

A Joint Standard of AASHTO, ITE, and NEMA

NTCIP 1201:2005 v02.32

National Transportation Communications for ITS Protocol Global Object (GO) Definitions – version 02

October 2005

*A major revision of NTCIP 1201 v01.10,
which included NTCIP 1201 Amendment 1 v07*

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Published by

American Association of State Highway and Transportation Officials (AASHTO)

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ACKNOWLEDGEMENTS

This publication was prepared by the NTCIP Global Object Working Group, which is a subdivision of the Joint Committee on the NTCIP. The Joint Committee is organized under a Memorandum of Understanding among the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the National Electrical Manufacturers Association (NEMA). The Joint Committee on the NTCIP consists of six representatives from each of the standards organizations, and provides guidance for NTCIP development.

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In addition to the many volunteer efforts, recognition is also given to those organizations who supported the efforts of the working groups by providing comments and funding for the standard, including:

- U.S. Department of Transportation, Federal Highway Administration
- Econolite Control Products, Inc.
- G. C. Herrick & Associates, Inc.
- Iteris, Inc.
- Ministry of Ontario
- Mitretek
- PB Farradyne, a Division of PBQD, Inc.
- Peek Transportation Systems
- Robert De Roche Consulting, Inc.
- Siemens ITS
- Trevilon
- Washington State Department of Transportation

This publication and version is dedicated to the memory of Curtis Herrick.

FOREWORD

This document uses only metric units.

The purpose of this publication is to identify and define the common object definitions that may be supported by devices that are NTCIP-compliant.

This document is an NTCIP Device Data Dictionary standard. Device Data Dictionary standards provide definitions of data elements for use within NTCIP systems. A Joint NTCIP data dictionary standards publication is equivalent to these document types at the standards organizations:

AASHTO – Standard Specification
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AASHTO – Standard Specification; October 2004
ITE – Software Standard; March 2005
NEMA – Standard; November 2004

History

From 1996 to 1999, this document was referenced as NEMA TS 3.4. However, to provide an organized numbering scheme for the NTCIP documents, this document is now referenced as NTCIP 1201. The technical specifications of NTCIP 1201 are identical to the former reference, except as noted in the development history below:

NEMA TS 3.4-1996 v96.01.7, April 7, 1997. October 1996 – Version 1.5 approved by NEMA. April 1997 – Version 1.7 published by NEMA with editorial corrections. October 1996 – Accepted as a Recommended Standard by the Joint Committee on the NTCIP. Approved by AASHTO in 1997 and approved by ITE in December 1997.

NEMA TS 3.4 Amendment 1 v98.01.07. October 1998 – Version 98.01.05 accepted as a Recommended Amendment by the Joint Committee on the NTCIP, and edited v01.07 referred for balloting and approval by NTCIP Standards Bulletin B0032 in May 1999. Approved by AASHTO in October 1999, approved by ITE in January 2001, and approved by NEMA in December 1999. Amendment 1 clarified ambiguities discovered during real-world implementations of this standard.

NTCIP 1201:1996 [assigned version 01.08]. August 1999 – Assigned NTCIP 1201 document number in NTCIP Standards Bulletin B0038. August 2000 – Joint NTCIP Standards Publication cover used over TS 3.4 contents.

NTCIP 1201:1996 v01.10, December 2001. January 2002 – Formatted for printing: incorporated Amendment 1 v07 into text; updated title page date and version number; modified and reorganized front matter to conform to NTCIP 8002. Most references to TS 3 standard designations were changed to equivalent NTCIP standard numbers.

NTCIP 1201 v02. Developed to reflect additional lessons learned, to incorporate better documentation (in the Annex) of some of the logic required to implement the standards, and to add new features requested by the ITS community.

NTCIP 1201 v02.14. September 2001 – Accepted by the NTCIP Joint Committee as a User Comment Draft. February 2002 – NTCIP Standards Bulletin B0071 distributed NTCIP 1201 v02.16 for review and comment.

