

ISO/IEC 8825-3:2015-11 (E)

Information technology - ASN.1 encoding rules: Specification of Encoding Control Notation (ECN)

CONTENTS

	<i>Page</i>
Introduction	x
Information technology – ASN.1 encoding rules: Specification of Encoding Control Notation (ECN)	1
1 Scope	1
2 Normative references.....	1
2.1 Identical Recommendations International Standards	1
2.2 Additional references	2
3 Definitions	2
3.1 ASN.1 definitions.....	2
3.2 ECN-specific definitions	2
4 Abbreviations	5
5 Definition of ECN syntax	5
6 Encoding conventions and notation	5
7 The ECN character set.....	5
8 ECN lexical items.....	6
8.1 Encoding object references	6
8.2 Encoding object set references	6
8.3 Encoding class references	7
8.4 Reserved word items	7
8.5 Reserved encoding class name items	7
8.6 Non-ECN item	7
9 ECN Concepts	8
9.1 Encoding Control Notation (ECN) specifications	8
9.2 Encoding classes	8
9.3 Encoding structures	9
9.4 Encoding objects	9
9.5 Encoding object sets.....	9
9.6 Defining new encoding classes	10
9.7 Defining encoding objects.....	11
9.8 Differential encoding-decoding.....	11
9.9 Encoders options in encodings.....	12
9.10 Properties of encoding objects	12
9.11 Parameterization.....	12
9.12 Governors.....	13
9.13 General aspects of encodings	13
9.14 Identification of information elements	14
9.15 Reference fields and determinants	14
9.16 Replacement classes and structures.....	14
9.17 Mapping abstract values onto fields of encoding structures.....	15
9.18 Transforms and transform composites	16
9.19 Contents of Encoding Definition Modules.....	16
9.20 Contents of the Encoding Link Module	17

9.21	Defining encodings for primitive encoding classes.....	17
9.22	Application of encodings	19
9.23	Combined encoding object set	19
9.24	Application point.....	19
9.25	Conditional encodings.....	20
9.26	Other conditions for applying encodings	20
9.27	Encoding control for the open type	21
9.28	Changes to ASN.1 Recommendations International Standards.....	21
10	Identifying encoding classes, encoding objects, and encoding object sets	21
11	Encoding ASN.1 types	24
11.1	General	24
11.2	Built-in encoding classes used for implicitly generated encoding structures	25
11.3	Simplification and expansion of ASN.1 notation for encoding purposes.....	25
11.4	The implicitly generated encoding structure	27
12	The Encoding Link Module (ELM).....	28
12.1	Structure of the ELM.....	28
12.2	Encoding types	28
13	Application of encodings.....	29
13.1	General	29
13.2	The combined encoding object set and its application	29
14	The Encoding Definition Module (EDM)	32
15	The renames clause.....	33
15.1	Explicitly generated and exported structures.....	33
15.2	Name changes	34
15.3	Specifying the region for name changes	35
16	Encoding class assignments.....	36
16.1	General	36
16.2	Encoding structure definition	39
16.3	Alternative encoding structure	42
16.4	Repetition encoding structure.....	43
16.5	Concatenation encoding structure	43
17	Encoding object assignments.....	44
17.1	General	44
17.2	Encoding with a defined syntax	44
17.3	Encoding with encoding object sets	45
17.4	Encoding using value mappings.....	46
17.5	Encoding an encoding structure	46
17.6	Differential encoding-decoding.....	48
17.7	Encoding options.....	49
17.8	Non-ECN definition of encoding objects	50
18	Encoding object set assignments	50
18.1	General	50
18.2	Built-in encoding object sets	51
19	Mapping values	52
19.1	General	52
19.2	Mapping by explicit values	53
19.3	Mapping by matching fields.....	54
19.4	Mapping by #TRANSFORM encoding objects	55
19.5	Mapping by abstract value ordering	56
19.6	Mapping by value distribution	57
19.7	Mapping integer values to bits	58

