INTERNATIONAL STANDARD

ISO/IEC 8825-2

First edition
2002-12-15

AMENDMENT 2
2007-04-01

Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) —

AMENDMENT 2: Time type support

Technologies de l'information — Règles de codage ASN.1: Spécification des règles de codage compact (PER) —

AMENDEMENT 2: Support de type temps

Reference number
ISO/IEC 8825-2:2002/Amd.2:2007(E)

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Published in Switzerland

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Amendment 2 to ISO/IEC 8825-2:2002 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems,* in collaboration with ITU-T. The identical text is published as ITU-T Rec. X.691:2002/Amd.2.

INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)

Amendment 2

Time type support

1) Contents

Update the Contents as follows:

2) New clause 9.3.11 *bis*

Insert clause 9.3.11 bis after clause 9.3.11:

9.3.11 *bis* Property setting constraints on the time type (or on the useful and defined time types) which are not extensible after the application of ITU-T Rec. X.680 | ISO/IEC 8824-1, 48.3 to 48.5, are PER-visible. Property setting constraints which are extensible are not PER-visible.

3) New clause 28 *bis*

Insert clause 28 bis before clause 29:

28 *bis* Encoding the time type, the useful time types, the defined time types and the additional time types

28 *bis*.1 General

28 *bis*.1.1 The encoding of the useful time types, the defined time types and the additional time types shall be determined by the property settings of the abstract values of these types. Property settings for the abstract values of the useful and defined time types are specified in ITU-T Rec. X.680 | ISO/IEC 8824-1, 34 *bis*.4 and Annex A *bis*, respectively. Property settings for the abstract values of additional time types are determined by the property settings of the parent type, restricted by any PER-visible constraints that apply (see 9.3.11 *bis*).

28 *bis*.1.2 If all the abstract values of the type to be encoded have one of the property settings listed in a row of column 2 of Table 2, then that type shall be encoded as if the type with its constraints (if any) had been replaced by the type specified in the corresponding row of column 3 of Table 2. Otherwise, it shall be encoded as specified in 28 *bis*.11.

NOTE – If a time property (for example **Midnight**) is not listed in Table 2 for a particular row, there is no constraint on its setting.

28 *bis*.1.3 For rows 24 to 32 to be applicable, all abstract values of the type are required to have the same value of ***n*** in **Fn**.

28 *bis*.1.4 The types specified in column 3 of Table 2 are defined (using the ASN.1 notation) in 28 *bis*.2 to 28 *bis*.10, and are assumed to be defined in an environment of **AUTOMATIC TAGS**.

NOTE 1 – The use of these type reference names in the specification of PER encodings does not make them available for use by an application designer in an ASN.1 specification, nor are they reserved words in such a specification. However, with the removal of **-ENCODING**, they correspond to the names of the useful time types or defined time types specified in ITU-T Rec. X.680 | ISO/IEC 8824-1, 34 *bis*.4 and Annex A *bis*.

NOTE 2 – All the useful and defined time types satisfy the conditions for one of the rows of Table 2, and hence have optimized encodings. Additional time types may satisfy the conditions for one of the rows, but are otherwise encoded as specified in 28 *bis*.11. The unconstrained **TIME** type is always encoded as specified in 28 *bis*.11.

Table 2 – Encoding of a time subtype with all abstract values having specified property settings