NTCIP 1201 v02.24. October 2002 – Accepted by the NTCIP Joint Committee as a Recommended Standard. April 2004 – NTCIP Standards Bulletin B0092 referred NTCIP 1201 v02.26 for balloting. Approved by AASHTO in October 2004, approved by ITE in March 2005, and approved by NEMA in November 2004.

NTCIP 1201 v02.31. February 2005 – Disposed of ballot period comments on backward compatibility, object deprecation, and others. In clause 1.3 Terms, added Deprecated and Obsolete definitions.

Specific changes made from NTCIP 1201 v01.10 (1996) to v02.31 include:

1. Added Unified Modeling Language (UML) diagrams to explain interrelationships between objects.
2. Adjusted the ISO Tree Structure diagram to conform to this updated document.
3. Modified the DESCRIPTION field of the object definitions to conform with ISO 14817.
4. Changed MIB name to reflect new version.
5. Added Default Value statements to several Configuration and Control object definitions. This was not necessary for Status-type object definitions.
6. Added wording to the moduleVersion object definition to clarify the value content of this object.
7. Added an object definition that allows to identify on which Information Profile MIB an implementation is based.
8. Added additional clarifications to the DESCRIPTION field of the dbCreateTransation object definition.
9. Deprecated the dbErrorType, the dbErrorID, the dbTransactionID, and the dbMakeID object definitions.
10. Expanded on the possible parameter values for the globalDaylightSavings object definition.
11. Added a timeBaseScheduleTable-status object definition to identify which schedule is currently selected by the schedule.
12. Added additional clarifying wording to the DESCRIPTION field of several objects within the dayPlanTable, especially the dayPlanActionNumberID object definition.
13. Deprecated the globalLocalTimeDifferential object definition.
14. Added the standardTimeZone and localTime object definitions.
15. Added clarifying wording to several object definitions within the Report node tables.
16. Changed the sequence of the three tables within the Report node to show the logical sequence of populating and querying those tables.
17. Added another value (andedWithValue) to the eventConfigMode object definition and clarified the wording explaining the various possible values.
18. Added another value (error) to the eventConfigStatus object definition.
19. Modified the SYNTAX of the maxEventLogSize object.
20. Deprecated the hdlcGroupAddress object definition.
21. Moved the object definitions previously defined under the Security node to NTCIP 1103.
22. Moved the object definitions for the Auxiliary I/O objects previously defined in NTCIP 1203 to a node under the Global object definitions. Some clarifications were added to those object definitions. Additionally, an object definition (auxIO-lastCommandedState) was added.
23. Deleted Section 3 (Group Definitions) and Section 4 (Conformance Statements) because conformance to definitions within this document should be made within the referencing Information Profiles such as NTCIP 1202 (ASC) or NTCIP 1203 (DMS).
24. Added Annex A to provide a Concept of Operations explaining the interrelationships between objects to achieve a particular function.
25. Added Annex B to show all deprecated object definitions.
26. Added Annex C to show UML class diagrams.
27. NOTE on dbVerifyStatus. To align NTCIP 1201 v02 with other NTCIP and several Internet standards, the object definitions in NTCIP 1201 v01.10 that had enumerated values starting with a value of (0) have been changed in NTCIP 1201 v02 to start with a value of (1). This change affected clause 2.3.6, dbVerifyStatus. The changed definition in NTCIP 1201 v02 makes this object incompatible with NTCIP 1201:1996 v01.10.

NTCIP 1201:2005 v02.32. October 2005 – Edited document for publication with modified and reorganized front matter.

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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 this document should also consult NTCIP 8004 for specific guidelines on compatibility.

INTRODUCTION

This publication defines data elements for use with various transportation devices. The data is defined using the Simple Network Management Protocol (SNMP) object-type format as defined in RFC 1212 and the NTCIP format defined in NTCIP 8004. This data would typically be exchanged using one of the NTCIP 1103 recognized Application Layers (e.g., SNMP).

This standard defines requirements that are applicable to all NTCIP environments and it also contains optional and conditional clauses that are applicable to specific environments for which they are intended.