20	Defining encoding objects using defined syntax	59
21	Types used in defined syntax specification	60
21.1	The Unit type	60
21.2	The EncodingSpaceSize type.....	60
21.3	The EncodingSpaceDetermination type.....	61
21.4	The UnusedBitsDetermination type.....	61
21.5	The OptionalityDetermination type	62
21.6	The AlternativeDetermination type	63
21.7	The RepetitionSpaceDetermination type.....	63
21.8	The Justification type	64
21.9	The Padding type	65
21.10	The Pattern and Non-Null-Pattern types	65
21.11	The RangeCondition type.....	66
21.12	The Comparison type.....	66
21.13	The SizeRangeCondition type	67
21.14	The ReversalSpecification type	67
21.15	The ResultSize type	68
21.16	The HandleValueSet type.....	68
21.17	The IntegerMapping type	69
22	Commonly used encoding property groups	69
22.1	Replacement specification.....	69
22.1.1	Encoding properties, syntax and purpose	69
22.1.2	Specification restrictions	70
22.1.3	Encoder actions	71
22.1.4	Decoder actions.....	72
22.2	Pre-alignment and padding specification	72
22.2.1	Encoding properties, syntax and purpose	72
22.2.2	Specification constraints	72
22.2.3	Encoder actions	73
22.2.4	Decoder actions.....	73
22.3	Start pointer specification.....	73
22.3.1	Encoding properties, syntax and purpose	73
22.3.2	Specification constraints	73
22.3.3	Encoder actions	73
22.3.4	Decoder actions.....	74
22.4	Encoding space specification	74
22.4.1	Encoding properties, syntax and purpose	74
22.4.2	Specification restrictions	75
22.4.3	Encoder actions	75
22.4.4	Decoder actions.....	76
22.5	Optionality determination	76
22.5.1	Encoding properties, syntax and purpose	76
22.5.2	Specification restrictions	76
22.5.3	Encoder actions	77
22.5.4	Decoder actions.....	77
22.6	Alternative determination.....	78
22.6.1	Encoding properties, syntax and purpose	78
22.6.2	Specification restrictions	78
22.6.3	Encoder actions	79
22.6.4	Decoder actions.....	79
22.7	Repetition space specification	79
22.7.1	Encoding properties, syntax and purpose	79
22.7.2	Specification constraints	80
22.7.3	Encoder actions	81
22.7.4	Decoder actions.....	82
22.8	Value padding and justification.....	82
22.8.1	Encoding properties, syntax, and purpose	82
22.8.2	Specification restrictions	83
22.8.3	Encoder actions	83
22.8.4	Decoder actions.....	84

22.9	Identification handle specification	84
22.9.1	Encoding properties, syntax and purpose	84
22.9.2	Specification constraints	85
22.9.3	Encoders actions	85
22.9.4	Decoders actions	85
22.10	Concatenation specification	86
22.10.1	Encoding properties, syntax and purpose	86
22.10.2	Specification constraints	86
22.10.3	Encoder actions	86
22.10.4	Decoder actions	87
22.11	Contained type encoding specification	87
22.11.1	Encoding properties, syntax and purpose	87
22.11.2	Encoder actions	87
22.11.3	Decoder actions	87
22.12	Bit reversal specification	87
22.12.1	Encoding properties, syntax, and purpose	87
22.12.2	Specification constraints	88
22.12.3	Encoder actions	88
22.12.4	Decoder actions	88
23	Defined syntax specification for bit-field and constructor classes	88
23.1	Defining encoding objects for classes in the alternatives category	88
23.1.1	The defined syntax	88
23.1.2	Purpose and restrictions	89
23.1.3	Encoder actions	89
23.1.4	Decoder actions	90
23.2	Defining encoding objects for classes in the bitstring category	90
23.2.1	The defined syntax	90
23.2.2	Model for the encoding of classes in the bitstring category	91
23.2.3	Purpose and restrictions	91
23.2.4	Encoder actions	92
23.2.5	Decoder actions	92
23.3	Defining encoding objects for classes in the boolean category	92
23.3.1	The defined syntax	92
23.3.2	Purpose and restrictions	94
23.3.3	Encoder actions	94
23.3.4	Decoder actions	94
23.4	Defining encoding objects for classes in the characterstring category	95
23.4.1	The defined syntax	95
23.4.2	Model for the encoding of classes in the characterstring category	95
23.4.3	Purpose and restrictions	96
23.4.4	Encoder actions	96
23.4.5	Decoder actions	97
23.5	Defining encoding objects for classes in the concatenation category	97
23.5.1	The defined syntax	97
23.5.2	Purpose and restrictions	98
23.5.3	Encoder actions	99
23.5.4	Decoder actions	99
23.6	Defining encoding objects for classes in the integer category	99
23.6.1	The defined syntax	99
23.6.2	Purpose and restrictions	99
23.6.3	Encoder actions	100
23.6.4	Decoder actions	100
23.7	Defining encoding objects for the #CONDITIONAL-INT class	100
23.7.1	The defined syntax	100
23.7.2	Purpose and restrictions	101
23.7.3	Encoder actions	102
23.7.4	Decoder actions	103
23.8	Defining encoding objects for classes in the null category	103
23.8.1	The defined syntax	103

