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Metode za preskušanje in specificiranje (MTS) - 3. različica zapisa preskušanja in krmiljenja preskusov - 7. del: Uporaba ASN.1 pri TTCN-3

Methods for Testing and Specification (MTS) - The Testing and Test Control Notation version 3 - Part 7: Using ASN.1 with TTCN-3

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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS).

The present document is part 7 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document defines a normative way of using ASN.1 as defined in Recommendations ITU-T X.680 [2], X.681 [3], X.682 [4] and X.683 [5] with TTCN-3. The harmonization of other languages with TTCN-3 is not covered by the present document.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".

[2] Recommendation ITU-T X.680 (2008): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[3] Recommendation ITU-T X.681 (2008): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".

[4] Recommendation ITU-T X.682 (2008): "Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification".

[5] Recommendation ITU-T X.683 (2008): "Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications".

[6] Recommendation ITU-T X.690 (2008): "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".

[7] Recommendation ITU-T X.691 (2008): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

[8] Recommendation ITU-T X.693 (2008): "Information technology - ASN.1 encoding rules: XML Encoding Rules (XER)".

[9] Recommendation ITU-T T.100 (1988): "International information exchange for interactive Videotex".

[10] Recommendation ITU-T T.101 (1994): "International interworking for Videotex services".

[11] Recommendation ITU-T X.660 (2011): "Information technology - Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree".

[12] ETSI ES 201 873-6: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 6: TTCN-3 Control Interface (TCI)".

[13] Recommendation ITU-T X.696 (2015): "Information technology - ASN.1 encoding rules: Specification of Octet Encoding Rules (OER)".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ISO 8601 (2004): "Data elements and interchange formats - Information interchange - Representation of dates and times".

[i.2] ETSI ES 201 873-10: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 10: TTCN-3 Documentation Comment Specification".

[i.3] ISO 3166-1: "Codes for the representation of names of countries and their subdivisions - Part 1: Country codes".

[i.4] Recommendation ITU-T X.121: "Public data networks - Network aspects - International numbering plan for public data networks".

NOTE: References to Recommendations ITU-T include the Recommendation and all Amendments and Corrigenda published to the Recommendation except when specified otherwise in other parts of the present document.

[i.5] Recommendation ITU-T X.208: "Specification of Abstract Syntax Notation One (ASN.1)" (Blue Book).

[i.6] Recommendation ITU-T X.680 (1994): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[i.7] Recommendation ITU-T X.680 (1997): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[i.8] Recommendation ITU-T X.680 (2002): "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[i.9] Recommendation ITU-T X.681 (1994): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".

[i.10] Recommendation ITU-T X.681 (1997): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".

[i.11] Recommendation ITU-T X.681 (2002): "Information technology - Abstract Syntax Notation One (ASN.1): Information object specification".

[i.12] Recommendation ITU-T X.682 (1994): "Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification".

[i.13] Recommendation ITU-T X.682 (1997): "Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification".

[i.14] Recommendation ITU-T X.682 (2002): "Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification".

[i.15] Recommendation ITU-T X.683 (1994): "Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications".

[i.16] Recommendation ITU-T X.683 (1997): "Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications".

[i.17] Recommendation ITU-T X.683 (2002): "Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications".

[i.18] Recommendation ITU-T X.690 (2002): "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".

[i.19] Recommendation ITU-T X.691 (2002): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

[i.20] ETSI ES 202 781: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Configuration and Deployment Support".

[i.21] ETSI ES 202 782: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: TTCN-3 Performance and Real Time Testing".

[i.22] ETSI ES 202 784: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Advanced Parameterization".

[i.23] ETSI ES 202 785: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Behaviour Types".

[i.24] ETSI ES 202 786: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Support of interfaces with continuous signals".

[i.25] ETSI ES 202 789: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Extended TRI".

[i.26] CCITT Blue Book.

[i.27] ETSI ES 201 873-8: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 8: The IDL to TTCN-3 Mapping".

[i.28] ETSI ES 201 873-9: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 9: Using XML schema with TTCN-3".

[i.29] ETSI ES 201 873-11: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 11: Using JSON with TTCN-3".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI ES 201 873-1 [1], Recommendation ITU-T X.660 [11] and the following apply:

associated TTCN-3 type: TTCN-3 type equivalent, obtained by transforming of the corresponding ASN.1 type definition according to clause 9.1 of the present document

NOTE: Associated TTCN-3 types and values may not exist in a visible way; this term is used to identify the part of the abstract information carried by the related ASN.1 type or value, which have significance from the point of view of TTCN-3 (also called the TTCN-3 view).

metatype "OPEN TYPE": used to explain the ASN.1 to TTCN-3 conversion process

NOTE: It does not exist in the input ASN.1 module or the output TTCN-3 module.

root type: Definition in ETSI ES 201 873-1 [1] applies with the following addition: in case of types based on imported ASN.1 types, the root type is determined from the associated TTCN-3 type (see clause 8).