The following keywords apply to this document: AASHTO, ITE, NEMA, NTCIP, global, data, data dictionary, object.

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 late 1998, the Global Object Working Group was tasked with updating the Global Object Definitions standard. The first meeting of the GO WG was held in January 1999.

CONTENTS

	Page
FOREWORD.....	ii
INTRODUCTION.....	vi
Section 1 GENERAL.....	1
1.1 Scope.....	1
1.2 References	1
1.2.1 Normative References.....	1
1.2.2 Other References	2
1.3 Terms.....	2
1.4 Abbreviations and Acronyms.....	3
1.5 Object Tree	4
1.6 Controller Class Diagram	6
Section 2 OBJECT DEFINITIONS.....	7
2.1 NTCIP Objects.....	7
2.2 Global Configuration Node	8
2.2.1 Global Set ID Parameter	8
2.2.2 Maximum Modules Parameter	8
2.2.3 Module Table	9
2.2.3.1 Module Number Parameter	9
2.2.3.2 Module Device Node Parameter	9
2.2.3.3 Module Make Parameter	10
2.2.3.4 Module Model Parameter	10
2.2.3.5 Module Version Parameter	10
2.2.3.6 Module Type Parameter	11
2.2.4 Base Standards Parameter	11
2.3 Global Database Management Node	12
2.3.1 Database Creation Transaction	12
2.3.2 Database Error Type Parameter	16
2.3.3 Database Error ID Parameter.....	16
2.3.4 Database Transaction ID Parameter.....	16
2.3.5 Database Make ID Parameter	17
2.3.6 Database Verify Status Parameter.....	17
2.3.7 Database Verify Error Parameter	17
2.4 Global Time Management Node	18
2.4.1 Global Time Parameter	18
2.4.2 Global Daylight Savings Parameter	18

2.4.3	TimeBase Event Scheduler Node	19
2.4.3.1	Maximum Number of Time Base Schedule Entries Parameter	20
2.4.3.2	Time Base Schedule Table	20
2.4.3.3	Schedule Status Parameter	23
2.4.4	Day Plan Parameters	23
2.4.4.1	Maximum Number of Day Plans- Parameter	23
2.4.4.2	Maximum Number of Day Plan Events - Parameter	24
2.4.4.3	Day Plan Table	24
2.4.4.4	Day Plan Status Parameter	27
2.4.5	Global Local Time Differential Parameter	27
2.4.6	Standard Time Zone Parameter	27
2.4.7	Local Time Parameter	28
2.5	Report Parameter Node	28
2.5.1	Maximum Event Classes Parameter	28
2.5.2	Event Class Table	29
2.5.2.1	Event Class Number Parameter	29
2.5.2.2	Event Class Limit Parameter	29
2.5.2.3	Event Class Clear Time Parameter	30
2.5.2.4	Event Class Description Parameter	30
2.5.2.5	Event Class Number of Rows in Event Log Table Parameter	30
2.5.2.6	Class Event Log Counter Parameter	31
2.5.3	Maximum Event Log Configurations Parameter	31
2.5.4	Event Log Configuration Table	31
2.5.4.1	Event Log Configuration ID Parameter	32
2.5.4.2	Event Log Configuration Class Parameter	32
2.5.4.3	Event Log Configuration Mode Parameter	33
2.5.4.4	Event Log Configuration Compare Value Parameter	34
2.5.4.5	Event Log Configuration Compare Value 2 Parameter	34
2.5.4.6	Event Log Configuration Compare Object Identifier Parameter	35
2.5.4.7	Event Log Configuration Log Object Identifier Parameter	35
2.5.4.8	Event Log Configuration Action Parameter	36
2.5.4.9	Event Log Configuration Status Parameter	36
2.5.5	Maximum Event Log Size Parameter	37
2.5.6	Event Log Table	37
2.5.6.1	Event Log Class Parameter	37
2.5.6.2	Event Log Number Parameter	38
2.5.6.3	Event Log ID Parameter	38
2.5.6.4	Event Log Time Parameter	38
2.5.6.5	Event Log Value Parameter	39
2.5.7	Total Event Log Counter Parameter	39
2.6	PMPP Object Node	39