23.9	Defining encoding objects for classes in the octetstring category	105
23.9.1	The defined syntax	105
23.9.2	Model for the encoding of classes in the octetstring category	106
23.9.3	Purpose and restrictions	106
23.9.4	Encoder actions	107
23.9.5	Decoder actions	107
23.10	Defining encoding objects for classes in the open type category	108
23.10.1	The defined syntax	108
23.10.2	Model for the encoding of classes in the open type category	109
23.10.3	Purpose and restrictions	109
23.10.4	Encoder actions	109
23.10.5	Decoder actions	110
23.11	Defining encoding objects for classes in the optionality category	110
23.11.1	The defined syntax	110
23.11.2	Purpose and restrictions	111
23.11.3	Encoder actions	111
23.11.4	Decoder actions	111
23.12	Defining encoding objects for classes in the pad category	111
23.12.1	The defined syntax	111
23.12.2	Purpose and restrictions	112
23.12.3	Encoder actions	113
23.12.4	Decoder actions	113
23.13	Defining encoding objects for classes in the repetition category	113
23.13.1	The defined syntax	113
23.13.2	Purpose and restrictions	113
23.13.3	Encoder actions	114
23.13.4	Decoder actions	114
23.14	Defining encoding objects for the #CONDITIONAL-REPETITION class	114
23.14.1	The defined syntax	114
23.14.2	Purpose and restrictions	115
23.14.3	Encoder actions	116
23.14.4	Decoder actions	116
23.15	Defining encoding objects for classes in the tag category	117
23.15.1	The defined syntax	117
23.15.2	Purpose and restrictions	118
23.15.3	Encoder actions	118
23.15.4	Decoder actions	119
23.16	Defining encoding objects for classes in the other categories	119
24	Defined syntax specification for the #TRANSFORM encoding class	119
24.1	Summary of encoding properties and defined syntax	119
24.2	Source and target of transforms	121
24.3	The int-to-int transform	122
24.4	The bool-to-bool transform	123
24.5	The bool-to-int transform	124
24.6	The int-to-bool transform	124
24.7	The int-to-chars transform	124
24.8	The int-to-bits transform	125
24.9	The bits-to-int transform	126
24.10	The char-to-bits transform	127
24.11	The bits-to-char transform	129
24.12	The bit-to-bits transform	129
24.13	The bits-to-bits transform	130
24.14	The chars-to-composite-char transform	130
24.15	The bits-to-composite-bits transform	131
24.16	The octets-to-composite-bits transform	131
24.17	The composite-char-to-chars transform	131
24.18	The composite-bits-to-bits transform	131
24.19	The composite-bits-to-octets transform	132