Row number	Property settings	ASN.1 type to be encoded
1	**"Basic=Date Date=C Year=Basic"** or **"Basic=Date Date=C Year=Proleptic"**	**CENTURY-ENCODING** (see 28 *bis*.2.1)
2	**"Basic=Date Date=C Year=Negative"** or **"Basic=Date Date=C Year=Ln"** (for any *n*)	**ANY-CENTURY-ENCODING** (see 28 *bis*.2.2)
3	**"Basic=Date Date=Y Year=Basic"** or **"Basic=Date Date=Y Year=Proleptic"**	**YEAR-ENCODING** (see 28 *bis*.2.3)
4	**"Basic=Date Date=Y Year=Negative"** or **"Basic=Date Date=Y Year=Ln"** (for any *n*)	**ANY-YEAR-ENCODING** (see 28 *bis*.2.4)
5	**"Basic=Date Date=YM Year=Basic"** or **"Basic=Date Date=YM Year=Proleptic"**	**YEAR-MONTH-ENCODING** (see 28 *bis*.2.5)
6	**"Basic=Date Date=YM Year=Negative"** or **"Basic=Date Date=YM Year=Ln"** (for any *n*)	**ANY-YEAR-MONTH-ENCODING** (see 28 *bis*.2.6)
7	**"Basic=Date Date=YMD Year=Basic"** or **"Basic=Date Date=YMD Year=Proleptic"**	**DATE-ENCODING** (see 28 *bis*.2.7)
8	**"Basic=Date Date=YMD Year=Negative"** or **"Basic=Date Date=YMD Year=Ln"** (for any *n*)	**ANY-DATE-ENCODING** (see 28 *bis*.2.8)

Table 2 – Encoding of a time subtype with all abstract values having specified property settings

Row number	Property settings	ASN.1 type to be encoded
9	**"Basic=Date Date=YD Year=Basic"** or **"Basic=Date Date=YD Year=Proleptic"**	**YEAR-DAY-ENCODING** (see 28 *bis*.2.9)
10	**"Basic=Date Date=YD Year=Negative"** or **"Basic=Date Date=YD Year=Ln"** (for any *n*)	**ANY-YEAR-DAY-ENCODING** (see 28 *bis*.2.10)
11	**"Basic=Date Date=YW Year=Basic"** or **"Basic=Date Date=YW Year=Proleptic"**	**YEAR-WEEK-ENCODING** (see 28 *bis*.2.11)
12	**"Basic=Date Date=YW Year=Negative"** or **"Basic=Date Date=YW Year=Ln"** (for any *n*)	**ANY-YEAR-WEEK-ENCODING** (see 28 *bis*.2.12)
13	**"Basic=Date Date=YWD Year=Basic"** or **"Basic=Date Date=YWD Year=Proleptic"**	**YEAR-WEEK-DAY-ENCODING** (see 28 *bis*.2.13)
14	**"Basic=Date Date=YWD Year=Negative"** or **"Basic=Date Date=YWD Year=Ln"** (for any *n*)	**ANY-YEAR-WEEK-DAY-ENCODING** (see 28 *bis*.2.14)
15	**"Basic=Time Time=H Local-or-UTC=L"**	**HOURS-ENCODING** (see 28 *bis*.3.1)
16	**"Basic=Time Time=H Local-or-UTC=Z"**	**HOURS-UTC-ENCODING** (see 28 *bis*.3.2)
17	**"Basic=Time Time=H Local-or-UTC=LD"**	**HOURS-AND-DIFF-ENCODING** (see 28 *bis*.3.3)
18	**"Basic=Time Time=HM Local-or-UTC=L"**	**MINUTES-ENCODING** (see 28 *bis*.3.4)
19	**"Basic=Time Time=HM Local-or-UTC=Z"**	**MINUTES-UTC-ENCODING** (see 28 *bis*.3.5)
20	**"Basic=Time Time=HM Local-or-UTC=LD"**	**MINUTES-AND-DIFF-ENCODING** (see 28 *bis*.3.6)
21	**"Basic=Time Time=HMS Local-or-UTC=L"**	**TIME-OF-DAY-ENCODING** (see 28 *bis*.3.7)
22	**"Basic=Time Time=HMS Local-or-UTC=Z"**	**TIME-OF-DAY-UTC-ENCODING** (see 28 *bis*.3.8)
23	**"Basic=Time Time=HMS Local-or-UTC=LD"**	**TIME-OF-DAY-AND-DIFF-ENCODING** (see 28 *bis*.3.9)
24	**"Basic=Time Time=HFn Local-or-UTC=L"** (but see 28 *bis*.1.3)	**HOURS-AND-FRACTION-ENCODING** (see 28 *bis*.3.10)
25	**"Basic=Time Time=HFn Local-or-UTC=Z"** (but see 28 *bis*.1.3)	**HOURS-UTC-AND-FRACTION-ENCODING** (see 28 *bis*.3.11)
26	**"Basic=Time Time=HFn Local-or-UTC=LD"** (but see 28 *bis*.1.3)	**HOURS-AND-DIFF-AND-FRACTION-ENCODING** (see 28 *bis*.3.12)
27	**"Basic=Time Time=HMFn Local-or-UTC=L"** (but see 28 *bis*.1.3)	**MINUTES-AND-FRACTION-ENCODING** (see 28 *bis*.3.13)
28	**"Basic=Time Time=HMFn Local-or-UTC=Z"** (but see 28 *bis*.1.3)	**MINUTES-UTC-AND-FRACTION-ENCODING** (see 28 *bis*.3.14)
29	**"Basic=Time Time=HMFn Local-or-UTC=LD"** (but see 28 *bis*.1.3)	**MINUTES-AND-DIFF-AND-FRACTION-ENCODING** (see 28 *bis*.3.15)
30	**"Basic=Time Time=HMSFn Local-or-UTC=L"** (but see 28 *bis*.1.3)	**TIME-OF-DAY-AND-FRACTION-ENCODING** (see 28 *bis*.3.16)