2.6.1	Maximum HDLC Group Address Parameter	40
2.6.2	HDLC Group Address Table	40
2.6.2.1	HDLC Group Address Index Parameter	41
2.6.2.2	HDLC Group Address Parameter	41
2.6.2.3	HDLC Group Address Number Parameter	41
2.7	Security Node	41
2.7.1	Community Name Administrator Parameter	42
2.7.2	Maximum Community Names Parameter	42
2.7.3	Community Names Table	42
2.7.3.1	Community Name Index Parameter	43
2.7.3.2	User Community Name Parameter	43
2.7.3.3	User Community Name Mask Parameter	44
2.8	Auxiliary I/O Objects	44
2.8.1	Maximum Number of Digital Auxiliary IOs Parameter	44
2.8.2	Maximum Number of Analog Auxiliary IOs Parameter	44
2.8.3	Auxiliary IO Table Parameter	45
2.8.3.1	Auxiliary Port Type Parameter	45
2.8.3.2	Auxiliary Port Number Parameter	46
2.8.3.3	Auxiliary Description Parameter	46
2.8.3.4	Auxiliary Resolution Parameter	46
2.8.3.5	Auxiliary Value Parameter	47
2.8.3.6	Auxiliary Port Direction Parameter	47
2.8.3.7	Auxiliary Port Last Commanded State Parameter	47
Section 3	CONFORMANCE	48
Annex A	CONCEPT OF OPERATIONS (NORMATIVE)	49
A.1	Download Transaction Use Case	49
A.2	Set Time	52
A.3	Configure Scheduler	54
A.4	Monitor Hysteresis Condition	54
Annex B	DOCUMENTATION OF REVISIONS (INFORMATIVE)	56
B.1	Transaction Mode	56
B.2	Local Time	56
B.3	HDLC Group Address	56
Annex C	CLASS DIAGRAMS (INFORMATIVE)	57
C.1	Configuration Information	57
C.2	Transaction Information	58
C.3	Time Information	58
C.4	Report Information	59

C.5	Auxiliary Input/Output Information	61
Annex D	SUMMARY OF CHANGES (INFORMATIVE)	62
D.1	Updated ISO Tree	62
D.2	Updates to Conform with NTCIP 8004	62
D.3	Updated Name of the MIB	62
D.4	Added Default Value Statements	62
D.6	Enhanced Module Version Definition	63
D.7	Added an Object to Identify Supported Standards	63
D.8	Corrected the Database Transaction Feature	63
D.9	Added Support for Additional Daylight Saving Modes	63
D.10	Added a Schedule Status Object	63
D.11	Clarified Definitions of Day Plan Objects	64
D.12	Corrected Problems with the Local Time Logic	64
D.13	Clarified Definitions Related to the Event Log	64
D.14	Reordered Clauses for the Event Log	64
D.15	Added Support for Another Mode to the Event Log	64
D.16	Added Error Value to the Event Configuration Status	64
D.17	Corrected Syntax of Event Log Size Object	65
D.18	Replaced the Group Address Object	65
D.19	Added Generic Auxiliary I/O Objects	65
D.20	Removed Conformance Statements	65
D.21	Added a Concept of Operations	65
D.22	Prepared Communication Objects to be Moved to 1103	66
D.23	Added Annex C to Document Deprecated Objects	66
D.24	Added Class Diagrams	66

Section 1 GENERAL

1.1 SCOPE

The messaging between Transportation Management Center and field devices is accomplished by using the NTCIP Application Layer services to convey requests to access or modify values stored in a given device; these values are referred to as objects. The purpose of this publication is to identify and define these objects definitions that may be supported by multiple device types (e.g. actuated signal controllers and variable message signs). The grouping of objects for a given device type is performed in the device-type-specific object definition standard.

