



**Methods for Testing and Specification (MTS);
The Testing and Test Control Notation version 3;
Part 1: TTCN-3 Core Language**

*Full standard available at:
https://standards.iteh.ai/catalog/standards/sist/4e48-a2d8-7995f668fe04/etsi-es-201-873-1-v4.8.1-2016-05*

Reference

RES/MTS-201873-1 T3ed481

Keywords

language, methodology, testing, TTCN-3

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2016.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	12
Foreword.....	12
Modal verbs terminology.....	12
1 Scope	13
2 References	13
2.1 Normative references	13
2.2 Informative references.....	14
3 Definitions and abbreviations.....	15
3.1 Definitions.....	15
3.2 Abbreviations	20
4 Introduction	21
4.0 General	21
4.1 The core language and presentation formats	21
4.2 Unanimity of the specification	23
4.3 Conformance	23
5 Basic language elements	23
5.0 General	23
5.1 Identifiers and keywords	24
5.2 Scope rules	24
5.2.0 General.....	24
5.2.1 Scope of formal parameters	27
5.2.2 Uniqueness of identifiers	27
5.3 Ordering of language elements.....	28
5.4 Parameterization.....	28
5.4.0 General.....	28
5.4.1 Formal parameters	29
5.4.1.0 General	29
5.4.1.1 Formal parameters of kind value.....	29
5.4.1.2 Formal parameters of kind template.....	32
5.4.1.3 Formal parameters of kind timer.....	34
5.4.1.4 Formal parameters of kind port.....	34
5.4.2 Actual parameters	35
5.5 Cyclic Definitions.....	40
6 Types and values	41
6.0 General	41
6.1 Basic types and values.....	41
6.1.0 Simple basic types and values.....	41
6.1.1 Basic string types and values	42
6.1.1.0 General	42
6.1.1.1 Accessing individual string elements	44
6.1.2 Subtyping of basic types	45
6.1.2.0 General	45
6.1.2.1 Lists of templates	45
6.1.2.2 Lists of types	45
6.1.2.3 Ranges.....	46
6.1.2.4 String length restrictions	47
6.1.2.5 Pattern subtyping of character string types	47
6.1.2.6 Mixing subtyping mechanisms.....	47
6.1.2.6.1 Mixing patterns, lists and ranges	47
6.1.2.6.2 Using length restriction with other constraints	48
6.2 Structured types and values	48
6.2.0 General.....	48
6.2.1 Record type and values	50
6.2.1.0 General.....	50

6.2.1.1	Referencing fields of a record type	52
6.2.1.2	Optional elements in a record.....	53
6.2.1.3	Nested type definitions for field types	53
6.2.2	Set type and values	54
6.2.2.0	General	54
6.2.2.1	Referencing fields of a set type.....	54
6.2.2.2	Optional elements in a set	54
6.2.2.3	Nested type definition for field types.....	54
6.2.3	Records and sets of single types	54
6.2.3.0	General	54
6.2.3.1	Nested type definitions.....	57
6.2.3.2	Referencing elements of record of and set of types	57
6.2.4	Enumerated type and values	58
6.2.5	Unions.....	60
6.2.5.0	General	60
6.2.5.1	Referencing fields of a union type	60
6.2.5.2	Option and union.....	61
6.2.5.3	Nested type definition for field types	61
6.2.6	The anytype	62
6.2.7	Arrays	62
6.2.8	The default type	64
6.2.9	Communication port types	64
6.2.10	Component types	66
6.2.10.1	Component type definition.....	66
6.2.10.2	Reuse of component types	67
6.2.11	Component references	69
6.2.12	Addressing entities inside the SUT.....	71
6.2.13	Subtyping of structured types	73
6.2.13.0	General	73
6.2.13.1	Length subtyping of record ofs and set ofs	73
6.2.13.2	List subtyping of structured types and anytype.....	74
6.2.13.3	Subtyping of the iterated type of record ofs and set ofs	76
6.2.13.4	Mixing subtyping mechanisms.....	77
6.3	Type compatibility	78
6.3.0	General.....	78
6.3.1	Compatibility of non-structured types	78
6.3.2	Compatibility of structured types.....	79
6.3.2.0	General	79
6.3.2.1	Compatibility of enumerated types	80
6.3.2.2	Compatibility of record and record of types	80
6.3.2.3	Compatibility of set and set of types	81
6.3.2.4	Compatibility of union types.....	81
6.3.2.5	Compatibility of anytype types	82
6.3.2.6	Compatibility between sub-structures	82
6.3.3	Compatibility of component types.....	83
6.3.4	Type compatibility of communication and connection operations	83
6.3.5	Type conversion.....	84
6.4	Type synonym	84
7	Expressions.....	84
7.0	General	84
7.1	Operators	85
7.1.0	General.....	85
7.1.1	Arithmetic operators	86
7.1.2	List operator.....	87
7.1.3	Relational operators	87
7.1.4	Logical operators	90
7.1.5	Bitwise operators	90
7.1.6	Shift operators.....	91
7.1.7	Rotate operators	92
7.2	Field references and list elements.....	92

