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SPECIFICATION

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**Transport information and control
systems — In-vehicle navigation
systems — ITS message set translator to
ASN.1 format definitions**

*Systèmes de commande et d'information des transports — Systèmes
de navigation dans les véhicules — Traducteur de l'ensemble des
messages ITS en définitions de format ASN.1*



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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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ISO/PAS 17684 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Introduction

Working Group 11 of the Technical Committee ISO/TC 204 is responsible for the ITS information concerning navigation and route guidance. This committee, during the preparation of ISO 15075, *Transport information and control systems — In-vehicle navigation systems — Communications message set requirements*, realized that the ISO/IEC directives require a formal description by ASN.1 whenever an information data structure, such as message set, is defined. ASN.1 is a well-defined language with significant descriptive power; however, due to the simplicity of almost all messages used in navigation and route guidance systems, they can be more simply expressed in tabular form. Since it is a common practice among navigation system engineers to define a message set by tables, the main part of this document specifies messages as tables. Faced with the situation of different types of descriptions for a message set, one practical and the other formal, ISO/TC 204 started a project that bridges these descriptions instead of writing down one ASN.1 description for ISO 15075. This document, which allows engineers to write message sets for navigation and route guidance in a tabular form that is automatically translated to ASN.1 description, is a result of that project.

In many navigation systems, traffic and travel information is transferred to and from vehicles and traffic information centers via transmitted messages. To make on-board navigation units compatible with navigation facilities, each message used in the system has to be precisely defined. The internationally accepted Abstract Syntax Notation One (ASN.1) is a powerful tool for describing information data structures. ISO/IEC has agreed that data structures, such as a message set, which define a standard should be formally described in ASN.1. As a consequence, ISO/TC 204 decided that information data structures such as the format of messages including navigation messages must be defined in ASN.1.

Navigation engineers, however, usually use much simpler tabular forms to describe their message sets. As the degree of complexity required in descriptions of navigation message sets does not require the full descriptive power of ASN.1, it was easy to imagine that some subset of ASN.1 could be defined for a simpler description of navigation message sets. Therefore, the first task was to define the subset of ASN.1 most suitable for this purpose. However, instead of directly extracting a subset of ASN.1, an intermediate language, DNF (Descriptor Normal Form; see Clause 5), was proposed. The intermediate DNF language must retain its compatibility with ASN.1, but can be simplified since most of the messages used in navigation are linear in the sense that they are simply written in the lines of a table. Thus, the descriptive power of DNF is strictly limited and any description defined by DNF should also be defined by ASN.1. This means that the set of all possible DNF descriptions is a subset of descriptions available in ASN.1. In this sense, DNF is a subset of ASN.1.

The bridge between the simple DNF tabular descriptions and their respective formal ASN.1 descriptions is a compiler “dnf2asn1”. As shown in the following figure, a DNF description is translated to ASN.1 description by the compiler “dnf2asn1.”

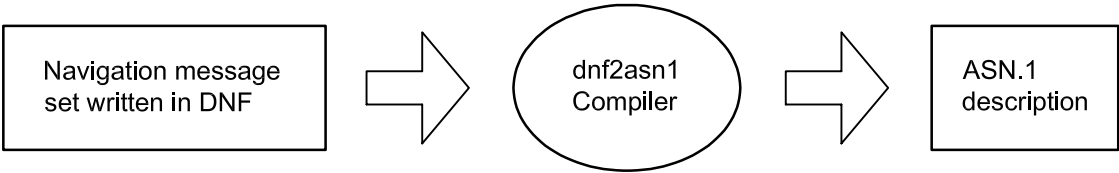


Figure 1 — Function of the bridge compiler dnf2asn1

With this compiling path, any navigation message set that is described in DNF is automatically converted to an ASN.1 description. By inserting an additional processing step prior to DNF, e.g. inserting another language definition and its compiler to DNF, a message set described in the new language can be converted to first DNF by the new compiler and then to ASN.1 by dnf2asn1. In this way, an ASN.1 description of the original message set is generated. If the new language is based on a tabular form, then this double-bridge system can convert a tabular-form description of a message set to its ASN.1 equivalent. It is well known that the tabular form description of message set is much easier for navigation engineers to understand, define and maintain. However, the type of tabular form which best serves this purpose has not yet been clearly defined. Therefore, this document presents an example of a tabular-form message-set description language and its compiler to DNF. Many aspects of the language were kept open for user definition so that descriptive features could be flexibly changed. As this tabular form message set/compiler is an example, it may not accommodate all the needs of a user, and thus it is recommended that a more specific message set/compiler be generated.

