

NTCIP 2104:2003

National Transportation Communications for ITS Protocol

Ethernet Subnetwork Profile

Joint Standard of AASHTO, ITE, and NEMA

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National Transportation Communications for ITS Protocol Ethernet Subnetwork Profile

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Institute of Transportation Engineers (ITE)
1099 14th Street, N.W., Suite 300 West
Washington, D.C. 20005-3438

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, Virginia 22209-3806

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At the time that this document was prepared, the following individuals were members of the NTCIP Profiles Working Group:

- Jas Bhullar
- Robert De Roche (Chair)
- Robert Force
- Willard "Bud" Kent
- Amit Misra
- Alex Mousadi
- Brian Paulsmeyer
- Joerg "Nu" Rosenbohm
- Kenneth Vaughn
- Hoi Wong

Other individuals providing input to the document include:

- Robert Barrett
- Joey Baumgartner
- Albert Bonificio
- Thomas Bryer
- Blake Christie
- Ken Earnest
- Arthur Felgate
- Michael Forbis
- Joesph Herr
- Earl Hoekman
- David Kingery
- Tom Kurihara
- Gary Meredith
- Bon Ninke
- Dale Peabody
- Jeff Racz
- Michael Robinson
- James Rose
- Bancroft Scott
- Bo Strickland
- Sonja Sun
- Paul Thorpe
- Gary Workman

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FOREWORD

This document uses only metric units.

This publication defines a subnetwork profile that is a combination of standards intended to meet specific requirements for subnetwork services in transportation devices and management centers in a networked environment. Its scope covers the data link and physical layers of the Open System Interconnect (OSI) Reference Model. The scope also references network layer interface requirements. It contains mandatory requirement statements that are applicable to all devices claiming conformance to this standard. It also contains optional and conditional requirements that may be applicable to a specific environment in which a device is used.

The text includes mandatory requirements in Annex A that are defined as normative.

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NTCIP Coordinator
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, Virginia 22209-3806
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e-mail: ntcip@nema.org

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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:

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INTRODUCTION

This publication defines a subnetwork profile that is a combination of standards intended to meet specific requirements for data transfers to and from roadside devices in either a networked or direct-connect environment. The objective is to facilitate the specification of ITS characterized by a high degree of interoperability and interchangeability of its components.

This standard defines a subnetwork profile that provides connection-oriented, acknowledged connectionless, and unacknowledged connectionless data link service. At the physical layer, it provides specifications for peer-to-peer access over coaxial cable, twisted pair wire, or fiber-optic medium. It is based upon the ISO/IEC 8802-2 and 8802-3 Standards.

Annex A is normative and contains a Profile Requirements List in the form of PICS proforma.

The following keywords apply to this document: AASHTO, ITE, NEMA, NTCIP, Profile, Subnetwork, Ethernet.

In 1992, the NEMA 3-TS Transportation Management Systems and Associated Control Devices Section began the effort to develop the NTCIP. Under the guidance of the Federal Highway Administration's NTCIP Steering Group, the NEMA effort was expanded to include the development of communications standards for all transportation field devices that could be used in an ITS network.

In September 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 a method for organizing class profiles. The Profiles WG first met in September 1997.

After research into how national and international standards organizations combine protocols and standards to address all seven layers of the OSI Basic Reference Model, the committee adopted the approach defined in the *NTCIP Profile Framework*. Following that approach, a complete protocol stack was specified by application, transport, and subnetwork profiles. An application profile addresses the application, presentation, and session layers. A transport profile addresses the transport and network layers. A subnetwork profile addresses the data link and physical layers. The *NTCIP - Ethernet Subnetwork Profile* is a subnetwork profile for use in center-to-field communications.

The Profiles Working Group is concerned with the methodology of defining profiles, and the definition and documentation of profiles in standards publications. This document is intended to provide a complete subnetwork profile (SP) that specifies the communications over an ISO/IEC 8802 "IEEE 802" type network. This subnetwork profile can be used with different transport profiles addressing the network and transport layer requirements. The objective is to facilitate the specification of ITS systems characterized by a high degree of interoperability and interchangeability of its components.

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Section 1 GENERAL

1.1 SCOPE

This standard is applicable to transportation devices and management systems that must operate in Intelligent Transportation Systems. It specifies a set of protocols and standards applicable to the data link and physical layers of the OSI Basic Reference Model. It specifies a combination of ISO/IEC Standards that collectively provide for connectionless and connection-oriented data link services on a common, shared media. Access to the media is through a process referred to as carrier sense multiple access with collision avoidance detection (CSMA/CD). It also defines the interface to and specification of the shared media.

Networks based upon this technique are often, but mistakenly, referred to as Ethernet-based Networks. This standard deals with IEEE 802 Networks that have additional functionality. Although similar to Ethernet based Networks, IEEE 802 Networks are distinguished by inclusion of Logical Link Control (LLC) and Media Access Control (MAC) layers.

1.2 PROFILE-PROTOCOL-LAYER RELATIONSHIPS

This subnetwork profile specifies the provisions for a connectionless and connection-oriented data link service and the physical interface between an end system and other compatible end systems. It has specific reference when these services are used through the Internet Protocol connectionless network service. The interoperable end system must use the same access methods contained within this Subnetwork Profile. An end system is compatible only if the sub-options (e.g., 10Base2) are compatible. A complete subnetwork profile requires knowledge of the subnetwork type, access method, circuit type, and service type. This profile deals primarily with subnetwork independent requirements that are independent of any transport profile. However, specific requirement related to interfacing specific transport profiles are presented. The layers, base standards, and profile taxonomy that make up this profile are shown in Figure 1-1.

ISO Layers	Base Standards		Profile
NETWORK LAYER (Interface)	IAB STD 3 (Internet Hosts) IAB STD 43 (IP over IEEE 802)		SP-Ethernet Subnetwork Profile
DATA LINK LAYER	LLC (ISO 8802-2)	IAB STD 50 (Ethernet-like MIB)	
	MAC (ISO 8802-3)		
PHYSICAL LAYER	PLS, AUI, MAU (ISO 8802-3)		

Figure 1-1
SP-Ethernet - Subnetwork Profile Relationship