8	Modules	93
8.0	General	93
8.1	Definition of a module	93
8.2	Module definitions part	94
8.2.0	General	94
8.2.1	Module parameters	95
8.2.2	Groups of definitions	96
8.2.3	Importing from modules	97
8.2.3.0	General	97
8.2.3.1	General format of import	97
8.2.3.2	Importing single definitions	104
8.2.3.3	Importing groups	104
8.2.3.4	Importing definitions of the same kind	105
8.2.3.5	Importing all definitions of a module	106
8.2.3.6	Import definitions from other TTCN-3 editions and from non-TTCN-3 modules	107
8.2.3.7	Importing of import statements from TTCN-3 modules	109
8.2.3.8	Compatibility of language specifications in imports	110
8.2.4	Definition of friend modules	110
8.2.5	Visibility of definitions	111
8.3	Module control part	112
9	Port types, component types and test configurations	113
9.0	General	113
9.1	Communication ports	113
9.2	Test system interface	116
10	Declaring constants	118
11	Declaring variables	118
11.0	General	118
11.1	Value variables	119
11.2	Template variables	120
12	Declaring timers	121
13	Declaring messages	122
14	Declaring procedure signatures	123
15	Declaring templates	124
15.0	General	124
15.1	Declaring message templates	125
15.2	Declaring signature templates	126
15.3	Global and local templates	128
15.4	In-line Templates	129
15.5	Modified templates	130
15.6	Referencing elements of templates or template fields	133
15.6.0	General	133
15.6.1	Referencing individual string elements	133
15.6.2	Referencing record and set fields	133
15.6.3	Referencing record of and set of elements	134
15.6.4	Referencing signature parameters	138
15.6.5	Referencing union alternatives	138
15.7	Template matching mechanisms	139
15.7.0	General	139
15.7.1	Specific values	140
15.7.2	Special symbols that can be used instead of values	141
15.7.3	Special symbols that can be used inside values	142
15.7.4	Special symbols which describe attributes of values	142
15.8	Template Restrictions	143
15.9	Match Operation	145
15.10	Valueof Operation	147
15.11	Concatenating templates of string and list types	147