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI ES 201 873-1 [1] and the following apply:

ASN.1	Abstract Syntax Notation One
BER	Basic Encoding Rules of ASN.1
CER	Canonical Encoding Rules of ASN.1
OER	Octet Encoding Rules of ASN.1
OID	Object IDentifier
PER	Packed Encoding Rules of ASN.1
XER	XML Encoding Rules of ASN.1

4 Introduction

When using ASN.1 with TTCN-3 all features of TTCN-3 and statements given in clause 4 of ETSI ES 201 873-1 [1] do apply. In addition, when supporting the present document, TTCN-3 becomes fully harmonized with ASN.1 which may be used with TTCN-3 modules as an alternative data type and value syntax. The present document defines the capabilities required in addition of those specified in ETSI ES 201 873-1 [1] when ASN.1 is supported. The approach used to combine ASN.1 and TTCN-3 could be applied to support the use of other type and value systems with TTCN-3. However, the details of this are not defined in the present document.

ETSI ES 201 873-1 [1] specifies the core capabilities of the TTCN-3 language. Other language mappings (see [i.27], [i.28] and [i.29]) and TTCN-3 language packages as ETSI ES 202 781 [i.20], ETSI ES 202 782 [i.21], ETSI ES 202 784 [i.22], ETSI ES 202 785 [i.23], ETSI ES 202 786 [i.24], ETSI ES 202 789 [i.25] may specify extensions to the core language that may define additional rules for the ASN.1 to TTCN-3 mapping. These additional rules are specified in the relevant other documents and need to be supported only if the implementation claims to support the other document.

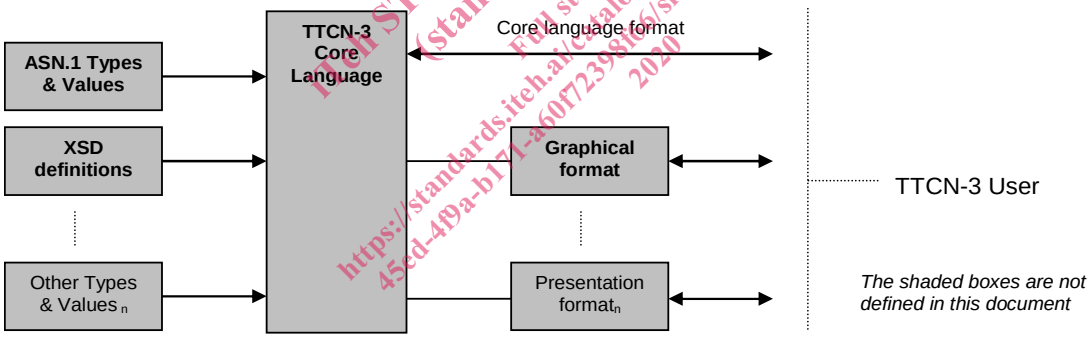

Figure 1: User's view of the core language and the various presentation formats

5 General

5.1 Approach

TTCN-3 provides a clean interface for using ASN.1 definitions (as specified in Recommendations ITU-T X.680 [2], X.681 [3], X.682 [4] and X.683 [5]) in TTCN-3 modules.

In general, there are two approaches to the integration of other languages with TTCN-3, which will be referred to as implicit and explicit mapping. The implicit mapping makes use of the import mechanism of TTCN-3, denoted by the keywords *language* and *import*, in which case the TTCN-3 tool shall produce an internal representation of the imported objects, which representation shall retain all the structural and encoding information. This internal representation is not accessible by the user. It facilitates the immediate use of the abstract data specified in the other language. Therefore, the definition of a specific data interface for each of these languages is required.

The explicit mapping translates the definitions of the other language directly into appropriate TTCN-3 language artefacts. This also means that all information needed for correct encoding and decoding shall be present in the TTCN-3 module(s) generated by this translation.

In case of the ASN.1 to TTCN-3 mapping no TTCN-3 encoding instructions are defined by the present document, hence only the implicit mapping is specified.

5.2 Conformance and compatibility

For an implementation claiming to support the use of ASN.1 with TTCN-3, all features specified in the present document will need to be implemented consistently with the requirements given in the present document and in ETSI ES 201 873-1 [1].

The language mapping presented in the present document is compatible to:

- ETSI ES 201 873-1 [1], V4.9.1.
- ETSI ES 201 873-10 [i.2], V4.5.1.