Table 2 – Encoding of a time subtype with all abstract values having specified property settings

Row number	Property settings	ASN.1 type to be encoded
31	**"Basic=Time Time=HMSFn Local-or-UTC=Z"** (but see 28 *bis*.1.3)	**TIME-OF-DAY-UTC-AND-FRACTION-ENCODING** (see 28 *bis*.3.17)
32	**"Basic=Time Time=HMSFn Local-or-UTC=LD"** (but see 28 *bis*.1.3)	**TIME-OF-DAY-AND-DIFF-AND-FRACTION-ENCODING** (see 28 *bis*.3.18)
33	**"Basic=Date-Time"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of the rows 15 to 32 for **"Basic=Time"**.	**DATE-TIME-ENCODING {Date-Type, Time-Type}** (instantiated as specified in 28 *bis*.4.1)
34	**"Basic=Interval Interval-type=SE SE-point=Date"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"**.	**START-END-DATE-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.5.1)
35	**"Basic=Interval Interval-type=SE SE-point=Time"** All abstract values are required to have the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**START-END-TIME-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.5.2)
36	**"Basic=Interval Interval-type=SE SE-point=Date-Time"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for "Basic=Date" together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**START-END-DATE-TIME-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.5.3)
37	**"Basic=Interval Interval-type=D"**	**DURATION-INTERVAL-ENCODING** (see 28 *bis*.6.1)
38	**"Basic=Interval Interval-type=SD SE-point=Date"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"**.	**START-DATE-DURATION-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.7.1)
39	**"Basic=Interval Interval-type=SD SE-point=Time"** All abstract values are required to have the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**START-TIME-DURATION-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.7.2)
40	**"Basic=Interval Interval-type=SD SE-point=Date-Time"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**START-DATE-TIME-DURATION-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.7.3)
41	**"Basic=Interval Interval-type=DE SE-point=Date"** All abstract values are required to have the same additional properties specified in one of rows 1 to 14 for **"Basic=Date"**.	**DURATION-END-DATE-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.7.4)

Table 2 – Encoding of a time subtype with all abstract values having specified property settings