16	Functions, altsteps and testcases	149
16.0	General	149
16.1	Functions	149
16.1.0	General.....	149
16.1.1	Invoking functions	151
16.1.2	Predefined functions	152
16.1.3	External functions	154
16.1.4	Invoking functions from specific places	155
16.2	Altsteps.....	156
16.2.0	General.....	156
16.2.1	Invoking altsteps.....	157
16.3	Test cases.....	159
17	Void.....	160
18	Overview of program statements and operations	160
19	Basic program statements.....	162
19.0	General	162
19.1	Assignments	163
19.2	The If-else statement	164
19.3	The Select statements	165
19.3.1	The Select case statement	165
19.3.2	The Select union statement	166
19.4	The For statement	167
19.5	The While statement.....	168
19.6	The Do-while statement	168
19.7	The Label statement	168
19.8	The Goto statement	169
19.9	The Stop execution statement.....	170
19.10	The Return statement.....	171
19.11	The Log statement	172
19.12	The Break statement.....	173
19.13	The Continue statement.....	174
19.14	Statement block	175
20	Statement and operations for alternative behaviours.....	175
20.0	General	175
20.1	The snapshot mechanism.....	176
20.2	The Alt statement	176
20.3	The Repeat statement	180
20.4	The Interleave statement	181
20.5	Default Handling.....	183
20.5.0	General.....	183
20.5.1	The default mechanism	183
20.5.2	The Activate operation.....	184
20.5.3	The Deactivate operation.....	185
21	Configuration Operations	186
21.0	General	186
21.1	Connection Operations	187
21.1.0	General.....	187
21.1.1	The Connect and Map operations	187
21.1.2	The Disconnect and Unmap operations	189
21.2	Test case operations.....	191
21.2.0	General.....	191
21.2.1	Test case stop operation.....	191
21.3	Test Component Operations.....	191
21.3.0	General.....	191
21.3.1	The Create operation.....	191
21.3.2	The Start test component operation	193
21.3.3	The Stop test behaviour operation	194
21.3.4	The Kill test component operation.....	195

21.3.5	The Alive operation	196
21.3.6	The Running operation	197
21.3.7	The Done operation	198
21.3.8	The Killed operation	200
21.3.9	Summary of the use of any and all with components	202
22	Communication operations.....	203
22.0	General	203
22.1	The communication mechanisms	203
22.1.0	General.....	203
22.1.1	Principles of message-based communication.....	203
22.1.2	Principles of procedure-based communication	204
22.1.3	Principles of unicast, multicast and broadcast communication.....	204
22.1.4	General format of communication operations	205
22.1.4.0	General	205
22.1.4.1	General format of the sending operations	205
22.1.4.2	General format of the receiving operations	206
22.2	Message-based communication.....	207
22.2.0	General.....	207
22.2.1	The Send operation	207
22.2.2	The Receive operation	208
22.2.3	The Trigger operation	212
22.3	Procedure-based communication.....	215
22.3.0	General.....	215
22.3.1	The Call operation	215
22.3.2	The Getcall operation.....	219
22.3.3	The Reply operation.....	222
22.3.4	The Getreply operation	223
22.3.5	The Raise operation	226
22.3.6	The Catch operation.....	227
22.4	The Check operation	230
22.5	Controlling communication ports.....	233
22.5.0	General.....	233
22.5.1	The Clear port operation.....	233
22.5.2	The Start port operation	233
22.5.3	The Stop port operation	234
22.5.4	The Halt port operation.....	234
22.5.5	The Checkstate port operation.....	235
22.6	Use of any and all with ports.....	236
23	Timer operations	237
23.0	General	237
23.1	The timer mechanism	237
23.2	The Start timer operation.....	237
23.3	The Stop timer operation.....	238
23.4	The Read timer operation	239
23.5	The Running timer operation.....	239
23.6	The Timeout operation	240
23.7	Summary of use of any and all with timers	241
24	Test verdict operations	241
24.0	General	241
24.1	The Verdict mechanism.....	242
24.2	The Setverdict operation	243
24.3	The Getverdict operation.....	243
25	External actions	244
26	Module control	244
26.0	General	244
26.1	The Execute statement.....	245
26.2	The Control part	247
27	Specifying attributes.....	249

27.0	General	249
27.1	The Attribute mechanism	249
27.1.0	General.....	249
27.1.1	Scope of attributes	249
27.1.2	Overwriting rules for attributes.....	250
27.1.2.0	General	250
27.1.2.1	Additional default overwriting rules for variant attributes	251
27.1.3	Changing attributes of imported language elements	252
27.2	The With statement	253
27.3	Display attributes.....	253
27.4	Encoding attributes.....	254
27.5	Variant attributes	255
27.6	Extension attributes	256
27.7	Optional attributes	257