1.2 REFERENCES

For approved revisions, contact:

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TS 2-2003 *Traffic Controller Assemblies with NTCIP Requirements*

NTCIP 1102 *Octet Encoding Rules*

NTCIP 1104 *Naming Conventions*

NTCIP 9001 *NTCIP Guide*

ANSI
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ISO/IEC 8825-1:1998 *Information Technology—ASN.1 Encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).*

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IAB STD 15 RFC 1157 *A Simple Network Management Protocol (SNMP)*. M. Schoffstall; M. Feder; J. Davin; J. Case; 05/10/1990

IAB STD 16 RFC 1155 *Structure and Identification of Management Information for TCP/IP-based Internets*. K. McCloghrie; M. Rose; 05/10/1990

 RFC 1212 *Concise MIB Definitions*. K. McCloghrie; M. Rose; 03/26/1991

IAB STD 17 RFC 1213 *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II*. K. McCloghrie; M. Rose; CP/IP-base

1.3 TERMS

For the purposes of this standard, the following terms, definitions, acronyms, and abbreviations apply. Terms not defined in this clause are in accordance with their definitions in the NTCIP 8004. Electrical and electronic terms not defined in this clause are used in accordance with their definitions in IEEE Std 100-2000. English words not defined in this clause or in IEEE Std 100-2000 are used in accordance with their definitions in *Webster's New Collegiate Dictionary*.

class	An abstraction of any kind of object that may be described; equivalent to a ISO 14817 Object Class.
component	A central system, field device, etc. that supports NTCIP.
conformance level	Each of the defined Profiles have one or more layers specifying the protocols that must be implemented in a device to correspond to a particular level of NTCIP support.
data value	The value of a data element.
database object	Any object identified as a 'database object' by the relevant device-specific standard. For example, in NTCIP 1202 (version 2), objects that are identified as 'P' or 'P2' are database objects.
deprecated	The 'deprecated' value in the STATUS field of an 'OBJECT-TYPE' macro indicates that the subject object was included in a previous version of the standard but no longer represents the preferred design. An implementer implementing this version of the standard is not required to implement a deprecated object, but may wish to support it to foster interoperability with older implementations. The STATUS of a deprecated object will likely change to obsolete in some future version of the standard.
Feature	A capability of an component
obsolete	The 'obsolete' value in the STATUS field of an 'OBJECT-TYPE' macro indicates that the subject object was included in a previous version of the standard but no longer in significant use within the industry. While an implementer is allowed to implement an obsolete object, the benefits of doing so may be minimal due to the limited use of the object.
Profile	Refers to a set of protocols, each of which operates independently on one of the seven (7) OSI Layers, if this layer is utilized. Different protocols are utilized at the same layer within different profiles.
Static Database Object	A parameter that does not change other than by a user command. For example, the controllerTimeZone object is a static database object since it only changes value through some sort of user command, however, globalTime is not a static database object since it is constantly incrementing.

1.4 ABBREVIATIONS AND ACRONYMS

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

ASC	Actuated Signal Controller
CRC	Cyclic Redundancy Check, polynomial algorithm performed on a specified range of data resulting in a 16 or 32 bit value.
MIB	Management Information Base, a collection of objects defined using Abstract Syntax Notation One (ASN.1) that can be accessed via a network management protocol.

NVT-ASCII	Network Virtual Terminal, American Standard Code for Information Interchange as defined in RFC 854
PMPP	Point-to-MultiPoint Protocol, a transporation specific subnetwork layer protocol that enables communication between multiple devices on the same communications line/channel.
STMP	Simple Transportation Management Protocol, part of the Transportation Management Protocols of the NTCIP effort (see NTCIP 1103). STMP provides a simple and bandwidth efficient mechanism to communicate with field devices.

1.5 OBJECT TREE

The following figure provides an overview of the organization of the data defined by this document.