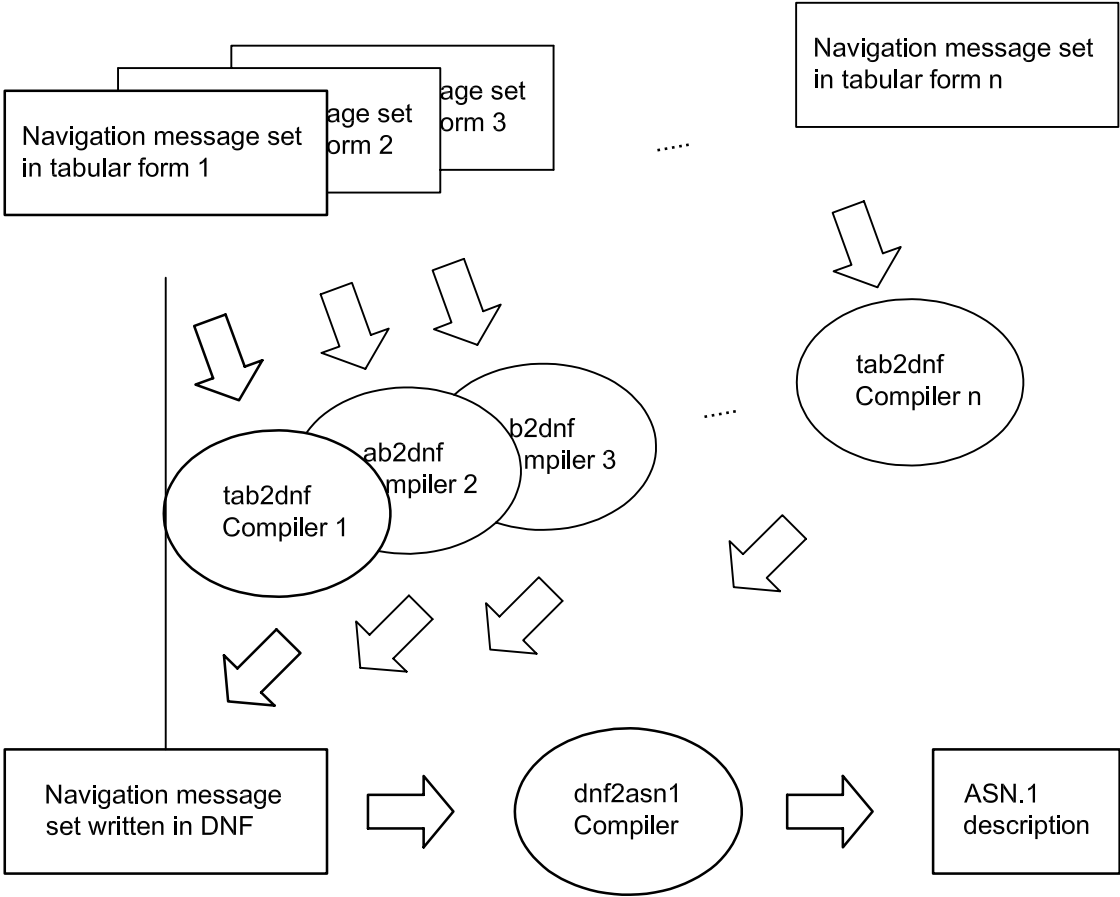


Figure 2 — Conversion of the tabular-form navigation message set into ASN.1

Transport information and control systems — In-vehicle navigation systems — ITS message set translator to ASN.1 format definitions

1 Scope

This Publicly Available Specification specifies a method that can be used to define navigation message sets in tabular form with a subsequent translation into a corresponding ASN.1 description. An intermediate language called Descriptor Normal Form (DNF), which is a subset of ASN.1, is specified and used as an intermediate description between a tabular form and its ASN.1 description.