Annex A (normative): BNF and static semantics259

A.1	TTCN-3 BNF	259
A.1.0	General.....	259
A.1.1	Conventions for the syntax description	259
A.1.2	Statement terminator symbols	259
A.1.3	Identifiers	259
A.1.4	Comments.....	259
A.1.5	TTCN-3 terminals	260
A.1.5.0	General	260
A.1.5.1	Use of whitespaces and newlines.....	262
A.1.6	TTCN-3 syntax BNF productions	262
A.1.6.0	TTCN-3 module.....	262
A.1.6.1	Module definitions part.....	262
A.1.6.1.0	General	262
A.1.6.1.1	Typedef definitions	263
A.1.6.1.2	Constant definitions	265
A.1.6.1.3	Template definitions.....	265
A.1.6.1.4	Function definitions	267
A.1.6.1.5	Signature definitions	268
A.1.6.1.6	Testcase definitions.....	268
A.1.6.1.7	Altstep definitions	268
A.1.6.1.8	Import definitions.....	268
A.1.6.1.9	Group definitions	269
A.1.6.1.10	External function definitions.....	269
A.1.6.1.11	External constant definitions.....	269
A.1.6.1.12	Module parameter definitions	269
A.1.6.1.13	Friend module definitions	269
A.1.6.2	Control part.....	270
A.1.6.3	Local definitions	270
A.1.6.3.1	Variable instantiation	270
A.1.6.3.2	Timer instantiation	270
A.1.6.4	Operations.....	270
A.1.6.4.1	Component operations	270
A.1.6.4.2	Port operations	271
A.1.6.4.3	Timer operations	273
A.1.6.4.4	Testcase operation.....	273
A.1.6.5	Type.....	273
A.1.6.6	Value.....	274
A.1.6.7	Parameterization	275
A.1.6.8	Statements.....	275
A.1.6.8.1	With statement	275
A.1.6.8.2	Behaviour statements	276
A.1.6.8.3	Basic statements.....	276
A.1.6.9	Miscellaneous productions	279

Annex B (normative): Matching values280

B.1	Template matching mechanisms	280
B.1.0	General	280
B.1.1	Matching specific values	280
B.1.2	Matching mechanisms instead of values	280
B.1.2.0	General.....	280
B.1.2.1	Template list	280
B.1.2.2	Complemented template list	281
B.1.2.3	Any value.....	282
B.1.2.4	Any value or none.....	282
B.1.2.5	Value range	283
B.1.2.6	SuperSet.....	284
B.1.2.7	SubSet	285
B.1.2.8	Omitting optional fields	286
B.1.2.9	Matching decoded content	287
B.1.2.10	Matching enumerated value with value list	288
B.1.3	Matching mechanisms inside values	289
B.1.3.0	General.....	289
B.1.3.1	Any element.....	289
B.1.3.1.0	General	289
B.1.3.1.1	Using single character wildcards.....	289
B.1.3.2	Any number of elements or no element	289
B.1.3.2.0	General	289
B.1.3.2.1	Using multiple character wildcards.....	290
B.1.3.3	Permutation.....	290
B.1.4	Matching attributes of values	291
B.1.4.0	General.....	291
B.1.4.1	Length restrictions	291
B.1.4.2	The IfPresent indicator.....	292
B.1.5	Matching character pattern	293
B.1.5.0	General.....	293
B.1.5.1	Set expression	295
B.1.5.2	Reference expression	296
B.1.5.3	Match expression n times.....	297
B.1.5.4	Match a referenced character set.....	297
B.1.5.5	Type compatibility rules for patterns	298
B.1.5.6	Case insensitive pattern matching	298

