NTCIP 2302:2001 v01.06

National Transportation Communications for ITS Protocol

Trivial File Transfer Protocol Application Profile

December 2001

This Adobe® PDF copy of an NTCIP standard is available at no-cost for a limited time through support from the U.S. DOT / Federal Highway Administration, whose assistance is gratefully acknowledged.

ACKNOWLEDGEMENTS

- Texas DOT
- Vanasse, Hagen & Brustlin, Inc.
- Washington State DOT

© 2001 AASHTO / ITE / NEMA

FOREWORD

This document uses only metric units.

This publication defines an application class profile that is a combination of standards intended to meet specific requirements for a simple block or file transfer mechanism to and from roadside devices in a networked environment. Its scope covers the application, presentation and session layers of the OSI Reference Model. 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.

For more information about NTCIP standards, visit the NTCIP Web Site at http://www.ntcip.org. For a hardcopy summary of NTCIP information, contact the NTCIP Coordinator at the address below.

In preparation of this NTCIP document, input of users and other interested parties was sought and evaluated. Inquires, comments, and proposed or recommended revisions should be submitted to:

> NTCIP Coordinator
> **National Electrical Manufacturers Association**
> 1300 North 17th Street, Suite 1847
> Rosslyn, VA 22209-3801
> fax: (703) 841-3331
> e-mail: ntcip@nema.org

Approvals

This document 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 2000
> ITE – Software Standard; May 2001
> NEMA – Standard; January 2001

History

From 1998 to 1999, this document was referenced as TS 3.TFTP. However, to provide an organized numbering scheme for the NTCIP documents, this document is now referenced as NTCIP 2302. The technical specifications of NTCIP 2302 are identical to the former reference, except as noted in the development history below:

> TS 3.TFTP v98.01.04. March 1998 – Accepted as a User Comment Draft by the Joint Committee on the NTCIP. July 1998 – NTCIP Standards Bulletin B0014 referred document for comment.

> NTCIP 2302 v99.01.05. July 1999 – Accepted v99.01.04 as a Recommended Standard by the Joint Committee on the NTCIP. January 2000 – NTCIP Standards Bulletin B0045 referred v99.01.05 with typographic corrections for approval. Approved by AASHTO in May 2000, approved by ITE in May 2001, and approved by NEMA in January 2001.

> NTCIP 2302:2001 v01.06. December 2001 – Reformatted for printing: incremented version number and updated date; modified and reorganized front matter to conform to NTCIP 8002; and

updated headers, footers, and page numbers. All references to TS 3 Standard designations were changed to equivalent NTCIP Standard designations.

© 2001 AASHTO / ITE / NEMA

INTRODUCTION

The context of the NTCIP is one part of the Intelligent Transportation Systems standardization activities covering base standards, profiles, and registration mechanisms.

- Base Standards define procedures and rules for providing the fundamental operations associated with communications and information that is exchanged over fixed-point communications links.

- Profiles define subsets or combinations of base standards used to provide specific functions or services. Profiles prescribe particular subsets or options available in base standards necessary for accomplishing a particular function or service. This provides a basis for the development of uniform, nationally recognized conformance.

- Registration Mechanisms provide a means to specify and uniquely identify detailed parameters within the framework of base standards and/or profiles.

The Profiles Working Group is concerned with the methodology of defining profiles, and their documentation in Standards Publications. This standard defines an application profile for block or file transfers to and from roadside devices. The objective is to facilitate the specification of ITS systems characterized by a high degree of interoperability and interchangeability of its components.

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 layer of the ISO-OSI Reference Model, the committee adopted the approach defined in the *NTCIP Profile Framework.* Following that approach, a protocol stack is specified by application, transport, 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 Trivial File Transfer Protocol – Application Profile* (AP-TFTP) is an application profile for use in center-to-roadside and center-to-center communications.

If you are not willing to abide by the following notices, return these materials immediately.

<div align="center">
Joint AASHTO, ITE, and NEMA
NTCIP Profile Requirements List
REPRODUCTION NOTICE
</div>

AASHTO / ITE / NEMA extend permission to the purchaser of this standards publication to make and/or distribute unlimited copies (including derivative works, which will then be known as PICS) of the excerpt identified as the Profile Requirements List, including copies for commercial distribution, provided that each copy made or distributed contains the notice "Based on an NTCIP Profile Requirements List. Used by permission of AASHTO / ITE / NEMA."

Disclaimer

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

AASHTO, ITE, and NEMA standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While AASHTO, ITE, and NEMA administer the process and establish rules to promote fairness in the development of consensus, they do not write the document and they do not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in their standards and guideline publications.