A tabular-form message-set description language called Message Set Tabular Form (MSTF) is included as an example of a tabular form definition.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 10646-1:2000, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. The following terms are defined in ISO/IEC 8824-1:1998 specification, bit string type, boolean type, character, character string types, choice types, component type, encoding, (ASN.1) encoding rules, enumerated types, false, integer type, module, null type, octetstring type, real type, recursive definitions, selection types, sequence types, sequence-of types, spacing character, simple type, tag, true, type, type reference name, value, value set, white-space.

3.1

DNF character set

set of characters used in the DNF notation

NOTE See 5.4.

3.2

floating-point number

number capable of being specified by the formula $M \times 10^E$ where M and E are two integers called the mantissa and the exponent, respectively

3.3

floating-point type

type consisting of all possible floating-point numbers plus the two values $+\infty$ and $-\infty$

NOTE The floating-point type is a subset of the real type in ASN.1. The real type accommodates bases other than 10.

3.4

items

named sequences of characters from the DNF character set which are used to form the DNF notation

NOTE See 5.4.

4 Message Set Tabular Form description

4.1 General

Message Set Tabular Form (MSTF) describes a message set by message components. A message component is defined by a line or lines, where a line consists of a sequence of boxes or cells. Each cell contains either a string of characters or is empty. A string of characters contained in a cell may be one of the following component items:

- a reserved word;
- a data type;
- a data item;
- a special indicator composed of one or two special characters;
- a comment denoted by the special indicator “//” at the beginning of the comment character string.

Some of the data items used in MSTF are DNF identifiers (see 5.5.2). These component items are arranged in cells to form a line in accordance with the rules for MSTF line format, and then the lines are structured to form a message component in MSTF. Major message components are structured in a block of lines where a block is separated by a line of empty cells.

The first message component of a message set is the TITLE component.

4.2 MSTF description

4.2.1 Character set

The characters that can appear in MSTF are the same characters used in DNF (see 5.4.1).

4.2.2 Special indicators

The following indicators, specified by one or two special character(s) and separated by commas, are used as special indicators: *,|, {}, [], //

4.2.3 Reserved words

The following words are reserved in MSTF description.

- EXPORT
- IMPORT
- TITLE

- IF
- ELSEIF

4.2.4 General line format

Each MSTF line is a sequence of cells organized in a *Label Value Control (LVC)* format. An *LVC form* is composed of a sequence of cells with the following items:

- a) Label — enumerated type label name or enumerated type name (see 5.5.5);
- b) Value — identifier, integer value (see 5.6.1.d) or range of values for the label;
- c) Control —special indicator or switch indicator specifying a control applied to the label or type.

*	In-VehicleNavigationSystemCommunicationDeviceMessageSet					
*	*	m1L	IF(m1L)			// Dynamic Link Times from Traffic Message Center (TMC)
*	*	*	messageCodeType	I 2		
*	*	*	*	causeCode	I 6	[] // causeCode is optional. It doesn't have to be specified always

1

2

3

Key

- 1 label
- 2 value
- 3 control

Figure 3 — A line with LVC form

When these three items are present in a line, they shall be in this (L V C) order. Every non-empty line shall have its “Label” item, but the “Value” and “Control” items are optional. Thus, there are four different combinations of the cell items: L, LC, LV or LVC depending on the number and type of items.

1

*	In-VehicleNavigationSystemCommunicationDeviceMessageSet					
*	*	m1L	IF(m1L)			// Dynamic Link Times from Traffic Message Center (TMC)
*	*	*	messageCodeType	I 2		
*	*	*	*	causeCode	I 6	[] // causeCode is optional. It doesn't have to be specified always

2

3

4

Key

- 1 L Type — The line is defined only by the label item
- 2 LC Type — The line is defined by the label item and the control item
- 3 LV Type — The line is defined by the label item and the value item
- 4 LVC Type — The line is controlled by the label item, the value item, and the control item

Figure 4 — The four different line forms

4.2.5 Message structure

A message component is a line or a block of lines. When a message component is a block of lines, the block is delimited by an empty line and structured by a special nesting indicator (default character is *, but may be changed), or indicators placed in the left-most cell or cells of each line. If the number of nesting indicators on a line is N then the line is nested to belong to the line which has N-1 nesting indicators and is above and nearest to the line.