Annex C (normative): Predefined TTCN-3 functions.....300

C.0	General exception handling procedures	300
C.1	Conversion functions.....	300
C.1.1	Integer to character	300
C.1.2	Integer to universal character	300
C.1.3	Integer to bitstring	300
C.1.4	Integer to enumerated.....	301
C.1.5	Integer to hexstring.....	301
C.1.6	Integer to octetstring.....	301
C.1.7	Integer to charstring.....	302
C.1.8	Integer to float	302
C.1.9	Float to integer	302
C.1.10	Character to integer	302
C.1.11	Character to octetstring	302
C.1.12	Universal character to integer.....	303
C.1.13	Bitstring to integer.....	303
C.1.14	Bitstring to hexstring	303
C.1.15	Bitstring to octetstring	303
C.1.16	Bitstring to charstring.....	304
C.1.17	Hexstring to integer	304
C.1.18	Hexstring to bitstring	304
C.1.19	Hexstring to octetstring	305
C.1.20	Hexstring to charstring	305

C.1.21	Octetstring to integer	305
C.1.22	Octetstring to bitstring	305
C.1.23	Octetstring to hexstring	306
C.1.24	Octetstring to character string	306
C.1.25	Octetstring to character string, version II	306
C.1.26	Charstring to integer	307
C.1.27	Character string to hexstring	307
C.1.28	Character string to octetstring	307
C.1.29	Character string to float	308
C.1.30	Enumerated to integer	308
C.1.31	Octetstring to universal character string	309
C.1.32	Universal character string to octetstring	309
C.1.33	Value or template to universal charstring	310
C.2	Length/size functions	310
C.2.1	Length of strings and lists	310
C.2.2	Number of elements in a structured value	312
C.3	Presence checking functions	313
C.3.1	The IsPresent function	313
C.3.2	The IsChosen function	314
C.3.3	The IsValue function	315
C.3.4	The IsBound function	316
C.3.5	Matching mechanism detection	317
C.4	String/list handling functions	318
C.4.1	The Regexp function	318
C.4.2	The Substring function	320
C.4.3	The Replace function	321
C.5	Codec functions	321
C.5.1	The encoding function	321
C.5.2	The decoding function	322
C.5.3	The encoding to universal charstring function	322
C.5.4	The decoding from universal charstring function	323
C.5.5	Retrieving the type of string encoding	324
C.5.6	Removing BOMs of UCS encoding schemes	324
C.6	Other functions	325
C.6.1	The random number generator function	325
C.6.2	The testcasename function	325
C.6.3	The hostId function	326
Annex D (normative):	Preprocessing macros	328
D.0	General	328
D.1	Preprocessing macro __MODULE__	328
D.2	Preprocessing macro __FILE__	328
D.3	Preprocessing macro __BFILE__	328
D.4	Preprocessing macro __LINE__	328
D.5	Preprocessing macro __SCOPE__	329
Annex E (informative):	Library of Useful Types	331
E.1	Limitations	331
E.2	Useful TTCN-3 types	331
E.2.1	Useful simple basic types	331
E.2.1.0	Signed and unsigned single byte integers	331
E.2.1.1	Signed and unsigned short integers	331
E.2.1.2	Signed and unsigned long integers	331
E.2.1.3	Signed and unsigned longlong integers	332