AASHTO, ITE, and NEMA disclaim liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. AASHTO, ITE, and NEMA disclaim and make no guaranty or warranty, express or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. AASHTO, ITE, and NEMA do not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, AASHTO, ITE, and NEMA are not undertaking to render professional or other services for or on behalf of any person or entity, nor are AASHTO, ITE, and NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

AASHTO, ITE, and NEMA have no power, nor do they undertake to police or enforce compliance with the contents of this document. AASHTO, ITE, and NEMA do not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety–related information in this document shall not be attributable to AASHTO, ITE, or NEMA and is solely the responsibility of the certifier or maker of the statement.

NTCIP is a trademark of AASHTO / ITE / NEMA.

CONTENTS

<This page is intentionally left blank>

Section 1
GENERAL

1.1   SCOPE

This standard is applicable to traffic control and transportation related devices that must operate in an Intelligent Transportation System. As an NTCIP application profile, it specifies a set of protocols and standards applicable to the application, presentation, and session layers of the ISO - OSI Reference Model. This standard is intended to provide a simple block or file transfer service between roadside devices and management stations over a connectionless transport service.

1.2   PROFILE-PROTOCOL-LAYER RELATIONSHIPS

This application profile specifies the provisions for the Trivial File Transfer Protocol. This profile provides connectionless file transfer services. The layers, base standards, and profile taxonomy that make up this profile are shown in Figure 1-1.

ISO Layers	Base Standard	Profile
APPLICATION LAYER	IAB STD 33 (TFTP) IAB STD 3 (Internet Hosts)	TFTP – Application Profile
PRESENTATION LAYER		
SESSION LAYER		

Figure 1-1
TFTP - Application Profile Relationship

1.3   REFERENCES

For approved revisions, contact:

NTCIP Coordinator
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209-3801
fax: (703) 841-3331
e-mail: ntcip@nema.org

For draft revisions of this document, which are under discussion by the relevant NTCIP Working Group, and recommended revisions of the NTCIP Joint Committee, visit the World Wide Web at http://www.ntcip.org.

The following standards (normative references) contain provisions, which through reference in this text, constitute provisions of this Standard. Other documents and standards (other references) are referenced in these documents, which might provide a complete understanding of the structure and use of profiles. At the time of publication, the editions indicated were valid. All standards are subject to revision, and

parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

1.3.1   Normative References

Internet Activities Board
available via electronic file transfer
use anonymous FTP from
nic.ddn.mil or ds.internic.net

IAB STD 3   *(RFC 1122: 1989, Requirements For Internet Hosts - Communication Layers, RFC 1123: 1989, Requirements For Internet Hosts - Application and Support)*

IAB STD 33   (*RFC 1350:1992, The TFTP Protocol (Revision 2)*

1.3.2   Other References

Guide to Open System Specifications, European Workshop for Open Systems, http://www.ewos.be/goss/top.htm, June 9, 1997

US-DOD Internet Related Standardized Profiles, DISA Internet Librarian, http://www-library.itsi.disa.mil/org/mil_std.html, October 31, 1997

American Association of State Highway and Transportation Officials (AASHTO)
444 North Capitol Street, N.W., Suite 249
Washington, D.C. 20001

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

National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209-3801

NTCIP 8003:2001   *NATIONAL TRANSPORTATION COMMUNICATIONS FOR ITS PROTOCOL Profile Framework*

1.4   DEFINITIONS

For the purposes of this standard, the following definitions apply:

Application Layer: That portion of the OSI Reference Model (Layer 7) that provides access to the communications services.

data: Information before it is interpreted.

Data Link Layer: That portion of the OSI Reference Model (Layer 2) responsible for flow control, framing, synchronization, and error control over a communications link.

datagram: A self-contained unit of data transmitted independently of other datagrams.

end-application: A process or program using the communications stack.

end system: The source or destination of an information exchange.

host: (Internet usage) The physical and/or logical part of the end-system's application. A computer attached to one or more networks that supports users and runs application programs.

Intelligent Transportation Systems: A major national initiative to apply information, communication and control technologies in order to improve the efficiency of surface transportation.

intermediate system: A system that participates in an information exchange but is not the source or destination of the exchange.

Internet: A large collection of connected networks, primarily in the United States, running the Internet suite of protocols. Sometimes referred to as the *DARPA Internet, NSF/DARPA, Internet*, or the *Federal Research Internet.*

Internet protocol: The network protocol offering a connectionless mode network service in the Internet suite of protocols.