Row number	Property settings	ASN.1 type to be encoded
42	**"Basic=Interval Interval-type=DE SE-point=Time"** All abstract values are required to have the same additional properties specified in one of rows 15 to 32 for **"Basic=Time"**.	**DURATION-END-TIME-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.7.5)
43	**"Basic=Interval Interval-type=DE SE-point=Date-Time"** All abstract values are required to have the same additional properties specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**DURATION-END-DATE-TIME-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.7.6)
44	**"Basic=Rec-Interval Interval-type=SE SE-point=Date"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"**.	**REC-START-END-DATE-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.8.1)
45	**"Basic=Rec-Interval Interval-type=SE SE-point=Time"** All abstract values are required to have the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-START-END-TIME-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.8.2)
46	**"Basic=Rec-Interval Interval-type=SE SE-point=Date-Time"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-START-END-DATE-TIME-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.8.3)
47	**"Basic=Rec-Interval Interval-type=D"**	**REC-DURATION-INTERVAL-ENCODING** (see 28 *bis*.9.1)
48	**"Basic=Rec-Interval Interval-type=SD SE-point=Date"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"**.	**REC-START-DATE-DURATION-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.10.1)
49	**"Basic=Rec-Interval Interval-type=SD SE-point=Time"** All abstract values are required to have the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-START-TIME-DURATION-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.10.2)
50	**"Basic=Rec-Interval Interval-type=SD SE-point=Date-Time"** All abstract values are required to have the same additional property settings specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-START-DATE-TIME-DURATION-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.10.3)
51	**"Basic=Rec-Interval Interval-type=DE SE-point=Date"** All abstract values are required to have the same additional properties specified in one of rows 1 to 14 for **"Basic=Date"**.	**REC-DURATION-END-DATE-INTERVAL-ENCODING {Date-Type}** (see 28 *bis*.10.4)

Table 2 – Encoding of a time subtype with all abstract values having specified property settings

Row number	Property settings	ASN.1 type to be encoded
52	**"Basic=Rec-Interval Interval-type=DE SE-point=Time"** All abstract values are required to have the same additional properties specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-DURATION-END-TIME-INTERVAL-ENCODING {Time-Type}** (see 28 *bis*.10.5)
53	**"Basic=Rec-Interval Interval-type=DE SE-point=Date-Time"** All abstract values are required to have the same additional properties specified in one of rows 1 to 14 for **"Basic=Date"** together with the same additional property settings specified in one of rows 15 to 32 for **"Basic=Time"**.	**REC-DURATION-END-DATE-TIME-INTERVAL-ENCODING {Date-Type, Time-Type}** (see 28 *bis*.10.6)

28 *bis*.2 Encoding subtypes with the "Basic=Date" property setting

This subclause defines the ASN.1 types referenced in Table 2, column 3 for types where all the abstract values of the type have the **"Basic=Date"** property setting.

28 *bis*.2.1 The **CENTURY-ENCODING** type is:

```
CENTURY-ENCODING ::= INTEGER(0..99) -- 7 bits
```

with the integer value set to the value specified by the first two digits of the year component of the abstract value.

28 *bis*.2.2 The **ANY-CENTURY-ENCODING** type is:

```
ANY-CENTURY-ENCODING ::= INTEGER(MIN..MAX)
```

with the integer value set to the value specified by the year component of the abstract value, ignoring the last two digits.

28 *bis*.2.3 The **YEAR-ENCODING** type is:

```
YEAR-ENCODING ::= CHOICE { -- 2 bits for choice determinant
     immediate       INTEGER (2005..2020),  -- 4 bits
     near-future     INTEGER (2021..2276),  -- 8 bits
     near-past       INTEGER (1749..2004),  -- 8 bits
     remainder       INTEGER (MIN..1748 | 2277..MAX)}
```

with the integer value set to the year component of the abstract value.

NOTE – This has been optimized to provide a 6-bit or a 10-bit encoding in common cases.

28 *bis*.2.4 The **ANY-YEAR-ENCODING** type is:

```
ANY-YEAR-ENCODING ::= INTEGER(MIN..MAX)
```

with the integer value set to the year component of the abstract value.