25	Complete encodings and the #OUTER class	132
25.1	Encoding properties, syntax and purpose for the #OUTER class.....	132
25.2	Encoder actions for #OUTER	133
25.3	Decoder actions for #OUTER	133
Annex A	Addendum to Rec. ITU-T X.680 ISO/IEC 8824-1.....	135
A.1	Exports and imports clauses	135
A.2	Addition of REFERENCE	136
A.3	Notation for character string values	136
Annex B	Addendum to Rec. ITU-T X.681 ISO/IEC 8824-2.....	137
B.1	Definitions.....	137
B.2	Additional lexical items	137
B.2.1	Ordered value list field references.....	137
B.2.2	Ordered encoding object list field references	137
B.2.3	Encoding class field references	137
B.3	Addition of "ENCODING-CLASS".....	137
B.4	FieldSpec additions	138
B.5	Fixed-type ordered value list field spec.....	138
B.6	Fixed-class encoding object field spec	138
B.7	Variable-class encoding object field spec	138
B.8	Fixed-class encoding object set field spec.....	139
B.9	Fixed-class ordered encoding object list field spec	139
B.10	Encoding class field spec	139
B.11	Ordered value list notation	140
B.12	Ordered encoding object list notation.....	140
B.13	Primitive field names	140
B.14	Additional reserved words	140
B.15	Definition of encoding objects	141
B.16	Additions to "Setting"	141
Annex C	Addendum to Rec. ITU-T X.683 ISO/IEC 8824-4.....	143
D.1	General examples	146
D.1.1	An encoding object for a boolean type.....	146
D.1.2	An encoding object for an integer type	147
D.1.3	Another encoding object for an integer type	147
D.1.4	An encoding object for an integer type with holes.....	147
D.1.5	A more complex encoding object for an integer type	148
D.1.6	Positive integers encoded in BCD.....	148
D.1.7	An encoding object of class #BITS.....	149
D.1.8	An encoding object for an octetstring type.....	150
D.1.9	An encoding object for a character string type.....	150
D.1.10	Mapping character values to bit values	150
D.1.11	An encoding object for a sequence type.....	151
D.1.12	An encoding object for a choice type.....	151
D.1.13	Encoding a bitstring containing another encoding	152
D.1.14	An encoding object set	152
D.1.15	ASN.1 definitions.....	153
D.1.16	EDM definitions.....	153
D.1.17	ELM definitions	154

D.2	Specialization examples	154
D.2.1	Encoding by distributing values to an alternative encoding structure	154
D.2.2	Encoding by mapping ordered abstract values to an alternative encoding structure	155
D.2.3	Compression of non-continuous value ranges	155
D.2.4	Compression of non-continuous value ranges using a transform	156
D.2.5	Compression of an unevenly distributed value set by mapping ordered abstract values	156
D.2.6	Presence of an optional component depending on the value of another component	156
D.2.7	The presence of an optional component depends on some external condition	157
D.2.8	A variable length list	157
D.2.9	Equal length lists	158
D.2.10	Uneven choice alternative probabilities	159
D.2.11	A version 1 message	160
D.2.12	The encoding object set	161
D.2.13	ASN.1 definitions	161
D.2.14	EDM definitions	162
D.2.15	ELM definitions	162
D.3	Explicitly generated structure examples	162
D.3.1	Sequence with optional components defined by a pointer	163
D.3.2	Addition of a boolean type as a presence determinant	163
D.3.3	Sequence with optional components identified by a unique tag and delimited by a length field	165
D.3.4	Sequence-of type with a count	166
D.3.5	Encoding object sets	166
D.3.6	ASN.1 definitions	167
D.3.7	EDM definitions	167
D.3.8	ELM definitions	167
D.4	A more-bit encoding example	168
D.4.1	Description of the problem	168
D.4.2	Use of ASN.1 to provide the more-bit determinant	168
D.4.3	Use of value mappings to provide the more-bit determinant	169
D.4.4	Use of the replacement mechanism to provide the more-bit determinant	170
D.5	Legacy protocol specified with tabular notation	170
D.5.1	Introduction	170
D.5.2	Encoding definition for the top-level message structure	172
D.5.3	Encoding definition for a message structure	172
D.5.4	Encoding for the sequence type "B"	173
D.5.5	Encoding for an octet-aligned sequence-of type with a length determinant	173
D.5.6	Encoding for an octet-aligned sequence-of type which continues to the end of the PDU	173
D.5.7	EDM definitions	173
D.5.8	ELM definitions	174
Annex E	Support for Huffman encodings	175
Annex F	Additional information on the Encoding Control Notation (ECN)	177
Annex G	Summary of the ECN notation	178