Internet suite of protocols: A collection of computer-communication protocols originally developed under DARPA sponsorship.

internetwork: The ability of devices to communicate across multiple networks.

netascii: This is ASCII as defined in USA Standard Code for Information Interchange with modifications specified in the Telnet Protocol Specification (See RFC 1350 Section 1).

network: A collection of subnetworks connected by intermediate systems and populated by end systems.

Network Layer: That portion of an OSI Reference Model (Layer 3) responsible for data transfer across the network, independent of both the media comprising the underlying subnetworks and the topology of those subnetworks.

Open Systems Interconnection: An international effort to facilitate communications among computers of different manufacture and technology.

OSI Reference Model: A widely accepted structuring technique that provides an abstract representation of the communication process that is divided into seven basic, functional layers.

Physical Layer: That portion of an OSI Reference Model (Layer 1) responsible for the electrical and mechanical interface between communicating systems.

Presentation Layer: That portion of an OSI Reference Model (Layer 6) responsible for converting and organizing data from one format to another.

proforma: A guide provided in advance to prescribe form or describe items.

Session Layer: That portion of an OSI Reference Model (Layer 5) which manages a series of data exchanges between end-system applications.

subnetwork: A physical network within a network. All devices on a subnetwork share a common physical medium.

taxonomy: A classification scheme for referencing profiles or sets of profiles unambiguously.

TCP/IP Reference Model: An alternate to the OSI Reference Model that organizes the communications process into 4 layers. It consists of host-to-network, internet, transport, and application layers.

Transport Layer: That portion of an OSI Reference Model (Layer 4) which attempts to guarantee reliable data transfer between two end-systems, using flow control and error recovery, and may provide multiplexing.

1.5   ABBREVIATIONS AND ACRONYMS

The acronyms used in this Standard Publication are defined as follows:

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
AP	Application Profile
ASCII	American National Standard Code for Information Interchange
FTP	File Transfer Protocol
IAB	Internet Advisory Board
IP	Internet Protocol
ISO	International Organization for Standardization
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
NEMA	National Electrical Manufacturers Association
NTCIP	National Transportation Communications for ITS Protocol
OSI	Open Systems Interconnection
PICS	Protocol Implementation Conformance Statement
RFC	(Internet) Request for Comments
STD	(Internet) Standard
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
UDP	User Datagram Protocol

Section 2
CONFORMANCE

2.1   GENERAL REQUIREMENTS

Implementations claiming conformance to the Trivial File Transfer Protocol - Application Profile shall support the following elements as stated.

    a.   All requirements in the remainder of Section 2 of this profile.
    b.   All of the constraints specified in Annex A (normative) of this profile.
    c.   All mandatory requirements of the standards referenced by this profile.

2.2   PROTOCOL FEATURES

There are no additional requirements to the protocol features as specified in RFC 1350, Section 4 and RFC 1123 Sections 4.2.3.1, 4.2.3.2, 4.2.3.4, and 4.2.3.5. Some requirements are predicated on whether an implementation operates as a client or server. A client is capable of initiating or sending TFTP commands. A server is capable of responding or replying to TFTP commands.

The extensions and options as discussed in the following are NOT required.
RFC 1785	*TFTP Option Negotiation Analysis*
RFC 2349	*TFTP Timeout Interval and Transfer Size Options*
RFC 2348	*TFTP Blocksize Option*
RFC 2347	*TFTP Option Extension*

2.3   TRANSMISSION MODES

There are no additional requirements to the transmission modes as specified in RFC 1350, Sections 1 and 5, and RFC 1123 Sections 4.2.3.1 and 4.2.3.5. Because the netascii mode is primarily intended for use with the Telnet Protocol and terminals, this mode is optional.

2.4   PACKET TYPES

There are no additional requirements to the packet types as specified in RFC 1350, Section 5.

2.5   ERROR CODES

There are no additional requirements to the error codes as specified in RFC 1350, Section 5. In the context of this standard, a "disk" may denote any form of data storage that serves the purposes of a disk.

2.6   INTERFACES

The general transport profile interface requirements shall conform to RFC 1350, Sections 3 and 4, and RFC 1123, Section 4.2.3.4. There are also conditional requirements depending on the specific type of interface. TFTP is designed to operate over any connectionless transport service. If the transport service uses UDP as the Transport Layer protocol, the interface requirements shall conform to RFC 1122 Section 4.1.4. If the transport service is Null (direct Data Link Layer Interface for example), the interface requirements shall conform to RFC 1122, Section 2.4.

<This page is intentionally left blank>

Annex A
TFTP APPLICATION PROFILE REQUIREMENTS LIST

(Normative)

A.1   INTRODUCTION

This annex provides the Profile Requirements List (PRL) for implementations of the TFTP - Application Profile. A Profile Implementation Conformance Specification (PICS) for an implementation is generated by an implementer or supplier by indicating the appropriate level of support provided by an implementation.