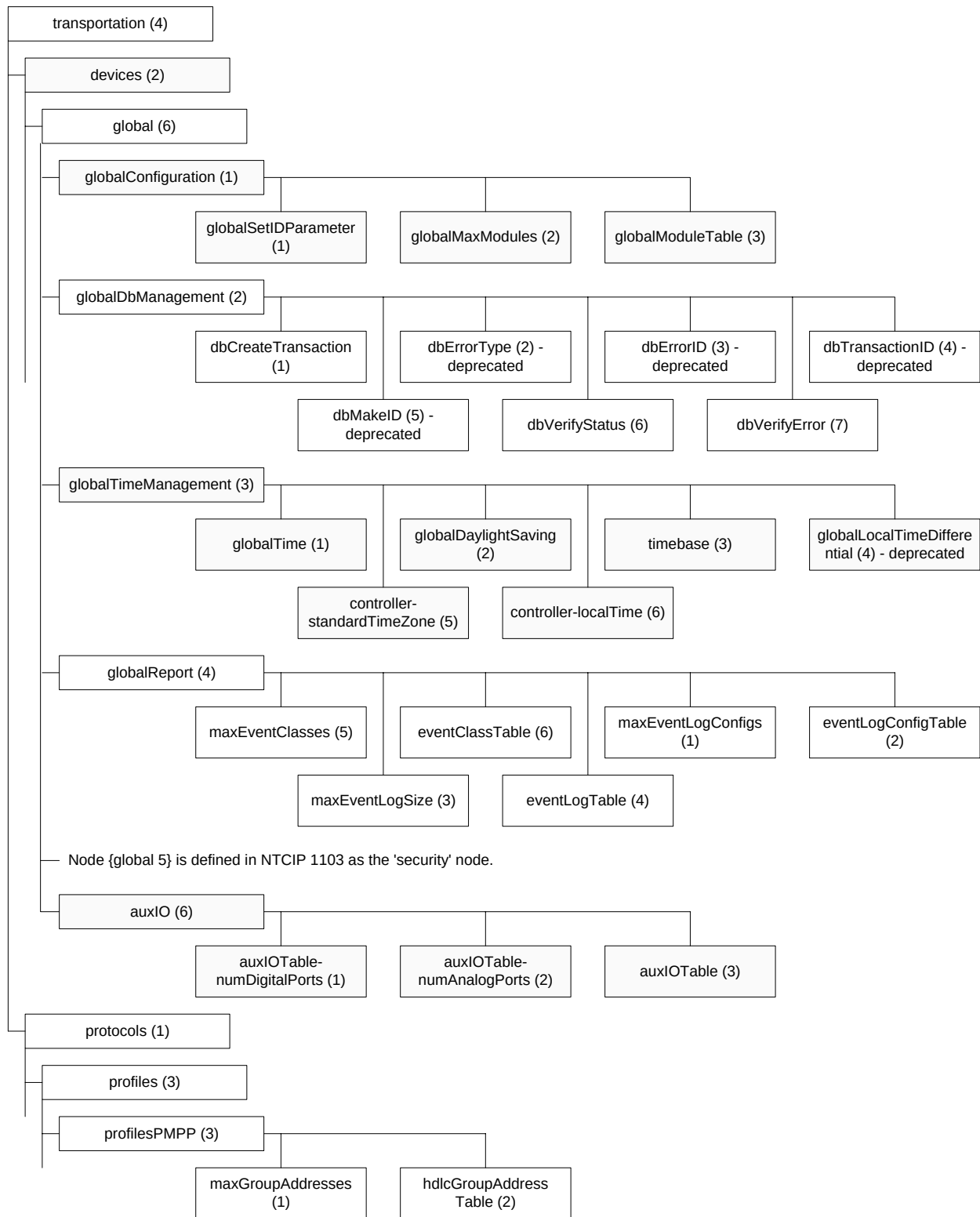


Figure 1-1
ISO Tree Structure

1.6 CONTROLLER CLASS DIAGRAM

The following figure depicts the components of data stored within a controller in Unified Modeling Language (UML) notation.

