Basic Reference Model). NTCIP 2103 v02 can be used in combination with a variety of upper layer protocols. NTCIP 2103 v02 is a subnet profile for use in center-to-roadside and center-to-center communications.

NTCIP 2103 v02 contains mandatory requirement statements that are applicable to all devices claiming conformance to NTCIP 2103 v02. It also contains options and conditional requirements, which may be applicable to a specific environment in which a device is used.

The following keywords apply to NTCIP 2103: AASHTO, Dial-up, ITE, NEMA, NTCIP, PPP, Point-to-Point, RS-232, Subnetwork Profile.

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Section 1
GENERAL

1.1 SCOPE

NTCIP 2103 v02 is applicable to transportation related devices that operate in a point-to-point configuration where exactly two devices (called peers) are connected by a logical Physical Layer communications link. As a subnetwork profile, NTCIP 2103 v02 specifies a set of protocols and standards applicable to the Data Link and Physical layers of the Open Systems Interconnect (OSI) Basic Reference Model. The Subnet Profile for the Point-to-Point Protocol over RS-232 is intended to provide an interoperability standard for the Physical and Data Link Layer aspects of communications in transportation related devices for dialed-up circuits.

The protocol stack described in NTCIP 2103 v02 is appropriate for the reliable exchange of data between processing equipment on switched data networks. The primary feature of this profile is reliable data transfer with security between directly connected devices.

1.2 SCENARIO

The OSI Basic Reference Model defines seven layers within a communications stack, each performing a particular role in the transmission of data over a medium. Communication standards typically relate to one or more portions of the OSI Model.

NTCIP 8003 defines how to combine base standards to produce a variety of *profile* standards. Profile standards reference base standards and may restrict options within the base standards in order to encourage the development of fully compatible implementations. NTCIP 2103 v02 is a Subnet Profile, which is defined to be a combination of standards specifying the requirements for the first two layers of the OSI Basic Reference Model.

The first layer, the Physical Layer, deals with how the bits of information are transmitted over a communications channel. This layer deals with the mechanical and electrical interfaces, and the physical transmission medium.

The second layer, the Data Link Layer, has the task of transforming the information that came in over the wire into data that appears to be free of transmission errors. This layer should incorporate mechanisms to ensure the integrity of the data and provide a method of ensuring that no data is lost.

This subnet profile is based on the Point-to-Point Protocol over an RS-232 or dial-up modem link. The profile provides a peer-to-peer relationship between the connected devices. The profile requires full-duplex circuits and is independent of the bit rate of the circuit. Subnet profiles do not address higher layer functionality such as routing, segmentation, and re-transmission of data packets, nor are they concerned with the application(s) residing in the device.

This Subnet Profile provides a mechanism to identify higher layer protocols by means of the PPP Protocol Field. This provides a mechanism to permit “multiplexing” messages generated by multiple protocols using a single communications link. The values for the Protocol Field are assigned internationally by the Internet Assigned Numbers Authority (IANA, www.iana.org).

The layers, base standards, and profile taxonomy that make up this profile are shown in Figure 1. The Data Link Layer is defined by a variety of standards specifying various sub-layer components.