E.2.1.4	IEEE 754™ floats	332
E.2.2	Useful character string types	332
E.2.2.0	UTF-8 character string "utf8string"	332
E.2.2.1	BMP character string "bmpstring"	333
E.2.2.2	UTF-16 character string "utf16string"	333
E.2.2.3	ISO/IEC 10646 character string "iso8859string"	333
E.2.2.4	Status values for TTCN-3 objects	333
E.2.2.5	Template kinds of TTCN-3 objects	334
E.2.3	Useful structured types	334
E.2.3.0	Fixed-point decimal literal	334
E.2.4	Useful atomic string types	335
E.2.4.1	Single Recommendation ITU-T T.50 character type	335
E.2.4.2	Single universal character type	335
E.2.4.3	Single bit type	335
E.2.4.4	Single hex type	335
E.2.4.5	Single octet type	335
Annex F (informative):	Operations on TTCN-3 active objects.....	336
F.0	General	336
F.1	Test components.....	336
F.1.1	Test component references	336
F.1.2	Dynamic behaviour of PTCs	337
F.1.3	Dynamic behaviour of the MTC.....	338
F.2	Timers.....	339
F.3	Ports.....	339
F.3.0	General	339
F.3.1	Configuration Operations	339
F.3.2	Port Controlling Operations	340
F.3.3	Communication Operations.....	341
Annex G (informative):	Deprecated language features.....	342
G.1	Group style definition of module parameters.....	342
G.2	Recursive import	342
G.3	Using all in port type definitions.....	342
G.4	sizeof for length of lists	342
G.5	sizeoftype predefined function	342
G.6	Mixed ports	342
G.7	External constants	343
G.8	Prefixing enumerated values	343
G.9	Record of/arrays not compatible to record; set of not compatible with set.....	343
G.10	The "UCS-2" predefined variant attribute string.....	343
G.11	Prefixing identifiers of local definitions with module identifiers.....	343
Annex H (informative):	Bibliography.....	344
History		345

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This final draft ETSI Standard (ES) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Testing and Test Control Notation version 3, as identified below:

Part 1: "TTCN-3 Core Language";

Part 2: "TTCN-3 Tabular presentation Format (TFT)";

NOTE: Part 2 of this multi-part deliverable is in status "historical" and is not maintained.

Part 3: "TTCN-3 Graphical presentation Format (GFT)";

Part 4: "TTCN-3 Operational Semantics";

Part 5: "TTCN-3 Runtime Interface (TRI)";

Part 6: "TTCN-3 Control Interface (TCI)";

Part 7: "Using ASN.1 with TTCN-3";

Part 8: "The IDL to TTCN-3 Mapping";

Part 9: "Using XML schema with TTCN-3";

Part 10: "TTCN-3 Documentation Comment Specification"

Part 11: "Using JSON with TTCN-3";

Part 12: "Using WSDL with TTCN-3".

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).

"must" and **"must not"** are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document defines the Core Language of TTCN-3. TTCN-3 can be used for the specification of all types of reactive system tests over a variety of communication ports. Typical areas of application are protocol testing (including mobile and Internet protocols), service testing (including supplementary services), module testing, testing of CORBA[®] based platforms, APIs, etc. TTCN-3 is not restricted to conformance testing and can be used for many other kinds of testing including interoperability, robustness, regression, system and integration testing. The specification of test suites for physical layer protocols is outside the scope of the present document.

TTCN-3 is intended to be used for the specification of test suites which are independent of test methods, layers and protocols. In addition to the textual format defined in the present document, while GFT (ETSI ES 201 873-3 [i.2]) defines a graphical presentation format for TTCN-3. The specification of these formats is outside the scope of the present document.

While the design of TTCN-3 has taken the eventual implementation of TTCN-3 translators and compilers into consideration the means of realization of Executable Test Suites (ETS) from Abstract Test Suites (ATS) is outside the scope of 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

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

- [1] ETSI ES 201 873-4: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 4: TTCN-3 Operational Semantics".
- [2] ISO/IEC 10646 (2014): "Information technology -- Universal Coded Character Set (UCS)".
- [3] Recommendation ITU-T X.292: "OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications - The Tree and Tabular Combined Notation (TTCN)".

NOTE: The corresponding ISO/IEC standard is ISO/IEC 9646-3: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 3: The Tree and Tabular Combined Notation (TTCN)".

- [4] Recommendation ITU-T T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange".

NOTE: The corresponding ISO/IEC standard is ISO/IEC 646: "Information technology -- ISO 7-bit coded character set for information interchange".

- [5] Recommendation ITU-T X.290: "OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications - General concepts".

NOTE: The corresponding ISO/IEC standard is ISO/IEC 9646-1: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework; Part 1: General concepts".

- [6] IEEE 754™: "IEEE Standard for Floating-Point Arithmetic".