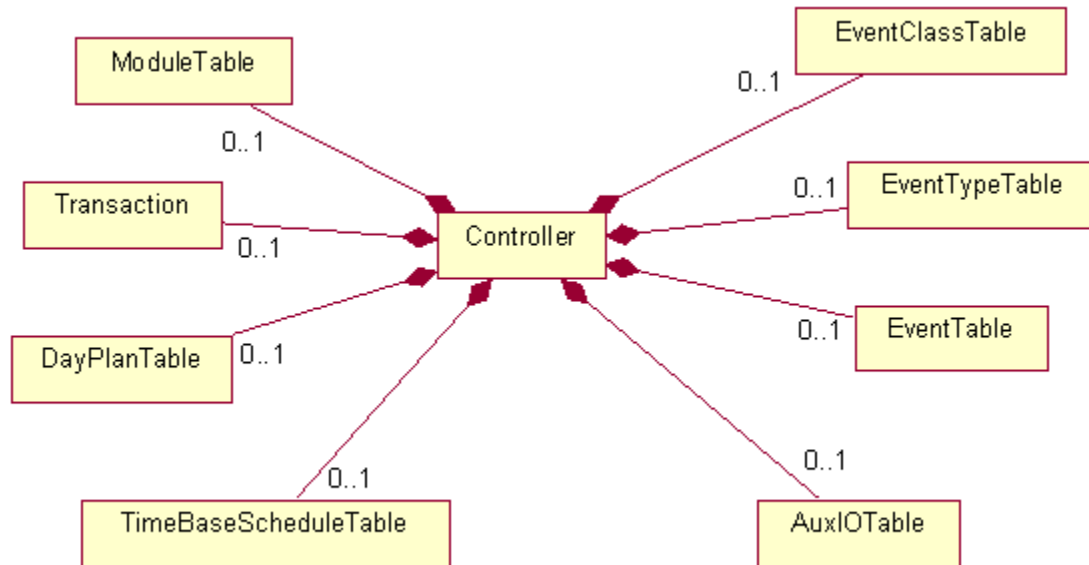


Figure 1-2
Controller Class Diagram

The diagram indicates that a Controller may or may not contain the following major components:

- A module table
- A transaction service
- A day plan table
- A timebase schedule table
- An event class table
- An event type table
- An event table
- An auxiliary input/output table

The details of each class are defined through the Management Information Base provided in Section 2. More detailed class diagrams for each feature are provided in Annex C.

Section 2 OBJECT DEFINITIONS

This section defines those objects which are expected to be used by different device types such as actuated signal controllers, variable message signs, ramp meter controllers. The objects are defined in OBJECT-TYPE macro defined in RFC 1212 per the rules defined in NTCIP 8004. The text provided from Clause 2.1 through the end of the section (except the clause headings) constitutes the standard NTCIP1201-2004 MIB.

In order to convert these object definitions into data concepts, e.g. for the exchange in center-to-center communications, the rules defined in NTCIP 8005 shall apply.

All of the objects defined in this document reside under the "global" node of the global naming tree. To aid in object management, the "global" node has been subdivided into logical categories, each defined by a node under the "global" node. The individual objects are then located under the appropriate node.

Nodes should not be confused with conformance requirements, which are defined in device specific object standards. Conformance requirements are based on logical groupings of objects that provide specific features that may be desired in a device. While the conformance requirements will frequently correspond to the nodal structure, a conformance group may contain objects that are not lexicographically ordered. For example, a schedule conformance group may contain both "global" and "asc" specific objects.

NOTE—This version of the standard uses the NTCIP 8004 version v01.36+ conventions. It specifies all (non-deprecated/non-obsolete) objects to have a STATUS of "mandatory" according to the conventions stated in NTCIP 8004; it is the responsibility of any document referring to this standard to specify exactly which objects should be supported under what conditions through a Protocol Requirements List (PRL). Documents referring to the 1201:1996 v01.10 version of this standard shall use the STATUS settings as defined in the published (and amended) 1201:1996 v01.10 version.

Text preceded by a double hyphen in the MIB definitions represent normative text for this standard. The class diagrams contained within this standard are supplemental normative requirements to the text.