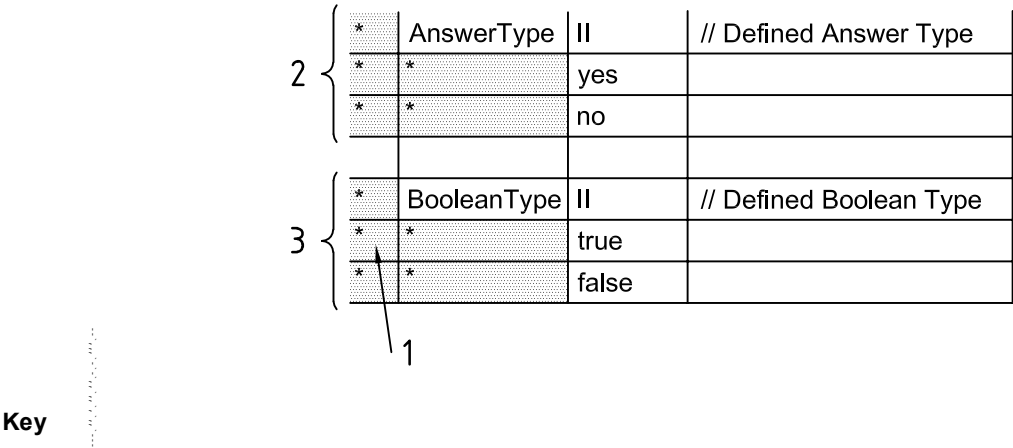


Figure 5 — Message component blocks

4.2.6 Message components

A message contains the following components.

a) Label definition

A label is assigned to each message by name. The simplest message components have an identifier with the same name as its label:

EXAMPLE simple label

*	Label	identifier
---	-------	------------

b) Sequence components

A sequence component is defined by a label and the data-item lines that follow, nested according to the label definition. A sequence component signifies that all data items defined in the component will appear in the same order as defined.

EXAMPLE sequence component

*	Label	
*	*	Data Item1
*	*	Data Item2
*	*	Data Item3

A switched sequence of components is described by switch indicators incorporating the reserved words IF, ELSEIF, or ELSE.

EXAMPLE switched sequence of components

	Label A	IF (Case Value)
*		Data ItemA1
*		Data ItemA2
*		Data ItemA3
	Label B	ELSEIF (Case Value)
*		Data ItemB1
*		Data ItemB2
*		Data ItemB3
	Label C	ELSE
*		Data ItemC1
*		Data ItemC2
*		Data ItemC3

Depending on the Case Values, the sequence of data items varies from A1,A2,A3 to B1,B2,B3 to C1,C2,C3.

c) Optional components

An optional component is defined by a label and the special indicator “[]” (square brackets).

EXAMPLE optional component

*	Label	identifier		
	Label			
		Data Item1	I6	
		Data Item2	A	[]

d) Repeat component

A repeat component is defined by a label and the special indicator “{}” (curly brackets).

EXAMPLE repeat component

*	Label	{ }		
	Label			
		Data Item1	I6	
		Data Item2	A	{ }

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e) Choice component

A choice component is defined by a label and the special indicator “||” (vertical bars). The data-item lines that follow the label line are nested according to the label definition. A choice component signifies that one or more of the data items defined in the component will appear in the message component without repetition.

EXAMPLE choice component

*	Label	
*	*	Data Item1
*	*	Data Item2
*	*	Data Item3

f) Reference component

A reference component signifies the outside reference to a message set defined externally. It is specified by the reserved words IMPORT or EXPORT.

EXAMPLE reference component

IMPORT	Other Message Set Components
EXPORT	Other Message Set Components

g) Title component

A title component defines the message set module name. It is specified by the reserved word TITLE.

EXAMPLE title component

TITLE	This Message Set Components
-------	-----------------------------

h) Comment

Anything on a line after a double slash (“//”) shall be treated as a comment but ignored by the compiler. It can be placed anywhere except at the head of an LVC form or in a composite element.

EXAMPLE comment component

*	In VehicleNavigationSystemCommunicationDeviceMessageSet					
*	*	M1L	IF(m1L)			// Dynamic Link Times from Traffic Message Center (TMC)
// m1L Detail						
*	*	*	messageCodeType	I 2		
*	*	*	*	causeCode	1 6	// causeCode is optional. It doesn't always have to be specified.