NOTE: Only the informative annex E uses features from ETSI ES 201 873-10 [i.2].

If later versions of those parts are available and should be used instead, the compatibility of the language mapping presented in the present document has to be checked individually.

6 Amendments to the core language

Using ASN.1 with TTCN-3 is handled at the static type-value level. Though it mainly means additions described in the subsequent clauses, some of the core language syntactical structures shall also be amended to support the use of ASN.1. These are specified in clause A.2.

7 Additional TTCN-3 types

7.1 General

The TTCN-3 types summarized in table 1 shall be supported in addition to those specified in clause 6 of ETSI ES 201 873-1 [1].

Table 1: Overview of TTCN-3 types

Class of type	Keyword	Sub-type
Simple basic types	`objid`	list, range

7.2 The object identifier type

7.2.0 The **`objid`** type

The object identifier type shall be supported as follows:

- **`objid`:** a type whose distinguished values are the set of all syntactically correct object identifier values. The value notations for the objid type shall conform to clause 31 of Recommendation ITU-T X.680 [2] with the exception that hyphens are replaced with underscores.

NOTE 1: This definition also allows object identifier values outside the collection of values defined in Recommendation ITU-T X.660 [11] (e.g. with a node beneath the root not defined in Recommendation ITU-T X.660 [11]).

The name form of object identifier components shall be used only for components defined in Recommendation ITU-T X.660 [11]. These predefined object identifier components are given in annex C for information. In case of any conflict between Recommendation ITU-T X.660 [11] and annex C of the present document, the former shall take precedence.

In cases when the identifier of a value referenced within an object identifier value notation is identical to any of the predefined component names, i.e. independently of the position of the predefined component or the referenced value inside the notation (considering name conversion rules in clause 8.2), the name of the referenced value shall be prefixed with the name of the module in which it is defined (see definition of ASN.1 modules in clause 12 of Recommendation ITU-T X.680 [2] and TTCN-3 modules in clause 8.1 of the core language standard ETSI ES 201 873-1 [1]). The prefix and the identifier shall be separated by a dot (.). Predefined object identifier component names may also be prefixed with the name "X660".

NOTE 2: To increase readability it is recommended to use the "X660" prefix also in object identifier values referring to a value identifier that is clashing with any of the predefined component names.

NOTE 3: Rules to resolve name clashes caused by imports are defined in clause 8.2.3.1 of the core language standard ETSI ES 201 873-1 [1].

EXAMPLE:

```
objid{itu_t(0) identified_organization(4) etsi(0)}
// or alternatively
objid {itu_t identified_organization etsi(0)}
// or alternatively
objid { 0 4 0}

// or alternatively
const integer etsi := 0;
const objid itu_idOrg := objid{ itu_t identified_organization }
objid{ itu_idOrg etsi } // note, that both names are referencing value definitions

const integer x := 162;
objid{ itu_t recommendation x A.x }          // it is mandatory to use the module name ('A')
                                             // to prefix the ambiguous identifier
                                             // or alternatively
objid{ itu_t recommendation X660.x A.x }     // the module name shall be present even if
                                             // the "X660" prefix is used
```


7.2.1 Sub-typing of the **objid** type

7.2.1.1 Subtrees of the **objid** type

The object identifier type is a collection of principally infinite set of unique identifier values, each containing a sequence of components; each given sequence of arbitrary length compose an object identifier node as shown on figure 2 (see also annex C). Thus, each node of the object identifier tree - except being a unique identifier itself - is the root of a subtree, containing a potentially infinite number of unique identifiers. The first n components of all the identifiers in the subtree are identical to the components of the node, being the root of the subtree, where n is the number of components of that node. Hence, each object identifier node distinguishes also a unique subset (subtype) of the **objid** type. Each member of this subtype (the subtree) is longer than the node identifying the subtree.

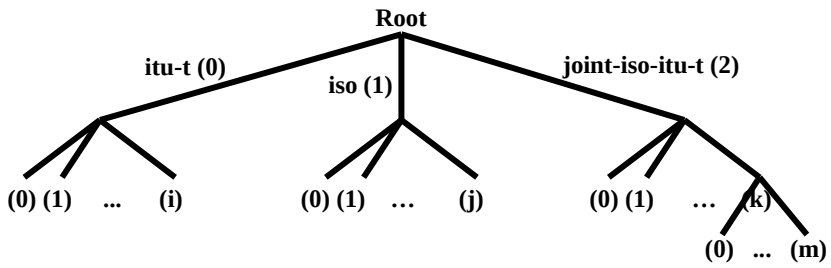

Figure 2: The object identifier tree