28 *bis*.2.5 The **YEAR-MONTH-ENCODING** type is:

```
YEAR-MONTH-ENCODING ::= SEQUENCE {
     year            YEAR-ENCODING,
     month           INTEGER (1..12) -- 4 bits -- }
```

with the **YEAR-ENCODING** set according to 28 *bis*.2.3 and the **month** integer value set to the month component of the abstract value.

NOTE – This has been optimized to provide a 10-bit or a 14-bit encoding in common cases.

28 *bis*.2.6 The **ANY-YEAR-MONTH-ENCODING** type is:

```
ANY-YEAR-MONTH-ENCODING ::= SEQUENCE {
     year            ANY-YEAR-ENCODING,
     month           INTEGER (1..12) }
```

with the **ANY-YEAR-ENCODING** set according to 28 *bis*.2.4 and the **month** integer value set to the month component of the abstract value.

28 *bis*.2.7 The **DATE-ENCODING** type is:

```
DATE-ENCODING ::= SEQUENCE {
     year            YEAR-ENCODING,
     month           INTEGER (1..12), -- 4 bits
     day             INTEGER (1..31) -- 5 bits -- }
```

with the **YEAR-ENCODING** set according to 28 *bis*.2.3, the **month** integer value set to the month component of the abstract value and the **day** integer value set to the day component of the abstract value.

NOTE – This has been optimized to provide a 15-bit or a 19-bit encoding in common cases.

28 *bis*.2.8 The **ANY-DATE-ENCODING** type is:

```
ANY-DATE-ENCODING ::= SEQUENCE {
     year            ANY-YEAR-ENCODING,
     month           INTEGER (1..12),
     day             INTEGER (1..31)}
```

with the **ANY-YEAR-ENCODING** set according to 28 *bis*.2.4, the **month** integer value set to the month component of the abstract value and the **day** integer value set to the day component of the abstract value.

28 *bis*.2.9 The **YEAR-DAY-ENCODING** type is:

```
YEAR-DAY-ENCODING ::= SEQUENCE {
     year            YEAR-ENCODING,
     day             INTEGER (1..366)}
```

with the **YEAR-ENCODING** set according to 28 *bis*.2.3 and the **day** integer value set to the day component of the abstract value.

28 *bis*.2.10 The **ANY-YEAR-DAY-ENCODING** type is:

```
ANY-YEAR-DAY-ENCODING ::= SEQUENCE {
     year            ANY-YEAR-ENCODING,
     day             INTEGER (1..366)}
```


with the **ANY-YEAR-ENCODING** set according to 28 *bis*.2.4 and the **day** integer value set to the day component of the abstract value.

28 *bis*.2.11 The **YEAR-WEEK-ENCODING** type is:


```
YEAR-WEEK-ENCODING ::= SEQUENCE {
     year            YEAR-ENCODING,
     week            INTEGER (1..53) -- 6 bits --}
```

with the **YEAR-ENCODING** set according to 28 *bis*.2.3 and the **week** integer value set to the week component of the abstract value.

NOTE – This has been optimized to provide a 12-bit or a 16-bit encoding in common cases.

28 *bis*.2.12 The **ANY-YEAR-WEEK-ENCODING** type is:

```
ANY-YEAR-WEEK-ENCODING ::= SEQUENCE {
     year            ANY-YEAR-ENCODING,
     week            INTEGER (1..53)}
```

with the **ANY-YEAR-ENCODING** set according to 28 *bis*.2.4 and the **week** integer value set to the week component of the abstract value.

28 *bis*.2.13 The **YEAR-WEEK-DAY-ENCODING** type is:

```
YEAR-WEEK-DAY-ENCODING ::= SEQUENCE {
     year            YEAR-ENCODING,
     week            INTEGER (1..53), -- 6 bits
     day             INTEGER (1..7) -- 3 bits -- }
```

with the **YEAR-ENCODING** set according to 28 *bis*.2.3, the **week** integer value set to the week component of the abstract value and the **day** integer value set to the day component of the abstract value.

NOTE – This has been optimized to provide a 15-bit or a 19-bit encoding in common cases.