To claim conformance with this profile, an implementation shall satisfy the mandatory conformance requirements of the base standards referenced in this profile.

An implementation's completed PRL is called the PICS. The PICS states which capabilities and options of the protocol have been implemented. The following can use the PICS:

   a. The protocol implementer, as a checklist to reduce the risk of failure to conform to the standard through oversight.

   b. The supplier and user, as a detailed indication of the capabilities of the implementation.

   c. The user, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to do so can often be predicted from incompatible PICSs).

   d. A user, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.1.1   Notation

The following notations and symbols are used to indicate status and conditional status in the PRL and PICS within all NTCIP standards. Not all of these notations and symbols may be used within this standard.

A.1.1.1   Status Symbols

The following symbols are used to indicate base standard and profile status:

m	mandatory
m.<n>	support of every item of the group labeled by the same numeral <n> required, but only one is active at time
o	optional
o.<n>	optional, but support of at least one of the group of options labeled by the same numeral <n> is required
c	conditional
n/a	non-applicable (i.e. logically impossible in the scope of the profile)
x	excluded or prohibited

The o.<n> notation is used to show a set of selectable options (i.e., one or more of the set must be implemented) with the same identifier <n>. Two character combinations may be used for dynamic conformance requirements. In this case, the first character refers to the static (implementation) status, and the second refers to the dynamic (use); thus "mo" means "mandatory to be implemented, optional to be used." Base standard requirements are shown using the equivalent notations in upper case (e.g., M, O, X).

The classification of the requirements and options in Internet RFCs does not correspond to the convention described above, and shall be mapped into the profile as follows:

RFC	Profile
MUST	Mandatory[1]
SHOULD	Mandatory[1]
MAY	Optional
SHOULD NOT	Prohibited
MUST NOT	Prohibited

A.1.1.2 Conditional Status Notation

The following predicate notations may be used:

<predicate>:	This notation introduces a single item that is conditional on the <predicate>.
<predicate>::	This notation introduces a table or a group of tables, all of which are conditional on the <predicate>.

The <predicate>: notation means that the status following it applies only when the PRL or PICS states that the feature or features identified by the predicate are supported. In the simplest case, <predicate> is the identifying tag of a single PICS item. The <predicate>:: notation may precede a table or group of tables in a clause or subclause. When the group predicate is true then the associated clause shall be completed. The symbol <predicate> also may be a Boolean expression composed of several indices. "AND", "OR", and "NOT" shall be used to indicate the Boolean logical operations.

A.1.1.3 Support Column Symbols

This profile is in the form of a PICS and, therefore, includes a support column. An implementer claims support of an item by circling the appropriate answer (Yes, No, or N/A) in the support column:

Yes	Supported by the implementation.
No	Not supported by the implementation.
N/A	Not applicable

A.1.1.4 Footnotes

Footnotes to the proforma are indicated by superscript numerals. The footnote appears on the page of the first occurrence of the numeral. Subsequent occurrences of a numeral refer to the footnote of the first occurrence.

---

[1] In the course of adapting communications industry standards to the transportation industry, there may be exceptions where specific mandatory requirements are not applicable to the new environment. Where these exceptions are made, a justification shall be provided.

A.1.1.5   Instructions for Completing the PRL

A profile implementer shows the extent of compliance to a Profile by completing the PRL. An implementer indicates whether mandatory requirements are complied with and whether optional requirements are supported. The resulting completed PRL is called a PICS. Where this profile refines the features of the base standards, the requirements expressed in this PRL shall be applied (as indicated in PRL items with no "Profile Support" column) to constrain the allowable responses in the base standard PICS proforma. When this profile makes additional requirements, the "Support" column for such PRLs shall be completed. In this column, each response shall be selected either from the indicated set of responses, or it shall comprise one or more parameter values as requested. If a conditional requirement is inapplicable, use the Not Applicable (NA) choice. If a mandatory requirement is not satisfied, exception information must be supplied by entering a reference Xi, where i is a unique identifier, to an accompanying rationale for the noncompliance. When the profile requirement is expressed as a two-character combination (as defined in A.1.1 above), the response shall address each element of the requirement; e.g., for the requirement "mo," the possible compliant responses are "yy" or "yn."

A.2   STANDARDS REFERENCED

This profile specifies the provision of the Trivial File Transfer Protocol (TFTP) as specified in IAB STD 33 (RFC 1350: July 1992, The TFTP Protocol (Revision 2)) and IAB STD 3 (RFC 1122: October 1989, Requirements for Internet Hosts – Communications Layers and RFC 1123: October 1989, Requirements for Internet Hosts – Application and Support).