2.1 NTCIP OBJECTS

--NTCIP OBJECTS

NTCIP1201-2004 DEFINITIONS ::= BEGIN

-- NTCIP 8004 Header

-- <DataConceptType>Entity Type

-- <DescriptiveName>Controller

-- <DescriptiveNameContext>ITS

-- <Definition>A microprocessor, typically located in the field, that controls and/or monitors a wayside

-- device of interest to an ITS management system.

--For the purpose of this section, the following OBJECT IDENTIFIERS are used:
IMPORTS

OBJECT-TYPE

FROM RFC-1212

```
DisplayString
FROM RFC1213-MIB
devices, protocols, profiles, global
FROM NTCIP8004-A-2004
Opaque, Counter, Gauge, null
FROM RFC1155-SMI;
```

```
-- global OBJECT IDENTIFIER ::= { devices 6 }
```

2.2 GLOBAL CONFIGURATION NODE

```
globalConfiguration OBJECT IDENTIFIER
::= { global 1 }
--This node is an identifier used to group all objects for support of
configuration functions
-- that are common to most device types.
```

2.2.1 Global Set ID Parameter

```
globalSetIDParameter OBJECT-TYPE
    SYNTAX      INTEGER (0..65535)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "<Definition>Specifies a relatively unique ID (e.g., this could be
        a counter, a check-sum, etc.) for current values stored in all
        user-changeable static database objects of the particular device-
        type currently implemented in the device. This value shall be
        calculated on the change of any static database object. The value
        reported by this object shall not change unless there has been a
        change in the static data since the last request; however a genErr
        shall be returned if the unique ID value has not yet been updated.
        A management station will be able to detect any change in the
        static database objects by monitoring this value after it has
        established a baseline. Often this ID is calculated using a CRC
        algorithm.

        <DescriptiveName>Controller.databaseID:number

        <DataConceptType>Data Element"
    ::= { globalConfiguration 1}
```

2.2.2 Maximum Modules Parameter

```
globalMaxModules OBJECT-TYPE
    SYNTAX      INTEGER (1..255)
    ACCESS      read-only
    STATUS      mandatory
    DESCRIPTION
        "<Definition>The number of rows that are listed in the
        globalModuleTable.

        <DescriptiveName>ModuleTable.maxModules:quantity

        <DataConceptType>Data Element

        <Unit>module"
    ::= { globalConfiguration 2}
```

2.2.3 Module Table

globalModuleTable OBJECT-TYPE

SYNTAX SEQUENCE OF ModuleTableEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"<Definition>A table containing information regarding manufacturer of software and hardware and the associated module models and version numbers as well as an indicator if the module is hardware or software related. The number of rows in this table shall equal the value of the globalMaxModules object.

<DescriptiveName>ModuleTable

<DataConceptType>Entity Type

<TableType> static"

::= { globalConfiguration 3 }

moduleTableEntry OBJECT-TYPE

SYNTAX ModuleTableEntry

ACCESS not-accessible

STATUS mandatory

DESCRIPTION

"<Definition>This object defines an entry in the module table.

<DescriptiveName>Module

<DataConceptType>Entity Type"

INDEX { moduleNumber }

::= { globalModuleTable 1 }

ModuleTableEntry ::= SEQUENCE {

moduleNumber INTEGER,

moduleDeviceNode OBJECT IDENTIFIER,

moduleMake OCTET STRING,

moduleModel OCTET STRING,

moduleVersion OCTET STRING,

moduleType INTEGER }

2.2.3.1 Module Number Parameter

moduleNumber OBJECT-TYPE

SYNTAX INTEGER (1..255)

ACCESS read-only

STATUS mandatory

DESCRIPTION

"<Definition>This object contains the row number (1..255) within this table for the associated module.

<DescriptiveName>Module.number:identifier

<DataConceptType>Data Element"

::= { moduleTableEntry 1 }

2.2.3.2 Module Device Node Parameter

moduleDeviceNode OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

ACCESS read-only