A.3   PICS REQUIREMENTS LIST

A.3.1   General Information

A.3.1.1   Implementation Identification

Ref	Question	Response
1	Supplier	
2	Contact point for queries about the profile	
3	Implementation Name(s) and Version(s)	
4	Date of statement	
5	Other Information: Machine Name, Operating Systems, System Name	
6	Amendments or revisions to the base standards or profiles that are applicable.	

A.3.1.2 Global Statement of Conformance

Are all mandatory requirements met for:

Ref	Question	Response
1	IAB STD 33 (RFC 1350) TFTP?	
2	IAB STD 3 (RFC 1223) Internet Hosts?	

A.4 BASIC REQUIREMENTS

The following table lists the detailed requirements for a TFTP implementation, and asks if the listed protocols have been implemented:

Index	Protocol	Clause of Profile	Profile Status	Support
tftp	IAB STD 33, RFC 1350, implemented?	2.1	m	Yes
host-com	IAB STD 3, RFC 1122, Section 2.4 or 4.1.4, implemented?	2.1	m	Yes
host-app	IAB STD 3, RFC 1123, Section 4.2.3, implemented?	2.1	m	Yes
Client	Is implementation capable of acting as an TFTP Client?	2.2	o.1	Yes No
Server	Is implementation capable of acting as an TFTP Server?	2.2	o.1	Yes No

A.4.1 Protocol Features

Item	Protocol Feature	Base Standard		Profile		Support
		Reference	Status	Clause	Status	
1.1	Fix Sorcerer's Apprentice Syndrome	RFC 1123: 4.2.3.1	M	2.2	m	Yes
1.2	Use Adaptive Timeout	RFC 1123: 4.2.3.2	M		m	Yes
1.3	Configurable Access Control	RFC 1123: 4.2.3.4	M		m	Yes
1.4	Silently Ignore Broadcast Request	RFC 1123: 4.2.3.5	M		m	Yes
1.5	Listen on Port Number 69	RFC 1350: 4	M		m	Yes
1.6	Transfer on an unused Port Number	RFC 1350: 4	M		m	Yes

A.4.2   Transmission Modes

Item	Transmission Modes	Base Standard		Profile		Support
		Reference	Status	Clause	Status	
2.1	Transfer Modes	RFC 1350: 1	M	2.3	m	Yes
2.1.1	netascii	RFC 1350: 5	M		o	Yes No
2.1.2	octet	RFC 1350: 5	M		m	Yes
2.1.3	mail	RFC 1350: 1 RFC 1123: 4.2.3.1	X		x	No
2.1.4	extensions	RFC 1350: 5 RFC 1123: 4.2.3.3	0		o	Yes No

A.4.3   Packet Types

Item	Packet Types	Base Standard		Profile		Support
		Reference	Status	Clause	Status	
3.1	Packet Types	RFC 1350: 5	M	2.4	m	Yes
3.1.1	Read Request		M		m	Yes
3.1.2	Write Request		M		m	Yes
3.1.3	Data		M		m	Yes
3.1.4	Acknowledge		M		m	Yes
3.1.5	Error		M		m	Yes

A.4.4   Error Codes

Item	Error Codes	Base Standard		Profile		Support
		Reference	Status	Clause	Status	
4.1	Error Codes	RFC 1350: 5	M	2.5	m	Yes
4.1.1	Not Defined (0)		M		m	Yes
4.1.2	File Not Found (1)		M		m	Yes
4.1.3	Access Violation (2)		M		m	Yes
4.1.4	Disk Full (3)		M		m	Yes
4.1.5	Illegal TFTP Operation (4)		M		m	Yes
4.1.6	Unknown Transfer ID (5)		M		m	Yes
4.1.7	File Already Exists (6)		M		m	Yes
4.1.8	No Such User (7)		M		m	Yes

A.4.5   Interfaces

Item	Interfaces	Base Standard		Profile		Support
		Reference	Status	Clause	Status	
5.1	Lower Layer Interface	RFC 1350: 3 and 4 RFC 1123: 4.2.3.4	M	2.6	m	Yes
5.1.1	Transport Layer Interface	RFC 1122: 4.1.4	M		udp:m^2	Yes No
5.1.2	Data Link Layer Interface	RFC 1122: 2.4	M		null:m^3	Yes No

§

---

2 The transport layer interface requirements are predicated on the use of UDP as the transport protocol.

3 The data link layer interface requirements are predicated on the use of null transport and network layer protocols.